

WASTE MANAGEMENT OF CANADA CORPORATION

WATFORD, ONTARIO

TWIN CREEKS ENVIRONMENTAL CENTRE SITE: 2020 FOURTH QUARTER & ANNUAL MONITORING REPORT VOLUME 3 OF 5: POPLAR SYSTEM MONITORING PROGRAM

RWDI # 2001313, 1000

February 25, 2021

SUBMITTED TO

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February 25, 2021

Ms. Angela McLachlan
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**Re: 2020 Fourth Quarter and Annual Monitoring Report
Twin Creeks Environmental Centre, Township of Warwick, Ontario
Volume 3 of 5: Poplar System Monitoring Program
RWDI Reference No. 2001313, 1000**

Dear Ms. McLachlan,

RWDI AIR Inc. is pleased to provide this 2020 Fourth Quarter and Annual Monitoring Report, Volume 3 of 5: Poplar System Monitoring Program, for the Twin Creeks Environmental Centre.

This report provides details of the monitoring completed in 2020 and an interpretation of the 2020 monitoring data, including our conclusions and recommendations. Relevant technical data are appended.

We trust that this report satisfies your requirements. If you have any questions or comments, please contact us.

Yours very truly,

RWDI

A handwritten signature in blue ink, appearing to read 'B. Langille'.

Brent J. Langille, B.Sc., P.Geo.
Strategic Director | Principal

JCL/BJL/jo
Attach.



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1 INTRODUCTION

1.1 Environmental Centre Description and Background

The Twin Creeks Environmental Centre (Site) is a solid, non-hazardous waste landfill facility that contains an existing landfill (Existing Site) and an area approved expansion (Expansion Site). The Site is located on Part of Lots 19 and 20, Concession 3, South of Egremont Road (SER) and Part of Lots 20 to 22, Concession 4 SER, in the Township of Warwick, County of Lambton, Ontario. The Site occupies an area of 301 hectares (ha) with 101.8 ha permitted for landfilling. The approximate Site location is shown on **Figure 1**.

The Site is located within a dominantly clayey to silty aquitard that extends to a depth of between 23.4 and 30.8 metres (m) below the Site. Landfill waste at the Site is located in two (2) areas: 1) the Existing Site, and 2) the Expansion Site. The Existing Site is comprised of Cells 3 through 12, as well as the West Cell and South Cell. As of November 16, 2009, waste disposal activities commenced in the Expansion Site. The Expansion Site consist of Cell 1, Cell 2, and Cell 4 (sub-cells 4A and 4B). The waste cell designations and other features of the Existing Site are shown in **Figure 2**.

The South Cell of the Existing Site consists of waste landfilled into trenches of various widths and depths excavated into the clayey soil. Three (3) finger drains that extend through the trenches provide gravity drainage to the perimeter maintenance holes for leachate collection. The remainder of the waste footprint contains waste trenches, as well as newer waste cells constructed with re-compacted clayey liners and, in some cells, waste underdrains.

Waste within the Expansion Site, to the west of the Existing Site, will extend to an average depth of 15 m below existing grade. Leachate is managed with a liner system that directs leachate toward dedicated leachate pumping stations. The liner system consists of a primary drainage layer below the waste to collect leachate, an underlying recompacted clayey liner (primary liner), then a secondary drainage layer for leak detection and contingency use, which is all underlain by a thick natural barrier of clayey soil (secondary liner).

Surface water flow at the Site is ephemeral, with flow that typically occurs after snowmelt or prolonged periods of precipitation. Runoff from most of the east half of the Existing Site flows to Sedimentation Pond 1 (SP1), while runoff from the northern portion of Cell 11, and the west half of the Existing Site from north of approximately the Cell 8/6 boundary, flows to Sedimentation Pond 4 (SP4). Runoff from most of Cell 6 and the remaining west half, to approximately the middle of the South Cell of the Existing Site is directed to Sedimentation Pond 2 (SP2). Runoff from the southern portion of the South Cell flows to sedimentation Pond 1 (SP1). Sedimentation Pond 3 (SP3) captures runoff from the northwest quadrant of the Expansion Site and therefore, runoff from the Poplar System would not flow through SP3.

Leachate generated at the Site is managed by: 1) on-Site disposal with phytoremediation using poplar trees; and 2) by transport off-Site for treatment and disposal. The Poplar System, in its expanded form of 9.3 ha, became operational on September 27, 2017. In 2020, leachate was managed for on-Site disposal from May 4 to September 28 during the irrigation season (May 1 to October 15, 2020).

Leachate phytoremediation at the Site can occur in the area noted below, which is shown in **Figure 2**.

- The Poplar System is located within the waste footprint of the Existing Site. In 2020, the Poplar System could manage leachate that satisfies the 100% concentration strength target. The four (4) zones of the Poplar System were operated in 2020 from May 4 to September 28.

The Site is permitted to treat leachate on-Site by use of poplar trees on the landfill cap (Poplar System). Approval details are presented in the Ontario Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) Waste Disposal Site No. A032203, dated December 13, 2011, and amended to December 5, 2019; and as amended in consolidated form on December 19, 2020 (Waste ECA). Items 63 through 65 in Schedule 'A' of the Waste ECA provides details pertaining to the expanded Poplar System.

1.2 Purpose and Scope

The purpose of the Poplar System Monitoring Program is outlined below.

- To evaluate the effectiveness of the Poplar System for the phytoremediation of leachate.
- To assess potential effects to surface water, soil, and air quality as a result of operating the Poplar System.
- To evaluate the Poplar System Monitoring Program and to recommend improvements, where required.

The Poplar System, in its original design form, was decommissioned in the early spring of 2014 and construction of the expanded system was completed in 2017. The Poplar System, in its expanded form of 9.3 ha, became operational on September 27, 2017. In 2020, the expanded Poplar System was operated between May 4 and September 28 during the irrigation season (May 1 to October 15). The monitoring components completed in 2020 are reflective of the period during which the Poplar System was operational.

The Poplar System Monitoring Program involves a data collection component, a comprehensive analysis and interpretation component, as well as a reporting component. Volume 3 of the 2020 Fourth Quarter and Annual Monitoring Report (2020 Annual Report) satisfies the reporting requirements for both the fourth quarter (Q4) of 2020 (October 1 to December 31) and 2020 Poplar System monitoring period.

1.3 Poplar System Regulatory Framework

The Poplar System is operated in conformance with the regulatory approvals noted below. Copies of the relevant ECAs and their amendments are provided in **Appendix A**.

- Amended Environmental Compliance Approval (ECA) No. A032203, dated December 13, 2011, plus amendments to December 5, 2019; and in amended consolidated form on December 19, 2020 (Waste ECA).
- Amended ECA for Industrial Sewage Works No. 2403-BE6LZ4, dated August 21, 2019 (Sewage ECA).
- Amended Permit-To-Take-Water (PTTW) No. 4430-8PLMKV, dated January 17, 2012, for the removal of surface water from four (4) Sedimentation Ponds and the dewatering of the Secondary Drainage Layer (SDL) for the Expansion Site.
- MECP Letter entitled "Request for Modification to Surface Water Monitoring/Assessment Process at Twin Creeks Landfill, dated February 27, 2014 (2014 MECP Letter).



Operation and monitoring of the Poplar System was completed during 2020 in accordance with conditions of the Waste ECA that relate to monitoring (Condition 8.7) and reporting requirements (Conditions 15.4 to 15.7), as well as the relevant monitoring requirements of the Sewage ECA and the PTTW.

Throughout 2020, quarterly monitoring reports were submitted to relevant stakeholders within 60 days following the last day of the previous quarter in accordance with Condition 15.4 of the Waste ECA. Volume 3 of the 2020 Annual Report was prepared in consideration of Conditions 15.4 through 15.7 of the Waste ECA.

1.4 Poplar System Design and Operation

The details of the expanded Poplar System at the Site are provided within Items 63 through 65 in Schedule 'A' of the Waste ECA. The Poplar System was initially operated as a pilot study from 2003 through 2007, at which time it became approved as an operational leachate phytoremediation system in 2008. In 2010, an application was submitted to the MECP for an increase in the area of the Poplar System over the waste footprint of the Existing Site. The application was approved in 2011 and the Poplar System area and monitoring program were revised. The approved leachate application area is about 9.3 ha in area, as shown in **Figure 2**.

The Poplar System, in its expanded form, became operational on September 27, 2017. The expanded Poplar System consists of four (4) zones, with each zone consisting of 40 to 50 rows of trees, planted in an east-west directional pattern, as shown in **Figure 3**. Trees in each row are separated by a spacing of approximately 0.6 m and rows are approximately 3 m apart. Each row is approximately 186 m in length. The expanded Poplar System includes similar infection-resistant poplar tree hybrids to the original Poplar System, as well as the planting of willow trees.

Leachate to be applied to the Poplar System is transferred from the Equalization Tank, which receives leachate from both the Existing and Expansion Sites, as well as condensate from the landfill gas extraction system, to a holding tank system [two 50 cubic metre (m³) tanks and two 100 m³ tanks] located near the southwest corner of Zone 1. Leachate is pumped into this holding tank system for storage and gravity drains to a pumping station for transfer to the Poplar System. The leachate is then pumped through the network of distribution piping for drip irrigation. Mixing the leachate with surface water, potable water, or weaker strength leachate (e.g., monofill cell leachate) may be required such that quality of the irrigation liquid satisfies the relevant concentration strength target for the poplar trees. The liquid for mixing with the leachate is typically obtained from the municipal water supply system (from an on-Site fire hydrant near Sedimentation Pond 1 (SP1)), temporary water storage area(s), surface water sumps, or weaker strength leachate (i.e. from monofill Cells 8, 10, and 12), or other locations as operations permit.

1.5 Precipitation Data

A summary of precipitation data for the 30-Year Normal (1961-1990, 1971-2000, and 1981-2010) and the 1995 through 2020 annual climatic data for the area around the Site is provided in **Table B- 1, Appendix B**. The 30-year normal and data to 1996 were collected at the Strathroy Climatological Station. Data from 1997 onward were collected from the Strathroy-Mullifarry Climatological Station, which is the nearest Environment Canada climatological station to the Site.



Precipitation data from the on-Site climatological station from January 1 to December 31, 2020, are also provided in **Table B-2, Appendix B**. The 2020 climatic data for the local Strathroy-Mullifarry Climatological Station are presented in **Table B-3, Appendix B**. A total of about 725.4 millimetres (mm) of precipitation was recorded from the on-Site climatological station during 2020, while the Strathroy-Mullifarry Climatological Station recorded about 966.6 mm of precipitation in 2020.

Relative to the 30-Year Normal (1981-2010), 2020 was slightly wetter than normal as recorded at the climatological station. The 2002 to 2020 on-Site precipitation data from January 1 to December 31 indicate that the yearly precipitation received at the Site was consistently less than the regional total. For example, the precipitation recorded from the on-Site climatological station in 2020 was approximately 25.0% less than what was measured at the Strathroy-Mullifarry Climatological Station. This pattern of annually less precipitation recorded at the Site than recorded regionally, has typically been observed since on-Site precipitation monitoring began in 2003 (2003 was first full year of monitoring).

