

TOWNSHIP OF HURON-KINLOSS

# 2020 ANNUAL MONITORING REPORT KINLOSS LANDFILL SITE

JUNE 2021





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TOWNSHIP OF HURON-KINLOSS

PROJECT NO.: 101-16945-00  
DATE: JUNE 2021

WSP  
SUITE 101  
1450, 1ST AVENUE WEST  
OWEN SOUND, ON, CANADA N4K 6W2

T: +1 519 376-7612  
F: +1 519 376-8008  
WSP.COM



June 14, 2021

TOWNSHIP OF HURON-KINLOSS  
PO Box 130  
21 Queen Street  
RIPLEY, ON  
N0G 2R0

**Attention: Mr. John Yungblut, CET, Director of Public Works**

Dear Mr. Yungblut:

**Subject: Kinloss Landfill Site, Township of Huron-Kinloss  
2020 Annual Monitoring Report**

Please find enclosed a copy of the report entitled, "2020 Annual Monitoring Report - Kinloss Landfill Site, Township of Huron-Kinloss", dated June 2021.

If you have any questions, please contact me at this office.

Yours truly,

A handwritten signature in black ink, appearing to read 'ST' or similar initials, followed by a flourish.

Stephen Taziar, P.Eng., DCE  
Senior Project Engineer

KMT/ST/kmt/dlw

Encl.

cc: Mr. Ian Mitchell, District Engineer, Ministry of the Environment, Conservation and Parks (MECP), Owen Sound (2 copies)

WSP ref.: 101-16945-00

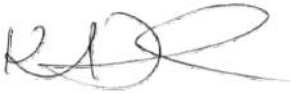
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OWEN SOUND, ON, CANADA N4K 6W2

T: +1 519 376-7612  
F: +1 519 376-8008  
wsp.com

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# SIGNATURES

## PREPARED BY



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**Kaurel Tamasauskas**  
**Environmental Technologist**

## REVIEWED BY



---

**Stephen Taziar, P.Eng., DCE**  
**Senior Project Engineer**

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Conditions can only be extrapolated to an undefined limited area around these testing and sampling locations. The conditions that WSP interprets to exist between testing and sampling points may differ from those that actually exist. The accuracy of any extrapolation and interpretation beyond the sampling locations will depend on natural conditions, the history of Site development and changes through construction and other activities. In addition, analysis has been carried out for the identified chemical and physical parameters only, and it should not be inferred that other chemical species or physical conditions are not present. WSP cannot warrant against undiscovered environmental liabilities or adverse impacts off-Site.



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# 1 INTRODUCTION

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## 1.1 BACKGROUND

The Kinloss Site is located on the north half of Part Lot 16, Concession 6 in the former Township of Kinloss in the amalgamated Township of Huron-Kinloss (Township). Refer to **Map 1** for the regional location of the site.

The landfill site is 6.0 hectares in area, all of which is approved by the Certificate of Approval. The primary landfilling area is 3.9 hectares in area and is located within the approved area. The Township also owns a 3.0 hectare parcel of land immediately south of the landfill site and holds a 99 year lease on a 12.3 hectare property abutting the eastern property of the landfill site. The respective locations of the aforementioned properties are presented in **Map 2**, Existing Conditions.

The landfill operates in accordance with Certificate of Approval No. A272801 issued on October 1, 1980, amended in February 1993 and February 1996. The Kinloss Site remains temporarily closed, until closure of the Huron Landfill. The Certificate of Approval and amendments are enclosed in **Appendix A**.

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## 1.2 PURPOSE

The purpose of this report is to provide an annual report regarding the operation and monitoring of the landfill. Annual Monitoring Reports are a required condition of the Certificate of Approval (**Appendix A**).



## 2 SITE OPERATIONS

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### 2.1 SITE USAGE

The Kinloss Landfill continues to accept recyclable materials from the former Village of Lucknow and Township of Kinloss. The acceptance of household waste was discontinued on August 1, 2002. Household waste from the Township of Kinloss is landfilled at the Huron Landfill. The Huron Landfill (Certificate of Approval No. A272601) is owned and operated by the Township of Huron-Kinloss. The ability to accept waste from the former Township of Kinloss and former Village of Lucknow at the Huron Landfill was approved by the Ministry of the Environment, Conservation and Parks (MECP) in 2010.

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### 2.2 SITE ACCESS

The Kinloss Landfill Site is open to residents during the months of April to October for the acceptance of recyclables, scrap metal, tires, burnables and brush. The operating hours during these months are on Saturdays from 10:00 a.m. to 2:00 p.m. The site is closed from November to the first Saturday in April.

The access road is gravel and well maintained by the Township. Access to the site is controlled by a lockable steel cable between a rigid steel frame. Fencing is in place around the entire perimeter of the site.

Signage at the front gate identifies who may use the site, hours of operation, Certificate of Approval number, acceptable waste types and emergency contact information. The existing topography and vegetation provide screening.

Township staff indicated no complaints regarding the operation of the Kinloss Landfill were received in 2020.

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### 2.3 SITE LIFE

The acceptance of household waste at the Kinloss Landfill was discontinued in August, 2002, the site continues to receive recyclable and burnable materials from residents of the former Township of Kinloss and the Village of Lucknow.

Based on information from the 2006 Annual Monitoring Report (R.J. Burnside & Associates Ltd.) the estimated remaining capacity of the site is 137,000 m<sup>3</sup>. This estimation is based on a site survey completed in August 2003, but this estimation was based on a cross-sectional survey of the waste surface only, followed by end-method volumetric calculations. It should be noted that calculations and projections are subject to change as circumstances change. It is recommended that once landfilling commences again, annual topographic surveys be completed to assess the progression of the landfilling operations. Data collected from these surveys, coupled with computer modelling, will allow for more accurate determination of annual landfilled volumes and remaining site life.

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### 2.4 BURNING OPERATIONS

Burning operations are conducted at the site. In accordance with MECP Guideline C-7 Burning at Landfill Sites, only segregated brush, lumber and clean wood may be burned at the site. Burning operations take place in a separate area as shown in **Map 2**. Burning operations are conducted when the site is closed to the public and weather conditions are favourable. Township Staff ensure that only designated materials are in the burn pile before burning and supervise all burning operations.



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## 2.5 RECYCLING/WASTE REDUCTION

As of August 1, 2002, the Kinloss Landfill ceased acceptance of household waste. Recyclables, scrap metal, white goods, brush, tires and burnables from the former Township of Kinloss and the Village of Lucknow are still accepted. Household waste from the former Township of Kinloss is transported to the Huron Landfill via curbside pickup. Household waste from the Village of Lucknow is landfilled at the Huron Landfill as of July 2018.

Bruce Area Solid Waste Recycling (BASWR) has provided curbside waste and blue box collection for the municipality since August, 2002. Residents of the former Township of Kinloss and the Village of Lucknow can also bring their recyclables and burnables to the landfill during open hours.

All waste diversion totals for 2020 are combined for all Township landfills.

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### 2.5.1 SCRAP METAL AND TIRES

In 2020, 148.35 tonnes of scrap metal was removed from the Huron and Kinloss landfills by AOR Metals.

In 2020, the number of tires collected at the Huron and Kinloss landfills as part of the Ontario Tire Stewardship Program totalled 1,768 tires, at an approximate mass of 110.50 tonnes. 1,768 tires (110.50 tonnes) were removed from the Huron and Kinloss landfills in 2020.

It is recommended that scrap metal and tires be removed by a recycling contractor when the quantity of the segregated material justifies removal.

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### 2.5.2 RECYCLABLE MATERIALS

The service area of the Kinloss Landfill is provided with regular Blue Box pickup on a bi-weekly basis, as is the whole of the Township of Huron-Kinloss. Blue Box pickup is provided by Bruce Area Solid Waste Recycling (BASWR).

Recycling bins are also located on-site as shown in **Map 2**. Cardboard recycling as well as regular Blue Box material recycling bins are available. BASWR picks up the materials from these bins on a regular basis.

The 2020 recycling data summaries for the Township from BASWR are enclosed in **Appendix B**.

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### 2.5.3 E-WASTE AND MATTRESSES

E-waste is diverted from landfilling within the Township as well. In 2020, a total of 11.37 tonnes of E-waste was diverted. E-waste is not accepted at the Kinloss Landfill Site.

Based on information provided by Huron-Kinloss, the Township initiated a mattress diversion program in 2015, the program was discontinued after 15 weeks. Mattresses were subsequently segregated at the site and stockpiled in a sea container. The total number of mattresses shipped off site in 2020 was 505 (17.17 tonnes) for the Huron Landfill. The Kinloss Landfill Site does not accept mattresses.

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### 2.5.4 SUMMARY OF RECYCLING/WASTE REDUCTION

**Table 1** summarizes the recycling and diverted materials data for the Township (both the Kinloss and Huron Landfills are represented) over the past five years. As shown in **Table 1**, the recyclable tonnages have been relatively consistent over time. The 2020 tonnage of recyclables (476 tonnes) was up from the 2019 tonnage (430 tonnes). When all segregated materials are included, the total tonnage diverted from both Township landfills (Kinloss and Huron) is 764 tonnes in 2020. This tonnage represents a 29% diversion rate for the Township. The estimated saving in landfill space is 1,528 m<sup>3</sup>.

# 3 MONITORING

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## 3.1 CURRENT MONITORING PROGRAM

The monitoring of the groundwater and surface water at the Kinloss Landfill enables the determination of the flow direction and concentration of the landfill generated leachate plume. The monitoring program is also a requirement of the Certificate of Approval for the site. Samples are obtained twice per year (spring and fall) from the monitoring wells and surface water stations. In addition, water level elevations are obtained twice per year to confirm the groundwater flow direction. The monitoring program has been in existence since 1988. Currently, groundwater elevations are relative to a historical survey with an inferred benchmark.

The monitoring program dictates that each observation well sampled be purged prior to actual sampling to obtain the most representative groundwater sample possible. To purge a well, a volume of water equivalent to three well casing volumes is removed from the well, or purged dry and allowed to recover prior to sample collection.

Each sample obtained from an observation well is simultaneously field filtered. The sampling and filtering device utilized is the Waterra manual pumping unit equipped with a disposable high turbidity 0.45 micron in-line filter.

The monitoring well system is summarized in **Table 2**. The monitoring wells OW4 to OW11 were installed by backhoe in 1985. These wells are relatively rudimentary in construction. The remaining wells were drilled in 1997 to 2004 and are constructed of 2" diameter PVC casing and 1.5 m PVC well screens. In addition, these wells are sand filter packed around the screened area and sealed with bentonite above the well screen. In October 2014, OW14 was replaced with OW14-14. In August 2016, OW11-85 was decommissioned and replaced with OW11-16. Additionally, OW15 and OW16 were drilled in August 2016. Borehole logs detailing the construction details of the monitoring wells are enclosed in **Appendix C**. All of the wells are protected by a lockable steel casing and have dedicated Waterra sampling tubes and foot valves.

Well inspections are conducted in conjunction with semi-annual sampling in spring and fall. As shown in **Table 2**.

**Table 2**  
**Kinloss Landfill Site**  
**Monitoring Well Security**

Observation Well	Well Protection	Well Security		Condition	
		July 2020	November 2020	July 2020	November 2019
OW4	Steel Casing and Lid	Locked	Locked	Good	Good
OW5	Steel Casing and Lid	Locked	Locked	Good	Good
OW6	Steel Casing and Lid	Locked	Locked	Good	Good
OW7	Steel Casing and Lid	Locked	Locked	Good	Good
OW9	Steel Casing and Lid	Locked	Locked	N/A	N/A
OW11-16	Steel Casing and Lid	Locked	Locked	Good	Good
OW12	Steel Casing and Lid	Locked	Locked	Good	Good
OW13S	Steel Casing and Lid	Locked	Locked	Good	Good
OW13I	Steel Casing and Lid	Locked	Locked	Good	Good
OW13D	Steel Casing and Lid	Locked	Locked	Good	Good
OW14-14	Steel Casing and Lid	Locked	Locked	Good	Good
OW15	Steel Casing and Lid	Locked	Locked	Good	Good
OW16	Steel Casing and Lid	Locked	Locked	Good	Good

**Notes:**

1. OW = Observation Well, S = Shallow, I = Intermediate and D = Deep
2. Wells OW4, OW5, OW6, OW7, OW9 & OW11 were installed by backhoe in 1985. Wells OW12 and OW13S were drilled in 1997. OW14 was drilled in 2003 and OW13I & OW13D were drilled in 2004. OW14-03 was decommissioned and replaced with OW14-14 on October 28, 2014.
3. OW9 is an inactive well on the site and is not part of the sampling program.
4. OW11-85 was decommissioned and replaced with OW11-16 on August 16, 2016.
5. OW15 and OW16 were drilled on August 15, 2016.



In addition to the monitoring wells, there are two surface water stations that are sampled semi-annually. These two stations are located on the creek immediately east of the site. SW1 is the upstream sampling location and SW2 is the downstream sampling location. The locations of both surface water stations are shown in **Map 2, Existing Conditions**.

In 2006, three gas probes were installed at the site. The logs detailing the construction details of the three gas probes are enclosed in **Appendix C**. Prior to the installation of these gas probes, methane readings were obtained from the headspace of the monitoring wells. Methane monitoring was conducted in February, July and November 2020. Frozen ground conditions were encountered during the February monitoring event.

In 2020, water level elevations were measured, and wells purged and sampled, on July 3 and November 3, 2020. The samples collected during the monitoring program were transferred to coolers with ice and submitted under chain-of-custody via overnight courier to Caduceon Environmental Laboratories for analysis. The certificates of analysis and lab results are enclosed in **Appendix D**.

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## 3.2 SHALLOW GROUNDWATER CONFIGURATION

To determine the groundwater gradient and flow direction in 2020, water level measurements were obtained on July 3, 2020.

A summary of the water table elevation data from 1989 to 2020 is presented in **Table 3**. **Figure 1** is a hydrograph for the monitoring wells except OW13S, OW13I and OW13D. The results for the OW13 wells are summarized in **Figure 2**. As shown in **Table 3** and **Figures 1** and **2**, there are seasonal fluctuations shown by many of the wells. In general, groundwater elevations are higher in the spring and lower in the fall. The upgradient wells in the northwest area of the site (OW7 and OW12) appear to be affected more by seasonal fluctuations than the wells in other areas.

The groundwater regime beneath the landfill site may act as a “mixing” reservoir for the leachate generated in the refuse. The groundwater flow system is also a transporting medium for conveying potential contaminants away from the landfill area. As a result, the impact assessment of the site is dependent, to a large extent, on the groundwater distribution, flow rate, and flow pattern.

Flow in a hydrostatic unit occurs, under the influence of gravity, from points of high hydraulic potential to points of lower hydraulic potential. The actual flow path will follow a three-dimensional route along the strata of least resistance. Resistance to flow is measured in terms of the hydraulic conductivity of the deposit and the hydraulic gradient across the flow path. An updated cross-section of the site and borehole logs for each of the monitoring wells is identified on the map enclosed in **Appendix C** for reference.

The site Cross-Section (**Appendix C**) shows that the groundwater elevations flow in a west-east direction through the landfill mound and are relatively flat indicating a relatively low hydraulic gradient. The sand zone under the waste appears to be largely unsaturated. The capping of the landfill may be limiting infiltration. The landfill is located on a topographic high which is limited in size. From the groundwater elevations (**Table 3**), the inferred shallow groundwater flow configuration is shown in **Map 3, Groundwater Flow**.

The groundwater contours in **Map 3** are based on groundwater level measurements obtained on July 3, 2020. It should be noted that the contours are considered reliable only in the vicinity of the wells, however a reasonable interpretation of the contours can be made on the basis that the water table is generally a subdued reflection of surface topography. Groundwater flow lines drawn perpendicular to groundwater contours indicate that the inferred flow direction is generally toward the east, as shown in **Map 3**. The flow pattern is consistent with past results. On July 3, 2020, the horizontal hydraulic gradient east of the landfill mound was observed to range from 0.025 m/m in the northeast corner to 0.007 m/m in the southeast, as shown in **Map 3**.

Monitoring wells OW13S, OW13I and OW13D were constructed in close proximity to each other. Their close relation allows for the determination of vertical hydraulic gradient in this area of the site. OW13S is screened at the top of sand and gravel unit. OW13I is screened at the bottom of the sand and gravel unit. OW13D is screened in the underlying silt till. The well logs for all three (3) wells are enclosed in **Appendix C**. During the July 3, 2020 water level monitoring, the vertical gradient was 0.05 m/m upward between OW13S and OW13I. As shown in

**Table 3**, the groundwater elevations of OW13I and OW13D have only a negligible difference in 2020. In most cases the vertical gradient is slightly upward. The vertical gradients for the monitoring events are relatively low, in the same scale as the horizontal gradients. The vertical gradient between OW13S and OW13I had been downward since monitoring began at OW13I in September 2004, and continued to remain downward until July 2008; however, since December 2008, the vertical gradient has been consistently upward, reporting an upward gradient of 0.05 m/m on July 3, 2020 and November 3, 2020, respectively, between these monitoring points. The upward gradients are not unexpected given the presence of the downgradient creek. Further monitoring of the vertical gradient should be conducted in order to observe any trends in the vertical gradient at the landfill.

### 3.3 GROUNDWATER MONITORING RESULTS

**Figure 3** is a summary of indicator parameters that are commonly representative of leachate impacts (i.e. chloride, hardness, DOC and conductivity). **Figure 3** summarizes the spring 2020 results. **Figures 4a to 4g** are graph representations for monitoring wells OW11-16 (upgradient); OW14; OW4; OW13-I; OW15 and OW16, that correspond to the primary flow path through the site. The graphs represent the concentration trend plots for the following indicator parameters: chloride, boron, barium, sulphate, ammonia, nitrate and DOC.

These parameters reflect the presence of potential contaminants in both an anaerobic or aerobic groundwater state and a range of solute velocities in groundwater.

Historical groundwater chemistry results are summarized in **Appendix E**. Also included in **Appendix E** are the results for 2020 monitoring.

#### 3.3.1 BACKGROUND GROUNDWATER CHEMISTRY

To evaluate the influence of landfill leachate on the local groundwater system, it is necessary to determine background conditions. These background conditions reflect the naturally occurring levels of various parameters and provide a reference point to determine the magnitude of leachate impacts. The background conditions reflect conditions unaffected by the landfill operation. Based on the groundwater flow configuration (**Map 3**), monitoring wells OW6, OW7 and OW12 are located upgradient or cross-gradient of the landfilled area.

In past reports, monitoring wells OW7 and OW12 have been considered as background monitors; however the MECP, in their review of the 2006 Annual Monitoring Report (correspondence enclosed in **Appendix F**), recommended that a new well be considered as a background well due to difficulties with monitoring wells OW7 and OW12. Monitor OW12 has exhibited indicator parameters elevated with respect to other monitoring wells. Monitor OW7 is not an ideal background well as it is often dry during sampling events. Historically, the MECP had recommended the consideration of OW6 as a background well due to the historical water quality and its cross-gradient location. The water quality of OW6 relative to other wells is illustrated in **Figure 3**. The groundwater elevations illustrated in **Map 3** confirm OW6 is in a cross-gradient location. In August 2016, OW11-85 was decommissioned and replaced by OW11-16 and upon the MECP's review of the 2017 annual monitoring report (**Appendix F**), OW11-16 will be referred to as the "background" monitoring well for the Reasonable Use Guideline Criteria (RUC).

The results in 2020 for select leachate indicator parameters at Monitor OW6 are summarized as follows:

OW6 Results		
Indicator	Spring 2020	Fall 2020
Chloride	4.5 mg/L	4.6 mg/L
Conductivity	526 µS/cm	523 µS/cm
Hardness	269 mg/L	274 mg/L
Dissolved Organic Carbon	2.3 mg/L	1.7 mg/L



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### 3.3.2 LEACHATE MONITORING

To determine leachate strength and characteristics, monitoring data from wells OW4, OW13 and OW14 have been used in the past. These wells are the closest downgradient wells to the waste and historical monitoring data have indicated elevated concentrations for leachate indicator parameters compared to background levels above background concentrations.

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### 3.3.3 DOWNGRAIDENT GROUNDWATER MONITORING

As shown in **Map 3**, the following wells are located downgradient of the filled waste:

OW4  
OW5  
OW13S  
OW13I  
OW13D  
OW14  
OW15  
OW16

**Figure 1** illustrates the indicator results for these wells for the spring and fall monitoring respectively. **Figures 4a to 4g** are plots of the following indicator results; chlorine, boron, barium, sulphate, ammonia, nitrate and DOC. The plots are illustrated over time for the downgradient monitoring wells not including OW5, as per agreement with the MECF review of the 2017 Annual Monitoring Report (**Appendix F**).

Monitors OW4 and OW5 are located approximately 20 m and 50 m respectively downgradient of the fill area as shown in **Map 3**. As shown in **Figure 3**, the leachate indicator parameters for OW4 are elevated with respect to other wells. The OW4 results for July and November show a slight increase in ammonia (**Figure 4e**). Leachate impacts are expected as OW4 is located immediately downgradient of the landfill mound. As shown in **Figure 4a**, the concentration of chloride has been decreasing over time since 2004 with occasional fluctuations, indicating leachate strength may be decreasing with time. The parameters of conductivity and sodium have also decreased over time. The results for OW5 are near background indicating leachate impacts have not migrated to the north or northeast. As shown in **Figure 3**, the concentrations of selected leachate parameters for OW5 are similar to those of the background well OW6.

In 2014, OW14-03 was replaced with OW14-14 and extended below the waste fill until it intersected the lower fall water table. OW14 is screened in silty fine sand. **Figure 3** illustrates the July 2020 results for OW14-14 plotted against other wells. As shown in **Figure 3**, the results for OW14-14 are above background (OW6) but less than downgradient well OW4 for the main leachate parameters, excluding hardness, July 2020. The 2007 to 2020 results for OW14 well (**Appendix E**) indicate parameters elevated relative to background concentrations. Elevated concentrations of iron (32.1 mg/L) in OW14-14, July 2020, indicate a reducing environment, which is typical of groundwater downgradient of a landfill. This parameter appeared to be increasing over time but subject to significant variation. Based on the overall results, landfill impacts in monitor OW14-14 were present, but were not high enough for groundwater at this monitor to be considered leachate. In OW14-14 leachate parameters are lower than were observed in OW14-03 (decommissioned). Leachate impacts do not appear to be migrating vertically downward.

As shown in the Cross-Section (**Appendix C**), OW13S is screened at the top of the sand and gravel unit. OW13I is screened at the bottom of the sand and gravel unit. OW13D is screened in the underlying silt till. Historically, leachate impacts in the silt till unit (at OW13D) are negligible. Continued monitoring will confirm the long-term trend at this location. The monitoring results for OW13D indicate near background concentrations for leachate parameters. Effectively, leachate does not appear to be impacting the silt till layer underlying the super-positioned landfill and sand overburden aquifer.

OW13S and OW13I continue to show elevated levels of organic nitrogen, hardness, DOC and sulphate. Landfill parameters such as chloride and iron continue to be reported in 2020 at concentrations much lower than one would expect for leachate impacted water. Iron concentrations in OW13S and OW13I are below concentrations reported in leachate monitor OW4.

The 2020 chemistry results at OW4 and OW13D indicate that the landfill cap, in combination with the upward gradient observed at the OW13 well nest, appears to be limiting leachate impacts downgradient, some leachate impacts have migrated eastward in the shallow region of the sand/gravel aquifer. Based on the interpreted hydraulic gradient (slightly upward as stated in Section 7.2) and the reported leachate parameter concentrations at OW4 and OW13D, the leachate impacts are likely moving in a near horizontal direction with little to no downward flow into the underlying silt till. This scenario means the leachate impacts are confined to the sand unit and have not migrated downward into the underlying silt till. It is also noted that the interpreted horizontal hydraulic gradient in the southeast area of the site is also relatively low (0.007 m/m as stated in Section 3.2). The groundwater migration in general will be relatively low in velocity.

The MECP provided correspondence regarding the groundwater monitoring program in 2015 on August 20, 2015. As part of this correspondence, an August 14, 2015 memorandum from MECP hydrogeologist, Mr. Simon Thuss was forwarded to the Township. WSP responded to this memorandum on October 8, 2015. The comments brought forward in MECP correspondence have been largely addressed in WSP's response. The exception being the reassessment of reasonable use criteria, which is discussed in Section 3.5 of this report. In 2016, the Township completed the installation and deepening of wells discussed in correspondence in August 2016.

Topographic survey data is not available at the Kinloss Waste Disposal Site. Due to the inactive status at the landfill, WSP Canada Inc. (WSP) proposes completion of a topographic survey at the Site when the Site resumes accepting waste.

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## 3.4 SURFACE WATER MONITORING

Surface water samples were obtained on July 3, 2020 and November 3, 2020 at the two surface water sampling stations. Both surface water stations are located on the creek which to the eastern boundary of the site. This creek flows in a northerly direction and is a tributary of Kinloss Creek. Station SW1 is upgradient of the landfill and is located at the south end of the culvert under Concession Road 5/6 as shown in **Map 2**. Station SW2 is downgradient of the landfill and is located approximately 150 m north of the northeast corner of the site.

The results of the 2007 to 2020 surface water sampling are summarized in the Surface Water Results (**Appendix G**). The lab detection limits and Provincial Water Quality Objectives (PWQO) are also included in the summaries. Exceedances of PWQO are indicated by shaded cell. **Figure 5** compares leachate indicators for the July 3, 2020 sampling event.

The PWQO was exceeded at the upstream station, SW1, for copper and iron July 2020. Iron concentrations are slightly elevated compared to the historical range is considered anomalous. SW2 did not show any exceedances compared to the PWQO. Continued monitoring will confirm the long-term trend at this location. Historically, there have been some exceedances of the PWQO at both the upgradient and downgradient monitoring points for metals, but this pattern indicates that the landfill does not have a measurable adverse influence on water quality within the creek. The concentrations of metals at SW1 and SW2 should continue to be monitored in 2020.

The MECP had no recommended changes to the surface water monitoring program as per their comment made on December 4, 2020 (**Appendix F**). The MECP also noted all sampled parameters were within historical norms.

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## 3.5 REASONABLE USE

In accordance with the appropriate Reasonable Use Guideline criteria (RUC) for particular reasonable uses, a change in quality of the groundwater on an adjacent property will be accepted only as follows:



*The quality cannot be degraded by an amount in excess of 50% of the difference between background and the Ontario Drinking Water Standards for non-health related parameters and in excess of 25% of the difference between background and the Ontario Drinking Water Standards for health-related parameters. Background is considered to be the quality of the groundwater prior to any man-made contamination.*

In assessing the amount of degradation that is acceptable, consideration is given to the natural, uncontaminated quality of the water, the present quality of the groundwater and potential contamination of the groundwater from all sources.

The maximum concentration of a particular contaminant that would be acceptable in the groundwater beneath an adjacent property is calculated in accordance with the following relationship.

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

Where

$C_m$	=	maximum concentration accepted
$C_b$	=	background concentration
$C_r$	=	maximum concentration permitted in accordance with the Ontario Drinking Water Standards.
$x$	=	a constant that reduces the contamination to a level that is considered by the MECP to have a negligible effect on the water use (i.e. 0.5 for non-health parameters; 0.25 for health parameters).

As stated in Section 7.3.1, it is agreed that pending the 2016 drilling program, monitoring well OW6 is a suitable “background” monitoring well. The MECP Landfill Guidelines states the following regarding establishing Background Concentration: *The background concentration of a contaminant in the ground water of receptor aquifer is the median value for that contaminant based on all ground water samples taken from the receptor aquifer in accordance with the following rules:*

1. *At least five samples must be taken.*
2. *The samples must be taken at or near the site boundary where potential impact is being examined.*
3. *The samples must not be taken from locations known to be or likely to be contaminated by human activity.*

OW6 monitoring meets the above requirements. In order to determine potential Reasonable Use parameters, the median values of the following parameters (all within Ontario Drinking Water Standards (ODWS)) were calculated using concentrations reported since 2007:

- Alkalinity
- Boron
- Chloride
- Dissolved Organic Carbon (DOC)
- Sodium

In their August 14, 2015, memorandum (**Appendix F**), the MECP had recommended the inclusion of hardness, iron, manganese, sulphate, nitrate and nitrite in the RUC annual evaluation.

The Township understands the intent of the RUC evaluation as a tool to determine if groundwater downgradient of the landfill is being impacted beyond a reasonable criteria. At the Kinloss Waste Disposal Site, the RUC evaluation is being used to determine the extent of leachate migration off-site.

Correspondence from the MECP was received August 18, 2016 regarding the MECP review of the “Annual Monitoring Report – 2015, Kinloss Landfill Site”. A copy of this letter is provided in **Appendix F**. The MECP continue to recommend that additional parameters (including at least hardness, manganese and sulphate) be included in the RUC annual evaluation.

In August 2016, a new upgradient background monitor (OW11-16) was drilled. Additionally, two new monitors, OW15 and OW16, were drilled (east of the OW13 nest) in the buffer lands to further define the extent of the leachate plume at the Kinloss Landfill Site.

The results of the RUC evaluation for 2020 have been summarized in **Table 4** using the OW11-16 monitoring location as the background concentration conditions, decided upon in correspondence between WSP and the MECP dated December 13, 2018 (**Appendix F**). It is noted that the requirement for a landfill site to be in compliance with the RUC applies to groundwater quality at the property boundary (monitors OW13 nest, OW15 and OW16). The remaining monitors are included in **Table 4** for comparison purposes, only. Monitor OW11-16 now satisfies the requirements for a suitable background concentration, based on the number of samples having been collected is now greater than five samples. The parameters hardness, manganese and sulphate have been included.

**Table 4** has been updated using the OW11-16 monitoring data from 2016 to 2020. The RUC historical data from OW6 can be found on Table E-3 in **Appendix E**. As in the past, spring and fall sampling data for the OW13 nest have been included in the RUC assessment.

All exceedances of RUC are shaded in **Table 4**. As shown in **Table 4**, monitoring wells OW13S and OW13I exceeded the RUC for alkalinity, DOC and hardness in both July and November 2020. OW13D exceeded the RUC for iron in July and November 2020 and DOC in July 2020.

In 2020, concentrations of RUC parameters remained elevated at OW13S and OW13I. Alkalinity remained above the RUC concentration but appears to be variable between years. No clear trend is apparent with this parameter in OW13S and OW13I. Aside from alkalinity, DOC was identified above the RUC in OW13S and OW13I during both the spring and fall monitoring events. With the 2016 addition of chemical parameters to the RUC criteria, hardness was shown to be above the RUC concentration in OW13S and OW13I during the spring and fall monitoring events. OW13S and OW13I continue to be influenced by leachate, as evidenced by the elevated leachate parameter concentrations and potentially the elevated RUC exceedances. Continued monitoring is recommended to confirm the long term trend at this location. The shallow aquifer in the southeast corner of the property remains influenced by leachate. Monitor OW13D does not appear to be influenced, which is likely a result of the fine soil conditions and upward gradient below the Kinloss Waste Disposal Site. Only DOC and iron exceed the RUC at OW13D in 2020, this monitor has historically exceeded iron at this location and is likely affected by natural conditions while the DOC exceedance appears to be an anomaly.

As shown in **Map 2**, there are substantial buffer lands downgradient of OW13S. These buffer lands are leased by the Township. In their review of the 2006 Annual Monitoring Report, the Ministry requested additional information regarding the buffer property. The following section provides additional information and discussion on leachate impacts within this area.

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## 3.6 BUFFER LANDS

In their review of the 2006 Annual Monitoring Report, the MECP asked the following question regarding the buffer lands:

*Are the lands to the east leased by the Township a part of a formal Contaminant Attenuation Zone?*

The buffer lands are shown in **Map 2**. The lands are approximately 12.1 hectares (30 acres) in area and are located on Part Lot 17, Concession 6, former Township of Kinloss, County of Bruce.

These buffer lands provide approximately 130 m of downgradient property to allow for additional leachate attenuation before the groundwater migrates off Township controlled property.

**Appendix H** contains a copy of legal agreement between the Township and the owners of the buffer lands. A copy of the Certificate of Registration, lease agreement and legal survey are enclosed in **Appendix H**. The lease agreement allows the lands to be used for contaminant attenuation. Access to the property for monitoring purposes is allowed through the agreement. The lease agreement was in effect from January 1, 1999 and has a 99 year term.

Therefore, the buffer lands east of the landfill site meet the requirements of a formal Contaminant Attenuation Zone (CAZ).

Correspondence from the MECP on August 14, 2015, acknowledged WSP's identification of leachate impacts at the site boundary in wells OW13S and OW13I. This correspondence also noted that since leachate has been identified within the CAZ, the Township must work to delineate the plume within the CAZ and ensure that it stays confined within this area.

In August 2016, the Township installed additional wells (OW15 and OW16) within the CAZ. These wells will be used to define the extent of the plume within the CAZ and assess the potential for leachate migration beyond the boundaries of the CAZ.

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### 3.7 COMBUSTIBLE GAS

In 2006, three gas probes were installed on-site to allow for the monitoring of combustible gas in the unsaturated overburden. The locations of these three gas probes, designated GP1, GP2, and GP3, are illustrated in **Map 2**. The construction details of the gas probes are provided in **Appendix C**.

The combustible monitoring results for 2007 – 2020 have been included in **Table 5**.



Table 5 Summary of Methane Monitoring Results			
Date	GP1	GP2	GP3
July/07	0	0	0
Jan/08	0	0	0
Jul/ 08	0	0	0
Jan/09	0	0	0
Dec/09	0	0	0
Mar/10	0	0	0
Feb/11	0	0	0
Mar/12	0	0	0
Feb/13	0	0	0
Jan/14	0	0	0
May/15	0	0	0
Oct/15	0	0	0
Feb/16	0	0	0
June/16	0	0	0
Nov/16	0	0	0
Feb/17	0	0	0
Jun/17	0	0	0
Nov/17	0	0	0
Feb/18	0	0	0
May/18	0	0	0
Nov/18	0	0	0
Feb/19	0	0	0
June/19	0	0	0
Nov/19	0	0	0
July/20	0	0	0
Nov/20	0	0	0
<b>Notes:</b> 1. All readings shown in % gas by volume in air.			

Studies have shown the principal combustible gas is methane. Since methane is lighter than air, it typically moves upwards from the refuse into the soil cover, and dissipates by venting to the atmosphere. During periods of frost and/or snow cover, venting is reduced or inhibited.

Based on the monitoring results, there was no indication of combustible gas migration within the unsaturated overburden.

## 4 PROPOSED FUTURE MONITORING PROGRAM

A summary of the proposed monitoring program is given in **Table 6**, on the following page. This proposed program is based on past monitoring. The parameters outlined in **Table 6** include the usual leachate indicators (i.e. chloride, iron, conductivity, sulphate, DOC, ammonia, etc.), as well as additional parameters to characterize the quality and extent of the leachate plume. If changes in leachate characteristics are observed in the future, this list of parameters will be modified.

Attempts to sample the surface water stations and monitoring wells will be made twice per year.

<b>Table 6</b> <b>Kinloss Landfill Site</b> <b>Monitoring Program</b>		
<b>Monitoring Location</b>	<b>Proposed Sampling Spring 2021</b>	<b>Proposed Sampling Fall 2021</b>
OW4	✓	✓
OW5	✓	✓
OW6	✓	✓
OW7	✓	✓
OW11-16	✓	✓
OW12	✓	✓
OW13S	✓	✓
OW13I	✓	✓
OW13D	✓	✓
OW14-14	✓	✓
OW15	✓	✓
OW16	✓	✓
SW1	✓	✓
SW2	✓	✓
<b>Notes:</b> <ol style="list-style-type: none"> <li>✓ indicates to be sampled.</li> <li>The lab parameters to be tested for groundwater and surface water will include: <ul style="list-style-type: none"> <li>Alkalinity</li> <li>Ammonia</li> <li>Anions – Cl, NO<sub>2</sub>, NO<sub>3</sub>, SO<sub>4</sub></li> <li>Conductivity</li> <li>Dissolved metals by ICPMS</li> <li>Total phosphorus (SW's only)</li> <li>DOC</li> <li>Hardness</li> <li>Phenols</li> <li>pH</li> <li>TKN</li> </ul> </li> <li>At all monitoring wells and SW stations the following field measurements should be obtained: <ul style="list-style-type: none"> <li>Temperature</li> <li>pH</li> <li>Conductivity</li> </ul> </li> <li>In addition, methane measurements from GP1, GP2 and GP3 will be obtained in spring, fall and once under frozen conditions.</li> </ol>		

## 5 CONCLUSIONS

1. Currently, the Kinloss Landfill is only recyclable and burnable materials. The site does not receive domestic waste. The remaining capacity of the site is estimated to be 137,000 m<sup>3</sup>.
2. Burning operations in 2020 were conducted in accordance with MECP Guideline C-7.
3. Security and control of the site in 2020 continued to be good.
4. The Blue Box Recycling Program diverted 476 tonnes of recyclable materials and approximately 287 tonnes of scrap metal, tires, E-waste and mattresses from the entire Township of Huron-Kinloss. Including all of the segregated waste, a total of 764 tonnes of materials were diverted from both Township landfills (Kinloss and Huron) in 2020. The total tonnage diverted in 2020 is higher than the 430 tonnes diverted in 2019.
5. In 2020, horizontal groundwater flow on the site was to the east which is comparable to historical patterns. A slight upward vertical gradient is present which is not unexpected, given the presence of the downgradient drainage channel.
6. Leachate influences are observed in the shallow aquifer downgradient of the landfill (OW4, OW13S and OW13I). Leachate influences are not observed nor are expected in the silt till underlying the sand aquifer (OW13D).
7. Surface water monitoring indicates the downstream (SW2) water quality of the stream east of the landfill is generally similar to the upstream (SW1) water quality. For the parameters that were analyzed, the PWQO exceeded for copper and iron at SW1, July 2020. This pattern indicates that the landfill site does not have a measurable adverse influence on water quality within the creek. Concentrations of metals at SW1 and SW2 should continue to be monitored in 2020.
8. Monitor OW11-16 was installed in August 2016 as a background well for the site. As there are 8 samples collected from this monitor, it will now be referred to as the background monitor for making conclusions regarding the RUC.
9. Reasonable Use parameters and criteria have been developed based on the background results of monitor OW11-16. Exceedance of alkalinity DOC and hardness parameters continued to be observed at OW13S and OW13I. At OW13D, exceedance of iron was observed in July and November 2020 and DOC in July 2020. DOC, iron and manganese exceed the RUC in OW15 for both monitoring events. An exceedance of alkalinity in OW15 for the July 2020 sampling event. Additionally, DOC exceeds the RUC in OW16 for the November 2020 sampling event.
10. Combustible gas monitoring indicates no evidence of methane migration or build up within the unsaturated overburden.



## 6 RECOMMENDATIONS

Based on the foregoing, the following is recommended:

1. The Township should continue to promote recycling both at home and at the landfill site.
2. No remedial measures are required for the site at the present time.
3. The monitoring program of semi-annual sampling of the 12 monitoring wells and two surface water stations should continue in 2020. Gas probes GP1, GP2 and GP3 should also be monitored annually for combustible gas under frozen conditions.
4. This report is to be submitted to the MECP for review and comment.

# TABLES



**TABLE 1  
SUMMARY OF RECYCLING DATA  
HURON and KINLOSS LANDFILLS**

Recyclable Product	2016		2017		2018		2019		2020	
	Weight (Tonnes)	Volume Saved (m <sup>3</sup> )	Weight (Tonnes)	Volume Saved (m <sup>3</sup> )	Weight (Tonnes)	Volume Saved (m <sup>3</sup> )	Weight (Tonnes)	Volume Saved (m <sup>3</sup> )	Weight (Tonnes)	Volume Saved (m <sup>3</sup> )
Newspaper	103.14	206.28	153.86	307.72	152.21	304.42	130.31	260.62	128.74	257.48
Steel (Cans, etc.)	22.04	44.08	23.89	47.78	32.20	64.40	27.57	55.14	32.66	65.32
Aluminum	9.12	18.24	9.90	19.80	9.94	19.88	8.51	17.02	16.00	32.00
Glass (Flint & Coloured)	41.96	83.92	48.57	97.14	65.80	131.60	56.33	112.66	80.74	161.48
Plastic (HDPE & PET)	54.85	109.70	58.61	117.22	74.20	148.40	63.52	127.04	76.25	152.50
White Paper	13.21	26.42	12.29	24.58	5.20	10.40	4.45	8.90	3.15	6.30
Boxboard	29.88	59.76	40.95	81.90	52.12	104.24	44.62	89.24	44.65	89.30
Corrugated Cardboard	44.70	89.40	81.75	163.50	111.83	223.66	94.48	188.96	94.26	188.52
<b>Total Recyclables</b>	<b>318.90</b>	<b>637.80</b>	<b>429.82</b>	<b>859.64</b>	<b>503.50</b>	<b>1007.00</b>	<b>429.79</b>	<b>859.58</b>	<b>476.45</b>	<b>952.90</b>
Tires	182.69	365.38	101.75	203.50	45.88	91.76	63.13	126.26	110.50	221.00
Scrap Metal	132.60	265.21	159.16	318.31	114.71	229.42	167.96	335.92	148.35	296.70
Bale Wrap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E-waste	20.19	40.37	15.17	30.33	18.85	37.70	14.95	29.90	11.37	22.74
Mattresses	11.76	23.53	11.32	22.64	15.54	31.08	15.00	31.76	17.17	34.34
<b>Total Segregated</b>	<b>347.24</b>	<b>694.48</b>	<b>287.39</b>	<b>574.79</b>	<b>194.98</b>	<b>389.96</b>	<b>261.92</b>	<b>523.84</b>	<b>287.39</b>	<b>574.78</b>
<b>Total Diverted</b>	<b>666.14</b>	<b>1332.28</b>	<b>717.21</b>	<b>1434.43</b>	<b>698.48</b>	<b>1396.96</b>	<b>691.71</b>	<b>1383.42</b>	<b>763.84</b>	<b>1527.68</b>
Notes:	1. Data obtained from BASWRA and Township. 2. Assumed compaction density is 500 kg/m <sup>3</sup> . 3. Tires are converted to a volume by a factor of 8 tires/m <sup>3</sup> . 4. Recyclable tonnages are for the entire Township excluding Lucknow. 5. Tonnages of scrap metal and tires are combined totals for Kinloss and Huron Landfills. 6. 1,768 tires received in 2020 @ 8/tires/m <sup>3</sup> 7. 505 mattresses received in 2020 at 29.4 mattresses/tonne 8. Volume Saved - defined as waste diverted from the landfill through recycling programs.									

**TABLE 3**  
**Summary of Groundwater Elevations**  
**Kinloss Landfill**

	OW4	OW5	OW6	OW7	OW11-16	OW12	OW13S	OW13I	OW13D	OW14	OW15	OW16
Ground Elevation (m)	81.1	80.3	79.7	83	96.18	97.9	80.4	80.4	80.4	91.9	80.00	79.99
Top of Casing (m)	81.3	80.5	80	83.2	96.98	98.7	81.2	81.1	81.1	92.8	81.01	80.83
Date of Water Level Measurement												
Nov-85	80.89	80.21	79.6	82.21								
Dec-87	80.61	80.33	79.61	82.57								
Nov-89	80.66	80.25	79.53	81.86								
Dec-89	80.51	80.25	79.56	81.95								
Aug-90	80.34	79.88	79.16	81.34								
Jan-91		80.31	79.6									
Apr-91	80.77	80.41	79.61	82.66								
Jun-91	80.73	80.29	79.58	81.76								
Oct-91	80.59	80.17	79.56	81.35								
Jul-92	80.48	80.04	79.13	81.52								
Oct-92	80.55	79.97	79.49	81.84								
Jun-93	80.67	80.08	79.5	81.69								
Sep-93	80.45	79.95	79.46	81.18								
Jun-94	80.65	80.03	79.51	81.97								
Oct-94	80.52	79.97	79.47	81.66								
May-95	80.56	80.02	79.44	81.81								
Sep-95	80.37	79.92	79.23	81.54								
May-96	80.9	80.32	79.63	82.78								
Sep-96	80.77	80.11	79.53	81.56								
May-97	80.82	80.18	79.57	82.17								
Sep-97	80.52	80.06	79.38	81.18		81.45	80.16					
May-98	80.71	80.09	79.33	81.74		82	80.25					
Sep-98	80.28	80.13	78.99	DRY		81	79.99					
May-99	80.56	80.05	79.4	81.8		81.09	80.19					
Sep-99	79.95	79.51	78.66	DRY		80.57	79.86					
May-00	80.52	79.96	79.35	81.91		81.09	80.15					
Sep-00	80.73	80.14	79.5	82.01		81.45	80.22					
May-01	80.84	80.19	79.49	81.83		82.53	80.28					
Sep-01	80.44	79.9	79.26	DRY		81.36	80.12					
May-02	80.84	79.86	79.28	82.11		82.51	80.31					
Sep-02	80.15	79.55	78.91	DRY		81.31	79.94					
May-03	80.79	80.11	79.56	82.43		81.23	80.3					
Oct-03	80.62	80.04	79.52	81.87		80.96	80.22			80.8		
May-04	80.82	80.11	79.63	82.37		82.52	80.28			81.68		
Sep-04	80.35	79.82	79.02	81.22		81.44	80.12	80.09	80.12	81.04		
May-05	80.58	80.04	79.43	81.89		81.89	80.32	80.26	80.31	81.4		
Sep-05	80.42	80.02	79.38	DRY		80.93	80.22	80.16	80.14	DRY		
Apr-06	80.72	80.19	79.48	82.57		82.32	80.39	80.35	80.41	81.61		
Oct-06	80.35	79.97	79.41	DRY		81	80.21	80.15	80.09	80.7		
Jul-07	NA	79.36	77.95	81.18		81.62	80.02	79.67	79.83	81.18		
Dec-07	80.68	79.69	79.2	DRY		80.53	79.9	79.89	80.01	80.42		
Jul-08	80.42	79.62	79.06	81.74		81.94	80.02	79.83	80.15	81.44		
Dec-08	80.66	80.04	79.47	82.34		81.44	80.2	80.24	80.28	DRY		
Jul-09	80.48	79.71	79.19	81.62		82.32	80.17	80.28	80.25	81.66		
Dec-09	80.47	80.07	79.15	81.98		80.82	80.15	80.28	80.24	DRY		
Mar-10	80.69	80.15	79.56	82.35		81.14	80.25	80.23	80.36	80.97		
Jun-11	80.67	79.88	79.40	81.76		82.15	80.25	80.36	80.38	81.57		
Oct-11	80.50	80.15	79.50	Dry		80.80	80.18	80.28	80.26	80.81		
Jun-12	80.32	79.78	79.12	81.47		81.42	80.05	80.14	80.16	81.06		
Oct-12	80.25	80.07	79.38	Dry		80.53	80.06	80.13	80.10	80.30		
Jun-13	80.58	80.17	79.46	81.83		82.13	80.26	80.35	80.39	81.55		
Nov-13	80.68	80.04	79.55	82.66		81.24	80.31	80.40	80.41	81.10		
Jul-14	80.66	79.99	79.51	81.71		82.33	80.31	80.40	80.41	81.66		
Oct-14	80.75	80.33	79.57	81.92		81.39	80.31	80.39	80.38	81.02		
May-15	80.61	79.94	79.41	81.82		81.78	80.25	80.34	80.35	81.32		
Oct-15	80.22	79.87	79.35	Dry		80.73	80.06	80.13	80.10	80.53		
Jun-16	80.53	79.77	79.16	81.68		82.20	80.17	80.26	80.30	81.54		
Nov-16	80.28	79.86	79.23	Dry	80.44	80.72	80.02	80.10	80.09	80.52	79.91	79.66
Jun-17	80.48	79.84	79.23	81.81	81.55	81.88	80.19	80.27	80.32	81.36	79.95	79.79
Nov-17	80.51	80.04	79.53	81.83	80.82	81.11	80.23	80.31	80.30	80.83	79.99	79.86
May-18	80.67	80.11	79.43	81.94	82.06	82.45	80.32	80.40	80.44	81.70	79.98	79.93
Nov-18	80.47	80.14	79.51	81.62	80.73	81.04	80.23	80.31	80.28	80.77	79.98	79.90
Jun-19	80.71	80.11	79.52	81.96	81.91	82.27	80.34	80.42	80.45	81.62	80.01	79.92
Nov-19	80.47	80.09	79.51	81.46	80.65	80.92	80.22	80.30	80.27	80.73	79.97	79.95
Jul-20	80.33	79.72	79.04	81.55	81.14	81.45	80.2	80.15	80.16	81.08	79.84	79.82
Nov-20	80.4	80.05	79.46	81.12	80.45	80.70	80.17	80.25	80.23	80.55	79.91	79.88

Note: Elevations are not geodetic and relate to an inferred benchmark.

**Table 4**  
**Reasonable Use Criteria - New Background Upgradient Monitor OW11-16**  
**Kinloss Landfill**

Chemical Parameter	Background Concentration	Standard / Objective	Type	Reference		RUC										
				Average	n		OW13S		OW13 I		OW13 D		OW15		OW16	
							Jul-20	Nov-20	Jul-20	Nov-20	Jul-20	Nov-20	Jul-20	Nov-20	Jul-20	Nov-20
Alkalinity(as CaCO3)	340	30 - 500	OG	320	6	414	456	546	556	512	235	304	490	355	271	262
Boron	0.039	5	IMAC	0.021	6	1.26	0.63	0.61	0.661	0.638	0.073	0.19	0.366	0.046	0.012	<0.005
Chloride	5.2	250	AO	4.9	6	124	10.6	14.7	19.4	15.1	7.6	10.1	67.5	18.6	8.3	7.1
DOC	0.4	5	AO	1.7	6	3.1	5.3	5.3	7.4	4.5	4.1	2.5	5.1	16.7	2.7	4.3
Iron	<0.005	0.3	AO	0.005	6	0.15	0.026	<0.005	0.048	0.051	0.22	0.586	0.423	0.808	0.046	0.132
Hardness	396	80-100	OG	356	6	396	560	647	662	656	246	373	810	411	305	332
Manganese	0.003	0.05	AO	0.005	6	0.030	0.115	0.12	0.298	0.266	0.018	0.029	0.378	0.258	0.096	0.154
Sulphate	14	500	AO	7	6	253	125	95	135	121	48	79	291	62	26	13

Chemical Parameter	Background Concentration	Standard / Objective	Type	Reference		RUC	DOWNGRADIENT						UPGRADIENT / CROSS-GRADIENT					
				Average	n		OW4		OW5		OW14		OW6		OW7		OW12	
							Jul-20	Nov-20	Jul-20	Nov-20	Jul-20	Nov-20	Jul-20	Nov-20	Jul-20	Nov-20	Jul-20	Nov-20
Alkalinity(as CaCO3)	340	30 - 500	OG	320	6	414	661	608	238	225	491	445	265	241	282	313	326	302
Boron	0.039	5	IMAC	0.021	6	1.26	0.445	0.399	0.015	<0.005	0.186	0.102	0.026	<0.005	0.006	<0.005	0.46	0.43
Chloride	5.2	250	AO	4.9	6	124	10.9	9.6	2.4	2.5	14.1	13.7	4.5	4.6	1.3	1.6	4.4	3.6
DOC	0.4	5	AO	1.7	6	3.1	13.1	8.9	1.9	1.1	10.3	8.9	2.3	1.7	2.4	1.9	3.0	4.6
Iron	<0.005	0.3	AO	0.005	6	0.15	21.8	18.2	0.110	0.024	32.1	3.23	0.78	0.46	0.018	<0.005	<0.005	0.06
Hardness	396	80-100	OG	356	6	396	579	595	252	275	553	553	269	274	293	367	415	423
Manganese	0.003	0.05	AO	0.005	6	0.030	0.697	0.665	0.173	0.024	0.204	0.185	0.072	0.039	0.184	0.001	<0.001	0.00
Sulphate	14	500	AO	7	6	253	21	29	22	18	36	40	17	18	2	3	76	64

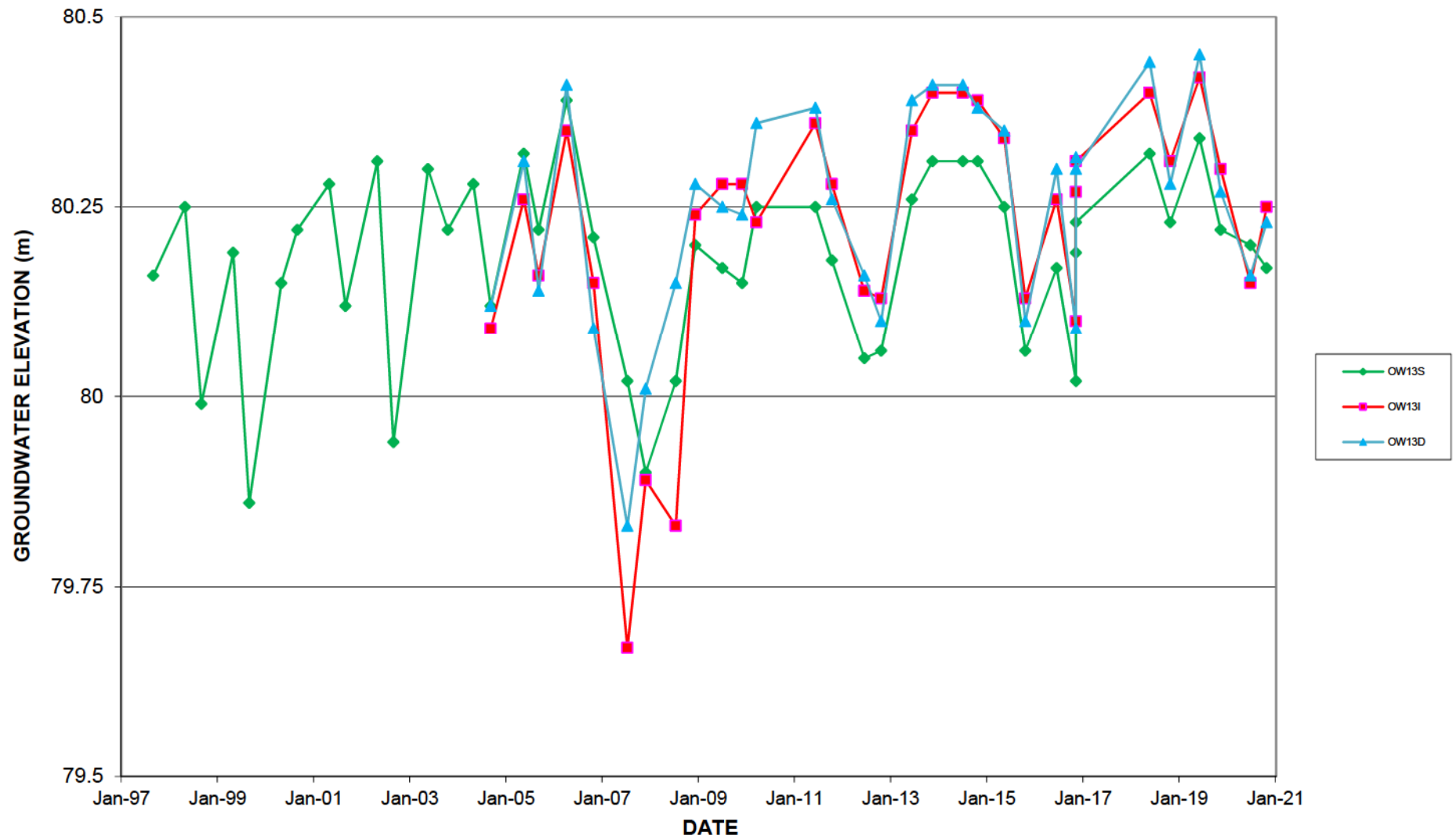
**Notes:**

1. Result concentrations reported in mg/L, unless otherwise indicated.
2. Shaded cell indicates parameter exceeded RUC.
3. Standard/Objective determined from Ontario Drinking Water Standards, Objectives and Guidelines (Revised June 2006).
4. OG = Operational Guideline  
AO = Aesthetic Objective  
IMAC = Interim Maximum Acceptable Concentration
5. Reference average based on the geometric mean for reference monitor OW11-16 since 2016.  
n - Indicates number of sample results included in the calculation of the reference average.

# FIGURES

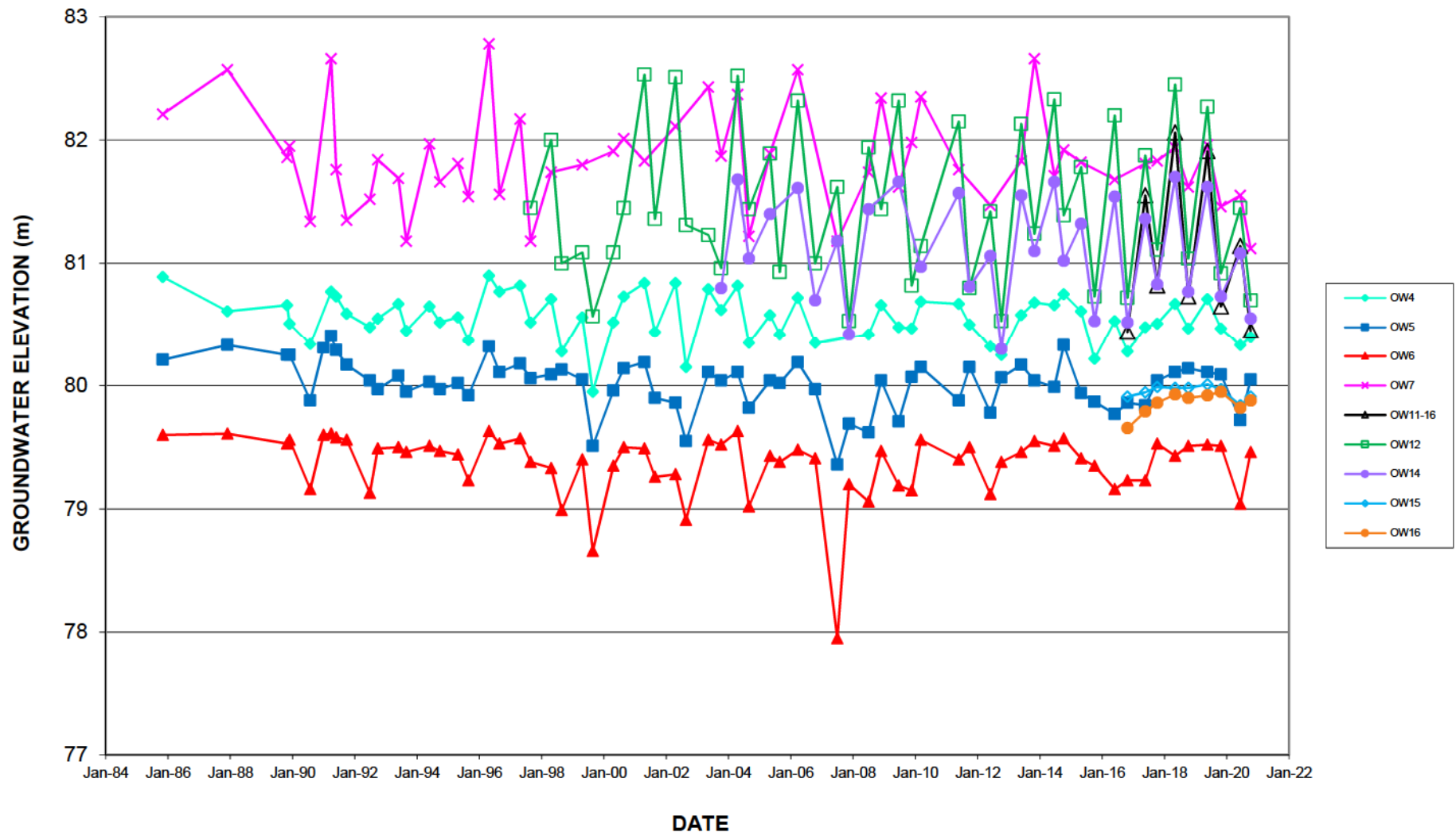


**FIGURE 1**  
**HYDROGRAPH - OW13**  
**KINLOSS LANDFILL**

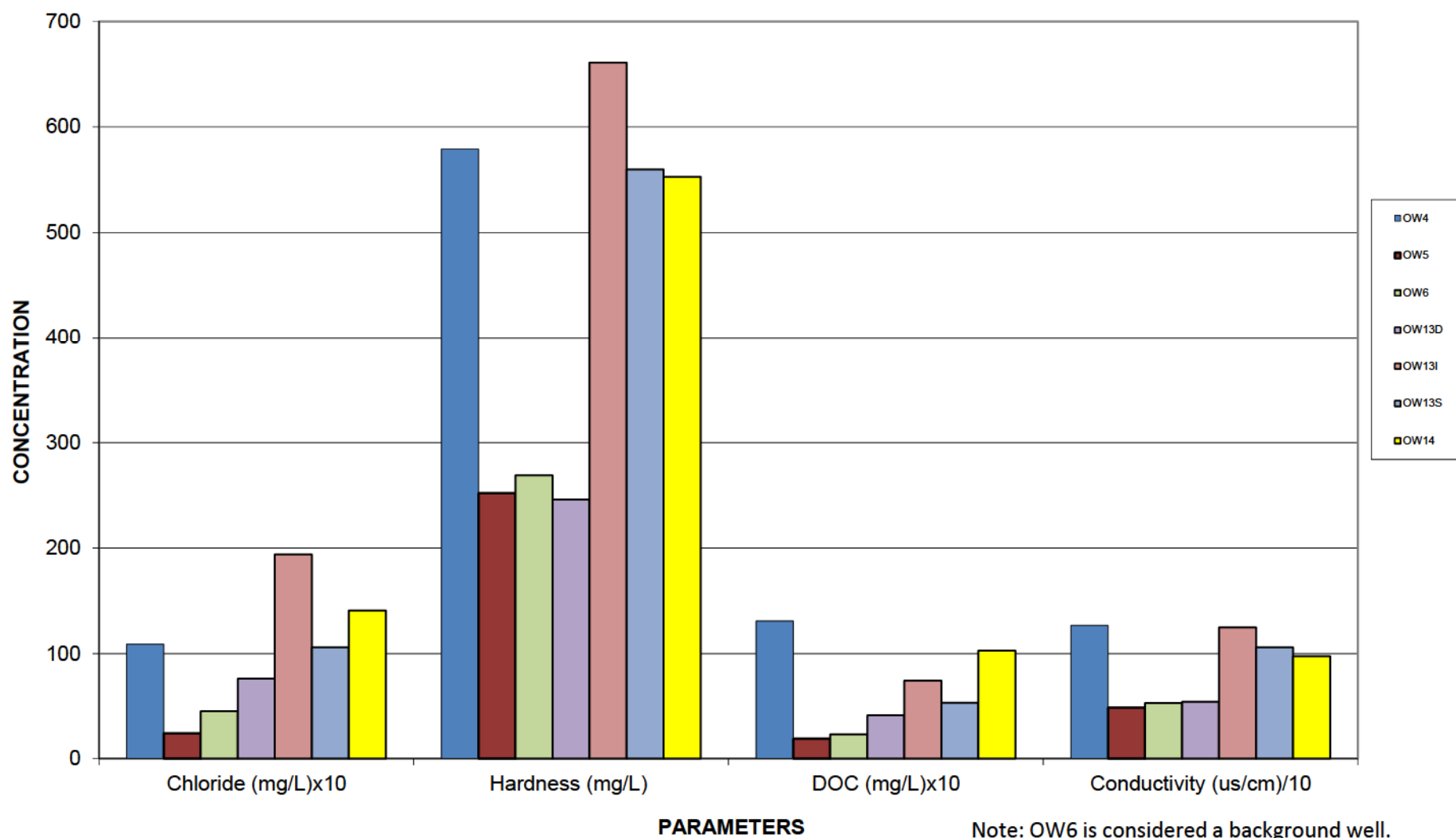




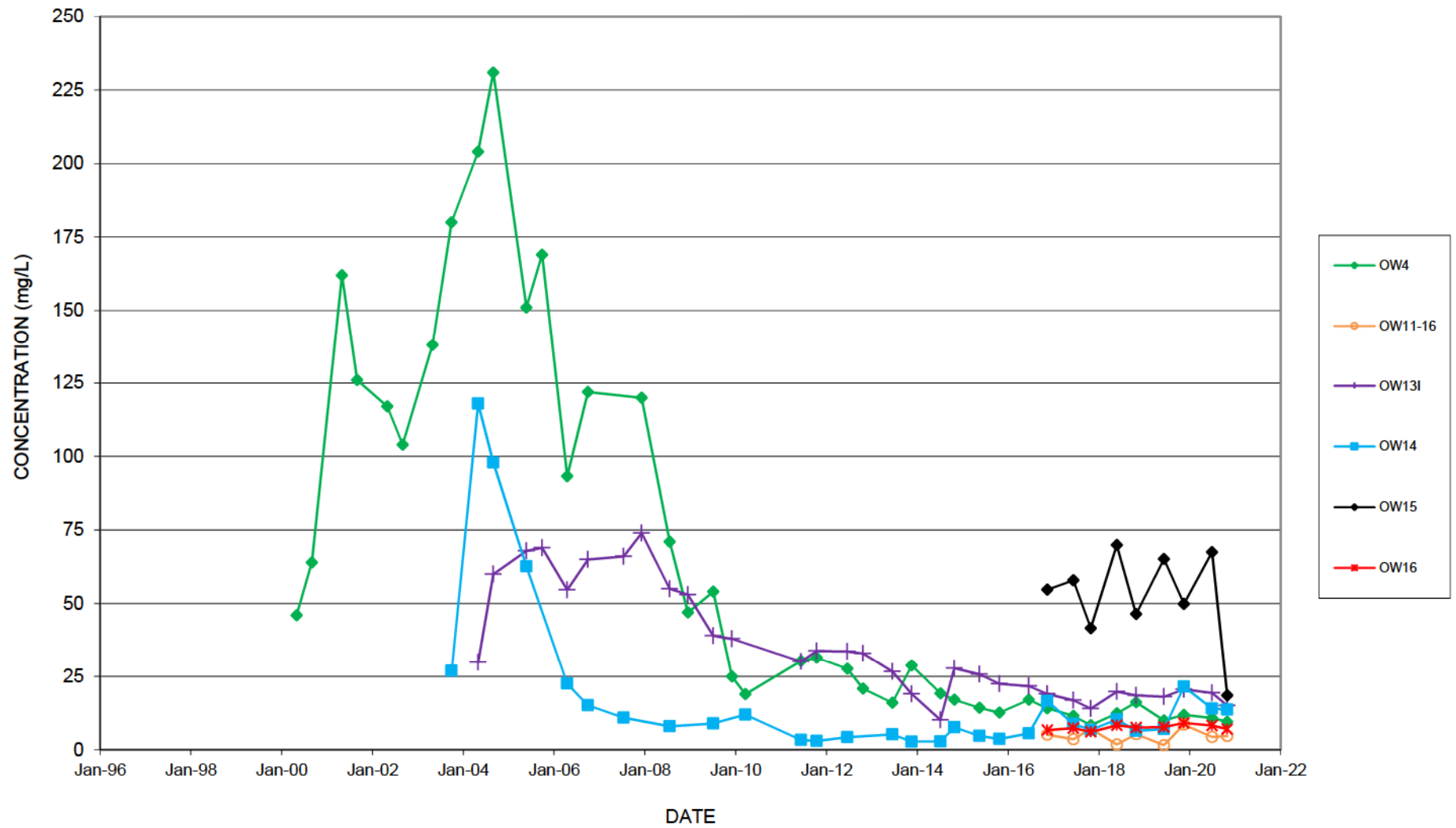
**FIGURE 2**  
**HYDROGRAPH (excluding OW13)**  
**KINLOSS LANDFILL**



