2022/2023 Monitoring Report

Final

Cobden Closed Waste Disposal Site
ECA No. A413204

May 1, 2024

Jp2g Project # 17-6046H

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

DISTRIBUTION LIST

PDF	PDF (with Database)	Association / Company
1	1	Township of Whitewater Region
1		Jp2g Consultants Inc.
1	1	Ministry of the Environment, Conservation and Parks (Ottawa District Office)

Jp2g Consultants Inc. Signatures

Abdul Alhaj

Report Prepared By:

Abdul kader Alhaj, EIT
Environmental Technologist | Environmental Services

Report Reviewed By:

Kevin Mooder, MCIP RPP
Manager | Environmental Services

PROFESSIONAL GEOSCIENTIST
ANDREW BUZZA
PRACTISING MEMBER
0942
ONTARIO
April 25, 2024

Report Reviewed By:

Andrew Buzza, P.Geo
Senior Hydrogeologist

EXECUTIVE SUMMARY

The following report has been prepared to satisfy conditions outlined in the Amended Environmental Compliance Approval (ECA) No. A413204 Notice No. 1 dated March 2, 2009 (and in consideration of Notices No. 2 and 3 dated March 19, 2012, and August 21, 2014, respectively) for the Closed Cobden Waste Disposal Site. The Cobden Waste Disposal Site is located in Part Lot 14, Concession 2, geographic Township of Ross, now in the Township of Whitewater Region. The municipally owned 2.06 ha landfill site was established under a Provisional Certificate of Approval No. A413204 dated February 2, 1978, supported by an application dated June 21, 1971. On March 2, 2009, the Township was issued an amended ECA which details the site closure, monitoring, compliance, and reporting requirements. Moreover, an amendment dated August 21, 2014, was issued to include the establishment of a contaminant attenuation zone and to update monitoring program requirements.

In April 2002 the Cobden Landfill Site ceased receiving municipal waste. The application of final cover was conducted over the period 2003 to 2009.

In 2013 the Municipality finalized the negotiations for the establishment of an 8.16ha CAZ extending west from the former landfilling site to monitoring well 02-10. The CAZ area was registered on Title under a Certificate of Requirement dated December 15, 2014.

Two environmental water quality monitoring events were completed for 2022 and 2023. The monitoring consisted of the collection of static groundwater levels, groundwater samples from selected monitors and an assessment of well conditions. Similar to previous years the direction of groundwater flow is to the west. The leachate at the site is characterized by groundwater from monitoring well 96-7A that is located downgradient and close to the former fill area. Historically, background values at the site have been characterized by groundwater from monitoring well 95-4 and are now currently characterized by groundwater at monitoring well 96-9. All monitoring wells included in 'Schedule B' of the Amended ECA and monitoring well 09-11 as required by Condition 7 are in working order.

An assessment of the Reasonable Use Concept has been applied to key monitoring wells. The 2022 and 2023 results reveal chemical values that are less than their respective RUC values with the exception of iron at 02-10 with values that are less than the ODWS.

Recommendations have been provided for continued monitoring and assessment of groundwater; particularly at off-site location 09-11 to ensure chemical concentrations do not reveal increasing trends.

TABLE OF CONTENTS

DISTRIBUTION LIST ..... **I**

EXECUTIVE SUMMARY ..... **I**

1.0 INTRODUCTION **1**

1.1 Site Location 1
1.2 Site Ownership and Key Personnel 1
1.3 Description and Development of the Waste Disposal Site 2
1.4 Monitoring and Reporting Program 4

2.0 BACKGROUND **4**

2.1 Work Activities 5
2.2 Ministry Review and Correspondence 5

3.0 PHYSICAL SETTING **7**

3.1 Subsurface Conditions 7
3.2 Hydraulic Gradients 7
3.3 Groundwater Flow 8

4.0 WELL MAINTENANCE AND CONSTRUCTION **8**

5.0 DESCRIPTION OF MONITORING PROGRAM **9**

6.0 GROUNDWATER QUALITY **10**

6.1 Assessment Program 10
6.2 Quality Assurance & Quality Control 10
6.3 Background Water Quality 10
6.4 Identification of Site-Specific Leachate Parameters 11
6.5 Overburden Groundwater 13
6.6 Organic Analysis 21
6.7 Assessment of Impact of Landfill on Groundwater 21
6.8 Groundwater-surface water interactions 23

7.0 CONTAMINANT ATTENUATION ZONE **24**

8.0 LANDFILL GAS **24**

9.0 MONITORING PROGRAM **24**

10.0 DISCUSSION AND RECOMMENDATIONS **25**

REFERENCES **27**

LIMITATIONS AND USE OF THE REPORT **28**

TABLE OF CONTENTS (Cont'd)

LIST OF TABLES

Table 1 2022-2023 Groundwater Levels
Table 2 2022-2023 Environmental Monitoring Details
Table 3 Background Values Monitoring Well 96-9
Table 4 Leachate Values
Table 5 2022-2023 Results from Monitoring Well 95-2
Table 6 2022-2023 Results from Monitoring Well 95-3
Table 7 2022-2023 Results from Monitoring Well 95-4
Table 8 2022-2023 Results from Monitoring Well 95-5A and 95-5B
Table 9 2022-2023 Results from Monitoring Well 96-6A and 96-6B
Table 10 2022-2023 Results from Monitoring Well 96-7A and 96-7B
Table 11 2022-2023 Results from Monitoring Well 96-8A and 96-8B
Table 12 2022-2023 Results from Monitoring Well 02-10A and 02-10B
Table 13 2022-2023 Results from Monitoring Well 09-11A and 09-11B
Table 14 Reasonable Use Criteria
Table 15 Summary of Guideline B-7 Reasonable Use Calculations
Table 16 Monitoring Program

LIST OF FIGURES

Figure 1 Site Location Map
Figure 2 Cobden WDS and Surrounding Area
Figure 3 Site Plan
Figure 4 Groundwater Elevations – November 2022
Figure 5 Groundwater Elevations – September 2023

APPENDICES

Appendix A Monitoring and Screening Checklist
Appendix B Environmental Compliance Approval
Appendix C Ministry Correspondence
Appendix D Borehole Logs
Appendix E Compiled Chemical Analysis
Appendix F Photographs

ACRONYMS

WDS	Waste Disposal Site
ECA	Environmental Compliance Approval
CAZ	Contaminant Attenuation Zone
TSS	Technical Support Section
GAL	Golder Associates Ltd.
ODWS/OG	Ontario Drinking Water Standards/Objectives and Guidelines
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percent Difference
RUC	Reasonable Use Criteria

1.0 INTRODUCTION

The Cobden Waste Disposal Site (WDS) is owned by the Township of Whitewater Region and is located within Part Lot 14 Concession 2 geographic Township of Ross as shown on **Figure 1**. The Township of Whitewater Region has requested that Jp2g Consultants Inc. assist with the preparation of the 2022-2023 Environmental Monitoring Report for the Cobden Waste Disposal Site (the Site).

This report presents the results of the 2022-2023 activities that were completed at the Site. The report and activities have been completed and reported on in *general conformance* with the November 2010 Ministry of the Environment (MOE) Technical Guidance Document for Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water. The "Monitoring and Screening Checklist" is provided in **Appendix A** for reference purposes.

The completion of the Biennial Monitoring Report is required to satisfy Condition 8 of the Environmental Compliance Approval (ECA) Number A413204 issued under Notice No. 1 dated March 2, 2009, for the closure of the Cobden WDS. Under Notice No. 2 dated March 19, 2012, the environmental compliance requirements involving the establishment of a contaminant attenuation zone (CAZ) were extended to December 31, 2012. Moreover, an amendment dated August 21, 2014 was issued to include the establishment of a contaminant attenuation zone and to update monitoring program requirements. A copy of the ECA is provided in **Appendix B**. A CAZ was established and registered on Title on December 15, 2014.

1.1 Site Location

A detailed description of the Site location is as follows:

- The Site is located within Part Lot 14, Concession 2 geographic Township of Ross. The Site is owned and operated by the Township of Whitewater Region and is closed for operation.
- The Site comprises a 2.06 hectare closed landfilling area and an 8.16 ha CAZ.
- The Site is closed under ECA No. A413204.
- The Site coordinates are:
    - 45^0 35' 55.28" N 76^0 49' 56.93" W
    - NAD 83 - UTM 18N – easting 357,030 northing 5,051,060 +/- 50 metres

A site location map is provided as **Figure 1**. The landfill site and surrounding features are provided in **Figure 2**.

1.2 Site Ownership and Key Personnel

The Site is closed and is owned by the Township of Whitewater Region. Contacts for the municipality and the Competent Environmental Practitioner for both the groundwater and surface water as defined by the Ministry (2010) are as follows:

Municipal Contact

The Corporation of the Township of Whitewater Region
Deanna Nicholson, Environmental Services Superintendent
44 Main Street
P.O Box 40,
Cobden, ON, K0J 1K0
Tel. Number: 613-646-2282 Ext. 127
Email: dnicholson@whitewaterregion.ca

CEP Contact Ground and Surface Water

Andrew Buzza, P.Geo
Tel: 613 828-7800
Fax: 613 828-2600
Email: andrewb@jp2g.com

1.3 Description and Development of the Waste Disposal Site

This section provides a general description of the Site including operational details. The following is provided:

Environmental Compliance Approval:
The Site is closed under ECA No. A413204. Based on available files the ECA history is as follows:

The municipally owned 2.06 ha landfill site was established under ECA No. A413204 amended February 2, 1978 in response to an application dated June 21, 1971. On January 1, 2001 the former Townships of Ross and Westmeath and Villages of Beachburg and Cobden amalgamated to form the Township of Whitewater Region. The proposed waste management plan consisted of the phased centralization of landfilling activities at the Westmeath Site (ECA No. A413602), and when it reached capacity, established operation at the Ross Site (ECA No. A4132609), and subsequently the use of the Cobden Site. On October 29, 2001 an application was submitted to the Ministry supported with a report entitled "Cobden Waste Disposal Site Interim Site Development and Operations Plan" prepared by Jp2g Consultants Inc. The Ministry Environmental Assessment and Approvals Branch acknowledged receipt of the application under Ministry Reference No. 9705-536PB4. This application was never processed, and the file was closed September 13, 2007.

Effective April 2002, the Cobden Landfill Site ceased receiving municipal waste for landfilling. Based on the results of the hydrogeological investigations and limited remaining capacity for waste disposal, the municipality decided to formally close the Site.

An application was filed with the Ministry dated July 31, 2007 supported with a report entitled "Cobden Waste Disposal Site – Site Closure Plan" prepared by Jp2g Consultants Inc. (Ministry Reference No. 0254 – 75QQDQ). Notice No. 1 dated March 2, 2009 was issued approving the closure of the Site. Notice No. 2 dated March 19, 2012 was issued regarding the CAZ.

Notice 2 dated March 19, 2012 was issued replacing Condition 6 of the ECA "by December 31, 2012, the Township of Whitewater Region shall purchase or obtain a written easement agreement with the property owner(s) of the land(s) required to establish a CAZ as per Items 9, 10, 11 and 12 of Schedule "A".

A final amendment dated August 21, 2014 was issued to include the requirement for the establishment of a contaminant attenuation zone and to update monitoring program requirements.

Site Status:
The Site ceased receiving waste for landfilling in April 2002, except for hydrocarbon contaminated soil in 2003 from a nearby gas station remediation project.

Site Capacity:
Total waste disposal volume is approximately 45,590m^3.

Projected Site Life:
The Site is closed.

Area of current waste cell footprint and approved footprint in hectares:
The waste cell footprint at the Cobden WDS is 1.16 hectares.

Area of entire waste disposal site in hectares:
The entire WDS is 10.22 ha, including the CAZ.

Total property area in hectares:
The entire site is 2.06 ha subject to a 16.7m wide right-of-way providing access from Hwy No. 17, and an 8.16 ha CAZ. The site configuration and surrounding area is illustrated in **Figure 2**.

Dates when waste disposal site opened, operated and closed as applicable:
The Site reportedly opened on or around 1967 and was closed for operation in 2002.

Information on final cover, slopes and engineering controls:
The final application of cover was applied in 2008 and 2009. There are no engineering controls.

Any Permits To Take Water associated with the Site:
There are no Permits To Take Water associated with the Site.

Other authorizing and or control instruments associated with the Site:
There are no authorizing and or control instruments associated with the Site.

Description of any storm water management facilities:
There are no stormwater management facilities associated with the Site.

Description of any leachate collection systems; and any sewage works, including the ECA number of the works:
The Cobden WDS is based on natural attenuation. There is no collection system and or any sewage works at the Site.

Any site developments, which occurred during the year of the monitoring report:
There were no new site developments during the reporting period, the CAZ was negotiated in 2013.

Any new developments in the vicinity of the Site of relevance from a monitoring perspective:
There were no new developments in the vicinity of the Site.

Historical Site Overview

Environmental baseline investigations which were undertaken:
Historical monitoring has been completed at the Cobden WDS. The earliest monitoring reported in this report is from the year 1995. Since this time, monitoring and monitoring well installations have been undertaken. A list of relevant studies is provided in the "References" at the end of the report.

Design and construction of the Site:
A Site Closure Plan dated July 31, 2007 describes details of the closure design and plan for the Site.

Development of environmental monitoring systems:
The development of environmental monitoring programs was initially provided in early documents. Jp2g has reported on the environmental monitoring since 2006. After this, the environmental monitoring has been amended at various times to reflect the comments provided by the Ministry and the latest ECA notices.

Development of engineered control systems:
There are no engineered control systems.

Conceptual Site Model:
Details that would comprise the conceptual model are provided in **Section 4.0** of this report.

Problems associated with the function or operation of the waste disposal site:
The Site is closed, there have not been any reported issues.

Placement of final cover:
The placement of final cover was completed in 2008 and 2009.

Date of site closure, actual or projected, including any closure plans:
The Site was closed for use in 2002.

1.4 Monitoring and Reporting Program

The amended ECA, which was issued based on a Ministry Technical Support Section (TSS) review of the 2010/2011 Report dated August 16, 2013, requires that the municipality conduct a monitoring program which reflects the closure of the Site and an established CAZ. The current ECA as amended August 21, 2014 details the required monitoring and reporting at the Site. The monitoring locations are illustrated on **Figure 2** and **3**, and the description of the 2022-2023 monitoring program is provided in **Section 5.0** of this report.

2.0 BACKGROUND

The amended ECA Notice No. 1 dated March 2, 2009 was issued in response to an Application for the final closure of the Site dated July 31, 2007, and includes conditions related to the application of final cover, water quality monitoring, environmental compliance and reporting requirements. The purpose of this report is to detail the specific requirements to obtain and maintain compliance with Ministry requirements specifically Conditions 4, 6, 7, and 8 of the ECA which read as follows:

4. The groundwater samples shall be collected and analyzed at the pre-determined frequency in accordance with Schedule "B"

6. By October 31, 2010 the Township of Whitewater Region shall purchase or obtain a written easement agreement with the property owner of the land required to establish a CAZ as per item 2 of Schedule "A". (See Note 1)

7. One additional groundwater monitoring well shall be installed and monitored beyond the proposed CAZ by December 31, 2009. (See Note 2)

8. The Township of Whitewater region shall prepare and submit an Annual report which outlines the results of the sampling program to the Ottawa District Office by May 1, 2010. The subsequent monitoring reports shall be submitted on a biennial basis by May 1 and they shall cover the previous two (2) calendar years.

Notes:

1. Under ECA Notice No. 3 dated August 21, 2014, the CAZ was added to the Compliance Approval as per Condition 6 of the Amended ECA. The various documents and correspondence resulting in the definition of the CAZ limits were included in Schedule "A" to the ECA. Correspondence regarding the negotiations involving the CAZ is included in **Appendix C** to this report.

2. Monitoring well 09-11 was installed in September 2009 as a bi-level shallow setting at 13m depth and deep setting at 22.86m.

2.1 Work Activities

Investigations of the Cobden WDS were initially carried out over several years by Golder Associates Ltd. (GAL). Discussions on the geologic and hydrogeologic details have been summarized in this report based on GAL descriptions. Over the monitoring period, numerous boreholes have been constructed and equipped with monitoring wells. Currently there are 16 monitoring points included in the monitoring program consisting of 6 bi-level piezometers and 4 single level piezometers. The latest bi-level piezometer (09-11) was added to the monitoring program in 2009 as per Ministry requirements outlined in Condition 7 of the Amended ECA. Borehole logs for these locations are provided in **Appendix D**. The location of the monitoring wells is provided in **Figure 3**.

2.2 Ministry Review and Correspondence

The Ministry of the Environment (referred to as the MECP, MOE, MOEE, MOECC and or The Ministry) has, over the past several years, provided comments from the TSS. A summary of the correspondence is as follows:

- Email from Marc-Etienne Lesieur (Ministry) to the Township of Whitewater Region containing the Provincial Officer's Report No. 1380-6XGQS7 and associated Provincial Officer's Order both dated February 7, 2007.
- Letter February 8, 2008 by Jp2g Consultants Inc. regarding soil sampling
- E-mail correspondence Steven Hodson, Kevin Mooder and Alan Tan February 2009

- Memo from Shawn Kinney, Ministry Technical Support Section to Marc Etienne LeSieur dated May 26, 2008 – received by Jp2g February 20, 2009.
- Memo from Bruce Metcalfe, Ministry Technical Support Section to Lance Larkin, June 15 2010.
- Solid Non-Hazardous Waste Disposal Site Inspection Report prepared by Tracy Hart dated June 26, 2010
- Memo from Shawn Kinney, Ministry Technical Support Section to Lance Larkin dated March 4, 2011.
- Solid Non-Hazardous Waste Disposal Site Inspection Report prepared by Lance Larkin dated May 5, 2011.
- Jp2g response to Lance Larkin May 20, 2011 on Site Inspection Report.

- Jp2g response to Lance Larkin May 20, 2011 on TSS review
- Memo from Shawn Kinney, Ministry TSS to Lance Larkin dated August 3, 2011
- Memo from Bruce Metcalfe Ministry TSS to Emily Tieu dated August 22, 2012
- Jp2g response to Emily Tieu dated November 22, 2012
- Jp2g filed request to amend ECA Condition 6 dated December 21, 2012
- Township filed ECA Application Form on January 17, 2013
- Jp2g filed status to Emily Tieu dated July 22, 2013
- Memo from Shawn Kinney, Ministry TSS to Emily Tieu dated August 16, 2013
  This memorandum is summarized as follows:
  1. That the Site is not in conformance with Guideline B-7
  2. The leachate plume is at the outer extent of the proposed CAZ
  3. New monitoring wells be included in the ECA
  4. The establishment of a CAZ as per Jp2g Correspondence dated July 22, 2013
  5. The Ministry's opinion of contaminants of concern included hardness, manganese and TDS
  6. Leachate indicator parameters include boron, barium, and potassium
  7. Recommendation of establishing a CAZ to monitoring well 09-11
- Township email to EAB dated November 26, 2013
- Tor Rustad response to Township dated December 13, 2013
- Township response to Ministry Ottawa December 17, 2013
- Memo from B. W. Metcalfe, Ministry TSS surface water comments to Emily Tieu dated October 27, 2014
- Memo from Lauren Forrester, Ministry TSS surface water comments to Thandeka Ponalo dated October 18, 2019

Copies of the above noted Ministry correspondence and corresponding responses are provided in **Appendix C.**

3.0 PHYSICAL SETTING

3.1 Subsurface Conditions

The geologic conditions of the Site have been reported in detail in previous GAL submissions. Borehole logs are provided in **Appendix D**. The geological conditions are summarized as follows:

- The Cobden WDS is located within a deep depression which was formerly used for sand and gravel extraction (GAL, 2007).
- Based on a review of the borehole logs and previous GAL reports, overburden materials at the Site are primarily sand, gravel, and cobles that extends to depths of approximately 22 to 26 metres before encountering bedrock (GAL, 2007).
- The bedrock that underlies the overburden at this Site consists of Precambrian metasediments and alkalic syenite (GAL, 2007).

3.2 Hydraulic Gradients

The hydrogeological conditions at the Site have been summarized in part from previous reports submitted by GAL. Horizontal hydraulic gradients at the Site has been determined at two locations across the Site.

The results of this assessment are summarized as follows using September 2023 water level values

Monitoring Locations	Horizontal Distance	Hydraulic Gradient Rounded	Approx. Migration Velocity (rounded)
95-4 → 02-10B	534 m	0.002	20.0 m/year
96-8B → 02-10B	172 m	0.005	60.0 m/year

A hydraulic conductivity value of 0.01cm/s was utilized for the above calculations as per GAL (2007).

Groundwater levels were measured at monitoring well locations at the Site to assist in determining the local direction of groundwater flow and vertical gradients. The 2022 and 2023 water table elevations and vertical gradients are provided in **Table 1.**

Table 1: 2022-2023 Groundwater Levels

Monitoring Location	Top of Pipe Elevation (m)	Ground Elevation (m)	Water Elevation (m)	
			Oct-22	Sep-23
BH 95-2	115.31	114.95	108.73	108.80
BH 95-3	115.19	114.21	108.64	108.73
BH 95-4	119.21	118.23	108.89	108.95
BH 95-5B Shallow	114.51	113.54	108.49 ⇧	108.56 ⇧
BH 95-5A Deep	114.50	113.54	108.56 ⇧	108.64 ⇧
BH 96-6B Shallow	122.94	121.93	108.55 ⇩	108.59 ⇩
BH 96-6A Deep	122.70	121.93	108.17 ⇩	108.23 ⇩
BH 96-7B Shallow	121.44	120.49	108.50 ⇩	108.57 ⇩
BH 96-7A Deep	121.33	120.49	108.48 ⇩	108.52 ⇩
BH 96-8B Shallow	125.54	124.43	108.72 ⇩	108.80 ⇩
BH 96-8A Deep	124.94	124.43	107.93 ⇩	108.00 ⇩
BH 96-9	124.86	123.94	108.41	108.48
BH 02-10B Shallow	121.48	120.80	107.88 ⇩	108.00 ⇩
BH 02-10A Deep	121.43	120.80	107.80 ⇩	107.92 ⇩
BH 09-11A Shallow	117.16	116.14	107.66 ⇧	107.75 ⇧
BH 09-11B Deep	117.14	116.13	107.71 ⇧	107.79 ⇧
Subdivision Well	123.753	-	108.71	108.75
Lake Level	-	-	108.65	108.71

All elevations are referenced to a local datum, an assumed benchmark with an elevation of 125m (top of iron bar located at the northeast corner of the Site). The water levels in 2022 and 2023 indicate primarily a downward movement of groundwater across the site.

3.3 Groundwater Flow

The 2022 and 2023 direction of groundwater flow is consistent with historical measurements of flows at the Site. Groundwater flow directions are interpreted to be to the west. The direction of shallow groundwater flow at the Site for 2022 and 2023 are provided in **Figures 4** and **5** respectively. In reference to the TSS memo dated June 15, 2010, there are no surface water features in the direct flow path. Round Lake (a conjoined segment of Astrolabe Lake) is located some 300 metres to the northwest and is slightly out of the direct flow path from the Site. Lake water levels surveyed in 2012, 2014, 2015, 2016, 2017, 2019, 2021 and more recently in 2023 are similar to the water levels in the upgradient wells and greater than water levels at the downgradient locations. Further discussion with respect to groundwater and surface water interactions can be found in **Section 6.8** of this report.

4.0 WELL MAINTENANCE AND CONSTRUCTION

In accordance with Condition 7 of the amended ECA a downgradient bi-level piezometer (09-11) was constructed in 2009 to assess the Site's performance with regard to the Ministry's Reasonable Use Policy (i.e., Guideline B-7). In 2022 and 2023, all monitoring wells required by the ECA were reported to be in good working order.

5.0 DESCRIPTION OF MONITORING PROGRAM

Two groundwater monitoring events were completed in which groundwater levels and selected water quality samples were collected. The events required by the ECA were completed in October 2022 and September 2023.

Table 2 outlines the monitoring stations sampled during the 2022-2023 monitoring program in reference to the ECA (March 2, 2009, as amended). The locations of the monitoring stations are provided in **Figure 3** and water level data collected from the October 2022 and September 2023 sampling events are provided in **Table 1.** Water level data from the 2022 and 2023 sampling events are shown on **Figures 4 and 5**.

Table 2: 2022-2023 Environmental Monitoring Details

Monitoring Locations	Required by ECA	B-7 Assessed Location	Oct-22		Sep-23	
			Water Level	Sample Collected	Water Level	Sample Collected
95-2	√		√	√	√	√
95-3	√		√	√	√	√
95-4	√		√	√	√	√
95-5A Deep	√		√	√	√	√
95-5B Shallow	√		√	√	√	√
96-6A Deep	√		√	√	√	√
96-6B Shallow	√		√	√	√	√
96-7A Deep	√		√	√	√	√
96-7B Shallow	√		√	√	√	√
96-8A Deep	√		√	√	√	√
96-8B Shallow	√		√	√	√	√
96-9	√		√	√ + DUP	√	√ + DUP
02-10A Deep	√	√	√	√	√	√
02-10B Shallow	√	√	√	√	√	√
09-11A Deep	√	√	√	√	√	√
09-11B Shallow	√	√	√	√	√	√
Subdivision Well			√		√	
Lake			√		√	

Notes:

DUP - duplicate sample collected

All sampling was completed by Jp2g Consultants Inc. staff and followed the standard procedures provided in **Appendix E**. Photographs of monitoring wells are included in **Appendix F**.

6.0 GROUNDWATER QUALITY

6.1 Assessment Program

Groundwater sampling was completed at the Site to evaluate the background water quality and to assess any impact that the former WDS may have on the local groundwater environment. Results of the compiled chemical analysis are provided in **Appendix E**. Highlighted values indicate an exceedance of provincial standards, or in the case of VOC's, exceedances of laboratory detection limits. The following sections discuss the variation of chemical concentrations of the sampled water at monitoring locations at the WDS. These sections include assessments of the Site background water quality, leachate impacted groundwater and water quality from other sample locations about the Site. Where applicable, chemical concentrations have been compared to the Ontario Drinking Water Standards/Objectives and Guidelines (ODWS/OG).

6.2 Quality Assurance & Quality Control

Blind field duplicate samples were collected from monitoring well 96-9 during the October 2022 and September 2023 sampling events.

All quality assurance and quality control (QA/QC) duplicate samples were submitted for laboratory analysis of the environmental quality site of parameters. Results are presented in the chemical data base provided in **Appendix E.**

Relative percent differences (RPDs) were calculated and reveal values that were in general below the standard of ≤20% for groundwater duplicates with the exception of sulphate in October 2022 and September 2023 sampling events with RPD of 29% and 40% respectively. Overall, the assessment suggests that groundwater sample handling and analytical protocols were acceptable, and that analytical results were reproducible.

6.3 Background Water Quality

The background water quality is defined as the groundwater which is believed to be unaffected by leachate from the WDS. Upon review by the Ministry's Technical Support Section (TSS) in a memo dated May 26, 2008, the background groundwater quality was determined to be best represented by water quality from monitoring well 96-9. Monitoring well 96-9 is located approximately 230m west and cross gradient from the former landfilling area and is interpreted to not be impacted by landfill leachate. Historically, monitoring well 96-9 reveals chemical parameters below ODWS/OG. **Table 3** presents the background groundwater chemical concentrations from monitoring well 96-9.

Table 3: Background Values Monitoring Well 96-9

Parameter mg/L	ODWS OG	Monitoring Well 96-9 (Background)		
		Oct-22	Sep-23	Median Values
Barium	1	0.05	0.04	0.03
Boron	5	<0.01	<0.01	0.010
Manganese	0.05	<0.01	<0.01	<0.001
Sulphate	500	4	3	4
Alkalinity	500	152	151	118
Iron	0.3	<0.03	<0.03	0.006
Strontium		0.094	0.084	0.073
Sodium	200	6	4	3.1
Calcium		43	36	36.3
TDS	500	155	133	127
Nitrate	10	0.62	0.33	0.52
Hardness	80-500	140	119	121

Notes:

Median values are taken from the past six monitoring events

***BOLD** values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

The 2022-2023 sampling at monitoring well 96-9 revealed concentrations of all parameters to be less than ODWS/OG. Hardness concentrations are noted to fall outside of the limit considered suitable for drinking water infrastructure; however, values are less than the overall ODWS/OG limit of 500mg/L.

6.4 Identification of Site-Specific Leachate Parameters

A "leachate indicator parameter" for a landfill site is defined as being a parameter which is useful in determining the presence/absence of landfill leachate impact on water resources; assessing the degree of leachate impact on water resources; and is useful in determining the extent of leachate impact near a landfill site.

For a parameter to be useful as a "leachate indicator parameter" at a landfill site, the following characteristics are desirable:[1]

- The parameter is present in relatively low concentrations in background water quality near the Site, and is characterized by significantly higher concentrations in leachate generated at the landfill site;
- The concentration of a "leachate indicator parameter" should not vary significantly over time at background monitoring locations (i.e., low variability is desirable) in order to be a reliable indicator of leachate impact.

1 Golder Associates, March 2012 Report-11-1127-0063

- The trend in the parameter concentration must be relatively consistent over time (allowing for seasonal variations in quality) in terms of the persistence of elevated levels in leachate relative to background conditions (i.e., parameter concentrations should not vary dramatically over short periods of time such that during one monitoring event the concentration at the same monitoring location is indicative of leachate impact);
- For natural attenuation landfill sites, conservative parameters which are relatively mobile in the groundwater flow system (i.e. chloride) and are not subject to attenuation mechanisms (i.e. adsorption, biological uptake, precipitation, etc.) are most appropriate for characterizing the extent of leachate impact from a landfill site on water resources; potential leachate constituents characterized by lower mobility on the subsurface environment (i.e. heavy metals) are typically attenuated by the soil in close proximity to the fill area and thus the extent of impact on groundwater resources is minimal; and,
- Parameter concentrations in groundwater and surface water should exhibit spatial variation in concentration relative to the location of the fill area(s) and physical hydrogeological setting of the site (i.e., higher parameter concentrations immediately downgradient from the fill area with progressively lower concentrations with increasing distance downgradient from the fill area.

For the Cobden WDS, leachate values are considered to be representative of concentrations from groundwater from the deep piezometer setting at monitoring well 96-7 (i.e., 96-7A) as suggested by the Ministry. Monitoring well 96-7A is located downgradient of the former landfilling area and is drilled to a depth of 16.5m. Monitoring well 96-7A is completed in the sand and gravel overburden. Chemical concentrations from monitoring well 96-7A are provided in **Table 4**.

Table 4: Leachate Values

Parameter mg/L	ODWS OG	Background Median Value 96-9	Monitoring Well 96-7A Deep (Leachate)	
			Oct-22	Sep-23
Barium	1	0.03	0.98	0.88
Boron	5	0.010	0.24	0.290
Manganese	0.05	<0.001	**0.11**	**0.09**
Sulphate	500	4	49	34
Alkalinity	500	118	**503**	500
Iron	0.3	0.006	<0.03	<0.03
Strontium		0.073	0.339	0.288
Sodium	200	3.1	15	15
Calcium		36.3	148	122
TDS	500	127	**663**	**561**
Nitrate	10	0.52	2.03	0.53
Hardness	80-500	121	**510**	436

Notes:

Median values are taken from the past six monitoring events

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

The leachate signature at the Cobden WDS is characterized by elevated levels of manganese and TDS which exceeded the ODWS/OG during both the October 2022 and September 2023 sampling events. Hardness concentrations are elevated during both events. Elevated levels of boron, barium, sodium, sulphate, strontium, and calcium are also noted characteristics of the leachate signature at the Site. These concentrations however do not exceed Ministry water quality objectives. Overall, there does not seem to be any specific trends in historical values at this location with the exception of seasonal fluctuation and random variance.

6.5 Overburden Groundwater

The following sections provide a discussion on the analytical results from the samples collected from individual sample locations. The location of all monitoring wells is provided in **Figure 3.**

Groundwater Monitoring Well 95-2

Monitoring well 95-2 is located along the northern boundary of the landfill site, cross-gradient from the former landfilling area. Historical results reveal fairly consistent ODWS/OG exceedances of manganese while hardness is greater than the optimal operational range of values. No exceedances are noted during the 2022 and 2023 sampling events. Chemical concentrations in comparison to leachate and background values are outlined in **Table 5.**

Table 5: 2022-2023 Results from Monitoring Well 95-2

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 95-2	
				Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.27	<0.01
Boron	5	0.010	0.24 - 0.29	<0.01	<0.01
Manganese	0.05	<0.001	**0.11 - 0.09**	0.04	<0.01
Sulphate	500	4	49 - 34	10	10
Alkalinity	500	118	503 - 500	326	357
Iron	0.3	0.006	<0.03 - <0.03	<0.03	<0.03
Strontium		0.073	0.339 - 0.288	0.21	<0.001
Sodium	200	3.1	15 - 15	3	3
Calcium		36.3	148 - 122	103	107
TDS	500	127	**663 - 561**	339	388
Nitrate	10	0.52	2.03 - 0.53	<0.10	<0.10
Hardness	80-500	121	**510** - 436	331	345

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

Due to elevated parameter concentrations at this monitoring location, the chemical results are interpreted to reveal slight leachate impact. The chemical values from this location do not reveal any significant or specific trends in concentration.

Groundwater Monitoring Well 95-3

Monitoring well 95-3 is located within the former landfilling area and historically has revealed ODWS/OG exceedances of hardness, iron, DOC, and manganese. Chemical concentrations from the 2022 and 2023sampling events are outlined in comparison to leachate and background values in **Table 6.**

Table 6: 2022-2023 Results from Monitoring Well 95-3

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 95-3	
				Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.12	0.1
Boron	5	0.010	0.24 - 0.29	0.08	0.09
Manganese	0.05	<0.001	**0.11 - 0.09**	**0.6**	**0.55**
Sulphate	500	4	49 - 34	<1	<1
Alkalinity	500	118	503 - 500	245	240
Iron	0.3	0.006	<0.03 - <0.03	**17**	**15.6**
Strontium		0.073	0.339 - 0.288	0.221	0.203
Sodium	200	3.1	15 - 15	28	29
Calcium		36.3	148 - 122	58	48
TDS	500	127	**663 - 561**	372	326
Nitrate	10	0.52	2.03 - 0.53	<0.10	<0.10
Hardness	80 - 500	121	**510** - 436	211	178

Notes:

***BOLD** values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

Exceedances of ODWS/OG at monitoring well 95-3 includes DOC, manganese and iron. All other chemical parameters revealed concentrations that were less than ODWS/OG. Due to elevated concentrations of select parameters it is interpreted that landfill leachate has a slight impact on monitoring well 95-3. Long-term trends at this location show that concentrations have increased slightly since the time of site closure.

Groundwater Monitoring Well 95-4

Monitoring well 95-4 is the former background well at the Cobden WDS. Upon recommendations by the Ministry in a memo dated May 26, 2008, monitoring well 95-4 was replaced by monitoring well 96-9 as the background monitoring point. Monitoring well 95-4 is located upgradient of the former landfilling area and has historically revealed low chemical concentrations similar to those reflective of background conditions. Results from the 2022 and 2023 monitoring of well 95-4 are summarized in **Table 7.**

Table 7: 2022-2023 Results from Monitoring Well 95-4

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 95-4	
				Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.15	0.15
Boron	5	0.010	0.24 - 0.29	<0.01	0.01
Manganese	0.05	<0.001	**0.11 - 0.09**	<0.01	<0.01
Sulphate	500	4	49 - 34	23	22
Alkalinity	500	118	503 - 500	193	213
Iron	0.3	0.006	<0.03 - <0.03	<0.03	<0.03
Strontium		0.073	0.339 - 0.288	0.16	0.178
Sodium	200	3.1	15 - 15	4	4
Calcium		36.3	148 - 122	65	67
TDS	500	127	**663 - 561**	286	280
Nitrate	10	0.52	2.03 - 0.53	0.12	0.13
Hardness	80 - 500	121	**510** - 436	216	225

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

As indicated in **Table 7,** chemical concentrations at this location are relatively low. Concentrations are, on balance, slightly higher than values representative of background conditions but significantly less than values considered to be representative of leachate values. The concentration of leachate indicator parameters has remained relatively the same over the past 20 years. This location may be characterized as not being impacted by the landfill site.

Groundwater Monitoring Well 95-5

Monitoring well 95-5 is a bi-level piezometer ('A' refers to the deep setting and 'B' refers to the shallow setting) located downgradient of the former landfilling area. In previous reports (GAL) monitoring well 95-5A was considered the leachate source well for the Cobden WDS. The Ministry (Memo dated May 26, 2008) recommended that monitoring well 96-7A be considered as the leachate source well. A summary of the 2022 and 2023 results from monitoring wells 95-5A and 95-5B is provided in **Table 8**.

Table 8: 2022-2023 Results from Monitoring Well 95-5A Deep and 95-5B Shallow

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 95-5A Deep		Monitoring Well 95-5B Shallow	
				Oct-22	Sep-23	Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.36	0.37	0.25	0.24
Boron	5	0.010	0.24 - 0.29	0.07	0.08	0.26	0.38
Manganese	0.05	<0.001	**0.11 - 0.09**	**1.53**	**1.64**	**1.2**	**1.16**
Sulphate	500	4	49 - 34	24	22	39	28
Alkalinity	500	118	503 - 500	318	342	422	462
Iron	0.3	0.006	<0.03 - <0.03	**0.66**	**0.75**	**0.55**	**0.8**
Strontium		0.073	0.339 - 0.288	0.25	0.258	0.316	0.316
Sodium	200	3.1	15 - 15	8	10	13	22
Calcium		36.3	148 - 122	94	92	124	117
TDS	500	127	**663 - 561**	422	415	**549**	**525**
Nitrate	10	0.52	2.03 - 0.53	<0.01	<0.01	<0.01	<0.01
Hardness	80 - 500	121	**510** - 436	317	312	421	391

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

As indicated in **Table 8**, ODWS/OG exceedances of manganese and iron are present at monitoring well 95-5A, this is consistent with historical trends at this deep location. Exceedances of manganese , iron and TDS are also present at monitoring point 95-5B. Concentrations of DOC at this location have been found to exceed provincial limits from time to time throughout the sampling. During the 2022 and 2023, TDS values at monitoring well 95-5A were less than the provincial guidelines. In addition to the exceedances, high concentrations of other select parameters characterize the groundwater as being impacted at this location.

Groundwater Monitoring Well 96-6

Monitoring well 96-6 is a bi-level piezometer ('A' refers to the deep setting and 'B' refers to the shallow setting) located just west of the former landfill site. Historical results indicate exceedances of iron and manganese to be greater than ODWS/OG. Chemical results from the 2022 and 2023sampling of monitoring well 96-6 are similar and are summarized in **Table 9.**

Table 9: 2022-2023 Results from Monitoring Well 96-6A Deep and 96-6B Shallow

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 96-6A Deep		Monitoring Well 96-6B Shallow	
				Oct-22	Sep-23	Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.155	0.15	0.16	0.13
Boron	5	0.010	0.24 - 0.29	0.03	0.04	0.08	0.05
Manganese	0.05	<0.001	**0.11 - 0.09**	**0.3**	**0.35**	**0.86**	**0.73**
Sulphate	500	4	49 - 34	28	26	37	24
Alkalinity	500	118	503 - 500	243	274	292	261
Iron	0.3	0.006	<0.03 - <0.03	0.29	**0.31**	**0.83**	**0.58**
Strontium		0.073	0.339 - 0.288	0.2	0.22	0.258	0.225
Sodium	200	3.1	15 - 15	5	6	7	6
Calcium		36.3	148 - 122	78	78	96	75
TDS	500	127	**663 - 561**	343	330	411	335
Nitrate	10	0.52	2.03 - 0.53	<0.1	<0.1	<0.1	<0.1
Hardness	80 - 500	121	**510** - 436	261	261	318	249

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

Exceedances of ODWS/OG at monitoring well 96-6A include manganese during October 2022 and September 2023, and iron in September 2023. . Exceedances of ODWS/OG at monitoring well 96-6B include iron and manganese during October 2022 and September 2023. Hardness values are outside the optimal operational range. All other parameters from these monitoring points were below their respective ODWS/OG guidelines. It is interpreted that this location has been slightly impacted by the former landfill site.

Groundwater Monitoring Well 96-7

Monitoring well 96-7 is a bi-level piezometer ('A' refers to the deep setting and 'B' refers to the shallow setting) located approximately 65m downgradient of the former landfill area approximately 45m NW of monitoring well 96-6. The deep monitoring point (96-7A) has been determined to be representative of leachate conditions at the Site. Water quality at this location is characterized by elevated concentrations of manganese, alkalinity, TDS, and hardness at values that are greater than the ODWS/OG. Water quality is also characterized by elevated concentrations of other parameters. Water quality results from the shallow setting (96-7B) reveals concentrations of TDS to exceed the ODWS/OG. Concentrations at the shallow setting of this well are slightly lower, but within range of the historical leachate values of the deep setting. **Table 10** summarizes the 2022 and 2023 chemical concentrations from monitoring well 96-7.

Table 10: 2022-2023 Results from Monitoring Well 96-7A Deep and 96-7B Shallow

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 96-7B Shallow	
				Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.34	0.31
Boron	5	0.010	0.24 - 0.29	0.25	0.35
Manganese	0.05	<0.001	**0.11 - 0.09**	<0.01	<0.01
Sulphate	500	4	49 - 34	31	30
Alkalinity	500	118	503 - 500	470	451
Iron	0.3	0.006	<0.03 - <0.03	<0.03	<0.03
Strontium		0.073	0.339 - 0.288	0.294	0.29
Sodium	200	3.1	15 - 15	17	15
Calcium		36.3	148 - 122	134	123
TDS	500	127	**663 - 561**	**580**	**514**
Nitrate	10	0.52	2.03 - 0.53	0.55	0.71
Hardness	80 - 500	121	**510** - 436	454	418

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

The groundwater quality at the shallow location, although impacted, reveals concentrations that are slightly less than the deeper setting. This location is impacted by the landfill site.

Groundwater Monitoring Well 96-8

Monitoring well 96-8 is a bi-level piezometer and is located further (approximately 150m) down gradient of the former landfilling area. Monitoring well 96-8A (deep setting) has historically revealed elevated concentrations of hardness, iron and manganese. Monitoring well 96-8B (shallow setting) has historically revealed relatively low chemical concentrations. The hardness values are slightly higher than those deemed to be representative of background values. A summary of the 2022 and 2023 chemical results at monitoring well 96-8 is provided in **Table 11**.

Table 11: 2022-2023 Results from Monitoring Well 96-8A Deep and 96-8B Shallow

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 96-8A Deep		Monitoring Well 96-8B Shallow	
				Oct-22	Sep-23	Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.32	0.34	0.22	0.2
Boron	5	0.010	0.24 - 0.29	0.07	0.06	0.01	<0.01
Manganese	0.05	<0.001	**0.11 - 0.09**	**0.15**	**0.19**	0.02	<0.01
Sulphate	500	4	49 - 34	34	30	4	5
Alkalinity	500	118	503 - 500	284	290	416	402
Iron	0.3	0.006	<0.03 - <0.03	**0.84**	**1.13**	0.04	<0.03
Strontium		0.073	0.339 - 0.288	0.225	0.222	0.229	0.215
Sodium	200	3.1	15 - 15	10	8	3	3
Calcium		36.3	148 - 122	90	84	125	110
TDS	500	127	**663 - 561**	393	364	484	419
Nitrate	10	0.52	2.03 - 0.53	<0.1	<0.1	1.47	1.36
Hardness	80 - 500	121	**510** - 436	307	288	419	369

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

On balance chemical concentrations at monitoring well 96-8 are low and do not reflect leachate concentrations. Manganese and iron slightly exceed ODWS/OG at 96-8A (deep setting) however these concentrations are interpreted to be primarily natural. The chemical results at this monitoring point suggest that monitoring well 96-8A is slightly impacted by landfill leachate.. Concentrations at monitoring well 96-8B are lower than those at the deeper setting and are comparable, though on balance are slightly higher than, background values. The shallow setting at this location is considered to be slightly impacted by landfill leachate.

Groundwater Monitoring Well 02-10

Monitoring well 02-10 is a bi-level piezometer located approximately 300m downgradient of the closed landfill Site. It is located on the downgradient boundary of the CAZ (**Figure 3**). Historically the groundwater at this location has revealed chemical concentrations below ODWS/OG with the exception of one iron exceedance in 2007 in the deep setting of this well. Hardness concentrations are outside the range of values that are considered the optimal balance between incrustation and corrosion but are less than the drinking water range. Results from the 2022 and 2023 monitoring events are summarized in **Table 12.**

Table 12: 2022-2023 Results from Monitoring Well 02-10A Deep and 02-10B Shallow

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 02-10A Deep		Monitoring Well 02-10B Shallow	
				Oct-22	Sep-23	Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.14	0.14	0.15	0.15
Boron	5	0.010	0.24 - 0.29	0.02	0.02	0.02	0.03
Manganese	0.05	<0.001	**0.11 - 0.09**	0.01	<0.01	<0.01	<0.01
Sulphate	500	4	49 - 34	29	25	28	28
Alkalinity	500	118	503 - 500	198	216	180	224
Iron	0.3	0.006	<0.03 - <0.03	0.18	<0.03	<0.03	0.2
Strontium		0.073	0.339 - 0.288	0.162	0.166	0.165	0.18
Sodium	200	3.1	15 - 15	5	6	6	5
Calcium		36.3	148 - 122	65	64	67	69
TDS	500	127	**663 - 561**	219	212	296	294
Nitrate	10	0.52	2.03 - 0.53	<0.10	<0.1	0.1	<0.1
Hardness	80 - 500	121	**510** - 436	224	226	229	238

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

The results of the 2022 and 2023 monitoring events at monitoring well 02-10 revealed all concentrations to be less than ODWS/OG. The chemical concentrations from the deep setting at this location reveal values that are slightly higher than background values but less than values representative of leachate concentrations. The values from the shallow setting are similar. This well location is considered to be slightly impacted by landfill-sourced leachate.

Groundwater Monitoring Well 09-11

Monitoring well 09-11 is a bi-level monitoring well. Historical nomenclature for this well has been reversed from the other wells in that level "A" is referred to the shallow piezometer setting and "B" referred to the deep setting. For clarity, this well will be discussed as 09-11 shallow (S) and Deep (D).

This well is located approximately 470m down gradient of the former landfill Site beyond the limits of CAZ. A borehole log for this well is provided in **Appendix D**. Water quality from both piezometer settings reveal low chemical values. Results from the 2022 and 2023 monitoring events are summarized in **Table 13**.

Table 13: 2022-2023 Results from Monitoring Well 09-11D Deep and 09-11S Shallow

Parameter mg/L	ODWS OG	Background Median Value 96-9	Leachate Monitoring Well 96-7A 2022 - 2023	Monitoring Well 09-11 Deep		Monitoring Well 09-11 Shallow	
				Oct-22	Sep-23	Oct-22	Sep-23
Barium	1	0.03	0.98 - 0.88	0.12	0.11	0.11	0.1
Boron	5	0.010	0.24 - 0.29	0.01	0.01	<0.01	<0.01
Manganese	0.05	<0.001	**0.11 - 0.09**	0.02	0.02	0.02	0.02
Sulphate	500	4	49 - 34	24	22	25	24
Alkalinity	500	118	503 - 500	131	139	124	133
Iron	0.3	0.006	<0.03 - <0.03	0.07	0.09	0.06	0.09
Strontium		0.073	0.339 - 0.288	0.139	0.142	0.086	0.088
Sodium	200	3.1	15 - 15	4	4	2	2
Calcium		36.3	148 - 122	42	42	43	42
TDS	500	127	**663 - 561**	159	152	153	148
Nitrate	10	0.52	2.03 - 0.53	<0.1	<0.10	<0.1	<0.10
Hardness	80 - 500	121	**510** - 436	146	146	144	142

Notes:

BOLD *values exceed ODWS/OG*

No Impact

Leachate Impact

Minor Impact

The results of the 2022 and 2023 monitoring from shallow and deep settings of monitoring well 09-11 revealed all concentrations to be less than ODWS/OG. The chemical concentrations from this location are interpreted to be naturally occurring and not a reflection of landfill leachate. To date, fifteen sampling events have been completed at this location and no significant trends have been noted. Water quality at this location is not interpreted to be impacted by the landfill Site.