Based on the available historical data from the Environment Canada climatological stations, there is typically a water deficit (evapotranspiration exceeds precipitation) from May through September. Therefore, there is a low potential for overland flow and an increase in infiltration rates during this period, which is beneficial for the operation of a Poplar System. For October through April, a water surplus (precipitation exceeds evapotranspiration) results in a greater potential for overland flow and a decrease in infiltration rates.

2 MONITORING METHODS

The Poplar System Monitoring Program completed for the monitoring period from January 1 to December 31, 2020, is outlined in **Tables 1 and 2**.

As discussed, the Poplar System was decommissioned in the early spring of 2014 and construction of the expanded system was completed in 2017. The Poplar System, in its expanded form of 9.3 ha, became operational on September 27, 2017. In 2020, the expanded Poplar System was operated between May 4 and September 28 during the irrigation season period that ranges from May 1 to October 15. Therefore, the monitoring components completed in 2020 are reflective of the period during which the Poplar System was operational. For the monitoring components completed, the monitoring methodology followed the protocols outlined for the Poplar System, which are provided in **Appendix C**.

Throughout 2020, the routine quarterly surface water monitoring component of the Poplar System Monitoring Program was completed for precipitation events in conjunction with the routine quarterly surface water monitoring of the Compliance Monitoring Program for the Site. Precipitation event monitoring is completed once per calendar quarter in response to greater than 10 mm of precipitation in a 24-hour period. The surface water storm event monitoring (≥ 25 mm in 24 hours) was required to be completed during the operation of the Poplar System in 2020, which was between May 4 and September 28.

A quality assurance and quality control (QA/QC) program was followed for each of the monitoring tasks completed in 2020, where required. QA/QC findings are discussed in **Section 3**.



2.1 Irrigation Application

In 2020, irrigation liquid was applied to the poplar trees intermittently for a total of 88 days from May 4 to September 28. Per the Waste ECA, the last approved day to apply irrigation liquid to the Poplar System is October 15. The volume of irrigation liquid applied was monitored on a daily basis by a flow meter. The volumes of irrigation liquid applied are discussed in **Section 4.1**.

The irrigation liquid applied to the Poplar System during 2020 was approximately 100% leachate by concentration (based on the target leachate concentrations) and 83.4% leachate by volume. Monthly samples of the irrigation liquid applied during the 2020 irrigation season were collected from the holding tank as required..

The collected samples were submitted to Bureau Veritas Inc. of Mississauga, Ontario (Bureau Veritas) for analysis of the required parameters. Bureau Veritas is a Canadian Association for Laboratory Accreditation (CALA) certified environmental laboratory. Irrigation quality findings are discussed in **Section 4.2**.

2.2 Liquid Measurements

Leachate levels were measured at the required leachate monitoring wells and maintenance holes as part of the Site operations on May 4 and November 2, 2020, with findings presented in **Section 5.1**.

2.3 Soil Monitoring

During the fall of 2020, a soil sample was collected within each zone of the Poplar System from a depth between ground surface and 0.6 m to 0.9 m below ground surface (mBGS). The collected samples were submitted to Bureau Veritas for analysis.

During 2020, soil electrical conductivity (EC) was measured weekly in the Poplar System during system operation, per Condition 8.7 of the Waste ECA. The EC measurements were taken at five (5) locations in the Poplar System. At each location and for each event, EC measurements were taken along a poplar tree row near a drip emitter, as well as between poplar tree rows. At each measurement location, EC measurements were taken at depths of 25 and 150 mm below ground surface.

Soil monitoring findings are discussed in **Section 5.2**.

2.4 Leaf Tissue Sampling

Leaf tissue samples were collected on September 2, 2020. The protocol for leaf tissue sample collection involved the accumulation of at least 200 grams (g) of leaf tissue from various trees.

Within each zone of the Poplar System, one (1) composite sample was prepared from the upper canopy (top of tree) and one (1) composite sample was prepared from the lower canopy (base of tree). Samples were submitted to Bureau Veritas for analysis. Leaf tissue monitoring findings are discussed in **Section 5.3**.



2.5 Stem Core Testing

To assess leachate constituent concentration accumulation within the tree trunk tissue, stem core samples are collected annually during operation of the Poplar System. In 2020, stem core sample collection was completed on September 2. Stem core samples were collected from one (1) location within each zone of the Poplar System. As stem core removal may kill a small diameter tree, the samples were obtained from the trees removed to investigate root depth penetration. Samples were collected from a location equivalent to about 1.5 m above the ground surface (mAGS). Samples were submitted to Bureau Veritas for analysis. Stem core monitoring findings are discussed in **Section 5.4**.

2.6 Root Tissue Testing

To compare leachate constituent concentration accumulation within the poplar tree leaf tissue, stem, and roots, root tissue samples are collected annually. In 2020, root tissue sample collection was completed on September 2. Root tissue samples were collected from one (1) location within each zone of the Poplar System. The root tissue samples were collected from the trees removed to investigate root depth penetration. Samples were submitted to Bureau Veritas for analysis. Root tissue monitoring findings are discussed in **Section 5.5**.

2.7 Visual Assessment

A visual assessment of the Poplar System was completed on September 3, 2020. The assessment considered the following characteristics.

- tree diameter & height
- crown density
- leaf size and discolouration
- insect infestation
- depth of root penetration
- crown dieback
- abnormally shaped leaves
- length of new tree branch extension roots
- tree mortality
- foliage transparency
- deformed growth

As part of the visual assessment, one (1) tree from each zone of the Poplar System was cut down, roots were excavated, and soil was removed to expose the roots. The depth of the taproot and brace roots for the tree excavated were measured and recorded. The visual assessment also included an inspection of the brace roots of the trees for evidence of animal damage.

Consistent with the assessment protocols, a visual assessment was completed for select trees within each zone of the Poplar System. The trees are staked and flagged for follow-up inspections in consecutive years. Visual assessment findings for the trees are presented in **Section 5.6**.

2.8 Daily Inspections

Daily inspections were completed during operation of the irrigation system for evidence of ponded water and/or leachate seeps in the land application area. Tree undergrowth and olfactory ambient air odour assessments were completed at the time of the inspections. Inspection records are maintained on file by RWDI.



2.9 Surface Water Sampling

The 2020 surface water monitoring program for the Poplar System included: 1) routine quarterly precipitation events (> 10 mm in 24 hours) as part of the Compliance Monitoring Program; and 2) storm events (> 25 mm in 24 hours) to be completed twice during system operation. The surface water monitoring stations for the Poplar System include SS14A, SS14B, and SS15A, which are shown in **Figure 2**.

Historical monitoring station SS14, located adjacent to Zone 2 of the Poplar System, was renamed SS14A in September 2009 due to surface water drainage system grading changes during construction of the gas collection system for the Existing Site. Similarly, SS15, which was formerly located downstream of the Poplar System, was renamed SS14B. As a result of the grading changes, SS14B represented an upstream station with respect to Zone 1 of the Poplar System. Monitoring station SS14B rarely received enough surface water for sampling as it was located on a flow divide for the ditch. In the late spring of 2011, SS14B was relocated to a location within the west ditch, adjacent to Zone 1 of the Poplar System. The monitoring stations will herein be referenced by their most recent designations.

With the activation of the expanded Poplar System in 2017, the former locations of monitoring stations SS14A and SS14B, as described above, were no longer representative of their monitoring intentions and therefore, were again relocated to account for the larger irrigation area of the expanded Poplar System. As discussed in the 2018 Annual Poplar System Report, SS14A was relocated to a location within the east ditch, upstream of the expanded Poplar System. SS14B was relocated to a location within the west ditch, adjacent to Zone 3 of the Poplar System. Monitoring station SS15A, which was created in September 2009, is located downstream of the Poplar System within the perimeter ditch, prior to discharge into SP1. The current surface water monitoring station locations for the Poplar System are shown in **Figure 2**.

A summary of the surface water monitoring stations, which formed part of the 2020 Poplar System Monitoring Program, is presented below.

Monitoring Station Designation	Monitoring Station Description
SS14A (former SS14)	On-Site flow within East Ditch of the Existing Site, upstream of the Poplar System.
SS14B (former SS15)	On-Site flow within West Ditch of the Existing Site, adjacent to Zone 3 of the Poplar System.
SS15A	South Ditch of the Existing Site and inlet point to Sedimentation Pond 1, downstream of Poplar System.

Surface water monitoring dates are presented in the summary below with the associated precipitation totals, as recorded from the on-Site climatological station.

Surface Water Monitoring Date	Stations Sampled	Previous Five Days of Precipitation (mm)	Task Description
January 11, 2020	SS14A SS14B SS15A	1.4, 0, 0, 0, 14.4	First Quarter: 14.4 mm precipitation event monitoring. Irrigation system was not active until May 4.
May 18, 2020	SS14A SS14B SS15A	0, 6.2, 1.2, 0, 15	Second Quarter: 11.8 mm precipitation event monitoring. Irrigation system was active until September 28.
November 15, 2020	SS14A SS14B SS15A	4.2, 0, 0, 0, 12.6	Fourth Quarter: 12.6 mm precipitation event monitoring. Irrigation system was active until September 28.

For the above-noted monitoring events, when flowing surface water conditions were observed, surface water samples were collected directly from the watercourse with an unpreserved laboratory prepared sample bottle. Where required, this water was transferred to sample bottles that contained preservatives. No field filtering was required or completed.

During the irrigation season in 2020, storm event monitoring was not required as there were no precipitation events greater than 25 mm of precipitation that fell over a period of 24 hours that produced observable flow. The observation of no flowing conditions after significant rain events $\geq 25\text{mm}/24\text{hrs}$ is expected and has been identified since precipitation monitoring began in 2003 at the Site.

The 2020 surface water findings for the Poplar System Monitoring Program are discussed in **Section 5.7**. The 2020 surface water findings for the Compliance Monitoring Program are presented under separate cover in the *2020 Compliance Monitoring and Operations Program Report, Twin Creeks Environmental Centre Site, Volumes 1 to 2* (RWDI AIR Inc., 2020).

2.10 Field QA/QC Sampling

The field sampling QA/QC program is presented in the following summary. It is noted that vegetation samples, by nature of their matrix, cannot have a field duplicate created.

Media	Monitoring Event	Original Sample ID	Field-Prepared Duplicate Sample ID
Soil	September 4, 2020	S2	SODUP
Surface Water	January 11, 2020	SS14A	PSSWDUP
	May 18, 2020	SS15A	PSSWDUP
	November 15, 2020	SS15A	PSSWDUP



3 QUALITY ASSURANCE AND QUALITY CONTROL EVALUATION

The QA/QC program for the monitoring completed in 2020 included field-prepared duplicate samples, comparisons with field-determined analytical results, laboratory-prepared duplicates, percent recoveries of analyses, and data review. Laboratory analytical results for soil and surface water are provided in **Appendix G** and **Appendix E**, respectively.