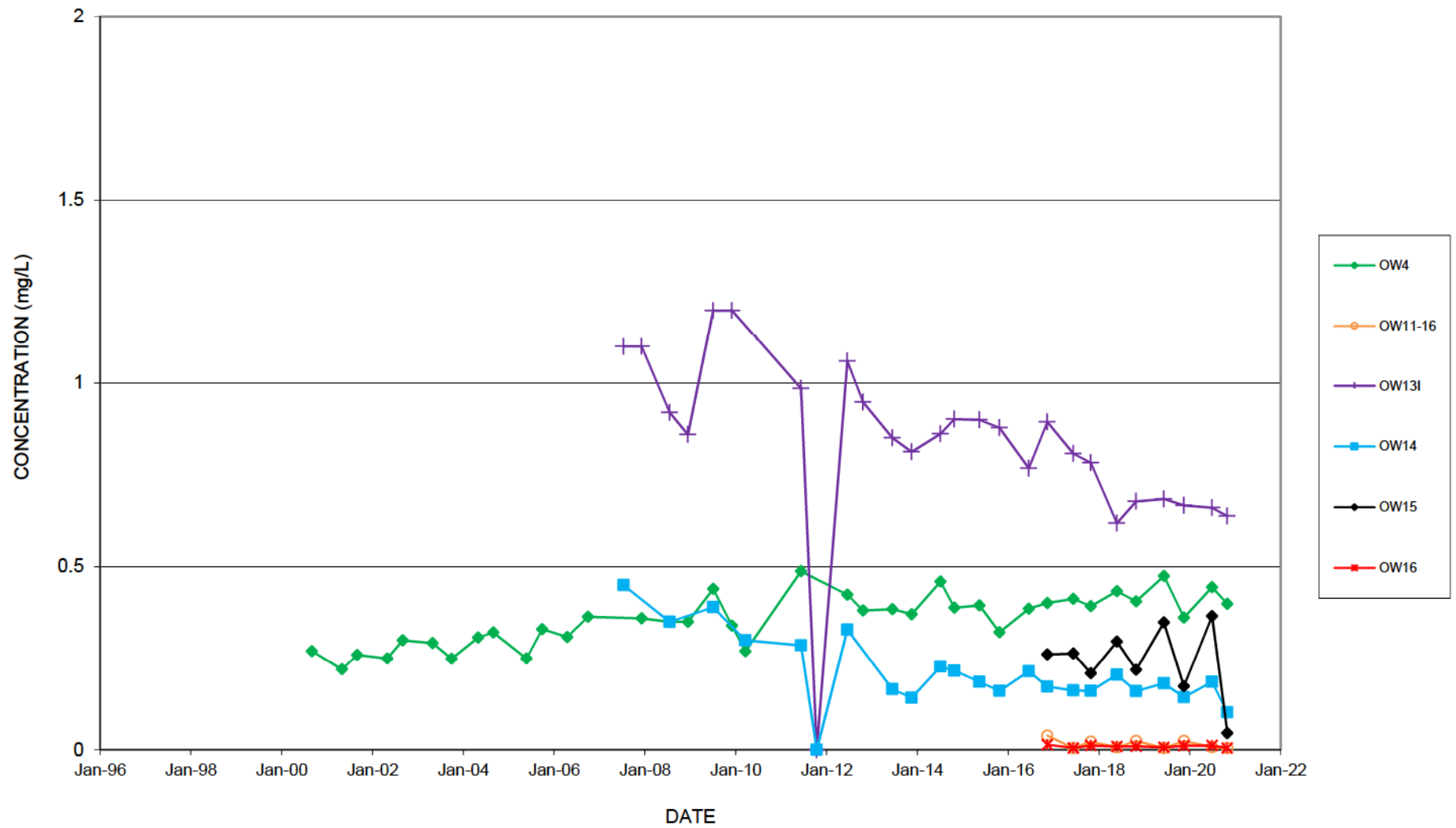
**FIGURE 3**  
**INDICATOR PARAMETERS - SPRING 2020 - MONITORING WELLS**  
**KINLOSS LANDFILL**



**FIGURE 4a**  
**CHLORIDE VS TIME - PRELIMINARY FLOW PATH MONITORING WELLS**  
**KINLOSS LANDFILL**

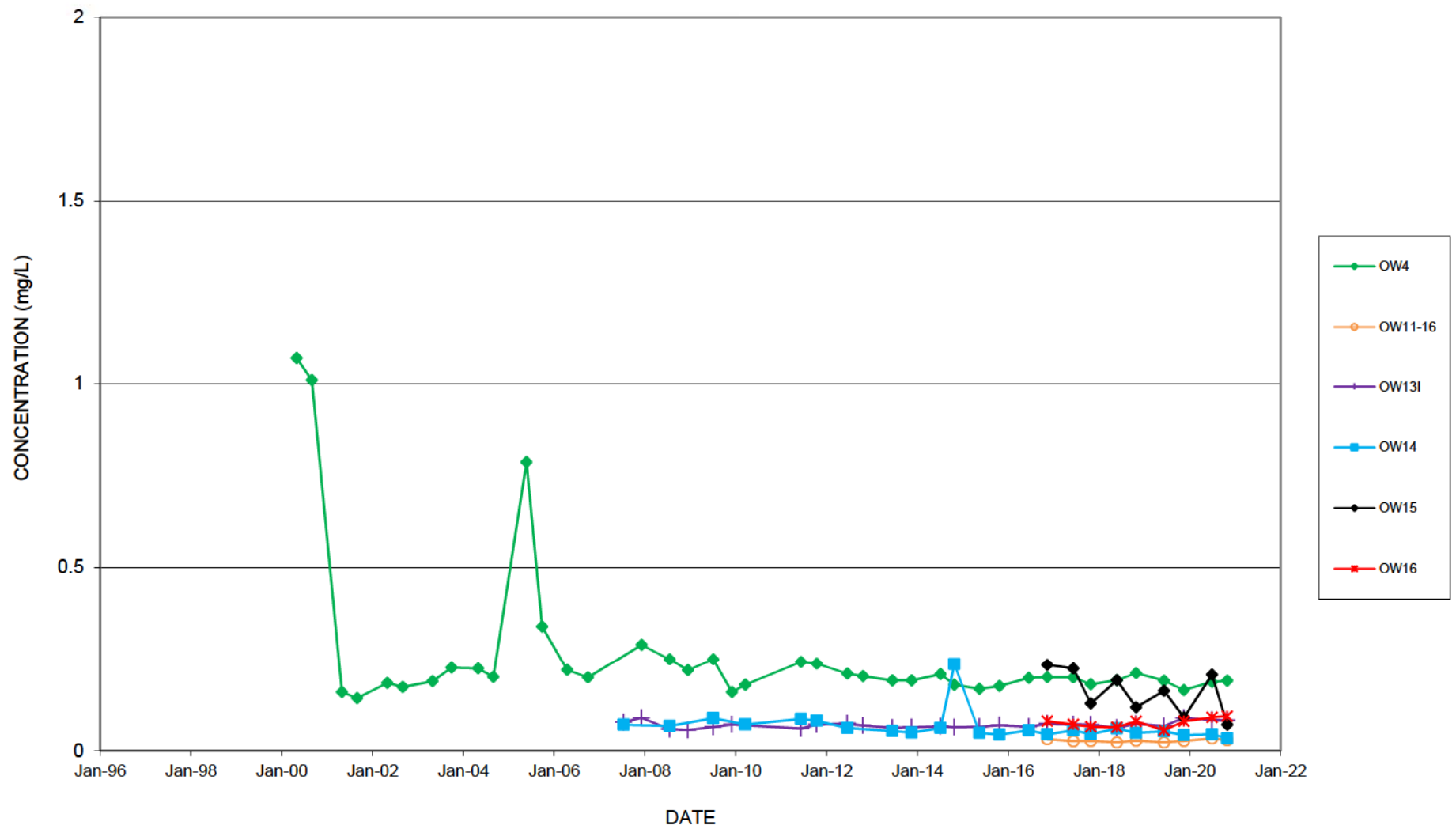


**FIGURE 4b**  
**BORON VS TIME - PRELIMINARY FLOW PATH MONITORING WELLS**  
**KINLOSS LANDFILL**

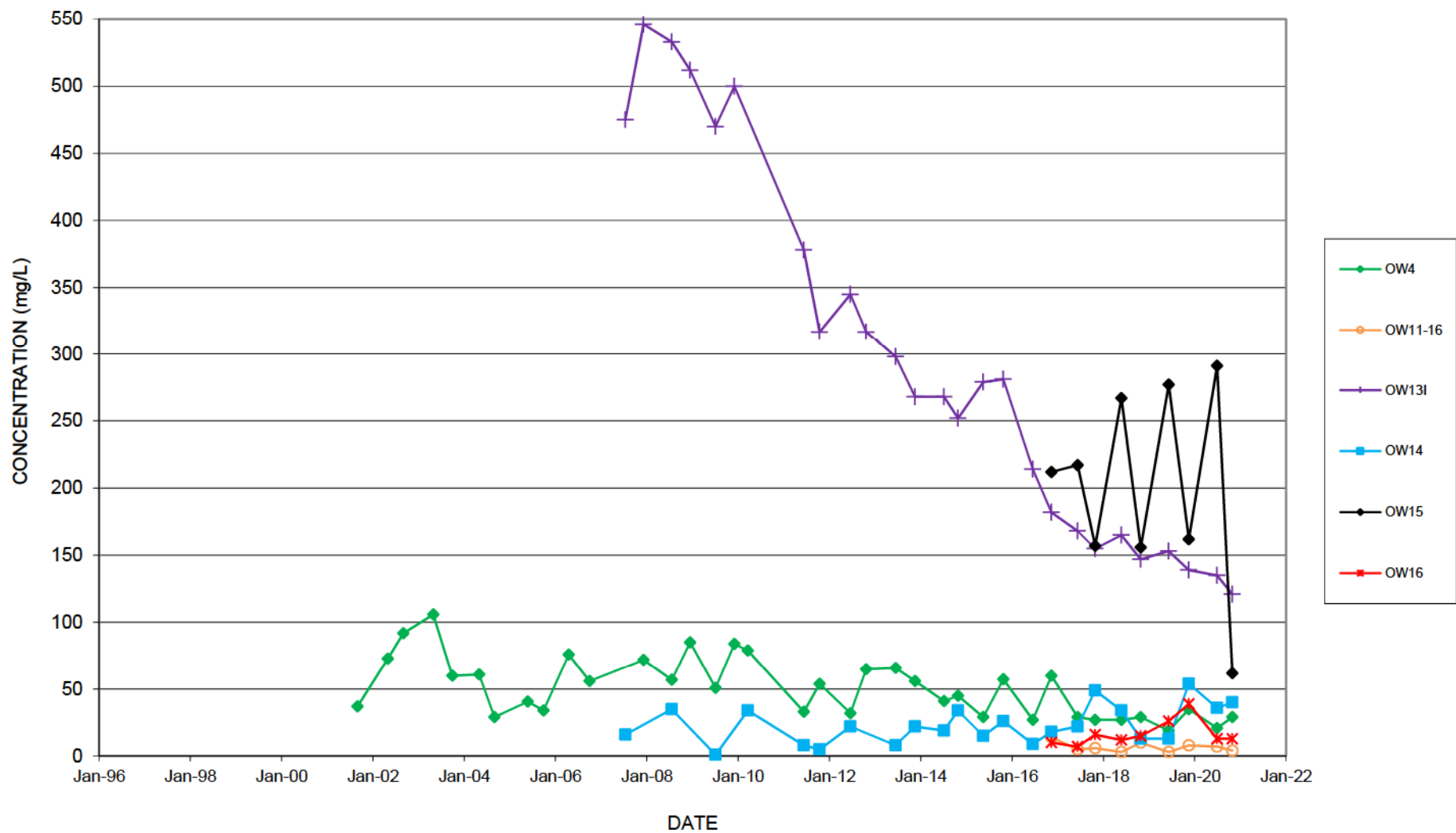




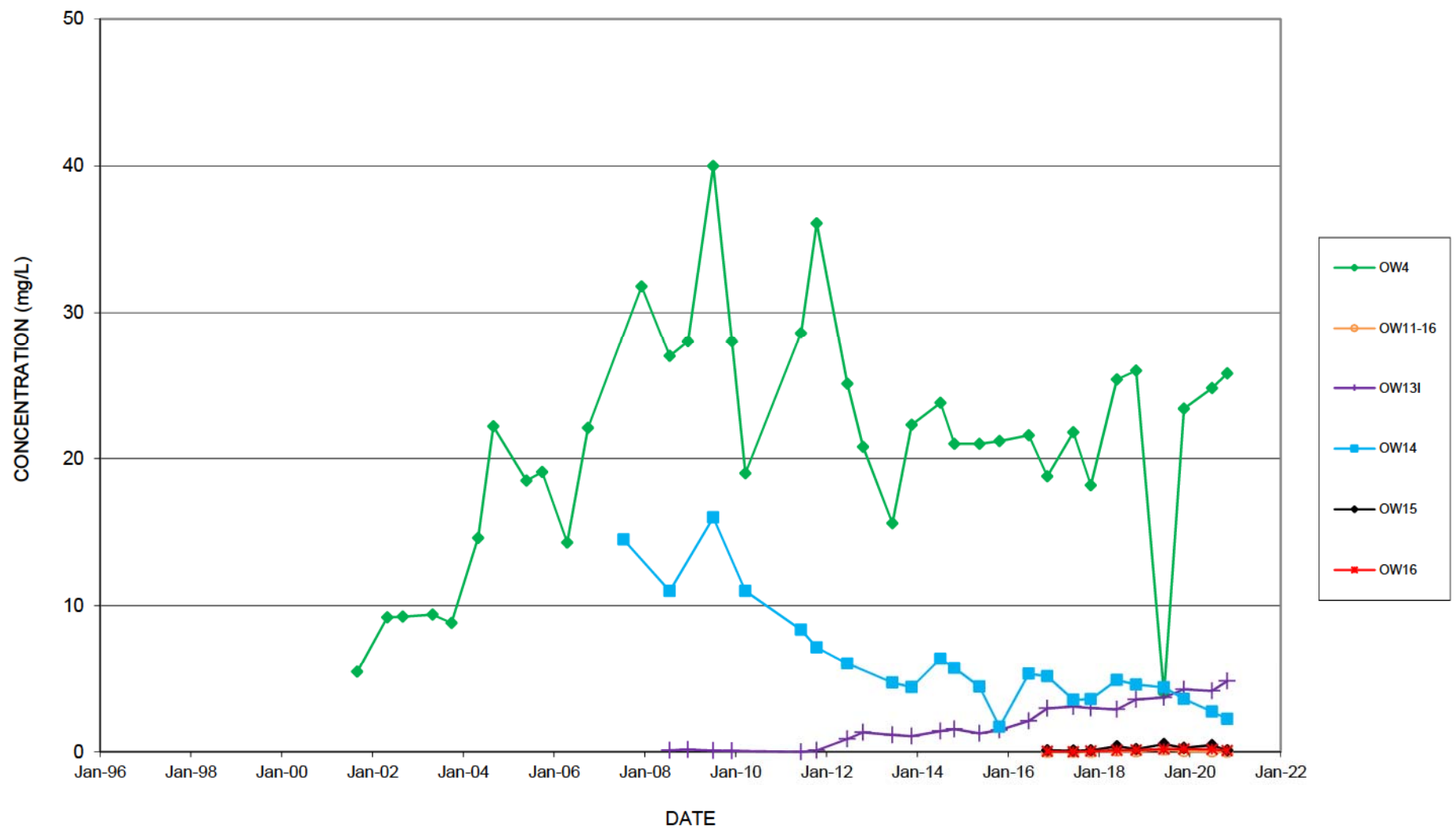
**FIGURE 4c**  
**BARIUM VS TIME - PRELIMINARY FLOW PATH MONITORING WELLS**  
**KINLOSS LANDFILL**



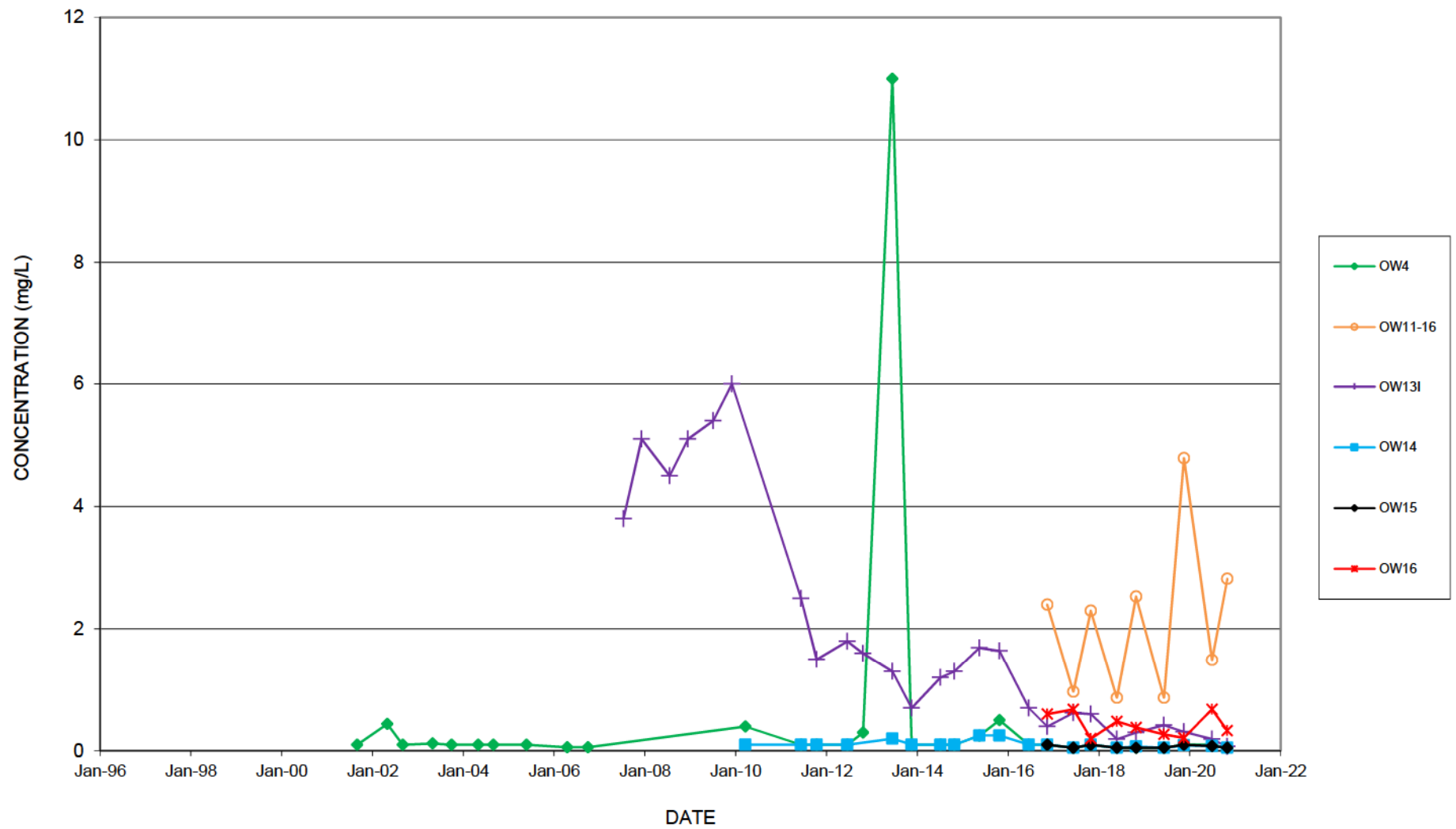
**FIGURE 4d**  
**SULPHATE VS TIME - PRELIMINARY FLOW PATH MONITORING WELLS**  
**KINLOSS LANDFILL**



**FIGURE 4e**  
**AMMONIA VS TIME - PRELIMINARY FLOW PATH MONITORING WELLS**  
**KINLOSS LANDFILL**

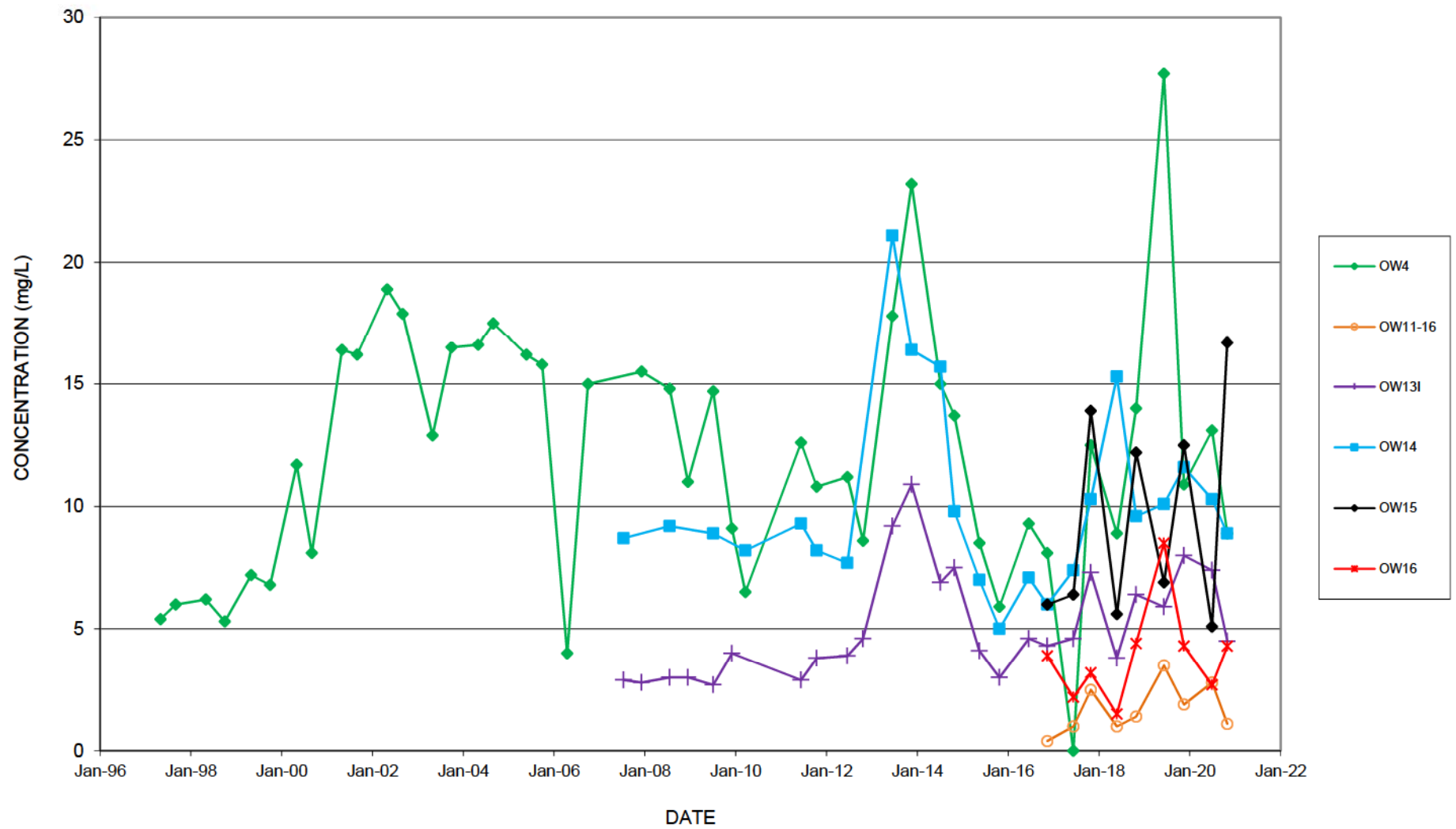


**FIGURE 4f**  
**NITRATE VS TIME - PRELIMINARY FLOW PATH MONITORING WELLS**  
**KINLOSS LANDFILL**

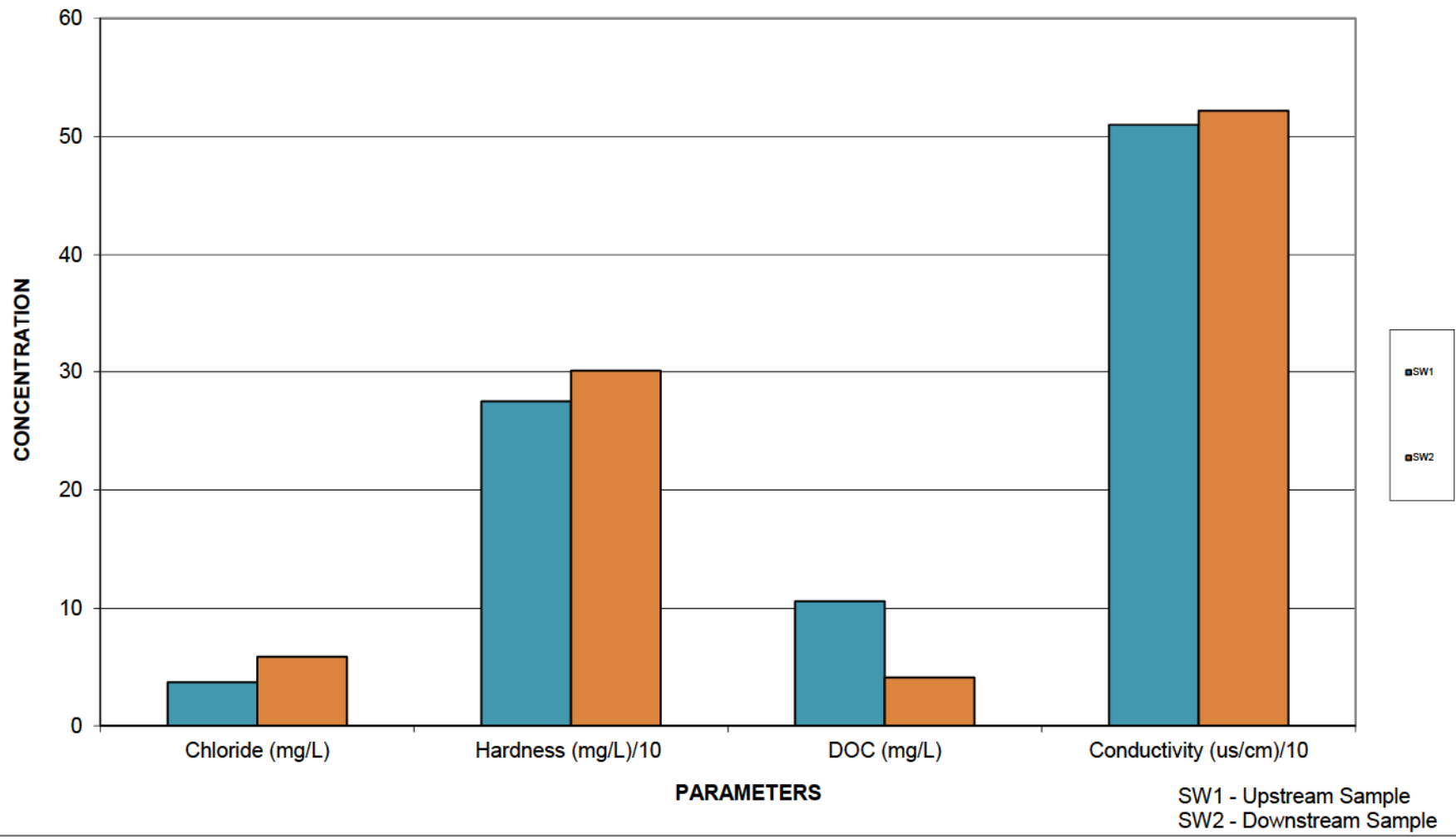




**FIGURE 4g**  
**DOC VS TIME - PRELIMINARY FLOW PATH MONITORING WELLS**  
**KINLOSS LANDFILL**

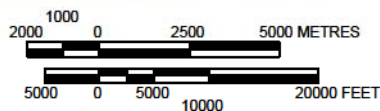


**FIGURE 5**  
**INDICATOR PARAMETERS - JUNE 2020- SURFACE WATER**  
**KINLOSS LANDFILL**



# MAPS





SOURCE: MAPART CORP. 1:250,000 MAP OF WEST CENTRAL ONTARIO 1990/1991

# REGIONAL LOCATION MAP KINLOSS LANDFILL SITE TOWNSHIP OF HURON-KINLOSS

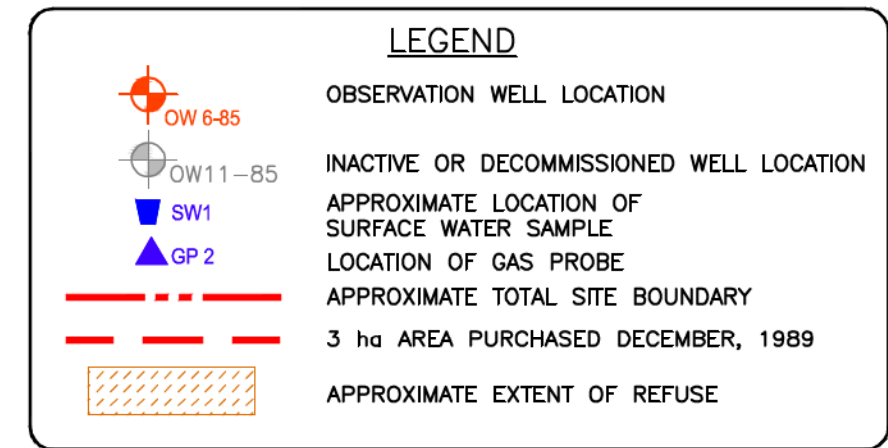
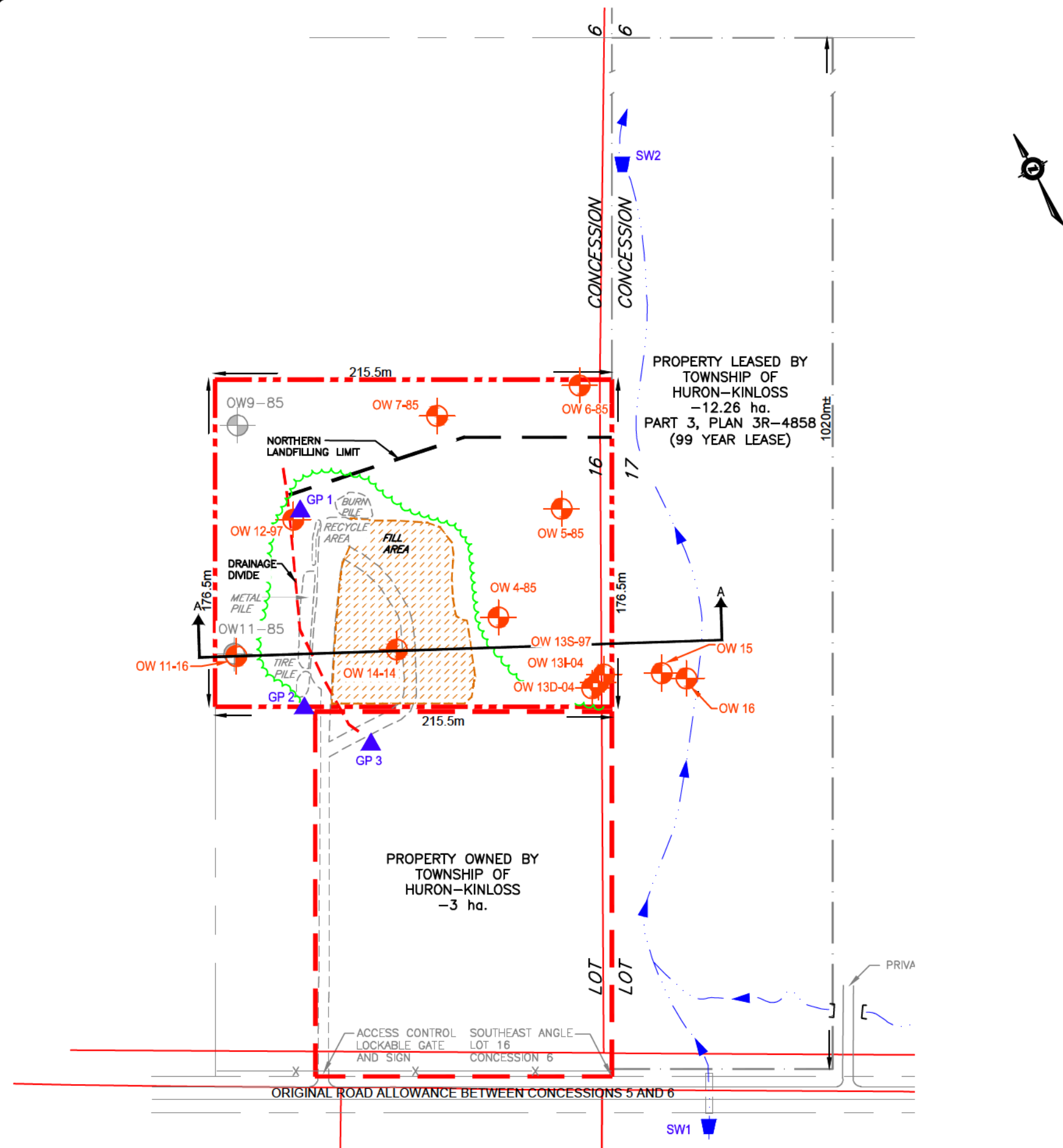


1450 1st Ave W. Suite 101, Owen Sound ON, N4K 6W2  
Telephone: (519) 376-7612 / Fax: (519) 376-8008  
Toll Free: 1-888-376-7612

DESIGN	---
DRAWN	TCG
APPROVED	---
DATE	MARCH 2021
SCALE	1:200,000
FILE No.	101-16945-00
FIG. No.	MAP 1



G:\2010\OS\401 - Environment\101-16945-00 - Kinloss WDS\DRAW\2020-AMR\Figure 2.3 and 4.dwg Mar 29, 2021 - 2:29pm



**NOTES:**

1. INFORMATION ON THIS DRAWING DERIVED FROM DRAWINGS CONTAINED IN THE TOWNSHIP OF HURON-KINLOSS 2006 ANNUAL OPERATIONS AND MONITORING REPORT, KINLOSS LANDFILL SITE PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED.
2. LANDS DESCRIBED AS PART OF LOT 17, CONCESSION 6, FORMER TOWNSHIP OF KINLOSS, COUNTY OF BRUCE (PART 3, PLAN 3R-4858), LEASED BY THE TOWNSHIP OF KINLOSS (NOVEMBER 30, 1989), TOTALING 12.26 ha (30.3 Acres)
3. WASTE NO LONGER ACCEPTED AT KINLOSS LANDFILL SITE. ONLY RECYCLABLES AND BURNABLE MATERIALS ACCEPTED. CURRENT FILLING AREA USED FOR DISPOSAL OF BURN PIT ASHES.
4. CORRECTED SITE BOUNDARIES PROVIDED BY THE TOWNSHIP OF HURON-KINLOSS.

THE CONTRACTOR SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS. DO NOT SCALE THE DRAWING - ANY ERRORS OR OMISSIONS SHOULD BE REPORTED TO WSP.

THE COPYRIGHTS TO ALL DESIGNS AND DRAWINGS ARE THE PROPERTY OF WSP. REPRODUCTION OR USE FOR OTHER THAN THAT AUTHORIZED BY WSP IS FORBIDDEN.

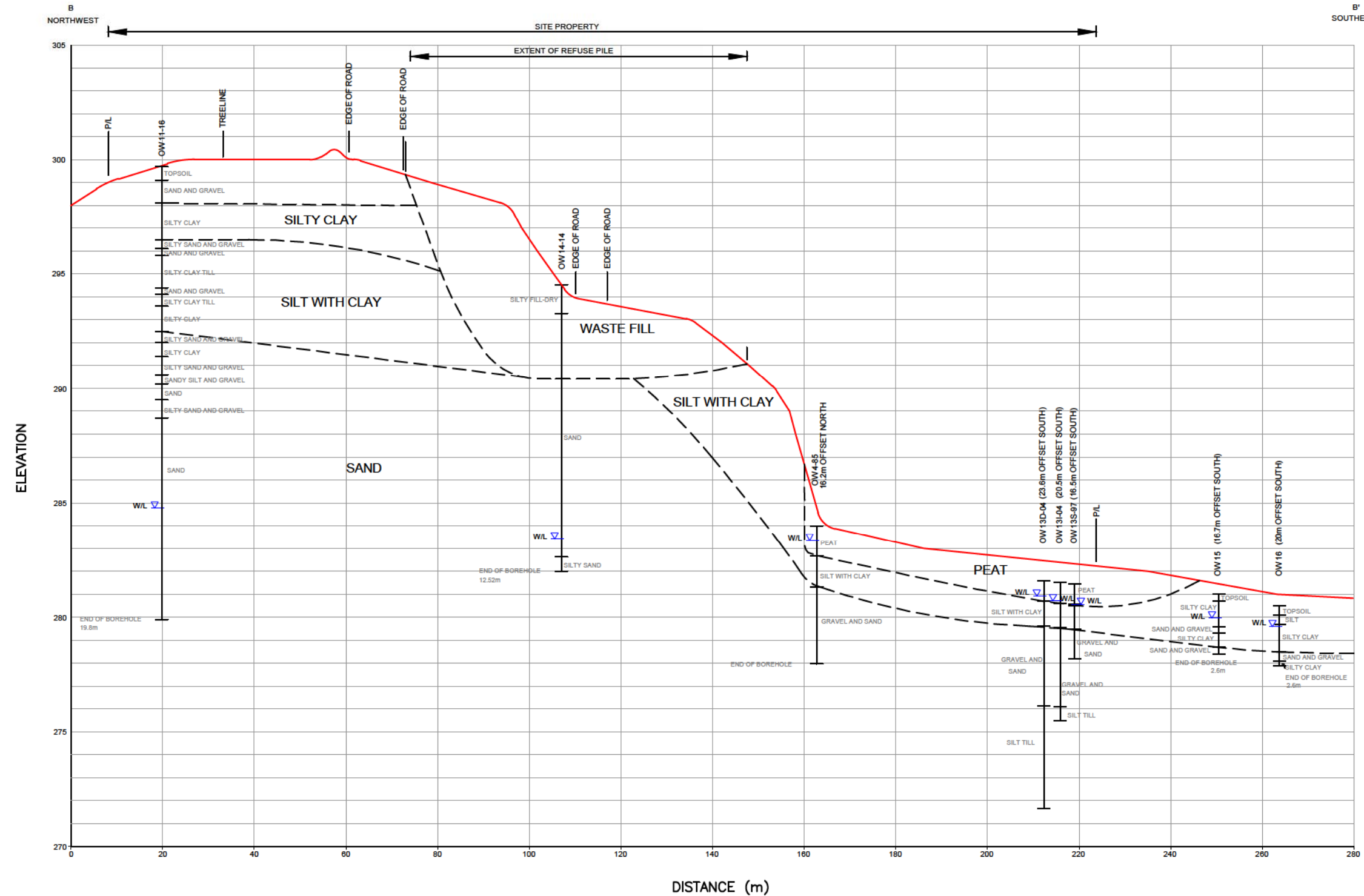
**EXISTING CONDITIONS MAP  
KINLOSS LANDFILL SITE  
TOWNSHIP OF HURON-KINLOSS**



1450 1st Ave W. Suite 101, Owen Sound ON, N4K 6W2  
Telephone: (519) 376-7612 / Fax: (519) 376-8008  
Toll Free: 1-888-376-7612

DESIGN	
DRAWN	TCG
APPROVED	L A L
DATE	MARCH 2021
SCALE	1 : 2,500
FILE No.	101-16945-00
FIG. No.	MAP 2





SCALE HORZ 1: 1000, VERT 1:200

NOTES:

1. CROSS-SECTION CONSTRUCTED FROM AVAILABLE LOCAL SURVEY DATA FOR MONITORING WELLS AND INFERRED GROUND ELEVATIONS (GEODETIC). INFERRED STRATIGRAPHY MAY CHANGE SLIGHTLY IF WELL SURVEY INFORMATION BECOMES AVAILABLE.
2. WATER ELEVATIONS REFLECT FIELD MEASUREMENTS IN MAY 2018 RELATIVE TO GROUND SURFACE. WATER ELEVATIONS ARE TYPICALLY LOWER IN NOVEMBER.

SECTION A-A  
KINLOSS LANDFILL SITE  
TOWNSHIP OF HURON-KINLOSS



1450 1st Ave W, Suite 101, Owen Sound ON, N4K 6W2  
Telephone: (519) 376-7612 / Fax: (519) 376-8008  
Toll Free: 1-888-376-7612

DESIGN	
DRAWN	J L K
APPROVED	L A L
DATE	MARCH 2021
SCALE	AS SHOWN
FILE No.	101-16945-00
FIG. No.	4

# APPENDIX

## A PROVISIONAL CERTIFICATE OF APPROVAL





Ontario

Ministry  
of the  
Environment

Provisional Certificate No. A 272801

## PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE

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

Township of Kinloss  
Holyrood, Ontario  
NOG 2B0

for the use and operation of a 6 hectare (15 acre) landfilling site

all in accordance with the following plans and specifications: 1. Plan of operation submitted to the Owen Sound District Office of MOE under cover of a letter dated August 23, 197

2. Site plan entitled "Kinloss Township Waste Disposal Site."

Located: Part Lot 16, Concession 6  
Township of Kinloss  
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, commercial and 10% non-hazardous solid industrial (limited to miscellaneous debris from agriculture such as wire, stumps and scrap metal) wastes.

and subject to the following conditions:

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

Dated this 1st day of October

19 80

Director, Section 39

# NOTICE

TO: Township of Kinloss  
Holyrood, Ontario  
NOG 2B0

You are hereby notified that Provisional Certificate of Approval No. A 272801 has been issued to you subject to the conditions outlined therein.

The reasons for the imposition of these conditions are as follows:  
The reason for the condition requiring registration of the Certificate is that Section 46 of The Environmental Protection Act, 1971 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.

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 Ave. West,  
5th Floor,  
Toronto, Ontario.  
M4V 1K7

AND The Director,  
Section 39  
Ministry of the Environment,

DATED

this 1st day of October . 1980 .

Wm. J. L.



### NOTICE OF AMENDMENT

TO: Township of Kinloss  
Holyrood, Ontario  
NOG 2B0

*You are hereby notified that the approval issued to you under Certificate of Approval No. A2728 dated October 1, 1980 is hereby amended as follows:*

*The following Condition and corresponding reason is added to the Provisional Certificate of Approval:*

2. *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:*
  - 1) *volumes of waste received; remaining capacity and site life expectancy;*
  - 2) *review of operating procedures, and any deficiencies therein*
  - 3) *the results of any surface water or ground water monitoring programs which may be initiated; and*
  - 4) *the extent and success of the recycling program established by the Township.*

*This report is to be submitted each year by March 31<sup>st</sup>, commencing March 31, 1993.*

*The reason for this addition is to ensure that the necessary studies are completed in order to ensure the protection of the natural environment.*

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

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

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

The name of the appellant;  
The address of the appellant;  
The Certificate of Approval number;  
The date of the Certificate of Approval;  
The name of the Director;  
The municipality within which the sewage works are located;

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


This Notice must be served upon:

Secretary,  
Environmental Appeal Board,  
100 St. Clair Avenue West,  
Suite 502,  
Toronto, Ontario.  
M5V 1N3

AND

The Director,  
Section 39  
Environmental Protection Act,  
Ministry of the Environment,  
985 Adelaide St. South  
London, Ontario  
N6E 1V3

SERVED AT LONDON this 12th day of February, 1993

  
Director  
Section 39,  
Environmental Protection Act

W. Page  
Director, Approvals Branch  
Director, Waste Management Branch  
File



Ministry of  
Environment  
and Energy

Ministère de  
l'Environnement  
et de l'Énergie

AMENDED PROVISIONAL CERTIFICATE OF APPROVAL  
FOR A WASTE DISPOSAL SITE (PROCESSING) NO. A272801  
Page 1 of 1

## NOTICE OF AMENDMENT

TO: Township of Kinloss  
Holyrood, Ontario  
NOG 2B0

You are hereby notified that the approval issued under Certificate of Approval No. A272801 dated October 1, 1980, including all revisions, is hereby amended to the following:

The following conditions are added:

3. Monitoring of groundwater and surface water at the waste disposal site shall be carried out each year to the satisfaction of the Director of the Southwestern Region of the Ministry of the Environment and Energy.
4. Any changes to the monitoring programs for groundwater or surface water must be approved by the Director of the Southwestern Region of the Ministry of the Environment and Energy in writing.

The reasons for the addition of these conditions are:

3. The reason for Condition 3 is to ensure that the appropriate monitoring takes place so that the environmental impact of the waste disposal site can be assessed.
4. The reason for Condition 4 is to ensure that any changes made to the monitoring programs accurately reflect the impact of the waste disposal site on the natural environment.

The following document is added as supporting information to this Certificate of Approval:

"Township of Kinloss Waste Disposal Site Plan of Operation & Development and Hydrogeologic Assessment" dated December 1991 and prepared by Paragon Engineering Ltd.

This Notice shall constitute part of the approval issued under Certificate of Approval No. A272801 dated October 1, 1980, including all revisions.



AMENDED PROVISIONAL CERTIFICATE OF APPEAL  
FOR A WASTE DISPOSAL SITE (PROCESSING) NO. A:  
Page

You may by written notice served upon me and the Environmental Appeal Board within 10 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, as amended, 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.

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 works are located;

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

This Notice must be served upon:

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

AND

The Director,  
Section 39, Environmental Protection Act,  
Ministry of the Environment and Energy,  
985 Adelaide Street South  
London, Ontario,  
N6E 1V3

DATED AT LONDON this 27<sup>th</sup> day of February, 1996



Director,  
Section 39,  
Environmental Protection Act

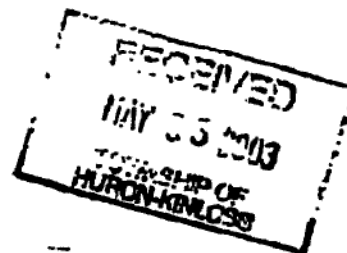
Ministry of the Environment  
Environmental Assessment and  
Approvals Branch  
Floor 12A  
2 St Clair Ave W  
Toronto ON M4V 1L5  
Fax (416)314-8462  
Telephone:

Ministère de l'Environnement  
Direction des évaluations et des  
autorisations environnementales  
Étage 12A  
2 av St Clair O  
Toronto ON M4V 1L5  
Télécopieur: (416)314-8462  
Téléphone:



April 30, 2003

Mary Rose Walden, Administrator  
PO Box 130  
Ripley, Ontario  
N0G 2R0



Dear Sir/Madam:

**Re: Notification of Change of Name/Address  
MOE Reference Number 1923-5M4HNL**

The Ministry of the Environment (the "Ministry") acknowledges receipt of your letter dated April 10, 2003 requesting a change in company name/address:

**FROM:** The Township of Kinloss  
Holyrood, Ontario  
N0G 2B0

**TO:** The Corporation of the Township of Huron-Kinloss  
PO Box 130  
Ripley, Ontario  
N0G 2R0

By this letter, the Ministry advises you that your notification of change in company name/address has been registered in our records for the following Certificate(s) of Approval:

Certificate(s) of Approval for Waste Disposal Sites, Section 27, EPA:  
A272801

The Ministry will not be providing you with an amended certificate(s) to reflect the change in company name/address. Therefore, this letter must be appended to its corresponding Certificate(s) of Approval. The name/address change will be included in any future amended Certificate(s) of Approval.

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

Yours truly,



Michael Durst  
Application Processor

cc: District Manager, Owen Sound

File Storage Number: 0899

# APPENDIX

## B

## BASWR RECYCLING DATA

## *Municipality of HURON-KINLOSS*

*December 2020 BASWR Tons Diverted from Landfill*

	<i>TOTAL TONS</i>	<i>TOTAL TONS TO DATE</i>	<i>TOTAL MT TO DATE</i>
<i>Newspaper</i>	<i>10.53</i>	<i>141.95</i>	<i>128.74</i>
<i>Steel Cans</i>	<i>2.67</i>	<i>36.01</i>	<i>32.66</i>
<i>Aluminum</i>	<i>1.31</i>	<i>17.65</i>	<i>16.00</i>
<i>Mixed Glass</i>	<i>6.60</i>	<i>89.02</i>	<i>80.74</i>
<i>HDPE Plastic</i>	<i>2.63</i>	<i>35.47</i>	<i>32.17</i>
<i>PET Plastic</i>	<i>3.63</i>	<i>48.90</i>	<i>44.35</i>
<i>White Paper</i>	<i>0.26</i>	<i>3.48</i>	<i>3.15</i>
<i>Boxboard</i>	<i>3.65</i>	<i>49.23</i>	<i>44.65</i>
<i>Cardboard</i>	<i>9.34</i>	<i>103.92</i>	<i>94.26</i>

<i>TOTAL</i>	<i>40.61</i>	<i>525.61</i>	<i>476.73</i>
<i>TOTAL TO DATE</i>	<i>525.61</i>		



# APPENDIX

## C CROSS-SECTION AND BOREHOLE LOGS

Project No.: LNE08508  
Location: North Half Part Lot 16, Concession 6, Kinloss Township  
Drilling Company: Noll Drilling Inc.  
Drilling Method: Geoprobe  
Sampling Interval: Continuous  
Supervised by: J. Rutherford  
Construction: 25 mm diameter threaded-joint PVC pipe with 10 slot PVC screen capped with slip-on labcock valve  
lockable steel protective casing

GP1	Depth	Soil Description	Concrete	Bentonite	Sand	Screen
	0.0 - 0.45	Medium brown fine sandy SILT, trace clay; compact; moist				
	0.45 - 3.65	Medium brown fine sandy SILT with 3 to 20 cm thick layers of light brown very fine SAND some silt, and light brown fine to medium sand; compact; moist	0 - 0.5	0.5 - 0.9	0.9 - 3.7	1.2 - 2.7
Borehole Location: North of OW1 Date Started: Jun 14, 2006 Date Completed: Jun 14, 2006						

GP2	Depth	Soil Description

GP2	Depth	Soil Description	Concrete	Bentonite	Sand	Screen
	0.0 - 0.40	Medium brown fine sandy SILT, trace clay; very stiff; moist	0 - 0.5	0.5 - 1.2	1.2 - 3.7	1.5 - 3
	0.40 - 1.00	Medium brown silty fine SAND; compact; moist				
	1.00 - 1.20	Medium brown fine sandy SILT, trace gravel; firm; moist				
	1.20 - 1.50	Medium brown fine sandy SILT, some gravel; non-plastic; firm; moist (appears disturbed - fill?)				
	1.50 - 2.25	Medium brown sandy SILT, some gravel; non-plastic; firm; moist				
	2.25 - 2.45	Light brown fine SAND, trace silt; loose; moist				
	2.45 - 3.60	Light brown fine SAND, some silt; layered with thin layers of medium sand nad sandy silt; loose; moist				
	3.60 - 3.65	Medium brown fine sandy SILT; non-plastic; firm; moist				
Borehole Location: West side of access road, between page wire fence and tire pile						
Date Started: Jun 14, 2006						
Date Completed: Jun 14, 2006						

GP3	Depth	Soil Description	Concrete	Bentonite	Sand	Screen
	0.0 - 0.10	Light brown gravelly SAND, some silt; trace organic matter; loose; dry	0 - 0.5	0.5 - 0.6	0.6 - 2.3	0.8 - 2.3
	0.10 - 0.55	Medium red-brown fine SAND, trace silt; loose; moist				
	0.55 - 1.20	Light brown fine SAND, trace silt; loose; moist				
	1.20 - 2.15	Light brown fine SAND, trace silt; layered with thin seams of fine sand some silt, and silty fine sand; loose; moist				
	2.15 - 2.45	Medium brown fine sand SILT; non-plastic; compact; moist				
Borehole Location: Between fill area and lower access road Date Started: Jun 14, 2006 Date Completed: Jun 14, 2006						



Paragon Engineering Limited

WELL No. TP

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

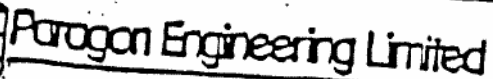
LOCATION Part Lot 16, Concession VI, Kinloss Township

DATE November 20, 1985

PROJECT No. 5-937

DEPTH METRES ELEV.	DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
		No.	TYPE	"X"		
0 82.316	GROUND LEVEL					
0.25 82.313	TOPSOIL					
0.610 81.906	LIGHT BROWN SILTY SAND GRAVEL AND SOME COBBLE					
1.118 81.398		2	G.S.			
1.524 80.992	FINE TO MEDIUM SAND					
2.032 80.484		3	G.S.			
	END OF TEST PIT					
						NO GROUND WATER

\* INCL. TUBE, 45° CRAB SAMPLE, 15° SPLIT SPOON, "X" - SLOWS



WELL No. II

CLIENT Township of Kinloss  
PROJECT Kinloss

PROJECT Kinloss Township Landfill

DATE November 20, 1981

LOCATION Part Lot 16, Concession VI, Kinloss Township

PROJECT No. 5-937

DEPTH METRES - FEET		DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
			NO.	TYPE	"N"		
	0.00	GROUND LEVEL					
0.20	0.66	TOPSOIL					
1.29	4.23	MEDIUM BROWN SAND					
1.77	5.81		1	G.S.			
2.21	7.25	END OF TEST PIT					

17 - INLET TUBE, 18 - GAS SAMPLE, 19 - SPLIT ROOM, "N" - BLOW

17 - INJECT TIME, 18 - GAS SAMPLE, 19 - INLET FLOW, 20 - BLOW





Paragon Engineering Limited

WELL No. TP3

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

DATE November 20, 1985

LOCATION Part Lot 16, Concession VI, Kinloss Township

PROJECT No. 5-937

DEPTH METRES ELEV		DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
			No.	TYPE	"H"		
0	35.37	GROUND LEVEL					
		TOPSOIL					
0.203	35.436	BROWN SILTY SAND, SOME GRAVEL					
0.610	35.029	GREY SANDY GRAVEL, SOME COBBLE					
0.914	34.732		4	G.S.			
1.931	33.358						
		FINE TO MEDIUM SAND					
2.432	33.201		5	G.S.			
2.794	32.645	END OF TEST PIT					
NO GROUND WATER							



Paragon Engineering Limited

WELL NO. TP4

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

DATE November 20, 1985

LOCATION Part lot 16, Concession VI, Kinloss Township

PROJECT No. 5-937

DEPTH METERS		DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
			No.	TYPE	"N"		
0.479	81.280						
0	80.301	GROUND LEVEL					OW4-85
		PEAT					
0.406	80.372						
0.404	80.177	YELLOW TO GREY SILTY SAND WITH GRAVEL					0.038 (1 1/2) $\phi$ $\Delta$ L PIPE
0.762	80.039						NOV. 20/85
1.219	79.282	SANDY GRAVEL SOME COBBLE					NATIVE BACKFILL
1.430	78.871						SLOTTED PIPES WRAPPED WITH FABRIC FILTER 10.6M LENGTH



Paragon Engineering Limited

WELL No. TP5-

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

LOCATION Part Lot 16, Concession VI, Kinloss Township

DATE November 20, 1985

PROJECT No. 5-937

DEPTH METRES ELEV		DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
			No.	TYPE	"N"		
0-122	80.510						OW5-85
0	80.516	GROUND LEVEL					
		PEAT					
0-203	80.57	LIGHT BROWN FINE TO MEDIUM SAND, SOME GRAVEL					
0-305	79.181						
0-410	79.446	SILTY SAND SOME GRAVEL					NOV. 20/85  0.038 (1 1/2") Ø ΔE PIPE  NATIVE BACKFI  SLOTTED PIPE WRAPPED WITH FABRIC FILTE (3.6M LENGTH)
0-714	78.322						
1-824	78.732	GREY SANDY SILT					
2-38	77.518						
2-40	77.716	END OF TEST PIT					

1 - Shelby Tube, 25 - Grab Sample, 33 - Split Spoon, "N" - Blows



Paragon Engineering Limited

WELL No. TP6

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

DATE November 20, 1985

LOCATION Part Lot 16, Concession VI, Kinloss Township

PROJECT No. 5-937

DEPTH METRES		DESCRIPTION	SAMPLE		WELL DETAIL	REMARKS
			No	TYPE "X"		
C	79.43	GROUND LEVEL				OW6-81
0.223	79.218	BLACK TOPSOIL	55			NOV. 20/85
0.610	78.991	LTGHT BROWN SILTY SAND	9	G.S.		0.038 (1 1/2") $\phi$ PIPE
0.914	78.687					NATIVE BACKFILL
1.219	78.382	GREY SILTY SAND, SOME GRAVEL	10	G.S.		SLOTTED PIPE WRAPPED WITH FABRIC FILTER (0.6M LENGTH)
1.340	78.11	END OF TEST PIT				

7 - TOP OF TIE    15 - GRAB SAMPLE    15 - SPLIT SPOON    "X" - BLOW



Paragon Engineering Limited

WELL No. TP7

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

LOCATION Part Lot 16, Concession VI, Kinloss Township

DATE November 20, 1983

PROJECT No. 5-937

DEPTH METERS ELEV.		DESCRIPTION	SAMPLE No. TYPE No.	WELL DETAIL	REMARKS
0.131	83.173				
0	83.42	GROUND LEVEL			
		TOPSOIL			
0.203	82.779	BROWN SILTY SAND			
0.610	82.412	GREYISH BROWN FINE TO MEDIUM SAND			
1.219	81.403	DENSE LIGHT BROWN SILTY SAND			
3.29	81.143		11 G.S.		
4.38	80.584	SILT			
5.63	80.457	END OF TEST PIT			

0.038 (1 1/2") Ø Δ PIPE

NATIVE BACKFILL

NOV. 20/83

SLOTTED PIPE  
WRAPPED WITH  
FABRIC FILTER  
(0.6M LENGTH)

Δ

OW7-8



Paragon Engineering Limited

WELL No. TP8

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

LOCATION Part Lot 16, Concession VI, Kinloss Township

DATE November 20, 1985

PROJECT No. 5-937

DEPTH METRES - ELEV.		DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
			No.	TYPE	"X"		
0	87.34	GROUND LEVEL					
		TOPSOIL					
0.508	87.226						
		BROWN SILTY SAND					
0.912	86.730						
		LIGHT BROWN FINE SAND					
1.219	86.343		12	G.S.			
2.236	85.378						
2.541	84.7-3	DENSE SILTY SAND SOME GRAVEL					
2.642	84.672		13	G.S.			
		END OF TEST PIT					

NO GROUND WATER

1T - INCHES TUBE, 05 - GRAB SAMPLE, 12 - SPLIT SPOON, "X" - BLOW





Paragon Engineering Limited

WELL No. TP-9

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

DATE November 20, 1985

LOCATION Part Lot 16, Concession VI, Kinloss Township

PROJECT No. 5-937

DEPTH METRES / FEET		DESCRIPTION	SAMPLE No. TYPE "N"			WELL DETAIL	REMARKS
0.000	0.000	GROUND LEVEL					OW-9-85
0.305	0.305	TOPSOIL					
1.219	1.219	BROWN SANDY SILT COBBLES AT 1.219m LEVEL (COMPACT AND WET)					
2.438	2.438	SILTY SAND AND GRAVEL (DRY)					
1.2	1.2	END OF TEST PIT					

0.038 (1 1/2")  $\phi$  A  
PIPE

NATIVE  
BACKFI

SLOTTED PIPE  
WRAPPED W/  
FILTER FABR  
(0.6m LENGTH)

NO GROUND  
WATER BU  
MOIST



Paragon Engineering Limited

WELL NO. TRIC

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

DATE November 20, 1985

LOCATION Part Lot 16, Concession VI, Kinloss Township

PROJECT No. 5-937

DEPTH METRES ELEV.		DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
			No.	TYPE	"X"		
0	101.452	GROUND LEVEL					
		TOPSOIL					
0.203	101.249						
		BROWN SANDY SILT, GRAVEL, COMPACT COBBLE AT F829 LEVEL					
1.324	99.128						
			15	G.S.			
1.418	98.104						
		END OF TEST PIT					

NO GROUND  
WATER

17 - INCH TUBE, 18 - GRAB SAMPLE, 19 - SPLIT SPON, "X" - BLOW



Perogon Engineering Limited

WELL No. TP11-

CLIENT Township of Kinloss

PROJECT Kinloss Township Landfill

DATE November 20, 1985

LOCATION Part Lot 16, Concession VI, Kinloss Township

PROJECT No. 5-937

DEPTH METRES <u>22.34</u>	DESCRIPTION	SAMPLE			WELL DETAIL	REMARKS
		No.	TYPE	"X"		
<u>0.127</u> <u>96.253</u>						<u>OW.TI-85</u>
<u>0</u> <u>96.168</u>	<u>GROUND LEVEL</u>					
	<u>TOPSOIL</u>					
<u>0.203</u> <u>95.965</u>	<u>DARK BROWN SILTY SAND</u>					<u>0.038 (1 1/2") Ø AB PIPE</u>
<u>0.610</u> <u>95.418</u>	<u>LIGHT BROWN SILTY SAND SOME GRAVEL COBBLE AT BOTTOM</u>					<u>NATIVE BACKFILL</u>
<u>1.524</u> <u>94.824</u>		<u>16</u>	<u>G.S.</u>			<u>SLOTTED PIPE WRAPPED WIT FILTER FABRI (0.6M LENGTH)</u>
<u>9.16</u> <u>93.162</u>	<u>END OF TEST PIT</u>					<u>NO GROUND WATER</u>

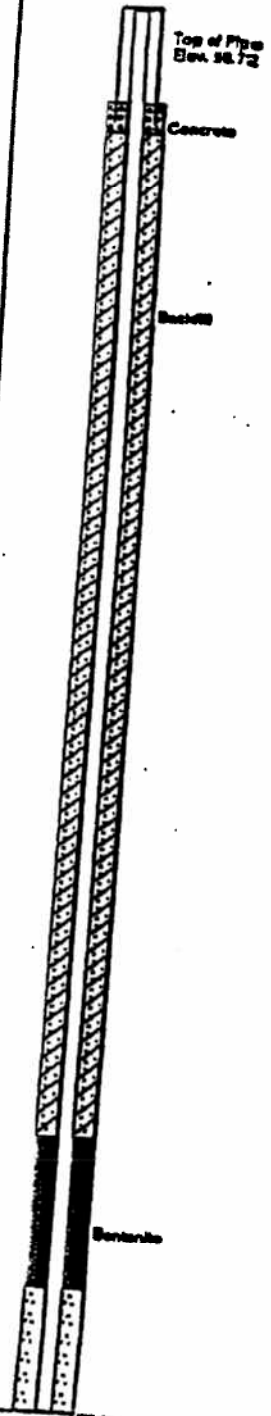
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96 - 1/2" PLUG  
97 - 1/2" PLUG  
98 - 1/2" PLUG  
99 - 1/2" PLUG  
100 - 1/2" PLUG

SAMPLE NUMBER: 63.5kg; DROP: 760mm

DATE: 10/1/97

DEPTH METRES	BORING METHOD	SOIL PROFILE		SAMPLES			ADDITIONAL LAB. TESTING	MONITORING INSTALLATIONS GROUNDWATER AND ENVIRONMENTAL OBSERVATIONS
		DESCRIPTION	STRATA PLOT DEPTH m	ELEV. m	NUMBER	TYPE		
		GROUND SURFACE		37.88 0.00				
		Compact to very dense brown fine SAND, trace silt			1	38		
					2	38		
					3	38		
					4	38		
					5	38		
					6	38		
					7	38		
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OW12-97



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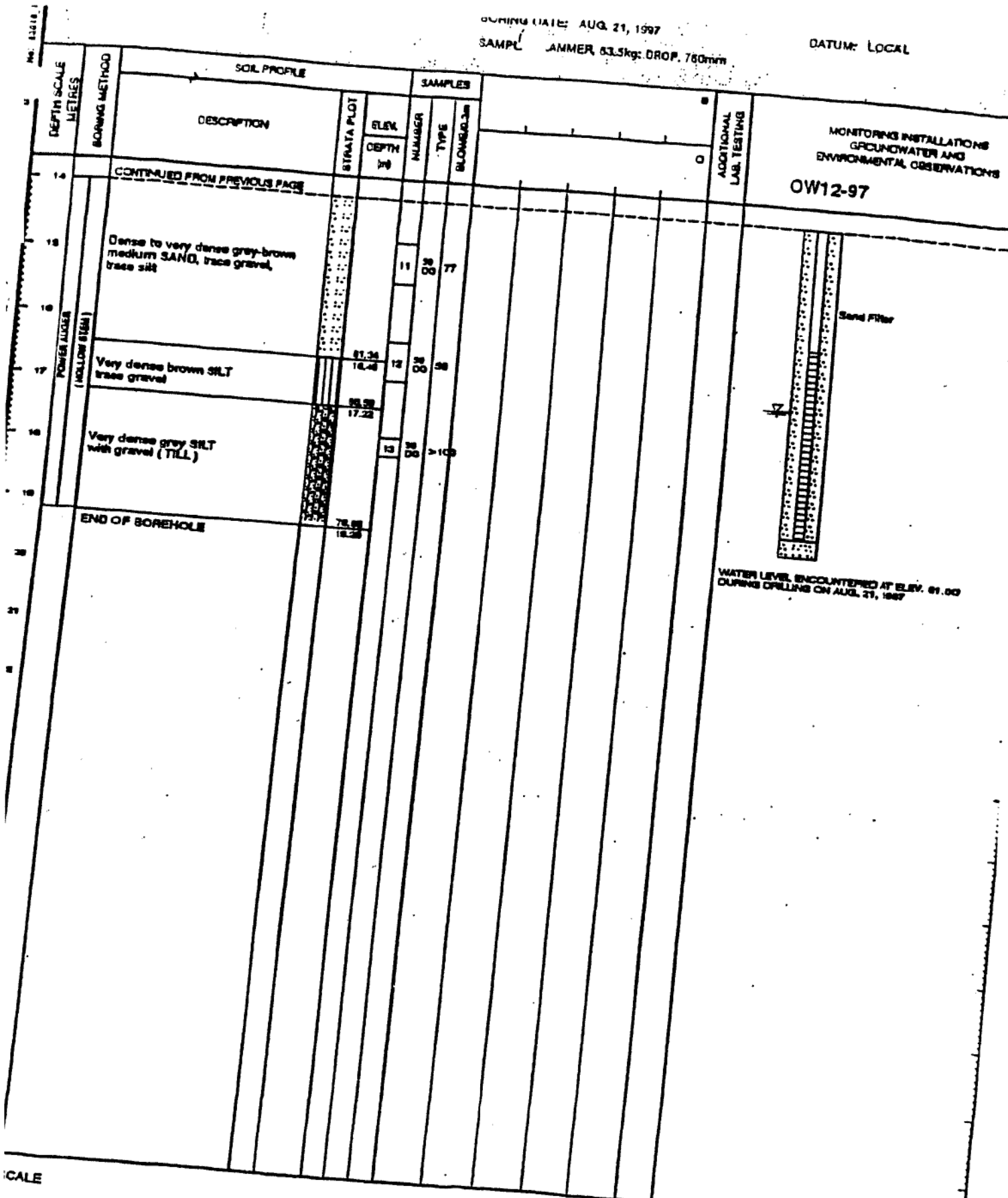
SCALE

Golder Associates

LOGGED: T.P.  
CHECKED: *RW*

BORING DATE: AUG 21, 1997  
 SAMPLE: ANMER, 53.5kg; DROP: 760mm

DATUM: LOCAL



SCALE

Golder Associates

LOGGED: T.P.

CHECKED: *RW*

**BOREHOLE LOG**

Project: **Kinloss Landfill**  
 Client: **Township of Huron - Kinloss**  
 Method: **HSA / Direct Push sampling**  
 Elev: **masl** TOC: **masl**

Dia: **197 mm**  
 Depth: **12.52 m**  
 Supervisor: **E. VanDenKieboom**

Project#: **101-16945-00**  
 Date: **Oct 28, 14**  
 Driller: **Strata Soil**

METRES	Depth	Stratigraphic  Description	Strata Plot	Samples				Well Instrumentation
				Sample Interval	Sample No.	Sample Type	SPT - N Value	
								Stickup = 0.75 metres
		SILTY FILL - Dry.						0.0 Concrete
		WASTE FILL - Black, strong odour, plastic in cuttings - Dry.						MOE WELL TAG # A171902
1								0.6
2								Bentonite Seal ( Holeplug )
3								
4		SAND - Medium grey grading to brown in colour with depth, very fine to fine grained SAND, moist. Soil has a distinct chemical odour.						PVC threaded 2 " dia. riser pipe
5		Occurence of several very thin SILTY CLAY lenses.			1 DP			
6								



**BOREHOLE LOG**

Project: **Kinloss Landfill**  
 Client: **Township of Huron - Kinloss**  
 Method: **HSA / Direct Push sampling**  
 Elev: **masl** TOC: **masl**

Dia: **197 mm**  
 Depth: **12.52 m**  
 Supervisor: **E. VanDenKieboom**

Project#: **101-16945-00**  
 Date: **Oct 28, 14**  
 Driller: **Strata Soil**

METRES Depth	Stratigraphic  Description	Strata Plot	Samples				Well Instrumentation
			Sample Interval	Sample No.	Sample Type	SPT - N Value	
8	<i>SAND - Medium grey grading to brown in colour with depth, very fine to fine grained SAND, moist. Soil has a distinct chemical odour.</i>						Bentonite Seal ( Holeplug )
8.2							
9							Graded Sandpack
9.5							
10							PVC threaded 2 " dia. 10 slot screen
11	<i>Sands are becoming saturated, with some silt.</i>			2	DP		Encountered water @ 10.66 mbgl - Oct 28, 2014
12	<i>SILTY very fine SAND - brown, saturated.</i>						Static Water Level @ 11.75 mbgl - Oct 29, 2014
12.5	<i>E.O.H. - End of Hole @ 12.52 mbgl</i>						Bottom of Well @ 12.52 mbgl
13							

PROJECT: Landfill Monitoring  
 CLIENT: Township of Huron-Kinloss  
 PROJECT LOCATION: Huron County, Kinloss Landfill  
 DATUM: Geodetic  
 BH LOCATION:

**DRILLING DATA**  
 Method: Direct Push Continuous Sampler  
 Diameter: 150  
 Date: Aug/16/2016  
 REF. NO.: 101-16945-00  
 ENCL NO.: 2

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	POCKET PEN. (C <sub>u</sub> ) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m												
SHEAR STRENGTH (kPa)																	
								20	40	60	80	100					
								○ UNCONFINED	+	FIELD VANE & Sensitivity							
								● QUICK TRIAXIAL	×	LAB VANE							
								WATER CONTENT (%)									
								20	40	60	80	100					
										</							

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: Landfill Monitoring  
 CLIENT: Township of Huron-Kinloss  
 PROJECT LOCATION: Huron County, Kinloss Landfill  
 DATUM: Geodetic  
 BH LOCATION:

**DRILLING DATA**  
 Method: Direct Push Continuous Sampler  
 Diameter: 150  
 Date: Aug/16/2016  
 REF. NO.: 101-16945-00  
 ENCL NO.: 2

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	POCKET PEN. (C <sub>u</sub> ) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
								20 40 60 80 100							
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							
								20 40 60 80 100							
11.0	SAND: very fine, trace to some silt, light brown, dry to moist		8	UNDIST			85								
12							84								
13			9	AUGER			83								
14							82								
15			10	AUGER			81								
16							80								
17	saturated		11	AUGER			79								
18			12	AUGER			78								
19			13	AUGER			77								
78.5 17.7															
76.4 19.8	END OF BOREHOLE: Notes: 1. At 12.2 mbg, had to switch to augers due to refusal of the direct push continuous sampler. 2. Borehole caved to 14.3 mbg upon completion. Drillers were able to push well pipe through saturated sand to 19.8 mbg. 3. Installed monitoring well upon completion.														