6.6 Organic Analysis

Sampling for synthetic organic parameters is not a requirement under the ECA (amended on August 21, 2014). The last sampling for an organic suite of parameter (EPA 624 scan) was completed in 2008 at monitoring well 95-3. The results of the analysis from that sampling (provided in **Appendix E)** did not reveal the presence of any concentrations to be greater than laboratory detection limits at that time

6.7 Assessment of Impact of Landfill on Groundwater

The Reasonable Use Concept addresses the levels of off-site contaminants, which are considered acceptable by the Ministry. The concept allows for the definition of the level of contamination in the groundwater beyond which mitigating action should be undertaken. The acceptability of the site in terms of its impact on groundwater has been assessed in terms of the Reasonable Use Criteria (RUC). The RUC establish the acceptability of change in groundwater quality as follows:

Aesthetic Parameters: Degradation of less than 50% of the difference between the background quality and the established objective for the particular health related parameter.

Health Related Parameters: Degradation of less than 25% of the difference between the background quality and the established objective for the particular health related parameter. Acceptable concentrations are based on background levels and water quality guidelines (i.e. drinking water objectives).

The chosen background values are utilized to calculate the RUC allowable concentrations for specific parameters, as per the following formulae:

Health Related:

$$C_{allow} = P_b + (C_m - P_b) \times 25\%$$

Non-Health Related:

$$C_{allow} = P_b + (C_m - P_b) \times 50\%$$

Where:
C_{allow} = Maximum allowable concentration of parameter as per the RUC guidelines
C_m = Maximum acceptable concentration (MAC) of parameter as per the ODWS/OG
P_b = Chosen background value of parameter

The parameters used in the Reasonable Use Assessment are considered to be Key Indicator Parameters representative of landfill leachate impact. The Ministry of the Environment in their correspondence dated August 16, 2013 (memo; Shawn Kinney to Emily Tieu) provides guidance on leachate indicator parameters. These include boron, barium, potassium and TDS. They have been identified as a result of having downgradient values that are in excess of 10x the background values. Other parameters as described by the Ministry Technical Support Section that are representative of impact include hardness, manganese and alkalinity and have been included in the B-7 assessment. **Table 14** outlines the Reasonable Use Criteria.

Table 14: Reasonable Use Criteria

Parameter mg/L	P_b	C_m	F	C_{allow}
Barium	0.03	1	0.25	0.27
Boron	0.01	5	0.25	1.26
Nitrate	0.52	10	0.25	2.89
Manganese	0.001	0.05	0.5	0.026
Sulphate	4	500	0.5	252
Alkalinity	118	500	0.5	309
Iron	0.006	0.3	0.5	0.15
Sodium	3.1	200	0.5	101.6
TDS	127	500	0.5	314
Hardness	121	500	0.5	311

Notes:
Background values that are below the MLDL were assumed to be at MLDL for the purposes of the RUC calculations

Point of compliance monitoring wells included in the reasonable use assessment are 02-10A, 02-10B and 09-11 shallow and deep. Monitoring wells 02-10A and 02-10B are located at the limit of the downgradient property boundary of the CAZ as outlined in **Figure 3**. Monitoring well 09-11S and D is located approximately 110 metres west of the downgradient CAZ boundary. A summary of the B-7 assessment results is provided in **Table 15**.

Table 15: Summary of Guideline B-7 Reasonable Use Calculations

Parameter mg/L	C_{allow}	Monitoring Well 02-10A Deep		Monitoring Well 02-10B Shallow		Monitoring Well 09-11 Deep		Monitoring Well 09-11 Shallow	
		Oct-22	Sep-23	Oct-22	Sep-23	Oct-22	Sep-23	Oct-22	Sep-23
Barium	0.27	0.14	0.14	0.15	0.15	0.12	0.11	0.11	0.1
Boron	1.26	0.02	0.02	0.02	0.03	0.01	0.01	<0.01	<0.01
Nitrate	2.89	<0.1	<0.1	0.1	<0.1	<0.10	<0.10	<0.10	<0.10
Manganese	0.026	0.01	<0.01	<0.01	<0.01	0.02	0.02	0.02	0.02
Sulphate	252	29	25	28	28	24	22	25	24
Alkalinity	309	198	216	180	224	131	139	124	133
Iron	0.15	0.18	<0.03	<0.03	0.2	0.07	0.09	0.06	0.09
Sodium	101.6	5	6	6	5	4	4	2	2
TDS	314	219	212	296	294	159	152	153	148
Hardness	311	224	226	229	238	146	146	144	142

Notes:

BOLD *values exceed ODWS/OG*

Highlighted values exceed Reasonable Use allowable concentrations

No Impact

Leachate Impact

Minor Impact

Results of the Ministry Guideline B-7 assessment reveal all parameters to be less than the RUPO with the exception of iron at monitoring well 02-10A in October 2022 and monitoring well 02-10B in September 2023. The values are below the drinking water limit and are consistent with historical iron exceedances of the RUC at this location. Iron is non-health related and does not pose a risk to human health and accordingly corrective action is not recommended at this time.

Chemical trends from downgradient wells 02-10 and 09-11 reveal a stable or slightly downward platform suggesting that leachate parameters at this location are, on balance stable or decreasing. The chemical analysis at these locations does not suggest leachate impact.

6.8 Groundwater-surface water interactions

In a Ministry TSS memo dated October 27, 2014, the surface water reviewer asked that an assessment be conducted as to the surface water to groundwater interaction at the Cobden WDS. Three surface water bodies are in the vicinity of the Cobden WDS, they are:

- Astrolabe Lake, located approximately 160m north (upgradient) of the waste foot print
- Round Lake, located approximately 300m northwest (cross-gradient) of the waste foot print
- Unnamed lake located approximately 140m east (upgradient) of the waste footprint.

Both Astrolabe Lake and the unnamed lake are located upgradient of the WDS and are not anticipated to be of concern. Round Lake, a conjoined segment of Astrolabe Lake, is located generally cross-gradient of the perceived direction of groundwater flow from the Site. The water level of Round Lake was monitored as part of the annual monitoring programs in 2012, 2014 – 2019, 2021 and 2023.

The monitoring groundwater level of Round Lake is generally higher than the groundwater levels of nearby monitoring wells. This suggests that Round Lake is a groundwater recharge point and would likely not be impacted by leachate from the Cobden WDS. Groundwater elevation data is provided in **Table 1.**

7.0 CONTAMINANT ATTENUATION ZONE

The Township has established a CAZ downgradient of the WDS. The limits of the CAZ are outlined in **Figure 3** and comprise an area of 8.16 hectares. As outlined in the Township correspondence to the Ministry (December 17, 2013, provided in **Appendix C**) the extent of the land purchased was the maximum amount the property the owner would allow. We suggest that at this time the CAZ is sufficient as only iron marginally exceeds the RUC. Continued monitoring will be completed to assess any trends at these locations. Should concentrations increase, the limits of the CAZ will be revisited.

The CAZ was registered on Title under a Certificate of Requirement dated December 15, 2014. The ECA was amended to include the establishment of the CAZ in ECA Notice No. 3 Condition 6 dated August 21, 2014.

8.0 LANDFILL GAS

Landfill gas was monitored in all monitoring wells during the October 2022 and September 2023 sampling events. No gas was detected during either event. Gas monitoring is recommended for future monitoring events.

9.0 MONITORING PROGRAM

An essential component of an effective water quality monitoring program is a well-developed and maintained sampling plan. It is necessary to follow the same procedures and protocols during each phase of the monitoring program to ensure that all measurements and samples are representative of the actual conditions. The monitoring program has been provided by the Ministry in 'Schedule B' of the Amended ECA and based on recent TSS review comments. **Table 16** lists the monitoring program for the Cobden WDS.

Table 16: Monitoring Program

Sampling Location	Parameters	Frequency
95-2, 95-3, 95-4, 95-5A, 95-5B, 96-6A, 96-6B, 96-7A, 96-7B, 96-8A, 96-8B, 96-9, 02-10A, 02-10B, 09-11 shallow and deep	Alkalinity, Barium, Boron, Calcium, Chloride, hardness, iron, Magnesium, Manganese, Nitrate(NO3-N), pH, Potassium, Sodium, Strontium, Total Dissolved Solids, Sulphate, COD, Dissolved Organic Carbon	Once a year (Fall)

Note: *any new wells should be included as part of the monitoring program*

10.0 DISCUSSION AND RECOMMENDATIONS

Water quality monitoring was completed in 2022 and 2023 at the Cobden WDS. Sampling was completed by Jp2g Consultants Inc. staff. The environmental monitoring events consisted of the collection of static groundwater levels, groundwater samples from selected monitoring wells and an assessment of well conditions. The following is a summary of the activities and investigations:

- The general trend of the direction of groundwater flow is similar to previous years. Groundwater flow is to the west.
- Leachate at the Site is characterized by groundwater from monitoring well 96-7A, located downgradient of the former fill area.
- Background values at the Site are characterized by groundwater from monitoring well 96-9. Monitoring well 96-9 is located west and cross-gradient from the former fill area.
- Several parameters have been identified as being indicators of landfill leachate, they include: *barium, boron, DOC, hardness iron, strontium, TDS, alkalinity, sulphate, sodium, and manganese*.
- The following monitoring points are not considered to be impacted by the landfill Site: 95-4, 96-9, 09-11S, and 09-11D.
- The following monitoring points are considered to be affected to some degree by the landfill Site: 95-2, 95-3*, 95-5A, 95-5B, 96-6A, 96-6B, 96-7A, 96-7B, 96-8A, 96-8B, 02-10A, and 02-10B.*
- The main landfill leachate impact at the Site is present in the subsurface in the area of on-site monitoring point's *95-5A, 95-5B, 96-7A, 96-7B*.
- An assessment of the Reasonable Use Concept has been applied to key monitoring wells. The 2020 ad 2021 results reveal chemical values that are less than their respective RUC values beyond the proposed Contaminant Attenuation Zone boundary with the exception of iron with marginal exceedances.
- A CAZ located west of the fill area was registered on Title through a Certificate of Requirement dated December 15, 2014. The downgradient boundary of the CAZ extends to the monitoring well 02-10.

The following is recommended to be completed at the Site.

- Continued environmental monitoring as outlined in 'Schedule B' of the Amended ECA including:
    - Ground water level measurements
    - Ground water quality monitoring
    - Measurement of the nearby lake level
- Maintain all monitoring wells in good working order.
- Provide a written report on the results of the 2024 and 2025 sampling in the spring of 2026. The report should continue to provide an assessment of any trends in water quality from monitoring wells 02-10 and 09-11 to ensure concentrations are not increasing at these points of compliance wells.

REFERENCES

Barnett, P.J. and Clarke, W.S., (1980) Quaternary Geology of the Cobden Area, Renfrew County; OGS Preliminary Map P. 2366, Scale 1:50,000.

Golder & Associates Ltd., (2007) 2003, 2004,2005, and 2006 Groundwater monitoring programs and hydrogeological component of final closure plan cobden landfill site, June 2007.

Jp2g Consultants Inc., (2022) 2020/2021 Cobden Waste Disposal Site Biennial Report, May 2022

Jp2g Consultants Inc., (2020) 2018/2019 Cobden Waste Disposal Site Biennial Report, April 2020

Jp2g Consultants Inc., (2018) 2016/2017 Cobden Waste Disposal Site Biennial Report, April 2018

Jp2g Consultants Inc., (2016) 2014/2015 Cobden Waste Disposal Site Biennial Report, April 2016

Jp2g Consultants Inc., (2014) 2012/2013 Cobden Waste Disposal Site Biennial Report, April 2014

Jp2g Consultants Inc., (2012) 2010/2011 Cobden Waste Disposal Site Biennial Report, April 2012

Jp2g Consultants Inc., (2010) Cobden Waste Disposal Site 2008 / 2009 Operations and Monitoring Report, May 2010

Jp2g Consultants Inc., (2007) Cobden Waste Disposal Site Closure Plan, July 2007.

Ministry of the Environment (2010) Technical Guidance Document Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water, November 2010.

Ministry of the Environment, (2006) Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines; Ontario Ministry of the Environment, june 2006.

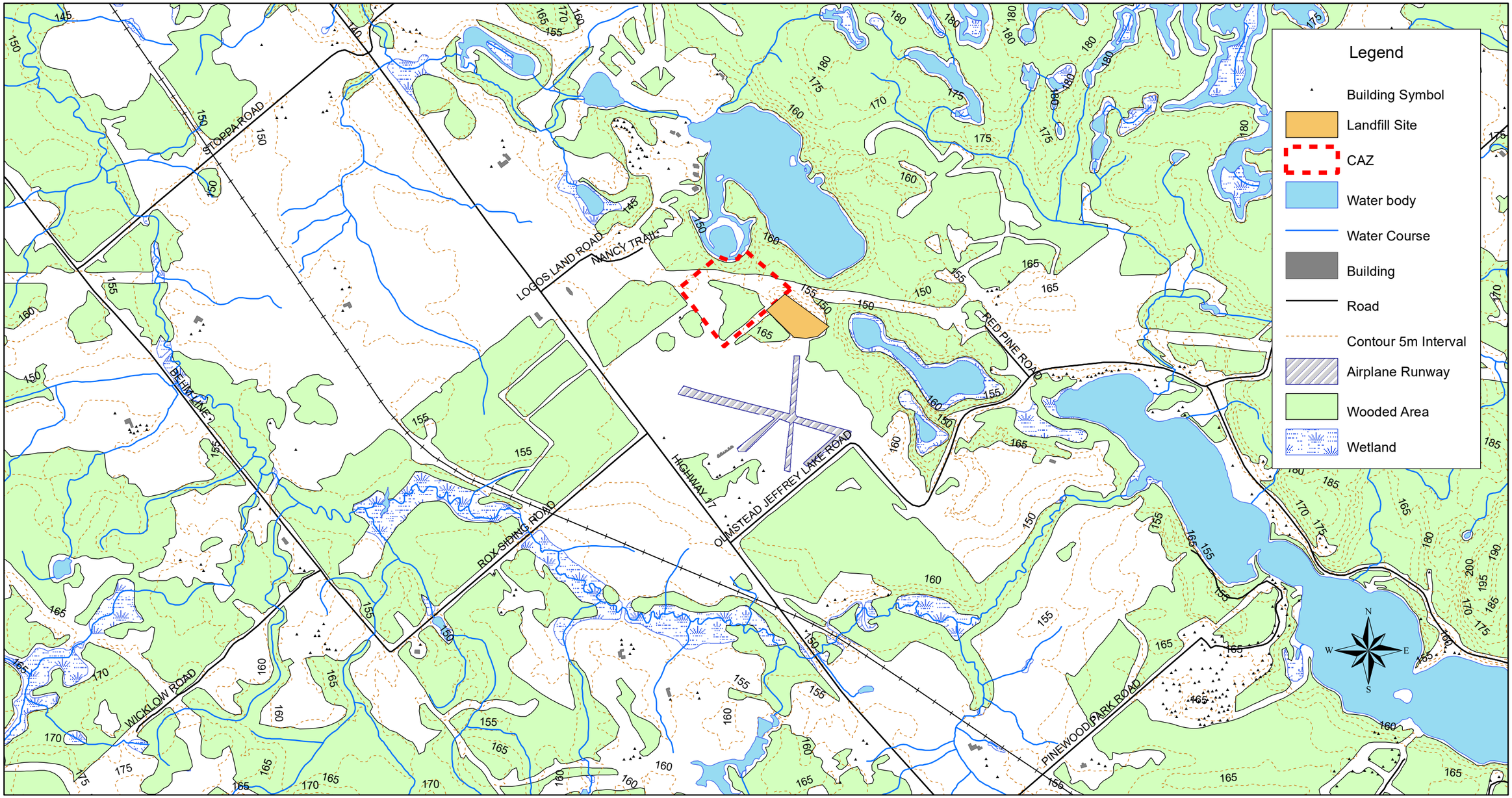
Ministry of the Environment, (1986) The Incorporation of the Reasonable Use Concept into the Groundwater Management Activities of the Ministry of the Environment; Ontario Ministry of the Environment, Water Resources Branch, 21 p.

LIMITATIONS AND USE OF THE REPORT

This report was prepared for the exclusive use of the Township of Whitewater Region. Any use which a third party makes of this report, or and reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Jp2g Consultants Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This landfill impact report involves a limited sampling of locations to assess the probability of contamination on site. The test data, chemical analyses, and conclusions given herein are the results of analyzing the groundwater encountered during the sampling programs. Based upon the total number of test holes performed, these are considered to be fairly representative of the groundwater conditions within each area tested. It should be noted, however, that any assessment regarding the presence of contamination on the property is based on interpretation of conditions determined at specific locations and depths. Chemical results are limited to those parameters tested.

FIGURES



Notes:
Shapefile Data obtained from Land Information Ontario, 2018
Shapefiles created by Jp2g Consultants Inc.

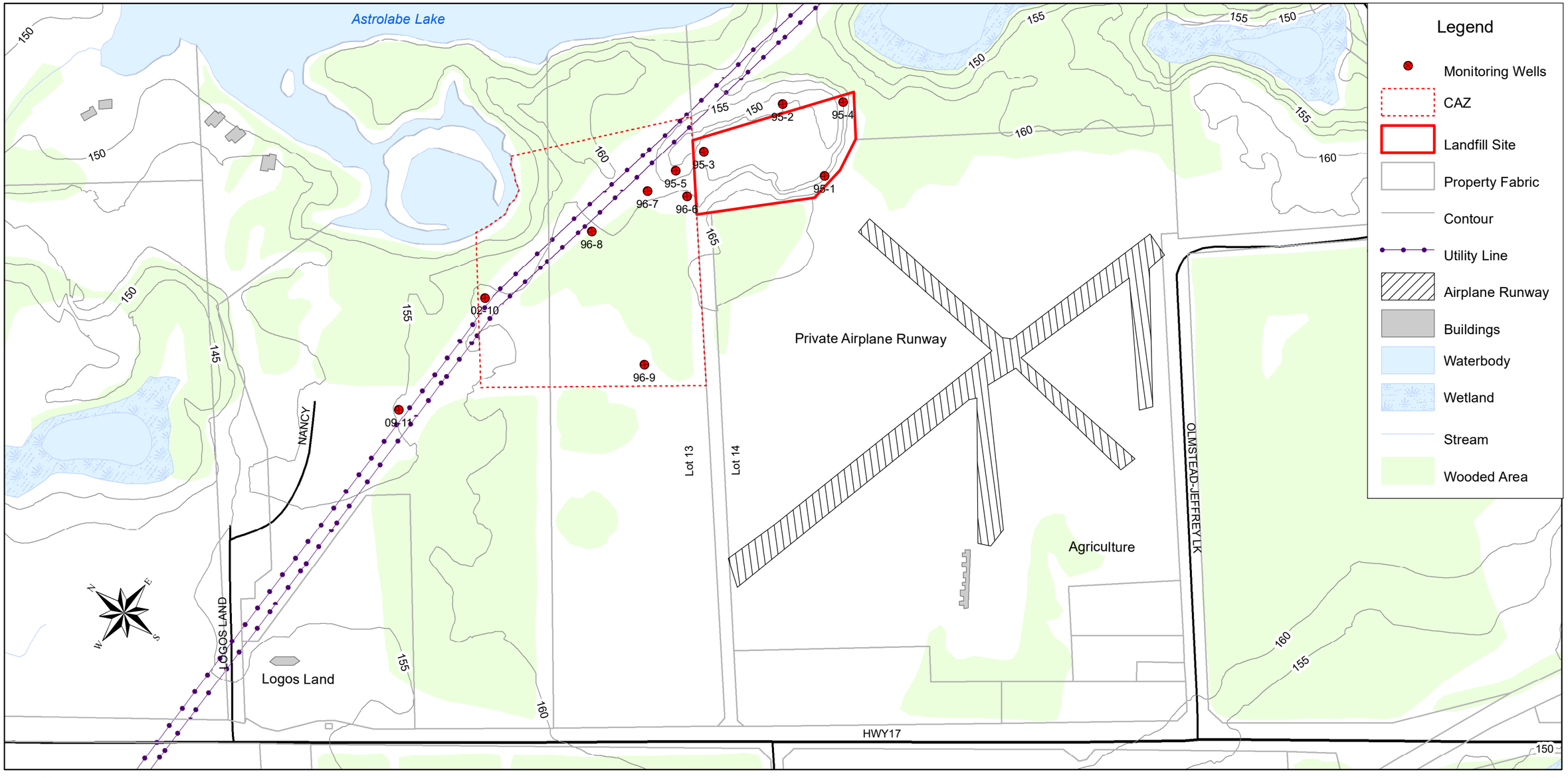
0 475 950 1,900 Meters

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Cobden Landfill Site

Twp of Whitewater Region

1:15,000	Figure 1 - Site Location Map
	Drawn By: AA
Project No. 17-6046F	Checked by: KM/AB
	Date: January 2024



Notes:
Locations of monitoring wells approximate
Shapefile Data obtained from Land Information Ontario, 2018
Shapefiles created by Jp2g Consultants Inc.

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

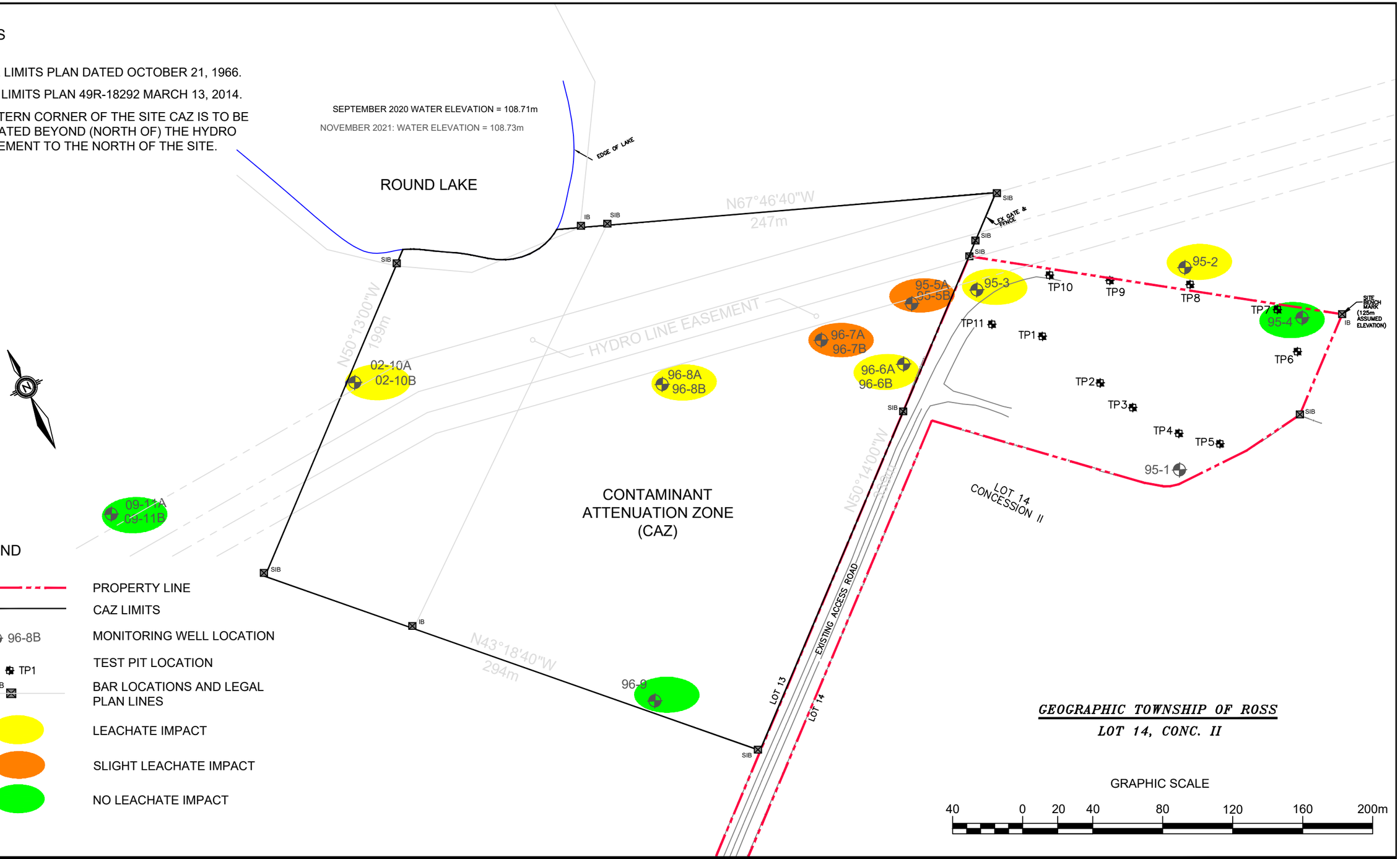
Cobden WDS and Surrounding Area

Township of Whitewater Region

Scale 1:5000	Figure 2 - Cobden WDS & Area
	Drawn By: AA
Project No. 17-6046F	Checked by: KM/AB
	Date: January 2024

NOTES

1. SITE LIMITS PLAN DATED OCTOBER 21, 1966.
2. CAZ LIMITS PLAN 49R-18292 MARCH 13, 2014.
3. EASTERN CORNER OF THE SITE CAZ IS TO BE LOCATED BEYOND (NORTH OF) THE HYDRO EASEMENT TO THE NORTH OF THE SITE.



LEGEND

- PROPERTY LINE
- CAZ LIMITS
- 96-8B — MONITORING WELL LOCATION
- TP1 — TEST PIT LOCATION
- SIB — BAR LOCATIONS AND LEGAL PLAN LINES
- LEACHATE IMPACT
- SLIGHT LEACHATE IMPACT
- NO LEACHATE IMPACT

GEOGRAPHIC TOWNSHIP OF ROSS

LOT 14, CONC. II

GRAPHIC SCALE

40 0 20 40 80 120 160 200m

No.	DATE	BY	REVISIONS

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

DESIGNED	AA
DRAWN	AA
CHECKED	KM
APPROVED	KM
SCALE	1:2000

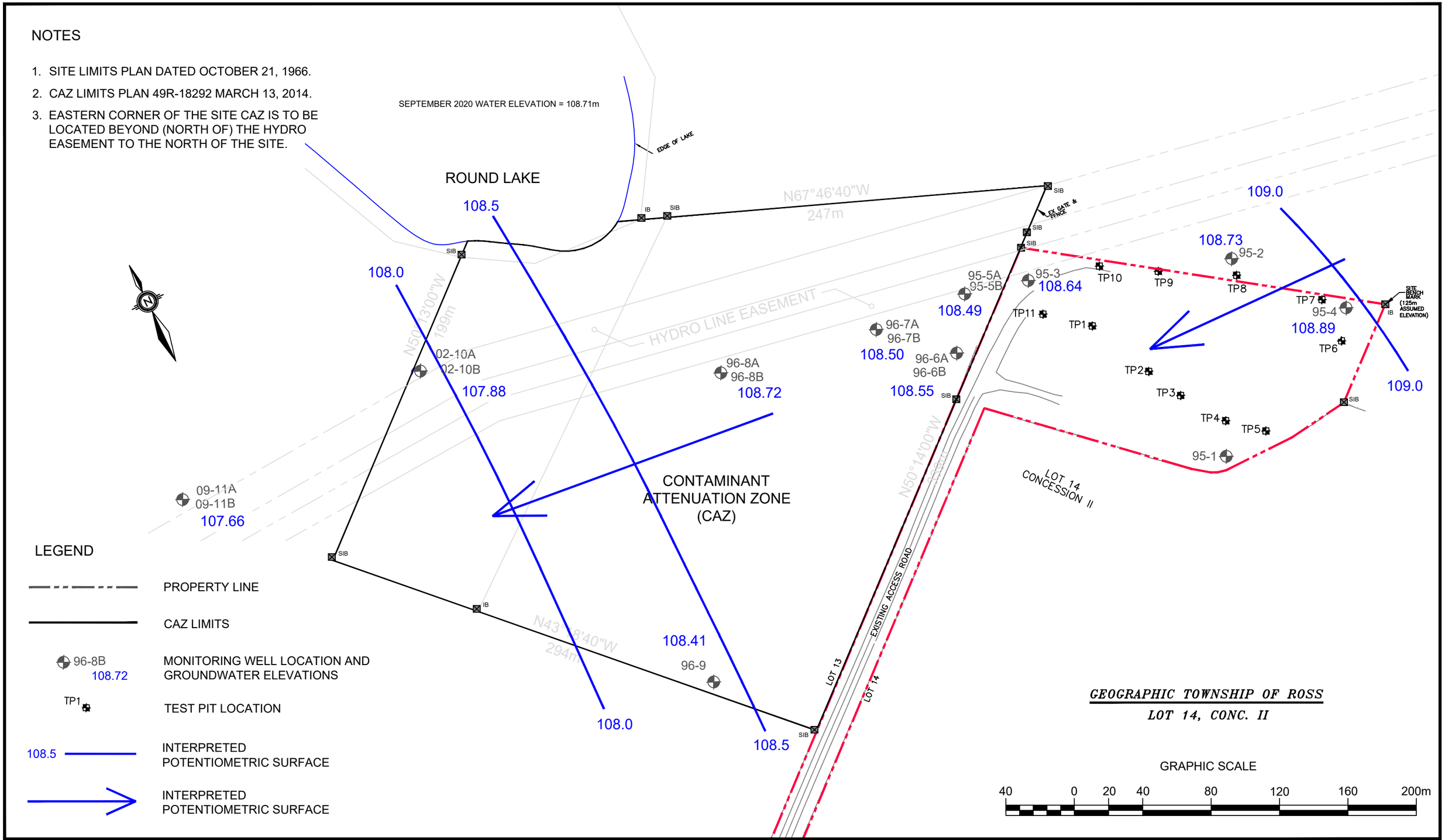
COBDEN WASTE DISPOSAL SITE
TOWNSHIP OF WHITEWATER REGION

SITE PLAN

DATE	JANUARY 2024
PROJECT	17-6046F
PLOTTED	19-JAN-24
FIGURE	3

NOTES

1. SITE LIMITS PLAN DATED OCTOBER 21, 1966.
2. CAZ LIMITS PLAN 49R-18292 MARCH 13, 2014.
3. EASTERN CORNER OF THE SITE CAZ IS TO BE LOCATED BEYOND (NORTH OF) THE HYDRO EASEMENT TO THE NORTH OF THE SITE.



LEGEND

- PROPERTY LINE
- CAZ LIMITS
- 96-8B / 108.72 — MONITORING WELL LOCATION AND GROUNDWATER ELEVATIONS
- TP1 — TEST PIT LOCATION
- 108.5 — INTERPRETED POTENTIOMETRIC SURFACE
- INTERPRETED POTENTIOMETRIC SURFACE

GEOGRAPHIC TOWNSHIP OF ROSS

LOT 14, CONC. II

GRAPHIC SCALE

40 0 20 40 80 120 160 200m

No.	DATE	BY	REVISIONS

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

DESIGNED	AA
DRAWN	AA
CHECKED	KM
APPROVED	KM
SCALE	1:2000

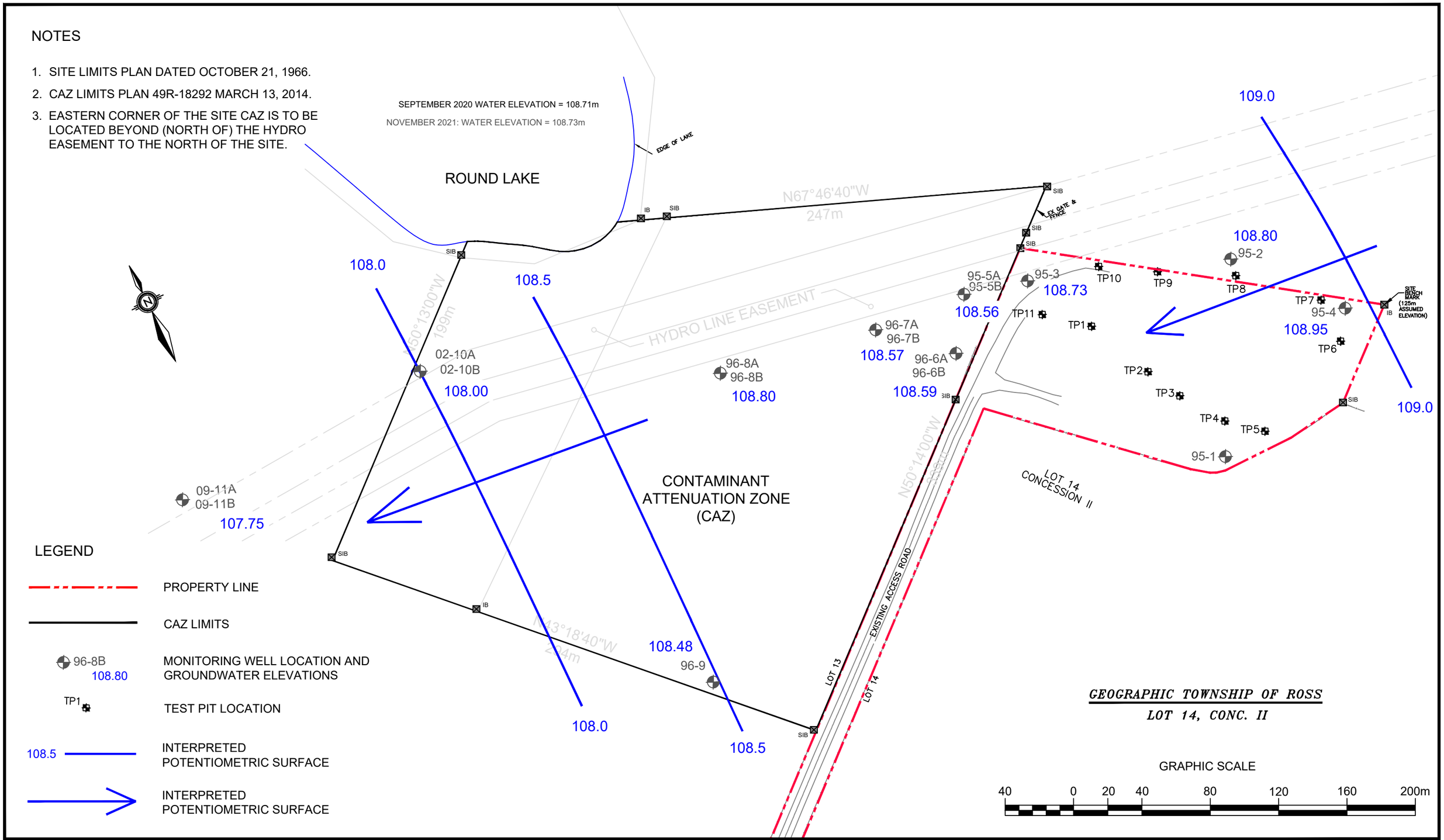
COBDEN WASTE DISPOSAL SITE
TOWNSHIP OF WHITEWATER REGION

DIRECTION OF SHALLOW GROUNDWATER FLOW
OCTOBER 2022

DATE	JANUARY 2024
PROJECT	17-6046F
PLOTTED	19-JAN-24
DRAWING	4

NOTES

1. SITE LIMITS PLAN DATED OCTOBER 21, 1966.
2. CAZ LIMITS PLAN 49R-18292 MARCH 13, 2014.
3. EASTERN CORNER OF THE SITE CAZ IS TO BE LOCATED BEYOND (NORTH OF) THE HYDRO EASEMENT TO THE NORTH OF THE SITE.



LEGEND

- PROPERTY LINE
- CAZ LIMITS
- 96-8B / 108.80 — MONITORING WELL LOCATION AND GROUNDWATER ELEVATIONS
- TP1 — TEST PIT LOCATION
- 108.5 — INTERPRETED POTENTIOMETRIC SURFACE
- INTERPRETED POTENTIOMETRIC SURFACE

GEOGRAPHIC TOWNSHIP OF ROSS
LOT 14, CONC. II

GRAPHIC SCALE
40 0 20 40 80 120 160 200m

No.	DATE	BY	REVISIONS

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

DESIGNED	AA
DRAWN	AA
CHECKED	KM
APPROVED	KM
SCALE	1:2000

COBDEN WASTE DISPOSAL SITE
TOWNSHIP OF WHITEWATER REGION

DIRECTION OF SHALLOW GROUNDWATER FLOW
SEPTEMBER 2023

DATE	JANUARY 2024
PROJECT	17-6046F
PLOTTED	19-JAN-24
DRAWING	5

APPENDIX A

MONITORING AND SCREENING CHECKLIST

Appendix D-Monitoring and Screening Checklist
General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.
Instructions: A complete checklist consists of:
(a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
(b) completed contact information for the Competent Environmental Practitioner (CEP)
(c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
Definition of Surface water CEP:
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information	
Waste Disposal Site Name	Cobden Waste Disposal Site
Location (e.g. street address, lot, concession)	Part Lot 14 Concession 2, Geographic Township of Ross in the Township of Whitewater Region
GPS Location (taken within the property boundary at front gate/ front entry)	NAD83 - UTM Zone 18 - Easting 356960 Northing 5051120
Municipality	Township of Whitewater Region
Client and/or Site Owner	Township of Whitewater Region
Monitoring Period (Year)	2022-2023
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval Number:	Closed under ECA No. A413204
Director's Order No.:	N/A
Provincial Officer's Order No.:	N/A
Other:	N/A

Report Submission Frequency	○ **Annual** ◉ **Other**	Biennial (once every two years)	
The site is: **(Operation Status)**	○ **Open** ○ **Inactive** ◉ **Closed**		
Does your Site have a Total Approved Capacity?	○ **Yes** ◉ **No**		
If yes, please specify Total Approved Capacity		*Units*	
Does your Site have a Maximum Approved Fill Rate?	○ **Yes** ◉ **No**		
If yes, please specify Maximum Approved Fill Rate		*Units*	
Total Waste Received within Monitoring Period (Year)	0	*Units*	
Total Waste Received within Monitoring Period (Year) *Methodology*			
Estimated Remaining Capacity	0	*Units*	
Estimated Remaining Capacity *Methodology*	The site is currently closed with a total capacity of 45,590 cubic metres		
Estimated Remaining Capacity *Date Last Determined*			
Non-Hazardous Approved Waste Types	☐ Domestic ☐ Industrial, Commercial & Institutional (IC&I) ☐ Source Separated Organics (Green Bin) ☐ Tires	☐ Contaminated Soil ☐ Wood Waste ☐ Blue Box Material ☐ Processed Organics ☐ Leaf and Yard Waste	☐ Food Processing/Preparation Operations Waste ☐ Hauled Sewage Other: This site is closed and does not accept any waste types.
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*	This site is closed and does not accept any subject waste.		
Year Site Opened *(enter the Calendar Year only)*	1967	**Current ECA Issue Date**	21-Aug-2014
Is your Site required to submit Financial Assurance?		○ **Yes** ◉ **No**	
Describe how your Landfill is designed.		◉ Natural Attenuation only ○ Fully engineered Facility ○ Partially engineered Facility	
Does your Site have an approved Contaminant Attenuation Zone?		◉ **Yes** ○ **No**	

If closed, specify C of A, control or authorizing document closure date:	2-Mar-2009
Has the nature of the operations at the site changed during this monitoring period?	○ **Yes** ◉ **No**
If yes, provide details:	N/A
Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)	○ Yes ◉ No

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	◉ **Yes** ○ **No**	
2) All groundwater, leachate and 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):	◉ **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

3) a) Is landfill gas being monitored or controlled at the site?	◉ **Yes** ○ **No**	
If yes to 3(a), please answer the next two questions below.		
b) Have any measurements been taken since the last reporting period that indicate landfill gas is present in the subsurface at levels exceeding criteria established for the site?	○ **Yes** ◉ **No**	
c) Has the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	◉ **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach additional information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

4) All field work for groundwater investigations was done in accordance with standard operating procedures as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◉ **Yes** ○ **No**	All sampling was completed in general as per our standard operating procedures.

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	(●) Yes ( ) No	We suggest that at this time the CAZ is sufficient as only iron was found to marginally exceed the RUC at 02-10, located at the far extent of the CAZ. No parameters were revealed to exceed the RUC beyond the CAZ limits, i.e. 09-11. The wells located down gradient of the landfilling area were noted to exhibit either stable or decreasing trends when assessing their long-term chemical profiles.	
6) The site meets compliance and assessment criteria.	( ) Yes (●) No	See Section 6.7 of the 2022-2023 Biennial Monitoring Report (Jp2g, 2024) for a detailed discussion of the RUC exceedances.	
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	(●) Yes ( ) No		
1) Is one or more of the following risk reduction practices in place at the site: ***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	(●) Yes ( ) No	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☒ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	( ) Yes ( ) No (●) Not Applicable	There has been no contingency plan developed for the Closed Cobden WDS.	

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:

Select Date

Recommendations:

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

◉ **No changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/are recommended:**	
◉ **No Changes to site design and operation are recommended** ○ **The following change(s) to the site design and operation is/ are recommended:**	

Name:	Andrew Buzza PGeo Report signed and sealed		
Seal:	Add Image		
Signature:		**Date:**	April 17, 2024
CEP Contact Information:	Andrew Buzza PGeo		
Company:	Jp2g Consultants Inc		
Address:	1150 Morrison Drive, Suite 410, Ottawa, ON, K2H8S9		
Telephone No.:	613-828-7800	Fax No. :	613-828-7800
E-mail Address:	andrewb@jp2g.com		
Co-signers for additional expertise provided:			
Signature:		**Date:**	Select Date
Signature:		**Date:**	Select Date

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):

Name (s)	1) Unnamed lake 2) Astrolabe Lake 3) Round Lake
Distance(s)	1) Located approximately 140m east of the waste footprint 2) Located approximately 160m north of the waste footprint 3) Located approximately 300m north west of the waste footprint

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	○ Yes ◉ No	There are no surface water features located immediately in the down-gradient flow path from the site. Astrolabe Lake and the conjoined Round Lake are located slightly out of the direct flow path from the site. Lake water levels surveyed in 2012, 2014, 2015, 2016, 2017, 2019, 2021 and 2023 monitoring events are similar to the water levels in the up-gradient wells and greater than water levels at the down-gradient locations.
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):	○ Yes ○ No ◉ **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

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.	◯ **Yes** ◯ **No** ◉ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	◯ **Yes** ◯ **No** ◉ **Not Applicable**	If no, specify below or provide details in an attachment.

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

4) All field work for surface water investigations was done in accordance with 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):	◯ **Yes** ◯ **No**	If no, specify (Type Here): NA

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
6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	○ **Yes** ○ **No**	NA no surface water sampling

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	◯ **Yes** ◯ **No**	NA no surface water sampling
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	◯ Yes ◯ No ◯ Not Known ◉ Not Applicable	If yes, provide details and whether remedial measures are necessary (Type Here)
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	◯ **Yes** ◯ **No** ◉ **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here)

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable 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:

Select Date

Recommendations:

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

◉ **No Changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/are recommended:**	Note that surface water monitoring was not completed at this site.
◉ **No changes to the site design and operation are recommended** ○ **The following change(s) to the site design and operation is/are recommended:**	

CEP Signature	
Relevant Discipline	PGeo with 30 years experience
Date:	April 17,2024
CEP Contact Information:	Andrew Buzza PGeo
Company:	Jp2g Consultants Inc
Address:	1150 Morrison Drive, Suite 410, Ottawa, ON, K2H 8S9
Telephone No.:	613-828-7800
Fax No. :	613-828-7800
E-mail Address:	andrewb@jp2g.com

Save As **Print Form**

APPENDIX B

ENVIRONMENTAL COMPLIANCE APPROVAL (ECA)

Ontario
Ministry of the Environment

Provisional Certificate No.
A 413204

PROVISIONAL CERTIFICATE OF APPROVAL
FOR A
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:

Village of Cobden
Box 40
Cobden, Ontario

THIS IS A TRUE COPY OF THE
ORIGINAL CERTIFICATE MAILED
ON FEB - 3 1978
(Signed)

for the Landfilling Site
located Lot 14, Concession 2
Township of Ross
Renfrew County

subject to the following conditions:

1. No domestic waste may be burned at the site.

2. Waste must be covered regularly in April, May, June, July, August, September and October.

This Provisional Certificate expires on the 31st day of December, 19 80

Dated this 2nd day of February, 19 78

D. P. Caplice
DIRECTOR, SECTION 3.(a) E.P.A.

01

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A413204
Notice No. 1
Issue Date: March 2, 2009

The Corporation of the Township of Whitewater Region
44 Main St P.O. Box 40, Cobden
Whitewater Region, Ontario
K0J 1K0

Site Location: Cobden Waste Disposal Site
15784 Hwy 17
Whitewater Region Township, County of Renfrew

You are hereby notified that I have amended Provisional Certificate of Approval No. A413204 issued on February 2, 1978 for the use and operation of a Waste Disposal Site (landfill) , as follows:

I. The following Conditions are hereby added:

3. The Township of Whitewater Region shall close the Cobden Landfill Site in accordance with the Items1 to 8 of Schedule "A" and no more waste shall be received at the Cobden Landfill Site.

4. The groundwater samples shall be collected and analysed at the pre-determined frequency in accordance with the Schedule "B".

5. Final Cover:
   (i) The Township of Whitewater Region shall place 600 mm of soil final cover and 150 mm of top soil over waste landfilled by December 31, 2009.
   (ii) Only low permeability clean soil and hydrocarbon-contaminated soils in accordance with Item 4 of Schedule "A" shall be used for final cover.
   (iii) Seeding of the final cover shall be undertaken in the next growing season following the placement of the final cover.
   (iv) Slopes of the final cover shall not be less than 5% to promote effective surface water run-off.

6. By October 31, 2010, The Township of Whitewater Region shall purchase or obtain a written easement agreement with the property owner(s) of the land(s) required to establish a Contaminant Attenuation Zone (CAZ) as per Item 2 of Schedule "A".

7. One additional groundwater monitoring well shall be installed and monitored beyond the proposed Contaminant
Attenuation Zone (CAZ) by December 31, 2009.

8. The Township of Whitewater region shall prepare and submit an Annual Report which outlines the results of the sampling program to the Ottawa District Office by May 1, 2010. The subsequent Annual Reports shall be submitted on a biennial basis by May 1 and they shall cover the previous two (2) calendar years.

9. The groundwater monitoring program may be amended from time-to-time with the written prior consent of the District Manager.

II. The following items are hereby added to Schedule "A":

1. Application for a Provisional Certificate of Approval for a Waste Disposal Site dated July 31, 2007 and signed by Kevin Mooder, Senior Project Planner, Jp2g Consultants Inc.