The laboratory analyzed several control samples to verify that the analytical equipment was functioning properly and reporting results accurately at the time of analysis for the samples collected at the Site. The control samples had an expected target value, which was compared against pre-determined data quality objectives. For the laboratory control samples, the results were within acceptable laboratory data quality criteria.

For field-prepared duplicate samples, the analytical results for the required parameters of analysis were evaluated for the relative percent difference (RPD) of parameter concentrations using the USEPA National Functional Guidelines (US EPA 540-R-10-011) as a general QA/QC RPD screening mechanism. The RPD screening mechanism is such that for concentrations greater than five (5) times the laboratory reportable detection limit (RDL), a concentration difference of less than or equal to 20% is deemed acceptable. For concentrations less than or equal to five (5) times the RDL, a concentration difference of equal to or less than the RDL is deemed acceptable. Where a calculated RPD is outside of the tolerance of the general QA/QC RPD screening mechanism, the results for the required parameters of analysis are evaluated against the applicable performance standards for sample duplicates noted in Tables 5.1 to 5.15 of the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, prepared by the Ministry of the Environment (MOE), dated March 8, 2004, and amended to July 1, 2011. For the results found to be outside of the tolerance of each QA/QC evaluation, a laboratory data quality review (DQR) of the results is requested to verify that the concentrations are accurate as presented and are within acceptable laboratory data quality criteria.

3.1 Soil QA/QC

For the 2020 soil sampling event, a QA/QC evaluation was completed for the analytical results of the original sample and its respective field-prepared duplicate sample, as outlined in **Section 2.10**. The results of the original and duplicate samples satisfied the criteria of the QA/QC evaluations.

3.2 Surface Water QA/QC

For the 2020 surface water monitoring events, QA/QC evaluations were completed for the analytical results of the original samples and their respective field-prepared duplicate samples, as outlined in **Section 2.10**. With one exception, the results of the original and duplicate samples satisfied the criteria of the QA/QC evaluations. The parameters for which the results of the original and duplicate samples were found to be outside of the tolerance of the QA/QC evaluations are presented below.

Date	Sample Designation (Original / Duplicate)	Parameter	QA/QC Evaluation
November 11, 2020	SS15A / PSSWDUP	Total Ammonia-N	RPD > 30%



A laboratory DQR of the above-noted QA/QC exception was completed and the results were verified by the lab to be accurate as presented. Therefore, although a QA/QC exception was identified, the relevant original sample results were deemed to be representative of conditions at the time of sampling. As such, the original sample results were included into the database for interpretive purposes.

In summary, acceptable QA/QC data for the field-prepared duplicate samples, laboratory duplicates, and percent recovery of analysis indicated that the detected constituent concentrations were accurate and reflected actual conditions at the time of sample collection.

4 SYSTEM IRRIGATION AND OPERATIONS

4.1 Irrigation Quantity

In 2020, irrigation liquid was applied to the poplar trees intermittently for a total of 88 days between May 4 and September 28. Irrigation details are provided in **Appendix D. Table D-1** presents a summary of the monthly and annual irrigation liquid volumes for the Poplar System. **Table D-2** presents a summary of application rates. **Table D-3** presents a summary of the annual volume of leachate managed on-Site by the Poplar System and transported off-Site for disposal.

The irrigation liquid applied to the Poplar System during 2020 was approximately 100% leachate by concentration (based on the target leachate concentrations) and 83.4% leachate by volume. A total of 12,972.9 m³ of irrigation liquid, containing 10,823.2 m³ of leachate, was applied during the irrigation period from May 4 to September 28, 2020.

A portion of leachate collected from the landfill leachate management system was transported off-Site for disposal at the Chatham Water Pollution Control Plant or Canflow Environmental Services. In 2020, a total of 38,972.22 m³ of leachate was removed from the Site for off-site treatment and disposal. Therefore, the total volume of leachate extracted for treatment (applied to the Poplar System and removed for offsite treatment) during 2020 was 49,795.39 m³. Since activation of the initial Poplar System (2003 to 2014 for the initial system and 2017 to 2020 for the expanded system), 70,194.5 m³ of leachate has been managed by phytoremediation at the Site.

The 2020 total annual irrigation rate (applied leachate and water) was approximately 139.5 millimetres per square metre (mm/m²) for the 9.3 ha Poplar System. The application rate is less than the available annual irrigation potential of 476 mm/m², as detailed in the *Expansion of Poplar Cap Irrigation System for Existing Waste Disposal Area* report, as prepared by GENIVAR Consultants LP and dated January 2010. The available annual irrigation potential of 476 mm/m² is based on a predicted irrigation period of 105 to 120 days, which accounts for days with precipitation. Therefore, on average, the available daily irrigation potential is 4 mm/m² to 4.5 mm/m². As irrigation liquid was applied to the poplar trees intermittently for a total of 88 days in 2020, the average daily irrigation rate was approximately 1.4 mm/m². The total volume of liquid (including irrigation liquid and precipitation) applied to the Poplar System in 2020, during the period from May 4 to September 28, was approximately 469.7 mm/m².



It is noted that the application of leachate was less in 2020 than in 2019, which is dominantly attributed to the lack of weaker strength leachate volume availability from the Existing Site. Many of the weaker strength leachate cells (Cell 3, Cell 4, Cell 5, Cell 8, Cell 10, and Cell 12) could not supply readily available leachate volume to meet the irrigation demand of the Poplar System. Essentially the leachate within these cells was drawn down to a point that the pumps could not operate without potentially causing damage to the pump. The recovery rate (speed of returning to static level conditions) of the leachate in these cells was commonly greater than several weeks, which significantly limited leachate availability for irrigation purposes. In the instances where weaker strength leachate volume was not available, stronger leachate was utilized from the Equalization Tank, or direct from select waste cells (i.e. Cell 9, Cell 11, etc.) and diluted with clean water extracted from the municipal drinking water system.

4.2 Irrigation Quality

Irrigation liquid monitoring for quality in consideration of application rates to the Poplar System is completed monthly during the irrigation season, which is permitted to run from May 1 to October 15. As irrigation liquid was applied during the irrigation period from May 4 to September 28, 2020, monthly samples of the irrigation liquid were collected from the holding tank from May to September. The analytical results for the irrigation liquid samples are presented in **Tables E-1 to E-3, Appendix E**. The Laboratory Certificates of Analysis for the 2020 samples are provided in **Table E-4, Appendix E**.

The 2020 analytical results for the irrigation liquid were compared to the target leachate concentrations for irrigation loading to the poplar trees. In 2020, most parameter concentrations within the irrigation liquid satisfied the 100% leachate target concentrations, with exceptions noted in **Table E-1, Appendix E**. The analytical results for the irrigation liquid that were greater than their respective 100% leachate target concentration in 2020 were primarily fertilizer related or metals parameters that should not notably affect tree health. Where parameters were found to be greater than their respective 100% target leachate concentration, they were verified to be within their respective historical range. As the poplar trees did not exhibit any indication of health stress in 2020, the aforementioned analytical results for the irrigation liquid did not appear to pose a concern to the poplar trees.

For comparative purposes, the 2020 irrigation liquid analytical results were also compared to guidelines for metals and general parameters in irrigation water from the Canadian Council of Ministers of the Environment (CCME, 2004) (CCME Guideline). In addition, the results were also assessed against values for chloride irrigation of salt tolerant poplar trees (Shanon et al., 1998). The CCME Guideline criteria are presented in **Table 4** and **Table E-1, Appendix E**. It is noted that the CCME Guideline criteria are for vegetable crops and do not represent upper toxicity limits for the poplar trees, however, they can be utilized as a guide for assessing chemical loading to the poplars. The analytical results which were found to be greater than their respective CCME Guideline criterion are highlighted in **Table E-1, Appendix E**. However, as discussed herein, there was not any evidence of tree stress, such as but not limited to, deformed growth or leave discolouration, that indicated the boron and chromium concentrations detrimentally affected tree health.

For the organic parameters tested, there is only a 100% leachate target concentration for the total BTEX compounds (benzene, toluene, ethylbenzene, and xylenes). The concentrations of total BTEX detected in 2020 were less than the respective 100% leachate target concentration. The organic analytical results are presented in **Tables E-2 and E-3, Appendix E**.



4.3 Operational Information

During 2020, the Poplar System did not operate during precipitation events or if soil conditions were excessively wet. Per Condition 8.7.c. of the Waste ECA, the Poplar System was deactivated a minimum of one (1) hour prior to precipitation events forecast in excess of 12.5 millimetres per hour (mm/hr).

The undergrowth of the Poplar System was controlled to reduce the activity of vermin that could damage the trees and drip irrigation lines. During the inspections completed for the land application area in 2020, vegetative undergrowth consisted primarily of grass and sparse weeds. Weed control is normally completed during the growing season by herbicide spraying under the direction of the St. Clair Region Conservation Authority (SCRC). Records of application rates and chemicals used are maintained on file with SCRC.

As discussed, the Poplar System in its expanded form of 9.3 ha became operational on September 27, 2017. Per the Waste ECA, the irrigation season for the Poplar System is permitted to run from May 1 to October 15. In 2020, the expanded Poplar System was operated during the irrigation season between May 4 and September 28, 2020.

5 MONITORING RESULTS

5.1 Liquid Levels

Leachate level monitoring points in and around the Poplar System historically included MH16, MH17, MH18, OW22A-10, and OW53-10. As the expanded Poplar System was constructed over more cells of the Existing Site, additional monitoring points were included for the assessment of leachate liquid levels. The monitoring points include monitoring well OW51A, maintenance holes MH3SA, MH3SB, MH3SC, MH3SD, MH3SE, MH3SF, MH4A, and MH4B, as well as the West Central Fill Area (Sump).

In consultation with the Landfill Engineer and Hydrogeologist Reviewers of the Technical Review Team (TRT), WM had agreed post-2016 to augment the existing leachate level monitoring program for the Site with the installation of additional leachate level monitoring wells within select waste cells of the Existing Site. The supplemental leachate level monitoring locations (LW1 to LW6) were installed within the Existing Site in 2017, at the locations shown in **Figure 2**. These monitoring wells are to be monitored for levels semi-annually together with the already established semi-annual spring and fall monitoring events for the Site to provide further insight toward leachate patterns within select waste cells of the Existing Site. The supplemental leachate monitoring wells installed in and around the Poplar System include LW4 (Cell 4), as well as LW5 and LW6 (South Cell).

Leachate levels for the leachate monitoring wells and maintenance holes were measured on May 4 and November 2, 2020. The 2020 and historical leachate elevations for the aforementioned monitoring points are presented in **Table F-1** and shown in **Figures F-1 to F-5, Appendix F**.

For the leachate monitoring points located at/near the top of cap surface in the vicinity of the Poplar System, a summary of the leachate level depth below the top of cap surface during 2020 is provided below.