W. L. 81.0 m  
Upon Completion

## GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

## GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity  
 ○ s=3% Strain at Failure

PROJECT: Landfill Monitoring  
 CLIENT: Township of Huron-Kinloss  
 PROJECT LOCATION: Huron County, Kinloss Landfill  
 DATUM: Geodetic  
 BH LOCATION:

**DRILLING DATA**  
 Method: Sonic Vibration  
 Diameter: 150  
 Date: Aug/15/2016  
 REF. NO.: 101-16945-00  
 ENCL NO.: 3

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	POCKET PEN. (C <sub>u</sub> ) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)									
80.0								20	40	60	80	100					
0.0	TOPSOIL: 300mm, trace organics, wet to saturated																GR SA SI CL
79.7			1	SS													TOC elevation = 81.01 masl
0.3	SILTY CLAY: grey, some brown weathering, wet, dense																
79.2																	
0.8	dark grey, some gravel, mosit to wet, some root channels		2	SS													Drilling supervised by Elaine VanDenKieboom
78.7																	
1.4	SAND AND GRAVEL: some silt, some clay, grey, saturated																
78.3																	
1.7	SILTY CLAY: some sand, some gravel, brown, wet, dense		3	SS													
77.7																	
2.3	SAND AND GRAVEL: coarse, brown, saturated		4	SS													
77.4																	
2.6	END OF BOREHOLE: Notes: 1. Borehole caved to approximately 2.3 mbg upon completion. 2. Installed monitoring well upon completion.																

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure

PROJECT: Landfill Monitoring  
 CLIENT: Township of Huron-Kinloss  
 PROJECT LOCATION: Huron County, Kinloss Landfill  
 DATUM: Geodetic  
 BH LOCATION:

**DRILLING DATA**  
 Method: Sonic Vibration  
 Diameter: 150  
 Date: Aug/15/2016  
 REF. NO.: 101-16945-00  
 ENCL NO.: 4

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	POCKET PEN. (C <sub>u</sub> ) (kPa)	NATURAL UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m			SHEAR STRENGTH (kPa)							
80.0								20 40 60 80 100	10 20 30						
0.0	TOPSOIL: 360mm, trace organics, saturated		1	SS				20 40 60 80 100	10 20 30						GR SA SI CL TOC elevation = 80.83 masl
79.6															
79.4	SILT: layered with silty clay, rust staining in silt lenses, light grey, moist, dense														
0.5	SILTY CLAY: some gravel, some coarse sand, greenish grey, moist, dense														
79.2			2	SS											
0.8	dark grey and light grey mottled, smooth														
1															
			3	SS											
2															
78.0															
2.0	SAND AND GRAVEL: some silt, coarse, brown, saturated														
77.6															
2.4	SILTY CLAY: dark grey		4	SS											
77.5															
77.4	SAND AND GRAVEL: coarse, saturated														
2.6	END OF BOREHOLE: Notes: 1. Borehole caved to approximately 2.4 mbg upon completion. 2. Installed monitoring well upon completion.														

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

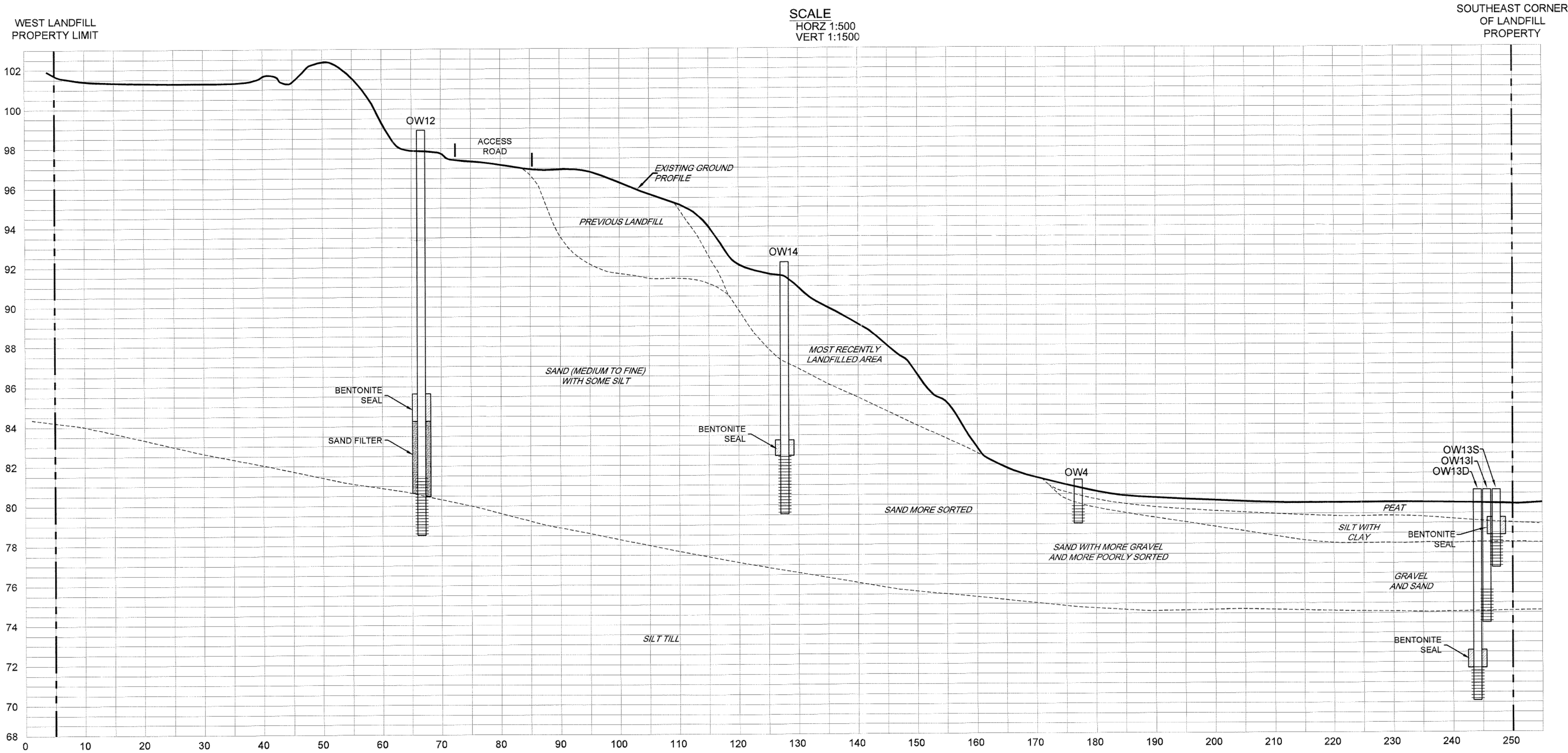
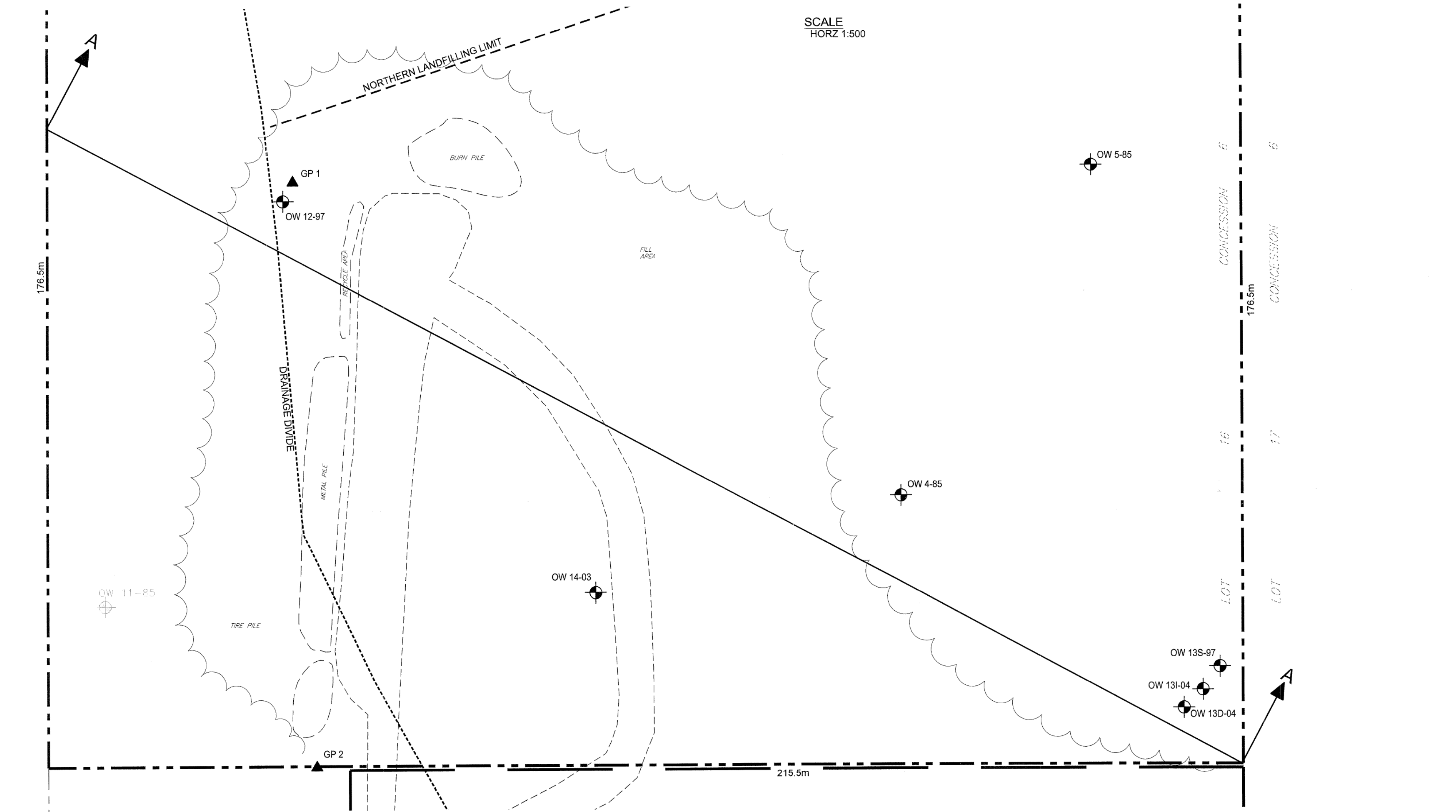
GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ s=3% Strain at Failure



ORIGINAL SHEET - A1  
Township of Huron-Kinloss (2017 Kinloss Landfill) 2019 JAF/BRP Map Site X-Section  
2010 March 30, 11:37 am

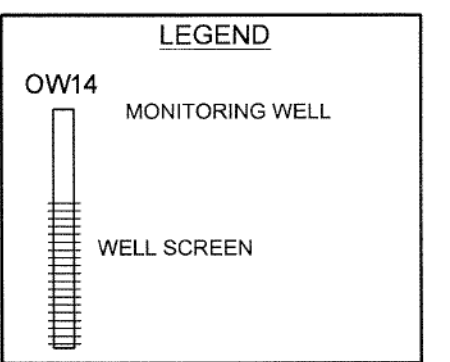
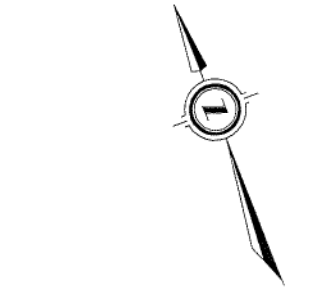


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Notes

1. ELEVATION IN METRES - ASSUMED DATUM



Revision

No.	Description	By	Appd.	Date
0	FIRST SUBMISSION	JS	BRP	2008.02.25
1	SECOND SUBMISSION	JS	BRP	2009.03.13
2	THIRD SUBMISSION	JS	BRP	2010.03.30

Seals



PRYDE SCHROPP McCOMB INC.

CONSULTING ENGINEERS

TEL: (519) 389-4343 FAX: (519) 389-4728

www.psmc.co

311 GODERICH STREET, P.O. BOX 1600, PORT ELGIN ON N0H 2C0

Client/Project

TOWNSHIP OF HURON-KINLOSS  
KINLOSS LANDFILL SITE

Township of Huron-Kinloss, Ontario

Title

SITE CROSS-SECTION

Project No.

00938

Scale

AS NOTED

Dwn by

JAF

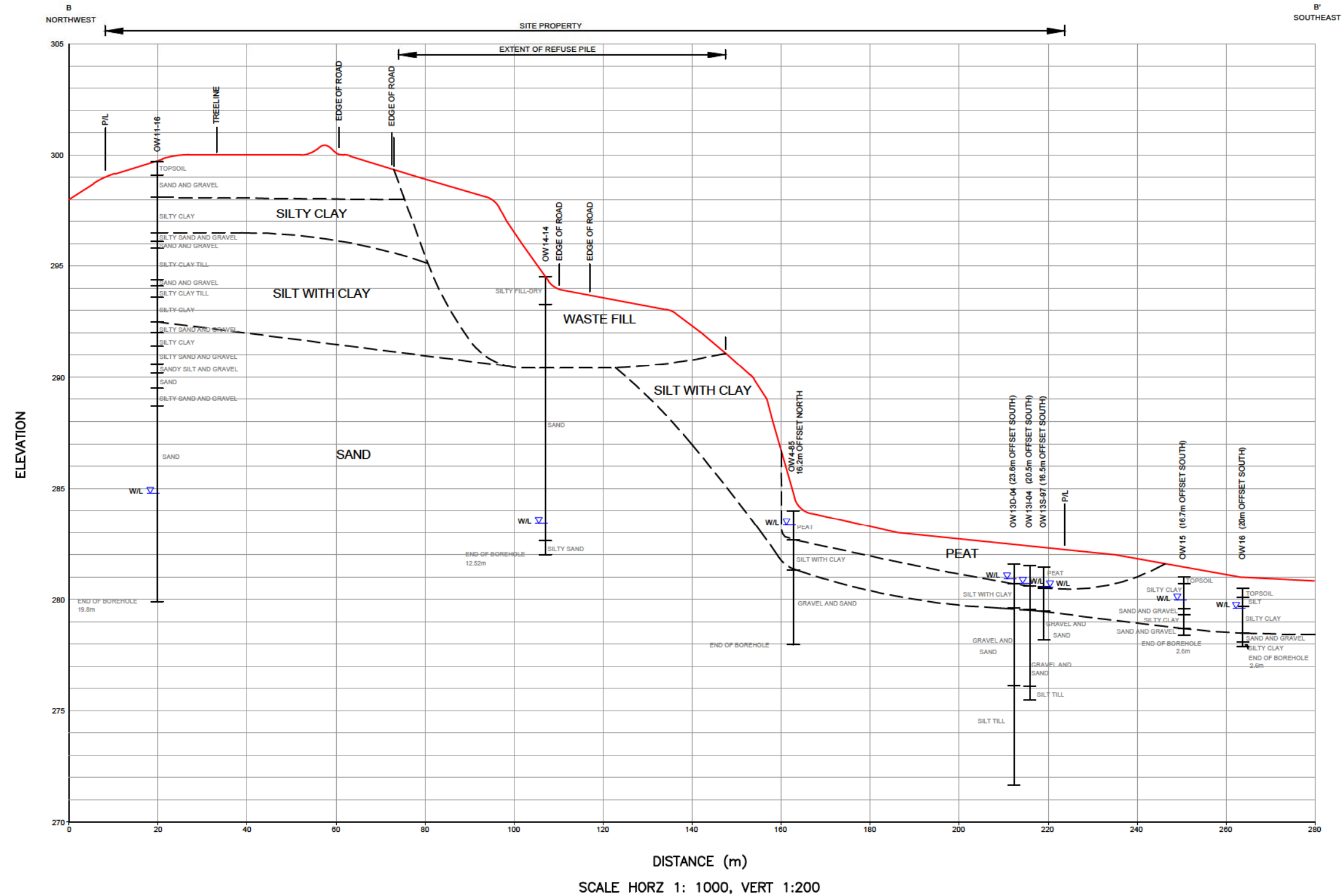
Drawing No.

Map 4

Revision

2





- NOTES:
1. CROSS-SECTION CONSTRUCTED FROM AVAILABLE LOCAL SURVEY DATE FOR MONITORING WELLS AND INFERRED GROUND ELEVATIONS (GEODETIC). INFERRED STRATIGRAPHY MAY CHANGE SLIGHTLY IF WELL SURVEY INFORMATION BECOMES AVAILABLE.
  2. WATER ELEVATIONS REFLECT FIELD MEASUREMENTS IN MAY 2018 RELATIVE TO GROUND SURFACE. WATER ELEVATIONS ARE TYPICALLY LOWER IN NOVEMBER.

SECTION A-A  
KINLOSS LANDFILL SITE  
TOWNSHIP OF HURON-KINLOSS



1450 1st Ave W, Suite 101, Owen Sound ON, N4K 6W2  
Telephone: (519) 376-7612 / Fax: (519) 376-8008  
Toll Free: 1-888-376-7612

DESIGN	
DRAWN	J L K
APPROVED	L A L
DATE	MARCH 2021
SCALE	AS SHOWN
FILE No.	101-16945-00
FIG. No.	4

# APPENDIX

D

## CERTIFICATE OF ANALYSIS AND LAB RESULTS

**C.O.C.: G95058, G95059**

**REPORT No. B20-18632**

**Report To:**

**WSP Canada Inc.**

1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 06-Jul-20

DATE REPORTED: 13-Jul-20

SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00

P.O. NUMBER: 121-60018-13

WATERWORKS NO.

			Client I.D.	OW4	OW5	OW6	OW7
			Sample I.D.	B20-18632-1	B20-18632-2	B20-18632-3	B20-18632-4
			Date Collected	03-Jul-20	03-Jul-20	03-Jul-20	03-Jul-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
pH @25°C	pH Units		SM 4500H	07-Jul-20/O	7.27	7.96	7.83
Conductivity @25°C	µmho/cm	1	SM 2510B	07-Jul-20/O	1270	483	526
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	07-Jul-20/O	661	238	265
Hardness (as CaCO3)	mg/L	1	SM 3120	08-Jul-20/O	579	252	269
Chloride	mg/L	0.5	SM4110C	07-Jul-20/O	10.9	2.4	4.5
Nitrite (N)	mg/L	0.05	SM4110C	07-Jul-20/O	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	07-Jul-20/O	0.10	0.06	0.11
Sulphate	mg/L	1	SM4110C	07-Jul-20/O	21	22	17
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	07-Jul-20/O	13.1	1.9	2.3
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	07-Jul-20/K	24.8	0.10	0.33
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	07-Jul-20/K	27.4	0.2	0.4
Organic Nitrogen	mg/L	0.1	E3199A.1	13-Jul-20/K	2.6	< 0.1	< 0.1
Phenolics	mg/L	0.002	MOEE 3179	08-Jul-20/K	< 0.002	< 0.002	< 0.002
Calcium	mg/L	0.02	SM 3120	08-Jul-20/O	174	57.1	67.0
Magnesium	mg/L	0.02	SM 3120	08-Jul-20/O	34.9	26.7	24.6
Potassium	mg/L	0.1	SM 3120	08-Jul-20/O	20.6	0.8	1.0
Sodium	mg/L	0.2	SM 3120	08-Jul-20/O	20.4	3.5	8.8
Aluminum	mg/L	0.01	SM 3120	08-Jul-20/O	0.08	0.02	0.02
Barium	mg/L	0.001	SM 3120	08-Jul-20/O	0.188	0.094	0.081
Boron	mg/L	0.005	SM 3120	08-Jul-20/O	0.445	0.015	0.026
Cadmium	mg/L	0.000015	EPA 200.8	08-Jul-20/O	< 0.000028	< 0.000015	< 0.000015
Chromium	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002	< 0.002	< 0.002
Copper	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002	< 0.002	< 0.002
Iron	mg/L	0.005	SM 3120	08-Jul-20/O	21.8	0.110	0.777



R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an \*

Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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**C.O.C.: G95058, G95059**

**REPORT No. B20-18632**

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1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

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Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 06-Jul-20

DATE REPORTED: 13-Jul-20

SAMPLE MATRIX: Groundwater

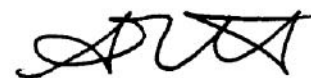
JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00

P.O. NUMBER: 121-60018-13

WATERWORKS NO.

			Client I.D.		OW4	OW5	OW6	OW7
			Sample I.D.		B20-18632-1	B20-18632-2	B20-18632-3	B20-18632-4
			Date Collected		03-Jul-20	03-Jul-20	03-Jul-20	03-Jul-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Lead	mg/L	0.00002	EPA 200.8	08-Jul-20/O	0.00006	0.00003	0.00016	0.00003
Manganese	mg/L	0.001	SM 3120	08-Jul-20/O	0.697	0.173	0.072	0.184
Zinc	mg/L	0.005	SM 3120	08-Jul-20/O	< 0.005	< 0.005	0.033	< 0.005
Anion Sum	meq/L		Calc.	09-Jul-20/O	14.0	5.28	5.79	5.72
Cation Sum	meq/L		Calc.	09-Jul-20/O	15.9	5.24	5.85	5.92
% Difference	%		Calc.	09-Jul-20/O	6.56	0.465	0.505	1.75
Ion Ratio	AS/CS		Calc.	09-Jul-20/O	0.877	1.01	0.990	0.966
Sodium Adsorption Ratio	-		Calc.	09-Jul-20/O	0.368	0.0950	0.234	0.0239
TDS(ion sum calc.)	mg/L	1	Calc.	09-Jul-20/O	733	255	283	276
Conductivity (calc.)	µmho/cm		Calc.	09-Jul-20/O	1234	479	525	522
TDS(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.577	0.529	0.539	0.534
EC(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.972	0.991	0.998	1.01
Langelier Index(25°C)	S.I.		Calc.	09-Jul-20/O	0.849	0.662	0.637	0.664

1 Fe not included in Ion Balance Calculations



R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an \*

Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive  
Barrie ON L4N 8W8  
Tel: 705-252-5743  
Fax: 705-252-5746

**DATE RECEIVED:** 06-Jul-20

**JOB/PROJECT NO.:** Kinloss Landfill -#101-16945-00

**DATE REPORTED:** 13-Jul-20

**P.O. NUMBER:** 121-60018-13

**SAMPLE MATRIX:** Groundwater

**WATERWORKS NO.**

			Client I.D.	OW11-16	OW12-97	OW13S-97	OW13I-04
			Sample I.D.	B20-18632-5	B20-18632-6	B20-18632-7	B20-18632-8
			Date Collected	03-Jul-20	03-Jul-20	03-Jul-20	03-Jul-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
pH @25°C	pH Units		SM 4500H	07-Jul-20/O	7.83	7.89	7.53
Conductivity @25°C	µmho/cm	1	SM 2510B	07-Jul-20/O	621	739	1060
Alkalinity(CaCO <sub>3</sub> ) to pH4.5	mg/L	5	SM 2320B	07-Jul-20/O	326	326	456
Hardness (as CaCO <sub>3</sub> )	mg/L	1	SM 3120	08-Jul-20/O	360	415	560
Chloride	mg/L	0.5	SM4110C	07-Jul-20/O	4.4	4.4	10.6
Nitrite (N)	mg/L	0.05	SM4110C	07-Jul-20/O	< 0.05	< 0.05	0.12
Nitrate (N)	mg/L	0.05	SM4110C	07-Jul-20/O	1.49	0.87	0.99
Sulphate	mg/L	1	SM4110C	07-Jul-20/O	7	76	125
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	07-Jul-20/O	2.8	3.0	5.3
Ammonia (N)-Total	mg/L	0.01	SM4500-NH <sub>3</sub> -H	07-Jul-20/K	0.04	0.10	2.84
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	07-Jul-20/K	0.1	0.2	3.2
Organic Nitrogen	mg/L	0.1	E3199A.1	13-Jul-20/K	< 0.1	0.1	0.4
Phenolics	mg/L	0.002	MOEE 3179	08-Jul-20/K	< 0.002	< 0.002	< 0.002
Calcium	mg/L	0.02	SM 3120	08-Jul-20/O	94.9	71.1	124
Magnesium	mg/L	0.02	SM 3120	08-Jul-20/O	29.9	57.8	60.9
Potassium	mg/L	0.1	SM 3120	08-Jul-20/O	0.5	11.4	25.2
Sodium	mg/L	0.2	SM 3120	08-Jul-20/O	2.4	6.5	14.6
Aluminum	mg/L	0.01	SM 3120	08-Jul-20/O	0.04	0.03	0.06
Barium	mg/L	0.001	SM 3120	08-Jul-20/O	0.034	0.079	0.067
Boron	mg/L	0.005	SM 3120	08-Jul-20/O	0.008	0.458	0.630
Cadmium	mg/L	0.00015	EPA 200.8	08-Jul-20/O	< 0.000015	< 0.000015	0.000017
Chromium	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002	< 0.002	< 0.002
Copper	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002	< 0.002	< 0.002
Iron	mg/L	0.005	SM 3120	08-Jul-20/O	0.010	< 0.005	0.026



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

**Steve Garrett**  
Director of Laboratory Services

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SAMPLE MATRIX: Groundwater

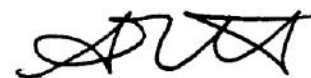
JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00

P.O. NUMBER: 121-60018-13

WATERWORKS NO.

			Client I.D.		OW11-16	OW12-97	OW13S-97	OW13I-04
			Sample I.D.		B20-18632-5	B20-18632-6	B20-18632-7	B20-18632-8
			Date Collected		03-Jul-20	03-Jul-20	03-Jul-20	03-Jul-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Lead	mg/L	0.00002	EPA 200.8	08-Jul-20/O	0.00011	0.00004	0.00012	0.00015
Manganese	mg/L	0.001	SM 3120	08-Jul-20/O	< 0.001	< 0.001	0.115	0.298
Zinc	mg/L	0.005	SM 3120	08-Jul-20/O	< 0.005	< 0.005	< 0.005	< 0.005
Anion Sum	meq/L		Calc.	09-Jul-20/O	6.88	8.28	12.1	14.5
Cation Sum	meq/L		Calc.	09-Jul-20/O	7.31	8.88	12.7	15.4
% Difference	%		Calc.	09-Jul-20/O	3.07	3.48	2.37	2.94
Ion Ratio	AS/CS		Calc.	09-Jul-20/O	0.940	0.933	0.954	0.943
Sodium Adsorption Ratio	-		Calc.	09-Jul-20/O	0.0552	0.139	0.267	0.448
TDS(ion sum calc.)	mg/L	1	Calc.	09-Jul-20/O	334	423	638	764
Conductivity (calc.)	µmho/cm		Calc.	09-Jul-20/O	628	761	1075	1266
TDS(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.538	0.572	0.602	0.612
EC(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	1.01	1.03	1.02	1.02
Langelier Index(25°C)	S.I.		Calc.	09-Jul-20/O	0.768	0.792	0.810	0.948

1 Fe not included in Ion Balance Calculations



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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DATE RECEIVED: 06-Jul-20

JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00

DATE REPORTED: 13-Jul-20

P.O. NUMBER: 121-60018-13

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.		OW13D-04	OW14/14	OW15	OW16
			Sample I.D.		B20-18632-9	B20-18632-10	B20-18632-11	B20-18632-12
			Date Collected		03-Jul-20	03-Jul-20	03-Jul-20	03-Jul-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
pH @25°C	pH Units		SM 4500H	07-Jul-20/O	7.95	7.22	7.52	7.79
Conductivity @25°C	µmho/cm	1	SM 2510B	07-Jul-20/O	539	976	1500	550
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	07-Jul-20/O	235	491	490	271
Hardness (as CaCO3)	mg/L	1	SM 3120	08-Jul-20/O	246	553	810	305
Chloride	mg/L	0.5	SM4110C	07-Jul-20/O	7.6	14.1	67.5	8.3
Nitrite (N)	mg/L	0.05	SM4110C	07-Jul-20/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	07-Jul-20/O	0.14	0.08	0.08	0.68
Sulphate	mg/L	1	SM4110C	07-Jul-20/O	48	36	291	13
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	07-Jul-20/O	4.1	10.3	5.1	2.7
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	07-Jul-20/K	0.19	2.74	0.47	0.17
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	07-Jul-20/K	0.3	3.5	0.7	0.4
Organic Nitrogen	mg/L	0.1	E3199A.1	13-Jul-20/K	< 0.1	0.8	0.2	0.2
Phenolics	mg/L	0.002	MOEE 3179	08-Jul-20/K	< 0.002	< 0.002	< 0.002	< 0.002
Calcium	mg/L	0.02	SM 3120	08-Jul-20/O	57.4	185	178	80.0
Magnesium	mg/L	0.02	SM 3120	08-Jul-20/O	24.8	21.9	89.1	25.6
Potassium	mg/L	0.1	SM 3120	08-Jul-20/O	2.0	5.8	2.9	1.2
Sodium	mg/L	0.2	SM 3120	08-Jul-20/O	14.7	7.6	51.5	3.0
Aluminum	mg/L	0.01	SM 3120	08-Jul-20/O	0.02	0.14	0.10	0.03
Barium	mg/L	0.001	SM 3120	08-Jul-20/O	0.094	0.045	0.208	0.091
Boron	mg/L	0.005	SM 3120	08-Jul-20/O	0.073	0.186	0.366	0.012
Cadmium	mg/L	0.000015	EPA 200.8	08-Jul-20/O	0.000397	< 0.000015	< 0.000028	< 0.000015
Chromium	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002	< 0.002	< 0.002	< 0.002
Copper	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002	< 0.002	< 0.002	< 0.002

R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an \*

Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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**C.O.C.: G95058, G95059**

**REPORT No. B20-18632**

**Report To:**

**WSP Canada Inc.**

1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 06-Jul-20

DATE REPORTED: 13-Jul-20

SAMPLE MATRIX: Groundwater

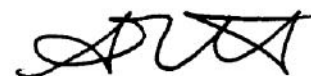
JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00

P.O. NUMBER: 121-60018-13

WATERWORKS NO.

			Client I.D.		OW13D-04	OW14/14	OW15	OW16
			Sample I.D.		B20-18632-9	B20-18632-10	B20-18632-11	B20-18632-12
			Date Collected		03-Jul-20	03-Jul-20	03-Jul-20	03-Jul-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Iron	mg/L	0.005	SM 3120	08-Jul-20/O	0.220	32.1	0.423	0.046
Lead	mg/L	0.00002	EPA 200.8	08-Jul-20/O	0.00002	0.00022	0.00025	0.00006
Manganese	mg/L	0.001	SM 3120	08-Jul-20/O	0.018	0.204	0.378	0.096
Zinc	mg/L	0.005	SM 3120	08-Jul-20/O	< 0.005	< 0.005	< 0.005	< 0.005
Anion Sum	meq/L		Calc.	09-Jul-20/O	5.91	10.9	17.8	5.98
Cation Sum	meq/L		Calc.	09-Jul-20/O	5.63	11.7	18.6	6.28
% Difference	%		Calc.	09-Jul-20/O	2.45	3.42 <sup>1</sup>	2.19	2.46
Ion Ratio	AS/CS		Calc.	09-Jul-20/O	1.05	0.934	0.957	0.952
Sodium Adsorption Ratio	-		Calc.	09-Jul-20/O	0.409	0.140	0.787	0.0743
TDS(ion sum calc.)	mg/L	1	Calc.	09-Jul-20/O	296	568	976	294
Conductivity (calc.)	µmho/cm		Calc.	09-Jul-20/O	534	996	1528	556
TDS(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.549	0.582	0.652	0.535
EC(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.990	1.02	1.02	1.01
Langelier Index(25°C)	S.I.		Calc.	09-Jul-20/O	0.638	0.706	0.957	0.684

<sup>1</sup> Fe not included in Ion Balance Calculations



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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**C.O.C.: G95058, G95059**

**REPORT No. B20-18632**

**Report To:**

**WSP Canada Inc.**

1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 06-Jul-20

JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00


DATE REPORTED: 13-Jul-20

P.O. NUMBER: 121-60018-13

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.	DUPLICATE #2			
			Sample I.D.	B20-18632- 13			
			Date Collected	03-Jul-20			
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
pH @25°C	pH Units		SM 4500H	07-Jul-20/O	7.98		
Conductivity @25°C	µmho/cm	1	SM 2510B	07-Jul-20/O	546		
Alkalinity(CaCO <sub>3</sub> ) to pH4.5	mg/L	5	SM 2320B	07-Jul-20/O	237		
Hardness (as CaCO <sub>3</sub> )	mg/L	1	SM 3120	08-Jul-20/O	245		
Chloride	mg/L	0.5	SM4110C	07-Jul-20/O	7.6		
Nitrite (N)	mg/L	0.05	SM4110C	07-Jul-20/O	< 0.05		
Nitrate (N)	mg/L	0.05	SM4110C	07-Jul-20/O	0.09		
Sulphate	mg/L	1	SM4110C	07-Jul-20/O	49		
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	07-Jul-20/O	2.2		
Ammonia (N)-Total	mg/L	0.01	SM4500- NH <sub>3</sub> -H	07-Jul-20/K	0.23		
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	07-Jul-20/K	0.3		
Organic Nitrogen	mg/L	0.1	E3199A.1	13-Jul-20/K	< 0.1		
Phenolics	mg/L	0.002	MOEE 3179	08-Jul-20/K	< 0.002		
Calcium	mg/L	0.02	SM 3120	08-Jul-20/O	57.2		
Magnesium	mg/L	0.02	SM 3120	08-Jul-20/O	24.8		
Potassium	mg/L	0.1	SM 3120	08-Jul-20/O	2.0		
Sodium	mg/L	0.2	SM 3120	08-Jul-20/O	14.7		
Aluminum	mg/L	0.01	SM 3120	08-Jul-20/O	0.02		
Barium	mg/L	0.001	SM 3120	08-Jul-20/O	0.093		
Boron	mg/L	0.005	SM 3120	08-Jul-20/O	0.072		
Cadmium	mg/L	0.00015	EPA 200.8	08-Jul-20/O	0.000215		
Chromium	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002		



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Steve Garrett

Director of Laboratory Services

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**C.O.C.: G95058, G95059**

**REPORT No. B20-18632**

**Report To:**

**WSP Canada Inc.**  
1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive  
Barrie ON L4N 8W8  
Tel: 705-252-5743  
Fax: 705-252-5746

**DATE RECEIVED:** 06-Jul-20

**JOB/PROJECT NO.:** Kinloss Landfill -#101-16945-00

**DATE REPORTED:** 13-Jul-20

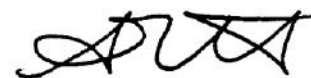
**P.O. NUMBER:** 121-60018-13

**SAMPLE MATRIX:** Groundwater

**WATERWORKS NO.**

			<b>Client I.D.</b>		DUPLICATE #2			
			<b>Sample I.D.</b>		B20-18632-13			
			<b>Date Collected</b>		03-Jul-20			
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Copper	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002			
Iron	mg/L	0.005	SM 3120	08-Jul-20/O	0.233			
Lead	mg/L	0.00002	EPA 200.8	08-Jul-20/O	< 0.00002			
Manganese	mg/L	0.001	SM 3120	08-Jul-20/O	0.017			
Zinc	mg/L	0.005	SM 3120	08-Jul-20/O	< 0.005			
Anion Sum	meq/L		Calc.	09-Jul-20/O	5.97			
Cation Sum	meq/L		Calc.	09-Jul-20/O	5.61			
% Difference	%		Calc.	09-Jul-20/O	3.13			
Ion Ratio	AS/CS		Calc.	09-Jul-20/O	1.06			
Sodium Adsorption Ratio	-		Calc.	09-Jul-20/O	0.408			
TDS(ion sum calc.)	mg/L	1	Calc.	09-Jul-20/O	298			
Conductivity (calc.)	µmho/cm		Calc.	09-Jul-20/O	536			
TDS(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.545			
EC(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.981			
Langelier Index(25°C)	S.I.		Calc.	09-Jul-20/O	0.670			

1 Fe not included in Ion Balance Calculations



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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**C.O.C.: G95056A**

**REPORT No. B20-18633**

**Report To:**

**WSP Canada Inc.**

1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 06-Jul-20

DATE REPORTED: 10-Jul-20

SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00

P.O. NUMBER: 121-60018-13

WATERWORKS NO.

			Client I.D.	SW1	SW2	DUPLICATE #1	
			Sample I.D.	B20-18633-1	B20-18633-2	B20-18633-3	
			Date Collected	03-Jul-20	03-Jul-20	03-Jul-20	
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
pH @25°C	pH Units		SM 4500H	07-Jul-20/O	7.81	8.19	7.84
Conductivity @25°C	µmho/cm	1	SM 2510B	07-Jul-20/O	510	522	513
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	07-Jul-20/O	272	271	272
Hardness (as CaCO3)	mg/L	1	SM 3120	08-Jul-20/O	275	301	273
Chloride	mg/L	0.5	SM4110C	07-Jul-20/O	3.7	5.9	3.4
Nitrite (N)	mg/L	0.05	SM4110C	07-Jul-20/O	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	07-Jul-20/O	0.08	0.20	0.09
Nitrate + Nitrite (N)	mg/L	0.05	SM4110C	07-Jul-20/O	0.10	0.20	0.10
Sulphate	mg/L	1	SM4110C	07-Jul-20/O	< 1	5	< 1
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	07-Jul-20/O	10.6	4.1	9.7
Turbidity	NTU	0.1	SM 2130	08-Jul-20/O	4.1	0.6	4.5
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	07-Jul-20/K	0.03	0.02	0.03
Phosphorus-Total	mg/L	0.01	E3199A.1	07-Jul-20/K	0.02	0.01	0.02
Phenolics	mg/L	0.002	MOEE 3179	08-Jul-20/K	< 0.002	< 0.002	< 0.002
Calcium	mg/L	0.02	SM 3120	08-Jul-20/O	74.9	79.8	74.4
Magnesium	mg/L	0.02	SM 3120	08-Jul-20/O	21.5	24.8	21.3
Potassium	mg/L	0.1	SM 3120	08-Jul-20/O	0.4	1.1	0.4
Sodium	mg/L	0.2	SM 3120	08-Jul-20/O	1.9	3.4	2.4
Aluminum (total)	mg/L	0.01	SM 3120	08-Jul-20/O	0.03	0.05	0.04
Barium	mg/L	0.001	SM 3120	08-Jul-20/O	0.036	0.036	0.036
Boron	mg/L	0.005	SM 3120	08-Jul-20/O	0.009	0.014	0.008
Cadmium	mg/L	0.000015	EPA 200.8	08-Jul-20/O	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.002	SM 3120	08-Jul-20/O	< 0.002	0.003	< 0.002



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett  
Director of Laboratory Services

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**C.O.C.: G95056A**

**REPORT No. B20-18633**

**Report To:**

**WSP Canada Inc.**

1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 06-Jul-20

DATE REPORTED: 10-Jul-20

SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Kinloss Landfill -#101-16945-00

P.O. NUMBER: 121-60018-13

WATERWORKS NO.

			Client I.D.	SW1	SW2	DUPLICATE #1	
			Sample I.D.	B20-18633-1	B20-18633-2	B20-18633-3	
			Date Collected	03-Jul-20	03-Jul-20	03-Jul-20	
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Copper	mg/L	0.0001	EPA 200.8	08-Jul-20/O	0.0006	0.0008	0.0004
Iron	mg/L	0.005	SM 3120	08-Jul-20/O	0.931	0.090	0.935
Lead	mg/L	0.00002	EPA 200.8	08-Jul-20/O	0.00025	0.00061	0.00015
Manganese	mg/L	0.001	SM 3120	08-Jul-20/O	1.44	0.053	1.44
Zinc	mg/L	0.005	SM 3120	08-Jul-20/O	< 0.005	0.010	0.005
Anion Sum	meq/L		Calc.	09-Jul-20/O	5.55	5.71	5.54
Cation Sum	meq/L		Calc.	09-Jul-20/O	5.71	6.20	5.69
% Difference	%		Calc.	09-Jul-20/O	1.44	4.13	1.33
Ion Ratio	AS/CS		Calc.	09-Jul-20/O	0.972	0.921	0.974
Sodium Adsorption Ratio	-		Calc.	09-Jul-20/O	0.0503	0.0841	0.0619
TDS(ion sum calc.)	mg/L	1	Calc.	09-Jul-20/O	268	283	268
Conductivity (calc.)	µmho/cm		Calc.	09-Jul-20/O	503	540	501
TDS(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.526	0.543	0.522
EC(calc.)/EC(actual)	-		Calc.	09-Jul-20/O	0.985	1.04	0.976
Langelier Index(25°C)	S.I.		Calc.	09-Jul-20/O	0.567	1.08	0.594



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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**C.O.C.: ---**

**REPORT No. B20-34929**

**Report To:**

**WSP Canada Inc.**  
1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

**DATE RECEIVED:** 04-Nov-20

**JOB/PROJECT NO.:** Kinloss Landfill - 121.60018.13

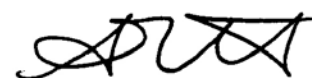
**DATE REPORTED:** 20-Nov-20

**P.O. NUMBER:** 101-16945-00

**SAMPLE MATRIX:** Groundwater

**WATERWORKS NO.**

					Client I.D.	OW 4	OW 5	OW 6	OW 7
					Sample I.D.	B20-34929-1	B20-34929-2	B20-34929-3	B20-34929-4
					Date Collected	03-Nov-20	03-Nov-20	03-Nov-20	03-Nov-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed					
pH @25°C	pH Units		SM 4500H	09-Nov-20/O	7.19	8.08	7.89	7.95	
Conductivity @25°C	µmho/cm	1	SM 2510B	09-Nov-20/O	1260	486	523	608	
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	09-Nov-20/O	608	225	241	313	
Hardness (as CaCO3)	mg/L	1	SM 3120	09-Nov-20/O	595	275	274	367	
Chloride	mg/L	0.5	SM4110C	09-Nov-20/O	9.6	2.5	4.6	1.6	
Nitrite (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrate (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05	< 0.05	< 0.05	0.07	
Sulphate	mg/L	1	SM4110C	09-Nov-20/O	29	18	18	3	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	06-Nov-20/O	8.9	1.1	1.7	1.9	
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	13-Nov-20/K	25.8	0.10	0.26	0.03	
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	17-Nov-20/K	37.2	0.2	0.3	0.2	
Organic Nitrogen	mg/L	0.1	E3199A.1	19-Nov-20/K	11.4	< 0.1	< 0.1	0.2	
Phenolics	mg/L	0.002	MOEE 3179	16-Nov-20/K	< 0.002	< 0.002	< 0.002	< 0.002	
Calcium	mg/L	0.02	SM 3120	09-Nov-20/O	178	62.3	67.1	100	
Magnesium	mg/L	0.02	SM 3120	09-Nov-20/O	36.3	29.1	25.9	28.3	
Potassium	mg/L	0.1	SM 3120	09-Nov-20/O	21.5	1.0	1.0	0.4	
Sodium	mg/L	0.2	SM 3120	09-Nov-20/O	25.7	3.5	10.5	0.8	
Aluminum	mg/L	0.01	SM 3120	09-Nov-20/O	0.08	0.03	0.12	0.05	
Barium	mg/L	0.001	SM 3120	09-Nov-20/O	0.191	0.098	0.078	0.014	
Boron	mg/L	0.005	SM 3120	09-Nov-20/O	0.399	< 0.005	< 0.005	< 0.005	
Cadmium	mg/L	0.00015	EPA 200.8	12-Nov-20/O	< 0.000028	0.000022	< 0.000015	0.000355	
Chromium	mg/L	0.002	SM 3120	09-Nov-20/O	< 0.002	< 0.002	< 0.002	< 0.002	
Copper	mg/L	0.002	SM 3120	09-Nov-20/O	< 0.002	< 0.002	< 0.002	0.002	
Iron	mg/L	0.005	SM 3120	09-Nov-20/O	18.2	0.024	0.463	< 0.005	
Lead	mg/L	0.00002	EPA 200.8	12-Nov-20/O	< 0.00004	0.00003	0.00013	0.00030	
Manganese	mg/L	0.001	SM 3120	09-Nov-20/O	0.665	0.024	0.039	0.001	
Zinc	mg/L	0.005	SM 3120	09-Nov-20/O	< 0.005	0.010	0.009	0.005	



R.L. = Reporting Limit

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett  
Director of Laboratory Services

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C.O.C.: ---

REPORT No. B20-34929

**Report To:**

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**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 04-Nov-20

JOB/PROJECT NO.: Kinloss Landfill - 121.60018.13

DATE REPORTED: 20-Nov-20

P.O. NUMBER: 101-16945-00

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.		OW 4	OW 5	OW 6	OW 7
			Sample I.D.		B20-34929-1	B20-34929-2	B20-34929-3	B20-34929-4
			Date Collected		03-Nov-20	03-Nov-20	03-Nov-20	03-Nov-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Anion Sum	meq/L		Calc.	10-Nov-20/O	13.0	4.94	5.32	6.37
Cation Sum	meq/L		Calc.	10-Nov-20/O	14.6	5.68	5.98	7.38
% Difference	%		Calc.	10-Nov-20/O	5.61	7.05	5.92	7.38
Ion Ratio	AS/CS		Calc.	10-Nov-20/O	0.894	0.868	0.888	0.863
Sodium Adsorption Ratio	-	1	Calc.	10-Nov-20/O	0.459	0.0927	0.277	0.0189
TDS(ion sum calc.)	mg/L		Calc.	10-Nov-20/O	684	251	272	322
Conductivity (calc.)	µmho/cm		Calc.	10-Nov-20/O	1122	487	515	616
TDS(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.543	0.517	0.520	0.530
EC(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.891	1.00	0.985	1.01
Langelier Index(25°C)	S.I.		Calc.	10-Nov-20/O	0.742	0.794	0.656	1.01



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

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Barrie ON L4N 8W8  
Tel: 705-252-5743  
Fax: 705-252-5746

**DATE RECEIVED:** 04-Nov-20

**JOB/PROJECT NO.:** Kinloss Landfill - 121.60018.13

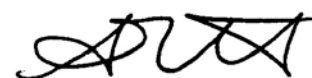
**DATE REPORTED:** 20-Nov-20

**P.O. NUMBER:** 101-16945-00

**SAMPLE MATRIX:** Groundwater

**WATERWORKS NO.**

			Client I.D.		OW 11-16	OW 12	OW 13S	OW 13I
			Sample I.D.		B20-34929-5	B20-34929-6	B20-34929-7	B20-34929-8
			Date Collected		03-Nov-20	03-Nov-20	03-Nov-20	03-Nov-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
pH @25°C	pH Units		SM 4500H	09-Nov-20/O	7.75	7.95	7.22	7.44
Conductivity @25°C	µmho/cm	1	SM 2510B	09-Nov-20/O	607	700	1240	1210
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	09-Nov-20/O	291	302	546	512
Hardness (as CaCO3)	mg/L	1	SM 3120	09-Nov-20/O	357	423	647	656
Chloride	mg/L	0.5	SM4110C	09-Nov-20/O	4.8	3.6	14.7	15.1
Nitrite (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	09-Nov-20/O	2.82	0.63	< 0.05	0.07
Sulphate	mg/L	1	SM4110C	09-Nov-20/O	4	64	95	121
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	06-Nov-20/O	1.1	4.6	5.3	4.5
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	13-Nov-20/K	0.01	0.03	8.02	4.84
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	17-Nov-20/K	0.1	0.2	9.7	4.9
Organic Nitrogen	mg/L	0.1	E3199A.1	19-Nov-20/K	0.1	0.2	1.7	< 0.1
Phenolics	mg/L	0.002	MOEE 3179	16-Nov-20/K	< 0.002	< 0.002	< 0.002	< 0.002
Calcium	mg/L	0.02	SM 3120	09-Nov-20/O	94.5	71.9	143	141
Magnesium	mg/L	0.02	SM 3120	09-Nov-20/O	29.4	59.2	70.7	73.9
Potassium	mg/L	0.1	SM 3120	09-Nov-20/O	0.5	11.4	32.3	27.5
Sodium	mg/L	0.2	SM 3120	09-Nov-20/O	3.2	6.4	24.8	24.4
Aluminum	mg/L	0.01	SM 3120	09-Nov-20/O	0.04	0.05	0.07	0.10
Barium	mg/L	0.001	SM 3120	09-Nov-20/O	0.029	0.078	0.096	0.083
Boron	mg/L	0.005	SM 3120	09-Nov-20/O	< 0.005	0.426	0.610	0.638
Cadmium	mg/L	0.000015	EPA 200.8	12-Nov-20/O	< 0.000015	< 0.000015	< 0.000028	0.000125
Chromium	mg/L	0.002	SM 3120	09-Nov-20/O	< 0.002	< 0.002	< 0.002	< 0.002
Copper	mg/L	0.002	SM 3120	09-Nov-20/O	0.002	0.002	0.004	0.004
Iron	mg/L	0.005	SM 3120	09-Nov-20/O	0.011	0.061	< 0.005	0.051
Lead	mg/L	0.00002	EPA 200.8	12-Nov-20/O	0.00003	0.00008	0.00004	0.00010
Manganese	mg/L	0.001	SM 3120	09-Nov-20/O	< 0.001	0.002	0.120	0.266
Zinc	mg/L	0.005	SM 3120	09-Nov-20/O	< 0.005	0.009	< 0.005	< 0.005



R.L. = Reporting Limit

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett  
Director of Laboratory Services

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**C.O.C.: ---**

**REPORT No. B20-34929**

**Report To:**

**WSP Canada Inc.**  
1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 04-Nov-20

JOB/PROJECT NO.: Kinloss Landfill - 121.60018.13

DATE REPORTED: 20-Nov-20

P.O. NUMBER: 101-16945-00

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.	OW 11-16	OW 12	OW 13S	OW 13I
			Sample I.D.	B20-34929-5	B20-34929-6	B20-34929-7	B20-34929-8
			Date Collected	03-Nov-20	03-Nov-20	03-Nov-20	03-Nov-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Anion Sum	meq/L		Calc.	10-Nov-20/O	6.23	7.51	13.3
Cation Sum	meq/L		Calc.	10-Nov-20/O	7.28	9.03	14.8
% Difference	%		Calc.	10-Nov-20/O	7.78	9.22	5.45
Ion Ratio	AS/CS		Calc.	10-Nov-20/O	0.856	0.831	0.897
Sodium Adsorption Ratio	-		Calc.	10-Nov-20/O	0.0743	0.136	0.424
TDS(ion sum calc.)	mg/L	1	Calc.	10-Nov-20/O	311	398	708
Conductivity (calc.)	µmho/cm		Calc.	10-Nov-20/O	600	737	1198
TDS(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.512	0.568	0.572
EC(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.989	1.05	0.969
Langelier Index(25°C)	S.I.		Calc.	10-Nov-20/O	0.746	0.835	0.628



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Barrie ON L4N 8W8  
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DATE RECEIVED: 04-Nov-20

JOB/PROJECT NO.: Kinloss Landfill - 121.60018.13

DATE REPORTED: 20-Nov-20

P.O. NUMBER: 101-16945-00

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.	OW 13D	OW 15	OW 16	OW 14/14
			Sample I.D.	B20-34929-9	B20-34929-10	B20-34929-11	B20-34929-12
			Date Collected	03-Nov-20	03-Nov-20	03-Nov-20	03-Nov-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
pH @25°C	pH Units		SM 4500H	09-Nov-20/O	7.78	7.59	7.82
Conductivity @25°C	µmho/cm	1	SM 2510B	09-Nov-20/O	763	842	563
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	09-Nov-20/O	304	355	262
Hardness (as CaCO3)	mg/L	1	SM 3120	09-Nov-20/O	373	411	332
Chloride	mg/L	0.5	SM4110C	09-Nov-20/O	10.1	18.6	7.1
Nitrite (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	09-Nov-20/O	0.13	< 0.05	0.33
Sulphate	mg/L	1	SM4110C	09-Nov-20/O	79	62	13
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	06-Nov-20/O	2.5	16.7	4.3
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	13-Nov-20/K	0.46	0.11	0.08
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	17-Nov-20/K	0.6	0.6	0.3
Organic Nitrogen	mg/L	0.1	E3199A.1	19-Nov-20/K	0.1	0.5	0.2
Phenolics	mg/L	0.002	MOEE 3179	16-Nov-20/K	< 0.002	< 0.002	< 0.002
Calcium	mg/L	0.02	SM 3120	09-Nov-20/O	83.6	102	86.4
Magnesium	mg/L	0.02	SM 3120	09-Nov-20/O	39.8	38.2	28.2
Potassium	mg/L	0.1	SM 3120	09-Nov-20/O	3.6	3.1	1.0
Sodium	mg/L	0.2	SM 3120	09-Nov-20/O	20.5	13.5	3.6
Aluminum	mg/L	0.01	SM 3120	09-Nov-20/O	0.04	0.05	0.05
Barium	mg/L	0.001	SM 3120	09-Nov-20/O	0.144	0.071	0.095
Boron	mg/L	0.005	SM 3120	09-Nov-20/O	0.190	0.046	< 0.005
Cadmium	mg/L	0.000015	EPA 200.8	12-Nov-20/O	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.002	SM 3120	09-Nov-20/O	< 0.002	< 0.002	< 0.002
Copper	mg/L	0.002	SM 3120	09-Nov-20/O	< 0.002	0.003	0.012
Iron	mg/L	0.005	SM 3120	09-Nov-20/O	0.586	0.808	0.132
Lead	mg/L	0.00002	EPA 200.8	12-Nov-20/O	0.00003	0.00019	0.00007
Manganese	mg/L	0.001	SM 3120	09-Nov-20/O	0.029	0.258	0.154

R.L. = Reporting Limit

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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**C.O.C.: ---**

**REPORT No. B20-34929**

**Report To:**

**WSP Canada Inc.**  
1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

**DATE RECEIVED:** 04-Nov-20

**JOB/PROJECT NO.:** Kinloss Landfill - 121.60018.13


**DATE REPORTED:** 20-Nov-20

**P.O. NUMBER:** 101-16945-00

**SAMPLE MATRIX:** Groundwater

**WATERWORKS NO.**

			Client I.D.	OW 13D	OW 15	OW 16	OW 14/14
			Sample I.D.	B20-34929-9	B20-34929-10	B20-34929-11	B20-34929-12
			Date Collected	03-Nov-20	03-Nov-20	03-Nov-20	03-Nov-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Zinc	mg/L	0.005	SM 3120	09-Nov-20/O	< 0.005	< 0.005	0.005
Anion Sum	meq/L		Calc.	10-Nov-20/O	8.01	8.92	5.71
Cation Sum	meq/L		Calc.	10-Nov-20/O	8.46	8.94	6.83
% Difference	%		Calc.	10-Nov-20/O	2.72	0.129	8.90
Ion Ratio	AS/CS		Calc.	10-Nov-20/O	0.947	0.997	0.837
Sodium Adsorption Ratio	-		Calc.	10-Nov-20/O	0.462	0.290	0.0853
TDS(ion sum calc.)	mg/L	1	Calc.	10-Nov-20/O	419	451	296
Conductivity (calc.)	µmho/cm		Calc.	10-Nov-20/O	742	798	571
TDS(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.550	0.536	0.526
EC(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.973	0.948	1.01
Langelier Index(25°C)	S.I.		Calc.	10-Nov-20/O	0.723	0.686	0.731



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DATE RECEIVED: 04-Nov-20

JOB/PROJECT NO.: Kinloss Landfill - 121.60018.13

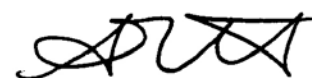
DATE REPORTED: 20-Nov-20

P.O. NUMBER: 101-16945-00

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.	DUP #2			
			Sample I.D.	B20-34929-13			
			Date Collected	03-Nov-20			
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
pH @25°C	pH Units		SM 4500H	09-Nov-20/O	7.48		
Conductivity @25°C	µmho/cm	1	SM 2510B	09-Nov-20/O	1210		
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	09-Nov-20/O	508		
Hardness (as CaCO3)	mg/L	1	SM 3120	09-Nov-20/O	655		
Chloride	mg/L	0.5	SM4110C	09-Nov-20/O	15.1		
Nitrite (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05		
Nitrate (N)	mg/L	0.05	SM4110C	09-Nov-20/O	0.06		
Sulphate	mg/L	1	SM4110C	09-Nov-20/O	121		
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	06-Nov-20/O	4.8		
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	13-Nov-20/K	4.90		
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	17-Nov-20/K	4.9		
Organic Nitrogen	mg/L	0.1	E3199A.1	19-Nov-20/K	< 0.1		
Phenolics	mg/L	0.002	MOEE 3179	16-Nov-20/K	0.003		
Calcium	mg/L	0.02	SM 3120	09-Nov-20/O	141		
Magnesium	mg/L	0.02	SM 3120	09-Nov-20/O	73.7		
Potassium	mg/L	0.1	SM 3120	09-Nov-20/O	27.4		
Sodium	mg/L	0.2	SM 3120	09-Nov-20/O	24.3		
Aluminum	mg/L	0.01	SM 3120	09-Nov-20/O	0.10		
Barium	mg/L	0.001	SM 3120	09-Nov-20/O	0.082		
Boron	mg/L	0.005	SM 3120	09-Nov-20/O	0.633		
Cadmium	mg/L	0.000015	EPA 200.8	12-Nov-20/O	< 0.000028		
Chromium	mg/L	0.002	SM 3120	09-Nov-20/O	< 0.002		
Copper	mg/L	0.002	SM 3120	09-Nov-20/O	0.002		
Iron	mg/L	0.005	SM 3120	09-Nov-20/O	0.053		
Lead	mg/L	0.00002	EPA 200.8	12-Nov-20/O	0.00006		
Manganese	mg/L	0.001	SM 3120	09-Nov-20/O	0.267		



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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Director of Laboratory Services

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Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 04-Nov-20

JOB/PROJECT NO.: Kinloss Landfill - 121.60018.13

DATE REPORTED: 20-Nov-20

P.O. NUMBER: 101-16945-00

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.	DUP #2			
			Sample I.D.	B20-34929-13			
			Date Collected	03-Nov-20			
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Zinc	mg/L	0.005	SM 3120	09-Nov-20/O	< 0.005		
Anion Sum	meq/L		Calc.	10-Nov-20/O	13.1		
Cation Sum	meq/L		Calc.	10-Nov-20/O	14.9		
% Difference	%		Calc.	10-Nov-20/O	6.32		
Ion Ratio	AS/CS		Calc.	10-Nov-20/O	0.881		
Sodium Adsorption Ratio	-		Calc.	10-Nov-20/O	0.413		
TDS(ion sum calc.)	mg/L	1	Calc.	10-Nov-20/O	707		
Conductivity (calc.)	µmho/cm		Calc.	10-Nov-20/O	1193		
TDS(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.584		
EC(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.984		
Langelier Index(25°C)	S.I.		Calc.	10-Nov-20/O	0.853		



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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

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C.O.C.: ---

REPORT No. B20-34930

**Report To:**

**WSP Canada Inc.**  
1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive  
Barrie ON L4N 8W8  
Tel: 705-252-5743  
Fax: 705-252-5746

DATE RECEIVED: 04-Nov-20

JOB/PROJECT NO.: Kinloss Landfill - 121.60018.13

DATE REPORTED: 25-Nov-20

P.O. NUMBER: 101-16945-00

SAMPLE MATRIX: Surface Water

WATERWORKS NO.

					Client I.D.	SW 1	SW 2	DUP #1
					Sample I.D.	B20-34930-1	B20-34930-2	B20-34930-3
					Date Collected	03-Nov-20	03-Nov-20	03-Nov-20
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
pH @25°C	pH Units		SM 4500H	09-Nov-20/O	8.14	8.12	8.10	
Conductivity @25°C	µmho/cm	1	SM 2510B	09-Nov-20/O	392	488	490	
Alkalinity(CaCO <sub>3</sub> ) to pH4.5	mg/L	5	SM 2320B	09-Nov-20/O	201	242	245	
Hardness (as CaCO <sub>3</sub> )	mg/L	1	SM 3120	06-Nov-20/O	214	260	265	
Chloride	mg/L	0.5	SM4110C	09-Nov-20/O	3.5	5.8	5.8	
Nitrite (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05	< 0.05	< 0.05	
Nitrate (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05	< 0.05	< 0.05	
Nitrate + Nitrite (N)	mg/L	0.05	SM4110C	09-Nov-20/O	< 0.05	< 0.05	< 0.05	
Sulphate	mg/L	1	SM4110C	09-Nov-20/O	2	10	10	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	06-Nov-20/O	10.3	7.4	7.1	
Turbidity	NTU	0.1	SM 2130	09-Nov-20/O	0.3	0.6	2.0	
Ammonia (N)-Total	mg/L	0.01	SM4500-NH <sub>3</sub> -H	09-Nov-20/K	0.01	< 0.01	< 0.01	
Phosphorus-Total	mg/L	0.01	E3199A.1	17-Nov-20/K	0.05	0.03	0.04	
Phenolics	mg/L	0.002	MOEE 3179	16-Nov-20/K	< 0.002	< 0.002	< 0.002	
Calcium	mg/L	0.02	SM 3120	06-Nov-20/O	59.0	71.1	72.7	
Magnesium	mg/L	0.02	SM 3120	06-Nov-20/O	16.1	20.0	20.2	
Potassium	mg/L	0.1	SM 3120	06-Nov-20/O	0.4	1.3	1.4	
Sodium	mg/L	0.2	SM 3120	06-Nov-20/O	1.3	3.1	3.1	
Aluminum (total)	mg/L	0.01	SM 3120	06-Nov-20/O	0.04	0.05	0.05	
Barium	mg/L	0.001	SM 3120	06-Nov-20/O	0.013	0.026	0.027	
Boron	mg/L	0.005	SM 3120	06-Nov-20/O	< 0.005	0.016	0.016	
Cadmium	mg/L	0.000015	EPA 200.8	18-Nov-20/O	< 0.000015	< 0.000015	< 0.000015	
Chromium	mg/L	0.002	SM 3120	06-Nov-20/O	< 0.002	< 0.002	< 0.002	
Copper	mg/L	0.0001	EPA 200.8	18-Nov-20/O	0.0001	0.0004	0.0002	
Iron	mg/L	0.005	SM 3120	06-Nov-20/O	0.088	0.034	0.031	
Lead	mg/L	0.00002	EPA 200.8	18-Nov-20/O	< 0.00002	0.00003	0.00002	
Manganese	mg/L	0.001	SM 3120	06-Nov-20/O	0.094	0.014	0.014	

R.L. = Reporting Limit

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Director of Laboratory Services

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REPORT No. B20-34930

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1450 1st Ave. West, Suite 101  
Owen Sound ON N4K 6W2 Canada

**Attention:** Kaurel Tamasauskas

**Caduceon Environmental Laboratories**

112 Commerce Park Drive

Barrie ON L4N 8W8

Tel: 705-252-5743

Fax: 705-252-5746

DATE RECEIVED: 04-Nov-20

JOB/PROJECT NO.: Kinloss Landfill - 121.60018.13

DATE REPORTED: 25-Nov-20

P.O. NUMBER: 101-16945-00

SAMPLE MATRIX: Surface Water

WATERWORKS NO.

