



GOLDER

REPORT

2020 Site Development, Operations and Environmental Monitoring
Arnprior Waste Disposal Site
Township of McNab/Braeside, Ontario

Submitted to:

Town of Arnprior

105 Elgin Street West
P.O. Box 130
Arnprior, Ontario
K7S 3H4

Submitted by:

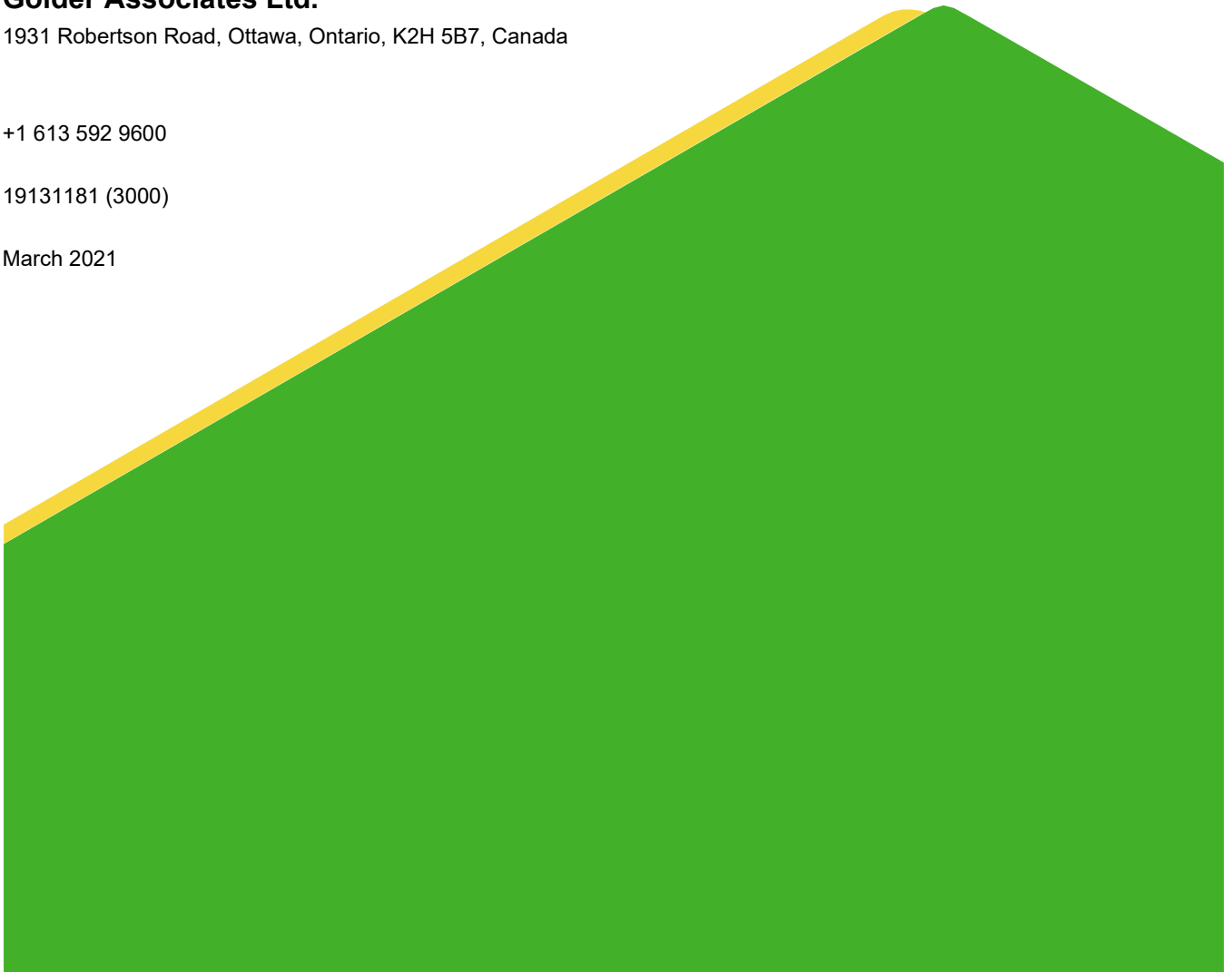
Golder Associates Ltd.

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19131181 (3000)

March 2021



Appendix D-Monitoring and Screening Checklist General Information and Instructions

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

Instructions: A complete checklist consists of:

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

Definition of Groundwater CEP:

For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:

- (a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
- (b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..

Definition of Surface water CEP:

A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

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

Monitoring Report and Site Information	
Waste Disposal Site (WDS) Name	Arnprior Waste Disposal Site
Location (e.g. street address, lot, concession)	Part of Lots 9, 10 & 11, Concession XIII
GPS Location (taken within the property boundary at front gate/ front entry)	390860 m E 5034788 m N, 18T
Municipality	Township of McNab - Amalgamated Township of McNab/Braeside
Client and/or Site Owner	Town of Arnprior
Monitoring Period (Year)	2020
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	A412603
Director's Order No.:	
Provincial Officer's Order No.:	

Other:			
Report Submission Frequency	<input checked="" type="radio"/> Annual <input type="radio"/> Other		
The site is: (Operation Status)	<input checked="" type="radio"/> Open <input type="radio"/> Inactive <input type="radio"/> Closed		
Is there an active waste transfer station at the site?	<input type="radio"/> Yes <input checked="" type="radio"/> No		
Does this WDS have a Closure Plan?	<input checked="" type="radio"/> Not yet submitted <input type="radio"/> Submitted and under review <input type="radio"/> Submitted and approved		
Total Approved Capacity	Unknown	Units	Cubic Metres
Maximum Approved Fill Rate		Units	Tonnes per Day
Total Waste Received within Monitoring Period (Year)	3,281	Units	Tonnes
Total Waste Received within Monitoring Period (Year) <i>Describe the methodology used to determine this quantity</i>	Estimated		
Estimated Remaining Capacity	160,221	Units	Cubic Metres
Estimated Remaining Capacity <i>Describe the methodology used to determine this quantity</i>	Direct Survey (GPS/Total Station)		
Estimated Remaining Capacity <i>Date Last Determined</i>	December 2020		
Non-Hazardous Approved Waste Types	<input checked="" type="checkbox"/> Domestic <input checked="" type="checkbox"/> Industrial, Commercial & Institutional (IC&I) <input type="checkbox"/> Source Separated Organics (Green Bin) <input checked="" type="checkbox"/> Tires	<input checked="" type="checkbox"/> Contaminated Soil <input checked="" type="checkbox"/> Wood Waste <input checked="" type="checkbox"/> Blue Box Material <input type="checkbox"/> Processed Organics <input checked="" type="checkbox"/> Leaf and Yard Waste	<input type="checkbox"/> Food Processing/Preparation Operations Waste <input checked="" type="checkbox"/> Hauled Sewage Other: <input type="text"/>
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial <i>(separate waste classes by comma)</i>	None		

Year Site Opened <i>(enter the Calendar Year <u>only</u>)</i>	<div style="border: 1px solid black; padding: 5px; width: 100%;">1960</div>	Current ECA Issue Date	March 10, 2020
Is your Site required to submit Financial Assurance?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Describe how your WDS is designed.		<input checked="" type="radio"/> Natural Attenuation only <input type="radio"/> Fully engineered Facility <input type="radio"/> Partially engineered Facility	
Does your Site have an approved Contaminant Attenuation Zone?		<input checked="" type="radio"/> Yes <input type="radio"/> No	
If closed, specify ECA, control or authorizing document closure date:		N/A	
Has the nature of the operations at the site changed during this monitoring period?	<input type="radio"/> Yes <input checked="" type="radio"/> No		
If yes, provide details:	Empty space for details		

<p>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)</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>
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Groundwater WDS Verification:

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

Sampling and Monitoring Program Status:

<p>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:</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>If no, list exceptions:</p>
<p>2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/control document(s):</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input type="radio"/> Not Applicable</p>	<p>If no, list exceptions below or attach information.</p>

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

3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document , <i>or Ministry concurrence.</i>	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable
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b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If no, list exceptions below or attach additional information.
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Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

<p>4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>Golder Associates Ltd. standard practices were followed as described in the report.</p>
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Sampling and Monitoring Program Results/WDS Conditions and Assessment:

<p>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.</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>An amended ECA No. A412603 was issued on March 10, 2020 which removed the deadline for submission of a revised trigger mechanism. The Town undertook and submitted an Options Assessment that considered contingency options available to alleviate groundwater compliance issues at the Site. Timing of next steps will be determined following comments on the Options Assessment.</p>
<p>6) The site meets compliance and assessment criteria.</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>See attached sheet.</p>
<p>7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>The site continues to perform as anticipated.</p>

<p>1) Is one or more of the following risk reduction practices in place at the site:</p> <p>(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</p> <p>(b) There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or</p> <p>(c) The site meets the following two conditions (typically achieved after 15 years or longer of site operation):</p> <p><i>i.</i> The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and</p> <p><i>ii.</i> Seasonal and annual water levels and water quality fluctuations are well understood.</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>Note which practice(s):</p>	<p><input type="checkbox"/> (a)</p> <p><input type="checkbox"/> (b)</p> <p><input type="checkbox"/> (c)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input type="radio"/> Not Applicable</p>	<p>See attached sheet.</p>	

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed, *as deemed appropriate for this site in my professional judgement*, 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:

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Recommendations:

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

No changes to the monitoring program are recommended

The following change(s) to the monitoring program is/are recommended:

It is recommended that an additional overburden and bedrock monitoring well be installed in the vicinity of OV-9, near the southern corner of CAZ Area B or the eastern corner of CAZ Area D if either of these locations is accessible, to discern groundwater flow direction and possible landfill leachate impacts at the southern property boundary.

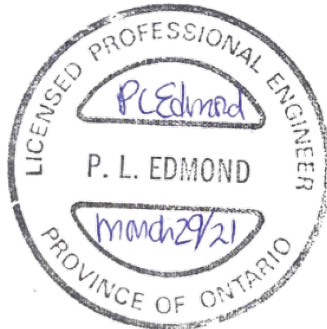
No Changes to site design and operation are recommended


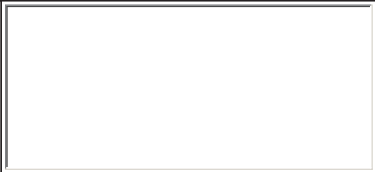

The following change(s) to the site design and operation is/are recommended:

Name:

Trish Edmond, P.Eng. with demonstrated relevant experience.

Seal:



Signature:		Date:	2021-03-29
CEP Contact Information:			
Company:	Golder Associates Ltd.		
Address:	1931 Robertson Road, Ottawa, ON, K2H 5B7		
Telephone No.:	613-592-9600	Fax No. :	613-592-9601
E-mail Address:			
Co-signers for additional expertise provided:			
Signature:		Date:	
Signature:		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)	On-site wetland / perennial ponds		

Distance(s)	
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Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	<input checked="" type="radio"/> Yes <input type="radio"/> No	If no, identify issues (Type Here):
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> 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

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document, or Ministry concurrence.	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable
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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:	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If no, specify below or provide details in an attachment.
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Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

<p>4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>Golder Associates Ltd. standard practices were followed as described in the report.</p>
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Sampling and Monitoring Program Results/WDS Conditions and Assessment:

<p>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):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>
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If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. ECA limit, PWQO, background	e.g. X% above PWQO
Dissolved Oxygen at SW-1 (May, Aug and Oct) Boron at SW-1 (Aug) Iron at SW-1 (Aug and Oct)	PWQO	30%, 18% and 37% below PWQO for dissolved oxygen in May, August and October, respectively. 10% above PWQO for boron in August. 37% and 40% above PWQO for iron for August and October, respectively.
Unionized Ammonia at SW-2 (May) Dissolved Oxygen at SW-2 (Oct) Boron at SW-2 (May) Cobalt at SW-2 (May) Iron at SW-2 (May, Aug, Oct)	PWQO	164% above PWQO for unionized ammonia in May. 32% below PWQO for dissolved oxygen in October. 10% above PWQO for boron in May. 6% above PWQO for cobalt in May. 633%, 130%, and 120% above PWQO for iron in May, August, October, respectively.
<p>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)?</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>SW-2 is interpreted to be impacted by the landfill and possibly by other industrial activities (like wood waste and railway fill of unknown quality).</p>

<p>7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>SW-2 has periodic exceedances of PWQO and water quality at this location is consistent over time.</p> <p>Water quality at all other surface water monitoring locations at the site is generally consistent over time.</p>
<p>8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Known</p> <p><input type="radio"/> Not Applicable</p>	<p>If yes, provide details and whether remedial measures are necessary</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input type="radio"/> Not Applicable</p>	<p>No action taken, parameter concentrations have been consistent.</p>

Surface Water CEP Declaration:

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

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed, as deemed appropriate for this site in my professional judgement, 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:

<p><input checked="" type="radio"/> No Changes to the monitoring program are recommended</p> <p><input type="radio"/> The following change(s) to the monitoring program is/are recommended:</p>	
<p><input checked="" type="radio"/> No changes to the site design and operation are recommended</p> <p><input type="radio"/> The following change(s) to the site design and operation is/are recommended:</p>	

CEP Signature	<i>Patricia Edmond</i>	
Relevant Discipline	P.Eng. with demonstrated relevant experience.	
Date:	2021-03-29	
CEP Contact Information:	Trish Edmond	
Company:	Golder Associates Ltd.	
Address:	1931 Robertson Road Ottawa, Ontario K2H 5B7	
Telephone No.:	613-592-9600	
Fax No. :	613-592-9601	
E-mail Address:	tedmond@golder.com	
Save As		Print Form

Arnprior Waste Disposal Site 2020 MECP Checklist

Sections 6 & 9 – The Site Meets Groundwater Compliance and Assessment Criteria & Trigger Values for Contingency Plans or Site Remedial Action Exceeded

Not including iron, manganese and TDS which are problematic leachate indicator parameters due to their presence in the background monitor, at least one leachate indicator parameter from Section 7.2.2 of the annual monitoring report exceeded the trigger concentration in either the spring or fall round, or both of the spring and fall rounds in monitors BR-5D, BR-6D, BR-6S, BR-7D, and BR-12. It is interpreted that exceedances of trigger concentrations in monitors BR-5D, BR-6D, BR-6S and BR-12 result from the effect of the wood waste historically deposited on the CAZ lands north of the Canadian Pacific Rail line, road salting and/or the effect of the landfill. It is interpreted that exceedances of trigger concentrations in monitors BR-7D result from road salt, wood waste, or other industrial activities formerly undertaken on the CAZ lands, but not by landfill leachate, based on the piper plots. It is important to note that the leachate indicator parameters exceeding the trigger concentrations at these locations all have concentrations which are generally consistent, consistently variable or slightly decreasing over time.

Distribution List

- 1 copy Ministry of the Environment, Conservation and Parks
- 1 e-copy Ministry of the Environment, Conservation and Parks
- 1 copy Township of McNab/Braeside
- 1 copy Town of Arnprior
- 1 e-copy Golder Associates Ltd., Ottawa

Executive Summary

This 2020 Annual Site Development, Operations and Environmental Monitoring Report has been prepared to fulfill the annual reporting requirements as set out in the Provisional Certificate of Approval (C of A.) No. A412603.

The Executive Summary highlights key points from the report only; for complete information and findings, as well as the limitations, the reader should examine the complete report.

The volume of material added to the waste mound (including waste and daily/interim cover material) between December 2019 and December 2020 is estimated to be 10,741 cubic metres.

The annual airspace consumed has ranged between 5,987 and 10,741 cubic metres over the past eight years. Assuming the annual waste receipt rate remains around the average 7,841 cubic metres per year between 2013 and 2020, the remaining landfill life is approximately 23 years.

The 2020 field investigation activities included groundwater level measurements and sampling of groundwater in May and October and surface water in May, August and October. There were no deviations from the groundwater or surface water monitoring programs outlined in the 2019 Site Development, Operations and Environmental Monitoring Report (Golder, 2020).

The direction of groundwater flow in the overburden and in the bedrock at the site is interpreted to be in a north, north-easterly and east direction towards the Ottawa River.

Conventional borehole logs detailing the geological conditions encountered in each borehole augered during the previous investigation programs were obtained and reviewed in 2006. There is a limited thickness of overburden downgradient of the site which explains why there are no overburden compliance monitoring wells. The bedrock encountered at the site generally consists of limestone, siltstone, shale and/or sandstone.

The groundwater data from background monitoring wells (OV-13, BR-13S and BR-13D), the background surface water location (SW-10), and the monitoring well most indicative of leachate quality (OV-7) were examined to determine site-specific *leachate indicator parameters*. Thirteen parameters typically monitored in the groundwater and often monitored in the surface water were identified as site-specific *leachate indicator parameters* and they include: alkalinity, ammonia (for groundwater) and unionized ammonia (for surface water), boron, barium, chloride, iron, hardness, potassium, manganese, sodium, TDS, DOC and dissolved reactive phosphorus (for groundwater) and total phosphorus (for surface water). These parameters were primarily used to evaluate site compliance with trigger mechanisms.

Based on historical results, the historical tannin and lignin concentrations, the piper trilinear diagrams, the groundwater flow directions, and the 2020 monitoring activities, groundwater monitors OV-7, BR-1D, BR-1S have been interpreted to be impacted by landfill leachate. Groundwater monitors BR-5D, BR-5S, BR-6D, BR-6S, BR-8D, BR-8S, BR-9D, BR-9S, BR-12, BR 08-1D, BR 08-1S, BR 08-2S and BR 08-2D are interpreted to be impacted by wood waste deposited on the CAZ Areas, and/or by landfill leachate. It is possible that groundwater monitors BR-5D, BR-5S, BR-6D and BR-6S are also impacted by road salt. Groundwater monitors BR-7D, BR-7S, BR-10 and BR-11 are interpreted to be impacted by road salt, wood waste, or other industrial activities on the CAZ lands, but not by landfill leachate. Groundwater monitors BR08-3D and BR08-3S are interpreted to be potentially impacted by landfill leachate, as well as wood waste or other industrial activities in the CAZ lands. Groundwater monitor BR-3 and OV-10 have historically been noted as being up-gradient or cross-gradient of the

landfill but more recent data may suggest they could be downgradient of a part of the landfill. At OV-10, increasing trends have been reported for several leachate indicator parameters, including chloride, barium, and sodium since 2006, and iron, potassium, ammonia and manganese. Similar increasing trends are being observed at BR-3, including concentrations of ammonia, DOC, hardness, potassium, TDS, chloride, and sodium. The samples collected from these groundwater monitors will be evaluated carefully in 2021 along with ongoing assessment of groundwater flow direction to assess on-going trends. Groundwater monitor OV-9 is interpreted not to be impacted by landfill leachate or wood waste. It is recommended that an additional overburden and bedrock monitoring well be installed near the southern corner of CAZ Area B or the eastern corner of CAZ Area D if either of these locations is accessible, to discern groundwater flow direction and possible landfill leachate impacts at the southern property boundary.

The water quality data for locations SW-10, SW-11 and SW-12 suggest a consistent water quality that is not being impacted by the landfill. The concentrations of total phosphorus were outside their respective PWQO during the May sampling session at SW-10, the concentration of unionized ammonia exceeded the PWQO in May at SW-12. There were no other exceedances of the PWQO during the 2020 sampling sessions at these locations (note that SW-10 was dry during the August and October sampling sessions). There were no exceedances of the CCME guidelines for chloride (short-term and long-term exposure) or boron at these locations during 2020. Historical exceedances observed at these sampling locations may be natural or may be attributable to road salting activities and/or industrial activities. All of the surface water sampling stations sampled within and on the periphery of the wetland (SW-1, SW-2, SW-21, SW-22 and SW-23) had one or more parameters that did not meet the PWQO (dissolved oxygen, boron, cobalt and/or iron) in 2020. These exceedances may be attributable to the landfill, industrial activities associated with the railway or lumber industries (i.e., the wood waste). Evaporation from the stagnant water within the wetland may be resulting in elevated parameter concentrations in surface water. Surface water sampling locations SW-18 and SW-19 within, or in close proximity to, the Ottawa River are interpreted not to be impacted by the landfill leachate even though several parameters exceed PWQO. The background surface water sampling location within the Ottawa River, SW-26, was found to have similar water quality to SW-18 with respect to PWQO exceedances in 2020. Water quality within the river (i.e., SW-18) is distinctly different than the ephemeral/intermittent stream and the ponds/wetland.

The impact of landfill leachate on the surface water quality in the wetland to the north of the fill area is not resulting in a persistent increase in the concentration of any of the analytical parameters beyond their site-specific PWQO trigger concentrations. In 2007, an additional surface water point of compliance (SW-2) was added, as recommended by Ministry of Environment, Conservation and Parks (MECP) to provide an earlier warning further upstream of potential impacts by landfill site contaminants to the receiving surface water regime.

At surface water sampling station SW-2, leachate indicator parameter alkalinity, boron, and iron exceeded the PWQO trigger concentrations during at least one monitoring session in 2020. No other PWQO trigger concentrations were exceeded in 2020 at surface water sampling station SW-2. Alkalinity and boron exceeded the respective PWQO trigger concentrations at surface water sampling station SW-1 during at least one monitoring session in 2020. The concentrations of alkalinity, boron, and iron exceeding the trigger concentrations at SW-2 in 2020 were within the historical concentrations at this location. Note that the CCME criteria for chloride and boron were not exceeded at SW-1 or SW-2 in 2020. A review of the 2020 surface water concentrations indicate that contingency measures are not required at this time.

The concern with beaver dams at landfills is with the potential for failure, causing potentially leachate-impacted water and sediment to suddenly be released to downstream surface waters. For this reason, the extent of beaver activity within the wetland watershed was monitored during the 2020 monitoring, with emphasis on documenting the location and age of the beaver dams. As in previous years (since 2014), beaver activity was reported upstream of SW-2 in 2020. Beaver activity will continue to be monitored during the 2021 monitoring program to determine the extent of the beaver activity and if steps need to be taken to control the activity.

Groundwater and surface water monitoring programs will be continued in order to evaluate site compliance on an ongoing basis and a proposed groundwater and surface water monitoring program for 2021 is presented in Section 12.0 of this report.

Trigger mechanisms and contingency measures were proposed in the 2013 Site Development, Operations and Environmental Monitoring Report (Jp2g, 2014). The recommended contingencies included installing groundwater monitoring wells on adjacent downgradient properties and/or acquiring additional CAZ. Given the historical land use around the site and known requirements of the existing property owner(s), this contingency measure is not readily achievable. Condition 28.1 of the revised ECA received on March 10, 2020 (see Section 11.2) required that by no later than June 30, 2020, the Town shall submit to the District Manager contingency measures to address groundwater compliance at the Site. The Town submitted a "Request for Pandemic Related Temporary Regulatory Relief (Alternate Arrangement) for Waste Disposal Sites and Waste Management System" dated June 15, 2020, requesting that the deadline for the submission of the contingency measures be revised to December 31, 2020. In a letter dated December 3, 2020, Golder provided the District Manager with the Town's preferred contingency option to address the groundwater compliance issue. It is considered that the submission of this letter fulfills the requirements of Condition 28.1.

As discussed in Section 2.5 of this report, the Town intends to enter into discussion with the MECP to determine how the fill beyond approved limits, which is now understood to consist of waste material, is to be managed.

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2020 Report

1.0 INTRODUCTION

This report serves as the 2020 site development and operations report and presents the results of monitoring activities carried out during 2020 at the Arnprior Waste Disposal Site (Site).

The Arnprior Waste Disposal Site is located on Part of Lots 9, 10, and 11, Concession XIII in the Geographic Township of McNab which is now part of the amalgamated municipality of the Township of McNab/Braeside, Ontario. The Site is situated south of County Road Number 3 (Usborne Street) and north of County Road Number 1 (River Road) (see Key Plan, Figure 1). This site is operated under Amended Environmental Compliance Approval (ECA) No. A412603, issued on March 10, 2020. The site originally operated under Provisional Certificate of Approval (C of A) No. A412603, dated October 26, 1999, which was amended by Notices on June 20, 2003, April 28, 2008, August 18, 2017, and October 12, 2018. The 2008 notice was an administrative amendment to resolve discrepancies between the approval documents and Annual Reports regarding the size of the Site and Contaminant Attenuation Zone (CAZ), and the 2017 notice added a requirement for an assessment for a landfill gas venting system in the final cover as part of the Closure Plan for the Site, approved waste diversion activities at the Site, added a requirement to update the proposed trigger mechanism and contingency plan, and added associated documents to Schedule A. The 2018 amendment was a minor change regarding an updated date for submission of the trigger mechanism. The March 2020 revision of the ECA was initiated by changes to the requirements to submit an updated trigger mechanism, as discussed in Section 11.2 of this report; the amended ECA generally incorporates the previously issued amendments to the C of A No. A412603, dated October 26, 1999.

This report has been prepared to fulfil the reporting requirements outlined in Condition 20 of ECA No. A412603.

Historically, the CAZ land located north and northeast of the existing approved landfill (between a Canadian Pacific Rail Line and Usborne Street) was owned by various industrial owners some of whom processed wood. It has been reported that much of this property is covered with wood waste fill and the property was used for lumber industry related activities. In addition, berms on this site related to the rail line are of unknown fill quality.

2.0 OPERATIONS

2.1 Description of Operations

The site consists of a 9.6 hectare landfilling area (6.2 hectare waste footprint surrounded by a 30 metre buffer) within a total site area of 40.4 hectares, as shown in Figure 2. The landfill has been in operation since about 1970 and as of July 1, 2011, the site operations were subcontracted to Tomlinson Environmental Services Inc. (Tomlinson) of Ottawa, Ontario.

A summary of the operations at the Arnprior Waste Disposal Site with respect to compliance with the conditions of ECA A412603 (issued March 10, 2020) at the time of 2020 are shown in Table 1. The site is in compliance with the conditions as available in 2020 with respect to the inspection and reporting as required in the ECA.

2.2 Site Plan Preparation

In December 2020, a site survey was conducted by Golder Associates Ltd. (Golder) using total station survey equipment to prepare a site plan showing the existing site conditions in 2020. The survey allowed Golder to establish the fill volume placed since the previous survey which was conducted in December 2019 by Golder.

The site plan, showing the landfill conditions in December 2020 is provided in Figure 2. Selected cross-sections showing the recent survey in comparison to historical surveys and proposed fill limits are provided in Figure 3; cross-sections A, B, C, and J are not shown, as no new fill was placed in these areas in 2020.

2.3 Cover Quantities

For 2020, the Town of Arnprior estimated that 8,952 cubic metres of sand (based on loads of sand) and an estimated 1,600 cubic metres of ground wood waste were used as daily cover. The ground wood waste volume is an estimate and is based on the number of loads of leaf and yard waste received in 2020.

As discussed below in Section 2.7, the town received multiple odour complaints in 2020 and in response, significantly increased the usage of daily cover material in the event that odour was related to 'insufficient cover'. The Town also received less waste than in previous years, in part due to the closure of the landfill to the public at the onset of the COVID-19 Pandemic but was still receiving sewage sludge deliveries during this time. This led to a higher proportion of sludge being landfilled in comparison to waste in 2020. The sludge material is difficult for heavy equipment to maneuver on and is supplemented with waste and cover material for ease of operations. Since there was proportionally less waste placed in 2020, more sand was applied than typical to assist in ease of operations. These factors are considered to have contributed to higher than normal daily cover quantities in 2020.

2.4 Air Space Utilization and Quantity of Waste Received

The volume of material added to the waste mound between December 12, 2019 and December 22, 2020 was calculated by Golder based on a comparison of the topographic data collected within the active waste disposal area (see Figure 2) during the site surveys carried out by Golder in December 2020 and previous surveys. The volume of material added to the waste mound (including waste and daily/interim cover material) between December 2019 and December 2020 is estimated to be 10,741 cubic metres. The volume of material added to the waste mound in 2020 is higher than in previous years, with the average volume of material added to the waste mound per year between 2013 and 2019 being 7,427 cubic metres. The increase in volume of material added to the waste mound is due in part to a larger volume of cover material used compared to previous years.

The quarterly masses of waste received and landfilled (excluding dewatered sludge) by the Town of Arnprior in 2020 were as follows:

- January to March – 777 tonnes
- April to June – 870 tonnes
- July to September – 889 tonnes
- October to December – 745 tonnes

These quantities are based on estimates of the average weight of municipal garbage collected weekly from the curbside in addition to the known weight and estimated volumes of garbage delivered in vehicles and other containers for direct disposal at the landfill. Assuming a waste density of 0.41 tonnes per cubic metre (CSR, 2003), the volumes of waste received (prior to compaction) are estimated to be:

- January to March – 1,895 m³
- April to June – 2,122 m³
- July to September – 2,168 m³
- October to December – 1,817 m³

Approximately 370 tonnes of dewatered sludge (based on 210 loads at 2 tonnes per load) was received from the Town of Arnprior Sewage Treatment Plant in 2020. It is noted that the sludge has been dewatered to approximately 25%, is anaerobic and has minimal odours due to the upgrades at the Water Pollution Control Centre.

The Town also stockpiled approximately 496 tonnes of clean fill to be used as cover material during final closure.

2.5 Remaining Capacity

The overall volumetric capacity remaining at the Arnprior Waste Disposal Site was estimated by Golder based on a comparison of the December 2013, 2014, 2015, 2016, 2017, 2018, 2019 and 2020 topographic survey information and the approved final contour elevations over the entire licensed fill limit. Based on this comparison, the total volumetric capacity remaining at the Arnprior Waste Disposal Site in December 2020 is estimated to be 206,721 cubic metres, which includes the final cover. The final cover is required to be 0.75 metres over the area of the landfill (6.2 hectares) for a volume of approximately 46,500 cubic metres. Therefore, the estimated airspace remaining for waste and daily cover is estimated to be 160,221 cubic metres.

The annual airspace consumed has ranged between approximately 5,990 and 10,741 cubic metres over the past seven years for an average of 7,841 cubic metres per year. From 2008 to 2012, the annual airspace consumed ranged from 11,087 cubic metres to 19,310 cubic metres per year (Golder, 2013). The annual airspace consumed between 2013 and 2019 has been consistently lower than the previous six years and the average airspace consumed over that time period was approximately 7,430 cubic metres per year. In 2020, the airspace consumed is more consistent with the consumed airspace between 2008 to 2012, however this is likely partially due to the increase in cover material used on site and is not consistent with recent years. As reported in previous years, there is a fill beyond approved limits within the landfill footprint that was previously understood to consist primarily of clay material placed within the landfill footprint approximately eight years ago prior to establishment of the clean fill stockpile area. As it was understood that this material was clean soil material available for use, this volume was not previously considered as contributing to the airspace consumed at the Site. Partial removal of this overfill area was undertaken in 2017. During removal, previously landfilled waste material and leachate were encountered at a depth shallower than anticipated; excavation activities were immediately stopped to avoid potential flow of leachate overland and to mitigate the development of odours. The exposed area was re-covered with a clay. As a result, the full depth of the overfill area was not excavated, and the remaining fill beyond approved limits is considered to be waste contributing to the airspace consumed. As such, when comparing the remaining airspace in 2016 and 2017, the apparent airspace consumed between those years was 18,930 cubic metres, which is not reflective of the waste and cover materials added to the waste mound as part of regular operations in 2017. Assuming the annual waste receipt rate remains around the average 7,841 cubic metres per year between 2013 and 2020, the remaining landfill life is approximately 23 years.

Selected cross-sections showing the recent December 2020 survey in comparison to 2013, 2014, 2015, 2016, 2017, 2018 and 2019 surveys and proposed fill limits are provided in Figure 3. Landfilling activities were not undertaken in the area of the fill beyond approved limits in 2020, so it is not shown in the sections on Figure 3. Now that it is understood that the fill beyond approved limits consist of waste material and not clean soil, the Town intends to enter into discussion with the MECP to determine how this material is to be managed.

2.6 Major Activities and Capital Works

No new capital works projects were undertaken in 2020.

2.7 Public Complaints and Response

Ten odour complaints were received in 2020 all appearing to come from the same residence. The Town requested the resident to come forward when odours were observed, as this would help the Town develop a pattern to determine the cause of the odour. It was determined that the odour complaints were likely occurring on days the landfill was closed.

The town began monitoring the site in early March 2020 which consisted of driving the landfill access road up to the gate, onto the landfill property (if the site was still open) and driving along Usbourne Street and River Road several times per week. The monitoring generally occurred in the afternoon, after the site was closed to assess whether there was sufficient daily cover. No odours were identified during the inspections.

The Town also improved their sludge delivery schedule and covering practices to manage another complaint by a resident who was inadvertently left waiting at the gate when the operator failed to notice them due to having been managing a delivery of sludge at that time. The Town began scheduling sludge deliveries to occur during periods of low operational activity so that the sludge could be covered immediately to avoid odour complaints and disruptions to service to the public.

In addition to creating a more coordinated sludge disposal practice at the site, the operator began to use increased daily cover material to address the odour complaints and to eliminate insufficient cover material as the cause. The operator also began inspecting the tipping face and surrounding area each morning prior to the start of the shift. Numerous coyote tracks were noticed during these inspections and it was hypothesized that the coyotes were uncovering the waste while the landfill was closed, and the exposed waste was contributing to the odours. The Town noted that complaints were often received on days when the landfill was closed, and therefore waste uncovered by coyotes would not be addressed until the site reopened. The areas of exposed waste were generally 1 to 2 square metres. The odour complaints have stopped since the onset of colder temperatures and snow cover.

The Town has been in discussion with the local Ministry of Natural Resources and Forestry (MNRF) office (Pembroke) to determine options for controlling the coyote populations. The MNRF suggested multiple options for reducing or eliminating the coyote population at the landfill, mainly trapping the animals, discharging the animals, or installing electric fencing. Harassing the animals to establish a negative association with the landfill was also discussed. It was determined that the electric fencing and harassing the animals would likely not be effective. The Town has contacted several members of the local Ontario Fur Managers Federation and Renfrew County Nuisance Animal Committee to find a licenced trapper willing to take on the assignment. Several trappers have identified that trapping coyotes is “overly time consuming” and given the current market for furs, desire and value of such pelts is low.

The operator has also noticed that on several occasions, very odorous carrion (mostly dead racoons), have been present on several of the adjacent properties, including on a nearby trail accessed by the public. It may be possible that some odour complaints received could be in relation to this issue rather than the exposed waste at the landfill.

3.0 FIELD ENVIRONMENTAL MONITORING PROCEDURES

3.1 Objectives

The objectives of the 2020 environmental monitoring program were:

- To comply with the annual monitoring and reporting requirements stipulated in Conditions 20 and 27 of ECA No. A412603.
- To monitor background groundwater and surface water quality; groundwater quality immediately downgradient of the landfilled area; surface water quality at various locations in the vicinity of the site.
- To assess site compliance with site-specific trigger levels relating to potential groundwater and surface water impacts due to leachate generated within the waste disposal area.

3.2 Groundwater Monitoring

The 2020 groundwater monitoring program followed the program outlined in Table 5 of the 2019 Site Development, Operations and Environmental Monitoring Report by Golder (Golder, 2020). The locations of all the groundwater monitors that Golder sampled are illustrated on the Site Plan (Figure 2). The groundwater levels in the monitors included in the sampling sessions were measured on May 5, 2020 and October 27, 2020. The spring groundwater monitoring session was conducted on May 5, May 6, May 7, and May 11. The fall groundwater monitoring session was conducted on October 27, October 28, and October 29, 2020.

The 2020 groundwater monitoring program was the same as the 2019 groundwater monitoring program with the exception of the inclusion of monitoring well BR-18D and BR-18S. Volatile organic compounds (VOCs) are only analyzed every five (5) years and were included as part of the 2019 spring monitoring session. The next scheduled session is in spring 2024.

In 2020, a groundwater monitor condition survey was carried out during each groundwater monitoring session. Monitoring well OV-9, for which the riser had been repeatedly cut down in recent years as the well was observed to have been heaving out of the ground, was replaced by Golder in the summer of 2017. A survey of the well was conducted in January 2019 and a well installation log is provided in Appendix B. In the fall of 2020, it was noted that BR-12 requires a new lock and BR-7D requires a cap. No other maintenance issues were identified during the surveys.

In October 2018, a new groundwater monitor, multi-level well BR-18D and BR-18S, was installed in the southeast part of CAZ Area B. The location of this monitor is shown on Figure 2, and a well installation log is provided in Appendix B.

All monitors sampled during 2020 were developed through the removal of at least three standing volumes of water or until dry, using dedicated samplers which have been provided in each groundwater monitor. Sampling of groundwater was generally performed immediately after monitor development.

The temperature, pH and electrical conductivity of the groundwater samples were measured in the field at the time of sample collection. All field instruments were calibrated in the field prior to use. All samples collected were entered on a Chain of Custody Form and placed in coolers with ice packs until they were delivered in person to the private analytical laboratory.

The groundwater samples were collected, prepared and preserved in the field as follows:

- one plastic bottle, field filtered to 0.45 microns and preserved with nitric acid for analysis of aluminum, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silver, sodium, vanadium and zinc
- one clear glass bottle, field filtered to 0.45 microns and preserved with hydrochloric acid for mercury analysis
- one plastic bottle, unfiltered and unpreserved for analysis of dissolved organic carbon (DOC)
- one plastic bottle, unfiltered and unpreserved for analysis of alkalinity, chloride, sulphate, pH, dissolved reactive phosphorus (orthophosphate) and conductivity
- one plastic bottle, unfiltered and unpreserved for analysis of total dissolved solids (TDS)
- one plastic bottle, unfiltered and preserved with sulphuric acid for analysis of ammonia and total phosphorus
- hardness was calculated based on the laboratory calcium and magnesium concentrations

Bureau Veritas Laboratories (formerly Maxxam Analytics) in Ottawa, Ontario performed all laboratory chemical and physical analyses on the groundwater samples. The Report of Analyses sheets from Bureau Veritas Laboratories are provided in Appendix A. The reportable detection limits (RDLs) for the specific groundwater analyses were commensurate with the standards established in the MECP's (formerly Ministry of Environment [MOE]), Ontario Drinking Water Quality Standards, Objectives and Guidelines (MOE, 2003).

3.3 Surface Water Monitoring

As outlined in Table 6 of the 2019 Site Development, Operations and Environmental Monitoring Report (Golder, 2020), surface water samples were taken during the prescribed periods of the year at stations SW-1, SW-2, SW-10, SW-11, SW-12, SW-18, SW-19, SW-21, SW-22, SW-23 and SW-26 except when a station was dry or frozen. Figure 2 shows the locations of these surface water sampling stations.

Surface water sampling sessions were carried out on May 5, August 26 and October 29, 2020. There were no deviations from the surface water monitoring program outlined in the 2019 Site Development, Operations and Environmental Monitoring Report (Golder, 2019).

The temperature, pH, dissolved oxygen and electrical conductivity of the surface water samples were measured in the field at the time of sample collection. All field instruments were calibrated in the field prior to use. All samples collected were entered on a Chain of Custody Form and placed in coolers with ice packs until they were delivered in person to the private analytical laboratory.

The surface water samples were collected, prepared and preserved in the field as follows:

- one plastic bottle, unfiltered and preserved with nitric acid for analysis of barium, beryllium, boron, cadmium, calcium, chromium, cobalt, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silver, sodium, vanadium and zinc
- one plastic bottle, field filtered to 0.45 microns and preserved with nitric acid for analysis of dissolved barium, beryllium, boron, cadmium, calcium, chromium, cobalt, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, selenium, silver, sodium, vanadium and zinc
- one plastic bottle, field filtered to 0.45 microns and preserved with ammonium hydroxide for analysis of chromium

- one clear glass bottle, field filtered to 0.45 microns and preserved with hydrochloric acid for mercury analysis
- one plastic bottle, field filtered to 0.45 microns and lab filtered to 0.2 microns with no preservative for analysis of aluminum
- one plastic bottle, unfiltered and unpreserved for analysis of DOC
- one plastic bottle, unfiltered and unpreserved for analysis of alkalinity, chloride, hardness, nitrate, sulphate, temperature, pH and conductivity
- one plastic bottle, unfiltered and unpreserved for analysis of biological oxygen demand (BOD)
- one plastic bottle, unfiltered and preserved with sulphuric acid for analysis of ammonia and total phosphorus
- one plastic bottle, unfiltered and unpreserved for analysis of TDS and total suspended solid (TSS)
- unionized ammonia was calculated based on the laboratory ammonia concentration and the field temperature and pH measurements
- hardness was calculated based on the laboratory dissolved calcium and magnesium concentrations

Bureau Veritas Laboratories in Ottawa, Ontario performed all laboratory chemical and physical analyses on the surface water samples. The Report of Analyses sheets from Bureau Veritas Laboratories are provided in Appendix A. The RDLs for the specific surface water analyses were commensurate with the standards established in the Provincial Water Quality Objectives (PWQO) (MOE, 1994b, reprinted 1999).

3.4 Landfill Gas Monitoring

In the 2013 Site Development, Operations and Environmental Monitoring Report (Jp2g, 2014), it was recommended that landfill gas monitoring be undertaken. All of the monitoring wells at the site have screens that are below the water table. Monitoring for landfill gas in these wells will not provide information about potential lateral migration of landfill gas since this migration will occur above the water table. The Town could consider installation of shallow landfill gas monitoring wells at the western property boundary to properly assess lateral subsurface migration of landfill gas. Landfill gas monitoring is not listed as a requirement in the ECA.

4.0 GEOLOGICAL CONDITIONS

Borehole logs detailing the geological conditions encountered during the previous investigation programs, conducted by Robinson Consultants Inc., and Golder are provided in Appendix B. The following discussion is based on a review of the information in Appendix B and the following maps:

- Natural Resources Canada – Topographical Map 31F8, Arnprior, 8th Edition, 1994
- Ministry of Natural Resources, Ontario Geological Survey – Map P2726, Paleozoic Geology, Arnprior – Quyon Area, 1984
- Geological Survey of Canada – Surficial Geology, Map 1599A Arnprior, 1976

4.1 Overburden Geology

The regional overburden geology consists of a complex pattern of glacial deposits, Champlain Sea deposits, and Post Champlain Sea deposits. The area has undergone a series of glacial events followed by an incursion of the Champlain Sea and more recent shoreline deposition and fluvial erosion.

In the direct area of the site, deposits from the boundary of abandoned channels of the Ottawa River occur. Within this area, bedrock outcrops have been covered by recent sediments and old channel sediments. The alluvial deposit consists of medium to fine grained fluvial sands with some silt.

To the south of the site and to the east towards Arnprior, lies a deposit of off-shore shallow marine materials. This unit consists of marine clay, silty clay and silt. Closer to the Ottawa River, the clay and silt of the off-shore marine deposit has been eroded by channel flow processes. Depending on the depth of erosion, uniform clay or sandy silty clay with sand bars and non-marine silts may be present.

Underneath the alluvial and marine deposits, fluvial-glacial materials can be encountered. The material is reported to be primarily sand and gravel with numerous cobbles and boulders and lenses of till.

According to Robinson (1997b), the major overburden deposits encountered in the study area are an alluvial sand unit and glacial sand and/or gravel. The alluvial sand is encountered as the surficial unit in approximately half of the augerholes/probeholes. A maximum thickness of 5.5 metres was encountered for this unit in monitor OV-5. The glacial material occurs as surficial material or below the alluvial material. The thickness of the glacial deposit ranges from less than a metre to up to 7 metres. The overburden thickness varied from less than 1 metre to approximately 24 metres. The thicker material is encountered in the southeastern portion of the study area.

Based on the borehole logs, overburden located within the CAZ northeast of the Canadian Pacific Railway line ranges from 0.5 to 1.8 metres in thickness and consists of topsoil, sawdust fill and/or sand and gravel fill. In particular, sawdust fill is noted to be present at monitors BR-8S, BR-8D, BR-9S and BR-9D.

4.2 Bedrock Geology

The regional bedrock geology consists of Precambrian rocks, and Lower to Middle Ordovician formations. The region is transected by several faults which generally trend in a northwesterly to southeasterly direction. One fault is reported to the southwest of the site with the landfill situated on the up-thrown side. In Robinson (1997b), it is reported that this fault is believed to coincide with the bedrock scarp observed on site.

In the direct area of the site, the Paleozoic geology consists of the Gull River Formation, the Rockcliffe Formation and the Oxford Formation. The Gull River Formation consists of interbedded silty dolostone, lithographic to fine crystalline limestone, oolitic limestone, shale, and fine-grained calcareous quartz sandstone. The Rockcliffe Formation consists of interbedded fine-grained light greenish grey quartz sandstone, shaly limestone, and shale. The Oxford and March Formations are often combined and consist of sublithographic to fine crystalline dolostone and interbedded quartz sandstone, sandy dolostone and dolostone, respectively.

According to Robinson (1997b), the Rockcliffe Formation occurs as outcrops or near surface bedrock in the study area and on adjacent properties. Red and green shale layers were observed in test holes and in outcrops. Robinson also reports that the test holes encountered primarily limestone bedrock. Shale layers were encountered in the limestone, primarily nearer the surface. In monitor BR-4, a conglomerate unit was encountered and Robinson interprets this as indicative of the base of the Rockcliffe Formation. Bedrock monitors

BR-5, BR-6 and BR-7 are located along Usborne Street north and east of the site and were drilled through the limestone of the March Formation and Oxford Formation. Shale was encountered in the upper regions of BR-6 which is believed to be the base of the Rockcliffe Formation.

Limestone and/or shale were encountered in the boreholes BR 08-1 and BR 08-3 from the ground surface to depths of 12.14 metres and 15.85 metres, respectively. BR 08-2 consisted of approximately 0.76 metres of sand and gravel fill underlain by sandstone, followed by layers of limestone, siltstone and shale. No field evidence indicative of soil or groundwater impacts were noted during the installation of these monitoring wells.

5.0 PHYSICAL HYDROGEOLOGY

5.1 Groundwater Level Data

Reference elevation data for the groundwater monitors installed at the Arnprior Waste Disposal Site are presented in Table 2.

Groundwater elevations in the overburden are fairly consistent over time with slightly overall decreasing groundwater elevation trends between 2009 and 2015 at groundwater monitors OV-5, OV-7, OV-9 and OV-13, and with slightly overall decreasing groundwater elevation trends since 2012 at OV-10, however this trend is stabilizing. In spring of 2016, groundwater elevations in all overburden monitors were higher than in recent years at their respective locations. Between 2016 and 2019, groundwater elevations at most overburden wells remained slightly elevated compared to pre-2016 conditions, with the exception of OV-7 which decreased to within historic conditions. Groundwater elevations reported during the 2020 monitoring session are generally consistent with elevations reported in 2017, 2018, and 2019, with the groundwater elevation decreasing slightly at OV-5, OV-9 and OV-10 in the fall of 2020. Historically, groundwater elevations at OV-9 are typically lower than elevations reported at OV-10 which is located just south of OV-9. Due to persistent issues with monitoring well OV-9 heaving out of the ground, the well was replaced in the summer of 2017 and was re-surveyed in 2019. Groundwater elevations at this location, reported in November 2017 and during the 2018 monitoring session, are similar to elevations reported at OV-10, making the interpretation of the direction of groundwater flow different from previous years. Evidence of heaving at OV-9 was not reported in 2019 or 2020, however will be monitored during the 2021 monitoring session.

The depth to groundwater reported at OV-4 during the fall 2018 monitoring session is more consistent with historical data from monitoring well OV-5 and vice versa. While it was not possible to confirm, it was assumed that the data recorded at these wells were accidentally mis-transcribed and switched, with the intent that if groundwater elevation measurements showed results consistent with November 2018 results during the 2019 monitoring session, this assumed mislabelling would be corrected in the 2019 annual monitoring report. During the November 2019 monitoring session, there was some confusion in the field around the association of groundwater level measurements to groundwater monitors, resulting in it not being possible to rely on the measurements recorded at OV-4 and OV-5. As such, groundwater levels at OV-4 and OV-5 in the fall of 2019 were not included in the 2019 report, nor this report. During the 2020 fall monitoring session, OV-4 was inadvertently missed and a water level was not obtained.

Groundwater elevations in the bedrock are fairly consistent over time, with the exception of the groundwater elevations at groundwater monitor BR-13D, which consistently varies three to five metres over time, and BR-3, which varied three to five metres between 2013 to 2016 and between 2019 and 2020. Groundwater elevations in bedrock monitors showed a slight increase in the spring of 2020 to similar levels as observed in the spring of 2016, 2017 and 2019 except for monitoring well BR-11 which had low groundwater levels relative to 2016 and

2017, similar to 2019. In the fall of 2019 and again in the fall of 2020, most groundwater elevations returned to similar levels as observed in the fall of 2016 and 2017 except where noted below. BR-13D is observed to be decreasing since spring of 2018. An historical high groundwater elevation was observed at monitor BR-11 in the fall of 2020, exceeding the historical high observed in the fall of 2019. An historical low groundwater elevation was observed at BR-12 in the fall of 2020 (by about 1 metre). Groundwater elevations at BR-1D had been lower in 2014 to 2016 compared to historical data at this location, however returned to pre-2013 elevations in 2017, with a slight increase in the 2018 and 2020 monitoring sessions. Groundwater elevations at BR-1S were significantly lower in 2019 compared to historical data; in 2020, groundwater levels at BR-1S increased to historical levels in the spring, but returned to historical low elevations in the fall. Groundwater elevations at BR 08-1D continue to be approximately 3 to 4 metres higher compared to historical data at this location, consistent with data from 2016 to 2019.

5.2 Hydraulic Gradients

5.2.1 Vertical Component

During the May 2020 monitoring event, the vertical gradient in multi-level bedrock monitoring wells BR-1S/BR-1D, BR-5S/BR-5D, BR-8S/BR-8D, BR-9S/BR-9D, BR-13S/BR-13D and BR-18S/BR-18D was downward or recharging. The vertical gradient at all multi-level wells in October 2020, except for BR-9S/BR-9D and BR-13S/BR-13D was upward or discharging. BR-6S/BR-6D and BR-7S/BR-7D, which had vertical gradients that were upward or discharging during both monitoring sessions, are located north of the licensed landfill area and in proximity to the Ottawa River and are likely discharging to the river.

Monitoring wells installed in July 2008 (BR 08-1S/BR 08-1D, BR 08-2S/BR 08-2D and BR 08-3S/BR 08-3D) were surveyed in January 2019. The vertical gradients in multi-level bedrock monitoring wells BR 08-2S/BR 08-2D and BR 08-3S/BR 08-3D were estimated to be downward or recharging. A vertical gradient did not exist at BR 08-1S/BR 08-1D during the May and October 2020 monitoring events.

Based on the May and October 2020 data available at boreholes OV-13/BR-13S, the vertical gradient between the overburden and bedrock at the site was downward or recharging.

5.2.2 Horizontal Component

The horizontal hydraulic gradients for the overburden and bedrock flow system at the site were estimated from the 2020 groundwater elevation data. The horizontal hydraulic gradient in the overburden groundwater flow system from borehole OV-13 to borehole OV-7 was estimated to be 0.014 in both May and October 2020. In the shallow bedrock, the horizontal hydraulic gradient from monitoring well BR-13S to BR-9S was estimated to be 0.010 in May and October 2020. These bedrock and overburden horizontal gradients are generally similar to the values obtained in previous years.

5.3 Horizontal Groundwater Flow Directions

The horizontal groundwater flow direction within the shallow bedrock zone near the site is shown on Figure 4 for the May 2020 groundwater elevation data and Figure 5 for the October 2020 groundwater elevation data. In general, the groundwater flow direction is north, north-easterly and east toward the Ottawa River. With the addition of monitoring well BR-18S there is now also a component of easterly flow. With this more recently identified easterly flow it would be helpful to install another monitoring well in the southern corner of CAZ Area B or the eastern corner of CAZ Area D if either of these locations is accessible.

The horizontal groundwater flow direction within the overburden near the site is shown on Figure 6 for the May 2020 groundwater elevation data and Figure 7 for the October 2020 groundwater elevation data. In general, the groundwater flow direction is towards the north and east. The easterly component hasn't been observed in recent years but monitoring well OV-9 was replaced in 2017 and water elevation data from this location is providing more information about horizontal groundwater flow direction in the overburden.

6.0 IDENTIFICATION OF SITE-SPECIFIC LEACHATE INDICATOR 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 the landfill site.

For a parameter to be useful as a *leachate indicator parameter* at a landfill site, the following characteristics are desirable:

- The parameter is present in relatively low concentrations in background water quality near the site and 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.
- 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 concentration should not vary dramatically over short periods of time such that during one monitoring event the concentration is indicative of background conditions, whereas during another 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 a lower mobility in 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.
- Parameter concentrations in groundwater and surface water should exhibit spatial variations 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 distances downgradient from the fill area).

The groundwater data from background monitoring wells at the Arnprior Waste Disposal Site, specifically OV-13, BR-13S and BR-13D, and the monitoring well most indicative of leachate quality, OV-7, were examined to determine site-specific *leachate indicator parameters*. Thirteen parameters typically monitored in the groundwater and often monitored in the surface water were identified as site-specific *leachate indicator parameters* and they include: alkalinity, ammonia (for groundwater) and unionized ammonia (for surface water), boron, barium, chloride, iron, hardness, potassium, manganese, sodium, TDS, DOC and dissolved reactive phosphorus (for groundwater) and total phosphorus (for surface water). It is recommended that these parameters be primarily used to define the extent of landfill leachate related impacts and to evaluate site compliance with specific trigger mechanisms as discussed in the following sections.

It is acknowledged that several of these parameters would also be indicative of impact associated with wood waste and/or road salting activities. This is particularly relevant when evaluating potential impact from the landfill on the CAZ land located northeast of the Canadian Pacific Railway line. Specifically, wood waste can contain high concentrations of the *leachate indicator parameters* TDS, alkalinity, DOC, iron and manganese and elevated levels of hardness, sodium and potassium. Other *leachate indicator parameters* such as boron and barium may also be elevated. With respect to road salting activities, *leachate indicator parameters* chloride, sodium and TDS may be elevated.

7.0 GROUNDWATER QUALITY

The groundwater quality in the vicinity of the Arnprior Waste Disposal Site was assessed by collecting groundwater samples from the existing monitoring wells and submitting them for chemical and physical analyses. The results of the field and laboratory chemical and physical analyses conducted during the 2020 monitoring program are presented in Appendix C along with relevant Ontario Drinking Water Quality Standards, Objectives and Guidelines (ODWQS, MOE, 2003) and the data from previous monitoring sessions, including data from monitoring wells not included in the 2020 monitoring program. Data from the 2013 monitoring session is provided in a separate table within Appendix C, with the exception of the background data that is included with all historical data in the main tables in Appendix C. Appendix D contains graphs of all *leachate indicator parameter* concentrations versus time for monitoring wells included in the 2020 monitoring program. These graphs are useful for ascertaining trends in the data but are not specifically referenced in the remainder of the report.

Historical groundwater chemical data were collected by Robinson Consultants Inc. The exact sampling methodology used by Robinson is unclear. For example, sample filtration and preservation methods may vary from Golder's sampling program. Therefore, some differences in historical data prior to 2005 data may be attributable to this factor. Sampling methods implemented by Jp2g during the 2013 monitoring program are documented in the 2013 Site Development, Operations and Environmental Monitoring Report (Jp2g, 2014).

Discussions relating to compliance with the ODWQS relate specifically to both non-health related objectives (i.e., aesthetic parameters) and health-related parameters for which a Maximum Acceptable Concentration (MAC) or Interim Maximum Acceptable Concentration (IMAC) have been established.

7.1 Quality Assurance/Quality Control

Two blind groundwater duplicates were analyzed during each of the spring and fall groundwater monitoring sessions in 2020, as part of the quality assurance/quality control (QA/QC) protocol. In addition, the laboratory performs equipment blanks as an internal method of QA/QC. All laboratory QA/QC results were reported to be within acceptable criteria limits by the laboratory in 2020.

Analytical results on blind sample duplicates are deemed to be outside of acceptable tolerance limits if the relative percent difference (RPD) between the original sample and its duplicate is greater than 50% and both analytical results are greater than 10 times the detection limit, or if the RPD is greater than 30% and both analytical results are greater than 20 times the detection limit. There were multiple groundwater concentrations that were exceeding acceptable tolerance limits for the bedrock blind duplicate sample at BR-6S during the fall monitoring session. Specifically, barium (53.66%), boron (61.73%), calcium (54.14%), hardness (42.74%), and sodium (113.64%) failed the RPD analysis because their respective RPD exceeded 50% and both analytical results were more than 10 times the detection limit. All parameter concentrations reported for the original and duplicate sample at BR-6S were within typical historical ranges. However, concentrations of sodium and barium reported at BR-6S were higher than reported in recent years. The laboratory performed a data check on these samples for the parameters in question. No errors were noted during their analysis and were deemed acceptable by the laboratory's QC

criteria. What this suggests is that the validity of unusual groundwater quality results in the fall 2020 data is uncertain.

There were no exceedances of the RPD in the blind duplicate sample at BR-6D and BR-5D in the spring, nor in the blind duplicate taken at BR-3 for groundwater during the fall monitoring session.

7.2 Background Water Quality and Trigger Concentrations

MECP Guideline B-7 (MOEE, 1994a) addresses the level of off-site leachate impact on groundwater considered acceptable by the MECP and defines the level of impact on groundwater beyond which some form of remedial measure(s) would be warranted.

Under MECP Guideline B-7 (the “Reasonable Use Guideline”), a change in the quality of groundwater on adjacent properties will only be acceptable if the quality is not degraded in excess of fifty percent of the difference between background concentrations and established water quality criteria for aesthetic related parameters, and twenty-five percent of the difference between background conditions and established water quality criteria for health related parameters. In this assessment, the Reasonable Use Performance Objectives (RUPO) are calculated on the basis of the established background concentrations and the ODWQS, with details provided below. Also, trigger levels are established based on the greater of 75 percent of the RUPO or the median background concentration. This trigger mechanism was first presented in the 2005 Operations and Environmental Monitoring Report (Golder, 2006) and it deviates from the methodology previously used by Robinson Consultants Inc. In the 2013 Site Development, Operations and Environmental Monitoring Report (Jp2g, 2014), Jp2g recommended that the trigger mechanism be 100% of the RUPO instead of 75% of the RUPO. ECA No. A412603, issued March 10, 2020, stipulates that trigger values shall be 75% of the RUPO.

Condition 28.2 of ECA No. A412603 requires that within six (6) months of the receipt of comments on the submission mentioned in Condition 28.1 from the District Manager (see Section 11.1 of this Report), the Owner shall submit to the Director for approval an amendment application for an update to this ECA that will include details of the contingency plan to be implemented as approved by the District Manager and a proposed deadline for an update to the trigger mechanism.

7.2.1 Overburden Background Water Quality

Prior to 2001, background groundwater conditions were represented by monitor OV-5 for the overburden and several nearby bedrock residential wells. In 2001, monitoring wells OV-13, BR-13S and BR-13D were installed to provide a more suitable background source of water quality data at the site. These monitoring wells are located over 100 metres upgradient of the active landfill. It should be noted that these new background monitoring wells are located closer to River Road and as such could be impacted by road salting activities.

Historic groundwater quality at monitoring well OV-13 is somewhat variable with concentrations of *leachate indicator parameters* historically being higher in the spring monitoring event than the fall monitoring event. Water quality from OV-13 is characterized by elevated concentrations of manganese (exceeding the ODWQS three times) and TDS (occasionally exceeding the ODWQS); slightly elevated concentrations of chloride (typically in the spring); and low or non-detect concentrations of boron. Concentrations of iron have historically exceeded the ODWQS twice. Elevated chloride and TDS concentrations are likely the result of road salting on River Road.

The background groundwater quality for each of the *leachate indicator parameters*, the RUPO and current trigger concentrations for the overburden are presented in the following table.

Leachate Indicator Parameters	ODWQS ² (mg/L)	n	Background Range ¹ (mg/L)	Reasonable Use Performance Objective Based on Median Background Concentration (mg/L)	Trigger Concentration (75% of the RUPO or Median Background Value) (mg/L)
Alkalinity	--	40	210 – 367	--	--
Ammonia	--	39	<0.02 – 0.09	--	--
Barium	1 (MAC)	39	0.08 – 0.24	0.35	>0.26
Boron	5 (IMAC)	41	<0.01 – 0.06	1.27	>0.95
Chloride	250 (AO)	41	<1 – 85	142	>106
Iron	0.3 (AO)	41	0.01 – 1.83*	0.18	>0.13
Hardness	--	35	190 – 424	--	--
Manganese	0.05 (AO)	39	<0.002 – 0.17*	0.03	>0.02
Potassium	--	40	3 – 5.3	--	--
Sodium	200 (AO)	40	8 – 32	110	>82
DOC	5 (AO)	30	0.6 – 2.1	3.0	>2.25
TDS	500 (AO)	41	200 – 645*	467.5	>435**
Dissolved Reactive Phosphorus	--	30	<0.01 – 0.09	--	--

Notes:

mg/L – milligrams per Litre

n – Number of groundwater samples collected

AO – Aesthetic Objective

MAC – Maximum Acceptable Concentration

IMAC – Interim Maximum Acceptable Concentration

NC – Median concentration exceeds ODWQS hence it is not possible to calculate the RUPO

ODWQS – Ontario Drinking Water Quality Standards (2003)

* Maximum background concentration exceeds ODWQS

** Median background concentration is greater than 75% of the RUPO.

¹ Background data obtained from monitor OV-13

² ODWQS values presented relate specifically to non-health related parameters (i.e., aesthetic parameters) and health related parameters for which a MAC or IMAC has been established

Entered by: ETB

Checked by: RPM

The calculated RUPO concentrations (MECP Guideline B-7) and trigger concentrations for the *leachate indicator parameters* will be modified, as required, based on additional background groundwater quality data which will be obtained during future monitoring programs.

7.2.2 Bedrock Background Water Quality

Robinson (2005) suggests that monitoring well BR-13S is representative of the Rockcliffe Formation and that monitoring well BR-13D is representative of the March-Oxford Formation. This cannot be verified based on the borehole log available for monitoring wells BR-13S and BR-13D.

Historic groundwater quality at monitoring wells BR-13S and BR-13D is characterized by elevated concentrations of TDS and chloride. Iron and manganese parameters measured from BR-13S and BR-13D have exceeded the ODWQS on occasion while TDS measured from these bedrock background wells frequently exceeds the ODWQS. In general, water quality within the bedrock is more mineralized than the overburden.

The concentration of ammonia reported at BR-13S in the spring (2.7 mg/L) and at BR-13D in the fall (8.5 mg/L) are considered outliers and have not been included in the background range. The historical high concentration reported at BR-13S (0.47 mg/L) is a new maximum background concentration for ammonia. Should future concentrations of ammonia at BR-13S and BR-13D be in line with the higher concentrations observed in 2020, the RUPO and trigger concentrations will be updated accordingly.

The background groundwater quality for each of the *leachate indicator parameters*, the RUPO and current trigger concentrations for the bedrock are presented in the table below:

Leachate Indicator Parameters	ODWQS ² (mg/L)	n	Background Range ¹ (mg/L)	Reasonable Use Performance Objective Based on Median Background Concentration (mg/L)	Trigger Concentration (75% of the RUPO or Median Background Value) (mg/L)
Alkalinity	--	80	220 – 355	--	--
Ammonia	--	79	<0.02 – 0.47	--	--
Barium	1 (MAC)	75	<0.002 – 0.23	0.32	>0.24
Boron	5 (IMAC)	80	0.01 – 0.49	1.31	>0.98
Chloride	250 (AO)	80	6 – 88	154	>115
Iron	0.3 (AO)	77	<0.01 – 1*	0.18	>0.13
Hardness	--	67	205 – 431	--	--
Manganese	0.05 (AO)	75	<0.002 – 0.41*	0.03	>0.02
Potassium	--	77	2 – 10	--	--
Sodium	200 (AO)	77	8 – 45	118	>89
DOC	5 (AO)	60	0.6 – 2.2	3.2	>2.4
TDS	500 (AO)	78	262 – 588*	NC	>515.5**
Dissolved Reactive Phosphorus	--	60	<0.01 – 0.1	--	--

Notes:

mg/L – milligrams per Litre

n – Number of groundwater samples collected

AO – Aesthetic Objective

MAC – Maximum Acceptable Concentration

IMAC – Interim Maximum Acceptable Concentration

NC – Median concentration exceeds ODWQS hence it is not possible to calculate the RUPO

ODWQS – Ontario Drinking Water Quality Standards (2003)

* Maximum background concentration exceeds ODWQS

** Median background concentration is greater than 75% of the RUPO

¹ Background data obtained from monitors BR-13S and BR-13D

² ODWQS values presented relate specifically to non-health related parameters (i.e., aesthetic parameters) and health related parameters for which a MAC or IMAC has been established

Entered by: ETB

Checked by: RPM

The calculated RUPO concentrations (MECP Guideline B-7) and trigger concentrations for the *leachate indicator parameters* will be modified, as required, based on additional background groundwater quality data which will be obtained during future monitoring programs.

7.3 Landfill Leachate Quality

Landfill leachate quality is represented by monitoring well OV-7. During May and October, the groundwater quality in this monitor met the ODWQS with the exception of DOC, TDS, iron, manganese, and sodium.

The groundwater quality at this location during 2020 was generally similar to monitoring sessions conducted since December 1992. Generally, parameter concentrations at this location are staying constant or decreasing slightly.

In comparison to background conditions (maximum values at OV-13) for the overburden, all site-specific *leachate indicator parameters* at OV-7 were elevated above background conditions, except for chloride during the May 2020 monitoring session and dissolved reactive phosphorous during the May and November 2020 monitoring sessions.

The groundwater quality at OV-7 was also compared to PWQO in 2020. Parameter concentrations that exceeded their respective PWQO values in May and October include unionized ammonia, boron, cobalt, iron, and phosphorus.

7.4 Impact Evaluation Monitoring Wells

In Robinson (2005), it is presumed that the March-Oxford Formation is encountered by those wells located north and east of the waste disposal site, along Osborne Street (CAZ Area A and CAZ Area B), including BR-5 (deep and shallow), BR-6 (deep and shallow), BR-10, BR-11 and BR-12. Additionally, Robinson (2005) reports that monitoring wells BR-2, BR-3 and BR-4 were completed to similar elevations and may also intersect the March-Oxford Formation.

The following discussion of impact evaluation monitoring wells includes the monitoring wells which were included in the 2020 monitoring program which are not representative of background water or leachate quality.

These monitoring wells include OV-9, OV-10, BR-1S, BR-1D, BR-3, BR-5S, BR-5D, BR-6S, BR-6D, BR-7S, BR-7D, BR-8S, BR-8D, BR-9S, BR-9D, BR-10, BR-11, BR-12, BR 08-1S, BR 08-1D, BR 08-2S, BR 08-2D, BR 08-3S, BR 08-3D. It should be noted that other monitoring wells exist at the site; however, they were not included in the 2020 monitoring program.

Table 3 summarizes the physical and chemical parameters with reported levels exceeding their respective trigger values; trends in groundwater quality; a comparison of the groundwater quality to background conditions and, a hydrogeological interpretation of the groundwater quality data from the impact evaluation monitors.

7.5 Piper Trilinear Plots

Piper trilinear diagrams of groundwater quality at all monitoring wells sampled in 2020 are provided in Figures 8 and 9 for spring and fall, respectively. The diagrams reveal a distinct plotting of presumed leachate-impacted monitoring wells including OV-7, BR-1S, BR-1D, and BR-6D. A second cluster exists for monitoring wells BR-8S, BR-8D, BR-9S, BR-11, BR-12, BR 08-2D, BR 08-3D and BR 08-3S. Water chemistry of BR08-3D was very similar to BR08-3S in the spring and fall of 2020 and therefore is not visible on the piper plots. Since BR-8 and BR-9 are located within the area of wood waste (the borehole logs for these wells indicate the presence of between one and two metres of sawdust have been deposited in this area), and BR-11 and BR-12 are downgradient of the wood waste, this result supports the argument that the groundwater plume at the Osborne Street property line is at least partially impacted from the effects of wood waste. It also shows that monitoring wells BR 08-2D, BR 08-3D and BR 08-3S installed in the CAZ in 2008 are also at least partially impacted by wood waste.

A third cluster, representing background or undifferentiated conditions is evident on both plots. Historically BR-6D, which is located on the Osborne Street property boundary down-gradient of both the landfill and the wood waste, and BR08-1D, which is located within the CAZ, plotted between this cluster and the cluster representing landfill leachate-impacted groundwater and supports the supposition of a combined (wood waste and landfill leachate related) source. Since 2010 BR-6D plots closer to or within (as in 2020) the leachate impacted cluster although its water quality of leachate-indicator parameters has not substantially changed in that time. In the spring of 2020, BR-7D and BR-8D plotted nearer to the leachate impacted cluster. Between 2016 and 2019, BR08-1D has plotted outside of and between the three identified clusters; in the spring of 2020, BR08-1D plotted within the landfill

leachate plus wood waste cluster, but in the fall of 2020, BR08-1D plotted within the undifferentiated cluster. OV-9 plotted within the undifferentiated cluster in the spring of 2021 but outside of any of the clusters in the fall of 2021. The fall representation of water quality at OV-9 seems to be a function of laboratory results outside of typical normal.

Similar to 2019, OV-13, the overburden background monitor, plotted with the grouping impacted by landfill leachate plus wood waste using the fall monitoring data.

7.6 VOC Concentrations

The next scheduled VOC monitoring session is 2024.

7.7 Interpreted Extent of Groundwater Plume

Historically, groundwater quality down-gradient of the landfill site has been described by Robinson Consultants as being impacted by the landfill, industrial activities (rail and lumber activities) and/or road salting activities.

Based on historical results, historical tannin and lignin concentrations, the piper trilinear diagrams, the groundwater flow directions, and the 2020 monitoring activities, groundwater monitors OV-7, BR-1D, BR-1S have been interpreted to be impacted by landfill leachate. Groundwater monitors BR-5D, BR-5S, BR-6D, BR-6S, BR-8D, BR-8S, BR-9D, BR-9S, BR-12, BR 08-1D, BR 08-1S, BR 08-2S and BR 08-2D are interpreted to be impacted by wood waste deposited on the CAZ Areas, and/or by landfill leachate. It is also possible that groundwater monitors BR-5D, BR-5S, BR-6D, BR-6S and BR-12 are also influenced by road salting. Groundwater monitors BR-7D, BR-7S, BR-10, and BR-11 are interpreted to be impacted by road salt, wood waste, or other industrial activities on the CAZ lands, but not by landfill leachate. Groundwater monitors BR08-3D and BR08-3S are interpreted to be potentially impacted by landfill leachate, as well as wood waste or other industrial activities in the CAZ lands. BR08-3D and BR08-3S have historically been interpreted to not be impacted by landfill leachate due to low chloride concentration and based on their position on the piper plots; however, based on their location between the waste and locations further downgradient that are interpreted to be potentially leachate impacted, it is considered possible that landfill leachate is impacting groundwater at this location. It is noted that BR08-3D and BR08-3S are screened at a higher elevation than further downgradient wells BR-5D and BR-5S, respectively, that are interpreted to be potentially impacted by landfill leachate; this difference in elevation may also be contributing to differences in groundwater quality. Since groundwater monitor BR-3 and OV-10 are cross-gradient or possibly downgradient of a portion of the landfill, the reason for elevated concentrations of several parameters could be associated with the landfill but additional groundwater elevation data is required to validate this. At OV-10, increasing trends have been reported for several leachate indicator parameters, including chloride, barium and sodium since 2006, iron, potassium and ammonia since 2011, and manganese since 2012. Concentrations of ammonia remained elevated at OV-10 after an historical high concentration in the spring of 2019. Similar increasing trends are being observed at BR-3, including concentrations of ammonia, DOC, hardness, potassium, and TDS (overall), chloride and sodium since 2009 (with historical high concentration of sodium in spring 2020) and manganese beginning to appear to be increasing. The samples collected from these groundwater monitors will be evaluated carefully in 2021 along with ongoing assessment of groundwater flow direction to assess ongoing trends. Groundwater monitor OV-9, located about 50 metres north of OV-10, is interpreted not to be impacted by landfill leachate or wood waste. It is recommended that an additional overburden and bedrock monitoring well be installed in the vicinity of OV-9, near the southern corner of CAZ Area B or the eastern corner of CAZ Area D if either of these locations is accessible, to discern groundwater flow direction and possible landfill leachate impacts at the southern property boundary.

It is expected that concentrations of iron, manganese, TDS, and DOC are equally likely to originate from the wood waste as from the landfill leachate and that these parameters are particularly problematic as landfill leachate indicators, while the distribution of barium and boron in the shallow and deep monitors in the licensed landfill area, CAZ Area A and CAZ Area B (BR-1S, BR-1D, BR08-2S, BR08-2D, BR-8D, and others) suggested that these parameters may be better indicators of impact by landfill leachate. The low concentrations of barium and boron in BR-7D, BR-7S, BR-11, BR 08-3D and BR 08-3S, which are interpreted to be impacted by road salt, wood waste or other industrial activities on the CAZ lands but not by landfill leachate, are consistent with this interpretation.

A map showing the water wells within 500 metres from the landfill boundaries is provided (based on MECP water well records) on Figure 10. It is noted that there are no residential wells that are downgradient from the site.

8.0 GROUNDWATER COMPLIANCE ASSESSMENT

Groundwater compliance to MECP Guideline B-7 (MOEE, 1994a) is assessed on the basis of exceedances of the RUPO values and associated trigger values provided in the tables in Sections 7.2.1 and 7.2.2 at overburden and bedrock monitoring wells, respectively, that are located at or near the site boundary. Bedrock monitoring wells at the site boundary include BR-5D, BR-5S, BR-6D, BR-6S, BR-7D, BR-7S, BR-10, BR-11, and BR-12. Overburden monitoring wells at the site boundary include OV-10. With respect to the two 2019 monitoring rounds, they will be referred to herein as the spring round and fall round.

Leachate indicator parameters, iron, manganese and TDS in both the spring and fall sampling rounds exceeded their respective trigger concentrations from Section 7.2.1 at monitor OV-10. TDS has historically been detected in the background monitor at similar concentrations to the spring and fall concentrations in the groundwater from monitor OV-10. The concentration of iron in the fall of 2020 at OV-10 was comparable to historical maximum concentrations in the background well, and the concentration of iron in the spring of 2020 was only slightly (<0.1 mg/L) higher than the historical maximum concentration at the background well. Concentrations of manganese that exceed the maximum concentration have been generally increasing since 2012, however are still lower than the historic concentrations at this location from 2000 and 2008. Trigger exceedances of TDS, iron and manganese have not previously been attributed to deteriorating groundwater quality due to the landfill. However, due to the increasing trends in some leachate indicator parameters observed at OV-10 and the more recent interpretation of groundwater flow direction, it is possible that these exceedances could be indicative of deteriorating groundwater quality. As stated in Section 7.7, it is recommended that a groundwater monitoring well be installed near the southern corner of CAZ Area B or the eastern corner of CAZ Area D if either of these locations is accessible to better define groundwater flow direction.

Not including iron, manganese and TDS which are problematic *leachate indicator parameters* due to their presence in the background monitor, at least one *leachate indicator parameter* from Section 7.2.2 exceeded the trigger concentration in either the spring or fall round, or both of the spring and fall rounds in monitors BR-5D, BR-6D, BR-6S, BR-7D, and BR-12. It is interpreted that exceedances of trigger concentrations in monitors BR-5D, BR-6D, BR-6S and BR-12 result from the effect of the wood waste historically deposited on the CAZ lands north of the Canadian Pacific Rail line, road salting and/or the effect of the landfill. It is interpreted that exceedances of trigger concentrations in monitors BR-7D result from road salt, wood waste, or other industrial activities formerly undertaken on the CAZ lands, but not by landfill leachate, based on the piper plots. It is important to note that the leachate indicator parameters exceeding the trigger concentrations at these locations all have concentrations which are generally consistent, consistently variable or slightly decreasing over time, with the exception of concentrations of barium reported at monitoring well BR-6S.

In accordance with ECA No. A412603, issued March 10, 2020, the 2020 data has been interpreted using 75% of the RUPO or the median background value to determine the trigger concentrations. The Town is taking actions to address groundwater compliance issues at the site which are discussed in Section 11.

9.0 SURFACE WATER QUALITY

Currently monitored surface water sampling stations are shown on Figure 2.

According to Robinson Consultants Inc. (1997b), the Arnprior Waste Disposal Site is drained by two watersheds to the Ottawa River. The northern watershed drains most of the landfill area. The watershed is drained by a small intermittent stream through a series of perennial ponds. This watershed has a step-like longitudinal profile with two base levels. One level is located down gradient of the Waste Disposal Site west of the railroad track. Surface water locations SW-2, SW-3, SW-4, SW-5 and SW-6 are located along this level which is controlled by a bedrock ledge. This level is followed downstream by another sill-like scarp to the Ottawa River. Surface water location SW-1 is located along this feature.

The northern watershed is characterized by the occurrence of a series of ponds on both sides of the railroad tracks and by a wetland area north and east of the tracks. Robinson reports that the wetland area behaves as a sink to numerous nutrients, metals and potential contaminants. Processes of the wetland area would include adsorption to settling sediments, plant adsorption, microbial activities and dilution effects.

In addition, the Ottawa River is monitored at locations SW-18 and SW-19 where water from the wetland is expected to possibly discharge to the river. In the case of station SW-19, the actual sampling location is approximately 5 metres upstream of the River. The additional upstream background sampling station for the Ottawa River (SW-26), which was added to the surface water sampling program in 2010, is located approximately 400 metres northwest (upstream) of SW-18.

The southern watershed is approximately twice as large as the northern watershed and approaches the southern boundary of the property. This watershed area is drained by an ephemeral stream (i.e., SW-10) that becomes an intermittent stream (i.e., SW-11 and SW-12) at the downgradient bedrock ledge, at the railroad tracks.

The results of the field and laboratory chemical and physical analyses conducted during the 2020 monitoring program are presented in Appendix C along with relevant PWQO (MOE, 1994b) and the data from previous monitoring sessions. Data from the 2013 monitoring session is provided in a separate table within Appendix C, with the exception of the data from the background station (SW-10), which is included with all historical data in the main tables in Appendix C. Appendix D contains graphs of all leachate indicator parameter concentrations versus time for surface water sampling locations included in the 2020 monitoring program. These graphs are useful for ascertaining trends in the data but are not specifically referenced in the remainder of the report.

9.1 Flow Conditions

Flow conditions in surface water bodies can have an impact on the parameter concentrations measured and the interpretation of compliance. Stagnant water bodies present the opportunity for some *leachate indicator parameters* to increase for reasons potentially unrelated to landfill leachate effects. Statements regarding flow conditions and some observations at each surface water sampling station during the 2020 monitoring events are provided in the following table.