Application Area	Approximate Cap Surface Elevation (mASL)	Range of Depth Below Cap Surface (m)
South Cell	243.9	5.53 to 5.76
Cell 3S	249.0	4.53 to 6.06
Cell 3	249.8	13.41 to 13.61
Cell 4	245.1	5.71 to 5.82
West Cell	248.8	7.77 to 8.43

Notes: 1) “m” denotes metres. “mASL” denotes metres above sea level.
2) Detailed leachate elevations are provided in **Appendix F**.
3) Approximate Cap Surface Elevation is based on the approximate cap surface elevation at each relevant monitoring point within its respective application area that exists on top of the landfill.

Based on the leachate levels measured historically and in 2020, the average annual leachate elevation within each cell below the cap surface within the footprint of the Poplar System indicates that the application of irrigation liquid is consumed by the trees and is therefore, not causing leachate mounding within the waste. Based on a comparison of the levels measured at leachate collection system maintenance holes and leachate wells in May and November 2020, most leachate levels expectedly decreased by the fall, which is attributable to the extensive leachate extraction for irrigation purposes. It is noted that the leachate levels at MH3SD, MH4A, and LW6 that had increased in 2019, have decreased back to within their respective historical ranges as of November 2020. Where leachate levels slightly increased into the fall of 2020, the levels were within their respective historical ranges.

The May and November 2020 data for leachate elevations from LW4, LW5, and LW6 were compared to their counterpart leachate monitoring locations within the same respective waste cells. The leachate elevations from LW4 and LW6 indicate that waste Cell 4 (LW4) and the eastern portion of the South Cell (LW5) have leachate stored within the waste that may not be directed to, or captured by, the leachate underdrain collection systems. As discussed in the 2020 Compliance Monitoring and Operations Program Report, Twin Creeks Landfill Site, Volume 1 (RWDI AIR Inc., 2020), an experimental liquid level assessment was completed weekly for leachate monitoring wells and their respective cell's pumping station maintenance hole between May and December 2020. When comparing the leachate elevation data for LW1 to LW6 to their counterpart maintenance hole, it is evident that there is a noticeable difference in the elevations.

During 2020, the leachate elevations within select maintenance holes were drawn down and fluctuated significantly as a result of leachate extraction for irrigation to the Poplar System. However, with respect to draw down as a result of leachate extraction, the leachate elevations in leachate monitoring wells LW1 to LW6 did not correlate to the elevations in their counterpart maintenance hole (within the same waste cell). This observation indicates that leachate is within the waste mound that is not making it to the collection system (i.e. perched, low hydraulic conductivity, or some other cause) and is therefore, not having an effect to the groundwater system (i.e. potentiometric pressures). This effect is observed in waste cells that are both positioned under and not under the Poplar System, indicating that the operation of the Poplar System is not the cause of this leachate elevation differential effect.



There was no observable negative affect observed to the sideslope of the Existing Site, such as leachate seeps, soil staining, stress vegetation, soil slumping or erosion, as a result of this leachate elevation differential. At this time the exact cause of the leachate differential is unknown, but it is not causing a detrimental effect to the operation of the Poplar System, excluding limiting leachate volume availability, and is not casing visible stress to the landfill cap and as such does not represent an immediate concern. Ongoing leachate level monitoring will enable an evaluation if this leachate differential is a long-term (i.e. over 5 years) situation, or has the potential to represent a concern (i.e. increasing trends with time, or stress to the landfill cap, etc.).

In summary, the Existing Site requires the ongoing leachate level monitoring program to enable input such that the leachate is managed environmentally effective in consideration of the destination target (eg. off-Site vs. on-Site treatment). As the poplar trees continue to grow, additional moisture from the landfill cap is expected to be removed by the trees, which should further reduce precipitation movement through the cap and reduce the generation of leachate, especially during the growing season in the area of the Poplar System.

5.2 Soil Monitoring

5.2.1 Soil Quality

The laboratory analytical results for the soil samples collected in 2020 are presented in **Table G-1, Appendix G**. The Laboratory Certificates of Analysis for the 2020 samples are provided in **Table G-3, Appendix G**.

Soil sampling was completed in September 2020 to evaluate select metals and other inorganic constituent concentrations in comparison to the MOE *Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Land*, dated March 1996.

The results for the select metals and other inorganic parameters were reasonable and consistent with the heterogeneity of soils, with variable results between Zones 1 through 4, with some exceptions. Between 2019 and 2020, the concentrations for most parameters were similar with some increasing and some decreasing in 2020 compared to the concentrations in 2019. Relative to historical data, elevated chloride concentrations were noted for the samples collected from Zones 3 and 4 in 2020. Conversely, relative to historical data, low chloride concentrations were noted at Zone 1 in 2020. Also, a medium and a high-level sodium adsorption ratio (SAR) was noted for the samples collected from Zones 3 and 4 in 2020. This is attributable to elevated sodium concentration levels, in comparison to historical ranges. The elevated concentrations of chloride and sodium are likely temporary and may be attributable to Poplar System irrigation being active the day of sample collection. These elevated parameters will continue to be monitored closely as more data are (is)collected. The noted chloride and sodium concentrations have not had a detrimental effect to tree health based on visual assessment, as outlined herein.



5.2.2 Soil Electrical Conductivity

During 2020, soil EC was measured weekly in the Poplar System during system operation per Condition 8.7 of the Waste ECA. The soil EC measurements are presented in **Table G-2, Appendix G**. To evaluate the EC results, the geometric mean of the measurements for each event were taken for: 1) the measurements taken along a poplar tree row near a drip emitter (location A); and 2) the measurements taken between poplar tree rows (location B). A plot of the geometric mean of the EC results for the expanded Poplar System is provided in **Figure G-1, Appendix G**. Between locations A and B, at the same depths, the EC results for the measurements taken near the drip emitters were generally greater during the period when irrigation liquid was being applied in 2020 than the EC results taken between the poplar tree rows.

In 2020, the geometric mean of the initial EC results at the beginning of the irrigation season (on May 4, 2020) were notably less than the results from the end of the 2019 season, as presented in **Figure G-1, Appendix G**. This decrease is indicative of natural soil flushing occurring repeatedly during off-season precipitation and snow-melt events. After May 13, 2020, the EC results generally increased during the period of the irrigation season when most of the irrigation liquid was applied (i.e., between May and September), which is expected with irrigation loading over the growing season.

Overall, based on the EC results in 2020, the application of irrigation liquid increases the EC of the shallow soil in the Poplar System. However, it is noted that after September 2020 the EC results generally exhibited a decreasing trend. This indicates that the EC results are primarily only elevated during active irrigation and that the application of irrigation liquid is not attributing to a build-up of EC in the shallow soil of the Poplar System over time. As the poplar trees did not exhibit any indication of health stress in 2020, the soil EC results did not appear to pose a concern to the poplar trees. As this is the third year of EC measurements of the soil in the expanded Poplar System, the results will be assessed for historical trends in more detail in the future as more data is collected.

5.3 Leaf Tissue Sampling

Leaf tissue samples were collected on September 2, 2020. The laboratory analytical results for the leaf tissue samples are presented in **Tables H-1 and H-2, Appendix H**. Indicator values are provided for guidance in evaluating acceptable tissue quality. These indicator values were established in 2002 during consultation with the MOE and considered a Manitoba Soil Fertility Guide as a guidance document for phytoremediation. The Laboratory Certificates of Analysis for the 2020 samples are provided in **Table H-5, Appendix H**.

In 2020, the leaf tissue results showed similar concentration loading in the upper and lower portions of the tree canopy. This pattern is expected for trees that are small (less than 4 to 5 m tall). Between 2019 and 2020, the concentrations for most parameters were similar with some increasing and some decreasing in 2020 compared to the concentrations in 2019. As the poplar trees did not exhibit any indication of health stress in 2020, the relevant concentrations within leaf tissue samples did not appear to pose a concern to the poplar trees.



To evaluate the leaf tissue quality and potential environmental effects as a result of dispersal as windblown material, the relevant constituent concentrations were compared to the Ontario Compost Quality Standards, as prepared by the MOE and last revised July 25, 2012. Of the tested parameters, the leaf tissue analytical results satisfied their respective composting guidelines, which indicates that the leaves were suitable to be used as compost and/or were acceptable to be left to naturally decay as there were no anticipated detrimental effects to local soil and water resources.

5.4 Stem Core Testing

In 2020, stem core sample collection was completed on September 2. The laboratory analytical results for the stem core samples are presented in **Table H-3, Appendix H**. The Laboratory Certificates of Analysis for the 2020 samples are provided in **Table H-5, Appendix H**.

Between 2019 and 2020, the concentrations for most parameters tested for the stem core samples were similar with some increasing and some decreasing in 2020 compared to the concentrations in 2019. As the poplar trees did not exhibit any indication of health stress in 2020, the relevant concentrations within the stem core samples did not appear to pose a concern to the poplar trees.

5.5 Root Tissue Testing

In 2020, root tissue sample collection was completed on September 2. The laboratory analytical results for the root tissue samples are presented in **Table H-4, Appendix H**. The Laboratory Certificates of Analysis for the 2020 samples are provided in **Table H-5, Appendix H**.

Between 2019 and 2020, the concentrations for most parameters tested for the root tissue samples were similar with some increasing and some decreasing in 2020 compared to the concentrations in 2019. Parameters of note that showed increases into 2020 relative to historical values were boron, chloride and sodium. It should be noted that less irrigation liquid was applied to the Poplar System during the 2020 season than in 2019. As the poplar trees did not exhibit any indication of health stress in 2020, the noted 2020 concentration trend observations within the root tissue samples did not appear to pose a concern to the poplar trees.

5.6 Visual Assessment

The findings from the visual assessment of select Poplar System trees are presented in **Table I-1, Appendix I**. A visual assessment of the Poplar System was completed on September 3, 2020. A summary of the 2020 and historical inspection findings is presented in **Table I-2, Appendix I**.

Overall, the tree plot condition within each zone of the Poplar System showed favourable conditions in 2020. The inspection results for the tree and leaf visual assessment were reasonable for six (6) year old trees, with tree heights/diameters and leaf dimensions associatively sized. The trees and leaves appeared healthy in 2020 with no apparent visual disease or toxicity symptoms. For the rows assessed, the average overall tree mortality (7.8 %) was relatively low in 2020. These deceased trees will be replaced with new trees during the next scheduled poplar tree planting at the Site.

It should be noted that each of the four zones had a tree mortality of 10 % or less. Zone One (1) and Zone Two (2), which are comprised of the least developed trees and the slower development of the trees within these zones is mostly attributed to the topographic gradient which causes higher runoff rates, and subsequently less opportunity for irrigation liquid infiltration as well as uptake by the trees. Zone three (3) and Zone four (4), which are comprised of the most developed trees, may start to be experiencing tree growth competition as the trees will compete with each other for more for sunlight, water, air, and nutrients as they grow.

Soil regrading and replacement of irrigation drip lines with solid lines occurred periodically throughout the irrigation season, in order to better manage the application of the irrigation liquid. Ongoing inspections and irrigation system maintenance for system improvements overtime should continue to improve the effectiveness of the system to irrigate greater volumes of leachate each year.