			Client I.D.	SW 1	SW 2	DUP #1	
			Sample I.D.	B20-34930-1	B20-34930-2	B20-34930-3	
			Date Collected	03-Nov-20	03-Nov-20	03-Nov-20	
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Zinc	mg/L	0.005	SM 3120	06-Nov-20/O	< 0.005	0.006	0.007
Anion Sum	meq/L		Calc.	10-Nov-20/O	4.17	5.20	5.25
Cation Sum	meq/L		Calc.	10-Nov-20/O	4.34	5.36	5.46
% Difference	%		Calc.	10-Nov-20/O	2.00	1.52	1.92
Ion Ratio	AS/CS		Calc.	10-Nov-20/O	0.961	0.970	0.962
Sodium Adsorption Ratio	-		Calc.	10-Nov-20/O	0.0381	0.0829	0.0826
TDS(ion sum calc.)	mg/L	1	Calc.	10-Nov-20/O	204	256	260
Conductivity (calc.)	µmho/cm		Calc.	10-Nov-20/O	393	485	492
TDS(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	0.520	0.525	0.530
EC(calc.)/EC(actual)	-		Calc.	10-Nov-20/O	1.00	0.994	1.00
Langelier Index(25°C)	S.I.		Calc.	10-Nov-20/O	0.782	0.923	0.917



R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an \*

Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Steve Garrett

Director of Laboratory Services

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

# APPENDIX

## E SUMMARY OF GROUNDWATER RESULTS



## APPENDIX

### *E-1 SUMMARY OF GROUNDWATER RESULTS (PRE-2007) – R.J. BURNSIDE*

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #4

	SEP 00					
pH	7.97					
conductivity	1190					
chloride	64					
hardness	488					
D.O.C.	8.4					
phenols	-					
colour	6					
alkalinity	582					
iron	9.60					
potassium	20.9					
magnesium	46.4					
calcium	119					
sodium	69.2					
sulphate	46					
nitrite	<0.02					
ammonia	3.01					
TKN (nitrogen)	3.36					
nitrate	<0.1					
Nickel	-					
Arsenic	-					
Cadmium	<0.002					
Chromium	<0.01					
Copper	<0.01					
Mercury	-					
Manganese	0.45					
Boron	0.27					
Lead	<0.001					
Selenium	-					
Zinc	0.42					
Cyanide	-					

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #5

	MAY 97	SEP 97	MAY 98	OCT 98	MAY 99	OCT 99
pH	7.78	7.81	8.53	7.43	8.24	7.86
conductivity	431	436	544	456.	442.	438
chloride	<1	4	4	2.	1.	1
hardness	221	241	174	233.	244.	266
D.O.C.	0.6	0.6	4.2	<0.5	0.9	1.0
phenols			-	-	-	-
colour	<5	9	<5	<5	<5	<5
alkalinity	208	217	410	248.	204.	230
iron	0.18	0.04	0.25	0.07	0.03	0.07
potassium	0.7	1.14	1.63	0.89	0.79	- .98
magnesium	24.5	26.9	11.3	22.9	23.3	25.8
calcium	48.2	52.1	51.0	55.4	59.3	63.8
sodium	8.0	3.87	93.5	9.02	4.26	4.61
sulphate	17	11	19	13.	21.	19
nitrite	<0.01	0.01	0.97	<0.02	<0.02	<0.02
ammonia	0.40	0.15	0.19	0.12	0.11	0.14
TKN (nitrogen)	0.70	0.49	2.21	1.28	0.94	0.49
nitrate	<0.05	0.05	-	<0.1	0.20	<0.1
Nickel			-	-	-	-
Arsenic			-	-	-	-
Cadmium	<.0003	<0.005	<0.002	<0.002	<0.002	<0.002
Chromium	<0.002	<0.02	<0.02	<0.02	<0.02	<0.01
Copper	0.002	<0.02	<0.01	<0.01	<0.01	<0.01
Mercury			-	-	-	-
Manganese	0.22	0.20	0.07	0.16	0.25	0.10
Boron	0.019	<0.02	0.04	0.11	0.10	0.02
Lead	0.0005	<0.04	<0.03	0.04	<0.03	<0.03
Selenium			-	-	-	-
Zinc	0.017	<0.01	1.01	0.41	0.07	0.02
Cyanide			-	-	-	-

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #5

	MAY 00	SEP 00				
pH	7.70	8.18				
conductivity	443	441				
chloride	1	2				
hardness	282	248				
D.O.C.	1.3	0.7				
phenols	-	-				
colour	<5	<5				
alkalinity	236	226				
iron	0.04	0.03				
potassium	0.34	1.10				
magnesium	28.4	26.3				
calcium	65.9	55.8				
sodium	5.82	3.95				
sulphate	15	12				
nitrite	<0.02	<0.02				
ammonia	0.08	0.11				
TKN (nitrogen)	4.01	0.20				
nitrate	0.85	<0.1				
Nickel	-	-				
Arsenic	-	-				
Cadmium	<0.002	<0.002				
Chromium	<0.01	<0.01				
Copper	0.01	0.01				
Mercury	-	-				
Manganese	0.40	0.27				
Boron	0.05	0.15				
Lead	<0.0005	<0.001				
Selenium	-	-				
Zinc	0.14	0.19				
Cyanide	-	-				

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #6

	MAY 97	SEP 97	MAY 98	OCT 98	MAY 99	OCT 99
pH	7.4	7.5	8.05	8.14	8.07	7.76
conductivity	509	528	467	485.	489.	489
chloride	2.40	6	4	5.	4.	5
hardness	270	175	257	252.	262.	275
D.O.C.	0.9	0.7	0.6	0.6	0.7	0.7
phenols			-	-	-	-
colour	<5	7	<5	<5	<5	<5
alkalinity	248	256	254	264.	246.	260
iron	0.99	1.21	1.07	0.74	0.75	0.17
potassium	0.9	1.3	1.20	1.03	1.33	1.18
magnesium	26.0	26.3	24.2	23.0	24.3	23.3
calcium	65.3	26.7	63.2	63.0	65.0	71.8
sodium	10	9.06	8.38	10.5	10.2	12.5
sulphate	19	13	17	21.	20.	29
nitrite	<0.01	0.01	0.02	<0.02	<0.02	<0.02
ammonia	1.77	0.36	0.26	0.39	0.38	0.28
TKN (nitrogen)	1.84	19.3	0.83	0.74	0.73	1.02
nitrate	<0.05	<0.05	<0.1	<0.1	0.15	<0.1
Nickel			-	-	-	-
Arsenic			-	-	-	-
Cadmium	<.0003	<0.005	<0.002	<0.002	<0.002	<0.002
Chromium	<0.002	<0.02	<0.02	<0.02	<0.02	<0.01
Copper	<0.002	<0.02	<0.01	<0.01	<0.01	0.01
Mercury			-	-	-	-
Manganese	0.13	0.13	0.16	0.13	0.14	0.02
Boron	0.028	<0.02	0.05	0.10	0.08	0.04
Lead	0.0002	<0.04	<0.03	<0.03	<0.03	<0.03
Selenium			-	-	-	-
Zinc	0.005	0.02	1.18	0.01	1.87	0.04
Cyanide			-	-	-	-



GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #6

	MAY 00	SEP 00				
pH	7.62	7.98				
conductivity	480	488				
chloride	4	2				
hardness	282	260				
D.O.C.	0.9	0.7				
phenols	-	-				
colour	<5	<5				
alkalinity	248	262				
iron	1.20	1.53				
potassium	0.96	1.16				
magnesium	25.9	24.6				
calcium	70.2	63.5				
sodium	12.5	10.5				
sulphate	24	19				
nitrite	<0.02	<0.02				
ammonia	0.06	0.08				
TKN (nitrogen)	0.58	0.08				
nitrate	0.94	<0.1				
Nickel	-	-				
Arsenic	-	-				
Cadmium	<0.002	<0.002				
Chromium	<0.01	<0.01				
Copper	<0.01	<0.01				
Mercury	-	-				
Manganese	0.08	0.08				
Boron	0.05	0.08				
Lead	<0.0005	<0.001				
Selenium	-	-				
Zinc	0.07	0.21				
Cyanide	-	-				

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #7

	SEP 97	MAY 98	MAY 99	MAY 00	SEP 00	
pH	7.97	7.97	7.56	7.53	8.01	
conductivity	400	407	478.	468	481	
chloride	2	2	<1	1	1	
hardness	166	270	296.	303	298	
D.O.C.	0.9	0.6	0.9	1.1	1.1	
phenols		-	-	-	-	
colour	11	<5	<5	<5	<5	
alkalinity	212	250	270.	251	277	
iron	0.42	0.84	<0.02	0.27	0.49	
potassium	0.68	0.82	0.54	<0.2	0.84	
magnesium	20.0	22.1	19.5	21.9	22.5	
calcium	33.4	71.6	86.2	85.2	82.1	
sodium	0.72	0.94	1.63	2.99	1.16	
sulphate	<2	2	17.	8	9	
nitrite	0.01	<0.02	<0.02	<0.02	<0.02	
ammonia	0.10	<0.05	<0.05	<0.05	<0.05	
TKN (nitrogen)	0.18	0.40	2.31	0.51	<0.05	
nitrate	0.14	0.12	0.17	1.03	<0.1	
Nickel		-	-	-	-	
Arsenic		-	-	-	-	
Cadmium	<0.005	<0.002	<0.002	<0.002	<0.002	
Chromium	<0.02	<0.02	<0.02	<0.01	<0.01	
Copper	0.02	<0.01	<0.01	0.01	<0.01	
Mercury		-	-	-	-	
Manganese	<0.02	0.06	<0.02	0.03	0.93	
Boron	<0.02	0.03	0.03	0.06	0.11	
Lead	0.04	<0.03	<0.03	<0.0005	<0.001	
Selenium		-	-	-	-	
Zinc	0.87	0.86	0.02	0.19	0.24	
Cyanide		-	-	-	-	

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #12

	SEP 97	MAY 98	OCT 98	MAY 99	OCT 99	MAY 00
pH	7.59	7.89	8.01	7.59	7.73	7.63
conductivity	1030	842	879.	855.	943	907
chloride	13	8	8.	9.	8	8
hardness	659	550	581.	565.	616	562
D.O.C.	2.0	1.4	2.1	1.8	1.9	1.3
phenols		-	-	-	-	-
colour	7	<5	<5	<5	<5	<5
alkalinity	339	334	382.	320.	350	332
iron	<0.04	0.29	0.02	<0.02	0.07	3.74
potassium	2.89	4.20	2.62	2.82	2.73	2.74
magnesium	81.1	66.8	67.1	62.0	70.1	78.2
calcium	130	110	122.	124.	131	96.0
sodium	11.9	11.0	11.1	12.1	13.0	12.2
sulphate	220	162	176.	184.	180	142
nitrite	0.02	0.05	<0.02	0.03	0.03	0.02
ammonia	0.11	<0.05	<0.05	<0.05	<0.05	<0.05
TKN(nitrogen)	0.28	0.44	0.60	0.67	0.48	0.44
nitrate	8.56	8.07	7.01	6.64	9.65	4.32
Nickel		-	-	-	-	-
Arsenic		-	-	-	-	-
Cadmium	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.02	<0.02	<0.02	<0.02	<0.01	0.01
Copper	<0.02	<0.01	0.01	<0.01	<0.01	0.01
Mercury		-	-	-	-	-
Manganese	0.07	0.02	<0.02	<0.02	<0.02	0.08
Boron	0.61	0.75	0.60	0.50	0.50	0.51
Lead	<0.04	<0.03	<0.03	<0.03	<0.03	0.0011
Selenium		-	-	-	-	-
Zinc	0.01	0.08	<0.01	0.02	0.03	0.09
Cyanide		-	-	-	-	-

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #12

	SEP 00					
pH	7.85					
conductivity	900					
chloride	7					
hardness	308					
D.O.C.	1.4					
phenols	-					
colour	<5					
alkalinity	373					
iron	1.84					
potassium	14.1					
magnesium	20.8					
calcium	88.9					
sodium	181					
sulphate	177					
nitrite	<0.02					
ammonia	<0.05					
TKN (nitrogen)	<0.05					
nitrate	3.97					
Nickel	-					
Arsenic	-					
Cadmium	<0.002					
Chromium	<0.01					
Copper	0.01					
Mercury	-					
Manganese	0.06					
Boron	0.58					
Lead	<0.001					
Selenium	-					
Zinc	0.13					
Cyanide	-					

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #13

	SEP 97	MAY 98	OCT 98	MAY 99	OCT 99	MAY 00
pH	7.24	7.64	7.69	7.06	7.46	7.40
conductivity	1570	1430	1410.	1450	1300	1270
chloride	72	63	60.	47.	34	36
hardness	871	903	879.	855.	831	823
D.O.C.	2.9	1.9	2.0	2.1	2.0	1.5
phenols		-	-	-	-	-
colour	9	<5	<5	<5	<5	<5
alkalinity	363	400	470.	338.	386	289
iron	<0.04	0.19	0.07	<0.02	<0.02	3.98
potassium	6.92	12.3	12.1	14.4	16.5	16.3
magnesium	115	92.5	89.8	82.8	83.6	97.5
calcium	159	209	204.	206.	195	169
sodium	42.0	34.9	36.9	34.6	29.4	31.0
sulphate	510	121	397.	462.	372	433
nitrite	0.05	<0.02	<0.02	<0.02	0.03	<0.02
ammonia	0.09	<0.05	0.08	<0.05	0.05	<0.05
TKN (nitrogen)	0.17	0.51	0.55	1.19	0.42	0.42
nitrate	1.60	3.59	2.40	3.95	1.96	2.71
Nickel		-	-	-	-	-
Arsenic		-	-	-	-	-
Cadmium	<0.005	0.004	<0.002	<0.002	<0.002	<0.002
Chromium	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01
Copper	<0.02	0.01	<0.01	<0.01	<0.01	0.01
Mercury		-	-	-	-	-
Manganese	0.48	0.21	0.21	0.15	0.18	0.33
Boron	0.53	0.57	0.56	0.63	0.59	0.64
Lead	<0.04	<0.03	<0.03	<0.03	<0.03	<0.0011
Selenium		-	-	-	-	
Zinc	<0.01	0.70	<0.01	0.17	0.09	0.14
Cyanide		-	-	-	-	-



GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

OBSERVATION WELL #13

	SEP 00					
pH	7.79					
conductivity	1240					
chloride	31					
hardness	701					
D.O.C.	1.6					
phenols	-					
colour	<5					
alkalinity	382					
iron	0.23					
potassium	14.4					
magnesium	81.2					
calcium	147					
sodium	27.7					
sulphate	358					
nitrite	<0.02					
ammonia	<0.05					
TKN (nitrogen)	<0.05					
nitrate	1.69					
Nickel	-					
Arsenic	-					
Cadmium	<0.002					
Chromium	<0.01					
Copper	<0.01					
Mercury	-					
Manganese	0.09					
Boron	0.54					
Lead	0.009					
Selenium	-					
Zinc	0.06					
Cyanide	-					

Appendix D  
Groundwater Chemistry - Observation Wells  
Kinross Landfill Site

Parameter	Units	OW7	RUC OW12	Ave.	OW4 May-00	OW5 May-00	OW6 May-00	OW7 May-00	OW12 May-00	OW13 May-00	OW4 Sep-00	OW5 Sep-00	OW6 Sep-00	OW7 Sep-00	OW12 Sep-00	OW13 Sep-00	OW4 May-01
<b>Vadose Zone Monitoring</b>																	
Methane	%LEL				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oxygen	% Vol/Vol				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>General Chemistry</b>																	
pH Value	pH units																
pH Value (Field)	pH units				7.18	7.7	7.62	7.53	7.63	7.4	7.97	8.18	7.98	8.01	7.85	7.79	7.53
Temperature (Field)	°C				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia as N	mg/L				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (un-ionized)	mg/L				3.22	0.08	0.06	< 0.05	< 0.05	< 0.05	3.01	0.11	0.08	< 0.05	< 0.05	< 0.05	4.5
Total Kjeldahl Nitrogen (as N)	mg/L				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (as N)	mg/L	2.59	6.55	4.57	3.66	4.01	0.58	0.51	0.44	0.42	3.36	0.2	0.08	< 0.05	< 0.05	< 0.05	5.3
Nitrite (as N)	mg/L				1.01	0.85	0.94	1.03	4.32	2.71	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Nitrate + Nitrite (as N)	mg/L				< 0.02	< 0.02	< 0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Organic Carbon (as C)	mg/L				1.01	0.85	0.94	1.03	4.34	2.71	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Conductivity	us/cm	3.1	3.6	3.3	11.7	1.3	0.9	1.1	1.3	1.5	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Conductivity (Field)	us/cm				1160	443	480	468	907	1270	84	0.7	0.7	1.1	1.4	1.6	16.4
Sulphate (as SO <sub>4</sub> )	mg/L				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity (as CaCO <sub>3</sub> )	mg/L	253	316	284	34	15	24	8	142	433	48	12	19	9	177	358	27
Chloride (as Cl)	mg/L				565	236	248	251	332	289	582	228	262	277	373	382	709
Colour	TCU	126	129	127	46	1	4	1	8	36	64	2	2	1	7	31	162
Calculated Hardness (as CaCO <sub>3</sub> )	mg/L				10	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total Cations	meq/L				513	282	282	303	582	823	488	248	290	298	308	701	710
Total Anions	meq/L				13.54	5.89	6.21	6.18	11.83	18.22	13.52	5.16	5.69	6.02	14.38	15.59	20.53
Ion Balance	% diff.				12.58	5.12	5.84	5.29	10.13	16.00	14.40	4.83	5.69	5.78	11.62	18.08	19.31
Calculated T.D.S.	mg/L				877	278	303	280	568	977	734	253	282	291	741	905	1033
<b>Trace Metals</b>																	
Aluminum, Al	mg/L				0.04	< 0.03	0.77	0.29	1.83	2.17	< 0.03	< 0.03	0.89	0.39	1.24	0.17	< 0.03
Barium, Ba	mg/L	0.50	0.54	0.52	1.07	0.54	0.55	0.83	0.49	0.64	1.01	1.05	0.79	1.13	0.5	0.32	0.18
Boron, B	mg/L	2.50	2.75	2.63	0.25	0.05	0.05	0.08	0.51	0.64	0.27	0.16	0.08	0.11	0.58	0.54	0.22
Cadmium, Cd	mg/L	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
Calcium, Ca	mg/L				120.0	85.9	70.2	85.2	96.0	169.0	119.0	55.8	83.5	82.1	88.9	147.0	200.0
Chromium, Cr	mg/L	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Copper, Cu	mg/L	0.50	0.50	0.50	< 0.01	0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron, Fe	mg/L	0.16	0.16	0.16	5.95	0.04	1.2	0.27	3.74	3.98	9.8	0.03	1.53	0.49	1.84	0.23	12.7
Lead, Pb	mg/L	0.003	0.003	0.003	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0011	< 0.0011	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Magnesium, Mg	mg/L				51.7	28.4	25.9	21.9	78.2	97.5	46.4	26.3	24.8	22.5	20.8	81.2	51.2
Manganese, Mn	mg/L	0.10	0.03	0.06	0.73	0.4	0.08	0.03	0.08	0.33	0.45	0.27	0.08	0.93	0.06	0.09	0.76
Potassium, K	mg/L				21.70	0.34	0.96	< 0.20	2.74	16.30	20.90	1.10	1.16	0.84	14.10	14.40	20.90
Silica, Reactive (as SiO <sub>2</sub> )	mg/L				12.5	13.8	12.0	5.6	10.2	8.9	14.8	16.0	13.8	7.2	10.3	9.0	14.5
Sodium, Na	mg/L	100.5	104.2	102.3	57.7	5.82	12.5	2.99	12.2	31	69.2	3.95	10.5	1.18	181	27.7	126
Zinc, Zn	mg/L	2.50	2.51	2.50	0.43	0.14	0.07	0.19	0.09	0.14	0.42	0.19	0.21	0.24	0.13	0.06	0.01

Note: While concentrations of parameters exceeding the Reasonable Use Criteria have been highlighted at all wells regardless of location, the Reasonable Use Guideline applies only to the boundary wells.

Appendix D  
Groundwater Chemistry - Observation Wells  
Kinkora Landfill Site

Parameter	Units	OW7	RUC OW12	Ave.	OW5 May-01	OW6 May-01	OW7 May-01	OW12 May-01	OW13 May-01	OW4 Sep-01	OW5 Sep-01	OW6 Sep-01	OW7 Sep-01	OW12 Sep-01	OW13 Sep-01	OW4 May-02	OW6 May-02
<b>Vadose Zone Monitoring</b>																	
Methane	%LEL				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0
Oxygen	% Vol/Vol				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21	21
<b>General Chemistry</b>																	
pH Value	pH units				8.09	8	8.08	7.91	7.67	7.31	7.95	7.8	DRY	7.89	7.55	7.86	9.01
pH Value (Field)	pH units				NA	NA	NA	NA	NA	NA	NA	NA	DRY	NA	NA	NA	NA
Temperature (Field)	°C				NA	NA	NA	NA	NA	NA	NA	NA	DRY	NA	NA	NA	NA
Ammonia as N	mg/L				0.08	0.06	0.14	< 0.05	< 0.05	5.48	0.08	0.09	DRY	< 0.05	0.19	9.21	0.06
Ammonia (un-ionized)	mg/L				NA	NA	NA	NA	NA	NA	NA	NA	DRY	NA	NA	NA	NA
Total Kjeldahl Nitrogen (as N)	mg/L				0.19	0.11	0.43	0.27	0.54	7.19	NA	NA	DRY	0.43	0.66	10.1	0.8
Nitrate (as N)	mg/L	2.50	6.55	4.57	< 0.1	< 0.1	< 0.1	6.58	2.64	< 0.1	< 0.1	< 0.1	DRY	< 0.02	< 0.02	< 0.02	< 0.20
Nitrite (as N)	mg/L				< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.03	< 0.02	< 0.02	DRY	6.58	1.82	0.44	3.09
Nitrate + Nitrite (as N)	mg/L				< 0.10	< 0.10	< 0.10	6.58	2.64	0.13	< 0.10	< 0.10	DRY	6.58	1.82	0.44	3.09
Dissolved Organic Carbon (as C)	mg/L	3.1	3.6	3.3	0.9	0.8	1.4	1.3	2.2	16.2	0.8	1	DRY	1.5	3.8	18.9	7.4
Conductivity	µS/cm				441	482	418	890	1410	1770	477	524	DRY	NA	NA	1680	724
Conductivity (Field)	µS/cm				NA	NA	NA	NA	NA	NA	NA	NA	DRY	NA	NA	NA	NA
Sulphate (as SO <sub>4</sub> )	mg/L	253	316	284	18	18	3	95	402	681	227	250	DRY	141	299	73	31
Alkalinity (CaCO <sub>3</sub> )	mg/L				234	262	239	405	402	126	7	2	DRY	5	50	117	10
Chloride (as Cl)	mg/L	126	129	127	2	2	1	4	42	126	2	1	DRY	5	50	117	10
Colour	TCU				7	8	< 5	< 5	< 5	648	252	274	DRY	569	850	785	189
Calculated Hardness (as CaCO <sub>3</sub> )	mg/L				264	271	264	562	855	848	252	274	DRY	569	850	785	189
Total Cations	meq/L				5.51	5.88	5.37	11.80	18.92	19.93	5.20	5.99	DRY	11.93	19.13	21.91	12.78
Total Anions	meq/L				5.11	5.83	4.87	10.66	17.15	17.85	4.89	5.44	DRY	10.54	17.45	22.01	11.93
Ion Balance	% diff.				3.80	2.14	4.84	5.07	4.92	5.22	3.14	4.78	DRY	6.16	4.81	0.23	3.44
Calculated T.D.S.	mg/L				269	292	249	576	1008	974	248	284	DRY	585	988	1248	847
<b>Trace Metals</b>																	
Aluminum, Al	mg/L				< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.01	< 0.01	< 0.01	DRY	< 0.01	< 0.01	< 0.01	0.058
Barium, Ba	mg/L	0.50	0.54	0.52	0.06	0.07	< 0.04	0.08	0.11	0.144	0.065	0.098	DRY	0.069	0.12	0.185	0.007
Boron, B	mg/L	2.50	2.75	2.63	0.02	0.03	< 0.02	0.41	0.7	0.26	0.02	0.04	DRY	0.62	0.71	0.25	0.02
Cadmium, Cd	mg/L	0.002	0.002	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0001	< 0.0001	< 0.0001	DRY	< 0.0001	< 0.0001	0.0001	0.0004
Calcium, Ca	mg/L				62.5	69.2	74.8	103.0	191.0	176.0	58.0	68.7	DRY	108.0	182.0	220.0	24.9
Chromium, Cr	mg/L	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.005	< 0.005	< 0.005	DRY	0.002	0.003	< 0.005	< 0.005
Copper, Cu	mg/L	0.50	0.50	0.50	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.002	< 0.002	< 0.002	DRY	0.04	< 0.03	0.33	< 0.03
Iron, Fe	mg/L	0.16	0.16	0.16	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	6.01	0.03	0.47	DRY	0.002	0.003	< 0.005	< 0.005
Lead, Pb	mg/L	0.003	0.003	0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.0005	< 0.0005	DRY	< 0.0005	< 0.0005	< 0.0005	0.0021
Magnesium, Mg	mg/L	0.10	0.03	0.06	0.27	0.08	0.07	73.9	91.7	50.2	28.1	24.8	DRY	72.8	98.1	57.2	30.8
Manganese, Mn	mg/L				0.81	0.83	0.87	11.20	18.60	0.535	0.221	0.082	DRY	4.40	0.112	0.897	0.008
Potassium, K	mg/L	100.5	104.2	102.3	5.08	9.89	1.35	9.7	8.4	7.3	6.9	8.5	DRY	4.4	4.4	7.0	5.7
Silica, Reactive (as SiO <sub>2</sub> )	mg/L	2.50	2.51	2.50	0.03	0.04	0.01	0.01	0.05	0.007	< 0.005	< 0.005	DRY	< 0.005	< 0.005	0.115	0.049
Sodium, Na	mg/L																
Zinc, Zn	mg/L																

Note: While concentrations of parameters exceeding the Reasonable Use Criteria

Appendix D  
Groundwater Chemistry - Observation Wells  
Kinross Landfill Site

Parameter	Units	OW7	RUC OW12	Ave.	OW6 May-02	OW7 May-02	OW12 May-02	OW13 May-02	OW4 Sep-02	OW5 Sep-02	OW6 Sep-02	OW7 Sep-02	OW12 Sep-02	OW13 Sep-02	OW4 May-03	OW5 May-03	OW6 May-03
<b>Vadose Zone Monitoring</b>																	
Methane	%LEL				0	0	0	0	0	1	0	DRY	1	0	0	0	0
Oxygen	% Vol/Vol				21	21	21	21	20.8	20.7	20.8	DRY	20.5	20.8	20.9	21.1	21.2
<b>General Chemistry</b>																	
pH Value	pH units				8.07	8.12	8	7.88	7.32	7.86	7.88	DRY	7.88	7.42	7.39	8	7.66
pH Value (Field)	pH units				NA	NA	NA	NA	6.7	7.6	7.3	DRY	7.3	7.1	8.25	7.2	7.1
Temperature (Field)	°C				NA	NA	NA	NA	14.3	16	15.6	DRY	11	11.2	11.7	12.2	12.6
Ammonia as N	mg/L				0.08	< 0.05	< 0.05	0.05	9.26	0.1	0.13	DRY	< 0.05	0.82	9.4	0.12	0.12
Ammonia (un-ionized)	mg/L				NA	NA	NA	NA	0.01389	0.00132	0.000845	DRY	< 0.00023	0.002378	0.3416	0.0004	0.0003
Total Kjeldahl Nitrogen (as N)	mg/L				0.22	0.15	0.31	0.39	11	0.43	0.51	DRY	0.41	1.48	10.3	0.3	0.29
Nitrate (as N)	mg/L	2.59	6.55	4.57	0.25	0.3	7.3	3.45	< 0.1	< 0.1	< 0.1	DRY	8.37	2.2	0.12	< 0.1	< 0.1
Nitrite (as N)	mg/L				< 0.02	< 0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02	DRY	< 0.02	< 0.02	0.02	< 0.02	< 0.02
Nitrate + Nitrite (as N)	mg/L				0.25	0.30	7.30	3.47	< 0.10	< 0.10	< 0.10	DRY	6.37	2.20	0.14	< 0.10	< 0.10
Dissolved Organic Carbon (as C)	mg/L				1.2	1.1	1.9	2.7	17.9	1.1	0.7	DRY	1.6	4	12.9	1	0.8
Conductivity	us/cm	3.1	3.6	3.3	485	404	859	1440	1700	448	486	DRY	863	1460	2030	525	537
Conductivity (Field)	us/cm				NA	NA	NA	NA	2040	550	590	DRY	1050	1820	1751	466	491
Sulphate (as SO4)	mg/L	253	316	284	18	6	122	411	82	18	21	DRY	135	381	106	17	20
Alkalinity (as CaCO3)	mg/L				259	239	387	411	830	243	253	DRY	378	497	867	268	272
Chloride (as Cl)	mg/L	128	129	127	2	1	5	55	104	2	5	DRY	7	67	138	3	4
Colour	TCU				< 5	< 5	< 5	< 5	10	< 5	< 5	DRY	< 5	< 5	< 5	< 5	< 5
Calculated Hardness (as CaCO3)	mg/L				259	236	495	797	745	258	260	DRY	557	889	905	287	286
Total Cations	meq/L				5.55	4.78	10.45	17.83	21.06	5.45	5.71	DRY	11.69	20.24	23.92	5.89	6.14
Total Anions	meq/L				5.63	4.96	10.94	18.57	21.45	5.29	5.64	DRY	11.02	19.50	23.45	5.80	5.97
Ion Balance	% diff.				0.74	1.98	2.31	2.03	0.91	1.50	0.80	DRY	2.94	1.88	0.99	0.81	1.39
Calculated T.D.S.	mg/L				284	238	572	1074	1217	266	291	DRY	598	1136	1331	285	306
<b>Trace Metals</b>																	
Aluminum, Al	mg/L				< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01	DRY	< 0.01	< 0.01	< 0.005	< 0.005	0.015
Barium, Ba	mg/L				0.068	0.006	0.065	0.11	0.174	0.072	0.084	DRY	0.075	0.127	0.19	0.065	0.077
Boron, B	mg/L	0.50	0.54	0.52	0.02	< 0.01	0.47	0.69	0.3	0.02	0.03	DRY	0.58	0.75	0.292	0.016	0.024
Cadmium, Cd	mg/L	2.50	2.75	2.63	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0028	< 0.0001	DRY	0.0002	< 0.0001	< 0.0001	0.0009	< 0.0001
Calcium, Ca	mg/L	0.002	0.002	0.002	66.1	65.0	91.8	173.0	205.0	61.1	67.2	DRY	104.0	191.0	259.0	69.3	76.8
Chromium, Cr	mg/L				< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	DRY	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper, Cu	mg/L	0.01	0.01	0.01	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	DRY	0.002	0.002	< 0.0005	< 0.0005	< 0.0005
Iron, Fe	mg/L	0.50	0.50	0.50	0.53	0.03	< 0.03	< 0.03	0.48	< 0.03	0.15	DRY	< 0.03	< 0.03	1.38	0.07	0.37
Lead, Pb	mg/L	0.16	0.16	0.16	22.7	18.0	64.6	88.6	56.8	25.7	22.4	DRY	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Magnesium, Mg	mg/L	0.003	0.003	0.003	0.075	< 0.005	< 0.005	0.09	0.622	0.225	0.051	DRY	< 0.005	0.113	62.8	27.6	23.0
Manganese, Mn	mg/L				< 1.00	< 1.00	8.20	19.40	23.20	1.10	1.00	DRY	7.10	25.30	28.20	0.403	0.087
Potassium, K	mg/L	100.5	104.2	102.3	5.9	2.9	4.7	4.1	7.2	7.1	8.1	DRY	4.4	4.4	7.2	8.4	5.8
Silica, Reactive (as SiO2)	mg/L	2.50	2.51	2.50	8.6	0.9	8	32.3	113	5.8	10.9	DRY	8.8	40.8	103	3.1	8.8
Sodium, Na	mg/L				< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.501	< 0.005	DRY	< 0.005	< 0.005	0.008	0.158	0.06
Zinc, Zn	mg/L																

Note: While concentrations of parameters exceeding the Reasonable Use Criteria

Appendix D  
Groundwater Chemistry - Observation Wells  
Kinross Landfill Site

Parameter	Units	OW7	RUC OW12	Ave.	OW7 May-03	OW12 May-03	OW13 May-03	OW13 (Rep) May-03	OW4 Oct-03	OW6 Oct-03	OW6 Oct-03	OW7 Oct-03	OW12 Oct-03	OW13 Oct-03	OW14 Oct-03	OW13 (Rep) Oct-03	OW4 May-04
<b>Vadose Zone Monitoring</b>																	
Methane	%LEL				0	0	0	NA	0	0	0	0	0	0	0	NA	0
Oxygen	% Vol/Vol				21	21	20.8	NA	20.9	20.9	20.9	20.9	20.5	20.9	20.8	NA	20.9
<b>General Chemistry</b>																	
pH Value	pH units				7.83	7.91	7.87	7.69	7.3	7.99	7.84	7.82	7.7	7.55	7.29	7.53	7.28
pH Value (Field)	pH units				7.63	7.88	7.15	NA	6.89	8.05	7.87	7.38	7.42	7.17	8.82	NA	6.78
Temperature (Field)	°C				14	14.4	12.3	NA	12.7	13	11.9	13	11.4	11.1	12.5	NA	11.2
Ammonia as N	mg/L				< 0.05	< 0.05	0.07	0.1	8.82	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	17.3	< 0.05	14.8
Ammonia (un-ionized)	mg/L				< 0.0005	< 0.0006	0.0002	NA	< 0.0157	< 0.0013	< 0.0005	< 0.0003	< 0.0003	< 0.0001	0.0257	NA	0.0179
Total Kjeldahl Nitrogen (as N)	mg/L				0.38	0.32	0.55	0.5	11.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08	0.1	18.3
Nitrate (as N)	mg/L	2.59	6.55	4.57	< 0.1	3.53	2.48	2.41	< 0.1	0.8	< 0.1	< 0.05	< 0.05	< 0.05	2.18	< 0.1	1.97
Nitrite (as N)	mg/L				< 0.02	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.1	< 0.02	< 0.02
Nitrate + Nitrite (as N)	mg/L				< 0.10	3.53	2.50	2.41	< 0.10	0.80	< 0.10	0.10	4.57	2.18	< 0.10	1.97	< 0.1
Dissolved Organic Carbon (as C)	mg/L	3.1	3.6	3.3	1.1	1.6	3.1	2.9	16.5	0.5	< 0.5	0.6	1.5	2.1	4.7	2.2	19.6
Conductivity	us/cm				504	994	1880	1890	2120	468	511	609	966	1570	1620	1550	2300
Conductivity (Field)	us/cm				453	834	1554	NA	1682	479	511	609	966	1570	1620	1550	2300
Sulphate (as SO4)	mg/L	253	316	284	8	138	572	590	60	19	22	6	137	471	29	482	61
Alkalinity (as CaCO3)	mg/L				272	387	400	397	902	245	268	352	385	382	916	382	953
Chloride (as Cl)	TCU	128	129	127	2	8	68	69	180	3	4	1	7	57	27	57	204
Colour	mg/L				< 5	< 5	< 5	< 5	10	6	< 5	< 5	< 5	< 5	8	< 5	71.2
Calculated Hardness (as CaCO3)	meq/L				291	549	1060	1040	800	256	273	333	542	809	783	831	820
Total Cations	meq/L				5.87	11.49	23.73	23.42	23.55	5.28	5.90	8.71	11.36	18.40	19.29	18.89	24.44
Total Anions	meq/L				5.86	11.09	21.99	22.33	24.36	5.44	5.93	7.20	11.07	19.40	19.68	19.61	26.08
Ion Balance	% diff.				1.83	1.80	3.80	2.38	1.69	1.43	0.26	3.55	1.28	2.65	1.00	1.88	3.24
Calculated T.D.S.	mg/L				280	595	1358	1367	1391	267	303	340	592	1137	997	1157	1461
<b>Trace Metals</b>																	
Aluminum, Al	mg/L				< 0.005	0.008	< 0.005	0.01	< 0.005	0.008	0.026	< 0.005	0.016	< 0.005	< 0.005	0.025	< 0.005
Barium, Ba	mg/L	0.50	0.54	0.52	0.007	0.071	0.116	0.116	0.227	0.068	0.078	0.01	0.069	0.096	0.078	0.095	0.225
Boron, B	mg/L	2.50	2.75	2.63	0.006	0.49	1.06	1.06	0.249	0.02	0.028	0.006	0.527	0.869	0.867	0.857	0.307
Cadmium, Cd	mg/L	0.002	0.002	0.002	0.0002	0.004	0.0002	< 0.0001	< 0.0001	0.0003	< 0.0001	0.0007	0.0004	< 0.0001	0.0002	< 0.0001	< 0.0001
Calcium, Ca	mg/L				83.4	114.0	237.0	233.0	227.0	62.3	73.9	95.5	107.0	178.0	192.0	183.0	225
Chromium, Cr	mg/L	0.01	0.01	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper, Cu	mg/L	0.50	0.50	0.50	< 0.0005	0.0012	0.0015	0.0015	0.0009	< 0.0005	< 0.0005	0.0007	0.0025	0.0012	0.0025	0.0012	< 0.0005
Iron, Fe	mg/L	0.16	0.16	0.16	< 0.03	< 0.03	< 0.03	< 0.03	0.38	< 0.03	0.49	0.03	< 0.03	< 0.03	0.31	< 0.03	0.07
Lead, Pb	mg/L	0.003	0.003	0.003	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Magnesium, Mg	mg/L				20.2	64.3	113.0	112.0	56.8	24.4	21.8	22.9	66.7	88.8	73.7	90.8	62.8
Manganese, Mn	mg/L	0.10	0.03	0.06	0.032	0.006	0.137	0.131	0.598	0.047	0.08	0.198	0.008	0.053	0.045	0.053	0.663
Potassium, K	mg/L				0.40	4.10	24.00	23.80	26.30	0.90	1.00	0.50	4.80	25.30	45.80	25.70	25.8
Silica, Reactive (as SiO2)	mg/L	100.5	104.2	102.3	0.9	9.4	45.6	45.1	144	14.8	13.2	8.4	9.7	8.1	10.7	8.3	8.05
Sodium, Na	mg/L				< 0.005	0.025	< 0.005	0.011	< 0.005	0.083	0.049	0.008	0.037	< 0.005	0.007	0.04	0.016
Zinc, Zn	mg/L	2.50	2.51	2.50													

Note: While concentrations of parameters exceeding the Reasonable Use Criteria

Appendix D  
Groundwater Chemistry - Observation Wells  
Kinross Landfill Site

Parameter	Units	RUC		Ave.	OW6 May-04	OW6 May-04	OW7 May-04	OW12 May-04	OW13 May-04	OW13I Jun-04	OW13D Jun-04	OW14 May-04	OW13SO4 May-04	OW4 Sep-04	OW6 Sep-04	OW6 Sep-04	OW7 Sep-04
<b>Vadose Zone Monitoring</b>																	
Methane	%LEL				0	0	0	0	0	NA	NA	0	NA	2	0	0	0
Oxygen	% Vol/Vol				20.9	20.9	21.1	20.8	20.8	NA	NA	20.9	NA	20.9	20.9	20.8	20.9
<b>General Chemistry</b>																	
pH Value	pH units				7.95	7.73	7.76	7.71	7.49	7.63	7.88	7.28	7.56	7.47	8.12	8.02	DRY
pH Value (Field)	pH units				7.83	7.38	7.38	7.14	7.03	NA	NA	6.72	NA	6.87	7.83	7.31	DRY
Temperature (Field)	°C				12.6	10.6	10.3	13.4	10.9	NA	NA	13.9	NA	15.5	17.6	16.2	DRY
Ammonia as N	mg/L				0.05	0.21	< 0.05	< 0.05	< 0.05	0.27	0.17	21.8	< 0.05	22.2	0.14	0.4	DRY
Ammonia (un-ionized)	mg/L				0.0008	0.001	< 0.0002	< 0.0002	< 0.0001	NA	NA	0.0287	NA	0.0294	0.0031	0.0024	DRY
Total Kjeldahl Nitrogen (as N)	mg/L				0.18	0.38	0.17	0.38	0.43	0.7	0.83	24.1	0.38	21.3	< 0.06	0.3	DRY
Nitrate (as N)	mg/L	2.59	6.55	4.57	< 0.1	0.1	0.13	4.81	2.84	0.38	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	DRY
Nitrite (as N)	mg/L				< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.12	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	DRY
Nitrate + Nitrite (as N)	mg/L				< 0.1	0.1	0.13	4.81	2.84	0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	DRY
Dissolved Organic Carbon (as C)	mg/L	3.1	3.6	3.3	1.5	1.8	2	3.1	3.3	2.4	1.8	10.7	4	17.5	0.7	2	DRY
Conductivity	µS/cm				468	516	439	959	1590	978	582	1870	1580	2360	487	518	DRY
Conductivity (Field)	µS/cm				468	478	405	851	1379	NA	NA	1846	NA	2080	435	462	DRY
Sulphate (as SO4)	mg/L	253	316	284	23	21	6	112	458	172	47	32	454	29	23	21	DRY
Alkalinity (as CaCO3)	mg/L				232	260	238	419	383	306	249	852	385	975	244	283	DRY
Chloride (as Cl)	mg/L	126	129	127	3	5	2	6	60	30	13	118	59	231	4	4	DRY
Colour	TCU				< 2.5	9.6	2.8	< 2.5	2.8	8.4	2.6	15.7	< 2.5	18.1	< 2.5	< 2.5	DRY
Calculated Hardness (as CaCO3)	mg/L				246	252	234	514	793	545	260	806	821	790	261	259	DRY
Total Cations	meq/L				5.07	5.44	4.73	10.93	17.99	12.32	5.97	21.18	18.64	25.48	5.37	5.67	DRY
Total Anions	meq/L				5.2	5.78	4.95	11.22	19.28	10.58	6.32	21.03	19.02	26.62	5.47	5.81	DRY
Ion Balance	% diff.				1.28	3.09	2.32	1.31	3.48	7.61	2.85	0.34	1.01	2.18	0.81	1.19	DRY
Calculated T.D.S.	mg/L				255	287	237	579	1123	637	332	1112	1127	1517	269	294	DRY
<b>Trace Metals</b>																	
Aluminum, Al	mg/L				< 0.005	< 0.005	0.008	< 0.005	< 0.005	< 0.005	0.013	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	DRY
Barium, Ba	mg/L				0.065	0.071	0.008	0.083	0.099	0.123	0.082	0.131	< 0.005	0.103	0.202	0.068	DRY
Boron, B	mg/L	0.50	0.54	0.52	0.012	0.019	< 0.005	0.456	0.814	0.353	0.064	0.729	0.855	0.321	0.012	0.021	DRY
Cadmium, Cd	mg/L	0.002	0.002	0.002	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	DRY
Calcium, Ca	mg/L				59.1	65.9	66.5	91	176	134	80.8	188	181	212	62.3	66.9	DRY
Chromium, Cr	mg/L	0.01	0.01	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	DRY
Copper, Cu	mg/L	0.50	0.50	0.50	< 0.0005	< 0.0005	< 0.0005	0.0012	0.0014	< 0.0005	< 0.0005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	DRY
Iron, Fe	mg/L	0.18	0.18	0.18	< 0.03	0.21	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	DRY
Lead, Pb	mg/L	0.003	0.003	0.003	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	DRY
Magnesium, Mg	mg/L				24	21.3	16.5	69.7	85.8	51.1	28.2	81.7	89.5	63.4	25.5	22.3	DRY
Manganese, Mn	mg/L	0.10	0.03	0.06	0.347	0.101	0.18	< 0.005	0.025	0.244	0.031	1.56	0.032	0.667	0.283	0.069	DRY
Potassium, K	mg/L				0.7	0.8	0.4	14.5	22	5.5	4.3	49.9	22.2	27.5	0.8	0.9	DRY
Silica, Reactive (as SiO2)	mg/L				5.82	5.17	2.35	4.5	3.65	4.4	5.63	4.99	3.82	8.98	7.28	6.4	DRY
Sodium, Na	mg/L	100.5	104.2	102.3	2.9	8.3	0.9	6.5	36.3	29.2	15.2	51.4	38.4	170	3.1	10.3	DRY
Zinc, Zn	mg/L	2.50	2.51	2.50	0.11	< 0.005	0.014	< 0.005	0.008	0.005	0.014	< 0.005	0.008	< 0.005	0.008	< 0.005	DRY

Note: While concentrations of parameters exceeding the Reasonable Use Criteria



Appendix D  
Groundwater Chemistry - Observation Wells  
Kinross Landfill Site

Parameter	Units	RUC		Ave.	OW12 Sep-04	OW13 Sep-04	OW13J Sep-04	OW13D Sep-04	OW14 Sep-04	OW13I-04 Sep-04
<b>Vadose Zone Monitoring</b>										
Methane	%LEL				0	1	1	1	55	NA
Oxygen	% Vol/Vol				20.9	20.9	20.9	20.9	15.2	NA
<b>General Chemistry</b>										
pH Value	pH units				7.89	7.63	7.73	7.85	7.53	8.05
pH Value (Field)	pH units				7.01	6.9	7.01	7.83	6.44	NA
Temperature (Field)	°C				15.3	12.1	12.3	11.4	15.1	NA
Ammonia as N	mg/L				< 0.05	0.18	< 0.05	< 0.05	24.8	< 0.05
Ammonia (un-ionized)	mg/L				< 0.0001	0.0003	< 0.0001	< 0.0004	0.0186	NA
Total Kjeldahl Nitrogen (as N)	mg/L				< 0.05	0.22	< 0.05	< 0.05	25.2	< 0.05
Nitrate (as N)	mg/L	2.59	6.55	4.57	5.8	2.67	2	2.06	< 0.1	< 0.1
Nitrite (as N)	mg/L				< 0.02	0.02	0.04	0.03	< 0.02	< 0.02
Nitrate + Nitrite (as N)	mg/L				5.8	2.69	2.04	2.09	< 0.1	< 0.1
Dissolved Organic Carbon (as C)	mg/L	3.1	3.6	3.3	3	2.6	2	2	7.7	1.8
Conductivity	us/cm				1020	1810	1570	1570	1720	530
Conductivity (Field)	us/cm				863	1375	1325	478	1454	NA
Sulphate (as SO4)	mg/L	253	316	284	145	447	458	455	7	48
Alkalinity (as CaCO3)	mg/L				381	381	384	390	817	236
Chloride (as Cl)	mg/L	126	129	127	11	64	60	60	98	7
Colour	TCU				3.2	< 2.5	4	< 2.5	7.9	< 2.5
Calculated Hardness (as CaCO3)	mg/L				530	800	823	823	574	252
Total Cations	meq/L				11.27	18.26	18.65	18.64	18.61	5.74
Total Anions	meq/L				11.38	19.11	19.04	19.11	19.25	5.92
Ion Balance	% diff.				0.41	2.3	1.05	1.24	1.7	1.48
Calculated T.D.S.	mg/L				603	1119	1127	1128	1060	315
<b>Trace Metals</b>										
Aluminum, Al	mg/L				< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Barium, Ba	mg/L	0.50	0.54	0.52	0.071	0.091	0.148	0.148	0.072	0.077
Boron, B	mg/L	2.50	2.75	2.63	0.489	0.734	0.78	0.757	0.606	0.043
Cadmium, Cd	mg/L	0.002	0.002	0.002	0.0003	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001
Calcium, Ca	mg/L				90.4	172	181	182	133	80.7
Chromium, Cr	mg/L	0.01	0.01	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper, Cu	mg/L	0.50	0.50	0.50	0.0014	0.0018	0.0013	0.0012	0.0009	< 0.0005
Iron, Fe	mg/L	0.16	0.16	0.16	< 0.03	< 0.03	< 0.03	< 0.03	0.3	0.41
Lead, Pb	mg/L	0.003	0.003	0.003	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Magnesium, Mg	mg/L				74	90	90	89.4	58.7	24.3
Manganese, Mn	mg/L	0.10	0.03	0.06	< 0.005	0.027	0.039	0.038	0.82	0.019
Potassium, K	mg/L				12.1	24.6	17.1	17.3	36.9	2.1
Silica, Reactive (as SiO2)	mg/L				4.24	3.93	4.68	4.67	4.68	6.66
Sodium, Na	mg/L	100.5	104.2	102.3	8.2	37.3	40.7	40.3	102	15.2
Zinc, Zn	mg/L	2.50	2.51	2.50	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

Note: While concentrations of parameters exceeding the Reasonable Use Criteria

Note: While concentrations of parameters exceeding the Reasonable Use Criteria

Appendix D  
Historical Groundwater Quality Data  
Kinross Landfill Site

Parameter	Units	RUC	TDL	OW4 5/25/2005	OW5 5/25/2005	OW6 5/25/2005	OW7 5/25/2005	OW12 5/25/2005	OW13 5/25/2005	OW13J 5/25/2005	OW13D 5/25/2005	OW14 Leachate 5/25/2005	OW14 Leachate-Rep 5/25/2005	OW4 9/28/2005	OW5 9/28/2005	OW6 9/28/2005	OW7 9/28/2005	OW12 9/28/2005	OW13 9/28/2005	OW13J 9/28/2005	OW13D 9/28/2005	OW14 9/28/2005
<b>FIELD MONITORING RESULTS</b>																						
Methane	%Vol			N/A	0.15	<0.05	<0.05	<0.05	0.05	<0.05	0.05	0.05	0.05									
Oxygen	%Vol			N/A	20.9	20.8	20.8	20.9	20.9	21	20.8	19.5										
Temperature	°C			N/A	20.9	20.8	20.8	20.9	20.9	21	20.8	19.5										
pH				N/A	10.9	12.5	10.3	12.8	12.8	10.5	8.8	15.3										
Conductivity	uS/cm			N/A	8.55	7.32	7.15	8.97	8.99	8.64	8.91	7.23	8.35									
<b>INORGANICS</b>																						
Un-ionized Ammonia (Calculated)	mg/L			N/A	0.0131	0.0007	0.0007	0.0038	N/A	0.0003	N/A	0.0114										
Total Ammonia-N	mg/L			N/A	0.06	0.140	0.270	1.22	N/A	0.0003	N/A	0.0114										
Conductivity	uS/cm			2	2040	485	507	438	948	1519	1520	521	1830									
Total Kjeldahl Nitrogen (TKN)	mg/L			2	2040	485	507	438	948	1519	1520	521	1830									
Nitrite (N)	mg/L			0.27	0.1	ND	ND	ND	ND	ND	ND	ND	ND									
Dissolved Organic Carbon	mg/L			4.08	0.1	16.2	1.10	0.900	1.00	3.90	2.80	ND	ND									
pH				0.01	7.85	8.20	8.01	8.03	8.11	8.02	8.05	8.25	7.77									
Alkalinity (Total as CaCO <sub>3</sub> )	mg/L			1	884	220	247	227	354	336	337	224	738									
Chloride (Cl)	mg/L			130	1	151	3.10	3.80	1.22	8.38	62.1	67.9	62.7									
p-Alkalinity	mg/L			6.8	0.3	ND	ND	ND	ND	ND	ND	ND	ND									
Dissolved Nitrate + Nitrite	mg/L			7.1	0.2	0.10	ND	0.10	0.10	8.8	3.8	1.9	ND									
Nitrate (N)	mg/L			320	1	40.8	20.4	17.8	4.80	148	428	442	43.0									
Phosphate-P	mg/L			1	ND	ND	ND	ND	ND	ND	ND	ND	ND									
Sulfate (SO <sub>4</sub> )	mg/L			1	ND	ND	ND	ND	ND	ND	ND	ND	ND									
<b>CALCULATED VALUES</b>																						
Anion Sum	meq/L			N/A	22.8	4.92	5.42	4.89	10.8	17.7	18.0	5.83	16.8									
Bicarb. Alkalinity (calc. as CaCO <sub>3</sub> )	mg/L			1	878	217	245	225	350	335	333	220	732									
Calculated TDS	mg/L			1	1200	256	271	232	563	1050	1070	287	885									
Carb. Alkalinity (calc. as CaCO <sub>3</sub> )	mg/L			1	9	3	2	2	4	3	4	4	4									
Cation Sum	meq/L			N/A	24.4	5.85	5.85	5.03	11.2	19.3	18.6	5.89	18.7									
Hardness (CaCO <sub>3</sub> )	mg/L			N/A	750	280	280	240	630	840	860	250	630									
Ion Balance (% Difference)	%			N/A	3.35	8.74	2.08	240	630	840	860	250	630									
Langelier Index (@ 20°C)	N/A			N/A	1.52	0.943	0.325	0.832	1.15	1.26	1.30	0.973	1.33									
Langelier Index (@ 4°C)	N/A			N/A	1.27	0.663	0.577	0.572	0.904	1.02	1.06	0.724	1.08									
Saturation pH (@ 20°C)	N/A			N/A	6.33	7.25	7.18	7.21	6.96	6.76	6.75	7.28	6.45									
Saturation pH (@ 4°C)	N/A			N/A	6.57	7.5	7.44	7.45	7.2	7.01	7	7.52	6.59									
<b>METALS</b>																						
Dissolved Aluminum (Al)	mg/L			0.005	ND	0.009	0.010	0.009	0.032	ND	ND	ND	ND									
Dissolved Arsenic (As)	mg/L			0.007	0.001	0.009	0.009	0.009	0.032	ND	ND	ND	ND									
Dissolved Barium (Ba)	mg/L			0.040	0.005	0.787	0.004	0.068	0.004	0.49	0.84	0.78	0.040									
Dissolved Boron (B)	mg/L			2.7	0.01	0.28	ND	0.028	0.030	0.072	0.083	0.080	0.071									
Dissolved Cadmium (Cd)	mg/L			0.0018	0.0001	0.0002	ND	ND	0.0006	ND	0.0002	ND	0.0001									
Dissolved Calcium (Ca)	mg/L			0.2	201	86.4	68.4	68.9	97.1	188	192	62.7	188									
Dissolved Chromium (Cr)	mg/L			0.014	0.005	ND	ND	ND	ND	ND	ND	ND	ND									
Dissolved Copper (Cu)	mg/L			0.5	0.001	ND	ND	ND	ND	ND	ND	ND	ND									
Dissolved Iron (Fe)	mg/L			0.16	0.05	ND	ND	ND	0.001	0.002	0.001	0.001	ND									
Dissolved Lead (Pb)	mg/L			0.003	0.0005	ND	ND	ND	ND	ND	ND	ND	ND									
Dissolved Magnesium (Mg)	mg/L			0.028	0.002	0.087	0.243	0.0520	0.0280	0.0280	0.0280	0.0170	1.06									
Dissolved Manganese (Mn)	mg/L			0.05	8.54	7.20	6.03	2.52	4.64	4.22	4.58	7.07	8.48									
Dissolved Nickel (Ni)	mg/L			104	0.1	169	3.40	8.80	0.800	8.20	41.8	14.4	91.0									
Dissolved Zinc (Zn)	mg/L			2.5	0.005	0.056	0.012	ND	0.0060	ND	0.081	ND	0.0070									

N/A = Not Applicable

ND = Not detected

TDL = Typical Detection Limit. Actual detection limit varies with concentration of each sample.

Reasonable Use Criteria (RUC) were calculated in accordance with MOE Guideline B-7 using 2 years of data for OW7 and OW12 and applying the detection limit when a non-detect is reported.

Refer to Table 5 for notes relating to landfill gas measurements.

Standard Groundwater Quality Package  
Kinross Landfill Site

Parameter	Short ID	Unit	RUC Max (OW7&OW12)	OW4	OW5	OW6	OW7	OW8	OW9	OW10	OW11	OW12	OW13B	OW13H	OW13D	OW14	OW4-Rap	OW4	OW5
West Class				Down Town	Down Town	Down Town	Up Town	Up Town	Up Town	Up Town	Up Town	Up Town	Down Town	Down Town	Down Town	Isachase Town	Down Town	Down Town	Down Town
West Owner				17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	17-Apr-06	03-Oct-06	03-Oct-06
Date of Sampling																			
FIELD MONITORING RESULTS																			
Temperature		°C																	
pH		pH	N/A																
Electrical Conductivity		Th. Cond.	uS/cm																
INORGANICS																			
pH		pH	N/A																
Chloride		Cl <sup>-</sup>	mg/L																
Electrical Conductivity		Th. Cond.	uS/cm	129	250	N/A	7.58	8.19	8.16	4.11									
Total Hardness (as CaCO3)		Hard (Calc)	mg/L	0.1	93.3	3.14	4.6	0.96											
Dissolved Organic Carbon (DOC)		DOC	mg/L	3.25	5	1	712	246	236	427									
Total Dissolved Solids		TDS	mg/L	562	500	29	1078	282	274	96									
Ammonia (Un-ionized)		NH <sub>3</sub> -N	mg/L				0.0043	0.0001	0.0008	0.0001									
Ammonia as N		NH <sub>4</sub> -N	mg/L				14.3	0.04	0.47	0.04									
Nitrate as N		NO <sub>3</sub> -N	mg/L	6.94	10	0.05	0.05	0.05	0.05	0.05									
Nitrate + Nitrite as N		NO <sub>2</sub> -N	mg/L	0.28	1	0.05	0.05	0.05	0.05	0.05									
Total Kjeldahl Nitrogen		NO <sub>2</sub> +NO <sub>3</sub>	mg/L	6.1	10	0.1	0.1	0.1	0.1	0.1									
Bromide		Br <sup>-</sup>	mg/L				15.5	0.13	0.43	0.13									
Fluoride		F <sup>-</sup>	mg/L				0.05	0.25	0.05	0.05									
Sulfate		SO <sub>4</sub> <sup>2-</sup>	mg/L	1.1	1.5	0.05	0.05	0.05	0.05	0.05									
Orthophosphate as P		PO <sub>4</sub> <sup>3-</sup>	mg/L	311	500	0.1	75.9	1.31	1.24	0.05									
Saturation pH		pHs	N/A				0.10	0.10	0.10	0.10									
p-Alkalinity (as CaCO3)		Alk. 8.3	mg/L				N/A	6.11	7.08	7.08									
p-Alkalinity (as CaCO3)		Alk. 4.2	mg/L				8	4.5	4.5	4.5									
CALCULATED VALUES																			
Anion Sum		Anion Sum	mg/L				8	885	240	224									
Cation Sum		Cation Sum	mg/L				NA	18.3	4.56	4.68									
% Difference/Calc Balance		CAB	%				NA	20.8	5.05	5.16									
Carbonate (as CaCO3)		CO <sub>3</sub> <sup>2-</sup>	mg/L				NA	6.5	4.9	4.8									
Bicarbonate (as CaCO3)		HCO <sub>3</sub> <sup>-</sup>	mg/L				10	<10	<10	<10									
Langlier Index		LI	N/A				10	885	240	246									
Aggressiveness Index		AI	N/A				10	885	240	246									
Rayner Stability Index		R.S.I.	N/A				10	885	240	246									
METALS																			
Aluminum		Al	mg/L				N/A	13.4	13	12.8									
Arsenic		As	mg/L				N/A	4.6	5.9	6									
Boron		B	mg/L	0.009	0.005	0.004	0.007	0.007	0.004	0.004									
Barium		Ba	mg/L	1.6	0.003	0.001	0.003	0.003	0.004	0.004									
Calcium		Ca	mg/L	0.29	0.004	0.001	0.004	0.004	0.004	0.004									
Cadmium		Cd	mg/L		0.002	0.001	0.002	0.002	0.002	0.002									
Chromium		Cr	mg/L	0.0028	0.006	0.002	0.002	0.002	0.002	0.002									
Copper		Cu	mg/L	0.015	0.006	0.003	0.003	0.003	0.003	0.003									
Iron		Fe	mg/L	0.5	1	0.003	0.003	0.003	0.003	0.003									
Potassium		K	mg/L	0.52	0.3	0.005	0.005	0.005	0.005	0.005									
Magnesium		Mg	mg/L				14.6	8.98	1.47	8.94									
Manganese		Mn	mg/L				0.05	0.05	0.05	0.05									
Sodium		Na	mg/L	0.027	0.05	0.002	0.002	0.002	0.002	0.002									
Lead		Pb	mg/L	104	200	0.05	1.98	8.289	8.863	8.864									
Selenium		Se	mg/L	0.004	0.01	0.002	0.002	0.002	0.002	0.002									
Silicon		Si	mg/L	0.006	0.01	0.004	0.004	0.004	0.004	0.004									
Zinc		Zn	mg/L				8.24	6.18	2.30	2.30									
EXTENDED ANALYSIS																			
Phenols		Phenol	mg/L	2.5	5	0.004	0.007	0.008	0.007	0.004									
Total Phosphorus		P (Tot.)	mg/L				0.001	0.001	0.001	0.001									
							0.06	0.14	0.08	0.08									

This table is in full agreement with the comments in Appendix D.



Appendix D  
Leachate Indicator Parameters - Historical Results  
Kinross Landfill Site

Date	Chloride Concentration (mg/L)										
	OW4	OW5	OW6	OW7	OW12	OW13	OW13 I	OW13D	OW14	SW1	SW2
Jun-88	102.8	1.6	6.0	1.5							
Sep-88	84.5	0.9	5.0	0.9							5.3
Jun-89	57.6	1.3	6.1	2.3							4.7
Sep-89	93.4	1.8	4.9	0.6							4.1
Jun-90	107.0	0.9	5.0	1.3							5.9
Sep-90	107.0	1.3	5.0	1.3						4.5	4.8
Jun-91	34.5	1.3	5.5	1.6						2.7	5.4
Sep-91	34.7	1.8	4.5	1.2						3.1	5.3
Jun-92	36.2	2.1	4.8	1.2						2.7	7.8
Sep-92	36.5	0.9	3.9	1.1						6.0	5.2
Jun-93	29.2	0.9	3.7	0.8						3.2	6.2
Sep-93	36.1	1.1	3.6	0.7						5.0	4.2
Jun-94	26.4	1.4	3.8	1.2						1.7	6.9
Sep-94	33.0	1.7	3.4	1.0						5.0	3.7
Jun-95	30.9	1.3	3.0	0.9						1.8	5.3
Sep-95	37.3	1.5	4.2	0.3						3.8	3.6
Jun-96	21.0	1.0	4.0	0.0						1.9	5.9
Sep-96	18.0	4.0	4.0	1.0						7.3	3.0
Jun-97	4.0	1.0	2.4	1.0						1.0	6.0
Sep-97	21.0	4.0	6.0	2.0						2.0	3.7
May-98	31.0	4.0	4.0	2.0						0.5	7.0
Sep-98	33.0	2.0	5.0	1.0	8.0	63.0				4.0	4.0
May-99	33.0	1.0	4.0	1.0	8.0	60.0				2.0	5.0
Sep-99	27.0	1.0	5.0	1.0	9.0	47.0					4.0
Jun-00	46.0	1.0	4.0	1.0	8.0	34.0				2.0	4.0
Sep-00	64.0	2.0	2.0	1.0	8.0	36.0					4.0
May-01	162.0	2.0	2.0	1.0	7.0	31.0				2.0	4.0
Sep-01	128.0	2.0	1.0	1.0	4.0	42.0				3.0	4.0
May-02	117.0	10.0	2.0	1.0	5.0	50.0				4.0	4.0
Sep-02	104.0	2.0	5.0	1.0	5.0	55.0				5.0	5.0
May-03	138.0	3.0	4.0	2.0	7.0	67.0				9.0	8.0
Oct-03	180.0	3.0	4.0	1.0	8.0	68.0					8.0
May-04	204.0	3.0	5.0	2.0	7.0	57.0				4.0	5.0
Sep-04	231.0	4.0	4.0	1.2	6.0	80.0			27.0	7.0	6.0
May-05	151.0	3.1	3.8	1.0	11.0	64.0	30.0	13.0	118.0	5.0	5.0
Sep-05	169.0	3.0	6.0	1.0	9.4	62.1	60.0	60.0	98.0	12.0	7.0
Apr-06	93.3	3.1	4.8	1.0	11.0	69.0	67.9	6.2	62.7	4.3	5.8
Oct-06	122.0	3.7	4.4		6.9	70.5	69.0	8.0		6.0	7.0
					9.9	64.5	54.6	6.7	22.8	3.9	5.2
							65.0	14.2	15.2	6.9	9.3

Appendix D  
Leachate Indicator Parameters - Historical Results  
Kinloss Landfill Site

Date	Conductivity (uS/cm)										
	OW4	OW5	OW6	OW7	OW12	OW13	OW13 I	OW13D	OW14	SW1	SW2
Jun-88	1800	455	545	457							
Sep-88	1530	478	501	586							505
Jun-89	1590	449	535	460							405
Sep-89	1620	512	538	555							445
Jun-90	1580	455	532	420							409
Sep-90	1580	441	528	420						388	
Jun-91	1520	447	490	430						482	510
Sep-91	1540	465	538	530						423	467
Jun-92	1590	459	529	434						428	485
Sep-92	1530	466	539	555						407	471
Jun-93	1440	448	523	428						497	517
Sep-93	1490	458	515	531						447	510
Jun-94	1430	445	506	447						411	460
Sep-94	1480	452	516	613						377	454
Jun-95	1570	444	516	438						420	468
Sep-95	1540	456	528	559						426	502
Jun-96	1230	395	449	394						425	479
Sep-96	1400	442	509	456						461	523
Jun-97	1070	431	509	434						273	329
Sep-97	1030	436	528	400						356	451
May-98	775	544	467	407						366	437
Sep-98	720	456	485		842	1430				441	512
May-99	1100	442	489	478	879	1410				376	430
Sep-99	931	438	489		855	1450					509
Jun-00	1160	443	480	468	943	1300				360	440
Sep-00	1190	441	488	481	907	1270					465
May-01	1620	441	482	418	900	1240				396	440
Sep-01	1770	477	524		890	1410				391	482
May-02	1680	724	465	404	876	1530				382	437
Sep-02	1700	448	486		859	1440				469	526
May-03	2030	525	537	504	863	1480				500	510
Oct-03	2120	468	511	609	994	1880					488
May-04	2300	468	516	439	965	1570				370	463
Sep-04	2360	487	518		959	1590			1620	439	495
May-05	2040	455	507	436	1020	1610	978	582	1870	372	436
Sep-05	1960	489	521		948	1510	1570	1570	1720	557	537
Apr-06	1980	504	520	407	959	1530	1520	521	1530	415	476
Oct-06	2010	495	528		882	1760	1500	523		425	499
					918	1630	1380	538	1310	388	469
							1590	625	1230	452	544



Appendix D  
Leachate Indicator Parameters - Historical Results  
Kinross Landfill Site

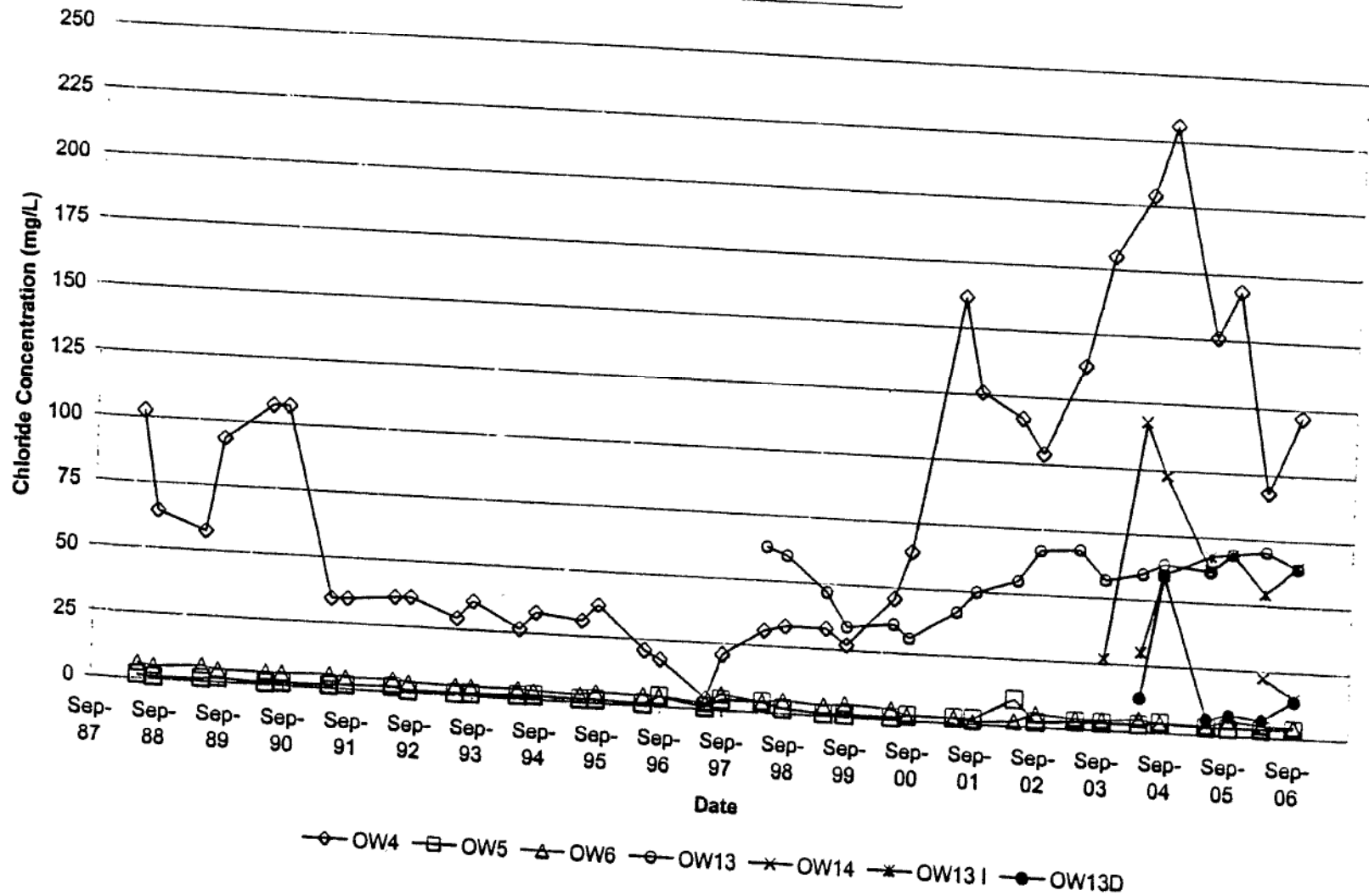
Date	Hardness (mg/L)										
	OW4	OW5	OW6	OW7	OW12	OW13	OW13 I	OW13D	OW14	SW1	SW2
Jun-88	668	237	248	264							
Sep-88	585	242	224	321							275
Jun-89	326	238	341	234							212
Sep-89	600	255	234	283							239
Jun-90	636	253	258	228							217
Sep-90	636	251	241	228						207	282
Jun-91	634	222	227	226						298	240
Sep-91	627	243	255	287						225	263
Jun-92	786	247	266	246						238	254
Sep-92	614	200	187	228						219	291
Jun-93	711	239	269	255						288	269
Sep-93	643	246	247	270						259	278
Jun-94	661	257	258	260						243	249
Sep-94	700	252	262	335						209	267
Jun-95	794	232	254	251						235	300
Sep-95	765	248	252	316						256	265
Jun-96	811	234	243	243						237	302
Sep-96	736	226	237	260						263	197
Jun-97	600	221	270	256						161	252
Sep-97	665	241	175	166						196	246
May-98	424	174	257	270						203	232
Sep-98	407	233	252		550	903				229	272
May-99	613	244	262	296	581	879				277	286
Sep-99	615	266	275		565	855					257
Jun-00	513	282	282	303	616	831				227	307
Sep-00	488	248	280	298	562	823					271
May-01	710	264	271	264	308	701				234	278
Sep-01	646	252	274		582	855				236	288
May-02	785	189	259	236	589	850				258	311
Sep-02	745	258	260		495	797				258	292
May-03	905	287	286	291	557	889				274	297
Oct-03	800	256	273	333	549	1060					230
May-04	820	248	252	234	542	809				195	269
Sep-04	790	261	259		514	793			783	235	227
May-05	750	280	260	240	530	800	545	260	806	198	277
Sep-05	760	280	280		530	840	823	823	574	308	290
Apr-06	712	246	236	221	570	860	860	250	630	240	250
Oct-06	677	250	242		453	862	900	270		210	244
					463	844	699	217	563	207	285
							816	251	493	242	

Appendix D  
Leachate Indicator Parameters - Historical Results  
Kinloss Landfill Site

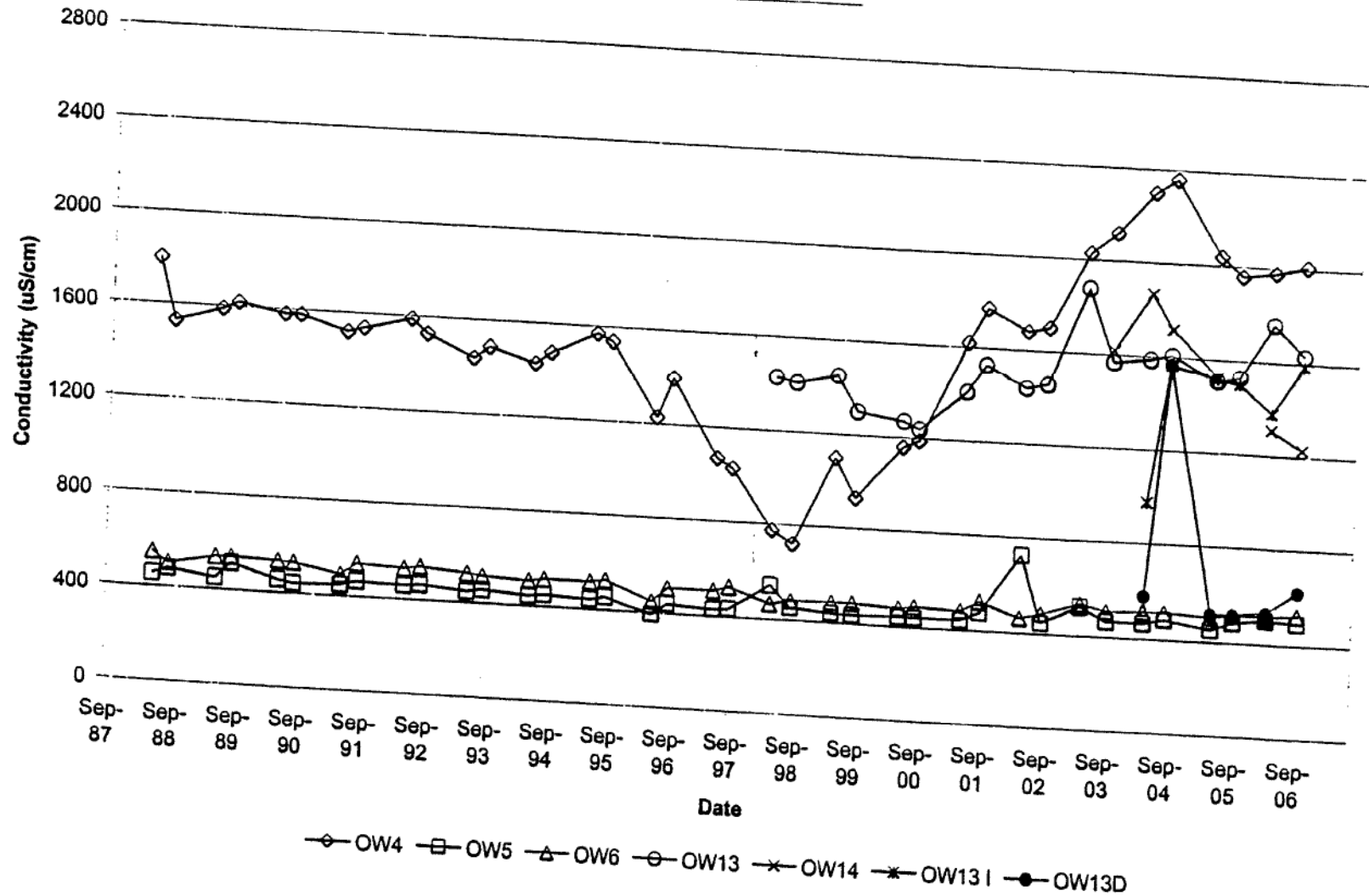
Date	D.O.C. (mg/L)										SW1	SW2
	OW4	OW5	OW6	OW7	OW12	OW13	OW13 I	OW13D	OW14			
Jun-88	1.7	2.0	3.0	3.0								
Sep-88	14.5	2.7	2.4	5.2								
Jun-89	11.7	1.3	1.3	3.3								1.6
Sep-89	1.6	1.2	1.0	2.1								6.2
Jun-90	13.0	1.3	1.2	1.2								4.0
Sep-90	13.0	1.2	2.5	1.2							6.5	5.9
Jun-91	12.4	2.4	2.2	9.4							8.0	2.3
Sep-91	26.0	15.2	26.5	13.4							1.0	2.9
Jun-92	11.0	1.8	0.9	1.6							9.3	6.3
Sep-92	8.2	1.3	6.0	1.4							11.7	7.4
Jun-93	7.0	1.0	1.1	1.7							7.3	3.7
Sep-93	7.4	1.8	18.0	1.8							6.2	3.9
Jun-94	7.1	1.5	0.7	1.2							7.6	5.5
Sep-94	7.1	1.6	1.1	1.5							9.3	9.2
Jun-95	5.7	0.7	1.0	0.9							6.8	4.6
Sep-95	6.3	1.5	1.2	16.0							7.2	4.4
Jun-96	4.4	0.6	0.5	0.8							53.0	3.2
Sep-96	8.5	1.1	1.9	4.5							8.3	3.8
Jun-97	5.4	0.6	0.9	0.8							6.8	5.7
Sep-97	6.0	0.6	0.7	0.9							10.0	5.3
May-98	6.2	4.2	0.6	0.6							3.8	2.9
Sep-98	5.3	0.5	0.6		1.4	1.9					7.1	3.1
May-99	7.2	0.9	0.7	0.9	2.1	2.0					5.4	2.6
Sep-99	6.8	1.0	0.7		1.8	2.1						3.4
Jun-00	11.7	1.3	0.9	1.1	1.9	2.0					9.3	7.1
Sep-00	8.4	0.7	0.7	1.1	1.3	1.5						1.9
May-01	16.4	0.9	0.6	1.4	1.4	1.6					8.6	5.8
Sep-01	16.2	0.6	1.0		1.3	2.2					9.8	
May-02	18.9	7.4	1.2	1.1	1.5	3.8					6.2	4.0
Sep-02	17.9	1.1	0.7		1.9	2.7					7.8	3.5
May-03	12.9	1.0	0.8	1.1	1.6	4.0					3.1	3.2
Oct-03	16.5	0.5	0.5	0.6	1.8	3.1						1.7
May-04	16.6	1.5	1.8	2.0	1.5	2.1						
Sep-04	17.5	0.7	2.0		3.1	3.3					8.7	4.8
May-05	16.2	1.1	0.9	1.0	3.0	2.6	2.4	1.8	6.7	7.3	4.8	
Sep-05	15.8	1.2	1.2		3.9	2.6	2.0	2.0	10.7	6.9	6.0	
Apr-06	4.0	1.0	1.0	1.0	2.6	4.4	2.3	0.9	7.7	6.5	2.0	
Oct-06	15.0	1.0	1.0		1.0	1.0	3.6	1.2	9.8	6.0	3.5	
					2.0	3.0	1.0	1.0		15.0 **	6.5 **	
							3.0	1.0	13.0	4.0	6.0	
								1.0	10.0	9.0	5.3	

\*\* Fall 2005 concentrations for SW1 and SW2 are reported as Total Organic Carbon (TOC).