2. "Cobden Waste Disposal Site - Site Closure Plan", dated July 31, 2007, prepared by Kevin Mooder, Senior Project Planner, Jp2g Consultants Inc.

3. "2003, 2004, 2005, and 2006 Groundwater Monitoring Program and Hydrogeological Component of Final Closure Plan", dated June, 2007, prepared by H.L.R.Fenton, P.Geo., Hydrogeologist, Golder Associates Ltd.

4. "Cobden Waste Disposal Site - Soil Sampling Results", dated February 8, 2008, prepared by Andrew Buzza, P.Geo., Project Manager, Jp2g Consultants Inc.

5. Memorandum dated May 26, 2008 from Shawn Kinney, Hydrogeologist of Eastern Region Technical Support Section to Marc Etienne LeSieur, Senior Enviornmental Officer of Ottawa District Office.

6. Email dated August 15, 2008 from Steven Hodson, Landfill Operations Manager, Township of Whitewater Region, to Marc Etienne LeSieur, Senior Enviornmental Officer of Ottawa District Office, providing responses to the comments from Shawn Kinney.

7. Email dated February 19, 2009 from Steven Hodson, Landfill Operations Manager, Township of Whitewater Region, to Alan Tan, Senior Waste Engineer, MOE, providing comments on the draft Notice.

8. Email dated February 23, 2009 from Kevin Mooder, Senior Project Planner, Jp2g Consultants Inc. to Alan Tan, Senior Waste Engineer, MOE, providing comments on the draft Notice.

III. Schedule "B" is added:

Schedule "B"

This Schedule "B" forms part of Certificate of Approval No: A413204

Groundwater Monitoring

Sampling Location	Parameters	Frequency
95-2, 95-3, 95-4, 95-5A, 95-5B, 96-6A, 96-6B, 96-7A, 96-7B, 96-8A, 96-8B, 96-9, 02-10A, 02-10B	Alkalinity, Barium, Boron, Calcium, Chloride, hardness, iron, Magnesium, Manganese, Nitrate(NO3-N), pH, Potassium, Sodium, Strontium, Total Dissolved Solids, Sulphate, COD, Dissolved Organic Carbon.	Once a year (October)

The reason for this amendment to the Certificate of Approval is as follows:

1. To approve the closure plan sumbitted by The Township of Whitewater Region, dated July 31, 2007, as amended.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A413204 dated February 2, 1978.

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

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

Toronto, Ontario
M4V 1L5

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

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

DATED AT TORONTO this 2nd day of March, 2009

THIS NOTICE WAS MAILED
ON March 6, 2009
DC
(Signed)

Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

AT/
c: District Manager, MOE Ottawa
Kevin Mooder, jp2g Consultants Inc.

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A413204
Notice No. 2
Issue Date: March 19, 2012

The Corporation of the Township of Whitewater Region
44 Main St P.O. Box 40, Cobden
Whitewater Region, Ontario
K0J 1K0

Site Location: Cobden Waste Disposal Site
15784 Hwy 17
Whitewater Region Township, County of Renfrew

You are hereby notified that I have amended Approval No. A413204 issued on February 2, 1978, and amended on March 2, 2009 for the use and operation of a Waste Disposal Site (Landfill) , as follows:

I. The following Conditions are hereby revoked and replaced with:

6. By **December 31, 2012**, the Township of Whitewater Region shall purchase or obtain a written easement agreement with the property owner(s) of the land(s) required to establish a Contaminant Attenuation Zone (CAZ) as per Items 9, 10, 11 and 12 of Schedule "A".

II. The following items are hereby added to Schedule "A":

9. Cobden Landfill Site 2008/2009 Operations and Monitoring Report dated May 2010, prepared by Jp2g Consultants Inc.

10. Memorandum dated March 04, 2011 from Shawn Kinney, Hydrogeologist of Eastern Region Technical Support Section to Lance Larkin, Senior Enviornmental Officer of Ottawa District Office.

11. Letter dated May 20, 2011 from from Andrew Buzza, Senior Hydrogeologist, Jp2g Consultants Inc. to Lance Larkin, Senior Environmental Officer, MOE, providing responses to MOE comments.

12. Memorandum dated August 3, 2011 from Shawn Kinney, Hydrogeologist of Eastern Region Technical Support Section to Lance Larkin, Senior Enviornmental Officer of Ottawa District Office.

The reason for this amendment to the Certificate of Approval is as follows:

To approve the request of the Township of Whitewater Region, dated October 26, 2010, to need more time to

purchase or obtain a written easement agreement.

This Notice shall constitute part of the approval issued under Approval No. A413204 dated February 2, 1978, as amended.

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

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

DATED AT TORONTO this 19th day of March, 2012

THIS NOTICE WAS MAILED
ON March 21, 2012
(Signed)

Dale L. Gable

Dale Gable, P.Eng.

Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AT/

c: District Manager, MOE Ottawa
Kevin J. Mooder, MCIP, RPP, Jp2g Consultants Inc. √

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A413204
Notice No. 3
Issue Date: August 21, 2014

The Corporation of the Township of Whitewater Region
44 Main St P.O. Box 40, Cobden
Whitewater Region, Ontario
K0J 1K0

Site Location: Cobden Waste Disposal Site
15784 Hwy 17
Whitewater Region Township, County of Renfrew

You are hereby notified that I have amended Approval No. A413204 issued on February 2, 1978 and amended on March 2, 2009 and March 19, 2012 for a closed landfill site , as follows:

In accordance with Environmental Compliance Approval Application dated January 17, 2013, and updated with letters dated July 22, 2013, and August 18, 2014 prepared by Kevin Mooder, Jp2g Consultants Inc. containing a drawing and survey for addition of Contaminant Attenuation Zone, this Approval is hereby amended as follows:

Condition 6 of Notice dated March 19, 2012 is hereby revoked and replaced by the following condition:

6. Contaminant Attenuation Zone as outlined in Reference Plan 49R- 18292 registered March 13, 2014, is hereby added to the Approval through Transfer Easement Part 1 to 5 Plan 49R-18292 and Transfer Easement Part 6 to 10 Plan 49R-18292.

Conditions 10, 11 and 12, regarding Registration on Title for Contaminant Attenuation Zone Easement Agreement, are hereby added to the Approval:

10. The Corporation of the Township of Whitewater Region shall, within thirty calendar days from the date of issuance of this Approval, submit to the Director, two copies of a completed Certificate of Requirement, containing a registerable description of the easement agreement for the Contaminant Attenuation Zone.

11. The Certificate of Requirement shall be registered in the appropriate land registry office on title to the Site by The Corporation of the Township of Whitewater Region within 10 calendar days of receiving the

Certificate of Requirement signed by the Director, and a duplicate registered copy shall be submitted to the Director.

12. The Corporation of the Township of Whitewater Region shall not amend or remove or consent to the removal of the easement from title without the prior written consent of the Director.

Schedule B is hereby revoked and replaced with the following:

Sampling Location	Parameter	Frequency
95-2, 95-3, 95-4, 95-5A, 95-5B, 96-6A, 96-6B, 96-7A, 96-7B, 96-8A, 96-8B, 96-9, 02-10A, 02-10B. 09-11A. 09-11B	Alkalinity, Barium, Boron, Calcium, Chloride, hardness, Iron, Magnesium, Manganese, Nitrate (NO3-N), pH, Potassium, Sodium, Strontium, Total Dissolved Solids, Sulphate, COD, and Dissolved Organic Carbon	Once per year (October)

The reason for this amendment to the Approval is to add contaminant attenuation zone and two additional monitoring wells to the Approval.

This Notice shall constitute part of the approval issued under Approval No. A413204 dated February 2, 1978 and all subsequent amendments.

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

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

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

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;

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

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

This Notice must be served upon:

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

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-3717 or www.ert.gov.on.ca**

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

DATED AT TORONTO this 21st day of August, 2014

THIS NOTICE WAS MAILED
ON Sept. 8, 2014
QC
(Signed)

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

NP/
c: District Manager, MOE Ottawa
Kevin Mooder, Jp2g Consultants Inc. ✓

APPENDIX C-1

MINISTRY CORRESPONDENCE
2007-2009

Ministry of the Environment
Ministère de l'Environnement
Ontario

Provincial Officer's Report

Order Number
1380-6XGQS7

The Corporation of the Township of Whitewater Region
Post Office Box 40
44 Main St
Cobden, Ontario, K0J 1K0
Canada

Site
Cobden Waste Disposal Site - 15784 Highway 17, Lot 14 Concession 2, Township of Ross, Whitewater Region, County of Renfrew

Observations

On January 5, 2007, I performed an inspection of the subject site. The findings of the inspection were outlined in an Inspection Report mailed to The Corporation of the Township of Whitewater Region on January 12, 2007. Section 3.0 of the Inspection Report outlined the following non-compliance.

An Inspection Report of the subject site was prepared by Senior Environmental Officer Andrew Polley in October 2005. The report identified non-compliance issues due to off-site groundwater impacts in exceedance of the Ministry Reasonable Use Policy requiring the establishment of a suitably sized Contaminate Attenuation Zone (CAZ) downgradient from the subject site. The establishment of a CAZ has been outstanding for several years.

The October 2005 Inspection Report noted the following:

Based on our file review, site inspections and meetings with staff and Council of Whitewater Region the following items have been identified as requiring action:

- Interim or final closure of the waste mound.
- Acquisition of a contaminate attenuation zone.
- Assessment of the physical condition of all of the monitoring wells and upgrading where required.
- Preparation of a consolidated and current environmental monitoring report.
- Review of current application for updated Certificate of Approval.

As these items have been outstanding for several years it will be necessary to develop a suitable Work Plan which identifies activities and time lines to bring this site into compliance with current legislative standards. The Work Plan is to be submitted to MOE Ottawa District

Office accompanied by a Resolution of Council by January 31, 2006.

On January 20, 2006, the Township provided the document entitled "Cobden Landfill Site - Work Plan - Outstanding Issues, Certificate of Approval #A413204, Township of Whitewater Region, Waste Management Department, January, 2006" to address the non-compliance issues. The Work Plan formed the basis of a Voluntary Abatement Program to bring the site into compliance.

On January 31, 2006, the Ministry approved the Work Plan and required quarterly report to be provided to monitor compliance. No quarterly reports could be located in the ministry file.

The Work Plan identified several activities to be completed by the Township until the end of 2008. However, as of December 31, 2006, the following activities still had not been completed with various deadlines.

- Spreading of hydrocarbon contaminated soils (due October 31, 2006). At the time of my inspection, this action was partly performed.
- Assessment of monitoring network (due June 31, 2006) and improvement/upgrades (due October 31, 2006). The upgrades to the monitoring network have not been completed at the time of my inspection.
- Determine an acceptable mitigation plan for CAZ boundaries (due March 31, 2006) and consolidated environmental monitoring data put forth in report form (due March 31, 2006). Based on discussion at the time of inspection with Steven Hodson, Landfill Operations Manager, a consultant report has been produced in the summer of 2006 regarding these issues but was not submitted to the Ministry.
- Withdrawal of the October 2001 Application for an Amendment to the Provisional Certificate of Approval (Early 2006) and submission of a current/relevant Final Closure Plan (December 31, 2006). This action item has not been performed at the time of my inspection.

Based on the above, several action items required under the approved Work Plan (Voluntary Abatement Program) are outstanding, which may cause or continue to cause environmental impairment as outlined in the inspection reports. As such, I am of the opinion that the issuance of this Order is required to bring the site into compliance.

Marc-Etienne Lesieur
Provincial Officer
Badge Number: 775
Date: 2007/02/09
District Office: Ottawa District Office

Ministry of the Environment
Ministère de l'Environnement
Ontario

Provincial Officer's Order

Environmental Protection Act, R.S.O. 1990, c.E 19 (EPA)
Ontario Water Resources Act, R.S.O. 1990, c. O. 40 (OWRA)
Pesticides Act, R.S.O. 1990, c. P11 (PA)
Safe Drinking Water Act, S.O. 2002, c.32 (SDWA)
Nutrient Management Act, 2002, S.O. 2002, c.4

Order Number
1380-6XGQS7

Incident Report No.
5778-6X9LVU

To: The Corporation of the Township of Whitewater Region
Post Office Box 40
44 Main St
Cobden, Ontario, K0J 1K0
Canada

Site: 15784 Hwy 17
Whitewater Region, County of Renfrew

Pursuant to my authority under EPA Section 157.1, EPA Section 196(1) and EPA Section 157, I order you to do the following:

Work Ordered

Item No. 1 **Compliance Date** 2007/07/31

As outlined in Section 1 of the document entitled "Cobden Landfill Site - Work Plan - Outstanding Issues, Certificate of Approval #A413204, Township of Whitewater Region, Waste Management Department, January, 2006"; implement the spreading of hydrocarbon contaminated soils over the waste mound.

Item No. 2 **Compliance Date** 2007/07/31

As outlined in Section 2 of the document entitled "Cobden Landfill Site - Work Plan - Outstanding Issues, Certificate of Approval #A413204, Township of Whitewater Region, Waste Management Department, January, 2006"; assess the physical condition of monitoring network and improve/upgrade the groundwater monitors as required.

Item No. 3 **Compliance Date** 2007/07/31

As outlined in Section 3 and 4 of the document entitled "Cobden Landfill Site - Work Plan - Outstanding Issues, Certificate of Approval #A413204, Township of Whitewater Region, Waste Management Department, January, 2006"; determine an acceptable mitigation plan for the Contaminant Attenuation Zone boundaries and provide a report to the Ministry consolidating the environmental monitoring data.

Item No. 4 **Compliance Date** 2007/07/31

As outlined in Section 5 of the document entitled "Cobden Landfill Site - Work Plan - Outstanding Issues, Certificate of Approval #A413204, Township of Whitewater Region, Waste Management Department, January, 2006"; implement the following actions:

1- Submit to the Ministry Environmental Assessments and Approval Branch a withdrawal of the October 2001 Application for an Amendment to the Provisional Certificate of Approval
2- Submit to the Ministry Environmental Assessments and Approval Branch an Amendment to the Certificate of Approval for the Final Closure Plan of the subject site.

Item No. 5 **Compliance Date** 2007/08/14

Provide to the undersigned environmental officer a report confirming compliance with Work Items 1 to 4.

A. While this Order is in effect, a copy or copies of this order shall be posted in a conspicuous place.

B. While this Order is in effect, report in writing, to the District or Area office, any significant changes of operation, emission, ownership, tenancy or other legal status of the facility or operation.

This Order is being issued for the reasons set out in the annexed Provincial Officers Report which forms part of this Order.

Issued at Ottawa this 9th day of February, 2007.

Marc-Etienne Lesieur
Badge No: 775
Ottawa District Office
Tel: (613) 521-3450

APPEAL/REVIEW INFORMATION

REQUEST FOR REVIEW

You may request that this order be reviewed by the Director. Your request must be made in writing (or orally with written confirmation) within seven days of service of this order and sent by mail or fax to the Director at the address below. In the written request or written confirmation you must,

- specify the portions of this order that you wish to be reviewed;
- include any submissions to be considered by the Director with respect to issuance of the order to you or any other person and with respect to the contents of the order;
- apply for a stay of this order, if necessary; and provide an address for service by one of the following means:
  1. mail 2. fax

The Director may confirm, alter or revoke this order. If this order is revoked by the Director, you will be notified in writing. If this order is confirmed or amended by order of the Director, the Director's order will be served upon you. The Director's order will include instructions for requiring a hearing before the Environmental Review Tribunal.

DEEMED CONFIRMATION OF THIS ORDER

If you do not receive oral or written notice of the Director's decision within seven days of receipt of your request, this order is deemed to be confirmed by order of the Director and deemed to be served upon you.

You may require a hearing before the Environmental Review Tribunal if, within 15 days of service of the confirming order deemed to have been made by the Director, you serve written notice of your appeal on the Environmental Review Tribunal and the Director. Your notice must state the portions of the order for which a hearing is required and the grounds on which you intend to rely at the hearing. Except by leave of the Environmental Review Tribunal , you are not entitled to appeal a portion of the order or to rely on grounds of appeal that are not stated in the notice requiring the hearing. Unless stayed by the Environmental Review Tribunal , the order is effective from the date of service.

Written notice requiring a hearing must be served personally or by mail upon:

The Secretary
Environmental Review Tribunal
P.O. Box 2382
2300 Yonge Street, Suite 1700
Toronto, ON M4P 1E4

and

Director (Provincial Officer Orders)
Ministry of the Environment
Ottawa District Office
2430 Don Reid Drive
Ottawa ON K1H 1E1
Fax: (613)521-5437
Tel: (613)521-3450

Where service is made by mail, it is deemed to be made on the fifth day after the date of mailing and the time for requiring a hearing is not extended by choosing service by mail.

Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal by:

Tel: (416) 314-4600 Fax: (416) 314-4506 www.ert.gov.on.ca

FOR YOUR INFORMATION

- Unless stayed by the Director or the Environmental Review Tribunal , this order is effective from the date of service. Non-compliance with the requirements of this order constitutes an offence.
- The requirements of this order are minimum requirements only and do not relieve you from complying with the following:
  - any applicable federal legislation;
  - any applicable provincial requirements that are not addressed in the order; and
  - any applicable municipal law.
- The requirements of this order are severable. If any requirement of this order or the application of any requirement to any circumstance is held invalid, the application of such requirement to other circumstances and the remainder of the order are not affected.
- Further orders may be issued in accordance with the legislation as circumstances require.
- The procedures to request a review by the Director and other information provided above are intended as a guide. The legislation should be consulted for additional details and accurate reference.

Jp2g Consultants Inc.
ENGINEERS ■ PLANNERS ■ PROJECT MANAGERS

J.M. Janota, P.Eng., M.Sc.
J.E. Hunton, MCIP, RPP

February 8, 2008

Township of Whitewater Region
P.O. Box 40
Cobden, ON
K0J 1K0

Attention: **Mr. Steven Hodson**

Re: **Cobden Waste Disposal Site**
Soil Sampling Results
Our Project No. 2016071H

Dear Mr. Hodson:

We are pleased to provide our report on the results of the recent soil sampling that was completed at the Cobden Waste Disposal Site.

Preamble

In the fall of 2003 the Cobden Waste Disposal Site received impacted the soil from a nearby gas station. The soil was characterized as being a solid non-hazardous waste for disposal purposes. Testing for Ontario Regulation 347 (as amended) parameters revealed concentrations below the Schedule 4 Leachate Quality Criteria. Testing for petroleum parameters and selected MOE Table B restoration criteria revealed the soil to be impacted by petroleum hydrocarbon concentrations and that bulk soil concentrations for total xylenes exceeded the Table B criteria. A copy of the 2003 report is provided attached.

Groundwater Sampling

Subsequent to receiving the soil, and as part of the groundwater monitoring program, three downgradient wells (95-3, 95-5 and 96-6) were sampled for BTEX and Total Petroleum Hydrocarbons. The sampling was completed between 2004 and 2006. In all instances, all parameters revealed values less that laboratory detection limits with the exception of one value (PHC-F4 from well 95-3 - October 2005 value 0.2 mg/L). This value is less that the Table 2 restoration criteria (Full Depth Generic Site Condtion Standards in a Potable Groundwater Condition, Soil Groundwater and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 2004). A copy of the analytical results are provided attached.

Objectives and Activities

The objective of the current study was to collect selected soils samples from the deposited gas station soil materials that had been brought to the site in 2003 and analyze them for Ontario Regulation 347/558 waste disposal parameters and selected petroleum products, and in doing so determine whether or not the materials exceed regulatory guidelines. The list of samples collected and the analysis completed is provided in Table 1.

Table 1
Details of Soil Samples

Sample ID	Parameters Tested
Sample 1 Composite sample collected from three locations across the entire section of contaminated materials	*O. Reg 347/558 Leachate parameters* flash point, selected metals, volatile organic compounds, PCBs, organic compounds. BTEX and TPH
Sample 2 Composite sample collected from east half of contaminated materials	*O. Reg 347/558 Leachate parameters* volatile organic compounds. BTEX and TPH
Sample 3 Composite sample collected from west half of contaminated materials	O. Reg 347/558 *Leachate parameters* volatile organic compounds. BTEX and TPH

Sampling Methodology

On November 29, 2007 soil samples were collected from the Cobden Landfill Site. The samples were collected from the upper 15 cm in the area in which the gas station soil had been spread. The soil sample materials were placed in jars provided by the laboratory and stored in coolers until such time that they were hand delivered to the laboratory. The sample locations as described in Table 1 are provided in the attached Figure 1.

Chemical Analysis

The chemical results for all samples are provided attached. The analysis of all samples revealed values that are at, or less than laboratory detection limits and consequently leachate quality criteria and Table 2 restoration concentrations (industrial/commercial land use, coarse textured soils in a potable groundwater situation, "Soil Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, March 9, 2004).

Discussion

The chemical values from the current soil sampling program indicate that the soil materials sampled are not considered to be impacted and may be considered to be a non-hazardous waste.

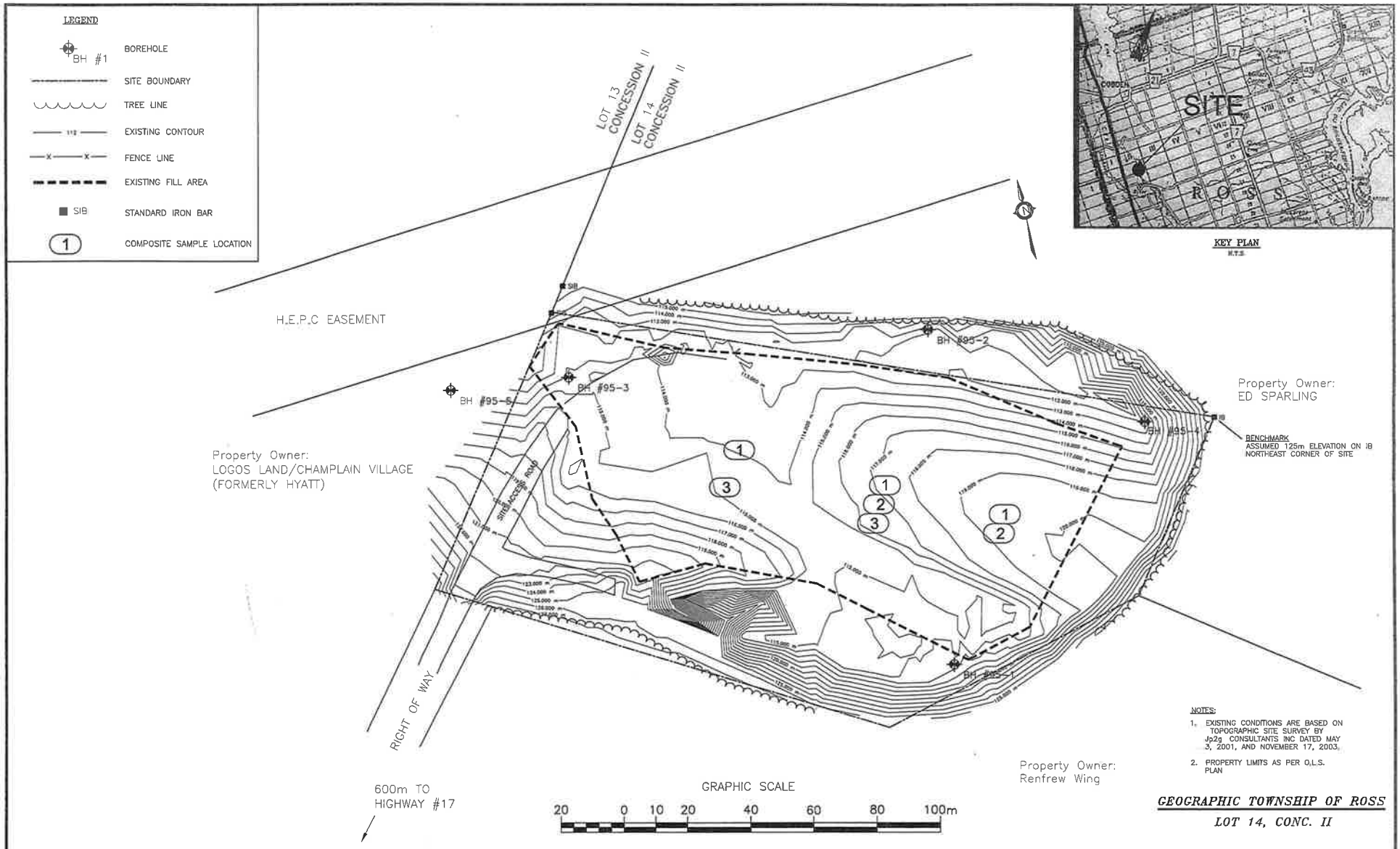
We trust that the contents of this letter are satisfactory. Please do not hesitate to contact this office if you wish to discuss its contents.

Yours very truly,
Jp2g Consultants Inc.
Engineers · Planners · Project Managers

Andrew Buzza, P.Geo.
Project Manager

AB:ab

c.c. Mr. Marc-Etienne Lesleur



No.	DATE	BY	REVISIONS

Jp2g Consultants Inc.

ENGINEERS · PLANNERS · PROJECT MANAGERS
PEMBROKE · OTTAWA

DESIGNED	–
DRAWN	–
CHECKED	–
APPROVED	–
SCALE	1:500 (2'x3' SHEET)

TOWNSHIP OF WHITEWATER REGION
COBDEN WASTE DISPOSAL SITE

SOIL SAMPLE LOCATIONS

DATE	JAN. 2004
PROJECT	2016071H
PLOTTED	19-DEC-07
DRAWING #	1

November 2003 Soil Reports

Aqua Terre Solutions Inc.
2 Gurdwara Rd., Suite 200, Nepean, Ontario, Canada K2E 1A2
Tel (613) 226-2456 Fax (613) 226-5529 Internet: www.aquaterre.ca

Fax Cover Page

TO:	**Kevin Mooder**	**FROM:**	**Mike Grinnell**
COMPANY:	**JP2G**	**FILE NO.:**	**95-571A**
FAX NO.:	**613-828-2600**	**NO. OF PAGES (incl. cover):**	**3**
DATE:	**November 25, 2003**	**ORIGINAL TO FOLLOW:**	**No**

If you do not receive all pages, please call (613) 226-2456 immediately.

Remarks: **Soil Sample Results - Disposal of Hydrocarbon Impacted Soil, Township of Whitewater Regions Cobden Landfill Site**

As discussed, attached please find analytical results for a soil sample collected from the Shell Northway site in Cobden, Ontario to characterize hydrocarbon impacted soil prior to excavation and off-site disposal.

Soil analytical results and O.Reg. 347 (as amended by O.Reg. 558) waste management criteria are presented in Table 1. As shown in the table, O.Reg. 347 leachate analyses indicates that petroleum hydrocarbon impacted soil at the Shell Northway site can be classified as a solid non-hazardous waste for disposal purposes. Soil analytical results for petroleum parameters and selected MOE Table B restoration criteria for the site are presented in Table 2. As shown, sample "REG" is impacted by petroleum hydrocarbons and bulk soil concentrations for total xylenes exceed the Table B criterion.

A copy of the analytical results can be provided to the Township under separate cover if requested.

As mentioned, Shell would like to begin hauling petroleum impacted soil from the site to the Township of Whitewater Region's Cobden disposal site beginning today. Please sign and return a copy of this fax to Mr. Mike Grinnell at (613) 226-5529 to confirm that Shell can begin hauling soil to the Township's landfill.

I trust that this is satisfactory. Should you have questions or comments, please call.

TABLE 1 SOIL ANALYTICAL RESULTS
Waste Disposal Parameters
Shell Canada Products, Highway 17, Cobden, Ontario.

Aqua Terre Sample No.	EQL	Units	Reg. 347 Criteria[1]	REG
Sampling Date	na	na	na	*19-Nov-03*
Sample Depth	na	m	na	*3.2*
Sample Location	na	na	na	*old USTs*
OVM Reading	na	see note	na	*>100% LEL*
Inorganics				
Cadmium	0.05	mg/L	0.5	nd
Chromium	0.1	mg/L	5.0	nd
Lead	0.1	mg/L	5.0	nd
Total PCB	0.2	µg/L	300	nd
Semi-Volatiles				
2,4-Dichlorophenol	2.0	µg/L	90.0	nd
2,4,5-Trichlorophenol	2.0	µg/L	400.0	nd
2,4,6-Trichlorophenol	2.0	µg/L	0.5	nd
2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2.0	µg/L	nc	nd
Pentachlorophenol	8.0	µg/L	6.0	nd
Pyridine	20	µg/L	5.0	nd
o-Cresol	2.0	µg/L	200.0	nd
m-Cresol & p-Cresol	2.0	µg/L	nc	nd
2,4-Dinitrotoluene	2.0	µg/L	0.13	nd
Nitrobenzene	2.0	µg/L	2.0	nd
Benzo(a)pyrene	0.8	µg/L	0.001	nd
Volatiles				
Vinyl Chloride	0.020	mg/L	0.2	nd
1,1-Dichloroethylene	0.010	mg/L	1.4	nd
Methylene Chloride	0.050	mg/L	5.0	nd
Methyl Ethyl Ketone	0.500	mg/L	200.0	nd
Chloroform	0.010	mg/L	10.0	nd
1,2-Dichloroethane	0.010	mg/L	0.5	nd
Carbon Tetrachloride	0.010	mg/L	0.5	nd
Benzene	0.010	mg/L	0.5	0.011
Trichloroethylene	0.010	mg/L	5.0	nd
Tetrachloroethylene	0.010	mg/L	3.0	nd
Chlorobenezene	0.010	mg/L	8.0	nd
1,4-Dichlorobenzene	0.010	mg/L	0.5	nd
1,2-Dichlorobenzene	0.010	mg/L	20.0	nd
Ignitability	1.0	mm/min	nl	nfs

EQL	estimated quantitation limit
nd	not detected at EQL
na	not applicable
nc	no criterion
nl	non ignitable
nfs	non flamable solid
OVM Reading	organic vapour meter reading (in ppmv unless noted)
ppmv	parts per million by volume
%LEL	percent of the lower explosive limit

[1] Ontario Regulation 347 - Waste Management as amended by O.Reg. 558/00
Schedule 4: Leachate Quality Criteria

AQUA TERRE

TABLE 2 **SOIL ANALYTICAL RESULTS**
Petroleum Parameters
Shell Canada Products, Highway 17, Cobden, Ontario.

Aqua Terre Sample No.	EQL	Units	MOE Criteria Table B [1]	REG
Sampling Date	na	na	na	*19-Nov-03*
Sample Depth	na	m	na	*3.2*
Sample Location	na	na	na	*old USTs*
OVM Reading	na	see note	na	*>100% LEL*
Bulk Soil Parameters				
Benzene	0.02	µg/g	5.3	0.44
Toluene	0.02	µg/g	34	4.2
Ethylbenzene	0.02	µg/g	290	3.98
m,p-Xylenes	0.04	µg/g	nc	33.3
o-Xylene	0.02	µg/g	nc	19.8
Total Xylenes	na	µg/g	34	**53.1**
Total Purgeable Hydrocarbons	10	µg/g	nc	280
Total Extractable Hydrocarbons	10.0	µg/g	nc	305
TPH - Gas/Diesel	na	µg/g	1000	585
TPH - (Hot Extractable)	100.0	µg/g	5000	nd

EQL	estimated quantitation limit
nd	not detected at EQL
na	not applicable
nc	no criterion
OVM Reading	organic vapour meter reading (in ppmv unless noted)
ppmv	parts per million by volume
%LEL	percent of the lower explosive limit
[1]	Table B criteria for industrial/commercial land use, coarse textured soils in a non-potable groundwater situation (MOEE, 1997)

Historical Groundwater Sample Results

Golder Associates

VILLAGE OF COBDEN LANDFILL - REPORT OF MONITORING RESULTS

Sample Source: 95-3

Date Sampled:		21-Oct-2003	02-Nov-2003	05-Oct-2004	08-Dec-2005	30-Oct-2006
Parameter	ODWQS					
Alkalinity (CaCO3)	30-500	169		167	134	159
Aluminum	0.1					
Barium	1	0.100		0.076	0.060	0.080
Beryllium						
Boron	5	0.060		0.048	0.060	0.050
Cadmium	0.005					
Calcium		43.0		45.5	33.0	40.0
Chloride	250	51.0		49.4	32.0	38.0
Chromium	0.05					
Cobalt						
COD		35		47	42	34
Conductivity (uS/cm)		510		515	1110	705
Copper	1					
DOC	5	12.5		15.2	10.9	14.3
Hardness (CaCO3)	80-100	157		164	120	145
Iron	0.3	15.40		19.10	15.70	15.90
Lead	0.01					
Magnesium		12.00		12.20	9.17	11.00
Manganese	0.05	0.560		0.506	0.360	0.420
Molybdenum						
Nickel						
Nitrate (as N)	10	<0.10		<0.20	<0.10	<0.10
pH (pH units)	6.5-8.5	6.9		7.0	6.8	7.4
PHC - F1 (C6-C10)					<0.1	
PHC - F2 (C10-C16)					<0.1	
PHC - F3 (C16-C34)					<0.1	
PHC - F4 (C34-C50)					0.2	
Phosphorus (total)						
Potassium		5.0		3.0	3.0	3.0
Silicon						
Silver						
Sodium	200	25.0		22.8	23.1	23.0
Strontium		0.220		0.199	0.140	0.185
Sulphate	500	2.0		<0.5	<5.0	3.0
Sulphur						
TDS	500	317		298	248	280
Temperature (C)	15	9.0		14.0	6.0	6.0
Thallium						
Tin						
Titanium						
TPH-Diesel			<0.200	<0.100		
TPH-ga/diesel			<0.2	<0.1		
TPH-Gasoline			<0.200	<0.100		
TPH-Heavy Oils			<1	<1		
Vanadium						
Zinc	5					
VOC's:						
Benzene	5		<0.5000	<0.2000	<0.2000	<0.5000
Ethylbenzene	2.4		<0.500	<0.200	<0.200	<0.500
Toluene	24		<0.5000	<0.2000	<0.2000	<0.5000
Xylene-m/p			<1.0000		<0.4000	<1.0000
Xylene-o			<0.5000	<0.2000	<0.2000	<0.5000
Xylenes	300		<1.5000	<0.4000	<0.4000	<1.5000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

VILLAGE OF COBDEN LANDFILL - REPORT OF MONITORING RESULTS

Sample Source: 95-5A

Date Sampled:		02-Nov-2003	05-Oct-2004	08-Dec-2005	30-Oct-2006
Parameter	ODWQS				
Alkalinity (CaCO3)	30-500		430	396	373
Aluminum	0.1				
Barium	1		0.377	0.370	0.390
Beryllium					
Boron	5		0.078	0.120	0.070
Cadmium	0.005				
Calcium			117.0	109.0	111.0
Chloride	250		32.6	24.0	20.0
Chromium	0.05				
Cobalt					
COD			19	21	7
Conductivity (uS/cm)			520	900	510
Copper	1				
DOC	5		6.3	4.5	6.7
Hardness (CaCO3)	80-100		398	370	368
Iron	0.3		1.73	1.04	1.14
Lead	0.01				
Magnesium			25.30	23.50	22.00
Manganese	0.05		0.997	1.140	1.270
Molybdenum					
Nickel					
Nitrate (as N)	10		<0.20	<0.10	<0.10
pH (pH units)	6.5-8.5		7.0	7.0	7.1
PHC - F1 (C6-C10)				<0.1	
PHC - F2 (C10-C16)				<0.1	
PHC - F3 (C16-C34)				<0.1	
PHC - F4 (C34-C50)				<0.1	
Phosphorus (total)					
Potassium			6.2	8.0	7.0
Silicon					
Silver					
Sodium	200		16.4	20.6	19.0
Strontium			0.258	0.230	0.242
Sulphate	500		25.7	26.0	24.0
Sulphur					
TDS	500		518	482	501
Temperature (C)	15		14.0	6.0	7.0
Thallium					
Tin					
Titanium					
TPH-Diesel		<0.200	<0.100		
TPH-ga/diesel		<0.2	<0.1		
TPH-Gasoline		<0.200	<0.100		
TPH-Heavy Oils		<1	<1		
Vanadium					
Zinc	5				
VOC's:					
Benzene	5	<0.5000	<0.2000	<0.2000	<0.5000
Ethylbenzene	2.4	<0.500	<0.200	<0.200	<0.500
Toluene	24	<0.5000	<0.2000	<0.2000	<0.5000
Xylene-m/p		<1.0000		<0.4000	<1.0000
Xylene-o		<0.5000	<0.2000	<0.2000	<0.5000
Xylenes	300	<1.5000	<0.4000	<0.4000	<1.5000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

VILLAGE OF COBDEN LANDFILL - REPORT OF MONITORING RESULTS

Sample Source: 95-5B

Date Sampled:		02-Nov-2003	05-Oct-2004	08-Dec-2005	30-Oct-2006
Parameter	ODWQS				
Alkalinity (CaCO3)	30-500		417	456	406
Aluminum	0.1				
Barium	1		0.118	0.160	0.140
Beryllium					
Boron	5		0.223	0.150	0.130
Cadmium	0.005				
Calcium			105.0	132.0	119.0
Chloride	250		57.1	91.0	51.0
Chromium	0.05				
Cobalt					
COD			13	23	<5
Conductivity (uS/cm)			900	825	395
Copper	1				
DOC	5		4.8	5.3	5.2
Hardness (CaCO3)	80-100		373	470	408
Iron	0.3		<0.03	<0.02	<0.03
Lead	0.01				
Magnesium			26.80	33.80	27.00
Manganese	0.05		0.140	0.230	0.220
Molybdenum					
Nickel					
Nitrate (as N)	10		0.20	1.10	0.49
pH (pH units)	6.5-8.5		7.1	7.0	7.3
PHC - F1 (C6-C10)				<0.1	
PHC - F2 (C10-C16)				<0.1	
PHC - F3 (C16-C34)				<0.1	
PHC - F4 (C34-C50)				<0.1	
Phosphorus (total)					
Potassium			12.8	15.0	11.0
Silicon					
Silver					
Sodium	200		53.1	41.2	31.0
Strontium			0.249	0.300	0.277
Sulphate	500		31.0	40.0	29.0
Sulphur					
TDS	500		544	688	609
Temperature (C)	15		14.0	6.0	5.0
Thallium					
Tin					
Titanium					
TPH-Diesel		<0.200	<0.100		
TPH-ga/diesel		<0.2	<0.1		
TPH-Gasoline		<0.200	<0.100		
TPH-Heavy Oils		<1	<1		
Vanadium					
Zinc	5				
VOC's:					
Benzene	5	<0.5000	<0.2000	<0.2000	<0.5000
Ethylbenzene	2.4	<0.500	<0.200	<0.200	<0.500
Toluene	24	<0.5000	<0.2000	<0.2000	<0.5000
Xylene-m/p		<1.0000		<0.4000	<1.0000
Xylene-o		<0.5000	<0.2000	<0.2000	<0.5000
Xylenes	300	<1.5000	<0.4000	<0.4000	<1.5000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

VILLAGE OF COBDEN LANDFILL - REPORT OF MONITORING RESULTS

Sample Source: 96-6A

Date Sampled:		05-Oct-2004	08-Dec-2005	30-Oct-2006
Parameter	ODWQS			
Alkalinity (CaCO3)	30-500	305	306	278
Aluminum	0.1			
Barium	1	0.174	0.150	0.160
Beryllium				
Boron	5	0.042	0.050	0.050
Cadmium	0.005			
Calcium		92.9	87.2	88.0
Chloride	250	17.4	12.0	12.0
Chromium	0.05			
Cobalt				
COD		5	14	10
Conductivity (uS/cm)		510	710	680
Copper	1			
DOC	5	1.6	1.5	2.4
Hardness (CaCO3)	80-100	320	300	298
Iron	0.3	0.36	0.34	0.30
Lead	0.01			
Magnesium		21.30	19.30	19.00
Manganese	0.05	0.101	0.090	0.080
Molybdenum				
Nickel				
Nitrate (as N)	10	<0.20	<0.10	<0.10
pH (pH units)	6.5-8.5	7.3	7.3	7.2
PHC - F1 (C6-C10)			<0.1	
PHC - F2 (C10-C16)			<0.1	
PHC - F3 (C16-C34)			<0.1	
PHC - F4 (C34-C50)			<0.1	
Potassium		5.2	5.0	5.0
Silicon				
Silver				
Sodium	200	9.7	10.6	11.0
Strontium		0.217	0.200	0.192
Sulphate	500	27.5	27.0	25.0
Sulphur				
TDS	500	380	402	384
Temperature (C)	15	15.0	5.0	6.0
Thallium				
Tin				
Titanium				
TPH-Diesel		<0.100		
TPH-ga/diesel		<0.1		
TPH-Gasoline		<0.100		
TPH-Heavy Oils		<1		
Vanadium				
Zinc	5			
VOC's:				
Benzene	5	<0.2000	<0.2000	<0.5000
Ethylbenzene	2.4	<0.200	<0.200	<0.500
Toluene	24	<0.2000	<0.2000	<0.5000
Xylene-m/p			<0.4000	<1.0000
Xylene-o		<0.2000	<0.2000	<0.5000
Xylenes	300	<0.4000	<0.4000	<1.5000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

VILLAGE OF COBDEN LANDFILL - REPORT OF MONITORING RESULTS

Sample Source: 96-6A

Sheet: 2

Date Sampled:		21-Oct-2000	18-Oct-2001	11-Oct-2002	21-Oct-2003	02-Nov-2003
Parameter	ODWQS					
Alkalinity (CaCO3)	30-500	305	317	310	304	
Aluminum	0.1					
Barium	1	0.130	0.150	0.160	0.210	
Beryllium						
Boron	5	0.060	0.050	<0.050	0.060	
Cadmium	0.005					
Calcium		93.0	89.0	88.0	96.0	
Chloride	250	14.0	12.0	12.0	19.0	
Chromium	0.05					
Cobalt						
COD		11	92	<5	<5	
Conductivity (uS/cm)		450	500	490	500	
Copper	1					
DOC	5	2.0	35.6	1.5	1.6	
Hardness (CaCO3)	80-100	323	313	306	326	
Iron	0.3	0.44	0.35	0.48	0.53	
Lead	0.01					
Magnesium		22.00	22.00	21.00	21.00	
Manganese	0.05	0.090	0.100	0.093	0.116	
Molybdenum						
Nickel						
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.3	7.1	7.3	7.1	
PHC - F1 (C6-C10)						
PHC - F2 (C10-C16)						
PHC - F3 (C16-C34)						
PHC - F4 (C34-C50)						
Potassium		3.0	5.0	6.0	7.0	
Silicon						
Silver						
Sodium	200	12.0	9.0	10.0	11.0	
Strontium		0.202	0.205	0.204	0.245	
Sulphate	500	26.0	22.0	32.0	34.0	
Sulphur						
TDS	500	400	388	413	424	
Temperature (C)	15	9.0	10.0	10.0	9.0	
Thallium						
Tin						
Titanium						
TPH-Diesel						<0.200
TPH-ga/diesel						<0.2
TPH-Gasoline						<0.200
TPH-Heavy Oils						<1
Vanadium						
Zinc	5					
VOC's:						
Benzene	5					<0.5000
Ethylbenzene	2.4					<0.500
Toluene	24					<0.5000
Xylene-m/p						<1.0000
Xylene-o						<0.5000
Xylenes	300					<1.5000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

VILLAGE OF COBDEN LANDFILL - REPORT OF MONITORING RESULTS

Sample Source: 96-6B

Date Sampled:		21-Oct-2000	18-Oct-2001	11-Oct-2002	21-Oct-2003	02-Nov-2003
Parameter	ODWQS					
Alkalinity (CaCO3)	30-500	389	350	348	321	
Aluminum	0.1					
Barium	1	0.260	0.150	0.120	0.140	
Beryllium						
Boron	5	0.190	0.090	0.120	0.090	
Cadmium	0.005					
Calcium		123.0	97.0	103.0	105.0	
Chloride	250	23.0	16.0	19.0	24.0	
Chromium	0.05					
Cobalt						
COD		16	<5	<5	<5	
Conductivity (uS/cm)		700	725	600	625	
Copper	1					
DOC	5	2.9	1.7	2.5	1.6	
Hardness (CaCO3)	80-100	423	362	356	365	
Iron	0.3	0.78	0.62	0.55	0.64	
Lead	0.01					
Magnesium		28.00	29.00	24.00	25.00	
Manganese	0.05	0.050	0.050	0.044	0.048	
Molybdenum						
Nickel						
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.1	7.0	6.9	7.0	
PHC - F1 (C6-C10)						
PHC - F2 (C10-C16)						
PHC - F3 (C16-C34)						
PHC - F4 (C34-C50)						
Potassium		28.0	14.0	8.0	9.0	
Silicon						
Silver						
Sodium	200	14.0	12.0	14.0	13.0	
Strontium		0.246	0.219	0.203	0.233	
Sulphate	500	69.0	56.0	37.0	35.0	
Sulphur						
TDS	500	524	488	481	459	
Temperature (C)	15	10.0	11.0	12.0	9.0	
Thallium						
Tin						
Titanium						
TPH-Diesel						<0.200
TPH-ga/diesel						<0.2
TPH-Gasoline						<0.200
TPH-Heavy Oils						<1
Vanadium						
Zinc	5					
VOC's:						
Benzene	5					<0.5000
Ethylbenzene	2.4					<0.500
Toluene	24					<0.5000
Xylene-m/p						<1.0000
Xylene-o						<0.5000
Xylenes	300					<1.5000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

VILLAGE OF COBDEN LANDFILL - REPORT OF MONITORING RESULTS

Sample Source: 96-6B

Date Sampled:		05-Oct-2004	08-Dec-2005	30-Oct-2006
Parameter	ODWQS			
Alkalinity (CaCO3)	30-500	480	335	313
Aluminum	0.1			
Barium	1	0.154	0.100	0.100
Beryllium				
Boron	5	0.162	0.080	0.120
Cadmium	0.005			
Calcium		136.0		99.0
Chloride	250	23.7	14.0	15.0
Chromium	0.05			
Cobalt				
COD		8	13	<5
Conductivity (uS/cm)		600	805	435
Copper	1			
DOC	5	2.4	1.8	2.4
Hardness (CaCO3)	80-100	474	320	338
Iron	0.3	1.03	0.67	0.58
Lead	0.01			
Magnesium		32.30	22.00	22.00
Manganese	0.05	0.052	0.040	0.040
Molybdenum				
Nickel				
Nitrate (as N)	10	<0.20	<0.10	<0.10
pH (pH units)	6.5-8.5	7.1	7.1	7.3
PHC - F1 (C6-C10)			<0.1	
PHC - F2 (C10-C16)			<0.1	
PHC - F3 (C16-C34)			<0.1	
PHC - F4 (C34-C50)			<0.1	
Potassium		7.3	6.0	4.0
Silicon				
Silver				
Sodium	200	17.2-	13.2	15.0
Strontium		0.298	0.210	0.228
Sulphate	500	61.7	32.0	36.0
Sulphur				
TDS	500	590	384	439
Temperature (C)	15	14.0	5.0	6.0
Thallium				
Tin				
Titanium				
TPH-Diesel		<0.100		
TPH-ga/diesel		<0.1		
TPH-Gasoline		<0.100		
TPH-Heavy Oils		<1		
Vanadium				
Zinc	5			
VOC's:				
Benzene	5	<0.2000	<0.2000	<0.5000
Ethylbenzene	2.4	<0.200	<0.200	<0.500
Toluene	24	<0.2000	<0.2000	<0.5000
Xylene-m/p			<0.4000	<1.0000
Xylene-o		<0.2000	<0.2000	<0.5000
Xylenes	300	<0.4000	<0.4000	<1.5000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

November 2007
Soil Sample Results

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: Jp2g Consultants Inc.
1150 Morrison Dr., Suite 410
Ottawa, ON
K2H 8S9
Attention: Mr. Andrew Buzza
P.O. : 270637

Report Number: 2728229
Date Reported: 2007-12-11
Date Submitted: 2007-12-04
Project: 2016071H
Matrix Soil

LAB Sample #: 591655 Client Sample ID: #1

Analytes on sample as received

Parameter	Result	MRL	UNIT	
Moisture	16.4	0.1	%	
Flash Point	>70		C	61 C (FPC)

Metals in TCLP Leachate Extract

Parameter	Result	MRL	UNIT	LQC
Cadmium	<0.001	0.001	mg/L	0.5
Chromium	<0.01	0.01	mg/L	5.0
Lead	<0.01	0.01	mg/L	5.0

Sample was extracted as per MOE Regulation 558 TCLP Leachate Extraction Procedure

Volatile Organic Compounds in ZHE Leachate Extract

Parameter	Result	MRL	UNIT	LQC
1,1-dichloroethylene	<0.5	0.5	ug/L	1400
1,2-dichlorobenzene	<0.4	0.4	ug/L	20000
1,2-dichloroethane	<0.5	0.5	ug/L	500
1,4-dichlorobenzene	<0.4	0.4	ug/L	500
Benzene	<0.5	0.5	ug/L	500
Carbon Tetrachloride	<0.5	0.5	ug/L	500
Chloroform	<0.5	0.5	ug/L	10000
Dichloromethane	<4.0	4.0	ug/L	5000
Methyl Ethyl Ketone (MEK)	<20	20	ug/L	200000
Monochlorobenzene	<0.2	0.2	ug/L	8000
Tetrachloroethylene	<0.3	0.3	ug/L	3000
Trichloroethylene	<0.3	0.3	ug/L	5000
Vinyl Chloride	<0.2	0.2	ug/L	200

Sample was extracted as per MOE Regulation 558 Zero Headspace Extraction Procedure

Volatile Surrogate Compounds

Parameter	Result	MRL	UNIT
1,2-dichloroethane-d4	115	1	%
4-bromofluorobenzene	106	1	%
Toluene-d8	108	1	%

MRL = Minimum Reporting Limit LQC = Leachate Quality Criteria (REG 558 Schedule 4) FPC = Flash Point Critical temperature
TEQ = Toxic Equivalent Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: Jp2g Consultants Inc.
1150 Morrison Dr., Suite 410
Ottawa, ON
K2H 8S9
Attention: Mr. Andrew Buzza
P.O. : 270637

Report Number: 2728229
Date Reported: 2007-12-11
Date Submitted: 2007-12-04
Project: 2016071H
Matrix Soil

LAB Sample #: 591655 Client Sample ID: #1

PCBs in TCLP Leachate Extract

Parameter	Result	MRL	UNIT	LQC
Polychlorinated Biphenyls (PCBs)	<3	3	ug/L	300

Sample was extracted as per MOE Regulation 558 TCLP Leachate Extraction Procedure

Organic Compounds in TCLP Leachate Extract

Parameter	Result	MRL	UNIT	LQC
2,3,4,6-tetrachlorophenol	<2.0	2.0	ug/L	10000
2,4,5-trichlorophenol	<1.0	1.0	ug/L	400000
2,4,6-trichlorophenol	<1.0	1.0	ug/L	500
2,4-dichlorophenol	<0.9	0.9	ug/L	90000
2,4-dinitrotoluene	<0.3	0.3	ug/L	130
2-methylphenol	<0.4	0.4	ug/L	
3- & 4-methylphenol	<0.3	0.3	ug/L	
Benzo(a)pyrene	<0.9	0.9	ug/L	1.0
Nitrobenzene	<0.2	0.2	ug/L	2000
Pentachlorophenol	<0.4	0.4	ug/L	6000

Sample was extracted as per MOE Regulation 558 TCLP Leachate Extraction Procedure

Sample Comment:

APPROVAL: _____
Ewan McRobbie
Inorganic Labortatory Supervisor

APPROVAL: _____
Mina Nasiral
Organic Labortatory Supervisor

MRL = Minimum Reporting Limit LQC = Leachate Quality Criteria (REG 558 Schedule 4) FPC = Flash Point Critical temperature
TEQ = Toxic Equivalent Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: Jp2g Consultants Inc.
1150 Morrison Dr., Suite 410
Ottawa, ON
K2H 8S9

Attention: Mr. Andrew Buzza
P.O. : 270637

Report Number: 2728229
Date Reported: 2007-12-11
Date Submitted: 2007-12-04
Project: 2016071H

Matrix Soil

LAB Sample #: 591656 Client Sample ID: #2

Analytes on sample as received

Parameter	Result	MRL	UNIT
Moisture	24.9	0.1	%

Volatile Organic Compounds in ZHE Leachate Extract

Parameter	Result	MRL	UNIT	LQC
1,1-dichloroethylene	<0.5	0.5	ug/L	1400
1,2-dichlorobenzene	<0.4	0.4	ug/L	20000
1,2-dichloroethane	<0.5	0.5	ug/L	500
1,4-dichlorobenzene	<0.4	0.4	ug/L	500
Benzene	<0.5	0.5	ug/L	500
Carbon Tetrachloride	<0.5	0.5	ug/L	500
Chloroform	0.5	0.5	ug/L	10000
Dichloromethane	<4.0	4.0	ug/L	5000
Methyl Ethyl Ketone (MEK)	<20	20	ug/L	200000
Monochlorobenzene	<0.2	0.2	ug/L	8000
Tetrachloroethylene	<0.3	0.3	ug/L	3000
Trichloroethylene	<0.3	0.3	ug/L	5000
Vinyl Chloride	<0.2	0.2	ug/L	200

Sample was extracted as per MOE Regulation 558 Zero Headspace Extraction Procedure

Volatile Surrogate Compounds

Parameter	Result	MRL	UNIT
1,2-dichloroethane-d4	110	1	%
4-bromofluorobenzene	103	1	%
Toluene-d8	111	1	%

Sample Comment:

APPROVAL: _____
Ewan McRobbie
Inorganic Labortatory Supervisor

APPROVAL: _____
Mina Nasirai
Organic Labortatory Supervisor

MRL = Minimum Reporting Limit LQC = Leachate Quality Criteria (REG 558 Schedule 4) FPC = Flash Point Critical temperature
TEQ = Toxic Equivalent Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD.