Between 2019 and 2020, the average diameters of the poplar trees inspected showed an increase, which is reflective of the difference in tree diameter measurement technique once the trees are 5 (five) years old. Prior to year five, the diameter measuring point is to be taken at the bottom third interval of the tree. From year five (5) and older, the diameter is to be measured at approximately breast height (~1.3 m). Given the average historical heights presented in **Table I-2, Appendix I**, measurements would have been taken at a height of 0.9 m or lower on each poplar tree up until the 2019 monitoring season. As the poplar trees are now six (6) years old, this was the second year in which field technicians measured tree diameter at approximately 1.3 m above ground level, which reflects the slight increase in average diameter as presented in **Table I-2, Appendix I**. As the trees did not display any signs of stress, the findings will be assessed in more detail in the future for trends as more data is collected in this manner.

Undergrowth and ponding inspections, as well as odour monitoring, are completed monthly during operation of the Poplar System. The undergrowth was generally confined between the tree rows and was groomed on a regular basis by WM. Periodic surface water ponding within the Poplar System area was observed during the permitted irrigation season in 2020. No irrigation liquid application occurred in areas with ponded water. Notable odours emanating as a result of the operation of the Poplar System were not detected during the daily inspections.

5.7 Surface Water Sampling

The 2020 surface water monitoring program for the Poplar System was completed for monitoring stations SS14A, SS14B, and SS15A. The current surface water monitoring station locations for the Poplar System are shown in **Figure 2**.



Quarterly precipitation event (> 10 mm in 24 hours) monitoring was completed in 2020 in January, May, and November. Storm event (> 25 mm in 24 hours) monitoring was not required as there were no precipitation events greater than 25 mm of precipitation that fell over a period of 24 hours that produced observable flow during the permitted irrigation season (May 1 to October 15) in 2020.

Surface water field analytical results are provided in **Table J-1, Appendix J**. During the 2020 monitoring events, the surface water temperatures varied between 2.2°C and 13.4°C, which reflected the ambient air temperature during sampling. Field pH, EC, turbidity, and dissolved oxygen values fluctuated with no notable anomalies.

Surface water laboratory analytical results for the monitoring stations around the Poplar System are presented in **Table J-2, Appendix J**. **Figures J-1 to J-4** provide concentration vs. time plots for chloride, boron, nitrate, and total ammonia as these parameters are useful leachate indicators and typically occur at detectable concentrations within the surface water. Laboratory Certificates of Analysis for the 2020 surface water samples are provided in **Table J-3, Appendix J**.

5.7.1 Precipitation Event Surface Water Monitoring

In 2020, surface water samples were collected at each the required monitoring stations as part of the routine monitoring following a precipitation event. For:

- The first quarter (Q1); precipitation event monitoring, which occurred on January 11, 2020, was completed for monitoring stations SS14A, SS14B, and SS15A.
- The second quarter (Q2); precipitation event monitoring, which occurred on May 18, 2020, was completed for monitoring stations SS14A, SS14B, and SS15A.
- During the third quarter (Q3); no surface water samples were collected, as there were no precipitation events which produced observable flow.
- The fourth quarter (Q4); precipitation event monitoring, which occurred on November 15, 2020, was completed for monitoring stations SS14A, SS14B, and SS15A.

The specific monitoring dates for each precipitation monitoring event in 2020 are presented in **Table J-1, Appendix J**.

Generally, the analytical concentrations within the surface water fluctuated at the internal assessment monitoring stations found in the on-Site ditch around the Poplar System. For the 2020 routine precipitation monitoring events, most parameter concentrations were similar between monitoring stations SS14A, SS14B, and the downstream monitoring station SS15A, except where discussed below for the fourth quarter monitoring event.

As apparent in **Figures J-1 to J-4**, during 2020 the indicator concentrations (i.e., chloride, boron, nitrate, and total ammonia) fluctuated at the surface water monitoring stations SS14A, SS14B, and SS15A, but were generally within their respective historical ranges. Exceptions were noted at SS14A and SS14B during the Q4 precipitation monitoring event. At SS14A and SS14B parameter concentrations were typically greater than detected historically, but some parameter concentrations were lower than historically detected. At these locations, chloride, boron, and nitrate were noted to be above their respective historical upper limits. However, within downstream monitoring station SS15A, chloride, boron, and nitrate concentrations were noted to be significantly lower than detected at upstream monitoring stations SS14A and SS14B, as well as were detected at concentrations that were similar to or less than historically detected at SS15A.

Although the Q4 chemical results for internal assessment monitoring stations SS14A and SS14B may be indicative of an irrigation liquid impact on surface water runoff from the operation of the Poplar System, the chemical results at downstream monitoring station SS15A do not support this possible effect. Furthermore, the concentrations for chloride, boron, and ammonia at farther downstream monitoring station SP1 were similar to noted at SS15A. Additionally, acceptable water quality was observed at compliance surface water monitoring station SS1, which is further downstream of SP1. For the water quality findings for both SP1 and SS1, refer to **Table I- 2, Appendix I** of the *2020 Compliance Monitoring and Operations Program Report, Twin Creeks Environmental Centre Site, Volumes 1 to 2* (RWDI AIR Inc., 2020).

In addition to the observed water quality patterns described above, other factors were used to evaluate the effectiveness of the Poplar System during operation to treat leachate without unacceptable effects to the natural environment, which include irrigation application control and inspections for stresses in the system. The 2020 irrigation loading by volume (139.5 mm/m²) to the Poplar System was significant less, over 50% less, than the target irrigation volume of 476 mm/m². There was no observation of irrigation liquid leaving the irrigation system to the surface water drainage ditches. Irrigation liquid was not applied within 1 hour prior to storm events that may be greater than 12.5 mm/hour per Condition 8.7c. of the Waste ECA, or when the field was too wet in consideration of Condition 8.7d of the Waste ECA. In fact, the 2020 irrigation application practices were more conservative than outlined in the Waste ECA. Additionally, there is no evidence of leachate seeps, stressed vegetation, soil staining/erosion or other visual signature of a potential unacceptable leachate effect to the Poplar System (i.e. no stressed trees).

In consideration of the aforementioned discussion, it is not known why the surface water at internal assessment monitoring stations SS14A and SS14B showed the noted elevated chemical concentrations, however, the concentrations are not directly attributed to the operation of the Poplar System during 2020. As further downstream internal assessment monitoring stations SS15A and SP1, as well as downstream compliance assessment monitoring station SS1 had acceptable surface water quality, the noted chemical results at SS14A and SS14B do not represent an immediate concern. The water quality at SS14A and SS14B will need to be evaluated for a continuance of these concentrations or if an emerging trend of concern occurs.

Notwithstanding the above observations at internal assessment stations SS14A and SS14B, the surface water quality downstream of the Existing Site at internal assessment monitoring stations SS15A and SP1, as well as downstream compliance assessment monitoring station SS1 were of acceptable quality.



As highlighted in **Table J-2, Appendix J**, select concentrations of the additional parameters tested for were greater than their respective Ontario Provincial Water Quality Objectives (PWQO) at the monitoring stations during each monitoring event in 2020. These parameters, in addition to the indicator parameters discussed above, which were found to be greater than their respective PWQO objectives were verified to be within their respective historical ranges (excluding as noted above for SS14A and SS14B), and therefore do not represent an immediate concern. The evaluation of the effectiveness of the Poplar System to not cause an unacceptable impact to surface water is based on the water quality observed at downstream internal assessment monitoring stations SS15A and SP1, as well as at further downstream monitoring station SS1, which was observed throughout 2020.

It is noted that surface water sampling protocols for the Poplar System do not include field filtering for dissolved metals and therefore, the resultant metals concentrations reported for surface water are for total metals, which include concentrations that are present within and/or adsorbed to the suspended soil particles.

Of the tested constituents, no organic compounds were detected at the surface water monitoring stations during the quarterly routine precipitation monitoring events in 2020.

5.7.2 Storm Event Surface Water Monitoring

In 2020, storm event monitoring was not required as there were no precipitation events greater than 25 mm of precipitation that fell over a period of 24 hours that produced observable flow during the permitted irrigation season (May 1 to October 15) in 2020.

6 2021 POPLAR SYSTEM MONITORING PROGRAM

The 2021 Poplar System Monitoring Program should be completed as outlined in **Tables 5 and 6**, and according to the field protocols provided in **Appendix C**.

7 CONCLUSIONS

The following conclusions are provided in consideration of the findings for the 2020 Poplar System Monitoring Program.

- In 2020, irrigation liquid was applied to the poplar trees intermittently for a total of 88 days from May 4 to September 28. The Poplar System was operated in conformance with Condition 8.7 of the Waste ECA.
- The irrigation liquid applied to the Poplar System in 2020 contained approximately 100% leachate by concentration and 83.4 % leachate by volume. A total of approximately 10,823.2 m³ of leachate was applied to the Poplar System in 2020.
- The 2020 total irrigation rate was approximately 139.5 mm/m² for the Poplar System. The application rate is more than 50% less than the available annual irrigation potential of 476 mm/m² detailed in the *Expansion of Poplar Cap Irrigation System for Existing Waste Disposal Area* report, as prepared by GENIVAR Consultants LP and January 2010.
- The application of leachate was less in 2020 than in 2019, which is dominantly attributed to the lack of weaker strength leachate volume availability from the Existing Site. Many of the weaker strength leachate cells could not supply readily available leachate volume to meet the irrigation demand of the Poplar System. The recovery rate (speed of returning to static level conditions) of the leachate in these cells was commonly greater than several weeks, which significantly limited leachate availability for irrigation purposes. Where weaker strength leachate volume was not available, stronger leachate was utilized from the Equalization Tank, or direct from select waste cells and diluted with clean water extracted from the municipal drinking water system.
- The leachate elevations within select maintenance holes were drawn down and fluctuated significantly as a result of leachate extraction for irrigation to the Poplar System. However, the leachate elevations in leachate monitoring wells typically did not show good correlation to their counterpart maintenance hole within each respective cell. This observation indicates that leachate is within the waste mound that is not making it to the collection system (i.e. perched, low hydraulic conductivity, or some other cause) and as of such is not having an effect to the groundwater system (i.e. potentiometric pressures). This effect is observed in waste cells that are both positioned under and not under the Poplar System, indicating that the operation of the Poplar System is not the cause of this leachate elevation differential effect.
 - At this time the exact cause of the leachate differential between collector system maintenance holes and intra waste leachate wells is unknown. However, this differential is not causing a detrimental effect to the operation of the Poplar System, excluding limiting leachate volume availability. There is no visible stress to the poplar trees or landfill cap; and as such the noted leachate elevations do not represent an immediate concern. Ongoing leachate level monitoring should enable input such that the Poplar System is managed environmentally effective in consideration of the destination target (eg. off-Site vs. on-Site treatment).
- Based on the soil samples collected for the Poplar System, soil quality was not adversely affected by the application of irrigation liquid in 2020.