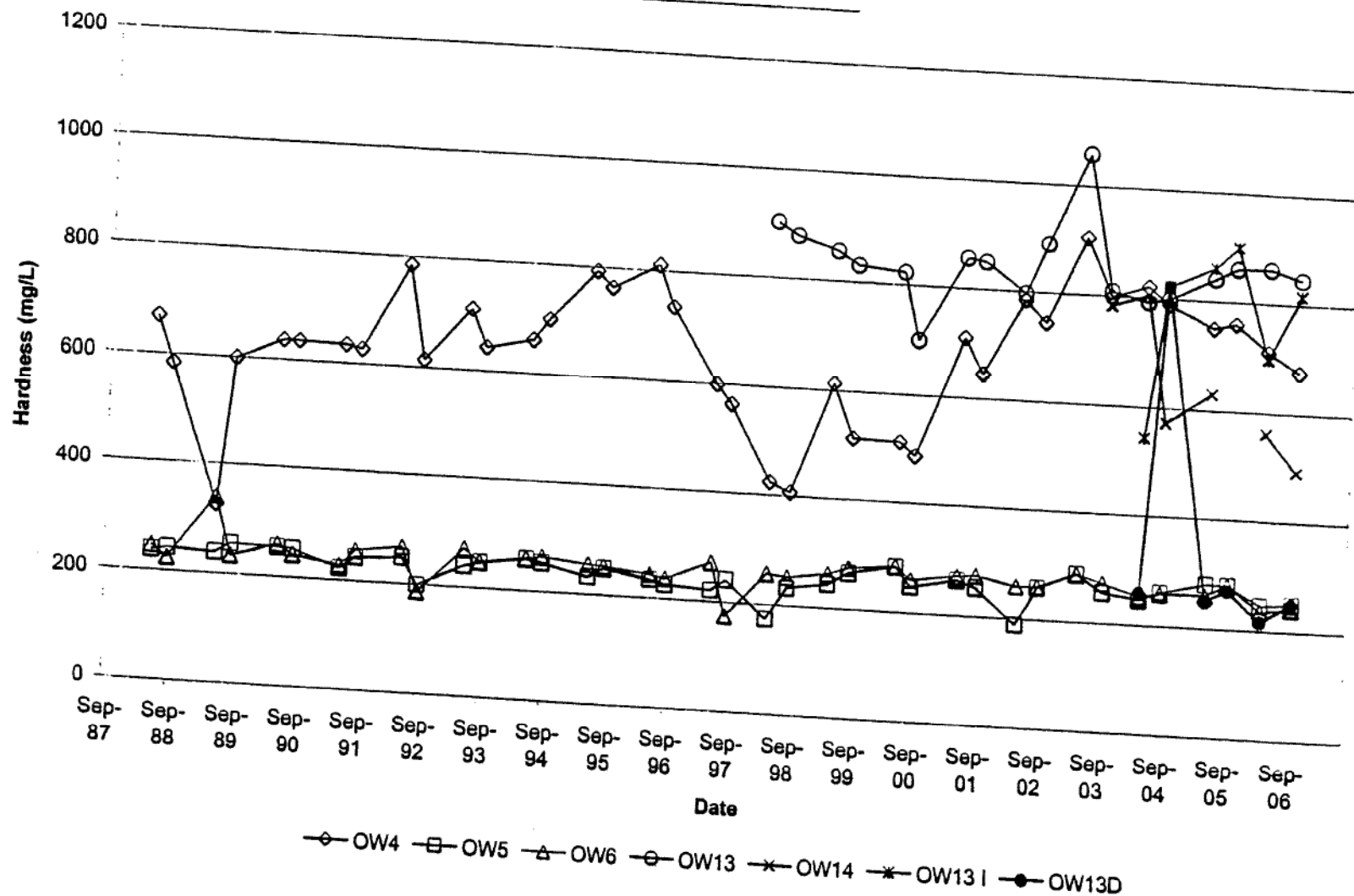
**KINLOSS LANDFILL SITE**  
**Chloride Concentration (mg/L) vs. Time**  
**Downgradient**



**KINLOSS LANDFILL SITE**  
**Conductivity (uS/cm) vs. Time**  
**Downgradient**

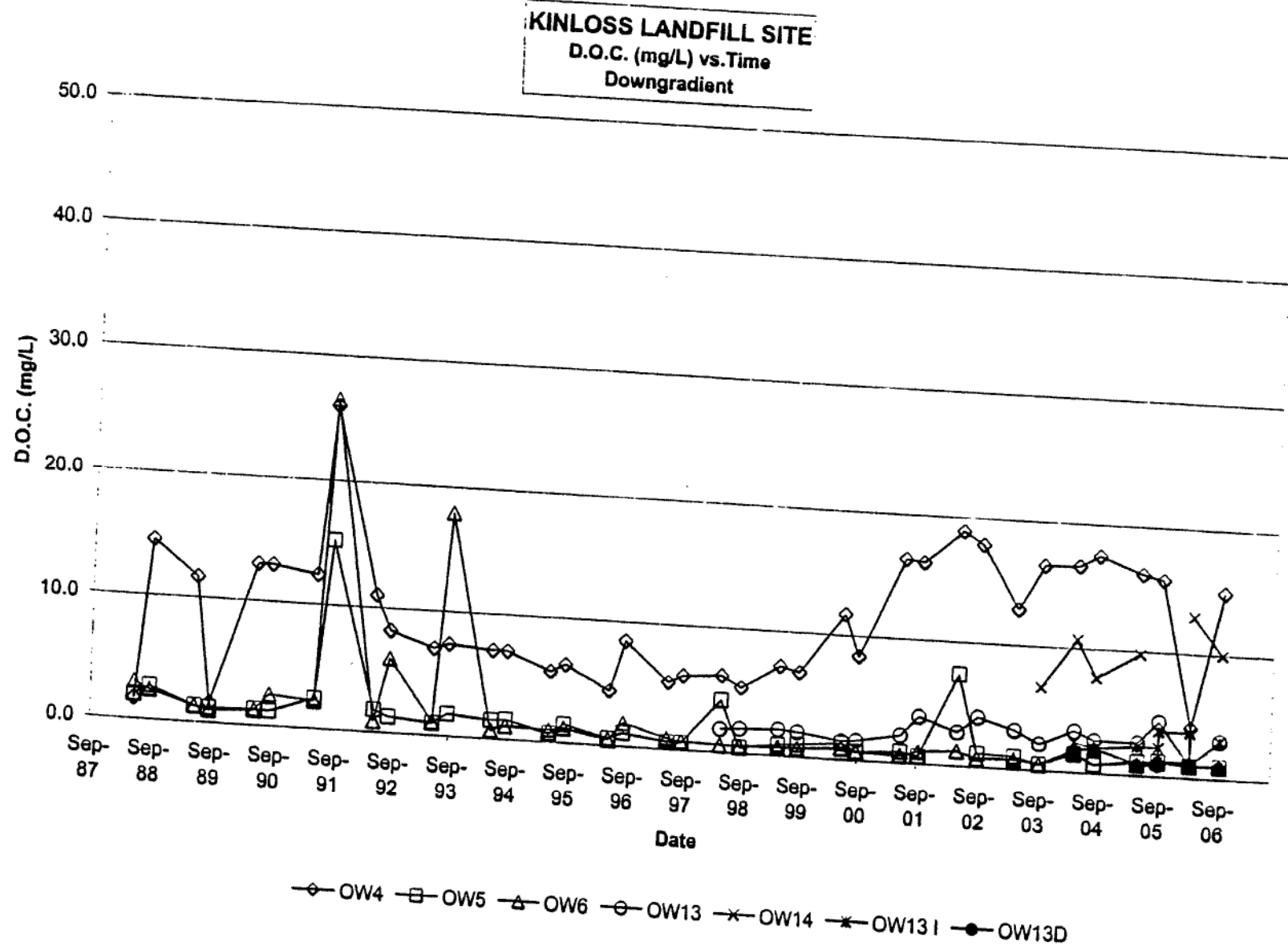


**KINLOSS LANDFILL SITE**  
**Hardness (mg/L) vs. Time**  
**Downgradient**



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R. J. Burnside & Associates Limited  
 Project Number: LNE08508

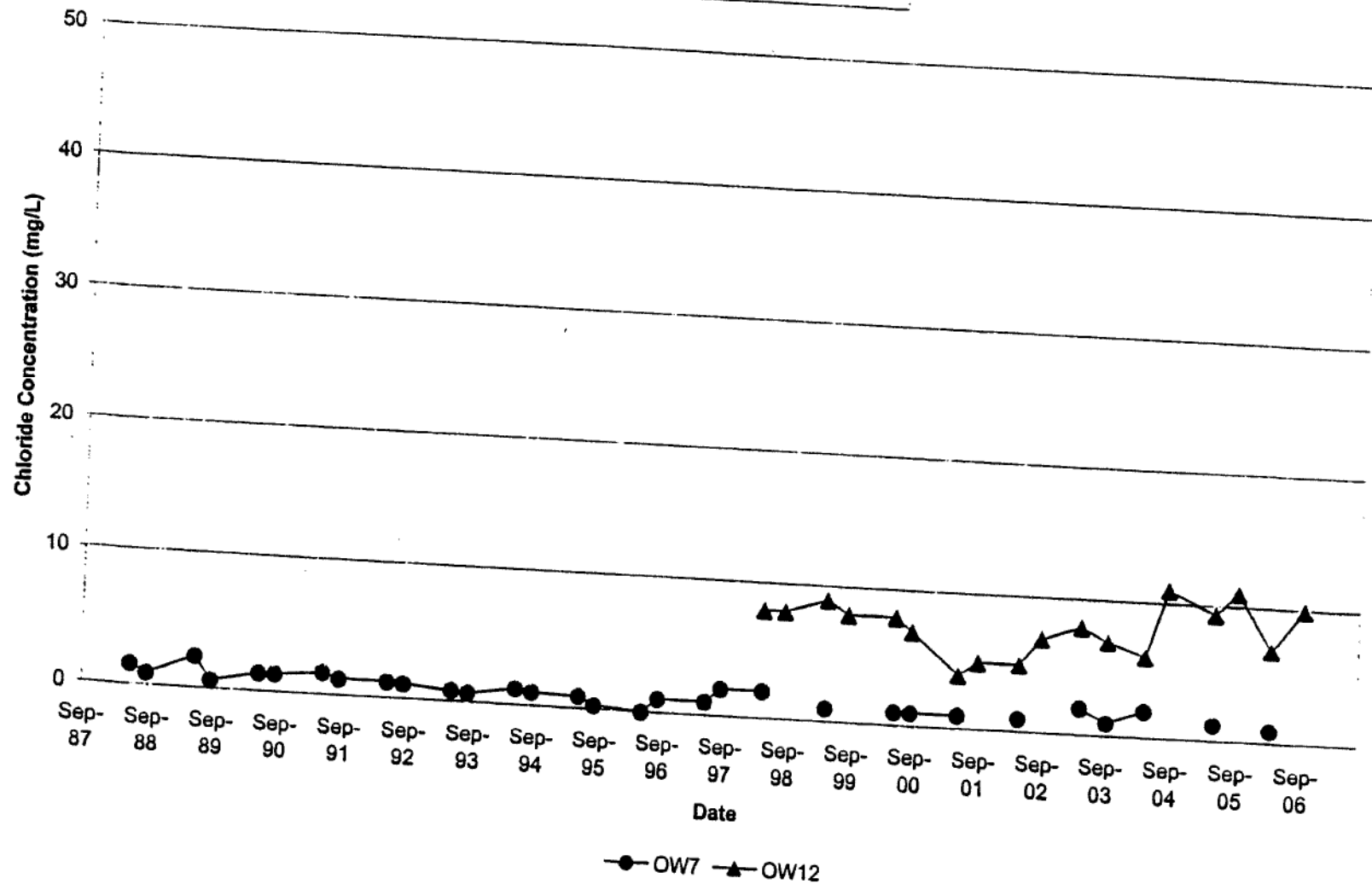


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R. J. Burnside & Associates Limited  
Project Number: LNE08508



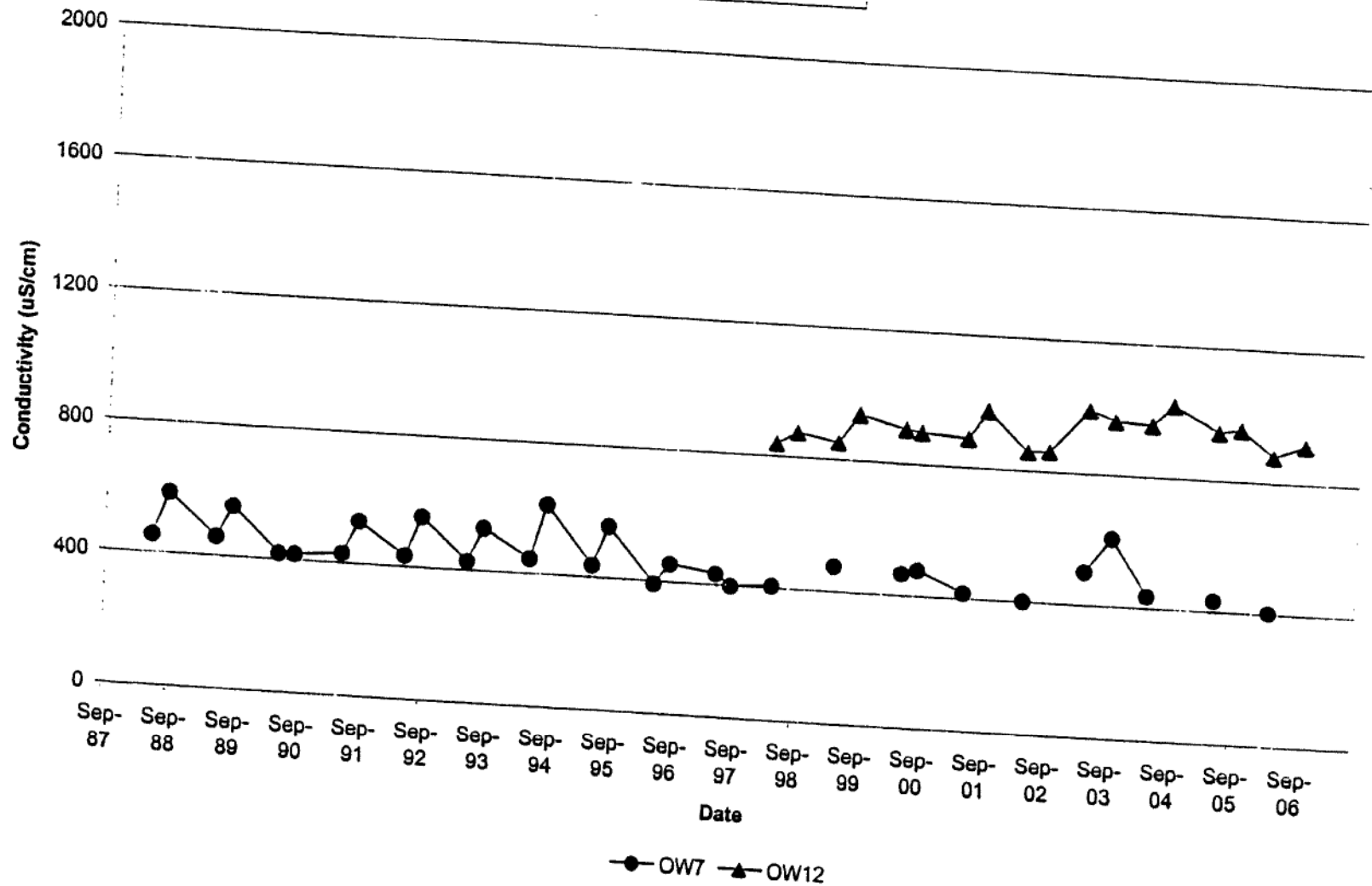
**KINLOSS LANDFILL SITE**  
**Chloride Concentration (mg/L) vs. Time**  
**Upgradient**



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R. J. Burnside & Associates Limited  
 Project Number: LNE08508

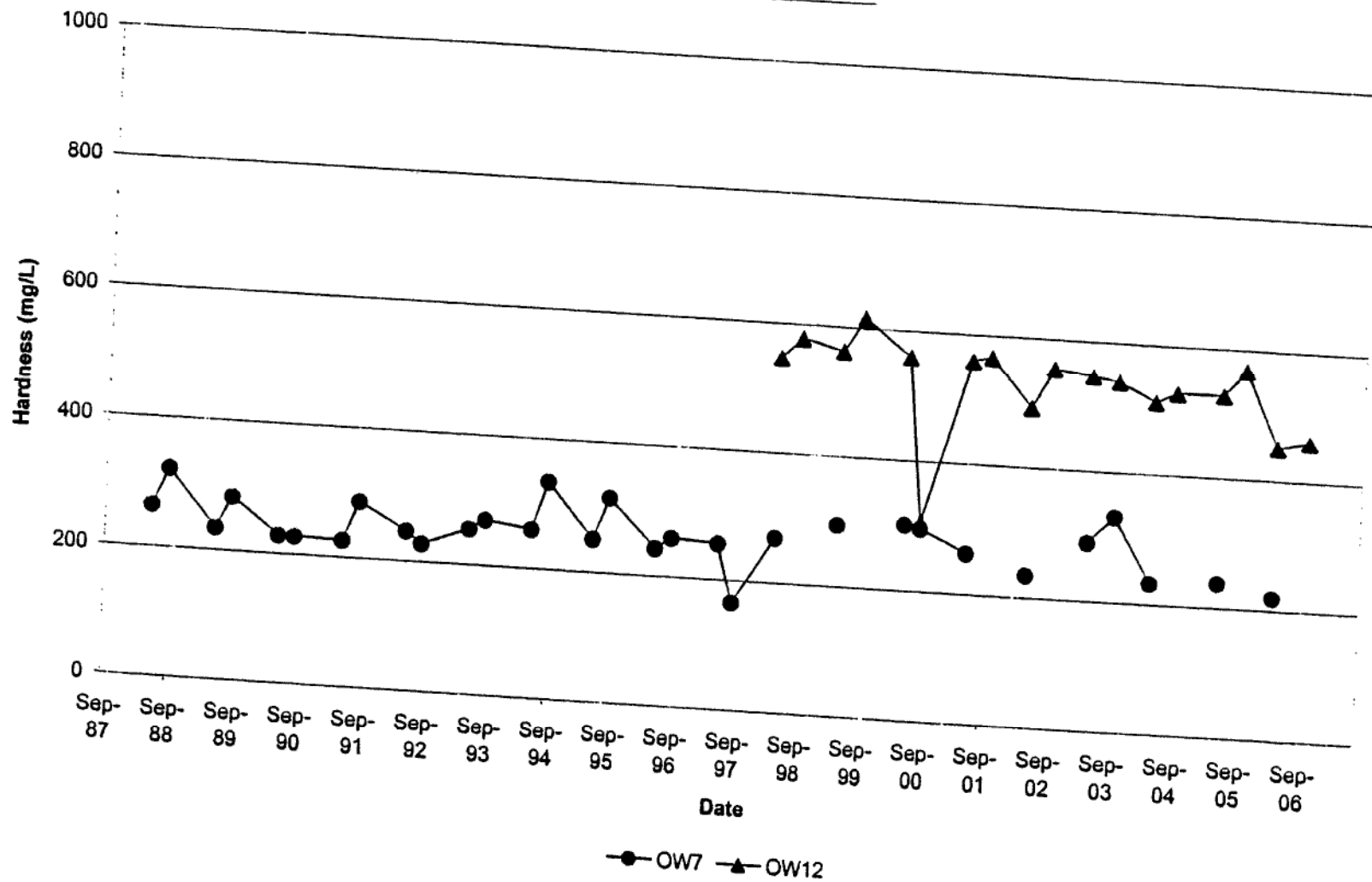
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**Conductivity (uS/cm) vs. Time**  
**Upgradient**

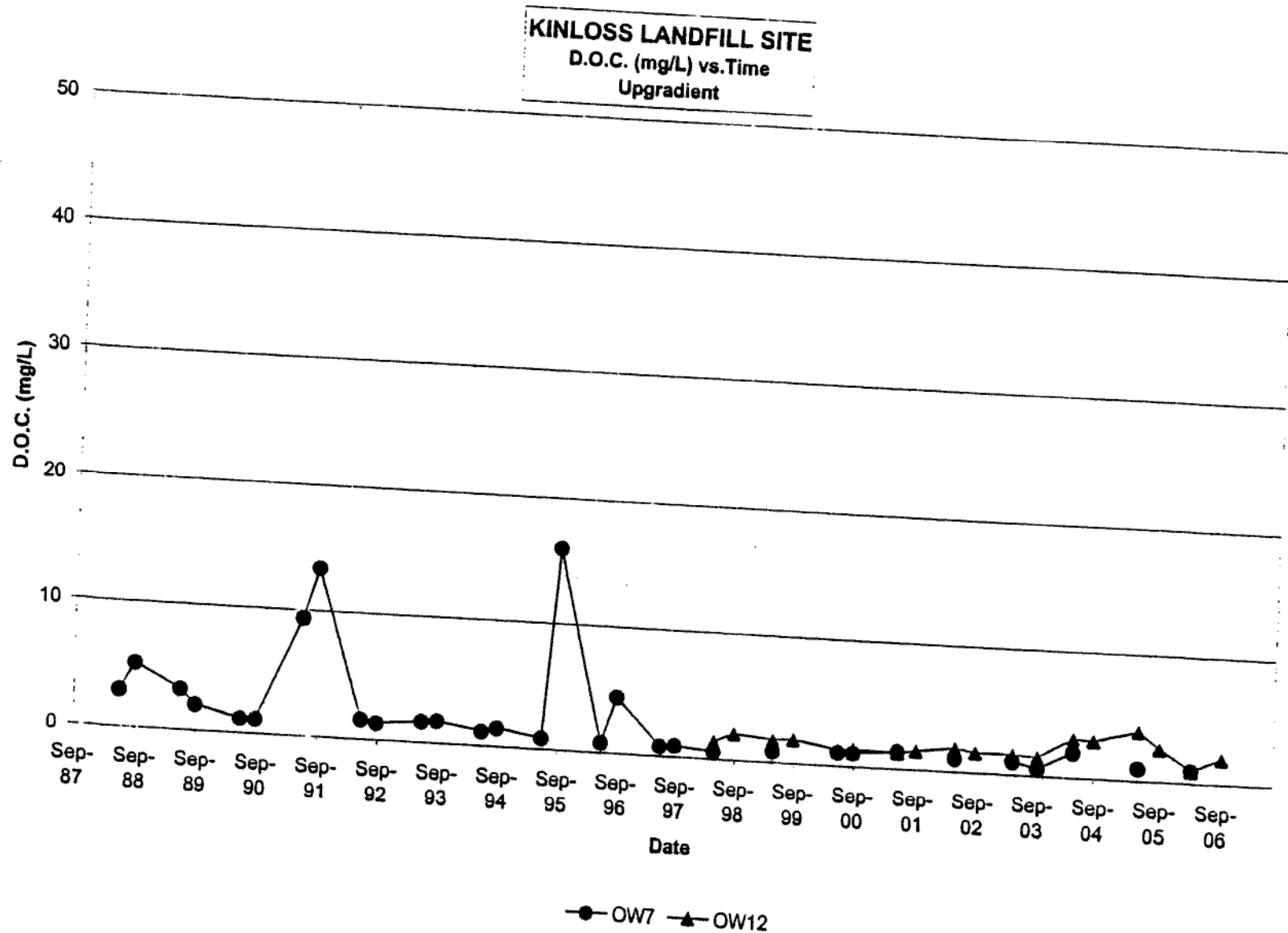


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R. J. Burnside & Associates Limited  
 Project Number: LNE08508

**KINLOSS LANDFILL SITE**  
**Hardness (mg/L) vs. Time**  
**Upgradient**





## APPENDIX

### *E-2 SUMMARY OF GROUNDWATER RESULTS (2007 – PRESENT)*

**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW4 Jan-08	OW4 Jul-08	OW4 Dec-08	OW4 Jul-09	OW4 Dec-09	OW4 Mar-10	OW4 Jun-11	OW4 Oct-11	OW4 Jun-12	OW4 Oct-12	OW4 Jun-13	OW4 Nov-13
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	925	922	828	853	709	697	590	792	840	836	756	734
Chloride	250 [AO]	120	71	47	54	25	19	30.4	31.5	27.7	20.9	16.1	28.8
Nitrate(as N)	10 (MAC) d	nd	nd	nd	nd	nd	0.4	<0.1	<0.1	<0.1	0.3	11	<0.1
Nitrite(as N)	1 (MAC) d	nd	nd	nd	nd	0.03	0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia(as N)		31.8	27	28	40	28	19	28.6	36.1	25.1	20.8	15.6	22.3
Total Kjeldahl Nitrogen(as N)		27	27	29	33	27	20	34.5	31.1	25.5	26.0	18.2	28.6
Organic Nitrogen	0.15	0	0	1	0	0	1	5.9	<0.01	0.40	5.2	2.6	6.3
Phenols		nd	0.003	nd	0.01	nd	<0.001	0.005	0.004	<0.001	<0.001	<0.001	0.002
Dissolved Organic Carbon(DOC)	5 [AO]	15.5	14.8	11	14.7	9.1	6.5	12.6	10.8	11.2	8.6	17.8	23.2
Conductivity (us/cm)		2060	1930	1690	1760	1470	1410	1670	1640	1530	1440	1430	1290
pH		7.7	7.7	7.5	7.4	7.7	7.5	7.19	7.25	7.33	7.26	7.44	7.48
Sulphate (as SO <sub>4</sub> )	250 (AO)	72	57	85	51	84	79	33	54	32	65	66	56
Sulphide		nd	nd	-	-	-	-	-	-	-	-	-	-
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	710	720	690	650	600	650	699	728	610	688	668	587
Aluminum	0.1 [OG]	0.006	0.005	nd	0.007	nd	<0.005	0.06	0.06	0.05	0.06	0.06	0.07
Barium	1 [MAC]	0.29	0.25	0.22	0.25	0.16	0.18	0.243	0.238	0.211	0.204	0.192	0.192
Boron	5 [IMAC]	0.36	0.35	0.35	0.44	0.34	0.27	0.488	-	0.424	0.381	0.385	0.371
Cadmium	0.005 (MAC)	0.0005	nd	nd	nd	0.0006	<0.0001	<0.00002	<0.00002	<0.00002	0.00010	<0.00002	<0.00002
Calcium	-	188	190	190	180	170	190	191	203	165	201	199	172
Chromium	0.05 (MAC)	nd	nd	nd	nd	nd	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	0.001	nd	nd	nd	0.001	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	0.0024
Iron	0.3 [AO]	13	8.8	6.2	17	1.6	16	19.0	17.2	15.6	14.5	13.9	13.1
Lead	0.01 (MAC)c	nd	nd	nd	nd	nd	<0.0005	<0.00002	<0.00002	0.00006	0.00003	<0.00002	0.00006
Magnesium	-	57.1	58	52	51	43	44	52.9	53.5	48.2	45.0	41.7	38.3
Manganese	0.05 [AO]	0.56	0.76	0.93	0.76	0.63	0.840	0.906	0.753	0.868	0.758	0.839	0.683
Potassium	-	30	32	29	29	27	20	29.6	33.0	25.6	24.7	21.4	21.3
Sodium	200 [AO]	160	110	82	87	44	40	61.8	62.3	49.0	46.9	29.2	44.8
Zinc	5 [AO]	0.006	0.01	0.014	nd	0.016	0.026	<0.005	<0.005	0.012	0.005	<0.005	<0.005

**NOTES:**

1. All results expresses in mg/L unless otherwise noted.
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3. MAC maximum acceptable concentration ODWQS.
4. IMAC indicates an interim maximum acceptable concentration ODWQS.
5. AO indicates an aesthetic objective ODWQS, not health related.
6. OG indicates an operational guideline ODWQS, not health related.
7. c indicates that the guideline applies to water at the point of consumption.
8. d, where nitrate and nitrite are present the total of the two should not exceed 10 mg/L.
9. nd indicates parameter not detected.
10. Shaded values indicate exceedance of ODWQS.



**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW4 Jul-14	OW4 Oct-14	OW4 May-15	OW4 Oct-15	OW4 Jun-16	OW4 Nov-16	OW4 Jun-17	OW4 Nov-17	OW4 May-18	OW4 Nov-18	OW4 Jun-19	OW4 Nov-19
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	731	718	683	664	973	726	738	658	663	655	663	605
Chloride	250 [AO]	19.3	17.1	14.3	12.7	17.1	14.2	11.6	8.4	12.4	16.2	10.0	11.9
Nitrate(as N)	10 (MAC) d	<0.1	<0.1	<0.25	<0.5	<0.1	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	0.10
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.25	<0.5	<0.1	<0.1	0.64	<0.1	<0.05	<0.05	<0.05	<0.05
Ammonia(as N)		23.8	21.0	21.0	21.2	21.6	18.8	21.8	18.2	25.4	26.0	3.97	23.4
Total Kjeldahl Nitrogen(as N)		27.5	23.2	22.2	22.4	21.9	19.6	22.9	20.1	25.6	28.3	26.4	31.0
Organic Nitrogen	0.15	3.7	2.2	1.2	1.20	0.3	0.8	1.10	1.90	0.20	2.30	22.43	7.60
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.012	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	15	13.7	8.5	5.9	9.3	8.1	<0.2	12.5	8.9	14.0	27.7	10.9
Conductivity (us/cm)		1490	1290	1360	1270	1420	1380	1390	1240	1300	1360	1320	1270
pH		7.44	7.32	7.87	7.80	7.36	7.35	7.31	7.41	7.4	7.14	7.48	7.27
Sulphate (as SO <sub>4</sub> )	250 (AO)	41	45	29.0	57.4	27	60	29	27	27	29	19	35
Sulphide		-	-	-	-	-	-	-	-	-	-	-	-
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	664	587	559	607	630	674	635	592	576	588	637	561
Aluminum	0.1 [OG]	0.07	0.04	0.019	0.006	0.05	0.06	0.05	0.10	0.09	0.09	0.09	0.08
Barium	1 [MAC]	0.209	0.180	0.169	0.177	0.199	0.201	0.200	0.182	0.193	0.212	0.191	0.166
Boron	5 [IMAC]	0.460	0.389	0.395	0.322	0.386	0.401	0.413	0.393	0.434	0.406	0.475	0.362
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.001	<0.001	<0.00002	0.00003	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015	<0.000028
Calcium	-	195	175	166	179	188	205	189	177	167	180	191	171
Chromium	0.05 (MAC)	<0.002	<0.002	<0.003	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001
Copper	1 [AO]	<0.002	0.0003	<0.003	<0.003	<0.002	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	0.0028
Iron	0.3 [AO]	18.9	16.1	17.2	13.0	18.7	20.7	17.1	14.3	19.4	19.0	23.5	18.1
Lead	0.01 (MAC)c	<0.00002	<0.00002	<0.002	<0.002	<0.00002	0.00006	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00006
Magnesium	-	43.1	36.5	35.2	38.8	39.2	39.5	39.6	36.4	38.6	33.5	38.8	32.6
Manganese	0.05 [AO]	0.941	0.848	0.885	0.787	0.818	0.807	0.657	0.658	0.736	0.676	0.778	0.625
Potassium	-	24.3	21.8	19.1	22.4	21.7	22.8	23.1	21.9	23.2	22.7	21.0	20.8
Sodium	200 [AO]	45.7	37.6	27.0	25.9	31.4	36.9	35.0	24.1	30.3	41.8	26.3	24.3
Zinc	5 [AO]	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

**NOTES:**

1. All results expresses in mg/L unless otherwise noted.
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6. OG indicates an operational guideline ODWQS, not health related.
7. c indicates that the guideline applies to water at the point of consumption.
8. d, where nitrate and nitrite are present the total of the two should not exceed 10 mg/L.
9. nd indicates parameter not detected.
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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW4	OW4
		Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	661	608
Chloride	250 [AO]	10.9	9.6
Nitrate(as N)	10 (MAC) d	0.1	<0.05
Nitrite(as N)	1 (MAC) d	<0.05	<0.05
Ammonia(as N)		24.8	25.8
Total Kjeldahl Nitrogen(as N)		27.4	37.2
Organic Nitrogen	0.15	2.60	11.40
Phenols		<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	13.1	8.9
Conductivity (us/cm)		1270	1260
pH		7.27	7.19
Sulphate (as SO <sub>4</sub> )	250 (AO)	21	29
Sulphide		-	-
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	579	595
Aluminum	0.1 [OG]	0.08	0.08
Barium	1 [MAC]	0.188	0.191
Boron	5 [IMAC]	0.445	0.399
Cadmium	0.005 (MAC)	<0.000028	<0.000028
Calcium	-	174	178
Chromium	0.05 (MAC)	<0.002	<0.002
Copper	1 [AO]	<0.002	<0.002
Iron	0.3 [AO]	21.8	18.2
Lead	0.01 (MAC)c	0.00006	<0.00004
Magnesium	-	34.9	36.3
Manganese	0.05 [AO]	0.697	0.665
Potassium	-	20.6	21.5
Sodium	200 [AO]	20.4	25.7
Zinc	5 [AO]	<0.005	<0.005

**NOTES:**

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW5 Jul-07	OW5 Dec-07	OW5 Jul-08	OW5 Dec-08	OW5 Jul-09	OW5 Dec-09	OW5 Mar-10	OW5 Jun-11	OW5 Oct-11	OW5 Jun-12	OW5 Oct-12	OW5 Jun-13
Alkalinity(as CaCO3)	30 - 500 [OG]	250	288	237	243	248	242	281	263	263	247	295	244
Chloride	250 [AO]	6	4	4	4	3	3	4	2.8	2.8	2.7	2.6	2.7
Nitrate(as N)	10 (MAC) d	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite(as N)	1 (MAC) d	nd	nd	nd	nd	nd	nd	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia(as N)		0.14	nd	0.16	0.13	0.07	nd	<0.05	0.03	0.11	0.11	0.07	0.09
Total Kjeldahl Nitrogen(as N)		0.5	0.2	0.9	0.7	0.9	0.5	0.6	0.90	0.25	0.50	0.38	0.80
Organic Nitrogen	0.15	0.36	0	0.74	0.57	0.83	0.5	<0.55	0.87	0.14	0.39	0.31	0.71
Phenols		nd	nd	nd	nd	nd	nd	<0.001	0.003	<0.001	<0.001	<0.001	<0.001
Dissolved Organic Carbon(DOC)	5 [AO]	1.9	0.8	1	0.7	0.8	1.1	0.8	0.8	1.2	1.3	2.3	12.6
Conductivity (us/cm)		498	556	493	504	513	509	560	520	537	497	518	501
pH		8.2	8.2	8.1	8	7.9	8.1	8.2	7.76	7.86	8.01	7.87	7.94
Sulphate (as SO4)	250 (AO)	25	11	28	28	29	28	29	26	19	25	8	23
Hardness(as CaCO3)	80-100 [OG]	270	290	240	250	270	260	250	254	302	258	284	257
Aluminum	0.1 [OG]	nd	nd	nd	nd	nd	nd	<0.005	0.02	0.03	0.02	0.03	0.03
Barium	1 [MAC]	0.077	0.081	0.071	0.072	0.086	0.078	0.066	0.076	0.092	0.084	0.088	0.084
Boron	5 [IMAC]	nd	0.019	0.014	0.011	0.022	0.018	0.012	0.016	-	0.019	0.010	0.016
Cadmium	0.005 (MAC)	nd	0.0011	nd	0.0003	nd	0.0002	0.0001	<0.00002	<0.00002	<0.00002	0.00004	<0.00002
Calcium	-	64	68	54	58	61	60	56	55.0	70.7	58.8	66.3	59.3
Chromium	0.05 (MAC)	nd	nd	nd	nd	nd	nd	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	nd	0.002	nd	0.001	nd	0.001	0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	0.3 [AO]	0.13	nd	0.13	nd	nd	nd	<0.1	0.013	0.037	0.047	0.160	0.317
Lead	0.01 (MAC)c	nd	nd	nd	nd	nd	nd	<0.0005	0.00009	0.00004	<0.00002	0.00003	<0.00002
Magnesium	-	28	29	27	26	28	27	27	28.3	30.6	27.0	28.8	26.4
Manganese	0.05 [AO]	0.28	0.006	0.22	0.38	0.56	0.003	0.200	0.215	0.276	0.222	0.196	0.347
Potassium	-	0.87	0.92	2.3	0.93	0.84	0.83	1.1	0.8	1.0	0.8	0.8	0.7
Sodium	200 [AO]	3.4	3.4	6.4	3.3	5.2	3.3	31	15.6	3.7	3.5	3.2	3.3
Zinc	5 [AO]	0.006	nd	0.01	0.068	nd	0.019	0.110	0.261	0.140	0.031	0.016	<0.005

**NOTES:**

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5. AO indicates an aesthetic objective ODWQS, not health related.
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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW5 Nov-13	OW5 Jul-14	OW5 Oct-14	OW5 May-15	OW5 Oct-15	OW5 Jun-16	OW5 Nov-16	OW5 Jun-17	OW5 Nov-17	OW5 May-18	OW5 Nov-18	OW5 Jun-19
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	250	236	243	240	265	257	273	239	253	240	235	226
Chloride	250 [AO]	2.4	2.3	2.8	2.60	3.19	2.3	2.0	3.7	2.7	2.3	1.9	2.0
Nitrate(as N)	10 (MAC) d	0.1	<0.1	0.1	<0.05	<0.10	<0.1	0.1	<0.05	<0.1	0.06	<0.05	0.09
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.1	<0.05	<0.10	<0.1	<0.1	<0.05	0.2	<0.05	<0.05	<0.05
Ammonia(as N)		0.07	0.08	0.06	<0.02	0.07	0.07	0.07	0.10	0.08	0.17	0.17	0.23
Total Kjeldahl Nitrogen(as N)		0.22	0.20	0.14	<0.10	0.23	0.12	0.23	0.11	0.3	0.2	0.2	0.2
Organic Nitrogen	0.15	0.15	0.12	0.08	<0.10	0.16	0.05	0.16	0.01	0.22	0.03	0.03	<0.05
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	3	2.7	2.3	1.1	0.8	2.5	1.0	1.2	2.4	1.4	2.1	2.3
Conductivity (us/cm)		426	501	470	497	502	491	519	498	490	476	512	489
pH		8.01	7.96	7.90	8.44	7.84	7.95	7.91	7.95	7.98	8.05	7.88	7.90
Sulphate (as SO <sub>4</sub> )	250 (AO)	23	24	24	24.2	21.9	23	12	19	14	24	17	22
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	240	277	260	243	257	262	303	277	269	249	267	272
Aluminum	0.1 [OG]	0.04	0.11	0.02	0.005	0.004	0.03	0.03	0.02	0.04	0.05	0.05	0.04
Barium	1 [MAC]	0.079	0.087	0.082	0.074	0.087	0.087	0.100	0.099	0.098	0.085	0.097	0.080
Boron	5 [IMAC]	0.014	0.016	0.020	0.014	0.018	0.015	0.012	0.008	0.021	0.015	0.015	0.013
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.00002	<0.001	<0.001	0.00003	0.00003	0.000028	<0.000014	0.000037	0.000134	<0.000015
Calcium	-	55.4	65.7	60.6	56.4	61.2	60.7	71.9	64.0	62.3	55.7	63.6	62.9
Chromium	0.05 (MAC)	<0.002	<0.002	<0.002	<0.003	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	<0.0001	<0.002	0.0002	<0.003	<0.003	<0.002	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	0.3 [AO]	0.068	0.214	0.128	0.267	0.140	0.177	0.163	0.139	0.131	0.094	0.074	0.236
Lead	0.01 (MAC)c	<0.00002	<0.00002	<0.00002	<0.002	<0.002	<0.00002	<0.00002	<0.00002	<0.00002	0.00003	<0.00002	0.00010
Magnesium	-	24.6	27.4	26.4	24.7	25.3	26.8	30.0	28.5	27.6	26.8	26.3	28.0
Manganese	0.05 [AO]	0.211	0.328	0.200	0.255	0.245	0.267	0.233	0.379	0.267	0.213	0.076	0.236
Potassium	-	0.7	0.8	0.9	0.71	0.90	0.7	0.9	0.7	0.8	0.6	0.7	0.7
Sodium	200 [AO]	2.9	3.5	3.2	2.96	3.20	3.5	4.0	3.8	3.4	3.6	3.5	3.6
Zinc	5 [AO]	0.015	0.006	0.012	0.005	0.008	<0.005	0.010	0.007	<0.005	<0.005	0.007	<0.005

**NOTES:**

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW5	OW5	OW5
		Nov-19	Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	238	238	225
Chloride	250 [AO]	2.0	2.4	2.5
Nitrate(as N)	10 (MAC) d	0.11	0.06	<0.05
Nitrite(as N)	1 (MAC) d	<0.05	<0.05	<0.05
Ammonia(as N)		0.15	0.1	0.1
Total Kjeldahl Nitrogen(as N)		0.1	0.2	0.2
Organic Nitrogen	0.15	<0.05	0.10	0.10
Phenols		<0.002	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	2.7	1.9	1.1
Conductivity (us/cm)		512	483	486
pH		7.95	7.96	8.08
Sulphate (as SO <sub>4</sub> )	250 (AO)	14	22	18
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	263	252	275
Aluminum	0.1 [OG]	0.05	0.02	0.03
Barium	1 [MAC]	0.091	0.094	0.098
Boron	5 [IMAC]	0.019	0.015	<0.005
Cadmium	0.005 (MAC)	0.000042	<0.000015	0.000022
Calcium	-	61.6	57.1	62.3
Chromium	0.05 (MAC)	<0.001	<0.002	<0.002
Copper	1 [AO]	0.0023	<0.002	<0.002
Iron	0.3 [AO]	0.025	0.11	0.024
Lead	0.01 (MAC)c	0.00004	0.00003	0.00003
Magnesium	-	26.6	26.7	29.1
Manganese	0.05 [AO]	0.080	0.173	0.024
Potassium	-	0.8	0.8	1
Sodium	200 [AO]	3.4	3.5	3.5
Zinc	5 [AO]	0.009	<0.005	0.01

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW6 Jul-07	OW6 Dec-07	OW6 Jul-08	OW6 Dec-08	OW6 Jul-09	OW6 Dec-09	OW6 Mar-10	OW6 Jun-11	OW6 Oct-11	OW6 Jun-12	OW6 Oct-12	OW6 Jun-13
Alkalinity(as CaCO3)	30 - 500 [OG]	254	246	251	255	245	257	259	278	265	270	271	274
Chloride	250 [AO]	8	9	5	5	4	3	6	3.1	3.3	3.3	4.1	3.7
Nitrate(as N)	10 (MAC) d	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1	0.1	<0.1	0.1
Nitrite(as N)	1 (MAC) d	nd	nd	nd	nd	nd	nd	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia(as N)		0.24	0.16	0.38	0.19	0.27	0.3	0.22	0.11	0.29	0.28	0.25	0.30
Total Kjeldahl Nitrogen(as N)		0.4	0.4	5	1.3	4	7	7	1.17	2.06	0.61	5.17	5.61
Organic Nitrogen	0.15	0.16	0.24	4.62	1.11	3.73	6.7	6.78	1.06	1.77	0.33	4.92	5.31
Phenols		nd	nd	nd	nd	nd	nd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Organic Carbon(DOC)	5 [AO]	1.4	0.8	1.8	0.6	0.8	1	0.8	1.1	1.5	0.9	1.6	3.0
Conductivity (us/cm)		507	534	518	508	496	512	513	528	543	522	509	535
pH		8.1	8.1	8	8.1	7.8	7.9	7.9	7.58	7.79	8.06	7.80	7.91
Sulphate (as SO4)	250 (AO)	21	26	24	20	20	20	17	14	16	13	17	13
Hardness(as CaCO3)	80-100 [OG]	270	230	240	250	230	240	240	267	285	257	263	249
Aluminum	0.1 [OG]	0.01	nd	nd	nd	nd	nd	<0.005	0.03	0.04	0.02	0.04	0.03
Barium	1 [MAC]	0.086	0.072	0.079	0.067	0.066	0.062	0.060	0.074	0.081	0.073	0.084	0.077
Boron	5 [IMAC]	0.028	0.027	0.026	0.026	0.027	0.024	0.019	0.023	-	0.027	0.016	0.022
Cadmium	0.005 (MAC)	nd	nd	0.0001	nd	nd	nd	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	0.00002
Calcium	-	68	57	58	61	58	59	58	67.4	72.8	64.5	67.8	62.6
Chromium	0.05 (MAC)	nd	nd	nd	nd	nd	nd	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	nd	nd	nd	0.001	nd	0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	0.3 [AO]	0.24	0.63	0.59	0.24	0.95	nd	0.540	0.975	0.567	0.733	0.150	0.909
Lead	0.01 (MAC)c	nd	0.0026	nd	nd	0.0017	nd	0.0005	<0.00002	<0.00002	<0.00002	0.00002	<0.00002
Magnesium	-	25	22	22	23	21	22	23	23.9	25.1	23.2	22.7	22.5
Manganese	0.05 [AO]	0.057	0.073	0.061	0.047	0.041	0.016	0.045	0.093	0.098	0.091	0.094	0.089
Potassium	-	1.1	0.83	2.6	1	0.8	0.82	0.7	0.8	1.1	0.9	0.9	0.8
Sodium	200 [AO]	14	12	14	11	11	10	9.1	8.3	9.8	8.3	8.7	9.2
Zinc	5 [AO]	nd	nd	0.006	nd	nd	nd	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW6 Nov-13	OW6 Jul-14	OW6 Oct-14	OW6 May-15	OW6 Oct-15	OW6 Jun-16	OW6 Nov-16	OW6 Jun-17	OW6 Nov-17	OW6 May-18	OW6 Nov-18	OW6 Jun-19
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	265	271	291	308	306	287	284	259	298	293	279	277
Chloride	250 [AO]	3.2	3.1	2.9	2.79	3.67	3.5	3.1	4.9	2.8	2.7	2.2	2.4
Nitrate(as N)	10 (MAC) d	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	<0.05	<0.1	<0.05	<0.05	0.08
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.1	<0.10	<0.10	<0.1	<0.1	<0.05	0.2	<0.05	<0.05	<0.05
Ammonia(as N)		0.21	0.33	0.23	0.21	0.26	0.18	0.17	0.08	0.24	0.31	0.36	0.40
Total Kjeldahl Nitrogen(as N)		21.8	2.58	1.32	0.43	0.51	0.23	0.36	0.31	0.5	0.8	1.7	2.4
Organic Nitrogen	0.15	21.59	2.25	1.09	0.22	0.25	0.05	0.19	0.23	0.26	0.49	1.34	2.0
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.015	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	3.4	2.9	3.2	1.9	1.1	1.2	0.7	1.3	3.0	1.9	2.9	4.8
Conductivity (us/cm)		436	547	531	585	571	528	551	527	563	545	578	556
pH		8.03	7.93	7.82	8.40	8.05	7.93	7.89	7.89	7.79	7.94	7.55	8.09
Sulphate (as SO <sub>4</sub> )	250 (AO)	14	11	10	7.03	15.0	15	13	14	8	9	10	9
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	227	280	283	285	280	266	303	269	284	282	322	286
Aluminum	0.1 [OG]	0.04	0.05	0.02	0.005	<0.004	0.02	0.03	0.02	0.05	0.05	0.18	0.05
Barium	1 [MAC]	0.075	0.076	0.070	0.063	0.079	0.072	0.081	0.069	0.077	0.068	0.078	0.062
Boron	5 [IMAC]	0.019	0.022	0.022	0.015	0.020	0.020	0.020	0.016	0.025	0.020	0.018	0.018
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.00002	<0.001	<0.001	<0.00002	<0.00002	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015
Calcium	-	57	72.0	72.5	74.8	73.4	68.0	78.6	67.6	72.1	70.5	84.9	73.6
Chromium	0.05 (MAC)	<0.002	<0.002	<0.002	<0.003	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	0.0001	<0.002	<0.0001	<0.003	<0.003	<0.002	<0.0001	<0.002	<0.002	<0.002	<0.002	0.005
Iron	0.3 [AO]	0.256	0.953	1.10	1.38	0.403	0.436	0.742	1.02	0.899	1.30	1.36	1.16
Lead	0.01 (MAC)c	<0.00002	<0.00002	<0.00002	<0.002	<0.002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00023	0.00005
Magnesium	-	20.6	24.4	24.7	23.9	23.6	23.5	26.0	24.3	25.2	25.8	26.7	24.9
Manganese	0.05 [AO]	0.085	0.114	0.125	0.231	0.135	0.101	0.110	0.087	0.119	0.138	0.134	0.113
Potassium	-	0.8	1.0	0.9	0.71	0.93	0.7	0.9	0.7	0.9	0.7	0.8	0.7
Sodium	200 [AO]	8	8.9	6.6	5.32	6.45	8.6	9.8	10.5	8.2	8.2	7.2	7.7
Zinc	5 [AO]	<0.005	<0.005	<0.005	0.007	0.008	<0.005	0.027	0.027	0.023	0.031	0.079	0.056

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW6	OW6	OW6
		Nov-19	Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	258	265	241
Chloride	250 [AO]	3.1	4.5	4.6
Nitrate(as N)	10 (MAC) d	0.13	0.11	<0.05
Nitrite(as N)	1 (MAC) d	<0.05	<0.05	<0.05
Ammonia(as N)		0.35	0.33	0.26
Total Kjeldahl Nitrogen(as N)		0.5	0.4	0.3
Organic Nitrogen	0.15	0.15	0.07	0.04
Phenols		<0.002	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	4.2	2.3	1.7
Conductivity (us/cm)		544	526	523
pH		7.87	7.83	7.89
Sulphate (as SO <sub>4</sub> )	250 (AO)	13	17	18
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	274	269	274
Aluminum	0.1 [OG]	0.06	0.02	0.12
Barium	1 [MAC]	0.061	0.081	0.078
Boron	5 [IMAC]	0.018	0.026	<0.005
Cadmium	0.005 (MAC)	<0.000015	<0.000015	<0.000015
Calcium	-	71.0	67	67.1
Chromium	0.05 (MAC)	<0.001	<0.002	<0.002
Copper	1 [AO]	0.0003	<0.002	<0.002
Iron	0.3 [AO]	0.983	0.777	0.463
Lead	0.01 (MAC)c	<0.00002	0.00016	0.00013
Magnesium	-	23.4	24.6	25.9
Manganese	0.05 [AO]	0.111	0.072	0.039
Potassium	-	0.7	1	1
Sodium	200 [AO]	6.3	8.8	10.5
Zinc	5 [AO]	0.134	0.033	0.009

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW7 Jul-07	OW7 Jul-08	OW7 Dec-08	OW7 Jul-09	OW7 Dec-09	OW7 Mar-10	OW7 Jun-11	OW7 Oct-11	OW7 Jun-12	OW7 Oct-12	OW7 Jun-13	OW7 Nov-13
Alkalinity(as CaCO3)	30 - 500 [OG]	269	248	278	242	349	284	252	Dry	273	Dry	269	288
Chloride	250 [AO]	4	2	2	4	nd	3	0.9		0.9		1.1	0.8
Nitrate(as N)	10 (MAC) d	IS	nd	nd	0.1	nd	<0.1	<0.1		<0.1		0.1	0.1
Nitrite(as N)	1 (MAC) d	IS	nd	nd	nd	nd	<0.01	<0.1		<0.1		<0.1	<0.1
Ammonia(as N)		IS	0.08	0.06	0.08	nd	<0.05	<0.01		0.03		<0.01	<0.01
Total Kjeldahl Nitrogen(as N)		IS	2.1	0.7	4	2	3	0.77		0.12		4.48	30.9
Organic Nitrogen	0.15	IS	2.02	0.64	3.92	2	<2.95	<0.77		0.09		4.48	30.9
Phenols		IS	nd	nd	nd	nd	<0.001	<0.001		<0.001		<0.001	<0.001
Dissolved Organic Carbon(DOC)	5 [AO]	IS	3.1	0.9	0.8	1.2	0.9	0.8		0.8		3.7	3.4
Conductivity (us/cm)		478	459	502	458	626	526	457		493		497	442
pH		8.2	8.1	7.9	7.8	7.9	7.9	7.62		8.06		7.86	7.86
Sulphate (as SO4)	250 (AO)	4	4	4	4	2	3	3		2		3	3
Hardness(as CaCO3)	80-100 [OG]	250	250	280	220	370	290	259		288		268	264
Aluminum	0.1 [OG]	IS	nd	nd	nd	nd	<0.005	0.02		0.03		0.03	0.03
Barium	1 [MAC]	IS	0.008	0.007	0.006	0.008	0.006	0.008		0.007		0.010	0.007
Boron	5 [IMAC]	IS	nd	nd	nd	nd	<0.01	0.006		0.011		0.006	<0.005
Cadmium	0.005 (MAC)	IS	nd	nd	0.0011	0.0003	0.0002	0.00005		0.00003		0.00008	<0.00002
Calcium	-	IS	69	76	61	100	79	71.1		79.6		74.1	73
Chromium	0.05 (MAC)	IS	nd	nd	nd	nd	<0.005	<0.002		<0.002		<0.002	<0.002
Copper	1 [AO]	IS	0.001	0.001	0.002	nd	0.001	<0.002		<0.002		<0.002	0.0002
Iron	0.3 [AO]	IS	nd	nd	nd	nd	<0.1	<0.005		0.019		0.009	0.01
Lead	0.01 (MAC)c	IS	nd	nd	nd	nd	<0.0005	<0.00002		<0.00002		<0.00002	<0.00002
Magnesium	-	IS	19	21	15	28	23	19.8		21.5		20.2	19.8
Manganese	0.05 [AO]	IS	0.012	0.007	0.032	0.027	0.240	0.104		0.043		0.119	0.179
Potassium	-	IS	2.2	0.67	0.61	0.54	0.62	0.5		0.7		0.7	0.4
Sodium	200 [AO]	IS	3.9	1.2	1.2	0.89	4.2	0.9		0.8		1.6	0.8
Zinc	5 [AO]	IS	0.006	nd	0.01	nd	0.006	<0.005		<0.005		0.039	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW7 Jul-14	OW7 Oct-14	OW7 May-15	OW7 Oct-15	OW7 Jun-16	OW7 Nov-16	OW7 Jun-17	OW7 Nov-17	OW7 May-18	OW7 Nov-18	OW7 Jun-19	OW7 Nov-19
Alkalinity(as CaCO3)	30 - 500 [OG]	262	312	259	Dry	288	Dry	283	376	270	362	291	304
Chloride	250 [AO]	1.0	1.4	1.40		1.1		2.9	1.8	1.0	0.7	0.8	0.5
Nitrate(as N)	10 (MAC) d	0.1	<0.1	<0.10		0.1		<0.05	<0.1	<0.05	<0.05	0.08	0.27
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.10		<0.1		<0.05	0.3	<0.05	<0.05	<0.05	<0.05
Ammonia(as N)		<0.01	<0.01	<0.02		<0.01		<0.01	<0.01	0.02	0.04	0.20	0.05
Total Kjeldahl Nitrogen(as N)		0.99	0.39	<0.10		<0.05		0.06	0.2	0.5	0.5	0.9	0.3
Organic Nitrogen	0.15	0.99	0.39	<0.10		<0.05		0.06	0.20	0.48	0.46	0.70	0.25
Phenols		<0.001	<0.001	<0.001		<0.001		<0.001	<0.001	<0.001	0.009	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	2.8	4.5	1.2		1.7		1.6	3.5	1.4	2.6	3.8	3.5
Conductivity (us/cm)		504	549	478		497		524	663	489	704	524	606
pH		7.87	7.69	8.45		7.88		7.83	7.75	7.96	7.37	8.02	7.78
Sulphate (as SO4)	250 (AO)	2	1	2.17		3		3	2	2	2	2	2
Hardness(as CaCO3)	80-100 [OG]	299	324	248		286		311	396	281	398	310	389
Aluminum	0.1 [OG]	0.03	0.02	0.004		0.02		0.02	0.06	0.05	0.07	0.04	0.25
Barium	1 [MAC]	0.010	0.009	0.007		0.009		0.011	0.013	0.010	0.012	0.008	0.017
Boron	5 [IMAC]	<0.005	0.011	<0.010		0.006		<0.005	0.009	0.005	0.006	<0.005	0.007
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.001		0.00002		0.000073	0.000015	<0.000015	0.000028	0.000016	0.000094
Calcium	-	83.3	89.2	68.5		78.0		85.1	110	74.6	111	83.5	105
Chromium	0.05 (MAC)	<0.002	<0.002	<0.003		<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.001
Copper	1 [AO]	<0.002	0.0003	<0.003		<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	0.0024
Iron	0.3 [AO]	0.010	0.214	<0.010		0.006		<0.005	0.086	0.005	0.091	<0.005	0.287
Lead	0.01 (MAC)c	0.00003	<0.00002	<0.002		<0.00002		<0.00002	0.00003	<0.00002	<0.00002	0.00047	0.00063
Magnesium	-	22.1	24.6	18.8		22.1		23.9	29.4	22.9	29.3	24.7	30.7
Manganese	0.05 [AO]	0.239	0.333	0.111		0.081		0.017	0.206	0.004	0.203	0.022	0.048
Potassium	-	0.7	0.7	0.41		0.5		0.5	0.5	0.4	0.3	0.4	0.5
Sodium	200 [AO]	1.1	1.0	0.82		1.0		1.1	1.0	1.0	0.8	1.1	1.0
Zinc	5 [AO]	0.006	<0.005	<0.005		<0.005		0.006	<0.005	<0.005	<0.005	0.014	0.007

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW7	OW7
		Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	282	313
Chloride	250 [AO]	1.3	1.6
Nitrate(as N)	10 (MAC) d	0.11	0.07
Nitrite(as N)	1 (MAC) d	<0.05	<0.05
Ammonia(as N)		0.05	0.03
Total Kjeldahl Nitrogen(as N)		0.3	0.2
Organic Nitrogen	0.15	0.25	0.17
Phenols		<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	2.4	1.9
Conductivity (us/cm)		517	608
pH		7.76	7.95
Sulphate (as SO <sub>4</sub> )	250 (AO)	2	3
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	293	367
Aluminum	0.1 [OG]	0.03	0.05
Barium	1 [MAC]	0.012	0.014
Boron	5 [IMAC]	0.006	<0.005
Cadmium	0.005 (MAC)	0.000017	0.000355
Calcium	-	78.8	100
Chromium	0.05 (MAC)	<0.002	<0.002
Copper	1 [AO]	<0.002	0.002
Iron	0.3 [AO]	0.018	<0.005
Lead	0.01 (MAC)c	0.00003	0.0003
Magnesium	-	23.4	28.3
Manganese	0.05 [AO]	0.184	0.001
Potassium	-	0.5	0.4
Sodium	200 [AO]	0.9	0.8
Zinc	5 [AO]	<0.005	0.005

**NOTES:**

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW11-16	OW11-16	OW11-16	OW11-16	OW11-16	OW11-16	OW11-16	OW11-16	OW11-16
		Nov-16	Jun-17	Nov-17	May-18	Nov-18	Jun-19	Nov-19	Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	340	323	329	342	313	309	302	326	291
Chloride	250 [AO]	5.2	3.6	7.2	1.8	5.4	1.6	8.6	4.4	4.8
Nitrate(as N)	10 (MAC) d	2.4	0.97	2.3	0.87	2.53	0.87	4.79	1.49	2.82
Nitrite(as N)	1 (MAC) d	<0.1	<0.05	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia(as N)		<0.01	<0.01	<0.01	0.08	0.03	0.16	0.06	0.04	0.01
Total Kjeldahl Nitrogen(as N)		0.17	0.12	0.2	0.6	0.2	0.2	0.1	0.1	0.1
Organic Nitrogen	0.15	0.17	0.12	0.20	0.52	0.17	0.04	0.04	0.06	0.09
Phenols		<0.001	<0.001	<0.001	<0.001	0.016	<0.002	<0.002	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	0.4	1.0	2.5	1.0	1.4	3.5	1.9	2.8	1.1
Conductivity (us/cm)		659	609	613	577	655	597	674	621	607
pH		7.88	7.91	7.96	7.97	7.65	8.07	7.85	7.83	7.75
Sulphate (as SO <sub>4</sub> )	250 (AO)	14	5	6	3	10	3	8	7	4
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	396	362	349	327	354	368	356	360	357
Aluminum	0.1 [OG]	0.04	0.03	0.05	0.05	0.05	0.05	0.05	0.04	0.04
Barium	1 [MAC]	0.032	0.026	0.027	0.023	0.028	0.023	0.027	0.034	0.029
Boron	5 [IMAC]	0.039	<0.005	0.022	0.007	0.024	<0.005	0.024	0.008	<0.005
Cadmium	0.005 (MAC)	<0.00002	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Calcium	-	110	97.0	95.0	85.4	96.2	98.0	95.8	94.9	94.5
Chromium	0.05 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002
Copper	1 [AO]	0.0002	<0.002	<0.002	<0.002	<0.002	0.002	0.0005	<0.002	0.002
Iron	0.3 [AO]	<0.005	<0.005	<0.005	0.032	<0.005	<0.005	0.005	0.01	0.011
Lead	0.01 (MAC)c	<0.00002	<0.00002	<0.00002	0.00004	<0.00002	0.00004	<0.00002	0.00011	0.00003
Magnesium	-	29.7	29.0	27.2	27.6	27.7	30.0	28.3	29.9	29.4
Manganese	0.05 [AO]	0.003	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001
Potassium	-	0.5	0.4	0.4	0.3	0.4	0.4	0.5	0.5	0.5
Sodium	200 [AO]	6.5	2.1	2.6	1.7	4.1	2.0	3.6	2.4	3.2
Zinc	5 [AO]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW12 Jul-07	OW12 Dec-07	OW12 Jul-08	OW12 Dec-08	OW12 Jul-09	OW12 Dec-09	OW12 Mar-10	OW12 Jun-11	OW12 Oct-11	OW12 Jun-12	OW12 Oct-12	OW12 Jun-13
Alkalinity(as CaCO3)	30 - 500 [OG]	381	359	359	383	365	372	369	384	366	360	365	359
Chloride	250 [AO]	21	17	19	17	17	9	11	4.7	6.2	7.1	6.1	4.9
Nitrate(as N)	10 (MAC) d	4.4	3.9	4.8	4.4	4.1	3.4	3.0	1.7	2.0	1.7	1.5	1.5
Nitrite(as N)	1 (MAC) d	nd	0.01	nd	nd	nd	nd	0.04	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia(as N)		0.19	IS	0.11	nd	0.06	IS	0.09	<0.01	<0.01	0.03	<0.01	<0.01
Total Kjeldahl Nitrogen(as N)		0.7	IS	3	0.8	6	IS	4	0.79	1.00	0.49	0.16	1.21
Organic Nitrogen	0.15	0.51	IS	2.89	nd	5.94	IS	3.91	<0.79	<1.00	0.46	0.16	1.21
Phenols		nd	IS	nd	nd	nd	IS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Organic Carbon(DOC)	5 [AO]	6.1	IS	2	2	2.3	IS	2.2	1.4	1.9	2.1	1.8	4.5
Conductivity (us/cm)		942	977	1000	994	993	919	904	813	914	873	831	821
pH		8.2	8.1	8.1	8	7.8	7.9	7.9	7.58	7.84	8.04	7.82	7.94
Sulphate (as SO4)	250 (AO)	157	148	164	157	160	120	130	84	125	127	119	89
Hardness(as CaCO3)	80-100 [OG]	580	490	530	560	550	470	490	459	538	487	478	426
Aluminum	0.1 [OG]	nd	nd	nd	nd	nd	IS	<0.005	0.03	0.04	0.02	0.04	0.03
Barium	1 [MAC]	0.081	0.073	0.081	0.086	0.085	IS	0.075	0.069	0.083	0.081	0.074	0.078
Boron	5 [IMAC]	0.52	0.48	0.45	0.46	0.53	IS	0.44	0.424	-	0.549	0.485	0.328
Cadmium	0.005 (MAC)	0.0006	0.0003	nd	0.0002	0.0002	IS	0.0001	<0.00002	<0.00002	0.00003	<0.00002	<0.00002
Calcium	-	98	88	89	92	95	IS	80	88.8	89.9	83.9	82.8	78.6
Chromium	0.05 (MAC)	nd	nd	nd	nd	nd	IS	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	0.002	0.001	0.002	0.001	0.001	IS	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	0.3 [AO]	nd	nd	nd	nd	nd	IS	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	0.01 (MAC)c	nd	nd	nd	nd	nd	IS	<0.0005	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Magnesium	-	82	65	74	81	76	IS	70	57.8	76.3	67.4	65.8	55.8
Manganese	0.05 [AO]	0.003	0.077	0.002	nd	nd	IS	0.037	<0.001	<0.001	<0.001	<0.001	<0.001
Potassium	-	12	9.6	14	15	14	IS	12	10.6	15.9	12.2	11.1	12.0
Sodium	200 [AO]	9.7	8	12	11	11	IS	9.2	8.1	10.5	9.4	9.1	6.2
Zinc	5 [AO]	nd	nd	0.006	nd	nd	IS	<0.005	<0.005	0.005	<0.005	<0.005	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW12 Nov-13	OW12 Jul-14	OW12 Oct-14	OW12 May-15	OW12 Oct-15	OW12 Jun-16	OW12 Nov-16	OW12 Jun-17	OW12 Nov-17	OW12 May-18	OW12 Nov-18	OW12 Jun-19
Alkalinity(as CaCO3)	30 - 500 [OG]	357	327	337	334	343	368	368	339	317	339	312	319
Chloride	250 [AO]	5.7	3.7	6.0	6.90	7.50	4.1	4.1	5.2	4.4	3.7	3.8	3.4
Nitrate(as N)	10 (MAC) d	1.5	1.1	2.0	2.37	1.98	1.2	1.3	1.26	2.0	1.68	1.63	1.66
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.1	<0.05	<0.25	<0.1	<0.1	<0.05	0.2	<0.05	<0.05	<0.05
Ammonia(as N)		<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	0.06	0.02	0.06
Total Kjeldahl Nitrogen(as N)		0.95	0.65	0.21	0.22	0.18	0.05	0.28	0.32	0.3	0.5	0.2	0.3
Organic Nitrogen	0.15	0.95	0.65	0.21	0.22	0.18	0.05	0.28	0.32	0.30	0.44	0.18	0.24
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.056
Dissolved Organic Carbon(DOC)	5 [AO]	5.4	3.3	3.9	2.0	1.8	2.1	1.6	1.9	4.0	2.0	3.2	5.6
Conductivity (us/cm)		709	726	770	827	772	745	782	778	776	709	762	732
pH		7.96	7.94	7.83	8.40	8.07	7.96	7.98	7.98	8.02	7.99	7.78	8.14
Sulphate (as SO4)	250 (AO)	109	52	93	99.5	96.8	75	90	69	71	59	75	63
Hardness(as CaCO3)	80-100 [OG]	405	378	428	407	397	410	458	443	434	396	410	427
Aluminum	0.1 [OG]	0.03	0.02	0.02	0.004	<0.004	0.02	0.03	0.02	0.05	0.05	0.06	0.05
Barium	1 [MAC]	0.067	0.044	0.069	0.066	0.068	0.068	0.076	0.070	0.073	0.065	0.069	0.060
Boron	5 [IMAC]	0.439	0.317	0.501	0.505	0.374	0.380	0.493	0.460	0.464	0.341	0.433	0.409
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.00002	<0.001	<0.001	<0.00002	<0.00002	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015
Calcium	-	71	70.9	74.4	70.5	70.9	75.4	82.2	77.5	74.9	76.7	73.1	79.1
Chromium	0.05 (MAC)	<0.002	<0.002	<0.002	<0.003	<0.003	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	0.0008	<0.002	0.0015	<0.003	<0.003	<0.002	0.0007	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	0.3 [AO]	<0.005	<0.005	<0.005	<0.010	<0.010	<0.005	<0.005	<0.005	0.005	<0.005	0.046	<0.005
Lead	0.01 (MAC)c	<0.00002	<0.00002	0.00002	<0.002	<0.002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00004	0.00017
Magnesium	-	55.3	48.7	58.9	56.1	53.5	61.4	60.6	60.0	49.7	55.2	55.9	
Manganese	0.05 [AO]	<0.001	<0.001	<0.001	<0.002	<0.002	0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001
Potassium	-	9.4	11.1	12.2	13.6	12.3	10.2	12.3	10.9	12.4	9.4	12.1	10.2
Sodium	200 [AO]	7.7	5.8	7.5	7.66	7.08	6.6	8.3	7.9	7.2	6.3	6.9	6.3
Zinc	5 [AO]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW12	OW12	OW12
		Nov-19	Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	316	326	302
Chloride	250 [AO]	3.6	4.4	3.6
Nitrate(as N)	10 (MAC) d	1.38	0.87	0.63
Nitrite(as N)	1 (MAC) d	<0.05	<0.05	<0.05
Ammonia(as N)		0.05	0.1	0.03
Total Kjeldahl Nitrogen(as N)		0.2	0.2	0.2
Organic Nitrogen	0.15	0.15	0.10	0.17
Phenols		<0.002	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	3.8	3.0	4.6
Conductivity (us/cm)		736	739	700
pH		8.01	7.89	7.95
Sulphate (as SO <sub>4</sub> )	250 (AO)	65	76	64
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	398	415	423
Aluminum	0.1 [OG]	0.06	0.03	0.05
Barium	1 [MAC]	0.069	0.079	0.078
Boron	5 [IMAC]	0.390	0.458	0.426
Cadmium	0.005 (MAC)	<0.000015	<0.000015	<0.000015
Calcium	-	76.0	71.1	71.9
Chromium	0.05 (MAC)	0.001	<0.002	<0.002
Copper	1 [AO]	0.0032	<0.002	0.002
Iron	0.3 [AO]	<0.005	<0.005	0.061
Lead	0.01 (MAC)c	0.00006	0.00004	0.00008
Magnesium	-	50.6	57.8	59.2
Manganese	0.05 [AO]	<0.001	<0.001	0.002
Potassium	-	10.3	11.4	11.4
Sodium	200 [AO]	5.9	6.5	6.4
Zinc	5 [AO]	<0.005	<0.005	0.009