Sample Station	Surface Water Flow (2020)		Comments
	Month	Flow (L/s)	
SW-1	May	Approx. 9.4 L/s	Clear, no colour, sulphur odour, no sediment
	Aug	Approx. 3.8 L/s	Clear, no colour, sulphur odour, no sediment
	Oct	Approx. 7.2 L/s	Clear, no colour, faint sulphur odour, no sediment
SW-2	May	Not measured	Clear, no colour, no odour, no sediment, no measurable flow
	Aug	Not measured	Clear, beige tinge, no odour, no sediment, flow through culvert
	Oct	Not measured	Clear, beige tinge, no odour, no sediment, good flow
SW-10	May	Approx. 2 L/s	Clear, no colour, no odour, no sediment
	Aug	Dry	Dry
	Oct	Dry	Dry
SW-11	May	Approx. 23.3 L/s	Clear, no colour, no odour, no sediment
	Aug	Approx. 3.5 L/s	Clear, no colour, no odour, no sediment
	Oct	Approx. 5.9 L/s	Clear, no colour, no odour, no sediment
SW-12	May	Approx. 10.9 L/s	Clear, no colour, no odour, no sediment
	Aug	Approx. 3.8 L/s	Clear, no colour, no odour, no sediment
	Oct	Approx. 5.1 L/s	Clear, no colour, no odour, no sediment
SW-18	May	River, not measured	Clear, beige tinge, no odour, no sediment
	Aug	River, not measured	Clear, beige tinge, no odour, no sediment
	Oct	River, not measured	Clear, beige tinge, no odour, no sediment
SW-19	May	Approx. 10.8 L/s	Clear, no colour, no odour, no sediment
	Aug	Approx. 2.6 L/s	Clear, no colour, no odour, no sediment
	Oct	Approx. 5.2 L/s	Clear, no colour, no odour, no sediment
SW-21	May	Not measured	Clear, no colour, no odour, no sediment
	Aug	Dry	Dry
	Oct	Not measured	Clear, beige tinge, no odour, no sediment
SW-22	May	Not measured	Clear, beige tinge, no odour, trace sediment
	Aug	Dry	Dry
	Oct	Not measured	Clear, beige tinge, no odour, no sediments
SW-23	May	Not measured	Clear, no colour, no odour, no sediment, no measurable flow
	Aug	Dry	Dry
	Oct	Dry	Dry
SW-26	May	River, not measured	Clear, beige tinge, no odour, no sediment
	Aug	River, not measured	Clear, beige tinge, no odour, no sediment
	Oct	River, not measured	Clear, beige tinge, no odour, no sediment

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Photographs of sampling stations at the time of each sampling event have been included in Appendix E.

9.2 Quality Assurance/Quality Control

One blind surface water duplicate was analyzed during the spring, summer and fall surface water monitoring session in 2020 as part of the QA/QC protocol. In addition, the laboratory performs equipment blanks as an internal method of QA/QC. All laboratory QA/QC results for surface water were within acceptable tolerance limits in May, August and October 2020.

Analytical results on blind sample duplicates are deemed to be outside of acceptable tolerance limits if the RPD between the original sample and its duplicate is greater than 50% and both analytical results are greater than 10 times the detection limit, or if the RPD is greater than 30% and both analytical results are greater than 20 times the detection limit.

During the fall monitoring session, one parameter exceeded the acceptable tolerance limits of the RPD analysis. The sample was obtained at surface water monitoring station SW-19 and ammonia nitrogen was recorded as having a relative percent difference of 76.6% with the duplicate, and both analytical results are 10 times the detection limit. Both concentrations exceeded historical ammonia concentrations at SW-19 with the original sample reported as having a concentration of 6.5 mg/L and the duplicate having a concentration of 2.9 mg/L. A data check was performed on the original sample ammonia concentration and the laboratory found no errors with QC.

9.3 Background Conditions and Revised PWQO Trigger Concentrations

Background surface water quality for the site is represented by the data available from SW-10 (south of the active landfill). There currently is no distinct background surface water source for the wetland to the north of the site and hence SW-10 is used to represent background for all surface water bodies around the site. Surface water quality at this station is characterized by repeated exceedances of the PWQOs for total phosphorus (including in May 2020), aluminum (including in May 2020) and iron. Occasional concentrations outside of the PWQOs for dissolved oxygen, cadmium, vanadium and zinc are noted in historical data and copper, cobalt, lead, phenols and silver have exceeded their respective PWQOs on one occasion. For comparison purposes, as discussed in Section 11, the surface water quality has also been compared to the Canadian Council of Ministers of Environment (CCME) Water Quality Guideline for the Protection of Aquatic Life (CWQG) for boron and chloride (CCME, 2015). The background surface water quality does not exceed the CCME guideline for boron or the short-term exposure CCME guideline for chloride (640 mg/L). The background surface water quality often exceeds the CCME guideline for long-term exposure of chloride (120 mg/L). The parameter concentrations measured at SW-10 are generally consistent to slightly variable with time. In 2020, SW-10 was dry during the summer and fall monitoring events.

The background surface water quality for each of the *leachate indicator parameters* for background surface water station SW-10, compliance parameter concentrations and current trigger parameter concentrations are presented below. It should be noted that the following PWQO trigger concentrations deviate from the values used by Robinson Consultants Inc. but they are the same as in the 2005 Operations and Environmental Monitoring Report (Golder, 2006). In the 2013 Site Development, Operations and Environmental Monitoring Report (Jp2g, 2014), Jp2g recommended using the trigger mechanism currently in use, with the exception of changing the guideline for boron from the PWQO of 0.2 mg/L to the CCME guideline of 1.5 mg/L. Condition 20.2 of the ECA indicates that surface water quality at the site should be assessed with respect to PWQO. Since the use of the CCME guideline is acceptable to the MECP reviewer (Golder, 2015) it is presented and discussed in the following section but not used to assess trigger compliance. The MECP reviewer also recommended using the CCME guideline for chloride. For the same reasons, the CCME chloride criteria (for short-term and long-term exposure) are used for

discussion, but not used to assess trigger compliance at the site. The chloride guideline should not be used on its own to make decisions about compliance of the site.

Condition 28.2 of ECA No. A412603 requires that within six (6) months of the receipt of comments on the submission mentioned in Condition 28.1 from the District Manager (see Section 11.1 of this Report), the Owner shall submit to the Director for approval an amendment application for an update to this ECA that will include details of the contingency plan to be implemented as approved by the District Manager and a proposed deadline for an update to the trigger mechanism.

Leachate Indicator Parameters	PWQO (mg/L)	n	Background Range ¹ (mg/L)	75 th Percentile Compliance for Parameters with PWQO (mg/L)	PWQO Trigger Parameter Concentration (higher of PWQO or 75 th Percentile) or CCME Criteria (mg/L)
Alkalinity	75% Bkgd	29	118 – 335	280	<280 ³
Unionized Ammonia	0.02	28	<0.02 (2.0)**	NC	>0.02
Barium	--	24	0.02 – 0.06	--	--
Boron	0.2 (1.5 ²)	24	<0.01 – 0.11	0.04	>0.2 (>1.5 ²)
Chloride	640 ² 120 ²	30	10.7 – 422	170.5	>640 ² >170.5 ²
Iron	0.3	30	0.06 – 2.5*	0.74	>0.74
Hardness	--	29	130 – 448	--	--
Manganese	--	23	<0.005 – 0.16	--	--
Potassium	--	29	3 – 7	--	--
Sodium	--	29	0.5 – 206	--	--
DOC	--	19	1.28 – 12	--	--
TDS	--	30	163 – 1290	--	--
Total Phosphorus	0.03	28	0.06 – 0.42 (1.01***)	0.20	>0.19

Notes:

mg/L – milligrams per Litre

n – Number of surface water samples collected

PWQO – Provincial Water Quality Objectives (1994b)

* Value exceeds the PWQO

** The value of 2.0 mg/L was obtained in November 1993 however the total ammonia concentration was 0.28 mg/L; therefore, the 2.0 mg/L appears to be an error and will not be included in the evaluation of trigger concentrations.

*** The value of 1.01 mg/L was obtained in May 1995 and appears to be an error and will not be included in the evaluation of trigger concentrations

NC – 75th percentile value not calculated because >50% of data for parameter are “non-detects”

¹ Background surface water quality based on SW-10

² CCME Water Quality Guidelines for the Protection of Aquatic Life for short term and long term exposure, respectively.

³ The trigger value for alkalinity is based on the 75th percentile value at the background location.

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Checked by: RPM

The calculated surface water PWQO trigger parameter concentrations based on data available from surface water sampling stations SW-10 will be modified, as required, based on additional background surface water quality data which will be obtained during future monitoring programs.

9.4 Discussion

Table 4 summarizes the physical and chemical parameters with reported levels exceeding their respective trigger values based on PWQO; trends in surface water quality; a comparison of the surface water quality to background conditions; and, an interpretation of the surface water quality data.

9.4.1 Southern Ephemeral/Intermittent Stream

The southern watershed containing the ephemeral/intermittent stream is outside the southern boundary of the property. Based on the stream's location and water quality data, it is interpreted not to be impacted by landfill leachate. The concentrations of chloride and sodium at SW-11 and SW-12 have historically shown a very slight increasing trend over time; concentrations appeared to have stabilized since 2015, however may continue to be slightly increasing at SW-11. The concentrations of chloride and sodium are highest at upstream monitoring station SW-10 during 2019, indicating that the source is not related to the landfill. Based on the elevated concentration of these parameters, it is considered that these results are likely related to road salting activities and/or industrial activities. The remaining water quality data for locations SW-10, SW-11 and SW-12 suggest a consistent water quality that is not being impacted by the landfill.

The concentrations of aluminum, and total phosphorus were outside their respective PWQO during the May sampling session at SW-10, the concentration of unionized ammonia exceeded the PWQO in May and aluminum in August at SW-12. Aluminum exceeded the PWQO at SW-11 in May and August. There were no other exceedances of the PWQO during the 2020 sampling sessions at these locations (note that SW-10 was dry during the August and October sampling sessions). There were no exceedances of the CCME guidelines for chloride (short-term and long-term exposure) or boron at these locations during 2020. Historical exceedances observed at these sampling locations may be natural or may be attributable to road salting activities and/or industrial activities.

9.4.2 Ponds/Wetland

All of the surface water sampling stations sampled within and on the periphery of the wetland (SW-1, SW-2, SW-21, SW-22 and SW-23) had one or more parameters that did not meet the PWQO (dissolved oxygen, boron, cobalt and/or iron) in 2020. There were no exceedances of the CCME guideline for boron or chloride (short-term and long-term exposure) at these locations during 2020. SW-23 and SW-22 were dry (or had insufficient volume to sample) during the August and October (SW-23 only) sampling sessions. Historically, an overall decreasing trend in dissolved oxygen has been observed from 2005 to 2016 at these locations, with the exception of SW-23 which has only been sampled twice since 2004 due to dry conditions. Reported concentrations of dissolved oxygen appear to be stabilizing or increasing at these locations based on the data from recent monitoring sessions (2017 to 2020). The PWQO exceedances observed at SW-1, SW-2, SW-21, SW-22 and SW-23 may be attributable to the landfill, industrial activities associated with the railway or lumber industries (i.e., the wood waste. As well, evaporation from the stagnant water within the wetland may be resulting in elevated parameter concentrations in surface water.

9.4.3 Ottawa River

Surface water sampling location SW-18 within the Ottawa River is interpreted not to be impacted by the landfill leachate, even though the concentration of aluminum was above the PWQO criteria during the spring, summer, and fall monitoring session in 2020 and the iron and unionized ammonia concentrations were above the PWQO during the spring monitoring session. The background surface water sampling location SW-26 within the Ottawa River had similar water quality to SW-18 in 2020 with SW-26 water sample concentrations of aluminum outside the PWQO in the spring, summer, and fall monitoring sessions, unionized ammonia outside the PWQO during the

spring and fall monitoring sessions, and concentrations of iron outside the PWQO concentration during the spring sampling sessions in 2020. There were no exceedances of the CCME guidelines for chloride (short-term and long-term exposure) or boron at either of these locations during 2020.

Water quality within the river is distinctly different than the ephemeral/intermittent stream and the ponds/wetland. Surface water sampling location SW-19, located approximately 5 metres upstream along a tributary which flows into the Ottawa River, is interpreted not to be impacted by the landfill leachate even though unionized ammonia exceeded the PWQO during the fall monitoring session, and iron and boron exceeded the PWQO in August. Dissolved oxygen, total phosphorous, boron and iron have periodically been outside the PWQO trigger concentrations at this location in the last number of years but in general water quality has remained consistent. Concentrations of unionized ammonia were elevated in 2020 at SW-19 noting that a duplicate sample failed the RPD; the concentration of unionized ammonia will be observed for potential increasing trends in 2021. A potential sheen on the surface of water at SW-19 has been previously reported; review of the photographs in Appendix E indicate no sheen on the surface during the 2020 monitoring session.

9.4.4 Beaver Dams

The concern with beaver dams at landfills is with the potential for failure, causing potentially leachate-impacted water and sediment to suddenly be released to downstream surface waters. For this reason, the extent of beaver activity within the wetland watershed was monitored during the 2020 monitoring, with emphasis on documenting the location and age of the beaver dams.

Beaver activity was noted upstream of sampling location SW-2 during the 2020 sampling sessions. Beaver activity in this area has been reported since 2014. No new beaver activity was observed during the 2020 monitoring session. Beaver activity will continue to be monitored during the 2021 monitoring program to determine the extent of the beaver activity and if steps need to be taken to control the activity.

10.0 SURFACE WATER COMPLIANCE ASSESSMENT

This section provides a surface water compliance assessment under MECP Policy 1 and Policy 2 (MOE, 1994b) based on the surface water PWQO trigger mechanism developed for the Arnprior Waste Disposal Site as outlined in Section 9.3.

For the purpose of this surface water quality compliance assessment, the PWQO and the surface water triggers are applied to surface water sampling stations SW-1 and SW-2. SW-1 is located where the northern wetland flows off the landfill site CAZ and SW-2 is located near the inlet of the northern wetland. The point of compliance at SW-2 was added in the 2008 Annual Report (Golder, 2009), as recommended by the MECP, to provide an earlier warning further upstream of potential impacts by landfill site contaminants to the receiving surface water regime. The trigger parameters include alkalinity, boron, iron, total phosphorus and unionized ammonia. Iron and total phosphorus represent Policy 2 parameters and the remaining parameters are Policy 1 parameters. Chloride will be compared to the CCME guideline for comparison purposes since there is not a PWQO for chloride.

At surface water sampling station SW-2, leachate indicator parameters unionized ammonia, boron, and iron exceeded the PWQO trigger concentrations during at least one monitoring session in 2020. No other PWQO trigger concentrations were exceeded in 2020 at surface water sampling station SW-2. Boron and iron exceeded the respective PWQO trigger concentration at surface water sampling station SW-1 during at least one monitoring session in 2020. The concentrations of unionized ammonia, boron and iron exceeding the trigger concentrations at SW-1 and SW-2 in 2020 were within the historical concentrations at these locations. Note that the CCME criteria for chloride and boron were not exceeded at SW-1 or SW-2 in 2020. A review of the 2020 surface water concentrations indicate that contingency measures are not required at this time.

11.0 MECP CORRESPONDENCE

11.1 Groundwater Compliance

Comments dated March 23, 2018 from MECP groundwater reviewer Thomas Guo were received on the 2016 Annual Monitoring Report (Golder, 2017). The groundwater reviewer provided the following recommendations and conclusions in their comments:

- 1) TDS, iron and alkalinity should be used as leachate indicator parameters for groundwater.
- 2) The Site is not in compliance with the Reasonable Use Guideline B-7 (RUG) along the northern property boundary, noting that the conclusion for the exceedances of the RUG at monitoring wells BR-5D, BR-6D, BR-10, BR-7S and BR-12 (i.e., that impacts at these monitoring wells result from impacts other than the landfill) is not acceptable. The reviewer states that the Town should address these exceedances and that DOC should be used as a leachate indicator parameter.
- 3) The groundwater reviewer states that the use of 75% of the RUG in the trigger mechanism is acceptable, contingent on the adoption of the other recommendations above.

Golder responded to the groundwater comments on behalf of the Town in the June 8, 2018 letter; it is provided in Appendix F, and the groundwater comments are attached to this letter. In the response, Golder proposed a meeting to discuss compliance issues at the Site. The meeting was subsequently held between the Town, Golder, and the MECP on June 22, 2018 to discuss groundwater compliance at the Site, and in particular the interpreted impact of wood waste and/or historical industrial activity within the CAZ lands on groundwater quality at the property boundary. A follow up conference call was held between the Town, Golder, and the MECP on August 22, 2018 during which time Golder and the Town proposed a plan of action (subsequently provided in an August 23, 2018 email from Megan Farnel of Golder to the MECP, attached) involving the installation of a new groundwater monitoring well within the CAZ lands in an area interpreted to be cross-gradient to the landfill but within an area potentially impacted by historic activities to help discern the differences between landfill impacts and historical impacts that could be contributing to groundwater quality at the Site boundary. Groundwater monitors BR-18S and BR-18D were installed in the southeast portion of CAZ Area B in October of 2018 (the location of BR-18S and BR-18D is shown on Figure 2, and a well installation log is provided in Appendix B). Groundwater level measurements, sampling and analytical testing of the groundwater were undertaken from the new well on October 29, 2018, November 24, 2018, December 15, 2018, January 1, 2019, and January 27, 2019.

On March 20, 2019, a follow up call was held between the Town, Golder and the MECP District Office and Groundwater Technical Support to discuss initial groundwater results from the new monitoring well, and to request additional time to collect seasonal data from the new monitoring well. Additional groundwater level measurements, sampling and analytical testing of the groundwater from BR-18S and BR-18D was undertaken on May 29, 2019 and August 7, 2019. An additional groundwater level measurement was taken on November 13, 2019 during the fall monitoring session.

Based on an analysis of the data from the above sampling sessions by Golder, the new interpreted groundwater flow direction establishes that BR-18 is downgradient of the landfill, and therefore not suitable for use as a background monitor. Therefore, the approach to establish BR-18 as a new background groundwater monitor for assessing compliance was abandoned by the Town.

A conference call was held between the Town, Golder and the MECP District Office and Groundwater Technical Support on November 27, 2019, and summarized in an email to attendees with copy to the MECP Client Services and Permissions Branch from Andria Caletti of Golder dated November 28, 2019 (provided in Appendix F). During

the call, it was discussed that BR-18 would not be presented as a possible new background monitor as previously considered. It was proposed that the Town retain Golder to undertake an Options Assessment that would consider if there are other contingency options available to alleviate the groundwater compliance issues. Condition 28.1 of the revised ECA received on March 10, 2020 (see Section 11.2) required that by no later than June 30, 2020, the Town shall submit to the District Manager contingency measures to address groundwater compliance at the Site.

The Town submitted a “Request for Pandemic Related Temporary Regulatory Relief (Alternate Arrangement) for Waste Disposal Sites and Waste Management System” dated June 15, 2020, requesting that the deadline for the submission of the contingency measures be revised to December 31, 2020. This is provided in Appendix F.

A call was held between the Town, Golder and the MECP District Office and Groundwater Technical Support on August 27, 2020 to discuss contingency measures that were being considered within the Options Assessment. A summary of call was provided by Golder on September 2, 2020 (provided in Attachment F). The MECP provided a response to questions arising from the call in an email dated October 6, 2020 (provided in Attachment F).

In a letter dated December 3, 2020, Golder provided the District Manager with the Town’s preferred contingency option to address the groundwater compliance issue. It is considered that the submission of this letter fulfills the requirements of Condition 28.1. Comment has not been received from the MECP on the proposed contingency option at this time.

11.2 Revision to ECA

As previously discussed in the 2019 Annual Monitoring Report, on April 24, 2019, Golder, on behalf of the Town sent a letter to the MECP Client Services and Permissions Branch requesting an extension to the April 30, 2019 deadline to revise the trigger mechanism for the Site under former Condition 41 to December 31, 2019, citing the on-going conversations with the district and regional MECP regarding groundwater compliance at the Site and to obtain seasonal groundwater data at the newly installed monitoring well BR-18 (as discussed in Section 11.1). An ECA Application was submitted with the request for extension on April 24, 2019 (provided in Appendix F) and the MECP acknowledged receipt of the application in their letter dated May 10, 2019 (Reference Number 5404-BBRM9M). A draft notice to the ECA was received on October 2, 2019.

The draft notice to the ECA was not finalized ahead of the November 27, 2019 conference call between the Town, Golder and the MECP District Office and Groundwater Technical Support (see Section 11.1). During that call, it was requested that former Condition 41 be amended to require submission of an Options Assessment, rather than a revised trigger mechanism. Proposed wording for the amendment to former Condition 41 was included in the November 28, 2019 email from Andria Caletti of Golder summarizing the call; Maliha Tariq, the contact at the MECP Client Services and Permissions Branch was included on this email. Subsequently, on December 9, 2019, a call was held between Andria Caletti (Golder) and Maliha Tariq during which it was discussed that the proposal to submit an Options Assessment to the District Manager was acceptable, with the timing of next steps and future submissions to be determined at that time. Removal of Condition 41 and the addition of a new Condition reflecting the Options Assessment would be formalized as part of a full revision to the ECA; the draft Notice No. 4 was no longer applicable. It was also confirmed that the Town would not be required to submit a revised trigger mechanism by December 31, 2019, as per former Condition 41. This discussion was summarized in an email from Golder dated December 9, 2019, and confirmed in a response from the MECP Client Services and Permissions Branch on December 12, 2019 (provided in Appendix F).

Correspondence between Golder and Maliha Tariq of the MECP related to the revised ECA occurred on January 10, 2020, January 17, 2020, January 20, 2020, February 6, 2020, February 20, 2020, and a call on February 24, 2020, March 2, 2020, and March 5, 2020. On March 10, 2020, the revised ECA was received. A copy of the correspondence is provided in Appendix F.

12.0 PROPOSED 2021 ENVIRONMENTAL MONITORING PROGRAM AND ACTIVITIES

12.1 Objectives

The objectives of the 2021 environmental monitoring program are:

- To comply with the annual monitoring and reporting requirements stipulated in Conditions 20 and 27 of Certificate of Approval No. A412603.
- To continue to monitor background groundwater and surface water quality; leachate quality; groundwater quality immediately downgradient of the landfilled area; and surface water quality at various locations in the vicinity of the site.
- To assess site compliance with site-specific trigger levels relating to groundwater and surface water impacts due to landfill leachate-related impacts.

12.2 Groundwater Component

The groundwater monitoring program proposed for 2021 is provided in Table 5 and is the same as the monitoring program completed 2020 noting that if any new monitoring wells are added to the site (as has been suggested) they will be included in monitoring events of the listed laboratory measured parameters.

12.3 Surface Water Component

The proposed 2021 surface water monitoring program is provided in Table 6. There are no proposed changes from the 2020 program.

12.4 Landfill Gas Component

Jp2g recommended monitoring landfill gas from on-site groundwater monitoring wells. Due to the construction of the groundwater monitoring wells and the location of the water table, monitoring the groundwater monitoring wells will not provide information on the lateral migration of landfill gas. Landfill gas monitoring from on-site groundwater monitoring wells is not recommended for 2021.

12.5 Site Activities

Beaver activity at the site will be documented with field notes and photographs where appropriate. A groundwater monitor condition survey will be carried out in the spring and fall of 2021.

12.6 Compliance Related Activities

Trigger mechanisms and contingency measures were proposed in the 2013 Site Development, Operations and Environmental Monitoring Report (Jp2g, 2014). The recommended contingencies included installing groundwater monitoring wells on adjacent downgradient properties and/or acquiring additional CAZ. Given the historical land use around the site and known requirements of the existing property owner(s), this proposed contingency measure is not readily achievable.

Condition 28.1 of the revised ECA received on March 10, 2020 (see Section 11.2) required that by no later than June 30, 2020, the Town shall submit to the District Manager contingency measures to address groundwater compliance at the Site.

In a letter dated December 3, 2020, Golder provided the District Manager with the Town's preferred contingency option to address the groundwater compliance issue. It is considered that the submission of this letter fulfills the requirements of Condition 28.1. Comment has not been received from the MECP on the proposed contingency option at this time.

As discussed in Section 2.5 of this report, the Town intends to enter into discussion with the MECP to determine how the fill beyond approved limits, which is now understood to consist of waste material, is to be managed.

13.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of the Town of Arnprior. The report, which specifically includes all tables, figures and appendices, is based on data and information collected by Golder Associates Ltd. (Golder) and is based solely on the conditions at the site at the time of the work, supplemented by historical information and data obtained by Golder and others as described in this report. Each of these reports must be read and understood collectively and can only be relied upon in their totality.

Golder has relied in good faith on all information provided and does not accept responsibility for any deficiency, misstatements, or inaccuracies contained in the reports as a result of omissions, misinterpretation, or fraudulent acts of the persons contacted or errors or omissions in the reviewed documentation.

The assessment of environmental conditions at this site has been made using the results of physical measurements and chemical analyses of liquids from a number of locations. The site conditions between sampling locations have been inferred based on conditions observed at borehole locations. Subsurface conditions may vary from these sampled locations.

The services performed, as described in this report, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

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

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder should be requested to re-evaluate the conclusions of this report, and to provide amendments as required. The groundwater monitors installed during previous investigations by Golder or other consultants have been left in place.

These groundwater monitors are the property of the Town of Arnprior and not Golder.

14.0 CLOSURE

We trust this report meets your current needs. If you have any questions regarding this report, please contact the undersigned

Golder Associates Ltd.



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Environmental Consultant



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ETB/PLE/ALC/sg

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Table 1 – Review of Conditions of Environmental Compliance Approval No. A412603

Condition No.	Item	Comments
1.1	The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Site is notified of the ECA and the conditions herein and shall take all reasonable measures to ensure the person complies with the same.	Understood
1.2	Any person authorized to carry out work on or operate any aspect of the Site shall comply with the conditions of this ECA.	Understood
2.1	Except as otherwise provided for in this ECA , the Site shall be designed, developed, constructed, operated, modified and maintained in accordance with the application for this ECA and the supporting documentation listed in Schedule "A".	Understood
3.1	The issuance of, and compliance with, this ECA does not: <ul style="list-style-type: none"> (a) relieve any person of any obligation to comply with any provision of the EPA or any other applicable statute, regulation or other legal requirement; or (b) limit in any way the authority of the Ministry to require certain steps be taken or to request that any further information related to compliance with this ECA be provided to the Ministry; unless a provision of this ECA specifically refers to the other requirement or authority and clearly states that the other requirement or authority is to be replaced or limited by this ECA. 	Understood
4.1	The Owner or Operator remain responsible for any contravention of any other condition of this ECA or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused an adverse effect or impairment of air and/or water quality.	Understood
5.1	Any information requested by the Ministry concerning the Site and its operation under this ECA, including but not limited to any records required to be kept by this ECA shall be provided in a timely manner.	Understood
5.2	The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action, under this ECA or under any statute, regulation or subordinate legal instrument, in relation to the information, shall not be construed as: <ul style="list-style-type: none"> (a) an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any condition of this ECA or any statute, regulation or other subordinate legal requirement; or (b) acceptance by the Ministry of the information's completeness or accuracy. 	Understood
5.3	Any information related to this ECA and contained in Ministry files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, R.S.O. 1990, C. F-31.	Understood
6.1	Where there is a conflict between a provision of any document, including the application, referred to in this ECA, and the conditions of this ECA, the conditions in this ECA shall take precedence.	Understood
6.2	Where there is a conflict between the application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the Ministry approved the amendment in writing.	Understood
6.3	Where there is a conflict between any two documents listed in Schedule "A", other than the application, the document bearing the most recent date shall take precedence.	Understood

Condition No.	Item	Comments
6.4	The conditions of this ECA are severable. If any condition of this ECA, or the application of any condition of this ECA to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this ECA shall not be affected thereby.	Understood
7.1	Pursuant to Section 197 of the EPA , no person having an interest in the Site shall deal with the Site in any way without first giving a copy of this ECA to each person acquiring an interest in the Site as a result of the dealing.	Understood
7.2	In the event any land is acquired that will be included as part of the Site, two (2) copies of a completed Certificate of Requirement, containing a registerable description of the Site, shall be submitted to the Director for the Director's signature within sixty (60) calendar days of a notice being issued for the Site that incorporates the land into the ECA.	Understood
7.3	In the event any land is acquired that will be included as part of the Site as discussed in Condition 7.2 then the Certificate of Requirement shall be registered in the appropriate land registry office on title to the Site and a duplicate registered copy shall be submitted to the Director within ten (10) calendar days of receiving the Certificate of Requirement signed by the Director.	Understood
8.1	The Owner shall notify the Director , in writing, and forward a copy of the notification to the District Manager, within 30 days of the occurrence of any changes in the following information: <ul style="list-style-type: none"> ■ the ownership of the Site; ■ the Operator of the Site; ■ the address of the Owner or Operator; ■ the partners, where the Owner is or at any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c. B-17 shall be included in the notification; and ■ the name of the corporation where the owner is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C-39 shall be included in the notification. 	Understood
8.2	No portion of this Site shall be transferred or encumbered prior to or after closing of the Site unless the Director is notified in advance and is satisfied with the arrangements made to ensure that all conditions of this ECA will be carried out and that sufficient financial assurance is deposited with the Ministry to ensure that these conditions will be carried out.	Understood
9.1	No person shall hinder or obstruct a Provincial Officer from carrying out any and all inspections authorized by the EPA, OWRA or the PA, of any place to which this ECA relates, and without limiting the foregoing: <ul style="list-style-type: none"> ■ to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this ECA are kept; ■ to have access to, inspect, and copy any records required to be kept by the conditions of this ECA; ■ to inspect the Site, related equipment and appurtenances; ■ to inspect the practices, procedures, or operations required by the conditions of this ECA; and ■ to sample and monitor for the purposes of assessing compliance with the terms and conditions of this ECA, or the EPA, OWRA or the PA. 	Understood
10.1	The service area from which the landfill receives waste shall be limited to the Town of Arnprior, Village of Braeside and the Township of McNab.	Understood

Condition No.	Item	Comments
10.2	<ul style="list-style-type: none"> a) The hours of operation for the Site are: Monday through Saturday, 9:00 a.m. to 4:00 p.m. b) The Owner may change the hours of operation for the Site with the approval of the District Manager. 	Understood
11.1	<p>The Owner shall install a sign at the main entrance/exit to the Site on which is legibly displayed the following information:</p> <ul style="list-style-type: none"> a) The name of the Site and Owner; b) the number of this Approval; c) the operating hours of the Site; d) a twenty-four (24) hour telephone number that can be used to reach the Owner in the event of a complaint or an emergency; e) the type of waste that is approved for receipt at the Site; f) a warning against unauthorized access; and g) a warning against dumping outside the Site. 	In Compliance
12.1	The Site shall be operated and maintained such that the vermin, vectors, dust, litter, odour, noise and traffic do not create a nuisance.	In Compliance
13.1	Burning of waste at the Site is prohibited.	Understood
13.2	Notwithstanding Condition 13.1, the burning of brush, trees and clean wood may be conducted at the Site in accordance with Section 4.21 and Item no. 3 of Appendix E of the Ministry's "Guidance Manual for Landfill Sites Receiving Municipal Waste" dated November 1993.	Understood
14.1	No waste shall be received, landfilled or removed from the Site unless Trained Personnel are present and supervises the operations during operating hours. Landfilling and waste diversion activities shall not be undertaken when Trained Personnel are not present to supervise these operations.	Understood
14.2	The Site shall be operated and maintained in a safe and secure manner. During non-operating hours, the Site entrance and exit gates shall be locked and the Site shall be secured against access by unauthorized persons.	In Compliance
15.1	A training plan specific to the Site shall be developed and implemented to ensure that all employees that operate the Site or carry out any activity required under this Approval are trained in the operation related to that activity.	In Compliance
16.1	<p>If at any time the Owner receives complaints regarding the operation of the Site, the Owner shall respond to these complaints according to the following procedure:</p> <ul style="list-style-type: none"> a) The Owner shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint; b) The Owner, upon notification of the complaint, shall initiate appropriate steps to determine possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and c) The Owner shall complete and retain on-site a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents. 	Understood
17.1	Any spills, fires and emergency situations at the Site resulting from activities approved under this ECA and with impacts to the environment or the health and safety of the public shall be forthwith reported directly to the Ministry's Spills Action Centre (1-800-268-6060) and shall be cleaned up immediately.	Understood

Condition No.	Item	Comments
17.2	In addition, the Owner shall submit, to the District Manager a written report within three (3) business days of the emergency situation under Condition 17.1, outlining the nature of the incident, remedial measures taken, handling of waste generated as a result of the emergency situation and the measures taken to prevent future occurrences at the Site.	Understood
17.3	All wastes resulting from an emergency situation shall be managed and disposed of in accordance with Reg. 347.	Understood
17.4	All equipment and materials required to handle the emergency situations shall be: <ul style="list-style-type: none"> a) kept on hand at all times that waste landfilling and/or handling is undertaken at the Site; and b) adequately maintained and kept in good repair. 	Understood
17.5	The Owner shall ensure that the emergency response personnel are familiar with the use of such equipment and its location(s).	Understood
18.1	A visual inspection of the entire Site and all equipment on the Site shall be conducted each day the Site is in operation to ensure that: <ul style="list-style-type: none"> a) the Site is secure; b) that the operation of the Site is not causing any nuisances including those from dust, odours, vectors, vermin, birds, litter, noise and traffic; c) that the operation of the Site is not causing any visual negative impacts on the environment or the health and safety of the public; and d) that the Site is being operated in compliance with this Approval. Any deficiencies discovered as a result of this inspection shall be remedied immediately, including temporarily ceasing operations at the Site if needed.	In compliance
18.2	A record of the inspections shall be kept in a daily log book that includes: <ul style="list-style-type: none"> a) the name of the person that conducted the inspection; b) the date and time of the inspection; c) the list of any deficiencies discovered; d) the recommendations for remedial action; and e) the date, time and description of actions taken. 	In compliance
18.3	A record shall be kept in the daily log book of all refusals of waste shipments, the reason(s) for refusal, and the origin of the waste, if known.	In compliance
19.1	A daily log shall be maintained in written or electronic format and shall include the following information: <ul style="list-style-type: none"> a) the type, date and time of arrival, hauler, and quantity (tonnes) of all waste and cover material received at the Site; b) the area of the Site in which waste disposal operations are taking place; c) a record of litter collection activities and the application of any dust suppressants; d) a record of the daily inspections; and e) a description of any out-of-service period of any control, treatment, disposal or monitoring facilities, the reasons for the loss of service, and action taken to restore and maintain service. 	In compliance
20.1	By March 31st of each year, an annual monitoring report (the "Annual Report") shall be submitted to the Regional Director reporting the results of the monitoring carried out during the previous calendar year.	Understood

Condition No.	Item	Comments
20.2	<p>The Annual Report shall include but not be limited to the following information:</p> <ul style="list-style-type: none"> a) the results and an interpretive analysis of the results of all leachate, groundwater, and surface water and monitoring, including an assessment of the need to amend the monitoring programs; b) an assessment of groundwater quality and compliance with Guideline B-7 and ODWO; c) an assessment of surface water quality and compliance with PWQO; d) an assessment of the operation and performance of all engineered facilities, the need to amend the design or operation of the Site, and the adequacy of and need to implement the contingency plans; e) site plans showing the existing contours of the Site; areas of landfilling operation during the reporting period; areas of intended operation during the next reporting period; areas of excavation during the reporting period; the progress of final cover, vegetative cover, and any intermediate cover application; facilities existing, added or removed during the reporting period; and site preparations and facilities planned for installation during the next reporting period; calculations of the volume of waste, daily and intermediate cover, and final cover deposited or placed at the Site during the reporting period and a calculation of the total volume of Site capacity used during the reporting period; f) a calculation of the remaining capacity of the Site and an estimate of the remaining Site life; g) a summary of the total annual quantity of waste received on a quarterly basis at the Site; h) a summary of any complaints received and the responses made; i) a discussion of any operational problems encountered at the Site and corrective action taken; j) any changes to the Design and Operations Report and the Closure Plan that have been approved by the Director since the last Annual Report; k) a report on the status of all monitoring wells and a statement as to compliance with Ontario Regulation 903; and l) any other information with respect to the Site which the Regional Director may require from time to time. 	
21.1	The Site is approved for the landfilling of solid non-hazardous waste from domestic, commercial and industrial sources, and de-watered sewage sludge.	Understood
21.2	<p>Dewatered sludge shall be disposed in accordance with the following sub-conditions:</p> <ul style="list-style-type: none"> a) sewage sludge shall be covered immediately following disposal and following incorporation into the active fill; b) no sewage sludge shall be disposed of at the tipping face of the landfill used by the general public; and c) access road and buffer areas shall be clear of any sludge material at all times. 	Understood
21.3	The maximum amount of waste landfilled at the Site shall not exceed 12,000 tonnes per year.	In compliance
22.1	Waste shall only be landfilled within the confines of the 6.2 hectares fill area and final top waste contours approved under this ECA.	Understood
22.2	No waste shall be deposited at the Site after the final contours have been attained as shown on Figure 4 and Figure 5 of Item no. 11 of Schedule "A".	Understood
22.3	No additional waste shall be landfilled in the Fill Beyond Approved Limits area identified in Figure 5 of Item no. 11 of Schedule "A".	Understood
23.1	The minimum thickness of daily cover shall be 150 millimetres as indicated in Item no. 11 of Schedule "A".	Understood

Condition No.	Item	Comments
23.2	A suitable stockpile of clean cover material, which shall be equivalent to 50% of the quantity of the required annual daily cover material shall be maintained at the Site as a contingency measure.	In compliance
23.3	The use of processed (chipped and/or mulched) wood as an alternative daily cover is allowed at the Site subject to the following sub-conditions: <ul style="list-style-type: none"> a) i. The source of all construction, demolition and woodwaste coming to the landfill Site shall be limited to within the approved service area. ii. Notwithstanding Condition 23.3 (a) (i) above, woodwaste suitable for chipping and/or mulching may be received from outside the approved service area provided it is within 100 kilometres of the Site. b) Stockpiling of waste shall be limited to wood or wood products with maximum dimensions of 30 metres by 15 metres by 10 metres. c) Stockpiles shall be located a minimum of 30 metres away from any forested area. d) Stockpiles shall be processed (chipped and/or mulched) once a year at a minimum, and shall not exceed the annual daily cover requirements of the Site by volume. 	In compliance
24.1	The minimum thickness of intermediate cover shall be 300 millimetres as indicated in Item no. 11 of Schedule "A".	Understood
24.2	The Site is approved to import up to 6,000 cubic metres of hydrocarbon contaminated (non-hazardous) soil to be used as an intermediate cover.	Understood
25.1	The maximum height of the peak/crown for the refuse and final cover shall not exceed 120.0 metres above the assumed elevation datum, as indicated in Figure 4 and Figure 5 of Item no. 11 of Schedule "A".	Understood
25.2	The final completed contours shall include 0.7 metre of final cover. This final cover shall consist of 0.6 metre of silt and/or clay overlain by 0.1 metre of topsoil or soil capable of sustaining vegetation.	Understood
26.1	Guideline B-7 levels are established on Pages 17 and 18 of Item no. 9 of Schedule "A". Trigger levels shall be 75% of the Guideline B-7 levels at the CAZ boundary.	Understood
27.1	<ul style="list-style-type: none"> a) The Owner shall carry out the groundwater monitoring program in accordance with Item no. 11 of Schedule "A". b) Any proposed changes to the groundwater monitoring program shall be subject to the approval of the Regional Director. 	Understood
27.2	<ul style="list-style-type: none"> a) The Owner shall carry out the surface water sampling program in accordance with Item no. 11 of Schedule "A". b) The surface water sampling program is subject to any changes to the OWRA, and/or to recommendations made by the Ministry. c) Any proposed changes to the surface water monitoring program shall be subject to the approval of the Regional Director. 	Understood
28.1	By no later than June 30, 2020, the Owner shall submit to the District Manager contingency measures to address groundwater compliance at the Site.	Complete

Condition No.	Item	Comments
28.2	<p>Within six (6) months of the receipt of comments on the submission mentioned in Condition 28.1 from the District Manager, the Owner shall submit to the Director for approval an amendment application for an update to this ECA. The amendment application shall include:</p> <ul style="list-style-type: none"> a) details of the contingency plan to be implemented as approved by the District Manager; and b) a proposed deadline for an update to the trigger mechanism. 	Understood
29.1	<p>No less than one (1) year prior to the planned closure of the Site, the Owner shall submit to the Director for approval, with copies to the District Manager, a detailed Site closure plan pertaining to the termination of landfilling operations at this Site, post-closure inspection, maintenance and monitoring, and end use. The plan shall include the following:</p> <ul style="list-style-type: none"> a) final contour plan; b) a description of the proposed end use of the Site; c) a description of the procedures for closure of the Site, including: <ul style="list-style-type: none"> i. advance notification of the public of the landfill closure; ii. posting of a sign at the Site entrance indicating the landfill is closed and identifying any alternative waste disposal arrangements; iii. completion, inspection and maintenance of the final cover and landscaping; iv. Site security; v. removal of unnecessary landfill-related structures, buildings and facilities; vi. final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water, stormwater and landfill gas; and vii. a schedule indicating the time-period for implementing sub-conditions (i) to (vi) above; d) descriptions of the procedures for post-closure care of the Site, including: <ul style="list-style-type: none"> i. operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water, stormwater and landfill gas; ii. monitoring of Site settlement; iii. record keeping and reporting; and iv. complaint contact and response procedures; e) an assessment of the adequacy of and need to implement the contingency plans for leachate; f) an assessment of the need for a landfill gas venting system in the final cover; and g) an updated estimate of the contaminating life span of the Site, based on the results of the monitoring programs to date. 	Understood
29.2	The Site shall be closed in accordance with the closure plan as approved by the Director.	Understood
30.1	Waste diversion activities are hereby approved to be to be conducted at the Site in accordance with the Design and Operations Report listed in Item no. 11 of Schedule "A".	Understood

Table 2 – Groundwater Elevations

Monitoring Well	Ground Surface Elev. (m)	Top of Pipe Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)
			April 30, 2008		November 27, 2008		April 24, 2009		November 27, 2009	
BR-1S	85.04	85.40	2.20	83.20	2.31	83.09	3.03	82.37	3.14	82.26
BR-1D	85.04	85.36	8.61	76.75	8.84	76.52	7.78	77.58	7.84	77.52
BR-3	89.63	89.86	2.51	87.35	2.665	87.20	2.10	87.76	2.175	87.69
BR-5S	83.95	84.39	6.87	77.52	7.68	76.71	6.87	77.52	6.91	77.48
BR-5D	83.95	84.37	7.74	76.63	7.91	76.46	6.96	77.41	6.995	77.38
BR-6S	82.06	82.79	6.67	76.12	7.26	75.53	6.17	76.62	6.23	76.56
BR-6D	82.06	82.77	6.46	76.31	7.07	75.70	6.54	76.23	6.62	76.15
BR-7S	79.69	80.76	4.9	75.86	5.02	75.74	4.64	76.12	4.71	76.05
BR-7D	79.69	80.76	4.76	76.00	4.88	75.88	4.5	76.26	4.53	76.23
BR-8S	85.17	85.90	3.17	82.73	3.19	82.71	2.63	83.27	2.665	83.24
BR-8D	85.17	85.95	3.66	82.29	3.49	82.46	3.00	82.95	3.045	82.91
BR-9S	84.80	85.61	2.58	83.03	2.68	82.93	2.09	83.52	2.135	83.48
BR-9D	84.80	85.80	9.17	76.63	9.53	76.27	8.865	76.94	8.90	76.90
BR-10	80.63	81.57	2.33	79.24	2.38	79.19	2.28	79.29	2.34	79.23
BR-11	82.38	83.37	3.67	79.70	3.65	79.72	3.06	80.31	3.115	80.26
BR-12	83.20	84.46	1.37	83.09	1.53	82.93	1.23	83.23	1.295	83.17
BR-13S	107.15	107.87	17.93	89.94	18.02	89.85	17.43	90.44	17.61	90.26
BR-13D	107.15	107.86	19.86	88.00	19.985	87.88	20.30	87.56	20.38	87.48
OV-2	85.14	85.90	0.83	85.07	1.02	84.88	0.75	85.15	0.81	85.09
OV-4	108.65	109.22	18.41	90.81	18.56	90.66	18.2	91.02	18.26	90.96
OV-5	89.73	90.12	2.62	87.50	3.04	87.08	2.84	87.28	2.90	87.22
OV-7	86.46	87.20	2.96	84.24	3.07	84.13	2.12	85.08	2.16	85.04
OV-9	87.00	87.67	1.01	86.66	1.11	86.56	0.96	86.71	1.085	86.59
OV-10	87.02	88.49	1.115	87.38	1.195	87.30	1.05	87.44	1.17	87.32
OV-13	107.15	107.75	17.29	90.46	17.43	90.32	17.16	90.59	17.31	90.44
BR 08-1S	82.23	83.06	---	---	1.67	---	1.25	---	1.31	---
BR 08-1D	82.23	83.02	---	---	3.12	---	5.16	---	5.20	---
BR 08-2S	86.27	87.03	---	---	4.34	---	3.64	---	3.695	---
BR 08-2D	86.27	86.99	---	---	4.65	---	4.06	---	4.115	---
BR 08-3S	85.41	86.26	---	---	3.28	---	2.64	---	2.70	---
BR 08-3D	85.41	86.35	---	---	4.12	---	3.85	---	3.91	---

Monitoring Well	Ground Surface Elev. (m)	Top of Pipe Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)
			May 17, 2010	November 29, 2010	May 9, 2011	November 29, 2011				
BR-1S	85.04	85.40	3.76	81.64	3.72	81.68	3.61	81.79	3.84	81.56
BR-1D	85.04	85.36	7.97	77.39	7.91	77.45	7.84	77.52	8.07	77.29
BR-3	89.63	89.86	2.46	87.40	2.41	87.45	2.38	87.48	2.62	87.24
BR-5S	83.95	84.39	7.61	76.78	7.66	76.73	7.29	77.10	7.69	76.70
BR-5D	83.95	84.37	7.95	76.42	8.10	76.27	7.31	77.06	7.43	76.94
BR-6S	82.06	82.79	7.47	75.32	7.32	75.47	6.72	76.07	7.44	75.35
BR-6D	82.06	82.77	7.28	75.49	7.18	75.59	6.43	76.34	7.41	75.36
BR-7S	79.69	80.76	5.54	75.22	5.59	75.17	4.86	75.90	5.83	74.93
BR-7D	79.69	80.76	5.43	75.33	5.50	75.26	4.84	75.92	5.75	75.01
BR-8S	85.17	85.90	3.62	82.28	3.60	82.30	3.46	82.44	3.70	82.20
BR-8D	85.17	85.95	3.39	82.56	3.34	82.61	3.24	82.71	3.45	82.50
BR-9S	84.80	85.61	2.75	82.86	2.71	82.90	2.62	82.99	2.31	83.30
BR-9D	84.80	85.80	9.61	76.19	9.555	76.25	9.45	76.35	9.63	76.17
BR-10	80.63	81.57	2.39	79.18	2.34	79.23	2.30	79.27	2.33	79.24
BR-11	82.38	83.37	3.84	79.53	3.80	79.57	3.67	79.70	2.97	80.40
BR-12	83.20	84.46	1.78	82.68	1.73	82.73	1.23	83.23	1.36	83.10
BR-13S	107.15	107.87	17.98	89.89	18.4	89.47	17.55	90.32	18.44	89.43
BR-13D	107.15	107.86	23.15	84.71	21.97	85.89	20.18	87.68	25.04	82.82
OV-2	85.14	85.90	0.98	84.92	0.92	84.98	0.90	85.00	0.99	84.91
OV-4	108.65	109.22	18.40	90.82	18.34	90.88	18.29	90.93	18.45	90.77
OV-5	89.73	90.12	3.04	87.08	3.00	87.12	2.94	87.18	3.18	86.94
OV-7	86.46	87.20	2.36	84.84	2.315	84.89	2.28	84.92	2.51	84.69
OV-9	87.00	87.67	1.20	86.47	1.17	86.50	1.10	86.57	1.16	86.51
OV-10	87.02	88.49	1.195	87.30	1.16	87.33	1.09	87.41	2.11	86.38
OV-13	107.15	107.75	17.54	90.21	18.06	89.69	17.30	90.45	17.90	89.85
BR 08-1S	82.23	83.06	1.96	---	1.92	---	1.53	---	1.98	---
BR 08-1D	82.23	83.02	6.57	---	6.515	---	6.01	---	6.40	---
BR 08-2S	86.27	87.03	4.25	---	3.76	---	3.53	---	3.02	---
BR 08-2D	86.27	86.99	4.53	---	4.21	---	3.98	---	4.69	---
BR 08-3S	85.41	86.26	3.36	---	3.04	---	2.77	---	3.02	---
BR 08-3D	85.41	86.35	5.06	---	4.90	---	4.74	---	5.05	---

Monitoring Well	Ground Surface Elev. (m)	Top of Pipe Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)
			May 6, 2012		November 12, 2012		June 2013		October 2013	
BR-1S	85.04	85.40	4.13	81.27	4.52	80.88	3.44	81.96	3.67	81.73
BR-1D	85.04	85.36	8.42	76.94	8.59	76.77	8.20	77.16	d.i.	---
BR-3	89.63	89.86	3.19	86.67	3.20	86.66	5.32	84.54	6.14	83.72
BR-5S	83.95	84.39	7.67	76.72	8.19	76.20	7.67	76.72	7.74	76.65
BR-5D	83.95	84.37	8.03	76.34	8.22	76.15	8.45	75.92	8.92	75.45
BR-6S	82.06	82.79	7.31	75.48	7.52	75.27	7.39	75.40	n.m.	---
BR-6D	82.06	82.77	7.16	75.61	7.39	75.38	7.32	75.45	n.m.	---
BR-7S	79.69	80.76	5.61	75.15	5.80	74.96	5.53	75.23	6.00	74.76
BR-7D	79.69	80.76	5.50	75.26	5.70	75.06	5.50	75.26	5.95	74.81
BR-8S	85.17	85.90	3.96	81.94	4.22	81.68	3.12	82.78	3.65	82.25
BR-8D	85.17	85.95	3.80	82.15	4.03	81.92	3.47	82.48	3.93	82.02
BR-9S	84.80	85.61	3.11	82.50	3.48	82.13	2.60	83.01	3.16	82.45
BR-9D	84.80	85.80	9.93	75.87	10.16	75.64	10.14	75.66	10.50	75.30
BR-10	80.63	81.57	2.41	79.16	2.53	79.04	2.35	79.22	2.48	79.09
BR-11	82.38	83.37	3.86	79.51	3.88	79.49	3.30	80.07	3.74	79.63
BR-12	83.20	84.46	1.60	82.86	2.00	82.46	1.45	83.01	1.90	82.56
BR-13S	107.15	107.87	18.30	89.57	18.33	89.54	18.35	89.52	19.06	88.81
BR-13D	107.15	107.86	20.80	87.06	20.01	87.85	23.81	84.05	26.61	81.25
OV-2	85.14	85.90	1.38	84.52	1.46	84.44	0.84	85.06	1.15	84.75
OV-4	108.65	109.22	18.84	90.38	18.99	90.23	18.55	90.67	14.15 ¹	95.07 ¹
OV-5	89.73	90.12	3.33	86.79	3.66	86.46	3.71	86.41	4.30	85.82
OV-7	86.46	87.20	2.69	84.51	2.88	84.32	3.16	84.04	3.42	83.78
OV-9	87.00	87.67	1.20	86.48	1.29	86.38	1.62	86.05	dry	---
OV-10	87.02	88.49	1.27	87.22	1.40	87.09	2.42	86.07	2.98	85.51
OV-13	107.15	107.75	17.78	89.97	17.94	89.81	17.90	89.85	18.44	89.31
BR 08-1S	82.23	83.06	2.01	---	2.93	---	1.72	---	1.98	---
BR 08-1D	82.23	83.02	6.53	---	6.39	---	5.03	---	5.14	---
BR 08-2S	86.27	87.03	3.90	---	4.07	---	3.98	---	4.55	---
BR 08-2D	86.27	86.99	4.49	---	4.56	---	4.75	---	5.23	---
BR 08-3S	85.41	86.26	3.29	---	3.31	---	3.19	---	3.81	---
BR 08-3D	85.41	86.35	5.45	---	5.96	---	5.56	---	6.53	---

Monitoring Well	Ground Surface Elev. (m)	Top of Pipe Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)
			May 30, 2014		November 17, 2014		May 4, 2015		November 15, 2015	
BR-1S	85.04	85.40	3.23	82.17	3.31	82.09	3.20	82.20	3.43	81.97
BR-1D	85.04	85.36	9.60	75.76	9.67	75.69	9.54	75.82	9.79	75.57
BR-3	89.63	89.86	1.61	88.25	1.69	88.17	1.58	88.28	1.83	88.03
BR-5S	83.95	84.39	7.68	76.71	7.74	76.65	7.60	76.79	7.99	76.40
BR-5D	83.95	84.37	7.73	76.64	7.75	76.62	7.61	76.76	8.02	76.35
BR-6S	82.06	82.79	7.06	75.73	7.09	75.70	6.99	75.80	7.54	75.25
BR-6D	82.06	82.77	6.80	75.97	6.86	75.91	6.75	76.02	7.40	75.37
BR-7S	79.69	80.76	5.17	75.59	5.23	75.53	5.22	75.54	5.77	74.99
BR-7D	79.69	80.76	5.07	75.69	5.10	75.66	4.99	75.77	5.69	75.07
BR-8S	85.17	85.90	3.02	82.88	3.07	82.84	3.00	82.90	3.38	82.52
BR-8D	85.17	85.95	3.40	82.55	3.39	82.56	3.31	82.64	3.70	82.25
BR-9S	84.80	85.61	2.58	83.03	2.63	82.98	2.53	83.08	2.92	82.69
BR-9D	84.80	85.80	10.00	75.80	10.01	75.79	9.895	75.91	10.19	75.61
BR-10	80.63	81.57	2.36	79.21	2.40	79.17	2.28	79.29	2.43	79.14
BR-11	82.38	83.37	3.82	79.55	3.83	79.54	3.74	79.63	3.51	79.86
BR-12	83.20	84.46	1.48	82.98	1.50	82.97	1.38	83.08	1.46	83.00
BR-13S	107.15	107.87	18.36	89.51	18.13	89.74	18.31	89.56	18.62	89.25
BR-13D	107.15	107.86	22.10	85.76	22.12	85.74	22.02	85.84	22.36	85.50
OV-2	85.14	85.90	0.86	85.04	0.94	84.96	0.88	85.02	1.30	84.60
OV-4	108.65	109.22	18.60	90.62	18.58	90.64	18.49	90.73	18.64	90.58
OV-5	89.73	90.12	3.80	86.32	3.76	86.36	3.64	86.48	3.79	86.33
OV-7	86.46	87.20	3.05	84.15	3.12	84.08	3.02	84.18	3.21	83.99
OV-9	87.00	87.67	1.60	86.07	dry	---	2.12	85.55	2.31	85.36
OV-10	87.02	88.49	2.10	86.39	2.15	86.34	2.09	86.40	2.34	86.15
OV-13	107.15	107.75	17.96	89.79	18.00	89.75	17.89	89.86	18.04	89.71
BR 08-1S	82.23	83.06	1.80	---	1.80	---	1.72	---	1.99	---
BR 08-1D	82.23	83.02	5.20	---	5.26	---	5.20	---	5.43	---
BR 08-2S	86.27	87.03	4.01	---	4.04	---	3.94	---	4.09	---
BR 08-2D	86.27	86.99	4.69	---	4.70	---	4.60	---	4.77	---
BR 08-3S	85.41	86.26	3.20	---	3.18	---	3.12	---	3.25	---
BR 08-3D	85.41	86.35	5.99	---	6.06	---	6.00	---	6.14	---

Monitoring Well	Ground Surface Elev. (m)	Top of Pipe Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)
			April 18, 2016		October 29, 2016		May 23, 2017		November 21, 2017	
BR-1S	85.04	85.40	2.66	82.74	3.47	81.93	2.70	82.70	2.99	82.41
BR-1D	85.04	85.36	8.92	76.44	9.48	75.88	8.90	76.46	8.15	77.21
BR-3	89.63	89.86	4.20	85.66	5.95	83.91	4.28	85.58	4.41	85.45
BR-5S	83.95	84.39	6.93	77.46	7.71	76.68	7.19	77.20	7.65	76.74
BR-5D	83.95	84.37	6.96	77.41	8.59	75.78	7.35	77.02	7.83	76.54
BR-6S	82.06	82.79	6.89	75.90	7.72	75.07	6.52	76.27	7.25	75.54
BR-6D	82.06	82.77	6.60	76.17	7.62	75.15	6.81	75.96	7.02	75.75
BR-7S	79.69	80.76	4.81	75.95	6.00	74.76	5.00	75.76	5.54	75.22
BR-7D	79.69	80.76	4.77	75.99	5.91	74.85	4.87	75.89	5.39	75.37
BR-8S	85.17	85.62	2.30	83.32	3.04	82.58	2.48	83.14	2.66	82.96
BR-8D	85.17	85.53	2.37	83.16	3.13	82.40	2.56	82.97	2.74	82.79
BR-9S	84.80	85.61	2.08	83.53	3.11	82.50	2.26	83.35	2.36	83.25
BR-9D	84.80	85.80	9.12	76.68	9.81	75.99	8.94	76.86	9.09	76.71
BR-10	80.63	81.57	2.23	79.34	2.47	79.10	2.27	79.30	2.29	79.28
BR-11	82.38	83.37	3.66	79.71	3.35	80.02	3.70	79.67	3.64	79.73
BR-12	83.20	84.46	1.28	83.18	1.81	82.65	1.34	83.12	1.32	83.14
BR-13S	107.15	107.87	18.02	89.85	18.66	89.21	18.40	89.47	18.44	89.43
BR-13D	107.15	107.86	21.28	86.58	22.19	85.67	21.31	86.55	21.40	86.46
OV-2	85.14	85.90	1.01	84.89	2.28	83.62	1.11	84.79	0.78	85.12
OV-4	108.65	109.22	17.05	92.17	17.84	91.38	16.17	93.05	16.27	92.95
OV-5	89.73	90.12	2.85	87.27	4.11	86.01	2.90	87.22	3.10	87.02
OV-7	86.46	87.20	2.14	85.06	3.04	84.16	2.09	85.11	3.06	84.14
OV-9	87.00	87.67	0.95 ²	86.72 ²	1.99 ²	85.68 ²	0.94 ²	--- ²	1.17	86.63
OV-10	87.02	88.49	1.58	86.91	2.61	85.88	1.64	86.85	1.84	86.65
OV-13	107.15	107.75	16.16	91.59	16.91	90.84	16.08	91.67	16.18	91.57
BR 08-1S	82.23	83.06	1.54	---	2.11	---	1.67	---	1.79	---
BR 08-1D	82.23	83.02	1.51	---	2.09	---	1.65	---	1.77	---
BR 08-2S	86.27	87.03	3.08	---	3.84	---	3.03	---	3.19	---
BR 08-2D	86.27	86.99	4.00	---	4.91	---	4.05	---	4.20	---
BR 08-3S	85.41	86.26	2.78	---	3.66	---	2.98	---	3.11	---
BR 08-3D	85.41	86.35	4.76	---	5.13	---	4.70	---	4.85	---

Monitoring Well	Ground Surface Elev. (m)	Top of Pipe Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)
			May 15, 2018		October 26, 2018		May 29, 2019		November 13, 2019	
BR-1S	85.04	85.40	3.04	82.36	3.06	82.34	8.01	77.39	8.72	76.68
BR-1D	85.04	85.36	7.36	78.00	7.30	78.06	8.11	77.25	8.81	76.55
BR-3	89.63	89.86	4.77	85.09	4.83	85.03	7.98	81.88	8.40	81.46
BR-5S	83.95	84.39	7.15	77.24	7.70	76.69	6.58	77.81	7.72	76.67
BR-5D	83.95	84.37	7.24	77.13	8.29	76.08	6.57	77.80	7.95	76.42
BR-6S	82.06	82.79	6.76	76.03	7.56	75.23	6.17	76.62	7.36	75.43
BR-6D	82.06	82.77	6.37	76.40	7.35	75.42	5.71	77.06	7.12	75.65
BR-7S	79.69	80.76	4.78	75.98	5.79	74.97	5.39	75.37	5.62	75.14
BR-7D	79.69	80.76	4.63	76.13	5.66	75.10	5.26	75.50	5.47	75.29
BR-8S	85.17	85.62	2.85	82.77	3.88	81.74	2.38	83.24	2.88	82.74
BR-8D	85.17	85.53	2.9	82.63	4.01	81.52	2.35	83.18	2.87	82.66
BR-9S	84.80	85.61	2.29	83.32	3.01	82.60	2.09	83.52	2.72	82.89
BR-9D	84.80	85.80	8.90	76.90	9.28	76.52	8.31	77.49	8.81	76.99
BR-10	80.63	81.57	2.3	79.27	2.44	79.13	2.09	79.48	2.34	79.23
BR-11	82.38	83.37	3.8	79.57	3.90	79.47	3.59	79.78	1.86	81.51
BR-12	83.20	84.46	1.43	83.03	1.83	82.63	1.24	83.22	2.10	82.36
BR-13S	107.15	107.87	18.38	89.49	18.40	89.47	18.29	89.58	18.89	88.98
BR-13D	107.15	107.86	21.21	86.65	21.30	86.56	22.01	85.85	23.11	84.75
OV-2	85.14	85.90	0.78	85.12	1.04	84.86	0.77	85.13	1.11	84.79
OV-4	108.65	109.22	16.26	92.96	16.30 ⁴	92.92	16.21	93.01	-- ⁵	-- ⁵
OV-5	89.73	90.12	3.22	86.90	2.63 ⁴	87.49	2.48	87.64	-- ⁵	-- ⁵
OV-7	86.46	87.20	2.99	84.21	2.93	84.27	2.64	84.56	3.11	84.09
OV-9	87.00	87.67	1.29	86.51	1.26	86.54	1.10	86.70	1.39	86.41
OV-10	87.02	88.49	1.9	86.59	1.95	86.54	1.72	86.77	1.96	86.53
OV-13	107.15	107.75	16.29	91.46	16.24	91.51	16.06	91.69	16.28	91.47
BR 08-1S ³	82.23	83.06	1.63	81.43	1.69	81.37	1.50	81.56	1.99	81.07
BR 08-1D ³	82.23	83.02	1.6	81.42	1.66	81.36	1.42	81.60	1.89	81.13
BR 08-2S ³	86.27	87.03	3.00	84.03	3.11	83.92	1.93	85.10	2.19	84.84
BR 08-2D ³	86.27	86.99	4.09	82.90	4.32	82.67	3.86	83.13	3.99	83.00
BR 08-3S ³	85.41	86.26	3.02	83.24	3.31	82.95	2.74	83.52	2.97	83.29
BR 08-3D ³	85.41	86.35	4.58	81.77	5.19	81.16	4.08	82.27	4.21	82.14
BR-18S ³	85.63	86.50					5.44	81.06	6.01	80.49
BR-18D ³	85.64	86.45					5.61	80.84	6.12	80.33

Monitoring Well	Ground Surface Elev. (m)	Top of Pipe Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)	Ground-water Depth (mbTOP)	Ground-water Elev. (m)
			May 05, 2020		October 28, 2020	
BR-1S	85.04	85.40	2.85	82.55	8.92	76.48
BR-1D	85.04	85.36	7.49	77.87	8.33	77.03
BR-3	89.63	89.86	4.30	85.56	5.40	84.46
BR-5S	83.95	84.39	7.30	77.09	7.80	76.59
BR-5D	83.95	84.37	7.33	77.04	8.18	76.19
BR-6S	82.06	82.79	6.89	75.90	7.50	75.29
BR-6D	82.06	82.77	6.53	76.24	7.26	75.51
BR-7S	79.69	80.76	5.06	75.70	5.72	75.04
BR-7D	79.69	80.76	4.90	75.86	5.59	75.17
BR-8S	85.17	85.62	2.33	83.29	3.25	82.37
BR-8D	85.17	85.53	2.36	83.17	2.28	83.25
BR-9S	84.80	85.61	2.09	83.52	2.80	82.81
BR-9D	84.80	85.80	8.97	76.83	9.75	76.05
BR-10	80.63	81.57	2.30	79.27	2.36	79.21
BR-11	82.38	83.37	3.33	80.04	1.56	81.81
BR-12	83.20	84.46	1.28	83.18	3.12	81.34
BR-13S	107.15	107.87	18.38	89.49	18.99	88.88
BR-13D	107.15	107.86	22.44	85.42	23.21	84.65
OV-2	85.14	85.90	1.22	84.68	1.10	84.80
OV-4	108.65	109.22	16.94	92.28	-- ⁶	-- ⁶
OV-5	89.73	90.12	3.08	87.04	4.10	86.02
OV-7	86.46	87.20	2.88	84.32	3.24	83.96
OV-9	87.00	87.67	1.20	86.60	1.60	86.20
OV-10	87.02	88.49	1.80	86.69	2.74	85.75
OV-13	107.15	107.75	15.79	91.96	16.30	91.45
BR 08-1S ³	82.23	83.06	1.64	81.42	2.08	80.98
BR 08-1D ³	82.23	83.02	1.60	81.42	2.04	80.98
BR 08-2S ³	86.27	87.03	1.90	85.13	2.30	84.73
BR 08-2D ³	86.27	86.99	3.83	83.16	4.11	82.88
BR 08-3S ³	85.41	86.26	2.69	83.57	3.03	83.23
BR 08-3D ³	85.41	86.35	4.20	82.15	4.28	82.07
BR-18S ³	85.63	86.50	5.68	80.82	7.16	79.34
BR-18D ³	85.64	86.45	5.89	80.56	7.38	79.07

Notes:

Italics Based on the 1997 Robinson Report.

--- No value.

mbTOP Metres below top of pipe elevation.

d.i. data incorrect

n.m. not measured

¹ Unusually high groundwater elevation reading in 2013 at groundwater monitor OV-4 is considered to be a result of a typographical error as the elevations in subsequent monitoring sessions have returned to within normal ranges

² OV-9 found to be damaged in fall 2016; well replaced in summer of 2017 and surveyed in 2019. GW elevations considered unreliable between fall of 2016 and fall of 2017.

³ BR08 and BR-18 well series surveyed in January 2019.

⁴ The depth to groundwater reported at OV-4 during the fall 2018 and fall 2019 monitoring session is more consistent with historical data from monitoring well OV-5 and vice versa. While it is not possible to confirm, for the purposes of this report, it is assumed that these wells were switched. Groundwater level measurement for OV-5 has not been used in determining groundwater flow direction during the fall monitoring session.

⁵ During the November 2019 monitoring session, there was some confusion in the field around the association of groundwater level measurements to groundwater monitors, resulting in it not being possible to rely on the measurements recorded at OV-4 and OV-5. As such, groundwater levels at OV-4 and OV-5 in the fall of 2019 have not been included in this report.

⁶ During the October 2020 monitoring session, monitoring well OV-4 was inadvertently missed.

Created by: ETB
Checked by: RPM

Table 3 – Interpretation of 2020 Groundwater Quality Data

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
OVERBURDEN WELLS				
OV-7	<ul style="list-style-type: none"> - barium (M,O) - boron (M,O) - chloride (O) - DOC (M,O) - iron (M,O) - manganese (M,O) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are relatively consistent. ■ Elevated concentration of calcium in October 2020. ■ Overall decreasing trend in alkalinity, TDS, and chloride since 2000. ■ Previously reported decreasing trend in sodium appears to be stabilizing. 	<ul style="list-style-type: none"> - ammonia (M,O) - barium (M,O) - boron (M,O) - chloride (O) - DOC (M,O) - hardness (M,O) - iron (M, O) - manganese (M,O) - potassium (M, O) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well OV-7 is located near the northern corner of the licensed fill area and represents the landfill leachate quality. It is located approximately 55 metres east of the northern limit of the licensed fill area. ■ Groundwater quality at monitoring well OV-7 is interpreted to be impacted by landfill leachate.
OV-9	<ul style="list-style-type: none"> - DOC (M,O) - TDS (O) 	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Variable concentrations of total phosphorus. ■ Previously decreasing concentration of alkalinity, barium, DOC, hardness and potassium appears to be stabilizing. ■ Sodium concentrations elevated compared to historic ranges at this location since 2008. ■ Concentrations of barium, boron, calcium, magnesium, potassium and sodium were below detection levels in October 2020. ■ Elevated concentration of sulphate in May and October 2020. ■ Field-measured conductivity was slightly low in both May and October 2020. 	<ul style="list-style-type: none"> - boron (M) - DOC (M,O) - sodium (M) 	<ul style="list-style-type: none"> ■ Monitoring well OV-9 is located approximately 100 metres east of the eastern licensed fill corner. ■ Groundwater quality at monitoring well OV-9 is interpreted not to be impacted by landfill leachate. ■ Monitoring well OV-9 was found to be damaged in the fall of 2016 and was repaired in the summer of 2017.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
OV-10	<ul style="list-style-type: none"> - iron (M,O) - manganese (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Overall increasing trend in chloride and sodium concentrations since 2006; historical high concentration of sodium in spring 2017, 2018 and 2019. ■ Overall increasing barium since 2006, and iron, potassium and ammonia concentrations since 2011. Concentrations of ammonia remained elevated after historic high reported in 2019. ■ Increasing trend in manganese since 2012. ■ Historic low concentrations of phosphorus in May and October 2020. 	<ul style="list-style-type: none"> - ammonia (M,O) - barium (M,O) - iron (M) - manganese (M,O) - potassium (M) - sodium (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well OV-10 is located approximately 150 metres east of the eastern licensed fill corner. ■ OV-10 is interpreted not to be impacted by landfill leachate however increasing trends will be monitored carefully.
BEDROCK WELLS				
BR-1D (deep)	<ul style="list-style-type: none"> - barium (M,O) - boron (M,O) - chloride (M,O) - DOC (M,O) - iron (M,O) - manganese (M,O) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Previously decreasing trends in concentrations of alkalinity, ammonia, chloride, DOC, and total phosphorus appear to be stabilizing since 2014. Concentration of nickel slightly elevated compared to historic concentrations. ■ Previously reported elevated concentrations of manganese and cobalt generally returning to within historic concentrations. ■ Variable sulphate concentrations. ■ Slight increasing trend in iron concentrations since 2014. ■ Concentrations of barium and iron remained elevated in 2020 after historic high concentrations reported in 2019. 	<ul style="list-style-type: none"> - ammonia (M,O) - barium (M,O) - boron (M,O) - chloride (M,O) - DOC (M,O) - hardness (M,O) - iron (M,O) - potassium (M,O) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-1D is located approximately 50 metres east of the northern limit of the licensed fill area. ■ Groundwater quality at monitoring well BR-1D is interpreted to be impacted by landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR-1S (<i>shallow</i>)	<ul style="list-style-type: none"> - barium (M,O) - boron (M,O) - chloride (M,O) - DOC (M,O) - iron (M,O) - manganese (M,O) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Slight increasing trend in barium concentrations over time appears to be stabilizing. ■ Slight increasing trend in boron, potassium, and sodium over time, with historical high concentrations of boron and sodium reported in October 2020. ■ Previously increasing trend in concentration of ammonia appears to be stabilizing since 2014. ■ Concentration of magnesium slightly elevated since 2014 compared to historic concentrations. ■ Elevated field conductivity reported in 2020. ■ Other parameter concentrations generally consistent over time. 	<ul style="list-style-type: none"> - ammonia (M,O) - barium (M,O) - boron (M,O) - chloride (M,O) - DOC (M,O) - hardness (M,O) - iron (M,O) - potassium (M,O) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-1S is located approximately 50 metres east of the northern limit of the licensed fill area. ■ Groundwater quality at monitoring well BR-1S is interpreted to be impacted by landfill leachate.
BR-3	<ul style="list-style-type: none"> - chloride (M) - DOC (M,O) - iron (M,O) - manganese (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Previously observed decreasing trends in concentrations of alkalinity and barium since 2010 appear to be stabilizing and/or returning to concentrations reported prior to 2010. ■ Previously observed decreasing and stabilizing trend in concentrations of manganese appear to be slightly increasing. ■ Overall increasing trend in concentrations of ammonia, DOC, hardness, potassium and TDS. ■ Increasing trend in chloride and sodium since 2009, with historical high concentration of sodium in the spring of 2020. 	<ul style="list-style-type: none"> - ammonia (M,O) - boron (M,O) - chloride (M,O) - DOC (M,O) - hardness (M,O) - iron (M,O) - potassium (M) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-3 is located approximately 120 metres south of the eastern limit of the licensed fill area. ■ BR-3 has previously been reported as being hydraulically up-gradient of the landfill site and interpreted not to be impacted by landfill leachate. BR-3 is now interpreted as being hydraulically cross-gradient or slightly downgradient of a small portion of the landfill. Due to the lack of well details, it is not discernable if elevated leachate indicator parameters are a result of landfill leachate. Increasing trends will be monitored carefully in the future.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR-5D (<i>deep</i>)	<ul style="list-style-type: none"> - barium (M) - DOC (M) - iron (M,O) - manganese (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent with time with the exception of some variability in ammonia and historic iron concentrations. ■ Concentration of DOC and TDS generally decreasing. ■ Historic high concentration of manganese in October 2020. 	<ul style="list-style-type: none"> - ammonia (M,O) - barium (M,O) - DOC (M,O) - hardness (O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-5D is located approximately 250 metres northeast of the landfill, immediately adjacent to Osborne Street. ■ Groundwater quality at monitoring well BR-5D is interpreted to be impacted by road salt, the wood waste deposited in CAZ area B, and/or by landfill leachate.
BR-5S (<i>shallow</i>)	<ul style="list-style-type: none"> - none 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent with some variability in historic concentrations of iron, ammonia and total phosphorus. ■ Slight decreasing concentration in TDS since 2012. ■ Slight increasing trend in sodium and chloride with highest concentration of chloride since 2005 reported in spring of 2020. ■ Slightly elevated concentrations of aluminum in 2020. 	<ul style="list-style-type: none"> - hardness (M) 	<ul style="list-style-type: none"> ■ Monitoring well BR-5S is located approximately 250 metres northeast of the landfill, immediately adjacent to Osborne Street. ■ Groundwater quality at monitoring well BR-5S is interpreted to be impacted by road salt, the wood waste deposited in CAZ area B, and/or by landfill leachate.
BR-6D (<i>deep</i>)	<ul style="list-style-type: none"> - barium (O) - DOC (O) - iron (M,O) - manganese (M,O) - TDS (O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent with time. ■ Slight decreasing trend in concentration of DOC and TDS. 	<ul style="list-style-type: none"> - ammonia (M,O) - barium (O) - DOC (O) - iron (M,O) - sodium (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-6D is located approximately 270 metres northeast of the landfill, immediate adjacent to Osborne Street. ■ Groundwater quality at monitoring well BR-6D is interpreted to be impacted by the wood waste deposited in CAZ area B, road salt and/or by landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR-6S (<i>shallow</i>)	<ul style="list-style-type: none"> - barium (O) - DOC (M) - manganese (M,O) - TDS (M) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent with time. ■ Previously reported decreasing trend in concentrations of DOC and TDS appear to be stabilizing. ■ Highest concentration of boron, calcium and sodium in fall of 2020 since 2002, 2003 and 2001, respectively. ■ Slight increasing trend in concentration of barium (highest since 2002 in fall 2020), potassium (highest since 2001 in spring and fall 2020). ■ Historical high concentration of hardness and magnesium reported in October 2020. 	<ul style="list-style-type: none"> - barium (O) - boron (O) - DOC (M) - hardness (M,O) - sodium (O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-6S is located approximately 270 metres northeast of the landfill, immediately adjacent to Osborne Street. ■ Groundwater quality at monitoring well BR-6S is interpreted to be impacted by the wood waste deposited in CAZ area B, road salt and/or by landfill leachate.
BR-7D (<i>deep</i>)	<ul style="list-style-type: none"> - manganese (O) - sodium (M) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent with time. ■ Variable iron concentrations over time. ■ Previously reported decreasing concentrations of magnesium since 2015 appear to be stabilizing. Previously reported low concentrations of barium, calcium, cobalt, and manganese have returned to typical historical concentrations in 2020. ■ Historic low concentration of sulphate in October 2020. 	<ul style="list-style-type: none"> - chloride (M,O) - hardness (O) - sodium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-7D is located approximately 400 metres north of the northern limit of the licensed fill area, immediately adjacent to Osborne Street. ■ Groundwater quality at monitoring well BR-7D is interpreted to be impacted by road salt, wood waste or other industrial activities on the CAZ lands, but not by landfill leachate.
BR-7S (<i>shallow</i>)	<ul style="list-style-type: none"> - manganese (M) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent with time. ■ Variable manganese and iron concentrations over time. ■ Decreasing trend in DOC and TDS concentrations over time. ■ Very slight increasing trend of sodium concentrations. 	<ul style="list-style-type: none"> - chloride (M) - sodium (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-7S is located approximately 400 metres north of the northern limit of the licensed fill area, immediately adjacent to Osborne Street. ■ Groundwater quality at monitoring well BR-7S is interpreted to be impacted by road salt, wood waste or other industrial activities on the CAZ lands, but not by landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR-8D (<i>deep</i>)	<ul style="list-style-type: none"> - barium (O) - DOC (M,O) - iron (O) - manganese (M,O) - TDS (O) 	<ul style="list-style-type: none"> ■ Some variability in ammonia, and total phosphorus concentrations. ■ Previously increasing trend in concentrations of chloride over time appears to be stabilizing or decreasing. ■ Very slight increasing trend in concentrations of barium over time. ■ Increasing trend in the concentration of potassium over time. ■ Historical high concentration of sodium reported in spring of 2020. ■ Historical low concentration of alkalinity, barium, hardness and TDS in spring of 2020, as well as relatively low concentrations of some other metal parameters including boron, calcium, iron and magnesium. 	<ul style="list-style-type: none"> - boron (O) - barium (O) - DOC (M,O) - hardness (M) - iron (O) - TDS (O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-8D is located approximately 150 metres north of the northern limit of the licensed fill area. ■ Groundwater quality at monitoring well BR-8D is interpreted to be impacted by the wood waste deposited in CAZ areas A and B, and/or by landfill leachate.
BR-8S (<i>shallow</i>)	<ul style="list-style-type: none"> - DOC (M,O) - iron (O) - manganese (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent to slightly variable over time. ■ Historic high concentration of sulphate in May of 2020 and of alkalinity in October 2020 with a slight increasing trend in alkalinity since 2011. ■ Previously reported historical high concentration of sodium in fall 2017 and spring 2018 remain elevated. ■ Concentration of iron was non-detect in the spring of 2020 as in the spring of 2017, 2018, and 2019. 	<ul style="list-style-type: none"> - ammonia (O) - hardness (M,O) - iron (O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-8S is located approximately 150 metres north of the northern limit of the licensed fill area. ■ Groundwater quality at monitoring well BR-8S is interpreted to be impacted by the wood waste deposited in CAZ areas A and B, and/or by landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR-9D <i>(deep)</i>	<ul style="list-style-type: none"> - boron (M,O) - DOC (M,O) - manganese (O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent to slightly variable. ■ Generally increasing trend in concentrations of chloride and sodium. ■ Previously reported decreasing trend in concentrations of DOC since 2009 appears to be stabilizing. ■ Slight increasing trend in concentrations of nickel. 	<ul style="list-style-type: none"> - boron (M,O) - DOC (M,O) - hardness (M,O) - potassium (M) - TDS (M) 	<ul style="list-style-type: none"> ■ Monitoring well BR-9D is located approximately 150 metres northeast of the landfill. ■ Groundwater quality at monitoring well BR-9D is interpreted to be impacted by the wood waste deposited in CAZ area B, and/or by landfill leachate.
BR-9S <i>(shallow)</i>	<ul style="list-style-type: none"> - DOC (M,O) - iron (M,O) - manganese (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent to slightly variable over time. ■ Historical high concentrations of sulphate in spring 2018 and spring 2020. Sulphate concentrations generally consistent prior to 2012; since 2012, concentrations are generally higher in the spring and low in the fall. ■ Historical high concentration of chloride in fall of 2020. 	<ul style="list-style-type: none"> - ammonia (O) - DOC (M,O) - hardness (M,O) - iron (M,O) - manganese (M,O) - TDS (O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-9S is located approximately 150 metres northeast of the landfill. ■ Groundwater quality at monitoring well BR-9S is interpreted to be impacted by the wood waste deposited in CAZ area B, and/or by landfill leachate.
BR-10	<ul style="list-style-type: none"> - iron (M,O) - DOC (O) - manganese (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent over time. ■ Slight decreasing trend in concentrations of TDS. ■ Concentrations of aluminum were detected in the spring and fall of 2020, which had not previously been detected since 2007. ■ Concentrations of lead were detected in spring and fall of 2020 which have not previously been detected. ■ Slightly elevated concentration of iron in the fall of 2020. ■ Historical low concentration of sulphate in the fall of 2020. 	<ul style="list-style-type: none"> - ammonia (J,N) - boron (M,O) - DOC (O) - iron (M,O) - sodium (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-10 is located approximately 550 metres northwest of the northern limit of the licensed fill area, immediately adjacent to Osborne Street and near Braeside boat launch. ■ Groundwater quality at monitoring well BR-10 is interpreted to be impacted by road salt, wood waste or other industrial activities on the CAZ lands, but not by landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR-11	<ul style="list-style-type: none"> - DOC (O) - iron (O) - manganese (O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent to slightly variable over time. ■ Previously reported historical high concentration of cobalt returned to within historical concentrations in 2019 but remained elevated in November 2019 and October 2020. ■ Previously reported historical high concentration of ammonia in fall 2019 returned to historical concentrations in the spring of 2020 but was elevated in the fall of 2020. ■ Previously reported increasing trend in boron and molybdenum appears to be stabilizing or decreasing. ■ Previous variable concentrations of potassium and sodium appear to be stabilizing since 2014. ■ Elevated concentrations of iron and manganese in the fall beginning in 2018 and continuing into 2020. Elevated concentration of hardness (calcium) and sulphate in fall of 2020. 	<ul style="list-style-type: none"> - DOC (O) - hardness (O) - iron (O) - manganese (O) 	<ul style="list-style-type: none"> ■ Monitoring well BR-11 is located approximately 320 metres north of the northern limit of the licensed fill area. ■ Groundwater quality at monitoring well BR-11 is interpreted to be impacted by road salt, wood waste or other industrial activities on the CAZ lands, but not by landfill leachate.
BR-12	<ul style="list-style-type: none"> - DOC (M) - iron (M) - manganese (M) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent over time with some variability in DOC, sulphate, ammonia and total phosphorus concentrations. ■ Decreasing trends in concentrations of boron (overall), and cobalt (since 2014). ■ Previously reported historic high concentration of boron returned to within historic concentrations in spring of 2020, but remained elevated in the fall of 2020. Historical low concentration of manganese, nickel, and potassium reported in October 2020. 	<ul style="list-style-type: none"> - DOC (M) - manganese (M) 	<ul style="list-style-type: none"> ■ Monitoring well BR-12 is located approximately 230 metres northeast of the landfill. ■ Groundwater quality at monitoring well BR-12 is interpreted to be impacted by the wood waste deposited in CAZ area B, road salt, and/or by landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR 08-1D	<ul style="list-style-type: none"> - barium (M) - DOC (M,O) - iron (M,O) - manganese (M,O) - TDS (M) 	<ul style="list-style-type: none"> ■ Variable concentrations of total phosphorous and chloride. ■ Previous variable iron concentrations over time have stabilized in recent years. ■ Historic high concentration of barium in spring of 2020. 	<ul style="list-style-type: none"> - barium (M) - boron (M) - DOC (M,O) - hardness (M) - iron (M) - potassium (O) - sodium (O) - TDS (M) 	<ul style="list-style-type: none"> ■ Monitoring well BR 08-1D is located approximately 200 metres north of the landfill. ■ Groundwater quality at monitoring well BR 08-1D is interpreted to be impacted by the wood waste deposited in CAZ area A, and/or by landfill leachate.
BR 08-1S	<ul style="list-style-type: none"> - barium (M,O) - DOC (M,O) - iron (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent over time. ■ Decreasing trend in concentrations of total phosphorus since 2014. <p>Concentrations of sodium appear to be slightly increasing with time.</p>	<ul style="list-style-type: none"> - ammonia (O) - barium (M,O) - boron (M,O) - DOC (M,O) - hardness (M,O) - potassium (M,O) - TDS (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR 08-1S is located approximately 200 metres north of the landfill. ■ Groundwater quality at monitoring well BR 08-1S is interpreted to be impacted by the wood waste deposited in CAZ area A, and/or by landfill leachate.
BR 08-2D	<ul style="list-style-type: none"> - DOC (M,O) - iron (M,O) - manganese (M,O) - TDS (O) 	<ul style="list-style-type: none"> ■ Parameter concentrations are generally consistent over time. ■ Overall decreasing trend in concentrations of barium since 2012 appears to be showing evidence of stabilizing. ■ Historical low concentration of ammonia in spring 2020. ■ Historical low field measured pH in spring and fall 2020. 	<ul style="list-style-type: none"> - boron (M,O) - DOC (M,O) - hardness (M,O) 	<ul style="list-style-type: none"> ■ Monitoring well BR 08-2D is located approximately 50 metres northeast of the landfill. ■ Groundwater quality at monitoring well BR 08-2D interpreted to be impacted by the wood waste deposited in CAZ area B, and/or by landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR 08-2S	<ul style="list-style-type: none"> - DOC (M,O) - TDS (O) 	<ul style="list-style-type: none"> ▪ Parameter concentrations are generally consistent over time ▪ Previously observed decreasing trend in concentrations of ammonia and manganese have stabilized (concentrations below detection limit). ▪ Elevated concentration of aluminum in fall of 2020. ▪ Historical low field measured conductivity in spring 2020. ▪ Historical high concentration of hardness (calcium) reported in fall of 2020. 	<ul style="list-style-type: none"> - DOC (M,O) - hardness (O) 	<ul style="list-style-type: none"> ▪ Monitoring well BR 08-2S is located approximately 50 metres northeast of the landfill. ▪ Groundwater quality at monitoring well BR 08-2S is interpreted to be impacted by the wood waste deposited in CAZ area B, and/or by landfill leachate.
BR 08-3D	<ul style="list-style-type: none"> - iron (M,O) - manganese (O) 	<ul style="list-style-type: none"> ▪ Parameters are generally consistent over time. ▪ Previous decreasing trend in total phosphorous shows evidence of increasing. ▪ Decreasing trend in concentrations of DOC and TDS (historical low concentration in spring 2020). ▪ Historical high concentration of aluminum in fall 2020. ▪ Historical low concentration of alkalinity in spring 2019 and 2020 and iron in spring 2020. ▪ Historical low conductivity field-measured in spring and fall of 2020. 	<ul style="list-style-type: none"> - none 	<ul style="list-style-type: none"> ▪ Monitoring well BR 08-3D is located approximately 100 metres northeast of the landfill. ▪ Groundwater quality at monitoring well BR 08-3D is interpreted to be impacted by wood waste or other industrial activities on the CAZ lands and potentially landfill leachate.