Report of Analysis

Client: Jp2g Consultants Inc.
1150 Morrison Dr., Suite 410
Ottawa, ON
K2H 8S9
Attention: Mr. Andrew Buzza
P.O.: 270637

Report Number: 2728229
Date Reported: 2007-12-11
Date Submitted: 2007-12-04
Project: 2016071H
Matrix Soil

LAB Sample #: 591657 Client Sample ID: #3

Analytes on sample as received

Parameter	Result	MRL	UNIT
Moisture	18.7	0.1	%

Volatile Organic Compounds in ZHE Leachate Extract

Parameter	Result	MRL	UNIT	LQC
1,1-dichloroethylene	<0.5	0.5	ug/L	1400
1,2-dichlorobenzene	<0.4	0.4	ug/L	20000
1,2-dichloroethane	<0.5	0.5	ug/L	500
1,4-dichlorobenzene	<0.4	0.4	ug/L	500
Benzene	<0.5	0.5	ug/L	500
Carbon Tetrachloride	<0.5	0.5	ug/L	500
Chloroform	0.5	0.5	ug/L	10000
Dichloromethane	<4.0	4.0	ug/L	5000
Methyl Ethyl Ketone (MEK)	<20	20	ug/L	200000
Monochlorobenzene	<0.2	0.2	ug/L	8000
Tetrachloroethylene	<0.3	0.3	ug/L	3000
Trichloroethylene	<0.3	0.3	ug/L	5000
Vinyl Chloride	<0.2	0.2	ug/L	200

Sample was extracted as per MOE Regulation 558 Zero Headspace Extraction Procedure

Volatile Surrogate Compounds

Parameter	Result	MRL	UNIT
1,2-dichloroethane-d4	102	1	%
4-bromofluorobenzene	107	1	%
Toluene-d8	120	1	%

Sample Comment:

APPROVAL: _____
Ewan McRobbie
Inorganic Labortatory Supervisor

APPROVAL: _____
Mina Nasiral
Organic Labortatory Supervisor

MRL = Minimum Reporting Limit LQC = Leachate Quality Criteria (REG 558 Schedule 4) FPC = Flash Point Critical temperature
TEQ = Toxic Equivalent Results relate only to the parameters tested on the samples submitted for analysis.

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: **Jp2g Consultants Inc.**
1150 Morrison Dr., Suite 410
Ottawa, ON
K2H 8S9
Attention: **Mr. Andrew Buzza**

INVOICE: Jp2g Consultants Inc. (Ottawa)
Chain of Custody Number: **76143**

Report Number: 2728228
Date: 2007-12-11
Date Submitted: 2007-12-04

Project: 2016071H

P.O. Number: 270637
Matrix: Soil

			LAB ID:	591651	591652	591653			GUIDELINE		
			Sample Date:	2007-11-29	2007-11-29	2007-11-29					
			Sample ID:	#1	#2	#3					
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
BTEX											
Benzene	ug/g	0.05		<0.05	<0.05	<0.05					
Ethylbenzene	ug/g	0.1		<0.1	<0.1	<0.1					
Toluene	ug/g	0.1		<0.1	<0.1	<0.1					
m/p-xylene	ug/g	0.2		<0.2	<0.2	<0.2					
o-xylene	ug/g	0.1		<0.1	<0.1	<0.1					
BTEX SURROGATES											
Toluene-d8	%			111	108	108					
Total Petroleum Hydrocarbons											
GRO (<C10)	ug/g	20		<20	<20	<20					
DRO (C10-C24)	ug/g	20		<20	<20	<20					
GRO + DRO	ug/g	20		<20	<20	<20					
Oil & Grease											
Oil & Grease - Mineral	ug/g	100		103	<100	<100					

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL: _____
Mina Nasirai
Organic Lab Supervisor

Ministry of the Environment

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

MEMORANDUM

26 May 2008

Received from Shawn Feb 20/09

TO: Marc Etienne LeSieur
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: Shawn Kinney
Hydrogeologist
Water Resources Unit
Technical Support Section

RE: Cobden Waste Disposal Site A413204, Site Closure Plan

I have reviewed the hydrogeologic aspects of the following document entitled:

- *"Cobden Waste Disposal Site, Site Closure Plan, Township of Whitewater Region"* Jp2g Consultants Inc., July 31, 2007, including:
  - Appendix C: *"Cobden Landfill Site – Work Plan, Outstanding Issues"* Township of Whitewater Region Waste Management Department, January 2006
  - Appendix E: *"Report on 2003, 2004, 2005 and 2006 Groundwater Monitoring Programs and Hydrogeological Component of Final Closure Plan, Cobden Landfill Site, Municipality of Whitewater Region, Lot 14, Concession II, Former Township of Ross, Ontario"* Golder Associates Ltd., June 2007

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

Summary

1. The site is not in compliance with Guideline B-7; however the site owners are applying to permanently close the site.

2. The leachate plume extends beyond the existing groundwater monitoring network and the proposed Contaminant Attenuation Zone. Additional groundwater monitors are required to address this.

3. The primary pathway for the migration of leachate is northwest towards the Champlain Village retirement community property.

4. There is no potential for surface water impacts at this time.

5. The proposed post-closure groundwater monitoring program is unsatisfactory. Monitors 96-7A and 96-7B should also be included because they are the most severely impacted.

6. Annual groundwater quality reporting should continue until such time as leachate impacts are confined to the Contaminant Attenuation Zone.

7. A low permeability final cover material should be used instead of highly permeable native sand. This is necessary to reduce the size of the off-site leachate plume more rapidly.

Certificate of Approval

The Cobden Waste Disposal Site operates under Certificate of Approval A413204. The instrument does not specify an approved site area or waste type. The provided waste site approval application form specifies a 2.1 hectare site receiving 95% domestic waste and 5% brush and scrap metal. The trench disposal method was historically used with the area landfilling method used more recently. The landfill is a naturally attenuating site.

Geology

Section 1.2, page 3 of the appended Golder report describes the site's geology as follows:

- Sand with gravel and cobbles in some locations: at least 25.9 metres thick.

Confirmatory borehole logs are provided in Appendix B of the Golder Report. None of the boreholes penetrated bedrock, therefore the maximum overburden thickness is unverified. The report cites geological mapping to describe local bedrock as Precambrian age carbonate metamorphic rocks.

Hydrogeologic Conditions

Section 3.0 of the Golder report provides a thorough description of local hydrogeologic conditions.

The consultant estimates horizontal hydraulic conductivity at 0.0001 $m^3/m^2/s$ in Section 3.3, page 7 of the report. This is the typical mid-range value for clean sand. Section 3.2, page 7 of the report gives a horizontal hydraulic gradient of 0.002 m/m at the site and horizontal hydraulic

gradients reportedly ranged for 0.005 m/m to 0.009 m/m northwest of the fill area. Figure 2 of the Golder Report depicts a northwestern groundwater flow direction. I concur with this assessment.

An upward vertical hydraulic gradient is reported at location 95-5, 40 m northwest of the fill area. Downward flow gradients are reported at all of the other measured locations northwest of the fill area.

The thick upper sand layer is the main leachate flow path off-site. The consultant estimates a horizontal groundwater flow velocity range of 40 to 80 m/year.

Background Water Quality

Section 4.1, page 9 of the Golder report designates monitor 95-4 as the background monitor. The consultant also assessed on page 10 of the report that borehole 96-9 also represents natural conditions.

I have examined the water quality data provided in Appendix D of the Golder report. Based upon the concentration of total dissolved solids, I conclude that borehole 96-9 best represents local background groundwater quality. Figure 2 of the report depicts the monitor's location as approximately 240 metres west of the fill area.

Based upon the median value of the 5 most recent sample analyses, groundwater quality at 96-9 conformed to provincial drinking water criteria for all reported parameters except the following:

- Hardness: Median value = 135 mg/l. This is 1.35 times greater than the 100 mg/l drinking water criterion

Leachate Water Quality

The Golder report does not designate a specific source leachate monitor. I have examined the Appendix D water quality data and conclude that monitor 96-7A is the most severely impacted monitor at this site.

I have compared the results of the most recent October 2006 sampling event at 96-7A to the provincial drinking water criteria. I note the following contaminants of concern:

- Hardness = 628 mg/l. This is more than 4 times greater that the 135 mg/l median background value at monitor 96-9.

- Manganese = 0.170 mg/l. This is more than 3 times greater than the 0.05 mg/l drinking water criterion.

- Alkalinity = 537 mg/l. This slightly exceeds the 500 mg/l drinking water criterion.

- Dissolved Organic Carbon = 4.9 mg/l. This approaches the 5 mg/l drinking water criterion.

I note that monitor 96-7A is located approximately 70 metres northwest of the fill area. Although it is the most severely impacted monitor, it too is likely measuring diluted rather than maximum-strength leachate. Additional contaminants of concern that are not measured by the existing monitoring network may also exist.

Downgradient Water Quality

I have examined the groundwater quality data provided for monitors 02-10A and 02-10B. These wells are located approximately 260 metres northwest of the fill area. The monitors are also approximately 35 metres up-gradient of the proposed CAZ boundary depicted in Figure 2 of the Golder report. I note the presence of the following leachate parameters at concentrations exceeding provincial drinking water criteria:

- Hardness ranged from 302 mg/l at 02-10B to 338 mg/l at 02-10A. These levels are 2.2 to 2.5 times greater than the 135 mg/l median background value at monitor 96-9.

I conclude that the leachate impacts extend beyond the existing groundwater monitoring network. Leachate impacts also likely extend beyond the CAZ boundary depicted in Figure 2 of the Golder report. Additional monitoring wells are required to fully delineate the extent of the plume. This should be addressed.

GW/SW Interaction

A surface water body named Astrolabe Lake is located approximately 240 metres northwest of the fill area. The reported water level elevation in the lake is greater than that of the nearby monitoring wells. This suggests that groundwater flows away from the lake. I conclude that there is no potential for surface water impacts.

Guideline B-7

The site is currently licensed under a Certificate of Approval. Reasonable Use Guideline B-7 applies. The site does not conform to reasonable use Guideline B-7. The site owners are applying to permanently close the site.

Guideline B-9 will be applicable at the site once the Certificate of Approval is amended to certify final closure and a satisfactory permanent landfill cover is installed. I note that the site also does not conform to Guideline B-9 criteria for hardness at the currently proposed CAZ boundary depicted in Figure 2 of the Golder report.

Continued monitoring of this situation is necessary to ensure that no existing or future groundwater users are negatively affected. Figure 1 of the Golder report depicts the Champlain Village retirement complex as the downgradient receptor property.

Other Issues: Closure Plan

Groundwater Monitoring Program and Reporting

Table 4 of the June 2007 Golder report describes the proposed post-closure groundwater monitoring program. The proposed monitoring once annual (October) monitoring frequency is satisfactory.

The proposed sampling locations in Table 4 exclude monitors 96-7A and 96-7B. The provided water quality data showed these to be the most severely leachate-impacted monitors. Their exclusion from the post-closure monitoring program is unsatisfactory. Monitors 96-7A and 96-7B should also be included.

I have compared the proposed analytical parameter list to Schedule 5 of the "Landfill Standards" Guideline. The proposed analytical list does not conform exactly to the generic indicator parameters in the Guideline. However, I conclude that it is adequate for this site, once closed, based upon the observed contaminants of concern.

Section 4.2, Page 8 of the July 2007 Jp2g Closure Plan suggests a reporting period at least once every two years. I question this reporting frequency, given that excessive hardness levels are currently observed at the proposed CAZ boundary. I recommend an annual reporting frequency until the hardness levels at monitors 02-10A and 02-10B decline to background conditions.

Landfill Cover

Installation of a satisfactory final cover is a prerequisite for application of Guideline B-9 criteria. Section 3.3, page 7 of the July 2007 Jp2g Closure Plan describes the proposed final cover. The proposed 4:1 side slopes are satisfactory.

Jp2g proposes to incorporate formerly hydrocarbon contaminated soils into the final landfill cover. Hydrocarbon contaminated soils should not be used unless the quality conforms to Table 3 of "Soils, Ground Water and Sediment Standards for use Under Part XV.1 of the EPA" (MOE 2004).

Jp2g proposes a permeable final landfill cover. Section 6.11 of the "Landfill Standards" Guideline states that a low permeability soil is typically used for a natural attenuation landfill where a reduced rate of infiltration and leachate generation is normally desirable. Golder has assessed the native overburden as having relatively high permeability. A low permeability final

cover material should be used instead of highly permeable native sand. This is necessary to reduce the size of the off-site leachate plume more rapidly.

Contingency Plan

I have reviewed the contingency plan summarized in Section 4.3 of the Jp2g submission. The plan includes enlarging the CAZ or installation of a leachate collection system. The installation of a less permeable final cover is proposed as an additional contingency action. This should instead be done at site closure as per the landfill guideline.

Shawn Kinney, P.Geo
SK/gl

c: Peter Taylor (Water Unit Supervisor, A)
Paul Kehoe (Ottawa District Office)
GW 03-03 WHIT Cobden WDS A413204, Fmr Township of Ross
SK #3713-779PGG

Kevin Mooder - RE: Amendment to Provisional Certificate of Approval - Cobden

From: "Steven - Waste Management" <shodson@whitewaterregion.ca>
To: "'Tan, Alan (ENE)'" <Alan.Tan@ontario.ca>
Date: 2/19/2009 10:51 AM
Subject: RE: Amendment to Provisional Certificate of Approval - Cobden
CC: "'Kevin Mooder'" <kmooder@jp2g.com>, "'Dean Sauriol'" <dsauriol@whitewaterregion.ca>

Alan,

Addressing a revised plan to extend the CAZ (as you just put forth in Condition 6) for Ministry Approval by October 31, 2009 is not really where I was heading with this. As I previously stated, I do not wish to carry out a "worst-case scenario" modelling plan at this point.

The issue of an acceptable CAZ size has been dragging on as you are aware. At some point somebody has got to say "carry on – the proposed CAZ is acceptable in size". And if there is uncertainty from the Ministry, well then the new monitoring well beyond the proposed CAZ will surely be installed (as put forth in your February 17th Draft Notice). I've got a landowner who has been patiently waiting for this to progress and certainly wants to work with us. When we meet with him and address our requirements I will be aiming for an extended CAZ....one that goes beyond the proposed limit (July, 2007 Closure Plan) in the direction of groundwater flow. I will also be notifying the landowner of the likelihood of another well being introduced on his property (February 17th Draft Notice).

If we have to put forth another revision to the size of the CAZ to the Ministry by October 31, 2009 (this latest February 18th Draft Notice you just forwarded for my comments)for approval simply to eliminate the need for another monitor.....I believe we are right back to "square 1" and have not made any progress on this matter.

From the Municipalities current stand-point, we can work with the Draft Notice you put forth on the 17th of February. The Municipality can indeed work toward attaining a written easement for a CAZ by October 31, 2010, one that will establish Contaminant Attenuation Zone as per Item 2 of Schedule "A" (Condition 6). The Municipality can also work with the requirement to install another monitor beyond the proposed CAZ by October 31st, 2010 (Condition 7).

Please allow the Municipality the benefit-of-the-doubt that we will indeed be working with this anxious landowner to aim for an extended CAZ – one that expands beyond the proposed limits in the July, 2007 Closure Plan – as well as the Ministry's desire for another well beyond this point. This is a Closed Site and has been for years. We've got to come to an agreement here and move forward.

Can the Ministry accommodate my request and let us all move forward with the Draft Notice Amendment to the Provisional Certificate of Approval No. A413204 that you put-forth and attached in you February 17th, 2009 e-mail. If not, I believe we have gotten no-where.

Respectfully,

Steven Hodson

From: Tan, Alan (ENE) [mailto:Alan.Tan@ontario.ca]
Sent: February-18-09 2:19 PM
To: Steven - Waste Management
Cc: Kevin Mooder
Subject: RE: Amendment to Provisional Certificate of Approval - Cobden

Hi Steven,

You are right that we need to address the revised plan to extend the CAZ first. We should deal with the revised plan first and then implement it. Attached pleased find the revised draft Notice for your comments. Thanks,

Alan

From: Steven - Waste Management [mailto:shodson@whitewaterregion.ca]
Sent: February 18, 2009 11:10 AM
To: Tan, Alan (ENE)
Subject: RE: Amendment to Provisional Certificate of Approval - Cobden

Thanks Alan,

I just want to discuss with Kevin prior to submitting a plan of attack with this requirement for one (1) more well. I appreciate the extended time allowed. I do not wish to carry out "worst-case" scenario modelling if the end result will mean having to extend the CAZ to a point where it is not acceptable to the landowner and is non-attainable.

I will get back to you with our plan.

Thanks,

From: Tan, Alan (ENE) [mailto:Alan.Tan@ontario.ca]
Sent: February-18-09 10:26 AM
To: Kevin Mooder; Lesieur, Marc-Etienne (ENE); Dean Sauriol; Steven - Waste Management
Subject: RE: Amendment to Provisional Certificate of Approval - Cobden

Thanks Kevin for your comments.

1. done
2. October 31 2010 should be more than sufficient if it only takes 12 months to get the easement agreement.
3. Please refer to the comments of Shawn Kinney, MOE hydrogeologist, as following:

The minimum necessary CAZ dimensions can be more confidently derived if the actual full extent of groundwater contamination is known. Additional boreholes are a superior method for doing this. If such additional data cannot be obtained, the local sand aquifer is amenable to predictive modeling using the data in hand. A revised CAZ dimension based upon a worst-case predictive model can be considered.

Steven, please let me know which approach the Township will take. If the modeling one, I can put a new condition to require the submission of revised CAZ dimension based upon a worst-case predictive model in and meanwhile take the condition of additional monitoring well out.

Let me know if you have any questions. Thanks!

Alan

From: Kevin Mooder [mailto:kmooder@jp2g.com]
Sent: February 17, 2009 4:48 PM
To: Tan, Alan (ENE); Lesieur, Marc-Etienne (ENE); Dean Sauriol; Steven - Waste Management
Subject: RE: Amendment to Provisional Certificate of Approval - Cobden

Alan thank you for copying me on this draft amendment. I have two quick comments, and a third item which I have briefly discussed with Steven when he sent me an earlier draft, but we have not yet decided how to address the MOE request.

1. Please change the cc from Brian Whitehead to me,

2. The additional time to complete condition 6 will certainly be required. Although there is one private property owner downgradient of the site who is totally aware of the current situation, the property is bisected by a hydro transmission corridor... and based on recent experience with the Ontario Realty Corporation to release or change land title, it will certainly take 10 to 12 months, and

3. The requirement for the installation of another monitoring well beyond the proposed CAZ is not well defined in condition 7. As the water quality in monitoring wells 02-10 A and B, and 96-9 does not exhibit parameters above ODWQS, when the municipality obtains control over groundwater usage within the proposed CAZ downgradient of the site as per condition 6, the limits seems more than adequate. Ongoing monitoring would identify any increase of leachate strength well before the NW limit, in the event the easement limit would need to be extended.

Unfortunately I am out of the office for the next few days, so I leave this for your further consideration. You may be able to reach me periodically on my cell phone 613-282-0268.

Kevin Mooder
Jp2g Consultants Inc.
Engineers - Planners - Project Managers
1150 Morrison Drive, Suite 410
Ottawa, Ontario K2H 8S9
Tel: (613) 828-7800
Fax: (613) 828-2600

>>> "Tan, Alan (ENE)" <Alan.Tan@ontario.ca> 2/17/2009 2:53 PM >>>
Steven,

Thanks for your comments. The Township of Whitewater Region should address the non-compliance issue as quickly as possible. However, given the current delays and a few more months will be a reasonable request. Attached please find the revised draft Notice for your further comments.

Regards,
Alan

Alan Tan, P.Eng.
Senior Waste Engineer
Environmental Assessment and Approvals Branch
Ontario Ministry of the Environment

2 St.Clair Avenue West, Toronto, ON M4V 1L5
T: (416) 212-4424 / F: (416) 314-8452
alan.tan@ontario.ca

From: Steven - Waste Management [mailto:shodson@whitewaterregion.ca]
Sent: February 13, 2009 12:37 PM
To: Tan, Alan (ENE); Lesieur, Marc-Etienne (ENE); 'Kevin Mooder'; 'Dean Sauriol'
Subject: Amendment to Provisional Certificate of Approval - Cobden

Alan,

Received your revised draft notice for the Cobden Site. Most welcomed as I do wish to put closure to

this Site. The conditions appear reasonable although I would wish to extend the dates in Conditions 6, 7 & 8 as suggested in the July, 2007 Closure Plan prepared by Jp2g. I ask this simply in case we experience any hurdles which may arise with respect to surveying, legal processes and such when negotiating an enlarged CAZ on the adjacent property.

An additional year (taking us into 2010) for Condition 6, 7 & 8 would be most welcomed.

Can the Ministry accommodate this request?

Respectfully,

Steven Hodson, Landfill Operations Manager
Township of Whitewater Region
(613)635-1517

APPENDIX C-2

MINISTRY CORRESPONDENCE
2010-2019

Ministry of the Environment

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

M E M O R A N D U M

15 June 2010

TO: L. Larkin
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: B. W. Metcalfe
Senior Environmental Officer
Water Resources Unit, Surface Water Group
Technical Support Section
Eastern Region

RE: 2008/2009 Water Quality Monitoring Report
Cobden Landfill Site
Part Lot 14, Concession 2, geographic Township of Ross
Township of Whitewater Region
Certificate of Approval No. A413204

I have reviewed the noted report dated March 2010 prepared by Jp2g Consultants Inc. for the Township of Whitewater Region and the following comments are offered relative to surface water impact concerns.

Approval to permanently close the Cobden Landfill Site has been issued under amendment to the Provisional Certificate of Approval No. A412304 Notice No. 1 dated March 2, 2009. The report reviewed represents the first operations and monitoring report under the amended Certificate of Approval.

The 2008/2009 Environmental Monitoring Report did not include a surface water impact assessment component. There has been no surface water sampling program incorporated into the current monitoring program for the Cobden Landfill Site.

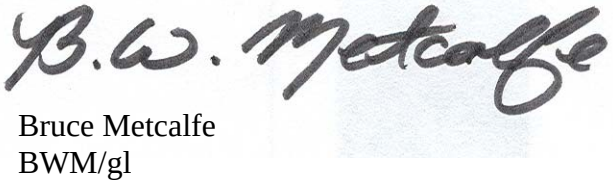
The consultant had determined relative to the landfill site that the direction of groundwater flow has been determined to be to the northwest and the leachate plume moves in a north north-westerly direction from the landfill site. The Cobden Landfill Site operates as a natural attenuation site.

The nearest significant surface water feature downgradient of the landfill site appears to be Astrolabe Lake (Ottawa River Basin) which is situated approximately 300 metres to the north of the landfill site. It is the reviewer's understanding that the reported water elevation of Astrolabe Lake is greater than that of the nearby groundwater monitoring wells and this suggests that groundwater flows away from the lake. This would suggest that there may be no potential for surface water quality impacts associated with the egress of landfill leachate impacted groundwaters.

Recommendations

- The groundwater/surface water interaction should be confirmed with the MOE, Eastern Region, Technical Support Section, Hydrogeologist providing the groundwater review of the 2008/2009 Water Quality Monitoring Report for the Cobden Landfill Site.

- The consultant has not identified any surface water vectors or downgradient terminal receiving surface waters which are recipient to landfill site run-off or leachate impacted groundwater egress. The reviewer recommends that the landfill site Owner provide confirmation to the Ministry of Environment that there are no surface water features within the proximity of the Cobden Landfill Site that would potentially receive leachate impacted waters directly or indirectly and if the surface water quality of the downgradient surface water regime could be potentially impacted. The delineation of the existing leachate impacted groundwater plume will be of relevance for the assessment of the potential impact to water quality of the downgradient surface water regime. Should surface water features be identified which may be potentially impacted by the landfill site operation then an appropriate surface water quality sampling program would be required of the landfill site Owner.



Bruce Metcalfe
BWM/gl

c: S. Kinney
P. Kehoe
B. Metcalfe (Aba2010\aba2310.mem) 8325-85JR93 / X-ref. 7263-85JQYX
File SW 05-04, Cobden Waste Disposal Site, Township of Whitewater Region
File SW 11-01-01, Astrolabe Lake, Ottawa River Basin

ec: P. Taylor

Ontario

Ministry of the Environment
Ministère de l'Environnement

Solid Non-Hazardous Waste Disposal Site Inspection Report

Client:	The Corporation of the Township of Whitewater Region Mailing Address: 44 Main St, Post Office Box, 40, Cobden, Ontario, Canada, K0J 1K0 Physical Address: 44 Main St P.O. Box 40, Cobden, Whitewater Region, Township, County of Renfrew, Ontario, Canada, K0J 1K0 Telephone: (613)646-2282, FAX: (613)646-2283, email: dsauriol@whitewaterregion.ca Client #: 0415-4RYKP5, Client Type: Municipal Government, NAICS: 92119 Additional Address Info: P.O. Box 40, Cobden		
Inspection Site Address:	Cobden Waste Disposal Site Address: 15784 Hwy 17, Whitewater Region, Township, County of Renfrew District Office: Ottawa GeoReference: Map Datum: NAD83, Zone: 18, Accuracy Estimate: 1-10 metres eg. Good Quality GPS, Method: GPS, UTM Easting: 356453, UTM Northing: 5050704, UTM Location Description: Hwy 17 entrance gate to site,		
Contact Name:	Steven Hodson	**Title:**	Landfill Operations Manager
Contact Telephone:	(613)638-4764 **ext**	**Contact Fax:**	
Last Inspection Date:	2007/10/26		
Inspection Start Date:	2010/06/23	**Inspection Finish Date:**	2010/06/23
Region:	Eastern		

1.0 INTRODUCTION

The Cobden Waste disposal Site is operated by the Corporation of the Township of Whitewater Region under the authority of the Provisional Certificate of Approval for a Waste Disposal Site # A413204. The site is no longer receiving waste.

The purpose of the inspection was to assess the site for compliance with the certificate of approval, and governing Ministry legislation. The inspection mainly focused on the operational activities which involved a site tour, discussion with Steve Hodson, landfill site operator, and a review of district files.

2.0 INSPECTION OBSERVATIONS

Certificate of Approval Number(s):

A413204, notice No. 1 issued March 2, 2009

2.1 FINANCIAL ASSURANCE:

Financial assurance is not required by the Ministry of the Environment for municipally operated waste disposal sites.

2.2 APPROVED AREA OF THE SITE:

2.1 Hectares

2.3 APPROVED CAPACITY:

The certificate of approval did not specify the sites capacity

2.4 ACCESS CONTROL:

The site is currently closed. There is a locked gate baring access to the lane leading to the site. There is no signage on the entrance gate.

2.5 COVER MATERIAL:

The site is no longer active. The Ministry has approved the Site Closure Plan as described in the certificate of approval.

According to Steven, a final cover between 3 and 5 feet has been placed on the landfill site. At the time of inspection, vegetation covered the Site. Erosion issues were address to part of the site bordering the North and West of the Site. There is an airport to the East of the site, slope and erosion control measures were not requested by the airport site owners and therefore were never addressed. The airport is at a higher elevation than the landfill.

The landfill appeared to be properly covered,

2.6 WASTE BURNING:

No sign of burning of waste were noted at the time of inspection

2.7 GROUNDWATER/SURFACEWATER IMPACT:

No signs of surface waste or groundwater impacts were noted at the time of inspections.

The Township is required under Condition 6 of the certificate of approval to purchase or obtain a written easement agreement with the property owners(s) of the land(s) required to establish a Contaminant Attenuation Zone (CAZ) **as per Item 2 of Schedule "A" by October 31, 2010.**

According to Steven, there is an agreement in place with the property owner to the West of the site but the agreement has not yet been finalised.

The Township is required to ensure that they are in compliance with their Certificate of Approval.

The 2009 Annual report has been forwarded to the Ministry's Technical Support section. Once comments are received they will be forwarded to the Township.

Condition 7 of the Certificate of approval requires the Site Owner to inspect and monitor an additional groundwater monitoring well beyond the proposed CAZ. According to the 2009 annual report, borehole 09-11A and borehole 09-11B were installed. Steven indicated that one set of samples had been taken.

2.8 LEACHATE CONTROL SYSTEM:

There is no leachate control system at the site

2.9 METHANE GAS CONTROL SYSTEM:

There is no methane gas control system at the site.

2.10 OTHER WASTES:

The site is no longer allowed to accept waste.

3.0 REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES

No action items listed on the previous inspection report.

4.0 SUMMARY OF INSPECTION FINDINGS (HEALTH/ENVIRONMENTAL IMPACT)

Was there any indication of a known or anticipated human health impact during the inspection and/or review of relevant material, related to this Ministry's mandate ?

No

Specifics:

Was there any indication of a known or anticipated environmental impact during the inspection and/or review of relevant material ?

No

Specifics:

Was there any indication of a known or suspected violation of a legal requirement during the inspection and/or review of relevant material which could cause a human health impact or environmental impairment ?

No

Specifics:

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material ?

No

Specifics:

Was there any indication of minor administrative non-compliance?

No

Specifics:

5.0 ACTION(S) REQUIRED

No actions required at this time.

6.0 OTHER INSPECTION FINDINGS

7.0 INCIDENT REPORT

Not Applicable

8.0 ATTACHMENTS

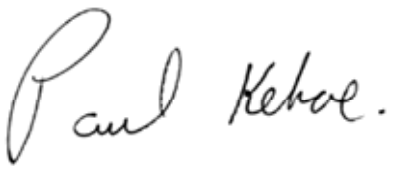
DSC00450.JPG; DSC00451.JPG; DSC00452.JPG; DSC00453.JPG

PREPARED BY:
Environmental Officer:

Name:	**Tracy Hart**
District Office:	**Ottawa District Office**
Date:	**2010/07/20**
Signature	

REVIEWED BY:
District Supervisor:

Name:	**Paul Kehoe**
District Office:	**Ottawa District Office**
Date:	**2010/07/22**
Signature:	



File Storage Number: SI RE RS C02

Note:
"This inspection report does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they may apply to this facility. It is, and remains, the responsibility of the owner and/or the operating authority to ensure compliance with all applicable legislative and regulatory requirements"

Ministry of the Environment

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

M E M O R A N D U M

04 March 2011

TO: Lance Larkin
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: Shawn Kinney
Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region

RE: Cobden Waste Disposal Site - A413204
2008/2009 Operations and Monitoring Report

I have reviewed the hydrogeologic aspects of the following document entitled:

- *"Cobden Landfill Site, Township of Whitewater Region, Certificate No. A413204, 2008/2009 Operations and Monitoring Report" Jp2g* Consultants Inc., May 2010.

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

Summary

1. The site is not in compliance with Guideline B-7.

2. The leachate plume extends beyond the existing groundwater monitoring network and the proposed Contaminant Attenuation Zone.

3. Groundwater elevations at fill area monitors 95-2 and 95-4 are anomalously low and must be verified.

4. There is no potential for surface water impacts at this time.

5. Annual groundwater quality reporting should continue until such time as leachate impacts are confined to the proposed Contaminant Attenuation Zone.

6. Hardness data for the November 2007, October 2008 and November 2009 sampling events are not provided. I cannot confirm compliance with Condition 4 of amended Certificate of Approval A413204.

7. For purposes of compliance assessment, data derived from the newly installed monitors 09-11A and 09-11B cannot be reliably compared to data from other groundwater monitors at the site. Such assessments should continue to be made at monitors 02-10A and 02-10B.

Certificate of Approval

The Cobden Waste Disposal Site is licensed under Certificate of Approval A413204. An amendment to the Certificate dated March 2, 2009 closed the site to further waste disposal. The former site was 2.1 hectares in area and received 95% domestic waste and 5% brush and scrap metal. The trench disposal method was historically used with the area landfilling method used more recently. The landfill is a naturally attenuating site.

Geology

Section 1.2, page 3 of a previously reviewed monitoring report for this site (Golder Associates Ltd, June 2007) described the site's geology as follows:

- Sand with gravel and cobbles in some locations: at least 25.9 metres thick.

Confirmatory borehole logs are provided in Appendix B of the May 2010 Jp2g Report. None of the boreholes penetrated bedrock, therefore the maximum overburden thickness is unverified. The report cites geological mapping to describe local bedrock as Precambrian age carbonate metamorphic rocks.

Hydrogeologic Conditions

Hydraulic Conductivity

Section 5.1, page 4 of the May 2010 Jp2g report references a hydraulic conductivity estimate of 0.0001 $m^3/m^2/s$ previously reported in a June 2007 monitoring report prepared by Golder Associates. This is the typical mid-range value for clean sand.

Horizontal Hydraulic Gradient

I have compared the groundwater elevations provided in Table 2, Page 5 of the May 2010 Jp2g report to historical (1996 to 2006) groundwater elevation measurements provided in Table 1 of the June 2007 Golder Associates report.

I note that the groundwater elevations in fill area monitors 95-2 and 95-4 have reportedly declined by 2.24 metres and 2.9 metres respectively since October 2006. I also note that the November 2009 groundwater level elevation in monitor 95-4 (105.98 metres) is lower than the documented depth of the well bore (106.21 metres).

I am unable to advise you regarding the current groundwater flow directions and velocity at the site until these data have been verified. The consultant should address this.

Background Water Quality

Borehole 96-9 best represents local background groundwater quality at this site based upon consistently low concentration of total dissolved solids. Figure 3A of the report depicts the monitor's location as approximately 240 metres west of the fill area.

I have examined the water quality data provided in Appendix D of the Jp2g report.

Based upon the median value of the 5 most recent sample analyses, groundwater quality at 96-9 conformed to provincial drinking water criteria for all reported parameters except the following:

- Hardness: Median value = 135 mg/l. This is 1.35 times greater than the 100 mg/l drinking water criterion

Leachate Water Quality

I have examined the Appendix D water quality data and conclude that monitor 96-7A is the most severely impacted monitor at this site. Monitor 96-7A is located approximately 70 metres northwest of the fill area. Although it is the most severely impacted monitor, it likely measures diluted rather than maximum-strength leachate.

I have compared the results of the most recent November 2009 sampling event at 96-7A to provincial drinking water criteria. I note the following contaminants of concern:

- Hardness = 628 mg/l (October 2006). This was more than 4 times greater that the 135 mg/l median background value at monitor 96-9. Hardness concentrations after October 2006 are not reported.

- Manganese = 0.23 mg/l. This is more than 4 times greater than the 0.05 mg/l drinking water criterion.

- Total Dissolved Solids = 708 mg/l. This is 1.4 times greater than the 500 mg/l drinking water criterion.

- Alkalinity = 527 mg/l. This slightly exceeds the 500 mg/l drinking water criterion.

Downgradient Water Quality

New Monitors

Two new monitoring wells designated as 09-11A and 09-11B were constructed approximately 300 metres northwest of the fill area and adjacent to Astrolabe Lake. The monitors are approximately 25 metres downgradient of the proposed CAZ boundary depicted in Figure 3B of the Jp2g report.

I have examined the groundwater quality data provided for monitors 09-11A and 09-11B. None of the reported parameters in the new monitors exceeded provincial drinking water criteria. However, I have concerns with the construction of the monitoring wells and possible effects on water quality data derived from them.

A monitoring well is intended to sample water quality over a discrete subsurface interval, typically spanning a vertical distance on the order of 1.5 to 3 metres. I have examined the borehole log and well construction details for monitors 09-11A and 09-11B as provided in Appendix B of the Jp2g report. The log information suggests that the well screens in monitors A and B are on the order of 6 metres and 9 metres long, respectively. By contrast, all other wells installed at this site have well screens 1.5 metres long (one quarter to one sixth as long as the newly-installed monitors).

The anomalously long screens in the 09-11 monitors create a potential hydraulic connection between contaminated and uncontaminated aquifer intervals. Such hydraulic connections permit contaminated and uncontaminated groundwater to mix in a process known as borehole dilution. Borehole dilution has the practical effect of decreasing the apparent concentrations of contaminants in samples obtained from the long-screen wells.

For purposes of compliance assessment, I do not assume that data derived from the long-screened monitors 09-11A and 09-11B can be reliably compared to data from other groundwater monitors at the site.

Hardness

Regular monitoring for hardness at this site is mandatory under Condition 4 of amended Certificate of Approval A413204. In my May 2008 memo regarding this site, hardness was identified as the most elevated leachate parameter relative to the provincial drinking water criterion. As of October 2006, hardness levels at the 02-10 monitoring wells (at the proposed CAZ boundary) were twice as great as background levels and 3 times greater than the drinking water criterion.

I have examined the groundwater quality data tables provided in Appendix D of the 2010 Jp2g report. I note that the tables do not provide hardness data for the November 2007, October 2008

and November 2009 sampling events. I cannot confirm compliance with Condition 4 of amended Certificate of Approval A413204.

GW/SW Interaction

A surface water body named Astrolabe Lake is located approximately 240 metres northwest of the fill area. The reported water level elevation in the lake is greater than that of the nearby monitoring wells. This suggests that groundwater flows away from the lake. I conclude that there is no potential for surface water impacts.

Guideline B-7

The anomalously long screened intervals in the 09-11 monitors may bias the concentrations of water quality parameters measured at these wells. I have instead assessed impacts at the 02-10 monitoring wells. I note the following excess concentrations of leachate contaminants of concern at this location.

- Total Dissolved Solids: 365 mg/l. This exceeds the 344 mg/l reasonable use limit based upon a median background value of 187 mg/l measured at monitor 98-9.

I cannot verify existing hardness levels. Continued monitoring is necessary to ensure that no existing or future downgradient groundwater users are negatively affected.

Shawn Kinney, P.Geo
SK/gl

c: GW 03-03 WHIT Cobden WDS A413204, Fmr Township of Ross
SK #3713-779PGG

ec: Peter Taylor (Water Unit Supervisor)
Paul Kehoe (Ottawa District Office)

Ontario

Ministry of the Environment
Ministère de l'Environnement

Closed Waste Disposal Site Inspection Report

Client:	The Corporation of the Township of Whitewater Region Mailing Address: PO Box 40, Cobden, Ontario, Canada, K0J 1K0 Physical Address: 1 Astrolabe Rd, Whitewater Region, Township, County of Renfrew, Ontario, Canada Telephone: (613)646-2282, email: dsimmons@whitewaterregion.ca Client #: 1185-5UDMEF, Client Type: Municipal Government, NAICS: 92411		
Inspection Site Address:	Cobden Waste Disposal Site Address: 15784 Hwy 17, Whitewater Region, Township, County of Renfrew District Office: Ottawa GeoReference: Map Datum: NAD83, Zone: 18, Accuracy Estimate: 1-10 metres eg. Good Quality GPS, Method: GPS, UTM Easting: 356453, UTM Northing: 5050704, UTM Location Description: Hwy 17 entrance gate to site,		
Contact Name:	Steven Hodson	**Title:**	Landfill Operations Manager
Contact Telephone:	613-638-4764 **ext**	**Contact Fax:**	
Last Inspection Date:	2010/06/23		
Inspection Start Date:	2011/04/13	**Inspection Finish Date:**	2011/04/13
Region:	Eastern		

1.0 INTRODUCTION

The Cobden Waste disposal Site is operated by the Corporation of the Township of Whitewater Region under the authority of the Provisional Certificate of Approval for a Waste Disposal Site # A413204. The site is no longer receiving waste.

Approval to permanently close the Cobden Landfill Site has been issued under amendment to the Provisional Certificate of Approval No. A413204 Notice No. 1 dated March 2, 2009.

The purpose of the inspection was to assess the site for compliance with the certificate of approval. The inspection involved a review of district files, visual inspection of the cover material, monitoring wells, adjacent land use, and discussion with Steve Hodson landfill operations manager for the Town of Whitewater.

One certificate of approval violation was noted with respect to acquiring land for a contaminant attenuation zone (CAZ).

2.0 INSPECTION OBSERVATIONS

Certificate of Approval Number(s): ● Yes ○ No
A413204, issued March 2, 2009

2.1 FINANCIAL ASSURANCE

Financial assurance is not required by the Ministry of the Environment for municipally operated waste disposal sites.

2.2 CLOSURE PLAN

A closure plan forms part of Schedule "B" of the Certificate. The establishment of an adequately sized CAZ is pending.

2.3 ACCESS CONTROL

The site is accessed by Highway 17. The site is currently closed. There is a locked gate baring access to a very long

lane (~1km) leading to the site. There is signage on the entrance gate but it is facing inward. The sign states the landfill was closed April 1, 2001. It also states to use the Kohlsmith Road site (The Ross landfill, 990 Kohlsmith Road).

2.4 FINAL COVER

All areas of the landfill appeared to be adequately covered with vegetation.

2.5 LEACHATE CONTROL SYSTEM

No leachate control system is in place.

2.6 METHANE GAS CONTROL SYSTEM

No methane gas control system is in place.

2.7 MONITORING PROGRAMS:

Well located at 18T0357126; 5051123, Accuracy 7.3 m. Well not locked. No metal casing.

Well located at 18T0357176, 5051068, Accuracy 7.3 m. Well not locked. No metal casing.