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 S Jul-07	OW13 S Dec-07	OW13 S Jul-08	OW13 S Dec-08	OW13 S Jul-09	OW13 S Dec-09	OW13 S Jun-11	OW13 S Oct-11	OW13 S Jun-12	OW13 S Oct-12	OW13 S Jun-13	OW13 S Nov-13
Alkalinity(as CaCO3)	30 - 500 [OG]	381	385	376	371	378	391	417	512	424	495	387	448
Chloride	250 [AO]	74	80	63	54	39	32	19.9	27.1	19.6	21.7	11.7	7.7
Nitrate(as N)	10 (MAC) d	5.5	6.7	6.3	7.9	5.8	10	3.0	2.4	3.8	3.4	2.6	3.7
Nitrite(as N)	1 (MAC) d	0.02	0.04	nd	nd	0.02	nd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia(as N)		0.16	0.1	0.11	0.1	0.21	0.62	<0.01	2.56	0.63	3.55	0.44	2.03
Total Kjeldahl Nitrogen(as N)		0.6	0.6	3	5	6	4	1.51	4.58	0.90	7.37	2.54	4.59
Organic Nitrogen	0.15	0.44	0.5	2.89	4.9	5.79	3.38	<1.51	2.02	0.27	3.82	2.10	2.56
Phenols		nd	nd	nd	nd	nd	nd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Organic Carbon(DOC)	5 [AO]	3.4	3.4	3.7	3.9	3.7	4.1	2.9	4.6	3.1	4.0	6.2	8.7
Conductivity (us/cm)		1680	2020	1840	1870	1620	1740	1300	1520	1390	1460	1210	1170
pH		8	7.9	7.9	7.8	7.6	7.7	7.44	7.55	7.64	7.64	7.77	7.72
Sulphate (as SO4)	250 (AO)	546	626	585	632	450	510	306	295	352	335	264	303
Hardness(as CaCO3)	80-100 [OG]	1100	1100	920	1000	860	850	712	847	722	889	609	621
Aluminum	0.1 [OG]	0.014	nd	nd	nd	nd	nd	0.04	0.05	0.04	0.05	0.04	0.06
Barium	1 [MAC]	0.086	81	0.079	0.078	0.068	0.055	0.055	0.073	0.069	0.063	0.049	0.053
Boron	5 [IMAC]	1.2	1.2	1.2	1.2	1.1	1.2	0.947	-	1.10	1.00	0.884	0.826
Cadmium	0.005 (MAC)	0.0013	0.0003	nd	0.0002	nd	nd	<0.00002	<0.00002	0.00015	0.00002	<0.00002	0.00004
Calcium	-	220	230	190	220	170	170	145	176	134	197	130	131
Chromium	0.05 (MAC)	nd	nd	nd	nd	nd	nd	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	0.002	0.002	0.003	0.002	0.001	0.002	<0.002	0.003	0.002	0.003	0.003	0.0038
Iron	0.3 [AO]	nd	nd	nd	nd	nd	nd	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	0.01 (MAC)c	nd	nd	nd	nd	nd	nd	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Magnesium	-	130	120	110	120	100	100	84.7	99.3	93.8	96.4	68.8	71.6
Manganese	0.05 [AO]	0.056	0.05	nd	nd	0.035	0.26	0.091	0.047	0.042	0.119	0.041	0.053
Potassium	-	30	37	32	36	33	33	32.4	39.9	34.2	36.1	26.4	26.7
Sodium	200 [AO]	53	48	46	48	39	37	23.2	33.4	23.8	26.8	17.4	19.7
Zinc	5 [AO]	nd	nd	nd	nd	nd	nd	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 S Jul-14	OW13 S Oct-14	OW13 S May-15	OW13 S Oct-15	OW13 S Jun-16	OW13 S Nov-16	OW13 S Jun-17	OW13 S Nov-17	OW13 S May-18	OW13 S Nov-18	OW13 S Jun-19	OW13 S Nov-19
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	421	385	400	484	472	518	409	432	444	426	385	463
Chloride	250 [AO]	4.9	13.1	<0.50	18.1	12.3	14.1	8.7	7.8	10.2	9.6	7.9	12.1
Nitrate(as N)	10 (MAC) d	2.9	4.1	3.25	2.34	1.6	1.7	2.01	2.4	1.18	1.83	1.73	1.43
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.25	<0.25	<0.1	<0.1	0.24	0.2	0.07	<0.05	0.33	0.25
Ammonia(as N)		1.00	1.64	0.52	1.07	1.26	6.16	0.78	3.15	2.56	5.56	1.82	7.49
Total Kjeldahl Nitrogen(as N)		1.73	2.09	0.84	2.50	1.70	6.82	1.74	3.9	2.9	5.6	2.2	7.9
Organic Nitrogen	0.15	0.73	0.45	0.32	1.43	0.44	0.66	0.96	0.75	0.34	0.04	0.38	0.41
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.017	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	6.8	5.7	3.3	2.9	4.1	4.3	3.2	6.9	3.6	6.2	10.3	6.8
Conductivity (us/cm)		1290	1220	1230	1280	1140	1280	1100	1160	1030	1160	1010	1190
pH		7.73	7.62	8.25	7.97	7.68	7.63	7.75	7.73	7.73	7.3	7.98	7.61
Sulphate (as SO <sub>4</sub> )	250 (AO)	257	299	269	279	189	192	168	174	134	173	144	158
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	692	647	573	626	585	679	598	617	517	587	563	595
Aluminum	0.1 [OG]	0.04	0.03	0.011	0.005	0.04	0.04	0.04	0.06	0.07	0.07	0.07	0.07
Barium	1 [MAC]	0.054	0.049	0.047	0.061	0.050	0.068	0.050	0.058	0.049	0.062	0.048	0.074
Boron	5 [IMAC]	0.978	1.01	0.969	0.933	0.721	0.862	0.791	0.833	0.561	0.682	0.645	0.653
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.001	<0.001	<0.00002	<0.00002	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015	<0.000015
Calcium	-	148	136	121	137	127	151	131	134	111	134	127	135
Chromium	0.05 (MAC)	<0.002	<0.002	<0.003	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001
Copper	1 [AO]	<0.002	0.0021	0.004	<0.003	0.003	0.0026	<0.002	0.002	<0.002	0.002	0.010	0.0068
Iron	0.3 [AO]	<0.005	<0.005	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.010
Lead	0.01 (MAC)c	<0.00002	<0.00002	<0.002	<0.002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00031	0.00008
Magnesium	-	78.3	74.6	65.8	69.0	65.1	73.6	65.7	68.6	58.3	61.4	59.7	62.7
Manganese	0.05 [AO]	0.065	0.049	0.036	0.055	0.050	0.061	0.067	0.088	0.066	0.094	0.070	0.114
Potassium	-	29.8	28.9	26.1	30.8	26.3	33.8	26.2	30.4	26.1	28.5	23.5	31.5
Sodium	200 [AO]	22.7	17.1	15.0	19.0	18.4	25.5	16.6	18.5	15.9	17.9	13.0	20.2
Zinc	5 [AO]	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.017	<0.005	<0.005	<0.005	0.006	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 S	OW13 S
		Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	456	546
Chloride	250 [AO]	10.6	14.7
Nitrate(as N)	10 (MAC) d	0.99	<0.05
Nitrite(as N)	1 (MAC) d	0.12	<0.05
Ammonia(as N)		2.84	8.02
Total Kjeldahl Nitrogen(as N)		3.2	9.7
Organic Nitrogen	0.15	0.36	1.68
Phenols		<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	5.3	5.3
Conductivity (us/cm)		1060	1240
pH		7.53	7.22
Sulphate (as SO <sub>4</sub> )	250 (AO)	125	95
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	560	647
Aluminum	0.1 [OG]	0.06	0.07
Barium	1 [MAC]	0.067	0.096
Boron	5 [IMAC]	0.630	0.61
Cadmium	0.005 (MAC)	0.000017	<0.000028
Calcium	-	124	143
Chromium	0.05 (MAC)	<0.002	<0.002
Copper	1 [AO]	<0.002	0.004
Iron	0.3 [AO]	0.026	<0.005
Lead	0.01 (MAC)c	0.00012	0.00004
Magnesium	-	60.9	70.7
Manganese	0.05 [AO]	0.115	0.12
Potassium	-	25.2	32.3
Sodium	200 [AO]	14.6	24.8
Zinc	5 [AO]	<0.005	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 I Jul-07	OW13 I Dec-07	OW13 I Jul-08	OW13 I Dec-08	OW13 I Jul-09	OW13 I Dec-09	OW13 I Jun-11	OW13 I Oct-11	OW13 I Jun-12	OW13 I Oct-12	OW13 I Jun-13	OW13 I Nov-13
Alkalinity(as CaCO3)	30 - 500 [OG]	372	370	350	327	355	374	430	511	510	535	507	523
Chloride	250 [AO]	66	74	55	53	39	38	30.2	33.8	33.7	33.0	26.8	19.1
Nitrate(as N)	10 (MAC) d	3.8	5.1	4.5	5.1	5.4	6	2.5	1.5	1.8	1.6	1.3	0.7
Nitrite(as N)	1 (MAC) d	nd	nd	nd	nd	nd	nd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia(as N)		nd	nd	0.1	0.16	0.08	0.07	<0.01	0.11	0.88	1.33	1.16	1.08
Total Kjeldahl Nitrogen(as N)		0.4	0.4	1.4	3	5	5	0.62	1.00	1.30	2.55	3.40	2.86
Organic Nitrogen	0.15	nd	nd	1.3	2.84	4.92	4.93	<0.62	0.89	0.42	1.22	2.24	1.78
Phenols		nd	nd	nd	nd	nd	nd	<0.001	<0.001	<0.001	<0.001	<0.001	0.008
Dissolved Organic Carbon(DOC)	5 [AO]	2.9	2.8	3	3	2.7	4	2.9	3.8	3.9	4.6	9.2	10.9
Conductivity (us/cm)		1530	1830	1690	1610	890	1680	1440	1550	1520	1470	1470	1260
pH		8.1	7.9	7.9	8	7.7	7.7	7.39	7.55	7.70	7.49	7.69	7.75
Sulphate (as SO4)	250 (AO)	475	546	533	512	470	500	378	317	345	317	298	268
Hardness(as CaCO3)	80-100 [OG]	1000	990	840	770	890	910	791	909	809	884	737	714
Aluminum	0.1 [OG]	nd	nd	nd	nd	nd	0.006	0.04	0.06	0.04	0.05	0.05	0.05
Barium	1 [MAC]	0.078	0.09	0.059	0.057	0.065	0.072	0.061	0.072	0.075	0.069	0.063	0.064
Boron	5 [IMAC]	1.1	1.1	0.92	0.86	1.2	1.2	0.985	-	1.06	0.948	0.851	0.813
Cadmium	0.005 (MAC)	0.0004	0.0002	0.0007	0.0002	nd	0.0001	0.00004	<0.00002	<0.00002	<0.00002	0.00004	<0.00002
Calcium	-	220	220	180	160	180	180	162	188	154	193	160	152
Chromium	0.05 (MAC)	nd	nd	nd	nd	nd	nd	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	0.002	0.002	0.002	0.002	0.002	0.002	<0.002	<0.002	0.003	0.003	<0.002	0.0027
Iron	0.3 [AO]	nd	nd	nd	nd	nd	nd	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	0.01 (MAC)c	nd	nd	nd	nd	nd	nd	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Magnesium	-	120	110	98	90	110	110	93.2	107	103	97.5	82.3	81.5
Manganese	0.05 [AO]	nd	nd	nd	nd	0.004	nd	0.018	0.011	0.034	0.048	0.088	0.087
Potassium	-	26	26	25	25	30	28	24.8	31.8	27.0	28.6	22.6	21.5
Sodium	200 [AO]	52	48	44	37	40	40	30.9	39.7	37.7	34.2	33.8	33.4
Zinc	5 [AO]	nd	nd	0.007	0.008	nd	nd	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 I Jul-14	OW13 I Oct-14	OW13 I May-15	OW13 I Oct-15	OW13 I Jun-16	OW13 I Nov-16	OW13 I Jun-17	OW13 I Nov-17	OW13 I May-18	OW13 I Nov-18	OW13 I Jun-19	OW13 I Nov-19
Alkalinity(as CaCO3)	30 - 500 [OG]	487	501	490	496	568	601	571	513	504	517	497	510
Chloride	250 [AO]	10.2	27.9	25.8	22.5	21.8	19.1	16.9	14.1	19.9	18.6	18.1	20.6
Nitrate(as N)	10 (MAC) d	1.2	1.3	1.69	1.64	0.7	0.4	0.62	0.6	0.19	0.30	0.42	0.31
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.25	<0.25	<0.1	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05
Ammonia(as N)		1.41	1.55	1.26	1.48	2.10	2.97	3.09	2.99	2.91	3.57	3.71	4.27
Total Kjeldahl Nitrogen(as N)		2.20	2.20	2.30	2.49	2.55	3.95	3.32	3.3	3.3	3.9	4.4	4.3
Organic Nitrogen	0.15	0.79	0.65	1.04	1.01	0.45	0.98	0.23	0.31	0.39	0.33	0.69	0.03
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.023	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	6.9	7.5	4.1	3.0	4.6	4.3	4.6	7.3	3.8	6.4	5.9	8.0
Conductivity (us/cm)		1450	1350	1390	1310	1320	1320	1350	1250	1200	1270	1220	1260
pH		7.69	7.46	8.16	8.04	7.66	7.61	7.59	7.72	7.69	7.28	8.01	7.66
Sulphate (as SO4)	250 (AO)	268	252	279	281	214	182	168	155	165	147	153	139
Hardness(as CaCO3)	80-100 [OG]	767	725	664	662	676	731	717	669	603	645	667	1050
Aluminum	0.1 [OG]	0.04	0.03	0.058	<0.004	0.04	0.05	0.05	0.08	0.07	0.07	0.07	0.34
Barium	1 [MAC]	0.067	0.064	0.066	0.070	0.066	0.074	0.072	0.071	0.063	0.074	0.068	0.090
Boron	5 [IMAC]	0.862	0.902	0.900	0.878	0.768	0.894	0.808	0.783	0.619	0.678	0.684	0.667
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.001	<0.001	0.00002	0.00003	0.000016	<0.000014	0.000015	0.000022	0.000016	0.000055
Calcium	-	166	154	137	145	144	160	153	144	128	144	146	252
Chromium	0.05 (MAC)	<0.002	<0.002	<0.003	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.001
Copper	1 [AO]	0.002	0.0029	<0.003	<0.003	0.004	0.0028	0.003	<0.002	<0.002	<0.002	0.002	0.0055
Iron	0.3 [AO]	<0.005	<0.005	<0.010	<0.010	<0.005	0.010	<0.005	<0.005	<0.005	<0.005	<0.005	0.603
Lead	0.01 (MAC)c	<0.00002	0.00005	<0.002	<0.002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00086	<0.00002	0.00104
Magnesium	-	85.5	82.9	78.2	72.9	80.6	81.3	75.1	68.9	69.4	73.6	103	
Manganese	0.05 [AO]	0.117	0.115	0.133	0.131	0.173	0.176	0.224	0.196	0.189	0.203	0.243	0.374
Potassium	-	22.8	24.1	24.5	27.5	23.6	29.7	27.3	26.5	24.7	26.0	25.4	26.9
Sodium	200 [AO]	34.6	29.9	30.2	25.0	29.1	31.4	32.2	27.0	28.4	27.4	27.4	25.1
Zinc	5 [AO]	<0.005	<0.005	0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 I	OW13 I
		Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	556	512
Chloride	250 [AO]	19.4	15.1
Nitrate(as N)	10 (MAC) d	0.19	0.07
Nitrite(as N)	1 (MAC) d	<0.05	<0.05
Ammonia(as N)		4.16	4.84
Total Kjeldahl Nitrogen(as N)		4.6	4.9
Organic Nitrogen	0.15	0.44	0.06
Phenols		<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	7.4	4.5
Conductivity (us/cm)		1250	1210
pH		7.53	7.44
Sulphate (as SO <sub>4</sub> )	250 (AO)	135	121
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	662	656
Aluminum	0.1 [OG]	0.08	0.10
Barium	1 [MAC]	0.084	0.083
Boron	5 [IMAC]	0.661	0.638
Cadmium	0.005 (MAC)	<0.000028	0.000125
Calcium	-	143	141
Chromium	0.05 (MAC)	<0.002	<0.002
Copper	1 [AO]	<0.002	0.004
Iron	0.3 [AO]	0.048	0.051
Lead	0.01 (MAC)c	0.00015	0.0001
Magnesium	-	74.1	73.9
Manganese	0.05 [AO]	0.298	0.266
Potassium	-	26.1	27.5
Sodium	200 [AO]	26.5	24.4
Zinc	5 [AO]	<0.005	<0.005

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8. d, where nitrate and nitrite are present the total of the two should not exceed 10 mg/L.
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13. Shaded values indicate exceedance of ODWQS.

**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 D Jul-07	OW13 D Dec-07	OW13 D Jul-08	OW13 D Dec-08	OW13 D Jul-09	OW13 D Dec-09	OW13 D Mar-10	OW13 D Jun-11	OW13 D Oct-11	OW13 D Jun-12	OW13 D Oct-12	OW13 D Jun-13
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	240	288	231	235	234	260	240	244	274	254	349	234
Chloride	250 [AO]	10	31	8	10	7	13	10	6.6	12.2	9.6	19.5	6.6
Nitrate(as N)	10 (MAC) d	nd	nd	0.1	nd	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
Nitrite(as N)	1 (MAC) d	nd	0.03	nd	0.3	nd	nd	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1
Ammonia(as N)		0.13	0.15	0.22	0.28	0.26	0.25	<0.05	0.03	0.09	0.13	0.06	0.09
Total Kjeldahl Nitrogen(as N)		0.2	0.4	1	1.5	5	nd	0.5	0.35	0.33	0.15	0.51	0.90
Organic Nitrogen	0.15	0.07	0.25	0.78	1.22	4.74	nd	<0.45	0.32	0.24	0.02	0.45	0.81
Phenols		nd	nd	nd	nd	nd	nd	nd	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Organic Carbon(DOC)	5 [AO]	1	2	1	0.7	0.7	1.6	0.9	0.7	2.7	1.0	2.3	2.6
Conductivity (us/cm)		516	1000	546	538	544	764	575	545	750	624	934	547
pH		8.2	8.1	8.2	8.2	8	8	8.0	7.73	7.87	8.05	7.74	7.95
Sulphate (as SO <sub>4</sub> )	250 (AO)	45	193	42	47	44	130	62	50	111	75	172	51
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	260	640	230	240	220	340	230	235	367	284	445	224
Aluminum	0.1 [OG]	nd	nd	nd	nd	nd	nd	nd	0.03	0.05	0.02	0.05	0.03
Barium	1 [MAC]	0.096	0.22	0.085	0.089	0.082	0.12	0.086	0.090	0.128	0.108	0.158	0.087
Boron	5 [IMAC]	0.044	0.45	0.04	0.057	0.043	0.19	0.045	0.053	-	0.104	0.289	0.061
Cadmium	0.005 (MAC)	0.0004	0.001	nd	nd	0.0003	nd	0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Calcium	-	61	140	54	55	51	79	55	56.1	87.3	66.8	104	53.2
Chromium	0.05 (MAC)	nd	nd	nd	nd	nd	nd	nd	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	nd	0.002	nd	0.001	nd	0.001	nd	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	0.3 [AO]	0.46	0.72	nd	nd	0.64	1.2	nd	0.111	0.611	0.360	0.799	0.376
Lead	0.01 (MAC)c	nd	nd	nd	nd	nd	nd	0.0006	<0.00002	<0.00002	<0.00002	0.00006	<0.00002
Magnesium	-	26	69	23	24	21	36	23	22.9	36.2	28.4	45.2	22.1
Manganese	0.05 [AO]	0.014	0.032	0.022	0.01	0.012	0.019	0.015	0.013	0.016	0.016	0.024	0.012
Potassium	-	1	3.6	0.86	1	0.82	1.3	0.91	1.0	1.7	1.3	2.5	1.1
Sodium	200 [AO]	16	39	14	15	14	19	14	13.9	21.4	16.3	24.1	14.0
Zinc	5 [AO]	nd	nd	nd	nd	nd	nd	nd	<0.005	0.008	<0.005	<0.005	<0.005

**NOTES:**

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2. ODWQS is the Ontario Drinking Water Quality Standards, MOE, revised 2001.
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4. IMAC indicates an interim maximum acceptable concentration ODWQS.
5. AO indicates an aesthetic objective ODWQS, not health related.
6. OG indicates an operational guideline ODWQS, not health related.
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12. nd indicates parameter not detected.
13. Shaded values indicate exceedance of ODWQS.

**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 D Nov-13	OW13 D Jul-14	OW13 D Oct-14	OW13 D May-15	OW13 D Oct-15	OW13 D Jun-16	OW13 D Nov-16	OW13 D Jun-17	OW13 D Nov-17	OW13 D May-18	OW13 D Nov-18	OW13 D Jun-19
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	268	219	256	263	357	249	341	237	274	227	278	222
Chloride	250 [AO]	9.8	6.6	9.7	10.2	16.1	6.6	11.7	7.2	7.6	6.6	9.8	6.8
Nitrate(as N)	10 (MAC) d	<0.1	<0.1	<0.1	<0.10	<0.25	0.1	<0.1	<0.05	0.2	<0.05	0.05	0.19
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.1	<0.10	<0.25	<0.1	<0.1	<0.05	0.3	<0.05	<0.05	0.06
Ammonia(as N)		0.09	0.10	0.10	0.03	0.17	0.08	0.19	<0.01	0.13	0.14	0.28	0.20
Total Kjeldahl Nitrogen(as N)		0.22	0.22	0.31	0.11	0.28	0.07	0.30	0.09	0.4	0.2	0.4	0.2
Organic Nitrogen	0.15	0.13	0.12	0.21	0.08	0.11	-	0.11	0.09	0.27	0.06	0.12	-
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	3.9	2.5	4.1	1.8	1.5	1.0	1.6	1.2	3.1	1.3	2.3	14.4
Conductivity (us/cm)		569	536	612	647	911	543	824	560	677	521	716	545
pH		8	8.03	7.86	8.36	7.93	8.05	7.84	8.01	7.98	8.10	7.65	8.02
Sulphate (as SO <sub>4</sub> )	250 (AO)	85	46	79	69.9	148	51	112	42	59	46	74	46
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	278	237	293	270	457	233	412	257	330	220	321	245
Aluminum	0.1 [OG]	0.04	0.02	0.02	<0.004	<0.004	0.02	0.04	0.02	0.05	0.03	0.05	0.03
Barium	1 [MAC]	0.102	0.080	0.102	0.092	0.163	0.085	0.147	0.092	0.122	0.078	0.120	0.081
Boron	5 [IMAC]	0.127	0.046	0.141	0.114	0.301	0.055	0.270	0.071	0.187	0.052	0.161	0.061
Cadmium	0.005 (MAC)	<0.00002	<0.00002	<0.00002	<0.001	<0.001	<0.00002	0.00002	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015
Calcium	-	65.4	57.5	68.8	63.9	105	55.5	97.5	60.7	76.6	50.6	76.6	57.9
Chromium	0.05 (MAC)	<0.002	<0.002	<0.002	<0.003	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Copper	1 [AO]	0.0002	<0.002	0.0002	<0.003	<0.003	<0.002	0.0005	<0.002	<0.002	<0.002	<0.002	0.008
Iron	0.3 [AO]	0.595	0.270	0.591	0.118	0.766	0.249	0.751	0.145	0.579	0.167	0.565	0.211
Lead	0.01 (MAC)c	<0.00002	<0.00002	<0.00002	<0.002	<0.002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.0108	0.00003
Magnesium	-	27.9	22.7	29.4	26.7	47.2	23.0	41.0	25.6	33.8	22.8	31.6	24.3
Manganese	0.05 [AO]	0.015	0.013	0.018	0.023	0.028	0.016	0.025	0.022	0.022	0.014	0.018	0.015
Potassium	-	1.6	1	1.6	1.72	3.85	1.1	3.3	1.7	2.7	1.3	2.5	1.5
Sodium	200 [AO]	16.2	14.3	16.5	15.7	23.7	14.5	24.3	16.5	18.8	14.9	19.3	14.9
Zinc	5 [AO]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

**NOTES:**

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4. IMAC indicates an interim maximum acceptable concentration ODWQS.
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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW13 D	OW13 D	OW13 D
		Nov-19	Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	289	235	304
Chloride	250 [AO]	10.8	7.6	10.1
Nitrate(as N)	10 (MAC) d	0.22	0.14	0.13
Nitrite(as N)	1 (MAC) d	0.18	<0.05	<0.05
Ammonia(as N)		0.31	0.19	0.46
Total Kjeldahl Nitrogen(as N)		0.4	0.3	0.6
Organic Nitrogen	0.15	0.09	0.11	0.14
Phenols		<0.002	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	2.8	4.1	2.5
Conductivity (us/cm)		730	539	763
pH		7.90	7.95	7.78
Sulphate (as SO <sub>4</sub> )	250 (AO)	74	48	79
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	324	246	373
Aluminum	0.1 [OG]	0.06	0.02	0.04
Barium	1 [MAC]	0.118	0.094	0.144
Boron	5 [IMAC]	0.170	0.073	0.190
Cadmium	0.005 (MAC)	<0.000015	0.000397	<0.000015
Calcium	-	75.8	57.4	83.6
Chromium	0.05 (MAC)	<0.001	<0.002	<0.002
Copper	1 [AO]	0.0007	<0.002	<0.002
Iron	0.3 [AO]	0.715	0.220	0.586
Lead	0.01 (MAC)c	0.00007	0.00002	0.00003
Magnesium	-	32.7	24.8	39.8
Manganese	0.05 [AO]	0.021	0.018	0.029
Potassium	-	2.8	2	3.6
Sodium	200 [AO]	18.2	14.7	20.5
Zinc	5 [AO]	<0.005	<0.005	<0.005

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13. Shaded values indicate exceedance of ODWQS.



**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW14 Jul-07	OW14 Jul-08	OW14 Jul-09	OW14 Dec-09	OW14 Mar-10	OW14 Jun-11	OW14 Oct-11	OW14 Jun-12	OW14 Oct-12	OW14 Jun-13	OW14 Nov-13	OW14 Jul-14
Alkalinity(as CaCO3)	30 - 500 [OG]	702	633	600	IS	619	590	548	550	Dry	581	535	523
Chloride	250 [AO]	11	8	9	IS	12	3.4	3.0	4.3		5.3	2.8	2.9
Nitrate(as N)	10 (MAC) d	nd	nd	nd	IS	<0.1	<0.1	<0.1	<0.1		0.2	<0.1	0.1
Nitrite(as N)	1 (MAC) d	nd	nd	nd	IS	<0.01	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Ammonia(as N)		14.5	11	16	IS	11	8.36	7.14	6.05		4.73	4.42	6.38
Total Kjeldahl Nitrogen(as N)		12	11	14	IS	11	10.6	7.22	6.77		8.06	7.24	7.93
Organic Nitrogen	0.15	0	0	0	IS	0	2.24	0.08	0.72		3.33	2.82	1.55
Phenols		0.006	0.001	0.004	IS	0.004	0.007	0.006	0.004		0.006	0.006	0.003
Dissolved Organic Carbon(DOC)	5 [AO]	8.7	9.2	8.9	IS	8.2	9.3	8.2	7.7		21.1	16.4	15.7
Conductivity (us/cm)		1160	1190	1120	IS	1170	1040	1050	1050		988	857	1060
pH		8	7.8	7.4	IS	7.4	7.09	7.15	7.34		7.27	7.32	7.35
Sulphate (as SO4)	250 (AO)	16	35	1	IS	34	8	5	22		8	22	19
Hardness(as CaCO3)	80-100 [OG]	590	560	520	IS	560	528	556	512		499	499	559
Aluminum	0.1 [OG]	0.009	0.007	0.007	IS	0.006	0.05	0.06	0.05		0.05	0.06	0.05
Barium	1 [MAC]	0.071	0.068	0.089	IS	0.072	0.087	0.082	0.062		0.054	0.05	0.062
Boron	5 [IMAC]	0.45	0.35	0.390	IS	0.30	0.286	-	0.329		0.166	0.142	0.228
Cadmium	0.005 (MAC)	0.0002	nd	0.0003	IS	0.0001	<0.00002	<0.00002	0.00004		0.00004	0.0001	<0.00002
Calcium	-	160	160	160	IS	170	142	181	159		166	167	182
Chromium	0.05 (MAC)	nd	nd	nd	IS	nd	<0.002	<0.002	<0.002		<0.002	<0.002	<0.002
Copper	1 [AO]	0.001	0.001	nd	IS	0.002	<0.002	<0.002	<0.002		<0.002	0.0004	<0.002
Iron	0.3 [AO]	0.69	1.9	6.5	IS	12	20.0	24.4	19.4		32.6	25.3	36.6
Lead	0.01 (MAC)c	nd	nd	nd	IS	nd	<0.00002	0.00002	<0.00002		0.00005	<0.00002	<0.00002
Magnesium	-	44	38	30	IS	33	42.3	24.8	27.6		20.5	20	25.3
Manganese	0.05 [AO]	4.7	5.3	2.7	IS	2	0.807	0.665	0.296		0.912	0.433	0.704
Potassium	-	25	22	22	IS	18	26.1	28.9	18.3		9.1	9.4	11.3
Sodium	200 [AO]	45	34	18	IS	15	8.2	6.9	8.4		5.8	4	6.7
Zinc	5 [AO]	nd	0.006	nd	IS	0.010	<0.005	<0.005	0.008		<0.005	<0.005	<0.005

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11. S.E. indicates a sampling error.
12. nd indicates parameter not detected.
13. IS indicates insufficient sample for analysis.
14. Shaded values indicate exceedance of ODWQS.

**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW14 Oct-14	OW14 May-15	OW14 Oct-15	OW14 Jun-16	OW14 Nov-16	OW14 Jun-17	OW14 Nov-17	OW14 May-18	OW14 Nov-18	OW14 Jun-19	OW14 Nov-19	OW14 Jul-20
Alkalinity(as CaCO3)	30 - 500 [OG]	597	506	531	677	519	530	501	519	458	510	460	491
Chloride	250 [AO]	7.7	4.77	3.76	5.6	16.7	8.8	6.8	10.4	6.5	7.1	21.6	14.1
Nitrate(as N)	10 (MAC) d	0.1	<0.25	<0.25	0.1	<0.1	<0.05	<0.1	0.05	0.07	<0.05	0.09	0.08
Nitrite(as N)	1 (MAC) d	<0.1	<0.25	<0.25	<0.1	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia(as N)		5.73	4.46	1.71	5.34	5.17	3.56	3.59	4.90	4.60	4.40	3.61	2.74
Total Kjeldahl Nitrogen(as N)		6.46	5.40	4.65	5.73	5.95	3.99	3.9	5.3	4.6	5.2	4.0	3.5
Organic Nitrogen	0.15	0.73	0.94	2.94	0.39	0.78	0.43	0.31	0.4		0.8	0.39	0.76
Phenols		0.003	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.003	0.015	<0.002	0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	9.8	7.0	5.0	7.1	6.0	7.4	10.3	15.3	9.6	10.1	11.6	10.3
Conductivity (us/cm)		1080	970	948	1020	81	1050	1020	1000	940	981	1030	976
pH		7.5	7.82	7.80	7.18	7.30	7.29	7.41	7.29	7.20	7.33	7.42	7.22
Sulphate (as SO4)	250 (AO)	34	15.1	26.0	9	18	22	49	34	13	13	54	36
Hardness(as CaCO3)	80-100 [OG]	574	471	505	516	578	580	572	523	506	554	534	553
Aluminum	0.1 [OG]	0.04	0.008	0.007	0.05	0.05	0.06	0.10	0.09	0.08	0.09	0.08	0.14
Barium	1 [MAC]	0.237	0.049	0.044	0.056	0.045	0.056	0.046	0.061	0.049	0.053	0.043	0.045
Boron	5 [IMAC]	0.216	0.186	0.161	0.215	0.173	0.162	0.161	0.205	0.160	0.182	0.144	0.186
Cadmium	0.005 (MAC)	0.00004	<0.001	<0.001	<0.00002	<0.00002	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Calcium	-	184	158	169	165	192	193	189	172	170	186	179	185
Chromium	0.05 (MAC)	0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002
Copper	1 [AO]	0.0012	<0.003	<0.003	<0.002	0.0002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0047	<0.002
Iron	0.3 [AO]	0.172	17.4	3.07	38.5	10.4	23.8	25.9	29.3	30.1	28.7	22.7	32.1
Lead	0.01 (MAC)c	<0.00002	<0.002	<0.002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	<0.00002	<0.00002	0.00007	0.00022
Magnesium	-	27.9	18.6	20.1	25.1	23.9	24.0	24.3	22.7	19.6	21.7	21.1	21.9
Manganese	0.05 [AO]	0.741	0.301	0.291	0.325	0.314	0.422	0.231	0.539	0.222	0.428	0.26	0.204
Potassium	-	15.7	9.33	8.68	8.7	9.8	7.8	7.2	9.1	8.5	7.8	7.1	5.8
Sodium	200 [AO]	7.9	4.91	3.64	4.5	3.9	5.1	5.5	7.0	7.0	7.2	6.1	7.6
Zinc	5 [AO]	0.022	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

**NOTES:**

1. All results expresses in mg/L unless otherwise noted.
2. ODWQS is the Ontario Drinking Water Quality Standards, MOE, revised 2001.
3. MAC maximum acceptable concentration ODWQS.
4. IMAC indicates an interim maximum acceptable concentration ODWQS.
5. AO indicates an aesthetic objective ODWQS, not health related.
6. OG indicates an operational guideline ODWQS, not health related.
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11. S.E. indicates a sampling error.
12. nd indicates parameter not detected.
13. IS indicates insufficient sample for analysis.
14. Shaded values indicate exceedance of ODWQS.

**TABLE E-2  
HISTORICAL WELL WATER QUALITY  
KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW14 Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	445
Chloride	250 [AO]	13.7
Nitrate(as N)	10 (MAC) d	<0.05
Nitrite(as N)	1 (MAC) d	<0.05
Ammonia(as N)		2.24
Total Kjeldahl Nitrogen(as N)		2.7
Organic Nitrogen	0.15	0.46
Phenols		0.002
Dissolved Organic Carbon(DOC)	5 [AO]	8.9
Conductivity (us/cm)		968
pH		7.28
Sulphate (as SO <sub>4</sub> )	250 (AO)	40
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	553
Aluminum	0.1 [OG]	0.09
Barium	1 [MAC]	0.034
Boron	5 [IMAC]	0.102
Cadmium	0.005 (MAC)	<0.000015
Calcium	-	184
Chromium	0.05 (MAC)	<0.002
Copper	1 [AO]	<0.002
Iron	0.3 [AO]	3.23
Lead	0.01 (MAC)c	0.00003
Magnesium	-	22.7
Manganese	0.05 [AO]	0.185
Potassium	-	5.7
Sodium	200 [AO]	7.5
Zinc	5 [AO]	<0.005

**NOTES:**

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**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW15 Nov-16	OW15 Dup#1 Nov-16	OW15 Jun-17	OW15 Nov-17	OW15 May-18	OW15 Nov-18	OW15 Jun-19	OW15 Nov-19	OW15 Jul-20	OW15 Nov-20
Alkalinity(as CaCO3)	30 - 500 [OG]	505	521	534	548	553	499	513	466	490	355
Chloride	250 [AO]	54.7	54.8	57.9	41.6	69.9	46.4	65.2	49.9	67.5	18.6
Nitrate(as N)	10 (MAC) d	<0.1	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	0.10	0.08	<0.05
Nitrite(as N)	1 (MAC) d	<0.1	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia(as N)		0.10	0.10	0.08	0.11	0.39	0.20	0.53	0.27	0.47	0.11
Total Kjeldahl Nitrogen(as N)		0.56	0.65	0.46	0.7	3.4	3.3	2.3	0.7	0.7	0.6
Organic Nitrogen	0.15	0.46	0.55	0.38	0.59	3.01	3.10	1.77	0.43	0.23	0.49
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	0.021	<0.002	<0.002	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	6.0	5.9	6.4	13.9	5.6	12.2	6.9	12.5	5.1	16.7
Conductivity (us/cm)		1370	1370	1540	1360	1530	1320	1520	1250	1500	842
pH		7.70	7.76	7.61	7.76	7.75	7.50	7.90	7.72	7.52	7.59
Sulphate (as SO4)	250 (AO)	212	213	217	157	267	156	277	162	291	62
Hardness(as CaCO3)	80-100 [OG]	766	764	768	684	748	676	805	576	810	411
Aluminum	0.1 [OG]	0.05	0.05	0.05	0.09	0.09	0.08	0.08	0.07	0.10	0.05
Barium	1 [MAC]	0.235	0.233	0.225	0.129	0.193	0.119	0.164	0.091	0.208	0.071
Boron	5 [IMAC]	0.261	0.260	0.264	0.209	0.296	0.219	0.349	0.174	0.366	0.046
Cadmium	0.005 (MAC)	0.00003	<0.00002	<0.000014	0.000014	<0.000015	<0.000015	<0.000015	<0.000028	<0.000028	<0.000015
Calcium	-	184	184	178	164	164	163	180	139	178	102
Chromium	0.05 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002
Copper	1 [AO]	0.0008	0.0008	<0.002	<0.002	<0.002	<0.002	<0.002	0.0043	<0.002	0.003
Iron	0.3 [AO]	0.084	0.080	0.332	0.619	0.352	0.999	0.330	1.17	0.423	0.808
Lead	0.01 (MAC)c	<0.00002	<0.00002	0.00010	0.00022	0.00017	0.00020	0.00020	0.00022	0.00025	0.00019
Magnesium	-	74.1	74.1	78.8	66.7	82.3	65.4	86.4	55.7	89.1	38.2
Manganese	0.05 [AO]	0.854	0.846	0.407	0.472	0.290	0.466	0.334	0.391	0.378	0.258
Potassium	-	1.9	1.9	2.4	2.9	2.5	3.1	2.7	3.1	2.9	3.1
Sodium	200 [AO]	48.1	47.8	51.1	39.0	55.2	41.5	52.3	29.7	51.5	13.5
Zinc	5 [AO]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

**NOTES:**

1. All results expresses in mg/L unless otherwise noted.
2. ODWQS is the Ontario Drinking Water Quality Standards, MOE, revised 2001.
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13. IS indicates insufficient sample for analysis.
14. Shaded values indicate exceedance of ODWQS.

**TABLE E-2**  
**HISTORICAL WELL WATER QUALITY**  
**KINLOSS LANDFILL**

Chemical Parameter	ODWQS	OW16	OW16	OW16	OW16	OW16	OW16	OW16	OW16	OW16
		Nov-16	Jun-17	Nov-17	May-18	Nov-18	Jun-19	Nov-19	Jul-20	Nov-20
Alkalinity(as CaCO <sub>3</sub> )	30 - 500 [OG]	303	289	280	274	263	263	268	271	262
Chloride	250 [AO]	6.7	7.4	6.1	8.4	7.6	7.8	9.2	8.3	7.1
Nitrate(as N)	10 (MAC) d	0.6	0.68	0.2	0.48	0.38	0.27	0.21	0.68	0.33
Nitrite(as N)	1 (MAC) d	0.2	0.33	0.3	0.08	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia(as N)		0.04	<0.01	0.06	0.10	0.12	0.19	0.20	0.17	0.08
Total Kjeldahl Nitrogen(as N)		0.37	0.27	0.3	18.7	3.2	0.5	0.5	0.4	0.3
Organic Nitrogen	0.15	0.33	0.27	0.24	18.6	3.08	0.31	0.30	0.23	0.22
Phenols		<0.001	<0.001	<0.001	<0.001	0.025	<0.002	<0.002	<0.002	<0.002
Dissolved Organic Carbon(DOC)	5 [AO]	3.9	2.2	3.2	1.5	4.4	8.5	4.3	2.7	4.3
Conductivity (us/cm)		585	573	569	554	573	558	572	550	563
pH		7.99	7.93	8.01	8.04	7.81	7.99	7.97	7.79	7.82
Sulphate (as SO <sub>4</sub> )	250 (AO)	10	7	16	12	15	26	39	13	13
Hardness(as CaCO <sub>3</sub> )	80-100 [OG]	338	325	314	275	325	315	315	305	332
Aluminum	0.1 [OG]	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.03	0.05
Barium	1 [MAC]	0.081	0.072	0.066	0.064	0.080	0.056	0.081	0.091	0.095
Boron	5 [IMAC]	0.014	<0.005	0.012	0.009	0.010	0.007	0.011	0.012	<0.005
Cadmium	0.005 (MAC)	0.00004	<0.000014	<0.000014	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015	<0.000015
Calcium	-	90.8	85.7	83.5	71.3	88.5	83.4	84.5	80.0	86.4
Chromium	0.05 (MAC)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002
Copper	1 [AO]	0.0303	<0.002	<0.002	<0.002	<0.002	0.006	0.0027	<0.002	0.012
Iron	0.3 [AO]	0.023	<0.005	0.005	0.010	0.023	0.005	0.146	0.046	0.132
Lead	0.01 (MAC)c	<0.00002	<0.00002	<0.00002	0.00006	0.00005	0.00002	0.00007	0.00006	0.00007
Magnesium	-	27.0	26.9	25.6	23.6	25.3	26.0	25.2	25.6	28.2
Manganese	0.05 [AO]	0.366	0.218	0.117	0.116	0.177	0.073	0.135	0.096	0.154
Potassium	-	0.9	1.0	1.0	0.9	0.8	1.0	0.8	1.2	1.0
Sodium	200 [AO]	4.7	3.7	3.2	3.1	3.7	3.1	3.3	3.0	3.6
Zinc	5 [AO]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005

**NOTES:**

1. All results expresses in mg/L unless otherwise noted.
2. ODWQS is the Ontario Drinking Water Quality Standards, MOE, revised 2001.
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# APPENDIX

F

2020 LANDFILL  
CORRESPONDENCE



Ministry of the Environment  
Southwestern Region  
Barrie District Office  
1580 20th St E  
Owen Sound ON N4K 6H6  
Fax: (519)371-2905  
Telephone: (519) 371-6191

Ministère de l'Environnement  
Direction régionale du Sud-Ouest  
Bureau du district de Barrie  
1580 rue 20th E  
Owen Sound ON N4K 6H6  
Télécopieur: (519)371-2905  
Téléphone : (519) 371-6191



July 16, 2007

Mr. Hugh Nicol  
Township of Huron-Kinloss  
21 Queen Street  
PO Box 130  
Ripley, ON, N0G 2R0

**RECEIVED**

**JUL 19 2007**

TOWNSHIP OF  
HURON-KINLOSS

**RE: Kinloss Landfill Site - 2006 Annual Report**

Dear Mr. Nicol,

We have received a copy of the report titled "Township of Huron-Kinloss 2006 Annual Operations and Monitoring Report, Kinloss Landfill Site", dated March 2007 and prepared by R.J. Burnside & Associates Limited. A copy of the report was sent to the Ministry's technical support section for their review and their comments follow:

The landfill does not appear to be resulting in any major impacts to ground water quality. However, there are some issues that should be addressed in time for the next annual monitoring report.

- Two wells (OW7 and OW12) have traditionally been considered to be "background" wells. Well OW7 is quite often dry during the sampling events, and is thus not ideal as a background well. Well OW12, even though apparently up-gradient of the waste and exhibiting low concentrations of chloride, still exhibits concentrations of some parameters (eg. nitrate, total dissolved solids, sulphate) that are considerably higher than exhibited at other wells (OW5, OW6, OW7). Thus, it is possible that this well samples water that has been impacted by leachate. We are not convinced that either OW7 or OW12 are ideal as background wells.

A discussion about whether another well (eg. OW6) may be more appropriate should be provided. Samples obtained from this well have consistently shown concentrations of indicator parameters that are lower than in waters from OW12. Could this well be considered to be "cross-gradient" to the waste and thus useful as a "background" well?

- The concentrations of sulphate in waters sampled by OW13 and OW13INT are typically elevated, sometimes above the calculated RUG. The consultant has suggested that these are not representative of leachate impact because sulphate concentrations were much lower at Well OW4, which is otherwise more clearly impacted by leachate (eg. elevated

chloride, TDS, etc). Could these high sulphate concentrations be the result of a redox transition along the flowpath between OW4 and OW13? Consider that 1) iron, manganese and ammonia are elevated at OW4, but are significantly less at OW13; and, 2) nitrate and sulphate are not detected and lower, respectively, at OW4, whereas they are both elevated at OW13. These two patterns suggest that reducing conditions prevail around OW4, while oxidizing conditions prevail around OW13. Are the elevated sulphate concentrations a leachate impact? Is there an RUG issue at the eastern property boundary?

- Future reports would benefit from the inclusion of a hydrogeologic cross section. This is a useful tool for the visualization of topography and stratigraphy, and the relationship between the location of the waste, observation wells and property boundaries.
- Are the lands to the east that are leased by the Township a part of a formal Contaminant Attenuation Zone?

The ministry's surface water review did not identify any concerns with the report.

If you have any questions concerning this letter, please contact the undersigned at (519) 371-6191.

Yours truly,



---

Ian Mitchell, P.Eng.  
District Engineer  
Owen Sound Area Office

File Storage Number: SI BR HK C6 610

cc. David Hopkins - Burnside & Associates, Guelph  
Mark Harris/Scott Abernethy - MOE, London  
Helmut Pfeiffer - MOE, Owen Sound

**Ministry of the Environment and  
Climate Change**

Southwestern Region  
Owen Sound District Office  
3rd Flr  
101 17th St  
Owen Sound ON N4K 0A5  
Fax: (519) 371-2905  
Tel: (519) 371-6191

**Ministère de l'Environnement et de  
l'Action en matière de changement  
climatique**

Direction régionale du Sud-Ouest  
Bureau du district d'Owen Sound  
101 rue 17th, 3ème étage  
Owen Sound ON N4K 0A5  
Télécopieur: (519) 371-2905  
Tél: (519) 371-6191



August 20, 2015

Mr. Hugh Nichol  
Township of Huron-Kinloss  
PO Box 130  
21 Queen Street  
Ripley, ON N0G 2R0

Dear Mr. Nichol,

**RE: Kinloss Landfill Site - 2014 Annual Report**

We have received a copy of the report titled "Annual Monitoring Report – 2014, Kinloss Landfill Site, Township of Huron-Kinloss" dated March 2015 and prepared by WSP Canada Inc. A copy of this report was forwarded to our Regional Technical Support Section and comments from our Regional Hydrogeologist are provided in the attached memorandum.

If you have any questions concerning the attached, please contact the undersigned at (519) 371-6191.

Yours truly,

Ian Mitchell, P.Eng.  
District Engineer  
Owen Sound District Office

File Storage Number: SI BR HK C6 610

enclosure

cc. Simon Thuss, MOECC, London  
Neil McLean, WSP, Owen Sound  
Natasha Munn, MOECC, Owen Sound

Ministry of the Environment  
and Climate Change

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

Ministère de l'Environnement  
et de l'Action en matière de  
changement climatique

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



---

## MEMORANDUM

File No. SI BR HK C6 610

TO: Ian Mitchell  
District Engineer  
Owen Sound District

FROM: Simon Thuss  
Hydrogeologist  
Water Resources Unit – Technical Support Section

DATE: August 14, 2015

RE: Annual Monitoring Report - 2014  
Kinloss Landfill Site, Township of Huron-Kinloss  
IDS Reference No. 0481-9V5RQD

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As requested, I have reviewed the following report:

- "Annual Monitoring Report – 2014, Kinloss Landfill Site, Township of Huron-Kinloss" dated March 2015 and prepared by WSP Canada Inc.

The review was limited to the hydrogeological aspects of the landfill monitoring program as presented in the report.

The landfill site is situated on the south half of Lot 16, Concession 6 in the former Township of Kinloss, now within the amalgamated Township of Huron-Kinloss. The landfill site is operated under Provisional Certificate of Approval (C of A) No. A272801, most recently amended in April 2003. It is understood that the acceptance of household waste was discontinued in 2002; however, the site has not been permanently closed. Currently, only recyclable and burnable materials are collected at the site.

The current monitoring network includes eleven monitoring wells and two surface water monitoring stations. Groundwater level monitoring and sample collection is carried out twice per year (typically July and October).

The stratigraphy at the site generally consists of surficial sand or sand and gravel (up to 16.5 metres in

thickness), overlying lower permeability silt till. The shallow groundwater flow within the surficial granular deposit is indicated to be towards the east.

Landfill leachate impacts are observed within the surficial granular deposit downgradient of the landfill at monitoring wells OW4, OW13S and OW13I. Samples collected from these locations are characterized by elevated concentrations of several leachate indicator parameters, including: alkalinity, hardness, chloride, sulphate, nitrate, ammonia, TKN, organic nitrogen, DOC, boron, sodium, iron and manganese.

A Reasonable Use assessment was completed using the measured concentrations of alkalinity, boron, chloride, DOC and sodium. Consistent with previous results, the alkalinity and DOC concentrations at the downgradient monitoring wells continue to exceed the corresponding Reasonable Use Guideline (RUG) criteria.

The Township holds a 99-year lease on a portion of the property to the east of the site for the purpose of establishing a buffer zone for contaminant attenuation; however, the C of A for the site has not been amended to formally recognize this area as a Contaminant Attenuation Zone (CAZ).

Upon completing the review of the 2014 report, the following comments are provided:

1. In a previous letter dated July 16, 2012, the Consultant indicated to the Ministry that the exceedances of the RUG criteria at the OW13 well nest were anticipated to be representative of a "slug" of leachate impacted groundwater flowing past the monitoring point. At that time, the Consultant proposed an additional three years of monitoring to evaluate the groundwater quality at the downgradient property boundary. Given the ongoing exceedances of the RUG criteria at this location, additional work should now be undertaken to delineate the leachate plume and confirm that the impacts are sufficiently attenuated within the buffer area. Ideally, this would be achieved through the installation of additional monitoring wells downgradient of the property boundary; however, it is understood that the area may not be readily accessible by drilling rig. The Consultant is encouraged to discuss the monitoring plan with the Ministry prior to proceeding with the work.
2. As illustrated on Map 3 in the report, the shallow groundwater flow direction is inferred to be towards the east; however, the map indicates that a "drainage divide" is present near the western limit of the landfilled area, suggesting that there may also be a component of groundwater flow to the west in this portion of the site. Consideration should be given to the installation of an additional monitoring well to the west of the fill area to characterize the groundwater quality and flow direction in this area.
3. Monitoring wells OW9 and OW11 are reported to be "inactive" and are not included in the

monitoring program. Based on the borehole logs included in the report, these wells were not installed to a sufficient depth to intersect the shallow groundwater table. Since these wells are not suitable for monitoring, they should be properly abandoned in accordance with Ontario Regulation 903.

4. Monitoring wells OW4 to OW11 were reportedly constructed with slotted ABS pipe installed in excavated test pits. There is some potential that precipitation and surface runoff may "short-circuit" to these wells since the permeability of the backfill would be enhanced relative to the undisturbed native deposits. As such, the groundwater chemistry observed at these locations may not fully represent the ambient shallow groundwater conditions at the site. The Consultant should comment on the integrity of these wells and any implications for the data collected at these locations. Consideration should be given to supplementing the existing monitoring network with properly constructed monitoring wells at key locations to confirm the groundwater conditions in the shallow overburden.
5. The report indicates that hardness, iron and manganese were excluded from the Reasonable Use assessment because the background concentrations of these parameters have typically been elevated relative to the corresponding Ontario Drinking Water Quality Standards (ODWQS). Although the background concentrations may be slightly elevated, the concentrations of these parameters increase significantly downgradient of the landfill and are considered to be representative of leachate impacts. For example, the iron concentration at downgradient well OW4 generally ranges from 10 to 20 mg/L, while the background concentration appears to be less than 1 mg/L. Appropriate RUG criteria for hardness, iron and manganese should be developed and included in the assessment for future reports.
6. Sulphate was not included in the Reasonable Use assessment as this parameter is reportedly present in elevated concentrations in background well OW6; however, a review of the historical data does not support this conclusion. The sulphate concentration in OW6 has ranged between approximately 10 and 26 mg/L over the period of record and appears to be representative of the background groundwater quality. In comparison, the sulphate concentration at downgradient wells OW13S and OW13I have ranged between 252 and 626 mg/L. As such, the elevated sulphate appears to be representative of leachate impacts and should be included in the Reasonable Use assessment going forward.
7. Ammonia appears to be elevated downgradient of the landfill, with concentrations ranging between 15 and 40 mg/L at OW4. Ammonia can be nitrified to produce nitrate and nitrite in aerobic environments. Historically, nitrate concentrations as high as 10 mg/L have been measured in samples collected from OW13S and OW13I, and low concentrations of nitrite have also been occasionally detected in samples from these locations. In comparison, nitrate and nitrite



are typically not detected in the background well OW6. The elevated nitrate and relatively low ammonia concentrations at OW13S / OW13I suggest that nitrification of ammonia is actively occurring in the leachate plume downgradient of the landfill. As such, nitrate and nitrite should also be included in the Reasonable Use assessment.

8. A review of the historical data for OW13S and OW13I suggests that the conditions within the plume at the southeast property boundary may be becoming more reducing over time. Since approximately 2011, the concentration of ammonia in these wells has followed an increasing trend, with a corresponding decrease in the concentrations of nitrate and sulphate. Future monitoring reports should include a discussion of these trends and include time series plots for all key leachate indicator parameters.
9. Several minor editorial errors were noted in the report. Figure 4 (Indicator Parameters – Fall) appears to be missing from the report, and the data for downgradient wells OW13S and OW13I was not included on Figure 3 (Indicator Parameters – Spring). Appendix C appears to be missing the borehole logs for OW13S, OW13I and OW13D.

If you have any questions or require clarification on any of the points provided herein, please contact me at [Simon.Thuss@ontario.ca](mailto:Simon.Thuss@ontario.ca) or 519-873-5033.

Yours truly,



Simon Thuss, P.Geo.  
Hydrogeologist  
Technical Support Section  
Southwestern Region

**Limitations:**

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



101-16945-00

October 8, 2015

Mr. Ian Mitchell, P. Eng., District Engineer  
Ministry of the Environment and Climate Change  
Owen Sound District Office  
Third Floor  
101 17<sup>th</sup> Street East  
OWEN SOUND, ON  
N4K 0A5

Re: MOECC Response to Kinloss Landfill Site – 2014 Annual Monitoring Report

Dear Mr. Mitchell:

The Township of Huron Kinloss (Township) has asked WSP Canada Ltd. (WSP) to form a response to the technical memorandum generated by Mr. Simon Thuss on August 14, 2015 regarding the Kinloss Landfill Site. The following nine (9) points are intended to be in response to the nine (9) points in Mr. Thuss' memorandum:

1. The continued presence of impacts at OW13S and OW13I suggest landfill impacted water may persist in this portion of the Site. WSP agrees with the Ministry of the Environment and Climate Change (MOECC) recommendation for installation of additional monitoring wells downgradient of the OW13 well nest. However, as the lands are within the leased buffer lands (Legal CON 6 PT LOT 17 PT LOT 18, comprising 43.5 ha or 107.5 ac owned by Barry Johnston), which act as a contaminant attenuation zone (CAZ), some discussion with the landowner may be required. The presence of the small tributary of Kinloss Creek and the high water table in the vicinity of the OW13 well nest are factors that must be taken into consideration. WSP recommends the installation of one (1) shallow (+/-6 m) monitoring well adjacent to the west side of the tributary, directly downgradient of the OW13 well nest. This monitoring well would be installed in order to investigate the groundwater adjacent to the tributary. WSP proposes one (1) additional shallow (+/-6 m) monitoring well be installed on the east side of the tributary. This well will serve as confirmation that leachate impacts to groundwater are not leaving the buffer lands, and will also allow refinement for increased interpretation of the groundwater contours and flow direction in the buffer lands. These two (2) monitoring wells will allow RUG compliance to be determined at the eastern boundary.

WSP Canada Inc.  
1450 - 1st Ave W,  
Suite 101  
Owen Sound ON N4K 6W2  
www.wspgroup.com



Drilling of the proposed monitoring wells within a wetland may pose access challenges requiring road construction and winter drilling to enable O. Reg. 903 to be complied with, regarding water around the casing. WSP proposes to scout suitable locations for the wells during the Fall 2015 monitoring event at the landfill.

2. The drainage divide represented in Maps of the Kinloss Waste Disposal Site is expected to impact overland surface water flow at the Site, but not significantly impact groundwater flow, which is predominantly to the east, and largely affected by the soil stratigraphy. Furthermore, the waste is landfilled downgradient (east) of this divide.
3. The Township will explore the option of deepening wells OW9 and OW11 to intersect the water table at these locations. This would further refine groundwater contours upgradient of the waste and provide insight into the possible impacts of the nearby run off water divide on the nearby flow direction of groundwater, as discussed by the MOECC in Comment 2.
4. WSP acknowledges that implementation of wells in test pits is not an ideal method of installation and may lead to biased sampling results. However, OW11-85 is one of the upgradient "dry" monitoring points. Effectively, it is unlikely that leachate will be able to impact this location. Further, the wells were installed in 1985. Ergo, it is reasonable to assume that they have established an equilibrium with the surrounding shallow aquifer. Effectively, WSP recommends retaining the shallow OW4-85, referenced by the MOECC in Comment 4, as is, in order to continue to evaluate the long term trend of groundwater down gradient of the waste without changing the well, which may alter the existing trend.

In addition, WSP inspects the wells during each field monitoring event. Any required maintenance or well conditions that are felt to not reflect actual groundwater conditions are reported and passed on to the Township. The Township then deals with these concerns within a reasonable time frame. WSP proposes to continue the field screening of well integrity in the future and continuation of this method of maintenance.

5. WSP acknowledges that iron, hardness and manganese are commonly used in defining leachate impacts. WSP will give further consideration to the inclusion of these parameters in future RUG guidelines.
6. WSP acknowledges that sulphate is commonly used in defining leachate impacts. WSP will give further consideration to the inclusion of this parameter in future RUG guidelines.

101-16945-00  
October 8, 2015  
Mr. Ian Mitchell, P.Eng., District Engineer



7. Ammonia may be nitrified to produce nitrate and nitrite in oxidizing environments. As noted by the MOECC in Comment 5, iron and manganese are elevated in the downgradient groundwater. The dissolved presence of iron and manganese parameters is only possible in reduced environments, albeit, this only typically occurs at a lower pH than observed in the field and laboratory sampling. Effectively, the groundwater environment downgradient of the landfill appears to be highly reduced.

WSP suspects that other factors may be affecting the concentration of nitrate at this location, and that mixing of oxidized and reduced groundwater may be occurring in this location. This statement formed a part of the reasoning behind the original suspicion of the leachate impacts at OW13S and OW13I being a slug moving through the down gradient area. WSP believes that further investigation should be conducted on this topic before acceptance of these parameters in the RUG.

8. WSP agrees with Comment 8 and suggests incorporation of our response for this comment with those of Comment 7.
9. Editorial comments noted.

Should you have any further questions or comments, please do not hesitate to contact the undersigned.

Yours truly,

WSP Canada Inc.

A handwritten signature in black ink, appearing to read "Neil McLean", written over a horizontal line.

Neil McLean, M.Sc., P. Geo.  
Geoscientist  
/nrm/dlw

cc Mr. Stephen Cobean, P.Eng., WSP Canada Inc.  
Mr. Hugh Nichol – Township of Huron Kinloss

**Ministry of the Environment and  
Climate Change**  
Southwestern Region  
Owen Sound District Office  
3rd Flr  
101 17th St  
Owen Sound ON N4K 0A5  
Fax: (519) 371-2905  
Tel: (519) 371-8191

**Ministère de l'Environnement et de  
l'Action en matière de changement  
climatique**  
Direction régionale du Sud-Ouest  
Bureau du district d'Owen Sound  
101 rue 17th, 3ème étage  
Owen Sound ON N4K 0A5  
Télécopieur: (519) 371-2905  
Tél: (519) 371-8191



August 16, 2016

Mr. Hugh Nichol  
Township of Huron-Kinloss  
PO Box 130  
21 Queen Street  
Ripley, ON N0G 2R0

Dear Mr. Nichol,

**RE: Kinloss Landfill Site - 2015 Annual Report**

We have received a copy of the report titled "Annual Monitoring Report – 2015, Kinloss Landfill Site, Township of Huron-Kinloss" dated March 2016 and prepared by WSP Canada Inc. A copy of this report was forwarded to our Regional Technical Support Section and comments from our Regional Hydrogeologist are provided in the attached memorandum.

If you have any questions concerning the attached, please contact the undersigned at (519) 371-6191.

Yours truly,

A handwritten signature in dark ink, which appears to read 'Ian Mitchell', is written over a horizontal line.

Ian Mitchell, P.Eng.  
District Engineer  
Owen Sound District Office

File Storage Number: SI BR HK C6 610

enclosure

cc. Simon Thuss, MOECC, London  
Neil McLean, WSP, Owen Sound  
Sierra Gillies, MOECC, Owen Sound

Ministry of the Environment  
and Climate Change

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

Ministère de l'Environnement  
et de l'Action en matière de  
changement climatique

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



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## MEMORANDUM

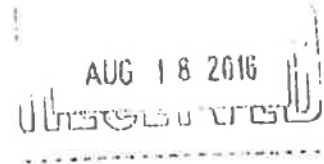
File No. SI BR HK C6 610

TO: Ian Mitchell  
District Engineer  
Owen Sound District

FROM: Simon Thuss  
Hydrogeologist  
Water Resources Unit – Technical Support Section

DATE: August 9, 2016

RE: Annual Monitoring Report - 2015  
Kinloss Landfill Site, Township of Huron-Kinloss  
IDS Reference No. 3866-A7VQEQ



---

As requested, I have reviewed the following report:

- "Annual Monitoring Report – 2015, Kinloss Landfill Site, Township of Huron-Kinloss" dated March 2016 and prepared by WSP Canada Inc.

The review was limited to the hydrogeological aspects of the landfill monitoring program as presented in the report.

The landfill site is situated on the south half of Lot 16, Concession 6 in the former Township of Kinloss, now within the amalgamated Township of Huron-Kinloss. The landfill site is operated under Provisional Certificate of Approval (C of A) No. A272801, most recently amended in April 2003. It is understood that the acceptance of household waste was discontinued in 2002; however, the site has not been permanently closed. Currently, only recyclable and burnable materials are collected at the site.

I previously reviewed the 2014 Annual Report for the Kinloss Landfill Site, with comments provided in a memorandum dated August 14, 2015. WSP Canada Inc. responded to these previous comments in a letter dated October 8, 2015.

In response to my previous comments, the Consultant has proposed to carry out some additional site



work in 2016. As detailed in the October 8, 2015 letter and the 2015 Annual Report, monitoring wells OW9 and OW11 will be deepened/replaced, facilitating better characterization of the background groundwater quality and the groundwater flow direction in the western portions of the site. In addition, two new monitoring wells will be installed downgradient of the OW13 well nest to evaluate groundwater quality within the leased buffer lands to the east of the site.

Consistent with data collected in previous years, in 2015 landfill leachate impacts were observed within the surficial granular deposit downgradient of the landfill at monitoring wells OW4, OW13S and OW13I. Samples collected from these locations are characterized by elevated concentrations (relative to background) of several leachate indicator parameters, including: alkalinity, hardness, chloride, sulphate, nitrate, ammonia, TKN, organic nitrogen, DOC, boron, sodium, iron and manganese.

A Reasonable Use assessment was completed using the measured concentrations of alkalinity, boron, chloride, DOC and iron. Consistent with previous results, concentrations of alkalinity (at OW13S and OW13I) and DOC (at OW13I spring 2015 only) continue to exceed the corresponding Reasonable Use Guideline (RUG) criteria.