Monitoring Well	Parameters Exceeding or Outside Trigger Values in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions* in 2020	Hydrogeological Interpretation
BR 08-3S	- iron (M,O)	<ul style="list-style-type: none"> ■ Parameters are generally consistent over time. ■ Concentrations of iron and molybdenum generally increasing over time. Historical high concentration of molybdenum in fall of 2020. ■ Previously reported increasing trend in concentrations of manganese appears to be stabilizing. ■ Slight decreasing trend in concentrations of TDS (historical low concentration in fall 2020). ■ Historical low concentration of field measured conductivity in spring and fall 2020. ■ Historical low concentration of total phosphorous reported in spring 2020. 	- none	<ul style="list-style-type: none"> ■ Monitoring well BR 08-3S is located approximately 100 metres northeast of the landfill. ■ Groundwater quality at monitoring well BR 08-3S is interpreted to be impacted by wood waste or other industrial activities on the CAZ lands and potentially landfill leachate.

Notes:

ODWQS – Ontario Drinking Water Quality Standards, Objectives and Guidelines (Ministry of the Environment, 2003).

* Background conditions are represented by current and historical water quality at OV-13 in the overburden and at BR-13S and BR-13D in the bedrock, as presented in Sections 7.2.1 and 7.2.2, respectively. Alkalinity is not included.

M = May 2020

O = October 2020

Prepared by: ETB

Checked by: RPM/ALC

Table 4 – Interpretation of 2020 Surface Water Quality Data

Surface Water Sampling Location	Parameters Outside PWQO Trigger Concentrations in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions ¹ in 2020	Interpretation
SW-1	<ul style="list-style-type: none"> - alkalinity (M,A,O) - boron (A) 	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time except as noted. ■ Variable concentrations of unionized ammonia and total phosphorus over time. ■ Decreasing trend in DO since 2005 appears to be stabilizing. ■ Slight decreasing trend in TDS since 2007. ■ Overall slight increasing trend in sodium appears to be stabilizing. ■ Historical high concentration of ammonia reported in fall of 2020. ■ First detected concentration of hexavalent chromium since monitoring began. 	<ul style="list-style-type: none"> - barium (M,A,O) - boron (M,A,O) - manganese (A,O) - potassium (M) 	<ul style="list-style-type: none"> ■ Surface water station SW-1 is located in the wetland downstream of the landfill. ■ SW-1 is located approximately 480 metres downstream of the landfill and is interpreted to possibly be impacted by the landfill or other industrial activities. ■ SW-1 represents one of two surface water points of compliance for the site.
SW-2	<ul style="list-style-type: none"> - alkalinity (M,A,O) - boron (M) - iron (M,) 	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Decreasing trend in DO from to 2005-2016 appears to be increasing or stabilizing. ■ Variable iron, unionized ammonia, total phosphorus, sulphate and manganese concentrations. ■ Decreasing trend in TDS concentrations since 2010. 	<ul style="list-style-type: none"> - barium (M,A,O) - boron (M,A) - hardness (N) - manganese (M,O) - potassium (M,A,O) 	<ul style="list-style-type: none"> ■ Surface water station SW-2 is located in the wetland downstream of the landfill. ■ SW-2 is located approximately 250 metres downstream of the landfill and is interpreted to be impacted by the landfill and possibly by other industrial activities. ■ SW-2 represents one of two surface water points of compliance for the site.
SW-11	<ul style="list-style-type: none"> - alkalinity (A,O)³ 	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Slight overall increasing trend in chloride. ■ Previously reported increasing trend in sodium appears to be stabilizing. ■ Variable iron concentrations. ■ Historical high concentration of alkalinity reported in fall 2020. ■ Slightly elevated concentration of unionized ammonia and chromium in spring 2020. 	<ul style="list-style-type: none"> - barium (A,O) 	<ul style="list-style-type: none"> ■ Surface water station SW-11 is located in the ephemeral/intermittent stream upgradient of the landfill and downstream of River Road. ■ SW-11 is located upgradient approximately 260 metres southeast of the landfill, has similar water quality to SW-10 (which is the surface water background monitoring location) and is interpreted to not be impacted by the landfill.

Surface Water Sampling Location	Parameters Outside PWQO Trigger Concentrations in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions ¹ in 2020	Interpretation
SW-12	- alkalinity (M,A,O) ³	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Variable iron concentrations. ■ Historic high concentration of unionized ammonia in spring 2020. ■ Previously reported elevated vanadium concentrations returned to within normal historical ranges in 2020. 	- barium (M,A,O)	<ul style="list-style-type: none"> ■ Surface water station SW-12 is located in the ephemeral/intermittent stream near the landfill and adjacent to Osborne Street. ■ SW-12 is located approximately 400 metres from the landfill, has similar water quality to SW-10 (which is the surface water background monitoring location) and is interpreted to not be impacted by the landfill.
SW-18 ²	None	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time with the exception of an inexplicable spike in concentrations in December 2003. ■ Decreasing trend in sulphate since 2015. ■ Historic high concentration of unionized ammonia in spring 2020. 	- None	<ul style="list-style-type: none"> ■ Surface water station SW-18 is located in the Ottawa River downgradient of the landfill near Braeside boat launch. ■ SW-18 is interpreted to not be impacted by the landfill.
SW-19	- alkalinity (M,A,O) ³ - boron (A)	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Variable iron, manganese and sulphate. ■ Historic high concentration of unionized ammonia and ammonia reported in fall of 2020 noting that a duplicate at this location failed the RPD. 	- barium (M,A,O) - boron (M,A,O) - manganese (A,O) - potassium (M.)	<ul style="list-style-type: none"> ■ Surface water station SW-19 is located in a tributary, approximately 5 metres upstream of the Ottawa River. ■ SW-19 is interpreted to not be impacted by the landfill.
SW-21 (location was dry during August)	- alkalinity (M,O) ³	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Previously interpreted decreasing trend in DO since 2005 appears to be stabilizing. ■ Variable iron, total phosphorus, manganese and sulphate. ■ Elevated unionized ammonia and ammonia nitrogen in the spring of 2020. 	- barium (M,O) - boron (M) - potassium (M)	<ul style="list-style-type: none"> ■ Surface water station SW-21 is located in the wetland downstream of the landfill. ■ SW-21 is located approximately 400 metres downstream of the landfill and is interpreted to possibly be impacted by the landfill and/or industrial activities.
SW-22 (location was dry during August)	- alkalinity (M,O) - boron (M)	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Variable unionized ammonia, iron, manganese and nitrate. ■ Previously reported decreasing trend in DO since 2005 appears to be stabilizing. ■ First detectable concentration of hexavalent chromium at this location in spring 2020. 	- barium (M,O) - boron (M) - potassium (M,O)	<ul style="list-style-type: none"> ■ Surface water station SW-22 is located in the wetland downstream of the landfill. ■ SW-22 is located approximately 280 metres downstream of the landfill and is interpreted to possibly be impacted by the landfill and/or industrial activities.

Surface Water Sampling Location	Parameters Outside PWQO Trigger Concentrations in 2020	Trend(s)	Leachate Indicator Parameters Exceeding Background Conditions ¹ in 2020	Interpretation
SW-23 (location was dry during August and October)	- alkalinity (M)	<ul style="list-style-type: none"> ■ Location has been dry since 2004, with the exception of spring 2016 and 2020; therefore, it is not possible to determine trends in parameter concentrations at this location. ■ Historical data suggests generally consistent concentrations with the exception of a decrease in December 2003. Parameter concentrations in spring 2016 and 2020 are generally within historical ranges or slightly lower. ■ Historical high concentration of ammonia in spring 2020. 	- barium (M)	<ul style="list-style-type: none"> ■ Surface water station SW-23 is in the wetland downgradient of the landfill. ■ SW-23 represents an alternate point of compliance when flow at SW-1 is obstructed. ■ SW-23 is located approximately 650 metres downstream of the landfill and is historically interpreted to possibly be impacted by the landfill or industrial activities.
SW-26 ²	- n/a	<ul style="list-style-type: none"> ■ Parameter concentrations relatively consistent over time. ■ Historical high concentration of unionized ammonia and ammonia nitrogen in spring and fall 2020, and elevated in the summer of 2020. ■ Historical low concentration of TDS and potassium in summer 2020. 	- n/a	<ul style="list-style-type: none"> ■ Surface water station SW-26 is located in the Ottawa River approximately 400 m upstream of station SW-18 (near Braeside boat launch). ■ SW-26 is interpreted to not be impacted by the landfill.

Notes:

PWQO – Provincial Water Quality Objectives (Ministry of the Environment, 1994b).

¹ Background conditions are represented by current and historical water quality at surface water station SW-10 as presented in Section 9.3.

Alkalinity is not included.

² Background conditions and trigger values determined by current and historical water quality at surface water station SW-26 (background station for Ottawa River).

³ While the concentration of alkalinity was outside of the trigger concentration at this location during this monitoring session, it should be noted that the concentration of alkalinity at this location could not be assessed with respect to the PWQO concentration (based on 75% of the concentration of alkalinity at the background location), as the background location (SW-10) was dry during this monitoring session.

M = May 2020

A = August 2020

O = October 2020

Prepared by: ETB

Checked by: RPM/ALC

Table 5 – Proposed 2021 Groundwater Monitoring Program**1.0 MONITORING SESSIONS****1.1 Water Level and Quality Monitoring**

Spring (April/May)

Fall (October/November)

2.0 GROUNDWATER SAMPLING LOCATIONS**2.1 Sampling Locations**

OV-7, OV-9, OV-10, OV-13

BR-1S, BR-1D, BR-3, BR-5S, BR-5D, BR-6S, BR-6D, BR-7S, BR-7D, BR-8S, BR-8D, BR-9S, BR-9D, BR-10, BR-11, BR-12, BR-13S, BR-13D, BR08-1S, BR08-1D, BR08-2S, BR08-2D, BR08-3S, BR08-3D

2.2 Field QA/QC

two duplicates per sampling event

one field blank for VOCs on years when VOCs are evaluated (next scheduled sampling date is 2024)

3.0 FIELD MEASURED PARAMETERS

groundwater levels in all accessible monitoring wells

temperature, conductivity, pH

4.0 LABORATORY MEASURED PARAMETERS

calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, vanadium, zinc

hardness (calculated from laboratory calcium and magnesium analyses)

alkalinity, TDS, chloride, sulphate

ammonia, total phosphorus, DOC

dissolved reactive phosphorus

VOCs at OV-7 and BR-1S every 5 years (next scheduled sampling date is 2024)

Special Note for Parameters with Established Ontario Drinking Water Quality Standards, Objectives and Guidelines

All laboratory analyses on groundwater samples will be performed by a private analytical laboratory and the method detection limits (MDLs) for the specific analyses should be commensurate with the standards established in the Provincial Water Quality Objectives or the Ontario Drinking Water Quality Standards, Objectives and Guideline, whichever is lower.

Table 6 – Proposed 2021 Surface Water Sampling Program**1.0 MONITORING SESSIONS****1.1 Water Quality Monitoring**

Spring (April/May)

Summer (July/August)

Fall (October/November)

2.0 SURFACE WATER SAMPLING STATIONS**2.1 Sampling Stations**

Ephemeral/Intermittent Stream to the South of the Site: SW-10, SW-11, SW-12

Wetland North of the Site: SW-1, SW-2, SW-21, SW-22, SW-23

Ottawa River: SW-18, SW-19, SW-26

2.2 Field QA/QC

one duplicate per sampling event

3.0 FIELD MEASURED PARAMETERS

temperature, conductivity, pH, dissolved oxygen

flow measurements or description of flow conditions

representative photographs

4.0 LABORATORY MEASURED PARAMETERS

calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, cadmium, chromium (hexavalent and total), cobalt, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, vanadium, zinc

hardness (calculated from laboratory calcium and magnesium analyses)

alkalinity, TDS, chloride, sulphate, BOD, nitrate, TSS

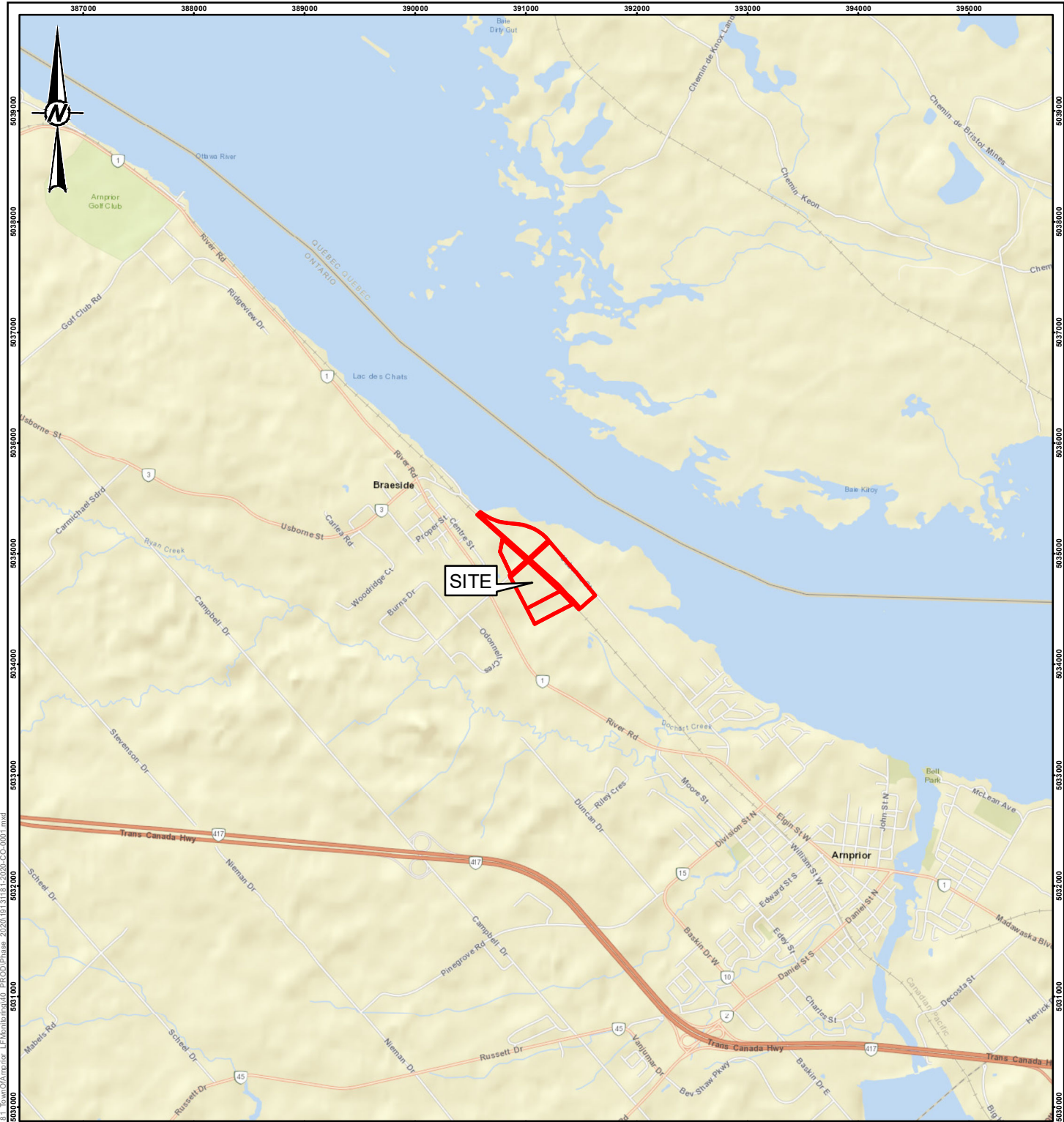
ammonia, total phosphorus, DOC

unionized ammonia (calculated from laboratory ammonia and field temperature and pH)

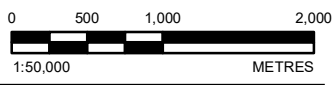
chromium III (calculated from laboratory total and hexavalent chromium)

Special Note for Parameters with Established Provincial Water Quality Criteria

All laboratory analyses on surface water samples will be performed by a private analytical laboratory and the method detection limits (MDLs) for the specific analyses should be commensurate with the standards established in the Provincial Water Quality Objectives or the Ontario Drinking Water Standards/Objectives, whichever is lower.



LEGEND
 SITE



NOTE(S)
 ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
 1. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
 COORDINATE SYSTEM: UTM ZONE 18 VERTICAL DATUM: CGVD28
 2. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
 CORPORATION OF THE TOWN OF ARNPRIOR

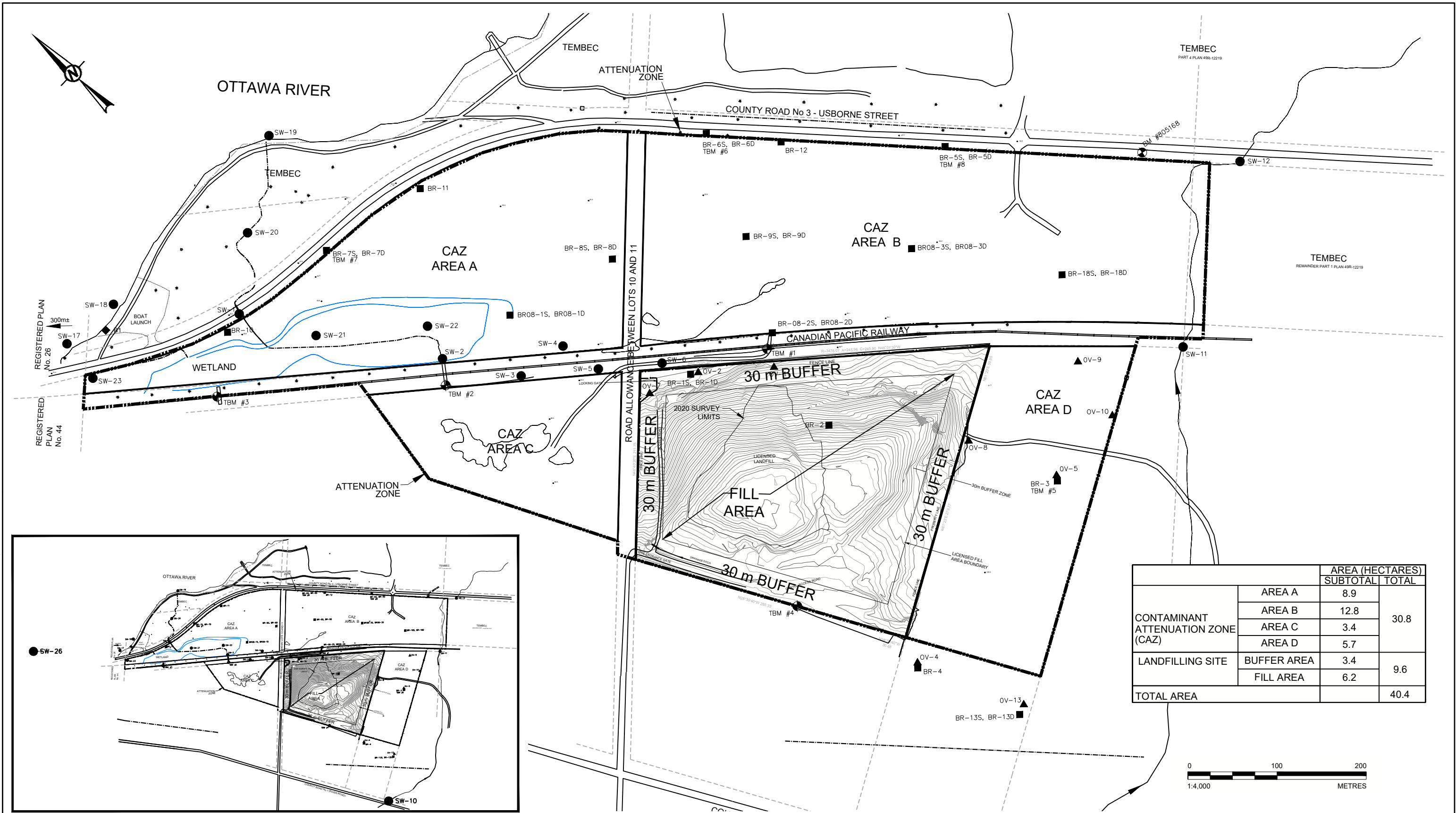
PROJECT
 2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL
 MONITORING ARNPRIOR WASTE DISPOSAL SITE

TITLE
KEY PLAN

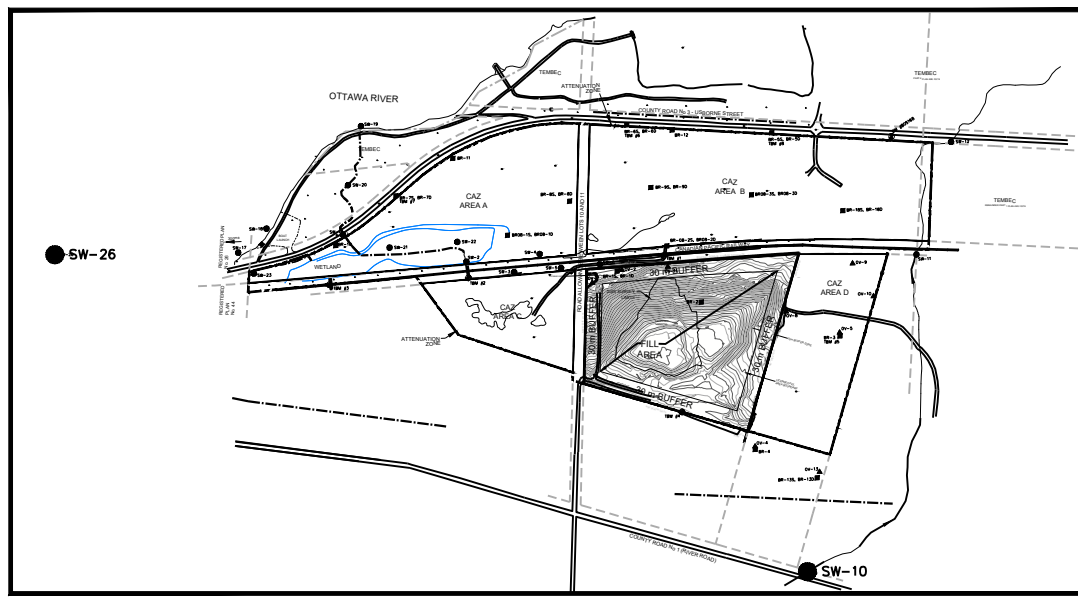
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	PREPARED	ABD
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	APPROVED	PLE

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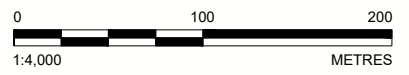
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		AREA (HECTARES)	
		SUBTOTAL	TOTAL
CONTAMINANT ATTENUATION ZONE (CAZ)	AREA A	8.9	30.8
	AREA B	12.8	
	AREA C	3.4	
	AREA D	5.7	
LANDFILLING SITE	BUFFER AREA	3.4	9.6
	FILL AREA	6.2	
TOTAL AREA			40.4



LEGEND

- BR-1 BEDROCK MONITORING STATION
- SW-6 SURFACE WATER MONITORING STATION
- ▲ OV-7 OVERBURDEN MONITORING STATION
- TBM #6 TEMPORARY BENCHMARK
- TOPOGRAPHICAL CONTOURS (2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020 COMBINED SURVEYS)

REFERENCE(S)

1. BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
2. TOPOGRAPHICAL CONTOURS BEYOND THE EXTENT OF THE 2014 TO 2019 SURVEYS SUPPLIED IN DIGITAL FORMAT BY JP2G CONSULTANTS INC.
3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

CLIENT
CORPORATION OF THE TOWN OF ARNPRIOR

CONSULTANT

YYYY-MM-DD	2021-01-19
PREPARED	ABD
DESIGN	ETB
REVIEW	ALC
APPROVED	PLE

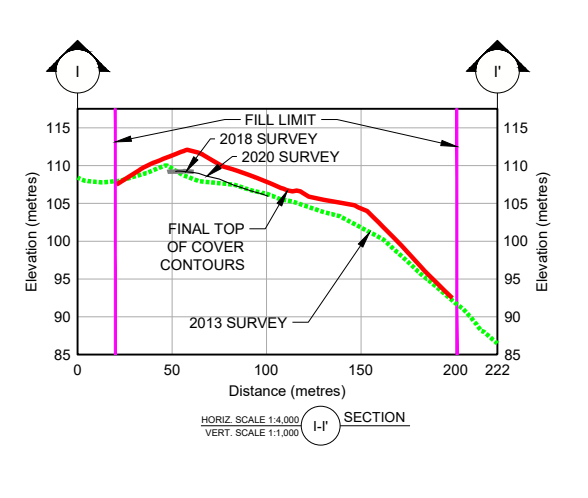
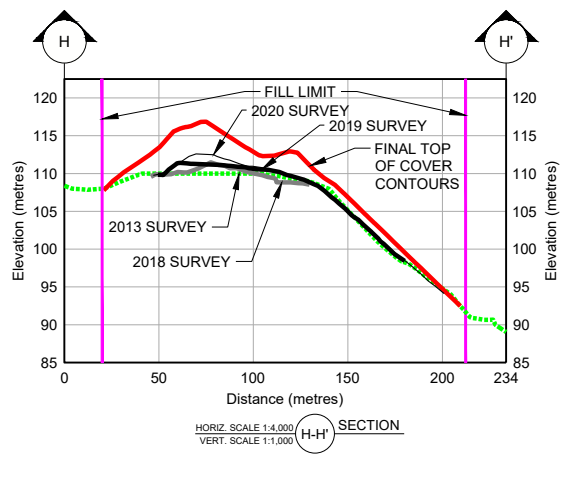
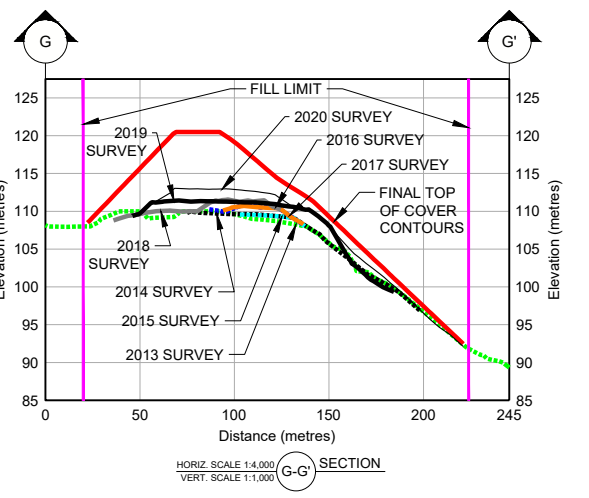
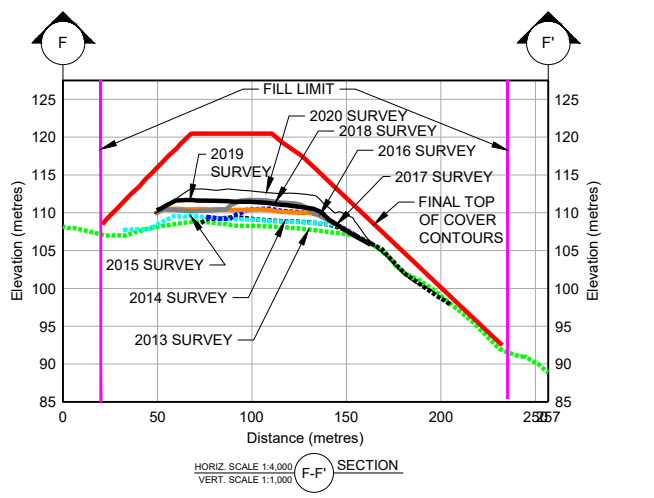
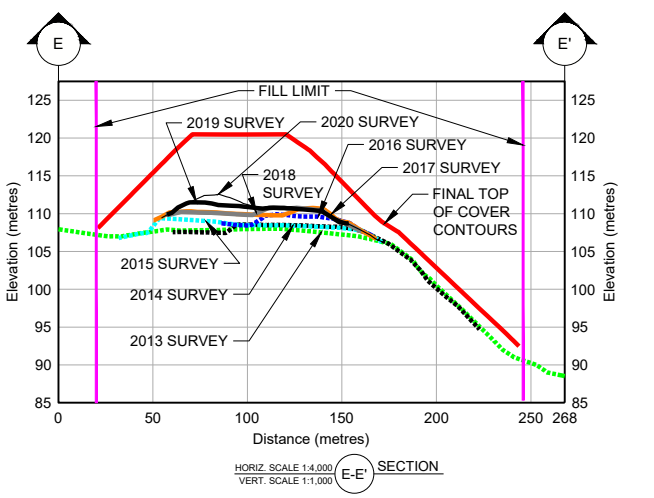
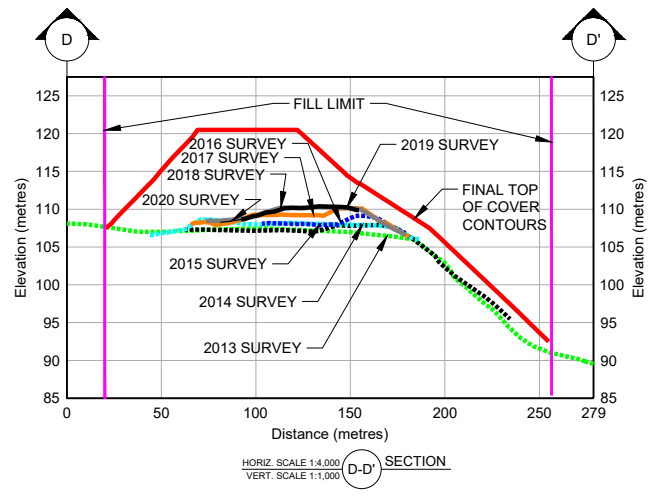
PROJECT
2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ARNPRIOR WASTE DISPOSAL SITE

TITLE
SITE PLAN

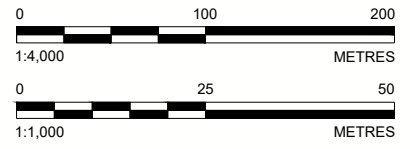
PROJECT No.	CONTROL	Rev.	FIGURE
19131181	3000	A	2

28 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B

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- LEGEND**
- PROPOSED FILL LIMITS
 - FINAL CONTOURS
 - - - 2013 SURVEY LIMIT
 - - - 2014 SURVEY LIMIT
 - - - 2015 SURVEY LIMIT
 - - - 2016 SURVEY LIMIT
 - - - 2017 SURVEY LIMIT
 - - - 2018 SURVEY LIMIT
 - - - 2019 SURVEY LIMIT
 - - - 2020 SURVEY LIMIT
- REFERENCE(S)**
1. BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
 2. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28



CLIENT
 CORPORATION OF THE TOWN OF ANRPRIOR

PROJECT
 2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ANRPRIOR WASTE DISPOSAL SITE

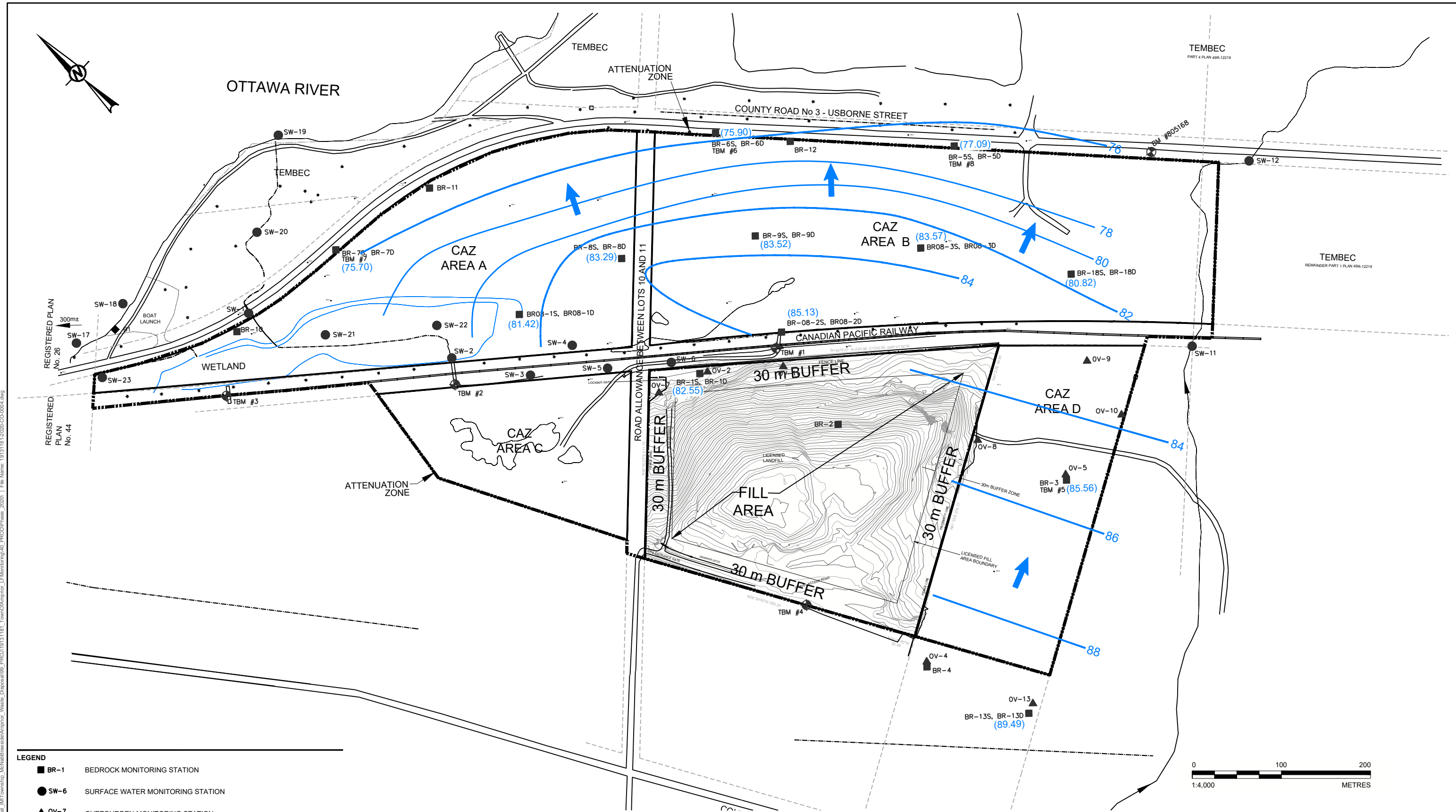
CONSULTANT

YYYY-MM-DD 2021-01-19
 PREPARED ABD
 DESIGN ETB
 REVIEW ALC
 APPROVED PLE

TITLE
CROSS-SECTIONS

PROJECT No. 19131181 CONTROL 3000 Rev. A FIGURE 3

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/B



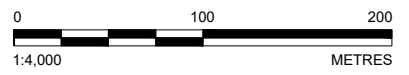
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LEGEND	
■ BR-1	BEDROCK MONITORING STATION
● SW-6	SURFACE WATER MONITORING STATION
▲ OV-7	OVERBURDEN MONITORING STATION
TBM #6	TEMPORARY BENCHMARK
(contour line)	TOPOGRAPHICAL CONTOURS (2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020 COMBINED SURVEYS)
→ (blue arrow)	INTERPRETED GROUNDWATER FLOW DIRECTION
(85.18)	GROUNDWATER ELEVATION (MAY 2020)
— (blue line)	INTERPRETED GROUNDWATER ELEVATION CONTOUR

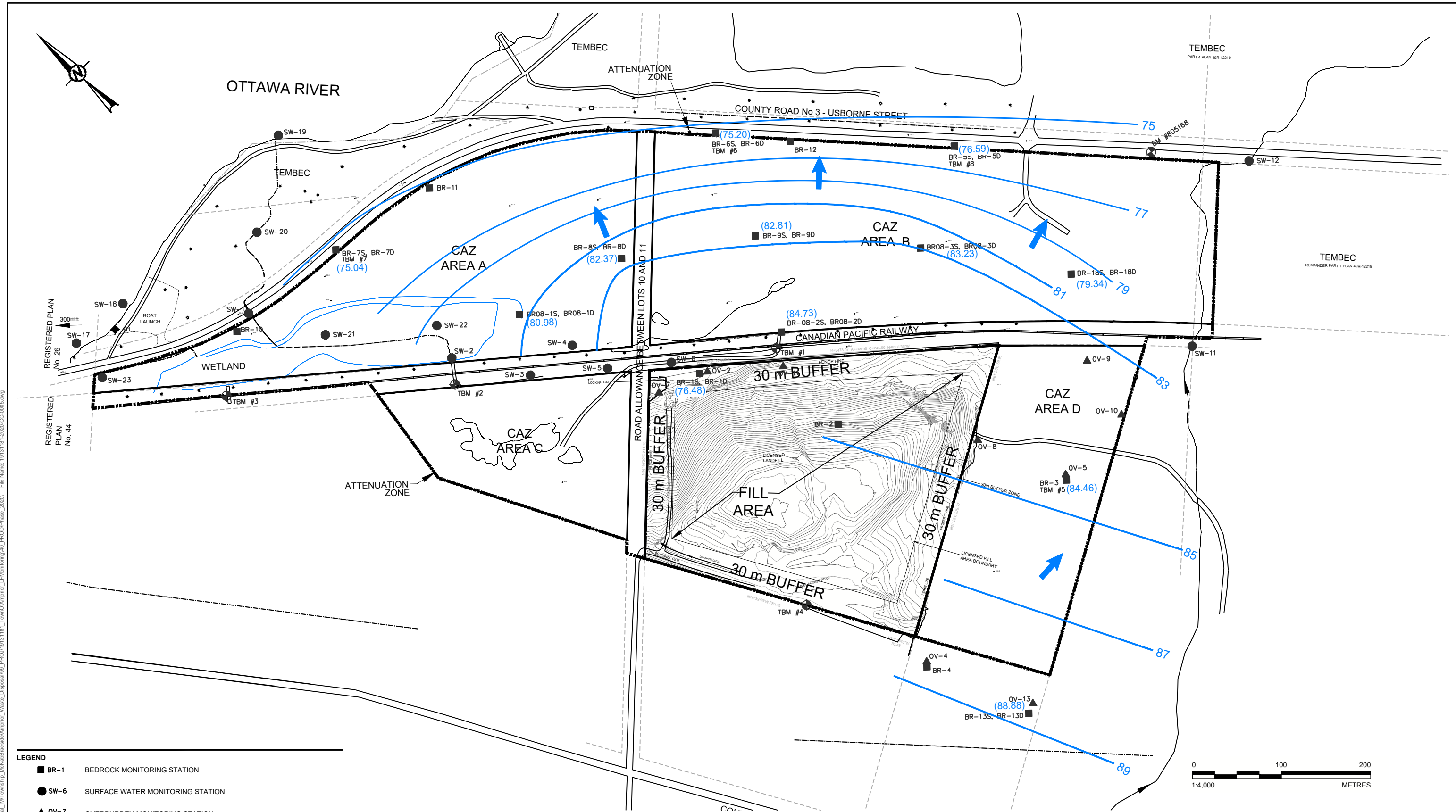
- REFERENCE(S)**
1. BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
 2. TOPOGRAPHICAL CONTOURS BEYOND THE EXTENT OF THE 2014 TO 2020 SURVEYS SUPPLIED IN DIGITAL FORMAT BY JP2G CONSULTANTS INC.
 3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

CLIENT	
CORPORATION OF THE TOWN OF ARNPRIOR	
CONSULTANT	
YYYY-MM-DD	2021-01-19
PREPARED	ABD
DESIGN	ETB
REVIEW	ALC
APPROVED	PLE

PROJECT	
2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ARNPRIOR WASTE DISPOSAL SITE	
TITLE	
SHALLOW BEDROCK GROUNDWATER FLOW DIRECTIONS (MAY 2020)	
PROJECT No.	CONTROL
19131181	3000
Rev.	FIGURE
A	4



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B



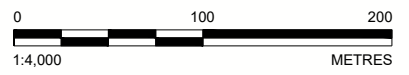
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LEGEND	
■ BR-1	BEDROCK MONITORING STATION
● SW-6	SURFACE WATER MONITORING STATION
▲ OV-7	OVERBURDEN MONITORING STATION
TBM #6	TEMPORARY BENCHMARK
—	TOPOGRAPHICAL CONTOURS (2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020 COMBINED SURVEYS)
→	INTERPRETED GROUNDWATER FLOW DIRECTION
(85.18)	GROUNDWATER ELEVATION (OCT. 2020)
—120	INTERPRETED GROUNDWATER ELEVATION CONTOUR

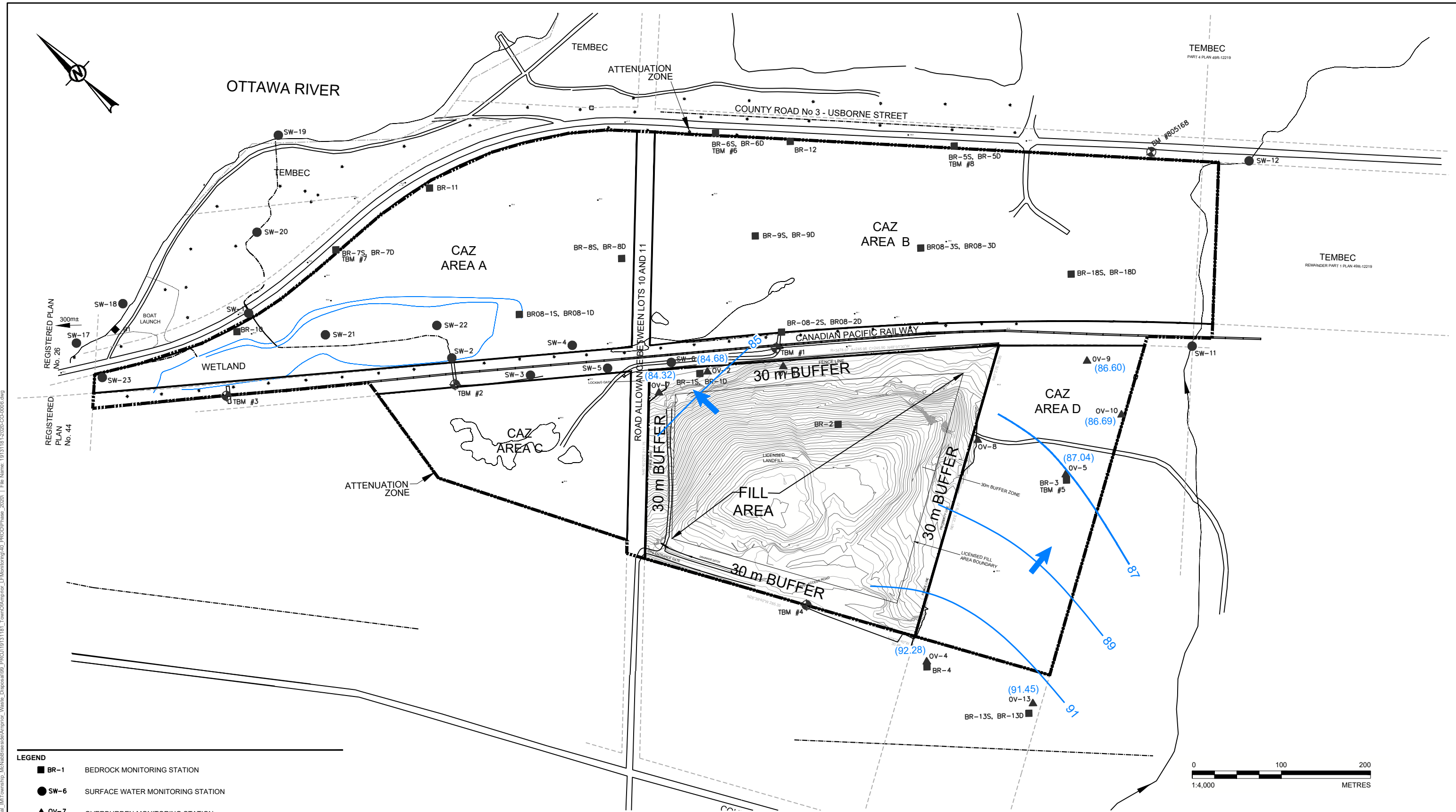
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1. BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
 2. TOPOGRAPHICAL CONTOURS BEYOND THE EXTENT OF THE 2014 TO 2020 SURVEYS SUPPLIED IN DIGITAL FORMAT BY JP2G CONSULTANTS INC.
 3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

CLIENT	
CORPORATION OF THE TOWN OF ARNPRIOR	
CONSULTANT	
YYYY-MM-DD	2021-01-19
PREPARED	ABD
DESIGN	ETB
REVIEW	ALC
APPROVED	PLE

PROJECT	
2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ARNPRIOR WASTE DISPOSAL SITE	
TITLE	
SHALLOW BEDROCK GROUNDWATER FLOW DIRECTION (OCTOBER 2020)	
PROJECT No.	CONTROL
19131181	3000
Rev.	A
FIGURE	5



IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B



LEGEND

■ BR-1	BEDROCK MONITORING STATION
● SW-6	SURFACE WATER MONITORING STATION
▲ OV-7	OVERBURDEN MONITORING STATION
TBM #6	TEMPORARY BENCHMARK
(contour line)	TOPOGRAPHICAL CONTOURS (2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020 COMBINED SURVEYS)
→ (blue arrow)	INTERPRETED GROUNDWATER FLOW DIRECTION
(85.18)	GROUNDWATER ELEVATION (MAY 2020)
— (blue line)	INTERPRETED GROUNDWATER ELEVATION CONTOUR

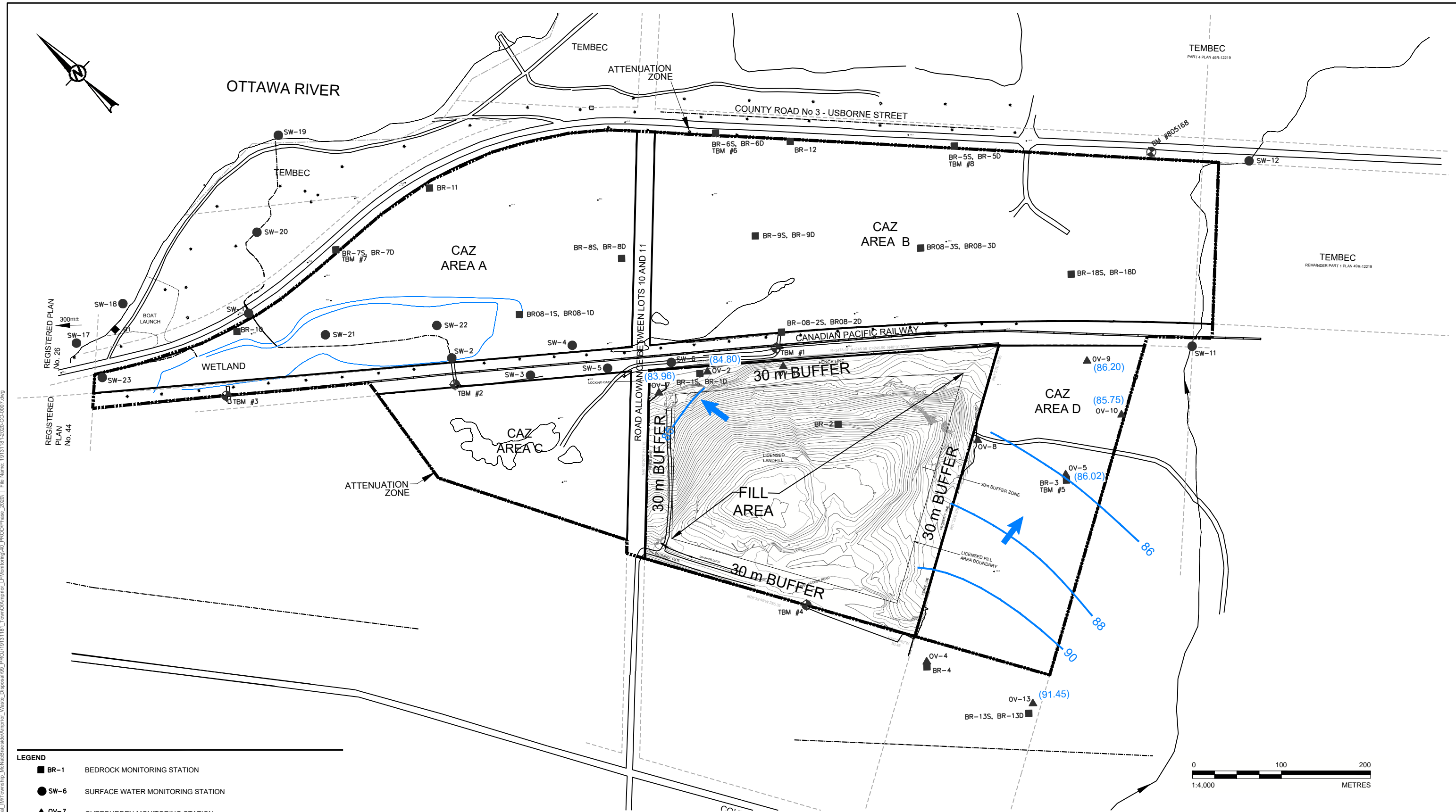
- REFERENCE(S)**
1. BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
 2. TOPOGRAPHICAL CONTOURS BEYOND THE EXTENT OF THE 2014 TO 2020 SURVEYS SUPPLIED IN DIGITAL FORMAT BY JP2G CONSULTANTS INC.
 3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

CLIENT	
CORPORATION OF THE TOWN OF ARNPRIOR	
CONSULTANT	
YYYY-MM-DD	2021-01-19
PREPARED	ABD
DESIGN	ETB
REVIEW	ALC
APPROVED	PLE

PROJECT	
2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ARNPRIOR WASTE DISPOSAL SITE	
TITLE	
OVERBURDEN GROUNDWATER FLOW DIRECTION (MAY 2020)	
PROJECT No.	CONTROL
19131181	3000
Rev.	A
FIGURE	6

Path: \\golder\gpc\projects\19131181\19131181_TownOfArnprior_L1\Monitoring\40_PROC\Phase_2020\19131181_2020-CC-0006.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS1 B



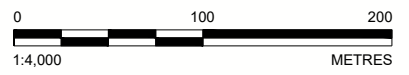
LEGEND

- BR-1 BEDROCK MONITORING STATION
- SW-6 SURFACE WATER MONITORING STATION
- ▲ OV-7 OVERBURDEN MONITORING STATION
- TBM #6 TEMPORARY BENCHMARK
- TOPOGRAPHICAL CONTOURS (2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020 COMBINED SURVEYS)
- INTERPRETED GROUNDWATER FLOW DIRECTION
- (85.18) GROUNDWATER ELEVATION (OCT. 2020)
- 120 INTERPRETED GROUNDWATER ELEVATION CONTOUR

- REFERENCE(S)**
1. BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
 2. TOPOGRAPHICAL CONTOURS BEYOND THE EXTENT OF THE 2014 TO 2020 SURVEYS SUPPLIED IN DIGITAL FORMAT BY JP2G CONSULTANTS INC.
 3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

CLIENT CORPORATION OF THE TOWN OF ARNPRIOR	
CONSULTANT	YYYY-MM-DD 2021-01-19
	PREPARED ABD
	DESIGN ETB
	REVIEW ALC
	APPROVED PLE

PROJECT 2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ARNPRIOR WASTE DISPOSAL SITE	
TITLE OVERBURDEN GROUNDWATER FLOW DIRECTIONS (OCTOBER 2020)	
PROJECT No. 19131181	CONTROL 3000
Rev. A	FIGURE 7



Path: \\golder\gpc\projects\19131181\TownOfArnprior_L1\Monitoring\40_PROC\Phase_2020\19131181-2020-CC-0007.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B1 TO A4/B1

FIGURE 8: PIPER TRILINEAR DIAGRAM – GROUNDWATER – MAY 2020

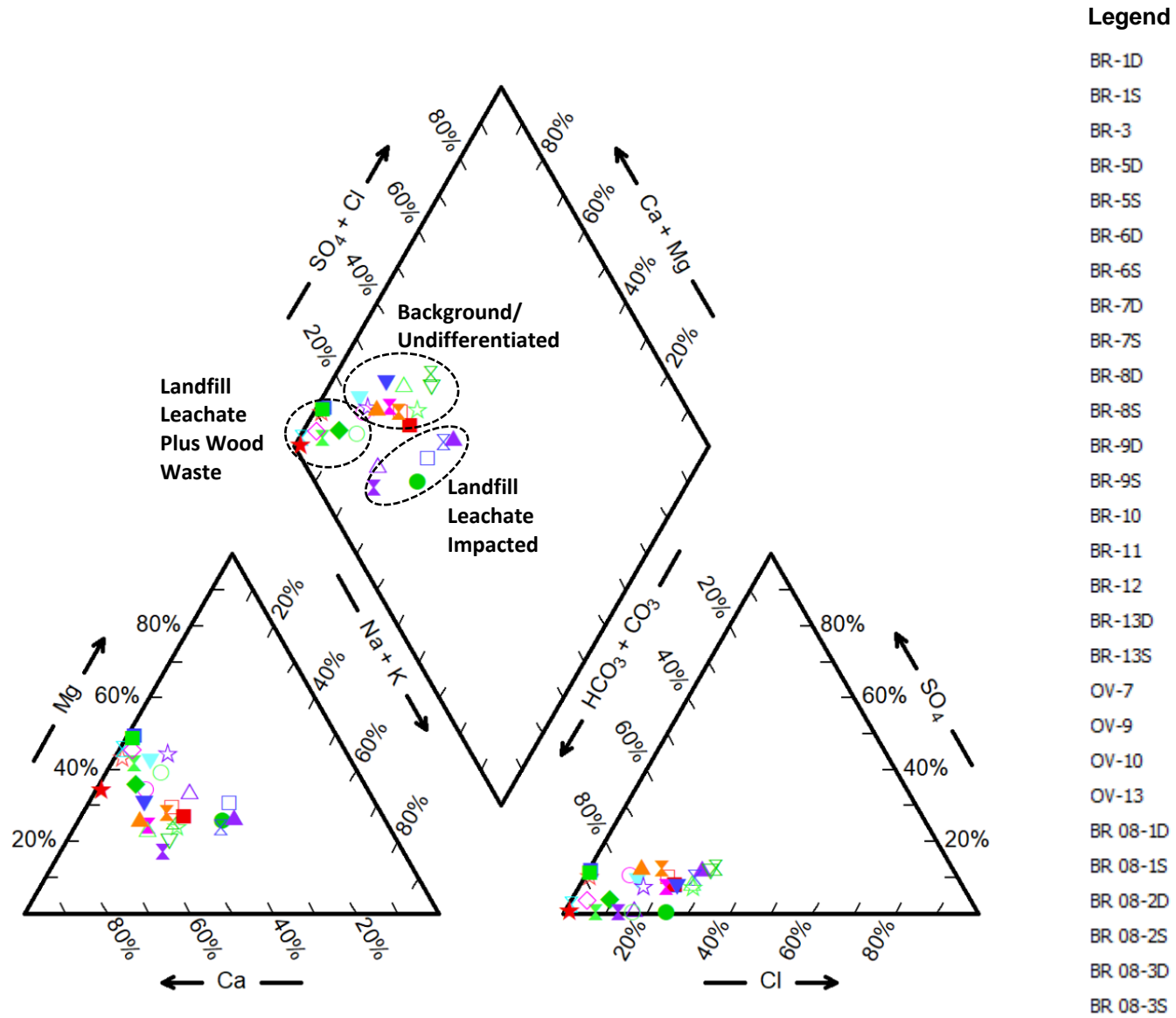
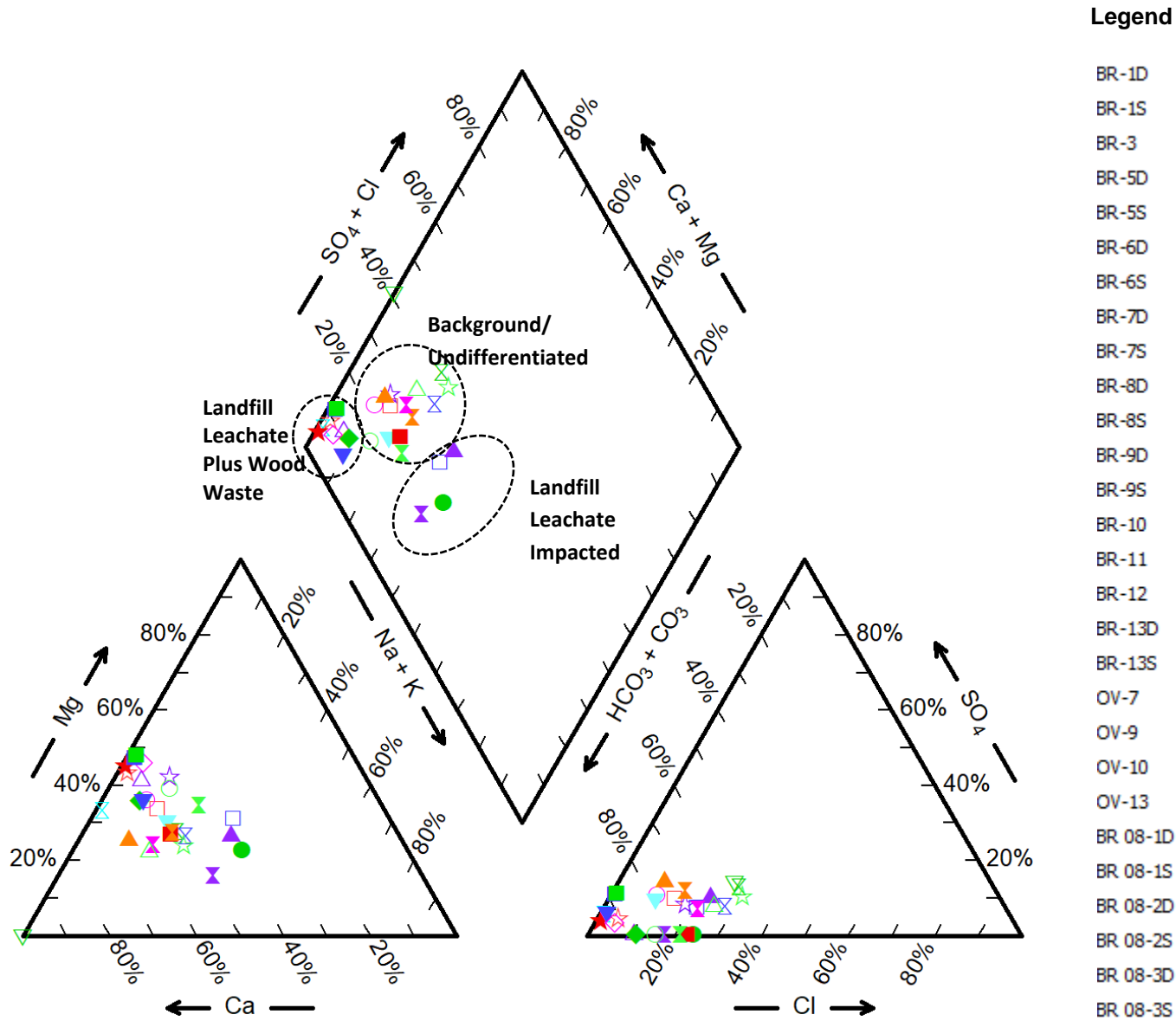
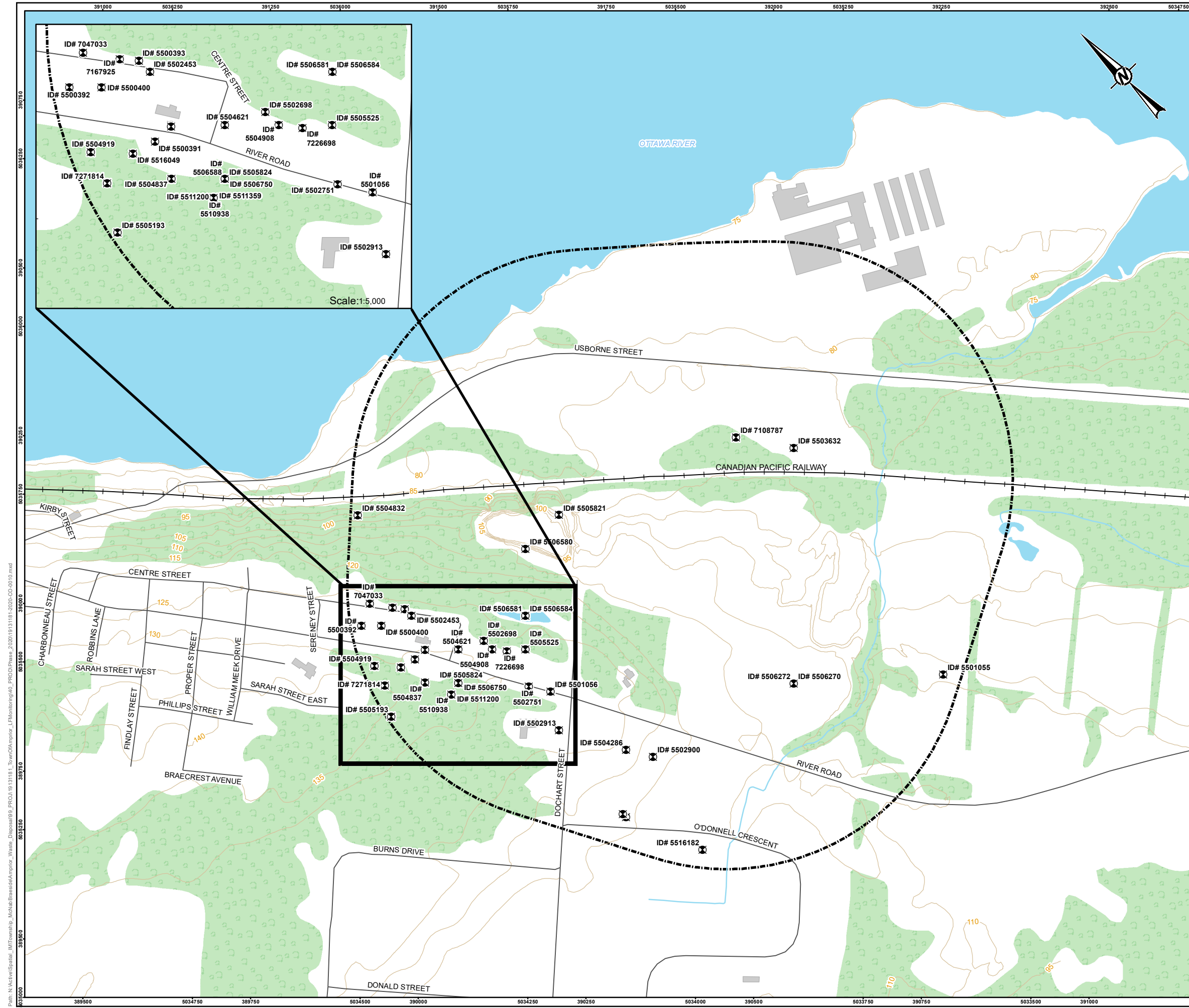


FIGURE 9: PIPER TRILINEAR DIAGRAM – GROUNDWATER – OCTOBER 2020





LEGEND

- MECP WWIS WATER WELL LOCATION
- ROADWAY
- RAILWAY
- CONTOUR, metres
- WATERCOURSE
- LANDFILL PROPERTY BOUNDARY
- 500 m BUFFER
- LOT AND CONCESSION
- BUILDING
- WATERBODY
- WETLAND
- WOODED AREA

NOTE(S)
ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY, © QUEENS PRINTER 2014
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 18 VERTICAL DATUM: CGVD28



CLIENT
CORPORATION OF THE TOWN OF ARNPRIOR

PROJECT
2020 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ARNPRIOR WASTE DISPOSAL SITE

TITLE
LOCATION OF RESIDENTIAL WELLS WITHIN 500M OF LANDFILL BOUNDARY

CONSULTANT

YYYY-MM-DD	2021-01-19
DESIGNED	ETB
PREPARED	ABD
REVIEWED	ALC
APPROVED	PLE

PROJECT NO. 19131181 PHASE 3000 REV. A **FIGURE 10**

Path: N:\Projects\Spatial_MIT\Township_Michelin\Bases\Arnprior_Waste_Disposal\19131181_TownOfArnprior_FRCD\Figures_2020\19131181-2020_CO-2010.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 26mm

APPENDIX A

**Report of Analyses, Bureau Veritas Laboratories
(Provided on USB)**

APPENDIX A-I – Spring Monitoring Session

APPENDIX A-II – Summer Monitoring Session

APPENDIX A-III – Fall Monitoring Session

Provided on USB

APPENDIX B

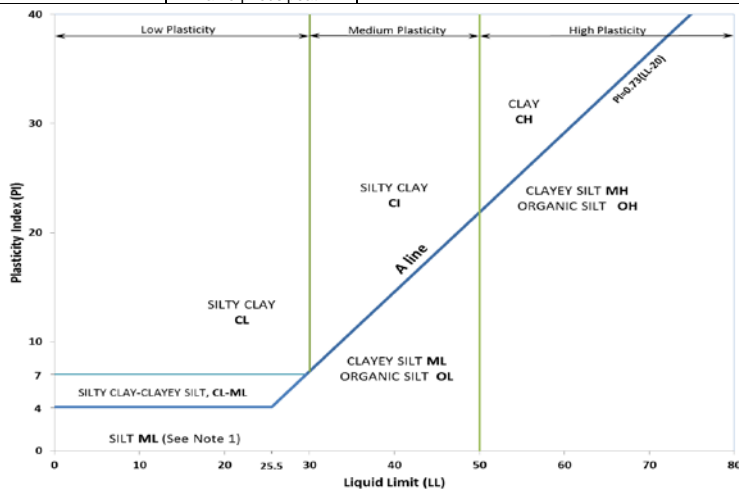
Borehole Logs

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil	Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$	Organic Content	USCS Group Symbol	Group Name	
									INORGANIC (Organic Content ≤30% by mass)
Well Graded	≥4	1 to 3	GW	GRAVEL					
GRAVELS with >12% fines (by mass)	Below A Line	n/a		GM	SILTY GRAVEL				
	Above A Line	n/a		GC	CLAYEY GRAVEL				
SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	SANDS with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3	SP	SAND			
		Well Graded	≥6	1 to 3	SW	SAND			
	SANDS with >12% fines (by mass)	Below A Line	n/a		SM	SILTY SAND			
		Above A Line	n/a		SC	CLAYEY SAND			

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
				Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
				Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	(see Note 2)	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)	Peat and mineral soil mixtures						30% to 75%	PT	SILTY PEAT, SANDY PEAT		
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat					75% to 100%		PEAT		



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor “trace organics” for soils with between 5% and 30% organic content include the prefix “organic” before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML. For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between “clean” and “dirty” sand or gravel). For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML. A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse	19 to 75	0.75 to 3
	Fine	4.75 to 19	(4) to 0.75
SAND	Coarse	2.00 to 4.75	(10) to (4)
	Medium	0.425 to 2.00	(40) to (10)
	Fine	0.075 to 0.425	(200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (i.e., SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

- PH:** Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w _p	plastic limit
LL , w _L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test ¹
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
D _R	relative density (specific gravity, G _s)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO ₄	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness²

Term	SPT 'N' (blows/0.3m) ¹
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

- SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
- Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grain size. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N' ^{1,2} (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

- SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
- SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
$\ln x$	natural logarithm of x
$\log_{10} x$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta \sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
C_v	coefficient of consolidation (vertical direction)
C_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = $\tan \delta$
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

* Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

Notes: 1
2

$$\tau = c' + \sigma' \tan \phi'$$

$$\text{shear strength} = (\text{compressive strength})/2$$

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERINGS STATE

Fresh: no visible sign of rock material weathering.

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

<u>Description</u>	<u>Bedding Plane Spacing</u>
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

<u>Description</u>	<u>Spacing</u>
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

<u>Term</u>	<u>Size*</u>
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

DISCONTINUITY DATA

Fracture Index

A count of the number of naturally occurring discontinuities (physical separations) in the rock core. Mechanically induced breaks caused by drilling are not included.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

JN Joint	PL Planar
FLT Fault	CU Curved
SH Shear	UN Undulating
VN Vein	IR Irregular
FR Fracture	K Slickensided
SY Stylolite	PO Polished
BD Bedding	SM Smooth
FO Foliation	SR Slightly Rough
CO Contact	RO Rough
AXJ Axial Joint	VR Very Rough
KV Karstic Void	
MB Mechanical Break	

PROJECT: 08-1122-0198

RECORD OF DRILLHOLE: 08-1

SHEET 1 OF 1

LOCATION: See Site Plan

DRILLING DATE: July 9 & 10, 2008

DATUM:

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Marathon Drilling Co. Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (mm/min)	FLUSH COLOUR % RETURN	FR/FX-FRACTURE F-FAULT				SM-SMOOTH		FL-FLEXURED		BC-BROKEN CORE		DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION
								CL-CLEAVAGE		J-JOINT		R-ROUGH		UE-UNEVEN		MB-MECH. BREAK			
								SH-SHEAR		P-POLISHED		ST-STEPPED		W-WAVY		B-BEDDING			
VN-VEIN		S-SLICKENSIDED		PL-PLANAR		C-CURVED													
		RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.3	DISCONJUNITY DATA		HYDRAULIC CONDUCTIVITY											
		TOTAL CORE %	SOLID CORE %			DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION		10 ⁻⁶	10 ⁻⁴	10 ⁻²								
0	Hand Dug	Bedrock Surface		0.00															
1	Rotary Drill HW Casing	Weathered, shaley LIMESTONE		0.76	1	100													Protective casing with cement seal
2		Slightly weathered, grey and grey brown LIMESTONE with siltstone layers, very thinly bedded		1.60	2	71	20												Bentonite Seal
3		Slightly weathered to fresh, grey and grey brown interbedded SHALE, SILTSTONE and LIMESTONE		3.00	3	84	20												Silica Sand
4				4.00	4	109	0												32mm Diam PVC #10 Slot Screen B
5	Rotary Drill HQ Core	Fresh, grey, dark grey to black and grey to green interbedded SHALE, SILTSTONE and LIMESTONE		6.12	5	76	0												Bentonite Seal
6		Fresh, grey and dark grey to black, interbedded SHALE and LIMESTONE		7.65	6	84	0												Silica Sand
7				8.00	7	97	0												32mm Diam PVC #10 Slot Screen A
8		Fresh, grey and dark grey shaley LIMESTONE		10.62	8	97	0												
9				11.00															
10		End of Drillhole		12.14															

MIS-RCK.001 0811220198-2000.GPJ GAL-MISS.GDT 1/23/09 S.L.

DEPTH SCALE
1 : 75



LOGGED: P.A.H.
CHECKED: A.W.

PROJECT: 08-1122-0198

RECORD OF DRILLHOLE: 08-2

SHEET 1 OF 1

LOCATION: See Site Plan

DRILLING DATE: July 11, 2008

DATUM:

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Marathon Drilling Co. Ltd.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH	COLOUR	% RETURN	FR/FX-FRACTURE F-FAULT			SM-SMOOTH			FL-FLEXURED			BC-BROKEN CORE			DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION			
										CL-CLEAVAGE			J-JOINT			R-ROUGH			UE-UNEVEN					MB-MECH. BREAK		
										SH-SHEAR			P-POLISHED			ST-STEPPED			W-WAVY					B-BEDDING		
VN VEIN			S-SLICKENSIDED			PL-PLANAR			C-CURVED																	
										RECOVERY		R.Q.D. %		FRACT INDEX PER 0.3		DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY								
										TOTAL CORE %		SOLID CORE %		DIP w.r.t CORE AXIS		TYPE AND SURFACE DESCRIPTION		10 ⁻⁶ K _c cm/sec								
																		10 ⁻⁶ K _c cm/sec								
0	Hand Dug	Bedrock Surface		0.00																						
0.76	Rotary Drill	Sand and gravel (FILL)		0.76																		Protective casing with cement seal				
1.11	Rotary Drill	Moderately weathered SANDSTONE		1.11	1	100																				
1.73	Rotary Drill	Slightly weathered, grey brown and grey shaley LIMESTONE, some thin mud seams		1.73																		Bentonite Seal				
2.00	Rotary Drill	Fresh, dark grey, grey green and light grey brown, interbedded SHALE, SILTSTONE and LIMESTONE		2.00	2	102	0																			
3.00	Rotary Drill			3.00																		Silica Sand				
4.00	Rotary Drill			4.00	3	104	0																			
5.00	Rotary Drill			5.00																		32mm Diam PVC #10 Slot Screen B				
6.00	Rotary Drill			6.00	4	125	0																			
6.27	Rotary Drill	Fresh, grey and dark grey, interbedded SHALE and LIMESTONE, small vugs at 6.40 to 6.58m depth		6.27																						
7.00	Rotary Drill			7.00	5	147	0															Bentonite Seal				
8.00	Rotary Drill			8.00																						
9.00	Rotary Drill			9.00	6	104	0															Silica Sand				
10.00	Rotary Drill			10.00																						
11.00	Rotary Drill	Fresh, grey and dark grey, shaley LIMESTONE, becoming dolomitic LIMESTONE, occasional calcite nodules		10.69																						
12.00	Rotary Drill			12.00	7		0																			
13.00	Rotary Drill			13.00	8	130	0															32mm Diam PVC #10 Slot Screen A				
12.25	Rotary Drill	End of Drillhole		12.25																						

MIS-RCK.001_0811220198-2000.GPJ_GAL-MISS.GDT_1/23/09_S.L.