The above wells should be secured all in accordance with ministry legislation. See section 5.0 below.

As per Condition 6 of the Certificate of Approval, by October 31, 2010, the Township of Whitewater Region shall purchase or obtain a written easement agreement with the property owner(s) of the land(s) required to establish a Contaminant Attenuation Zone (CAZ) as per Item 2 of Schedule"A". Item 2 is the "Cobden Waste Disposal Site - Site Closure Plan", dated July 31, 2007, prepared by Kevin Mooder, Senior Project Planner, Jp2g Consultants Inc.

This requirement has not been met. The Township requested by certificate of approval application to extend the due date under Condition 6. On May 2, 2011, the undersign wrote to the Approvals branch highlighting concerns that the proposed CAZ under Item 2, Schedule "A" may not be adequate since the ministry's groundwater reviewer commented that the leachate plume extends beyond the proposed CAZ (see groundwater review dated March 4, 2011, attached). As per the email dated May 2, 2011 from the undersigned, the township should submit an abatement plan detailing how an adequately sized CAZ will be established. See section 5.0 below.

As per Condition 7, one additional groundwater monitoring well shall be installed and monitored beyond the proposed Contaminant Attenuation Zone (CAZ) by December 31, 2009.

Two new monitoring wells designated as 09-11A and 09-11B were constructed approximately 300 metres northwest of the fill area and adjacent to Astrolabe Lake. The monitors are approximately 25 metres downgradient of the proposed CAZ boundary depicted in Figure 3B of the Jp2g report. The ministry review has concerns with the construction of the monitoring wells and possible effects on water quality data derived from them (see MOE report dated March 4, 2011, attached below).

2.8 GROUND WATER/SURFACE WATER IMPACTS

GROUND WATER:

The following is excerpted from the ministry's groundwater review of the site dated March 4, 2011:

"...The leachate plume extends beyond the existing groundwater monitoring network and the proposed Contaminant Attenuation Zone..."

"...Guideline B-7:

The anomalously long screened intervals in the 09-11 monitors may bias the concentrations of water quality parameters measured at these wells. I have instead assessed impacts at the 02-10 monitoring wells. I note the following excess concentrations of leachate contaminants of concern at this location.

• Total Dissolved Solids: 365 mg/l. This exceeds the 344 mg/l reasonable use limit based

upon a median background value of 187 mg/l measured at monitor 98-9.
I cannot verify existing hardness levels. Continued monitoring is necessary to ensure that no existing or future downgradient groundwater users are negatively affected..."

The above noted groundwater review was sent to the Township on April 11, 2011.

SURFACE WATER:

No evidence of surface water impacts noticed during the inspection. No odours were noticed. The surrounding landscape is mainly agriculture. There is an airport south-west of the site.

The following is excerpted from the ministry's review of surface water aspects for the site, memorandum dated June 15, 2010:

"...The nearest significant surface water feature downgradient of the landfill site appears to be Astrolabe Lake (Ottawa River Basin) which is situated approximately 300 metres to the north of the landfill site. It is the reviewer's understanding that the reported water elevation of Astrolabe Lake is greater than that of the nearby groundwater monitoring wells and this suggests that groundwater flows away from the lake. This would suggest that there may be no potential for surface water quality impacts associated with the egress of landfill leachate impacted groundwaters..."

"...The reviewer recommends that the landfill site Owner provide confirmation to the Ministry of Environment that there are no surface water features within the proximity of the Cobden Landfill Site that would potentially receive leachate impacted waters directly or indirectly and if the surface water quality of the downgradient surface water regime could be potentially impacted. The delineation of the existing leachate impacted groundwater plume will be of relevance for the assessment of the potential impact to water quality of the downgradient surface water regime. Should surface water features be identified which may be potentially impacted by the landfill site operation then an appropriate surface water quality sampling program would be required of the landfill site Owner..."

The above noted memorandum was forwarded to the Township for follow up on July 9, 2010 by email.

2.9 Registration On Title:
Township to submit copy to the undersigned.

3.0 REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES

No previous non-compliance issues were noted with respect to the last inspection.

4.0 SUMMARY OF INSPECTION FINDINGS (HEALTH/ENVIRONMENTAL IMPACT)

Was there any indication of a known or anticipated human health impact during the inspection and/or review of relevant material, related to this Ministry's mandate ?
No
Specifics:

Was there any indication of a known or anticipated environmental impact during the inspection and/or review of relevant material ?
No
Specifics:

Was there any indication of a known or suspected violation of a legal requirement during the inspection and/or review of relevant material which could cause a human health impact or environmental impairment ?
Yes
Specifics:
Condition 6 of the Certificate states that by October 31, 2010, the Township of Whitewater Region shall purchase or obtain a written easement agreement with
the property owner(s) of the land(s) required to establish a Contaminant Attenuation Zone (CAZ) as per Item 2 of Schedule "A". This has not been met.

At this time, there is no evidence of human health impacts.

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material ?
Yes

Specifics:
As per the ministry's groundwater review dated March 4, 2011, total dissolved solids were 365 mg/l. This exceeds the 344 mg/l reasonable use limit. In addition, the leachate plume extends beyond the existing groundwater monitoring network and the proposed Contaminant Attenuation Zone.

Was there any indication of minor administrative non-compliance?
No
Specifics:

5.0 ACTION(S) REQUIRED

1. Continue assessments at monitors 02-10A and 02-10B as per ministry hydrogeological review dated April 4, 2011.
2. By May 23, 2011, submit a detailed abatement plan that establishes how the Township will obtain an adquately sized CAZ, satisfactory to the ministry.
3. By July 1, 2011, verify groundwater elevations at fill area monitors 95-2 and 95-4 as per ministry hydrogeological review dated April 4, 2011.
4. By July 1, 2011, secure wells noted in section 2.7 above, all in accordance with ministry legislation. By the same date, submit a detailed compliance report to the undersigned.

6.0 OTHER INSPECTION FINDINGS

No other inspection findings.

7.0 INCIDENT REPORT

Applicable
7030-8GGMYX

8.0 ATTACHMENTS

fsk-ll-Cobden WDS-A413204.pdf; June 15 2010 Tech Support Memo.pdf

PREPARED BY:
Environmental Officer:
Name: **Lance Larkin**
District Office: **Ottawa District Office**
Date: **2011/05/03**
Signature

REVIEWED BY:
District Supervisor:
Name: **Jason Ryan**
District Office: **Cornwall Area Office**
Date: **2011/05/05**

Signature:

File Storage Number: SI RE RS CO2 610

Note:
"This inspection report does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they may apply to this facility. It is, and remains, the responsibility of the owner and/or the operating authority to ensure compliance with all applicable legislative and regulatory requirements"

Jp2g Consultants Inc.
ENGINEERS ■ PLANNERS ■ PROJECT MANAGERS

J.M. Janota, P.Eng., M.Sc.
J.E. Hunton, MCIP, RPP

May 20, 2011

Ministry of Environment
2430 Don Reid Drive
Ottawa, ON K1H 1E1

Attention: Lance Larkin

Re: Cobden Landfill Site
Certificate No. A413204
Our Project No. 2016071L

Dear Sir:

We acknowledge receipt of the Waste Disposal Site Inspection Report dated May 5, 2011 and in consultation with the Township of Whitewater Region we provide the following to address the Actions Required in the order in which they appear in Section 5.0 (reproduced in italics).

1. *Continue assessments at monitors 02-10A and 02-10B as per ministry hydrogeological review dated April 4, 2011.*

   These monitors are included in the 2011 monitoring program as required under the Certificate and will be assessed as per TSS groundwater review comments dated **March 4, 2011**.

2. *By May 23, 2011 submit a detailed abatement plan that establishes how the Township will obtain an adequately sized CAZ, satisfactory to the ministry.*

   We respectfully submit that the proposed CAZ limits are adequate as per the attached response to the TSS groundwater comments dated March 4, 2011. We would also advise that the Township has continued discussions with the adjacent property owner and in consideration of TSS comments a proposed Abatement Plan is attached. In this regard we have copied S. Kinney and Alan Tan to facilitate their review of the submission to amend Condition 6 MOE Reference No. 3266-8AVPRK.

3. *By July 1, 2011 verify groundwater elevations at fill area monitors 95-2 and 95-4 as per ministry hydrogeological review dated April 4, 2011.*

   As detailed in the attached response to the TSS groundwater review comments dated **March 4, 2011** the discrepancy in the elevations in the monitors was based on the summary data provided by Golder Associates Ltd. in the Site Closure Plan dated July, 2007. It is noted that monitoring well 95-2 was extended by Golder in 2003 to accommodate slope stabilization works by the municipality but historical values in their Table 1 did not reflect the pipe elevation change. Monitor 95-4 was extended by the municipality in 2007 to accommodate slope stabilization work. Regardless the groundwater flow direction as presented by Jp2g in the 2010 Annual Report is correct, the monitoring wells will be surveyed before July 1, 2011 to verify actual groundwater levels.

4. *By July 1, 2011 secure wells noted in Section 2.7 above, all in accordance with ministry legislation. By the same date submit a detailed compliance report to the undersigned.*

   The monitoring wells cited in Section 2.7 include 09-11A and 09-11B. These wells are secure, for reference attached find a revised borehole log.

Trusting this is satisfactory.

Yours very truly,

Jp2g Consultants Inc.
Engineers • Planners • Project Managers

Kevin Mooder, MCIP RPP
Sr. Project Manager

Andrew Buzza, P.Geo
Sr. Hydrogeologist

KJM/jlp

c.c. Steve Hodson
Dean Sauriol

Encl.: May 20, 2011 response to TSS
Abatement Plan

Cobden Landfill Site
Certificate No. A413204
Abatement Plan to Establish CAZ
Response to Site Inspection Report May 5, 2011

Item	Description of Task	Responsibility	Schedule
1.	Prepare draft response to Inspection Report and TSS memo March 4, 2011	Jp2g	May 10, 2011
2.	Review with Council	Jp2g/Twp	May 18, 2011
3.	Submit to MOE	Jp2g	May 20, 2011
4.	Meeting with adjacent owner Paxton	Jp2g/Twp	June, 2011
5.	Confirm with Paxton existing and proposed domestic water supply requirements	Jp2g/owner	June, 2011
6.	Consultation with S. Kinney to address concerns, A. Tan to amended Condition 6	Jp2g/MOE	June, 2011
7.	Survey monitors 95-2 and 95-4 and confirm O.Reg 309 compliance of all wells report to L. Larkin	Jp2g/Twp	By July 1, 2011
8.	Survey lake level to address B. Metcalfe memo June 15, 2010	Jp2g	By July 1, 2011
9.	2011 annual monitoring program	Jp2g	October, 2011
10.	Conduct Reasonable Use calculations for all off-site monitors to submit to MOE	Jp2g	November, 2011
11.	Submit to MOE for review to confirm CAZ limits	Jp2g/MOE	December, 2011
12.	Meeting adjacent owner Paxton to review revised limits and terms of establishment	Jp2g/Twp	January, 2012
13.	OLS field survey	OLS/Twp	March, 2012
14.	Application for Zoning By-Law amendment	Twp/Owner	March – August, 2012
15.	Registration of R-Plan	Twp	September, 2012
16.	Transfer of Deed	Twp	October, 2012

Jp2g Consultants Inc.
ENGINEERS ■ PLANNERS ■ PROJECT MANAGERS

J.M. Janota, M.Sc., P.Eng.
J.E. Hunton, MCIP, RPP

May 20, 2011

Ministry of the Environment
2430 Don Reid Drive
Ottawa, ON K1H 1E1

Attention: **Mr. Lance Larkin**
Senior Environmental Officer

Reference: **Cobden Waste Disposal Site – A413204**
Response to MOE Comments
MOE Reference No. 3266-8AVPRK
Our File No. 2016071L

Dear Sir:

We are in receipt of the Eastern Region Technical Support Section (TSS) groundwater comments prepared by Shawn Kinney originally received by Alan Tan (EAAB) March 10, 2011. The comments pertain to our May 2010 report entitled "*Cobden Landfill Site Township of Whitewater Region, Certificate No. A413204, 2008/2009 Operations and Monitoring Report*". We are providing the following in response to Mr. Kinney's comments/concerns and have addressed the comments shown in italics in the order in which they appear in his March 4, 2011 memorandum.

(1) Geology: *Confirmatory borehole logs are provided in Appendix B of the May 22010 Jp2g Report. None of the boreholes penetrated bedrock, therefore the maximum overburden thickness is unverified. The report sites geological mapping to describe bedrock as Precambrian age carbonate.*

The depth of overburden is based on the previous Golder Associates Ltd. (GAL) investigations and reports. Overburden downgradient of the site is at least between 22.66m (96-7) and 24.38m (02-10) in thickness. Borehole 96-6 was terminated as a result of auger refusal (22.56m) which may represent near bedrock surface.

(2) Horizontal Gradient: *I have compared the groundwater elevations provided in Table 2, Page 5 of the May 2010 Jp2g report to historical (1996 to 2006) groundwater elevation measurements provided in Table 1 of the June 2007 GAL report. I note that the groundwater elevations in fill area monitors 95-2 and 95-4 have reportedly declined by 2.24 metres and 2.9 metres respectively since October 2006. I also note that the November 2009 groundwater level elevation in monitor 95-4 (105.98) is lower than the documented depth of the well bore (106.21m). I am unable to advise you regarding the current groundwater flow directions and velocity at the site until these data have been verified. The consultant should address this. .*

We have reviewed the GAL Table 1 (2007) and our Table 2 (page 5, May 2010). We note that in 2003, monitoring well 95-2 was extended and resurveyed (new reference elevation 115.3m). As a result, ground water elevations from 2007 to 2009 are 108.70, 108.71 and 108.72 respectively. Regardless the groundwater flow directions as outlined in Figures 3A and 3B of the 2010 Annual Report are correct.

We will reconfirm the water level at monitoring location 95-4 through field survey of the well head prior to the next monitoring event as it was extended by the municipality in 2007. Regardless, the historical data from this location confirms the direction of flow. We have attached a summary of the historical groundwater database with the corrected 95-2 and without 95-4 data for 2007 to 2009.

(3) <u>New Monitors:</u> *A monitoring well is intended to sample water over a discrete subsurface interval, typically spanning a vertical distance in the order of 1.5 to 3 metres. I have examined the borehole log and well construction details for monitors 09-11A and 09-11B as provided in Appendix B of the Jp2g report.. The log information suggests that the well screen in monitors A and B are on the order of 6 metres and 9 metres long, respectively. By contrast, all other wells installed at the site have well screens 1.5 metres long (one quarter to one sixth al long as the newly installed monitors.*

The anomalously long screens in the 09-11 monitors create a potential hydraulic connection between contaminated and uncontaminated aquifer intervals…. Borehole dilution has the practical effect of decreasing the apparent concentrations of contaminants in samples obtained from the long well screens.

For the purpose of compliance assessment, I do not assume that data derived from the long screened monitors can be reliably compared to data from other groundwater monitors at the site.

We acknowledge the ambiguity of the 09-11 borehole logs provided. However, the log clearly labels the screens as being 5'0" by 2" which is equivalent to a 1.5 metre screen that is 5 centimetres in diameter. Attached find a revised illustration of the screen length on the borehole log.

Borehole dilution ? The construction of the 09-11 wells and length of screens do not create a potential hydraulic connection between contaminated and uncontaminated aquifer intervals in the unconfined sand aquifer.

As the length of the screens in the new monitors (09-11A and B) is consistent with the balance of the screen lengths in the other monitors, and "borehole dilution" is not an issue, the data from the above mentioned monitoring wells is reliable and should be reassessed by the reviewer.

(4) <u>Hardness</u> – *Regular monitoring of hardness at the site is mandatory……. I cannot confirm compliance with Condition 4 of the amended Certificate of Approval A413204.*

We agree that hardness is to be monitored regularly. In reference to the Golder report accompanying the Closure Plan dated June 2007 hardness was noted to be calculated from laboratory calcium and magnesium analyses. Condition 4 of the amended Certificate of Approval (Notice 1, March 2, 2009) refers to Schedule "B" detailing the monitoring parameters and frequency at which they are collected and the analysis requirements which included hardness. The laboratory did not provide this analysis in 2007 to 2009. We would confirm that hardness concentrations were provided by the lab for all monitors in 2010 and will be included in the future monitoring program.

As hardness is calculated from calcium and magnesium, the values are available for review. We have updated the chemical data base to include the hardness values.

(5) *Guideline B7 – The anomalously long screened intervals in the 09-11 monitors may bias concentrations of water quality parameters measured in these wells. I have instead assessed impacts at the 2-10 monitoring wells. I note the following excess concentrations of leachate contaminants of concern…… I cannot verify existing hardness levels.*

As indicated, the screens are not anomalously long and impacts at the 09-11 wells can be assessed. We have provided below a revised RUC Table, this reflects the 2009 and 2010 Reasonable Use Concentrations.

Parameter	P_b	C_m	F	C_{allow}
Barium	0.04	1	0.25	0.28
Boron	0.01	5	0.25	1.26
Alkalinity	136	500	0.5	318
Hardness	134	100	0.5	134
DOC	1	5	0.5	3
Iron	0.03	0.3	0.5	0.165
Manganese	0.01	0.05	0.5	0.03
Sulphate	8	500	0.5	254
Chloride	6	250	0.5	128
Sodium	8	200	0.5	104
TDS	187	500	0.5	344

Parameter	Background	C_{allow}	02-10A		02-10B		09-11A		09-11B	
	96-9		Nov-09	Nov-10	Nov-09	Nov-10	Nov-09	Nov-10	Nov-09	Nov-10
Barium	0.04	0.28	0.18	0.16	0.12	0.13	0.1	0.1	0.07	0.09
Boron	0.01	1.26	0.05	0.04	0.02	0.03	0.01	0.02	<0.01	<0.01
Alkalinity	136	318	259	241	199	210	147	132	127	126
Hardness	134	134	276	259	210	231	158	136	135	132
DOC	1	3	1.1	1.1	1	1	1.2	0.8	1.6	0.7
Iron	0.03	0.165	0.19	0.18	<0.03	<0.03	0.17	0.1	0.03	0.06
Manganese	0.01	0.03	0.01	0.01	<0.01	<0.01	0.02	0.01	0.04	0.02
Sulphate	8	254	35	34	27	30	23	24	25	26
Chloride	6	128	9	8	4	7	4	3	3	3
Sodium	8	104	11	8	6	7	4	4	2	3
TDS	187	344	365	341	283	304	220	198	197	190

Background values are the medium concentration of the last 8 monitorng events

The downgradient 09-11 monitoring wells located approximately 300 metres from the waste footprint reveal all parameters from the 2010 sampling to be below the RUC with the exception of 09-11A (hardness 136 mg/L). The concentration range of hardness at background monitor 96-9 (104-165 mg/L) reflects the natural groundwater chemistry. Hardness is not a health related parameter and given its variable and elevated concentration naturally should not be considered as a compliance indicator under Guideline B-7.

As required under Condition 7 monitors 09-11A and 09-11B were installed before December 31, 2009 beyond the CAZ limits, a CAZ proposed by Golder Associates Ltd. and reviewed by MOE as part of the Site Closure Plan application. As required under Condition 6 the municipality was to establish the CAZ by October 31, 2010. There has been on-going discussions with the adjacent landowner, however final negotiations should only be concluded if the MOE accepts the CAZ limits, based on the post closure monitoring program and the groundwater compliance assessment reflective of the site's hydrogeological setting.

We would like to thank you for the review comments and the opportunity to clarify. We trust that the above information is satisfactory. Should you have any questions please do not hesitate to contact us.

Yours very truly,
Jp2g Consultants Inc.
Engineers · Planners · Project Managers

Andrew Buzza, P.Geo.
Senior Hydrogeologist

AB:ab

c.c. Mr. Steven Hodson
Mr. Dean Sauriol, CAO
Mr. Shawn Kinney
Mr. Alan Tan

Encl: Historical Groundwater Levels
Borehole Log No. 09-11
Chemical Data Base (CD to S. Kinney)

COBDEN WDS - HISTORICAL GROUNWATER LEVELS

Monitor	Top of Pipe Elevation (m)	Ground Elevation (m)	12-Jun-96		18-Oct-96		16-Oct-97		30-Oct-98		19-Oct-99		20-Oct-00		18-Oct-01		11-Oct-02	
			Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)
BH 95-1A	116.85	115.74	8.11	108.74	8.26	108.59												
BH 95-2	113.04	111.97	4.34	108.70	4.48	108.56	4.44	108.60	4.46	108.58	4.56	108.48	4.38	108.66	4.46	108.58	5.01	108.03
BH 95-3	115.19	114.21	6.57	108.62	6.72	108.47	6.68	108.51	6.69	108.50	6.78	108.41	6.61	108.58	6.72	108.47	6.66	108.53
BH 95-4	112.56	111.70	3.69	108.87	3.83	108.73	3.79	108.77	3.82	108.74	3.91	108.65	3.74	108.82	3.85	108.71	3.79	108.77
BH 95-5A	114.50	113.54	5.95	108.55	6.10	108.40	6.07	108.43	6.08	108.42	6.17	108.33	6.00	108.50	6.11	108.39	6.06	108.44
BH 95-5B	114.51	113.54	6.03	108.48	6.18	108.33	6.15	108.36	6.17	108.34	6.27	108.24	6.08	108.43	6.20	108.31	6.14	108.37
BH 96-6A	122.70	121.93	14.18	108.52	14.37	108.33	14.02	108.68	14.33	108.37	14.42	108.28	14.25	108.45	14.35	108.35	14.29	108.41
BH 96-6B	122.94	121.93	14.41	108.53	14.59	108.35	14.54	108.40	14.56	108.38	14.55	108.39	14.48	108.46	14.58	108.36	14.52	108.42
BH 96-7A	121.33	120.49	12.86	108.47	13.04	108.29	12.99	108.34	13.00	108.33	13.10	108.23	12.94	108.39	13.04	108.29	12.98	108.35
BH 96-7B	121.44	120.49	12.95	108.49	13.12	108.32	13.08	108.36	13.09	108.35	13.19	108.25	13.01	108.43	13.12	108.32	13.06	108.38
BH 96-8A	124.94	124.43	16.52	108.42	16.71	108.23	16.66	108.28	16.67	108.27	16.78	108.16	17.60	107.34	16.62	108.32	16.65	108.29
BH 96-8B	125.54	124.43	17.15	108.39	17.34	108.20	17.28	108.26	17.30	108.24	17.38	108.16	17.24	108.30	17.34	108.20	17.29	108.25
BH 96-9	124.86	123.94	16.44	108.42	16.62	108.24	16.57	108.29	16.58	108.28	16.68	108.18	16.53	108.33	16.66	108.20	16.58	108.28
BH 02-10A	121.43	120.80															13.70	107.73
BH 02-10B	121.48	120.80															13.75	107.73
BH 09-11A	117.14	116.13																
BH 09-11B	117.16	116.14																

Top of pipe elevation for 95-5 changed to 115.3 in 2004
Top of pipe elevation for 95-4 requires re-survey

COBDEN WDS - HISTORICAL GROUNWATER LEVELS

Monitor	Top of Pipe Elevation (m)	Ground Elevation (m)	21-Oct-03		5-Oct-04		8-Oct-05		30-Oct-06		12-Nov-07		31-Oct-08		19-Nov-09	
			Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)	Water Level (m)	Water Elev. (m)
BH 95-1A	116.85	115.74														
BH 95-2	115.30	111.97	4.45	108.59	6.62	108.68	6.66	108.64	6.60	108.70	6.60	108.70	6.59	108.71	6.58	108.72
BH 95-3	115.19	114.21	6.69	108.50	6.60	108.59	6.63	108.56	6.48	108.71	6.50	0.19	6.54	108.65	6.53	108.66
BH 95-4	112.56	111.70	3.82	108.74	3.72	108.84	3.75	108.81	3.68	108.88						
BH 95-5A	114.50	113.54	6.07	108.43	5.99	108.51	6.03	108.47	5.94	108.56	5.91	0.16	5.94	108.56	5.94	108.56
BH 95-5B	114.51	113.54	6.16	108.35	6.06	108.45	6.10	108.41	6.01	108.50	5.99	0.17	6.01	108.50	6.15	108.36
BH 96-6A	122.70	121.93	14.34	108.36	14.23	108.47	14.28	108.42	14.19	108.51			14.54	108.16	14.53	108.17
BH 96-6B	122.94	121.93	14.56	108.38	14.46	108.48	14.50	108.44	14.41	108.53	14.36	0.20	14.39	108.55	14.39	108.55
BH 96-7A	121.33	120.49	13.01	108.32	12.92	108.41	12.95	108.38	12.88	108.45	12.90	0.11	12.86	108.47	12.85	108.48
BH 96-7B	121.44	120.49	13.11	108.33	13.00	108.44	13.03	108.41	12.96	108.48	12.81	0.30	12.94	108.50	12.93	108.51
BH 96-8A	124.94	124.43	16.70	108.24	16.59	108.35	16.62	108.32	16.52	108.42	16.98	-0.28	17.00	107.94	17.00	107.94
BH 96-8B	125.54	124.43	17.33	108.21	16.86	108.68	16.90	108.64	16.48	109.06	16.98	0.35	16.82	108.72	16.79	108.75
BH 96-9	124.86	123.94	16.63	108.23					16.46	108.40	16.46	0.17	16.40	108.46	16.43	108.43
BH 02-10A	121.43	120.80	13.74	107.69	13.60	107.83	13.65	107.78	13.54	107.89	13.48	0.26	13.54	107.89	13.53	107.90
BH 02-10B	121.48	120.80	13.81	107.67	13.66	107.82	13.71	107.77	13.59	107.89	13.53	0.28	13.57	107.91	13.57	107.91
BH 09-11A	117.14	116.13													9.41	107.73
BH 09-11B	117.16	116.14													9.43	107.73

Top of pipe elevation for 95-5 changed to 115.3 in 2004
Top of pipe elevation for 95-4 requires re-survey

Ministry of the Environment

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

M E M O R A N D U M

August 3, 2011

TO: Lance Larkin
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: Shawn Kinney
Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region

RE: Cobden Waste Disposal Site A413204, Response to MOE Comments

---

I have reviewed the hydrogeologic aspects of the following document entitled:

- *"Cobden Waste Disposal Site – A413204, Response to MOE Comments, MOE Reference No. 3266-AVPRK, Our File No. 2016071L*" Jp2g Consultants Inc., May 20, 2011

Based upon the information provided in the above-captioned document, I submit the following comments for your consideration. I have numbered my comments so as to conform to the numbered comments used by the consultant.

1. Geology

I had previously commented that the maximum overburden thickness at the site was unverified as no monitoring wells penetrated bedrock.

The consultant states that borehole 96-6 encountered auger refusal at a depth of 22.56 metres, which may represent "near bedrock surface".

The consultant also states that overburden thickness is at least 22.66 metres at 96-7. This information was available to me at the time of my original comment. No additional subsurface information is provided that would compel me to revise my earlier conclusion.

A borehole which penetrates bedrock is a definitive determination of overburden thickness. Although this parameter may need to be more accurately constrained at this site in the future, it is not presently a critical information requirement.

2. Hydraulic Gradient

I had previously noted significant reductions in reported groundwater elevations at fill area monitors 95-2 and 95-4 and that the reported water elevation at 95-4 was lower than the reported depth of the well.

The consultant has provided corrected water levels for monitor 95-2 and has removed data from 95-4 pending reconfirmation of water levels at this location. This is satisfactory.

The apparent direction of groundwater flow is west-northwest.

3. New Monitors

I had previously noted that borehole logs provided for new monitors 09-11A and 09-11B appeared to depict well screens on the order of 6 and 9 metres long, respectively. I had commented that such anomalously long screens could result in a downward bias of water quality parameters due to borehole dilution of water samples.

The consultant has clarified that the screened intervals of 09-11A and 09-11B are, in fact 1.5 metres long. The consultant has provided revised borehole log illustrations which conform to actual screened intervals. This is satisfactory.

Based on this revised information, I am satisfied that the risk of borehole dilution is minimal. Data from these wells can be compared with that derived from other groundwater monitors at the site.

4. Hardness Monitoring

I had noted that the chemical parameter “hardness” was not reported as required in Condition 4 of C of A A413204.

The consultant reports that the analytical laboratory did not provide hardness analyses during 2007 and 2008. The consultant provides assurances that hardness will be included in future monitoring reports, and has provided retroactive values for previous monitoring years calculated from available calcium and magnesium data. This is satisfactory.

5. GuidelineB-7

I had assessed B-7 compliance at the 2-10 monitoring well instead of the 09-11 monitoring wells. This was a precautionary measure pending resolution of the screen length questions related to the 09-11 monitors.

As discussed above, the screen length issues at the 09-11 monitors are resolved. I have re-assessed Guideline B-7 compliance at the 09-11 location. I have used historical median water quality values at monitor 96-9 to represent background quality for the purpose of calculating acceptable B-7 limits. I note the following excess concentrations:

- Hardness: 158 mg/ at BH 09-11A during Nov 2009. This is 17% greater than the 135 mg/l B-7 criterion for hardness.

Subsequent hardness concentrations calculated from November 2010 data reportedly decreased to 135 mg/l. This would satisfy the B-7 criterion for hardness.

Based upon the water quality data provided, I suspect that the 09-11 locations may be measuring the outer extent of the leachate plume. As such, I am satisfied that the extent of the plume is delineated and lies within the monitoring network.

If water quality at the BH09-11 monitors remains stable or continues to improve, then the proposed CAZ boundaries are likely satisfactory for maintaining long-term compliance with Reasonable Use Guideline B-7.

Shawn Kinney, P.Geo
SK/gl

c: GW 03-03 WHIT Cobden WDS A413204, Fmr Township of Ross
SK #1107-8HELFV

ec: Peter Taylor (Water Unit Supervisor)
Tara MacDonald (Ottawa District Office)

Ministry of the Environment

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

M E M O R A N D U M

22 August 2012

TO: E. Tieu
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: B.W. Metcalfe
Senior Environmental Officer
Water Resources Unit, Surface Water Group
Technical Support Section
Eastern Region

RE: 2010/2011 Monitoring Report
Closed Cobden Landfill Site
Part Lot 14, Concession 2, Geographic Township of Ross
Township of Whitewater Region
Certificate of Approval No. A413204

I have reviewed the noted report dated April 2012 prepared by Jp2g Consultants Inc. for the Township of Whitewater Region and the following comments are offered relative to surface water impact concerns.

Background Information

Approval to permanently close the Cobden landfill site was issued under amendment to the Provisional Certificate of Approval No. A412304 Notice No. 1 dated March 2, 2009. The site was closed for operation in 2002. The application of final cover for the landfill site was conducted over the period 2003 to 2009. The Cobden waste disposal site (WDS) functions as a naturally attenuating site. There is no leachate collection system and/or any sewage works at the site. There are no stormwater management facilities associated with the site.

Surface Water Monitoring

The 2010/2011 Environmental Monitoring Report did not include a surface water impact assessment component. There has been no surface water sampling program incorporated into the current monitoring program for the Cobden landfill site.

The consultant had determined relative to the landfill site that the direction of groundwater flow has been determined to be to the northwest and the leachate plume moves in a north north-westerly direction from the landfill site. The Cobden landfill site operates as a natural attenuation site.

The nearest significant surface water feature downgradient of the landfill site appears to be Astrolabe Lake (Ottawa River Basin) which is situated approximately 300 metres to the north of the landfill site. It is the reviewer's understanding that the reported water elevation of Astrolabe Lake is greater than that of the nearby groundwater monitoring wells and this suggests that groundwater flows away from the lake. This would suggest that there may be no potential for surface water quality impacts associated with the egress of landfill leachate impacted groundwaters.

Recommendations

- The groundwater/surface water interaction for the Cobden WDS should be confirmed by the landfill site owner.

- The landfill site owner's consultant has not identified any surface water vectors or downgradient terminal receiving surface waters which are recipient to landfill site run-off or leachate impacted groundwater egress. The reviewer recommends that the landfill site owner provide confirmation to the Ministry of the Environment that there are no surface water features within the proximity of the Cobden landfill site that would potentially receive leachate impacted waters directly or indirectly and if the surface water quality of the downgradient surface water regime could be potentially impacted. The delineation of the existing leachate impacted groundwater plume will be of relevance for the assessment of the potential impact to water quality of the downgradient surface water regime. Should surface water features be identified which may be potentially impacted by the landfill site operation then an appropriate surface water quality sampling program would be required of the landfill site owner.

B.W. Metcalfe
BWM/sh

ec: P. Taylor
T. M. MacDonald

c: S. Kinney
B. Metcalfe (Aba2012\aba4012.mem) 0471-8V6RSM \ X-ref. 1718-8V6QE5
File SW RE WH 03 06, Cobden WDS, Township of Whitewater Region
File SW 07 02 11 01 01, Astrolabe Lake, Ottawa River Basin

Jp2g Consultants Inc.

ENGINEERS ■ PLANNERS ■ PROJECT MANAGERS

J.M. Janota, P.Eng., M.Sc.
J.E. Hunton, MCIP, RPP

November 12, 2012

Ministry of the Environment
Ottawa District Office
2430 Don Reid Drive
Ottawa, ON K1H 1E1

By e-mail

Attention: Emily Tieu
Sr. Environmental Officer

Re: Cobden Closed WDS
Certificate No. A413204
Township of Whitewater Region
Our Project No. 2016071M

Dear Emily:

We acknowledge receipt of the TSS surface water review memo dated August 22, 2012 from the Township sent from your office by e-mail September 2012.

We would confirm as per the previous TSS surface water review memo dated June 15, 2010 and the TSS groundwater review memo dated August 2011 that Jp2g has re-surveyed all monitoring wells modified and the Astrolabe Lake elevation to confirm and support the original submission of Golder Associates Ltd. that there is no potential for surface water quality impacts. These findings will be reported in the next Biennial Report.

Regarding the requirement to establish the CAZ under Condition 6 of Certificate No. 413204 Notice No. 2 dated March 19, 2012 discussions are ongoing. As stated during the process of amending the Certificate it would be difficult to satisfy the December 31, 2012 timeline and the municipality will keep the Ministry advised of further progress.

Trusting this is satisfactory.

Yours very truly,
Jp2g Consultants Inc.
Engineers • Planners • Project Managers

Kevin Mooder, MCIP, RPP
Project Manager

KJM/jlp

c.c. Steven Hodson

Jp2g Consultants Inc.

ENGINEERS ■ PLANNERS ■ PROJECT MANAGERS

J.M. Janota, P.Eng., M.Sc.
J.E. Hunton, MCIP, RPP

December 21, 2012

Ministry of the Environment
Environmental Approvals Branch
2 St. Clair Avenue West, Floor 12A
Toronto, ON M4V 1L5

By e-mail and mail

Attention: Agatha Garcia-Wright
Director Environmental Approvals Branch

Re: Cobden Closed Waste Disposal Site
ECA No. A413204
Township of Whitewater Region
Our Project No. 2016071M

Dear Director:

The above captioned waste disposal site ceased receiving municipal solid non-hazardous waste in April 2002 when landfilling operations were centralized at another site in the Township of Whitewater Region. Due to the results of on-going hydrogeological investigations and the limited remaining capacity at the site, the municipality decided to close the site. An application and supporting documentation was filed July, 2007, the amended Certificate was issued March 2, 2009. One of the conditions, Condition 6, required that a CAZ be established by October 31, 2010, this timetable was amended to December 31, 2012 under Notice No. 2 dated March 19, 2012. Copies of the ECA are attached.

The purpose of this submission is to request an administrative amendment to amend Condition 6 providing a December 31, 2013 timeline. A cheque in the amount of $100.00 is enclosed.

Discussions with the adjacent landowner has been on-going for many years, and upon the Ministry's acceptance of the leachate plume furthest point of potential non-compliance migration downgradient in August 2011 the CAZ limits were defined. As shown on the attached figure the 2.6 ha landfill site and the proposed 8.3 ha CAZ which includes all monitoring wells. There has been no impact on the lake along the northerly limit of the proposed CAZ.

Currently the owner has tentatively accepted an offer to establish the CAZ as an easement subject to monetary compensation and other access issues. We expect the negotiation to conclude early in the new year. The Ontario Land Surveyor will then prepare the Reference Plan and the lawyers will finalize the easement agreement all to be registered on title.

Trusting this request is satisfactory.

Yours very truly,
Jp2g Consultants Inc.
Engineers • Planners • Project Managers

Kevin Mooder, MCIP, RPP
Project Manager

KJM/dr

c.c. - Steven Hodson, Township Environmental Services Manager
- Steve Burns, MOE Ottawa District Manager
- William Instance, Township Solicitor

Ontario
Ministry of the Environment

Provisional Certificate No.
A 413204

PROVISIONAL CERTIFICATE OF APPROVAL
FOR A
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:

Village of Cobden
Box 40
Cobden, Ontario

for the Landfilling
located Lot 14, Concession 2
Township of Ross
Renfrew County

THIS IS A TRUE COPY OF THE
ORIGINAL CERTIFICATE MAILED
ON FEB - 3 1978

(Signed)

Site

subject to the following conditions:

1. No domestic waste may be burned at the site.
2. Waste must be covered regularly in April, May, June, July, August, September and October.

This Provisional Certificate expires on the 31st day of December, 19 80

Dated this 2nd day of February, 19 78

D. P. Caplice
DIRECTOR, SECTION 3.(a) E.P.A.

01

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A413204
Notice No. 1
Issue Date: March 2, 2009

The Corporation of the Township of Whitewater Region
44 Main St P.O. Box 40, Cobden
Whitewater Region, Ontario
K0J 1K0

Site Location: Cobden Waste Disposal Site
15784 Hwy 17
Whitewater Region Township, County of Renfrew

You are hereby notified that I have amended Provisional Certificate of Approval No. A413204 issued on February 2, 1978 for the use and operation of a Waste Disposal Site (landfill) , as follows:

I. The following Conditions are hereby added:

3. The Township of Whitewater Region shall close the Cobden Landfill Site in accordance with the Items1 to 8 of Schedule "A" and no more waste shall be received at the Cobden Landfill Site.

4. The groundwater samples shall be collected and analysed at the pre-determined frequency in accordance with the Schedule "B".

5. Final Cover:
   (i) The Township of Whitewater Region shall place 600 mm of soil final cover and 150 mm of top soil over waste landfilled by December 31, 2009.
   (ii) Only low permeability clean soil and hydrocarbon-contaminated soils in accordance with Item 4 of Schedule "A" shall be used for final cover.
   (iii) Seeding of the final cover shall be undertaken in the next growing season following the placement of the final cover.
   (iv) Slopes of the final cover shall not be less than 5% to promote effective surface water run-off.

6. By October 31, 2010, The Township of Whitewater Region shall purchase or obtain a written easement agreement with the property owner(s) of the land(s) required to establish a Contaminant Attenuation Zone (CAZ) as per Item 2 of Schedule "A".

7. One additional groundwater monitoring well shall be installed and monitored beyond the proposed Contaminant
Attenuation Zone (CAZ) by December 31, 2009.

8. The Township of Whitewater region shall prepare and submit an Annual Report which outlines the results of the sampling program to the Ottawa District Office by May 1, 2010. The subsequent Annual Reports shall be submitted on a biennial basis by May 1 and they shall cover the previous two (2) calendar years.

9. The groundwater monitoring program may be amended from time-to-time with the written prior consent of the District Manager.

II. The following items are hereby added to Schedule "A":

1. Application for a Provisional Certificate of Approval for a Waste Disposal Site dated July 31, 2007 and signed by Kevin Mooder, Senior Project Planner, Jp2g Consultants Inc.

2. "Cobden Waste Disposal Site - Site Closure Plan", dated July 31, 2007, prepared by Kevin Mooder, Senior Project Planner, Jp2g Consultants Inc.

3. "2003, 2004, 2005, and 2006 Groundwater Monitoring Program and Hydrogeological Component of Final Closure Plan", dated June, 2007, prepared by H.L.R.Fenton, P.Geo., Hydrogeologist, Golder Associates Ltd.

4. "Cobden Waste Disposal Site - Soil Sampling Results", dated February 8, 2008, prepared by Andrew Buzza, P.Geo., Project Manager, Jp2g Consultants Inc.

5. Memorandum dated May 26, 2008 from Shawn Kinney, Hydrogeologist of Eastern Region Technical Support Section to Marc Etienne LeSieur, Senior Enviornmental Officer of Ottawa District Office.

6. Email dated August 15, 2008 from Steven Hodson, Landfill Operations Manager, Township of Whitewater Region, to Marc Etienne LeSieur, Senior Enviornmental Officer of Ottawa District Office, providing responses to the comments from Shawn Kinney.

7. Email dated February 19, 2009 from Steven Hodson, Landfill Operations Manager, Township of Whitewater Region, to Alan Tan, Senior Waste Engineer, MOE, providing comments on the draft Notice.

8. Email dated February 23, 2009 from Kevin Mooder, Senior Project Planner, Jp2g Consultants Inc. to Alan Tan, Senior Waste Engineer, MOE, providing comments on the draft Notice.

III. Schedule "B" is added:

Schedule "B"

This Schedule "B" forms part of Certificate of Approval No: A413204

Groundwater Monitoring

Sampling Location	Parameters	Frequency
95-2, 95-3, 95-4, 95-5A, 95-5B, 96-6A, 96-6B, 96-7A, 96-7B, 96-8A, 96-8B, 96-9, 02-10A, 02-10B	Alkalinity, Barium, Boron, Calcium, Chloride, hardness, iron, Magnesium, Manganese, Nitrate(NO3-N), pH, Potassium, Sodium, Strontium, Total Dissolved Solids, Sulphate, COD, Dissolved Organic Carbon.	Once a year (October)

The reason for this amendment to the Certificate of Approval is as follows:

1. To approve the closure plan sumbitted by The Township of Whitewater Region, dated July 31, 2007, as amended.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A413204 dated February 2, 1978.

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

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

Toronto, Ontario
M4V 1L5

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

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

DATED AT TORONTO this 2nd day of March, 2009

THIS NOTICE WAS MAILED
ON March 6, 2009
DC
(Signed)

Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

AT/
c: District Manager, MOE Ottawa
Kevin Mooder, jp2g Consultants Inc.

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A413204
Notice No. 2
Issue Date: March 19, 2012

The Corporation of the Township of Whitewater Region
44 Main St P.O. Box 40, Cobden
Whitewater Region, Ontario
K0J 1K0

Site Location: Cobden Waste Disposal Site
15784 Hwy 17
Whitewater Region Township, County of Renfrew

You are hereby notified that I have amended Approval No. A413204 issued on February 2, 1978, and amended on March 2, 2009 for the use and operation of a Waste Disposal Site (Landfill) , as follows:

I. The following Conditions are hereby revoked and replaced with:

6. By **December 31, 2012**, the Township of Whitewater Region shall purchase or obtain a written easement agreement with the property owner(s) of the land(s) required to establish a Contaminant Attenuation Zone (CAZ) as per Items 9, 10, 11 and 12 of Schedule "A".

II. The following items are hereby added to Schedule "A":

9. Cobden Landfill Site 2008/2009 Operations and Monitoring Report dated May 2010, prepared by Jp2g Consultants Inc.

10. Memorandum dated March 04, 2011 from Shawn Kinney, Hydrogeologist of Eastern Region Technical Support Section to Lance Larkin, Senior Enviornmental Officer of Ottawa District Office.

11. Letter dated May 20, 2011 from from Andrew Buzza, Senior Hydrogeologist, Jp2g Consultants Inc. to Lance Larkin, Senior Environmental Officer, MOE, providing responses to MOE comments.

12. Memorandum dated August 3, 2011 from Shawn Kinney, Hydrogeologist of Eastern Region Technical Support Section to Lance Larkin, Senior Enviornmental Officer of Ottawa District Office.

The reason for this amendment to the Certificate of Approval is as follows:

To approve the request of the Township of Whitewater Region, dated October 26, 2010, to need more time to

purchase or obtain a written easement agreement.

This Notice shall constitute part of the approval issued under Approval No. A413204 dated February 2, 1978, as amended.

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

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

DATED AT TORONTO this 19th day of March, 2012

THIS NOTICE WAS MAILED
ON March 21, 2012
(Signed)

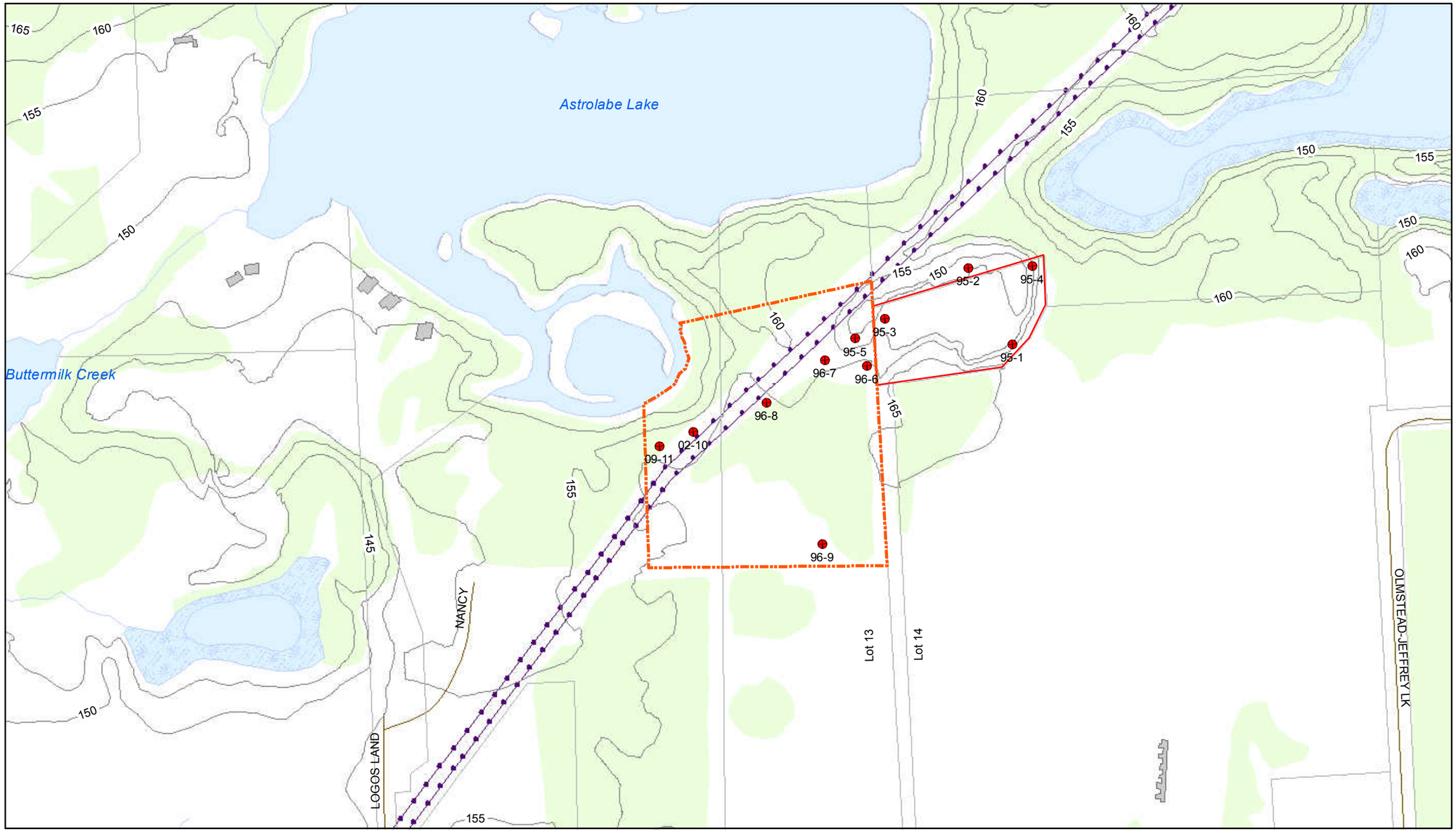
Dale L. Gable

Dale Gable, P.Eng.

Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AT/

c: District Manager, MOE Ottawa
Kevin J. Mooder, MCIP, RPP, Jp2g Consultants Inc. √



Legend

- Monitoring Wells
- Proposed CAZ 2012 8.3 ha
- Landfill Site
- Waterbody
- Wetland, Permanent
- Property Fabric
- Buildings
- Contour
- Utility Line
- Stream
- Wooded Area
- Road
- Highway

0 125 250 500 Meters

Jp2g Consultants Inc.

ENGINEERS ■ PLANNERS ■ PROJECT MANAGERS

Site Plan Cobden WDS

Township of Whitewater Region

Scale 1:5000	Figure 1
	Drawn By: PJ
Project 2016071M	Checked by: KM
	Date: Dec 2012

Andrew Buzza

From: Steven - Environmental Services <shodson@whitewaterregion.ca>
Sent: Thursday, January 17, 2013 1:46 PM
To: sara.sideris@ontario.ca; Emily.Tieu@ontario.ca
Cc: Kevin Mooder
Subject: Environmental Compliance Approval - Cobden Closed Waste Site
Attachments: Env. Compliance Approval, Condition 6, Jan. 2013.pdf

Hi Sara,

Attached, please find a scanned copy of a completed Environmental Compliance Approval referencing an application for an administrative amendment to Provisional Certificate of Approval #A413204 (Condition 6 Time line).

The MOE Reference Number is 5425-93MQM7.

Please let me know if there is any missing or incomplete information on the form.

Thanks,

Steven Hodson, Environmental Services Manager
Township of Whitewater Region
(613) 635-1517

Jp2g Consultants Inc.
ENGINEERS ■ PLANNERS ■ PROJECT MANAGERS

J.M. Janota, M.Sc., P.Eng.
J.E. Hunton, MCIP, RPP

July 22, 2013

Ministry of the Environment
2430 Don Reid Drive
Ottawa, ON K1H 1E1

Attention: Emily Tieu
Sr. Environmental Office

Re: Cobden Closed Landfill Site
ECA No. A413204
Township of Whitewater Region
Application to EAB MOE Reference No. 5425-93MQM7
Our Project No. 2016071N

Dear Emily:

The Township of Whitewater Region has entered into an agreement with the adjacent owner to establish a CAZ by means of an easement.

The Ontario Land Surveyor has prepared a draft reference plan to include all monitoring wells in the CAZ, copy attached. The attached Drawing generally illustrates the proposed CAZ limits as shown on the OLS plan. In this regard the northwesterly CAZ limit includes monitoring wells 09-11. The owner has suggested that the CAZ is too large and would rather have the limits only to 02-10. This would be consistent with the proposal presented in the 2010-2011 Biennial Report and the ongoing discussions with Mr. Shawn Kinney.

I have no record from EAB who the application has been assigned to, however in order to resolve this issue we request TSS approval so the Township can register the OLS plan and file a Certificate of Requirement on the subject lands. By copy of this letter I have forwarded to Mr. Kinney.

Trusting this is satisfactory.

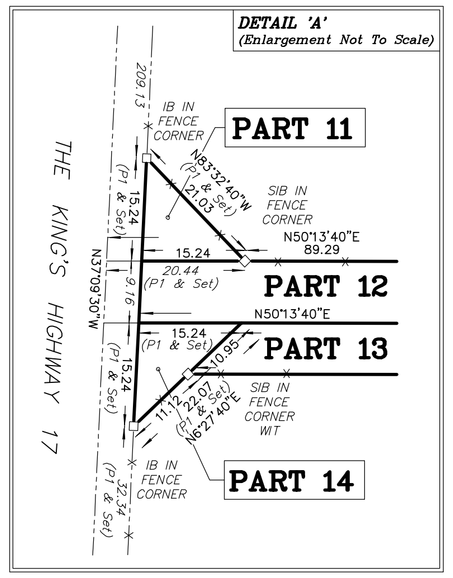
Yours very truly,

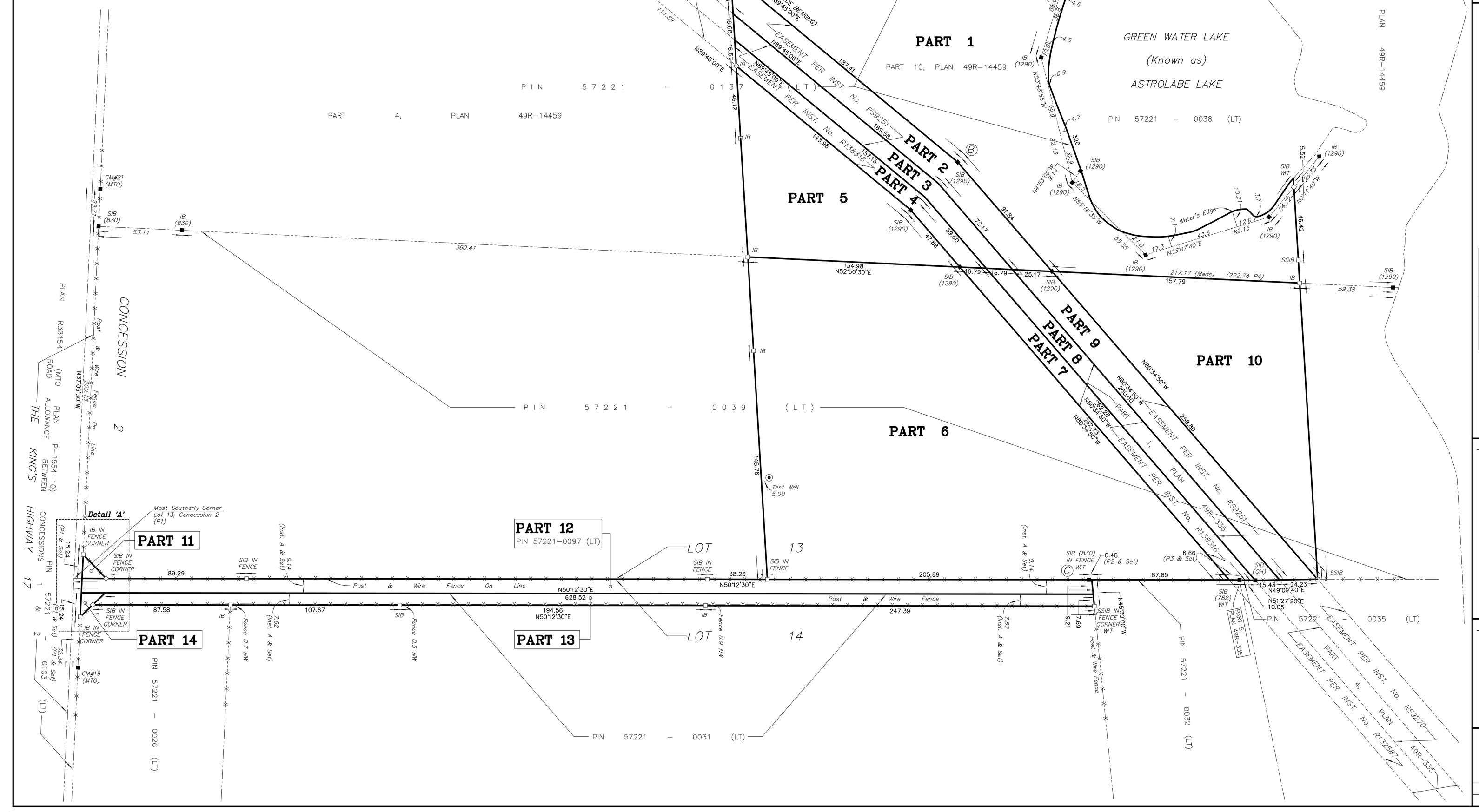
Jp2g Consultants Inc.
Engineers • Planners • Project Managers

Kevin Mooder, MCIP RPP
Sr. Project Planner

KJM/jlp

c.c. Christine Fitz Simons, CAO
Steven Hodson, Environmental Services Manager
Shawn Kinney, Ministry of the Environment





SCHEDULE

PART	LOT	CONCESSION	PIN	AREA (HA)
1	13	2	Pt. 57221–0137 (LT)	?
2				?
3				?
4				?
5				?
6			Pt. 57221–0039 (LT)	?
7				?
8				?
9				?
10				?
11				?
12				?
13	14		Pt. 57221–0031 (LT)	?
14				?

PARTS 2, 3, 8 AND 9 ON THIS PLAN ARE SUBJECT TO AN EASEMENT PER INST. No. RS9251.

PARTS 3, 4, 7 AND 8 ON THIS PLAN ARE SUBJECT TO AN EASEMENT PER INST. No. R138316.

PLAN 49R –

RECEIVED AND DEPOSITED

(date)

Representative for LAND REGISTRAR FOR THE LAND TITLES DIVISION OF RENFREW (No. 49)

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT

DATE: MAY 8, 2013

ADAM KASPRZAK

PLAN OF SURVEY
OF PART OF
LOTS 13 & 14
CONCESSION 2
GEOGRAPHIC TOWNSHIP OF ROSS
TOWNSHIP OF WHITEWATER REGION
COUNTY OF RENFREW

SCALE 1 : 1250

10 5 0 20 40 60 80 100 METRES

ADAM KASPRZAK SURVEYING LTD.

BEARING NOTE:

BEARINGS ARE UTM GRID, DERIVED FROM SIMULTANEOUS GPS OBSERVATIONS ON MONUMENTS A AND B, SHOWN HEREON, HAVING A GRID BEARING OF N89°45'00"E, NAD83 AND ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 18, 75° WEST.

ASTRONOMIC BEARINGS CAN BE CALCULATED BY ROTATING THE GRID BEARINGS COUNTER CLOCKWISE 1°17'30" AS REFERRED TO PLAN 49R–14459.

DISTANCE NOTE:

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

DISTANCE NOTE:

DISTANCES SHOWN ON THIS PLAN ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.99983.

NOTE:

SSIB PLANTED DUE TO INSUFFICIENT OVERBURDEN.

INTEGRATION DATA:

COORDINATES ARE DERIVED FROM GPS OBSERVATIONS USING THE PRECISE POINT POSITIONING (PPP) SERVICE AND ARE REFERRED TO UTM ZONE 18 (75° WEST) NAD83 (CSRS) (1997)

POINT ID	NORTHING	EASTING
A	5 051 267.600	356 351.185
B	5 051 269.189	356 715.532
C	5 051 119.493	356 950.940

COORDINATE VALUES ARE TO RURAL ACCURACY PER SEC. 14 (2) OF O. REG. 216/10 AND CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

LEGEND (If Applicable)

IB	– IRON BAR
SIB	– STANDARD IRON BAR
SSIB	– SHORT STANDARD IRON BAR
■	– MONUMENT FOUND
□	– MONUMENT SET
CP	– CONCRETE PIN
WIT	– WITNESS
RB	– ROCK BAR
(782)	– A. C. BOURNE, O.L.S.
(830)	– E. W. PETZOLD, O.L.S.
(1290)	– D. W. PATTERSON, O.L.S.
(MTO)	– MINISTRY OF TRANSPORTATION OF ONTARIO
(P1)	– PLAN R33154 (MTO PLAN P–1554–10)
(P2)	– PLAN BY A. C. BOURNE, O.L.S., DATED OCTOBER 21st, 1966, ATTACHED TO INST. No. R87163
(P3)	– PLAN 49R–335
(P4)	– PLAN 49R–14459
(INST. A)	– INST. No. R46993

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON APRIL 25th, 2013.

DATE: MAY 8, 2013

ADAM KASPRZAK
ONTARIO LAND SURVEYOR

ADAM KASPRZAK SURVEYING LTD.
ONTARIO LAND SURVEYORS
432 PEMBROKE ST. W. P.O. BOX 492
PEMBROKE ONTARIO K8A 6X7
PHONE (613) 735–0764

SCALE: 1 : 1250 REF: 13–5011 D

FILE No :

NOTES

1. EASTERN CORNER OF THE SITE CAZ IS TO BE LOCATED BEYOND (NORTH OF) THE HYDRO EASEMENT TO THE NORTH OF THE SITE.

JUNE 12, 1996: WATER ELEVATION = 108.57m

SEPTEMBER 28, 2012: WATER ELEVATION = 108.558m

EDGE OF LAKE

NEW WELL

02-10A
02-10B

96-8A
96-8B

09-11A
09-11B

96-9

96-7A
96-7B

96-6A
96-6B

95-5A
95-5B

95-3

95-2

95-4

95-1

TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8 TP9 TP10 TP11

SIB

IB

SITE BENCH MARK

EX HYDROLINES

EX GATE & FENCE

LOT 13

LOT 14

EXISTING ACCESS ROAD

LOT 14
CONCESSION II

GEOGRAPHIC TOWNSHIP OF ROSS

LOT 14, CONC. II

GRAPHIC SCALE

40 0 20 40 80 120 160 200m

LEGEND

- PROPERTY LINE
- CAZ LIMITS
- MONITORING WELL LOCATION (96-8B)
- TEST PIT LOCATION (TP1)
- BAR LOCATION (SIB)

No.	DATE	BY	REVISIONS

Jp2g Consultants Inc.

ENGINEERS · PLANNERS · PROJECT MANAGERS
PEMBROKE · OTTAWA

DESIGNED	PJ/KM
DRAWN	EA/RM
CHECKED	KM
APPROVED	KM
SCALE	1:2000

TOWNSHIP OF WHITEWATER REGION
COBDEN WASTE DISPOSAL SITE
GROUNDWATER ELEVATIONS AND FLOW DIRECTION

SITE PLAN AND CAZ

DATE	APRIL 2013
PROJECT	2016071N
PLOTTED	03-APR-13
DRAWING	1

Andrew Buzza

From: Kinney, Shawn (ENE) <Shawn.Kinney@ontario.ca>
Sent: Friday, August 16, 2013 4:50 PM
To: Tieu, Emily (ENE); Dagg-Foster, Gillian (ENE); Taylor, Peter (ENE); MacDonald, Tara (ENE); Pourhassani, Nafiseh (ENE)
Cc: Kevin Mooder
Subject: FW: Electronic Copy - Cobden WDS - A413204 - 2010-11 MR
Attachments: fsk-et-Cobden WDS - A413204 - 2010-11 MR.pdf

Hi all,

Here are my review comments on the Cobden WDS monitoring report and proposed CAZ dimensions.

Please note that Summary Point #5 refers to "the July 2012 Jp2g letter". This should read as "the July 2013 Jp2g letter". I apologise for any confusion.

Regards,
Shawn

From: Lindsay, Gloria (ENE)
Sent: August 16, 2013 4:23 PM
To: Kinney, Shawn (ENE)
Subject: Electronic Copy - Cobden WDS - A413204 - 2010-11 MR

Hi Shawn,

Attached is your electronic copy.

Thanks.

Gloria Lindsay
Program Support Assistant
Business Services Unit
Ministry of the Environment
1259 Gardiners Road, Unit 3
Kingston, ON K7P 3J6
Phone: (613) 540-6860
Fax: (613) 548-6908

Ministry of the Environment

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

M E M O R A N D U M

16 August 2013

TO: Emily Tieu
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: Shawn Kinney
Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region

RE: Cobden Waste Disposal Site A413204
2010/2011 Monitoring Report and CAZ Proposal

I have reviewed the hydrogeologic aspects of the following documents entitled:

- *"Cobden Waste Disposal Site, Township of Whitewater Region, Certificate No. A413204, 2010/2011 Biennial Report"* Jp2g Consultants Inc., April 2012.

- *"Re: Cobden Closed Landfill Site, ECA No. A413204, Township of Whitewater Region, Application to EAB MOE Reference No. 5425-93MQM7, Our Project No. 2016071N"* Jp2g Consultants Inc., July 22, 2013.

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

Summary

1. The site is not in compliance with Guideline B-7.

2. The leachate plume is at the outer extent of the existing groundwater monitoring network and the maximum proposed Contaminant Attenuation Zone.

3. There is no potential for surface water impacts.

4. I recommend that Schedule B of the ECA be updated to include monitoring locations 09-11A and 09-11B.

5. I recommend that the CAZ be established as depicted in Figure 1 of the July 2012 Jp2g letter.

Certificate of Approval

The Cobden Waste Disposal Site is licensed under Certificate of Approval A413204. An amendment to the Certificate dated March 2, 2009 closed the site to further waste disposal. The former site was 2.1 hectares in area and received 95% domestic waste and 5% brush and scrap metal. The trench disposal method was historically used with the area landfilling method used more recently. The landfill is a naturally attenuating site.

Geology

Confirmatory borehole logs are provided in Appendix C of the May 2010/2011 Jp2g Report. None of the boreholes reportedly penetrated bedrock.

Section 1.2, page 3 of a previously reviewed monitoring report for this site (Golder Associates Ltd, June 2007) described the site's overburden geology as follows:

Overburden

- Sand with gravel and cobbles in some locations: at least 25.9 metres thick.

Bedrock

- Precambrian marble (east) and syenite (west) (ref. Ont. Geol. Survey Map M2460).

Hydrogeologic Conditions

Hydraulic Conductivity

Section 4.2, page 6 of the Jp2g report references a hydraulic conductivity estimate of $1 * 10^{-4}$ $m^3/m^2/s$ based upon Golder Associates (2007). This is the typical mid-range value for clean sand.

Horizontal and Vertical Hydraulic Gradients

Table 1, page 7 of the monitoring report presents groundwater elevation measurements. I have examined this data and note the following:

- Horizontal: 0.002 m/m west. This is a relatively gradual gradient.
- Vertical: predominantly downward as groundwater migrates to the west.

Groundwater Flow Direction and Velocity

Given the above-noted hydraulic conductivity and horizontal hydraulic gradients, Darcy's Law predicts a groundwater flow velocity generally westward on the order of 10's of metres per year.

Background Water Quality

Figure 1 of the July 22 2013 letter depicts borehole 96-9 located approximately 240 metres southwest of the fill area. Report Appendix E presents historical groundwater quality data for this monitor.

Borehole 96-9 consistently yields samples having low total dissolved solids concentrations. I am satisfied that water samples from borehole 96-9 represent natural local groundwater quality.

The historical median groundwater quality at borehole 96-9 conformed to the Ontario Drinking Water Standards and Objectives (ODWS/O) for all reported parameters except the following:

Parameter	ODWS/O (mg/l)	Median Background BH 96-9 (mg/l)	Excess Factor
Hardness	80-100	134	1 x

Reasonable Use Guideline B-7 sets this background concentration as the maximum permissible concentration for hardness at the downgradient property boundary.

Leachate Water Quality

Monitor 96-7A is located approximately 70 metres northwest of the historical fill area. The Appendix E water quality data indicate that monitor 96-7A is the most severely impacted monitor at this site.

Leachate Contaminants of Concern

I have compared the most recently reported groundwater quality of 96-7A samples the ODWS/O I note the following contaminants of concern:

Parameter	ODWS/O (mg/l)	Leachate Conc. BH 96-7A (mg/l)	Excess Factor
Hardness	80-100	427	4 x
Manganese	0.05	0.09	2 x
TDS	500	558	1 x

These concentrations are generally lower than those measured in previous years. This may be attributable to weakening of leachate strength since site closure.

I note that groundwater samples are typically acquired during autumn at this site. The October 2011 leachate monitor sample was reportedly lost in transit. The above-noted data is derived from a re-sampling event performed during February 2012. It is possible that the reduced leachate strength may reflect a seasonal effect (i.e. winter vs. autumn). Future autumn sampling events may clarify this.

Leachate Indicator Parameters

I have compared the most recent leachate quality to the background water quality provided for monitor BH 96-9. The following leachate parameters which were elevated by at least an order of magnitude (10 x) greater than background parameters:

Parameter	Background Conc. BH 96-9 (mg/l)	Leachate Conc. BH 96-7A (mg/l)	Excess Factor
Boron	<0.01	0.30	30 x
Barium	0.04	0.50	13 x
Potassium	<1	12	12 x

These parameters may be promising site-specific indicators of leachate impacts to groundwater.

Downgradient Water Quality

Figure 1 of the July 22 2013 letter depicts monitoring wells 02-10A/B located approximately 340 metres west (downgradient) of the fill area. Figure 1 additionally depicts monitoring wells 09-11A/B located approximately 500 metres west (downgradient) of the historical fill area.

I have examined the groundwater quality data for monitors 02-10A/B and 09-11A/B as provided in Report Appendix E. I note the following:

Leachate Indicator Parameter	Background BH 96-9 (mg/l)	02-10A (Deep) (mg/l)	02-10B (Shallow) (mg/l)	09-11A (Shallow) (mg/l)	09-11B (Deep) (mg/l)
Boron	<0.01	**0.02 (2x)**	**0.03 (3x)**	<0.01	**0.02 (2x)**
Barium	0.04	**0.13 (3x)**	**0.14 (3x)**	**0.09 (2x)**	**0.10 (2x)**
Potassium	<1	**2 (2x)**	**2 (2x)**	**2 (2x)**	**2 (2x)**
TDS	190	**299**	**308**	188	190

I conclude that the leachate indicator parameters are somewhat elevated at monitoring locations BH 02-10 A/B (340 metres downgradient) and BH 09-11 A/B (500 metres downgradient).

I note a general trend of lower leachate indicator concentrations with increasing distance downgradient of the fill area. This is indicative of the natural attenuation of leachate.

GW/SW Interaction

A surface water body named Astrolabe Lake is located approximately 240 metres northwest of the fill area. The reported water level elevation in the lake is greater than that of the nearby monitoring wells. This suggests that groundwater flows away from the lake. I conclude that there is no potential for surface water impacts.

Guideline B-7

I have compared the February 2012 downgradient groundwater quality to the Guideline B-7 compliance criteria for the site's contaminants of concern. I note the following:

Contaminant Of Concern	B-7 Criterion (mg/l)	02-10A (Deep) (mg/l)	02-10B (Shallow) (mg/l)	09-11A (Shallow) (mg/l)	09-11B (Deep) (mg/l)
Hardness	134	**248 (2x)**	**246 (2x)**	**156 (1x)**	**146 (1x)**
Manganese	0.03	<0.01	<0.01	0.02	0.02
TDS	344	299	308	188	190

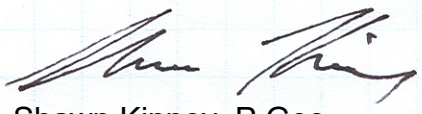
Groundwater quality exceeded the Reasonable Use Criterion for hardness at the farthest downgradient monitoring wells. The excess hardness was almost twice the B-7 limit at the BH 02-10A/B monitoring location. However, the excess hardness at the BH 09-11A/B location was marginal.

A CAZ which terminated at the 02-10A/B location would not yield Guideline B-7 compliance.

I recommend that at a minimum, a Contaminant Attenuation Zone (CAZ) should extend to the 09-11 A/B monitoring location. The CAZ dimensions depicted in Figure 1 of the June 22 2013 Jp2g letter are satisfactory. I am optimistic that the proposed CAZ expansion will yield Guideline B-7 compliance at this site.

Groundwater Monitoring and Reporting

The consultant proposes to continue monitoring and reporting as per Schedule B of Amended Certificate of Approval A413204. I note that Schedule B does not include monitoring locations 09-11A and 09-11B. I recommend that the monitoring requirements be updated to include these monitors in the monitoring regime.



Shawn Kinney, P.Geo.
SK/gl

c: GW RE WH 01-03 WHIT Cobden WDS A413204, Fmr Township of Ross
SK #3326-8V6RRT

ec: Gillian Dagg-Foster (Water Unit Supervisor)
Peter Taylor (Technical Support Section)
Tara MacDonald (Ottawa District Office)
Nafiseh Pourhassani (EAB)

Andrew Buzza

From: Steven - Environmental Services <shodson@whitewaterregion.ca>
Sent: Tuesday, November 26, 2013 3:47 PM
To: Tor (ENE) Rustad; Nafiseh.Pourhassani@ontario.ca
Cc: Christine FitzSimons; Kevin Mooder
Subject: Cobden Closed Landfill Site
Attachments: SWhitewater13112614490.pdf

Hello,

Recognising the recent draft Environmental Compliance Approval for addition of CAZ for the Cobden Waste Disposal Site, 15784 Highway 17, Approval #413204, issued by Nafiseh Pourhassani, I wish to update the Ministry.

The Municipality will be discussing at Committee on Wednesday, December 11th, 2013 what will likely result in the finalization of the Agreement with the adjacent property owner for the acquisition of a CAZ for the Site. Final negotiations on the size limitation (perimeters) of the CAZ have been challenging and at this time I will suggest that the North Westerly limit of the CAZ (encroaching toward Champlain Village development) may just take in monitoring well 02-10, assuming the December 11th Committee discussions are positive. Currently the Adjacent property owner is seeking a North Westerly limit that falls quite short of monitor 02-10 (please see attached sketch). Again, it is the intent of the Municipality to extend this line to extend just beyond the 02-10 monitor and I believe we have the property owner on board.

The Agreement, if finalized on the 11th of December will result in a legal groundwater easement to secure a the CAZ. Please understand that the perimeter extending to the NorthWest as negotiated will not take in further monitor 09-11. This monitor encroaches well into the property owners planned Champlain Village Development as well as upon his own dwelling. Following much talks, meetings and negotiating...the property owner has made it quite clear that the CAZ will not extend any further than monitor 02-10 (at best). Perhaps this correspondence could be forwarded to Mr. Shawn Kinney at MOE Technical Branch in Kingston to keep his office informed.

I deem it necessary to inform the Ministry of this perhaps less-than-suitable CAZ North West limit as well as what will likely result in the inability to meet the December 31st deadline to acquire. The Municipality has done everything it can to work with the adjacent property owner and come up with a zone that suits the needs of all parties. The Municipality is hopeful for favourable groundwater monitoring results from this Fall`s program for this closed Site as well as into the future to satisfy Guideline B7.

I will prepare a formal letter depicting that the time frame to acquire a suitable CAZ and have it registered will likely not be achieved by December 11th, 2013.

Please advise on any reporting or follow up I should take note of.

Respectfully,

Steven Hodson, Environmental Services Manager

Township of Whitewater Region
(613) 646-2282

Township of Whitewater Region
Environmental Services Department
P.O. Box 40 44 Main St.
Cobden, ON
K0J 1K0

December 17th, 2013

Tor Rustad, Senior Environmental Officer
Ministry of the Environment
Ottawa District Office
2430 Don Reid Drive
Ottawa, ON K1H 1E1

Re: Closed Landfill Site 15784 Highway 17 West

Dear Tor,

The Corporation of the Township of Whitewater Region is in receipt of your letter dated December 13th, 2013 in reference to the Closed Cobden Waste Site and Mr. Kinney's attached Technical Review dated August 16th, 2013. Upon review I offer the following:

The acquisition of the larger Contaminant Attenuation Zone (CAZ), as depicted in Mr. Kevin Mooder's (Jp2g Consultants Inc.) letter and attached draft OLS drawing dated July 22nd, 2013 to Emily Tieu, Senior Environmental Officer, was always the intent. Mr. Kinney's past and recent comments have always been acknowledged, respected and taken into consideration through the entire process. The Township has strived to acquire a CAZ that extends beyond monitors 02-10 and includes monitors 09-11 (hence the resulting draft OLS drawing). Unfortunately, latter stages of negotiations with the adjacent property owner have been stalled for upwards of a year due to this resulting draft land survey of the proposed CAZ. The adjacent property owner has expressed his sincere discontent with the size of the CAZ as shown in the draft survey and has conversed he was never aware it was to even extend to monitors 02-10. Following recent negotiations progress was made to extend the North West limitation / boundary of the proposed CAZ to include monitors 02-10. The adjacent property owner has made it clear that this will be the limit of the Zone.

Both he and the Township are indeed anxious to complete these dealings and with him currently in agreement to extend the boundary to include monitors 02-10, the Township deems in necessary to move ahead to finalize. I would ask the Ministry please reference this letter as formal notification that, due to stalled negotiations, the Township is in no position to meet the December 31st, 2013 deadline to acquire a Contaminant Attenuation Zone.

Please forward any comments or concerns to myself at your convenience.

Respectfully,

Steven Hodson, Environmental Services Manager
Township of Whitewater Region
(613) 646-2282

Ministry of the Environment and Climate Change

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

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

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

M E M O R A N D U M

27 October 2014

TO: E. Tieu
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: B.W. Metcalfe
Senior Environmental Officer
Water Resources Unit, Surface Water Group
Technical Support Section
Eastern Region

RE: 2012/2013 Monitoring Report
Closed Cobden Landfill Site
Part Lot 14, Concession 2, Geographic Township of Ross
Township of Whitewater Region
Environmental Compliance Approval No. A413204

I have reviewed the noted report dated April 2014, prepared by Jp2g Consultants Inc. for the Township of Whitewater Region and the following comments are offered relative to surface water impact concerns.

Background Information

Approval to permanently close the Cobden landfill site was issued under amendment to the Provisional Environmental Compliance Approval No. A412304 Notice No. 1 dated March 2, 2009. The site was closed for operation in 2002. The application of final cover for the landfill site was conducted over the period 2003 to 2009. The Cobden waste disposal site (WDS) functions as a naturally attenuating site. There is no leachate collection system and or any sewage works at the site. There are no stormwater management facilities associated with the site.

Surface Water Monitoring

The 2012/2013 Environmental Monitoring Report for the Cobden WDS did not include a surface water impact assessment component. There has been no surface water sampling program incorporated into the current monitoring program for the Cobden landfill site.

The consultant had determined relative to the landfill site that the direction of groundwater flow has been determined to be to the northwest and the leachate plume moves in a north north-westerly direction from the landfill site. The Cobden landfill site operates as a natural attenuation site.

The nearest significant surface water feature downgradient of the landfill site appears to be Astrolabe Lake (Ottawa River Basin) which is situated approximately 300 metres to the north of the landfill site. It is the reviewer's understanding that the reported water elevation of Astrolabe Lake is greater than that of the nearby groundwater monitoring wells and this suggests that groundwater flows away from the lake. This would suggest that there may be no potential for surface water quality impacts associated with the egress of landfill leachate impacted groundwaters.

Recommendations

The reviewer's recommendations remain as previously provided in my memorandum Re: 2010/2011 Monitoring Report Cobden Landfill Site, dated August 21, 2012, to E. Tieu, Senior Environmental Officer, Ottawa District Office, Eastern Region from B.W. Metcalfe, Senior Environmental Officer, Water Resources Unit, Technical Support Section, Eastern Region and are restated below:

- The groundwater/surface water interaction for the Cobden WDS should be confirmed by the landfill site owner.

- The landfill site owner consultant has not identified any surface water vectors or downgradient terminal receiving surface waters which are recipient to landfill site run-off or leachate impacted groundwater egress. The reviewer recommends that the landfill site owner provide confirmation to the Ministry of the Environment and Climate Change that there are no surface water features within the proximity of the Cobden landfill site that would potentially receive leachate impacted waters directly or indirectly and if the surface water quality of the downgradient surface water regime could be potentially impacted. The delineation of the existing leachate impacted groundwater plume will be of relevance for the assessment of the potential impact to water quality of the downgradient surface water regime. Should surface water features be identified which may be potentially impacted by the landfill site operation then an appropriate surface water quality sampling program would be required of the landfill site owner.

B.W. Metcalfe

B.W. Metcalfe
BWM/sh

ec: G. Dagg-Foster
P. Taylor
J. Leavoy (Acting District Supervisor)

c: S. Kinney
B. Metcalfe (Aba2014\aba6314.mem) 0637-9LUQHQ \ X-ref. 5374-9LUQBW
File SW RE WH 03 06 C2, Cobden WDS, Township of Whitewater Region
File SW 07 02 11 01 01, Astrolabe Lake, Ottawa River Basin

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

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

Ontario

M E M O R A N D U M

October 18, 2019

TO: Thandeka Ponalo
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: Lauren Forrester
Surface Water Specialist
Technical Support Section
Eastern Region

RE: Cobden WDS 2016/2017 Annual Report
15784 Highway 17, Township of Whitewater Region
Renfrew County
ECA No. A413204

As requested, I have reviewed the 2016/2017 Annual Report for the Cobden Waste Disposal Site (WDS), dated April 25, 2018 and prepared by Jp2g Consultants Inc. I offer the following comments in relation to surface water matters.

Background

The Cobden WDS was operated as a naturally attenuating site under Environmental Compliance Approval (ECA) No. A412304. The WDS is reported to be located within a deep depression, which was formerly used as a sand and gravel pit. No waste has been placed at the site 2002 (except hydrocarbon contaminated soil deposited in 2003). The site was closed based on the findings of hydrogeological assessments and in recognition of the limited remaining capacity. A Closure Plan adopted March 2, 2009. A Contaminant Attenuation Zone (CAZ) was adopted in 2012 and 2014 amendments to the Approval.

The total volume of waste on site is 45,590 m^3 within a 1.16 ha waste footprint.

Leachate indicators are interpreted by Jp2g to be barium, boron, DOC, hardness, iron, strontium, TDS, alkalinity, sulphate, sodium, and manganese.

Surface Water Regime

Nearby surface water features include Astrolabe lake (160 m north of the waste footprint); unnamed lake (140 m east of the waste footprint); Round Lake (300 m northwest of the waste footprint).

An upward groundwater gradient is interpreted by Jp2g to occur with distance for the former fill area. Groundwater flows are interpreted to be to the west.

Both Astrolabe Lake and the unnamed lake are interpreted by Jp2g to be upgradient of the landfill. Based on groundwater elevations relative to lake water levels between 2014 and 2017, Round lake is believed to be groundwater recharge point and unlikely to be impacted by leachate. There is currently no surface water monitoring component to the Monitoring Program for the Cobden WDS.

Results and Discussion

Based on groundwater interpretations made by Jp2g, the leachate plume extends to the west of the waste footprint. The northwest extent of the plume does not appear to have been delineated. I defer to the groundwater reviewer for opinion on extent of plume and interpretation of groundwater impacts.

Wells 02-10A/B and 96-8A/B identified by Jp2g as being impacted by landfill leachate. These wells are nearest to Round Lake and west of the WDS. For parameters included in groundwater analyses with surface water criteria (Provincial Water Quality Objectives / Canadian Water Quality Guidelines) concentrations are generally low. Considering Jp2g's interpretation of Round Lake as a groundwater recharge point and the relatively dilute leachate signature (compared to surface water criteria), surface water impacts to Round Lake, Astrolabe Lake and the unnamed lake are unlikely.

Recommendations

Monitoring of groundwater / surface water levels should continue. Initiation of surface water monitoring is not justified at this time.

It is my understanding that, except for the lakes identified above, there are no surface water features in proximity to the landfill site. Should surface water features that may be impacted by the landfill site be identified, an appropriate surface water quality sampling program should be required of the landfill site owner.

If you have any questions about these comments, I would be happy to discuss them with you.

Lauren Forrester, M.Sc.
LF

ec: Victor Castro, Water Unit Supervisor (acting)
Shawn Kinney, Regional Hydrogeologist
Emily Tieu, Ottawa District Supervisor

c: File SW RE WH 03 06 C2 - Cobden WDS
LF/IDS No. 3388-B82RC6

APPENDIX D

BOREHOLE LOGS

PROJECT: 951-2809

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 95-1

BORING DATE: May 2, 1995

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.6 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ● ( ) LEL % □	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT, PERCENT Wp ⊢ ○ W ⊣ Wl	INSTALLATIONS
0	Power Auger 200mm Diam. (Hollow Stem)	Ground Surface		115.74 / 0.00								
1		Brown fine to coarse SAND, trace to some gravel, occasional cobble		114.52 / 1.22								Bentonite Seal
2		Compact to very dense brown SAND, GRAVEL, COBBLES and BOULDERS										
3				112.23 / 3.51	1	SS DO	19					Native Backfill
4		Compact brown stratified fine SAND										
5												
6				109.49 / 6.25	2	SS DO	21					
7		Compact brown stratified fine SAND, trace silt		108.27 / 7.47								
8		Compact brown fine SAND										
9					3	SS DO	27		M			
10				105.07 / 10.67								Well Screen
11		End of Hole										W.L. in Well Screen at Elev. 106.59m Sept. 21, 1995
12												

DEPTH SCALE (ALONG HOLE)

1 to 60

Golder Associates

LOGGED: D.J.S

CHECKED: KAM

PROJECT: 951-2809

RECORD OF BOREHOLE 95-2

SHEET 1 OF 1

LOCATION: See Plan

BORING DATE: May 2, 1995

DATUM: Local

DIP:

SAMPLER HAMMER, 63.6kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR @ ( ) LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS
0	Power Auger 200mm Diam. (Hollow Stem)	Ground Surface		111.97 / 0.00								Bentonite Seal
1		Brown fine to coarse SAND, trace to some gravel			1	SS DO	8					Native Backfill
2				109.53 / 2.44								
3		Brown fine to coarse SAND, some gravel, cobbles and boulders			2	SS DO	28					
4												
5					3	SS DO	20					Well Screen
6					4	SS DO	32					
7		End of Hole		105.26 / 6.71								W.L. in Well Screen at Elev. 106.57m Sept. 21, 1995
8												
9												
10												
11												
12												

DEPTH SCALE (ALONG HOLE)

1 to 60

Golder Associates

LOGGED: D.J.S

CHECKED: KAM

PROJECT: 951-2809

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 95-3

BORING DATE: May 2, 1995

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.6 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ● ( ) / LEL % □	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp — W — Wl	INSTALLATIONS
0	Power Auger 200mm Diam. (Hollow Stem)	Ground Surface		114.21 / 0.00								Bentonite Seal
1		Dark brown fine to coarse SAND, trace to some gravel (FILL)			1	SS	8					
2					2	SS	2					
3												Native Backfill
4					3	SS	2					
5				109.03 / 5.18								
6		Brown to grey fine to coarse SAND, trace to some gravel			4	SS	7					
7												
8					5	SS	3					Well Screen
				105.68 / 8.53								
9		End of Hole										W.L. in Well Screen at Elev. 108.48m Sept. 21, 1995
10												
11												
12												

DEPTH SCALE (ALONG HOLE)

1 to 60

Golder Associates

LOGGED: D.J.S

CHECKED: KAM

PROJECT: 951-2809

RECORD OF BOREHOLE 95-4

SHEET 1 OF 1

LOCATION: See Plan

BORING DATE: May 3, 1995

DATUM: Local

DIP:

SAMPLER HAMMER, 63.6 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ( ) / LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS
0	Power Auger 200mm Diam. (Hollow Stem)	Ground Surface		111.70 / 0.00								A B C
1		Stratified brown fine to medium SAND, occasional clayey silt layer			1	SS DO	9					Bentonite Seal; Native Backfill
2												
3					2	SS DO	7					
4												Well Screen
5				106.21 / 5.49								
6		End of Hole										W.L in Screen at Elev.106.72m Sept. 21, 1995
7												
8												
9												
10												
11												
12												

DEPTH SCALE (ALONG HOLE)

1 to 60

Golder Associates

LOGGED: D.J.S

CHECKED:

PROJECT: 951-2809

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 95-5

BORING DATE: July 12, 1995

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.6 kg; DROP, 760 mm

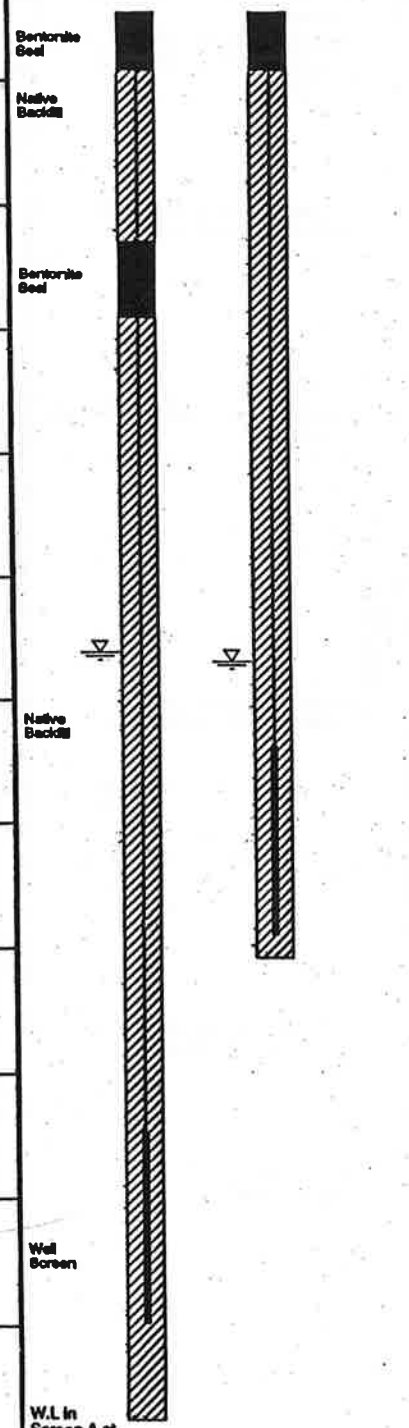
DEPTH SCALE METRE	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING
0	Power Auger 200mm Diam. (Hollow Stem)	Ground Surface		113.54					
		Dark brown silty TOPSOIL		0.00					
		Light brown SANDY SILT		0.16 / 113.08					
				0.46					
1		Loose dark brown SAND and GRAVEL, some cobbles			1	SS	50/4	DO	
2									
				110.80 / 2.74					
3		Compact to dense light brown SAND and GRAVEL, occasional cobble			2	SS	50/9	DO	
4									
5					3	SS	50/7	DO	
				107.75 / 5.79					
6		Compact brown SAND and GRAVEL, trace silt, occasional cobble			4	SS	50/4	DO	
7									
8					5	SS	50/7	DO	
9									
10				103.16	6	SS	50/9	DO	
		Compact brown stratified fine SAND		10.36					
11					7	SS	50/9	DO	
				102.26					
		End of Hole		11.28					
12									

COMBUSTIBLE VAPOUR ( ) ⊕ — LEL % □

HYDRAULIC CONDUCTIVITY, k, cm/s

WATER CONTENT, PERCENT — Wp ⟨ W ⟩ Wl

INSTALLATIONS



DEPTH SCALE (ALONG HOLE)

1 to 60

Golder Associates

LOGGED: D.J.S

CHECKED:

PROJECT: 961-2704

RECORD OF BOREHOLE 96-6

SHEET 1 OF 1

LOCATION: See Plan

BORING DATE: May 30, 1996

DATUM: Local

DIP:

SAMPLER HAMMER, 63.5kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING
0	Power Auger 200mm Diam (Hollow Stem)	Ground Surface		121.93					
		Dark brown silty TOPSOIL		0.15					
		Yellow brown SILTY SAND and GRAVEL		120.56					
				1.37					
2		Probably brown fine to medium SAND, trace gravel							
4									
6				114.61					
		Probably brown SAND and GRAVEL, some cobbles		7.32					
8				113.40					
				8.53					
10		Brown fine to coarse SAND, trace gravel							
				109.74					
12				12.19					
		Loose yellow brown fine to medium SAND, trace silt			1	SS	DO	8	
14				106.69					
				15.24					
16		Grey fine to medium SAND							
				103.03	2	AS			
18				18.80					
		Grey fine to coarse SAND, some gravel and cobbles							
20					3	AS			
22				99.37					
		End of Hole Auger Refusal		22.56					
24									
26									
28									
30									

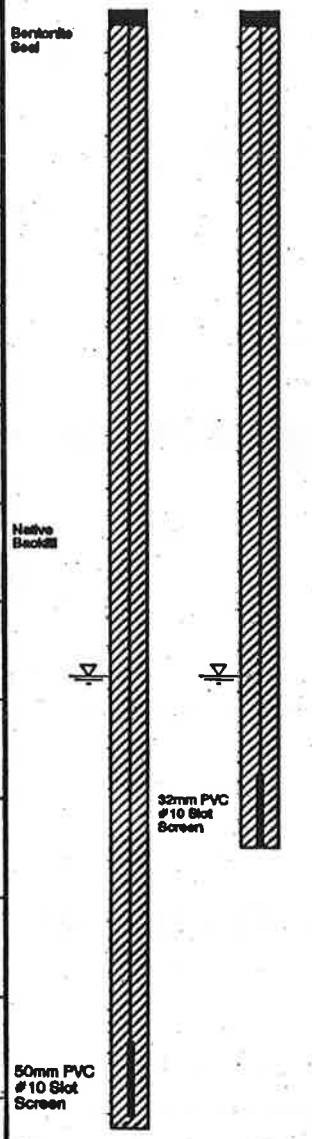
COMBUSTIBLE VAPOUR ( ) ⊕

LEL % □

HYDRAULIC CONDUCTIVITY, k, cm/s

WATER CONTENT, PERCENT Wp — W — Wl

INSTALLATIONS



W.L. in Screen A at Elev. 106.52m
Screen B at Elev. 106.53m
June 12, 1996

DEPTH SCALE (ALONG HOLE)

1 to 150

Golder Associates

LOGGED: D.J.S

CHECKED: KAM

PROJECT: 961-2704

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 96-7

BORING DATE: May 31, 1996

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

SHEET 1 OF 1

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING
0	Power Auger 200mm Diam (Hollow Stem)	Ground Surface		120.49					
		Dark brown silty TOPSOIL		0.12					
		Yellow brown SILTY SAND and GRAVEL		119.27 / 1.22					
2		Brown fine to coarse SAND and GRAVEL		117.44 / 3.05					
4		Brown fine to medium SAND							
6				113.65 / 6.84	1	SS	50 DO 5		
8		Brown fine to coarse SAND, trace to some gravel							
10				110.58 / 9.91					
		Probably fine to coarse SAND, GRAVEL and COBBLES		109.52 / 10.97					
12					2	SS	50 DO 8		
14		Loose brown fine SAND							
16									
18									
20									
22				97.63 / 22.86					
		End of Hole							
24									
26									
28									
30									

COMBUSTIBLE VAPOUR ( ) ⊕

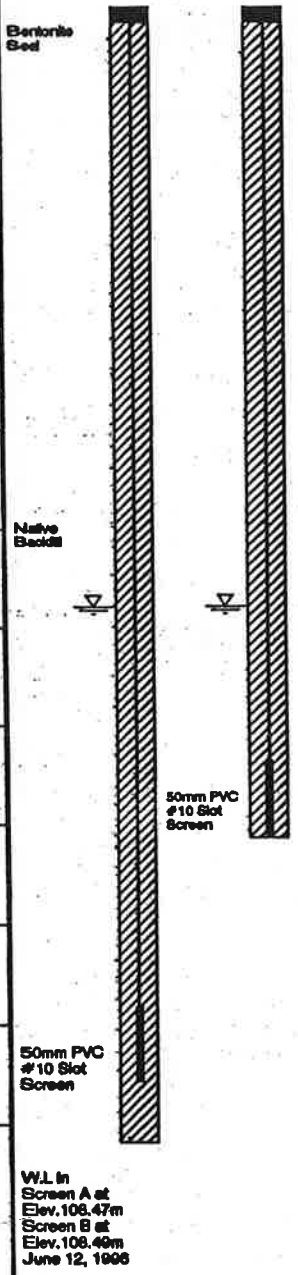
LEL % ·□

HYDRAULIC CONDUCTIVITY, k, cm/s

WATER CONTENT, PERCENT

Wp ⊢—O W —⊣ Wl

INSTALLATIONS



W.L in Screen A at Elev.108.47m
Screen B at Elev.108.49m
June 12, 1996

DEPTH SCALE (ALONG HOLE)

1 to 150

Golder Associates

LOGGED: D.J.S

CHECKED: KAM

PROJECT: 961-2704

RECORD OF BOREHOLE 96-8

SHEET 1 OF 1

LOCATION: See Plan

BORING DATE: May 31, 1996

DATUM: Local

DIP:

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ( ) LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS
0	Power Auger 200mm Diam (Hollow Stem)	Ground Surface		124.43								
		Dark brown silty TOPSOIL		0.00								
		Yellow brown SILTY SAND and GRAVEL		123.21								
2		Brown fine to coarse SAND		1.22								
				121.38								
4				3.05								
6					1	SS	50 DO 8					
8												
10												Native Backfill
12		Probably brown to grey fine to medium SAND										
14												
16					2	SS	50 DO 16					
18					3	SS	50 DO 11					
20				103.09								
				21.34								
22		Probably grey fine to coarse SAND										
24												50mm PVC #10 Slot Screen
				98.52								
26		End of Hole		25.91								
28												W.L in Screen A at Elev. 108.42m Screen B at Elev. 108.39m June 12, 1996
30												

INSTALLATIONS: A B C

Bentonite Seal

32mm PVC #10 Slot Screen

DEPTH SCALE (ALONG HOLE)

1 to 150

Golder Associates

LOGGED: D.J.S

CHECKED: KAM

PROJECT: 961-2704

LOCATION: See Plan

DIP:

RECORD OF BOREHOLE 96-9

BORING DATE: June 4, 1996

SHEET 1 OF 1

DATUM: Local

SAMPLER HAMMER, 63.5kg; DROP, 760 mm

METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	RECOVERY %	LAB. TESTING	COMBUSTIBLE VAPOUR ( ) / LEL %	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT, PERCENT Wp W Wl	INSTALLATIONS
0	Power Auger 200mm Diam (Hollow Stem)	Ground Surface		123.64								
		Dark brown silty TOPSOIL		0.15								Bentonite Seal
		Yellow brown SILTY SAND and GRAVEL		122.87								
2		Brown fine to coarse SAND, trace gravel		1.07								
				121.35								
4		Brown fine to medium SAND		2.59								
				118.61								
6		Brown fine SAND, trace silt, occasional sandy silt seam		5.33	1	SS DO	10					
8												
10												Native Backfill
				112.36								
12		Brown fine SAND		11.58	2	SS DO	22					
14												
				108.70								
16		Brown fine to medium SAND		15.24								50mm PVC #10 Slot Screen
18												
				104.10								
20		End of Hole		19.84								W.L in Screen at Elev.106.42m June 12, 1996
22												
24												
26												
28												
30												

DEPTH SCALE (ALONG HOLE)

1 to 150

Golder Associates

LOGGED: D.J.S

CHECKED: KAM

PROJECT: 991-2815 5050

RECORD OF BOREHOLE: 02-10

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: September 11, 2002

DATUM: Local

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q- ●, rem V. ⊕ U- ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE		120.80							
		TOPSOIL		0.06							
		Yellow brown SILTY FINE SAND		119.89							Casing and Bentonite Seal
		Brown stratified fine SAND, some silt		0.91	1	SS DO	11				
2					2	SS DO	9				
4		Brown fine to coarse SAND, scattered trace gravel		116.69 4.11	3	SS DO	9				
6					4	SS DO	6				Native Backfill
		Grey brown CLAYEY SILT		113.48 7.32							
8		Brown SILTY FINE TO MEDIUM SAND, occasional thin sandy silt seam		112.88 7.92	5	SS DO	7				
		Brown stratified fine SAND		111.50 9.30	6	SS DO	13				
10		Brown fine to coarse SAND, scattered trace gravel		110.44 10.36	7	SS DO	16				
12					8	SS DO	16				Bentonite Seal
14				106.47	9	SS DO	13				
		Probably brown to grey fine to coarse SAND, scattered trace gravel		14.33							Native Backfill
16				104.04							
		Probably grey fine to medium SAND, trace silt		16.76							
18											32mm PVC #10 Slot Screen B
20											Native Backfill
				99.46							
22		Probably grey fine to coarse SAND, trace gravel		21.34							
24				96.42							32mm PVC #10 Slot Screen A
		END OF BOREHOLE		24.38							
26											
28											
30											

BOREHOLE 991-2815.GPJ GLDR_CAN.GDT 4/15/03 K.P.T.