- Based on the EC results in 2020, the application of irrigation liquid increases the EC of the shallow soil in the Poplar System. However, it is noted that after September 2020 the EC results generally exhibited a decreasing trend. This indicates that the EC results are primarily only elevated during active irrigation and that the application of irrigation liquid is not attributing to a build-up of EC in the shallow soil of the Poplar System over time. As the poplar trees did not exhibit any indication of health stress in 2020, the soil EC results did not appear to pose a concern to the poplar trees.
- Overall, the tree plot condition within each zone of the Poplar System showed favourable conditions in 2020. The trees and leaves appeared healthy in 2020 with no apparent visual disease or toxicity symptoms. Therefore, no detrimental effects to tree health or growth vigour were observed during 2020 as a result of the application of irrigation liquid.
- Leaf tissue quality satisfied available compost guidelines.
- Notable odours emanating as a result of the operation of the Poplar System were not detected in 2020.
- For the surface water monitoring events completed in 2020, the parameter concentrations within the surface water at the monitoring stations for the Poplar System fluctuated, but were within their respective historical ranges. Exceptions were noted at SS14A and SS14B during the Q4 precipitation monitoring event.
 - At SS14A and SS14B, chloride, boron, and nitrate were noted to be above their respective historical upper limits. However, chloride, boron, and nitrate concentrations were noted to be significant lower, as well as were detected at concentrations that were similar to or less than historically detected at downstream monitoring station SS15A.
 - Although the Q4 chemical results for internal assessment monitoring stations SS14A and SS14B may be indicative of an irrigation liquid impact on surface water runoff from the operation of the Poplar System, the chemical results at downstream monitoring station SS15A do not support this possible effect.
 - it is not known why the surface water at internal assessment monitoring stations SS14A and SS14B showed the noted elevated chemical concentrations, however, based on other assessment evaluations (i.e. no evidence of leachate seeps, and less than 50% of the target irrigation quantity was applied), the concentrations are not directly attributed to the operation of the Poplar System during 2020.
 - As further downstream internal assessment monitoring stations SS15A and SP1, as well as downstream compliance assessment monitoring station SS1 had acceptable surface water quality, the noted chemical results at SS14A and SS14B do not represent an immediate concern. The water quality at SS14A and SS14B will need to be evaluated for a continuance of these concentrations or if an emerging trend of concern occurs.
- Overall, the Poplar System provides an effective system for the on-Site management of landfill leachate with no distinctive detrimental effects to soil, air, or surface water quality, and no notable detrimental effects to the poplar trees. Select areas of focus, including surface water quality evaluations at SS14A, SS14B, and SS15A, as well as leachate level monitoring should continue such that the Poplar System is managed environmentally effective manner.



8 CLOSURE

We trust that this 2020 Fourth Quarter and Annual Monitoring Report, Volume 3 of 5, for the Poplar System at the Twin Creeks Environmental Centre is satisfactory for your requirements. Should there be any questions or comments, please do not hesitate to contact us.

Sincerely,

RWDI

A handwritten signature in blue ink, appearing to read 'Jeff Cleland'.

Jeff Cleland, B.Eng., EIT.
Geoscience | Scientist

A handwritten signature in blue ink, appearing to read 'Brent J. Langille'.

Brent J. Langille, B.Sc., P.Geo.
Strategic Director | Principal

TABLES

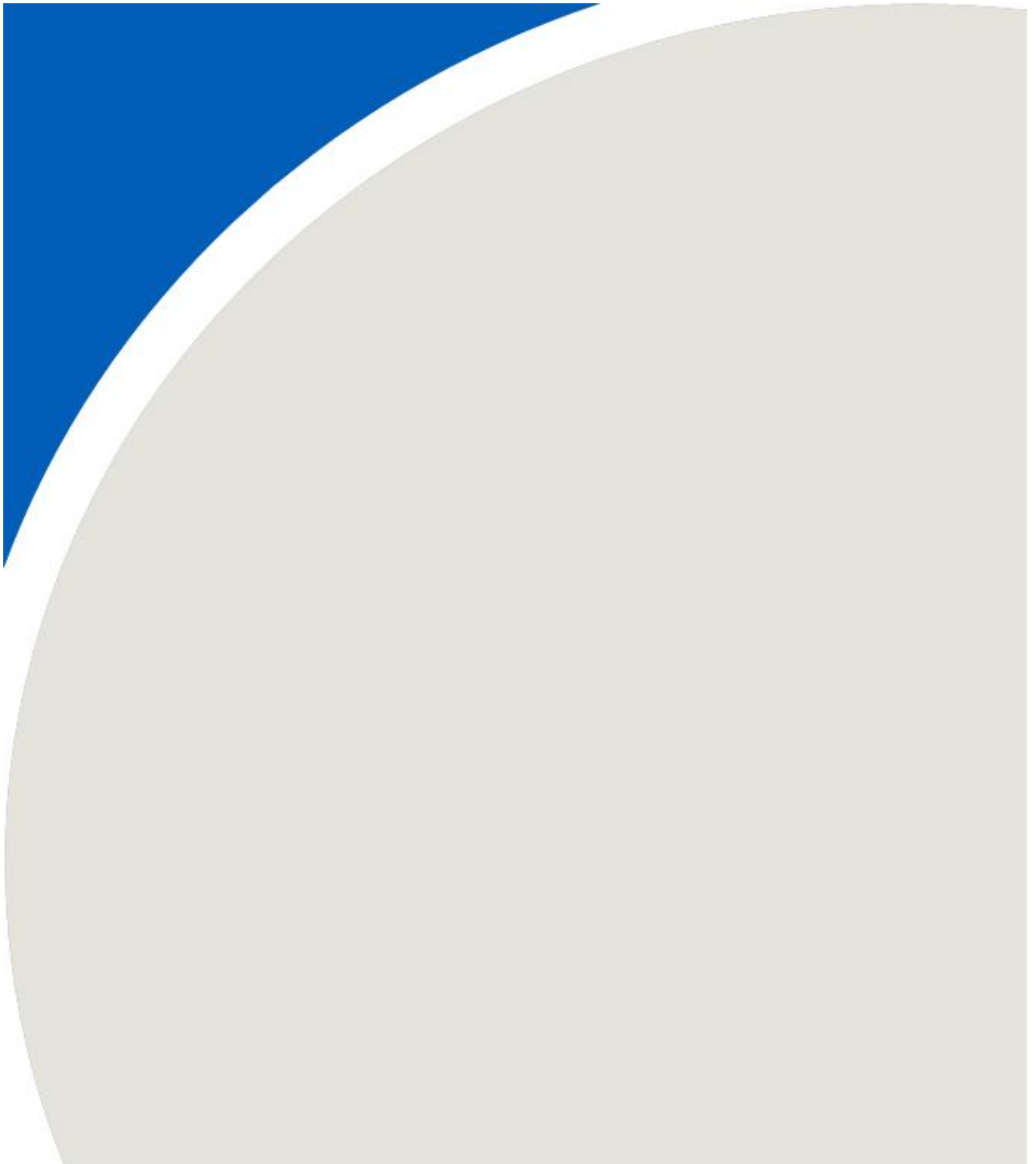


Table 1
Poplar System Monitoring Program - 2020
Twin Creeks Environmental Centre - Poplar System

Task	Monitoring Location	Parameters	Frequency	Monitoring Dates	Comments
Visual Assessment	Poplar System	Tree diameter, tree height, tree mortality, crown dieback, foliage transparency, crown density, leaf size, discolouration of leaves, abnormally shaped leaves, length of new tree branch extension shoots, deformed growth, insect infestation.	Annually - September	3-Sep-20	
Root Depth	Poplar System	Depth of root penetration	Annually - September	2-Sep-20	
Inspections	Poplar System	Brace roots for animal damage etc.	Annually - September	3-Sep-20	
Undergrowth	Poplar System	Type and condition	Monthly - During Irrigation	21-May-20, 7-Jun-20, 7-Jul-20, 19-Aug-20, 3-Sep-20	
Ponding and Runoff	Poplar System	Ponding and runoff of irrigation water	Monthly - During Irrigation	21-May-20, 7-Jun-20, 7-Jul-20, 19-Aug-20, 3-Sep-20	
Soil Conductivity	Poplar System	Soil Conductivity	Weekly - During Irrigation		Five (5) locations, two (2) stations at each location, and depths of 25 and 150 mm. Stations are at drip emitter (A) and between irrigation lines (B).
Soil Sampling	Poplar System	Nitrate (N), Ammonium and Ammonia, TKN, Phosphorus**, Calcium*, Magnesium*, Sodium*, Potassium*, TOC, Sulphate, Chloride, Boron, Total Metals.	Annually - September	4-Sep-20	Four (4) composite soil samples per location (S1 to S4) from a sample interval from grade to a depth of between 0.6 m (minimum) and 0.9 m (maximum).
Leachate Irrigation	Poplar System Leachate Holding Tank	General Chemistry, VOCs, Heavy Metals	Monthly - During Irrigation	20-May-20, 9-Jun-20, 21-Jul-20, 31-Aug-20, 15-Sep-20	
Odour	Poplar System	Subjective Olfactory Assessment	Monthly - During Irrigation	21-May-20, 7-Jun-20, 7-Jul-20, 19-Aug-20, 3-Sep-20	
Leaf Tissue Analysis	Poplar System	Total Nitrogen, Phosphorus, Potassium, Boron, Copper, Iron, Manganese, Zinc and Chloride.	Annually - September	2-Sep-20	Eight (8) samples. Four (4) composite of the lower canopy and four (4) composite of the upper canopy.
Stem Core and Root Tissue	Poplar System	Full Metal Scan, Chloride	Annually - September	2-Sep-20	Four (4) composites for the Poplar System.
Leachate Levels	Poplar System		May and November	4-May-20, 2-Nov-20	MH16,MH17,MH18,OW22A-10, OW51A-15, OW53-10, MH3SA, MH3SB, MH3SC, MH3SD, MH3SE, MH3SF, MH4A, MH4B, Sump
Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	SW-P, BTEX	In conjunction with EMP monitoring.	11-Jan-20 (Routine monitoring for Q1 precipitation events) 18-May-20 (Routine monitoring for Q2 precipitation events) 15-Nov-20 (Routine monitoring for Q4 precipitation events)	Surface water monitoring not required during Q3 as there were no precipitation events during which greater than 10 mm of precipitation fell over 24 hours and produced observable flow.
Storm Event Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	Nitrate, Nitrite, TKN, Ammonia (total), Phosphorus, Heavy Metals, BTEX, Chloride, pH, Dissolved Oxygen.	Two (2) events during irrigation and after storm events.		Storm Event Surface water monitoring not required during 2020 irigation season as there were no precipitation events greater than 25 mm of precipitation that fell over 24

Notes:

- 1) Poplar System - Located on a 9.3 ha portion of the Central and South Cell.
- 2) Monitoring locations are shown in Figure 2.
- 3) General Chemistry indicates: pH, conductivity, chloride, sulphate, alkalinity, calcium, magnesium, potassium, sodium, nitrate, nitrogen, TKN, ammonia, and total phosphorus.
- 4) VOCs indicates a scan for volatiles and semi-volatiles per GC/MS.
- 5) Total Metals denotes: Al, As, Ba, Be, Bi, B, Cd, Cr, Co, Pb, Mo, Ni, P, Se, Ag, Sr, Ti, Sn, V, and Zn.
- 6) Full Metal Scan denotes: Al, As, Ba, Be, Bi, B, Ca, Cd, Cr, Co, Cu, K, Pb, Mg, Mo, Na, Ni, P, Se, Ag, Sr, Sn, V, and Zn.
- 7) SW-P denotes: chloride, ammonia (un-ionized), sulphate, phenols, nitrate, alkalinity, TOC, B, Ni, Cr, Zn, Ca, Mg, K, Na, and Fe; as well as Field Parameters: pH, conductivity, temperature, turbidity, and dissolved oxygen.
- 8) BTEX indicates: benzene, toluene, ethylbenzene, and xylenes (total).
- 9) TPH indicates total petroleum hydrocarbons for gas/diesel and heavy oils.
- 10) '*' indicates NH₄ Acetate Extractable.
- 11) '**' indicates NaHCO₃ Extractable.