DEPTH SCALE

1 : 75



LOGGED: P.A.H.

CHECKED: A.W.

PROJECT: 08-1122-0198

RECORD OF DRILLHOLE: 08-3

SHEET 1 OF 2

LOCATION: See Site Plan

DRILLING DATE: July 14, 2008

DATUM:

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Water Well Rig

DRILLING CONTRACTOR: Stanton Drilling Inc

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH % RETURN	RECOVERY		R.O.D. %	FRACT INDEX PER 0.3	DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY K, cm/sec			DIAMETRAL POINT LOAD INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION
								TOTAL CORE %	SOLID CORE %			DIP w.r.t CORE AXIS	TYPE AND SURFACE DESCRIPTION	10 ⁰	10 ¹	10 ²		
								FR/FX-FRACTURE F-FAULT	SM-SMOOTH			FL-FLEXURED	BC-BROKEN CORE					
								CL-CLEAVAGE	J-JOINT			R-ROUGH	UE-UNEVEN					
SH-SHEAR	P-POLISHED	S1-STEPPED	W-WAVY															
VN-VEIN	S-SLICKENSIDED	PL-PLANAR	C-CURVED															
0		Bedrock Surface		0.00														
0		Grey LIMESTONE and SHALE	[Symbolic Log]															Protective casing with cement seal
1																		
2																		Bentonite Seal
3																		Silica Sand
4																		
5																		38mm Diam PVC #10 Slot Screen B
6																		
7																		
8	Air Rotary Drill																	
9																		Bentonite Seal
10																		
11																		Silica Sand
12																		
13																		38mm Diam PVC #10 Slot Screen A
14																		
15																		

CONTINUED NEXT PAGE

MIS-RCK-001 0811220198-2000.GPJ GAL-MISS GDT 1/23/09 S.L

DEPTH SCALE

1 : 75



LOGGED: P.A.H.

CHECKED: A.W.

PROJECT: 08-1122-0198

RECORD OF DRILLHOLE: 08-3

SHEET 2 OF 2

LOCATION: See Site Plan

DRILLING DATE: July 14, 2008

DATUM:

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: Water Well Rig

DRILLING CONTRACTOR: Stanton Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RLN No.	PENETRATION RATE (min/m)	FLUSH	COLOUR	% RETURN	FR/FX-FRACTURE F-FAULT		SM-SMOOTH		FL-FLEXURED		BC-BROKEN CORE		NOTES WATER LEVELS INSTRUMENTATION						
										CL-CLEAVAGE	J-JOINT	R-ROUGH	UE-UNEVEN	MB-MECH. BREAK	B-BEDDING	RECOVERY			R.Q.D. %	FRACT. INDEX PER 0.3	DISCONTINUITY DATA		HYDRAULIC CONDUCTIVITY	
										SH-SHEAR	P-POLISHED	ST-STEPPED	W-WAVY			DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION				K _i cm/sec			
										VN-VEIN	S-SLICKENSIDED	PL-PLANAR	C-CURVED						10 ^e	10 ⁺	10 ⁺	10 ⁺		
TOTAL CORE %	SOLID CORE %																							
15	---	--- CONTINUED FROM PREVIOUS PAGE ---																						
	Rotary Drill	Grey LIMESTONE and SHALE																						
16		End of Drillhole		15.85																				
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25																								
26																								
27																								
28																								
29																								
30																								

MIS-RCK 001 0811220198-2000.GPJ GAL-MISS GDT 1/23/09 S.L.

DEPTH SCALE

1 : 75



LOGGED: P.A.H.

CHECKED: A.W.

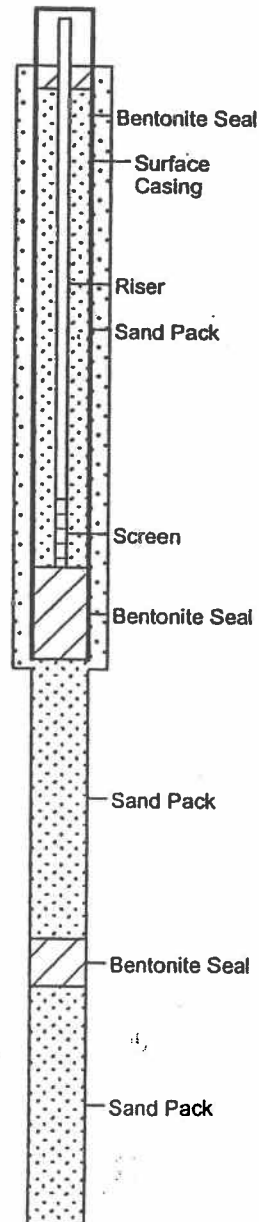
Municipality of The Town of Arnprior
 Arnprior Landfill Site
 Part Lot 10 Concession 13
 Township of McNab

Date Completed : Nov, 2001
 Hole Diameter : 15 cm
 Drilling Method : ODEX
 Sampling Method : Grab

Company Rep. : A Buzza

Depth in Metres	Surf. Elev.	GRAPHIC	USCS	DESCRIPTION
0	0		ML	Top Soil Clayey Loam
5	-5		SC	
10	-10			
15	-15		SW	Fine And Medium Sand Becoming Coarser With Depth.
20	-20			
25	-25		SL	Fractured Bedrock (Shale)
25	-25		LS	Limestone (Dark Grey) Limestone (Light Grey)
30	-30		LC	
35	-35			
40	-40			Well Termination
45	-45		LC	
50	-50			
55				

Well: OV-13



Town of Amprior Waste Disposal Site
 Lot 10
 Concession 13

Date Drilled : 1994
 Equipment : Rotary
 Surface Elevation : 84.2
 Bi level Date : July 2000

McNabb Township

Depth
 in
 Meters

GRAPHIC

Wells: BR-5S,
 BR-5D

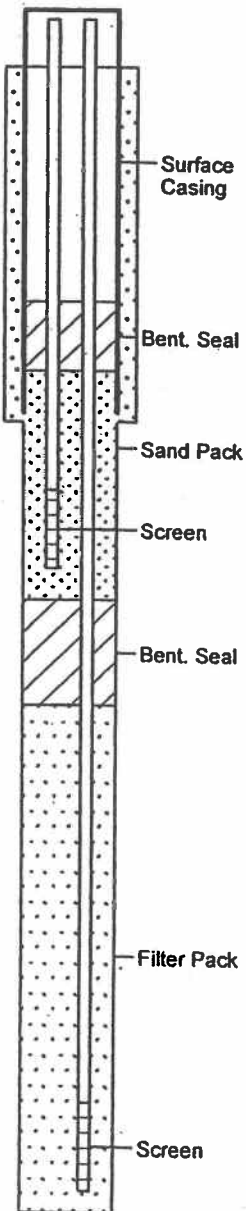
Elev.: 84.6

DESCRIPTION

Sand and Gravelly topsoil

Limestone

0
2
4
6
8
10
12
14
16
18
20
22
24



0	2	4	6	8	10	12	14	16	18	20	22	24
Sand and Gravelly topsoil												
Limestone												

Town of Armprior Waste Disposal Site
 Lot 10
 Concession 13

Date Drilled : 1994
 Equipment : Rotary
 Surface Elevation : 80.05
 Bi level Date : July 2000

McNabb Township

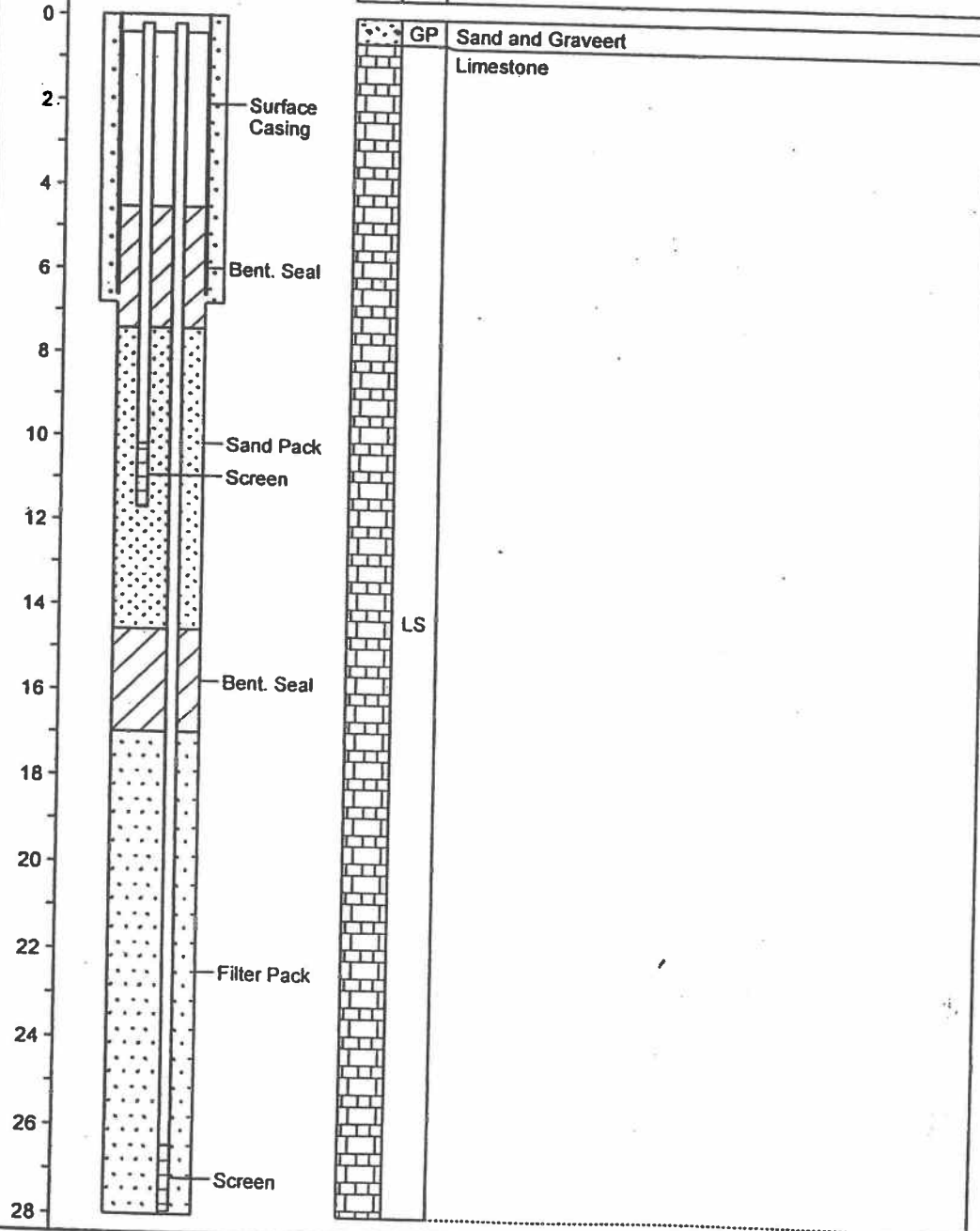
Wells: BR-7S,
 BR-7D
 Elev.: 80.98

Depth
 in
 Meters

GRAPHIC

USCS

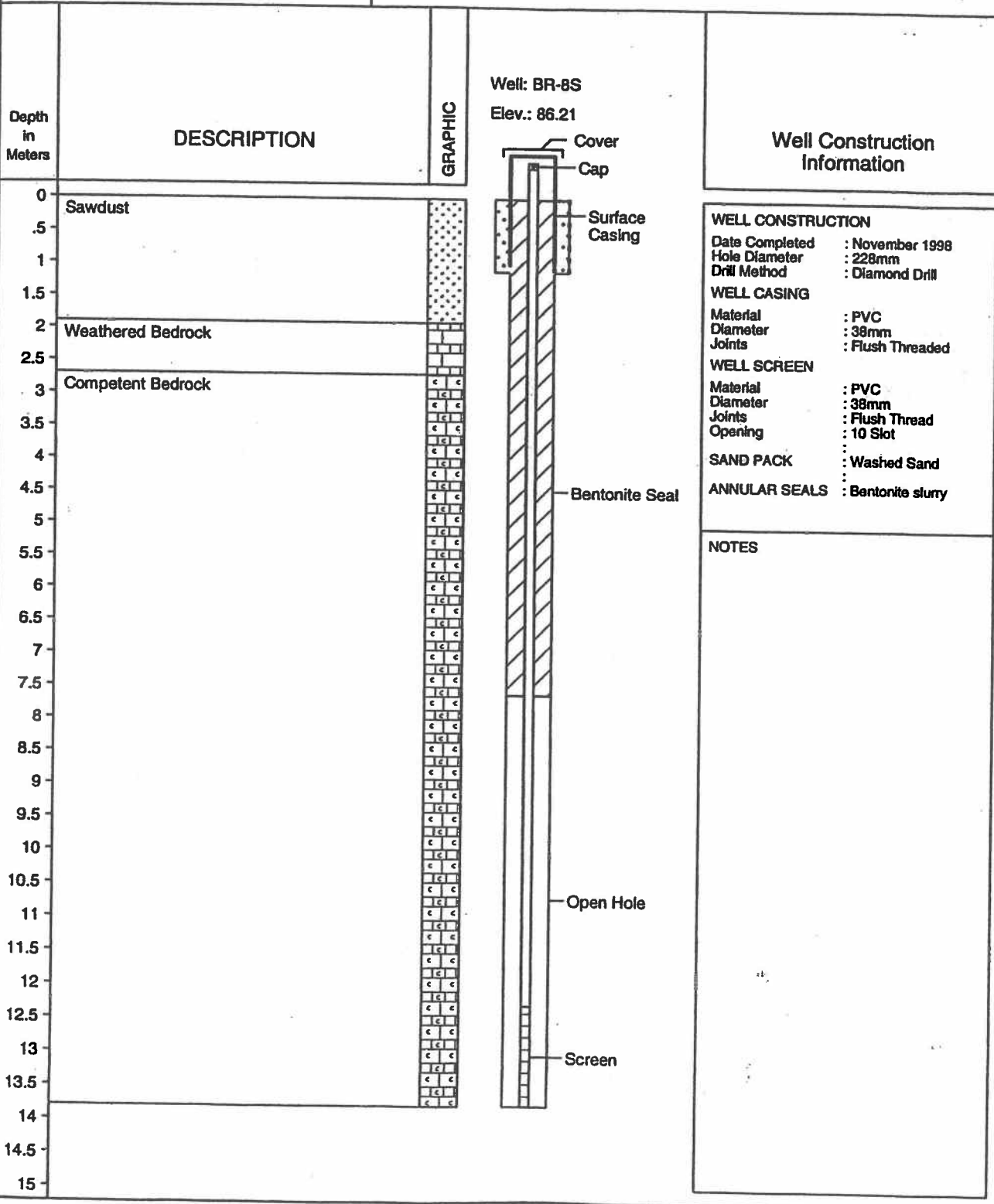
DESCRIPTION



Town of Amprior Waste Disposal Site
 Part Lot 10
 Concession 13
 McNab Township

Date Drilled : November 1998
 Drilling Company : OGS
 Drilling Method : Diamond Drill
 Hole Diameter : 228mm

Logged By : AB



Town of Amprior Waste Disposal Site
 Part Lot 10
 Concession 13
 McNab Township

Date Drilled : November 1998
 Drilling Company : OGS
 Drilling Method : Diamond Drill
 Hole Diameter : 228mm

Logged By : WO

Depth in Meters	DESCRIPTION	GRAPHIC	Well: BR-9S Elev.: 85.93	Well Construction Information
0	Sawdust	[Dotted pattern]	<p>Cover Cap Surface Casing Bentonite Seal Open Hole Screen</p>	<p>WELL CONSTRUCTION Date Completed : November 1998 Hole Diameter : 228mm Drill Method : Diamond Drill</p> <p>WELL CASING Material : PVC Diameter : 38mm Joints : Flush Threaded</p> <p>WELL SCREEN Material : PVC Diameter : 38mm Joints : Flush Thread Opening : 10 Slot</p> <p>SAND PACK : Washed Sand</p> <p>ANNULAR SEALS : Bentonite slurry</p> <p>NOTES</p>
1	Sand and Gravel Fill	[Stippled pattern]		
2	Organic	[Horizontal line pattern]		
2	Weathered Bedrock	[Block pattern]		
3	Competent Bedrock	[Grid pattern]		
4		[Grid pattern]		
5		[Grid pattern]		
6		[Grid pattern]		
7		[Grid pattern]		
8		[Grid pattern]		
9		[Grid pattern]		
10		[Grid pattern]		
11		[Grid pattern]		
12		[Grid pattern]		
13		[Grid pattern]		
14		[Grid pattern]		
15		[Grid pattern]		

Robinson Consultants

LOG OF BORING BR-11

(Page 1 of 1)

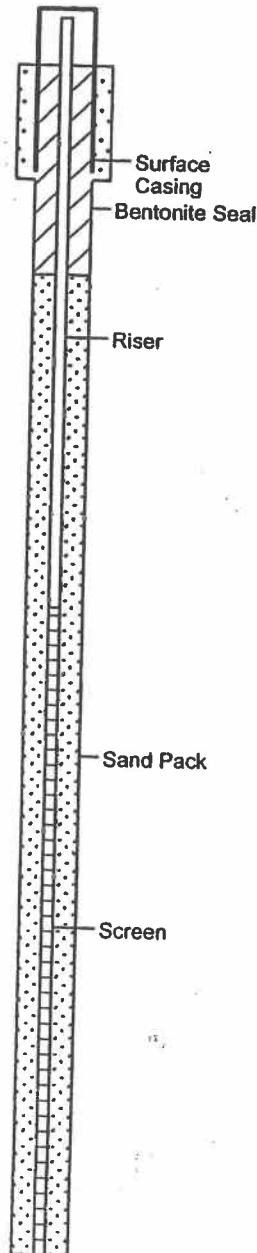
Municipality of The Town of Arnprior
Arnprior Landfill Site
Part Lot 10 Concession 13
Township of McNab

Date Completed : Sept. 2001
Hole Diameter : 7cm
Drilling Method : Core Drilling
Sampling Method : Grab

Company Rep. : A Townsend

Depth in Metres	Surf. Elev.	GRAPHIC	USCS	DESCRIPTION
0 - 0.			ML	Top Soil
				Fractured Bedrock (Limestone)
1 - -1				
2 - -2				
3 - -3			LC	
4 - -4				
5 - -5				
6				

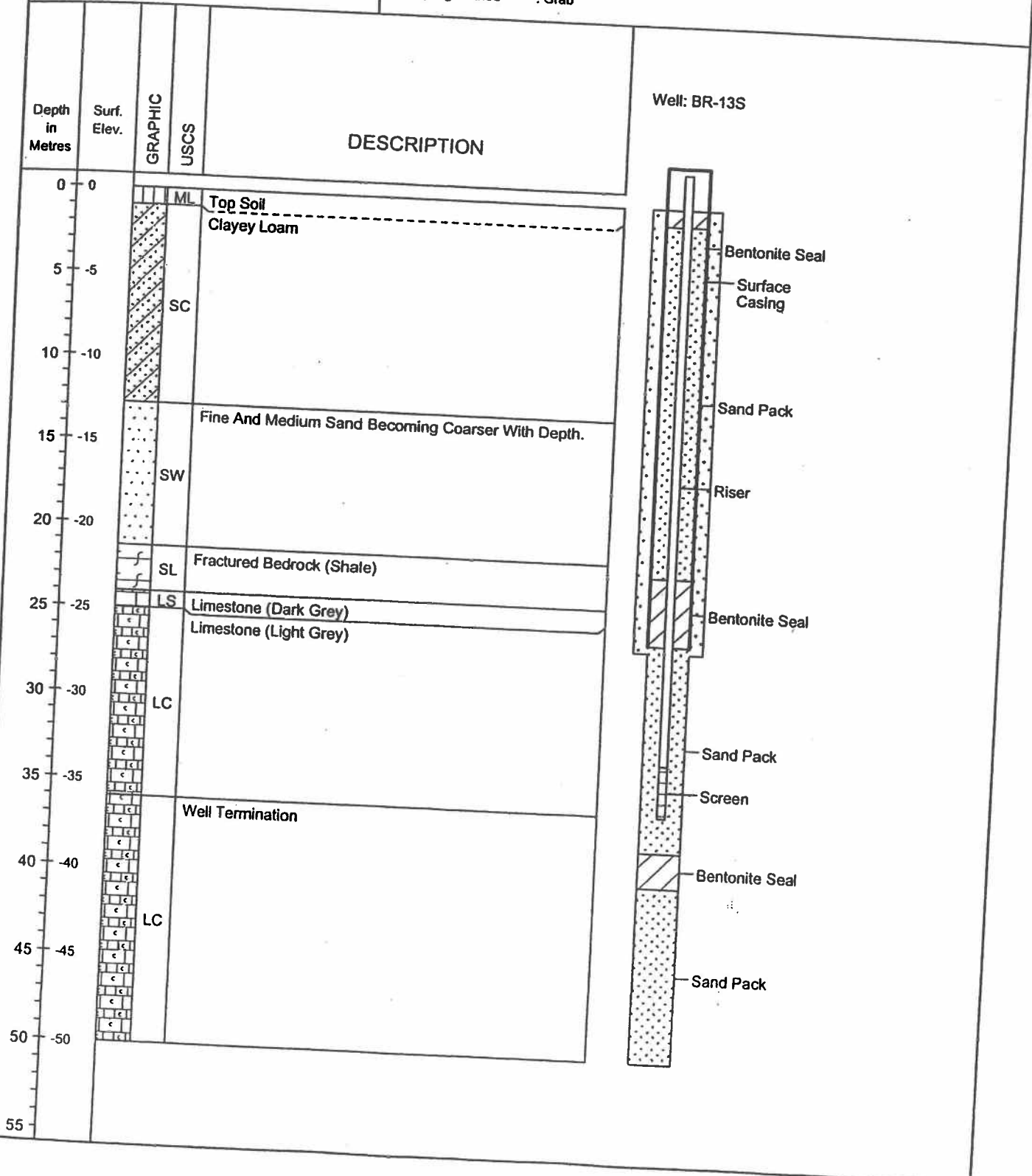
Well: BR-11



Municipality of The Town of Arnprior
 Arnprior Landfill Site
 Part Lot 10 Concession 13
 Township of McNab

Date Completed : Nov, 2001
 Hole Diameter : 15 cm
 Drilling Method : ODEX
 Sampling Method : Grab

Company Rep. : A Buza



PROJECT: 1401322

RECORD OF BOREHOLE: BR-18D

SHEET 1 OF 3

LOCATION: N 5034656.8 ;E 391416.6

BORING DATE: October 30, 2018

DATUM: CGVD28

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
0		GROUND SURFACE		85.64 0.00												
1																
2																
3																
4																
5	Air Percussion															
6																
7																
8																
9																
10																

DRAFT

Bentonite Seal

CONTINUED NEXT PAGE

MIS-BHS 001 1401322.GPJ GAL-MIS.GDT 20-3-5 JM



PROJECT: 1401322

RECORD OF BOREHOLE: BR-18D

SHEET 2 OF 3

LOCATION: N 5034656.8 ;E 391416.6

BORING DATE: October 30, 2018

DATUM: CGVD28

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
10		-- CONTINUED FROM PREVIOUS PAGE --														
11																
12																
13																
14																
15	Air Percussion															
16																
17																
18																
19																
20																
		CONTINUED NEXT PAGE														

DRAFT

Bentonite Seal

Silica Sand

50 mm Diam. PVC
#10 Slot Screen

MIS-BHS 001 1401322.GPJ GAL-MIS.GDT 20-3-5 JM

DEPTH SCALE

1 : 50



LOGGED: JS

CHECKED: ALC

PROJECT: 1401322

RECORD OF BOREHOLE: BR-18D

SHEET 3 OF 3

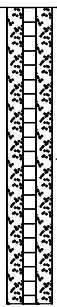
LOCATION: N 5034656.8 ;E 391416.6

BORING DATE: October 30, 2018

DATUM: CGVD28

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m				WATER CONTENT PERCENT					
							SHEAR STRENGTH Cu, kPa		nat V. + rem V. ⊕ - ⊙		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		Wp			W
20		-- CONTINUED FROM PREVIOUS PAGE --				20	40	60	80	20	40	60	80			
21	Air Percussion															
22															50 mm Diam. PVC #10 Slot Screen	
23																
24																
25																
26																
27																
28																
29																
30																

DRAFT



MIS-BHS 001 1401322.GPJ GAL-MIS.GDT 20-3-5 JM



PROJECT: 1401322
 LOCATION: N 5034656.1 ;E 391414.7

RECORD OF BOREHOLE: BR-18S

BORING DATE: October 5, 2018

SHEET 1 OF 2
 DATUM: CGVD28

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
							20 40 60 80		nat V. + rem V. ⊕ - ⊙		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		Wp — W — WI			
0		GROUND SURFACE		85.63 0.00												
1																
2																
3																
4																
5	Air Percussion															
6																
7																
8																
9																
10																

DRAFT

Bentonite Seal

Silica Sand

50 mm Diam. PVC #10 Slot Screen

CONTINUED NEXT PAGE

MIS-BHS 001 1401322.GPJ GAL-MIS.GDT 20-3-5 JM



PROJECT: 1401322

RECORD OF BOREHOLE: BR-18S

SHEET 2 OF 2

LOCATION: N 5034656.1 ;E 391414.7

BORING DATE: October 5, 2018

DATUM: CGVD28

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
10		-- CONTINUED FROM PREVIOUS PAGE --														
11																
12																
13	Air Percussion															
14																
15																
16																
17																
18																
19																
20																

Silica Sand

Bentonite Seal

DRAFT



MIS-BHS 001 1401322.GPJ GAL-MIS.GDT 20-3-5 JM

DEPTH SCALE

1 : 50



LOGGED: CA

CHECKED: ALC

PROJECT: 1401322
 LOCATION: N 5034576.6 ;E 391357.9

RECORD OF BOREHOLE: OV-9(R)

BORING DATE: September 29, 2017

SHEET 1 OF 1
 DATUM: CGVD28

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
							20 40 60 80		nat V. + Q - rem V. ⊕ U - ● ○		10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		Wp ----- W ----- WI			
0	Hand Auger	GROUND SURFACE		86.85												
		Unsampled Overburden		0.00												
1																
2																
		End of Borehole		84.65												
		Note: 1. Reinstalled in 2017.		2.20												
3																
4																
5																
6																
7																
8																
9																
10																

Bentonite Seal

Silica Sand

32 mm PVC #10 Slot Screen



MIS-BHS 001 1401322.GPJ GAL-MIS.GDT 3/26/19 JM

DEPTH SCALE
1 : 50



LOGGED: CA
CHECKED: ALC

APPENDIX C

**Results of Field and Laboratory
Chemical and Physical Analyses
(Provided on USB)**

- APPENDIX C-I – Overburden Groundwater Monitors Organic
- APPENDIX C-II – Overburden Groundwater Monitors Inorganic
- APPENDIX C-III – Bedrock Groundwater Monitors Organic
- APPENDIX C-IV – Bedrock Groundwater Monitors Inorganic
- APPENDIX C-V – Surface Water Sampling Stations
- APPENDIX C-VI – 2013 Groundwater and Surface Water Data