DEPTH SCALE

1 : 150

Golder Associates

LOGGED: D.J.S.

CHECKED: PLE

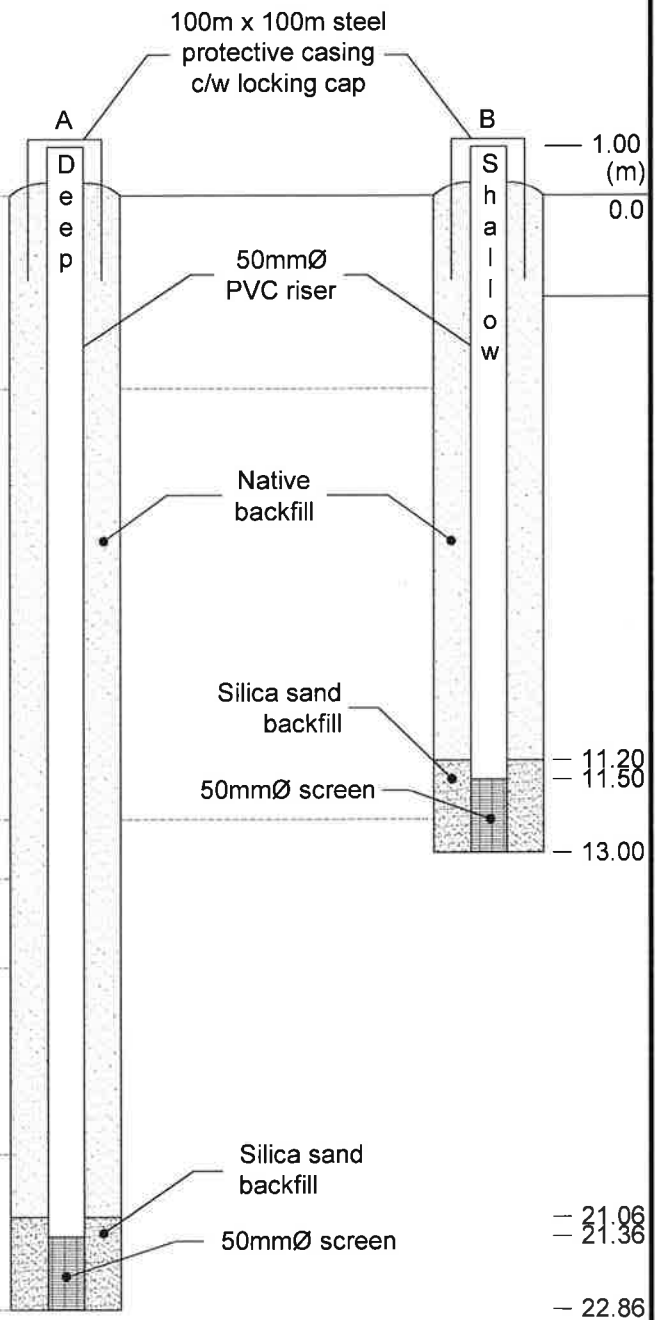
BH# 09-11

BOREHOLE LOG NO: 09-11 (Deep and Shallow)

PROJECT No. 2016071K
CLIENT: Township of Whitewater Region
PROJECT: Cobden Waste Disposal Site
LOCATION: BH #09-11
DATE: SEPT. 14, 2009

DRILLING DATA
METHOD: 6" Hollow Stem Auger
DEPTH OF HOLE: 22.86m
TOP OF PIEZOMETER: 117.1
GROUND ELEVATION: 116.1

ELEV (m)	DEPTH (m)	PROFILE	DESCRIPTION
116.1	0.0		Fine dry brown sand.
112.1	3.96		Fine damp brown sand.
103.3	12.80		Fine damp greyish-brown sand.
102.1	14.01		Fine greyish-brown sand.
100.3	15.84		Saturated medium-grained greyish-brown sand.
96.4	19.67		Saturated medium-grained sand.
93.2	22.86		Terminated.



TYPICAL GROUND - WATER MONITORING WELL
SCALE: N.T.S.

REMARKS:

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS
PEMBROKE · OTTAWA

APPENDIX E

COMPILED CHEMICAL ANALYSIS

Water Quality Notes

Surface Water

CWQG	CCME Water Quality Guidelines for the Protection of Aquatic Life	
PWQO	Provincial Water Quality Objectives	
IPWQO	Interim Water Quality Objectives	
"a"	*Alkalinity*	Should not be decreased by more than 25%
"b"	*Beryllium*	If hardness <75 then 0.011 mg/L
		If hardness >75 then 1.1 mg/L
"c"	*Cadmium*	
	PWQO	0.0002 mg/L
	IPWQO	If hardness 0-100 mg/L then 0.0001 mg/L
		If hardness >100 mg/L then 0.0005 mg/L
	CWQG	Cadmium concentration = $10^{0.86[\log10(\text{hardness})]-3.2}$ µg/L
"d"	*Copper*	
	PWQO	0.005 mg/L
	IPWQO	If hardness 0 –20 mg/L then 0.001 mg/L
		If hardness >20 mg/L then 0.005 mg/L
	CWQG	Copper concentration = $e^{0.8545[\ln(\underline{\text{hardness}})]-1.465} * 0.2$ µg/L
"e"	*Lead*	
	PWQO	If alkalinity <20 then 0.005 mg/L
		If alkalinity 20 - 40 mg/L then 0.010 mg/L
		If alkalinity 40 - 80 mg/L then 0.02 mg/L
		If alkalinity > 80 mg/L then 0.025 mg/L
	IPWQO	If hardness <30 mg/L then 0.001 mg/L
		If hardness 30 - 80 mg/L then 0.003 mg/L
		If hardness > 80 mg/L then 0.005 mg/L
	CWQG	Lead concentration = $e^{1.273[\ln(\underline{\text{hardness}})]-4.705}$ µg/L
"f"	*DO*	
	PWQO	Varies with temperature
"g"	*Nickel*	
	CWQG	Nickel concentration = $e^{0.76[\ln(\underline{\text{hardness}})]+1.06}$ µg/L

Groundwater

MAC	Maximum Acceptable Concentration
IMAC	Interim Maximum Acceptable Concentration
OG	Operational Guideline (non health related)
MDC	Maximum Desirable Concentration
AO	Aesthetic Objective

STANDARD SAMPLING PROTOCOL

The following is a description of the monitoring procedures and protocols used for groundwater and surface water monitoring for landfill sites.

Equipment Cleaning and Calibration

Regardless of matrix, prior to traveling to the site to be sampled, all equipment such as water level indicators and multi-parameter meters must be cleaned and calibrated as specified by the equipment manufacturer. Details of the cleaning and calibration should be recorded in the field notes**.**

GROUNDWATER
Monitoring Well Assessment

- provide an assessment of the status of all monitoring wells at the site;
- note any changes to the well and/or protective casing and record the physical condition of the well; and
- label all observation wells clearly and accurately on both the protective casing and well pipe.

Groundwater Monitoring

- maintain and use an accurate, up-to-date list of all observation wells to be monitored;
- check all field equipment for cleanliness; and
- wear personnel protective equipment (i.e. gloves, protective glasses, splash guards) during all phases of work, and follow any appropriate health and safety plan procedures.

Water Level Measurements (Prior to Purging)

- remove protective casing cover and well cap avoiding introduction of foreign materials into the well;
- always take water level measurements prior to purging or sampling;
- do not move dedicated sampling devices such as the "Waterra" inertial pump prior to measuring the water level; reference the measurement from the same location each time (marked location or lowest point on pipe);
- lower the tape/probe into the wells - record the depth to water when the indicator (audible/visual) shows the water level has been reached;
- measure the water level twice by raising and lowering the tape/probe; and
- record the measurement to the nearest cm (0.5 cm) in the appropriate column on the field data sheet or field book.

Well Purging (Prior to Sampling)

The purpose of purging is to remove the stagnant water from within a monitor (removal of 3 to 5 standing volumes) so that a representative water sample may be collected. The procedures for purging are as follows:

- purge the well only after water levels have been confirmed;
- lift the tubing off the bottom of the well and "pump" stagnant water from the well into a graduated container such as a bucket, pail or cylinder so that the purged volume can be measured and recorded;
- for low-yield wells, it is expected that either “no purge sampling techniques or low flow purging will be utilized (avoid purging well dry);

- under normal circumstances purged water may be discarded on the ground, away from the well to avoid the potential of water seeping back into the well; and
- allow a sufficient recovery period before sampling (not more than 48 hours).

Field Measurements

Field measurements are to be collected and recorded as outlined in the Certificate of Approval or the approved monitoring program.

Well Sampling

- collect the water sample as soon as practical (not more than 48 hours) after purging starting at the least contaminated and proceeding to the most contaminated;
- lift tubing and check valve off bottom of well to avoid introducing unnecessary sediment into the sample and transfer some representative sample water into a clean, well rinsed container to conduct measurements of field parameters;
- lift the tubing and gently transfer a sample into a clean container and thoroughly mix to form a single representative sample;
- transfer the sample into a pre-labelled sample bottle;
- for samples that require filtering, attach the disposable filter onto the end of the tubing (a 0.45 micron membrane filter should be used);
- attempt to keep sample agitation to a minimum during sample transfer;
- store samples in a cooler, with ice packs to keep cool;
- conduct field measurements (these typically include: temperature, pH and conductivity; and
- transport samples to laboratory within the maximum hold time established by the laboratory (typically within a 48 hour period).

Volatile Organic Compound (VOC) Sampling

Volatile Organic Compounds (VOC) can be easily lost during sample collection, storage, and transportation. The following sampling and handling protocols are adhered to.

VOC samples are to be collected in special containers provided by the laboratory. These typically include: glass vials, preferably amber, with a minimum capacity of 20 ml and sealed with Septum tops.

- vials must be filled just to overflowing in such a manner that no air bubbles pass through the vial as it is being filled (this is easier to accomplish by inserting a 4' length of ¼ " poly tubing into the existing wattera tubing and filling the vial from the ¼" tubing);
- vials must then be sealed with the cap so that no air bubbles are entrapped within it; the septum is placed with the Teflon side face down toward the inside of the bottle;
- check for the presence of air bubbles by inverting the vial and tapping on hard surface; if air bubbles are present, discard the sample and re-sample;
- all VOC samples must be preserved as specified by the laboratory (typically with 1 to 2 drops of Hydrochloric Acid (HCl)) and refrigerated or stored on ice until analysed; and
- VOC samples should be submitted in duplicate.

SURFACE WATER SAMPLING (GENERAL)

Surface water samples should be collected at the same designated location during each sample event (*do not collect samples from any station which is frozen, stagnant or otherwise not representative of normal conditions).*

- if you must stand in the stream, position yourself downstream of the sample location to avoid contaminating the sample with sediment, debris, and other floating materials;
- all equipment must be thoroughly rinsed with distilled water at the beginning of each station to avoid cross-contamination;
- wear gloves to handle the sample bottles;
- fill all bottles using an unpreserved transfer bottle (to avoid overflowing pre-preserved bottles);
- when sampling for dissolved metals, the sample must be filtered and placed in a separate metals bottle, while sampling for total metals, the sample is placed in a common bottle for metals that is provided by the laboratory;
- label and store all samples in the same manner as for groundwater samples; and
- conduct field measurements (these typically include: temperature, pH, conductivity, Dissolved Oxygen and Flow).

Flow Measurements (General)

- Discharge flow measurements must be taken at designated stations.

QA/QC Water Samples

A field quality assurance and quality control program for all monitoring events will be established as follows:

- where groundwater or surface water samples are taken, a field blank in which a set of sample bottles is filled with distilled water at a known site or monitoring station is submitted to the laboratory for analysis along with the samples;
- where VOC samples are taken, a trip blank, in which 1 set of VOC vials are filled with distilled water (at the laboratory or office) prior to going to the field and accompanies the sample bottles until they are returned to the lab; and
- duplicate of at least one sample set per sampling event or 1 duplicate for every 10 groundwater samples (do not identify the well number to the laboratory, but have it recorded in the field notes) use the sampling technique as for observation wells.

SAMPLING

Station Sampling Order

The stations will be sampled beginning with those wells exhibiting the lowest chemical concentrations and then moving on to wells with greater chemical concentrations.

Monitoring Periods

The monitoring periods are as recommended in either the annual report or the Certificate of Approval.:

Analytical Parameters

Analysis will be as recommended in either the annual report or the Certificate of Approval.

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-1					
Date>		May-95	Sep-95	Jun-96	Oct-96	Oct-97	Oct-98
Parameters	ODWQS						Destroyed
Alkalinity ($CaCO_3$)	30-500	168	166	172			
Aluminum	0.1	<0.030	0.09	0.31			
Arsenic	0.025						
Barium	1	0.12	0.11	0.12			
Beryllium		<0.010	<0.010	<0.010			
Boron	5	0.01	<0.010	<0.010			
Cadmium	0.005	<0.0050	<0.0050	<0.0050			
Calcium		58	51	56			
Chloride	250	3	3	3	NS	NS	
Chromium	0.05	<0.0100	<0.0100	<0.0100			
Cobalt		<0.0100	<0.0100	<0.0100			
BOD							
COD		<3	3	5			
Conductivity (µS/cm)		290	310	230			
Copper	1	<0.0050	<0.0050	<0.0050			
DOC	5	0.6	0.7	1.1			
Hardness ($CaCO_3$)	80-100	194	173	189			
Iron	0.3	0.07	0.15	0.13			
Lead	0.01	<0.0020	<0.0020	<0.0020			
Magnesium		12	11	12			
Manganese	0.05	0.01	<0.010	<0.010			
Mercury							
Molybdenum		<0.010	<0.010	0.04			
Nickel		<0.010	<0.010	0.04			
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.21	0.23	0.2			
pH (Unitless)	6.5-8.5	7.9	8	6.4			
Phenols		<0.100	<0.100				
Total Phosphorus							
Potassium		2	2	2			
Silicon		5.2	5	5.9			
Silver		<0.01000	<0.01000	<0.01000			
Sodium	200	2	2	2			
Strontium		0.14	0.121	0.142			
Sulphate	500	27	25	26			
Sulphur		8	8	9			
Total Sus. Solids							
TDS	500	224	220	224			
Temperature (°C)	15	9	8.5	6			
Thallium		<0.05000	<0.05000	<0.20000			
Tin		<0.050	<0.050	<0.050			
Titanium		<0.010	<0.010	0.01			
TKN							
Vanadium		<0.0100	<0.0100	0.02			
Zinc	5	<0.010	<0.010	<0.010			
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-2					
Date>		May-95	Sep-95	Jun-96	Oct-96	Oct-97	Oct-98
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	351	273	316		300	278
Aluminum	0.1	<0.030	0.12	0.35			
Arsenic	0.025						
Barium	1	0.53	0.35	0.42		0.41	0.39
Beryllium		<0.010	<0.010	<0.010			
Boron	5	0.02	0.01	0.02		0.01	<0.010
Cadmium	0.005	<0.0050	<0.0050	<0.0050			
Calcium		116	71	94			
Chloride	250	12	7	2	NS	3	3
Chromium	0.05	<0.0100	<0.0100	<0.0100			
Cobalt		0.01	<0.0100	<0.0100			
BOD							
COD		<3	7	5		5	5
Conductivity (µS/cm)		675	410	420		460	420
Copper	1	<0.0050	<0.0050	<0.0050			
DOC	5	1.8	3.1	3		2.1	2
Hardness ($CaCO_3$)	80-100	368	227	301		288	302
Iron	0.3	0.08	0.23	0.02		0.24	0.09
Lead	0.01	<0.0020	<0.0020	<0.0020			
Magnesium		19	12	16			
Manganese	0.05	3.68	2.85	2.24		2.17	1.59
Mercury							
Molybdenum		<0.010	<0.010	<0.030			
Nickel		0.01	<0.010	0.04			
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.33	<0.10	<0.10		<0.10	<0.10
pH (Unitless)	6.5-8.5	7.4	7.5	6.4		7.1	7.2
Phenols							
Total Phosphorus							
Potassium		3	3	4		3	2
Silicon		5.9	5.8	6.5			
Silver		<0.01000	<0.01000	<0.01000			
Sodium	200	6	7	5		6	2
Strontium		0.282	0.194	0.267		0.236	0.199
Sulphate	500	16	12	10		6	12
Sulphur		5	4	4			
Total Sus. Solids							
TDS	500	420	324	348		352	328
Temperature (°C)	15	8.5	12	10		9	8
Thallium		<0.05000	<0.05000	<0.20000			
Tin		<0.050	<0.050	<0.050			
Titanium		<0.010	<0.010	0.01			
TKN							
Vanadium		<0.0100	<0.0100	0.01			
Zinc	5	<0.010	<0.010	<0.010			
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-2					
Date>		Oct-99	Oct-00	Oct-01	Oct-02	Oct-03	Oct-04
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	376	341	243	268	239	257
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.52	0.34	0.31	0.34	0.36	0.2
Beryllium							
Boron	5	<0.010	<0.010	0.01	<0.050	0.01	<0.005
Cadmium	0.005						
Calcium		133	113	75	88	83	83.6
Chloride	250	4	4	3	4	3	18.9
Chromium	0.05						
Cobalt							
BOD							
COD		5	19	5	<5	<5	11
Conductivity (µS/cm)		400	600	650	450	495	505
Copper	1						
DOC	5	2	2.3	0.5	1.2	1.4	2
Hardness ($CaCO_3$)	80-100	402	348	237	277	261	260
Iron	0.3	0.26	0.24	0.03	<0.01	0.1	<0.03
Lead	0.01						
Magnesium		17	16	12	14	13	12.3
Manganese	0.05	1.59	1.44	0.6	0.716	0.434	0.342
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.1	<0.10	<0.10	0.1	<0.10	1
pH (Unitless)	6.5-8.5	7.4	7.2	7.3	7.3	7.1	7.2
Phenols							
Total Phosphorus							
Potassium		3	3	2	2	3	1.8
Silicon							
Silver							
Sodium	200	4	5	<2.0	3	4	10
Strontium		0.247	0.172	0.146	0.157	0.16	0.105
Sulphate	500	14	15	17	18	28	14.4
Sulphur							
Total Sus. Solids							
TDS	500	388	380	300	340	311	306
Temperature (°C)	15	10	10	10	11	8	14
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-2					
Date>		Dec-05	Oct-06	Nov-07	Oct-08	Nov-09	Nov-10
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	204	294	242	311	351	338
Aluminum	0.1						
Arsenic	0.025					<0.001	
Barium	1	0.11	0.48			0.4	0.38
Beryllium							
Boron	5	<0.020	<0.010	0.01	0.01	<0.01	<0.01
Cadmium	0.005					<0.0001	
Calcium		62	100		108	112	122
Chloride	250	4	3	3	3	3	3
Chromium	0.05					0.001	
Cobalt							
BOD						1	
COD		<4	<5	<5	8	20	8
Conductivity (µS/cm)		1010	520		592	661	650
Copper	1			0.004	0.004	0.001	
DOC	5	0.8	2.6			1.9	1.8
Hardness ($CaCO_3$)	80-100	210	307.00		322.45	336.53	371
Iron	0.3	<0.02	0.04	<0.03	<0.03	<0.03	<0.03
Lead	0.01					<0.001	
Magnesium		13	14	11	13	14	16
Manganese	0.05	<0.010	1.11	0.45	0.23	0.14	0.20
Mercury						<0.0001	
Molybdenum							
Nickel							
N-NH-3 (Ammonia)					<0.02	0.02	<0.02
N-NO2 (Nitrite)					<0.10	<0.10	
N-NO3 (Nitrate)	10	0.2	<0.10	0.11	0.11	<0.10	<0.10
pH (Unitless)	6.5-8.5	6.8	7.3			7.51	7.88
Phenols					<0.001	<0.001	
Total Phosphorus						0.94	
Potassium		2	2	2	2	2	2
Silicon							
Silver							
Sodium	200	2.8	5	5	3	3	3
Strontium		0.14	0.206	0.154	0.174	0.197	0.212
Sulphate	500	24	17	11	17	17	18
Sulphur							
Total Sus. Solids						483	
TDS	500	242	371	302	385	430	422
Temperature (°C)	15	6	7				
Thallium							
Tin							
Titanium							
TKN					0.14	<0.10	<0.10
Vanadium							
Zinc	5					<0.01	
Ion Balance					1.00		1.05
Field Parameters							
Temperature (°C)					10.6	9.6	9.8
pH (Unitless)					7.10	9.21	6.5
Conductivity (µS/cm)					587	671	683

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-2					
Date>		Oct-11	Feb-12	Oct-12	Nov-13	Oct-14	Oct-15
Parameters	ODWQS	Sample	re-sample				
Alkalinity ($CaCO_3$)	30-500	Lost in	367	320	339	311	296
Aluminum	0.1	Transit					
Arsenic	0.025						
Barium	1		0.34	0.41	0.33		0.252
Beryllium							
Boron	5		0.01	<0.01	<0.01		< 0.005
Cadmium	0.005					< 0.00002	
Calcium			121	112	126	105	91.5
Chloride	250		2	3	3	3.5	3.5
Chromium	0.05						
Cobalt							
BOD							
COD			<5	<5	<5	39	10
Conductivity (µS/cm)			676	603	642	587	
Copper	1						
DOC	5		1.8	1.3	0.9	3	1
Hardness ($CaCO_3$)	80-100		376	350	401	339	299
Iron	0.3		<0.03	0.22	0.04	0.08	0.005
Lead	0.01						
Magnesium			18	17	21	19.1	17.1
Manganese	0.05		0.22	0.47	0.19	0.233	0.089
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10		<0.10	<0.10	<0.10	0.2	0.1
pH (Unitless)	6.5-8.5		7.64	7.87	7.57		7.85
Phenols							
Total Phosphorus							
Potassium			2	2	2	1.8	1.5
Silicon							
Silver							
Sodium	200		3	3	3	3.1	2.6
Strontium			0.209	0.204	0.194	0.202	0.171
Sulphate	500		16	18	18	16	17
Sulphur							
Total Sus. Solids							
TDS	500		439	392	417	336	366
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance						0.953	1.04
Field Parameters							
Temperature (°C)		8.5	8.3	8.8	8.7	9.3	9.6
pH (Unitless)		7.1	7.3	7.2	7.50	7.0	7.3
Conductivity (µS/cm)		692	687	680	656	576	508

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-2					
Date>		Sep-16	Oct-17	Nov-18	Oct-19	Sep-20	Nov-21
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	321	597	344	488	383	336
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.238	0.57	0.338	0.458	0.309	0.25
Beryllium							
Boron	5	0.007	0.051	0.006	0.018	0.015	<0.01
Cadmium	0.005						
Calcium		91	193	128	151	125	101
Chloride	250	3.3	1	2.9	1.6	2.7	2
Chromium	0.05						
Cobalt							
BOD							
COD		< 5	< 5	7	70	5	<5
Conductivity (µS/cm)		593	1050	719	885		619
Copper	1						
DOC	5	1.1	6.1	3.3	5.1	1.6	1.7
Hardness ($CaCO_3$)	80-100	303	624	423	509	441	326
Iron	0.3	< 0.005	0.164	0.042	< 0.005	0.02	<0.03
Lead	0.01						
Magnesium		18.2	34.5	25	31.9	24	18
Manganese	0.05	0.072	0.318	0.177	0.277	0.142	0.07
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.2	0.12	1.31	1.11	0.53	<0.10
pH (Unitless)	6.5-8.5	7.87	7.55	7.96	7.77	7.79	7.61
Phenols							
Total Phosphorus							
Potassium		1.2	1.9	1.8	2	1.6	1
Silicon							
Silver							
Sodium	200	3.2	7.1	6.1	7.3	5.1	3
Strontium		0.155	0.342	0.245	0.314	0.244	0.207
Sulphate	500	16	3	16	9	13	14
Sulphur							
Total Sus. Solids							
TDS	500	398	599	387	495	402	402
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance				0.844	0.953	0.949	
Field Parameters							
Temperature (°C)		9.8	9	8.9	8.9	8.7	9.0
pH (Unitless)		7	7	7	7.2	6.8	6.8
Conductivity (µS/cm)		642	911	487	897	772	611

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-2					
Date>		Oct-22	Sep-23				
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	326	357				
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.27	<0.01				
Beryllium							
Boron	5	<0.01	<0.01				
Cadmium	0.005						
Calcium		103	107				
Chloride	250	2	1				
Chromium	0.05						
Cobalt							
BOD							
COD		< 5	<5				
Conductivity (µS/cm)		614	597				
Copper	1						
DOC	5	1.8	1.5				
Hardness ($CaCO_3$)	80-100	331	345				
Iron	0.3	<0.03	<0.03				
Lead	0.01						
Magnesium		18	19				
Manganese	0.05	0.04	<0.01				
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.1	<0.1				
pH (Unitless)	6.5-8.5	7.37	7.43				
Phenols							
Total Phosphorus							
Potassium		1	2				
Silicon							
Silver							
Sodium	200	3	3				
Strontium		0.21	<0.001				
Sulphate	500	10	10				
Sulphur							
Total Sus. Solids							
TDS	500	399	388				
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)		8.9	12.3				
pH (Unitless)		7.1	7.2				
Conductivity (µS/cm)		640	680				

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-3					
Date>		May-95	Sep-95	Jun-96	Oct-96	Oct-97	Oct-98
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	136	115	90	132	124	141
Aluminum	0.1	0.17	0.21	0.4	0.14		
Arsenic	0.025						
Barium	1	0.19	0.13	0.11	0.13	0.07	0.09
Beryllium		<0.010	<0.010	<0.010	<0.010		
Boron	5	0.11	0.07	<0.010	0.01	0.04	<0.010
Cadmium	0.005	<0.0050	<0.0050	<0.0050	<0.0050		
Calcium		54	34	30	47		
Chloride	250	149	116	74	108	23	67
Chromium	0.05	<0.0100	<0.0100	<0.0100	<0.0100		
Cobalt		<0.0100	<0.0100	<0.0100	0.01		
BOD							
COD		46	53	45	59	37	53
Conductivity (µS/cm)		725	600	390	520	300	440
Copper	1	<0.0050	<0.0050	0.015	0.006		
DOC	5	16.7	16.5	15	21.1	11.4	17
Hardness ($CaCO_3$)	80-100	205	130	120	183	122	192
Iron	0.3	40.7	36.4	33	26.6	19.1	23.7
Lead	0.01	<0.0020	<0.0020	<0.0020	<0.0020		
Magnesium		17	11	11	16		
Manganese	0.05	1.07	0.75	0.65	0.69	0.42	0.66
Mercury							
Molybdenum		<0.010	<0.010	0.04	<0.030		
Nickel		<0.010	<0.010	0.05	<0.010		
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH (Unitless)	6.5-8.5	6.7	6.4	6.4	6	6.1	6.3
Phenols							
Total Phosphorus							
Potassium		7	6	6	6	4	4
Silicon		7.7	6.7	8.5	8.6		
Silver		<0.01000	<0.01000	<0.01000	<0.00100		
Sodium	200	31	30	25	45	14	22
Strontium		0.29	0.188	0.18	0.201	0.13	0.23
Sulphate	500	5	<3.0	<3.0	<3.0	<3.0	<3.0
Sulphur		2	<3	<3	<3		
Total Sus. Solids							
TDS	500	430	356	280	372	212	320
Temperature (°C)	15	10	10	8	5.5	8	7.5
Thallium		<0.05000	<0.05000	<0.20000	<0.20000		
Tin		<0.050	<0.050	<0.050	<0.050		
Titanium		<0.010	<0.010	0.02	0.01		
TKN							
Vanadium		<0.0100	<0.0100	0.02	0.03		
Zinc	5	<0.010	<0.010	<0.010	<0.010		
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-3					
Date>		Oct-99	Oct-00	Oct-01	Oct-02	Oct-03	Nov-03
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	172	178	167	172	169	
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.11	0.1	0.09	0.08	0.1	
Beryllium							
Boron	5	0.02	0.13	0.05	0.06	0.06	
Cadmium	0.005						
Calcium		49	54	43	42	43	
Chloride	250	91	64	51	43	51	
Chromium	0.05						
Cobalt							
BOD							
COD		57	53	43	43	35	
Conductivity (µS/cm)		320	550	650	480	510	
Copper	1						
DOC	5	18.2	17.1	13.2	15.5	12.5	
Hardness ($CaCO_3$)	80-100	176	201	161	163	157	
Iron	0.3	23.1	26.9	22.3	20.2	15.4	
Lead	0.01						
Magnesium		13	16	13	14	12	
Manganese	0.05	0.6	0.7	0.58	0.476	0.56	
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10	<0.10	
pH (Unitless)	6.5-8.5	6.3	6.2	7.3	6.8	6.9	
Phenols							
Total Phosphorus							
Potassium		5	5	4	4	5	
Silicon							
Silver							
Sodium	200	40	25	25	22	25	
Strontium		0.23	0.258	0.211	0.187	0.22	
Sulphate	500	<3.0	2	2	4	2	
Sulphur							
Total Sus. Solids							
TDS	500	328	340	312	316	317	
Temperature (°C)	15	10	10	10	11	9	
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-3					
Date>		Oct-04	Dec-05	Oct-06	Nov-07	Oct-08	Nov-09
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	167	134	159	168	188	218
Aluminum	0.1						
Arsenic	0.025						<0.001
Barium	1	0.076	0.06	0.08			0.1
Beryllium							
Boron	5	0.048	0.06	0.05	0.04	0.05	0.05
Cadmium	0.005						<0.0001
Calcium		45.5	33	40	50	55	57
Chloride	250	49.4	32	38	29	45	67
Chromium	0.05						0.004
Cobalt							
BOD							6
COD		47	42	34	22	35	43
Conductivity (µS/cm)		515	1110	705	415	503	644
Copper	1				<0.001	<0.001	<0.001
DOC	5	15.2	10.9	14.3			15.5
Hardness ($CaCO_3$)	80-100	164	120	145	182.15	186.37	203.70
Iron	0.3	19.1	15.7	15.9	14.6	18.70	23.2
Lead	0.01						<0.001
Magnesium		12.2	9.17	11	14	12	15
Manganese	0.05	0.506	0.36	0.42	0.43	0.57	0.62
Mercury						<0.0001	<0.0001
Molybdenum							
Nickel							
N-NH-3 (Ammonia)						2.09	2.39
N-NO2 (Nitrite)						<0.10	<0.10
N-NO3 (Nitrate)	10	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10
pH (Unitless)	6.5-8.5	7	6.8	7.4			6.69
Phenols						<0.001	<0.001
Total Phosphorus							0.25
Potassium		3	3	3	3	2	3
Silicon							
Silver							
Sodium	200	22.8	23.1	23	18	21	32
Strontium		0.199	0.14	0.185	0.18	0.18	0.24
Sulphate	500	<0.5	<5.0	3	5	2	5
Sulphur							
Total Sus. Solids							37
TDS	500	298	248	280	270	327	419
Temperature (°C)	15	14	6	6			
Thallium							
Tin							
Titanium							
TKN						3.02	2.51
Vanadium							
Zinc	5						<0.01
Ion Balance						0.93	
Field Parameters							
Temperature (°C)						9.8	8.4
pH (Unitless)						6.30	8.54
Conductivity (µS/cm)						554	724

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-3					
Date>		Nov-10	Oct-11	Oct-12	Nov-13	Oct-14	Oct-15
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	192	218	274	238	278	253
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.10	0.08	0.11	0.10		0.115
Beryllium							
Boron	5	0.05	0.03	0.06	0.05		0.086
Cadmium	0.005					< 0.00002	
Calcium		45	65	71	76	66.6	54.5
Chloride	250	48	36	76	65	76.9	67.7
Chromium	0.05						
Cobalt							
BOD							
COD		48	40	51	48	67	55
Conductivity (µS/cm)		545	512	755	658	734	
Copper	1						
DOC	5	15.9	4.90	16.2	10.1	18.2	14.6
Hardness ($CaCO_3$)	80-100	166	232	256	276	243	202
Iron	0.3	23.40	15.4	22.3	20.2	29.9	24.8
Lead	0.01						
Magnesium		13	17	19	21	18.9	16.1
Manganese	0.05	0.59	0.54	0.70	0.65	0.74	0.607
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)		1.91					
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10	< 0.1	< 0.1
pH (Unitless)	6.5-8.5	7.33	6.86	6.96	6.69		6.86
Phenols							
Total Phosphorus							
Potassium		3	2	3	3	3.8	3.6
Silicon							
Silver							
Sodium	200	32	18	51	41	59.6	53.1
Strontium		0.233	0.235	0.259	0.254	0.279	0.228
Sulphate	500	8	2	<3	<3	< 1	< 1
Sulphur							
Total Sus. Solids							
TDS	500	354	333	491	428	424	438
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN		2.27					
Vanadium							
Zinc	5						
Ion Balance		0.92				0.841	0.893
Field Parameters							
Temperature (°C)		9.2	9.0	10.6	8.4	9.4	9.1
pH (Unitless)		5.52	6.60	5.90	6.60	6.60	6.9
Conductivity (µS/cm)		631	543	778	735	750	640

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-3					
Date>		Oct-15	Sep-16	Oct-17	Nov-18	Oct-19	Sep-20
Parameters	ODWQS	BH 13 Dup					
Alkalinity ($CaCO_3$)	30-500	253	204	194	186	176	238
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.115	0.066	0.083	0.07	0.07	0.092
Beryllium							
Boron	5	0.086	0.05	0.107	0.087	0.06	0.074
Cadmium	0.005						
Calcium		54.4	46.2	48.1	48.3	43.3	64.1
Chloride	250	67.9	32.3	30.5	27.7	25.6	35.8
Chromium	0.05						
Cobalt							
BOD							
COD		50	33	50	39	32	49
Conductivity (µS/cm)			466	471	448	412	
Copper	1						
DOC	5	14.8	10.6	16.4	14.7	12.7	11.3
Hardness ($CaCO_3$)	80-100	202	178	180	180	165	238
Iron	0.3	24.9	14.5	17.5	14.1	12.2	17.90
Lead	0.01						
Magnesium		16	15.3	14.6	14.5	13.9	18.9
Manganese	0.05	0.604	0.462	0.506	0.473	0.403	0.592
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	< 0.1	0.1	< 0.05	< 0.05	0.07	<0.05
pH (Unitless)	6.5-8.5	6.93	7.2	7.34	7.76	7.23	7.32
Phenols							
Total Phosphorus							
Potassium		3.7	2.4	2.8	2.7	2.5	2.9
Silicon							
Silver							
Sodium	200	53.1	22.9	33.1	27.2	23.6	25.4
Strontium		0.232	0.159	0.175	0.179	0.175	0.236
Sulphate	500	< 1	< 1	< 1	< 1	2	<1
Sulphur							
Total Sus. Solids							
TDS	500	432	849	247	233	229	308
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance		0.896			0.926	0.846	0.832
Field Parameters							
Temperature (°C)			9.0	9.3	8.6	8.6	8.6
pH (Unitless)			7.0	6.70	6.54	6.80	6.2
Conductivity (µS/cm)			720	461	369	470	645

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-3					
Date>		Nov-21	Oct-22	Sep-23			
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	264	245	240			
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.1	0.12	0.1			
Beryllium							
Boron	5	0.09	0.08	0.09			
Cadmium	0.005						
Calcium		52	58	48			
Chloride	250	33	34	20			
Chromium	0.05						
Cobalt							
BOD							
COD		39	41	36			
Conductivity (µS/cm)		584	572	501			
Copper	1						
DOC	5	15	15.1	15.0			
Hardness ($CaCO_3$)	80-100	192	211	178			
Iron	0.3	17.9	17.0	15.6			
Lead	0.01						
Magnesium		15	16.0	14.0			
Manganese	0.05	0.54	0.600	0.55			
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	< 0.1	< 0.1			
pH (Unitless)	6.5-8.5	6.88	6.61	6.81			
Phenols							
Total Phosphorus							
Potassium		3	3.0	3.0			
Silicon							
Silver							
Sodium	200	43	28.0	29.0			
Strontium		0.207	0.221	0.203			
Sulphate	500	2	< 1	< 1			
Sulphur							
Total Sus. Solids							
TDS	500	380	372	326			
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)		8.7	8.4	9.7			
pH (Unitless)		6.10	6.9	6.70			
Conductivity (µS/cm)		617	620	610			

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-4					
Date>		May-95	Sep-95	Jun-96	Oct-96	Oct-97	Oct-98
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	176	178	177		171	172
Aluminum	0.1	<0.030	<0.030	0.27			
Arsenic	0.025						
Barium	1	0.1	0.1	0.11		0.06	0.09
Beryllium		<0.010	<0.010	<0.010			
Boron	5	0.01	<0.010	<0.010		<0.010	<0.010
Cadmium	0.005	<0.0050	<0.0050	<0.0050			
Calcium		60	53	57			
Chloride	250	3	3	3	NS	4	4
Chromium	0.05	<0.0100	<0.0100	<0.0100			
Cobalt		<0.0100	<0.0100	<0.0100			
BOD							
COD		<3	5	5		5	<3
Conductivity (µS/cm)		350	320	230		300	290
Copper	1	<0.0050	<0.0050	<0.0050			
DOC	5	0.9	1	1		1.1	1.2
Hardness ($CaCO_3$)	80-100	203	182	192		194	204
Iron	0.3	0.13	0.26	0.16		0.21	0.02
Lead	0.01	<0.0020	<0.0020	<0.0020			
Magnesium		13	12	12			
Manganese	0.05	<0.010	<0.010	<0.010		0.01	<0.010
Mercury							
Molybdenum		<0.010	<0.010	<0.030			
Nickel		0.01	<0.010	0.01			
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.2	0.2	0.2		0.22	0.19
pH (Unitless)	6.5-8.5	7.8	7.6	6.5		7.1	7.4
Phenols							
Total Phosphorus							
Potassium		2	1	2		2	1
Silicon		5.2	5.2	<0.10			
Silver		<0.01000	<0.01000	<0.01000			
Sodium	200	2	2	2		2	2
Strontium		0.145	0.129	0.143		0.129	0.131
Sulphate	500	25	22	25		24	24
Sulphur		8	7	9			
Total Sus. Solids							
TDS	500	232	224	244		236	228
Temperature (°C)	15	8	9	6		7.5	7
Thallium		<0.05000	<0.05000	<0.20000			
Tin		<0.050	<0.050	<0.050			
Titanium		<0.010	<0.010	0.02			
TKN							
Vanadium		<0.0100	<0.0100	<0.0100			
Zinc	5	<0.010	<0.010	<0.010			
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-4					
Date>		Oct-99	Oct-00	Oct-01	Oct-02	Oct-03	Oct-04
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	179	185	181	188	183	197
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.1	0.1	0.11	0.1	0.12	0.115
Beryllium							
Boron	5	<0.010	<0.010	0.02	<0.050	0.02	<0.005
Cadmium	0.005						
Calcium		61	61	56	58	60	63
Chloride	250	4	4	4	4	5	3.5
Chromium	0.05						
Cobalt							
BOD							
COD		5	13	<5	<5	<5	<5
Conductivity (µS/cm)		230	360	385	330	340	400
Copper	1						
DOC	5	1.4	1.1	0.6	0.6	0.5	1
Hardness ($CaCO_3$)	80-100	206	202	181	198	203	211
Iron	0.3	<0.01	0.07	<0.01	<0.01	<0.01	<0.03
Lead	0.01						
Magnesium		13	12	10	13	13	13
Manganese	0.05	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.27	<0.10	0.25	0.24	0.27	0.2
pH (Unitless)	6.5-8.5	7.8	7.6	7.4	7.2	7.1	7.3
Phenols							
Total Phosphorus							
Potassium		1	2	1	2	2	1.4
Silicon							
Silver							
Sodium	200	3	4	3	3	3	2.7
Strontium		0.135	0.132	0.129	0.128	0.151	0.144
Sulphate	500	22	22	21	22	34	24.3
Sulphur							
Total Sus. Solids							
TDS	500	224	228	240	260	258	248
Temperature (°C)	15	8	9	10	11	8	14
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-4					
Date>		Dec-05	Oct-06	Nov-09	Nov-10	Oct-11	Feb-12
Parameters	ODWQS					Sample	re-sample
Alkalinity ($CaCO_3$)	30-500	297	192	196	188	Lost in	194
Aluminum	0.1					Transit	
Arsenic	0.025			<0.001			
Barium	1	0.34	0.12	0.12	0.10		0.12
Beryllium							
Boron	5	<0.020	<0.010	0.01	<0.01		0.01
Cadmium	0.005			<0.0001			
Calcium		91.9	60	60	61		67
Chloride	250	4	4	5	6		6
Chromium	0.05			<0.001			
Cobalt							
BOD				<1			
COD		33	<5	5	13		<5
Conductivity (µS/cm)		980	645	419	417		419
Copper	1			<0.001			
DOC	5	2.4	1.4	2.2	1.4		1.1
Hardness ($CaCO_3$)	80-100	280	203	198.82	206		225
Iron	0.3	0.04	<0.03	<0.03	<0.03		<0.03
Lead	0.01			<0.001			
Magnesium		13.2	13	12	13		14
Manganese	0.05	1.31	<0.010	<0.01	<0.01		0.01
Mercury				<0.0001			
Molybdenum							
Nickel							
N-NH-3 (Ammonia)				0.02	<0.02		
N-NO2 (Nitrite)				<0.1			
N-NO3 (Nitrate)	10	<0.10	0.17	<0.1	0.13		0.13
pH (Unitless)	6.5-8.5	6.9	7.3	7.94	8.14		7.92
Phenols				<0.001			
Total Phosphorus				0.3			
Potassium		2	2	1	1		2
Silicon							
Silver							
Sodium	200	3.8	2	2	3		3
Strontium		0.17	0.146	0.146	0.139		0.156
Sulphate	500	18	31	22	24		23
Sulphur							
Total Sus. Solids				316			
TDS	500	348	265	272	271		272
Temperature (°C)	15	6	7				
Thallium							
Tin							
Titanium							
TKN				<0.10	<0.10		
Vanadium							
Zinc	5			<0.01			
Ion Balance					0.96		
Field Parameters							
Temperature (°C)				7.8	8.3	7.6	7.3
pH (Unitless)				9.3	6.43	7.6	7.7
Conductivity (µS/cm)				437	424	411	436