Upon completing the review of the 2015 report, the following comments are provided:

1. In response to my previous comments, the Consultant re-evaluated the RUG criteria and added iron to the list of parameters used in the assessment for the 2015 annual report. I maintain my opinion that several other parameters (including at least hardness, manganese and sulphate) should also be included in the RUG assessment as these parameters are elevated in the downgradient wells and are thus indicative of leachate impacts at the Kinloss Landfill site.

For example, using the average background concentrations measured at OW6 between 2007 and 2015, the RUG criteria for hardness and sulphate would be approximately 285 and 133 mg/L, respectively. A RUG criterion of 0.23 mg/L for manganese could also be developed using the maximum background concentration observed at OW6 (May 2015).

Given these values, the current concentrations of hardness and sulphate at both OW13S and OW13I would exceed the RUG criteria (in addition to the exceedances of alkalinity and DOC identified by the Consultant). Though not considered a compliance point, samples from OW4 would also exceed the RUG criteria for alkalinity, DOC, hardness, iron and manganese. The inclusion of these additional parameters in the RUG assessment provides a more comprehensive evaluation of the leachate impacts to groundwater quality downgradient of the landfill.

All relevant indicator parameters (i.e. all parameters which are elevated above background concentrations within the leachate or downgradient of the landfill) should be included in the RUG

assessment for future monitoring reports. This will be of particular importance when evaluating the groundwater quality within the leased buffer lands to the east of the site.

2. The elevated concentrations of ammonia in samples from OW4 (typically >20 mg/L) and OW13S/OW13I (typically 0.5 to 3.6 mg/L) are indicative of leachate impacts. Although reducing conditions are anticipated within the leachate plume near OW4 and OW13, it is anticipated that the ammonia may be converted to nitrate where the plume mixes with more oxic groundwater downgradient of the site. Accordingly, my previous comments recommended that nitrate and nitrite should be included in the RUG assessment in future reports.

It is acknowledged that the RUG assessment may be complicated by the presence of organic nitrogen within the shallow aquifer. For example, elevated concentrations of organic nitrogen and TKN have been historically measured in samples from the background well OW6. However, concentrations of other nitrogen compounds (ammonia, nitrate, nitrite) are typically low at this location (<0.3 mg/L for ammonia, nitrate and nitrite not detected).

The use of nitrate and nitrite in the RUG assessment should be reconsidered once additional data is available to characterize groundwater quality upgradient and downgradient of the landfill (i.e. new wells to be installed in 2016).

3. The 2015 annual report suggests that groundwater quality appears to be improving at OW13S and OW13I since (aside from alkalinity), only DOC was identified above the RUG criteria in OW13I during the spring 2015 monitoring event. However, as detailed in the two comments above, this evaluation does not consider the other relevant leachate indicator parameters.

A review of the historical data suggests that the concentration of several leachate indicator parameters (primarily chloride, sulphate, hardness, alkalinity and conductivity) at OW13S and OW13I peaked in approximately 2007. The chloride concentration has since decreased significantly and is now starting to approach background concentrations. Although hardness, sulphate and conductivity have also followed a declining trend since approximately 2007, these parameters are still significantly elevated relative to background conditions. This data suggest that while there has been some improvement in groundwater quality at the OW13 well nest since 2007, this location remains impacted by leachate.

Future reports should include time-series plots for key indicator parameters (in addition to chloride) to further characterize any trends in groundwater quality at the site.

4. There appears to be two minor errors in the calculated RUG criteria as summarized in Table 4 of the 2015 annual report. Since boron is considered a "health-related" parameter, a constant of 0.25

should be used in the RUG calculation. Accordingly, given the average background concentration of 0.023 mg/L, and an ODWS IMAC of 5 mg/L, the RUG criterion for boron should be 1.27 mg/L.

The RUG criterion for iron (0.5 mg/L) is less than the average background concentration (0.7 mg/L). In cases where the background concentration exceeds the applicable ODWS, it is suggested that the RUG criterion be set at the maximum observed background concentration (1.4 mg/L for iron at OW6).

All RUG criteria should be re-evaluated once additional background data becomes available.

If you have any questions or require clarification on any of the points provided herein, please contact me at [Simon.Thuss@ontario.ca](mailto:Simon.Thuss@ontario.ca) or 519-873-5033.

Yours truly,



Simon Thuss, P.Geo.  
Hydrogeologist  
Technical Support Section  
Southwestern Region

**Limitations:**

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

Ministry of the Environment,  
Conservation and Parks  
Southwestern Region  
Owen Sound District Office  
3rd Flr  
101 17th St  
Owen Sound ON N4K 0A5  
Fax: (519) 371-2905  
Tel: (519) 371-6191

Ministère de l'Environnement, de la  
Protection de la nature et des  
Parcs  
Direction régionale du Sud-Ouest  
Bureau du district d'Owen Sound  
101 rue 17th, 3ème étage  
Owen Sound ON N4K 0A5  
Télécopieur: (519) 371-2905  
Tél: (519) 371-6191



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SEP 17 2018

September 13, 2018

Mr. Hugh Nicol  
Township of Huron-Kinloss  
PO Box 130  
21 Queen Street  
Ripley ON N0G 2R0

Dear Mr. Nicol,

**RE:** Kinloss Landfill 2017 Annual Report

We have received a copy of the report titled "Annual Monitoring Report (2017), Kinloss Landfill Site" dated March 2018 and prepared by WSP. Staff from our technical support section reviewed the above report, as well as the 2016 annual report, and our regional hydrogeologist provides the following comments on the hydrogeological aspects of the 2016 and 2017 annual reports. Our hydrogeologist attended the site on September 5, 2018, to supplement his understanding of the conditions on the site and surrounding area.

Consistent with data collected in previous years, the 2016/2017 data indicates leachate impacts within the surficial granular deposit downgradient of the landfill at monitoring wells OW4, OW13S and OW13I. Samples collected from these locations are characterized by elevated concentrations (relative to background) of several leachate indicator parameters, including: alkalinity, hardness, sulphate, nitrate, ammonia, TKN, DOC, boron, sodium, iron and manganese.

Based on data collected from the new downgradient monitoring wells, offsite leachate impacts appear to extend to at least OW15, with elevated concentrations of several leachate indicator parameters at this location. The groundwater chemistry observed at OW16 appears to be consistent with background conditions at the site. It is noted that the saturated organic soils in the area of OW15 and OW16 may influence the shallow groundwater chemistry for these wells (e.g. DOC, manganese).

Upon reviewing the 2016 and 2017 monitoring reports for the Kinloss landfill site, the following comments are provided:

1. In response to previous review comments, the Consultant has argued that it is "excessive" to include several parameters (including nitrate and nitrite) in the Reasonable Use Assessment. The Consultant has claimed that certain parameters (e.g. manganese and

sodium) are redundant since other parameters (iron and chloride) are already being evaluated. Based on this response, it appears that there may be some misunderstanding regarding the purpose of the Reasonable Use assessment. The Reasonable Use assessment is not intended as a simple test to identify the presence or absence of leachate in groundwater. The Reasonable Use Guideline establishes procedures for determining what constitutes the reasonable use of groundwater on property adjacent to sources of contaminants, and establishes limits on the discharge of contaminants from landfill sites and other waste disposal facilities. Given the many factors that can affect the geochemical conditions within the leachate plume (e.g. heterogeneous distribution of waste, weathering/decomposition of waste over time, changing redox conditions over time and/or distance along the plume), the critical contaminants with respect to Reasonable Use may vary by time and monitoring location at a given site.

For these reasons, the Reasonable Use assessment should consider all contaminants that potentially originate from the landfill site. In general, the standard practice used at other similar landfill sites is to develop Reasonable Use criteria for all parameters that have corresponding drinking water standards. In completing the assessment, consideration is given to other sources of contamination that may affect specific monitoring locations (e.g. road salt impacts adjacent to roadways).

If the Consultant requires additional guidance on this issue, a teleconference or meeting can be scheduled to discuss these concerns.

2. Specific to nitrate and nitrite, the Consultant believes that these parameters should not be included in the Reasonable Use Assessment “due to the typical lack of these parameters in reducing groundwater conditions, typically associated with leachate impacted groundwater”.

It is our hydrogeologist’s opinion, as previously stated, that elevated concentrations of ammonia have been observed downgradient of the landfill, and that ammonia may potentially be nitrified to produce nitrate and nitrite as the plume mixes with more oxic groundwater downgradient of the site. Accordingly, nitrate and nitrite should be included in the Reasonable Use assessment. It is acknowledged that nearby sources (e.g. agricultural activities or decomposition of organic nitrogen) may also contribute to nitrate in groundwater.

3. There appears to be a calculation error in the Reasonable Use criterion for hardness. As shown in Table 4, the Reasonable Use criterion for hardness (248 mg/L) is less than the background concentration measured at OW11-16 (396 mg/L). In cases where the background concentration exceeds the applicable drinking water standard, it is suggested that the Reasonable Use criterion be set at the maximum observed background concentration.
4. The report should include an updated east-west cross-section, including the new wells OW11-16, OW15 and OW16. The cross-section should include the interpreted stratigraphy, limits of the waste, and current groundwater levels.

5. The ECA should be amended to formally recognize the leased buffer lands as a Contaminant Attenuation Zone for the site.
6. As previously recommended, the report should include time series plots for several key indicator parameters (in addition to chloride). The purpose of these plots is to further characterize any groundwater quality trends at the site.

Please contact me at (519) 371-6191, if you would like to arrange a teleconference to discuss the above comments or if you have any questions concerning this letter.

Yours truly,



---

Ian Mitchell, P.Eng.  
District Engineer  
Owen Sound District Office

File Storage Number: SI BR HK C6 610

cc.     Natasha Munn, MECP Owen Sound  
          Simon Thuss, MECP London  
          Norm Bell, WSP, Owen Sound



Ministry of the Environment,  
Conservation and Parks  
Southwestern Region  
Owen Sound District Office  
3rd Flr  
101 17th St  
Owen Sound ON N4K 0A5  
Fax: (519) 371-2905  
Tel: (519) 371-6191

Ministère de l'Environnement, de la  
Protection de la nature et des  
Parcs  
Direction régionale du Sud-Ouest  
Bureau du district d'Owen Sound  
101 rue 17th, 3ème étage  
Owen Sound ON N4K 0A5  
Télécopieur: (519) 371-2905  
Tél: (519) 371-6191



RECEIVED

OCT 17 2018

October 2, 2018

Mr. John Yungblut  
Township of Huron-Kinloss  
PO Box 130  
21 Queen Street  
Ripley ON N0G 2R0

Dear Mr. Yungblut

**RE:** Kinloss Landfill 2017 Annual Report

Further to my letter to the municipality dated September 13, 2018, containing groundwater comments for the Kinloss Landfill Site 2017 Annual Monitoring Report, our regional surface water specialist has reviewed the annual report and provides the following comments:

This site is currently mothballed. The site is currently capped and the landfill has not accepted waste since August 2002. Only recyclables are collected and transferred from the site (page 2). Surface water sampling is completed in spring and fall from two sites (upstream and downstream) from a creek running adjacent to the landfill.

Page 13 of the report notes that only zinc exceeded the PWQO in the downstream (SW2) location. A subsequent duplicate was collected and it was determined that upstream (SW1) also exceeded the PWQO for zinc.

All sampled parameters remain within historical norms (Appendix G.2); accordingly there are no surface water issues associated with the site.

No changes are recommended to the surface water monitoring program for 2018 (page 18). Our surface water reviewer has no additional comments.

If you have any questions concerning this letter, please contact me at (519) 371-6191.

Yours truly,

---

Ian Mitchell, P.Eng.  
District Engineer  
Owen Sound District Office

File Storage Number: SI BR HK C6 610

cc.     Natasha Munn, MECP Owen Sound  
          Hugh Geurts, MECP London  
          Norm Bell, WSP, Owen Sound



December 13, 2018

Mr. Ian Mitchell, District Engineer  
Ministry of the Environment, Conservation and Parks  
101 17th Street East  
3rd Floor  
OWEN SOUND, ON  
N4K 0A5

**Subject: Response to MECP Comments on 2017 Annual Monitoring Report - Kinloss Landfill**

Dear Mr. Mitchell:

Thank you for providing WSP Canada Inc. (WSP) with the opportunity to review the comments prepared by the Ontario Ministry of the Environment, Conservation and Parks (MECP) (Southwestern Region) on September 13, 2018 following their hydrogeologist's review of the 2017 Annual Monitoring Report (2017 AMR), Kinloss Landfill Site (Site), dated March 2018 as prepared by WSP. WSP has also received comments from MECP dated October 2, 2018 relating to the surface water monitoring.

WSP have reviewed the September 13, 2018 comments (restated below in italics) and have prepared the following responses for your consideration. These responses may influence the scope of work required by WSP to address these comments to the satisfaction of the MECP. No comments are required with respect to the October 2, 2018 letter.

In preparing our response to the September 13, 2018 comments, WSP reviewed the content of the 2017 AMR and consulted our team responsible for landfill monitoring in other jurisdictions. We have proposed a solution to become more consistent with the MECP expectations and to provide more clarity with respect to the task of monitoring to identify potential impacts related to the inactive landfill. In addition to a response to each comment, WSP has prepared a concise list of recommended actions to be followed for the preparation of the 2018 AMR, pending direction from the Township of Huron-Kinloss (Township) and agreement from MECP (where appropriate).

- 1 *In response to previous comments, the consultant has argued that it is "excessive" to include several parameters (including nitrate and nitrite) in the Reasonable Use Assessment. The Consultant has claimed that certain parameters (e.g. manganese and sodium) are redundant since other parameters (iron and chloride) are already being evaluated. Based on this response, it appears that there may be some misunderstanding regarding the purpose of the Reasonable Use assessment. The Reasonable Use assessment is not intended as a simple test to identify the presence or absence of leachate in groundwater. The Reasonable Use Guideline establishes procedures for determining what constitutes the reasonable use of groundwater on property adjacent to sources of contaminants, and establishes limits on the discharge of contaminants from landfill sites and other waste disposal facilities. Given the many factors within the leachate plume (e.g. heterogeneous distribution of waste, weathering/decomposition of waste over time, changing*

Suite 101  
1450, 1st Avenue West  
Owen Sound, ON, Canada N4K 6W2

T: +1 519 376-7612  
F: +1 519 376-8008  
wsp.com

WSP Canada Inc.



*redox conditions over time and/or distance along the plume), the critical contaminants with respect to Reasonable Use may vary by time and monitoring location at a given site.*

*For these reasons the Reasonable Use assessment should consider all contaminants that potentially originate from the landfill site. In general, the standard practice used at other similar landfill sites is to develop Reasonable Use criteria for all parameters that have corresponding drinking water standards. In completing the assessment, consideration is given to other sources of contamination that may affect specific monitoring locations (e.g. road salt impacts adjacent to roadways).*

*If the Consultant requires additional guidance on this issue, a teleconference or meeting can be scheduled to discuss these concerns.*

WSP understands the purpose of the Reasonable Use Assessment process. It is our experience that there is some flexibility in the application of this approach between MECP jurisdictions. The approach followed at this site has been based on observations that this is an inactive landfill site where the impacts from ongoing generation of landfill leachate appear to be reducing naturally (see discussion in response to point 6) and the interest of our client to work to minimize efforts related to ongoing monitoring and reporting associated with inactive landfills.

Review of the available monitoring data indicates that the current monitoring program includes the following parameters that have an Ontario Drinking Water Quality Standard (ODWQS) value:

- Alkalinity
- Chloride
- Nitrate\*
- Nitrite\*
- Organic Nitrogen\*
- Dissolved Organic Carbon
- Sulphate
- Hardness
- Aluminum\*
- Barium\*
- Boron
- Cadmium\*
- Chromium\*
- Copper\*
- Iron
- Lead\*
- Manganese
- Sodium\*; and
- Zinc\*.

In response to the MECP comment, WSP proposes to calculate Reasonable Use Criteria (RUC) for this entire suite of parameters based on the concentrations measured at background well (OW11-16). Parameters marked with an asterisk are not currently included in the evaluation of reasonable use criteria (Tables 4 and 4A). Note that the observed concentrations of many of the metals parameters are less than the method detection limits.

*Specific to nitrate and nitrite, the Consultant believes that these parameters should not be included in the Reasonable Use Assessment “due to the typical lack of these parameters in reducing groundwater conditions, typically associated with leachate impacted groundwater.*

*It is our hydrogeologist's opinion, as previously stated, that elevated concentrations of ammonia have been identified downgradient of the landfill and that ammonia may potentially be nitrified to produce nitrate and nitrite as the plume mixes with more oxic groundwater downgradient of the site. Accordingly, nitrate and nitrite should be included in the Reasonable Use assessment. It is acknowledged that nearby sources off agricultural activities or decomposition of organic nitrogen) may also contribute to nitrate in groundwater.*

WSP agrees that RUC values are to be calculated for nitrate and nitrite as there is a drinking water quality objective for these values. WSP has consulted our team involved in landfill monitoring across Ontario and have found that a variety of approaches are used to monitor nitrogen transformations in areas where there is anaerobic water in which ammonia is the stable form of nitrogen species (and where nitrate and nitrite are typically absent). As there is no drinking water standard available for ammonia, WSP proposes to use the RUC calculated for nitrate (as N) to identify situations when concentrations of ammonia (as N) have potential to transform to nitrate. This approach may show some historical circumstances where elevated ammonia concentrations have been elevated relative to the RUC value, but overall recent samples are likely to comply. WSP would like to have confirmation from MECP that this approach will be acceptable.

- 2 *There appears to be a calculation error in the Reasonable Use criterion for hardness. As shown in Table 4, the Reasonable Use criterion for hardness (248 mg/L) is less than the background concentration measured at OW11-16 (396 mg/L). In cases where the background concentration exceeds the applicable drinking water standard, it is suggested that the Reasonable Use criterion be set at the maximum observed background concentration.*

WSP has reviewed Tables 4 and 4A in the 2017 AMR and have observed that some of the RUC reported in the 2017 AMR are in error.

Firstly, the method employed by WSP to calculate the RUC for Hardness as presented in Table 4 is based on the average parameter values observed at OW6 between 2007 and 2015. The value for Hardness shown in Table 4 was obtained using the formula provided in the guidance is 179 mg/L. This value does not reflect the direction that a maximum background value is to be used when background concentrations are greater than the ODWQS value. Note that the background concentrations were considered for some parameters (eg. Iron and manganese).

To be correct in terms of the MECP comment provided above, this value is to reflect the maximum hardness value observed, which would be 284 mg/L. The RUC values for hardness presented in Table 4 have not been updated to reflect monitoring data obtained since 2016 and have consistently used the calculated value for hardness and not the maximum value.

Secondly, Table 4A in the 2017 AMR presents the RUC calculated using OW11-16 as the background monitor and this table shows a RUC for Hardness of 248 mg/L. This RUC value was calculated using the formula provided in the guidance, and does not reflect the maximum background value. Use of the maximum value observed at OW11-16 would increase the RUC value to 296 mg/L and would reduce the number of occurrences of an exceedance of the RUC in the monitoring. Hardness continues to be elevated in the monitoring wells downgradient of the landfill.

Review of the chloride concentrations for OW11-16 indicates that this well can reasonably be considered as reflecting background water quality, however the hardness values are elevated relative to OW5, OW6, OW7, OW13-D (most events); and OW16. Hardness values appear to be elevated at wells where landfill leachate is present.

Table 4 has continued to be used to present reasonable use values based on OW6 as background as there is a longer data record available for OW6 relative to OW11-16. This practice is explained in the





2017 AMR. WSP understands that OW11-16 was installed with the expectation that this would be used in the future as the background well once sufficient data is available (three years).

WSP proposes that for the 2018 report, that the reasonable use calculations be updated to reflect use of OW11 as the background well and to ensure that the calculation consistently reflects the practice of assuming the maximum value when the background value is higher than the drinking water quality objective. This is a reasonable approach for Hardness in Ontario, as most groundwater has hardness values that are greater than the range for the ODWQS.

In review of the RUC calculations, WSP also noted that the RUC for Manganese in Table 4 did not reflect that background concentrations at OW6 were greater than the ODWQS. The corrected value for the RUC is 0.23 mg/L.

- 3 *The report should include an updated east-west cross-section, including the new wells OW11-15, OW15 and OW16. The cross-section should include the interpreted stratigraphy, limits of the waste, and current groundwater levels.*

The current cross-section was prepared by a previous consultant, prior to the installation of OW11-15, OW15 and OW16. WSP agrees that this section line can be updated to reflect new data along an “approximate flowpath” from OW11-16 through OW14, OW4, OW13 (3 levels), OW15 and OW16. WSP also recommends including the surface water feature on the cross-section to better reflect the groundwater flow path.

Although WSP agrees that this section line can be updated, we do not believe that presentation of this section line will change the understanding of conditions, although it will more clearly illustrate the current distribution of monitoring points along the primary groundwater flowpath beneath and downgradient of the landfill and discharge relationships to the stream.

- 4 *The ECA should be amended to formally recognize the leased buffer lands as a Contaminant Attenuation Zone for the site.*

WSP notes that this landfill is currently operating under amended Certificate of Approval No. A272901. WSP agrees that it is appropriate to update the amended Certificate of Approval No. A272901 for this site to an Environmental Compliance Approval (ECA) to recognize the leased buffer lands as a Contaminant Attenuation Zone (CAZ). Assistance from MECP is requested to ensure that the Township understands the technical effort, including costs to negotiate with MECP, associated with submitting the request to update the Certificate of Approval to an ECA.

- 5 *As previously recommended, the report should include time series plots for several key indicator parameters (in addition to chloride). The purpose of these plots is to further characterize any groundwater quality trends at the site.*

The trend plots presented for chloride illustrate an interesting trend for the conservative contaminant parameters associated with landfill leachate. Chloride concentrations show that a pulse of elevated concentrations passed OW4 between 2000 and 2010. Since 2010, the chloride concentrations at this location have remained low. A similar pulse has been observed to pass through other monitoring locations (OW14 – 2003-2007; OW13D – 2013; OW13-I – 2004-2014 (although tail continues to 2017)). These data show that the highest concentrations at downgradient monitors is substantially lower than was observed at OW4-85. These trends are consistent with what would be expected from a landfill that closed in 2002.

This type of trend indicates that the primary release of contaminants from this source occurred as a pulse that is now reflected by concentrations that are less elevated relative to background than the original.



With this as the typical behaviour shown for a conservative parameter from the landfill, a non-conservative parameter would be expected to behave in one of two ways:

- 1 Follow a similar trend of a pulse passing through with a lower peak concentration and a shorter time (due to degradation/transformation). Peak concentrations would be observed at distances further downgradient along the flowpath.
- 2 For a parameter that is stable in anoxic conditions within a landfill leachate, the above trend could be accompanied by an increase in concentrations of the oxygenated species (for example ammonia would transform to nitrate/nitrite; sulphide would transform to sulphate). Typically, the profile of the second species would also form a pulse (potentially with a longer tail).

WSP agrees that there may be benefit in revisiting the presentation of trend plots, to confirm that these “pulse trends” are occurring and that there are no trends of increasing parameter concentrations in a downgradient well. The current trend plots (Figure 4) do not clearly show the pulses, nor allow the reader to distinguish trends at different spots along the flow path.

WSP proposes to replace the current trend plot in Figure 4 (Chloride vs time) with additional trend plots for select parameters along a profile that corresponds to the primary flow path through the site. This flowpath would be defined by OW11-16 (upgradient) OW14; OW4; OW13-I; OW15 and OW16. Concentration trend plots for selected parameter would be plotted on an individual graph and presented on a single page for these six monitors. A page would be prepared for the following parameters: Chloride, Boron, Barium, Sulphate, Ammonia, Nitrate, and DOC. WSP has prepared this list based on the list of indicator parameters and the suitability of these parameters to reflect the presence of potential contaminants in both an anaerobic or aerobic groundwater state and a range of solute velocities in groundwater. Other parameters can be plotted in the event that evidence of an increasing trend is observed at a downgradient monitor. The graph scales will be selected to be consistent for the available monitoring record and for the observed concentration range of each parameter.

## RECOMMENDED ACTIONS

Pending authorization from the Township of Huron-Kinloss and agreement of MECP, WSP proposes to consider incorporating the following changes in the 2018 AMR.

- 1 Prepare updated RUC calculations for all parameters with a drinking water standard. The complete list of parameters is presented in response to comment 1. A Reasonable Use criterion value for ammonia (as N) will be developed based on the Nitrate (as N) concentration and ODWQS to reflect the potential risks associated with transformation of ammonia to nitrate. Updated RUC calculations will reflect average background concentrations at OW11-16 and, where background values are higher than the drinking water quality objective, the maximum value observed at OW11-16. The RUC will be updated in each annual report as new background values are calculated each year. These values are expected to be relatively stable moving forward as a longer data record is available for OW11-16. Moving forward, Table 4A will replace Table 4.
- 2 Prepare an updated plan and cross-section along the groundwater flow path as requested by MECP. This updated section will illustrate the new wells and will include the surface water course. This drawing will need to be regenerated as the current drawing was prepared by others and has not been updated regularly.
- 3 Initiate the process to amend the ECA to formally recognize the leased buffer lands as a Contaminant Attenuation Zone for the site.
- 4 Replace Figure 4 with a series of trend plots to illustrate parameter concentration changes over time at key points in the groundwater flow path for a series of parameters that are associated with the landfill leachate. Plots would be prepared to illustrate parameter concentration trends for:



OW11-16 (upgradient) OW14; OW4; OW13-I; OW15 and OW16 in separate graphs presented on a single page. Graphs would be prepared for the following parameters that reflect the presence of landfill impacts: Chloride; Boron, Barium, Sulphate; Ammonia; Nitrate; and DOC. Plots on each page will be prepared with consistent time scales and concentration scales to illustrate the changes in concentration along the flow path over time. Review of this figure will focus on identifying potential presence of increasing parameter trends, particularly in locations downgradient of the landfill. When increasing trends are observed, WSP shall review data for other parameters and prepare additional trend plots.

- 5 WSP believes that these updated concentration trend plots will effectively replace the current bar graphs presented as Figure 3 as well as Figure 4, and request that MECP provide direction that the current Figure 3 may also be removed/replaced.

WSP will be pleased to provide the Township with a fee estimate to reflect the additional effort required to address the MECP concerns and update the 2018 reports in accordance with these recommendations upon agreement to the proposed changes by MECP and to prepare the ECA amendment.

Please feel free to contact us to discuss these comments.

Yours truly,

Norman A. Bell, P.Geo.  
Senior Hydrogeologist / Project Geoscientist

Lloyd A. Lemon, M.Sc., P.Geo.  
Senior Project Geoscientist, Team Lead -  
Environmental Management

LAL/NAB

cc: Mr. John Yungblut, Township of Huron-Kinloss  
Ms. Natasha Munn, MECP  
Mr. Simon Thuss, MECP

WSP ref.: 121-60018-11

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Lemon\_Response to MECP Comments on 2017 AMR - Kinloss Landfill\_Letter.pdf.docx

Ministry of the Environment,  
Conservation & Parks  
Owen Sound District Office

101 17<sup>th</sup> Street East, 3<sup>rd</sup> Floor  
Owen Sound ON N4K 0A5  
Tel.: 519-371-2901  
Fax.: 519-371-2905

Ministère de l'Environnement, de la Protection de  
la nature et des Parcs  
Bureau de district d'Owen Sound

101 17<sup>ème</sup> rue Est, 3<sup>e</sup> étage  
Owen Sound ON N4K 0A5  
Tél. : 519-371-2901  
Télééc. : 519-371-2905



November 30, 2020

Mr. John Yungblut  
Township of Huron-Kinloss  
PO Box 130  
21 Queen Street  
Ripley ON N0G 2R0

Via email: [jyungblut@huronkinloss.com](mailto:jyungblut@huronkinloss.com)

Dear Mr. Yungblut,

Re: Kinloss Landfill 2019 Annual Report  
MOE File: SI BR HK C6 610

We have received a copy of the report titled “2019 Annual Monitoring Report, Kinloss Landfill Site”, dated July 2020, and prepared by WSP. A copy of this report was forwarded to our Regional Technical Support Section for review. Our Regional Hydrogeologist reviewed the report and provides the following comments limited to the hydrogeological aspects of the landfill monitoring program as presented in the 2019 report.

The results of the 2019 groundwater monitoring program were generally consistent with data collected in previous years. Leachate impacts are observed in monitoring wells downgradient of the landfill, including OW4, OW13S, OW13I and OW15. Samples collected from these locations are characterized by elevated concentrations of several leachate indicator parameters in excess of the Reasonable Use Guideline (RUG) criteria, including alkalinity, hardness, iron, DOC and manganese. Iron, DOC, and manganese are also slightly elevated at several upgradient or cross-gradient locations, indicating that there is some natural variability in the background concentration of these parameters. Samples collected at OW16 continue to return results similar to background groundwater quality, indicating that the leachate plume is sufficiently attenuated on the downgradient property.

Upon reviewing the 2019 monitoring reports for the Kinloss landfill site, the following comments are provided:

1. Section 3.5 of the report argues that it is “excessive” to include several parameters (including nitrate and nitrite) in the Reasonable Use Assessment. However, as detailed in the December 13, 2018 letter from WSP, the consultant has previously agreed to include these parameters in the assessment. As mentioned previously, if the Consultant requires additional guidance on this issue, it is recommended that a teleconference be scheduled to discuss these concerns.

2. As detailed in the December 13, 2018 letter from WSP, the consultant has proposed to use the RUG criterion for nitrate (as N) to set a compliance limit for the concentration of ammonia at the boundary well locations. It is suggested that that a compliance criterion for ammonia is not needed at this time, provided that the downgradient ammonia concentration remains low and nitrate and nitrite are included in the RUG assessment going forward.

In the letter dated December 13, 2018, from WSP, they acknowledged that the ECA should be amended to formally recognize the CAZ on the leased lands located to the east of the site. Could you please provide an update on the status of the ECA amendment application to recognize the leased buffer lands as CAZ.

If you have any questions concerning this letter or the attached memo, please contact me at (519) 374-1388.

Sincerely,



Ian Mitchell  
District Engineer  
Owen Sound District

cc. Stephen Taziar, WSP Owen Sound, [Stephen.Taziar@wsp.com](mailto:Stephen.Taziar@wsp.com)  
Lisa Hines, MECP, Owen Sound  
Simon Thuss, MECP, London



Ministry of the Environment,  
Conservation & Parks  
Owen Sound District Office

101 17<sup>th</sup> Street East, 3<sup>rd</sup> Floor  
Owen Sound ON N4K 0A5  
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Ministère de l'Environnement, de la Protection de  
la nature et des Parcs  
Bureau de district d'Owen Sound

101 17<sup>ème</sup> rue Est, 3<sup>e</sup> étage  
Owen Sound ON N4K 0A5  
Tél. : 519-371-2901  
Télééc. : 519-371-2905



December 4, 2020

Mr. John Yungblut  
Township of Huron-Kinloss  
PO Box 130  
21 Queen Street  
Ripley ON N0G 2R0

Via email: [jyungblut@huronkinloss.com](mailto:jyungblut@huronkinloss.com)

Dear Mr. Yungblut,

Re: Kinloss Landfill 2019 Annual Report  
MOE File: SI BR HK C6 610

Further to my letter to you dated November 30, 2020, containing groundwater comments for the Kinloss Landfill Site 2019 Monitoring Report, our regional surface water specialist has reviewed the 2019 annual report.

During 2019 monitoring year, surface water samples were collected on June 12 and November 20 from SW1 and SW2 locations. The samples were analyzed for field parameters, general chemistry, nutrients and selected metals. The following is a summary of analytical results:

- The PWQO for aluminum exceeded in both SW1 and SW2 samples collected on June 12, 2019.
- The PWQO for iron also exceeded in SW1 sample collected on November 20, 2019.
- Other water quality parameters were measured below PWQO, where available.

Our surface water reviewer has the following comments based the 2019 surface water monitoring data for the Kinloss Landfill Site:

1. Measured concentrations of aluminum and iron in 2019 samples were slightly higher than their concentrations reported for past monitoring events. Since levels higher than PWQO were also measured in samples collected from the upstream location, no action is required at this time.
2. In general, water quality measured at both, upstream and downstream, surface water monitoring locations is similar and therefore suggest that the landfill Site does not have significant adverse effects on the Creek's water quality.
3. It is agreed that surface water monitoring should continue as per the requirements of the current ECA.

If you have any questions concerning this letter, please contact me at (519) 374-1388.

Sincerely,

A handwritten signature in cursive script, appearing to read "Ian Mitchell".

Ian Mitchell  
District Engineer  
Owen Sound District

cc. Stephen Taziar, WSP Owen Sound, [Stephen.Taziar@wsp.com](mailto:Stephen.Taziar@wsp.com)  
Lisa Hines, MECP, Owen Sound  
Nilima Gandhi, MECP, London



# APPENDIX

G

## SUMMARY OF SURFACE WATER RESULTS

## APPENDIX

### *G-1 SUMMARY OF SURFACE WATER RESULTS (PRE-2007) – R.J. BURNSIDE*

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

CREEK - UPSTREAM

	SEP 95	MAY 96	SEP 96	MAY 97	SEP 97	MAY 98
alkalinity	239	155	209	188	238	234
pH	7.50	8.2	7.7	7.73	7.5	7.97
conductivity	461	273	356	366	441	376
chloride	7.3	1.0	2.0	<1	4	2
hardness	263	161	195	203	229	277
D.O.C.	8.3	6.8	10.0	3.8	7.1	5.4
phenols	3.6	<1	<1	<1	<1	<1
turbidity	0.437	0.10	0.10	0.10	1.3	0.5
total phos.	0.02	0.009	0.016	<0.01	0.007	0.004
soluble phos.	<0.01	<0.04	0.05	<0.01	<0.01	<0.01
colour		60	49	16	33	41
magnesium	20.5	12.5	13.9	17.2	23.4	18.9
calcium	71.4	43.8	55.3	52.9	53.2	79.6
sodium	1.1	0.70	0.85	0.8	0.83	1.20
iron		0.041	0.033	<0.02	3.88	0.17
nitrite	0.1	<0.03	<0.03	<0.01	0.01	<0.02
ammonia	0.12	<0.05	<0.05	1.01	0.06	<0.05
TKN (nitrogen)	0.48	0.39	0.64			-
nitrate	0.1	<0.03	<0.03	<0.05	<0.05	<0.1
Nickel						<0.05
Arsenic						-
Cadmium		<0.003	<0.003	<.0003	<0.005	<0.002
Chromium		<0.005	<0.005	<0.002	<0.02	<0.02
Copper		<0.003	<0.003	<0.002	<0.02	<0.01
Mercury						-
Manganese		0.014	0.012	0.004	1.62	-
Lead		<0.025	<0.025	0.0001	<0.04	<0.03
Selenium						-
Zinc		0.006	<0.005	0.004	<0.01	0.49
Silver						<0.01

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

CREEK - UPSTREAM

	MAY 99	MAY 00	SEP 00			
alkalinity	200	200	213			
pH	7.72	7.52	8.06			
conductivity	360	396	391			
chloride	2	2	3			
hardness	227	234	236			
D.O.C.	9.3	8.6	9.8			
phenols	<1	<1	<1			
turbidity	1.26	0.81	0.27			
total phos.	0.007	0.008	0.002			
soluble phos.	<0.01	<0.01	<0.01			
colour	47	45	43			
magnesium	16.1	19.5	18.8			
calcium	64.3	61.7	63.5			
sodium	1.21	1.06	1.05			
iron	0.27	0.17	0.19			
nitrite	<0.02	<0.02	<0.02			
ammonia	<0.05	<0.05	<0.05			
TKN (nitrogen)	-	-	-			
nitrate	0.10	<0.1	0.12			
Nickel	<0.05	<0.05	<0.05			
Arsenic	-	-	-			
Cadmium	<0.002	<0.0001	<0.0001			
Chromium	<0.02	<0.01	<0.01			
Copper	<0.01	<0.002	<0.002			
Mercury	-	-	-			
Manganese	-	-	-			
Lead	<0.03	<0.0005	<0.0005			
Selenium	-	-	-			
Zinc	<0.01	<0.01	0.02			
Silver	<0.01	<0.01	<0.01			

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

CREEK DOWNSTREAM

	MAY 97	SEP 97	MAY 98	OCT 98	MAY 99	OCT 99
alkalinity	225	262	258	240.	230.	270
pH	8.06	8.12	8.30	8.50	8.03	8.28
conductivity	437	512	430	509.	440.	465
chloride	3.7	7	4	5.	5.	4
hardness	246	232	272	286.	257.	307
D.O.C.	2.9	3.1	2.6	3.4	7.1	1.9
phenols	<1	<1	<1	<1	<1	12
turbidity	0.10	0.7	0.3	2.0	0.89	0.27
total phos.	<0.01	0.022	0.012	<0.013	0.020	0.017
soluble phos.	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
colour	12	18	14	19.	37.	6
magnesium	22.4	27.5	21.8	22.8	19.6	24.2
calcium	61.6	47.5	73.0	76.9	70.7	83.0
sodium	1.9	2.19	2.00	3.07	3.02	3.34
iron	<0.02	<0.04	0.09	0.09	0.13	0.08
nitrite	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02
ammonia	0.38	0.06<	<0.05	<0.05	<0.05	<0.05
TKN(nitrogen)			-	-	-	-
nitrate	0.07	0.13	<0.1	<0.1	0.15	<0.1
Nickel			<0.05	<0.05	<0.05	<0.05
Arsenic			-	-	-	-
Cadmium	0.0006	<0.005	0.005	<0.002	<0.02	0.021
Chromium	<0.002	<0.02	<0.02	<0.02	<0.02	<0.01
Copper	<0.002	<0.02	<0.01	<0.01	<0.01	<0.01
Mercury			-	-	-	-
Manganese	0.018	0.02	-	-	-	-
Lead	0.0002	<0.04	0.03	0.03	<0.03	<0.03
Selenium			-	-	-	-
Zinc	0.004	<0.01	0.68	<0.01	0.11	0.14
Silver			<0.01	<0.01	0.01	<0.01

GROUNDWATER SAMPLING  
KINLOSS TOWNSHIP LANDFILL SITE (W99613)

CREEK DOWNSTREAM

	MAY 00	SEP 00				
alkalinity	232	262				
pH	7.95	8.28				
conductivity	440	462				
chloride	4	4				
hardness	271	278				
D.O.C.	5.8	6.0				
phenols	<1	21				
turbidity	1.48	2.26				
total phos.	0.033	0.009				
soluble phos.	<0.01	<0.01				
colour	27	25				
magnesium	23.8	23.2				
calcium	69.2	72.9				
sodium	2.69	2.07				
iron	0.08	0.09				
nitrite	<0.02	<0.02				
ammonia	0.10	<0.05				
TKN (nitrogen)	-	-				
nitrate	<0.1	<0.1				
Nickel	<0.05	<0.05				
Arsenic	-	-				
Cadmium	<0.0001	<0.0001				
Chromium	<0.01	<0.01				
Copper	<0.002	<0.002				
Mercury	-	-				
Manganese	-	-				
Lead	<0.0005	<0.0005				
Selenium	-	-				
Zinc	<0.01	0.12				
Silver	<0.01	<0.01				



Appendix D  
Surface Water Chemistry  
Kinross Landfill Site

Parameter	Units	PWQO	SW1 May-00	SW2 May-00	SW1 Sep-00	SW2 Sep-00	SW1 May-01	SW2 May-01	SW1 Sep-01	SW2 Sep-01	SW1 May-02	SW2 May-02	SW1 Sep-02	SW2 Sep-02
<b>General Chemistry</b>														
pH Value	pH units		7.52	7.95	8.06	8.28	8.08	8.24	7.8	8.28	8.33	8.24	DRY	8.06
pH Value (Field)	pH units		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DRY	8
Temperature (Field)	°C		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DRY	15.1
Ammonia as N	mg/L	0.020	< 0.05	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	DRY	< 0.05
Ammonia (un-ionized)	mg/L		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DRY	< 0.00136
Nitrate (as N)	mg/L		< 0.1	< 0.1	0.12	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	DRY	0.41
Nitrite (as N)	mg/L		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	DRY	< 0.02
Nitrate + Nitrite (as N)	mg/L		< 0.1	< 0.1	0.12	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	DRY	0.41
Carbon, Diss. Org. as C	mg/L		8.6	5.8	9.8	6	6.2	4	7.8	3.5	3.1	3.2	DRY	1.7
Total Phosphorus (as P)	mg/L		0.008	0.033	0.002	0.009	0.002	< 0.002	0.025	0.005	0.011	0.017	DRY	0.445
Diss. Organic Phosphorus (as P)	mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY	< 0.01
Conductivity	µS/cm		366	440	391	462	382	437	469	528	500	510	DRY	489
Conductivity (Field)	µS/cm		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DRY	NA
Sulphate (as SO4)	mg/L		13	18	2	5	3	4	4	10	13	17	DRY	13
Alkalinity (CaCO3)	mg/L		200	232	213	262	212	246	234	260	255	254	DRY	272
Chloride (as Cl)	mg/L		2	4	3	4	4	5	5	9	8	8	DRY	8
Colour	TCU		45	27	43	25	31	24	34	17	6	9	DRY	6
Calculated Hardness (as CaCO3)	mg/L		234	271	236	278	256	288	258	311	274	292	DRY	297
Turbidity	NTU		0.81	1.48	0.27	2.26	0.2	0.43	0.85	0.18	2.31	5.95	DRY	104
Total Phenolics (4-AAP)	mg/L	0.001	< 0.001	< 0.001	< 0.001	0.021	NA	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	DRY	< 0.002
Total Carbon	meq/L		4.75	5.56	4.78	5.67	5.21	5.88	5.21	6.34	5.72	6.1	DRY	6.08
Total Anions	meq/L		4.33	5.13	4.39	5.46	4.42	5.12	4.9	5.56	5.91	5.98	DRY	5.91
Ion Balance	% diff.		4.67	4.08	1.89	8.22	6.82	3.04	5.68	1.59	0.98	1.25	DRY	294
Calculated T.D.S.	mg/L		223	265	223	274	230	265	244	287	299	311	DRY	294
<b>Trace Metals</b>														
Aluminum, Al	mg/L	0.075	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.08	0.012	0.115	0.093	0.149	DRY	0.245
Beryllium, Be	mg/L	1.100	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.024	0.038	< 0.001	< 0.001	DRY	< 0.001
Boron, B	mg/L	0.200	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.01	0.01	0.01	0.01	DRY	0.02
Cadmium, Cd	mg/L	0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	0.0001	0.0004	0.0003	DRY	0.0005
Calcium, Ca	mg/L		81.7	69.2	83.5	72.9	72.4	78.9	68.5	81.7	74.8	79.5	DRY	79.4
Chromium, Cr	mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005	DRY	< 0.005
Cobalt, Co	mg/L	0.0008	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.001	< 0.001	< 0.001	< 0.001	DRY	< 0.001
Copper, Cu	mg/L	0.005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	DRY	< 0.002
Iron, Fe	mg/L	0.3	0.17	0.08	0.19	0.09	< 0.02	0.1	0.2	0.28	0.1	0.18	DRY	0.61
Lead, Pb	mg/L	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	DRY	< 0.0005
Magnesium, Mg	mg/L		19.5	23.8	18.8	23.2	18.7	22.1	21.1	28	21.3	22.8	DRY	24
Molybdenum, Mo	mg/L	0.040	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	DRY	< 0.02
Nickel, Ni	mg/L	0.025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.02	< 0.02	< 0.02	< 0.02	DRY	< 0.02
Potassium, K	mg/L		0.81	1.09	0.58	1.16	0.22	0.72	< 1	< 1	1.7	1.9	DRY	< 1
Silica, Reactive (as SiO2)	mg/L		4.89	6.32	5.82	7.81	3.32	4.74	2.19	4.37	2.1	2.58	DRY	NA
Silver, Ag	mg/L	0.0001	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.0001	< 0.0001	< 0.0001	< 0.0001	DRY	< 0.0001
Sodium, Na	mg/L		1.06	2.69	1.06	2.07	1.11	2.07	1.3	2.9	4.4	4.7	DRY	< 0.002
Vanadium, V	mg/L	0.0050	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.002	< 0.002	< 0.002	< 0.002	DRY	< 0.002
Zinc, Zn	mg/L	0.020	< 0.01	< 0.01	0.02	0.12	0.07	0.03	< 0.005	0.006	< 0.005	< 0.005	DRY	0.007

Note:  
Shading indicates exceedance of the Provincial Water Quality Objectives  
Exceedences of the PWQO due to detection limits are not noted

Appendix D  
Surface Water Chemistry  
Kinross Landfill Site

Parameter	Units	PWQO	SW1 May-03	SW2 May-03	SW1 Oct-03	SW2 Oct-03	SW1 May-04	SW2 May-04	SW1 Sep-04	SW2 Sep-04
<b>General Chemistry</b>										
pH Value	pH units		7.99	8.14	7.8	8	7.95	7.98	7.73	8.21
pH Value (Field)	pH units		7.38	8.81	7.74	7.86	7.77	7.84	6.98	8.02
Temperature (Field)	°C		19.3	14.8	11.7	11.5	21.9	17.7	20.5	15.4
Ammonia as N	mg/L		< 0.05	< 0.05	< 0.05	< 0.05	0.05	0.05	0.07	0.05
Ammonia (un-ionized)	mg/L	0.020	< 0.0004	< 0.0074	< 0.0006	< 0.0007	0.0013	0.0011	0.0003	0.0014
Nitrate (as N)	mg/L		0.24	0.27	0.27	0.15	0.31	0.38	0.1	0.32
Nitrite (as N)	mg/L		< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Nitrate + Nitrite (as N)	mg/L		0.24	0.27	0.27	0.15	0.31	0.38	< 0.1	0.32
Carbon, Diss. Org. as C	mg/L		8.7	4.8	7.3	4.6	8.9	6	6.5	2
Total Phosphorus (as P)	mg/L		0.006	0.006	0.003	0.01	< 0.002	< 0.002	0.377	0.013
Diss. Organic Phosphorus (as P)	mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.002	< 0.002	< 0.002	< 0.002
Conductivity	us/cm		370	463	438	495	372	438	567	537
Conductivity (Field)	us/cm		346	428	412	455	352	411	510	477
Sulphate (as SO4)	mg/L		14	21	11	17	8	11	3	15
Alkalinity (CaCO3)	mg/L		182	223	231	258	193	219	290	278
Chloride (as Cl)	mg/L		4	5	7	8	5	5	12	7
Colour	TCU		45	24	26	18	40	30.1	43	11.8
Calculated Hardness (as CaCO3)	mg/L		185	230	235	269	198	227	308	277
Turbidity	NTU		0.1	< 0.1	0.35	0.48	0.31	0.25	3.8	0.38
Total Phenolics (4-AAP)	mg/L	0.001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Total Cations	meq/L		3.95	4.71	4.78	5.52	4	4.67	8.31	5.68
Total Anions	meq/L		4.06	5.06	5.07	5.69	4.15	4.78	8.2	6.09
Ion Balance	% diff.		1.41	3.67	2.87	1.55	1.78	1.17	0.87	3.64
Calculated T.D.S.	mg/L		199	246	244	279	200	234	305	293
<b>Trace Metals</b>										
Aluminum, Al	mg/L	0.075	0.029	0.028	0.022	0.014	< 0.006	0.046	0.512	0.095
Beryllium, Be	mg/L	1.100	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Boron, B	mg/L	0.200	0.011	0.013	0.011	0.013	0.009	0.012	0.007	0.007
Cadmium, Cd	mg/L	0.0006	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0005	0.0013	0.0003
Chromium, Cr	mg/L		54	61.7	66.7	73	54.8	61.9	85.9	74.9
Cobalt, Co	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Copper, Cu	mg/L	0.0009	< 0.0001	< 0.0001	< 0.0001	0.0003	0.0001	0.0001	0.0009	0.0001
Iron, Fe	mg/L	0.005	< 0.0005	< 0.0005	0.0006	0.0007	0.0008	0.0019	0.005	0.0011
Lead, Pb	mg/L	0.3	0.04	0.04	< 0.03	< 0.03	< 0.03	0.1	4.64	0.22
Magnesium, Mg	mg/L	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0039	0.0008
Molybdenum, Mo	mg/L		14.8	18.5	17.3	21.1	14.8	17.7	22.8	21.9
Nickel, Ni	mg/L	0.040	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Potassium, K	mg/L	0.025	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001
Silica, Reactive (as SiO2)	mg/L		0.5	0.8	0.8	0.8	0.5	1	1.4	0.8
Silver, Ag	mg/L		1.55	1.82	3.9	6.8	1.21	1.6	5.04	3.73
Sodium, Na	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vanadium, V	mg/L		0.9	2	1.5	2.7	0.9	2.2	2.8	2.4
Zinc, Zn	mg/L	0.0060	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0015	< 0.0005
	mg/L	0.020	0.031	0.039	0.04	< 0.005	< 0.005	< 0.005	0.024	0.008

Note:  
Shading indicates exceedance of the Provincial Water Quality Obj  
Exceedences of the PWQO due to detection limits are not noted

Appendix D  
Historical Surface Water Quality Data  
Kinloss Landfill Site

Parameter	Units	PWQO	TDL	SW1 5/25/2005	SW2 5/25/2005	SW1 9/28/2005	SW2 9/28/2005
<b>FIELD MONITORING RESULTS</b>							
Temperature	°C						
pH	pH		N/A	15.1	11.1	18.6	13.7
Conductivity	uS/cm		N/A	4.00	7.63	7.22	7.73
<b>INORGANICS</b>							
Un-ionized Ammonia (Calculated)	mg/L	0.02	N/A				
Total Ammonia-N	mg/L		0.05	ND	ND	N/A	N/A
Conductivity	uS/cm			415	476	425	499
Nitrite (N)	mg/L		2	ND	ND	ND	ND
Dissolved Organic Carbon	mg/L		0.3	ND	ND	ND	ND
Total Organic Carbon (TOC)	mg/L		0.1	6.0	3.5		
pH	pH		1			15	6.5
Phenol-4AAP	mg/L	0.001	0.01	8.11	8.25	8.00	8.20
Total Phosphorus	mg/L		0.001	0.001	0.001	0.003	0.004
Turbidity	NTU		0.002	0.017	0.008	0.022	0.037
Total Alkalinity (Total as CaCO3)	mg/L		0.1	2.9	0.40	1.0	2.4
Chloride (Cl)	mg/L		1	212	245	190	250
Total p-Alkalinity	mg/L		1	4.3	5.8	6.0	7.0
Nitrate (N)	mg/L		1	ND	ND		
Phosphate-P	mg/L		0.2	0.10	0.20	1.5	ND
Sulphate (SO4)	mg/L		1	ND	ND	2	ND
<b>CALCULATED VALUES</b>							
Anion Sum	me/L			3.00	10.2	38.0	27.0
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		N/A	4.43	5.29		
Calculated TDS	mg/L		1	209	241	188	246
Carb. Alkalinity (calc. as CaCO3)	mg/L		1	220	266	242	276
Cation Sum	me/L		1	3	4	2	4
Dissolved Hardness (CaCO3)	mg/L		N/A	4.81	5.84		
Ion Balance (% Difference)	%		N/A	240	290	210	250
Langelier Index (@ 20C)	N/A		N/A	4.16	4.99		
Langelier Index (@ 4C)	N/A		N/A	0.849	1.10	0.651	1.03
Saturation pH (@ 20C)	N/A		N/A	0.599	0.652	0.401	0.782
Saturation pH (@ 4C)	N/A		N/A	7.27	7.15	7.37	7.19
<b>METALS</b>							
Dissolved Aluminum (Al)	mg/L	0.075	0.005	0.021	0.012		
Dissolved Beryllium (Be)	mg/L	1.100	0.0005	ND	ND		
Dissolved Boron (B)	mg/L	0.200	0.01	0.01	0.01		
Dissolved Cadmium (Cd)	mg/L	0.0005	0.0001	ND	ND		
Dissolved Calcium (Ca)	mg/L		0.2	64.2	76.0	57.6	67.4
Dissolved Chromium (Cr)	mg/L		0.005	ND	ND		
Dissolved Cobalt (Co)	mg/L	0.0009	0.0005	0.0006	ND		
Dissolved Copper (Cu)	mg/L	0.005	0.001	0.011	0.0030		
Dissolved Iron (Fe)	mg/L	0.3	0.05	ND	ND		
Dissolved Lead (Pb)	mg/L	0.005	0.0005	ND	ND		
Dissolved Magnesium (Mg)	mg/L		0.05	18.6	23.4	17.1	21.0
Dissolved Molybdenum (Mo)	mg/L	0.040	0.001	ND	ND		
Dissolved Nickel (Ni)	mg/L	0.025	0.001	ND	ND		
Dissolved Potassium (K)	mg/L		0.2	0.6	0.8	1	ND
Dissolved Silver (Ag)	mg/L	0.0001	0.0005	ND	ND		
Dissolved Sodium (Na)	mg/L		0.1	1.5	2.4	1.7	3.6
Dissolved Vanadium (V)	mg/L	0.006	0.001	ND	ND		
Dissolved Zinc (Zn)	mg/L	0.020	0.005	0.009	0.007		

N/A = Not Applicable

ND = Not detected

TDL = Typical Detection Limit. Actual detection limit varies with the concentration of each sample.  
Spring metals samples were erroneously filtered by Maxxam Analytics and thus only the 'dissolved' concentration of each trace metal is reported. The total concentration of trace metals would have been somewhat higher and therefore could have exceed the PWQO, however this information is not known.

Appendix D  
Historical Surface Water Quality Data  
Kinloss Landfill Site

Parameter	Units	PWQO	TDL	SW1 5/25/2005	SW2 5/25/2005	SW1 9/28/2005	SW2 9/28/2005
Total Aluminum (Al)	mg/L	0.075	0.005			0.028	0.010
Total Arsenic (As)	mg/L	0.005	0.001			ND	ND
Total Beryllium (Be)	mg/L	1.1	0.0005			ND	ND
Total Boron (B)	mg/L	0.2	0.01			ND	ND
Total Cadmium (Cd)	mg/L	0.0005	0.0001			0.017	0.022
Total Calcium (Ca)	mg/L		0.2			0.0001	ND
Total Chromium (Cr)	mg/L		0.005			63	76
Total Cobalt (Co)	mg/L	0.0008	0.0005			0.006	0.006
Total Copper (Cu)	mg/L	0.005	0.001			ND	ND
Total Iron (Fe)	mg/L	0.3	0.05			ND	ND
Total Lead (Pb)	mg/L	0.005	0.0005			0.12	0.071
Total Magnesium (Mg)	mg/L		0.05			ND	ND
Total Molybdenum (Mo)	mg/L	0.040	0.001			17	22
Total Nickel (Ni)	mg/L	0.025	0.001			ND	ND
Total Potassium (K)	mg/L		0.2			0.008	ND
Total Silicon (Si)	mg/L		0.05			1.6	1.2
Total Silver (Ag)	mg/L	0.0001	0.0005			2.2	3.4
Total Sodium (Na)	mg/L		0.1			ND	ND
Total Vanadium (V)	mg/L	0.006	0.001			1.6	3.3
Total Zinc (Zn)	mg/L	0.020	0.005			ND	ND

N/A = Not Applicable

ND = Not detected

TDL = Typical Detection Limit. Actual detection limit varies with the concentration of each sample.

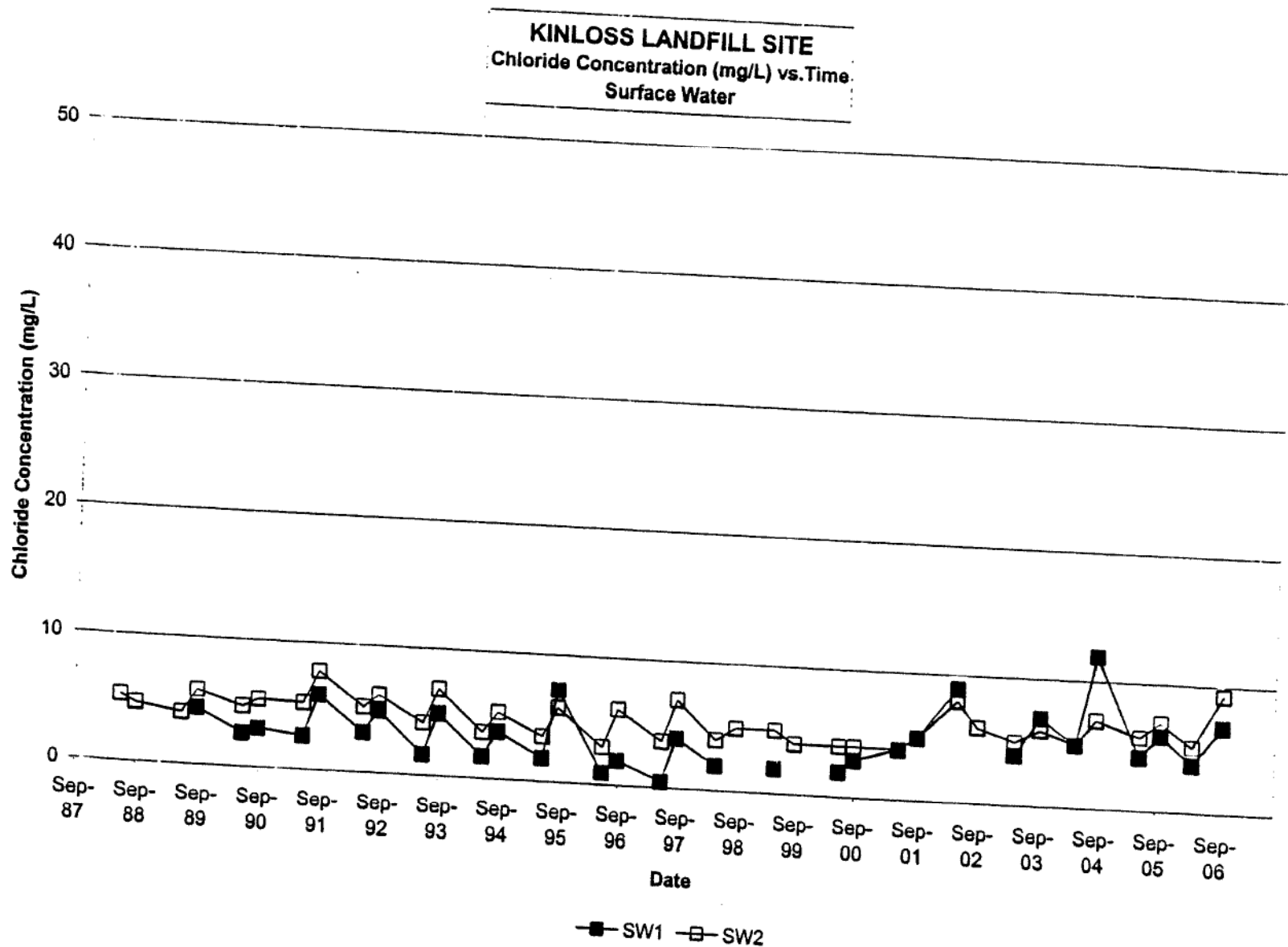
Spring metals samples were erroneously filtered by Maxxam Analytics and thus only the 'dissolved' concentration of each trace metal is reported. The total concentration of trace metals would have been somewhat higher and therefore could have exceed the PWQO, however this information is not known.