APPENDIX D

Graphs of Groundwater Monitoring and Surface Water Sampling Locations

APPENDIX D-I – Groundwater Monitoring Locations

APPENDIX D-II – Surface Water Sampling Locations

APPENDIX D-I

Groundwater Monitoring Locations

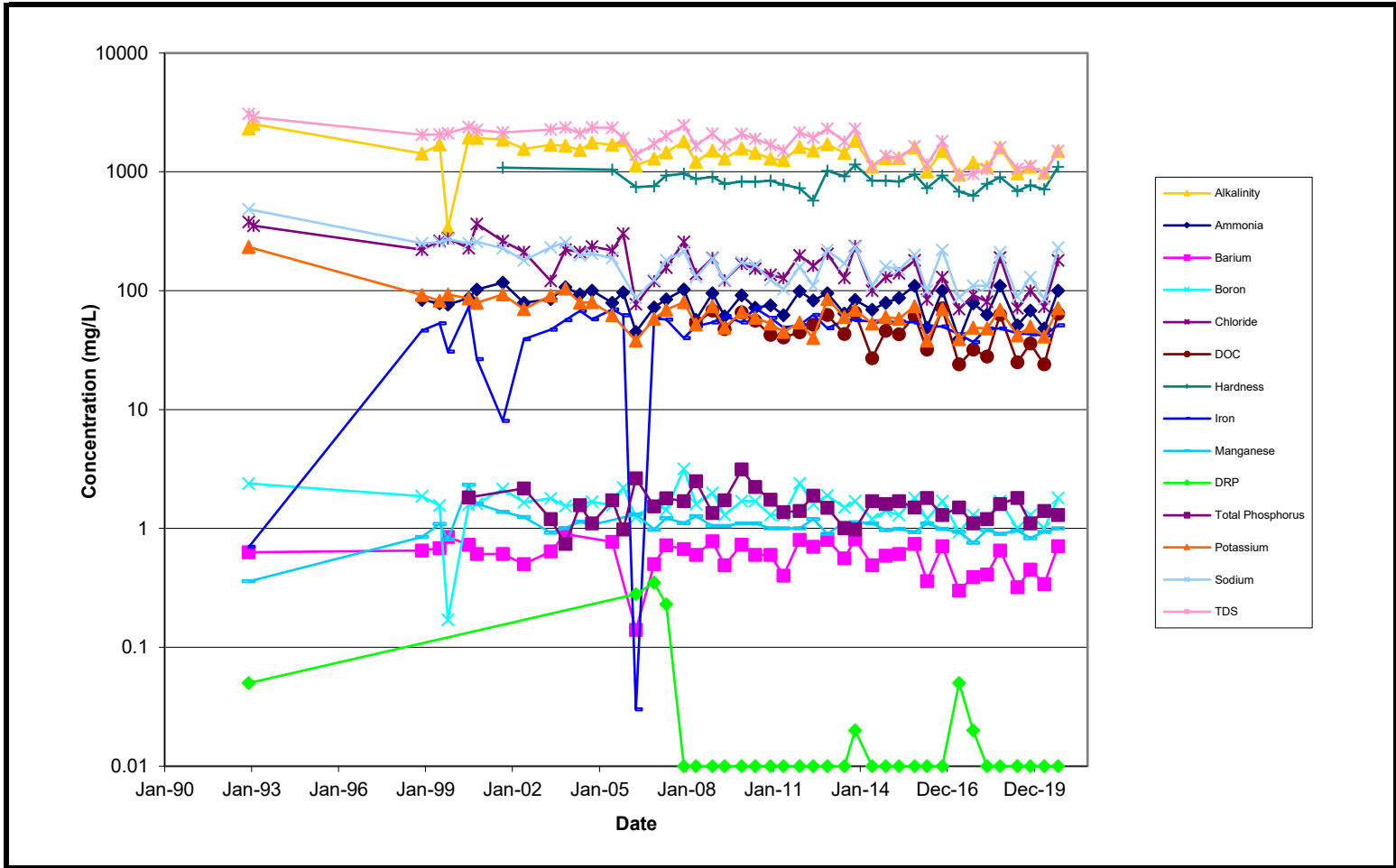


FIGURE D-I 1

Town of Arnprior
 Waste Disposal Site
 OV-7



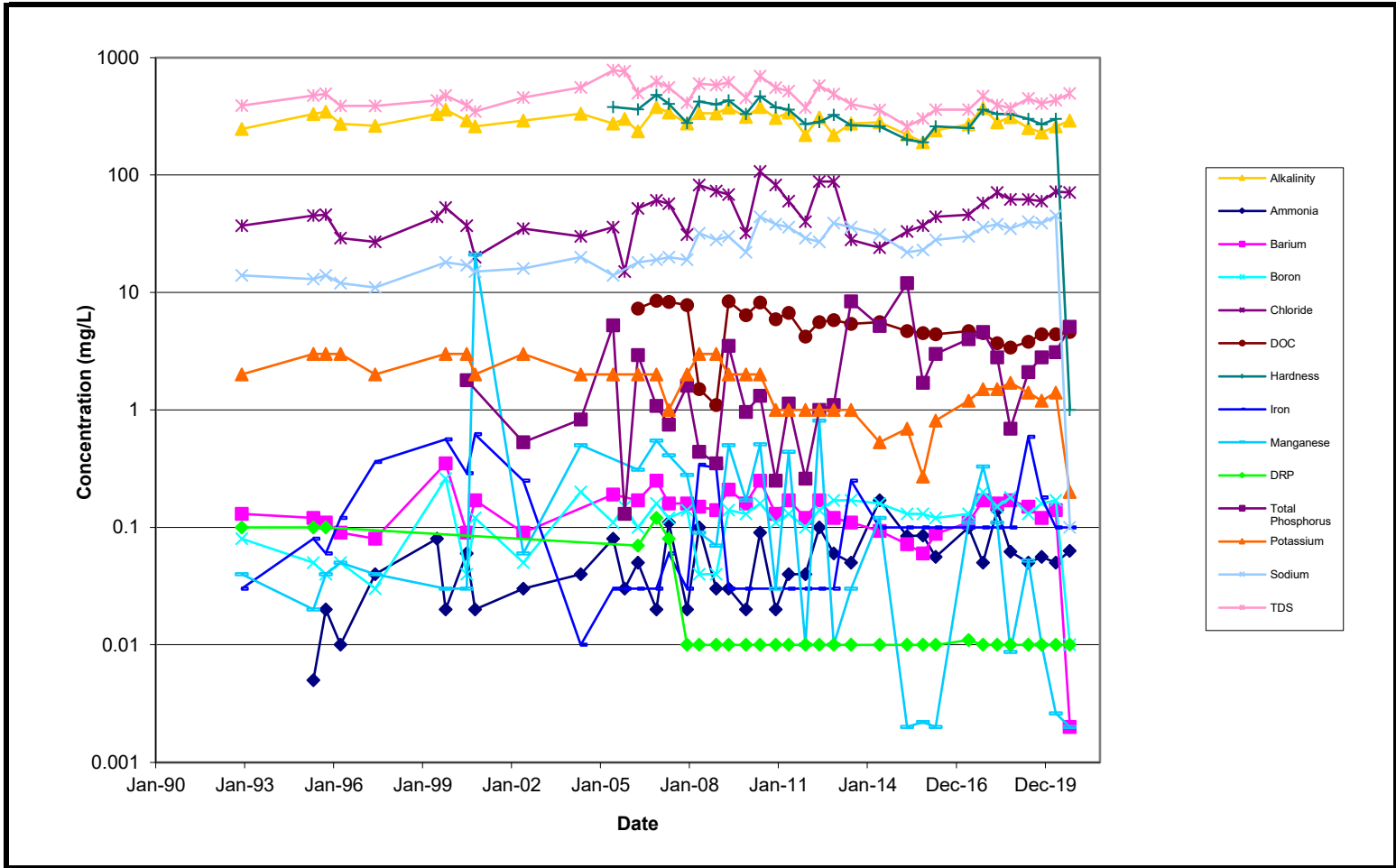


FIGURE D-I 2

Town of Arnprior

Waste Disposal Site
OV-9



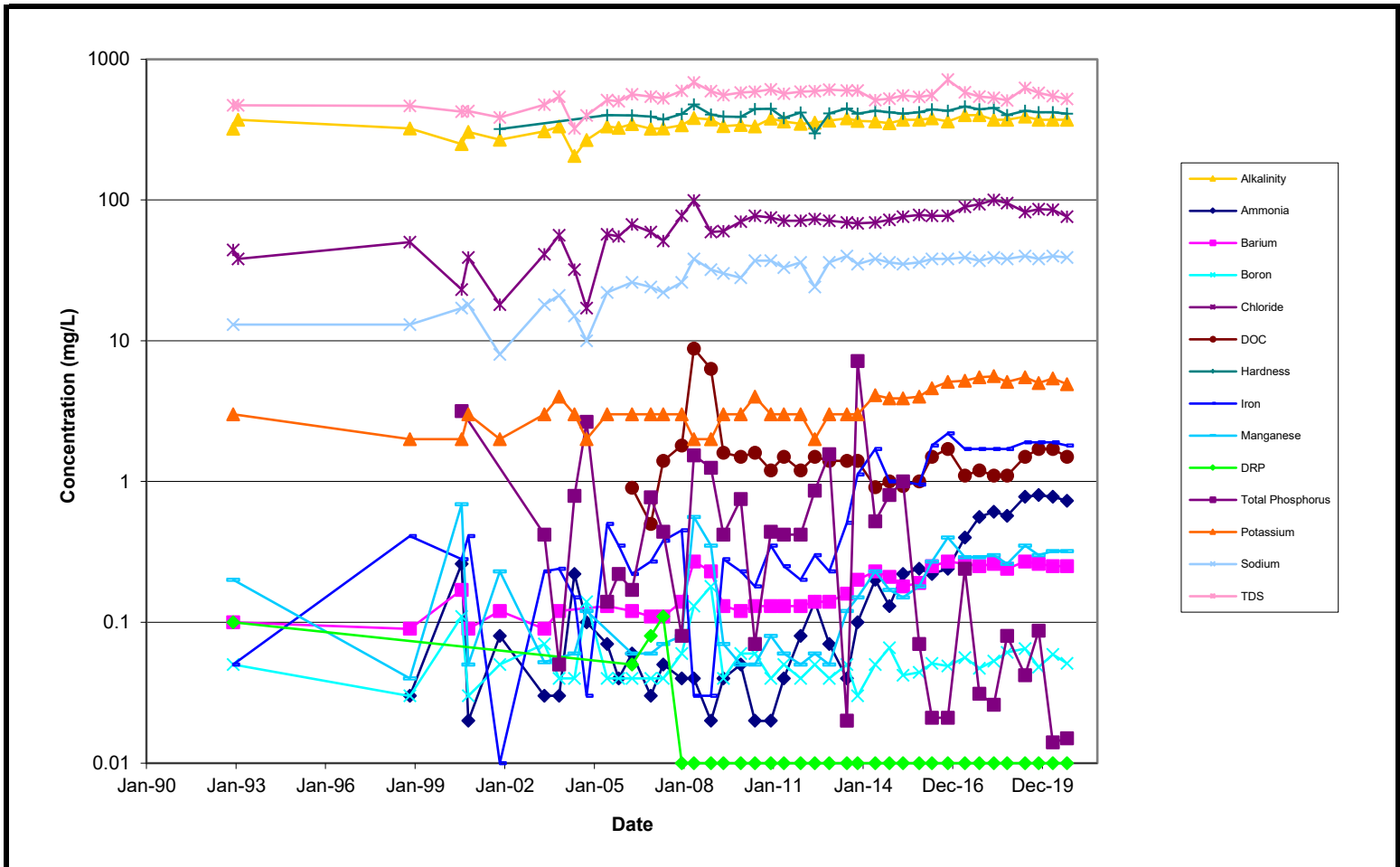


FIGURE D-I 3

Town of Arnprior

Waste Disposal Site
OV-10



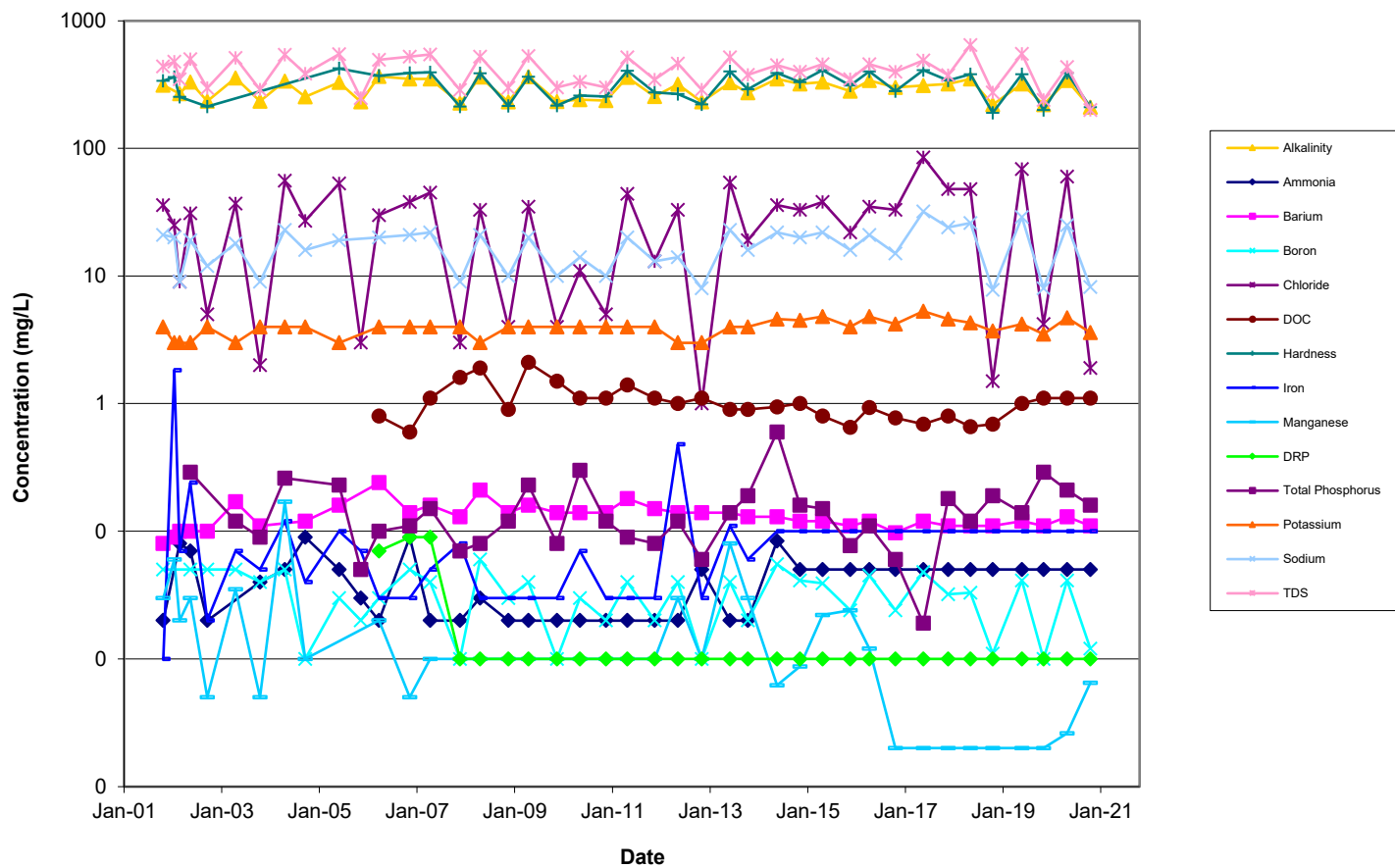


FIGURE D-I 4

Town of Arnprior

Waste Disposal Site
OV-13



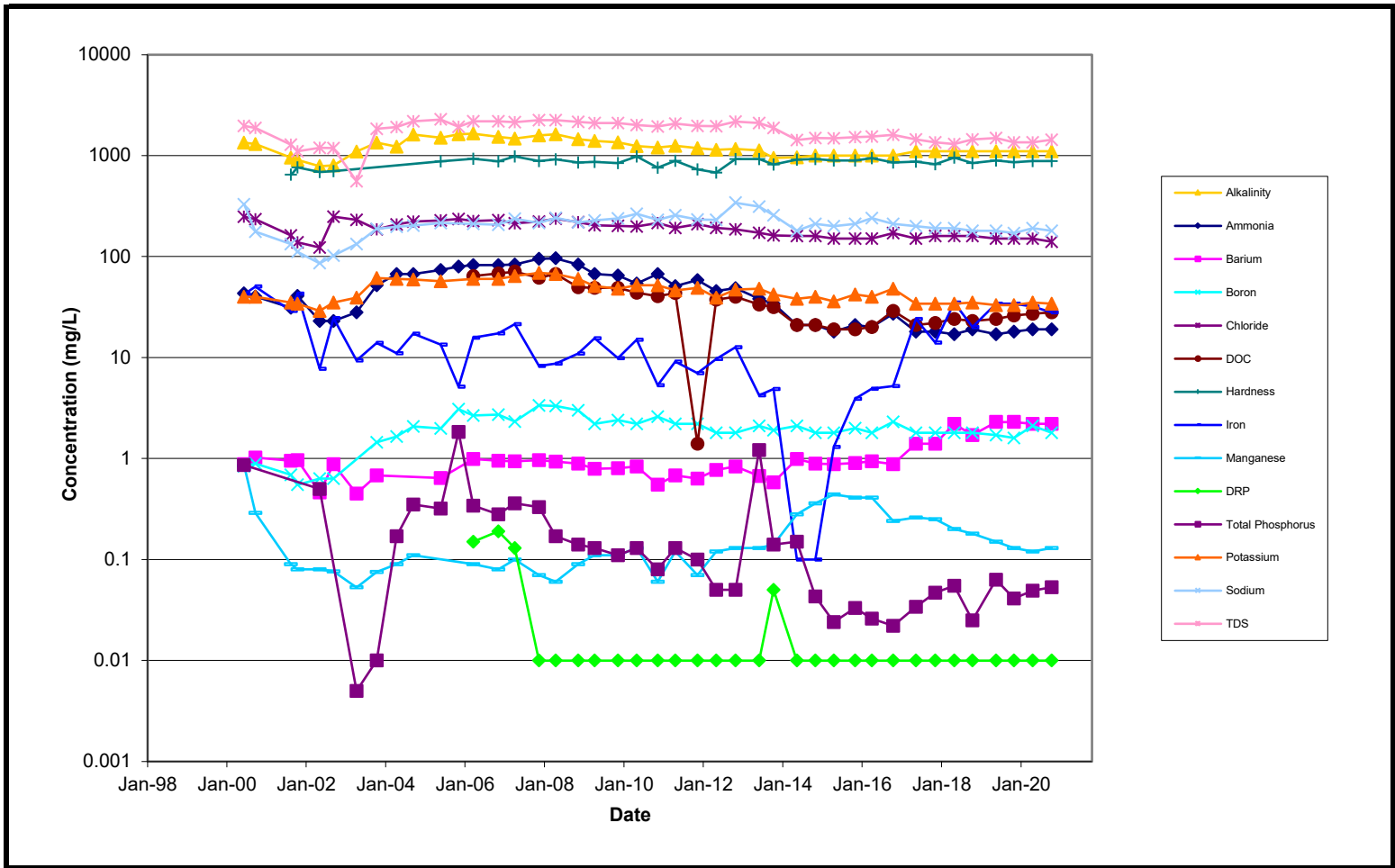


FIGURE D-I 5

Town of Arnprior
Waste Disposal Site
BR-1D



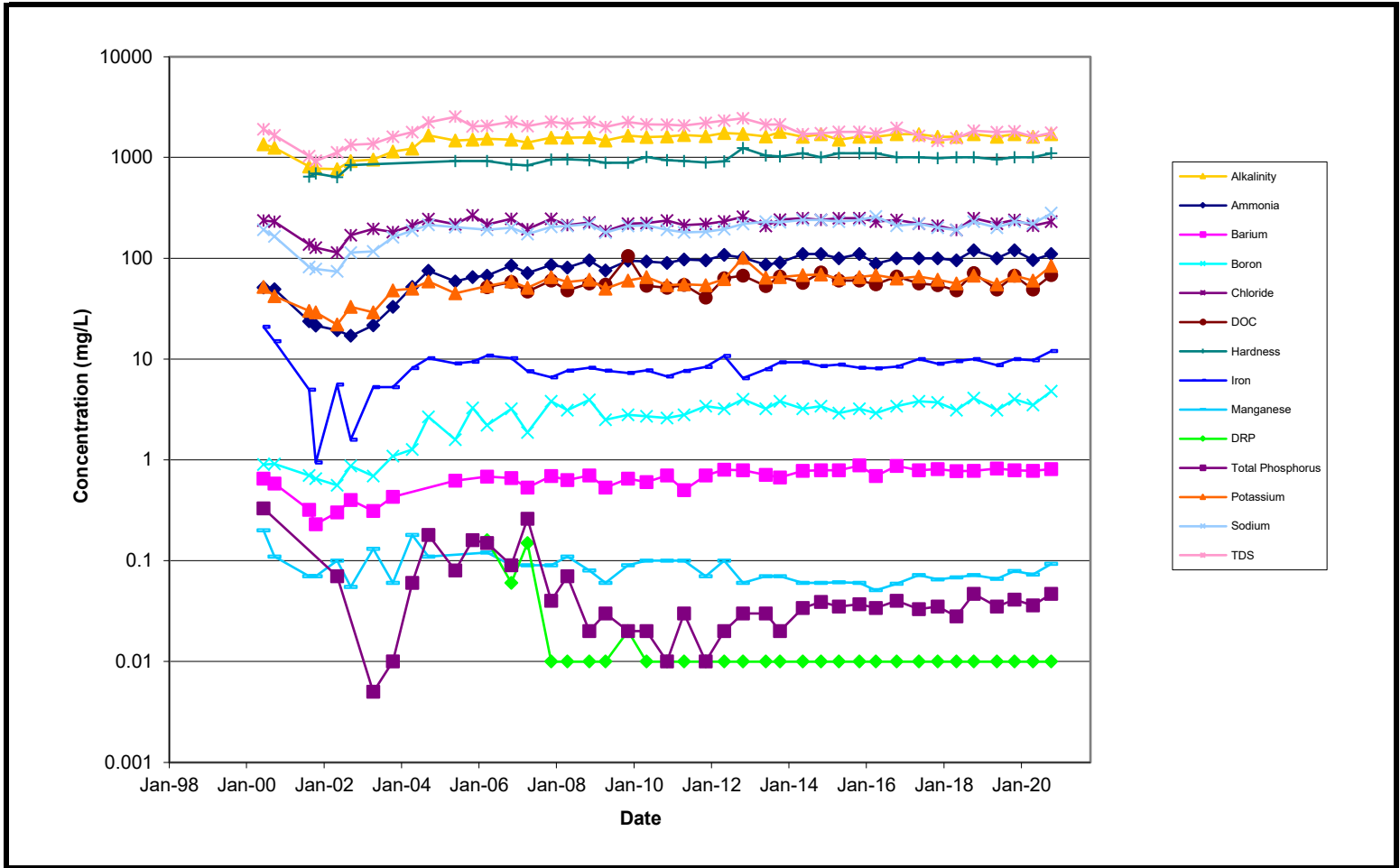


FIGURE D-I 6

Town of Arnprior

Waste Disposal Site
BR-1S



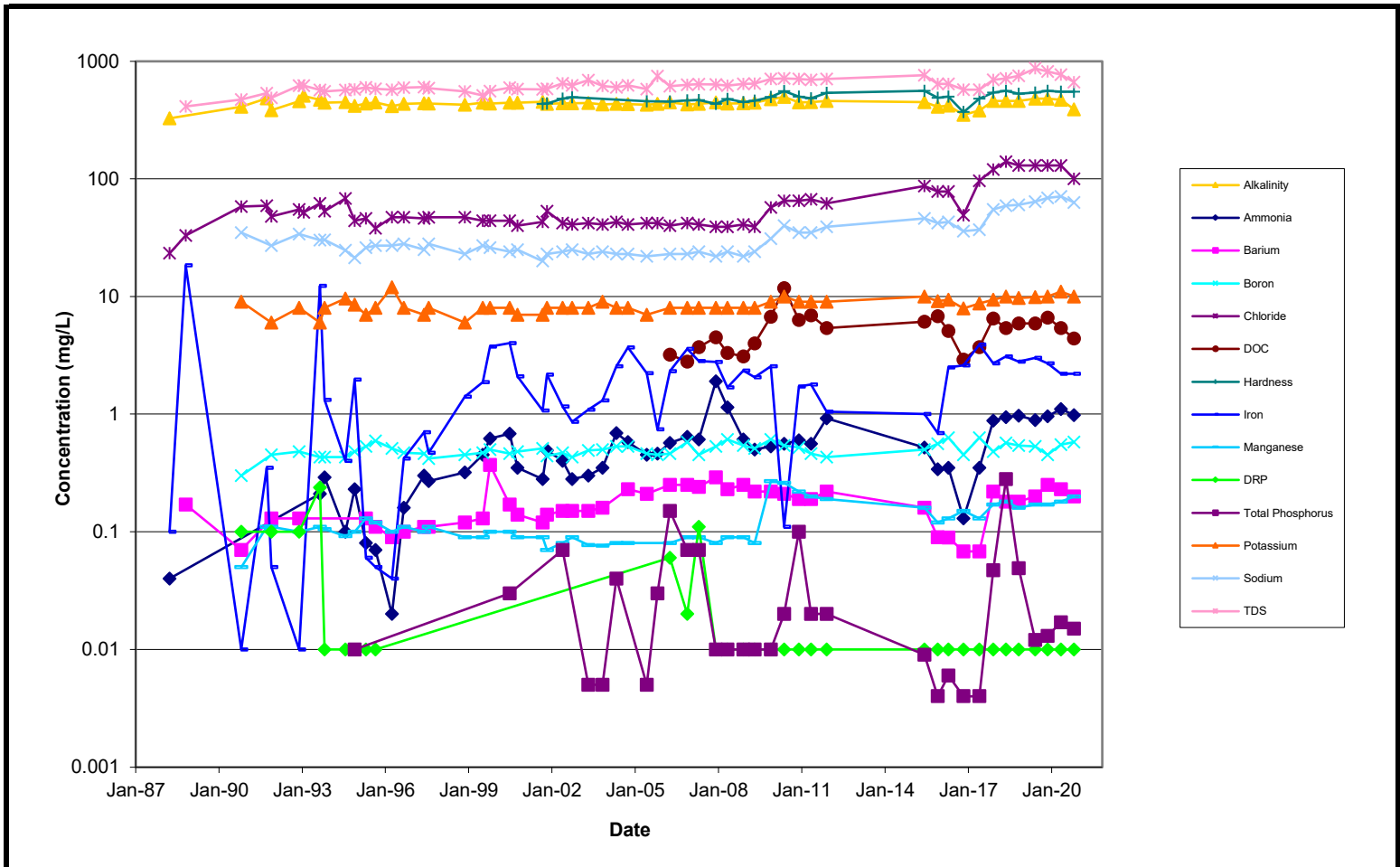


FIGURE D-I 7

Town of Arnprior

Waste Disposal Site
BR-3



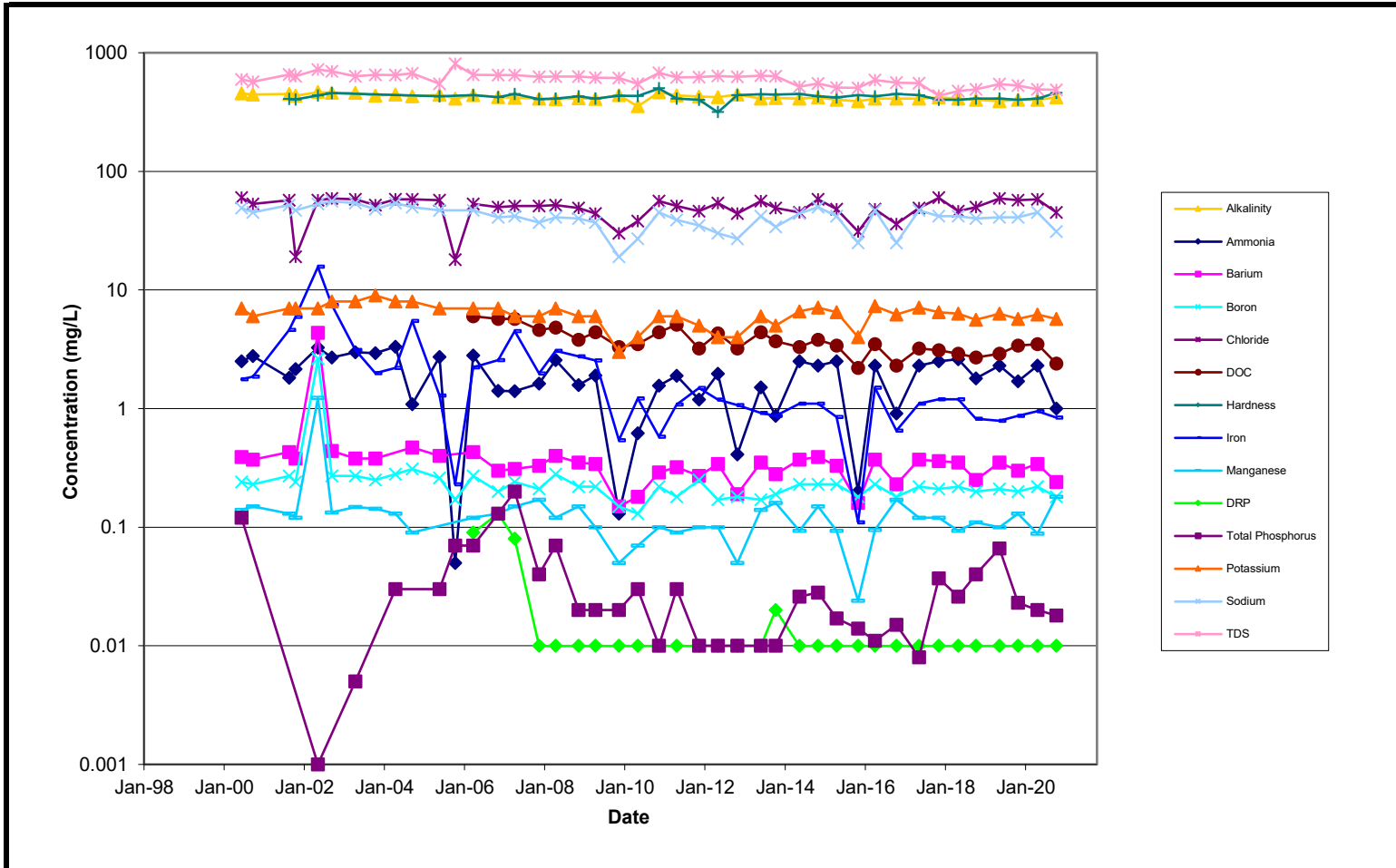


FIGURE D-I 8

Town of Arnprior

Waste Disposal Site
BR-5D



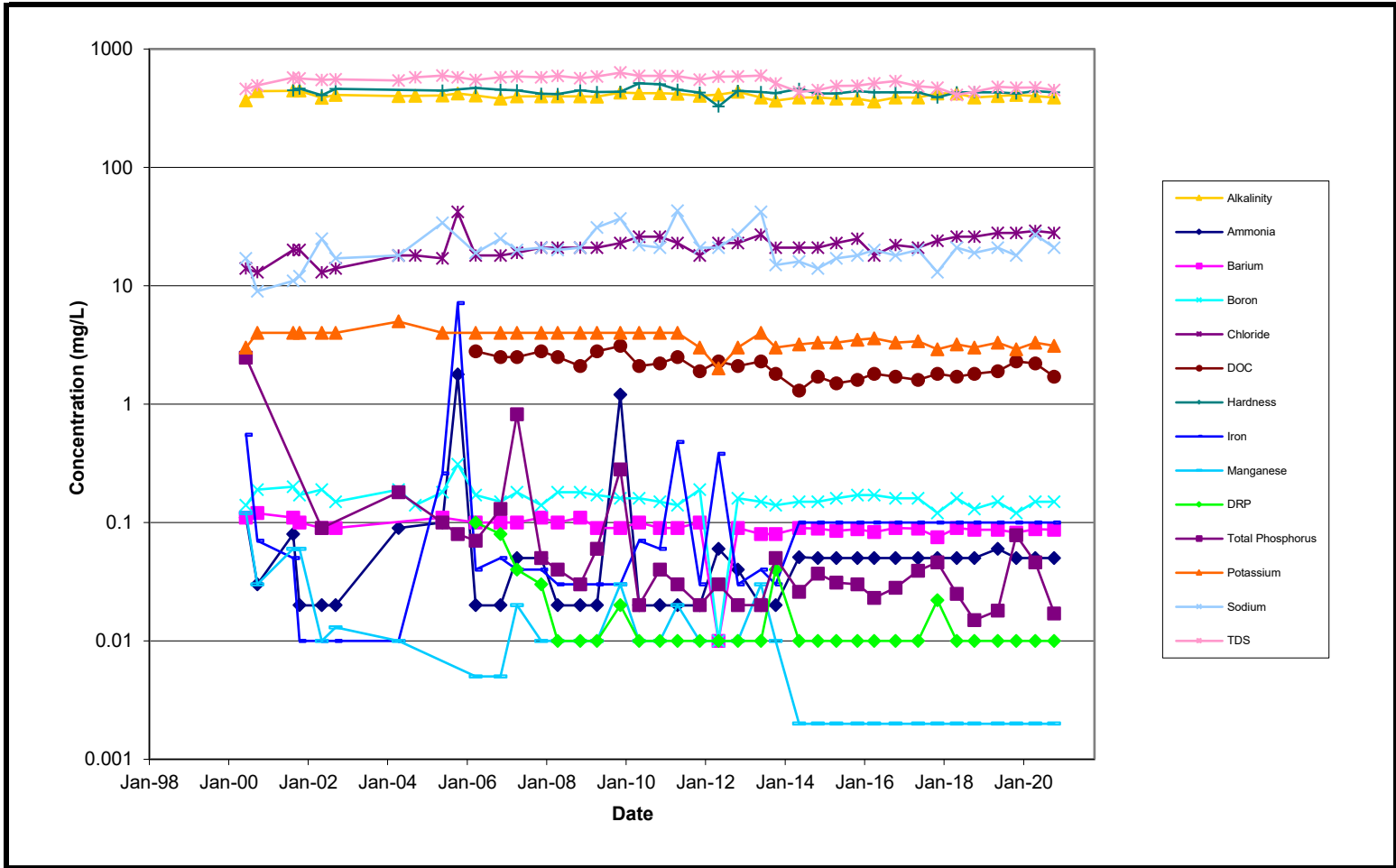


FIGURE D-I 9

Town of Arnprior
 Waste Disposal Site
 BR-5S



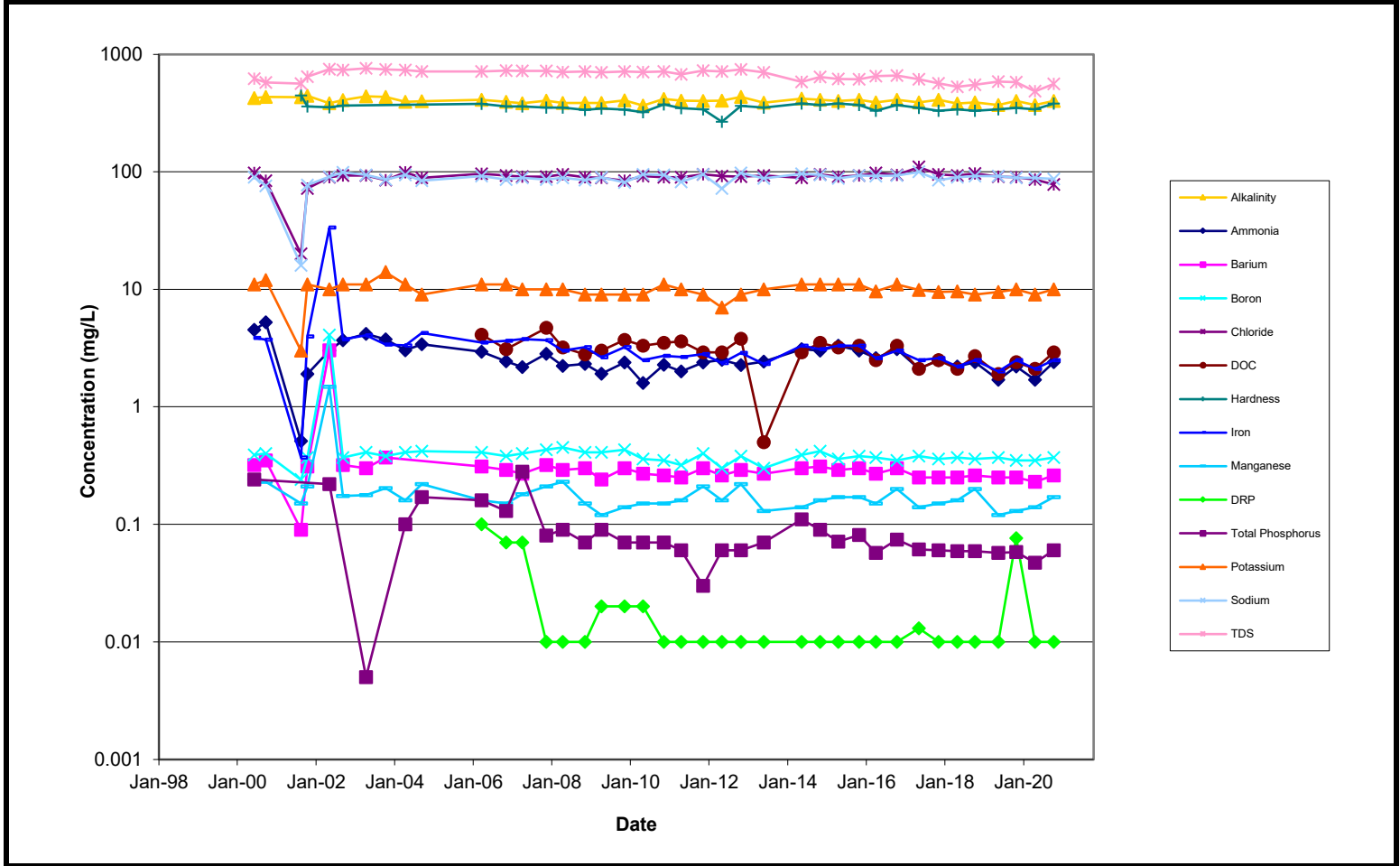


FIGURE D-I 10

Town of Arnprior
 Waste Disposal Site
 BR-6D



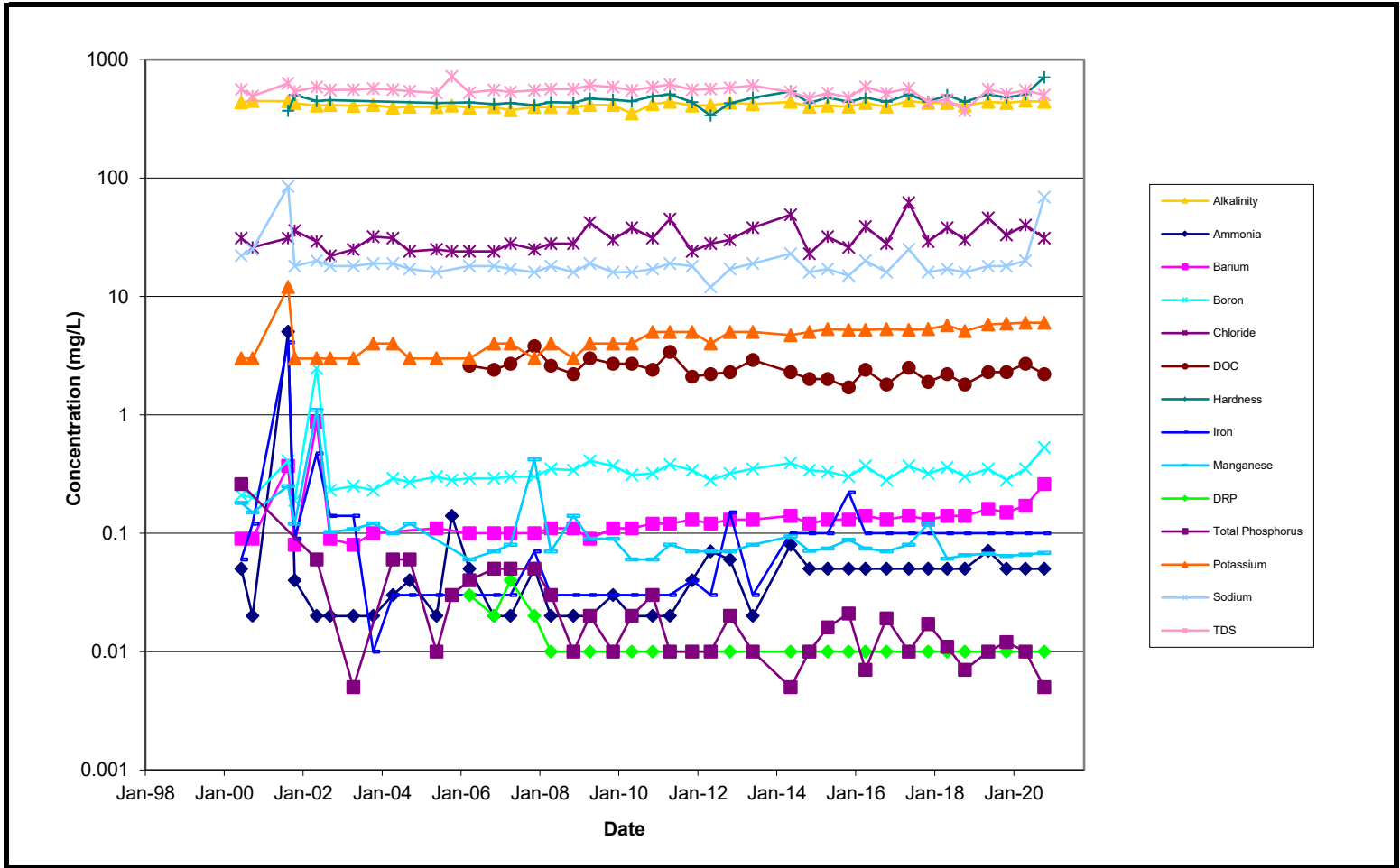


FIGURE D-I 11

Town of Arnprior
 Waste Disposal Site
 BR-6S



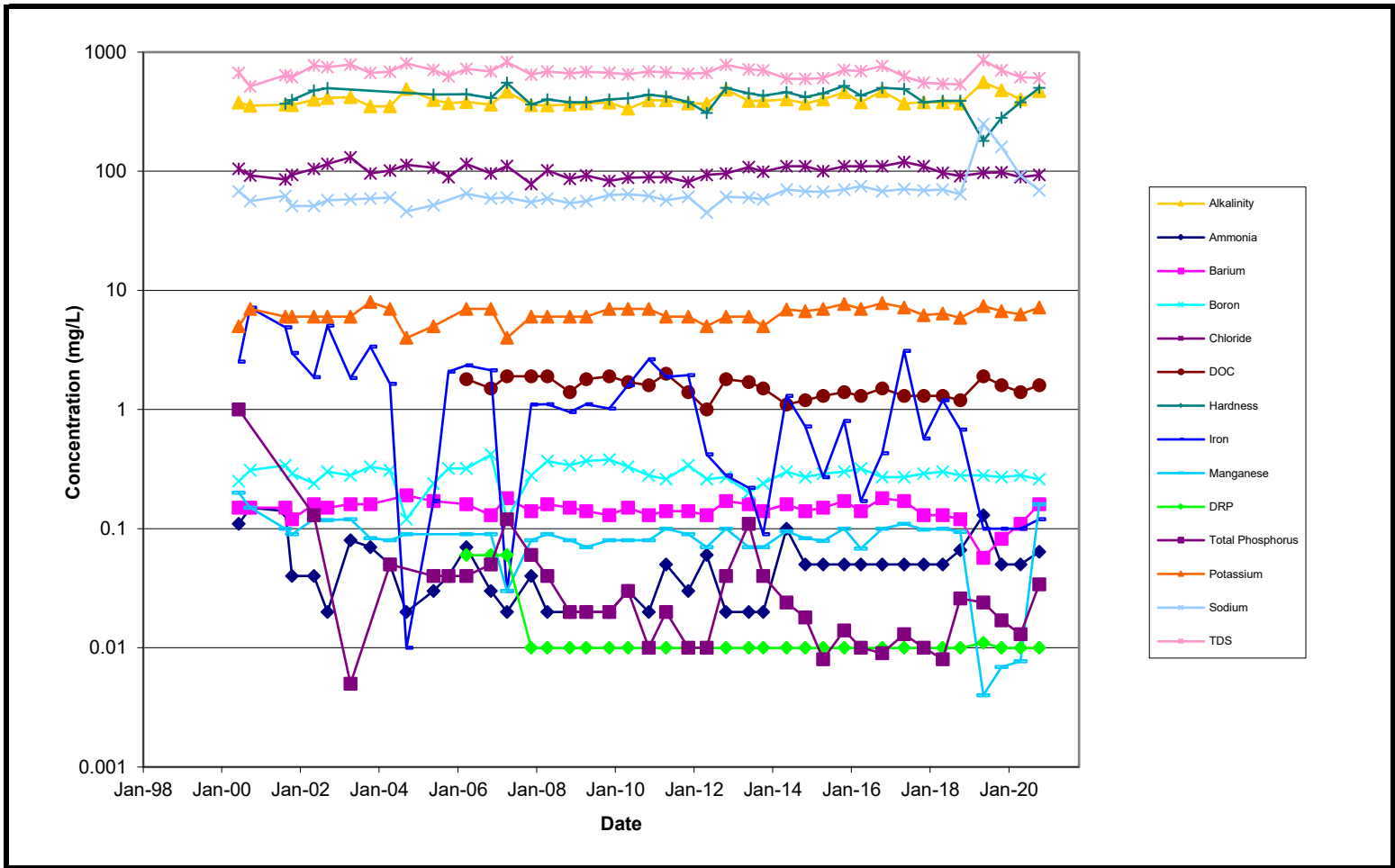


FIGURE D-I 12

Town of Arnprior

Waste Disposal Site
BR-7D



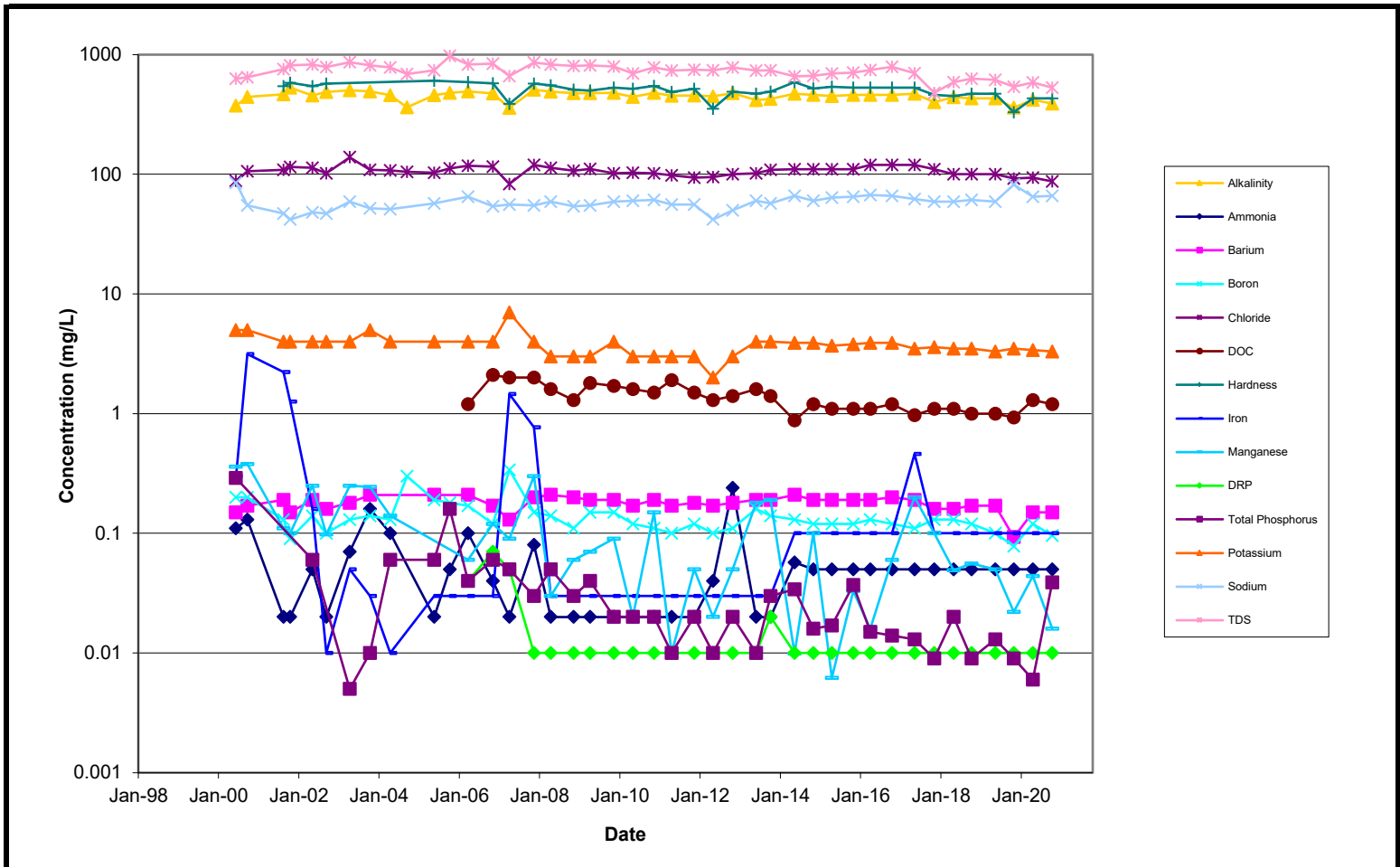


FIGURE D-I 13

Town of Arnprior

Waste Disposal Site
BR-7S



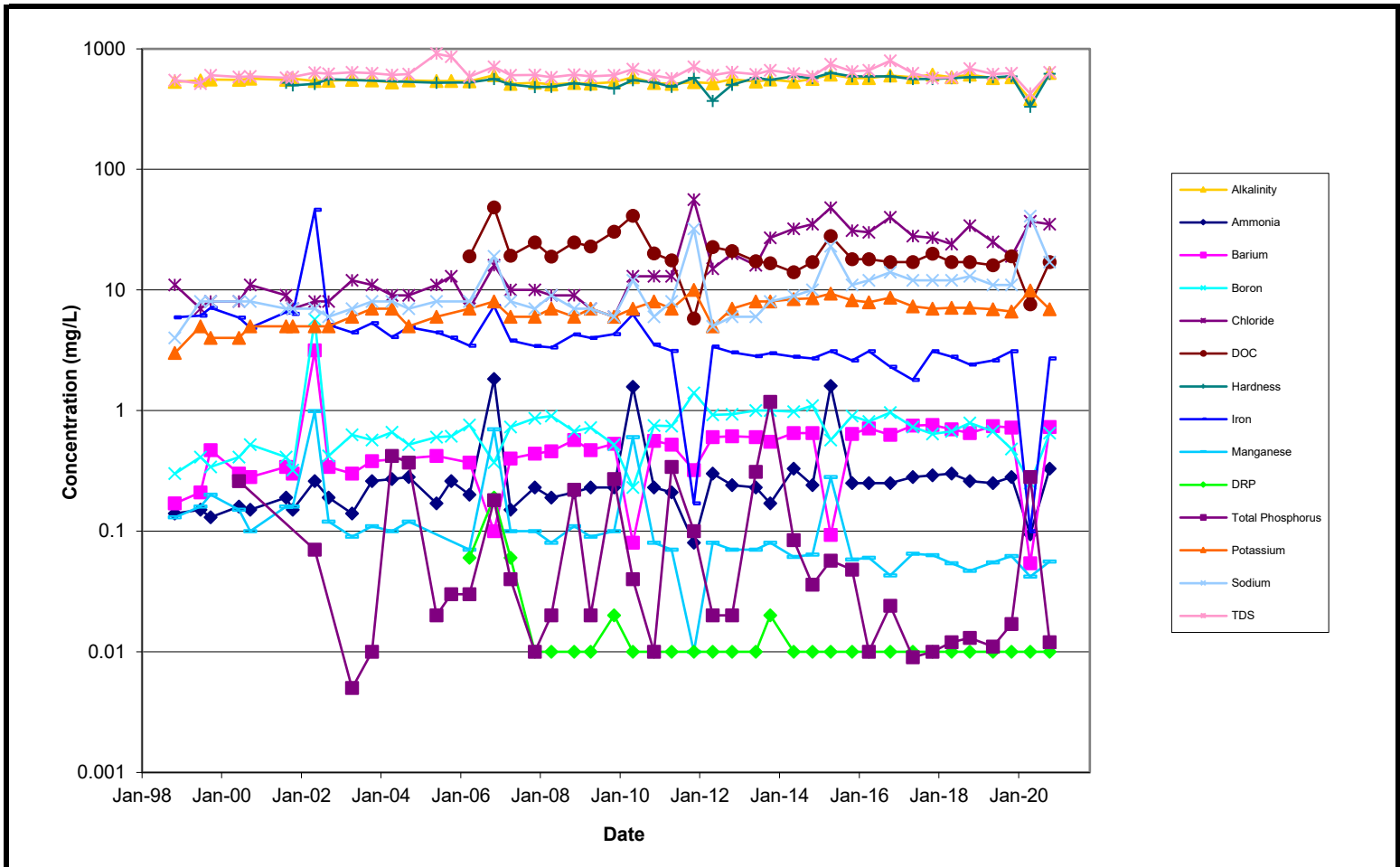


FIGURE D-I 14

Town of Arnprior

Waste Disposal Site
BR-8D



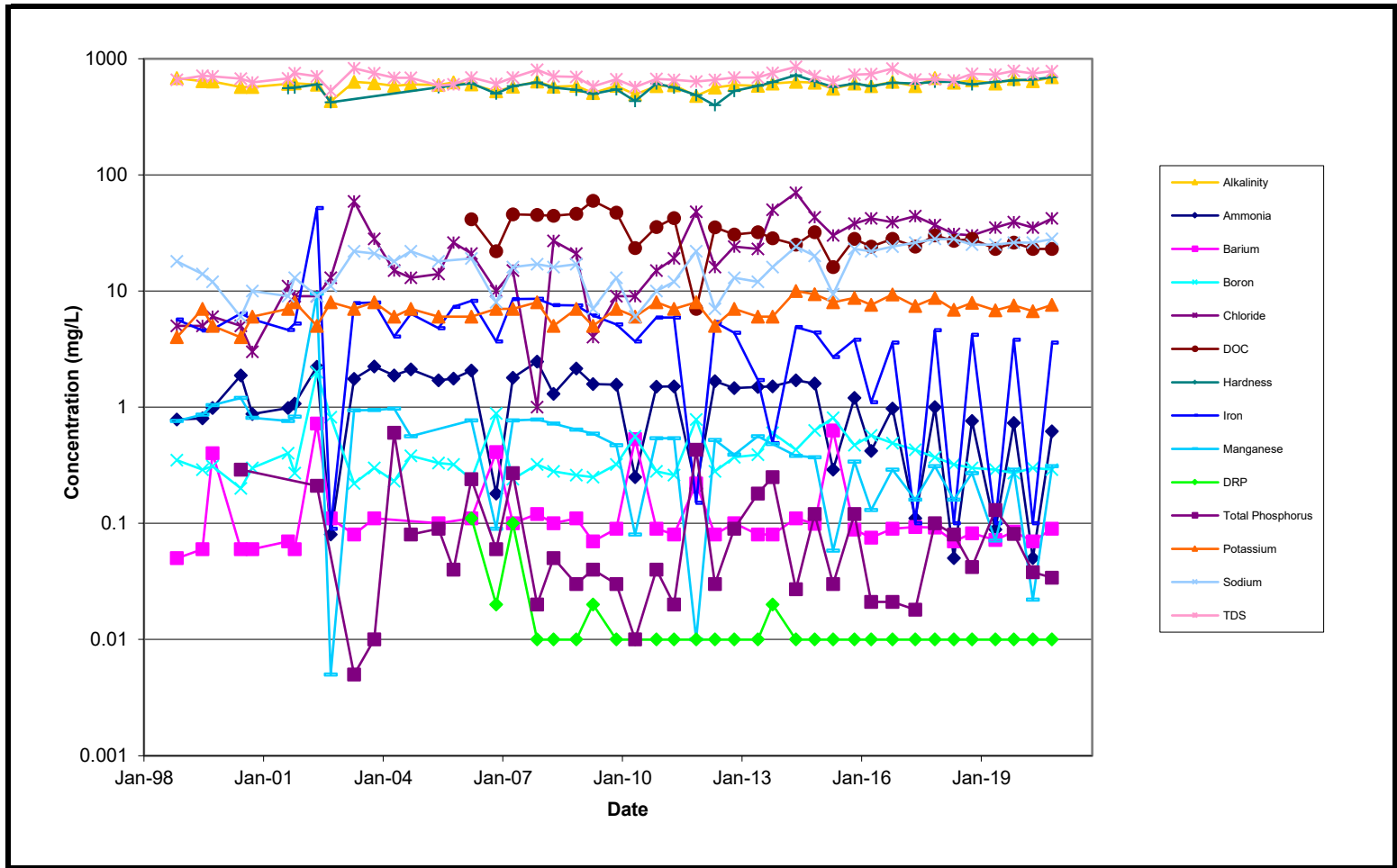


FIGURE D-I 15

Town of Arnprior

Waste Disposal Site
BR-8S



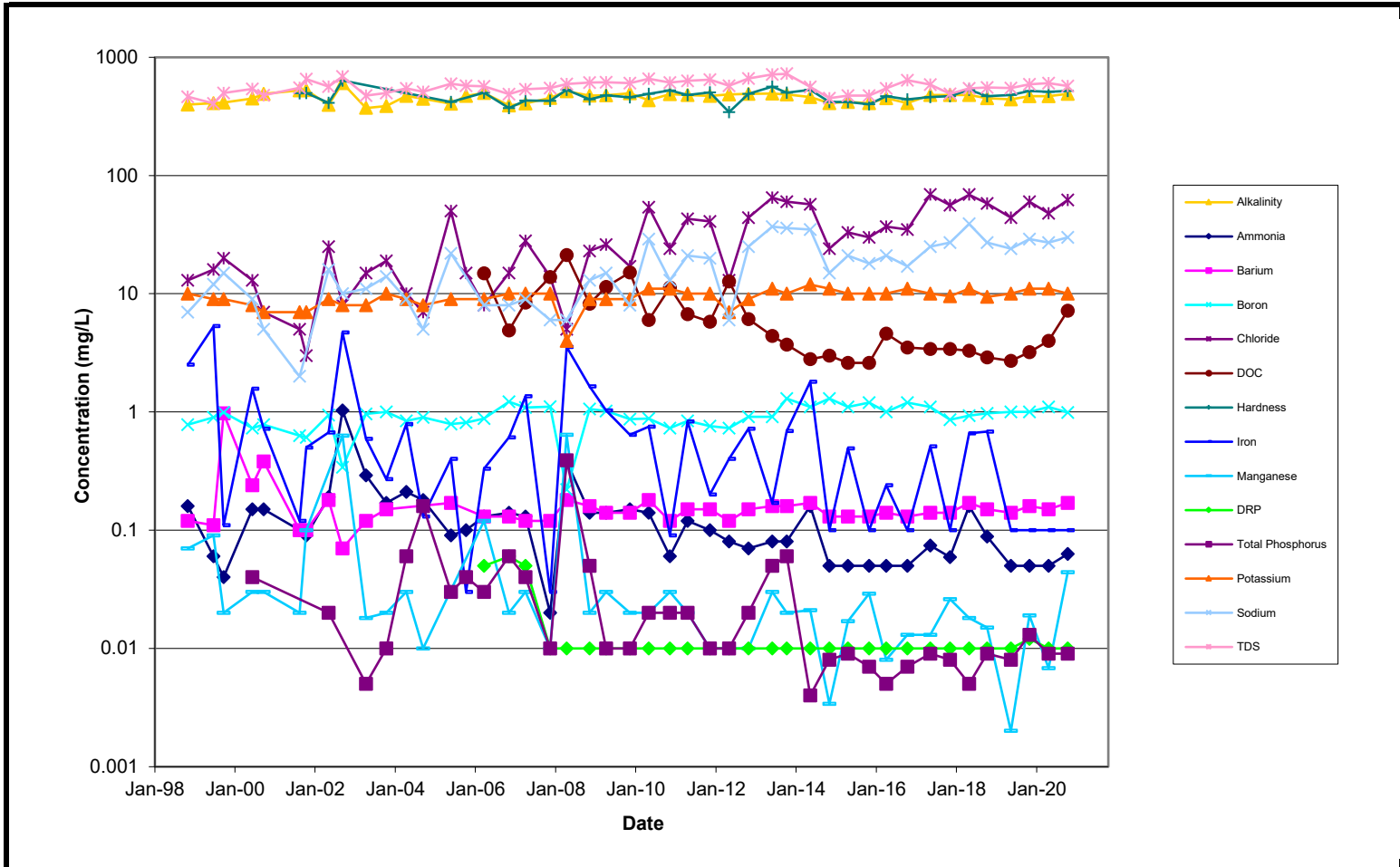


FIGURE D-I 16

Town of Arnprior

Waste Disposal Site
BR-9D



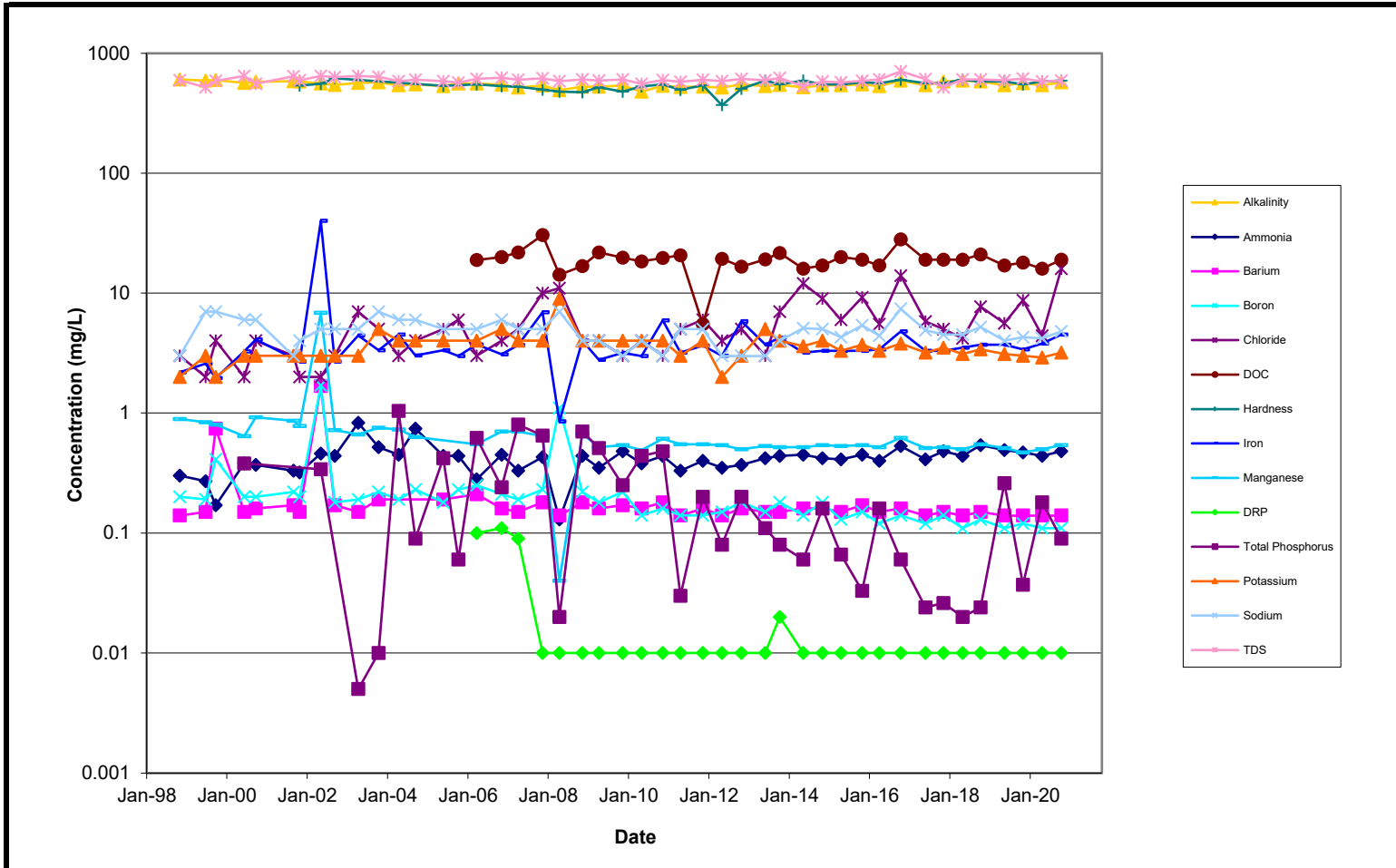


FIGURE D-I 17

Town of Arnprior

Waste Disposal Site
BR-9S





FIGURE D-I 18

Town of Arnprior

Waste Disposal Site
BR-10



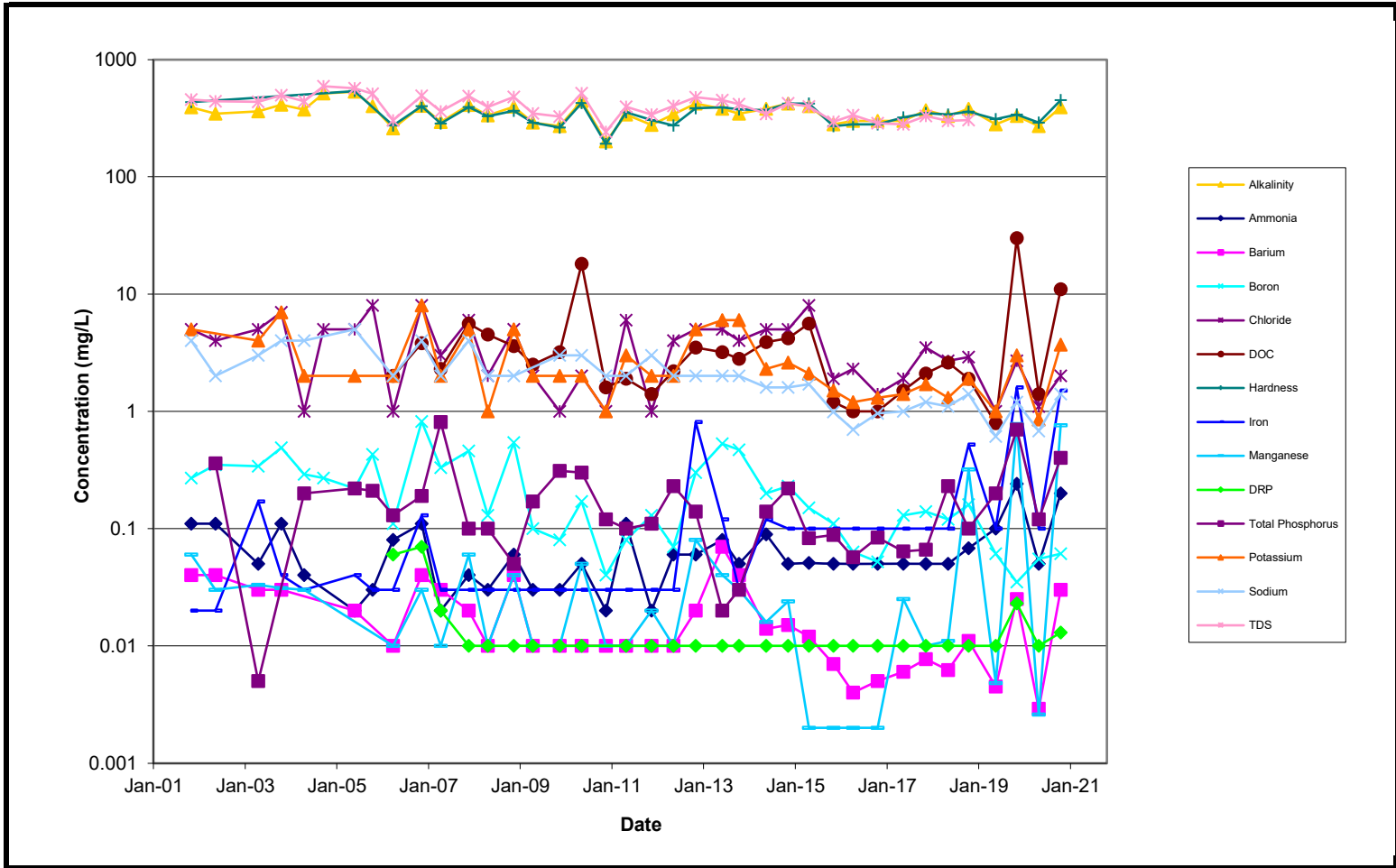


FIGURE D-I 19

Town of Arnprior

Waste Disposal Site
BR-11



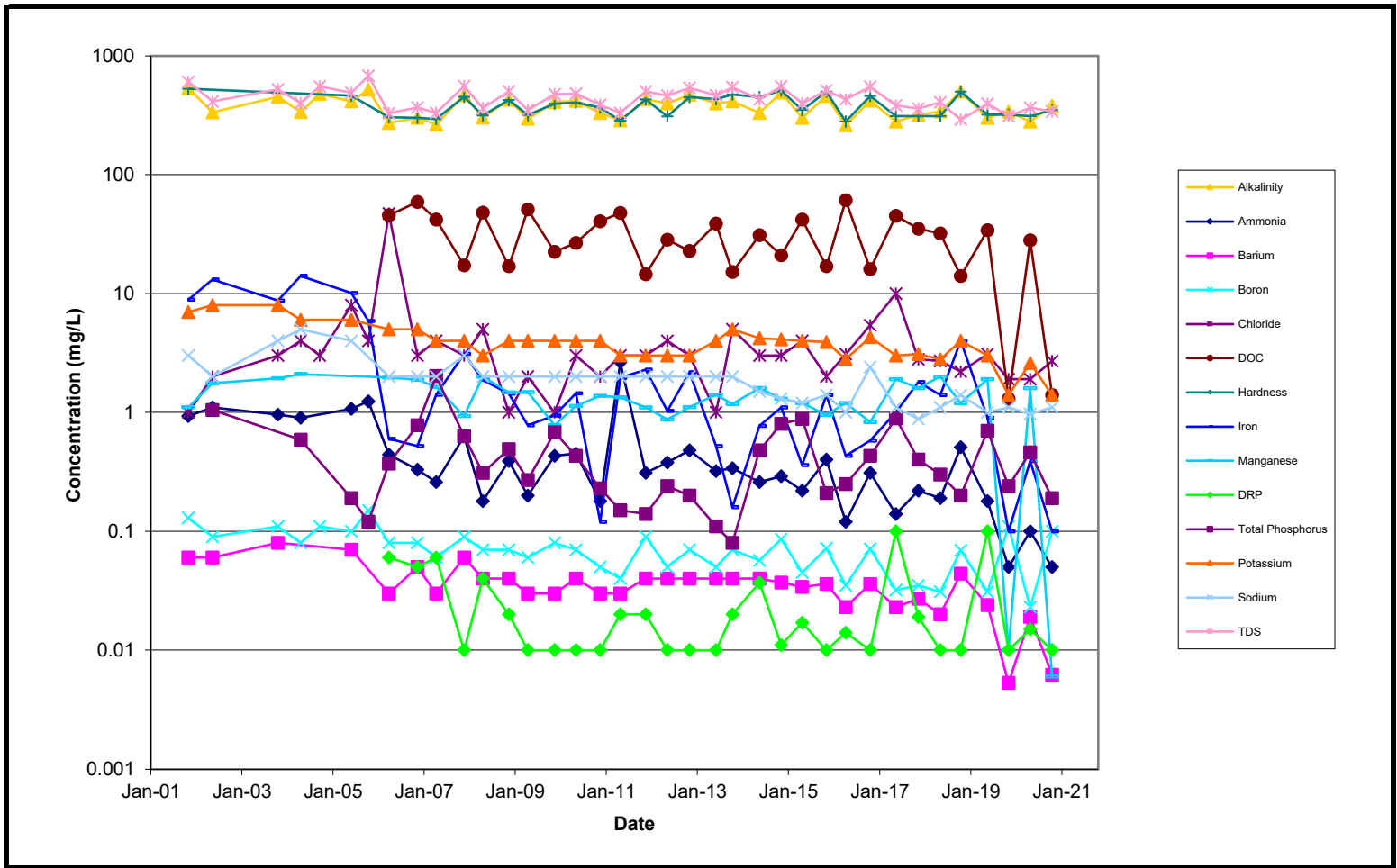


FIGURE D-I 20

Town of Arnprior

Waste Disposal Site
BR-12



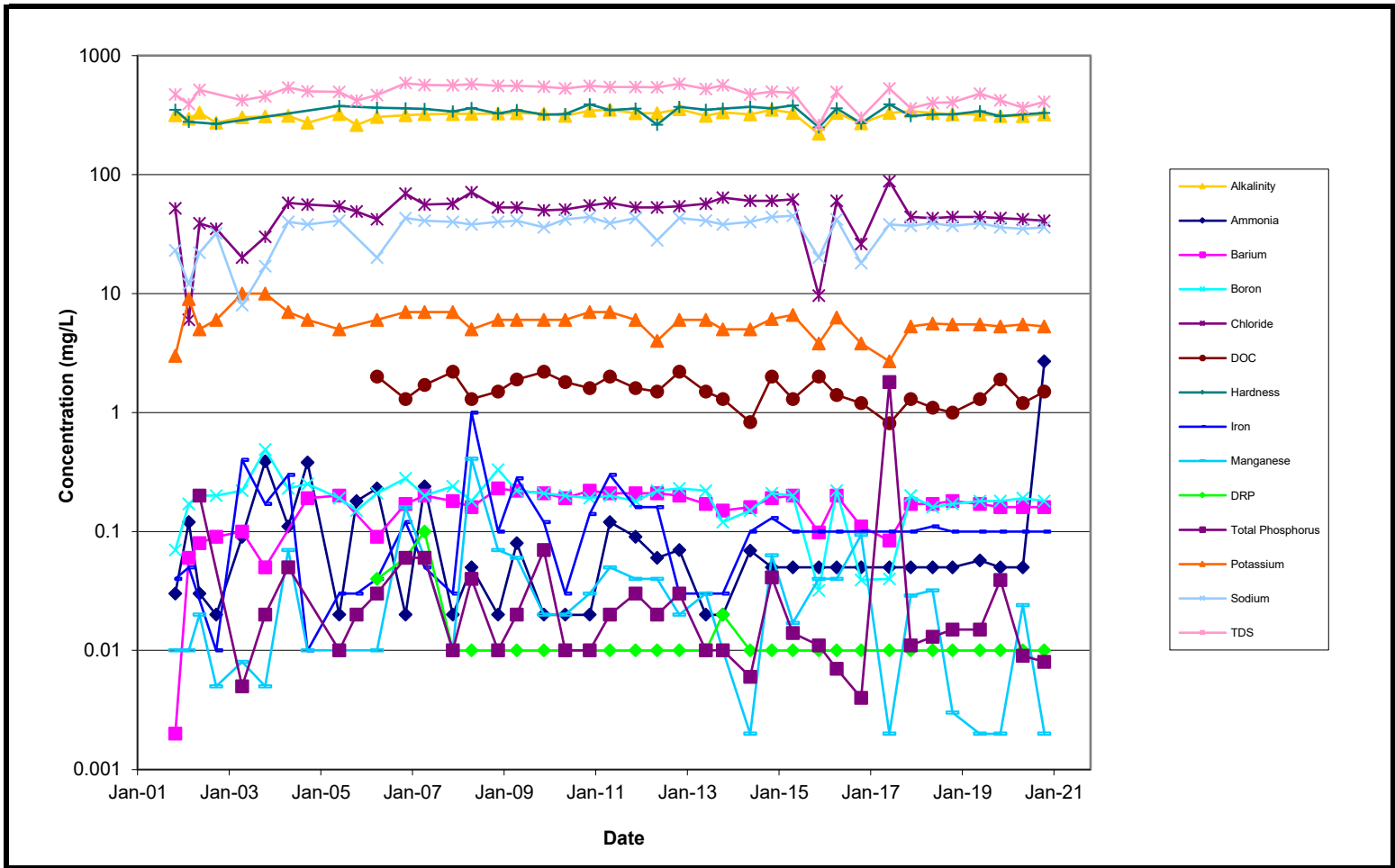


FIGURE D-I 21

Town of Arnprior
 Waste Disposal Site
 BR-13D



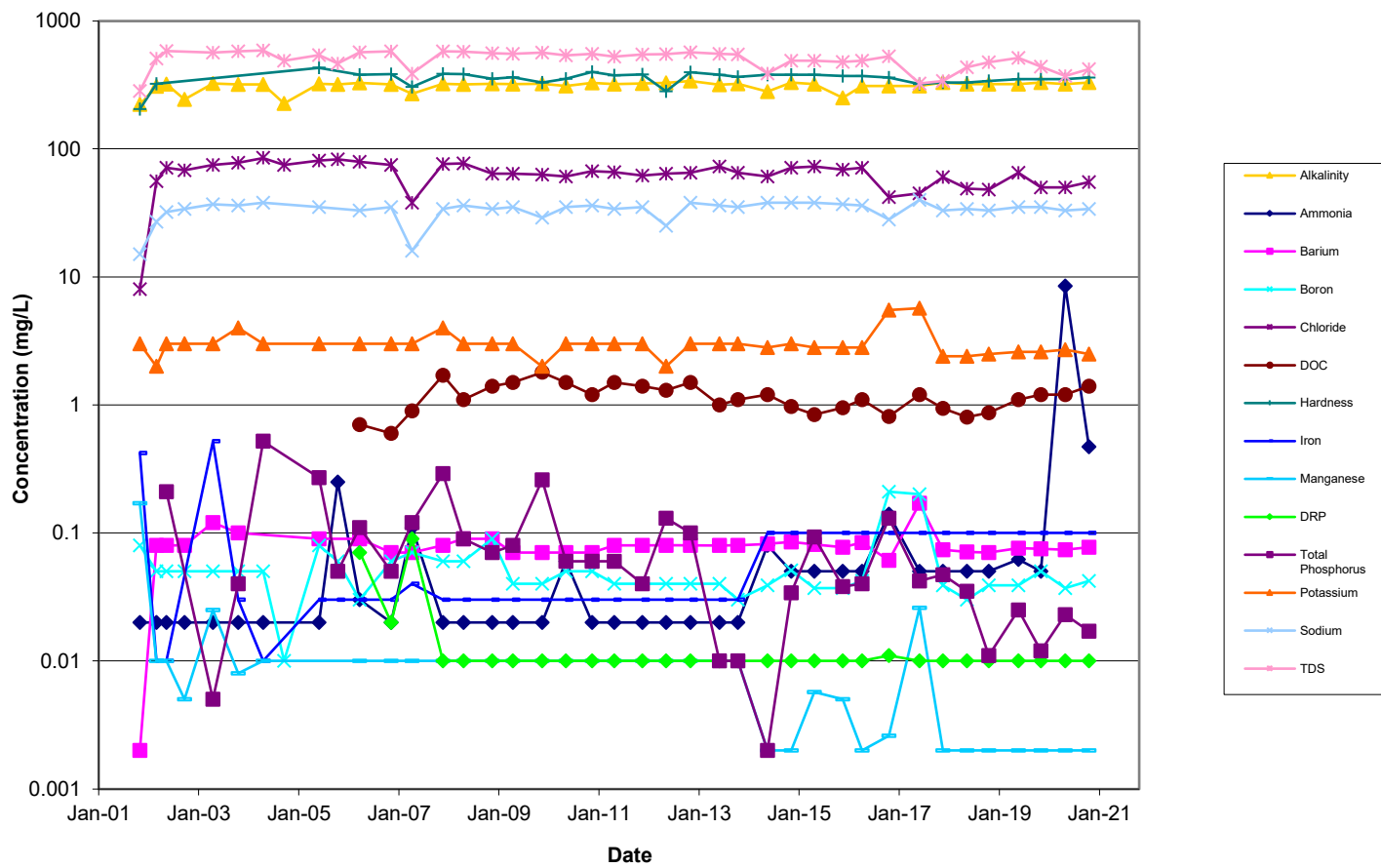


FIGURE D-I 22

Town of Arnprior

Waste Disposal Site
BR-13S



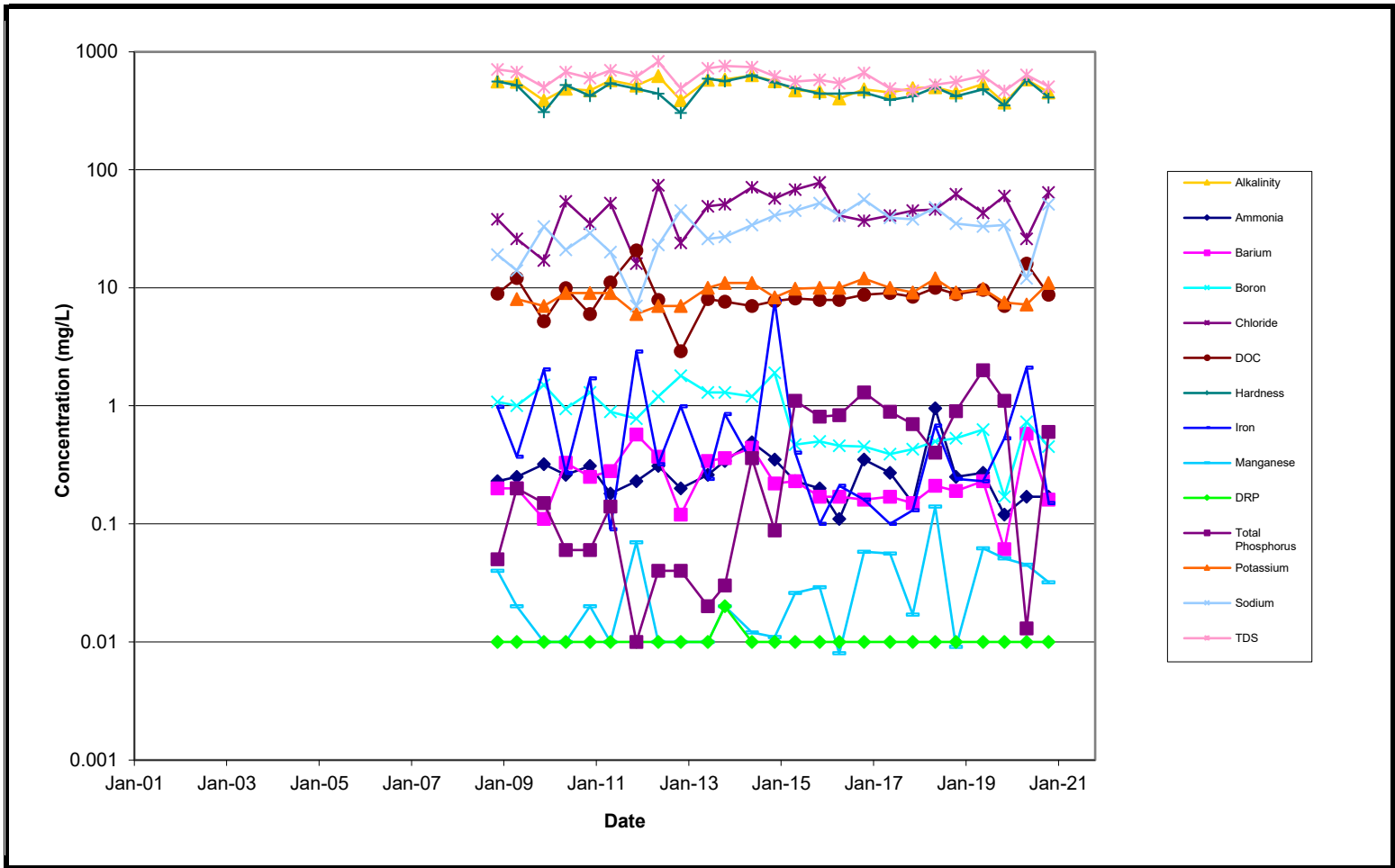


FIGURE D-I 23

Town of Arnprior

Waste Disposal Site
BR 08-1D



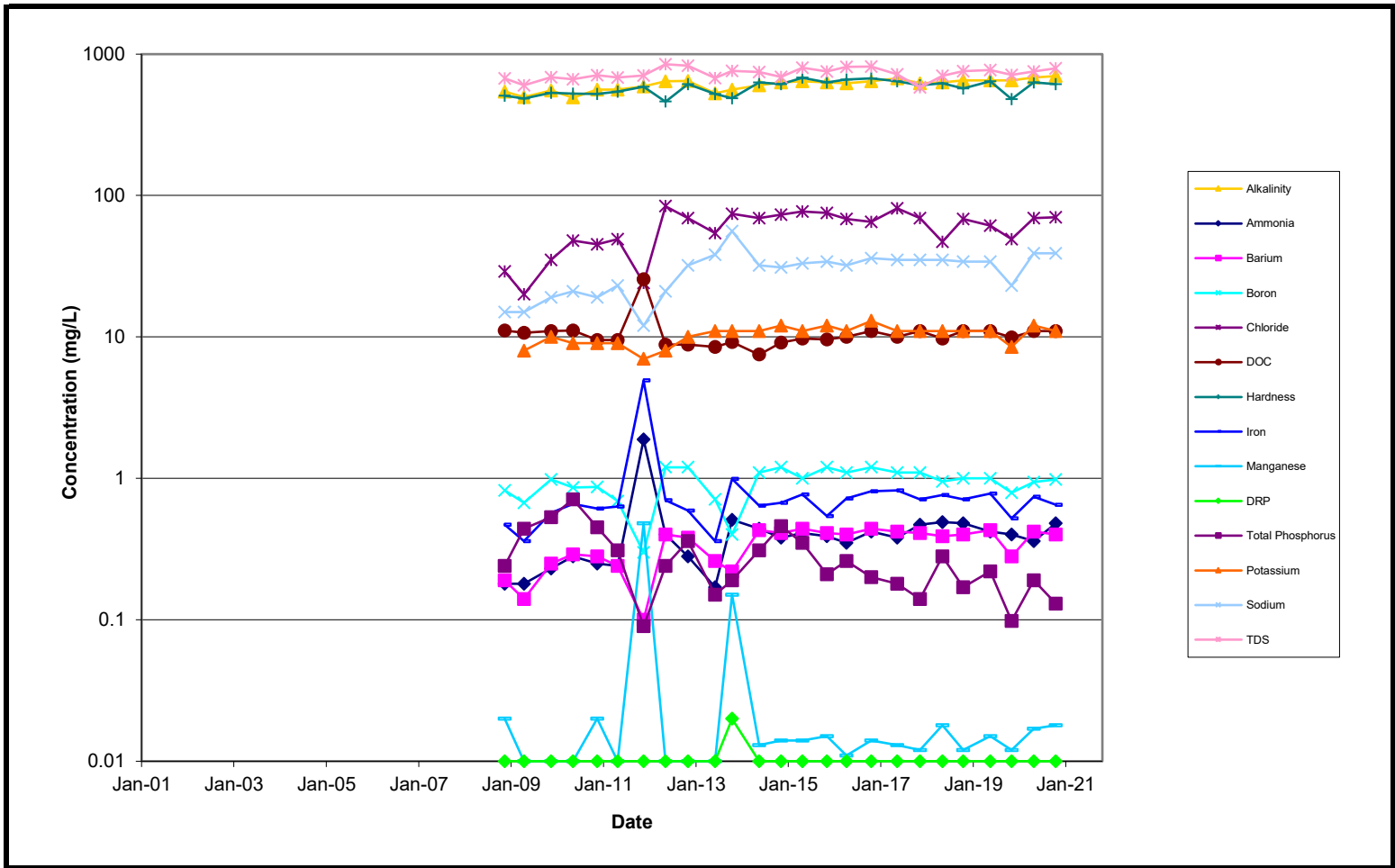


FIGURE D-I 24

Town of Arnprior

Waste Disposal Site
BR 08-1S



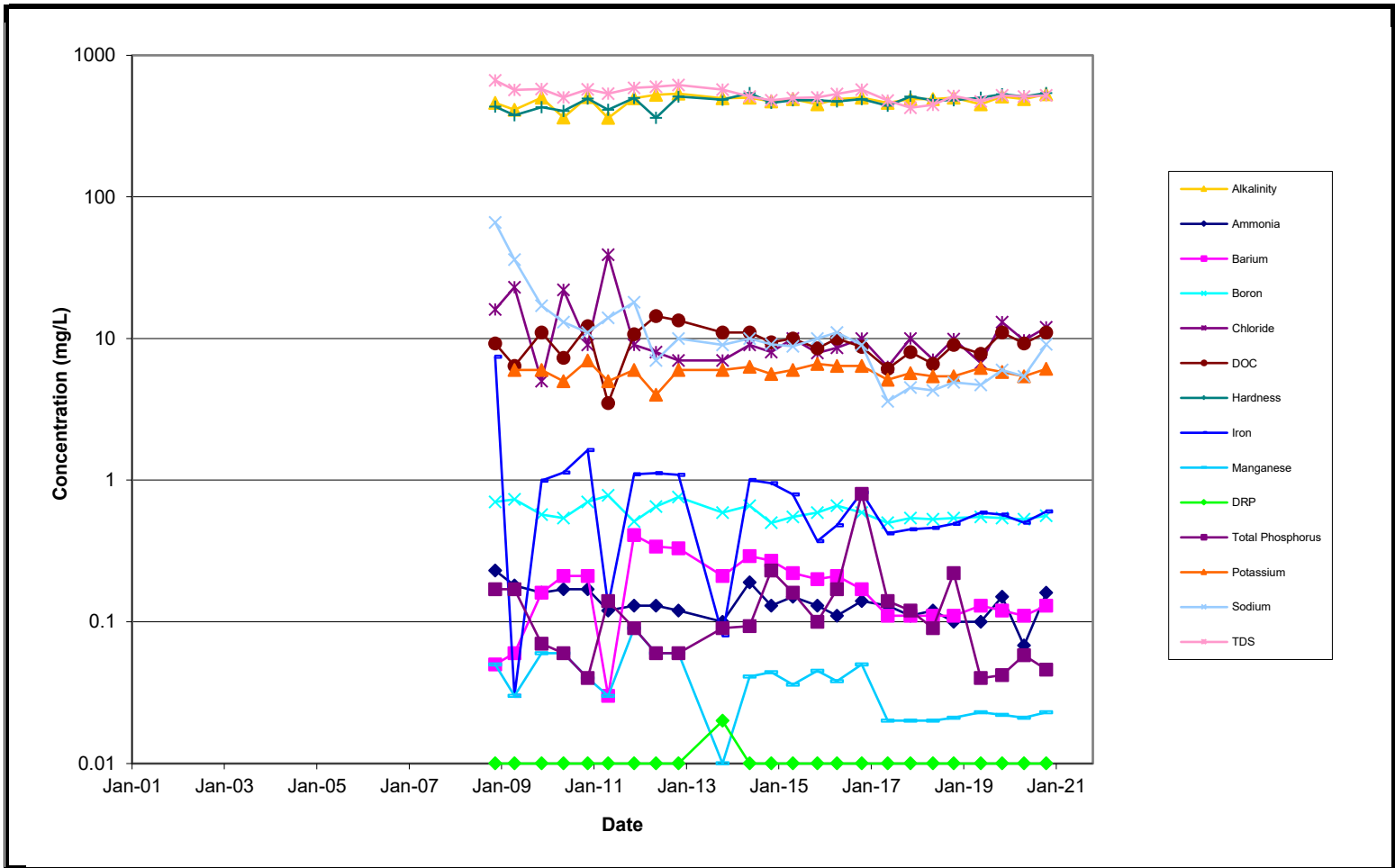


FIGURE D-I 25

Town of Arnprior

Waste Disposal Site
BR 08-2D



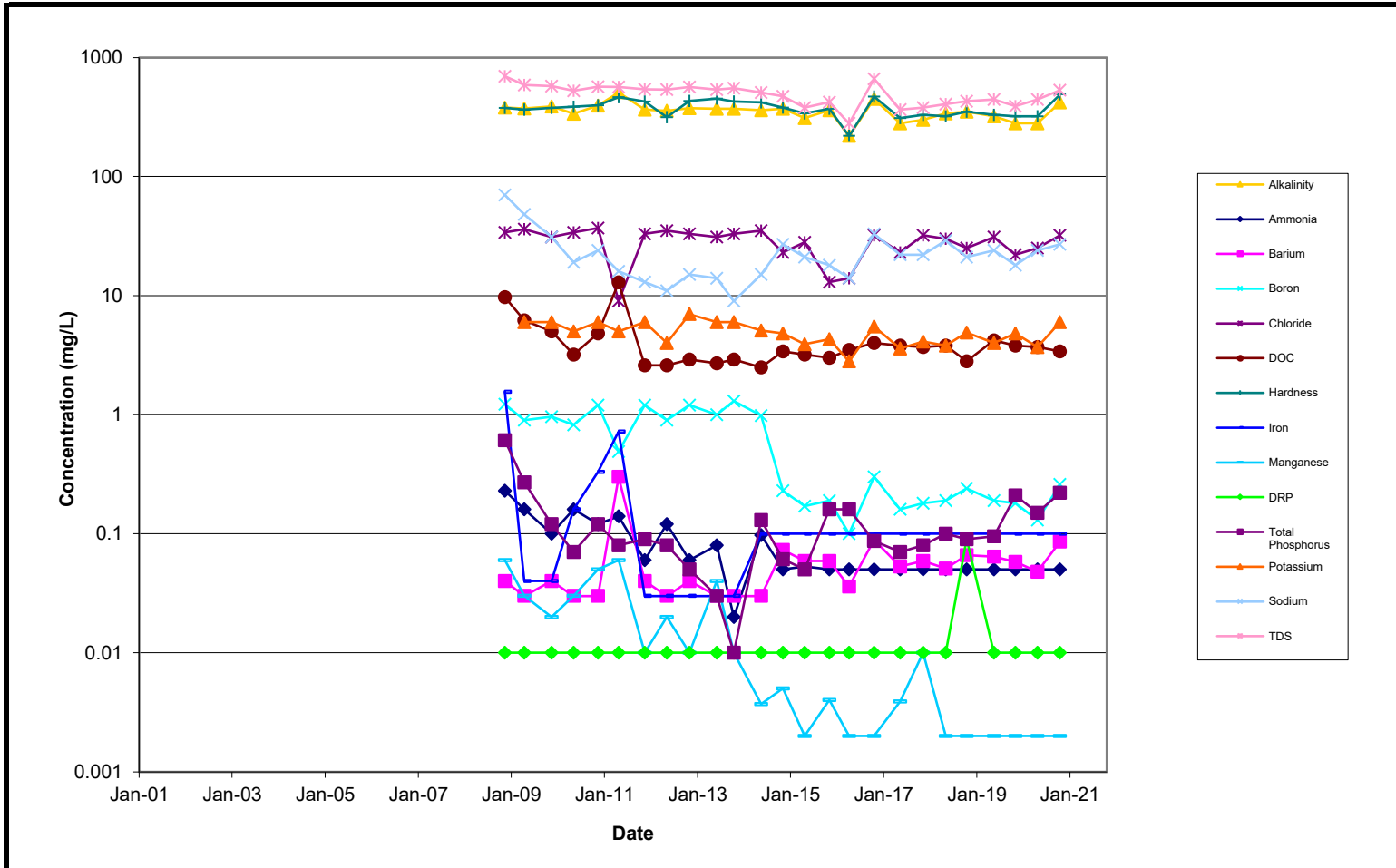


FIGURE D-I 26

Town of Arnprior

Waste Disposal Site
BR 08-2S



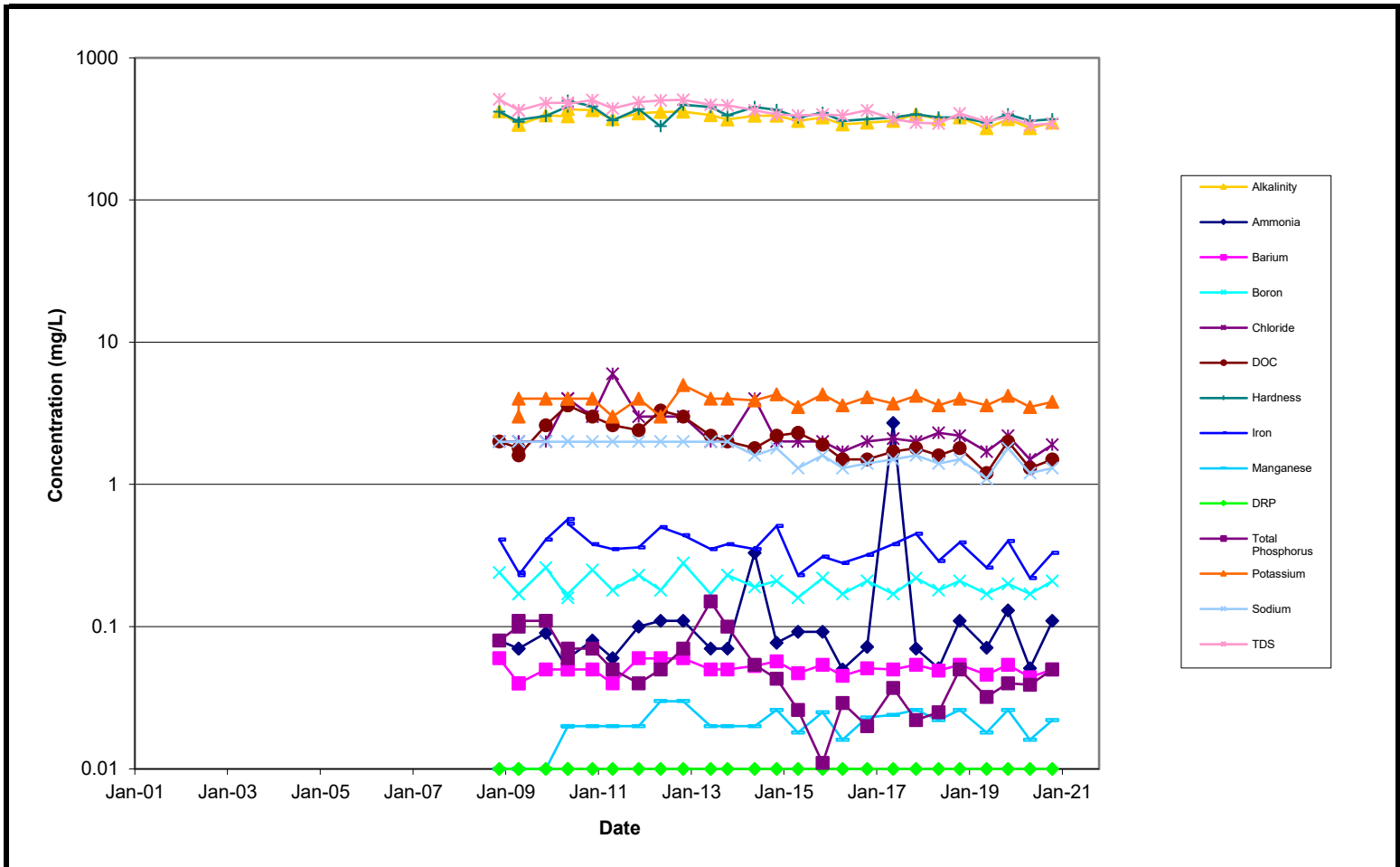


FIGURE D-I 27

Town of Arnprior
 Waste Disposal Site
 BR 08-3D



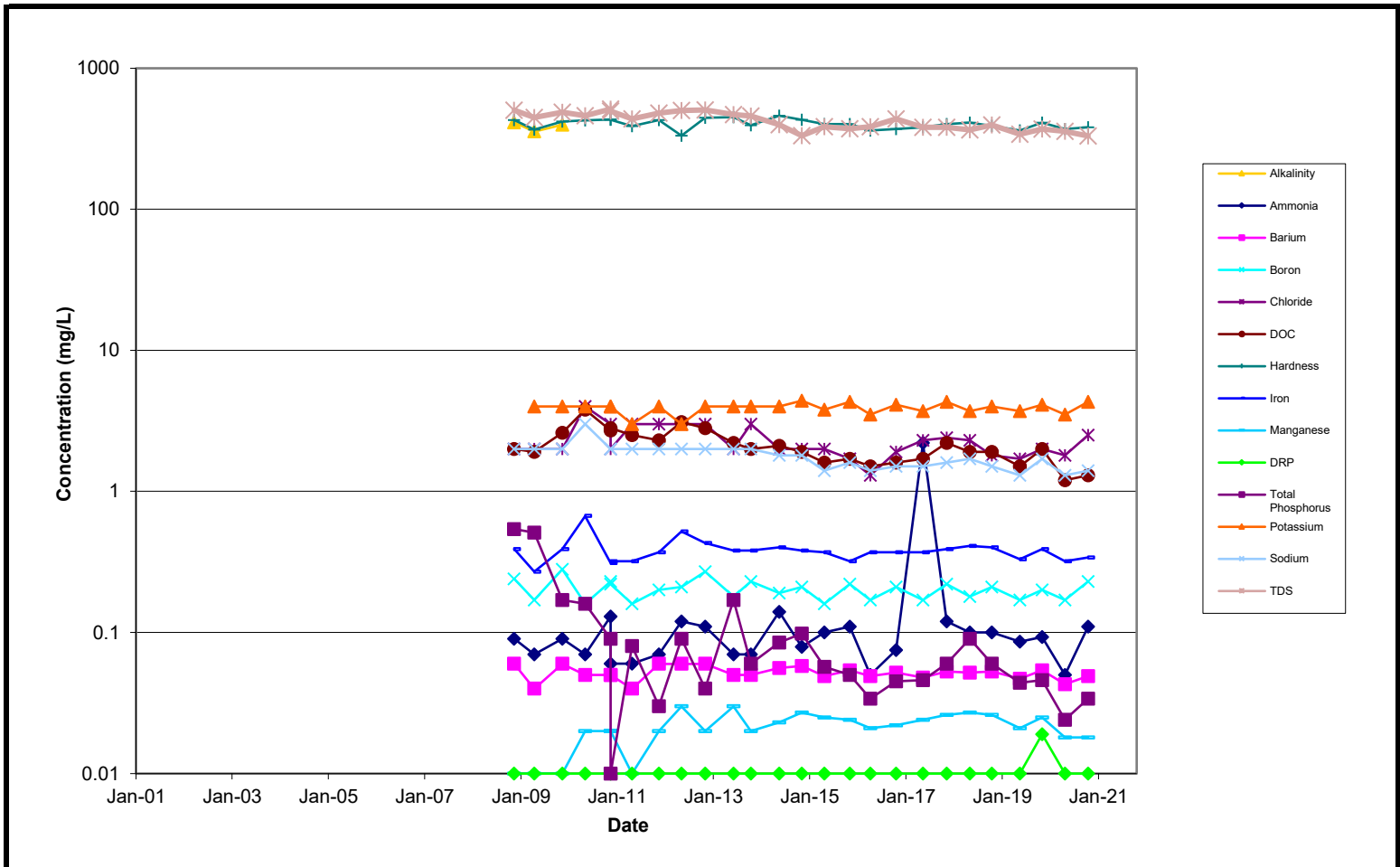


FIGURE D-I 28

Town of Arnprior

Waste Disposal Site
BR 08-3S



APPENDIX D-II

Surface Water Sampling Locations



FIGURE D-II 1

Town of Arnprior

Waste Disposal Site
SW-1



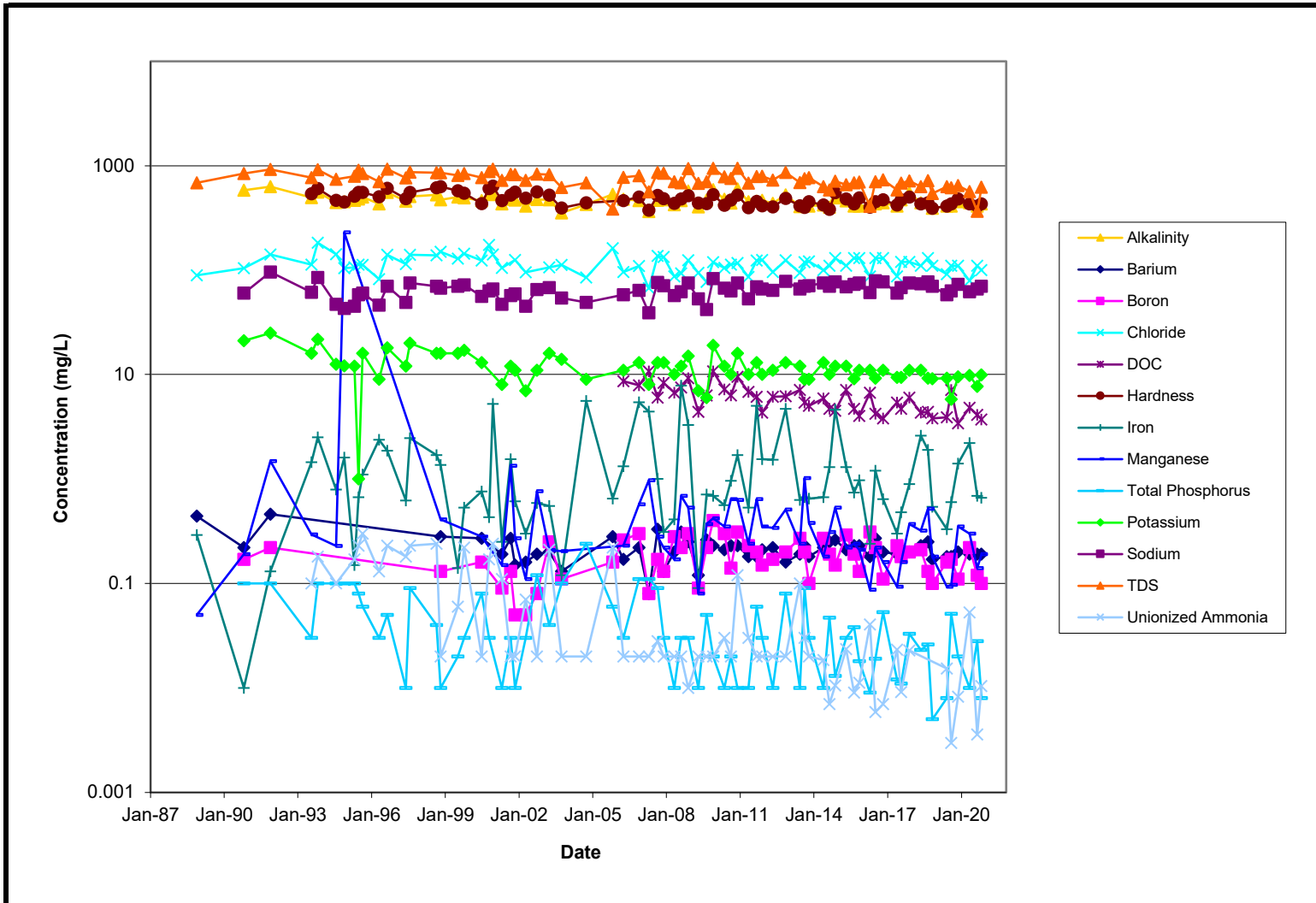


FIGURE D-II 2

Town of Arnprior
 Waste Disposal Site
 SW-2



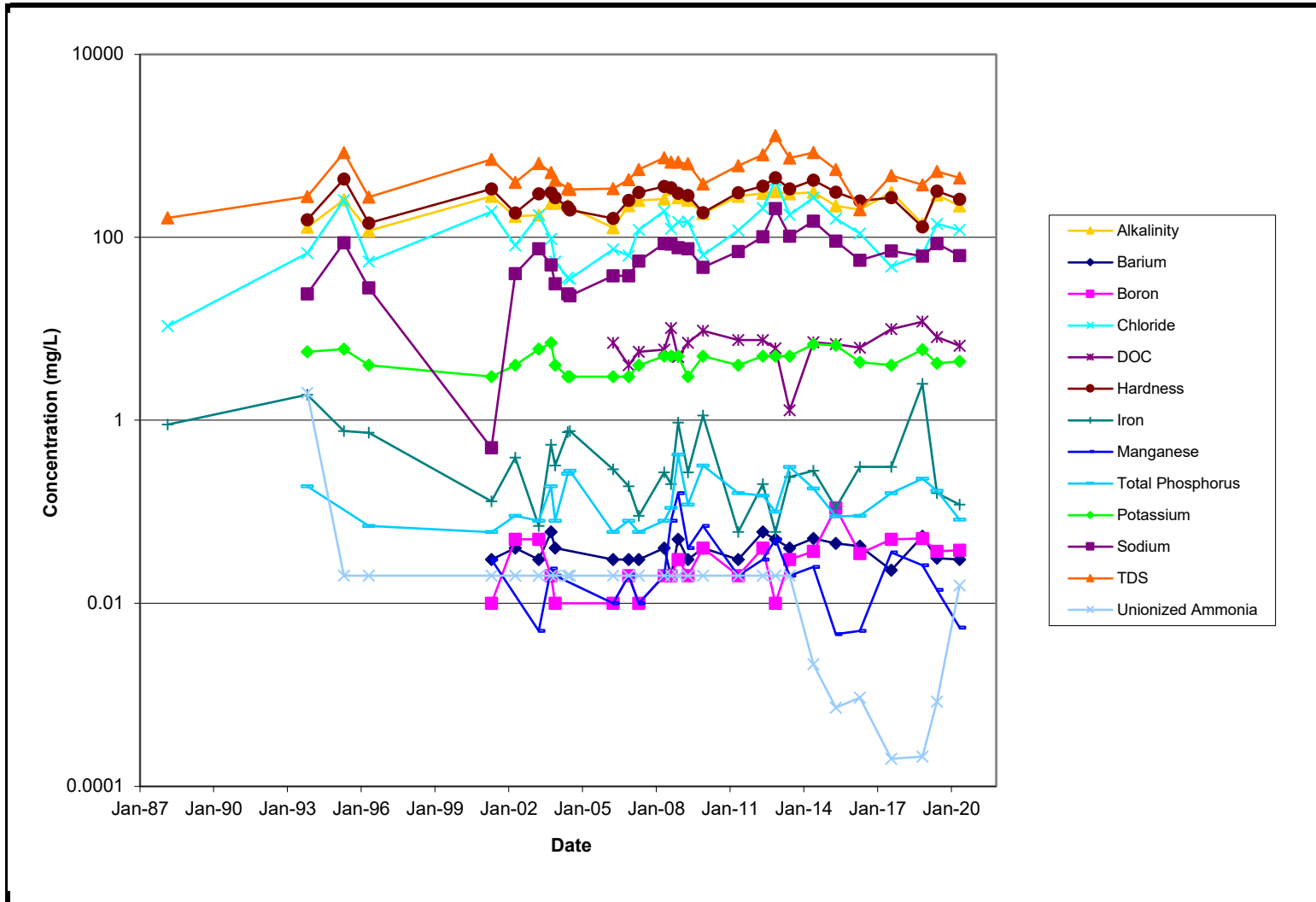


FIGURE D-II 3

Town of Arnprior
 Waste Disposal Site
 SW-10



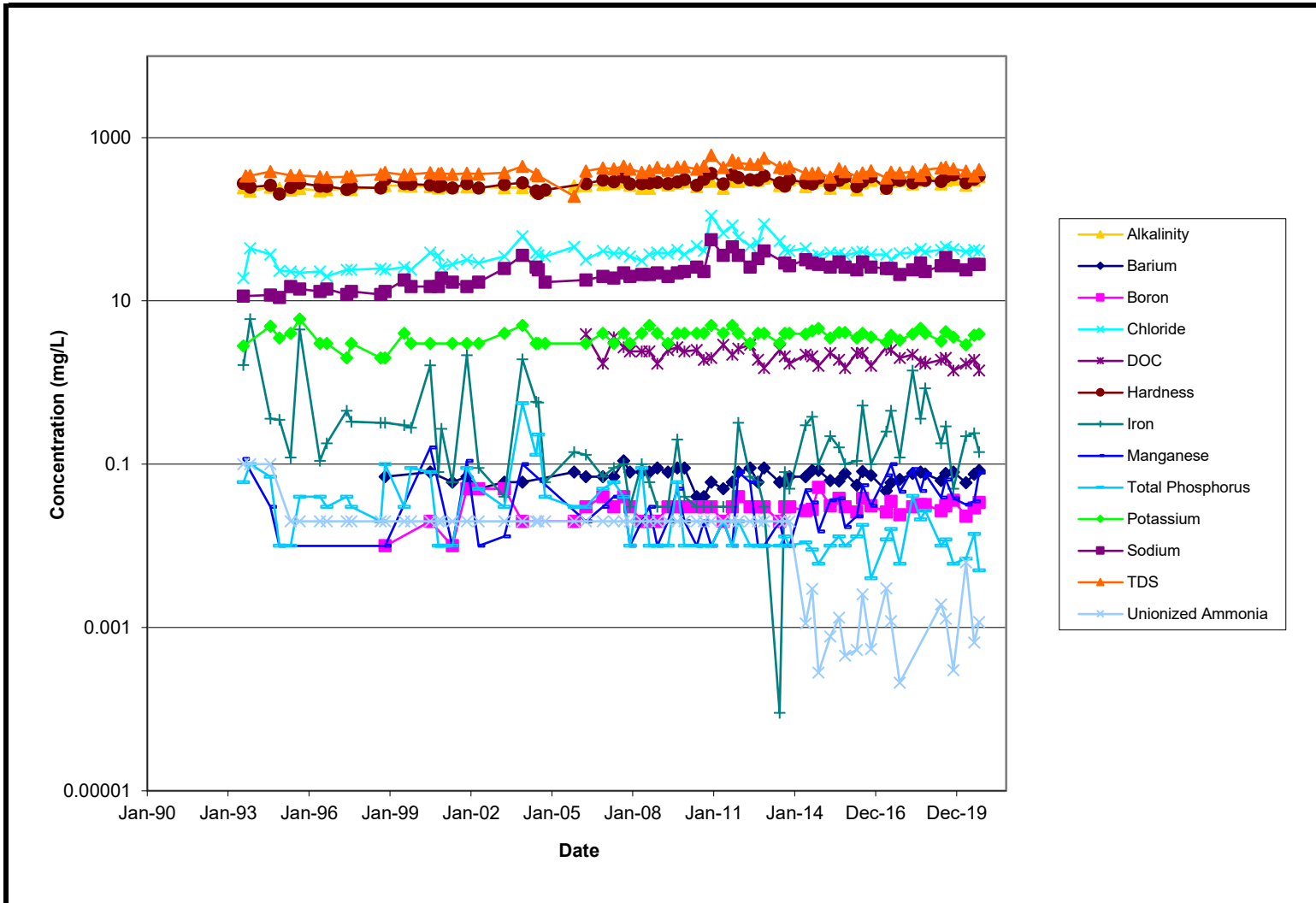


FIGURE D-II 4

Town of Arnprior

Waste Disposal Site
SW-11



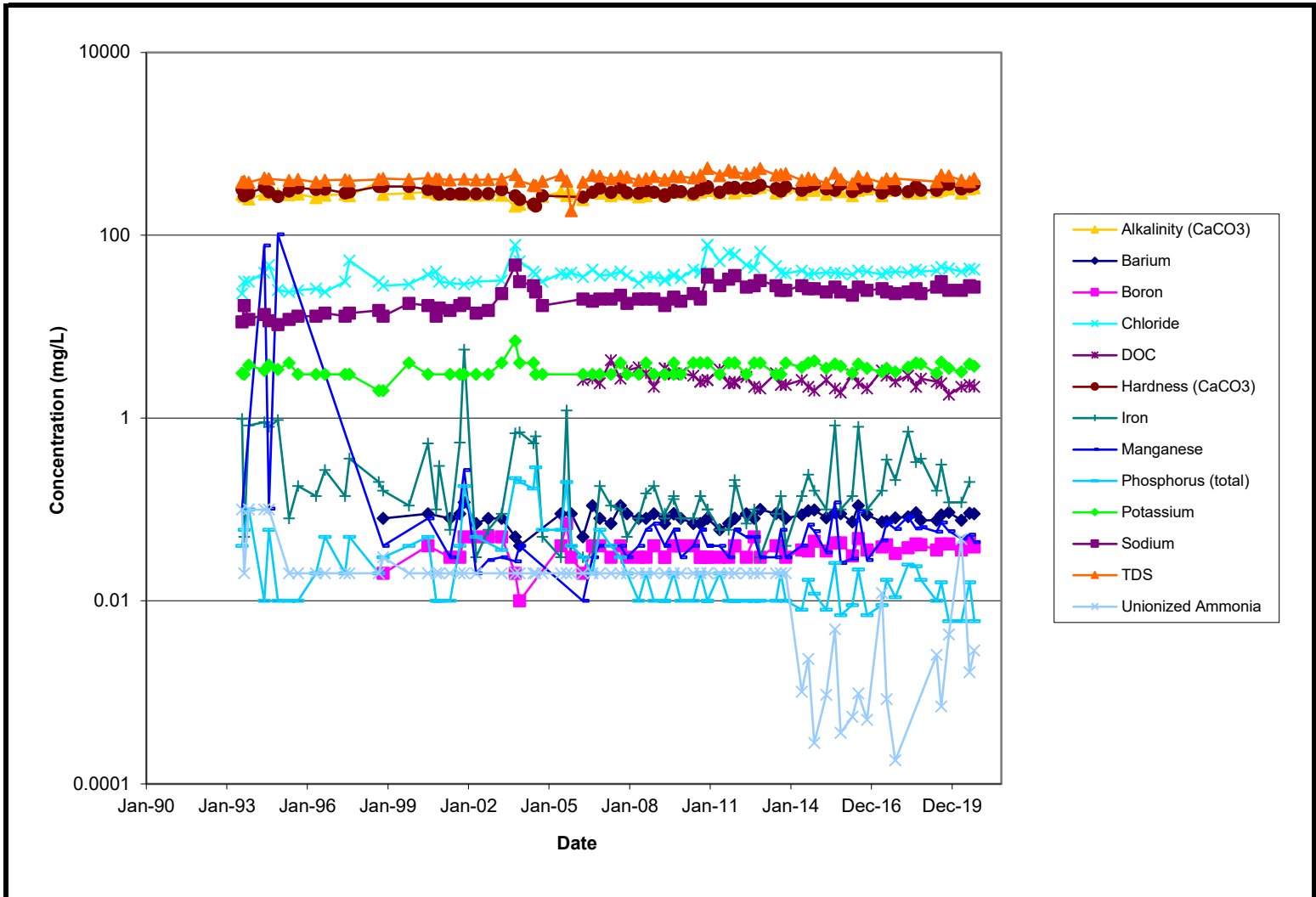


FIGURE D-II 5

Town of Arnprior

Waste Disposal Site
SW-12



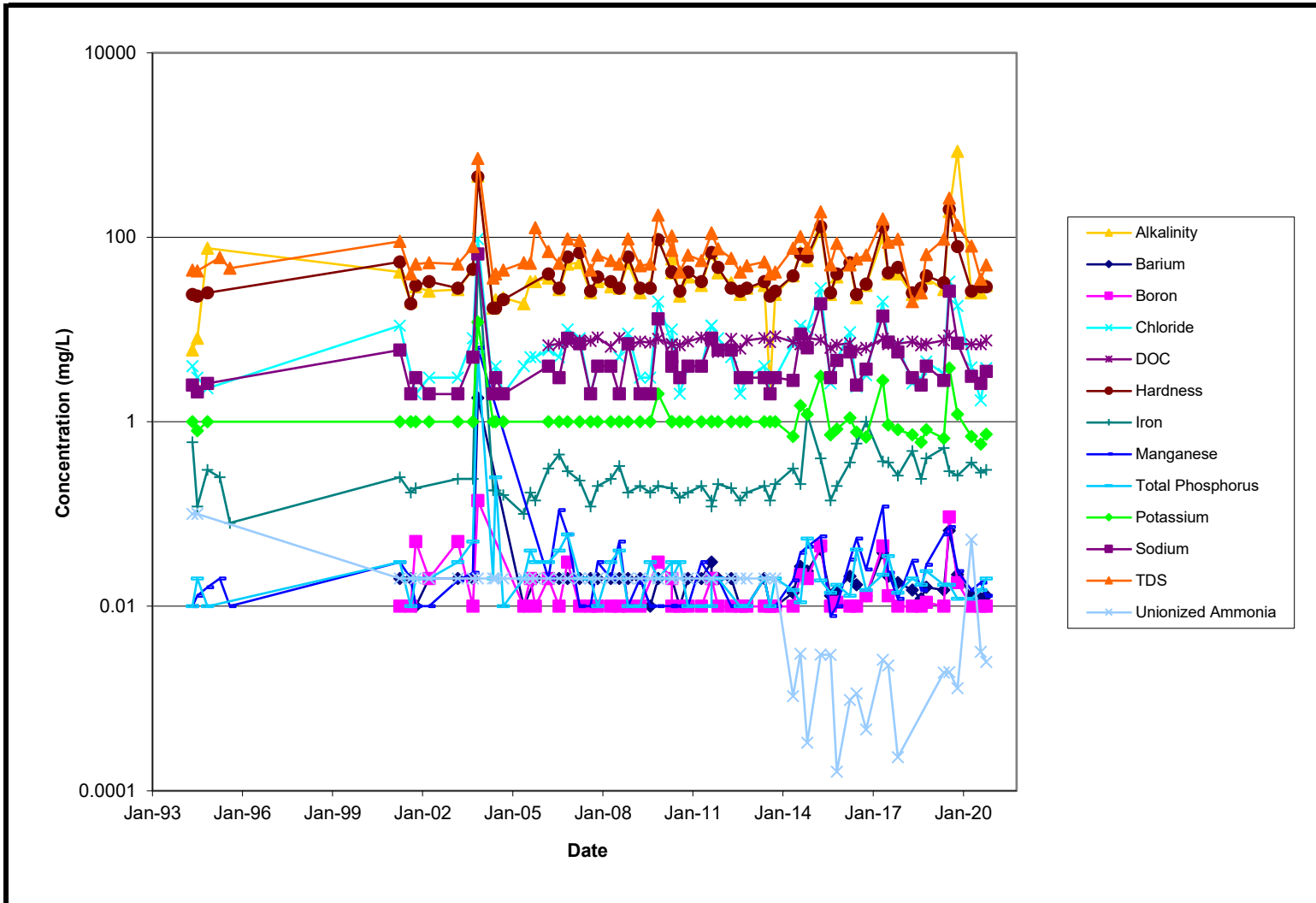


FIGURE D-II 6

Town of Arnprior

Waste Disposal Site
SW-18



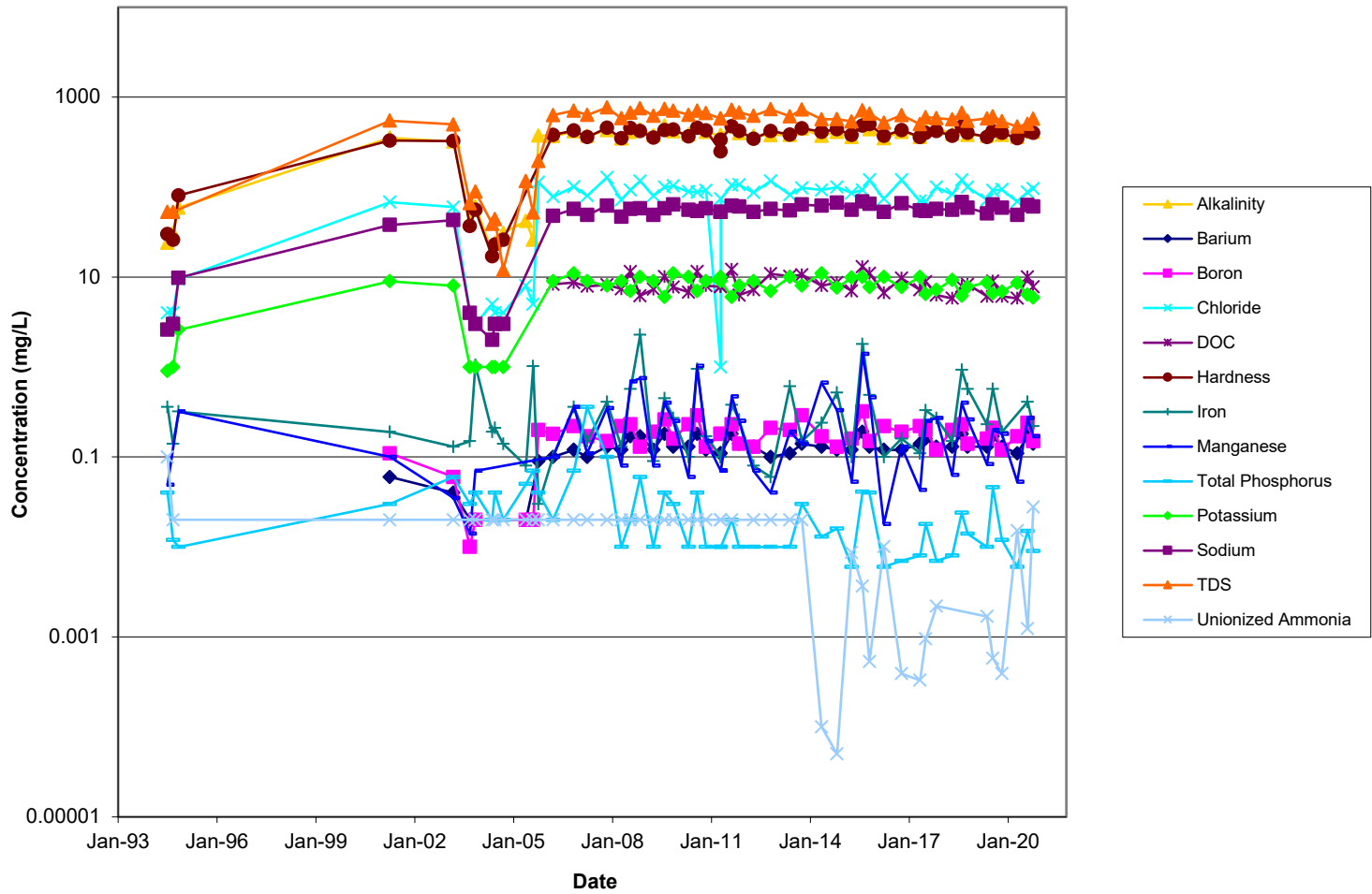


FIGURE D-II 7

Town of Arnprior

Waste Disposal Site
SW-19



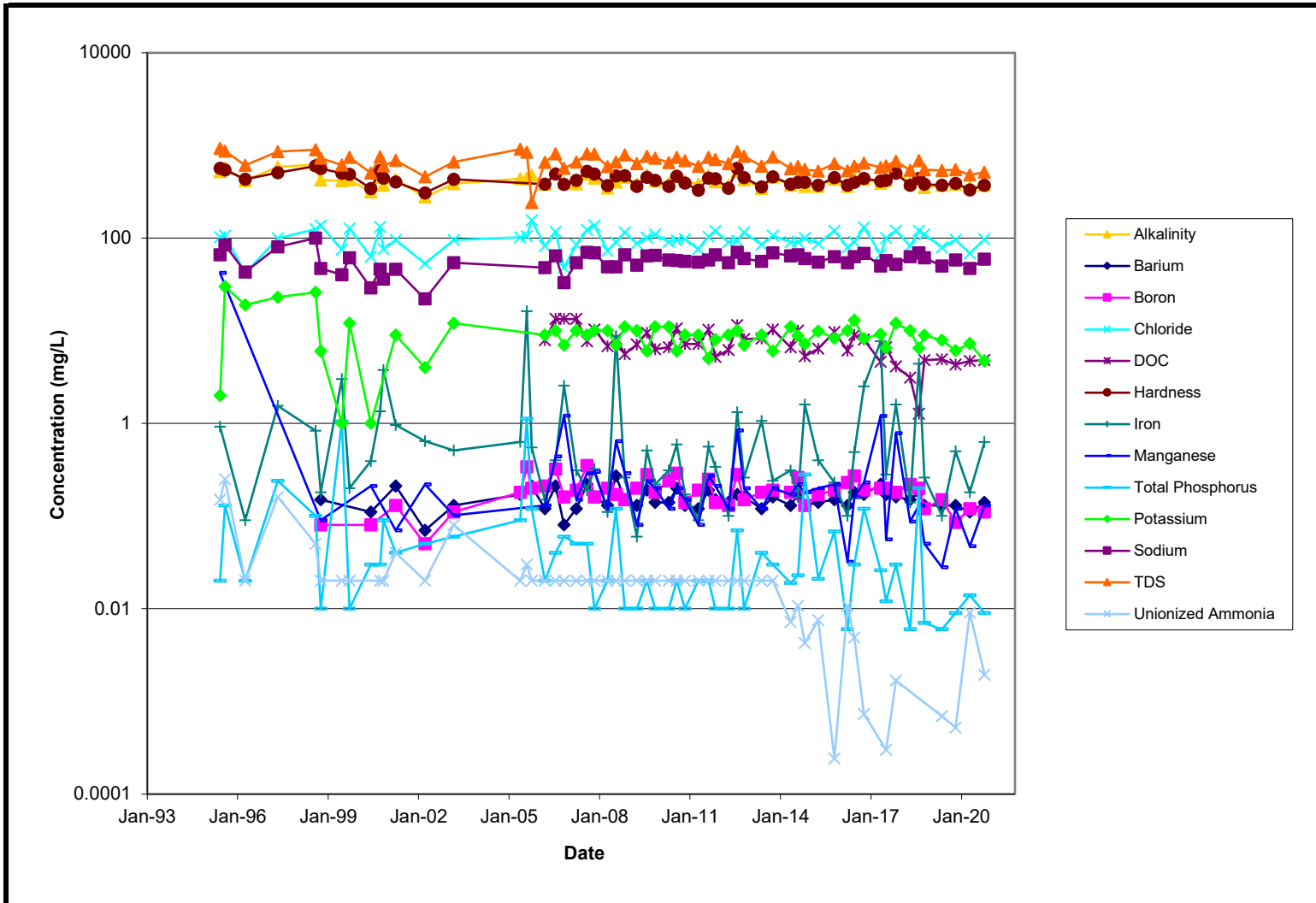


FIGURE D-II 8

Town of Arnprior

Waste Disposal Site
SW-21



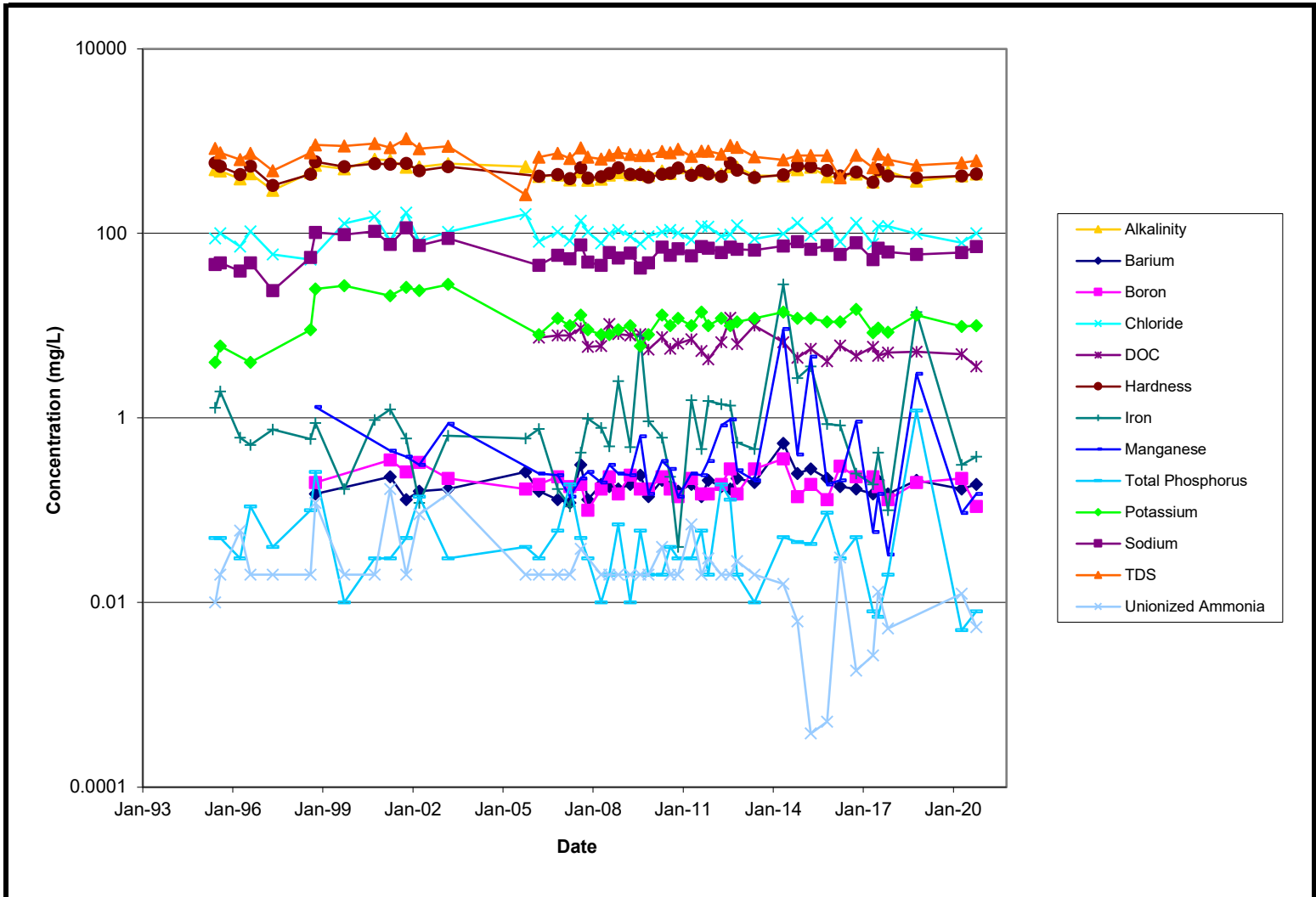


FIGURE D-II 9

Town of Arnprior
 Waste Disposal Site
 SW-22



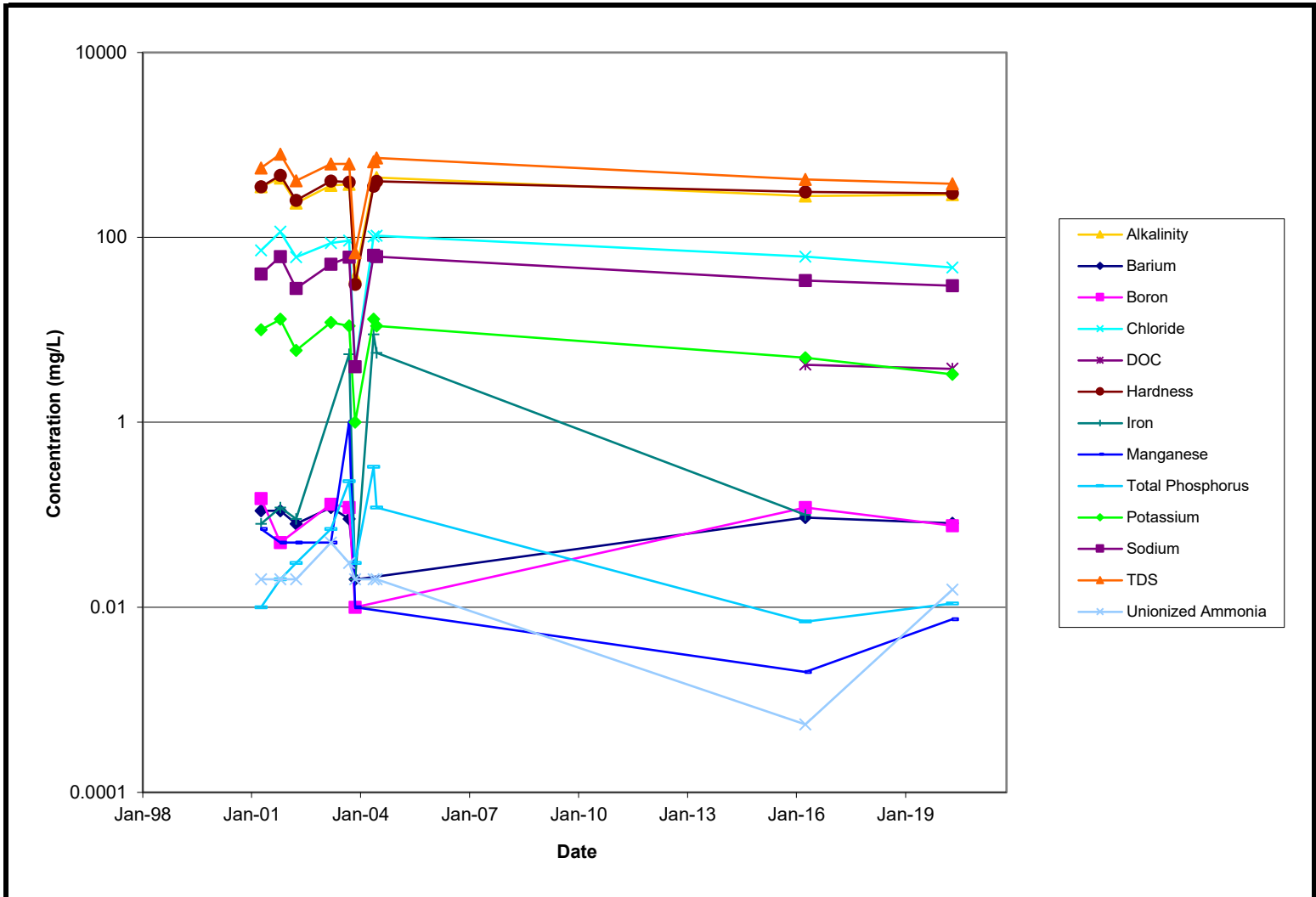


FIGURE D-II 10

Town of Arnprior

Waste Disposal Site
SW-23



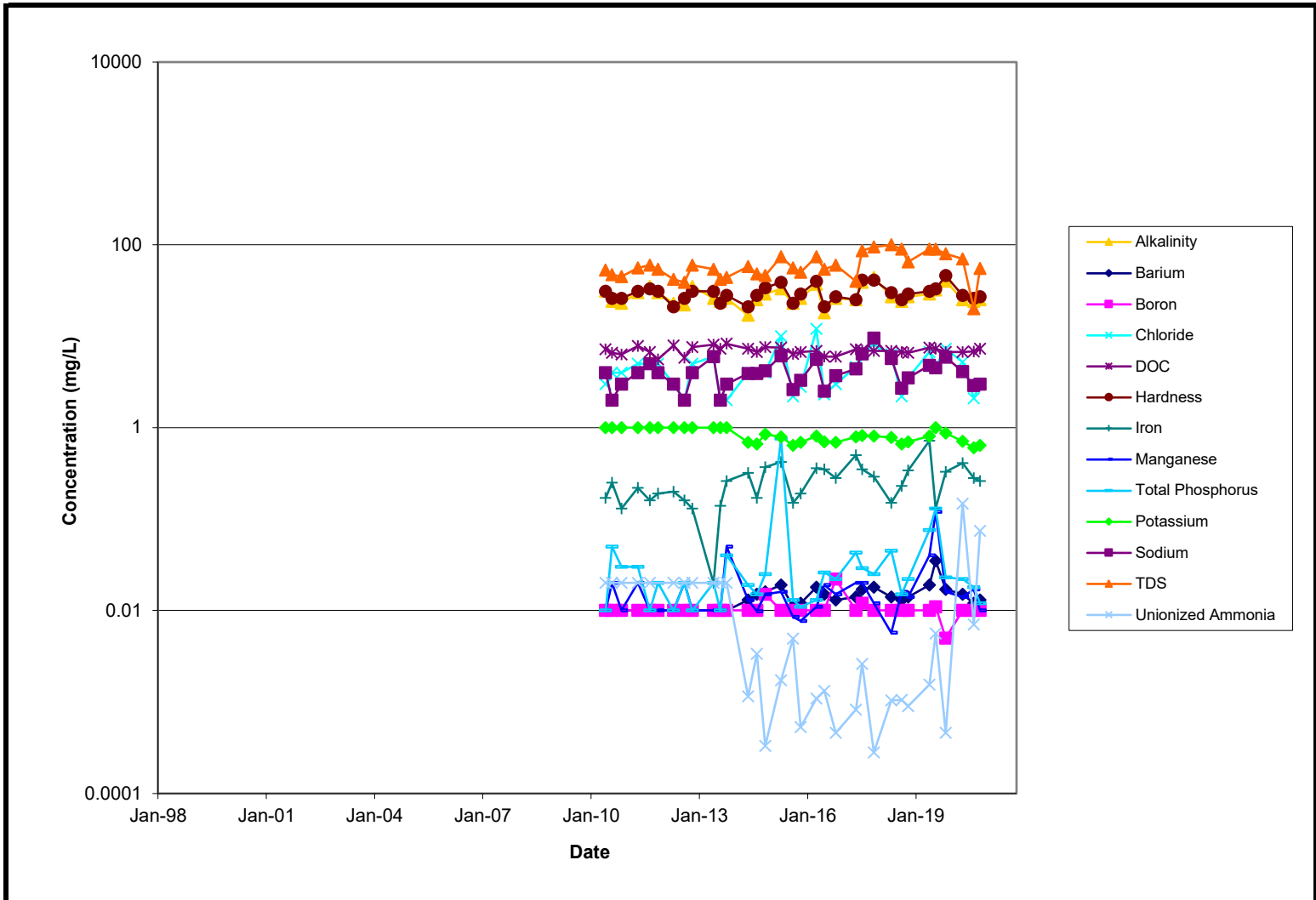


FIGURE D-II 11

Town of Arnprior

Waste Disposal Site
SW-26



APPENDIX E

Photographs of Surface Water Sampling Stations

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity

SPRING SESSION



Photograph of SW-1 taken in May 2020



Photograph of SW-2 taken in May 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-10 taken in May 2020