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-4					
Date>		Oct-12	Nov-13	Oct-14	Oct-14	Oct-15	Sep-16
Parameters	ODWQS				BH 13 DUP		
Alkalinity ($CaCO_3$)	30-500	194	187	183	184	193	204
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.12	0.12			0.117	0.108
Beryllium							
Boron	5	<0.01	<0.01			< 0.005	0.01
Cadmium	0.005			< 0.00002	< 0.00002		
Calcium		71	75	67.7	67.6	65.9	60.7
Chloride	250	8	9	8.1	8.1	8.7	6.9
Chromium	0.05						
Cobalt							
BOD							
COD		<5	<5	< 5	< 5	< 5	< 5
Conductivity (µS/cm)		425	421	406	404		416
Copper	1						
DOC	5	0.9	<0.5	2	1.8	1.1	0.6
Hardness ($CaCO_3$)	80-100	235	253	229	229	223	212
Iron	0.3	0.09	0.07	0.064	0.049	< 0.005	0.012
Lead	0.01						
Magnesium		14	16	14.9	15	14.1	14.6
Manganese	0.05	0.02	<0.01	0.002	0.008	< 0.001	< 0.001
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.13	0.13	0.2	0.2	0.2	0.2
pH (Unitless)	6.5-8.5	8.09	8.01			7.9	8
Phenols							
Total Phosphorus							
Potassium		2	2	1.5	1.6	1.6	1.3
Silicon							
Silver							
Sodium	200	3	3	3.4	3.5	3.1	3.1
Strontium		0.157	0.155	0.158	0.158	0.16	0.138
Sulphate	500	26	25	24	24	25	22
Sulphur							
Total Sus. Solids							
TDS	500	276	274	230	231	277	415
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance				0.919	0.921	1.00	
Field Parameters							
Temperature (°C)		9.3	7.7	7.8		8.7	8.9
pH (Unitless)		7.5	8.0	7.8		7.4	7.6
Conductivity (µS/cm)		407	436	398		384	464

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-4					
Date>		Oct-17	Nov-18	Oct-19	Sep-20	Nov-21	Oct-22
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	196	187	190	186	198	193
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.13	0.125	0.126	0.12	0.13	0.15
Beryllium							
Boron	5	0.013	< 0.005	0.012	0.013	0.01	<0.01
Cadmium	0.005						
Calcium		67.9	66.5	64.8	65.4	65	65
Chloride	250	5.5	7.3	7.6	7.9	11	11
Chromium	0.05						
Cobalt							
BOD							
COD		< 5	< 5	< 5	<5	<5	<5
Conductivity (µS/cm)		431	429	426		331	440
Copper	1						
DOC	5	1.5	1.5	3	0.8	1.4	1.5
Hardness ($CaCO_3$)	80-100	231	226	224	221	216	216
Iron	0.3	< 0.005	< 0.005	0.009	0.02	<0.03	<0.03
Lead	0.01						
Magnesium		14.8	14.6	15	13.9	13	13
Manganese	0.05	0.001	< 0.001	< 0.001	<0.001	<0.01	<0.01
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.06	0.08	0.15	0.08	<0.10	0.12
pH (Unitless)	6.5-8.5	8.12	8.27	8.04	8.09	7.89	7.7
Phenols							
Total Phosphorus							
Potassium		1.5	1.6	1.5	1.5	2	2
Silicon							
Silver							
Sodium	200	2.9	3.6	3.4	3.4	4	4
Strontium		0.151	0.158	0.163	0.153	0.162	0.16
Sulphate	500	15	20	17	20	22	23
Sulphur							
Total Sus. Solids							
TDS	500	226	226	223	225	215	286
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance			0.93	0.940	0.958		
Field Parameters							
Temperature (°C)		8.3	7.7	7.9	8.4	7.7	7.8
pH (Unitless)		7.9	7.3	7.8	7.2	7.3	7.5
Conductivity (µS/cm)		373	331	438	444	436	440

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-4					
Date>		Sep-23					
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	213					
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.15					
Beryllium							
Boron	5	0.01					
Cadmium	0.005						
Calcium		67					
Chloride	250	10					
Chromium	0.05						
Cobalt							
BOD							
COD		< 5					
Conductivity (µS/cm)		431					
Copper	1						
DOC	5	1.1					
Hardness ($CaCO_3$)	80-100	225					
Iron	0.3	<0.03					
Lead	0.01						
Magnesium		14					
Manganese	0.05	<0.01					
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.13					
pH (Unitless)	6.5-8.5	7.77					
Phenols							
Total Phosphorus							
Potassium		1					
Silicon							
Silver							
Sodium	200	4					
Strontium		0.178					
Sulphate	500	22					
Sulphur							
Total Sus. Solids							
TDS	500	280					
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)		8.5					
pH (Unitless)		7.4					
Conductivity (µS/cm)		500					

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5A	Deep				
Date>		Sep-95	Jun-96	Oct-96	Oct-97	Oct-98	Oct-99
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	343	366	321	402	390	406
Aluminum	0.1	0.05	0.5	0.18			
Arsenic	0.025						
Barium	1	0.29	0.57	0.29	0.42	0.45	0.49
Beryllium		<0.010	<0.010	<0.010			
Boron	5	0.11	0.15	0.09	0.1	0.1	0.11
Cadmium	0.005	<0.0050	<0.0050	<0.0050			
Calcium		90	107	107			131
Chloride	250	18	24	20	26	29	22
Chromium	0.05	<0.0100	<0.0100	<0.0100			
Cobalt		<0.0100	<0.0100	0.01			
BOD							
COD		8	16	5	21	18	16
Conductivity (µS/cm)		750	600	500	860	790	470
Copper	1	<0.0050	<0.0050	<0.0050			
DOC	5	4.2	6.1	4.2	6.5	5.4	4.2
Hardness ($CaCO_3$)	80-100	311	366	374	395	409	435
Iron	0.3	0.64	2.33	0.49	1.49	0.44	0.56
Lead	0.01	<0.0020	<0.0020	<0.0020			
Magnesium		21	24	26			26
Manganese	0.05	0.35	0.41	0.4	0.47	0.45	0.49
Mercury							
Molybdenum		<0.010	<0.030	<0.030			
Nickel		<0.010	0.05	<0.010			
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	0.17	<0.10	<0.10
pH (Unitless)	6.5-8.5	7.3	6.4	6.3	7	7.2	7.1
Phenols							
Total Phosphorus							
Potassium		5	12	8	12	12	12
Silicon		6.2	7.6	6.9			
Silver		<0.01000	<0.01000	<0.00100			
Sodium	200	18	16	14	19	17	20
Strontium		0.208	0.261	0.198	0.263	0.263	0.34
Sulphate	500	28	44	36	36	38	25
Sulphur		9	16	11			
Total Sus. Solids							
TDS	500	432	468	408	520	500	460
Temperature (°C)	15	9	7	5	7.5	6.5	7
Thallium		<0.05000	<0.20000	<0.20000			
Tin		<0.050	<0.050	<0.050			
Titanium		<0.010	0.01	0.02			
TKN							
Vanadium		<0.0100	<0.0100	0.02			
Zinc	5	<0.010	<0.010	<0.010			
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5A	Deep				
Date>		Oct-00	Oct-01	Oct-02	Oct-03	Nov-03	Oct-04
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	430	414	388	383		430
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.36	0.4	0.38	0.42		0.377
Beryllium							
Boron	5	0.09	0.08	0.06	0.09		0.078
Cadmium	0.005						
Calcium		131	104	106	124		117
Chloride	250	24	18	18	30		32.6
Chromium	0.05						
Cobalt							
BOD							
COD		21	11	<5	6		19
Conductivity (µS/cm)		620	650	540	500		520
Copper	1						
DOC	5	5.1	4.6	3.6	3.3		6.3
Hardness ($CaCO_3$)	80-100	426	375	372	408		398
Iron	0.3	1.83	0.93	0.78	1.05		1.73
Lead	0.01						
Magnesium		24	28	26	24		25.3
Manganese	0.05	0.37	0.65	0.752	0.929		0.997
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10		<0.20
pH (Unitless)	6.5-8.5	7	7	6.8	6.9		7
Phenols							
Total Phosphorus							
Potassium		15	12	11	10		6.2
Silicon							
Silver							
Sodium	200	19	14	15	21		16.4
Strontium		0.244	0.232	0.221	0.26		0.258
Sulphate	500	20	19	21	28		25.7
Sulphur							
Total Sus. Solids							
TDS	500	516	508	510	528		518
Temperature (°C)	15	9	10	10	8		14
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5A	Deep				
Date>		Dec-05	Oct-06	Nov-07	Oct-08	Nov-09	Nov-10
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	396	373	399	330	331	347
Aluminum	0.1						
Arsenic	0.025					<0.001	
Barium	1	0.37	0.39			0.35	0.35
Beryllium							
Boron	5	0.12	0.07	0.16	0.11	0.1	0.08
Cadmium	0.005					<0.0001	
Calcium		109	111	122	102	85	91
Chloride	250	24	20	23	14	11	12
Chromium	0.05					0.001	
Cobalt							
BOD						4	
COD		21	7	<5	15	10	10
Conductivity (µS/cm)		900	510	817	686	684	771
Copper	1			0.007	0.003	0.003	
DOC	5	4.5	6.7			4	4.2
Hardness ($CaCO_3$)	80-100	370	368	402.61	336.34	289.89	318
Iron	0.3	1.04	1.14	1.18	1.53	1.16	1.02
Lead	0.01					<0.001	
Magnesium		23.5	22	24	20	19	22
Manganese	0.05	1.14	1.27	1.26	1.12	1.05	1.18
Mercury						<0.0001	
Molybdenum							
Nickel							
N-NH-3 (Ammonia)					0.65	0.73	0.74
N-NO2 (Nitrite)					<0.10	<0.10	
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH (Unitless)	6.5-8.5	7	7.1			7.6	8.03
Phenols					<0.001	<0.001	
Total Phosphorus						0.07	
Potassium		8	7	8	8	9	9
Silicon							
Silver							
Sodium	200	20.6	19	22	17	17	12
Strontium		0.23	0.242	0.259	0.211	0.224	0.235
Sulphate	500	26	24	31	30	28	28
Sulphur							
Total Sus. Solids						94	
TDS	500	482	501	531	446	445	462
Temperature (°C)	15	6	7				
Thallium							
Tin							
Titanium							
TKN					0.78	0.83	0.72
Vanadium							
Zinc	5					<0.01	
Ion Balance					1.01		0.91
Field Parameters							
Temperature (°C)					8.2	8.7	8.4
pH (Unitless)					6.90	8.9	6.91
Conductivity (µS/cm)					688	691	722

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5A	Deep				
Date>		Oct-11	Oct-12	Nov-13	Oct-14	Oct-15	Sep-16
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	357	360	350	324	359	359
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.35	0.38	0.37		0.33	0.302
Beryllium							
Boron	5	0.07	0.07	0.07		0.056	0.068
Cadmium	0.005				0.00005		
Calcium		111	110	119	101	102	95.9
Chloride	250	12	11	12	11.3	12.6	12.3
Chromium	0.05						
Cobalt							
BOD							
COD		8	<5	7	< 5	6	12
Conductivity (µS/cm)		698	711	715	657		695
Copper	1						
DOC	5	2.4	3	2.4	4.7	2.8	2.4
Hardness ($CaCO_3$)	80-100	372	374	404	344	347	334
Iron	0.3	0.92	0.98	1.31	0.546	0.59	0.396
Lead	0.01						
Magnesium		23	24	26	22.7	22.3	22.8
Manganese	0.05	1.45	1.74	1.69	1.83	1.7	1.6
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	< 0.1	< 0.1	0.1
pH (Unitless)	6.5-8.5	7.4	7.81	7.48		7.78	7.84
Phenols							
Total Phosphorus							
Potassium		10	9	10	10.3	8.4	8
Silicon							
Silver							
Sodium	200	14	10	14	11.3	10.9	11.9
Strontium		0.251	0.256	0.244	0.248	0.248	0.211
Sulphate	500	25	26	24	24	25	25
Sulphur							
Total Sus. Solids							
TDS	500	454	462	465	377	458	466
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance					0.941	1.04	
Field Parameters							
Temperature (°C)		8.5	8.8	7.8	8.8	8.6	8.8
pH (Unitless)		7.2	7.0	7.3	7.2	7.2	7.2
Conductivity (µS/cm)		704	682	740	638	624	756

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5A	Deep				
Date>		Oct-17	Nov-18	Oct-19	Sep-20	Nov-21	Oct-22
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	374	298	345	322	323	318
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.401	0.326	0.369	0.325	0.34	0.36
Beryllium							
Boron	5	0.122	0.108	0.132	0.107	0.08	0.07
Cadmium	0.005						
Calcium		122	96.8	97.6	93.7	93	94
Chloride	250	11.1	11.8/	13	10.7	13	11
Chromium	0.05						
Cobalt							
BOD							
COD		7	< 5	7	<5	<5	5
Conductivity (µS/cm)		773	652	702		651	650
Copper	1						
DOC	5	4.9	3.8	5.8	2.4	2.7	2.8
Hardness ($CaCO_3$)	80-100	413	327	343	321	315	317
Iron	0.3	0.592	0.741	0.767	0.69	0.91	0.66
Lead	0.01						
Magnesium		26.2	20.6	24	21	20	20
Manganese	0.05	1.98	1.38	1.34	1.37	1.54	1.53
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	< 0.05	< 0.05	0.15	<0.05	<0.01	<0.01
pH (Unitless)	6.5-8.5	7.86	8.17	7.8	7.82	7.6	7.35
Phenols							
Total Phosphorus							
Potassium		8.6	8.2	11.3	9.4	9	8
Silicon							
Silver							
Sodium	200	12.2	12.7	13.8	11	9	8
Strontium		0.268	0.238	0.271	0.24	0.246	0.25
Sulphate	500	24	31	26	28	26	24
Sulphur							
Total Sus. Solids							
TDS	500	431	362	395	369	423	422
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance			0.942	0.998	1.02		
Field Parameters							
Temperature (°C)		8.6	8.5	8.4	8.5	8.0	8.2
pH (Unitless)		7.3	7.0	7.4	6.9	7.0	7.1
Conductivity (µS/cm)		671	458	714	681	653	650

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5A	Deep				
Date>		Sep-23					
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	342					
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.37					
Beryllium							
Boron	5	0.09					
Cadmium	0.005						
Calcium		92					
Chloride	250	9					
Chromium	0.05						
Cobalt							
BOD							
COD		12					
Conductivity (µS/cm)		639					
Copper	1						
DOC	5	2.4					
Hardness ($CaCO_3$)	80-100	312					
Iron	0.3	0.75					
Lead	0.01						
Magnesium		20					
Manganese	0.05	1.64					
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.1					
pH (Unitless)	6.5-8.5	7.53					
Phenols							
Total Phosphorus							
Potassium		8					
Silicon							
Silver							
Sodium	200	10					
Strontium		0.258					
Sulphate	500	22					
Sulphur							
Total Sus. Solids							
TDS	500	415					
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)		9.4					
pH (Unitless)		6					
Conductivity (µS/cm)		710					

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5B	Shallow				
Date>		Sep-95	Jun-96	Oct-96	Oct-97	Oct-98	Oct-99
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	352	433	401	405	456	417
Aluminum	0.1	<0.030	0.56	<0.030			
Arsenic	0.025						
Barium	1	0.14	0.14	0.11	0.13	0.13	0.15
Beryllium		<0.010	<0.010	<0.010			
Boron	5	0.12	0.16	0.23	0.1	0.22	0.25
Cadmium	0.005	<0.0050	<0.0050	<0.0050			
Calcium		115	136	119			147
Chloride	250	60	77	56	67	89	43
Chromium	0.05	<0.0100	<0.0100	<0.0100			
Cobalt		<0.0100	<0.0100	<0.0100			
BOD							
COD		16	21	5	16	8	19
Conductivity (µS/cm)		900	790	680	920	1000	615
Copper	1	<0.0050	<0.0050	0.005			
DOC	5	7	8.2	6.2	7.2	5.6	6.6
Hardness ($CaCO_3$)	80-100	411	479	433	434	467	487
Iron	0.3	0.1	0.31	0.02	0.13	<0.01	<0.01
Lead	0.01	<0.0020	<0.0020	<0.0020			
Magnesium		30	34	33			29
Manganese	0.05	0.01	0.02	0.02	0.02	<0.010	0.02
Mercury							
Molybdenum		<0.010	<0.030	<0.030			
Nickel		<0.010	<0.010	<0.010			
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.82	1.39	0.56	0.62	0.28	0.77
pH (Unitless)	6.5-8.5	7.3	6.4	6.1	7.2	7	7.1
Phenols							
Total Phosphorus							
Potassium		6	9	9	10	14	4
Silicon		4.3	4.7	4.6			
Silver		<0.01000	<0.01000	<0.00100			
Sodium	200	21	36	54	38	59	28
Strontium		0.282	0.308	0.221	0.275	0.289	0.299
Sulphate	500	45	65	49	56	47	38
Sulphur		20	24	15			
Total Sus. Solids							
TDS	500	544	712	568	620	684	520
Temperature (°C)	15	9	7	4.5	7	7	8
Thallium		0.13	<0.20000	<0.20000			
Tin		<0.050	<0.050	<0.050			
Titanium		<0.010	0.01	0.02			
TKN							
Vanadium		<0.0100	<0.0100	0.01			
Zinc	5	<0.010	<0.010	<0.010			
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5B	Shallow				
Date>		Oct-00	Oct-01	Oct-02	Oct-03	Nov-03	Oct-04
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	434	415	434	417		417
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.13	0.11	0.1	0.12		0.118
Beryllium							
Boron	5	0.2	0.22	0.39	0.39		0.223
Cadmium	0.005						
Calcium		112	103	100	102		105
Chloride	250	42	65	86	88		57.1
Chromium	0.05						
Cobalt							
BOD							
COD		19	24	10	11		13
Conductivity (µS/cm)		700	680	860	880		900
Copper	1						
DOC	5	5	8.5	5.6	4.7		4.8
Hardness ($CaCO_3$)	80-100	387	381	349	341		373
Iron	0.3	0.06	<0.01	0.02	<0.01		<0.03
Lead	0.01						
Magnesium		26	30	24	21		26.8
Manganese	0.05	0.02	0.05	0.062	0.078		0.14
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	0.28	0.47	0.35		0.2
pH (Unitless)	6.5-8.5	7	7.1	7.2	7.2		7.1
Phenols							
Total Phosphorus							
Potassium		11	9	12	17		12.8
Silicon							
Silver							
Sodium	200	73	62	102	117		53.1
Strontium		0.232	0.219	0.212	0.224		0.249
Sulphate	500	37	36	42	69		31
Sulphur							
Total Sus. Solids							
TDS	500	572	600	728	722		544
Temperature (°C)	15	11	11	12	9		14
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5B	Shallow				
Date>		Dec-05	Oct-06	Nov-07	Oct-08	Nov-09	Nov-10
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	456	406	441	416	401	405
Aluminum	0.1						
Arsenic	0.025					<0.001	
Barium	1	0.16	0.14			0.1	0.09
Beryllium							
Boron	5	0.15	0.13	0.27	0.2	0.16	0.11
Cadmium	0.005					<0.0001	
Calcium		132	119	126	111	114	129
Chloride	250	91	51	26	17	14	16
Chromium	0.05					0.002	
Cobalt							
BOD						<1	
COD		23	<5	<5	13	5	15
Conductivity (µS/cm)		825	395	897	829	819	822
Copper	1			0.006	0.002	0.002	
DOC	5	5.3	5.2			4.1	3.6
Hardness ($CaCO_3$)	80-100	470	408	429.04	375.22	366.22	425
Iron	0.3	<0.02	<0.03	0.04	<0.03	<0.03	<0.03
Lead	0.01					<0.001	
Magnesium		33.8	27	28	24	20	25
Manganese	0.05	0.23	0.22	0.25	0.27	0.34	0.31
Mercury						<0.0001	
Molybdenum							
Nickel							
N-NH-3 (Ammonia)					0.27	0.18	0.22
N-NO2 (Nitrite)					<0.10	<0.10	
N-NO3 (Nitrate)	10	1.1	0.49	<0.10	<0.10	0.14	<0.10
pH (Unitless)	6.5-8.5	7	7.3			7.51	7.94
Phenols					<0.001		
Total Phosphorus						0.09	
Potassium		15	11	11	11	7	8
Silicon							
Silver							
Sodium	200	41.2	31	42	31	24	16
Strontium		0.3	0.277	0.254	0.223	0.261	0.243
Sulphate	500	40	29	34	30	34	34
Sulphur							
Total Sus. Solids						116	
TDS	500	688	609	583	539	532	534
Temperature (°C)	15	6	5				
Thallium							
Tin							
Titanium							
TKN					0.41	0.34	0.40
Vanadium							
Zinc	5					<0.01	
Ion Balance					0.97		1.02
Field Parameters							
Temperature (°C)					8.5	8.9	8.9
pH (Unitless)					6.8	8.79	6.52
Conductivity (µS/cm)					837	803	812

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5B	Shallow				
Date>		Oct-11	Oct-12	Nov-13	Oct-14	Oct-15	Sep-16
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	409	370	324	327	396	422
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.10	0.09	0.08		0.086	0.074
Beryllium							
Boron	5	0.24	0.12	0.16		0.223	0.266
Cadmium	0.005				< 0.00002		
Calcium		108	113	111	99.2	111	85.7
Chloride	250	14	12	12	10.2	12.1	11.8
Chromium	0.05						
Cobalt							
BOD							
COD		22	11	8	< 5	16	12
Conductivity (µS/cm)		800	735	671	663		793
Copper	1						
DOC	5	<0.5	3.7	3	5.2	4.8	3.5
Hardness ($CaCO_3$)	80-100	360	373	368	327	366	290
Iron	0.3	0.09	<0.03	<0.03	< 0.005	0.057	0.063
Lead	0.01						
Magnesium		22	22	22	19.6	21.6	18.5
Manganese	0.05	0.38	0.34	0.31	0.389	0.564	0.501
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.12	<0.10	<0.10	0.3	0.2	0.1
pH (Unitless)	6.5-8.5	7.39	7.73	7.49		7.74	7.81
Phenols							
Total Phosphorus							
Potassium		12	9	9	7.7	7.5	7.3
Silicon							
Silver							
Sodium	200	37	18	19	26.5	35.6	56.8
Strontium		0.255	0.216	0.223	0.232	0.267	0.189
Sulphate	500	31	27	28	28	35	38
Sulphur							
Total Sus. Solids							
TDS	500	520	478	436	389	517	532
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance					0.937	0.993	
Field Parameters							
Temperature (°C)		8.8	9.1	8.2	9	8.8	8.7
pH (Unitless)		7.00	6.9	7.4	7.4	7.3	7.2
Conductivity (µS/cm)		787	698	680	653	692	858

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5B	Shallow				
Date>		Oct-17	Nov-18	Oct-19	Sep-20	Nov-21	Oct-22
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	645	398	387	408	351	422
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.159	0.146	0.126	0.155	0.18	0.25
Beryllium							
Boron	5	0.448	0.388	0.428	0.462	0.16	0.26
Cadmium	0.005						
Calcium		158	122	90.7	114	97	124
Chloride	250	8.4	11.2	10.9	9.8	12	10
Chromium	0.05						
Cobalt							
BOD							
COD		19	5	13	10	<5	8
Conductivity (µS/cm)		1190	832	816		703	845
Copper	1						
DOC	5	10	6.3	7.3	4.2	3.2	4.2
Hardness ($CaCO_3$)	80-100	527	423	323	391	329	421
Iron	0.3	0.044	0.312	0.142	0.49	0.46	0.55
Lead	0.01						
Magnesium		32.1	28.6	23.5	25.9	21	27
Manganese	0.05	1.04	1.03	0.7	1.0	0.97	1.2
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.16	< 0.05	0.19	<0.05	<0.01	<0.10
pH (Unitless)	6.5-8.5	7.82	8.03	7.91	7.82	7.51	7.14
Phenols							
Total Phosphorus							
Potassium		11.4	125.7	13.9	13.2	16	15
Silicon							
Silver							
Sodium	200	85.9	23.7	62.6	38.4	11	13
Strontium		0.35	0.301	0.251	0.279	0.247	0.316
Sulphate	500	34	31	37	31	29	39
Sulphur							
Total Sus. Solids							
TDS	500	718	469	472	479	457	549
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance			0.905	0.922	0.919		
Field Parameters							
Temperature (°C)		8.9	8.8	8.4	8.7	8.6	8.2
pH (Unitless)		7.20	6.9	7.4	6.7	6.6	6.9
Conductivity (µS/cm)		1011	523	842	874	693	850

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 95-5B	Shallow				
Date>		Sep-23					
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	462					
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.24					
Beryllium							
Boron	5	0.38					
Cadmium	0.005						
Calcium		117					
Chloride	250	9					
Chromium	0.05						
Cobalt							
BOD							
COD		16					
Conductivity (µS/cm)		807					
Copper	1						
DOC	5	3.8					
Hardness ($CaCO_3$)	80-100	391					
Iron	0.3	0.8					
Lead	0.01						
Magnesium		24					
Manganese	0.05	1.16					
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.1					
pH (Unitless)	6.5-8.5	7.37					
Phenols							
Total Phosphorus							
Potassium		14					
Silicon							
Silver							
Sodium	200	22					
Strontium		0.316					
Sulphate	500	28					
Sulphur							
Total Sus. Solids							
TDS	500	525					
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)		10.5					
pH (Unitless)		6.70					
Conductivity (µS/cm)		930					

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6A	Deep				
Date>		Jun-96	Oct-96	Oct-97	Oct-98	Oct-99	Oct-00
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	296	303	332	281	305	305
Aluminum	0.1	0.4	0.87				
Arsenic	0.025						
Barium	1	0.16	0.16	0.14	0.12	0.13	0.13
Beryllium		<0.010	<0.010				
Boron	5	0.07	0.09	0.09	<0.010	0.07	0.06
Cadmium	0.005	<0.0050	<0.0050				
Calcium		87	95			101	93
Chloride	250	14	11	13	10	12	14
Chromium	0.05	<0.0100	<0.0100				
Cobalt		<0.0100	0.02				
BOD							
COD		8	<3	8	<3	16	11
Conductivity (µS/cm)		425	450	600	480	470	450
Copper	1	0.083	0.008				
DOC	5	2.1	2.2	2.3	1.4	2.4	2
Hardness ($CaCO_3$)	80-100	304	344	350	316	343	323
Iron	0.3	0.17	0.84	0.43	0.26	0.23	0.44
Lead	0.01	0.003	<0.0020				
Magnesium		21	26			22	22
Manganese	0.05	0.09	0.13	0.12	0.07	0.07	0.09
Mercury							
Molybdenum		<0.030	<0.030				
Nickel		0.04	<0.010				
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH (Unitless)	6.5-8.5	6.5	7	7.1	7.4	7.4	7.3
Phenols							
Total Phosphorus							
Potassium		4	4	4	3	3	3
Silicon		6.1	7.6				
Silver		<0.01000	<0.00100				
Sodium	200	11	17	11	12	14	12
Strontium		0.254	0.225	0.23	0.26	0.201	0.202
Sulphate	500	45	43	41	37	30	26
Sulphur		16	14				
Total Sus. Solids							
TDS	500	412	376	428	360	356	400
Temperature (°C)	15	7	4	7	6	7	9
Thallium		<0.20000	<0.20000				
Tin		<0.050	<0.050				
Titanium		0.02	0.05				
TKN							
Vanadium		<0.0100	<0.0100				
Zinc	5	<0.010	0.01				
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6A	Deep				
Date>		Oct-01	Oct-02	Oct-03	Nov-03	Oct-04	Dec-05
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	317	310	304		305	306
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.15	0.16	0.21		0.174	0.15
Beryllium							
Boron	5	0.05	<0.050	0.06		0.042	0.05
Cadmium	0.005						
Calcium		89	88	96		92.9	87.2
Chloride	250	12	12	19		17.4	12
Chromium	0.05						
Cobalt							
BOD							
COD		92	<5	<5		5	14
Conductivity (µS/cm)		500	490	500		510	710
Copper	1						
DOC	5	35.6	1.5	1.6		1.6	1.5
Hardness ($CaCO_3$)	80-100	313	306	326		320	300
Iron	0.3	0.35	0.48	0.53		0.36	0.34
Lead	0.01						
Magnesium		22	21	21		21.3	19.3
Manganese	0.05	0.1	0.093	0.116		0.101	0.09
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10		<0.20	<0.10
pH (Unitless)	6.5-8.5	7.1	7.3	7.1		7.3	7.3
Phenols							
Total Phosphorus							
Potassium		5	6	7		5.2	5
Silicon							
Silver							
Sodium	200	9	10	11		9.7	10.6
Strontium		0.205	0.204	0.245		0.217	0.2
Sulphate	500	22	32	34		27.5	27
Sulphur							
Total Sus. Solids							
TDS	500	388	413	424		380	402
Temperature (°C)	15	10	10	9		15	5
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6A	Deep				
Date>		Oct-06	Oct-08	Nov-09	Nov-10	Oct-11	Oct-12
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	278	280	271	268	281	281
Aluminum	0.1						
Arsenic	0.025			<0.001			
Barium	1	0.16		0.13	0.13	0.16	0.17
Beryllium							
Boron	5	0.05	0.07	0.06	0.05	0.04	0.04
Cadmium	0.005			<0.0001			
Calcium		88	86	76	85	90	94
Chloride	250	12	14	8	8	8	8
Chromium	0.05			<0.001			
Cobalt							
BOD				<1			
COD		10	5	<5	10	10	<5
Conductivity (µS/cm)		680	597	577	572	572	581
Copper	1		0.001	0.001			
DOC	5	2.4		2	1.80	<0.5	1.40
Hardness ($CaCO_3$)	80-100	298	288.26	255.13	282	307	313
Iron	0.3	0.3	0.17	<0.03	0.22	0.38	0.42
Lead	0.01			<0.001			
Magnesium		19	18	16	17	20	19
Manganese	0.05	0.08	0.08	0.04	0.07	0.08	0.08
Mercury				<0.0001			
Molybdenum							
Nickel							
N-NH-3 (Ammonia)			0.16	0.33	0.35		
N-NO2 (Nitrite)			<0.10	<0.10			
N-NO3 (Nitrate)	10	<0.10	0.23	0.27	<0.10	0.20	<0.10
pH (Unitless)	6.5-8.5	7.2	7.20	7.82	8.14	7.61	7.96
Phenols			<0.001	<0.001			
Total Phosphorus				0.02			
Potassium		5	4	4	4	5	5
Silicon							
Silver							
Sodium	200	11	13	11	9	9	7
Strontium		0.192	0.20	0.181	1.88	0.235	0.222
Sulphate	500	25	28	29	29	32	31
Sulphur							
Total Sus. Solids				3			
TDS	500	384	388	375	372	372	378
Temperature (°C)	15	6					
Thallium							
Tin							
Titanium							
TKN			0.51	0.63	0.30		
Vanadium							
Zinc	5						
Ion Balance			0.98		1.00		
Field Parameters							
Temperature (°C)			11.2	7.9	8.6	8.6	8.8
pH (Unitless)			7.40	9.43	6.91	7.30	7.20
Conductivity (µS/cm)			590	582	573	567	560

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6A	Deep				
Date>		Nov-13	Oct-14	Oct-15	Sep-16	Oct-17	Nov-18
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	268	252	276	275	230	231
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.16		0.157	0.137	0.142	0.14
Beryllium							
Boron	5	0.05		0.055	0.035	0.036	0.04
Cadmium	0.005		0.00002				
Calcium		98	86	84.6	80.9	82.1	81
Chloride	250	8	7	8.5	7.9	6.4	8
Chromium	0.05						
Cobalt							
BOD							
COD		5	< 5	< 5	< 5	< 5	< 5
Conductivity (µS/cm)		571	529		561	525	535
Copper	1						
DOC	5	1.1	2.8	1.6	1.1	1.7	2.00
Hardness ($CaCO_3$)	80-100	331	292	290	284	282	279
Iron	0.3	0.39	0.35	0.357	0.226	0.284	0.27
Lead	0.01						
Magnesium		21	19	19.1	19.8	18.6	19
Manganese	0.05	0.08	0.087	0.12	0.098	0.128	0.17
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	< 0.1	< 0.1	0.1	0.29	0.28
pH (Unitless)	6.5-8.5	7.72		7.86	7.94	8.04	8.14
Phenols							
Total Phosphorus							
Potassium		6	5.4	5.5	5	4.5	4
Silicon							
Silver							
Sodium	200	8	8	6.9	6.6	5.9	8
Strontium		0.216	0.207	0.239	0.184	0.185	0.197
Sulphate	500	29	28	30	28	23	29
Sulphur							
Total Sus. Solids							
TDS	500	371	306	374	376	279	289
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance			0.913	1.02			0.91
Field Parameters							
Temperature (°C)		7.7	8.1	8.5	8.6	8.3	8.1
pH (Unitless)		7.6	7.80	7.50	7.30	7.60	7.10
Conductivity (µS/cm)		593	527	509	612	455	393

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6A	Deep				
Date>		Oct-19	Sep-20	Nov-21	Oct-22	Sep-23	
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	229	243	250	243	274	
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.122	0.128	0.13	0.15	0.15	
Beryllium							
Boron	5	0.04	0.042	0.04	0.03	0.04	
Cadmium	0.005						
Calcium		74.1	91.6	79	78	78	
Chloride	250	10	9.2	11	10	9	
Chromium	0.05						
Cobalt							
BOD							
COD		< 5	<5	<5	<5	<5	
Conductivity (µS/cm)		516		538	528	507	
Copper	1						
DOC	5	2.7	1.1	1.7	2	1.4	
Hardness ($CaCO_3$)	80-100	260	280	263	261	261	
Iron	0.3	0.257	0.33	0.46	0.29	0.31	
Lead	0.01						
Magnesium		18.1	18.5	16	16	16	
Manganese	0.05	0.193	0.231	0.3	0.3	0.35	
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.33	0.24	0.16	<0.1	<0.1	
pH (Unitless)	6.5-8.5	7.98	8.01	7.76	7.45	7.62	
Phenols							
Total Phosphorus							
Potassium		4.3	4	4	4	4	
Silicon							
Silver							
Sodium	200	7	6.6	6	5	6	
Strontium		0.201	0.206	0.203	0.2	0.22	
Sulphate	500	28	30	30	28	26	
Sulphur							
Total Sus. Solids							
TDS	500	279	297	350	343	330	
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance		0.972	0.963				
Field Parameters							
Temperature (°C)		8	8.4	7.5	7.5	10.0	
pH (Unitless)		7.7	6.9	7.0	6.10	7.30	
Conductivity (µS/cm)		544	570	530	570	600	

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6B	Shallow				
Date>		Jun-96	Oct-96	Oct-97	Oct-98	Oct-99	Oct-00
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	281	332	361	386	346	389
Aluminum	0.1	0.47	0.26				
Arsenic	0.025						
Barium	1	0.16	0.24	0.31	0.18	0.18	0.26
Beryllium		<0.010	<0.010				
Boron	5	0.13	0.17	0.17	0.01	0.18	0.19
Cadmium	0.005	<0.0050	<0.0050				
Calcium		82	115			106	123
Chloride	250	14	21	26	19	19	23
Chromium	0.05	<0.0100	<0.0100				
Cobalt		<0.0100	<0.0100				
BOD							
COD		21	5	11	<3	14	16
Conductivity (µS/cm)		450	600	850	720	440	700
Copper	1	<0.0050	<0.0050				
DOC	5	3	3.6	3.4	2.9	2.8	2.9
Hardness ($CaCO_3$)	80-100	279	402	456	438	368	423
Iron	0.3	0.41	0.4	0.78	0.51	0.66	0.78
Lead	0.01	<0.0020	<0.0020				
Magnesium		18	28			25	28
Manganese	0.05	0.1	0.07	0.08	0.05	0.04	0.05
Mercury							
Molybdenum		0.04	<0.030				
Nickel		0.05	<0.010				
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH (Unitless)	6.5-8.5	6.4	6.7	7.1	7.2	7.3	7.1
Phenols							
Total Phosphorus							
Potassium		8	15	20	10	14	28
Silicon		6.1	5.9				
Silver		<0.01000	<0.00100				
Sodium	200	14	18	16	22	23	14
Strontium		0.195	0.209	0.303	0.263	0.213	0.246
Sulphate	500	41	61	128	66	50	69
Sulphur		15	23				
Total Sus. Solids							
TDS	500	368	460	616	504	420	524
Temperature (°C)	15	7	4	7.5	6.5	7	10
Thallium		<0.20000	<0.20000				
Tin		<0.050	<0.050				
Titanium		0.02	0.01				
TKN							
Vanadium		<0.0100	0.02				
Zinc	5	<0.010	<0.010				
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6B	Shallow				
Date>		Oct-01	Oct-02	Oct-03	Nov-03	Oct-04	Dec-05
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	350	348	321		480	335
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.15	0.12	0.14		0.154	0.1
Beryllium							
Boron	5	0.09	0.12	0.09		0.162	0.08
Cadmium	0.005						
Calcium		97	103	105		136	
Chloride	250	16	19	24		23.7	14
Chromium	0.05						
Cobalt							
BOD							
COD		<5	<5	<5		8	13
Conductivity (µS/cm)		725	600	625		600	805
Copper	1						
DOC	5	1.7	2.5	1.6		2.4	1.8
Hardness ($CaCO_3$)	80-100	362	356	365		474	320
Iron	0.3	0.62	0.55	0.64		1.03	0.67
Lead	0.01						
Magnesium		29	24	25		32.3	22
Manganese	0.05	0.05	0.044	0.048		0.052	0.04
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10		<0.20	<0.10
pH (Unitless)	6.5-8.5	7	6.9	7		7.1	7.1
Phenols							
Total Phosphorus							
Potassium		14	8	9		7.3	6
Silicon							
Silver							
Sodium	200	12	14	13		17.2	13.2
Strontium		0.219	0.203	0.233		0.298	0.21
Sulphate	500	56	37	35		61.7	32
Sulphur							
Total Sus. Solids							
TDS	500	488	481	459		590	384
Temperature (°C)	15	11	12	9		14	5
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Field Parameters							
Temperature (°C)							
pH (Unitless)							
Conductivity (µS/cm)							

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6B	Shallow				
Date>		Oct-06	Nov-07	Oct-08	Nov-10	Oct-11	Oct-12
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	313	378	364	331	298	282
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.1			0.18	0.14	0.11
Beryllium							
Boron	5	0.12	0.09	0.13	0.13	0.06	0.06
Cadmium	0.005						
Calcium		99	132	105	100	102	90
Chloride	250	15	24	15	11	9	8
Chromium	0.05						
Cobalt							
BOD							
COD		<5	<5	5	13	78	<5
Conductivity (µS/cm)		435	843	773	719	629	584
Copper	1		0.001	0.001			
DOC	5	2.4			2.2	1.50	1.8
Hardness ($CaCO_3$)	80-100	338	443.98	356.16	344	337	299
Iron	0.3	0.58	0.79	0.79	0.81	0.74	0.52
Lead	0.01						
Magnesium		22	28	23	0.08	20	18
Manganese	0.05	0.04	0.06	0.07	0.08	0.11	0.08
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)				0.45	0.52		
N-NO2 (Nitrite)				<0.10			
N-NO3 (Nitrate)	10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10
pH (Unitless)	6.5-8.5	7.3			8.1	7.44	7.82
Phenols				<0.001			
Total Phosphorus							
Potassium		4	6	5	10	8	6
Silicon							
Silver							
Sodium	200	15	14	15	11	10	9
Strontium		0.228	0.299	0.27	0.292	0.258	0.203
Sulphate	500	36	64	46	50	43	30
Sulphur							
Total Sus. Solids							
TDS	500	439	548	502	467	409	380
Temperature (°C)	15	6					
Thallium							
Tin							
Titanium							
TKN				0.79	0.53		
Vanadium							
Zinc	5						
Ion Balance				0.91	0.96		
Field Parameters							
Temperature (°C)				11.1	8.8	9.2	8.7
pH (Unitless)				7.10	6.59	7.30	7.1
Conductivity (µS/cm)				777	733	638	564

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6B	Shallow				
Date>		Nov-13	Oct-14	Oct-15	Sep-16	Oct-17	Nov-18
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	243	243	268	262	283	255
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.10		0.105	0.094	0.123	0.104
Beryllium							
Boron	5	0.04		0.029	0.032	0.096	0.116
Cadmium	0.005		0.00003				
Calcium		89	84	82.9	77.2	95.9	87.4
Chloride	250	8	8	9.4	8	9.3	9.8
Chromium	0.05						
Cobalt							
BOD							
COD		<5	6	16	< 5	< 5	6
Conductivity (µS/cm)		524	520		533	625	601
Copper	1						
DOC	5	0.9	2.90	1.5	1.2	2.8	2.7
Hardness ($CaCO_3$)	80-100	300	285	282	271	330	302
Iron	0.3	0.45	0.58	0.567	0.324	0.631	0.469
Lead	0.01						
Magnesium		19	19	18.2	18.9	21.9	20.3
Manganese	0.05	0.10	0.15	0.234	0.322	0.475	0.514
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	<0.10	< 0.1	< 0.1	< 0.1	< 0.05	< 0.05
pH (Unitless)	6.5-8.5	7.70		7.84	7.91	7.97	8.24
Phenols							
Total Phosphorus							
Potassium		6	6	5.9	5.4	5.7	4.9
Silicon							
Silver							
Sodium	200	6	6	5.9	6.1	8.6	13.6
Strontium		0.198	0.21	0.213	0.185	0.229	0.223
Sulphate	500	28	26	27	28	28	41
Sulphur							
Total Sus. Solids							
TDS	500	341	295	362	358	341	332
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance			0.91	1.02			0.921
Field Parameters							
Temperature (°C)		7.8	8.3	8.9	9.1	8.5	8.2
pH (Unitless)		7.6	7.60	7.6	7.3	7.40	7.2
Conductivity (µS/cm)		542	516	501	592	544	439

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden Waste Disposal Site
Groundwater Chemistry

Monitor Number>		BH 96-6B	Shallow				
Date>		Oct-19	Sep-20	Nov-21	Oct-22	Sep-23	
Parameters	ODWQS						
Alkalinity ($CaCO_3$)	30-500	270	285	293	292	261	
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.10	0.094	0.10	0.16	0.13	
Beryllium							
Boron	5	0.067	0.074	0.06	0.08	0.05	
Cadmium	0.005						
Calcium		88.2	89	89	96	75	
Chloride	250	11.5	10	13	11	9	
Chromium	0.05						
Cobalt							
BOD							
COD		8	9	<5	<5	10	
Conductivity (µS/cm)		600		606	632	515	
Copper	1						
DOC	5	4.2	1.4	1.9	2	1.5	
Hardness ($CaCO_3$)	80-100	310	306	300	318	249	
Iron	0.3	0.583	0.59	0.73	0.83	0.58	
Lead	0.01						
Magnesium		21.7	20.3	19	19	15	
Manganese	0.05	0.58	0.601	0.78	0.86	0.73	
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.09	<0.05	<0.10	<0.10	<0.10	
pH (Unitless)	6.5-8.5	8.03	7.86	7.68	7.37	7.6	
Phenols							
Total Phosphorus							
Potassium		4.4	4	4	6	5	
Silicon							
Silver							
Sodium	200	9.9	8.1	9	7	6	
Strontium		0.24	0.222	0.233	0.258	0.225	
Sulphate	500	28	27	31	37	24	
Sulphur							
Total Sus. Solids							
TDS	500	326	331	394	411	335	
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance		0.928	0.993				
Field Parameters							
Temperature (°C)		8.5	8.8	8.0	7.8	8.8	
pH (Unitless)		7.7	6.9	7.0	6.8	7.1	
Conductivity (µS/cm)		624	617	602	650	600	

All values reported in mg/L unless otherwise noted.
Shaded Values Exceed ODWS Criteria

Cobden WDS
GROUNDWATER QA/QC
RPD Calculations

Parameter	ODWS	BH 9 Oct-22	BH 9 DUP #1 Oct-22	BH 9 RPD	BH 9 Sep-23	BH 9 DUP #1 Sep-23	BH 9 RPD
Alkalinity ($CaCO_3$)	30-500	152	149	1.99%	151	139	8.28%
Aluminum	0.1						
Arsenic	0.025						
Barium	1	0.05	0.05	0.00%	0.04	0.04	0.00%
Beryllium							
Boron	5	<0.01	<0.01	NC	<0.01	<0.01	NC
Cadmium	0.005						
Calcium		43	42	2.35%	36	35	2.82%
Chloride	250	1	1	0.00%	<1	<1	NC
Chromium	0.05						
Cobalt							
BOD							
COD		<5	<5	NC	<5	<5	NC
Conductivity (µS/cm)		239	238	0.42%	204	207	1.46%
Copper	1						
DOC	5	1	1	0.00%	0.9	0.9	0.00%
Hardness ($CaCO_3$)	80-100	140	138	1.44%	119	116	2.55%
Iron	0.30	<0.03	<0.03	NC	<0.03	<0.03	NC
Lead	0.01						
Magnesium		8	8	0.00%	7	7	0.00%
Manganese	0.05	<0.01	<0.01	NC	<0.01	<0.01	NC
Mercury							
Molybdenum							
Nickel							
N-NH-3 (Ammonia)							
N-NO2 (Nitrite)							
N-NO3 (Nitrate)	10	0.41	0.41	0.00%	0.38	0.39	2.60%
pH (Unitless)	6.5-8.5	7.72	7.7	0.26%	7.99	8.02	0.37%
Phenols							
Total Phosphorus							
Potassium		<1	<1	NC	<1	<1	NC
Silicon							
Silver							
Sodium	200	6	5	18.18%	4	4	0.00%
Strontium		0.094	0.093	1.07%	0.084	0.084	0.00%
Sulphate	500	4	3	28.57%	3	2	40.00%
Sulphur							
Total Sus. Solids							
TDS	500	155	155	0.00%	133	135	1.49%
Temperature (°C)	15						
Thallium							
Tin							
Titanium							
TKN							
Vanadium							
Zinc	5						
Ion Balance							
Average RPD				**3.88%**			**4.58%**

NC = Not Calculated
RDP greater than 25%
RDP greater than 50%
All units are mg/L unless otherwise noted

APPENDIX F

PHOTOGRAPHS

2022 PHOTOGRAPHS

BH 2

BH 4

BH 5 Shallow

BH 3

BH 5 Deep

BH 6 Deep

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Cobden Closed Waste Disposal Site

Fall 2022 Groundwater Monitoring Locations

DATE	Oct-22
PROJECT	17-6046H
FIGURE	1

BH 6 Shallow

BH 7 Shallow

BH 8Shallow

BH 7 Deep

BH 8 Deep

BH 9

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Cobden Closed Waste Disposal Site

Fall 2022 Groundwater Monitoring Locations

DATE	Oct-22
PROJECT	17-6046H
FIGURE	2

BH 10 Deep & Shallow

BH 11 Shallow

BH 11 Deep

Residential Well

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Cobden Closed Waste Disposal Site

Fall 2022 Groundwater Monitoring Locations

DATE	Oct-22
PROJECT	17-6046H
FIGURE	3

2023 PHOTOGRAPHS

BH 2

BH 4

BH 5 Shallow

BH 3

BH 5 Deep

BH 6 Deep

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Cobden Closed Waste Disposal Site

Fall 2020 Groundwater Monitoring Locations

DATE	Sep-23
PROJECT	17-6046F
FIGURE	1

BH 6 Shallow

BH 7 Shallow

BH 8 Shallow

BH 7 Deep

BH 8 Deep

BH 9

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Cobden Closed Waste Disposal Site

Fall 2020 Groundwater Monitoring Locations

DATE	Sep-23
PROJECT	17-6046F
FIGURE	2

BH 10 Deep & Shallow

Residential Well

BH 11 Deep

BH 11 Shallow

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Cobden Closed Waste Disposal Site

Fall 2023 Groundwater Monitoring Locations

DATE	Sep-23
PROJECT	17-6046H
FIGURE	3