Standard Surface Water Quality Package  
Kinross Landfill Site

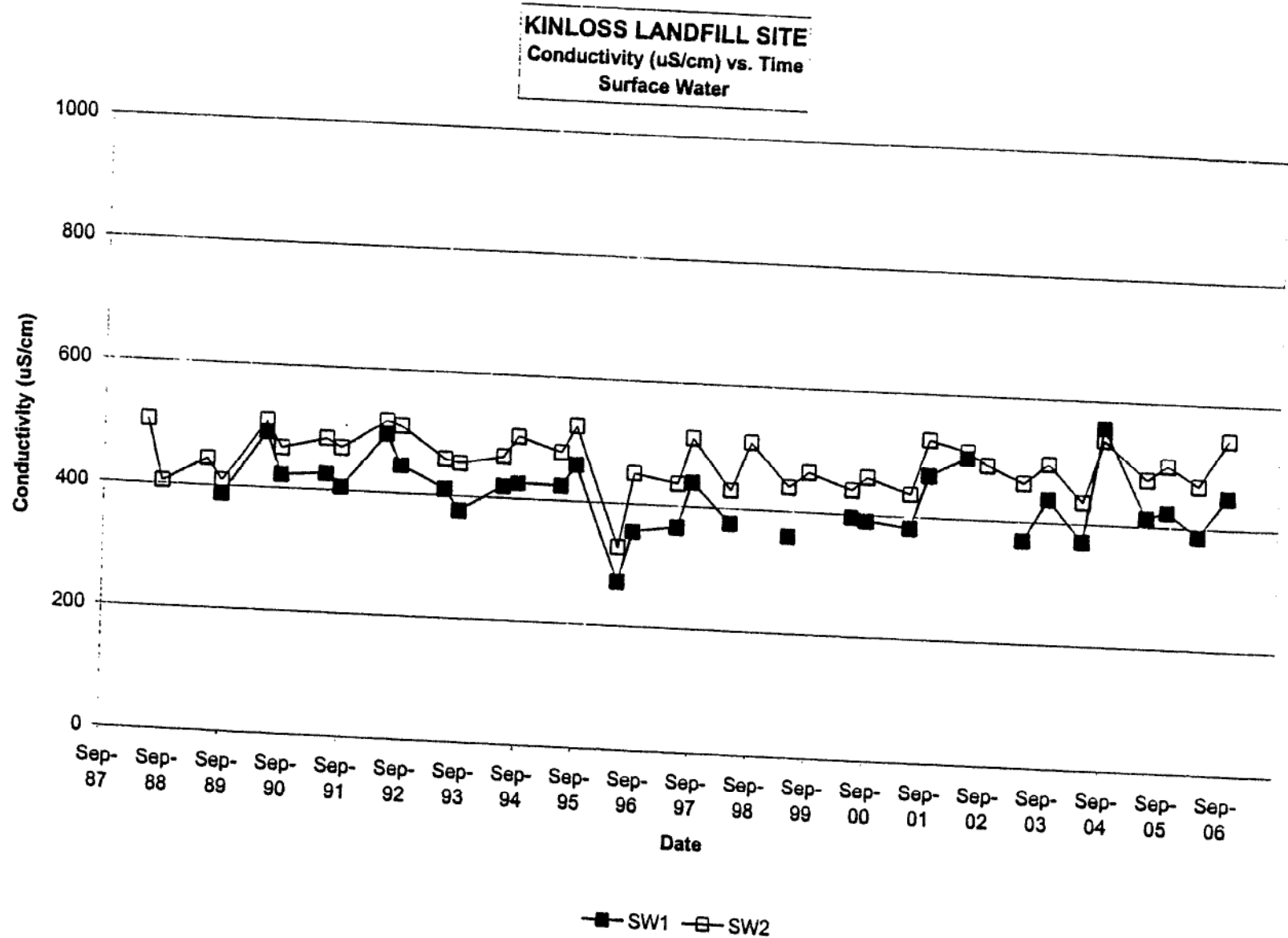
Parameter	Short I.D.	Unit	PWQO	M.D.L	SW1	SW2	SW1	SW2
Well Class								
Well Owner								
Date of Sampling					Up Town 17-Apr-06	Down Town 17-Apr-06	Up Town 3-Oct-06	Down Town 3-Oct-06
<b>FIELD MONITORING RESULTS</b>								
Temperature	°C	°C						
pH	pH	N/A			16.8	12.7	16.8	12.7
Electrical Conductivity	Th. Cond.	uS/cm			7.72	7.48	7.72	7.48
<b>INORGANICS</b>								
pH	pH	N/A			374	454	374	454
Chloride	Cl <sup>-</sup>	mg/L		N/A	8.2	8.35	7.79	8.15
Electrical Conductivity	Th. Cond.	uS/cm		0.10	3.85	5.18	6.86	9.29
Total Hardness (as CaCO <sub>3</sub> )	Hard(Calc)	mg/L		2	388	469	452	544
Dissolved Organic Carbon (DOC)	DOC	mg/L			207	244	242	285
Total Dissolved Solids	Th. TDS	mg/L		1	4	2	9	5.3
Ammonia (un-ionized)	NH <sub>3</sub> -un-ion	mg/L		20	214	262	262	294
Ammonia as N	NH <sub>3</sub> -N	mg/L	0.02		0.0003	<0.0001	0.0003	<0.0001
Nitrate as N	NO <sub>3</sub> -N	mg/L		0.02	<0.02	<0.02	<0.02	<0.02
Nitrite as N	NO <sub>2</sub> -N	mg/L		0.05	0.1	0.29	<0.05	0.14
(Nitrate + Nitrite) as N	NO <sub>3</sub> +NO <sub>2</sub>	mg/L		0.05	<0.05	<0.05	<0.05	<0.05
Bromide	Br <sup>-</sup>	mg/L		0.10	0.1	0.28	<0.05	<0.05
Sulphate	SO <sub>4</sub> <sup>2-</sup>	mg/L		0.05	<0.05	<0.05	<0.05	<0.05
Phosphate as P	PO <sub>4</sub> <sup>3-</sup>	mg/L		0.10	7.48	12.8	4.68	20.7
pH, Saturation	pHs	N/A		0.10	<0.10	<0.10	<0.10	<0.10
Phenols	Phenol	mg/L		N/A	7.22	7.07	7.08	6.95
Turbidity	Turbidity	NTU	0.001	0.001	<0.001	<0.001	<0.001	<0.001
p-Alkalinity (as CaCO <sub>3</sub> )	Alk 8.3	mg/L		0.5	<0.5	<0.5	<0.5	<0.5
t-Alkalinity (as CaCO <sub>3</sub> )	Alk 4.2	mg/L		5	<5	<5	<5	<5
<b>CALCULATED VLAUES</b>								
Anion Sum	Anion	mg/L			198	233	231	268
Cation Sum	Cation	mg/L		NA	3.52	4.37	4.09	5.08
Ion Balance	CAB	%		NA	4.19	5	4.91	5.89
Carbonate (as CaCO <sub>3</sub> )	CO <sub>3</sub> <sup>2-</sup>	mg/L		NA	8.68	6.87	9.1	7.4
Bicarbonate (as CaCO <sub>3</sub> )	HCO <sub>3</sub> <sup>-</sup>	mg/L		5	<5	7	<5	<5
Langlier Index	L.I.	N/A		5	198	226	231	268
Aggressive Index	A.I.	N/A		NA	0.98	1.28	0.71	1.2
Ryznar Stability Index	R.S.I.	N/A		NA	12.8	13.1	12.5	13
<b>METALS</b>								
Silver	Ag	mg/L		NA	6.2	5.8	6.37	5.75
Aluminum	Al	mg/L	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	As	mg/L	0.075	0.004	0.004	0.01	0.008	0.012
Boron	B	mg/L	0.005	0.003	<0.003	<0.003	<0.003	<0.003
Barium	Ba	mg/L	0.20	0.010	<0.010	<0.010	<0.010	0.019
Beryllium	Be	mg/L		0.002	0.014	0.022	0.021	0.032
Calcium	Ca	mg/L	0.011	0.002	<0.002	<0.002	<0.002	<0.002
Cadmium	Cd	mg/L		0.05	56.5	65.4	68	76
Cobalt	Co	mg/L	0.0005	0.0002	<0.0002	<0.0002	0.0013	<0.0002
Chromium	Cr	mg/L	0.0009	0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper	Cu	mg/L	0.0089	0.003	<0.003	0.003	<0.003	<0.003
Iron	Fe	mg/L	0.005	0.002	<0.002	<0.002	0.002	<0.002
Potassium	K	mg/L	0.3	0.005	0.439	0.508	0.172	0.175
Magnesium	Mg	mg/L		0.05	0.56	0.99	0.39	1.07
Molybdenum	Mo	mg/L		0.05	15.9	19.7	18.7	23.2
Sodium	Na	mg/L	0.04	0.002	<0.002	<0.002	<0.002	<0.002
Nickel	Ni	mg/L		0.05	1.03	1.96	1.46	3.68
Total Phosphorus	P (Tot.)	mg/L	0.025	0.003	<0.003	<0.003	<0.003	<0.003
Lead	Pb	mg/L	0.01	0.01	0.014	0.017	<0.02	<0.02
Vanadium	V	mg/L	0.005	0.001	<0.001	<0.001	<0.001	<0.001
Zinc	Zn	mg/L	0.008	0.002	<0.002	<0.002	<0.002	<0.002
			0.03	0.004	<0.004	<0.004	0.011	0.005

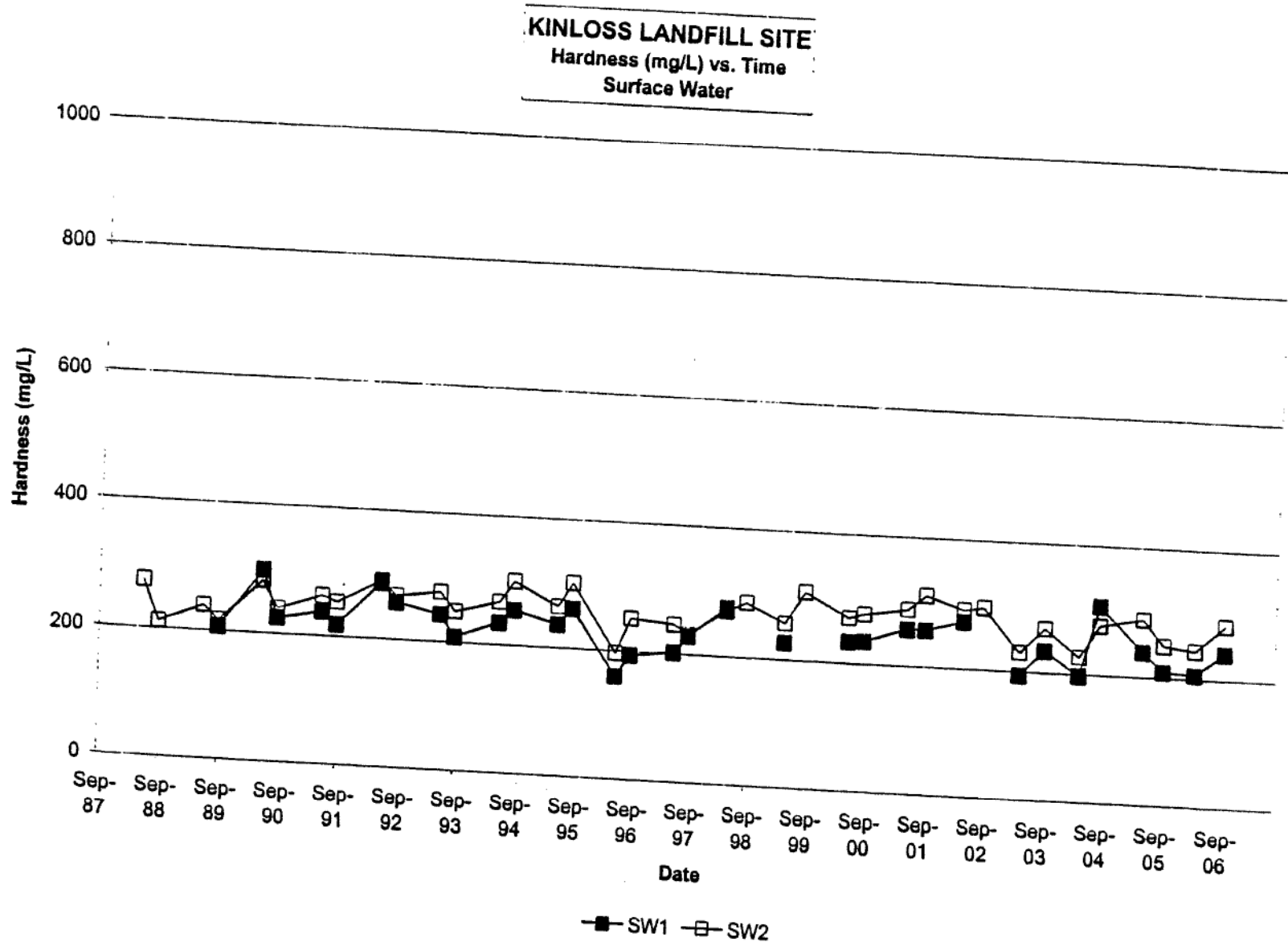
This table is to be reviewed with the comments in Appendix D

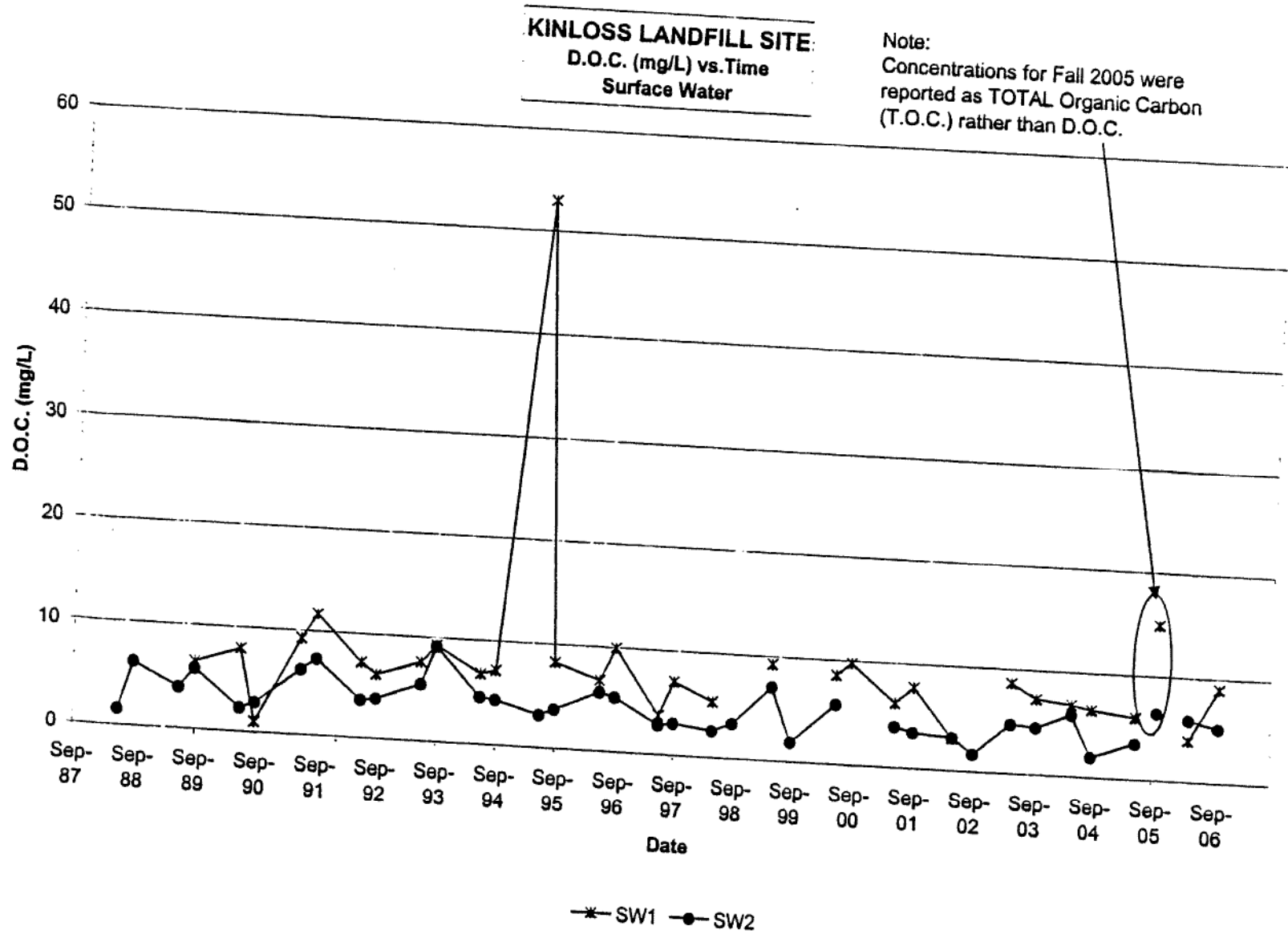
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R.J. Burnside & Associated Limited.  
Project Number: LNE 08508











## APPENDIX

### *G-2 SUMMARY OF SURFACE WATER RESULTS (2007 – PRESENT)*

**Table G-2**  
**Surface Water Quality Results**  
**Kinloss Landfill - 2007 to 2020**

Surface Water Station				SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW1	SW1	SW1	SW1
Date				Jul-07	Dec-07	Jul-08	Dec-08	Jul-09	Dec-09	Mar-10	Jun-11	Oct-11	Jun-12	Oct-12	Jun-13	Nov-13
	Units	RDL	PWQO													
<b>INORGANICS</b>																
Total Ammonia-N	mg/L	0.05		0.06	ND	0.05	0.05	0.05	ND	<0.05	<0.01	<0.01	0.03	<0.01	0.02	<0.01
Calculated Un-ionized Ammonia	mg/L	2	0.020 (10)	0.003	0	0.0018	0.0006	0.001	-	<0.004	<0.01	-	<0.02	<0.02	<0.02	<0.02
Conductivity	umho/cm			538	449	476	435	487	385	403	469	440	532	450	479	371
Total Dissolved Solids	mg/L	1		352	286	330	NA	NA	NA	NA	265	233	276	292	237	220
Dissolved Organic Carbon	mg/L	0.1		3.6	8.8	10.3	4.7	7.1	8.3	5.0	8.0	12.3	2.0	11.6	11.8	9.5
Orthophosphate	mg/L	0.01		ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus	mg/L	0.002	0.030 (9)	NA	NA	NA	0.009	0.01	ND	<0.002	<0.01	<0.01	0.01	0.02	<0.01	<0.01
pH	pH		6.5 - 8.5	8.3	8.1	8.1	8.1	7.9	8.2	8.1	7.72	7.94	8.07	7.37	7.97	8.09
Phenol-4AAP	mg/L	0.001	0.001	ND	ND	ND	ND	ND	ND	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Sulphate (SO4)	mg/L	1		13	43	ND	2	ND	ND	<1	1	11	<1	61	1	4
Turbidity				0.7	1.3	0.4	NA	0.8	0.2	0.4	0.4	1.3	7.0	1.2	1.1	0.5
Alkalinity (Total as CaCO3)	mg/L	1	(7)	287	183	257	229	260	200	213	256	212	274	200	253	223
Dissolved Chloride (Cl)	mg/L	1		8	9	5	5	5	4	5	4.1	4.3	5.4	6.5	4.1	4.4
Nitrite (N)	mg/L	0.01		ND	ND	ND	ND	ND	ND	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (N)	mg/L	0.1		0.2	0.1	ND	0.4	ND	0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
Nitrate + Nitrite	mg/L	0.1		0.2	0.1	ND	0.4	ND	0.1	0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hardness	mg/L									210	299	251	295	288	221	216

Surface Water Station				SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW1	SW1	SW1	SW1
Date				16-Jul-07	8-Dec-07	21-Jul-08	14-Dec-08	6-Jul-09	5-Dec-09	23-Mar-10	14-Jun-11	17-Oct-11	20-May-12	25-Oct-12	17-Jun-13	20-Nov-13
	Units	RDL	PWQO													
<b>METALS</b>																
Total Aluminum (Al)	µg/L	1	75 (8)	9200	6	ND	ND	11	ND	<5	30	20	20	50	20	30
Total Barium (Ba)	µg/L	5		18	13	27	12	25	12	16	24	17	32	26	20	11
Total Boron (B)	µg/L	10	200 (1)	ND	ND	ND	ND	ND	ND	<10	10	99	8	<5	10	<5
Total Cadmium (Cd)	µg/L	0.1	0.5 (3)	680	2.5	0.1	ND	0.5	0.2	<0.1	<0.02	<0.02	<0.02	0.04	<0.02	<0.02
Total Calcium (Ca)	µg/L	200		35000	60000	76000	65000	75000	58000	60000	81300	68200	80400	80100	60200	57500
Total Chromium (Cr)	µg/L	5	100	ND	ND	ND	ND	ND	ND	<5	<2	<2	<2	<2	<2	<2
Total Copper (Cu)	µg/L	1	5 (4)	69000	1	ND	ND	1	ND	<1	<2	<2	0.3	<2	2	0.3
Total Iron (Fe)	µg/L	50	300	300	ND	ND	ND	220	ND	<100	59	32	912	24	47	7
Total Lead (Pb)	µg/L	0.5	25 (5)	150	ND	ND	ND	ND	ND	<0.5	<0.02	<0.02	0.03	0.04	0.03	<0.02
Total Magnesium (Mg)	µg/L	50		89000	18000	22000	21000	23000	18000	18000	23300	19700	22900	21300	17100	17500
Total Manganese (Mn)	µg/L	2		14000	3	110	ND	140	2	7	18	13	1030	13	26	2
Total Potassium (K)	µg/L	200		8000	360	540	390	230	600	520	400	1000	300	700	300	400
Total Sodium (Na)	µg/L	100		4800	1400	1300	1200	1400	1100	1200	1500	1400	2100	2500	1600	1600
Total Zinc (Zn)	µg/L	5	30 (6)	270000	ND	ND	ND	8	ND	<5	<5	<5	<5	<5	<5	<5

ND = Not detected  
NA = Not analyzed  
RDL = Reportable Detection Limit

Surface Water Station				SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW 1	SW1	SW1	SW1	SW1
Date				16-Jul-07	8-Dec-07	21-Jul-08	14-Dec-08	6-Jul-09	5-Dec-09	23-Mar-10	14-Jun-11	17-Oct-11	20-May-12	25-Oct-12	17-Jun-13	20-Nov-13
<b>FIELD MEASUREMENTS</b>																
Temperature	Degrees C			22.5	1.3	19.2	1.6	15.2	3.1	10.6	24.2	9.86	25	15.2	24.6	2.6
Conductivity	µmhos			580	700	590	490	510	260	400	430	404	493	448	511	356
pH				7.20	7.79	7.99	8.00	8.07	8.58	8.60	8.3	7.55	7.15	7.65	7.65	7.90

**NOTES:**

- PWQO indicates Provincial Water Quality Objectives.
- (I) indicates interim PWQO
- Cadmium Interim PWQO = 0.5 µg/L (for Hardness >100 mg/L as CaCO3)
- Copper Interim PWQO = 5 µg/L (for Hardness >20 mg/L)
- Revised Interim PWQO = 5 µg/L (for Alkalinity > 80 mg/L (as CaCO3)
- Zinc Revised Interim PWQO = 20 µg/L

- Alkalinity should not be decreased by more than 25 % of the natural concentration.
- Interim PWQO = 75 µg/L for pH >6.5 to 9.0.
- PWQO = 0.020 mg/L to avoid nuisance algae growth, PWQO = 0.010 mg/L for high level of protection  
PWQO = 0.030 mg/L for prevention of excessive plant growth
- PWQO for un-ionized ammonia
- Shaded values indicates exceedance of PWQO.

**Table G-2**  
**Surface Water Quality Results**  
**Kinloss Landfill - 2007 to 2020**

Surface Water Station				SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1
Date				Jul-14	Oct-14	May-15	Oct-15	Jun-16	Nov-16	Jun-17	Nov-17	May-18	Nov-18	Jun-19	Nov-19
	Units	RDL	PWQO												
INORGANICS															
Total Ammonia-N	mg/L	0.05		<0.01	<0.01	<0.02	<0.02	<0.01	0.02	<0.01	0.01	0.02	0.04	0.11	0.03
Calculated Un-ionized Ammonia	mg/L	2	0.020 (10)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Conductivity	umho/cm			455	432	447	464	485	468	490	416	470	418	408	420
Total Dissolved Solids	mg/L	1		252	224	-	-	276	262	259	222	258	232	225	209
Dissolved Organic Carbon	mg/L	0.1		12.4	10.2	5.7	5.5	8.0	7.7	8.1	11.4	7	12.7	8.1	8.1
Orthophosphate	mg/L	0.01		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus	mg/L	0.002	0.030 (9)	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01	0.14	<0.01	0.01	0.02
pH	pH		6.5 - 8.5	8.05	7.97	8.44	8.08	7.92	7.97	7.98	8.03	8.44	8.01	8.03	8.07
Phenol-4AAP	mg/L	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Dissolved Sulphate (SO4)	mg/L	1		<1	1	0.97	2.98	<1	5	<1	2	<1	1	<1	2
Turbidity				0.5	0.9	<0.5	<0.5	-	-	0.8	1.8	0.8	1.6	0.5	1.5
Alkalinity (Total as CaCO3)	mg/L	1	(7)	233	230	238	248	283	243	265	224	251	214	213	206
Dissolved Chloride (Cl)	mg/L	1		2.3	3.9	<0.10	8.01	2.6	5.1	4.4	3.1	3.1	3.7	2.1	4.6
Nitrite (N)	mg/L	0.01		<0.1	<0.1	<0.05	<0.10	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate (N)	mg/L	0.1		<0.1	0.1	<0.05	<0.10	<0.1	0.1	<0.05	<0.05	<0.05	<0.05	0.05	0.16
Nitrate + Nitrite	mg/L	0.1		<0.1	<0.1	<0.05	<0.10	<0.1	-	-	-	<0.05	<0.05	0.10	0.20
Hardness	mg/L			305	224	231	249	287	288	265	233	287	258	257	218

Surface Water Station				SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	
Date				9-Jul-14	29-Oct-14	20-May-15	27-Oct-15	20-Jun-16	15-Nov-16	14-Jun-17	1-Nov-17	29-May-18	1-Nov-18	12-Jun-19	20-Nov-19
	Units	RDL	PWQO												
METALS															
Total Aluminum (Al)	µg/L	1	75 (8)	30	20	8	<4	20	30	30	50	50	90	40	
Total Barium (Ba)	µg/L	5		26	15	20	16	-	-	22	16	37	45	41	15
Total Boron (B)	µg/L	10	200 (I)	7	<5	<10	<10	6	<5	34	<5	9	5	108	5
Total Cadmium (Cd)	µg/L	0.1	0.5 (3)	<0.02	<0.02	<0.1	<0.1	<0.02	<0.2	<0.014	<0.014	<0.015	0.033	<0.015	<0.015
Total Calcium (Ca)	µg/L	200		84900	60000	63300	68800	78000	79000	72500	61300	78700	70200	71400	58900
Total Chromium (Cr)	µg/L	5	100	<2	<2	<3	<3	<2	<2	<1	<1	<2	<2	<1	2
Total Copper (Cu)	µg/L	1	5 (4)	<0.1	<0.1	<2	<2	<0.1	<0.1	0.2	<0.1	<0.1	4.6	0.1	1
Total Iron (Fe)	µg/L	50	300	76	53	<10	100	98	819	94	49	213	3630	130	411
Total Lead (Pb)	µg/L	0.5	25 (5)	<0.02	<0.02	<1	<1	<0.02	0.09	0.03	<0.02	<0.02	0.49	0.03	0.14
Total Magnesium (Mg)	µg/L	50		22600	18100	17700	18800	22500	22100	20300	19400	22000	20100	19200	17100
Total Manganese (Mn)	µg/L	2		30	14	28	24	82	382	125	24	129	823	19	164
Total Potassium (K)	µg/L	200		600	800	320	550	100	200	300	500	500	700	300	400
Total Sodium (Na)	µg/L	100		1600	1600	1640	2580	2000	3000	2000	1500	2800	2800	2900	1800
Total Zinc (Zn)	µg/L	5	30 (6)	8	6	<5	<5	<2	<5	<5	<5	18	17	12	25

ND = Not detected  
NA = Not analyzed  
RDL = Reportable Detection Limit

Surface Water Station				SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1				
Date				9-Jul-14	29-Oct-14	20-May-15	27-Oct-15	20-Jun-16	15-Nov-16	14-Jun-17	1-Nov-17	29-May-18	1-Nov-18	12-Jun-19	20-Nov-19			
FIELD MEASUREMENTS				Units														
Temperature				Degrees C			23.9	9.0	18.4	8.6	21.2	7.2	24.5	6.8	24.2	7.1	20.6	4.1
Conductivity				µmhos			442	416	427	436	511	434	483	447	460	366	460	420
pH							7.39	7.80	7.58	7.36	7.62	7.38	7.15	7.65	7.11	7.88	7.43	7.45

**NOTES:**

- PWQO indicates Provincial Water Quality Objectives.
- (I) indicates interim PWQO
- Cadmium Interim PWQO = 0.5 µg/L (for Hardness >100 mg/L as CaCO3)
- Copper Interim PWQO = 5 µg/L (for Hardness >20 mg/L)
- Revised Interim PWQO = 5 µg/L (for Alkalinity > 80 mg/L (as CaCO3)
- Zinc Revised Interim PWQO = 20 µg/L

- Alkalinity should not be decreased by more than 25 % of the natural concentration.
- Interim PWQO = 75 µg/L for pH >6.5 to 9.0.
- PWQO = 0.020 mg/L to avoid nuisance algae growth, PWQO = 0.010 mg/L for high level of protection  
PWQO = 0.030 mg/L for prevention of excessive plant growth
- PWQO for un-ionized ammonia
- Shaded values indicates exceedance of PWQO.



**Table G-2**  
**Surface Water Quality Results**  
**Kinloss Landfill - 2007 to 2020**

Surface Water Station				SW1	SW1
Date				Jul-20	Nov-20
	Units	RDL	PWQO		
<b>INORGANICS</b>					
Total Ammonia-N	mg/L	0.05		0.03	0.01
Calculated Un-ionized Ammonia	mg/L	2	0.020 (10)	<0.02	<0.02
Conductivity	umho/cm			510	392
Total Dissolved Solids	mg/L	1		268	204
Dissolved Organic Carbon	mg/L	0.1		10.6	10.3
Orthophosphate	mg/L	0.01		NA	NA
Total Phosphorus	mg/L	0.002	0.030 (9)	0.02	0.05
pH	pH		6.5 - 8.5	7.81	8.14
Phenol-4AAP	mg/L	0.001	0.001	<0.002	<0.002
Dissolved Sulphate (SO4)	mg/L	1		<1	2
Turbidity				4.1	0.3
Alkalinity (Total as CaCO3)	mg/L	1	(7)	272	201
Dissolved Chloride (Cl)	mg/L	1		3.7	3.5
Nitrite (N)	mg/L	0.01		<0.05	<0.05
Nitrate (N)	mg/L	0.1		0.08	<0.05
Nitrate + Nitrite	mg/L	0.1		0.1	<0.05
Hardness	mg/L			275	214

Surface Water Station				SW1	SW1
Date				3-Jul-20	3-Nov-20
	Units	RDL	PWQO		
<b>METALS</b>					
Total Aluminum (Al)	µg/L	1	75 (8)	30	40
Total Barium (Ba)	µg/L	5		36	13
Total Boron (B)	µg/L	10	200 (I)	9	<5
Total Cadmium (Cd)	µg/L	0.1	0.5 (3)	<0.015	<0.015
Total Calcium (Ca)	µg/L	200		74900	59000
Total Chromium (Cr)	µg/L	5	100	<2	<2
Total Copper (Cu)	µg/L	1	5 (4)	6	0.1
Total Iron (Fe)	µg/L	50	300	931	88
Total Lead (Pb)	µg/L	0.5	25 (5)	0.25	<0.02
Total Magnesium (Mg)	µg/L	50		21500	16100
Total Manganese (Mn)	µg/L	2		1440	94
Total Potassium (K)	µg/L	200		400	400
Total Sodium (Na)	µg/L	100		1900	1300
Total Zinc (Zn)	µg/L	5	30 (6)	<5	<5

ND = Not detected  
 NA = Not analyzed  
 RDL = Reportable Detection Limit

Surface Water Station				SW1	SW1
Date				3-Jul-20	3-Nov-20
<b>FIELD MEASUREMENTS</b>					
Temperature	Units				
Conductivity	Degrees C			18.6	8.0
pH	µmhos			531	335
				6.85	7.81

**NOTES:**

- PWQO indicates Provincial Water Quality Objectives.
- (I) indicates interim PWQO
- Cadmium Interim PWQO = 0.5 µg/L (for Hardness >100 mg/L as CaCO3)
- Copper Interim PWQO = 5 µg/L (for Hardness >20 mg/L)
- Revised Interim PWQO = 5 µg/L (for Alkalinity > 80 mg/L (as CaCO3)
- Zinc Revised Interim PWQO = 20 µg/L
- Alkalinity should not be decreased by more than 25 % of the natural concentration.
- Interim PWQO = 75 µg/L for pH >6.5 to 9.0.
- PWQO = 0.020 mg/L to avoid nuisance algae growth, PWQO = 0.010 mg/L for high level of protection  
 PWQO = 0.030 mg/L for prevention of excessive plant growth
- PWQO for un-ionized ammonia
- Shaded values indicates exceedance of PWQO.

**Table G-2**  
**Surface Water Quality Results**  
**Kinloss Landfill - 2007 to 2020**

Surface Water Station				SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2
Date				Jul-07	Dec-07	Jul-08	Dec-08	Jul-09	Dec-09	Mar-10	Jun-11	Oct-11	Jun-12	Oct-12	Jun-13	Nov-13
	Units	RDL	PWQO													
INORGANICS																
Total Ammonia-N	mg/L	0.05		0.07	ND	0.09	ND	0.05	ND	<0.05	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Calculated Un-ionized Ammonia	mg/L	2	0.020 (10)	0.003	-	0.003	ND	0.001	-	<0.003	<0.01	-	<0.02	<0.02	<0.02	<0.02
Conductivity	umho/cm			500	518	561	490	533	512	493	507	514	540	523	520	397
Total Dissolved Solids	mg/L	1		340	330	380	NA	NA	NA	NA	294	287	301	364	259	246
Dissolved Organic Carbon	mg/L	0.1		8.7	4.5	7.0	3.8	4.3	5.3	3.3	4.7	7.8	2.5	5.7	8.5	7.9
Orthophosphate	mg/L	0.01		ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus	mg/L	0.002	0.030 (9)	NA	NA	NA	0.011	0.013	0.004	0.004	0.01	<0.01	0.02	<0.01	0.01	<0.01
pH	pH		6.5 - 8.5	8.2	8.2	8.3	8.1	8.1	8.2	8.2	8.10	7.96	7.85	7.72	8.14	8.18
Phenol-4AAP	mg/L	0.001	0.001	0.001	ND	ND	ND	ND	ND	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Sulphate (SO4)	mg/L	1		ND	40	7	15	6	14	14	4	19	9	41	4	7
Turbidity				0.8	0.5	4.9	NA	1.3	0.6	0.6	1.5	0.6	6.9	1.4	3.8	1.7
Alkalinity (Total as CaCO3)	mg/L	1	(7)	277	227	298	249	280	251	245	277	246	289	314	272	243
Dissolved Chloride (Cl)	mg/L	1		6	10	8	7	7	11	11	4.8	6.0	6.1	7.5	4.8	4.7
Nitrite (N)	mg/L	0.01		ND	ND	ND	ND	ND	ND	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate (N)	mg/L	0.1		0.3	0.1	0.1	0.2	0.1	0.1	0.3	0.1	<0.1	0.3	<0.1	0.1	0.1
Nitrate + Nitrite	mg/L	0.1		0.3	0.1	0.1	0.2	0.1	0.1	0.3	<0.2	<0.2	<0.3	<0.2	<0.1	<0.1
Hardness	mg/L									250	330	312	309	349	237	243

Surface Water Station				SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2
Date				16-Jul-07	8-Dec-07	21-Jul-08	14-Dec-08	6-Jul-09	5-Dec-09	23-Mar-10	14-Jun-11	17-Oct-11	20-Jun-12	25-Oct-12	17-Jun-13	20-Nov-13
	Units	RDL	PWQO													
<b>METALS</b>																
Total Aluminum (Al)	µg/L	1	75 (8)	10	9	140	17	12	12	52	50	20	70	40	60	70
Total Barium (Ba)	µg/L	5		29	27	41	19	31	23	25	30	36	34	44	27	21
Total Boron (B)	µg/L	10	200 (I)	14	ND	15	ND	14	ND	15	12	109	12	18	13	8
Total Cadmium (Cd)	µg/L	0.1	0.5 (3)	0.1	0.8	0.5	1	0.9	0.1	0.1	<0.02	<0.02	<0.02	<0.02	0.22	<0.02
Total Calcium (Ca)	µg/L	200		92000	70000	91000	68000	82000	73000	72000	88700	83500	81800	93200	63700	64100
Total Chromium (Cr)	µg/L	5	100	ND	ND	ND	ND	ND	ND	<5	<2	<2	35	6	<2	<2
Total Copper (Cu)	µg/L	1	5 (4)	ND	ND	1	ND	ND	ND	1	<2	<2	0.4	<2	2.4	0.3
Total Iron (Fe)	µg/L	50	300	580	ND	550	ND	ND	ND	<100	111	47	399	36	98	52
Total Lead (Pb)	µg/L	0.5	25 (5)	ND	ND	1.7	ND	ND	ND	<0.5	0.14	0.09	0.25	<0.02	0.62	0.17
Total Magnesium (Mg)	µg/L	50		25000	22000	27000	22000	26000	24000	22000	26300	25000	25400	28100	19000	20100
Total Manganese (Mn)	µg/L	2		360	8	220	9	43	13	15	49	15	66	10	50	21
Total Potassium (K)	µg/L	200		ND	880	1100	960	760	1100	1100	1000	1700	900	1300	700	800
Total Sodium (Na)	µg/L	100		2200	3800	3100	2900	2800	3200	2900	2600	3500	3100	4700	2400	2300
Total Zinc (Zn)	µg/L	5	30 (6)	ND	ND	7	ND	7	ND	<5	<5	<5	<5	<5	<5	<5

ND = Not detected  
NA = Not analyzed  
RDL = Reportable Detection Limit

Surface Water Station				SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2
Date				16-Jul-07	8-Dec-07	21-Jul-08	14-Dec-08	6-Jul-09	5-Dec-09	23-Mar-10	14-Jun-11	17-Oct-11	20-Jun-12	25-Oct-12	17-Jun-13	20-Nov-13
<b>FIELD MEASUREMENTS</b>																
Temperature	Degrees C			18.7	2.7	19.1	1.6	15.2	3.8	7.7	15	9.68	18.3	12.3	16.1	3.0
Conductivity	µmhos			520	390	530	560	540	270	440	480	471	482	498	549	398
pH				8.20	8.34	8.15	7.93	7.93	8.49	8.67	8.2	7.60	8.08	8.86	8.11	7.84

**NOTES:**

1. PWQO indicates Provincial Water Quality Objectives.
2. (I) indicates interim PWQO
3. Cadmium Interim PWQO = 0.5 µg/L (for Hardness >100 mg/L as CaCO3)
4. Copper Interim PWQO = 5 µg/L (for Hardness >20 mg/L)
5. Revised Interim PWQO = 5 µg/L (for Alkalinity > 80 mg/L (as CaCO3)
6. Zinc Revised Interim PWQO = 20 µg/L

7. Alkalinity should not be decreased by more than 25 % of the natural concentration.
8. Interim PWQO = 75 µg/L for pH >6.5 to 9.0.
9. PWQO = 0.020 mg/L to avoid nuisance algae growth, PWQO = 0.010 mg/L for high level of protection  
PWQO = 0.030 mg/L for prevention of excessive plant growth
10. PWQO for un-ionized ammonia
11. Shaded values indicates exceedance of PWQO.

**Table G-2**  
**Surface Water Quality Results**  
**Kinloss Landfill - 2007 to 2020**

Surface Water Station				SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW2	SW2	SW2	SW2	SW2
Date				Jul-14	Oct-14	May-15	Oct-15	Jun-16	Nov-16	Jun-17	Nov-17	May-18	Nov-18	Jun-19	Nov-19
	Units	RDL	PWQO												
<b>INORGANICS</b>															
Total Ammonia-N	mg/L	0.05		<0.01	<0.01	<0.02	<0.02	<0.01	<0.01	<0.01	0.01	0.01	0.02	0.13	0.05
Calculated Un-ionized Ammonia	mg/L	2	0.020 (10)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Conductivity	umho/cm			505	512	515	570	517	560	522	503	486	515	470	490
Total Dissolved Solids	mg/L	1		276	269	-		296	311	287	269	276	292	258	253
Dissolved Organic Carbon	mg/L	0.1		9.2	8.1	3.6	3.5	5.4	2.9	4.9	8.4	4.6	7.8	6.1	6.3
Orthophosphate	mg/L	0.01		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus	mg/L	0.002	0.030 (9)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.08	<0.01	0.03	<0.01
pH	pH		6.5 - 8.5	8.12	7.98	8.59	8.15	8.17	8.14	8.18	8.06	8.58	8.14	8.13	8.17
Phenol-4AAP	mg/L	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002
Dissolved Sulphate (SO4)	mg/L	1		3	4	4.08	22.5	4	14	5	4	3	6	2	9
Turbidity				2.2	0.3	1.2	<0.5	-	-	0.8	0.7	2	0.6	0.7	0.7
Alkalinity (Total as CaCO3)	mg/L	1	(7)	259	266	268	286	294	287	277	266	272	283	245	232
Dissolved Chloride (Cl)	mg/L	1		4.6	5.8	5.48	9.05	4.8	5.8	5.7	4.7	4.6	5.8	3.9	6.7
Nitrite (N)	mg/L	0.01		<0.1	<0.1	<0.05	<0.10	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate (N)	mg/L	0.1		0.1	0.1	0.06	<0.10	0.2	0.2	<0.05	<0.05	<0.05	<0.05	0.08	0.16
Nitrate + Nitrite	mg/L	0.1		<0.1	<0.1	<0.06	<0.10	0.2	-	-	-	<0.05	<0.05	0.10	0.20
Hardness	mg/L			310	275	268	299	307	326	303	280	290	300	286	270

Surface Water Station				SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW2	SW2	SW2	SW2	SW2	SW2
Date				9-Jul-14	29-Oct-14	20-May-15	27-Oct-15	20-Jun-16	15-Nov-16	14-Jun-17	1-Nov-17	29-May-18	1-Nov-18	12-Jun-19	20-Nov-19
	Units	RDL	PWQO												
<b>METALS</b>															
Total Aluminum (Al)	µg/L	1	75 (8)	50	30	<4	<4	30	30	60	50	60	50	90	60
Total Barium (Ba)	µg/L	5		31	23	26	34	-	-	40	26	40	44	47	26
Total Boron (B)	µg/L	10	200 (I)	12	11	10	20	11	18	40	13	12	15	119	16
Total Cadmium (Cd)	µg/L	0.1	0.5 (3)	<0.02	<0.02	<0.1	<0.1	<0.02	<0.02	<0.014	<0.014	0.017	<0.015	<0.015	<0.015
Total Calcium (Ca)	µg/L	200		84500	72500	71700	79800	82000	86900	81600	72700	78200	80700	77800	72400
Total Chromium (Cr)	µg/L	5	100	<2	<2	<3	<3	<2	<2	<1	<1	<2	<2	<1	<1
Total Copper (Cu)	µg/L	1	5 (4)	<0.1	0.1	<2	<2	<0.1	<0.1	0.2	0.1	0.2	0.2	0.2	0.2
Total Iron (Fe)	µg/L	50	300	116	38	10	<0.10	49	11	68	34	62	54	96	28
Total Lead (Pb)	µg/L	0.5	25 (5)	0.16	<0.02	<1	<1	0.07	<0.02	0.03	<0.02	0.09	<0.02	0.06	0.02
Total Magnesium (Mg)	µg/L	50		24100	22900	21600	24300	24700	26500	24200	23800	23000	23900	22300	21700
Total Manganese (Mn)	µg/L	2		42	19	28	11	31	7	38	26	28	13	25	23
Total Potassium (K)	µg/L	200		1000	1400	820	1330	800	1100	800	1100	700	1400	600	1200
Total Sodium (Na)	µg/L	100		2700	2700	2510	3950	2800	4400	3900	2900	3200	4500	3600	2800
Total Zinc (Zn)	µg/L	5	30 (6)	7	5	<5	<5	<5	<5	50	<5	17	16	16	9

ND = Not detected  
NA = Not analyzed  
RDL = Reportable Detection Limit

Surface Water Station				SW 2	SW 2	SW 2	SW 2	SW 2	SW 2	SW2	SW2	SW2	SW2	SW2	SW2
Date				9-Jul-14	29-Oct-14	20-May-15	27-Oct-15	20-Jun-16	15-Nov-16	14-Jun-17	1-Nov-17	29-May-18	1-Nov-18	12-Jun-19	20-Nov-19
<b>FIELD MEASUREMENTS</b>															
Temperature	Degrees C			16.0	8.7	10.2	8.6	20.7	8.2	16.6	7.1	17.9	7.7	13.9	4.7
Conductivity	µmhos			486	489	483	524	534	518	504	531	473	435	520	497
pH				7.87	7.81	7.79	7.63	8.11	7.62	7.60	7.54	7.40	7.44	7.9	7.11

**NOTES:**

- PWQO indicates Provincial Water Quality Objectives.
- (I) indicates interim PWQO
- Cadmium Interim PWQO = 0.5 µg/L (for Hardness >100 mg/L as CaCO3)
- Copper Interim PWQO = 5 µg/L (for Hardness >20 mg/L)
- Revised Interim PWQO = 5 µg/L (for Alkalinity > 80 mg/L (as CaCO3)
- Zinc Revised Interim PWQO = 20 µg/L

- Alkalinity should not be decreased by more than 25 % of the natural concentration.
- Interim PWQO = 75 µg/L for pH >6.5 to 9.0.
- PWQO = 0.020 mg/L to avoid nuisance algae growth, PWQO = 0.010 mg/L for high level of protection  
PWQO = 0.030 mg/L for prevention of excessive plant growth
- PWQO for un-ionized ammonia
- Shaded values indicates exceedance of PWQO.

**Table G-2**  
**Surface Water Quality Results**  
**Kinloss Landfill - 2007 to 2020**

Surface Water Station				SW2	SW2
Date				Jul-20	Nov-20
	Units	RDL	PWQO		
<b>INORGANICS</b>					
Total Ammonia-N	mg/L	0.05		0.02	<0.01
Calculated Un-ionized Ammonia	mg/L	2	0.020 (10)	<0.02	<0.02
Conductivity	umho/cm			522	488
Total Dissolved Solids	mg/L	1		283	256
Dissolved Organic Carbon	mg/L	0.1		4.1	7.4
Orthophosphate	mg/L	0.01		NA	NA
Total Phosphorus	mg/L	0.002	0.030 (9)	0.01	0.03
pH	pH		6.5 - 8.5	8.19	8.12
Phenol-4AAP	mg/L	0.001	0.001	<0.002	<0.002
Dissolved Sulphate (SO4)	mg/L	1		5	10
Turbidity				0.6	0.6
Alkalinity (Total as CaCO3)	mg/L	1	(7)	271	242
Dissolved Chloride (Cl)	mg/L	1		5.9	5.8
Nitrite (N)	mg/L	0.01		<0.05	<0.05
Nitrate (N)	mg/L	0.1		0.2	<0.05
Nitrate + Nitrite	mg/L	0.1		0.2	<0.05
Hardness	mg/L			301	260

Surface Water Station				SW2	SW2
Date				3-Jul-20	3-Nov-20
	Units	RDL	PWQO		
<b>METALS</b>					
Total Aluminum (Al)	µg/L	1	75 (8)	50	50
Total Barium (Ba)	µg/L	5		36	26
Total Boron (B)	µg/L	10	200 (1)	14	16
Total Cadmium (Cd)	µg/L	0.1	0.5 (3)	<0.015	<0.015
Total Calcium (Ca)	µg/L	200		79800	71100
Total Chromium (Cr)	µg/L	5	100	3	<2
Total Copper (Cu)	µg/L	1	5 (4)	0.8	0.4
Total Iron (Fe)	µg/L	50	300	90	34
Total Lead (Pb)	µg/L	0.5	25 (5)	0.61	0.03
Total Magnesium (Mg)	µg/L	50		24800	20000
Total Manganese (Mn)	µg/L	2		53	14
Total Potassium (K)	µg/L	200		1100	1300
Total Sodium (Na)	µg/L	100		3400	3100
Total Zinc (Zn)	µg/L	5	30 (6)	10	6

ND = Not detected  
 NA = Not analyzed  
 RDL = Reportable Detection Limit

Surface Water Station			SW2	SW2
Date			3-Jul-20	3-Nov-20
<b>FIELD MEASUREMENTS</b>				
Temperature	Units			
Conductivity	Degrees C		16.4	7.2
pH	µmhos		534	407
			7.21	7.62

**NOTES:**

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2. (I) indicates interim PWQO
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4. Copper Interim PWQO = 5 µg/L (for Hardness >20 mg/L)
5. Revised Interim PWQO = 5 µg/L (for Alkalinity > 80 mg/L (as CaCO3)
6. Zinc Revised Interim PWQO = 20 µg/L

7. Alkalinity should not be decreased by more than 25 % of the natural concentration.
8. Interim PWQO = 75 µg/L for pH >6.5 to 9.0.
9. PWQO = 0.020 mg/L to avoid nuisance algae growth, PWQO = 0.010 mg/L for high level of protection  
 PWQO = 0.030 mg/L for prevention of excessive plant growth
10. PWQO for un-ionized ammonia
11. Shaded values indicates exceedance of PWQO.



# APPENDIX

H

BUFFER LANDS  
CERTIFICATE OF  
REGISTRATION AND  
LEASE AGREEMENT



P.O. Box 130  
21 Queen Street  
Ripley, ON  
N0G 2R0

Phone: (519) 395-3735  
Fax: (519) 395-4107

email: [hurontwp@hurontel.on.ca](mailto:hurontwp@hurontel.on.ca)

**FACSIMILE**

To: Pryde, Schropp, McComb From: Hugh Nichol  
Attn: Jim Scott Pages: 10 (incl. cover)  
Fax: 1-519-389-4728 Date: September 11, 2007  
Re: Kinloss Waste Disposal Site

**Comments:**

As per your request, please find  
attached the lease agreement.

**RECEIVED**  
SEP 11 2007

CR14 00941

cc g Scott by email.



09/11/2007

18:19

TWP. OF HURON KINLOSS

of Ontario

## Document General

(FAX) 519 395 4107

P.002/010

Form 4 - Land Registration Reform Act, 1986

D

FOR OFFICE USE ONLY

Number **264927**  
**CERTIFICATE OF REGISTRATION**  
 90 FEB 28 P7:21  
 BRUCE No. 3  
 WALKERTON  
 Land Registrar

(1) Registry ☒ Land Titles ☐ (2) Page 1 of 1 pages ☒

(3) Property Identifier(s) Block Property ☒

(4) Nature of Document  
 Lease **XXXXXX**

(5) Consideration  
**Twenty Thousand** Dollars **\$20,000.00**

(6) Description  
 Part of Lot 17, Concession 6, in the Township of Kinloss, in the County of Bruce and described as Part 3 on Reference Plan 3R-4858.

New Property Identifier(s) Additional See Schedule ☐

Executions Additional See Schedule ☐

(7) This Document Contains (a) Redescription New Easement Plan/Sketch ☐ (b) Schedule for: Description ☐ Additional Parties ☐ Other ☒

(8) This Document provides as follows:

See Lease **XXXXXX** attached.

(9) This Document relates to instrument number(s)

Continued on Schedule ☐

(10) Party(ies) (Set out Status or Interest)  
 Name(s) (Lessee)  
 THE CORPORATION OF THE TOWNSHIP OF KINLOSS, by their solicitor  
 George C. Magwood  
 Signature(s) *George C. Magwood*  
 Date of Signature Y M D 1990 22 25

(11) Address for Service  
 Holyrood, Ontario NOG 2B0

(12) Party(ies) (Set out Status or Interest)  
 Name(s) (Lessor)  
 JOHNSTON, Donald  
 JOHNSTON, Barry  
 Signature(s)  
 Date of Signature Y M D

(13) Address for Service *RR#3 Holyrood, Ontario*

(14) Municipal Address of Property

Not assigned

(15) Document Prepared by  
 George C. Magwood  
 WAECHTER, MAGWOOD,  
 VAN DE VYVERE & THOMPSON  
 215 Durham Street  
 Walkerton, Ontario  
 NOG 2V0

## Fee and Tax

Registration Fee	22.00
L.T.	100.00
Total	122.00

# This Indenture

made (in duplicate) the 30th day of November  
in the year one thousand nine hundred and eighty-nine  
In Pursuance of the Short Form of Lease Act

Between

DONALD JOHNSTON  
and HARRY JOHNSTON

hereinafter called the LESSOR of the FIRST PART  
and

THE CORPORATION OF THE TOWNSHIP OF KINLOSS

hereinafter called the LESSEE of the SECOND PART

Witnesseth that in consideration of the Rents, Covenants and Agreements hereinafter respectively reserved and contained on the part of the Lessee, to be respectively paid, observed and performed, the Lessor hath demised and Leased and by these presents DOETH demise and LEASE unto the Lessee ALL THAT parcel or tract of land and premises situate, lying and being in the Township of Kinloss in the County of Bruce containing by admeasurement

being composed of 30.30 acres, be the same more or less, and Part of Lot 17, Concession 6, in the Township of Kinloss, in the County of Bruce and more particularly described as Part 3 on Reference Plan 3R-4858.

Farm Lease, p. 2 - 196 - revised 1978

Do Here and to Hold the said demised premises for and during the term of 99  
 -----NINETY-NINE----- years  
 to be computed from the 1st day of January one thousand  
 nine hundred and ninety and thenceforth next ensuing, and  
 fully to be complete and ended on the 10th day of December 2089..

YIELDING AND PAYING therefor yearly and every year during the said term hereby  
 granted unto the Lessor the sum of TWENTY THOUSAND  
 -----(\$20,000.00)----- Dollars, of lawful  
 money of Canada, without any deduction, defalcation or abatement whatsoever to be  
 payable on the following days and times, that is to say:

The sum of \$20,000.00 to be paid to the lessor on the final  
 signing of this agreement by all parties.

THE first of such payments to become due and be made on the --  
 day of --

THE Lessee COVENANTS with the Lessor to pay rent.

~~AND to pay taxes, except for local improvements.~~

~~AND to repair, reasonable wear and tear and damage by fire, lightning and tempest only~~  
~~excepted.~~

~~AND to keep up fences~~

AND to perform all statute labour.

AND not to cut down timber or trees of any kind whatsoever, except

AND that the Lessor may enter and view state of repair.

~~AND that the Lessee will repair according to notice in writing, reasonable wear and tear,~~  
~~and damage by fire, lightning and tempest only excepted.~~

AND will not assign or sub-let without leave; and such consent may, notwithstanding any  
 section of the Landlord and Tenant Act of the Province of Ontario, be arbitrarily refused  
 by the Lessor in his sole and uncontrolled discretion.

AND will not carry on any business that shall be deemed a nuisance on said premises.

AND that he will leave the premises in good repair (reasonable wear and tear and damage  
 by fire, lightning and tempest only excepted).

~~PROVIDED that the Lessee may remove his fixtures, if such removal may be and is done~~  
~~without injury to the said premises.~~

~~PROVIDED that in the event of damage by fire, lightning or tempest, rent shall cease until~~  
~~the premises are rebuilt.~~

THE SAID LESSEES hereby covenants and agrees with the said Lessor, that in considera-  
 tion of the premises, and of the leasing and letting by the said Lessor to the said Lessee  
 of the lands and premises above named for the term hereby created (and it is upon that  
 express understanding that these presents are entered into), that notwithstanding any-  
 thing contained in Section 30 of Chapter two hundred and thirty six of the Revised  
 Statutes of Ontario, 1970, or in any other section of the said Act, or any other Statute  
 which may hereafter be passed to take the place of the said Act or to amend the same,  
 that none of the goods or chattels of the said Lessee at any time during the continuance  
 of the term hereby created, on said demised premises, shall be exempt from levy by distress  
 for rent in arrear by said Lessee as provided for by section or sections of the said Act  
 above named, or any amendment or amendments thereto, and that upon any claim being  
 made for such exemption by said Lessee or on distress being made by the said Lessor this  
 covenant and agreement may be pleaded as an estoppel against the said Lessee in any  
 action brought to test the right to the levying upon any such goods as are named as  
 exempted in said Section or Sections, or amendment or amendments, thereto. Said Lessee  
 waiving, as he hereby does all and every benefit that could or might have accrued to him  
 under and by virtue of the said Section or Sections of said Act, or any amendment or  
 amendments thereto but for the above Covenant.

~~AND the Lessee doth hereby further covenant and agree with the Lessor in manner follow-  
 ing, that is to say: THAT the Lessee will during the said term, cultivate, till, manure and  
 employ such parts of the said premises as are now or shall hereafter be brought under  
 cultivation in a good farmer-like and proper manner, and will in like manner crop the same  
 in a regular rotation of crops so as not to impoverish, depreciate or injure the soil, and will  
 plough the lands in each year during the said term, and at the end of the said term will  
 leave the said land so manured as aforesaid. AND will during the continuance of said  
 term mow the grass along the fences and in the fence corners on the said lands, keep down  
 all noxious weeds and grasses, which shall grow upon the said premises or on the side of  
 the roads or highways adjacent thereto, and will not sow or permit to be sown any grain  
 infected by smut or containing any foul seeds or noxious weeds, and will not suffer or  
 permit any such foul seeds or noxious weeds to go to seed on the said premises.~~

AND that if at any time during the said term the Lessee shall neglect to pull up or other-  
 wise destroy or prevent from going to seed on the said lands any noxious weeds or grasses  
 growing thereon, and which are reasonably within the power and duty of the Lessee so to

Farm Lease, p. 3 - 197 - revised 1978

~~pull-up or otherwise destroy or prevent from going to seed, the Lessor may, by notice in writing, require the Lessee within 48 hours after the service of such notice, to pull up or otherwise destroy or prevent them from going to seed, and on default of the Lessee so doing, the Lessor may enter upon the said lands with laborers and workmen and do the work by the said notice required to be done by the Lessee, and all costs, charges and expenses of or incidental thereto shall be added to the rents hereby reserved, and shall be recoverable in like manner as rent reserved, but this provision shall not in any way impair or abridge the right of re-entry by the Lessor on non-performance of covenants. This clause shall not supersede the provisions contained in The Weed Control Act R.S.O. 1970, Chapter 193 as amended from time to time.~~

AND will keep the mouths of all underdrains on the said premises open and free from obstruction, and in good running order at all times during the said term, and will not suffer or permit such drains, or the water-courses in any open ditches on said premises to become obstructed, but will constantly keep the same free and clear, for the escape of the water flowing therein.

~~AND will carefully protect and preserve all orchard, fruit and shade and ornamental trees on said premises from waste, injury or destruction, and will carefully prune and care for all such trees as often as they require it, and will not suffer or permit any horse, cattle or sheep to have access to the orchard on said premises. And will not allow the manure to be placed or lie against the said buildings on said premises. And will allow any incoming tenant or purchaser to plow the said lands after harvest in the last year of said term, and to have stabling for one team or shelter for one tractor and bedroom for one man, and reasonable privilege and rights of way to do said plowing.~~

PROVIDED also, and it is hereby expressly agreed and understood by the parties hereto that if the term hereby granted or any of the goods or chattels of the Lessee shall be at any time during said term seized or taken in execution, or attachment by any creditor of the Lessee or if the Lessee shall make any Chattel Mortgage or Bill of Sale of any of his crops or other goods and chattels, or any assignment for the benefit of creditors, or becoming bankrupt and insolvent, shall take the benefit of any Act, that may be in force for bankrupt and insolvent debtors, or shall attempt to abandon said premises, to sell and dispose of his farm stock and implements, so that there would not in the event of such sale or disposal be a sufficient distress on said premises for the then accruing rent, of which the Lessor shall be sole judge, then in every such case, the then current and next ensuing year's rent and the taxes for the then current year (to be reckoned upon the rate of the previous year, in case rate shall not have been fixed for current year) shall immediately become due and payable and the term hereby granted shall at the option of the Lessor immediately become forfeited, void and determined, and in every of the above cases such taxes or accrued portion thereof may be recoverable by the Lessor in the same manner as the rent hereby reserved.

PROVIDED also that, in case of removal by the Lessee of his goods and chattels in whole or substantial part from off the said premises, the Lessor may distrain for the rents hereby reserved upon the goods and chattels of the Lessee upon any other premises to which they may have been removed.

~~IN case the Lessor should desire to sell the said lands and premises during the said term, the said term may be determined at any time upon one (1) month's notice by a notice to such effect, and that the Lessee will, at the expiration of the time limited by the said notice, peaceably and quietly give up possession of the said lands and premises to the Lessor; provided that upon such earlier determination of the said term, and after the Lessee shall have delivered up possession in manner aforesaid, and paid to the Lessor the full proportion of rent and taxes up to the date of such earlier determination, the Lessee shall be entitled to be compensated for the value of the crops sown and then growing, or of the ploughing done on the said lands in preparing for a crop, the amount of such compensation to be determined by arbitration if the parties cannot agree thereon.~~

IN the event of any misunderstanding or misinterpretation arising out of the lease, the parties herein agree that the matter shall be then settled forthwith in accordance with the provisions contained in The Arbitration Act, R.S.O. 1970, as amended from time to time to be bound by any such decisions obtained as a result thereof.

~~AND it is hereby agreed between the parties hereto that should the Lessee remain in possession of the said lands and premises after the termination of the term hereby granted, without other special agreement, it shall be as a monthly tenant only at a rental of \$ 0.15 per month payable in advance on the 1st day of every month and subject in all other respects to the terms of this lease.~~

ANY notice or other communication required or permitted to be given hereunder shall be in writing and shall be given either by delivering the same to the recipient or mailing the same postage prepaid in a government post box to the recipient at the following address:

If to the Lessor:

If to the Lessee:

- 2 -

9. The benefits and burdens of this lease shall be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

THE CORPORATION OF THE TOWNSHIP  
OF KINLOSS

David Eades  
Reeve  
Acting

W. R. Hawthorne  
Clerk

Donald Johnston  
Donald Johnston

Barry Johnston  
Barry Johnston



Form 1 - Land Transfer Tax Act  
Affidavit of Residence and of Value of the Consideration  
Refer to all instructions on reverse sideIN THE MATTER OF THE CONVEYANCE OF (insert brief description of land) Part of Lot 17, Concession 6, Township of Kinloss, County of Bruce being described as Part 1 on Reference Plan 1R-481BY (insert names of all transferors in full) Donald Johnston & Barry JohnstonTO (insert names of all transferees in full) The Corporation of the Township of KinlossI, (insert name of and print name of all) George C. Magwood

## MAKE OATH AND SAY THAT:

- I am giving a solemn oath under the statute respecting that one of the following paragraphs that describes the capacity of the signatory: (see instruction 2)
- ☐ (a) A person in trust for whom the land conveyed in the above-described conveyance is being conveyed;
- ☐ (b) A trustee named in the above-described conveyance to whom the land is being conveyed;
- ☐ (c) A transferee named in the above-described conveyance;
- ☒ (d) The authorized agent or solicitor acting in this transaction for (insert name of paragraph) Township of Kinloss The Corporation of the
- ☐ (e) The President, Vice President, Manager, Secretary, Director, or Treasurer authorized to act for (insert name of corporation)
- ☐ (f) A transferee described in paragraph (a), (b), (c) above: (insert name and reference to applicable paragraph)
- ☐ (g) A transferee described in paragraph (a), (b), (c) above: (insert name and reference to applicable paragraph)
- I swear only one of paragraph (a), (b), (c) above, as applicable, and am making this affidavit on my own behalf and on behalf of (insert name of transferee) who is my spouse described in paragraph (a)

2. (To be completed where the value of the consideration for the conveyance exceeds \$20,000.)
- I have read and considered the definition of "single family residence" set out in clause 1(1)(i) of the Act. The land conveyed in the above-described conveyance
- ☐ contains at least one and not more than two single family residences
- ☐ does not contain a single family residence.
- ☐ contains more than two single family residences. (see instruction 3)

NOTE: Clause 2(1) (ii) imposes an additional tax at the rate of one-half of one per cent upon the value of consideration in excess of \$20,000 where the conveyance contains at least one and not more than two single family residences.

3. I have read and considered the definitions of "non-resident corporation" and "non-resident person" set out respectively in clauses 1(1)(i) and (j) of the Act and each of the following persons to whom or in trust for whom the land is being conveyed in the above-described conveyance is a "non-resident corporation" or a "non-resident person" as set out in the Act. (see instructions 4 and 5)

None

## 4. THE TOTAL CONSIDERATION FOR THIS TRANSACTION IS ALLOCATED AS FOLLOWS

(a) Monies paid or to be paid in cash		
(b) Mortgage (i) Assumed (other principal and interest to be serviced against purchase price)	\$ 20,000.00	
(ii) Given back to vendor	\$ nil	
(c) Property transferred in exchange (other debts)	\$ nil	
(d) Securities transferred to the value of (insert value)	\$ nil	
(e) Liens, legacies, annuities and maintenance charges to which transfer is subject	\$ nil	
(f) Other valuable consideration subject to land transfer (see instruction 5)	\$ nil	
(g) VALUE OF LAND, BUILDING, FIXTURES AND GOODWILL SUBJECT TO LAND TRANSFER TAX (Total of (a) to (f))	\$ 20,000.00	\$ 20,000.00
(h) VALUE OF ALL CHATTELS - (Items of tangible personal property placed upon the land or in the possession of the transferee under the provisions of the "Hurdle Sale Tax Act", R.S.O. 1990, c. 44, as amended)	\$ nil	
(i) Other consideration for transaction not included in (g) or (h) above	\$ nil	
(j) TOTAL CONSIDERATION	\$ nil	\$ 20,000.00

5. If consideration is nominal, describe relationship between transferor and transferee and state purpose of conveyance. (see instruction 6)
6. If the consideration is nominal, is the land subject to any encumbrance? n/a
7. Other remarks and explanations, if necessary. n/a

Sworn before me at the Town of Walkerton  
in the County of Bruce  
this 27 day of February 19 90

A Commissioner for taking Affidavits, etc.  
JOHN KEE, a Commissioner, etc., Bruce County, for  
Wheatley, Magwood, Van De Vyvere & Thompson,  
Barristers & Solicitors, Expires March 3, 1992.

## Property Information Record

- A. Describe nature of instrument Document General - Lease
- B. (i) Address of property being conveyed (if available) Not assigned
- (ii) Assessment Roll file # available Not assigned
- C. Mailing address for future Notices of Assessment under the Assessment Act for property being conveyed (see instruction 3) Holyrood, Ontario
- D. (i) Registration number for last conveyance of property being conveyed (if known)
- (ii) Legal description of property conveyed. Same as in D (i) above.
- E. Name(s) and address(es) of each transferee's solicitor
- George C. Magwood  
WAECHTER, MAGWOOD, VAN DE VYVERE  
& THOMPSON  
215 Durham Street  
Walkerton, Ontario  
N0G 2V0

Yes ☐ No ☐ Not known ☐

For Land Registry Office use only

REGISTRATION NO. \_\_\_\_\_

Land Registry Office No \_\_\_\_\_

Registration Date \_\_\_\_\_





Form Lease, p. 4 - 198 - revised 1978

ANY notice or other communication mailed or delivered as aforesaid shall be deemed to have been given at the date it was personally delivered or if mailed shall be deemed to have been given on the third business day following the date of which it was mailed. Either the Lessor or the Lessee may change his address for service from time to time by giving notice in accordance with the foregoing.

PROVISO for re-entry by the Lessor on non-payment of rent, or non-performance of Covenants.

THE Lessor COVENANTS with the Lessee for quiet enjoyment. The parties further covenant that the terms contained in Schedule A attached hereto shall form part of this lease and be binding on the parties.

IT is hereby declared and agreed that this Indenture shall enure to the benefit of and be binding upon the parties hereto, their heirs, executors, administrators and assigns, respectively.

AND it is further agreed that wherever the singular and masculine are used in this Indenture they shall be construed as if the plural or the neuter or feminine had been used, where the context or the party or parties hereto so require, and the rest of the sentence shall be construed as if the grammatical and terminological changes thereby rendered necessary had been made.

IN WITNESS WHEREOF the said parties hereto have hereunto set their hands and seal.

Signed, Sealed and Delivered  
In the presence of

THE CORPORATION OF THE TOWNSHIP OF  
KINLOSS

Reeve  
Acting

Bernard Johnston

BARRY JOHNSTON

AFFIDAVIT AS TO AGE AND MARITAL STATUS



I/WE

of the

in the

make oath and say:

When

executed the attached instrument.

I/WE

at least eighteen years old.

I was

married / divorced / widower

was my wife / husband.

We were married to each other.

(SEVERALLY) SWORN before me at the

this day of

19

A COMMISSIONER FOR TAKING AFFIDAVITS ETC

\* Where affidavit made by attorney substitute: "When I executed the attached instrument as attorney for (name), he/she was married, and if married, name of spouse, and when he, she executed the power of attorney, he/she had attained the age of majority."

SCHEDULE A

To the lease dated November 30, 1989 between the Corporation of the Township of Kinloss as Lessee and Donald and Barry Johnston as Lessors.

1. It is acknowledged by the parties that the demised premises described in this lease will be used by the Lessee as a buffer zone for the purpose of protecting the existing Kinloss Township waste disposal site located on Part Lot 16, Concession 6, Kinloss Township, Bruce County.
2. It is acknowledged that the right to use the land by the Lessee shall include the full right of access at any time by the lessee, its employees, servants and agents, and necessary equipment for the purpose of making inspections and for the purpose of monitoring surface and ground water upon and under the buffer lands, and the lessee agrees to restore, as nearly as may be possible the lands to the extent that they may be altered or disturbed by the exercise of the rights granted in this lease.
3. The Lessor as owners shall have the continued use of the land and access thereto for recreational purposes and shall specifically retain the right to cut timber on the land and to sell any such timber and retain the proceeds therefrom. Provided the Lessors shall not erect any buildings or drill any wells on the said land.
4. It is acknowledged that there is a small spring-fed pond in the southerly portion of the leased land and it is acknowledged that the Lessee will include the pond in the water monitoring program which is required by the Ministry of the Environment as a result of the operation of the adjoining waste disposal site.
5. The Lessor shall be responsible for any real property taxes assessed against the said leased lands and shall pay the taxes so assessed to the Township of Kinloss as they fall due.
6. (a) The Lessee shall indemnify and save harmless the Lessor from all liability whatsoever which may be directly or indirectly attributed to the use of the land by the Lessor as a buffer to its waste disposal site.  
(b) It is acknowledged by the Lessor that the water within the ground may migrate from the adjoining land fill site owned by the Lessee under the surface of the buffer lands, or that surface water may flow across the lands and that such water may not be suitable as drinking water or for other uses and the Lessors agree not to hold the Lessee liable or in any way responsible for a diminution of water quality on the buffer lands.
7. It is acknowledged and agreed by both parties that no further ponds or wells of any type, or the alteration of any existing streams, waterways, or ponds shall be permitted on the said buffer lands, without approval in writing having first been obtained from the Provincial Ministry of the Environment.
8. This agreement and the easements and rights hereby granted are and shall be conditional upon the approval, pursuant to the Environmental Assessment Act and the Environmental Protection Act, of the use of the Township lands for an enlargement and extension of the Township's waste disposal site.

Cont'd

# APPENDIX

I

## MONITORING & SCREENING CHECKLIST

## Appendix D-Monitoring and Screening Checklist

### General Information and Instructions

**General Information: The checklist is to be completed, and submitted with the Monitoring Report.**

**Instructions:** A complete checklist consists of:

- (a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
- (b) completed contact information for the Competent Environmental Practitioner (CEP)
- (c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

**Definition of Groundwater CEP:**

For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:

- (a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
- (b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..

**Definition of Surface water CEP:**

A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

<b>Monitoring Report and Site Information</b>	
<b>Waste Disposal Site Name</b>	Kinloss Waste Disposal Site
<b>Location (e.g. street address, lot, concession)</b>	Part Lot 16, Concession 6, in the Former Township of Kinloss, Township of Huron-Kinloss, County of Bruce
<b>GPS Location (taken within the property boundary at front gate/ front entry)</b>	463575 m E, 4871980 m N
<b>Municipality</b>	Township of Huron-Kinloss
<b>Client and/or Site Owner</b>	Township of Huron-Kinloss
<b>Monitoring Period (Year)</b>	2020
This Monitoring Report is being submitted under the following:	
<b>Certificate of Approval No.:</b>	A272801
<b>Director's Order No.:</b>	
<b>Provincial Officer's Order No.:</b>	
<b>Other:</b>	

<b>Report Submission Frequency</b>	<input checked="" type="radio"/> <b>Annual</b> <input type="radio"/> <b>Other</b>	Specify (Type Here):
<b>The site is:</b>	<input type="radio"/> <b>Active</b> <input checked="" type="radio"/> <b>Inactive</b> <input type="radio"/> <b>Closed</b>	
<b>If closed, specify C of A, control or authorizing document closure date:</b>		N/A
<b>Has the nature of the operations at the site changed during this monitoring period?</b>	<input type="radio"/> <b>Yes</b> <input checked="" type="radio"/> <b>No</b>	
<b>If yes, provide details:</b>	Type Here	
<b>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)</b>	<input type="radio"/> <b>Yes</b> <input checked="" type="radio"/> <b>No</b>	



## Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

### Sampling and Monitoring Program Status:

<b>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:</b>	<input checked="" type="radio"/> Yes  <input type="radio"/> No	
<b>2) All groundwater, leachate and WDS gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by Certificate(s) of Approval or other relevant authorizing/control document(s):</b>	<input checked="" type="radio"/> Yes  <input type="radio"/> No  <input type="radio"/> 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

<b>3) a) Some or all groundwater, leachate and WDS gas sampling and monitoring requirements have been established or defined outside of a ministry C of A, authorizing, or control document.</b>		<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable	
<b>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:</b>		<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If no, list exceptions below or attach additional information.
<b>Groundwater Sampling Location</b>	<b>Description/Explanation for change (change in name or location, additions, deletions)</b>	<b>Date</b>	
Type Here	Type Here	Select 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	
<b>4) All field work for groundwater investigations was done in accordance with standard operating procedures 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):</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	If no, specify (Type Here):	

## Sampling and Monitoring Program Results/WDS Conditions and Assessment:

<b>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.</b>	<input checked="" type="radio"/> Yes  <input type="radio"/> No		
<b>6) The site meets compliance and assessment criteria.</b>	<input checked="" type="radio"/> Yes  <input type="radio"/> No		
<b>7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.</b>	<input checked="" type="radio"/> Yes  <input type="radio"/> No		
<b>1) Is one or more of the following risk reduction practices in place at the site:</b> <b>(a) There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/treatment; or</b> <b>(b) There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or</b> <b>(c) The site meets the following two conditions (typically achieved after 15 years or longer of site operation):</b>  <i>i. The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and</i> <i>ii. Seasonal and annual water levels and water quality fluctuations are well understood.</i>	<input checked="" type="radio"/> Yes          <input type="radio"/> No	<b>Note which practice(s):</b>	<input type="checkbox"/> (a)  <input type="checkbox"/> (b)  <input checked="" type="checkbox"/> (c)
<b>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</b>	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here):	

## 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 Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

## Recommendations:

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


☒ No changes to the monitoring program are recommended

☐ The following change(s) to the monitoring program is/are recommended:

☒ No Changes to site design and operation are recommended

☐ The following change(s) to the site design and operation is/are recommended:



<b>Name:</b>	Stepen J. Taziar, P. Eng		
<b>Seal:</b>	Add Image 		
<b>Signature:</b>		<b>Date:</b>	1-Jun-2021
<b>CEP Contact Information:</b>	126 Don Hillock Drive, Unit 2 Aurora, ON L4G 0G9		
<b>Company:</b>	WSP Canada Inc.		
<b>Address:</b>	126 Don Hillock Drive, Unit 2 Aurora, ON L4G 0G9		
<b>Telephone No.:</b>	(289) 984-0426	<b>Fax No. :</b>	(905) 727-0463
<b>E-mail Address:</b>	stephen.taziar@wsp.com		
<b>Co-signers for additional expertise provided:</b>			
<b>Signature:</b>		<b>Date:</b>	Select Date
<b>Signature:</b>		<b>Date:</b>	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)	Tributary of Kinloss Creek
Distance(s)	235 m east of landfill

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:	<input checked="" type="radio"/> Yes <input type="radio"/> No	
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the Certificate(s) of Approval or relevant authorizing/control document(s) (if applicable):	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not applicable (No C of A, authorizing / control document applies)	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



<b>3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry C of A or authorizing/control document.</b>		<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable	
<b>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:</b>		<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If no, specify below or provide details in an attachment.
<b>Surface Water Sampling Location</b>	<b>Description/Explanation for change (change in name or location, additions, deletions)</b>		<b>Date</b>
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
<b>4) All field work for surface water investigations was done in accordance with standard operating procedures, 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):</b>	<input checked="" type="radio"/> Yes <input type="radio"/> 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**

☐ **No**

**If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table below or provide details in an attachment:**

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. C of A limit, PWQO, background	e.g. X% above PWQO
As outlined in Section 3.4 of report	As outlined in Section 3.4 of report	As outlined in Section 3.4 of report
<b>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)?</b>	<input checked="" type="radio"/> <b>Yes</b>  <input type="radio"/> <b>No</b>	As outlined in Section 3.4 of report, the pattern indicates that the landfill site does not have a measurable affect on the water quality of the creek.

<p>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.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>If no, list parameters and stations that is outside the expected range. Identify whether parameter concentrations show an increasing trend or are within a high historical range (Type Here)</p>
<p>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)):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p><input type="radio"/> Not Known</p> <p><input type="radio"/> Not Applicable</p>	<p>If yes, provide details and whether remedial measures are necessary (Type Here)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here)</p>

## 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 Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

## Recommendations:

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

<p><input checked="" type="radio"/> <b>No Changes to the monitoring program are recommended</b></p> <p><input type="radio"/> <b>The following change(s) to the monitoring program is/are recommended:</b></p>	<p>Type Here</p>
<p><input checked="" type="radio"/> <b>No changes to the site design and operation are recommended</b></p> <p><input type="radio"/> <b>The following change(s) to the site design and operation is/are recommended:</b></p>	<p>Type Here</p>



<b>CEP Signature</b>		
<b>Relevant Discipline</b>	Engineer	
<b>Date:</b>	1-Jun-2021	
<b>CEP Contact Information:</b>	Stephen J. Taziar, P. Eng	
<b>Company:</b>	WSP Canada Inc.	
<b>Address:</b>	126 Don Hillock Drive, Unit 2 Aurora, ON L4G 0G9	
<b>Telephone No.:</b>	(289) 984-0426	
<b>Fax No. :</b>	(905) 727-0463	
<b>E-mail Address:</b>	stephen.taziar@wsp.com	
<b>Save As</b>		<b>Print Form</b>