Photograph of SW-11 taken in May 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-12 taken in May 2020



Photograph upstream SW-12 taken in May 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-19 taken in May 2020



Photograph of downstream of SW-19 taken in May 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-21 taken in May 2020



Photograph of SW-22 taken in May 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-23 taken in May 2020



Photograph of SW-18 taken in May 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-26 taken in May 2020



Photograph of upstream of SW-26 taken in May 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity

SUMMER SESSION

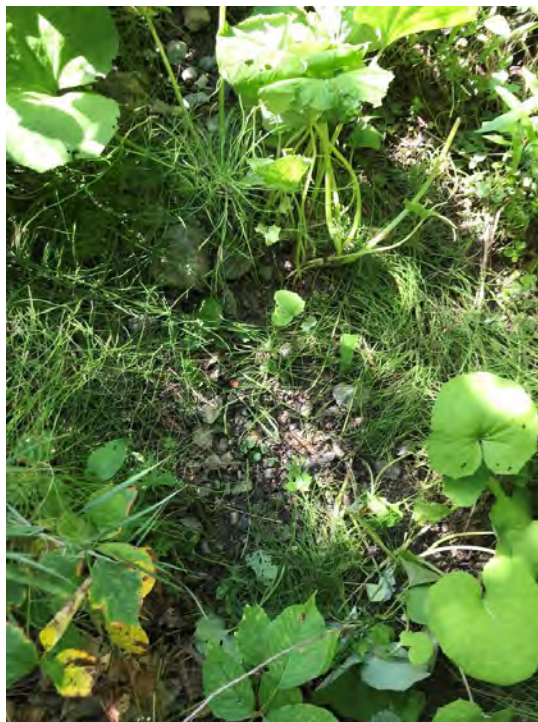


Photograph of SW-1 taken in August 2020



Photograph of SW-2 taken in August 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-10 taken in August 2020



Photograph downstream of SW-10 taken in August 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-11 taken in August 2020



Photograph upstream of SW-11 taken in August 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-12 taken in August 2020



Photograph upstream of SW-12 taken in August 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-19 taken in August 2020



Photograph of upstream of SW-19 taken in August 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-21 during the August 2020 monitoring session.



Photograph of SW-22 during the August 2020 monitoring session.

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-23 taken in August 2020.



Photograph of SW-26 taken in August 2020.

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of upriver of SW-26 taken in August 2020.



Photograph of upriver of SW-18 taken in August 2020.

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity

FALL SESSION



Photograph of SW-1 taken in October 2020



Photograph of SW-2 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph downstream of SW-2 taken in October 2020



Photograph of SW-10 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph downstream of SW-10 taken in October 2020



Photograph of SW-11 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph upstream of SW-11 taken in October 2020



Photograph of SW-12 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-18 taken in October 2020



Photograph of downstream of SW-18 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph downstream of SW-19 taken in October 2020



Photograph upstream of SW-19 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph of SW-21 taken in October 2020



Photograph of SW-22 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph north of SW-22 taken in October 2020



Photograph of SW-23 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph southeast of SW-23 taken in October 2020



Photograph of SW-26 taken in October 2020

APPENDIX E
Photographs of Surface Water Sampling Stations and Beaver Activity



Photograph downstream of SW-26 taken in October 2020

APPENDIX F

MECP Correspondence

June 8, 2018

Project No. 1401322/2018

Emily Tieu

Senior Environmental Officer
Ministry of the Environment and Climate Change
Ottawa District Office, Eastern Region
103-2430 Don Reid Drive
Ottawa ON K1H 1E1

**RESPONSE TO SURFACE WATER AND GROUNDWATER COMMENTS
2016 ANNUAL MONITORING REPORT – ARNPRIOR WASTE DISPOSAL SITE**

Dear Ms. Tieu,

Golder Associates Ltd. (Golder) has prepared this letter on behalf of the Town of Arnprior (Town) in response to the memoranda listed below, addressed to you, providing comment on the groundwater and surface water at the Arnprior Waste Disposal Site (Site) (ECA No. A412603) following review of the report on *2016 Site Development, Operations and Environmental Monitoring, Arnprior Waste Disposal Site, Township of McNab/Braeside, Ontario* (Golder, 2017) (referred to herein as the 2016 Annual Monitoring Report). The memoranda include:

- Memorandum providing comments on surface water matters by Lauren Forrester dated April 11, 2018.
- Memorandum providing comments on hydrogeological (e.g., groundwater) matters by Thomas Guo dated March 23, 2018.

Surface Water Comments

The surface water reviewer expressed general agreement with the findings and recommendations presented in the 2016 Annual Monitoring Report, and agreed that contingency measures were not required to be implemented.

The surface water reviewer recommended that concentrations of chloride be compared to the Canadian Water Quality Guideline (CWQG) for both long-term and short-term exposure. This is acknowledged by the Town. Future reports will refer to both long-term and short-term exposure guidelines for chloride as applicable.

Groundwater Comments

The groundwater reviewer provided the following recommendations and conclusions in their comments:

- 1) TDS, iron and alkalinity should be used as leachate indicator parameters for groundwater.
- 2) The Site is not in compliance with the Reasonable Use Guideline B-7 (RUG) along the northern property boundary, noting that the conclusion for the exceedances of the RUG at monitoring wells BR-5D, BR-6D, BR-10, BR-7S and BR-12 (i.e., that impacts at these monitoring wells result from impacts other than the landfill) is not acceptable. The reviewer states that the Town should address these exceedances and that DOC should be used as a leachate indicator parameter.
- 3) The groundwater reviewer states that the use of 75% of the RUG in the trigger mechanism is acceptable, contingent on the adoption of the other recommendations above.

As discussed in the 2016 Annual Monitoring Report (and preceding and subsequent Annual Monitoring Reports), the contaminant attenuation zone (CAZ) lands located to the north and northeast of the existing approved landfill (between a Canadian Pacific Rail Line and Osborne Street) was previously owned by Gillies Brothers, Stone Consolidated and then Tembec. According to the report on Site History by Robinson Consultants (Robinson, 1998), these lands were acquired by the Town in 1996 with funding from the MOECC (then Ministry of the Environment) under the Waste Management Improvement Program (WMIP). It has been reported that much of this property is covered with wood fill and the property was used for lumber industry related activities. Drilling activities on this property confirm the extensive presence of wood fill. In addition, berms on this site related to the rail line are of unknown fill quality. As discussed in the 2016 Annual Monitoring Report, it is considered that groundwater quality at groundwater monitors within the CAZ areas and downgradient is likely influenced by these historical activities in addition to potential or interpreted impacts from landfill leachate.

Based on the comments provided by the groundwater reviewer and based on discussion with the MOECC during the site visit on February 23, 2018, it is understood that the MOECC is in agreement that groundwater quality within the CAZ lands to the north and northeast of the landfill is influenced by historical industrial activities. It is further understood from the comments provided by the groundwater reviewer that the Town is responsible for impacts originating from the Site and CAZ lands, regardless of whether the observed impacts are resulting from one or multiple sources.

The MOECC reviewer states that the site is out of compliance with RUG. The RUG “establishes limits on the discharge of contaminants from facilities, approved by the Ministry, that are used for the disposal of waste into the shallow subsurface”. As the RUG is applicable only to waste disposal sites, it is considered that impacts related to contaminant sources other than the landfill should be evaluated against the applicable criteria and not to the RUG.

It is Golder’s interpretation that the groundwater quality within the CAZ area that is understood to have been impacted by historical industrial activities is appropriately compared to Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) of Ontario Regulation (O.Reg.) 153/04. It should be noted that the Table 2 criteria would apply only to those parameters that are expected to be from the wood fill and/or road salt and not parameters that are solely related to the landfill. With the exception of barium, the parameters identified as exceeding the RUG at monitoring wells BR-5D, BR-6D, BR-10, BR-7S and BR-12 are related to wood fill and/or road salt and not just the landfill. Based on a comparison of historical data at monitoring wells BR-5D, BR-6D, BR-10, BR-7S and BR-12, the parameters identified as exceeding the RUG related to wood fill and/or road salt are consistently below the Table 2 concentrations at these locations.

Barium has been interpreted historically to potentially be a better indicator of leachate impact than the other site-specific leachate indicator parameters based on higher concentrations of barium in groundwater monitors within the licensed fill area compared to background groundwater monitors and downgradient groundwater monitors interpreted not to be impacted by landfill leachate. Barium exceeded the RUG at groundwater monitor BR-5D in the spring of 2016 (note that the groundwater comments on the 2016 monitoring report note that the RUG is exceeded at BR-6D, however this is incorrect). A review of the historical concentrations of barium at upgradient monitoring wells BR-9D, BR-9S, BR08-3D and BR08-3S, however, indicate that the concentration of barium is lower upgradient of BR-5D, indicating that the concentration of barium increases with distance from the landfill. This is not consistent with what would be expected if the landfill were the only source of barium in groundwater, and suggests that other industrial activity may be contributing to the elevated concentrations of barium at groundwater monitor BR-5D. It is therefore recommended that the concentration of barium at BR-5D is also more appropriately compared to Table 2. Historically, the concentration of barium at BR-5D exceeded Table 2 on one occasion in 2002 by 334%; no other concentrations of barium have exceeded 50% of the Table 2 concentration of barium, so the 2002 data is considered anomalous.

Recommendations

A revision to the groundwater and surface water trigger mechanisms and contingency measures for the landfill is to be undertaken and submitted to the MOECC for approval by August 21, 2018 as required by Item 41 of ECA A412603 Notice 2 dated August 18, 2017. The revised trigger mechanism and contingency measures will apply to impacts from the landfill, and will consider ways in which landfill leachate may be differentiated from historical industrial activity for the purpose of evaluating compliance of the landfill.

It is proposed that a meeting be held between the Town, the MOECC and Golder to discuss this response to the comments on the 2016 Annual Monitoring Report and the plans for the proposed trigger mechanism.

We trust that this response meets your needs at this time. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Golder Associates Ltd.



Andria Caletti, P.Eng.
Environmental Engineer



Megan Farnel, P.Eng.
Environmental Engineer

Reviewed by: Trish Edmond, M.Sc., P.Eng., Associate

ALC/MKF/PLE/sg

\\golder.gds\gal\ottawa\active\2014\1125 - eceag\1401322 arnprior wds 2014 to 2018\additional work\moecc comments on 2016 report\1401322-l-rev 0-response to moecc comments on 2016 report.docx

CC: Deanna Nicholson, Town of Arnprior

Attachments: Attachment A – Surface Water and Groundwater Comments on the 2016 Annual Monitoring Report

References

CCME, 2015. Canadian Council of Ministers of the Environment, Water Quality Guidelines for the Protection of Aquatic Life. <http://st-ts.ccme.ca/en/index.html>. Accessed February, 2015.

Golder Associates Ltd., 2017. 2016 Site Development, Operations and Environmental Monitoring, Arnprior Waste Disposal Site, Township of McNab/Braeside, Ontario. March 2017.

Ministry of the Environment and Energy, 1994a. Guideline B-7: Incorporation of the Reasonable Use Concept into MOEE Groundwater Management: MOEE Program Development Branch: Ontario Ministry of the Environment and Energy, April 1994, 8 p.

Robinson Consultants Inc., 1998. Arnprior Waste Disposal Site History, Robinson Project No. 8898, April 1998.

ATTACHMENT A

**Surface Water and Groundwater Comments
on the 2016 Annual Monitoring Report**

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



MEMORANDUM

April 6, 2018

TO: Emily Tieu
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: Lauren Forrester
Surface Water Specialist
Technical Support Section
Eastern Region

RE: 2016 Annual Monitoring Report
Arnprior WDS
Part lots 9, 10 and 11, Concession 13
Geographic Township of NcNab/Braeside, Renfrew County
ECA No.



As requested, I have reviewed the pertinent sections of the subject report, prepared by Golder Associates and dated March 2017. I offer the following comments with respect to surface water matters.

Background

The site is operated under ECA No. A412603 and functions as a naturally attenuating site. The WDS has been in operation since about 1970. The landfill site currently consists of a licensed 9.6 ha fill area (which includes 30 metre buffer) within a total site area of 40.44 hectares.

Contaminant Attenuation Zone (CAZ) has historically been to the north and northeast (between a CP Rail Line and Osborne Street) (CAZ Areas A, B and C). It has been reported that property is covered with wood waste fill and the property was used for lumber industry related activities. Berms related to the CP Rail line are of unknown quality. An additional CAZ Area (CAZ Area D) is located to the southwest.

The site receives dewatered sludge from the Town of Arnprior Sewage Treatment Plant. Approximately 438 tonnes of dewatered sludge was received in 2016. Approximately 6,333 cubic metres of waste was placed in 2016.

Surface Water Regime

The site is drained by two separate watersheds, both of which ultimately drain to the Ottawa River. The northern watershed drains most of the landfill area, including CAZ areas A and C, by way of a small intermittent stream through a series of perennial ponds on both sides of the CP railroad tracks and a wetland area north and east of the CPR tracks. Monitoring stations SW-2, SW-21, and SW-22 area intended to capture water quality conditions within CAZ Area A, ponds and wetlands downstream of the landfill area.

The southern watershed approaches the southern boundary of the landfill property and is drained by an unnamed ephemeral stream that becomes intermittent downgradient of the bedrock ledge. The southern watershed is captured by monitoring locations SW-10 (background), SW-11, and SW-12.

The Ottawa River is monitored at three locations: SW-26 (Background), Braeside Beach (SW-18) (downgradient of the landfill), and at the outfall from the northern drainage area (SW-19).

Groundwater generally flows to the north, northeast, towards the Ottawa River.

Site specific LIP for surface water include alkalinity, unionized ammonia, barium, chloride, iron, hardness, potassium, manganese, sodium, total dissolved solids (TDS), dissolved organic carbon (DOC), and total phosphorus.

Results

Surface water monitoring was undertaken in April, July and October 2016 and there were no deviations from the prescribed monitoring program. Either insufficient flows for measurement or dry conditions were encountered at SW2, SW10 (except April), SW18, SW21, SW22, SW23 (except April) and SW26 in 2016.

Northern Drainage Area

With respect to the northern watershed, all sampling stations within and on the periphery of the wetland (SW1, SW2, SW21, SW22, SW23) had parameters in excess of PWQO, attributable to the landfill, industrial activities (railway / lumber industry), and/or natural wetland conditions.

- Water quality at SW-1 and SW-2 was similar. Both stations are characterized as having high alkalinity and hardness, low dissolved oxygen, and slightly elevated chloride, boron and iron. At both station, unionized ammonia slightly exceeded the PWQO in the spring, but was otherwise low.
- SW-21 and SW-22 were also similar. As with SW-1 and SW-2, water quality at these stations was characterized by high hardness and alkalinity, low dissolved oxygen, slightly elevated chloride, boron and iron, and low unionized ammonia (except in the spring at SW-22). Cobalt also exceeds the PWQO in the spring at SW-22.

The concentration of DOC appears to increase with distance across CAZ Area A, with the highest concentrations reported at SW-1 (downstream), possibly representing impacts from historical lumber industry activities.

- Golder notes an overall decreasing trend in dissolved oxygen since 2005 within the northern watershed (except SW23, which is geographically separated from the remaining stations). This should continue to be monitored moving forward.
- At SW-23 (in the northern-most extent of CAZ Area A), water quality is notably less impacted (lower alkalinity, hardness, chloride). Metal concentrations were also relatively low (below PWQO, where applicable).

- Boron exceeded the trigger concentration (PWQO) on at least one occasion at each SW-1, SW-2, SW-21, and SW-22, but did not exceed the Canadian Water Quality Guideline (CWQG).
- Chloride exceeds the CWQG for long term exposure at all northern drainage area stations on at least one date in 2016, with the exception of SW-23. The guideline for short-term exposure is not exceeded at any station. Notably, Golder refer only to the short-term exposure guideline (640 mg/L) and not the guideline for long term exposure (120 mg/L). I recommend that both the short and long term guidelines be considered in future reports for the purpose of impact assessment.

Within the northern drainage area, PWQO/trigger exceedances may be linked to the landfill, industrial activities (lumber / railway) or natural wetland conditions, or some combination thereof. Significant impacts are not likely at this time.

Southern Drainage Area

Background is characterized by SW-10. This location is frequently dry and the potential for road-related impacts has been noted previously. In 2016, only a spring sample was collected, showing slightly elevated chloride (110 mg/L), hardness and alkalinity, and relatively low concentrations of other leachate indicator parameters.

SW-11 and SW-12 were characterized as having low chloride (<41 mg/L), moderate alkalinity, hardness and TDS, high dissolved oxygen, and low boron concentrations. Iron was slightly elevated.

The southern drainage area does not appear to be impacted by landfill leachate in 2016. Previously identified increasing trends in sodium and chloride in this area have reportedly stabilized since 2015.

Ottawa River

Background water quality within the Ottawa is characterized at SW-26 as having low alkalinity, hardness, total dissolved solids and chloride, iron concentrations exceeding the PWQO and low concentrations of other metals.

Minor changes can be observed at SW-18 (offshore, downgradient of CAZ Area A and up-gradient of the outfall from the northern drainage area) (i.e. slightly elevated iron and chloride compared to upstream). The relative contribution from the landfill cannot be distinguished from other possible sources (i.e. road impacts).

A clear signature is evident at the outfall from the northern drainage area (alkalinity, hardness, chloride, TDS). While the CWQG for short term exposure is not exceeded, the chloride concentration at SW-19 matches the CWQG for long-term exposure in the fall (120 mg/L). It is noteworthy that the CWQG was also exceeded at SW-2 (upgradient of Osborne Road) and SW-1 (downgradient of CAZ Area A). As such, leachate is can be confirmed to contribute to that result.

Beaver Dams

Previous reviews have raised concerns with respect to beaver dams. In 2016, additional assessment was undertaken. Beaver dams were located upstream of SW2 in April and October. Remnants of historical beaver activity were also noted at the culvert under the CPR line. Continued monitoring is recommended.

Discussion

Significant impacts are unlikely at this time; however, ongoing monitoring is justified at this site. I am in general agreement with the findings and recommendations presented by Golder within the subject report.

Given that no parameters consistently exceeded trigger concentrations in 2016, contingency measures were not deemed necessary. Based on my review of the submitted data, I agree.

Triggers for surface water impact assessment include alkalinity, unionized ammonia, boron, chloride, iron and total phosphorus. With respect to the trigger concentrations, it appears that only the CCME short-term exposure guideline for chloride (640 mg/L) is considered. The long-term exposure guideline (120 mg/L) is not referenced. Chloride concentration in concurrent background samples were below the long term CWQG (regardless, the 75th percentile value for background of 176 mg/L is noted). Please ensure that future reports refer to both guidelines more clearly.

If you have any questions about these comments, I would be happy to discuss them with you.



Lauren Forrester, M.Sc.
LF

ec: Peter Taylor, Technical Support Section Manager
Greg Faaren, Water Resources Unit Supervisor
Thomas Guo, Regional Hydrogeologist
Tara MacDonald, Ottawa District Supervisor

c: File SW RE MB 03 06 C13 - Arnprior WDS, Township of McNab-Braeside
File 13 01 07 02 OT – Ottawa River
LF/IDS No. 7066AS83E

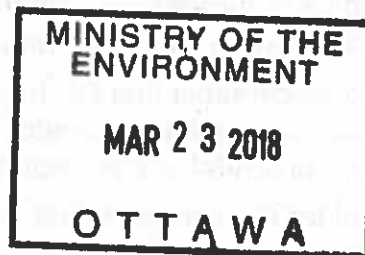


MEMORANDUM

March 19, 2018

TO: Emily Tieu
Senior Environmental Officer
Ottawa District Office
Eastern Region

FROM: Thomas Guo
Hydrogeologist
Technical Support Section
Eastern Region



RE: 2016 Site Development, Operations and Environmental Monitoring Report
Arnprior Waste Disposal Site
Part of Lots 9, 10, 11, Concession 13
Township of McNab/Braeside
County of Renfrew

Environmental Compliance Approval (ECA): A412603

I have reviewed the hydrogeologically pertinent sections of the document entitled "2016 Site Development, Operations and Environmental Monitoring Report, Arnprior Waste Disposal Site, Township of McNab/Braeside, Ontario", prepared by Golder Associates Ltd. (Golder) with project No. 1401322 (2016) and dated March 2017.

The report was provided on behalf of the Town of Arnprior to document the monitoring results at the site in 2016.

With reference of the report entitled "2013 Site Development, Operations and Environmental Monitoring Report, Arnprior Waste Disposal Site, Township of McNab/Braeside, Ontario", prepared by Jp2g Consultants Inc. (Jp2g) with project No. 2136188A and dated March 2014.

I offer the following comments for your consideration.

Summary

- Reasonable Use Guideline B-7 (RUG) applies to operating waste disposal sites and sites closed post 1986. The landfill site is an active site; thus the RUG applies to this site;
- As per the ministry's policy, it is not acceptable that exceedances of RUG limits and trigger concentrations at monitors BR-5D, BR-6D and BR-12 are the result from the effect of the wood waste historically deposited on the contaminant attenuation zone (CAZ) north of the rail line and/or the effect of the landfill;

- Exceedances of the RUG were detected at monitoring wells BR-5D, BR-6D, BR-10, BR-7S and BR-12 along the northern property boundary. As such, the site is not in compliance with the RUG along the northern property boundary. The town should address the exceedance;
- Dissolved organic carbon (DOC) and alkalinity should be added to the leachate indicator parameters. Total dissolved solids (TDS) and iron should be used as the leachate indicator parameters for all the bedrock monitoring wells;
- It is acceptable that the trigger mechanism for groundwater is 75% of the RUG limits for leachate indicator parameters as long as above-mentioned recommendations are adopted; and,
- Golder recommends that groundwater monitoring and sampling continue at a frequency of twice per year (spring and fall) with the current parameters list (Table 5). The reporting frequency is to be annual. I concur with these recommendations.

Environmental Compliance Approval (ECA)

The Arnprior Waste Disposal Site (WDS) operates under ECA No. A412603 as a domestic, commercial and non-hazardous solid industrial waste and dewatered sewage sludge disposal site. The landfill is located on Part of Lots 9, 10, 11, Concession 13, Geographic Township of McNab. The approved waste disposal area is approximately 9.6 ha within a total approved site area of 40.44 ha. There are no engineering systems in place to control generated leachate and therefore the site operates as a naturally attenuating landfill.

Golder indicates that Contaminant Attenuation Zone (CAZ) lands located north and northeast of the landfill are covered with wood waste fill and the property was used for lumber industry related activities. Golder states that, in addition, the berms related to a rail line on CAZ lands are of unknown fill quality.

The landfill has been in operation since about 1970 and as of July 1, 2011, the site operations were subcontracted to Tomlinson Environmental Service Inc., Ottawa, Ontario.

Geology

Golder reports that the geology of the site comprises the following:

Overburden

- Major overburden deposits in the area are alluvial sand and glacial sand and/or gravel;
- The alluvial sand has a maximum thickness of 5.5 m at monitoring location OV-5;
- The glacial material occurs at surface or below the alluvial material and has a maximum thickness of 7 metres;
- Overburden thickness varies from less than 1 m to approximately 24 m in the southeastern portion of the site; and,
- Overburden located within the CAZ northeast of the rail line ranges from 0.5 to 1.8 m in thickness and consists of topsoil, sawdust fill and/or sand and gravel fill.

Bedrock

- The region is transected by several faults which generally trend in a northwesterly to southeasterly direction;
- A fault is reported to the southwest of the site with the landfill situated on the up-thrown side;
- Paleozoic bedrock geology at the site consists of Gull River Formation, Rockcliffe Formation and Oxford-March formation;
- The Rockcliffe Formation occurs as outcrops or near surface bedrock in the site area and adjacent properties;
- Test holes primarily encountered limestone bedrock. Bedrock monitors BR-5, BR-6 and BR-7, located north and east of the site, are drilled through the limestone of March-Oxford formation;
- The base of the Rockcliffe formation is believed to be shale encountered in the upper portion of bedrock well BR-6; and,
- Limestone and/or shale are encountered in monitors BR08-1 and BR08-3 to depths of 12.14 and 15.85 m, respectively. Monitor BR08-2 consists of approximately 0.76 m of sand and gravel fill underlain by sandstone, followed by layers of limestone, siltstone and shale.

Hydrogeology

The consultant determined the physical hydrogeological characteristics to be:

- Downward vertical gradients (recharging condition) are observed in multi-level bedrock monitors BR-1D/1S, BR-5D/5S, BR-8D/8S, BR-9D/9S and BR-13D/13S, and upward vertical gradients (discharging condition) at monitor BR-7D/7S which is close to Ottawa River;
- The vertical gradient between the overburden monitor OV-13 and bedrock monitor BR- 13S indicates downward groundwater flow;
- The horizontal hydraulic gradient in overburden is estimated to be 0.011 in April and 0.012 in October 2016;
- The horizontal hydraulic gradient in the shallow bedrock is estimated to be 0.011 in April and 0.010 in October 2016;
- The horizontal groundwater flow within the overburden unit is interpreted towards the north to northeast; and,
- The horizontal groundwater flow direction within the shallow bedrock unit is interpreted to be north and north-easterly towards the Ottawa River.

Site Visit

On February 23, 2018, Sr. Environmental Officer of MOECC, Emily Tieu; Surface Water Specialist of MOECC, Lauren Forrester; and Hydrogeologist of MOECC, Thomas Guo conducted a site visit of the landfill site and had an in-situ meeting with Deanna Nicholson from the town and Megan Farnel from Golder.

Groundwater Monitoring

In 2016, groundwater was sampled twice (spring and fall) at four (4) overburden monitors (OV-7, OV-9, OV-10 and OV-13), and at thirteen (13) bedrock monitors, nine (9) of them being multilevel monitors.

The spring groundwater monitoring session was conducted on April 19 and 20, 2016. The fall groundwater monitoring session was conducted on October 31 and November 1, 2016.

Background Groundwater quality

Prior to 2001, background groundwater conditions were represented by monitor OV-5 for the overburden and several nearby bedrock residential wells. In 2001, monitoring wells OV-13, BR-13S and BR-13D were installed to provide a more suitable background source of water quality at the site.

Overburden Background Quality

Groundwater quality at overburden background monitoring well OV-13 is historically variable with higher leachate indicator parameter concentrations in the spring than in the fall. Water quality from this monitor is characterized by elevated concentrations of iron, manganese and total dissolved solids (TDS) occasionally exceeding Ontario Drinking Water Quality Standards (ODWQS); slightly elevated concentrations of chloride (typically in spring); and low or non-detect concentrations of boron. Elevated chloride and TDS concentrations are interpreted by road salting activities.

Bedrock Groundwater Quality

Bedrock background quality has been monitored at monitors BR-13S and BR-13D which are characterized by elevated concentrations of TDS and chloride. TDS frequently exceeds the ODWQS and iron and manganese have occasionally exceeded the ODWQS. Groundwater quality within the bedrock is reported to be more mineralized than the overburden.

Leachate

Leachate quality from the waste mound has been characterized at monitoring well OV-7. During April and October 2016, the groundwater quality in this monitor met the ODWQS with the exceptions of dissolved organic carbon (DOC), iron, manganese, sodium (October only) and TDS. Golder states that generally parameter concentrations at this location are staying constant or decreasing.

The following parameters have been identified as site-specific leachate indicator parameters: alkalinity, ammonia, barium, boron, chloride, iron, hardness, potassium, manganese, sodium, TDS, and dissolved reactive phosphorous.

Volatile Organic Compounds (VOC's) were sampled in the spring of 2014. Benzene, chlorobenzene and 1,4 -Dichlorobenzene slightly exceeded the ODWQS.

Golder reports that the analytical results are historically consistent at this location.

Downgradient Water Quality

Golder provides the following interpretations, based on analysis of water quality using the Piper trilinear diagrams:

- Monitoring wells OV-7, BR-1D and BR-1S have been impacted by landfill leachate;
- Monitoring wells BR-5D, BR-5S, BR-6D, BR-6S, BR-8D, BR-8S, BR-9D, BR-9S, BR-12, BR08-1D, BR08-1S, BR08-2D and BR08-2S have been possibly impacted by landfill and wood waste deposited on the CAZ;
- Monitoring wells BR-7D, BR-7S, BR-10, BR-11, BR08-3D and BR08-3S are interpreted to be impacted by road salt, wood waste, or other industrial activities on CAZ lands, but not by landfill leachate; and,
- Monitoring wells OV-9, OV-10 and BR-3 are interpreted not to be impacted by landfill leachate or wood waste.

Golder indicates that concentrations of iron, manganese, TDS and DOC are equally likely to originate from the wood waste as from the landfill leachate and that these parameters are problematic as landfill leachate indicators, while the distribution of barium and boron in the shallow and deep monitors in CAZ lands suggested that these parameters may be better landfill leachate impact indicators.

Groundwater Surface Water Interaction

An on-site wetland is located to the north of the waste disposal area. There is a potential for groundwater to impact on-site surface water.

Guideline B-7

Reasonable Use Guideline B-7 (RUG) applies to operating waste disposal sites and sites closed post 1986. Golder provides the RUG assessment for leachate indicator parameters and compares the RUG limits to the downgradient groundwater quality at bedrock monitors BR-5D, BR-5S, BR-6D, BR-6S, BR-7D, BR-7S, BR-10, BR-11 and BR-12.

The following exceedances of RUG limits and/or trigger levels (75 % of RUG limits) were observed at these monitors:

- OV-10 – alkalinity, barium, iron, manganese and TDS;
- BR-5D – alkalinity, iron, manganese, DOC and TDS;
- BR-5S – alkalinity;
- BR-6D – alkalinity, barium, iron, manganese, sodium, DOC and TDS;
- BR-6S – alkalinity, manganese, and TDS;
- BR-7D – alkalinity, iron, manganese and TDS;
- BR-7S – alkalinity, manganese and TDS;
- BR-10 – alkalinity, iron, manganese, DOC and TDS; and,
- BR-12 – alkalinity, iron, manganese, DOC and TDS.

The consultant states that:

- Iron, manganese and TDS have historically been detected in the background monitor at similar concentrations to the spring concentrations in monitor OV-10. The sampling record for these parameters in the background monitor has shown significant fluctuation above or below the trigger value; therefore, these trigger exceedances at OV-10 are not considered indicative of deterioration groundwater quality due to the landfill;
- Exceedances of RUG limits and trigger concentrations at monitors BR-5D, BR-6D and BR-12 are interpreted to be the result from the effect of the wood waste historically deposited on the CAZ north of the rail line and/or the effect of the landfill;
- Exceedances at monitors BR-10 and BR-7S are interpreted to be due to the wood waste, road salt, or other industrial activities, but not to the landfill leachate; and,
- Based on the piper plots, BR-7D is interpreted to not be impacted by landfill leachate.

Trigger/Contingency Plans

Golder indicated that the trigger mechanism for groundwater was considered to be 75% of the RUG limits for leachate indicator parameters in the 2013 annual monitoring report. Golder indicates that iron, manganese and TDS are problematic leachate indicator parameters, due to their presence in the background monitor. Golder suggests that barium and boron may be better landfill leachate impact indicators.

Exceedances of trigger concentrations at compliance monitoring wells have been attributed to industrial and road salt activities and/or the effect of the landfill leachate. Trigger mechanisms should be developed which would initiate contingency actions as a result of unacceptable landfill leachate impact.

Groundwater Monitoring Program

Golder recommends that groundwater monitoring and sampling continue at a frequency of twice per year (spring and fall) with the current parameters list (Table 5). The reporting frequency is to be annual.

Discussion

(1) Leachate Indicator Parameters

The consultant suggests that barium and boron may be the better landfill impact indicators as iron, manganese and TDS are problematic.

I have noticed that that TDS and iron in bedrock aquifer are consistent low in the back groundwater monitoring wells. So, TDS and iron should be used as the leachate indicator parameters for all the bedrock monitoring wells.

Alkalinity is an important leachate indicator. As such, alkalinity should be included in the leachate indicator parameters.

(2) Wood Waste Historically Deposited on the CAZ

The ministry's policy requires the property owner take measures to prevent any contaminants from migrating off his/her property boundary. As such, the consultant's conclusions for exceedance of the RUG at monitoring wells BR-5D, BR-6D, BR-10, BR-7S and BR-12 along the northern property boundary are not acceptable. The site is not in compliance with the RUG along the northern property boundary.

The town should address the exceedance. Also, DOC should be used as one of the leachate indicator parameters.

(3) Trigger/Contingency Plans

It is acceptable that the trigger mechanism for groundwater is 75% of the RUG limits for leachate indicator parameters as long as above-mentioned recommendations are adopted.



Thomas Guo, M. Eng, P. Geo.
TG/dv

cc: Peter Taylor, Technical Support Manager
Greg Faaren, Water Resources Supervisor

c: Lauren Forrester, Surface Water Specialist
File No. GW RE MC 01 02 C13 (Arnprior WDS -A412603)
TG/IDS# 8377-AS8KHH

From: Farnel, Megan
To: ["emily.tieu@ontario.ca"](mailto:emily.tieu@ontario.ca)
Cc: [John Steckly](mailto:John.Steckly@arnprior.ca); ewilliams@arnprior.ca; [Edmond, Trish](mailto:Edmond.Trish@golder.com); [Caletti, Andria](mailto:Caletti.Andria@golder.com); [Guo, Thomas \(MECP\)](mailto:Guo.Thomas@ontario.ca); [Stephenson, Kyle \(MECP\)](mailto:Stephenson.Kyle@ontario.ca)
Subject: RE: Arnprior Waste Disposal Site - Groundwater Compliance actions
Date: August-23-18 2:06:53 PM
Attachments: [Proposed Location BR18-1S and D.PDF](#)
[image001.jpg](#)
[image003.jpg](#)

Hello,

I missed the attachment on the first email. Please see attached.

Regards,

Megan

From: Farnel, Megan
Sent: Thursday, August 23, 2018 9:08 AM
To: 'emily.tieu@ontario.ca' <emily.tieu@ontario.ca>
Cc: 'John Steckly' <jsteckly@arnprior.ca>; 'ewilliams@arnprior.ca' <ewilliams@arnprior.ca>; Edmond, Trish <Trish_Edmond@golder.com>; Caletti, Andria <Andria_Caletti@golder.com>; Guo, Thomas (MECP) <Thomas.Guo@ontario.ca>; Stephenson, Kyle (MECP) <Kyle.Stephenson@ontario.ca>
Subject: Arnprior Waste Disposal Site - Groundwater Compliance actions

Hi Emily,

Further to our conference call on Wednesday, we provide the following information regarding actions by the Town to address groundwater compliance concerns as presented in groundwater comments on the 2016 Report (and associated groundwater trigger mechanism) and subsequently discussed during the meeting on June 22, 2018:

Golder, on behalf of the Town, proposes to install a multi-level monitoring well at the location shown on the attached site plan. The wells would be installed as per Ontario Regulation (O.Reg.) 903/90 under the supervision of a licensed Golder technician at depths of approximately 10 metres below ground surface (BH18-1S) and 22 metres below ground surface (BH18-1D). Based on historical interpretations of groundwater flow direction in bedrock at the Site, this location is interpreted to be cross-gradient from the landfill leachate plume. As such, it is interpreted that groundwater sampled at a monitoring well at this location could be representative of impacts from historical industrial activities and not from landfill leachate, provided that groundwater levels in bedrock confirm the previous groundwater flow interpretation. Should the above be confirmed by initial sampling, this new groundwater monitoring well would be proposed to establish background groundwater quality for the purpose of assessing compliance of the Site with Guideline B-7. Five sampling sessions (collected on a roughly 3 week to monthly basis) will be conducted in order to accumulate sufficient data to characterize the groundwater quality at this location. Groundwater levels will be measured in the new wells alongside a subset of the existing wells during the five monitoring events to establish an understanding of groundwater flow conditions.

Should you have any questions, please don't hesitate to contact us.

Thank you,

Megan

Megan Farnel (P. Eng.)

Senior Environmental Engineer

Golder Associates Ltd.

1931 Robertson Road, Ottawa, Ontario, Canada, K2H 5B7

T: +1 613 592 9600 | **D:** +1 613 287 3286 x3260 | **C:** +1 613 402 3571 | golder.com

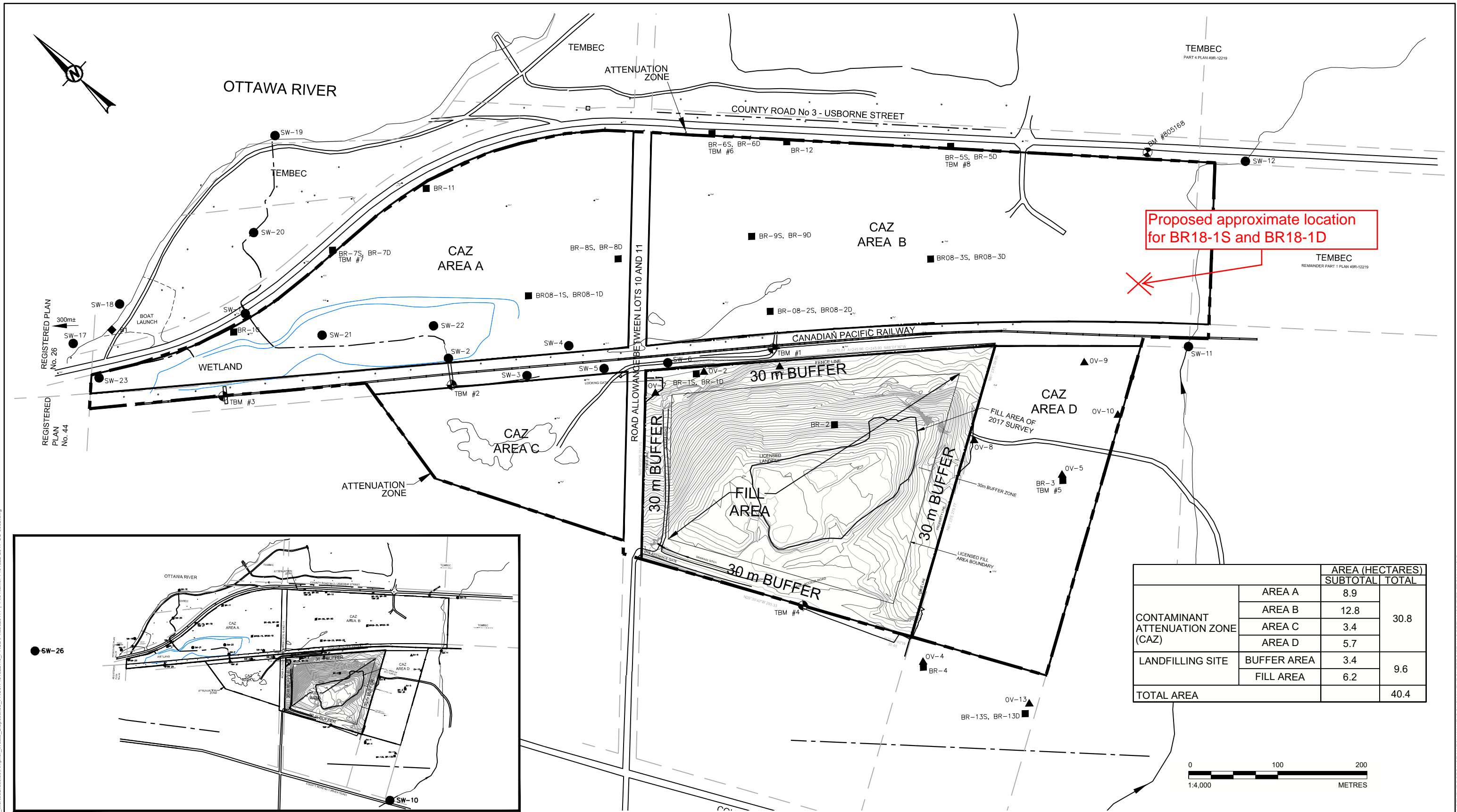
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Proposed approximate location for BR18-1S and BR18-1D

		AREA (HECTARES)	
		SUBTOTAL	TOTAL
CONTAMINANT ATTENUATION ZONE (CAZ)	AREA A	8.9	30.8
	AREA B	12.8	
	AREA C	3.4	
	AREA D	5.7	
LANDFILLING SITE	BUFFER AREA	3.4	9.6
	FILL AREA	6.2	
TOTAL AREA			40.4



- LEGEND**
- BR-1 BEDROCK MONITORING STATION
 - SW-6 SURFACE WATER MONITORING STATION
 - ▲ OV-7 OVERBURDEN MONITORING STATION
 - TBM #6 TEMPORARY BENCHMARK
 - TOPOGRAPHICAL CONTOURS (2013, 2014, 2015, 2016 & 2017 COMBINED SURVEYS)

- NOTES**
- THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT No. 1401322-2017.
 - COORDINATE SYSTEM: UTM ZONE 18 North (75w), DATUM: NAD 1983 (CAN.), GEOID: CANADA EAST.
- REFERENCE**
- BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
 - TOPOGRAPHICAL CONTOURS BEYOND THE EXTENT OF THE 2014 TO 2017 SURVEYS SUPPLIED IN DIGITAL FORMAT BY JP2G CONSULTANTS INC.

CLIENT	CORPORATION OF THE TOWN OF ARNPRIOR
CONSULTANT	YYYY-MM-DD 2017-01-16
	PREPARED MLF
	DESIGN ALC
	REVIEW MKF
	APPROVED PLE

PROJECT	2017 SITE DEVELOPMENT, OPERATIONS AND ENVIRONMENTAL MONITORING ARNPRIOR WASTE DISPOSAL SITE		
TITLE	SITE PLAN		
PROJECT No.	1401322	PHASE	2017
Rev.	0		
FIGURE	2		

Path: \\golder\gpc\projects\active\spatial\mrt\township_mech\brasside\ampric_v\waste_disposal\99_PROD\1401322\40_PROD\Phase2017\1 File Name: 1401322-2017-CD-0002.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B

From: Caletti, Andria
Sent: November 28, 2019 5:17 PM
To: Ponal, Thandeka (MECP)
Cc: kyle.stephenson@ontario.ca; thomas.guo@ontario.ca; Edmond, Trish; Deanna Nicholson; John Steckly; Tariq, Maliha (MECP)
Subject: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call
Attachments: REFERENCE NUMBER 5404-BBRM9M.pdf

Hi Thandeka,

As discussed on the conference call between the MECP Technical Support and District Office, the Town of Arnprior and Golder, we are proposing that the deadline for the revised trigger mechanism for the Arnprior Waste Disposal Site (ECA No. A412603) be removed, and be replaced with a requirement to submit to the MECP District Office an Options Assessment of contingency measures related to groundwater compliance at the Site.

As discussed at a high level, the Town previously retained Golder to investigate whether groundwater monitoring wells installed in an area expected to be upgradient of the landfill and in an area believed to be impacted by historical activities could help discern the differences between landfill impacts and historical impacts in the CAZ. Specifically the hope was that the investigation could be used to establish a new understanding of background groundwater quality that would put the site into compliance at the property boundary. Golder conducted analyses to determine if the new background wells (BR-18S/D) were useful in reducing or eliminating site compliance issues. When analyzing the groundwater level data and groundwater quality data, there is evidence to suggest that there may be two different aquifers present at site. Based on this, two different methods were used to develop a Reasonable Use Guideline; an RUG based on combined background data of the shallow and deep wells as well as a separate RUG for shallow and deep monitoring wells. Both methods to develop the RUG alleviated some site compliance issues but not all. It was determined that using BR-18 as a background well was not effective in reducing or eliminating site compliance issues. Further, the predominant interpreted groundwater flow direction establishes that BR-18 is in fact downgradient of the landfill and not suitable as a background monitor.

The Town has considered the purchase of the downgradient groundwater rights, but given that the downgradient property has high development value attaining groundwater rights or property purchase will be very costly. In addition, the Town has concerns regarding potential pre-existing contamination of the downgradient groundwater via historical activities on that property. The Town has asked Golder undertake an Options Assessment that would consider if there are other contingency options available to alleviate the groundwater compliance issues.

Presently, there is a draft Notice to the ECA to amend condition 41 of the ECA to extend the deadline for the trigger mechanism to December 31, 2019 (MECP Reference No. 5404-BBRM9M). As discussed on the call, we would like to propose to the MECP Approvals Branch (with concurrence from the District Office and Technical Support) that the draft ECA condition 41 be changed to provide a deadline for submission of the Options Assessment to the MECP by June 30, 2020.

We propose that Condition 41 be amended to read:

41. By no later than June 30, 2020, the Owner shall submit to the District Manager an Options Assessment providing contemplated contingency measures to address groundwater compliance at the Site.

It is acknowledged that in some point in the future the site ECA will require amendment to formally acknowledge and approve the preferred contingency measure to address groundwater compliance. At that time the groundwater trigger mechanism is also likely to require amendment.

Please advise if the District Office and Technical Support are in agreement with the proposed course of action. I have CC'ed Maliha Tariq from Approvals Branch who is looking after the draft ECA Notice (MECP Reference No. 5404-BBRM9M).

Thank you,

Andria

From: [Deanna Nicholson](#)
To: enviropermissions@ontario.ca; [Ponalo, Thandeka \(MECP\)](#)
Cc: [Caletti, Andria](#)
Subject: PANDEMIC RELIEF - ECA REQUEST - WASTE - TOWN OF ARNPRIOR
Date: June 15, 2020 2:59:19 PM
Attachments: [Relief Waste ECA Form - Town of Arnprior - Options Assessment Contingency Measures - June 15 2020. \(JS DN\).pdf](#)
[Relief Waste ECA Form - Town of Arnprior - Options Assessment Contingency Measures - June 15 2020. \(JS DN\).pdf](#)
[FINAL - AWDS Design and Operations Report, April 2015.pdf](#)

EXTERNAL EMAIL

Good Afternoon,

Please find attached a request for relief from ECA conditions imposed by ECA A412603, for the Town of Arnprior's Waste Disposal Site, due to Covid-19. The Town has provided our local MECP contact (Thandeka Ponalo) with notification of our intent to submit this request and cc'd her on this email.

If you have any questions or concerns regarding this application, please do not hesitate to call or email.

Kind Regards,
Deanna Nicholson

Deanna Nicholson
Environmental Engineering Officer
Town of Arnprior
105 Elgin Street W.
Arnprior ON K7S 0A8
(613)623-4231 ext. 1832
dnicholson@arnprior.ca
www.arnprior.ca
[@arnprior](#)

We are OPEN for business, however due to the COVID-19 pandemic and in line with recommendations from local health units we are not allowing the public to enter our offices. We ask you to please call or e-mail for assistance with your query. Please visit www.arnprior.ca. We thank you for your patience during this time, and appreciate the role you play in keeping our community safe.

This e-mail is privileged & confidential. If it is not addressed to or intended for you, and you receive it, kindly delete it and all copies and advise the sender right away. Thank you.

Please consider the environment before printing this e-mail.

General Information and Instructions

General

Information requested in this form is collected under the authority of the *Environmental Protection Act*, R.S.O. 1990, c. E.19 (EPA) and the *Environmental Bill of Rights, 1993*, S.O. 1993, c. 28, (EBR) and will be used to evaluate requests for relief regarding environmental compliance approvals (ECA) issued under Part II.1 of the EPA.

This form may **only** be used for requesting temporary relief (alternate arrangements) with the Ministry of the Environment, Conservation and Parks (ministry) for waste disposal site and waste management system ECAs during a pandemic event. If the ministry determines the activities requested are not related to operational activities resulting from the COVID-19 emergency, the request will be returned.

Questions regarding the preparation or submission of this form or about the ministry's collection of information related to applying for an ECA, contact the Client Services and Permissions Branch by phone at 416-314-8001 or 1-800-461-6290 (toll free) or by e-mail at enviopermissions@ontario.ca.

Instructions

1. Applicants are responsible for ensuring that they complete the appropriate form for their request. Information about the required supporting documentation and technical requirements are available from the Client Services and Permissions Branch and from the local district office. You can find the local district office online at <https://www.ontario.ca/environment-and-energy/ministry-environment-district-locator>.
2. A complete request consists of:
 - A completed and signed request form
 - All required supporting documents and technical requirements identified in section 5 of this form, ministry guidance and the applications for Environmental Compliance Approvals regulation.
3. Submit a complete electronic copy of this request to enviopermissions@ontario.ca with the subject heading "PANDEMIC RELIEF ECA REQUEST – WASTE"
4. The applicant must also submit a copy of the request to the local ministry district office.

Information collected by the ministry is subject to the *Freedom Information and Protection of Privacy Act*, R.S.O. 1990, c. F.31. If the applicant is of the view that any part of the request is confidential on the grounds that such information constitutes a trade secret or scientific, technical, commercial, financial or labour relations information, please make this known now. Otherwise, the ministry may make the information available to the public without further notice to the applicant. It is an offence under the EPA to provide false or misleading information in this application and/or accompanying documents.

1. Applicant Information

1.1 Applicant Type

- Corporation
 Individual
 Federal Government
 Municipal Government
 Partnership
 Sole Proprietor
 Provincial Government
 Other _____

1.2 Applicant Name and Business

Applicant Name (legal name of individual or organization as evidenced by legal documents)

Corporation of the Town of Arnprior

Business Name same as legal name above

Primary North American Industry Classification System (NAICS) Code
91391

Other NAICS Code

Business Activity Description

Lower Tier Municipality

1.3 Applicant Physical Address

Unit Number	Street Number 105	Street Name Elgin St W	
Concession/Rural Route		PO Box	
City/Town Arnprior	Province ON, Canada	Country	Postal Code K7S0A8

1.4 Applicant Mailing Address

same as Applicant physical address above

Unit Number	Street Number	Street Name	
Concession/Rural Route		PO Box	
City/Town	Province	Country	Postal Code

1.5 Applicant Contact Name

Last Name Steckly	First Name John	Title General Manager, Operations
Telephone Number 613-623-4231 ext 1831	Mobile Number 613-314-7333	Email Address jsteckly@arnprior.ca

2. Technical Contact Information

2.1 Primary Technical Contact

same as Applicant contact name above

Last Name Nicholson	First Name Deanna	
Title Environmental Engineering Officer	Company Name Town of Arnprior	
Telephone Number 613-623-4231 ext 1832	Mobile Number	Email Address dnicholson@arnprior.ca

2.2 Secondary Technical Contact

Last Name Caletti	First Name Andria	
Title Environmental Engineer	Company Name Golder Associates Ltd.	
Telephone Number 613-592-9600 ext 3285	Mobile Number	Email Address Andria_Caletti@golder.com

3. Project Site Address

Mobile Truck Storage Yard Location Multi-Site Note: Provide site location(s) in a separate attachment, if necessary

Unit Number	Street Number 658	Street Name River Road
Municipality/Unorganized Township McNab/Braeside		County/District Renfrew
Concession and/or Rural Route		Ministry District Office (use the online district locator to find your local district office) Ottawa

4. Project Information

4.1.a. Project Type – Waste Disposal Site (check all that apply)

- Landfill Site Processing Site Thermal Treatment Site
 Transfer Site Composting Site

4.1.b. Project Type – Waste Management Systems (check all that apply)

- Liquid Industrial Waste and Hazardous Management System Hauled Sewage (Septage)
 Mobile Waste Processing

4.2 Name and Description

Project Name

ECA Condition 28.1 - Contingency Measures to address groundwater compliance.

Rationale for Relief Request - note, if the ministry determines the requested activities are not related to operational activities resulting from the COVID-19 emergency, the request will be returned.

The Town of Arnprior has been operating under reduced capacity, including the closure of Arnprior Town Hall, since mid March due to Covid-19 restrictions. As such there were significant delays in the initiation and undertaking of this task (preparation of Contingency Measures report) due to Covid-19. The preparation of an Options Assessment report to identify and evaluate the contingency measures available to address groundwater compliance has since been initiated and significant progress has been made to date. However, it has been identified that consultation with affected parties and some additional engineering work is required before the report can be responsibly provided to the Town of Arnprior Council and MECP.

Summary Description of Relief Services - please use the table in section 4.3 of this form to summarize proposed changes to conditions of current approvals (or use the table as a separate attachment)

The Town requests a 6 month extension to the deadline stated in condition 28.1, to submit contingency measures. The current deadline is June 30, 2020. The Town requests a new deadline of December 31, 2020.

4.2 Request Type

- New ECA Amendment to existing ECA

4.3 Existing Approvals and Conditions (if amendment)

Separate list attached? Yes No

Current ECAs that may be amended by this request - only complete fields applicable to request

ECA Number	Date of Issuance (yyyy/mm/dd)	Condition No.	Description of Proposed Changes to Current Condition
A412603	2020/03/10	28.1	Extension of deadline to submit Contingency Measures from June 30, 2020 to December 31, 2020.

5. Checklist of Supporting Documentation

5.a. Waste Disposal Sites

For waste disposal sites, please ensure the following documentation is included with your request for relief activities:

- Proof of legal name
- List of current ECAs that may be amended
- Clear description of changes to conditions of current approval(s) [table in 4.3 of request form may be provided as a separate attachment]
- Concise Design and Operations Report to include the following information:
 - Clear description of processes (for each site, if multiple sites)
 - Clear description of relief activities requiring ministry approval
 - Site plan where waste will be handled, stored and/or processed
 - Description of mitigation measures to manage the waste (e.g. mandatory cleaning schedules for waste storage areas and equipment, covered leak proof containers to prevent off-site impacts), staff training
- Contingency plan that will be used to ensure relief activities are managed effectively to minimize adverse effects (e.g. spill, fire, other emergency situations)
- Complaint response protocols that will be used during temporary period/operation of relief activities

5.b. Waste Management Systems

For waste management systems, please ensure the following documentation is included with your request for relief activities:

- Proof of legal name
- List of current ECAs that may be amended
- List of waste types and classes to be hauled
- Clear description of changes to conditions of current approval(s) [table in 4.3 of request form may be provided as a separate attachment]
- Truck storage yard location(s)
- Letter of consent from land owner (if the applicant is not the owner of the truck storage location)
- Vehicle insurance
- Vehicle ownership

Please note: No fees are required in connection with this request.

6. Authorization

6.1 Statement of the Applicant

I am authorized and have legal authority to prepare and submit this request for the subject pandemic relief. I have reviewed the complete request and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The activities proposed in this request is considered a pandemic related relief activity.
- The information contained in this request is complete and accurate.
- The technical contact identified in this request has/have been authorized to prepare certain technical material, and act on behalf of the applicant to discuss this request with the ministry and to provide additional information about this request to the ministry on request.
- The information provided to Technical Contact in relation to the request is complete and accurate.

Name of Signing Authority

Last Name
Steckly

First Name
John

Title
General Manager, Operations

Email Address
jsteckly@arnprior.ca

Telephone Number
613-623-4231 ext 1831

Mobile Number
613-314-7333

Signature



Date (yyyy/mm/dd)

2020/06/15

6.2 Statement of Technical Contacts

I have been authorized by the applicant to prepare the technical materials for the area(s) of responsibility identified in section 5 that are included in this request. I have reviewed those technical materials and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The technical materials contained in this request in respect of the area(s) of responsibility identified in section 5 are complete and accurate.
- I have the relevant education and experience necessary to provide this certification.

Name of Technical Contact

Last Name
Nicholson

First Name
Deanna

Title
Environmental Engineering Officer

Email Address
dnicholson@arnprior.ca

Telephone Number
613-623-4231 ext 1832

Mobile Number

Signature

Deanna Nicholson

Digitally signed by Deanna Nicholson
Date: 2020.06.15 13:51:52 -04'00'

Date (yyyy/mm/dd)

2020/06/15

From: [Caletti, Andria](#)
To: [Ponalo, Thandeka \(MECP\)](#)
Cc: [kyle.stephenson@ontario.ca](#); [thomas.guo@ontario.ca](#); [Edmond, Trish](#); [Deanna Nicholson](#); [John Steckly](#)
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call
Date: September 2, 2020 3:30:00 PM
Attachments: [image001.jpg](#)
[image002.jpg](#)
[image005.jpg](#)

Hi All,

Please see below for a summary of the discussions had and actions arising from the call on Thursday, August 27, 2020.

Golder provided a summary of the groundwater compliance issue and actions to date by the Town. The Town is presently working toward fulfilling the requirements of Condition 28.1 of ECA No. A412603 (i.e., submit contingency measures to address groundwater compliance issue) (note: an extension to the deadline for Condition 28.1 was submitted using the Pandemic Relief form on June 15, 2020).

The purpose of the call was to seek comments from the MECP on short-listed contingency options so that these comments could be considered in the presentation of the options to the Town of Arnprior's Municipal Council. Approval from the Town Council will be required before a contingency option can be presented to the MECP to fulfill Condition 28.1.

Golder presented the following short-listed contingency options, discussed as described below:

1. Purchase of Downgradient Groundwater Rights

The purchase of GW rights on the downgradient property between the landfill site and the Ottawa River would put the Site into compliance with the requirements of Guideline B-7 by removing the possibility for future downgradient groundwater users (there are presently no downgradient groundwater users). It was discussed that this option is anticipated to be cost prohibitive at this time, due to the perceived value of the waterfront property. The Town/Golder indicated that while there has been interest expressed in the Site by residential developers in the past, none have pursued the purchase of the land. A review of the MECP well database by Golder during the call indicated that there have been no test-wells installed on the property to assess groundwater quality. The Town also expressed concern with inheriting legacy groundwater contamination issues that could be present on the former lumber yard not related to the landfill.

The Town/Golder asked if a legal agreement with the current property owner giving the Town first right of refusal to purchase the groundwater rights could be considered as an alternative to immediately purchasing the downgradient groundwater rights. The MECP expressed that while a first right of refusal type agreement has not been used for this purpose before to their knowledge, this would meet the same intent as purchasing groundwater rights of limiting the use of downgradient groundwater. It was acknowledged by all that this could result in the required future purchase of the groundwater rights by the Town, however would delay the requirement to do so

and is reasonable given that there are currently no groundwater users downgradient from the Site. The MECP agreed to discuss internally and advise the Town on whether such an agreement in principle would be acceptable, noting that there are details that would have to be considered on implementation.

2. Pump and Treat

The option to collect and treat impacted groundwater to lower concentrations of parameters of concern at the property boundary was discussed. Golder noted that this would not be an immediate solution (requiring time to implement (design and construct) and time before a decrease in concentrations at the property boundary would be observed). Golder also noted that the hydrogeological conditions (fractured bedrock and proximity to the Ottawa River) mean that this could not be guaranteed as a solution. Golder noted that the option to pump and treat would be a long-term and costly requirement for the Town, and that before this could even be pursued, additional studies would be required to assess the potential effectiveness.

The MECP indicated that, because there are no existing groundwater users, the time required to achieve compliance concentrations is less urgent than if there were existing downgradient groundwater users.

3. Low Permeability Cover and/or Early Site Closure

The option to replace the approved soil final cover with a low permeability cover to reduce the volume of leachate generated by the landfill over time was discussed. This would be a long-term solution, with improvement to downgradient water quality not expected for decades after the remaining site capacity is filled. A phased implementation of a low-permeability final cover has been considered, however due to the way the site has been developed only small portions are presently at final elevation and ready for cover, mostly on the slope of the landfill.

The option to close the site early and install a final cover (either soil or low-permeability) was also discussed. Golder has estimated the contaminating lifespan of the site with early closure and regular soil cover, and it is estimated to be around 50 years (noting that the lack of hydrogeological information as discussed above limits the accuracy of the model). Compliant concentrations of parameters of concern at the property boundary would likely be observed prior to the end of the CLS, however this is still considered to be a long term solution.

The MECP noted that while there are no current groundwater users, the risk is that the downgradient property be developed in the future and groundwater use pursued before the Site becomes compliant with Guideline B-7. It was generally acknowledged that these long-term solutions may require further action in the future should downgradient groundwater use be proposed.

Actions arising from the call:

- MECP to discuss the possibility of a legal agreement between the Town and the downgradient

property owner that would provide the Town the first right of refusal to purchase the groundwater rights.

- MECP to provide additional comments on the other proposed options if applicable.

Please let us know if you have any comments, corrections or additions to this record.

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

Golder Associates Ltd.

1931 Robertson Road, Ottawa, Ontario, Canada, K2H 5B7

T: +1 613 592 9600 | **D:** +1 613 592 9600 x3285 | **C:** +1 613 983 4654 | golder.com

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Please consider the environment before printing this email.

From: Caletti, Andria

Sent: August 6, 2020 5:02 PM

To: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>

Cc: kyle.stephenson@ontario.ca; thomas.guo@ontario.ca; Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly <jsteckly@arnprior.ca>

Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

Hi Thandeka,

Further to the correspondence below and to the associated new Condition 28.1 of ECA A412603 (attached), the Town is preparing contingency measures to address groundwater compliance at the Site to be presented to Town Council for concurrence before submission to the MECP (note that the Town has applied for an extension to the June 30, 2020 deadline through the "Request for Pandemic Related Temporary Regulatory Relief").

The Town is proposing a conference call to discuss some of the contingency options that have been identified. Prior to presenting contingency options to Council for a decision, the Town would like to speak with you about the possible contingency measures so that comments that you may have can

be considered in the selection of a contingency measure to fulfill the requirements of Condition 28.1.

We are proposing a conference call for the week of August 24th, 2020. Please advise on availability for a conference call during that week.

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

Golder Associates Ltd.
1931 Robertson Road, Ottawa, Ontario, Canada, K2H 5B7
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From: Caletti, Andria
Sent: November 28, 2019 5:17 PM
To: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>
Cc: kyle.stephenson@ontario.ca; thomas.guo@ontario.ca; Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly <jsteckly@arnprior.ca>; Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Subject: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

Hi Thandeka,

As discussed on the conference call between the MECP Technical Support and District Office, the Town of Arnprior and Golder, we are proposing that the deadline for the revised trigger mechanism for the Arnprior Waste Disposal Site (ECA No. A412603) be removed, and be replaced with a requirement to submit to the MECP District Office an Options Assessment of contingency measures related to groundwater compliance at the Site.

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landfill impacts and historical impacts in the CAZ. Specifically the hope was that the investigation could be used to establish a new understanding of background groundwater quality that would put the site into compliance at the property boundary. Golder conducted analyses to determine if the new background wells (BR-18S/D) were useful in reducing or eliminating site compliance issues. When analyzing the groundwater level data and groundwater quality data, there is evidence to suggest that there may be two different aquifers present at site. Based on this, two different methods were used to develop a Reasonable Use Guideline; an RUG based on combined background data of the shallow and deep wells as well as a separate RUG for shallow and deep monitoring wells. Both methods to develop the RUG alleviated some site compliance issues but not all. It was determined that using BR-18 as a background well was not effective in reducing or eliminating site compliance issues. Further, the predominant interpreted groundwater flow direction establishes that BR-18 is in fact downgradient of the landfill and not suitable as a background monitor.

The Town has considered the purchase of the downgradient groundwater rights, but given that the downgradient property has high development value attaining groundwater rights or property purchase will be very costly. In addition, the Town has concerns regarding potential pre-existing contamination of the downgradient groundwater via historical activities on that property. The Town has asked Golder undertake an Options Assessment that would consider if there are other contingency options available to alleviate the groundwater compliance issues.

Presently, there is a draft Notice to the ECA to amend condition 41 of the ECA to extend the deadline for the trigger mechanism to December 31, 2019 (MECP Reference No. 5404-BBRM9M). As discussed on the call, we would like to propose to the MECP Approvals Branch (with concurrence from the District Office and Technical Support) that the draft ECA condition 41 be changed to provide a deadline for submission of the Options Assessment to the MECP by June 30, 2020.

We propose that Condition 41 be amended to read:

41. By no later than June 30, 2020, the Owner shall submit to the District Manager an Options Assessment providing contemplated contingency measures to address groundwater compliance at the Site.

It is acknowledged that in some point in the future the site ECA will require amendment to formally acknowledge and approve the preferred contingency measure to address groundwater compliance. At that time the groundwater trigger mechanism is also likely to require amendment.

Please advise if the District Office and Technical Support are in agreement with the proposed course of action. I have CC'ed Maliha Tariq from Approvals Branch who is looking after the draft ECA Notice (MECP Reference No. 5404-BBRM9M).

Thank you,

Andria

From: [Ponalo, Thandeka \(MECP\)](#)
To: [Caletti, Andria](#)
Cc: [Stephenson, Kyle \(MECP\)](#); [Guo, Thomas \(MECP\)](#); [Edmond, Trish](#); [Deanna Nicholson](#); [John Steckly](#)
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call
Date: October 6, 2020 10:04:46 AM
Attachments: [image001.jpg](#)
[image003.jpg](#)

EXTERNAL EMAIL

Hello Andria,

As requested, the Ministry has reviewed option one of the short-listed contingency options to Purchase the Downgradient Groundwater Rights. The review concluded that obtaining a right of first refusal to purchase the groundwater rights may comply with the requirements in Guideline B-7. However, before we can approve it, we will require a detailed proposal which includes the legal instruments to be used to obtain these rights. Once we have the full proposal, we can review the legality of the option and provide a definite response.

If you have any questions about the above, please do not hesitate to give me a call at 613-858-0695.

Thank you,

Thandeka Ponalo

Senior Environmental Officer
Ministry of the Environment, Conservation and Parks
Ottawa District Office
2430 Don Reid Drive
Ottawa ON K1H 1E1
Tel: 613-521-3450 x249 | Fax: 613-521-5437
Spills Action Centre (SAC): 1-800-268-6060
Thandeka.Ponalo@ontario.ca | www.ene.gov.on.ca

From: Caletti, Andria <Andria_Caletti@golder.com>
Sent: September 2, 2020 3:30 PM
To: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>
Cc: Stephenson, Kyle (MECP) <Kyle.Stephenson@ontario.ca>; Guo, Thomas (MECP) <Thomas.Guo@ontario.ca>; Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly <jsteckly@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

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Please let us know if you have any comments, corrections or additions to this record.

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

Golder Associates Ltd.

1931 Robertson Road, Ottawa, Ontario, Canada, K2H 5B7

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Sent: August 6, 2020 5:02 PM

To: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>

Cc: kyle.stephenson@ontario.ca; thomas.guo@ontario.ca; Edmond, Trish

<Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly

<jsteckly@arnprior.ca>

Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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Thank you,

Andria

Andria Caletti, P.Eng.

Environmental Engineer

Golder Associates Ltd.

1931 Robertson Road, Ottawa, Ontario, Canada, K2H 5B7

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Sent: November 28, 2019 5:17 PM

To: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>

Cc: kyle.stephenson@ontario.ca; thomas.guo@ontario.ca; Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly <jsteckly@arnprior.ca>; Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>

Subject: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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41. By no later than June 30, 2020, the Owner shall submit to the District Manager an Options Assessment providing contemplated contingency measures to address groundwater compliance at the Site.

It is acknowledged that in some point in the future the site ECA will require amendment to formally acknowledge and approve the preferred contingency measure to address groundwater compliance. At that time the groundwater trigger mechanism is also likely to require amendment.

Please advise if the District Office and Technical Support are in agreement with the proposed course of action. I have CC'ed Maliha Tariq from Approvals Branch who is looking after the draft ECA Notice (MECP Reference No. 5404-BBRM9M).

Thank you,

Andria

December 3, 2020

Project No. 19134510

District Manager

Ministry of the Environment, Conservation and Parks
Ottawa District Office
2430 Don Reid Dr, Unit 103
Ottawa, ON
K1H 1E1

ARNPRIOR WASTE DISPOSAL SITE – GROUNDWATER COMPLIANCE CONTINGENCY PLAN

Dear District Manager,

Golder Associates Ltd. (Golder) is submitting this letter on behalf of the Town of Arnprior (Town). The purpose of this letter is to fulfill the requirements of Condition 28.1 of Environmental Compliance Approval (ECA) No. A412603 for the Arnprior Waste Disposal Site. Condition 28.1 states:

By no later than June 30, 2020, the Owner shall submit to the District Manager contingency measures to address groundwater compliance at the Site.

It is noted that a request for pandemic related temporary regulatory relief was submitted to the Ministry of the Environment, Conservation and Parks (MECP) requesting a six month extension to the requirements of Condition 28.1. The request for pandemic related temporary regulatory relief is provided in Attachment A.

An Options Assessment was prepared by Golder to present and compare possible contingency options that the Town could consider to address the groundwater compliance issue identified by the MECP Groundwater Reviewer in March 23, 2018 comments on the 2016 Annual Monitoring Report for the Site. The Options Assessment is provided in Attachment B.

Following a review of the options assessment, the Town's municipal council resolved that the Town would further investigate Option 1 as described in the Options Assessment (Attachment B) as the preferred contingency option to bring the Arnprior Waste Disposal Site back into compliance with respect to groundwater.

As required by Condition 28.2 of ECA No. A412603, an amendment application to the ECA providing details of the contingency plan to be implemented and the proposed deadline for an update to the trigger mechanism shall be submitted within six months of receiving approval of the proposed contingency measure from the District Manager.

We trust that this letter and its attachments satisfy the requirements of Condition 28.1 of ECA No. A412603. Should you have any questions, please do not hesitate to contact the undersigned.

Golder Associates Ltd.



Andria Caletti, P.Eng.
Environmental Engineer



Trish Edmond, M.E.Sc., P.Eng.
Principal

ALC/PLE/sg

[https://golderassociates.sharepoint.com/sites/119264/project files/5 technical work/mecp submission/19134510-l-awds gw compliance contingency plan.docx](https://golderassociates.sharepoint.com/sites/119264/project%20files/5%20technical%20work/mecp%20submission/19134510-l-awds%20gw%20compliance%20contingency%20plan.docx)

CC: Deanna Nicholson, Town of Arnprior
Thandeka Ponalo, Environmental Officer, MECP

Attachments: Attachment A – Request for Pandemic Related Temporary Regulatory Relief
Attachment B – Options Assessment

ATTACHMENT A

**Request for Pandemic Related
Temporary Regulatory Relief**

General Information and Instructions

General

Information requested in this form is collected under the authority of the *Environmental Protection Act*, R.S.O. 1990, c. E.19 (EPA) and the *Environmental Bill of Rights, 1993*, S.O. 1993, c. 28, (EBR) and will be used to evaluate requests for relief regarding environmental compliance approvals (ECA) issued under Part II.1 of the EPA.

This form may **only** be used for requesting temporary relief (alternate arrangements) with the Ministry of the Environment, Conservation and Parks (ministry) for waste disposal site and waste management system ECAs during a pandemic event. If the ministry determines the activities requested are not related to operational activities resulting from the COVID-19 emergency, the request will be returned.

Questions regarding the preparation or submission of this form or about the ministry's collection of information related to applying for an ECA, contact the Client Services and Permissions Branch by phone at 416-314-8001 or 1-800-461-6290 (toll free) or by e-mail at enviopermissions@ontario.ca.

Instructions

1. Applicants are responsible for ensuring that they complete the appropriate form for their request. Information about the required supporting documentation and technical requirements are available from the Client Services and Permissions Branch and from the local district office. You can find the local district office online at <https://www.ontario.ca/environment-and-energy/ministry-environment-district-locator>.
2. A complete request consists of:
 - A completed and signed request form
 - All required supporting documents and technical requirements identified in section 5 of this form, ministry guidance and the applications for Environmental Compliance Approvals regulation.
3. Submit a complete electronic copy of this request to enviopermissions@ontario.ca with the subject heading "PANDEMIC RELIEF ECA REQUEST – WASTE"
4. The applicant must also submit a copy of the request to the local ministry district office.

Information collected by the ministry is subject to the *Freedom Information and Protection of Privacy Act*, R.S.O. 1990, c. F.31. If the applicant is of the view that any part of the request is confidential on the grounds that such information constitutes a trade secret or scientific, technical, commercial, financial or labour relations information, please make this known now. Otherwise, the ministry may make the information available to the public without further notice to the applicant. It is an offence under the EPA to provide false or misleading information in this application and/or accompanying documents.

1. Applicant Information

1.1 Applicant Type

- Corporation
 Individual
 Federal Government
 Municipal Government
 Partnership
 Sole Proprietor
 Provincial Government
 Other _____

1.2 Applicant Name and Business

Applicant Name (legal name of individual or organization as evidenced by legal documents)

Business Name same as legal name above

Primary North American Industry Classification System (NAICS) Code

Other NAICS Code

Business Activity Description

1.3 Applicant Physical Address

Unit Number	Street Number	Street Name	
Concession/Rural Route		PO Box	
City/Town	Province	Country	Postal Code

1.4 Applicant Mailing Address

same as Applicant physical address above

Unit Number	Street Number	Street Name	
Concession/Rural Route		PO Box	
City/Town	Province	Country	Postal Code

1.5 Applicant Contact Name

Last Name	First Name	Title
Telephone Number	Mobile Number	Email Address

2. Technical Contact Information

2.1 Primary Technical Contact

same as Applicant contact name above

Last Name	First Name	
Title	Company Name	
Telephone Number	Mobile Number	Email Address

2.2 Secondary Technical Contact

Last Name	First Name	
Title	Company Name	
Telephone Number	Mobile Number	Email Address

3. Project Site Address

Mobile Truck Storage Yard Location Multi-Site Note: Provide site location(s) in a separate attachment, if necessary

Unit Number	Street Number	Street Name
Municipality/Unorganized Township		County/District
Concession and/or Rural Route		Ministry District Office (use the online district locator to find your local district office)

4. Project Information

4.1.a. Project Type – Waste Disposal Site (check all that apply)

- Landfill Site Processing Site Thermal Treatment Site
 Transfer Site Composting Site

4.1.b. Project Type – Waste Management Systems (check all that apply)

- Liquid Industrial Waste and Hazardous Management System Hauled Sewage (Septage)
 Mobile Waste Processing

4.2 Name and Description

Project Name

Rationale for Relief Request - note, if the ministry determines the requested activities are not related to operational activities resulting from the COVID-19 emergency, the request will be returned.

Summary Description of Relief Services - please use the table in section 4.3 of this form to summarize proposed changes to conditions of current approvals (or use the table as a separate attachment)

4.2 Request Type

- New ECA Amendment to existing ECA

4.3 Existing Approvals and Conditions (if amendment)

Separate list attached? Yes No

Current ECAs that may be amended by this request - only complete fields applicable to request

ECA Number	Date of Issuance (yyyy/mm/dd)	Condition No.	Description of Proposed Changes to Current Condition

5. Checklist of Supporting Documentation

5.a. Waste Disposal Sites

For waste disposal sites, please ensure the following documentation is included with your request for relief activities:

- Proof of legal name
- List of current ECAs that may be amended
- Clear description of changes to conditions of current approval(s) [table in 4.3 of request form may be provided as a separate attachment]
- Concise Design and Operations Report to include the following information:
 - Clear description of processes (for each site, if multiple sites)
 - Clear description of relief activities requiring ministry approval
 - Site plan where waste will be handled, stored and/or processed
 - Description of mitigation measures to manage the waste (e.g. mandatory cleaning schedules for waste storage areas and equipment, covered leak proof containers to prevent off-site impacts), staff training
- Contingency plan that will be used to ensure relief activities are managed effectively to minimize adverse effects (e.g. spill, fire, other emergency situations)
- Complaint response protocols that will be used during temporary period/operation of relief activities

5.b. Waste Management Systems

For waste management systems, please ensure the following documentation is included with your request for relief activities:

- Proof of legal name
- List of current ECAs that may be amended
- List of waste types and classes to be hauled
- Clear description of changes to conditions of current approval(s) [table in 4.3 of request form may be provided as a separate attachment]
- Truck storage yard location(s)
- Letter of consent from land owner (if the applicant is not the owner of the truck storage location)
- Vehicle insurance
- Vehicle ownership

Please note: No fees are required in connection with this request.

6. Authorization

6.1 Statement of the Applicant

I am authorized and have legal authority to prepare and submit this request for the subject pandemic relief. I have reviewed the complete request and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The activities proposed in this request is considered a pandemic related relief activity.
- The information contained in this request is complete and accurate.
- The technical contact identified in this request has/have been authorized to prepare certain technical material, and act on behalf of the applicant to discuss this request with the ministry and to provide additional information about this request to the ministry on request.
- The information provided to Technical Contact in relation to the request is complete and accurate.

Name of Signing Authority

Last Name
Steckly

First Name
John

Title
General Manager, Operations

Email Address
jsteckly@arnprior.ca

Telephone Number
613-623-4231 ext 1831

Mobile Number
613-314-7333

Signature



Date (yyyy/mm/dd)

2020/06/15

6.2 Statement of Technical Contacts

I have been authorized by the applicant to prepare the technical materials for the area(s) of responsibility identified in section 5 that are included in this request. I have reviewed those technical materials and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The technical materials contained in this request in respect of the area(s) of responsibility identified in section 5 are complete and accurate.
- I have the relevant education and experience necessary to provide this certification.

Name of Technical Contact

Last Name
Nicholson

First Name
Deanna

Title
Environmental Engineering Officer

Email Address
dnicholson@arnprior.ca

Telephone Number
613-623-4231 ext 1832

Mobile Number

Signature

Deanna Nicholson

Digitally signed by Deanna Nicholson
Date: 2020.06.15 13:51:52 -04'00'

Date (yyyy/mm/dd)

2020/06/15

ATTACHMENT B

Options Assessment

TECHNICAL MEMORANDUM

DATE December 3, 2020

Project No. 19134510

TO Ms. Deanna Nicholson
Town of Arnprior

FROM Andria Caletti, P.Eng.

EMAIL andria_caletti@golder.com

OPTIONS ASSESSMENT FOR THE TOWN OF ARNPRIOR WASTE DISPOSAL SITE COMPLIANCE ISSUE

1.0 INTRODUCTION

The Corporation of the Town of Arnprior (Town) owns and operates the Arnprior Waste Disposal Site (Site) under Environmental Compliance Approval (ECA) No. A412603. A revision to ECA No. A412603 was issued for the Site on March 10, 2020. As per Condition 28.1 of this ECA, the Town is required to submit contingency measures to address an existing and historic groundwater compliance issue at the Site prior to June 30, 2020. A request for pandemic related temporary regulatory relief was submitted to the MECP requesting a six month extension to this deadline. This memorandum will present and compare possible contingency options that the Town can consider to alleviate or remove entirely the groundwater compliance issue at the Site.

2.0 BACKGROUND

Comments on the 2016 Annual Monitoring Report for the Site dated March 23, 2018 were received from the Ministry of the Environment, Conservation and Parks (MECP) which addressed a non-compliance issue in regard to the Reasonable Use Guideline B-7 (MECP, 1994) at the northern boundary of the Site. Under Guideline B-7, groundwater quality on an adjacent property must not be degraded beyond 50 percent of the difference between background concentrations and established water quality criteria for aesthetic related parameters and 25 percent of the difference between background concentrations and established water quality criteria for health related parameters. The reasonable use performance objectives (RUPO) for the Site are based on the noted calculations using established background water quality and the Ontario Drinking Water Quality Standards (ODWQS). Generally, trigger levels are established for the Site which are based on 75 percent of the RUPO. The trigger concentrations are slightly lower than the RUPO to allow time to take action or implement contingencies if exceedances of the RUPO are anticipated. As identified in the March 23, 2018 comments, the Site is out of compliance with Guideline B-7 due to exceedances of the RUPO at some compliance monitoring wells located within bedrock at the northern Site property boundary. The Site compliance issue had previously been attributed to historical impacts on former Tembec Inc. property now owned by the Town (i.e., the existing contaminant attenuation zone) comingled with possible landfill related impacts, but not solely landfill related impacts

A subsequent meeting was held on June 22, 2018 between the Town, MECP and Golder to discuss the non-compliance issue. At that time, it was recommended by MECP that the Town should consider purchasing the downgradient groundwater rights to alleviate and remove the groundwater compliance issue. As an alternative to purchasing the downgradient groundwater rights, the establishment of a new background well was also discussed to help better understand the potential impact from historic activity on the former Tembec Inc. property versus the landfill and possibly substantively identify the former Tembec Inc. property as the source of (or significant

contributor to) the groundwater compliance issue. Two background wells (BR-18S and BR18-D) were subsequently drilled in an area expected to be upgradient of the landfill and in an area believed to be impacted by historical activities to help discern the differences between landfill impacts and historical impacts that could be contributing to groundwater quality at the Site boundary. Groundwater levels were obtained at the new background monitoring wells from October 2018 to August 2019, and sampling and analysis of groundwater from the new wells also occurred during this time period.

As discussed in the technical memorandum by Golder dated September 18, 2019, it was determined that using BR-18 as a background well was not effective in reducing or eliminating the Site compliance issue as it did not provide data that excluded the landfill as a potential source of the groundwater compliance issue. Golder subsequently discussed with the Town possible contingency options available to alleviate or remove the groundwater compliance issue through the undertaking of an options assessment. Further to a phone call held between the Town, Golder, and the MECP (District Office and Technical Support) on November 27, 2019, the MECP expressed their concurrence with the proposed undertaking of an options assessment. On March 10, 2020, ECA No. A412603 was re-issued and included Condition 28.1 requiring the Town to submit contingency measures to address the groundwater compliance issue at the Site to the MECP District Manager. The purpose of this options assessment is to provide a review of possible contingency measures to alleviate or remove the Site groundwater non-compliance for consideration by the Town in determining the contingency measures to be presented to the MECP District Manager per Condition 28.1.

3.0 POSSIBLE CONTINGENCY MEASURES TO ALLEVIATE OR REMOVE THE GROUNDWATER COMPLIANCE ISSUE

The possible contingency measures identified below provide a wide range of possible options to address the groundwater compliance issue at the Site. Some contingency measures have been removed from further detailed consideration based on general ability of the contingency measure to alleviate the compliance issue and/or the identification of significant concerns with the requirements for implementation. Contingency measures that are considered more likely to alleviate or remove the groundwater compliance issue and that could reasonably be implemented have been carried forward, developed with some additional details and assessed using a comparison matrix presented in Section 4.0.

The proposed contingency measures that have been considered include:

- 1) Extend the contaminant attenuation zone (through purchase of downgradient property and/or groundwater rights)
- 2) Pump and treat leachate-impacted groundwater
- 3) Early closure of the Site
- 4) Progressive installation of low permeability cover
- 5) Dig and dump waste and/or soil
- 6) Engineering of the base of the landfill for leachate collection
- 7) Tree system
- 8) Leachate recirculation
- 9) Construction of a physical barrier

3.1 Extend the Contaminant Attenuation Zone

Guideline B-7 (MECP, 1994) describes that the purpose of a contaminant attenuation zone (CAZ) is to allow the limited impairment of use of off-site property by means of easements or other methods without imposing the severe restrictions on land use which apply to the disposal site. In the CAZ, it is intended that contaminants will be naturally attenuated to levels compatible with the reasonable use of the adjacent property.

The Site already has four owned CAZ areas (Area A, B, C and D) comprising an area of approximately 31 hectares. The location of the CAZ areas are shown in Figure 1. The contingency option being considered could involve the purchasing of downgradient property or groundwater rights on the lands (or some portion of them) located to the north, east and northeast between the Site and the Ottawa River, presently privately owned. As Golder is aware that this land may have some potential for re-development it is suggested that purchasing the groundwater rights on the lands, by way of a groundwater easement, may be more affordable and palatable to the current owner than outright property purchase. Purchasing the groundwater rights allows the land to continue to be used for other purposes and does not fully sterilize the land. By purchasing the rights, the use of groundwater would be restricted for present and future property owners between the Site and the Ottawa River. By removing any potential for downgradient groundwater users, the Site would no longer be required to assess groundwater compliance based on impacts to groundwater at the current property boundary (i.e., groundwater quality at the point where it discharges off of the Site). Site compliance would instead be assessed in surface water in the Ottawa River, as agreed by the MECP during the June 22, 2018 meeting. This option may be costly depending on the development value of the land.

Groundwater quality on the privately owned downgradient property and impacts from historic activity on that property are not known to the Town, however it is known that a lumber mill and yard and associated activities was historically operated on the property.

Extending the CAZ via purchase of the groundwater rights was originally suggested by the MECP during early discussions about the groundwater compliance issue. This option will completely remove the groundwater compliance issue at the Site, and therefore has been carried forward to the comparison matrix.

A variation on this contingency option involves the initiation of a legal agreement with the current property owner that would give the Town the first right of refusal to purchase the groundwater rights in the event that the property were to be put up for sale, this could be considered as an alternative to immediately purchasing the downgradient land or groundwater rights. It is envisioned that compensation to the land owner would be required to secure this agreement. This variation on the option is discussed further in Section 4.1.

3.2 Pump and Treat Leachate-impacted Groundwater

Purge wells are a relatively common method to remove impacted water from the ground before it leaves a site and then subsequently treat the impacted water. Purge wells are most commonly used in locations where the impact to groundwater is in the overburden soils and can be more easily captured and controlled. Purge wells in bedrock, such as the rock at the Arnprior Landfill Site, are less favourable as fractures in the rock control groundwater flow and there is less certainty that the location (distal and depth) of individual purge wells are targeting the best location for groundwater capture. Further, to appropriately design a purge well system several test wells would need to be installed to identify the expected groundwater capture area and thus understand the number and spacing of wells required. To complete this options assessment Golder has relied upon existing Site information to conceptually project the requirements of a purge well system, noting that there is a fair amount of uncertainty in the projection unless or until test wells are completed. This contingency option is expected to

involve the installation of a series of purge wells (approximately 2 to 11 wells) to remove leachate-impacted groundwater for treatment. The purge wells would be installed within the existing CAZ in a configuration to capture the extent of the landfill leachate plume in the bedrock groundwater. It is conceived that this would consist of purge wells installed near the northern edge of the landfill (i.e., near to the source of contamination) and not at the property boundary (i.e., the compliance location) so as to reduce the amount of groundwater intercepted by the well from the off-Site privately owned downgradient property and/or the Ottawa River. It is acknowledged that potential impacts to the groundwater from historic activities not related to the landfill on the former Tembec Inc. property (now the existing CAZ owned by the Town) could also be collected by the purge well system.

Leachate-impacted groundwater that is pumped could be treated on-site or off-site. On-site treatment would require the development of a treatment facility and groundwater would need to be treated such that it could be released to the natural environment. It is Golder's experience that the level of treatment to achieve the required natural environment discharge quality can often be hard to achieve and expensive in on-site treatment facilities. Alternatively, the extracted leachate-impacted groundwater can be collected in a holding pond or tank, and transported off-site to a wastewater treatment facility for disposal. It is Golder's experience that this is typically more affordable than on-Site treatment noting that pre-treatment of impacted groundwater may be required to be accepted at the wastewater treatment plant. Also, the management of leachate-impacted groundwater may require a Municipal Class Environmental Assessment study.

This option may take several years before improvements in groundwater quality are observed at the property boundary that would relieve the groundwater compliance issue. As noted above, purge wells in bedrock may not alleviate the groundwater compliance issue at the property boundary if leachate-impacted groundwater is not fully captured due to fracture flow.

Further, this option at the Arnprior Landfill Site is complicated in that the off-Site groundwater on the privately owned downgradient property may also be impacted by historic activities. It is expected that the zone of influence of the purge well system will pull some groundwater from this property and the current groundwater quality on the neighbouring property is not presently known.

Costs associated with this contingency option include engineering design of the purge well system and possibly treatment or pre-treatment, capital installation costs of the purge wells, possibly capital costs of on-site treatment construction or holding tank construction and likely a Municipal Class Environmental Assessment for evaluation of options to manage groundwater impacted by leachate. Operational costs include ongoing pumping and treatment or transport for off-site treatment of groundwater. Ongoing pumping and treatment of impacted groundwater would be an operational cost for the contaminating lifespan of the landfill, which would conceivably be the current remaining capacity of the site (24 years) and an additional 25 to 50 years post-closure of the Site. Note that the contaminating lifespan is the time at which engineering support is no longer required and the leachate-impacted groundwater would not need to be pumped and could be left in the bedrock and not cause a groundwater compliance issue.

This option has been carried forward to the comparison matrix as it represents a feasible option with some potential for success to alleviate the groundwater compliance issue.

3.3 Early Closure of the Site

This contingency would consider the early closure of the Site. No additional waste would be accepted for landfilling at the Site, and closure would include the installation of either a permeable (soil) or low permeability (compacted clay, geosynthetic clay liner (GCL) or geomembrane) final cover over the landfill. Early site closure would require the preparation of a Closure Plan as required by Condition 29 in the ECA.

Capital costs would include engineering services for preparation of the Closure Plan and design of the final cover and construction costs for the final cover system estimated at several hundreds of thousands of dollars. Operational costs for the landfill would be significantly lower, reduced to the cost to continuing groundwater and surface water monitoring and occasional inspection and possible maintenance of the final cover system. Groundwater and surface water monitoring would likely be required for 20 to 50 years post closure based on preliminary contaminating lifespan estimates. The Town would need to find an alternate means of managing the waste generated by the Town that is received at the Site and an alternate waste management site will charge a tipping fee for disposal of the Town's waste.

This contingency option does not actively address the existing groundwater compliance issue. Based on Golder's experience, this is a long-term strategy that would take years, if not decades, before an improvement to groundwater quality at the property boundary would be observed. Early closure of the Site is, however, technically feasible to undertake and long-term could be a contingency measure acceptable to the MECP, or could be combined with a more immediate solution to achieve groundwater compliance if the downgradient lands are considered for groundwater use in the future. Therefore, this option has been carried forward to the comparison matrix.

3.4 Progressive Installation of Low Permeability Cover

This contingency option involves the progressive installation of a low permeability final cover as described in Section 3.3, however would not include closing the Site early; the final cover would be installed progressively over areas of the landfill that have reached capacity. As landfilling activities are progressed, the low permeability cover will be installed in phases as designated areas reach final approved elevations. It is noted that there is currently one small area located at the eastern edge of the landfill footprint at the Site that has reached capacity.

Capital costs would be similar to those described in Section 3.3, however the Town could continue to manage residential waste through disposal at the Site.

As with the approach described in Section 3.3, this contingency option does not actively address the existing groundwater compliance issue. This is a long-term strategy that would likely take decades before an improvement to groundwater quality at the property boundary would be observed. Therefore, this option has not been carried forward to the comparison matrix.

3.5 Dig and Dump Impacted Waste and/or Soil

The term "dig and dump" is an industry term for remediation projects whereby impacted material is dug up, removed and/or treated and dumped back in the same location following treatment or dumped at a new location if not treated. Generally speaking, if the material is not treated the dug up material is "dumped" at a landfill. This contingency option would involve the excavation of impacted soil from the existing CAZ and/or waste from the landfill, removal from the Site and disposal of the material at another licenced facility expected to be a landfill. Removal of waste as described would remove the source of leachate impacting groundwater but would not immediately affect groundwater quality at the property boundary (though improvements could be expected more

quickly than with an impermeable final cover and/or early closure of the Site, as the source of the leachate would be completely eliminated). However realistically this makes little sense to dig up a landfill to take the material to another landfill. The excavation and hauling of waste from the landfill would be expected to produce significant odours for the duration of the activity that could impact nearby residents and would require careful operational practices to mitigate. Other potential operational challenges with excavation of waste include issues with vermin due to exposed waste, and management of perched leachate if encountered. The Arnprior Waste Disposal Site is an older landfill and disposed materials, regulations as well as public perception have changed over time. All material unearthed would need to be disposed of appropriately in accordance with current regulations.

Removal of soil above the bedrock in the CAZ near the north property boundary could provide some improvement to groundwater quality, however would be a temporary solution without also removing the waste, since waste would continue to generate leachate that would over a longer period of time re-contaminate the groundwater. Further, the groundwater compliance issue has been observed in the bedrock at the property boundary; removal of the overburden soil at the property boundary is thus not expected to alleviate the groundwater compliance issue.

The capital costs associated with this contingency option include construction costs to excavate the waste, costs associated with hauling off-site, and the tipping fees at the licenced waste disposal facility. Tipping fees may be expensive. The Town would need to find an alternate means of managing the waste generated by the Town that is received at the Site. Although this option could alleviate compliance concerns more quickly than the options discussed in Section 3.3 and 3.4, it may still need to be combined with a more immediate option to achieve groundwater compliance if the downgradient lands are considered for groundwater use in the future. Due to the expense and logistical challenges associated, this contingency measure has not been included in the comparison matrix.

3.6 Engineering of the Base of the Landfill for Leachate Collection

The existing landfill at the Site is a natural attenuation landfill, meaning that it does not have any engineered features including engineered low permeability base or liner for leachate containment, nor a leachate collection system to remove leachate generated by the waste. With a natural attenuation landfill leachate is released to groundwater to be attenuated by natural process and/or dilution such that the RUPO is achieved prior to leachate-impacted groundwater reaching the property boundary. The Town could consider excavating the existing waste and building an engineered liner and leachate collection system at the base of the landfill. Leachate generated by future waste or re-landfilled existing waste would be captured by the leachate collection system rather than released to the groundwater.

This option would require systematic excavation of existing waste from the landfill in phases, and would involve similar logistical challenges such as odour, vermin, perched leachate management and disposal of waste materials as discussed in Section 3.5. Typically, the addition of engineering of landfill cells is an undertaking that is more easily adopted at landfill sites with undeveloped landfill cells where the excavated historic waste can be re-landfilled in a new, undeveloped landfill cell to allow the addition of a liner and leachate collection system. The Site does not have any undeveloped cells that could accept the excavated waste, and so a lateral area for waste processing would require approval from the MECP which would be challenging to get approved, if even possible. Alternatively some portion of landfilled waste from the Site would need to be hauled off-site to a licensed waste disposal facility to create the undeveloped cell area that could then be engineered with a liner and leachate collection system and start to move waste around in the landfill. Constraints with sending waste to another landfill are similar to the option discussed in Section 3.5.

Once the engineered liner and leachate collection system is installed, leachate that is generated from the re-landfilling of existing waste or landfilling of new waste would be collected through the leachate collection system. From there, the leachate would need to be treated prior to discharge to the natural environment. Treatment could occur on-site through the construction of an on-site treatment facility, or the leachate could be collected, hauled, and disposed at a wastewater treatment facility. Leachate treatment and collection would occur at minimum for the contaminating lifespan of the Site meaning until such time as the leachate could be released to the groundwater without exceeding the RUPO which is estimated to be 25 to 50 years post closure in this case. Considerations regarding on-Site and off-Site leachate treatment are presented in Section 3.2.

The capital costs associated with this contingency option include an engineering design for the liner and leachate collection system, engineering design of leachate treatment, pre-treatment and/or holding tanks or ponds, an ECA amendment, possibly a municipal class Environmental Assessment on leachate-impacted groundwater treatment and specialized construction of the designed components including the excavation of landfilled waste. There would be costs for hauling and disposal of some of the excavated waste at a licenced waste disposal facility to create the undeveloped landfill cell. Tipping fees may be expensive. Ongoing operation and maintenance costs associated with collection and treatment of leachate would be an operational cost for the contaminating lifespan of the landfill, which would be decades post-closure of the Site.

Although this option could alleviate compliance concerns more quickly than the options discussed in Section 3.3 and 3.4, it may still need to be combined with a more immediate option to achieve groundwater compliance if the downgradient lands are considered for groundwater use in the future. Due to logistical challenges associated with the engineering and the excessive anticipated capital and operational costs, this contingency measure has not been included in the comparison matrix.

3.7 Tree System

A passive installation of trees could be considered at the Site boundary where the groundwater compliance issue exists whereby a series of trees would be planted to uptake leachate-impacted groundwater. It is noted that such a planting would require appropriate soil to support tree growth. Sufficient land would need to be available to plant enough trees to accept the volume of groundwater requiring treatment. This system would not operate during the winter dormant period of the vegetation, and impacted groundwater would need to be otherwise managed. It is anticipated that this method would only be able to treat impacted groundwater in the overburden, leaving groundwater in the bedrock continuing to be impacted. Therefore, this contingency is not carried forward to the comparison matrix.

3.8 Leachate Recirculation

This contingency option involves the collection of leachate from the landfill or leachate-impacted groundwater from the downgradient groundwater and placing it within (typically at the top of) the landfill. This process increases the rate of waste decomposition thereby reducing the contaminating lifespan of the Site. There are many issues associated with leachate recirculation including odour issues and infrastructure and operational issues. This action would require the design and installation of a collection system for leachate, with the same issues associated with engineering and installation of a landfill liner and leachate collection system as outlined in Section 3.6 or alternatively collection of leachate-impacted groundwater as outlined in Section 3.2. Leachate recirculation has been undertaken in the Province of Ontario historically, but is currently not looked upon favorably by the MECP and would likely not be approved; Golder is not aware that this practice is currently being approved in the Province at this time other than on an emergency basis. Presently any approval by the MECP for leachate recirculation seems to be for short term, site specific situations and not longer term contingency or operational options. This option has not been carried forward to the comparison matrix.

3.9 Construction of a Physical Barrier

This contingency option would involve the construction of a physical barrier to minimize the migration of leachate-impacted groundwater. Groundwater flow at the Site is interpreted to be towards the Ottawa River, to the north, northeast and east. Thus, a physical barrier would need to be installed to restrict the groundwater movement in these directions. Physical barriers are typically installed in overburden soil often using geosynthetic clay liners. In bedrock, the only way to produce a physical barrier is to attempt to grout the fractures within the bedrock to lower the permeability of the bedrock. Given the highly fractured nature of the bedrock at the Arnprior Landfill Site and the proximity to the Ottawa River, creating a physical barrier in bedrock is not considered feasible. As the groundwater compliance issue is in the bedrock, a physical barrier is not a contingency option at this Site and this option is not carried forward to the comparison matrix.

3.10 Other Considerations

3.10.1 Combination of Options

Many of the options presented above could be implemented in combination although not all are considered viable when combined. For example, the Town could consider progressively placing low permeability cover while also implementing a purge well system to achieve groundwater compliance more efficiently. Trees could also be planted as a complementary measure. Should the Town wish to consider a combination of the above options, this can be further evaluated, however for the purpose of this assessment only those options considered individually viable and reasonably feasible are carried forward to the comparison matrix.

3.10.2 Change to Floodplain Elevation

Historic high floods from the Ottawa River were experienced in the spring of 2017 and 2019. While it is unknown what affect flooding had on the privately owned lands downgradient of the Site located along the Ottawa River, it is possible that continued flood occurrences could result in development restrictions on these lands (if the Township of McNab/Braeside were to raise the elevation of the floodplain) or could make development of these lands less desirable. It is understood that the Township of McNab/Braeside is not presently intending to raise the elevation of the flood plain. Should development ever be restricted due to a change in the elevation of the flood plain, it is recommended that the MECP be consulted to determine if this negates the need to implement a contingency measure as this could inherently restrict the ability to use the groundwater on the downgradient privately owned lands.

3.10.3 Alleviate or Remove Groundwater Compliance Issue

It is noted that purchasing downgradient groundwater rights will not improve the groundwater quality at the property boundary. However, only an acquisition of groundwater rights or purchase of property adjacent to the landfill will completely resolve and remove the existing groundwater compliance issue at the current property boundary. None of the other options presented remove the groundwater compliance issue but alleviate it.

4.0 COMPARISON OF OPTIONS

The three contingency options that have been carried forward for further description and to be evaluated in the comparison matrix include the purchase of downgradient groundwater rights or agreement to do so, the installation of purge wells for the collection and treatment of leachate-impacted groundwater, and the early closure of the Site as discussed in sections 3.1, 3.2 and 3.3, respectively. A more detailed assessment of these options is provided below. For each option an estimate of the capital costs has been provided where possible noting that in some instances there is just not sufficient information to provide this information. These cost estimates should not be used for budgeting purposes, but rather as “ballpark” estimates to compare financial implications of each option presented in this memorandum. Some thoughts on operation costs have also been identified again noting that in many instances there is insufficient information to provide this information.

On August 27, 2020, a call between the Town, Golder and the MECP (District Office and Groundwater Technical Reviewers) was held to discuss the three options. The purpose of this call was to solicit feedback from the MECP on the three potential contingency options so that initial comments from the MECP could be considered as part of this options assessment. General comments on the three options as discussed during the August 27, 2020 call are provided below.

4.1 Extend the Contaminant Attenuation Zone via Groundwater Easement

There is currently CAZ owned by the Town that is located downgradient of the landfill Site as shown on Figure 1, but not beyond Usborne Street. Purchasing the downgradient groundwater rights would extend the current CAZ areas north, northeast and east, between the current property boundary at Usborne Street and the Ottawa River. The land between Usborne Street and the Ottawa River is privately owned. As discussed in Section 3.1, by removing any potential for downgradient groundwater users, the Site would no longer be required to assess groundwater compliance based on impacts to groundwater at the property boundary (i.e., groundwater quality at the point where it discharges off of the Site) per MECP Guideline B-7. This contingency option would immediately resolve the groundwater compliance issue upon acquisition of the groundwater rights. The MECP has said that Site compliance would be assessed in the Ottawa River for this type of contingency; due to the large volume of the Ottawa River, it is generally considered that contaminant loading to the Ottawa River from the landfill Site would have minimal impact and future contingency measures would likely not be required. Removal of the requirement for groundwater compliance may result in a reduction to the groundwater monitoring program for the Site, and likely a slight increase in surface water monitoring requirements.

There is a large portion of land that is privately owned that fronts the Ottawa River, and the property has previously been the subject of interest for development opportunities in the last decade. Due to the desirability of this waterfront land, downgradient groundwater rights could be costly. Restricting development opportunities through acquisition of the groundwater rights (the property is not municipally serviced by the Township of McNab/Braeside) could become a political issue or an issue of public interest for the Town and the Township of McNab/Braeside. It is noted that parts of the privately owned property are interpreted to be hydrogeologically cross-gradient from the landfill, and groundwater in these areas are therefore considered to be unlikely to have been impacted by landfill leachate. It is considered that the groundwater rights on the entirety of the privately owned property may not need to be acquired in order to address the groundwater compliance issue. Thus, severing of the land such that groundwater rights can be acquired only in the areas considered to be potentially impacted by landfill leachate may be favorable to the Town and to the property owner.

The industrial activities historically carried out on the privately owned downgradient property included a lumber mill and lumber storage. Groundwater quality on the privately owned downgradient property and potential impacts from historic activity on this property are not known to the Town. It is possible that by purchasing the downgradient groundwater rights on the privately owned downgradient property, the Town of Arnprior may assume responsibility for impacts to groundwater resulting from historic contamination not related to the landfill; this could affect Site compliance if groundwater discharging to the Ottawa River is significantly impacted although again the large volume of the Ottawa River would be expected to mitigate this groundwater discharge. Monitoring of groundwater or surface water on the privately owned downgradient property prior to purchase of a groundwater easement has been discussed historically so that the Town could understand what they are purchasing and ensure it is a viable solution. Historically the Town has been told that monitoring could be conducted but results would need to remain private. Given the Town is a Municipal entity information collected by the Town, or by its consultants on behalf of the Town can always be requested under the Freedom of Information Act. This complicates understanding exactly what the Town would be purchasing.

This contingency option and the concerns noted above were generally discussed with the MECP during the call on August 27, 2020. It was generally acknowledged that this contingency option would alleviate groundwater compliance issues as described.

During the call, the Town and Golder inquired about a variation on the option to purchase the downgradient property or groundwater easement, specifically if a legal agreement with the current property owner of the downgradient land giving the Town first right of refusal to purchase the groundwater rights could be considered as an alternative to immediately purchasing the downgradient groundwater rights. It is envisioned that compensation to secure this type of agreement would be required. The MECP expressed that while a first right of refusal type agreement has not been used for this purpose before to their knowledge, this would meet the same intent as purchasing groundwater rights of limiting the use of downgradient groundwater. It was acknowledged by all that this could result in the required future purchase of the groundwater rights by the Town, however would delay the requirement to do so and is reasonable given that there are currently no groundwater users downgradient from the Site. The MECP agreed to discuss internally and advise the Town on whether such an agreement in principle would be acceptable, noting that there are details that would have to be considered on implementation. Subsequently, in an email dated October 6, 2020, the MECP Environmental Officer for the Site indicated that a review of this variation on the contingency option concluded that obtaining a right of first refusal to purchase the groundwater rights may comply with the requirements in Guideline B-7. They noted that before this were to be approved, the MECP will require a detailed proposal which includes the legal instruments to be used to obtain these rights so that they could review the legality of the option and provide a definite response.

At this time the cost of purchasing the downgradient groundwater rights on the downgradient property are unknown. The cost to secure a first right of refusal on the purchase of groundwater rights is also unknown.

4.2 Pump and Treat Leachate-Impacted Groundwater

As discussed in Section 3.2, this contingency option would involve the installation of purge wells to extract leachate-impacted groundwater for treatment. The goal of the purge well system would be to capture leachate-impacted groundwater from the fractured bedrock, creating an inward gradient towards the wells, thereby controlling and reducing the migration of leachate-impacted groundwater to the property boundary and beyond off the CAZ. Extracted leachate-impacted groundwater would be treated either on-site or off-site.

The option to collect and treat impacted groundwater to lower concentrations of parameters of concern at the property boundary was discussed with the MECP during the call held on August 27, 2020. It was discussed that this option would not provide an immediate solution (requiring time to implement (design and construct) and time before a decrease in concentrations at the property boundary would be observed). The MECP indicated that, because there are no existing groundwater users on the downgradient property, the time required to achieve compliance concentrations is less urgent than if there were existing downgradient groundwater users.

As discussed in greater detail in the following sections, Golder also noted to the MECP that the hydrogeological conditions (fractured bedrock and proximity to the Ottawa River) mean that this could not be guaranteed as a solution. Further, Golder noted to the MECP that the option to pump and treat would be a long-term and costly requirement for the Town, and that before this could even be pursued, additional studies would be required to assess the potential effectiveness. It was generally acknowledged that this long-term solution may require further action in the future should downgradient groundwater use be proposed (i.e., purchase of downgradient groundwater rights).

4.2.1 Purge Well Network

The design of this contingency would require a pumping test program with a computer model simulation to design the well arrangement in terms of spacing, radius of influence, and zone of capture and to estimate the volume of leachate-impacted groundwater to be collected. Conceptually, the purge wells would be installed in the upper bedrock, and, if placed near the northern edge of the waste, would have a higher likelihood of capturing leachate-impacted groundwater close to its source before it has migrated (horizontally and vertically) through the fractured bedrock network. Placement of the wells near the edge of the waste would also capture leachate from beneath the waste. Collected leachate-impacted groundwater would be transported to a treatment location, either off-site at a municipal wastewater treatment facility or private facility, or on-site. Treatment options are discussed in Section 4.2.2.

The purge wells should avoid drawing down the groundwater level so much as to draw in surface water from the Ottawa River. The average river elevation measured at the Lac des Chats measurement station upstream of the Site in the Ottawa River is 74.18 metres above sea level between 1950 and 2019 (ORRPB, 2020), about 1.4 metres below the average groundwater elevations at monitoring wells BR-6 and BR-7. The goal of the purge well system would therefore be to draw down the groundwater levels at monitoring wells BR-6 and BR-7 by no more than 1.4 metres. For the purposes of cost estimates for this contingency approach, the purge well system can be conceptualized to be located immediately downgradient of the CP Rail line and aligned parallel to it. The system would be located approximately 230 metres upgradient of monitoring well BR-6, and be distributed along a length of approximately 460 metres, which is the approximate width of the landfill on the northern side. Due to the lack of existing information on the depths and distribution of fracture zones within the bedrock, it has been assumed that a purge well depth of 10 metres will be sufficient to capture leachate-impacted groundwater from the shallow bedrock.

It should be noted that the purge wells are being conceptually designed to not capture water from the Ottawa River as this would be too much water to manage and would make this contingency unreasonable, but there is the possibility that the system may not capture all of the leachate-impacted groundwater either based on this limitation. A test well and computer modelling of results may be able to bring some greater certainty around this option and if what percentage is expected to be captured should positively influence compliance. Fractured flow in the bedrock also causes uncertainty regarding the reliability of this option.

No hydraulic conductivity, aquifer transmissivity or storativity information has been collected from the bedrock at the Site. As mentioned, a more detailed design of this contingency would require a pumping test program with a computer model simulation to design the well arrangement in terms of spacing, radius of influence, and zone of capture and to estimate the volume of leachate-impacted groundwater to be collected. Published geological mapping and borehole records from the Site monitoring wells suggest that dolostone of the Oxford Formation is present within the CAZ. Based on Golder's experience with wells installed in the Oxford Formation at other locations in Eastern Ontario, the transmissivity of this bedrock formation can range from approximately $6 \times 10^{-5} \text{ m}^2/\text{s}$ to $9 \times 10^{-3} \text{ m}^2/\text{s}$.

This information was used to estimate the potential range in pumping rates required to capture leachate-impacted groundwater with a target amount of no more than 1.4 metres of cumulative drawdown at the evaluation point (monitoring well BR-6). The cumulative drawdown was calculated using the Cooper and Jacob equation using the range of aquifer transmissivity for the Oxford Formation, a storativity of 1×10^{-5} (general estimate for bedrock), and an estimated time of 6 months to achieve steady state conditions. Two scenarios were considered, for 2 and 11 equally-spaced purge wells, with the pumping rate varied to achieve no more than 1.4 metres of cumulative drawdown at the evaluation point. The estimated pumping rates required to achieve a drawdown of 1.4 m at the evaluation point (BR-6) under the high and low transmissivity scenarios is provided in Table 1, for a configuration with 2 and 11 wells.

Table 1: Pumping Rate required to achieve 1.4 m drawdown at BR-6

Number of Purge Wells	Purge Well Spacing (m)	High Transmissivity Scenario Cumulative Pumping Rate (L/day)	Low Transmissivity Scenario Cumulative Pumping Rate (L/day)
2	460	1,080,000	12,000
11	46	1,045,000	11,000

These preliminary estimates indicate that as little as two and up to eleven purge wells could be sufficient to reduce the groundwater elevation in the shallow bedrock such that migration of leachate-impacted groundwater off the CAZ should be minimized. Using the maximum estimate of purge wells would result in a smaller individual well pumping rate and more control over the purge well system. The estimated volume of leachate-impacted groundwater to be pumped ranges from 11 m^3/day to 1,080 m^3/day and is highly dependant on the aquifer transmissivity.

Once a purge well system is installed, it may take several years of monitoring to determine the optimum pumping rate to capture enough leachate-impacted groundwater to improve the groundwater quality at the boundary of the CAZ. This action is flexible in terms of adjusting/adding to the system depending on the results of on-going monitoring. The timeline to achieve a measurable impact would be highly dependant on the hydraulic properties of the shallow bedrock at the Site.

Achieving the maximum acceptable drawdown of 1.4 m at BR-6 would have the most significant effect on groundwater quality at the property boundary. This, however, would also likely draw groundwater from off-site to the north on Osborne Street or from the privately owned downgradient property. Not only does this increase the volume of water to be managed, but off-site impacts to groundwater from Osborne Street or from historic industrial activity on the privately owned downgradient property could also be drawn onto the property and into the vicinity of the compliance monitoring wells. There is a risk that this could worsen the groundwater quality at the compliance monitors and also change the quality of groundwater collected by the purge well requiring treatment, however the groundwater quality on the privately owned downgradient property is not currently known to the Town. To mitigate this risk, the Town could consider reducing the pumping rate to limit the potential to draw impacted groundwater from off-site activities onto the property, however this should be expected to result in a longer time period before the groundwater at the property boundary is compliant with Guideline B-7. This would also decrease the volume of water being extracted.

Approval Requirements and Cost

An opinion of probable cost for the capital expenditure to install 2 to 11 purge wells based on an assumed 460 to 46 metre well spacing along the CP Rail line and extending into the upper 10 metres of bedrock with leachate-impacted water collection into one or two 1,300 m³ storage tank(s), and some piping or forcemain is approximately \$200,000 to \$450,000 excluding HST, depending on the pumping rate. Tree clearing costs have not been included. The implementation of the purge well system would require a technical amendment to the ECA for the Site, including hydrogeological studies and system design; associated costs are estimated at \$130,000 to \$250,000. It is noted that the cost for a test system and computer modelling is not included, as it would be a separate step in the process. It is unclear if a Permit to Take Water will be required, but would be determined during pre-consultation with the MECP; associated costs are not included. This estimate assumes that two phase power is available at the Site but if it isn't then a capital cost to get it to the Site would be required.

Costs to operate the purge well system would include power supply to continuously run the purge wells (highly variable depending on the number of purge wells that would be installed), administrative costs (i.e., Town staff to operate the system), system maintenance and repair, especially of the well screens and pumps handling the corrosive leachate-impacted water. The system would be required to operate for the duration of the landfill site life of approximately 24 years and for the contaminating lifespan of the Site, which would be 25 to 50 years after closure, seven days a week, 365 days a year. Storage capacity and/or a backup power supply would be needed in the event of power outages. Golder generally doesn't operate leachate collection systems but assists with troubleshooting, maintenance and compliance. Leachate-impacted water collection and treatment operational costs are discussed in Section 4.2.2.

4.2.2 Treatment Options

Treatment of leachate impacted groundwater is required before it can be discharged to the natural environment. There are two options to consider for treatment: on-Site or off-Site of the Arnprior Waste Disposal Site. Selection of on-Site or off-Site treatment of the leachate-impacted groundwater is expected to require a Municipal Class Environmental Assessment.

Off-Site Treatment

Golder is unaware of local private wastewater treatment facilities that would be close enough to Arnprior for economical use and receipt of the leachate-impacted groundwater. As such, for purposes of this assessment it is assumed that off-Site treatment means at the Town's wastewater treatment facility. It is noted that the total current capacity of the Town's wastewater treatment facility (the Water Pollution Control Centre, ECA No. 8537-7Y6SGZ) is 9,700 m³ per day noting that the current available capacity of the wastewater treatment facility is reported by the Town staff to be 4,170 m³ per day (i.e., 43% of the total capacity). The predicted ranges in pumped leachate-impacted groundwater for the purge well system are 11 m³/day to 1,080 m³/day, seven days a week, 365 days a year. Presently Golder has contemplated a small amount of holding capacity on the Site but schedule and availability of the Water Pollution Control Centre will need to be evaluated moving forward, i.e., how often is the facility open and available to receive leachate-impacted water. This would dictate how many truckloads would be required a day as well as on-Site storage capacity requirements in tanks. It is noted at the anticipated high transmissivity of the bedrock approximately 1,080 m³ of leachate-impacted water per day would require treatment (i.e., 11% of the Town's facility's existing capacity). This is a significant proportion of the existing Water Pollution Control Centre capacity and could make this option not as feasible or undesirable as this capacity needs to be reserved for future Town growth.

If the leachate-impacted groundwater will be treated off-Site at the Town's wastewater treatment facility, the impacted groundwater would need to meet the criteria set out in the Town's sewer-use by-law (Town of Arnprior, bylaw No. 6227-13) unless otherwise agreed and permitted. As discussed in Section 4.2.1, if the purge wells are operated such that the maximum acceptable drawdown of 1.4 m at BR-6 is achieved, groundwater from off-Site to the north on Usborne Street or from the privately owned downgradient property may be drawn onto the Site and extracted through the purge wells for treatment, including groundwater that has been impacted by Usborne Street or from historic industrial activity on the privately owned downgradient property. There is a risk that off-site impacts to groundwater could worsen the groundwater quality being extracted through the purge wells for treatment, however the groundwater quality on the privately owned downgradient property is not currently known to the Town.

Historically there have been some parameters within the leachate monitoring wells at the Site that exceed Schedule A Table 1 of the Town's sewer-use by-law criteria on one or more occasion, namely TKN, cadmium, chromium, cobalt, manganese, benzene, 1,3,5-trimethylbenzene and toluene. Since the purge wells are proposed to be located within 100 m downgradient from the edge of the landfill, they will draw groundwater from within a radius of influence that includes the most leachate-impacted groundwater and it is possible that the groundwater quality will exceed the criteria presently or in the future. Should the purged groundwater not meet the criteria for discharge to the Town's wastewater treatment facility, a pre-treatment system could be constructed on-site such that impacted groundwater could be treated to the point of meeting the applicable criteria prior to being accepted at the wastewater treatment facility. The pre-treatment approach would depend on the parameters of concern to meet the wastewater treatment facility. The on-site pre-treatment system would be required to be operated until groundwater quality improves to within the sewer-use by-law criteria. The wastewater treatment facility may implement or request discharge analysis of the leachate-impacted groundwater, pre-treated or not, to

demonstrate it meets the Town's sewer-use by-law requirements. It is conceivable that the wastewater treatment facility could need this analysis for each day or week, therefore possibly needing the holding tank on Site to be larger to enable more controlled, batch discharge.

On-Site Treatment

Alternatively, discharge to a surface water body may be achievable through on-site treatment. A treatment facility would need to be approved through the Ontario Water Resources Act and constructed to treat leachate-impacted groundwater to acceptable criteria set out by the MECP. Acceptance criteria for discharge to the natural environment would be more stringent than the Town's sewer-use by-law criteria and therefore may require a more robust treatment facility compared to pre-treatment for disposal at the wastewater treatment facility; this is again highly dependent on the parameters of concern, and should be expected to operate through the contaminating lifespan of the landfill (i.e., decades after closure). It is Golder's experience that the level of treatment to achieve the required natural environment discharge quality can often be hard to achieve and expensive in on-site treatment facilities. The process of getting MECP approval for this type of system is also arduous. It can be expected that the MECP would request treated leachate-impacted groundwater to be not acutely toxic and meet provincial water quality objectives for the protection of surface water.

A significantly increased water treatment and surface water monitoring program can be expected as a requirement of this option.

Based on Golder's experience with other landfill sites in Ontario we would always recommend treatment at a municipal wastewater treatment facility over construction of an on-Site facility as it has always proven to be a more easily attained approval with lower capital and operation costs. As such on-Site treatment is not further considered in this memo.

Approval Requirements and Cost

It is anticipated that a Municipal Class Environmental Assessment would be required to assess leachate-impacted groundwater treatment options, but that the end result would be treatment off-Site at the Town's Water Pollution Control Centre. The capital cost of the Municipal Class Environmental Assessment has not been provided but is likely small in comparison to other approvals required. Discharging impacted groundwater directly at the Town's wastewater treatment facility would incur hauling fees for the approximate 5 km distance. Generally, tanker trucks can hold 30,000 L that would mean for the range in bedrock aquifer transmissivity that 1 to over 30 trucks would be required a day assuming operation 365 days per year. One could assume at the higher transmissivity it would be advisable that the Town purchase their own tanker trucks; these trucks have their own capital and operational cost that has not been included. There could also be fees related to the cost of discharging to the wastewater treatment facility, a cost that could be negotiated internally by the Town. Based on an assumed fee of \$1.00 per cubic metre per Schedule B of the Town's sewer-use by-law, the high transmissivity scenario with well spacing of 460 metres, a total of 1,080 m³ would require treatment each day compared to the 12 m³ in the low transmissivity scenario. This could cost in the range of \$4,380 to \$394,200 of direct disposal fees each year. It is noted that exceedances of the sewer-use by-law by certain parameters may incur additional charges, if even allowed. Should the impacted groundwater exceed the requirement for TKN for instance, it has a discharge premium fee of \$5.25 per kg.

At present it is unclear what type of pre-treatment could be required but a capital cost for engineering and design would be required. No MECP approvals of on-Site pre-treatment would be required.

There are significant unknowns regarding the development of this contingency and Golder generally doesn't operate leachate collection systems but assists with troubleshooting, maintenance and compliance. Depending on off-Site leachate-impacted groundwater treatment fees and leachate-impacted groundwater volume, Golder would anticipate that annual operational costs for maintenance, some type pre-treatment, staffing, monitoring, transport and off-Site treatment could range from several hundred thousand dollars a year up to a million dollars a year.

4.3 Early Closure of the Site

This contingency would consider the early closure of the Site. No additional waste would be accepted for landfilling at the Site, and closure would include the installation of either a permeable (soil) or low permeability (compacted clay, geosynthetic clay liner (GCL) or geomembrane) final cover over the landfill. Early site closure would require the preparation of a Closure Plan as required by Condition 29 in the ECA.

Using either a permeable or a low permeability cover, the total volume of leachate generated that could impact groundwater downgradient of the Site over time would be reduced by the application of the cover. Ceasing landfilling operations provides less waste and hence less contaminant mass that can generate leachate from the landfill over time. A permeable cover will allow precipitation to infiltrate into the existing waste; leachate will continue to be generated at a similar but slightly lower rate as it currently is. A low permeability cover will significantly reduce the amount of precipitation that infiltrates into the existing waste, thereby reducing the rate of leachate generation rate and the peak concentration in the groundwater produced, but extending the length of time that the groundwater is impacted. This is likely to mean that post-closure monitoring is required for a longer period of time. As part of this assessment, Golder estimated the contaminating lifespan of the Site with early closure and a permeable soil cover using the POLLUTE model to estimate landfill leachate source concentrations. The POLLUTE model results were calibrated to actual site measured data and input parameters of the model were amended to better match existing conditions. The POLLUTE data were compared to the RUPO to evaluate the site potential contaminating lifespan and was found to be 20 to 50 years (noting that there is a general lack of hydrogeological information, as discussed earlier in this Options Assessment, that limits the accuracy of the model). It could generally be stated that the contaminating lifespan of the Site should a low-permeability cover be installed would be longer.

It is important to note that compliant concentrations of parameters of concern in groundwater at the property boundary would likely be observed prior to the end of the contaminating lifespan, however post-closure monitoring will be required to the end of the contaminating lifespan (as is typical of the environmental monitoring requirements for landfill sites in Ontario) even after compliance concentrations at the property boundary are reached. Even if the early closure of the Site results in compliant concentrations of parameters of concern in groundwater at the property boundary before the contaminating lifespan is reached, it is still expected that early closure represents a long term solution to the groundwater compliance issues. This was discussed with the MECP during the call on August 27, 2020. The MECP noted that, as there are no current downgradient groundwater users, the risk is that the downgradient property be developed in the future and groundwater use pursued before the Site becomes compliant with Guideline B-7. It was generally acknowledged that this long-term solution may require further action in the future should downgradient groundwater use be proposed.

In order to pursue early site closure, preparation of a Closure Plan would be required as per Condition 29 of the ECA. Additional capital costs would include engineering costs for the design of the final cover system, and the cost to construct the final cover system. Generally speaking, both the engineering costs and the construction costs would be expected to be higher should a low-permeability final cover be the preferred option.

Implementation of a low-permeability final cover system would also require an amendment to the design and operations report and the ECA. Capital costs are estimated to range from \$700,000 to \$1,130,000.

The early closure of the Site would significantly decrease operational costs for the Site, which would then be limited to Town staff time to manage the asset, on-going environmental monitoring and reporting, likely continuing but slowly decreasing in its requirements until the end of the contaminating lifespan (estimated at 25 to 50 years), and some maintenance of the final cover system. With early closure, there will be no further revenue generated from the Site.

Early closure of the Site should be expected to incur costs to otherwise manage the waste generated by the Town. The Site presently has about 24 more years of capacity for landfilling waste. The Town would be required to find an alternate means to manage the waste that would have otherwise been landfilled. This could include hauling the waste to a private or a neighbouring municipality's waste management facility (transfer station or landfill). Potential costs associated would include:

- hauling fees for transport of waste
- tipping fees at the destination site
- re-negotiation of the current arrangement for waste collection and hauling (if a private contract)
- consideration of age of fleet of waste collection vehicles utilized by the Town (owned by the Town or contracted) due to increased hauling distance
- establishment of a transfer station to reduce hauling distance (requiring additional capital costs and environmental approval)

4.4 Comparison Matrix

Table 2 provides a comparison of purchasing downgradient groundwater rights, purge wells for leachate-impacted groundwater collection and off-Site treatment at the Town's Water Pollution Control Centre and early site closure. The comparison matrix considers the expected time frame for implementation and site compliance, the likelihood of achieving site compliance, MECP approvability, probable capital costs, operation and maintenance considerations and costs, and other considerations.

Table 2: Comparison Matrix

Contingency Option	Expected Timeframe	Likelihood of Achieving Site Compliance	Approvability	Probable Capital Costs	Operation and Maintenance Costs	Other Considerations
<p>Option 1: Extend the Contaminant Attenuation Zone via Groundwater Easement</p>	<p>Process to acquire rights could take 2 to 5 years.</p> <p>Will immediately achieve groundwater compliance if groundwater easement purchased.</p> <p>Expected timeframe would be similar for pursuing a legal agreement with the downgradient property owner giving the Town first right of refusal to purchase the land/groundwater rights.</p>	<p>Immediate resolution of groundwater compliance issues if groundwater rights purchased through elimination of potential for downgradient groundwater users. Site compliance would transition to assessing surface water quality within the Ottawa River.</p> <p>Pursuing a legal agreement with the downgradient property owner for first right of refusal to purchase the land/groundwater rights controls the compliance issues potentially to the satisfaction of the MECP.</p>	<p>Approvability of a groundwater easement purchase is relatively simple. Will require an administrative ECA amendment.</p> <p>A legal agreement giving the Town first right of refusal to purchase the land/groundwater rights would require a detailed proposal to the MECP which includes the legal instruments to be used to obtain these rights so that they could review the legality of the option and provide a definite response</p>	<p>Cost to purchase groundwater rights, including legal fees: is presently unknown.</p> <p>If the Town pursues a legal agreement with the owner giving the Town first right of refusal to purchase the land/groundwater rights, these costs would not be incurred immediately but could possibly be expected in the near to long term. Some sort of compensation to secure this agreement is expected and it could be a capital or annual cost. Legal fees would be incurred twice.</p> <p>Cost to conduct an investigation (i.e., drilling, sampling and testing) of groundwater quality to support decision to purchase groundwater easement.</p>	<p>Minimal annual costs for a groundwater easement purchase. Will require some administrative effort and negligible impact to monitoring costs.</p> <p>Pursuit of a legal agreement with the downgradient property owner giving the Town first right of refusal to purchase the land/groundwater rights may be more complicated at the onset and involve ongoing discussion with the downgradient property owner likely including a capital or annual cost.</p>	<p>Acquiring downgradient groundwater rights on waterfront property could be contentious within the communities of Arnprior and McNab/Braeside.</p> <p>Possibility the Town could become responsible for historical groundwater contamination from activities un-related to the landfill.</p> <p>Reduction in annual groundwater monitoring program may be possible as Site would transition to surface water-based site compliance in the Ottawa River. Some additional surface water monitoring likely to be required.</p> <p>While pursuit of a legal agreement with the downgradient property owner giving the Town first right of refusal to purchase the land/groundwater rights delays the capital costs associated with this option, it should only be considered a delay to that capital expenditure at this time.</p>
<p>Option 2: Pump and Treat Leachate-Impacted Groundwater with Treatment at the Water Pollution Control Centre</p>	<p>Process to design, permit and construct system will take 2-3 years.</p> <p>Will take 2-10 years to <u>possibly</u> achieve groundwater Site compliance; the MECP indicated that achieving compliance is not immediately urgent provided that the downgradient groundwater remains unused.</p>	<p>Volume of water required to be treated may be too high to be feasible for the Water Pollution Control Centre and will use up capacity otherwise available for Town growth.</p> <p>Continual optimization of system would be required to achieve and maintain compliance.</p> <p>Fractured bedrock groundwater flow and/or desire to not collect water from the Ottawa River may make this option technically unfeasible such that compliance certainty is reduced.</p> <p>Re-direction of groundwater south toward purge well system could result in off-site groundwater contamination impacting compliance at the property boundary.</p>	<p>Will require technical ECA amendment. Technical information to support the ECA amendment would include hydrogeological studies and purge well system design.</p> <p>May require a Municipal Class EA including supporting technical information and system design details detailing the selection of treatment at the Water Pollution Control Centre.</p> <p>May require a Permit to Take Water.</p>	<p>ECA amendment, including hydrogeological studies and purge well system design: \$130K - \$250K</p> <p>Install purge wells: \$200K - \$450K</p> <p>Pre-treatment system engineering design and construction: cost not developed</p> <p>Possible purchase of tanker trucks: cost not developed</p> <p>Municipal Class EA and Permit to Take Water: cost not developed</p> <p>Two phase power assumed to be available at the Site: cost not included</p>	<p>Depending on off-Site leachate treatment fees and leachate-impacted groundwater volume, the annual operational costs for maintenance, some type of pre-treatment, staffing, monitoring, transport and off-Site treatment for the duration of the Site operation (24 years) and for the contaminating lifespan of the landfill (a minimum of 20 to 50 years post closure) in 2020 dollars: \$100K - \$1,000K</p>	<p>Re-direction of groundwater south toward purge well system could result in off-site groundwater contamination un-related to the landfill being extracted for treatment (quality unknown).</p> <p>If use of the groundwater on the downgradient property is pursued by the current or a future owner before this system improves groundwater quality to meet compliance requirements, the Town may be required to quickly implement option 1.</p>

Contingency Option	Expected Timeframe	Likelihood of Achieving Site Compliance	Approvability	Probable Capital Costs	Operation and Maintenance Costs	Other Considerations
<p>Option 3: Early Closure of the Site</p>	<p>Process to design, permit and construct system will take 2-3 years.</p> <p>Compliance concentrations would not be reached at the property boundary potentially for decades; the MECP indicated that achieving compliance is not immediately urgent provided that the downgradient groundwater remains unused.</p>	<p>A long-term solution that will alleviate compliance concerns over the very long term (decades).</p>	<p>Relatively simple. Early site closure would require the preparation of a Closure Plan as required by Condition 29 in the ECA.</p> <p>Implementation of a low-permeability final cover system would require an amendment to the design and operations report and the ECA.</p>	<p>Engineering services for preparation of the Closure Plan and design of the final cover: \$100K - \$130K (more for a low-permeability cover)</p> <p>Construction costs for the final cover system: \$600K - \$1,000K (more for a low-permeability cover)</p>	<p>Minimal. Will require some administrative effort and ongoing monitoring costs to end of contaminating lifespan (20 to 50 years, longer for a low permeability cover). Some maintenance of final cover system may also be required.</p> <p>Operational costs associated with the Site will decrease significantly if not entirely upon closure and capping.</p> <p>The Town would need to find an alternate means of managing the waste generated by the Town that is received at the Site.</p>	<p>The Town would lose in any revenue stream associated with landfill.</p> <p>If use of the groundwater on the downgradient property is pursued by the current or a future owner before this system improves groundwater quality to meet compliance requirements, the Town may be required to quickly implement option 1.</p> <p>Potential additional costs associated with changes to requirements for hauling waste or establishment of a transfer station.</p>

5.0 DISCUSSION

Based on the above comparison matrix, a list of the advantages and disadvantages for pursuing each option are listed below in Table 3.

Table 3: Advantages and Disadvantages of Contingency Options

Contingency Option	Advantages	Disadvantages
Extend the Contaminant Attenuation Zone via Groundwater Easement	<ul style="list-style-type: none"> ■ Groundwater easement immediately resolves groundwater Site compliance ■ Possible reduction in annual groundwater monitoring program as Site would transition to surface water compliance ■ Simple MECP approval process (slightly more complex if pursuing a legal agreement with the downgradient property owner giving the Town first right of refusal to purchase the land/groundwater rights) 	<ul style="list-style-type: none"> ■ Expensive up-front costs (immediate or in future) ■ Permanently restricting groundwater use on waterfront property ■ Possibility this is a political and/or contentious undertaking from public's perspective ■ Possibility of acquiring responsibility for historic contamination on downgradient property (currently unknown) ■ No change to groundwater quality
Pump and Treat Leachate-impacted Groundwater with Treatment at the Water Pollution Control Centre	<ul style="list-style-type: none"> ■ Potentially lower initial costs compared to purchase of groundwater rights ■ Positive impact on groundwater quality ■ Legally, development opportunities requiring groundwater utilization may be available on the downgradient privately owned property (depending on existing groundwater quality and impacts from other historic activity) 	<ul style="list-style-type: none"> ■ Achieving groundwater compliance is not guaranteed (may have to resort to extending the CAZ in the longer term) ■ Expensive long-term costs, ongoing operation, maintenance and monitoring of the system for contaminating lifespan of the landfill (i.e., after closure of the landfill) ■ More sophisticated landfill staffing will be required to operate and maintain the purge wells and any pre-treatment system ■ Will require more complex MECP approvals; possibly a Municipal Class EA, ECA amendment and possibly a Permit to Take Water. ■ Possibility of extracting/treating off-site groundwater contaminated by activities other than the landfill. ■ May have to resort to extending the CAZ in the longer term if the use of downgradient groundwater is pursued prior to achieving compliance at the site boundary

Contingency Option	Advantages	Disadvantages
Early Closure of the Site	<ul style="list-style-type: none"> ■ Potentially lower initial costs compared to purchase of groundwater rights. ■ Effectively eliminates costs associated with landfill operation (work for Town staff and ongoing environmental monitoring still required). ■ Positive impact on groundwater over the long term (alleviates compliance issues within decades). ■ Legally, development opportunities requiring groundwater utilization may be available on the downgradient privately owned property (depending on existing groundwater quality and impacts from other historic activity). ■ Approval framework is relatively simple. 	<ul style="list-style-type: none"> ■ Environmental monitoring required for 25 to 50 years (to end of contaminating lifespan). ■ The Town would need to find an alternate means of managing the waste generated by the Town that is received at the Site (could be costly). ■ The Town would lose in any revenue stream associated with landfill. ■ May have to resort to extending the CAZ in the longer term if the use of downgradient groundwater is pursued prior to achieving compliance at the site boundary.

6.0 LIMITATIONS

Golder Associates Ltd. has relied in good faith on all information provided and does not accept responsibility for any deficiency, misstatements or inaccuracies contained in the memorandum as a result of omissions, misinterpretation, or fraudulent acts of the persons contacted or errors or omissions in the reviewed documentation.

The services performed, as described in this memorandum, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

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

The findings and conclusions of this memorandum are valid only as of the date of this memorandum. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this letter and to provide amendments as required.

7.0 CLOSURE

Should you have any questions regarding this memorandum, please contact the undersigned.

Golder Associates Ltd.



Andria Caletti, P.Eng.
Environmental Engineer

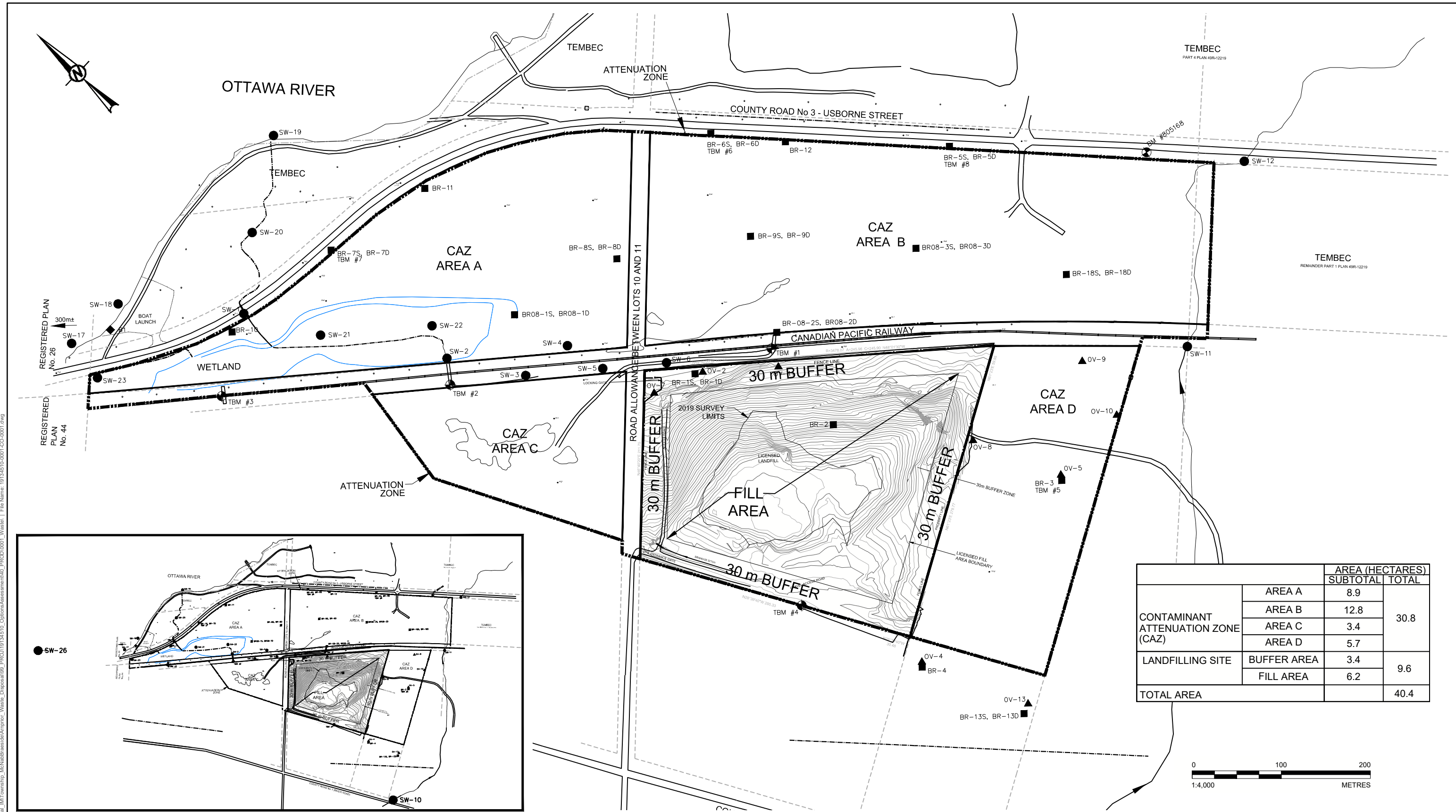


Trish Edmond, M.E.Sc., P.Eng.
Geoenvironmental Engineer/ Principal

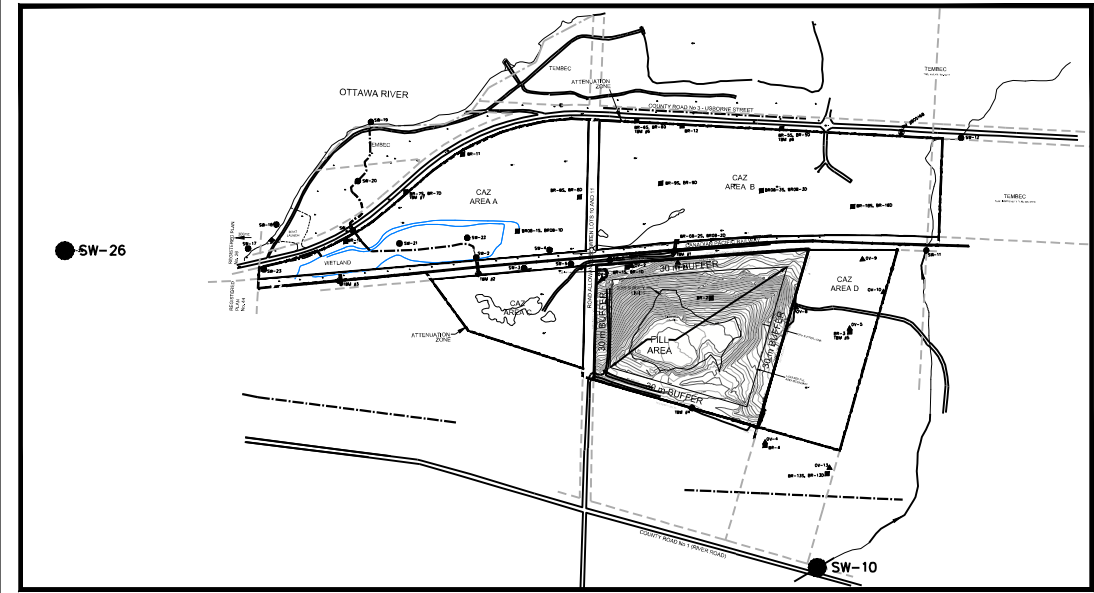
ETB/ALC/PLE/sg

[https://golderassociates.sharepoint.com/sites/119264/project files/5 technical work/options assessment/03_december 2020 revision - mecp/19134510-tm-rev0-options assessment - dec2020.docx](https://golderassociates.sharepoint.com/sites/119264/project%20files/5%20technical%20work/options%20assessment/03_december%202020%20revision%20-%20mecp/19134510-tm-rev0-options%20assessment%20-%20dec2020.docx)

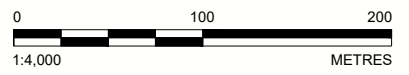
Attachments: Figure 1 – Site Plan



Path: \\golder\gpc\projects\19134510_OptionAssessment\40_PRCO\0001_Views\19134510-0001-CD-0001.dwg



		AREA (HECTARES)	
		SUBTOTAL	TOTAL
CONTAMINANT ATTENUATION ZONE (CAZ)	AREA A	8.9	30.8
	AREA B	12.8	
	AREA C	3.4	
	AREA D	5.7	
LANDFILLING SITE	BUFFER AREA	3.4	9.6
	FILL AREA	6.2	
TOTAL AREA			40.4



- LEGEND**
- BR-1 BEDROCK MONITORING STATION
 - SW-6 SURFACE WATER MONITORING STATION
 - ▲ OV-7 OVERBURDEN MONITORING STATION
 - TBM #6 TEMPORARY BENCHMARK
 - TOPOGRAPHICAL CONTOURS (2013, 2014, 2015, 2016, 2017, 2018 AND 2019 COMBINED SURVEYS)

- REFERENCE(S)**
1. BASE PLAN SUPPLIED IN DIGITAL FORMAT BY J.L. RICHARDS
 2. TOPOGRAPHICAL CONTOURS BEYOND THE EXTENT OF THE 2014 TO 2019 SURVEYS SUPPLIED IN DIGITAL FORMAT BY JP2G CONSULTANTS INC.
 3. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28

CLIENT
CORPORATION OF THE TOWN OF ARNPRIOR

PROJECT
TOWN OF ARNPRIOR OPTIONS ASSESSMENT,
ARNPRIOR WASTE DISPOSAL SITE

CONSULTANT	DATE	APPROVED
GOLDER	2020-05-29	PLE
PREPARED	ABD	
DESIGN	ETB	
REVIEW	ALC	
APPROVED	PLE	

TITLE	PROJECT No.	CONTROL	Rev.	FIGURE
SITE PLAN	19134510	0001	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3/B

8.0 REFERENCES

Cooper, H.H., Jr., and Jacob, C.R., 1946. A generalized graphical method for evaluation formation constants and summarizing well field history. *Transactions, American Geophysical Union*, Vol. 27, No. 4.

Ministry of the Environment and Energy, 1994. Guideline B-7: Incorporation of the Reasonable Use Concept into MOEE Groundwater Management: MOEE Program Development Branch: Ontario Ministry of the Environment and Energy, April 1994, 8 p.

Ottawa River Regulation Planning Board (ORRPB), 2020. Monthly and Annual Mean Water Levels in Metres From 1950 (Chats Lake). <http://ottawariver.ca/information/historical-water-level-streamflow-summary/chats-lake-at-arnprior/>

Town of Arnprior, By-law No. 6227-13, Sewer Use By-Law.



REPORT

Request to Extend Deadline for Updated Trigger Mechanism and Contingency Plans

*Corporation of the Town of Arnprior
Arnprior Waste Disposal Site
ECA No. A412603*

Submitted to:

Ministry of Environment, Conservation and Parks

Client Services and Permissions Branch (CSPB)
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario M4V 1P5

Attention: Director

Submitted by:

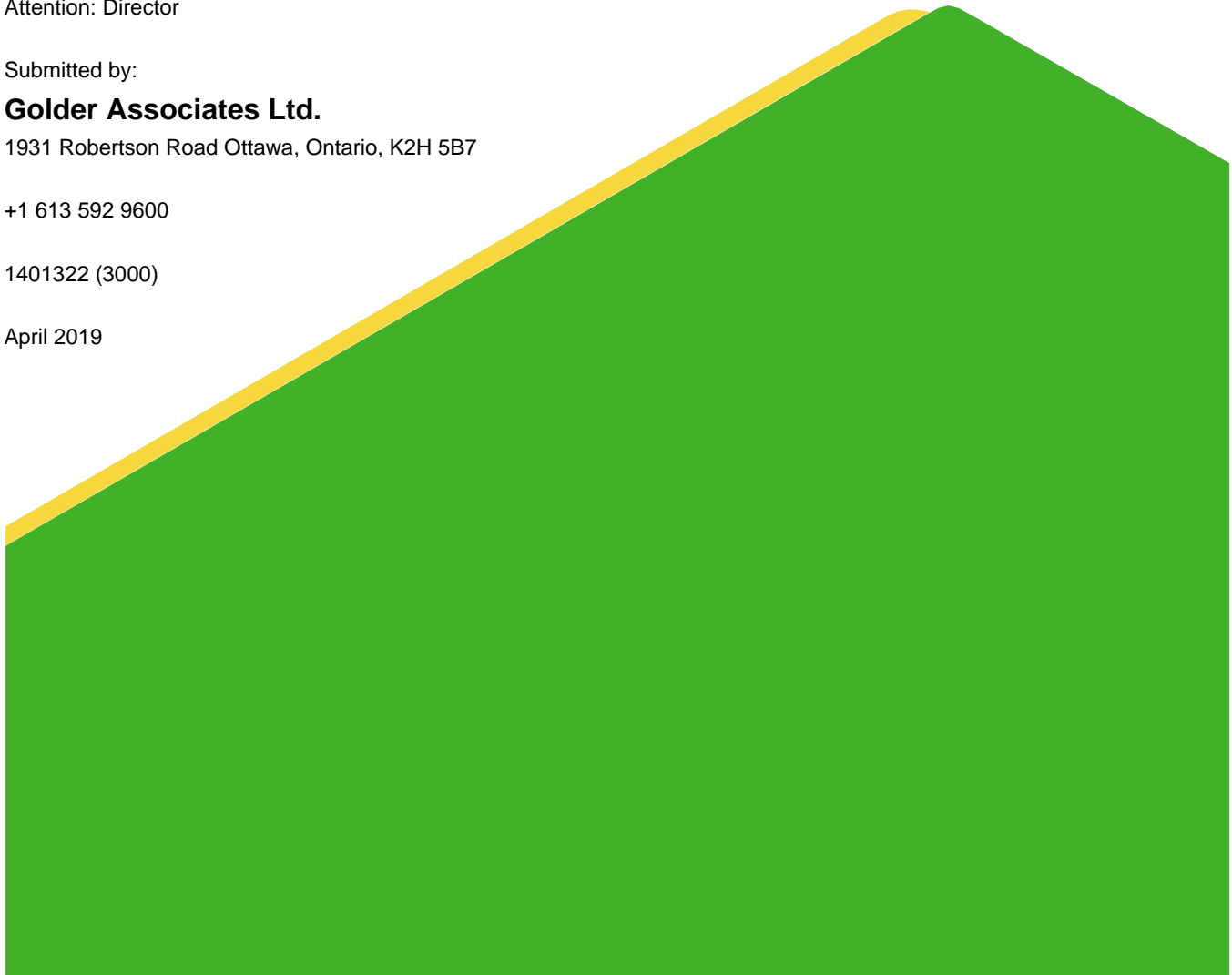
Golder Associates Ltd.

1931 Robertson Road Ottawa, Ontario, K2H 5B7

+1 613 592 9600

1401322 (3000)

April 2019



Distribution List

- 1 copy MECP, Client Services and Permissions Branch
- 1 e-copy MECP, Client Services and Permissions Branch
- 1 copy MECP, Ottawa District Office
- 1 copy The Corporation of the Town of Arnprior
- 1 e-copy Golder Associates Ltd.

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APPLICATION FORM

Environmental Compliance Approval

ATTACHMENTS

ATTACHMENT A

Supporting Documentation

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General Information and Instructions

General Information

Information requested in this form is collected under the authority of the *Environmental Protection Act* (EPA), *Ontario Water Resources Act* (OWRA) and Environmental Bill of Rights (EBR), and will be used to evaluate applications for Environmental Compliance Approvals (ECAs) issued under Part II.1 of the EPA. This application form should not be used for mobile PCB destruction facilities.

For all questions related to preparing or submitting this form or about the Ministry's collection of information related to applying for an ECA, contact:

Client Services and Permissions Branch
135 St. Clair Ave. West, 1st Floor
Toronto Ontario M4V 1P5
Telephone outside Toronto 1-800-461-6290 or in Toronto 416-314-8001.

Instructions

1. Applicants are responsible for ensuring that they complete the most recent application form. Application forms and information about the required supporting documentation and technical requirements are available from the Client Services and Permissions Branch (the address and phone number are provided in the General Information on this page). As well, you can get this information from your local District Office of the Ministry of the Environment and Climate Change, and online at: <https://www.ontario.ca/page/environmental-approvals>
2. A complete application consists of:
 - a completed and signed application form;
 - all required supporting documents and technical requirements identified in:
 - i. this form,
 - ii. Ministry guidance,
 - iii. the Applications for Environmental Compliance Approvals regulation, and
 - payment of the application fee (in Canadian funds) by certified cheque or money order made payable to the Minister of Finance, or credit card payment (for payments up to \$10,000). For Transfer of Review, make the cheque or money order payable to the appropriate municipality. **The Ministry may return or refuse incomplete applications to the applicant.** The Director may require additional information of any application initially accepted as complete.
3. Submit the complete application as follows:
 - One (1) paper copy (unless the application is a Transfer of Review), one (1) electronic copy and the fee to the Director, Client Services and Permissions Branch at the address provided in the General Information on this page.
 - If the application is a Transfer of Review, the applicant must submit two (2) copies of the completed application and the fee to the designated municipal authority.
4. The applicant must also send a copy of the application without the fee to the local Ministry District Office that has jurisdiction over the area where the facilities are located. DO NOT send payment to the District Office.
 - To locate the appropriate local Ministry District Office, visit the Ministry of the Environment and Climate Change website at: <http://www.ontario.ca/environment-and-energy/ministry-environment-and-climate-change-regional-and-district-offices>
5. For Waste Disposal Sites the applicant must also send a copy of the application without the fee to the Clerk's office of the local municipality (both upper and lower tier) in which the facility/proposed facility is located unless the application is for a revocation or an amendment that is environmentally insignificant or the applicant is a municipality. DO NOT send any payment information to the municipality.

Information collected by the Ministry of the Environment and Climate Change is subject to the *Freedom of Information and Protection of Privacy Act (FIPPA)*. If the applicant is of the view that any part of the application is confidential on the grounds that such information constitutes a trade secret or scientific, technical, commercial, financial or labour relations information, please make this known now. Otherwise, the Ministry may make the information available to the public without further notice to the applicant.

It is an offence under the EPA and OWRA to provide false or misleading information in this application and/or accompanying documents.

Complete the sections as shown below.

- Section 1: Applicant Information
- Section 2: Project Information
- Section 3: Regulatory Requirements
- Section 4: Site Information
- Section 5: Facility Information
- Section 6: Supporting Documentation
- Section 7: Payment Information
- Section 8: Authorization

Fields marked with an asterisk (*) are mandatory.

1. Applicant Information

1.1 Applicant Information

Applicant Type *

- Corporation Individual Federal Government Municipal Government
- Partnership Provincial Government Sole Proprietor
- Other (specify) _____

Applicant Name (Legal name of individual or organization as evidenced by legal documents) *

[Corporation of the Town of Arnprior](#)

Select if Business Name same as Applicant Name

Business Name *

[Corporation of the Town of Arnprior](#)

Business Number

Business Website Address

www.arnprior.ca

Primary North American Industry Classification System (NAICS) Code *


[56221](#)

Other NAICS Code

Separate list attached?

Yes No

Business Activity Description

 Completion Status (1.1 Applicant Information)

1.2 Applicant Physical Address

Address Type? *

Civic Address Survey Address

Civic Address

Unit Number	Street Number *	Street Name *
	105	Elgin Street West

Survey Address

Enter Lot and Concession or Part and Reference Plan

Lot	Concession	Part	Reference Plan

Municipality/Unorganized Township *	County/District		
Arnprior	County of Renfrew		
Province/State *	Country *	Postal/Zip Code *	
Ontario	Canada	K7S 0A8	
Telephone Number *	Fax Number	Mobile Number	Email Address *
613-623-4231 ext.1831			jsteckly@arnprior.ca

Geo Reference

Description of location	Map Datum	Zone	Accuracy Estimate	Geo-Referencing Method	UTM Easting	UTM Northing
Southwest corner of property						
Physical location of front door or main entrance						

✓ Completion Status (1.2 Applicant Physical Address)

1.3 Applicant Mailing Address

Select if same as Physical Address

Unit Number	Street Number *	Street Name *	
	105	Elgin Street West	
Delivery Designator	Delivery Identifier	Postal Station	
Municipality/Unorganized Township *	County/District		
Arnprior	County of Renfrew		
Province/State *	Country *	Postal/Zip Code *	
Ontario	Canada	K7S 0A8	
Telephone Number *	Fax Number	Mobile Number	Email Address *
613-623-4231 ext.1831			jsteckly@arnprior.ca

✓ Completion Status (1.3 Applicant Mailing Address)

2. Project Information

2.1 Project Name and Description

Project Name *

[Request to Extend Deadline for Updated Trigger Mechanism and Contingency Plans - Arnprior Waste Disposal Site](#)

Project Description Executive Summary *

[The town of Arnprior is requesting an extension to the deadline for submission of a proposed update to the Trigger Mechanism and Contingency Plans for the Arnprior Waste Disposal Site. \(Environmental Compliance Approval \(ECA\) No. A412603\). It is proposed that the deadline be extended to December 31, 2019.](#)

Supplemental Application Information (select information button for required information for this field) *

[Attachment A to this application provides a summary of the pre-consultation conversations with the Ministry of the Environment, Conservation and Parks Ottawa District Office and Technical Support Branch related to this application.](#)

 Completion Status (2.1 Project Name and Description)

2.2 Application Type

Type *

New ECA

Amendment to existing ECA

Revocation of existing ECA

Administrative amendment to existing ECA

Application for renewal of limited operational flexibility

Consolidation of existing ECAs

Is this application for the addition of a new project type to the site or a new municipal waste category/class code to the waste management systems or a new sewage facility type? *

Yes No

Is this application for Transfer of Review? *

Yes No

 Completion Status (2.2 Application Type)

2.3 Project Type

Project Type (Select all that apply) *	Limited Operational Flexibility?	Pilot Project?
<input type="checkbox"/> Air - Stationary	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Air - Mobile	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Noise	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Vibration	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Waste Disposal Site - Landfill site	N/A	<input type="checkbox"/>
<input type="checkbox"/> Waste Disposal Site - Transfer site	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Waste Disposal Site - Processing site	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Waste Disposal Site - Composting site	N/A	<input type="checkbox"/>
<input type="checkbox"/> Waste Disposal Site - Thermal Treatment site	N/A	<input type="checkbox"/>
<input type="checkbox"/> Sewage - Industrial	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sewage - Municipal	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Sewage - Private	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Waste Management System – General Waste Management System	N/A	<input type="checkbox"/>
<input type="checkbox"/> Waste Management System - Hauled Sewage (Septage)	N/A	<input type="checkbox"/>
<input type="checkbox"/> Waste Management System – Soil Conditioner for transport to a site for Application on Land	N/A	<input type="checkbox"/>
<input type="checkbox"/> Waste Management System - Mobile Waste Processing	N/A	<input type="checkbox"/>
<input type="checkbox"/> Cleanup of contaminated sites - Mobile	N/A	<input type="checkbox"/>
<input type="checkbox"/> Cleanup of contaminated sites - Site specific	N/A	<input type="checkbox"/>

 Completion Status (2.3 Project Type)

2.4 Approval Information

Application initiated by *

- Applicant
 S. 20.18 Order (attach copy)
- Condition of existing approval
 Provincial Officer Order (attach copy)
- Inspection Report (attach copy)
 Other (specify) _____

Current Environmental Compliance Approvals that may be changed or amended by this application: N/A

Environmental Compliance Approval Number *	Date of Issuance (yyyy/mm/dd) *
A412603	1999/10/26

Separate list attached?


- Yes No

Proposed Environmental Compliance Approvals related to this project: N/A

Project Type	Ministry Reference Number (if applicable)	Have Submitted	Have not Submitted
		<input type="checkbox"/>	<input type="checkbox"/>

Separate list attached?

- Yes No

 Completion Status (2.4 Approval Information)

2.5 Other Approval/Permits for Facility N/A

List all other instruments (approvals or permits) issued by the Ministry of the Environment and Climate Change or applied for under the *Environmental Protection Act*, *Environmental Assessment Act*, *Ontario Water Resources Act* and *Safe Drinking Water Act, 2002* and any Environmental Activity and Sector Registrations that are relevant to this application.

Instrument Type	Instrument Number/ Application Reference Number	Approval or Application Date (yyyy/mm/dd)

Separate list attached?


Yes No

List all other instruments (approvals or permits) issued by an agency, municipality or another ministry that are relevant to this application.

Issuing Agency	Approval or Permit Name	Approval or Permit Number	Issued Date (yyyy/mm/dd)

Separate list attached?

Yes No

 Completion Status (2.5 Other Approval/Permits for Facility)

2.6 Technical Contacts

Technical Contact 1

Area of Responsibility (Select all that apply) *

Air Noise/Vibration Sewage Waste

Name of Technical Contact

Last Name *

Caletti

First Name *

Andria

Company *

Golder Associates Ltd.

Address Information

Select if same as Applicant Mailing Address

Civic Address

Unit Number

Street Number *

1931

Street Name *

Robertson Road

Delivery Designator

Delivery Identifier

Postal Station

Municipality/Unorganized Township *

Ottawa

County/District

Province/State *

ON

Country *

Canada

Postal/Zip Code *

K2H 5B7

Telephone Number *


613-592-9600 ext. 3285

Fax Number

Mobile Number

Email Address *

andria_caletti@golder.com

 Completion Status (2.6 Technical Contacts)

3. Regulatory Requirements

3.1 Environmental Bill of Rights (EBR) Requirements

Is this a proposal for a prescribed instrument under the EBR? *

Yes No

If yes, is this proposal exempted from the EBR requirements? *

Yes No

If yes, please check one of the following (Please provide supporting information.) *

This proposal has been considered in a substantially equivalent process of public participation. (EBR, 1993, s.30.)

Was the public participation process carried out in fulfillment of the requirements related to an approval under the *Planning Act*?

Yes No

If yes, was the *Planning Act* approval related to a plan of subdivision?

Yes No

This proposal is for an emergency situation. (EBR, 1993, s. 29.)

This proposal is for an amendment to or revocation of an existing Environmental Compliance Approval that is not environmentally significant. (EBR, 1993, s. 22 (3).)

This proposal has been subject to or exempted from EAA Requirements or considered in a decision of a tribunal. (EBR, 1993, s. 32.)

Completion Status (3.1 Environmental Bill of Rights (EBR) Requirements)

3.2 Environmental Assessment Act (EAA) Requirements

Is the proposed undertaking subject to the requirements of the EAA? *

Yes No

If yes, please select one of the following:

The proposed undertaking has fulfilled the requirements of the EAA through the completion of a Class EA process

Name of Class EA _____

Schedule/Group/Category (if applicable) _____

If applicable, please submit a copy of the proof of completion (for example, Notice of Completion).

Was the undertaking subject of a Part II Order request(s)?

Yes No

If yes, please submit a copy of the Director's or Minister's decision letter.

The proposed undertaking has fulfilled all of the requirements for the EAA through:

Select all that apply:

completion of an Environmental Screening Process pursuant to O. Reg. 101/07 of the EAA

completion of an Environmental Screening Process pursuant to O. Reg. 116/01 of the EAA

Was the undertaking subject of an elevation request(s)?

Yes No

If yes, please submit a copy of the Director's decision letter. If an appeal was made to the Director's decision, please also submit a copy of the Minister's decision letter.

completion of an Environmental Screening Process pursuant to O. Reg. 231/08 of the EAA

Was the undertaking subject of an objection(s)?

Yes No

If yes, please submit a copy of the Minister's decision letter.

The proposed undertaking has fulfilled the requirements of the EAA through the completion of an individual Environmental Assessment.

Please submit a copy of the signed Notice of Approval.

Was the undertaking exempted from the requirements of the EAA? *

Yes No


The proposed undertaking has fulfilled the requirements of the EAA through an exemption provided under:

Select one of the following

Section _____ of Ontario Regulation No. _____ or

Declaration/Exemption Order Number _____

If Regulation, Declaration Order or Exemption Order does not refer directly to this undertaking, please provide supporting documentation to explain why it applies to this facility

 Completion Status (3.2 *Environmental Assessment Act* (EAA) Requirements)

3.3 Consultation/Notification

Indigenous Consultation:

Is the proposed project/activity on Crown land or does/would it alter access to Crown land? * Yes No

Is the proposed project/activity in an open or forested area where hunting, trapping or plant gathering could occur? * Yes No

Does the proposed project/activity involve the clearing of forested land? * Yes No

Could the proposed project/activity impact a water body (e.g., direct discharge) or alter access to a water body? * Yes No

Could the proposed project/activity impact cultural heritage or archaeological resources, or access to them? * Yes No

Is the proposed project/activity adjacent or close to a First Nation Reserve? * Yes No

Is the applicant aware of any concerns from Indigenous communities about this proposed project/activity? * Yes No

Were there conditions placed, or direction provided, in another (or previous) permit or approval for consultation in relation to this project/activity? * Yes No

Based on the online Guide to Applying for an Environmental Compliance Approval, or direction provided by the ministry or another agency, are Indigenous consultation activities likely required as part of this application process? * Yes No

If Yes to the question above, please describe the consultation/notification activities undertaken for this application or as part of another process (e.g., EAA) in relation to the proposed project/activity, including a summary of the notification/consultation, First Nation and Métis communities contacted, key issues raised and how they were addressed, any changes to the project as a result of these activities, and any planned consultation/notification activities in the future.

Please attach supporting documents (e.g., record of consultation, delegation letter and/or direction provided by the Crown, materials provided to communities, meeting notes and agendas, correspondence with communities as appropriate).

If the applicant has determined that consultation with First Nation and Métis communities is not likely required for the proposed project/activity, please provide a rationale why: *

The requested amendment is administrative only.

Other Consultation/Notification:

Has the applicant had a ministry pre-application consultation in relation to the proposed project? *

Yes No

If this application is for a waste disposal site, have the neighbour notification requirements been completed? *

Yes No

If yes, please attach a Public Consultation/Notification Report that includes the notice and list of recipients.

If no, please select the reason for not undertaking neighbour notification: *

Application is for an administrative amendment

The proposal was subject to public consultation through an Environmental Assessment process

other , please explain _____

Are there any other consultation/notification activities that have been undertaken to fulfill requirements by other legislation or through voluntary efforts? *

Yes No

If yes, please:

1. describe the consultation/notification activities below; and
 2. attach documents describing each of these consultation\nnotification activities, any changes to the project as a result of these activities and any planned consultation/notification activities in the future.
-



Completion Status (3.3 Consultation/Notification)

4. Site Information

4.1 Site Address or Storage Location

Will the vehicles or equipment be stored at more than one location?

Yes No

(If yes, please enter all vehicle or equipment storage locations below and attach separate list, as necessary.)

Select if same as Applicant Physical Address

Address Type? *

Civic Address Survey Address

Primary Civic Address

Unit Number	Street Number	Street Name

Additional Civic Addresses

Unit Number	Street Number	Street Name

Separate list attached?

Yes No

Primary Survey Address

Enter Lot and Concession or Part and Reference Plan *

Lot *	Concession *	Part	Reference Plan
Part of 9, 10 and 11	XIII		

Additional Survey Address

Enter Lot and Concession or Part and Reference Plan

Lot	Concession	Part	Reference Plan

Separate list attached?

Yes No

Municipality/Unorganized Township *	County/District
Township of McNab/Braeside	County of Renfrew

Province/State *	Country *	Postal/Zip Code *
Ontario	Canada	K0A 1G0

Non-address Information (includes any additional information to clarify the physical location)

Geo Reference (required)

Select if same as Applicant Physical Geo Reference

Description of location	Map Datum *	Zone *	Accuracy Estimate *	Geo-Referencing Method *	UTM Easting *	UTM Northing *
Southwest corner of property	NAD83	18	+10 meters	Google Earth	390,857.00	5,034,787.00
Physical location of front door or main entrance	NAD83	18	+10 meters	Google Earth	390,857.00	5,034,787.00

✓ Completion Status (4.1 Site Address or Storage Location)

4.2 Site or Storage Location Information

Site Name *

[Arnprior Waste Disposal Site](#)

Days and Hours of Operation *

[Monday to Saturday, 9 am to 4 pm](#)

Ministry of the Environment and Climate Change District Office *

[Ottawa District Office](#)

Is the site (property) that is the subject of this application owned by the applicant? *

Yes No

If no, please include the owner's name, address and a signed document indicating that the applicant has the authority to install and operate the proposed activity, or store vehicles or equipment on the land.

Is the applicant the operating authority of the site that is the subject of this application? *

Yes No

If no, please include the operating authority name, address and phone number.

Is the site located in an area of development control as defined by the *Niagara Escarpment Planning and Development Act* (NEPDA)? *

Yes No

If yes, please attach a copy of the NEPDA permit for proposed activity.

Is the site within an area covered by the Oak Ridges Moraine Conservation Plan? *

Yes No

If yes, please attach proof of municipal planning approval for the proposed activity/work (for example, zoning by-law, letter from municipality, etc.).

Completion Status (4.2 Site or Storage Location Information)

4.3 Site Zoning and Classification N/A

Current Land Use *

[Landfill](#)

Official Plan Designation *

[Disposal Industrial](#)

Current Zoning (Please attach zoning map, if available.) *

[Disposal Industrial](#)

Adjacent Land Use (select all that apply) *

Industrial Agricultural Commercial Recreational Residential

Other (specify) * [Environmental Protection, Extractive Industrial](#)

Adjacent Land Zoning *

[General Industrial, Extractive Industrial, Residential, Environmental Protection, Rural](#)

Does the current zoning permit the proposed activity? *

Yes No

Does the applicant have correspondence from the municipality to confirm that the current zoning of the property permits the proposed use? *

Yes No If yes, please attach correspondence from the municipality.

Does the official plan designation support the proposed activity? *

Yes No N/A

Completion Status (4.3 Site Zoning and Classification)

4.4 Point of Entry into Ontario N/A

(for waste management system vehicles that are stored at an address outside of Ontario)

City in closest proximity to the point of entry

Description of Point of Entry

✓ Completion Status (4.4 Point of Entry into Ontario)

4.5 Source Protection/Drinking Water Threats (sewage or waste disposal site applications only) N/A

Check the source protection area(s) where the activity is/will be located *

- | | | |
|--|--|--|
| <input type="checkbox"/> Ausable Bayfield | <input type="checkbox"/> Cataraqui Region | <input type="checkbox"/> Catfish Creek |
| <input type="checkbox"/> Central Lake Ontario | <input type="checkbox"/> Credit Valley | <input type="checkbox"/> Crowe Valley |
| <input type="checkbox"/> Essex | <input type="checkbox"/> Ganaraska | <input type="checkbox"/> Grand River |
| <input type="checkbox"/> Grey Sauble | <input type="checkbox"/> Halton | <input type="checkbox"/> Hamilton |
| <input type="checkbox"/> Kawartha-Haliburton | <input type="checkbox"/> Kettle Creek | <input type="checkbox"/> Long Point |
| <input type="checkbox"/> Lakehead | <input type="checkbox"/> Lake Simcoe and Couchiching/Black River | <input type="checkbox"/> Lower Trent |
| <input type="checkbox"/> Lower Thames Valley | <input type="checkbox"/> Maitland Valley | <input type="checkbox"/> Mattagami |
| <input type="checkbox"/> Mississippi Valley | <input type="checkbox"/> Niagara | <input type="checkbox"/> North Bay Mattawa |
| <input type="checkbox"/> Northern Bruce Peninsula | <input type="checkbox"/> Nottawasaga Valley | <input type="checkbox"/> Rideau Valley |
| <input type="checkbox"/> Raisin Region | <input type="checkbox"/> South Nation | <input type="checkbox"/> Saugeen Valley |
| <input type="checkbox"/> Sault Ste. Marie | <input type="checkbox"/> Severn Sound | <input type="checkbox"/> Sudbury |
| <input type="checkbox"/> St. Clair Region | <input type="checkbox"/> Toronto and Region | <input type="checkbox"/> Otonabee-Peterborough |
| <input checked="" type="checkbox"/> Outside a source protection area | <input type="checkbox"/> Quinte | <input type="checkbox"/> Upper Thames River |

Is the proposed activity located or planned to be located in a vulnerable area identified in a local assessment report source protection plan under the *Clean Water Act, 2006*? *

Yes No

If yes, what is/are the vulnerable area(s)/zone(s)?

- Wellhead Protection Areas Surface Water Intake Protection Zones Highly Vulnerable Aquifers
 Significant Groundwater Recharge Areas

Is the activity being applied for identified as a significant drinking water threat in the assessment report for the local source protection area? *

Yes No

✓ Completion Status (4.5 Source Protection/Drinking Water Threats)

4.6 Receiver of Effluent Discharge (sewage applications only) N/A

Intermediate Receiver Name

Watershed Name

Type of Receiver

- Surface Water Groundwater Other (specify) _____
-

Has the facility received local Conservation Authority clearance? (for stormwater management facility discharging to the natural environment)

Yes No

If yes, please include a copy of the Conservation Authority clearance.

Final Receivers N/A

Will the proposed activity discharge sewage to any of the following critical receivers?

Lake Simcoe

Rideau River

Detroit River

Great Lakes

Rouge River

Bay of Quinte

Other (specify) _____

Is the receiver a Policy 2 receiver?

Yes No

Does the applicant have a Policy 2 deviation approval from the directors?

Yes No

If yes, please attach a copy of the Director's approval.

✓ Completion Status (4.6 Receiver of Effluent Discharge)

5. Facility Information

5.1 Air Note** - If the application does not have air emissions please proceed to Section 5.2

[Information](#)

5.1.1 Summary of Equipment that Discharges Contaminants to the Air

Select Type of Equipment	Number of Pieces of Equipment
<input type="checkbox"/> Combustion equipment that uses natural gas, propane, no. 2 oil, landfill gas or sewage treatment gas for fuel for the purpose of providing comfort heating or emergency power, producing hot water or steam, or heating material in a system that does not discharge to the atmosphere (Total Heat input of all units: $\leq 50,000,000$ kJ/hr)	N/A
<input type="checkbox"/> Storage tanks	N/A
<input type="checkbox"/> Welding operations that use a maximum of 10 kilograms of welding rod per hour	N/A
<input type="checkbox"/> Combustion equipment that uses waste-derived fuel for the purpose of providing comfort heating, burning ≤ 15 litres per hour	
<input type="checkbox"/> Heat cleaning ovens used for parts cleaning and associated parts washers or degreasing equipment, other than solvent degreasing equipment	
<input type="checkbox"/> Cooling towers	
<input type="checkbox"/> Equipment used to control emissions of contaminants, other than a fume incinerator	
<input type="checkbox"/> Laboratory fume hoods	
<input type="checkbox"/> Paint spray booths and associated equipment that have a design capacity of up to 8 litres per hour of paint	
<input type="checkbox"/> Grain dryers	
<input type="checkbox"/> Any other equipment not listed above with a flow rate of less than or equal to $1.5 \text{ m}^3/\text{second}$	
<input type="checkbox"/> Any other equipment not listed above with a flow rate of greater than $1.5 \text{ m}^3/\text{second}$	
<input type="checkbox"/> Equipment that is subject to an Environmental Compliance Approval, and from which there is no proposed increase in the discharge of any contaminant that was previously reviewed by the Director.	N/A

✓ Completion Status (5.1.1 Summary of Equipment that Discharges Contaminants to the Air)

5.1.2 Emission Summary and Dispersion Modelling (ESDM) Report

Is the review of an existing, approved ESDM required as part of this proposed application?

Yes No

If yes, identify the number of emission sources described in the existing ESDM Report that emit contaminants in common with the sources forming the subject of the application (if none, enter zero).

Have all of these emission sources been described in an ESDM Report that was previously reviewed as part of an application for an existing Environmental Compliance Approval?

Yes No

✓ Completion Status (5.1.2 ESDM Report)

5.1.3 O. Reg. 419/05 Requirements

Which of the following sections of O. Reg. 419/05 applies to the facility?

s.19 (Schedule 2)

s. 20 (Schedule 3)

Does not apply. Please indicate reason _____

Has an instrument under O. Reg. 419/05 been issued?

Yes No

If yes, what type(s) of instruments (including any notices, orders or approvals) has (have) been issued? (select all that apply)

ss. 4(2) Adjacent Properties

ss. 7(1) Specified Dispersion Models

ss. 8(2) Negligible Sources

ss. 10(2) Operating Conditions

ss. 11(2) Refined Emission Rates

ss. 13.1 Value of Dispersion Modeling Parameters

ss. 13(1) Meteorological Data

ss. 14(6) Area of Modelling Coverage

ss. 20(4) Speed-up Request

ss. 20(5) Speed-up Order

s. 35 Site-specific Standard

ss. 35(14) Site-specific Standard Order

ss. 39(3) Technical Standard Registration (Industry Standard)

ss. 39(4) Technical Standard Registration (Equipment Standard)

Other (list all that have been issued) _____

Is an instrument under O. Reg. 419/05 being requested as part of this application?

Yes No

If yes, what type(s) of notice, order or approval is (are) being requested?

ss. 7(1) Specified Dispersion Models

ss. 8(2) Negligible Sources

ss. 10(2) Operating Conditions

ss. 11(2) Refined Emission Rates

ss. 13(1) Meteorological Data

ss. 14(6) Area of Modelling Coverage

ss. 20(4) Speed-up Request

s. 32 Request for a Site-specific Standard Order

ss. 39(1)(a) Application for Technical Standard Registration (Industry Standard)

ss. 39(1)(b) Application for Technical Standard Registration (Equipment Standard)

Other (list all that have been issued) _____

Please attach the form(s) requesting the notice(s) and/or order(s) and any additional supporting information.

Has an s. 30 Upper Risk Threshold (Schedule 6) been exceeded?

Yes No

If yes, please include additional supporting information.

Is the facility located in a multi-tenant building?

Yes No

If yes, additional information may be requested.

Are all of the contaminants to which the application relates represented in the Ministry of the Environment and Climate Change publication titled "Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution- Local Air Quality" or have they been screened out based on the publication titled " Jurisdictional Screening Level (JSL) List, A Screening Tool for Ontario Regulation 419: Air Pollution - Local Air Quality"?

Yes No

(If no, please attach Supporting Information for a Maximum Ground Level Concentration Acceptability Request for Compounds with no Ministry POI Limit - Supplement to Application for Approval, EPA S. 9).

✓ Completion Status (5.1.3 O. Reg. 419/05 Requirements)

✓ Completion Status (5.1 Air)

5.2 Noise Note** - If the application does not have noise emissions please proceed to Section 5.3

5.2.1 Noise Assessment [Information](#)

Has an Acoustic Assessment Report (AAR) been completed in relation to the proposed project/activity?

Yes No

If yes, please attach the Acoustic Assessment Report

Does the AAR show that applicable limits are met?

Yes No

If no, please attach the Acoustic Assessment Report including the Noise Abatement Action Plan

If no, is the application eligible for Primary or Secondary Noise Screening?

Yes No

Note that if the proposed activity is not eligible for either of the screenings, an AAR must be submitted.

If yes, is the proposed activity eligible for the Primary Noise Screening?

Yes No

If yes, is the actual separation distance between the facility and the nearest noise sensitive point of reception (POR) greater than the minimum required separation distance calculated from the Primary Noise Screening?

Yes No

If yes, please attach the Primary Noise Screening form and supporting documentation.

Note that if the Primary Noise Screening is not successful then the applicant may attempt to proceed with the Secondary Noise Screening.

If no, does the Secondary Noise Screening Form show that the applicable sound level limits are met?

Yes No

If yes, please attach the Secondary Noise Screening Form and supporting documentation.

Note that if meeting the applicable sound level limits cannot be demonstrated, then an AAR must be submitted.

✓ Completion Status (5.2.1 Noise Assessment)

5.2.2 Equipment Subject to Noise Review

Description	Number of Pieces of Equipment
<input type="checkbox"/> Arc Furnaces	
<input type="checkbox"/> Asphalt Plants	
<input type="checkbox"/> Blow-down Devices	
<input type="checkbox"/> Co-Generation Facilities	
<input type="checkbox"/> Crushing Operations	
<input type="checkbox"/> Flares	
<input type="checkbox"/> Gas Turbines	
<input type="checkbox"/> Pressure Blowers or Large Induced Draft Fans (flow rate > 47 m ³ /second or static pressure > 1.25 kilopascals)	
<input type="checkbox"/> Any other equipment not listed above that has not previously been reviewed by the Director in connection with an application for an Environmental Compliance Approval with respect to the facility	
<input type="checkbox"/> Any other equipment not listed above that is identical to equipment for which a noise assessment was previously reviewed by the Director in connection with an application for an Environmental Compliance Approval with respect to the facility	

✓ Completion Status (5.2.2 Equipment Subject to Noise Review)

✓ Completion Status (5.2 Noise)

5.3 Sewage Works [Information](#)

Note** - If the application does not contain Sewage Works please proceed to Section 5.4

5.3.1 Facility Type - Sewage Works

Select the type of facility that is the subject of the application (select all that apply).

- Sewage Treatment Plant (STP) Stormwater Management Facility

For the following, the applicant must complete and attach the relevant sections of the pipe data form:

- Storm Sewers Ditches Combined Sewers
 Force mains Sanitary Sewers Pumping Station

Sewage Treatment Plant Details

- Primary Secondary Tertiary
 Receives septage Constructed/Engineered Wetlands On-site system

Lagoons (check all that apply below)

- Septage Municipal Other (specify) _____

Facility Type

Municipal or private facility

Category: New 1 2 3 4

Please indicate the maximum design capacity of the municipal or private sewage treatment plant:

≤ 4,500 m³/day > 4,500 m³/day

Facility for the treatment of leachate

Category: New 1 2 3 4

Facility for the treatment of industrial process wastewater

Category: New 1 2 3 4

Facility for the disposal of non-contact cooling water

Subsurface disposal

Please indicate the design capacity of the subsurface disposal:

$\leq 15\text{m}^3/\text{day}$ $> 15\text{m}^3/\text{day}$ and $< 50\text{m}^3/\text{day}$ $> 50\text{m}^3/\text{day}$

Stormwater Management Facility Details

Category: New 1 2 3 4

Pond Type

Wet Pond Dry Pond Other (specify) _____

What is the drainage area (in hectares) associated with the proposed activity? _____

Does the applicant own all, or part of the drainage area?

Applicant owns all of the drainage area

Applicant owns part of the drainage area

Applicant does not own the drainage area

For the drainage area land that the applicant does not own, does the applicant have an agreement with the owner(s) of the drainage area?

Yes No

What is the predominant type of land use in the drainage area?

Rural or Agricultural Commercial or Industrial Residential

Is a Hydrogeological Assessment required?

Yes No

(If yes, please attach the hydrogeological assessment.)

Is a review of effluent criteria assessment for stormwater management, cooling water or soil remediation facilities required?

Yes No

(If yes, please attach the final effluent criteria accepted by the Regional Office of the Ministry.)

Is a review of effluent criteria assessment for municipal or private sewage, industrial process wastewater or leachate treatment plant required?

Yes No

(If yes, please attach the final effluent criteria accepted by the Regional Office of the Ministry.)

Note: The Hydrogeological Assessment, effluent criteria, and surface water assessment must be discussed and prepared with the Ministry's regional technical support section during a pre-application meeting(s) and consultation(s) with the Ministry. A proof of concurrence from technical support must be included as part of the ECA application package.

✓ Completion Status (5.3.1 Facility Type - Sewage Works)

5.3.2 Servicing

The works will provide sewage servicing for (select all that apply):

Residential

Residential Type

Subdivision

Condominium

Institutional

Other (specify) _____

Is there a Municipal Responsibility Agreement in place?

Yes No N/A

(If yes, please attach a copy of the Municipal Responsibility Agreement.)

Commercial

Commercial Type

Hotel, Motel, Inn

Campground, Park

Rental Cabins

Resort

Shopping Malls

Restaurant

Highway Service Station/Gas Bars Other (specify) _____

Industrial

Describe _____

✓ Completion Status (5.3.2 Servicing)

5.3.3 Sewage Servicing for Waste Disposal/Landfill Sites

Does/Will the sewage treatment facility receive waste disposal/landfill site leachate?

Yes No

If yes, please identify the site(s) below.

Name of Site Contributing Leachate	Environmental Compliance Approval Number	Volume of Leachate (m ³)
1.		

✓ Completion Status (5.3.3 Sewage Servicing for Waste Disposal/Landfill Sites)

✓ Completion Status (5.3 Sewage Works)

5.4 Waste Disposal Site

Note** - If the application is not for a waste disposal or processing site please proceed to Section 5.5

5.4.1 Facility Description - Waste Disposal Site (information on the nature of the proposed business or activity at this site)

Service Area *

Town of Arnprior, Village of Braesdie, Township of McNab

Total Area of Site (hectares) *

40.40

Monitoring (select all that apply) *

Groundwater

Surface Water

Landfill Gas

Leachate

None

Other (specify) _____

Type(s) of waste to be accepted at this site (select all that apply) *

Subject:

Non-subject:

Hazardous Waste

Municipal (non-hazardous)

Liquid Industrial Waste

Other Liquid Waste

Municipal waste categories to be accepted at this site (select all that apply) *

All Categories

Contaminated Soil

Domestic Sources

IC & I Sources

Source Separated Organics

Tires

Leaf and Yard Waste

Wood Waste

Blue Box Materials

Other (specify) * De-watered Sewage Sludge

Other liquid waste categories to be accepted at this site (select all that apply)

- Processed Organics
 Hauled Sewage
 Waste from Food Processing/Preparation Operations
 Other (specify) _____

Hazardous Waste / Liquid Industrial Waste

Class Code	Class Code	Class Code	Class Code	Class Code

✓ Completion Status (5.4.1 Facility Description - Waste Disposal Site)

5.4.2 Waste Transfer/Processing/Composting - Complete this information if waste transfer and/or processing and/or composting take(s) place at this facility

Waste Type to be Transferred or Processed

- Hazardous waste or liquid industrial waste

Design Capacity

- ≤ 100 tonnes per day
 > 100 tonnes per day

- Waste other than hazardous waste and liquid industrial waste

Design Capacity

- ≤ 100 tonnes per day
 > 100 tonnes per day

Change to Operations

- No Change Proposed
 Change does not require fundamental design review
 Change requires fundamental design review

Liquid Waste

Maximum Storage Capacity (m³)

Hazardous	Liquid Industrial	Other Liquid Waste
-----------	-------------------	--------------------

Maximum Residual for Final Disposal (m³)

Hazardous		Liquid Industrial Waste		Other Liquid Waste	
Daily	Annually	Daily	Annually	Daily	Annually

Solid Waste

Maximum Storage Capacity (tonnes)

Hazardous	Non-Hazardous
-----------	---------------

Maximum Residual for Final Disposal (tonnes)

Hazardous		Non-hazardous	
Daily	Annually	Daily	Annually

Maximum Amount of Waste to be Received Daily

Liquid (m ³)			Solid (tonnes)	
Hazardous	Liquid Industrial	Other Liquid Waste	Hazardous	Non-hazardous

✓ Completion Status (5.4.2 Waste Transfer/Processing/Composting)

5.4.3 Thermal Treatment Facility - Complete this information if thermal treatment takes place at this facility

Waste Type for Thermal Treatment

Hazardous waste or liquid industrial waste

Design Capacity

≤ 100 tonnes per day > 100 tonnes per day

Waste other than hazardous waste and liquid industrial waste

Design Capacity

≤ 100 tonnes per day > 100 tonnes per day

Change to Operations

No Change Proposed

Change does not require fundamental design review

Change requires fundamental design review

Liquid Waste

Maximum Storage Capacity (m³)

Hazardous	Liquid Industrial	Other Liquid Waste

Maximum Residual for Final Disposal (m³)

Hazardous		Liquid Industrial Waste		Other Liquid Waste	
Daily	Annually	Daily	Annually	Daily	Annually

Solid Waste

Maximum Storage Capacity (tonnes)

Hazardous	Non-Hazardous

Maximum Residual for Final Disposal (tonnes)

Hazardous		Non-hazardous	
Daily	Annually	Daily	Annually

Maximum Amount of Waste to be Received Daily

Liquid (m ³)			Solid (tonnes)	
Hazardous	Liquid Industrial	Other Liquid Waste	Hazardous	Non-hazardous

Maximum Daily Feed Rate (tonnes/m³)

Hazardous Waste (tonnes)	Non-hazardous Waste (tonnes)	Liquid Industrial Waste (m ³)	Other Liquid Waste (m ³)

Completion Status (5.4.3 Thermal Treatment Facility)

5.4.4 Landfill Site - Complete this information if this facility operates as a landfill site

Waste Types to be accepted at the Landfill *

Hazardous waste or liquid industrial waste

Design Capacity

≤ 40,000 m³ > 40,000 m³ ≤ 3 million m³ > 3 million m³

Waste is only uncontaminated tree stumps, leaves, branches, concrete and rocks

Design Capacity

≤ 40,000 m³ > 40,000 m³ ≤ 3 million m³ > 3 million m³

Waste other than hazardous waste and liquid industrial waste, other than uncontaminated tree stumps, leaves, branches, concrete and rocks.

Design Capacity *

≤ 40,000 m³ > 40,000 m³ ≤ 3 million m³ > 3 million m³

Change to Operations *

No Change Proposed

Change does not require fundamental design review or hydrogeological assessment

Change requires fundamental design review or hydrogeological assessment

Note: The Hydrogeological Assessment, effluent criteria, and surface water assessment must be discussed and prepared with the Ministry's regional technical support section during a pre-application meeting(s) and consultation(s) with the Ministry. A proof of concurrence from technical support must be included as part of the ECA application package.

Maximum Landfilling Capacity (m³)

Hazardous Waste	Non-hazardous Waste *	Liquid Industrial Waste	Other Liquid Waste *
	999,999.99		0

Maximum Amount of Waste to be Received

Hazardous Waste (tonnes)		Non-hazardous Waste (tonnes)		Liquid Industrial Waste (m ³)		Other Liquid Waste (m ³)	
Daily	Annually	Daily *	Annually *	Daily	Annually	Daily *	Annually *
		230	12,000			0	0

Landfill Information

Area to be Landfilled (hectares) *	30.8	Total Site Area including Buffer Area (hectares) *	40.4
Estimated Date of Closure (yyyy/mm/dd) *	2041/12/31	Population Served	16,000

Control Types (select all that apply) *

- Leachate Collected and Treated Off-site Leachate Collected and Treated On-site
- Landfill Gas Collected and Flared Landfill Gas Collected for Energy Generation
- Other (specify) * None

- Completion Status (5.4.4 Landfill Site)
- Completion Status (5.4 Waste Disposal Site)

5.5 Waste Management Systems (Except Mobile Waste Processing)

Note**- If the application is not for a waste management system please proceed to Section 5.7.

5.5.1 Fleet List (all vehicles and equipment to be used in the operation of the Waste Management System)

Year	Make	Model	Vehicle Identification Number (VIN)	License Plate Number	Province/State

Separate list attached?

Yes No

- Completion Status (5.5.1 Fleet List)

5.5.2 Vehicle Information

Are all the vehicles to be used owned by the applicant?


- Yes No

If no, please include additional information about ownership arrangements for each vehicle not owned by the applicant.

Has a minimum of \$1,000,000.00 liability insurance been obtained for all vehicles for which it is required?

- Yes No

Describe any additional insurances that are held (for example, environmental impairment liability insurance).

 Completion Status (5.5.2 Vehicle Information)

5.5.3 General Waste Management System

Type(s) of Waste to be Transported by the General Waste Management System (select all that apply)

Subject:

- Hazardous Waste
- Liquid Industrial Waste

Non-subject:

- Municipal (non-hazardous)
- Other Liquid Waste

Non-subject Categories to be Transported by the General Waste Management System (select all that apply)

- | | |
|---|---|
| <input type="checkbox"/> Blue Box Materials | <input type="checkbox"/> Domestic Sources |
| <input type="checkbox"/> Commercial | <input type="checkbox"/> Non-Hazardous Solid Industrial |
| <input type="checkbox"/> Leaf/Yard Waste | <input type="checkbox"/> Wood Waste |
| <input type="checkbox"/> Spill Cleanup Material | <input type="checkbox"/> Contaminated Soil |
| <input type="checkbox"/> Tires | <input type="checkbox"/> Asbestos Waste in Bulk |
| <input type="checkbox"/> Waste Wash Water | <input type="checkbox"/> Grease Trap Waste |
| <input type="checkbox"/> Waste from Food Processing/ Preparation Operations | <input type="checkbox"/> Dewatered Catch Basin Clean-out Material |
| <input type="checkbox"/> Processed Organics (not for land application) | <input type="checkbox"/> Other (specify) _____ |

Subject Waste Categories to be Transported by the General Waste Management System

Hazardous Waste / Liquid Industrial Waste

Class Code	Class Code	Class Code	Class Code	Class Code

Separate list attached?

- Yes No

- All drivers are/will be trained in accordance with O. Reg. 347 and all pertinent environmental legislation.
- Each vehicle used to transport a specific subject waste class is suitable for that waste transportation in order to protect the health and safety of the public and the natural environment.

Note: For transporters of pathological waste and PCBs (waste classes 243 and 312) Operations Manual and Driver Training Manual must also be attached and Financial Assurance must be provided.

General Waste Management System - Disposal Site Information

What is the Final Destination of Waste to be Transported by the General Waste Management System? (select all that apply)

- A disposal site in Ontario approved by the Ministry of the Environment and Climate Change
- Disposal sites outside of Ontario approved by another regulatory agency

List the destination province(s)/state(s)

Province/State	Province/State	Province/State	Province/State

✓ Completion Status (5.5.3 General Waste Management System)

5.5.4 Soil Conditioner Waste Management System (includes non-agricultural source material (NASM) that is waste and processed organic waste (biosolids) destined for land application only)

Has the applicant received recommendation from Biosolids Utilization Committee (BUC) for land application of processed organic waste (biosolids) or NASM?

Yes If yes, please provide a copy of the BUC recommendation.

No If no, please clarify _____

Spreading equipment (land application only)

Equipment Type	Make and Model	Description

Separate list attached?

Yes No

Method of system operation (land application only)

Estimated quantity to be handled on an annual basis (cubic metres/litres/tonnes)

Please describe the loading procedures:

Please describe the spreading methods:

Please describe the storage facilities (tanks, lagoons, etc.):

Soil Conditioner Waste Management System - Land Application Sites

What is the final destination of waste to be transported by the soil conditioner waste management system? (must include for land application only)

Non-agricultural land

Agricultural land

Both agricultural and non-agricultural land

✓ Completion Status (5.5.4 Soil Conditioner Waste Management System)

5.5.5 Hauled Sewage (Septage) Waste Management System

Type(s) of hauled sewage (septage) to be transported

Portable toilet waste

Septic tank waste

Holding tank waste

Other (specify) _____

Spreading equipment (land application only)

Equipment Type	Make and Model	Description

Separate list attached?

Yes No

Does this system include in-transit storage?

Yes No

If yes:

a) What is the duration of storage? Please specify (Maximum period of in-transit storage should not exceed more than two weeks):

b) Is the storage tank a prefabricated tank with the capacity < 100,000 L, designed and constructed in accordance with a Class 5 Sewage System under the Ontario Building Code or CAN/CSA B66-05?

Yes No If no, please provide a copy of the design of the storage tank signed and dated by a professional engineer.

Does this system include in-transit processing?

Yes No

If yes:

a) Location of in-transit processing:

In Vehicle In-storage Tank

b) Describe the method of in-transit processing:

Does this system use barge/boat to transport hauled sewage (septage)?

Yes No

If yes:

a) Has a minimum of \$1,000,000.00 liability insurance been obtained for the barge/boat for which it is required?

Yes No

b) Does the barge/boat have an engine of 10 horsepower (hp) or more, for which a commercial vessel license is required from Transport Canada?

Yes No If yes, please include a copy of the commercial vessel license.

Note: For in-transit storage or processing the applicant must include with the application the consent of the landowner, if the landowner is different than the applicant. A financial assurance estimate must be provided by applicants using in-transit storage or using in-transit processing where processing is conducted in the in-transit storage tanks.

Hauled Sewage (Septage) Waste Management System - Land Application Sites N/A

List the Environmental Compliance Approval Number(s) of all disposal site(s) approved by the Ministry of the Environment and Climate Change for land application of hauled sewage in association with this waste management system.

Instrument Type	Instrument Number	Approval or Application Date (yyyy/mm/dd)

✓ Completion Status (5.5.5 Hauled Sewage (Septage) Waste Management System)

✓ Completion Status (5.5 Waste Management Systems (Except Mobile Waste Processing))

5.6 Waste Management System - Mobile Waste Processing

Note**: If the application is not for the use and operation of mobile waste processing equipment, proceed to Section 5.7

5.6.1 Mobile Waste Management System Process and Equipment Description

Type(s) of Waste to be Processed (select all that apply)

Subject:

- Hazardous Waste
- Liquid Industrial Waste

Non-subject:

- Municipal (non-hazardous)
- Other Liquid Waste

Type of Waste to be Processed by the Unit(s)	Number of Units	Financial Assurance (per unit)	Financial Assurance Required
Non-hazardous Solid Waste		\$5,000	
Hazardous Waste		\$20,000	
Liquid Industrial Waste		\$20,000	
Other Liquid Waste		\$20,000	
Multiple Types of Waste from the Categories Above		\$20,000	

Total Financial Assurance

Municipal (non-hazardous) Waste Categories to be Processed (select all that apply)

- Contaminated Soil at Cleanup Site
- Wood Waste
- Construction and Demolition Waste
- Asbestos Waste
- Tires
- Domestic Waste
- Other (specify) _____

Other Liquid Waste Categories to be Processed (select all that apply)

- Hauled Sewage
- Waste from Food Processing/Preparation Operations
- Processed Organic
- Other (specify) _____

Hazardous / Liquid Industrial Waste Types to be Processed

Class Code	Class Code	Class Code	Class Code	Class Code

✓ Completion Status (5.6.1 Mobile Waste Management System Process and Equipment Description)

5.6.2 Equipment Information - Please attach a separate list if more space is required.

Equipment List

Unit No.	Unit Type	Process Description	Equipment Type	Make	Model	Serial Number	Equipment Capacity (including unit of measurement)

Separate list attached?

- Yes No

✓ Completion Status (5.6.2 Equipment Information)

✓ Completion Status (5.6 Waste Management System - Mobile Waste Processing)

5.7 Cleanup of Contaminated Sites

Note** - If the application is not for a cleanup of a contaminated site please proceed to Section 6.

Type of Cleanup

- In-situ
- Ex-situ
- Both

Contaminated media to be treated:

Groundwater

Surface water

Sediment

Soil

Waste Type

Subject:

Hazardous Waste

Liquid Industrial Waste

Non-subject:

Municipal (non-hazardous)

Other Liquid Waste

Type of discharge

Air

Groundwater

Storm or sanitary

Surface water

Noise

Completion Status (5.7 Cleanup of Contaminated Sites)

6. Supporting Documentation and Technical Requirements

6.1 General

This is a list of supporting information to this application and is subject to the FIPPA and EBR.

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Proof of legal name	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Enhanced EBR description	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Provincial Officer Notice	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Inspection Report	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Detailed project and process description	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Pre-application Consultation Record	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Legal Survey(s)	Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Amendment is administrative only.	<input type="checkbox"/>
Site Plan(s)	Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Amendment is administrative only.	<input type="checkbox"/>
Scaled area location plan(s) with geo-referencing points identified	Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Amendment is administrative only.	<input type="checkbox"/>
Documentation in support of EBR Exception	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Proof of Compliance with EAA Requirements	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Proof of Consultation/Notification	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Financial Assurance Estimate	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Name, address and consent of land/site owner for the installation and operation of the proposed activity or storage location of equipment or vehicle	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Name, address and phone number of the Operating Authority	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copy of NEPDA Permit	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copy/Proof of Municipal Planning Approval (ORMCA, general)	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Municipal Zoning Confirmation Letter	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Zoning map	Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Amendment is administrative only.	<input type="checkbox"/>
Conservation Authority Clearance	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Director's approval for Policy 2 Deviation	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Application Fee	Required	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
A copy of this application has been sent to the Ministry Local District Office	Required	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>



Completion Status (6.1 General)

6.2 Air

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Emission Summary and Dispersion Modelling (ESDM) Report prepared in accordance with s. 22 and of O. Reg. 419/05 (including signed checklist)	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Electronic copy of the Dispersion Modelling input and output files prepared in accordance with s. 26 of O. Reg. 419/05	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Supporting Information for a Maximum Ground Level Concentration Acceptability Request for Compounds with no Ministry POI Limit - Supplement to Application for Approval, EPA S. 9	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copies of forms requesting O. Reg. 419/05 instruments and supporting documentation	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

✓ Completion Status (6.2 Air)

6.3 Noise and Vibration

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Primary Noise Screening	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Secondary Noise Screening	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Acoustic Assessment Report including signed checklist (AAR)	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Vibration Assessment Report	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Noise Abatement Action Plan	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

✓ Completion Status (6.3 Noise and Vibration)

6.4 Sewage Works

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Signed Municipal Responsibility Agreement	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Detailed description of the proposed activities/works	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Notice of Completion for the Environmental Study Report (ESR)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design Brief	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Preliminary Engineering Report	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Final Plans	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Engineering Drawings and Specifications	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Sewage quantity and quality characteristics	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Stormwater Management Report	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Stormwater Management Plan	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Hydrogeological Assessment with proof of concurrence from the Ministry's Regional technical support section	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Environmental Impact Analysis	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Final effluent criteria accepted with proof of concurrence from the Ministry's Regional Technical Support Section	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Sewage Works Limited Operational Flexibility Requirements - Engineer's Report	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Sewage Works Limited Operational Flexibility Requirements - Declarations	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Pipe Design Data Form	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

✓ Completion Status (6.4 Sewage)

6.5 Waste Disposal Sites

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design and Operations Report	Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Amendment is administrative only.	<input type="checkbox"/>
Stormwater Management Report	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Hydrogeological Assessment with proof of concurrence from the Ministry's Regional technical support section	Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Amendment is administrative only.	<input type="checkbox"/>
Assessment of Physical and Water Use Conditions	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Waste Limited Operational Flexibility Requirements - Engineer's Report	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Waste Limited Operational Flexibility Requirements - Declarations	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copy of notification to adjacent landowners	Required	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Amendment is administrative only.	<input type="checkbox"/>

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

✓ Completion Status (6.5 Waste Disposal Sites)


6.6 Waste Management Systems

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Proof of vehicle and/or equipment ownerships	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Complete Fleet List (list of all vehicles, trailers and equipment used)	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copy of the Liability Insurance for all vehicles for which insurance is required	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copy of BUC recommendation	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copy of the storage tank design	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Copy of commercial vehicle licence	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Description of the physical location where the vehicles transporting biomedical waste are being disinfected	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Drivers Training Manual (for PCB/ Biomedical Waste)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
A copy of the applicant's Operation Plan including detailed packaging and biomedical waste handling methods	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Contingency and Emergency Procedures Plan (for PCB/ Biomedical Waste/Hauled Sewage (Septage))	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

✓ Completion Status (6.6 Waste Management Systems)

6.7 Mobile Waste Processing N/A

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design and Operations Report - Mobile Waste Processing of General Waste	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Design and Operations Report - Mobile Waste Processing of Liquid Waste	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

 Completion Status (6.7 Mobile Waste Processing)

6.8 Cleanup of Contaminated Sites N/A

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Design Report for Cleanup of Contaminated Sites	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>
Other (please describe)	Optional	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

 Completion Status (6.8 Cleanup of Contaminated Sites)


6.9 Other Attachments N/A

Title	Reference	Confidential
Supporting Letter		<input type="checkbox"/>

Is there an attachment of an additional list of attachments?

Yes No

If there is not enough space to list all of the attachments included in this application package, please include an additional listing of these attachments.

 Completion Status (6.9 Other Attachments)

6.10 Confidentiality

Attachment	Required, Optional or N/A	Attached?	If no, provide explanation, (include referenced attachment if more space is required for rationale)	Confidential
Explanation for confidentiality	N/A	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/>

 Completion Status (6.10 Confidentiality)

Please note: The collection of personal information in this application is necessary to administer the Ministry's approvals program, which is authorized pursuant to the *Environmental Protection Act* and the *Ontario Water Resources Act*. The personal information collected in this application will be used to administer the program, including for the purposes of the Ministry's compliance and enforcement activities under the aforementioned acts, and for the purposes of making information in respect of Environmental Compliance Approvals available to the public with the exception of payment information. Questions about the collection of the information can be directed to a Client Service Representative, Client Services and Permissions Branch, 135 St. Clair Avenue West, 1st Floor, Toronto ON M4V 1P5; Telephone outside Toronto 1-800-461-6290 or in Toronto 416-314-8001 or Fax 416-314-8452.

7. Authorization

7.1 Statement of the Applicant

I am authorized to prepare and submit this application and to make this certification. I have reviewed the complete application and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The information contained in this application is complete and accurate.
- The Technical Contact(s) identified in this application has/have been authorized to prepare certain technical material, and act on behalf of the applicant to discuss this application with the Ministry of the Environment and Climate Change and to provide additional information about this application to the Ministry on request.
- The information provided to the Technical Contact(s) in relation to this application is complete and accurate.

Name of Signing Authority (Please print) *

John Steckly

Title *

General Manager, Operations

Telephone Number

613-623-4231

ext. 1831

Mobile Number

Fax Number

Email Address

jsteckly@arnprior.ca

Signature

Date (yyyy/mm/dd)

2019/04/23

✓ Completion Status (7.1 Statement of the Applicant)

7.2 Statement of the Municipality N/A

I, the undersigned hereby declare on behalf of the Municipality, that the Municipality has no objection to the construction of the works in the Municipality.

Name (Please print)

Title

Name of Municipality

Signature

Date (yyyy/mm/dd)

✓ Completion Status (7.2 Statement of the Municipality)

7.3 Statement of Technical Contacts

Technical Contact 1

I have been authorized by the applicant to prepare the technical materials for the area(s) of responsibility identified in section 2.6 that are included in the application. I have reviewed those technical materials and I have made all inquiries that are necessary to declare to the best of my knowledge, information and belief:

- The technical materials contained in this application in respect of the area(s) of responsibility identified in section 2.6 are complete and accurate.
- I have the relevant education and experience necessary to provide this certification.

Name of Technical Contact (Please print) *

Andria Caletti

Signature

Date (yyyy/mm/dd)

2019/04/23

✓ Completion Status (7.3 Statement of Technical Contacts)

8. Payment Information - Application for an Environmental Compliance Approval

Please Note:

1. If this form has been completed by hand, the fee calculations must be completed and attached separately. The supplemental fee calculations do not need to be included if this form has been completed electronically.
2. If this form has been completed electronically, the fees for this application have been calculated based on the information provided. The Ministry may require additional information during the review of the application that could impact the total fee required.
3. All fees should be paid in Canadian funds, payable to the *Minister of Finance*, except fees for *Transfer of Review*, which are payable to the local municipality.
4. Credit card payments are accepted for payments under \$10,000 only. **Never email credit card information.**
5. If payment is being made by certified cheque or money order, please staple the payment to this page.
6. The information collected in this section of the form is considered confidential and will only be used to process the application fee.
7. To protect credit card information, do not submit this page containing payment information via e-mail or any other electronic means if it includes credit card information. Credit card information should be submitted only by mail, facsimile, or hand-delivery. Applications containing payment information that are submitted via e-mail or any other electronic means will not be processed and will be destroyed.

Do not include this page in the copies of the application that are being provided to the Local Ministry District Office.

Amount Enclosed

100

Method of Payment *

Certified Cheque Money Order VISA MasterCard

Credit Card Information (if paying by VISA or MasterCard)

Name of Cardholder (Please print)

Card Number

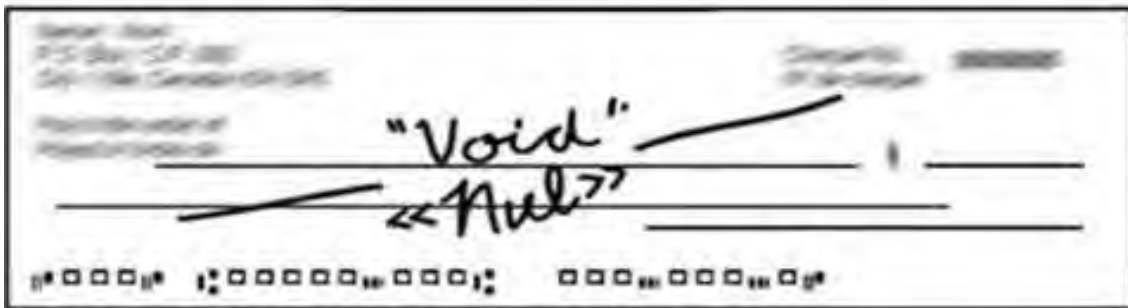
Expiry Date (mm/yy)

Card Holder's Signature

Date (yyyy/mm/dd)

X Completion Status (8 Payment Information)

If paying by certified cheque or money order, please attach it here.



Application Summary

For Office Use Only

Reference Number	Payment Received (\$)	Date (yyyy/mm/dd)	Initials

Applicant Name

Corporation of the Town of Arnprior

Project Name

Request to Extend Deadline for Updated Trigger Mechanism and Contingency Plans - Arnprior Waste Disposal Site

Project Description Executive Summary

The town of Arnprior is requesting an extension to the deadline for submission of a proposed update to the Trigger Mechanism and Contingency Plans for the Arnprior Waste Disposal Site. (Environmental Compliance Approval (ECA) No. A412603). It is proposed that the deadline be extended to December 31, 2019.

Supplemental Application Information

Attachment A to this application provides a summary of the pre-consultation conversations with the Ministry of the Environment, Conservation and Parks Ottawa District Office and Technical Support Branch related to this application.

Application Status

Section	Completed?			
1. Application Information	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
2. Project Information	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
3. Regulatory Requirements	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
4. Site Information	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
5. Facility Information	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
6. Supporting Documentation	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
7. Payment Information	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No
8. Authorization	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>	No

Fee Summary

Activity	Amount (\$)
Administrative Processing	\$100.00
Review of EPA s. 9 activities	\$0.00
Review of EPA s. 27 activities	\$0.00
Review of OWRA s. 53 activities	\$0.00
Total Fee	\$100.00

The Ministry may request additional fees upon review of this application.

If this form is submitted in print version only and the smart calculation feature is not used, please attach the fee calculation separately.

ATTACHMENT A

Supporting Documentation

April 24, 2019

Project No. 1401322

Client Services and Permissions Branch

Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

**REQUEST TO EXTEND DEADLINE FOR UPDATED TRIGGER MECHANISM AND CONTINGENCY PLANS
ARNPRIOR WASTE DISPOSAL SITE (A412603)**

Dear Sir/Madam,

On behalf of the Town of Arnprior (Town), Golder Associates Ltd. (Golder) would like to request an extension to the deadline for submission of a proposed update to the Trigger Mechanism and Contingency Plan for the Arnprior Waste Disposal Site (Environmental Compliance Approval (ECA) No. A412603).

On August 18, 2017, Notice No. 2 to ECA No. A412603 was issued by the Ministry of the Environment, Conservation and Parks (MECP). Notice No. 2 included the addition of Condition 41, which stated that by August 21, 2018, the Town is to submit updated details to the proposed trigger mechanism, originally proposed by Jp2g Consultants Inc. in the 2013 Site Development, Operations and Environmental Monitoring Report, as well as details of a contingency plan to be implemented in the event that the surface water or groundwater quality exceeds the trigger mechanism. On October 12, 2018, Notice No. 3 to ECA No. A412603 was issued by the MECP, which extended the deadline for submission of updated details to the proposed trigger mechanism and contingency plan to April 30, 2019.

The extension to the submission of the updated trigger mechanism and contingency measures in Notice No. 3 to the ECA was granted in recognition of ongoing discussions with the MECP Ottawa District Office and the Eastern Region Technical Support Branch regarding compliance of groundwater quality with MECP Guideline B-7, as per comments made by MECP groundwater reviewer (Thomas Guo) dated March 23, 2018.

The Town has taken action to address the groundwater compliance concerns, including the installation, sampling and testing of groundwater from a new monitoring well within the Contaminant Attenuation Zone to assess the impacts of historic activities on the site. The new monitoring well was installed in the fall of 2018 and sampling was conducted in late fall and winter of 2018/2019.

It is proposed that the deadline to update the Trigger Mechanism and Contingency Plan be extended to December 31, 2019 to allow adequate time to collect seasonal data, groundwater elevation and chemistry data from the new monitoring well, to continue ongoing discussions with the MECP District Office and the Eastern Region Technical Support Branch, undertake additional investigations and associated data analysis if needed, and subsequently update the trigger mechanism and contingency plan. The extension of the deadline was discussed with MECP Ottawa District Office and the Eastern Region Technical Support Branch representatives during a conference call on March 20, 2019. This application is submitted to formally acknowledge the reasons for the proposed new date associated with Condition 41.

We trust that this letter meets your needs at this time. Should you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

Golder Associates Ltd.



Andria Caletti, P.Eng.
Environmental Engineer



Trish Edmond, M.E.Sc., P.Eng.
Associate

ETB/ALC/PLE/sg

\\golder.gds\galottawa\active\2014\1125 - eceag\1401322 amprior wds 2014 to 2018\additional work\trigger\eca application for extension 02\attachment a\1401322-l-awds proposed extension to trigger mechanism deadline_alc.docx

CC: Thandeka Polano, Ministry of the Environment, Conservation and Parks, Ottawa District Office
Erin Williams, Town of Arnprior



golder.com

From: [Tariq, Maliha \(MECP\)](#)
To: [Caletti, Andria](#)
Cc: [Edmond, Trish](#); [Deanna Nicholson](#)
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call
Date: March 10, 2020 1:33:34 PM
Attachments: [image001.jpg](#)
[image002.jpg](#)
[image004.jpg](#)
[image007.jpg](#)
[ECA no. A412603 - signed March 10, 2020.pdf](#)

EXTERNAL EMAIL

Good afternoon,

Please find attached the signed ECA. It will be mailed to the Town as well.

Regards,
Maliha

From: Tariq, Maliha (MECP)
Sent: March 5, 2020 4:27 PM
To: 'Caletti, Andria' <Andria_Caletti@golder.com>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

Hi Andria,

Thank you. I am now sending the draft for signature.

(I had forgotten to add the following item to Schedule "A" which I have done:
[17. Email dated March 2, 2020 from Andria Caletti, Golder Associates Ltd. addressed to Maliha Tariq, MECP, re: expanding service area for woodwaste used for daily cover.](#))

Regards,
Maliha

From: Caletti, Andria <Andria_Caletti@golder.com>
Sent: March 5, 2020 11:57 AM
To: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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NOTE: This email chain appears to contain email from outside Golder

Hi Maliha,

We have reviewed your revisions (attached) and have no further comments. Thank you.

Regarding the 0.1 metres of “topsoil or soil capable of sustaining vegetation” in Condition 25.2, specific quality criteria have not been established in previous ECA amendments.

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

Golder Associates Ltd.
1931 Robertson Road, Ottawa, Ontario, Canada, K2H 5B7
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Please consider the environment before printing this email.

From: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Sent: March 4, 2020 4:51 PM
To: Caletti, Andria <Andria_Caletti@golder.com>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

EXTERNAL EMAIL

Hi Andria,

Thank you for the detailed information and attachments.

Question about topsoil used for final cover – was there any quality criteria established for the topsoil in the previous ECA amendments?

Please find attached the updated draft for your review. I have deviated a little from the wording you have proposed – I hope it makes things a little clearer. Let me know your thoughts!

Regards,

Maliha Tariq

Waste Evaluator
 Client Services and Permissions Branch | Ontario Ministry of the Environment, Conservation and Parks
 135 St. Clair Ave. W | 5th Floor | Toronto, ON | M4V 1P5
 Telephone: (416) 212-4201

From: Caletti, Andria <Andria_Caletti@golder.com>
Sent: March 2, 2020 12:58 PM
To: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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Hi Maliha,

Further to our call on February 24th, I have spoken with Town. Below, I have summarized our call and provided further suggestions and/or information in the table below, as discussed.

Further, with respect to our discussion last week regarding the new O.Reg. 406/19, we understand that landfills (waste disposal sites) are not considered re-use sites under this regulation. As such, the use of excess soils for daily cover, final cover, or other uses supporting the operation of the landfill (see Section 22(2)) are not considered “beneficial purposes” that are subject to the associated requirements of O.Reg. 406/19. Therefore, no additional changes to the draft ECA related to O.Reg. 406/19 are proposed.

Please don’t hesitate to let us know if you have any further questions or comments.

Condition No.	Comments	Suggested Changes (in red)
14.1	We agree with your proposed wording.	None
15.1	<p>As discussed, we are in agreement that the intent is that there always be at least one “Trained Personnel”, as defined for this ECA, on site when landfilling and/or waste diversion activity is being undertaken, as required by Condition 14.1.</p> <p>The way that Condition 15.1 is worded implies that all employees be trained in all activities associated with the operation of the site, which is not the case. The suggested change is to clarify that not all employees will be trained in</p>	<p>A training plan specific to the Site shall be developed and implemented to ensure that all employees that operate the Site or carry out any activity required under this Approval are trained in its the operation related to that activity.</p>

	every activity under the ECA (with the exception of the Trained Personnel, per Condition 14.1).	
17.1	We agree with your proposed wording.	None
18.1	<p>As discussed, we disagree with the following wording:</p> <p>An inspection of the entire Site and all equipment on the Site shall be conducted each day the Site is in operation to ensure that: ... that the operation of the Site is not causing any adverse effects on the environment ...</p> <p>We agreed during our call that the intent of this condition is to define the requirements of the daily inspection. The definition of “adverse effects” in the EPA includes effects that may not be possible to directly observe during a daily inspection (for instance, off-site impacts to groundwater). The proposed change is requested so that the requirements of the daily inspection include things that can reasonably be evaluated as part of the daily inspection.</p>	<p>An inspection of the entire Site and all equipment on the Site shall be conducted each day the Site is in operation to ensure that: the Site is secure; that the operation of the Site is not causing any nuisances; that the operation of the Site is not causing any adverse effects on the environment spills, fires or emergency situations with impacts to the environment or the health and safety of the public (as per Condition 17.1) and that the Site is being operated in compliance with this Approval. Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the Site if needed.</p>
22.4	The final contours will reflect the approved contours under condition 22.2, which are approximately 4:1 and 3% as discussed in the D&O Report.	N/A
23.3	As discussed, occasionally the Town is made aware of woodchips and/or woodwaste suitable for chipping that would meet the requirements for its use as daily cover, but that is located outside of the approved service area. In general, this occurs very occasionally, and would not interfere with other site operational requirements such as increasing truck traffic to the site or a change to the operating hours. It is proposed that woodchips and woodwaste suitable for chipping for use as daily cover be permitted to be received from outside the service area,	<p>23.3 The use of processed (chipped and/or mulched) wood as an alternative daily cover is allowed at the Site subject to the following sub-conditions:</p> <p>(a) The source of all construction, demolition and woodwaste coming to the landfill Site shall be limited to within the approved service area, with the exception of woodchips and/or woodwaste suitable for chipping and/or mulching for alternative daily cover, which may be sourced from within 100km of the Site provided that</p>

	<p>but limited to within 100 km of the site (or approximately the distance from Arnprior to the limits of the City of Ottawa).</p> <p>It is considered that the ability to receive woodwaste from outside of the service area for the site could be mutually environmentally beneficial, since woodwaste materials are being used beneficially and supplementing the daily cover needs at the site.</p>	<p>receipt does not interfere with the operational requirements of this ECA.</p>
25.2	<p>As discussed, subsequent to submitting the ECA Application (Item 10 under Schedule A) providing the revised D&O Report, an addendum was submitted that revised the final cover thickness requirements. The thickness of the general earth material component of the final cover was changed to 0.6 metres as per Condition 30 of the ECA that indicates that the final cover (including cover and top soil) is 0.7 metres. This is discussed in Item 12 of Schedule A.</p> <p>I have attached both the addendum to the ECA Application package, dated July 15, 2015, and the letter listed as Item 12 of Schedule A dated June 9, 2017.</p>	<p>The final completed contours shall include 0.85 0.7 metre of final cover. This final cover shall consist of 0.75 0.6 metre of silt and/or clay overlain by 0.1 metre of topsoil or soil capable sustaining vegetation.</p> <p>AND</p> <p>Add Addendum 1 to the April 2015 ECA Amendment Application (listed as Item 10 of Schedule A).</p>
28.1	We agree with your proposed wording.	None

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

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Please consider the environment before printing this email.

From: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Sent: February 20, 2020 9:16 AM
To: Caletti, Andria <Andria_Caletti@golder.com>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

EXTERNAL EMAIL

Hi Andria,

Please find attached an updated draft incorporating your comments. Please note the following:

1. Condition 14.1 – I have added “Landfilling and waste diversion activities...” as all approved waste activities must be undertaken by trained personnel.
2. Condition 17.1 – I have added the following wording to make it more clear on what is considered significant and reportable: “Any spills, fires and emergency situations at the Site resulting from activities approved under this ECA and with impacts to the environment or the health and safety of the public...”
3. Condition 18.1 – I am a little unclear on your comments here. The condition does not imply that there cannot be any odour/noise etc., but that it does not cause an adverse effect (adverse effect is as defined in the EPA).
4. I have removed Condition 22.4, however, the 2015 D&O says that side slopes of 4:1 and a top slope of 3% will be maintained. Please confirm if this is correct.
5. Condition 23.3 – I copied this from page 6 of the 2015 D&O which does not talk about woodwaste being received from outside the service area. Please provide more details on this.
6. Condition 25.2 – I have taken details from the 2015 D&O.
7. Condition 28.1 – I made this more simple for clarification and ease of understanding to someone who is reading the ECA for the first time lets say. The District is aware of what you are submitting (as per items in Schedule “A”). So you can continue to submit the options assessment which includes the contingency measures.

Also to clarify, the conditions of the ECA must reflect enforceable and clear language. Words such as reportable, observable, contemplated are not enforceable. I think it would be a good idea to set up a time to chat. I am available today or tomorrow.

Regards,

Maliha Tariq
Waste Evaluator

Client Services and Permissions Branch | Ontario Ministry of the Environment, Conservation and Parks
135 St. Clair Ave. W | 5th Floor | Toronto, ON | M4V 1P5
Telephone: (416) 212-4201

From: Caletti, Andria <Andria_Caletti@golder.com>
Sent: February 6, 2020 11:34 AM
To: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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Hi Maliha,

Please see attached for our proposed changes to the Draft ECA for the Arnprior Waste Disposal Site. Proposed changes are accompanied by comments to provide the reasoning behind the proposed change.

Please don't hesitate to reach out should you have any questions.

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

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Please consider the environment before printing this email.

From: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Sent: January 28, 2020 11:12 AM
To: Caletti, Andria <Andria_Caletti@golder.com>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>

Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

EXTERNAL EMAIL

Andria,

Please find attached.

Thanks,
Maliha

From: Caletti, Andria <Andria_Caletti@golder.com>
Sent: January 28, 2020 11:05 AM
To: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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Hi Maliha,

Would it be possible to receive an editable version of the draft ECA (i.e., in Microsoft Word) for ease in returning comments to you?

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

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Please consider the environment before printing this email.

From: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>

Sent: January 20, 2020 4:47 PM

To: Caletti, Andria <Andria_Caletti@golder.com>

Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>

Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

Hi Andria,

Thank you for providing the responses. Please find attached a draft ECA, and note the following in particular:

1. Conditions 1.0 – 9.0 address general compliance. Conditions 15.0 – 20.0 and 29.0 address site operational procedures. You may find that the wording in these conditions may be updated from the 1999 Approval.
2. I have added Conditions 21.3 and 22.1 – 22.4 to identify waste quantities and limits of fill.
3. I have not included Conditions 21, 31 and 32 (from the original approval) in my draft, as I have addressed them under Conditions 20.2 and 28.0.
4. Condition 28.0 addresses the options assessment to be submitted by the Town.

Please review the draft and let me know your comments.

Regards,

Maliha Tariq

Waste Evaluator | Environmental Assessment and Permissions Branch | Ontario Ministry of the Environment, Conservation and Parks

135 St. Clair Ave. W | 5th Floor | Toronto, ON | M4V 1P5

Telephone: (416) 212-4201 | Email: maliha.tariq@ontario.ca

From: Caletti, Andria <Andria_Caletti@golder.com>

Sent: January 17, 2020 2:03 PM

To: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>

Cc: Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>

Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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Hi Maliha,

Responses to your questions as follows:

1. The Site does not have a theoretical capacity. The maximum amount of waste that can be landfilled is defined by the approved final contour elevations. The approved final contours are provided in cross-section in the annual report (similar to Figure 5 of the D&O Report), and the Town reports on the remaining capacity annually by comparing a survey of the waste mound to the final contour elevations.
2. There remains a FBAL at the Site. The following is an excerpt from Section 2.5 of the 2018

Annual Monitoring Report related to the FBAL:

As reported in previous years, there is a fill beyond approved limits within the landfill footprint that was previously understood to consist primarily of clay material placed within the landfill footprint approximately eight years ago prior to establishment of the clean fill stockpile area. As it was understood that this material was clean soil material available for use, this volume was not previously considered as contributing to the airspace consumed at the Site. Partial removal of this overfill area was undertaken in 2017. During removal, previously landfilled waste material and leachate were encountered at a depth shallower than anticipated; excavation activities were immediately stopped to avoid potential flow of leachate overland and to mitigate the development of odours. The exposed area was re-covered with a clay. As a result, the full depth of the overfill area was not excavated, and the remaining fill beyond approved limits is considered to be waste contributing to the airspace consumed.

3. Correct, the maximum amount of waste per year is 12,000 tonnes as per the 2019 ECA Amendment Application.

Thank you,

Andria

Andria Caletti, P.Eng.
Environmental Engineer

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Please consider the environment before printing this email.

From: Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Sent: January 10, 2020 1:57 PM
To: Caletti, Andria <Andria_Caletti@golder.com>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

EXTERNAL EMAIL

Hi Andria,

Thank you for taking my call this afternoon. Apologies for the delay in my response for this application. As discussed, please provide a response to the following:

1. Is there a theoretical capacity calculated for the site? (The attached Ministry document is used as a guideline for the calculation. Please see part ii (b) on page 2).
2. Please confirm the Fill Beyond Approved Limits area which is identified in figure 5 of the April 2015 Design and Operations Report.
3. Please confirm the maximum amount of waste landfilled per year (in the 2019 amendment application this is identified as 12,000 tonnes per year).

Have a great weekend!

Regards,

Maliha Tariq

Waste Evaluator | Environmental Assessment and Permissions Branch | Ontario Ministry of the Environment, Conservation and Parks

135 St. Clair Ave. W | 5th Floor | Toronto, ON | M4V 1P5

Telephone: (416) 212-4201 | Email: maliha.tariq@ontario.ca

From: Tariq, Maliha (MECP)

Sent: December 12, 2019 3:43 PM

To: Caletti, Andria <Andria_Caletti@golder.com>; Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>

Cc: Stephenson, Kyle (MECP) <Kyle.Stephenson@ontario.ca>; Guo, Thomas (MECP) <Thomas.Guo@ontario.ca>; Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly <jsteckly@arnprior.ca>

Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

Hi Andria,

Thank you for sending a summary of the discussion. I will prepare a draft ECA (compiling the previous ECA and notices of amendment), and send to you for your review in the upcoming weeks. As discussed, the Town is not expected to submit a revised trigger mechanism by Dec 31, 2019.

Have a good afternoon.

Regards,

Maliha Tariq

Waste Evaluator | Environmental Assessment and Permissions Branch | Ontario Ministry of the Environment, Conservation and Parks

135 St. Clair Ave. W | 5th Floor | Toronto, ON | M4V 1P5

Telephone: (416) 212-4201 | Email: maliha.tariq@ontario.ca

From: Caletti, Andria <Andria_Caletti@golder.com>
Sent: December 9, 2019 10:24 AM
To: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>
Cc: Stephenson, Kyle (MECP) <Kyle.Stephenson@ontario.ca>; Guo, Thomas (MECP) <Thomas.Guo@ontario.ca>; Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly <jsteckly@arnprior.ca>; Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Subject: RE: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

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Hi Maliha,

Thanks for taking my call this morning. To summarize our discussion:

- The proposed ECA Condition in the email below (i.e., to require the Town to submit an Options Assessment to the District Manager by the end of June 2020) is acceptable.
- The Town will not be expected to submit a revised trigger mechanism by December 31, 2019 per the existing ECA Condition 41.
- Removal of the existing Condition 41 and addition of the new proposed Condition will be formalized in a full update to the ECA which the Town can expect for review in a few weeks time.
- Following submission of the Options Assessment to the District Manager, discussion is to be had with the District regarding next steps, including timing for subsequent submissions to the District Office and/or Approvals as appropriate.

Thank you,

Andria

From: Caletti, Andria
Sent: November 28, 2019 5:17 PM
To: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>
Cc: kyle.stephenson@ontario.ca; thomas.guo@ontario.ca; Edmond, Trish <Trish_Edmond@golder.com>; Deanna Nicholson <dnicholson@arnprior.ca>; John Steckly <jsteckly@arnprior.ca>; Tariq, Maliha (MECP) <Maliha.Tariq@ontario.ca>
Subject: Arnprior Waste Disposal Site ECA No. A412603 - Summary of Call

Hi Thandeka,

As discussed on the conference call between the MECP Technical Support and District Office, the Town of Arnprior and Golder, we are proposing that the deadline for the revised trigger mechanism for the Arnprior Waste Disposal Site (ECA No. A412603) be removed, and be replaced with a requirement to submit to the MECP District Office an Options Assessment of contingency measures related to groundwater compliance at the Site.

As discussed at a high level, the Town previously retained Golder to investigate whether groundwater monitoring wells installed in an area expected to be upgradient of the landfill and in an area believed to be impacted by historical activities could help discern the differences between landfill impacts and historical impacts in the CAZ. Specifically the hope was that the investigation could be used to establish a new understanding of background groundwater quality that would put the site into compliance at the property boundary. Golder conducted analyses to determine if the new background wells (BR-18S/D) were useful in reducing or eliminating site compliance issues. When analyzing the groundwater level data and groundwater quality data, there is evidence to suggest that there may be two different aquifers present at site. Based on this, two different methods were used to develop a Reasonable Use Guideline; an RUG based on combined background data of the shallow and deep wells as well as a separate RUG for shallow and deep monitoring wells. Both methods to develop the RUG alleviated some site compliance issues but not all. It was determined that using BR-18 as a background well was not effective in reducing or eliminating site compliance issues. Further, the predominant interpreted groundwater flow direction establishes that BR-18 is in fact downgradient of the landfill and not suitable as a background monitor.

The Town has considered the purchase of the downgradient groundwater rights, but given that the downgradient property has high development value attaining groundwater rights or property purchase will be very costly. In addition, the Town has concerns regarding potential pre-existing contamination of the downgradient groundwater via historical activities on that property. The Town has asked Golder undertake an Options Assessment that would consider if there are other contingency options available to alleviate the groundwater compliance issues.

Presently, there is a draft Notice to the ECA to amend condition 41 of the ECA to extend the deadline for the trigger mechanism to December 31, 2019 (MECP Reference No. 5404-BBRM9M). As discussed on the call, we would like to propose to the MECP Approvals Branch (with concurrence from the District Office and Technical Support) that the draft ECA condition 41 be changed to provide a deadline for submission of the Options Assessment to the MECP by June 30, 2020.

We propose that Condition 41 be amended to read:

41. By no later than June 30, 2020, the Owner shall submit to the District Manager an Options Assessment providing contemplated contingency measures to address groundwater compliance at the Site.

It is acknowledged that in some point in the future the site ECA will require amendment to formally acknowledge and approve the preferred contingency measure to address groundwater compliance. At that time the groundwater trigger mechanism is also likely to require amendment.

Please advise if the District Office and Technical Support are in agreement with the proposed course of action. I have CC'ed Maliha Tariq from Approvals Branch who is looking after the draft ECA Notice (MECP Reference No. 5404-BBRM9M).

Thank you,

Andria



golder.com