Table 2
Poplar System Monitoring Schedule - 2020
Twin Creeks Environmental Centre - Poplar System

Task	Monitoring Location	Frequency	2020											
			January	February	March	April	May	June	July	August	September	October	November	December
Monitoring Network Installation			Maintenance											
Visual Assessment	Poplar System	September												
Root Depth	Poplar System	September												
Inspections	Poplar System	September												
Undergrowth	Poplar System	Monthly - During Irrigation												
Ponding	Poplar System	Monthly - During Irrigation												
Soil Conductivity	Poplar System	Weekly - During Irrigation												
Soil Sampling	Poplar System	September												
Leachate Toxicity	Poplar System Leachate Holding Tank	Monthly - During Irrigation												
Odour	Poplar System	Monthly - During Irrigation												
Leaf Tissue Analysis	Poplar System	September												
Stem Core and Root Tissue	Poplar System	September												
Leachate Levels	Poplar System	May and November												
Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	In conjunction with EMP monitoring	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
Storm Event Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	Two (2) events during irrigation and after storm events					Two events							

Table 3
Poplar System Inspection Record - 2-Year Summary
Twin Creeks Environmental Centre - Poplar System

Task	Monitoring Parameters	ZONE 1		ZONE 2		ZONE 3		ZONE 4	
		Sep-19	Sep-20	Sep-19	Sep-20	Sep-19	Sep-20	Sep-19	Sep-20
Visual Assessment	<i>TREE DIAMETER (cm)</i>	2.7	3.5	3.0	3.4	3.7	6.3	3.7	4.7
	<i>TREE HEIGHT (m)</i>	2.9	3.0	2.8	4.7	4.1	4.4	3.9	4.5
	<i>TREE MORTALITY (%)</i> ³	18.0	8.0	3.0	9.0	3.0	4.0	5.0	10.0
	<i>CROWN DENSITY</i>	40.0	49.7	50.0	43.4	49.0	59.1	53.0	66.9
	<i>LEAF SIZE (cm)</i> <i>(length/width)</i>	<u>8.0</u> 7.8	<u>6.7</u> 6.0	<u>9.0</u> 9.0	<u>6.6</u> 6.2	<u>10.3</u> 9.3	<u>7.1</u> 6.7	<u>9.2</u> 8.6	<u>8.2</u> 8.0
	<i>DISCOLOURATION OF LEAVES (%)</i>	5.0	7.5	3.0	3.0	3.0	11.0	5.0	7.5
	<i>LENGTH OF NEW TREE BRANCH EXTENSION SHOOTS (cm)</i>	41.5	21.0	45.9	11.1	44.7	15.8	49.3	24.1
	<i>INSECT INFESTATION (%)</i>	<5.0	2.5	4.0	2.0	2.0	2.5	<5.0	3.0
	<i>DEPTH OF ROOT PENETRATION* (m)</i>	0.55	0.42	0.79	0.41	0.41	0.58	0.32	0.45

Notes:

- 1) Expanded Poplar System initiated in 2017.
- 2) Blank denotes data not available.
- 3) The tree mortality is based on the number of trees which died from the previous year.

Table 4
Irrigation Water - Poplar System Target Leachate Concentrations
Twin Creeks Environmental Centre - Poplar System

Parameter	LMP (Pre-2000)	Target Concentrations ⁹ Zones 1 to 4 - 100% Leachate	CCME Guidelines
Alkalinity	9,150	9,150	-
Conductivity (mS/cm)	10,616	10,616	-
Sodium	921	921	-
Potassium	238	238	-
Magnesium	347	347	-
Chloride	1241	1241	700 to 14,000*
Iron	2.9 - 25	2.9 - 25	20.0
Manganese	0.24	0.24	10.0
Ammonia (total)	554	554	-
TKN	2,948	2948	-
Boron	25.3	25.3	6.0
Chromium	0.12	0.12	0.1
Copper	0.43	0.43	5.0
Lead	<0.02-0.33	<0.02-0.33	2.0
Molybdenum	<0.02-1.82	<0.02-1.82	0.05
Nickel	<0.02-29.3	<0.02-29.3	2.0
Total Phosphorus	2.37	2.37	-
Zinc	0.043	0.043	5.0
Phenols	0.160	0.16	-
Total BTEX (µg/L)	127	127	-

Notes:

- 1) All data are mg/L unless otherwise specified.
- 2) LMP denotes geometric mean leachate quality from Leachate Management Plan, July 2001.
- 3) Target Concentrations derived from LMP and "Expansion of Poplar Cap Irrigation System for Existing Waste Disposal Area" report by GENIVAR Consultants LP dated January 2010.
- 4) CCME Guidelines denotes maximum concentration for negative effects to vegetation for irrigation water per Canadian Water Quality Guidelines (2004).
- 5) '*' denotes concentration estimated based on poplar tree tolerance and vegetable crops. of > 710 mg/L (CCME, 2004), and salty water irrigation at 400 to 14,000 mg/L (Shanon et al, 1998).
- 6) '-' denotes no LMP and/or CCME Guideline.
- 7) Target Concentrations denotes leachate strength appropriate for 'Year 1' trees.
- 8) Target Concentrations denotes leachate strength appropriate for 'Year 2' trees.
- 9) Target Concentrations denotes leachate strength appropriate for 'Year 3' trees and beyond.

Table 5
Poplar System Monitoring Program - 2021
Twin Creeks Environmental Centre - Poplar System

Task	Monitoring Location	Parameters	Frequency	Comments
Visual Assessment	Poplar System	Tree diameter, tree height, tree mortality, crown dieback, foliage transparency, crown density, leaf size, discolouration of leaves, abnormally shaped leaves, length of new tree branch extension shoots, deformed growth, insect infestation.	Annually - September	
Root Depth	Poplar System	Depth of root penetration	Annually - September	
Inspections	Poplar System	Brace roots for animal damage etc.	Annually - September	
Undergrowth	Poplar System	Type and condition	Monthly - During Irrigation	
Ponding and Runoff	Poplar System	Ponding and runoff of irrigation water	Monthly - During Irrigation	
Soil Conductivity	Poplar System	Soil Conductivity	Weekly - During Irrigation	Five (5) locations, two (2) stations at each location, and depths of 25 and 150 mm. Stations are at drip emitter (A) and between irrigation lines (B).
Soil Sampling	Poplar System	Nitrate (N), Ammonium and Ammonia, TKN, Phosphorus**, Calcium*, Magnesium*, Sodium*, Potassium*, TOC, Sulphate, Chloride, Boron, Total Metals.	Annually - September	Four (4) composite soil samples per location (S1 to S4) from a sample interval from grade to a depth of between 0.6 m (minimum) and 0.9 m (maximum).
Leachate Irrigation	Poplar System Leachate Holding Tank	General Chemistry, VOCs, Heavy Metals	Monthly - During Irrigation	
Odour	Poplar System	Subjective Olfactory Assessment	Monthly - During Irrigation	
Leaf Tissue Analysis	Poplar System	Total Nitrogen, Phosphorus, Potassium, Boron, Copper, Iron, Manganese, Zinc and Chloride.	Annually - September	Eight (8) samples. Four (4) composite of the lower canopy and four (4) composite of the upper canopy.
Stem Core and Root Tissue	Poplar System	Full Metal Scan, Chloride	Annually - September	Four (4) composites for the Poplar System.
Leachate Levels	Poplar System		May and November	MH16,MH17,MH18,OW22A-10, OW51A-15, OW53-10, MH3SA, MH3SB, MH3SC, MH3SD, MH3SE, MH3SF, MH4A, MH4B, Sump
Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	SW-P, BTEX	In conjunction with EMP monitoring.	
Storm Event Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	Nitrate, Nitrite, TKN, Ammonia (total), Phosphorus, Heavy Metals, BTEX, Chloride, pH, Dissolved Oxygen.	Two (2) events during irrigation and after storm events.	

Notes:

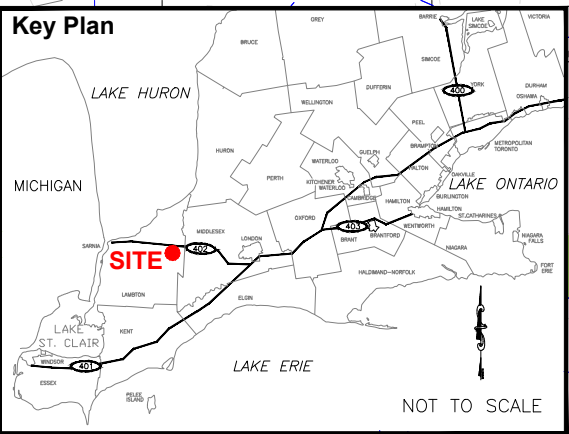
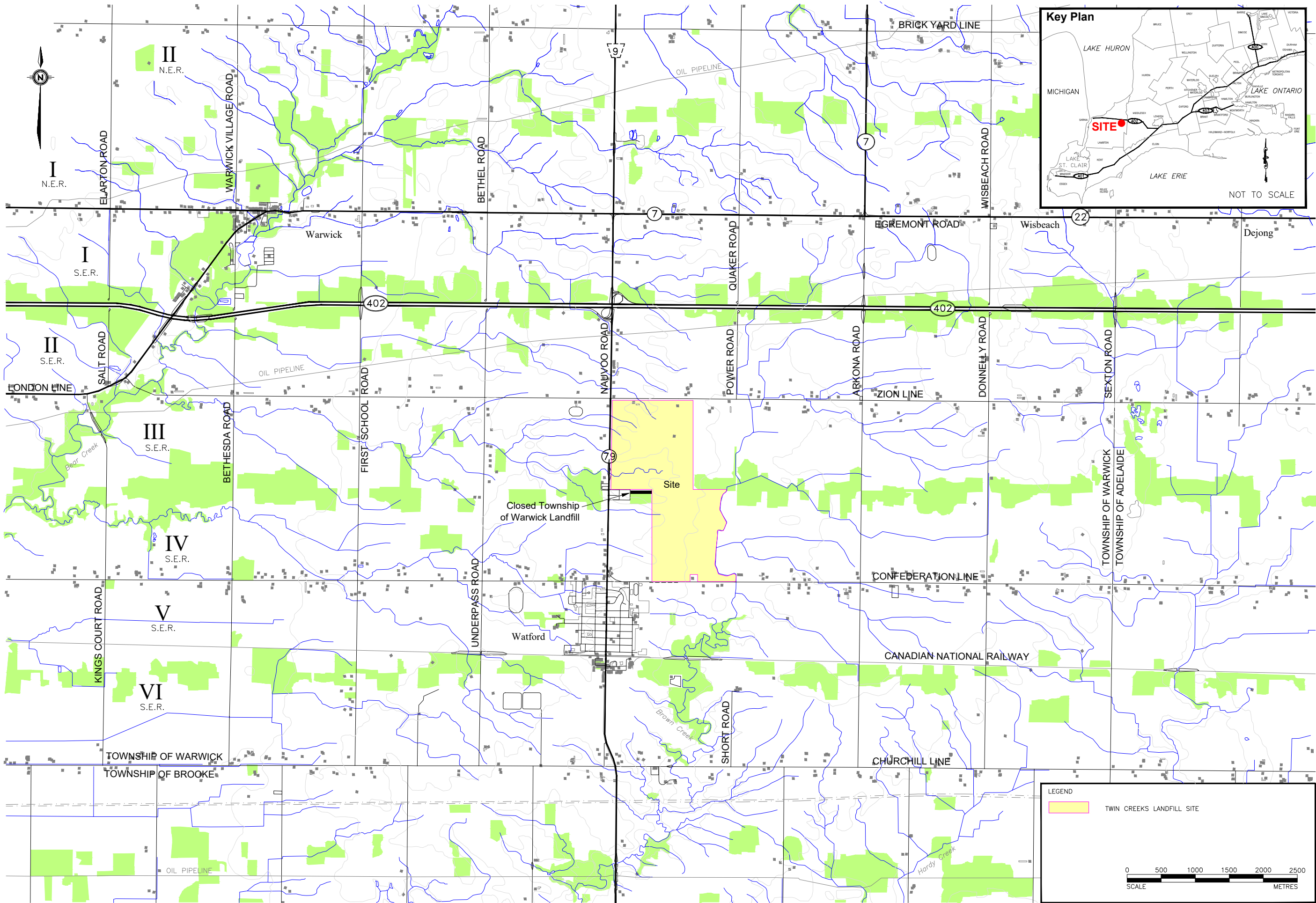
- 1) Poplar System - Located on a 9.3 ha portion of the Central and South Cell.
- 2) Monitoring locations are shown in Figure 2.
- 3) General Chemistry indicates: pH, conductivity, chloride, sulphate, alkalinity, calcium, magnesium, potassium, sodium, nitrate, nitrogen, TKN, ammonia, and total phosphorus.
- 4) VOCs indicates a scan for volatiles and semi-volatiles per GC/MS.
- 5) Total Metals denotes: Al, As, Ba, Be, Bi, B, Cd, Cr, Co, Pb, Mo, Ni, P, Se, Ag, Sr, Ti, Sn, V, and Zn.
- 6) Full Metal Scan denotes: Al, As, Ba, Be, Bi, B, Ca, Cd, Cr, Co, Cu, K, Pb, Mg, Mo, Na, Ni, P, Se, Ag, Sr, Sn, V, and Zn.
- 7) SW-P denotes: chloride, ammonia (un-ionized), sulphate, phenols, nitrate, alkalinity, TOC, B, Ni, Cr, Zn, Ca, Mg, K, Na, and Fe; as well as Field Parameters: pH, conductivity, temperature, turbidity, and dissolved oxygen.
- 8) BTEX indicates: benzene, toluene, ethylbenzene, and xylenes (total).
- 9) TPH indicates total petroleum hydrocarbons for gas/diesel and heavy oils.
- 10) '*' indicates NH₄ Acetate Extractable.
- 11) '**' indicates NaHCO₃ Extractable.

Table 6
Poplar System Monitoring Schedule - 2021
Twin Creeks Environmental Centre - Poplar System

Task	Monitoring Location	Frequency	2021											
			January	February	March	April	May	June	July	August	September	October	November	December
Monitoring Network Installation			Maintenance											
Visual Assessment	Poplar System	September												
Root Depth	Poplar System	September												
Inspections	Poplar System	September												
Undergrowth	Poplar System	Monthly - During Irrigation												
Ponding	Poplar System	Monthly - During Irrigation												
Soil Conductivity	Poplar System	Weekly - During Irrigation												
Soil Sampling	Poplar System	September												
Leachate Toxicity	Poplar System Leachate Holding Tank	Monthly - During Irrigation												
Odour	Poplar System	Monthly - During Irrigation												
Leaf Tissue Analysis	Poplar System	September												
Stem Core and Root Tissue	Poplar System	September												
Leachate Levels	Poplar System	May and November												
Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	In conjunction with EMP monitoring	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
Storm Event Surface Water Monitoring	Poplar System at SS14A, SS14B, and SS15A	Two (2) events during irrigation and after storm events					Two events							

FIGURES





MAP SOURCE:
FIGURE PROVIDED BY GENIVAR INC., FIGURE 1, FILE REF NO. 111-53111-00-F1-LM PS2012, DATED FEBRUARY 2013.



SITE LOCATION MAP
2020 POPLAR SYSTEM

TWIN CREEKS LANDFILL SITE
TOWNSHIP OF WARWICK, ONTARIO

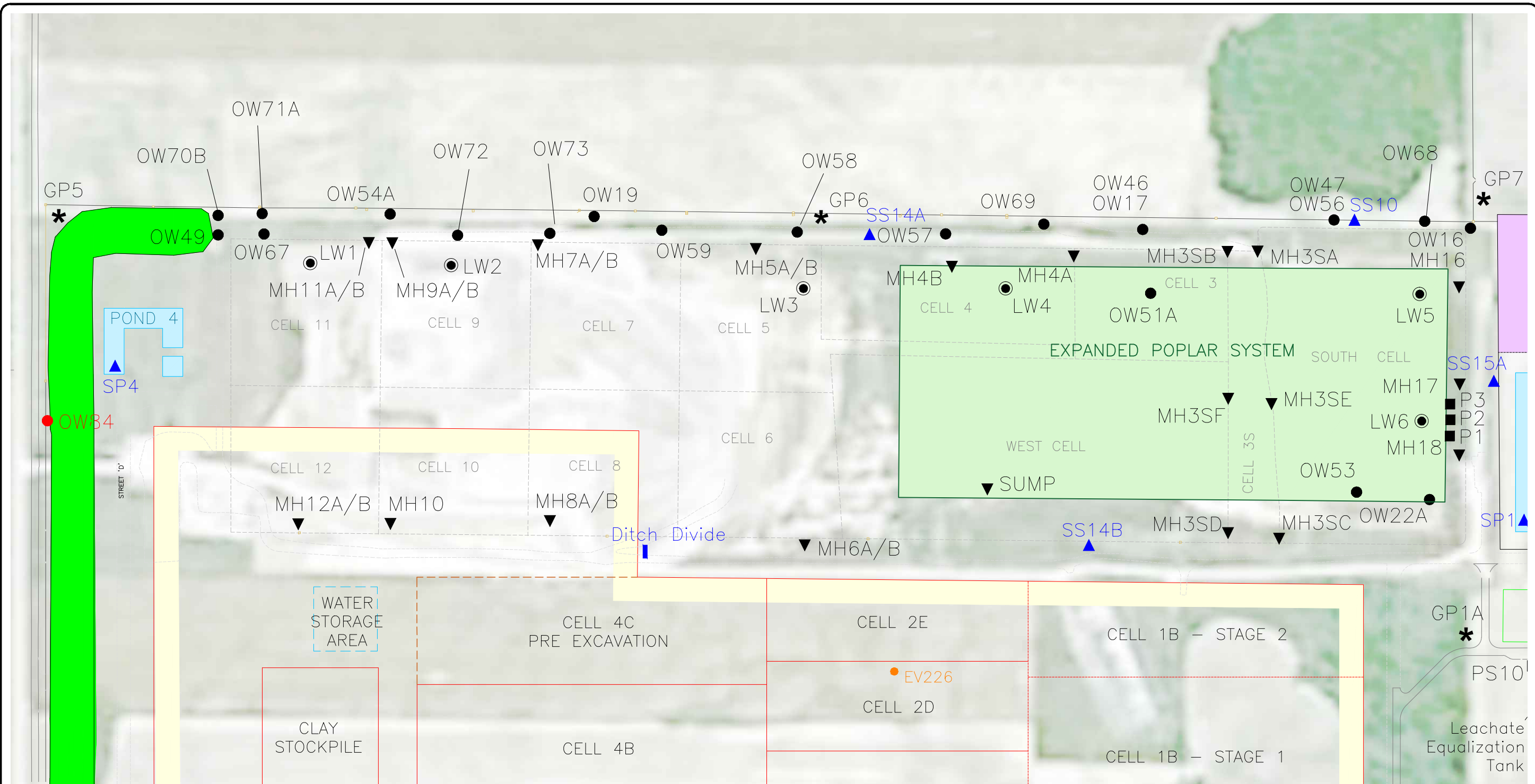
DWN BY: DBB
CHK BY: JCL
DATE: JAN 2021
SCALE: 1:50,000

WASTE MANAGEMENT OF CANADA CORP.

PROJECT NO.

2001313

FIGURE
1



- LEGEND**
- LANDFILL EXPANSION WASTE FOOTPRINT
 - PROPOSED BERMS / INFRASTRUCTURE (APPROXIMATE)
 - EXISTING BERMS / INFRASTRUCTURE (APPROXIMATE)
 - SEDIMENTATION POND
 - PS11 PUMPING STATION LOCATION & DESIGNATION
 - 195.0 EXISTING GROUND CONTOURS AT 0.5m INTERVALS
 - OW58 ACTIVE MONITORING WELL LOCATION & DESIGNATION
 - OW84 PROPOSED MONITORING LOCATION & DESIGNATION
 - SS1 SURFACE WATER MONITORING LOCATION & DESIGNATION
 - GP1 ACTIVE GAS PROBE LOCATION & DESIGNATION
 - GP8 PROPOSED GAS PROBE LOCATION & DESIGNATION
 - P1 PEIZOMETER LOCATION & DESIGNATION
 - LW1 LEACHATE MONITORING WELL LOCATION & DESIGNATION

- EV226 EARLY VERTICAL GAS WELL (EVGW)
- MH5A/B MAINTENANCE HOLE LOCATION & DESIGNATION

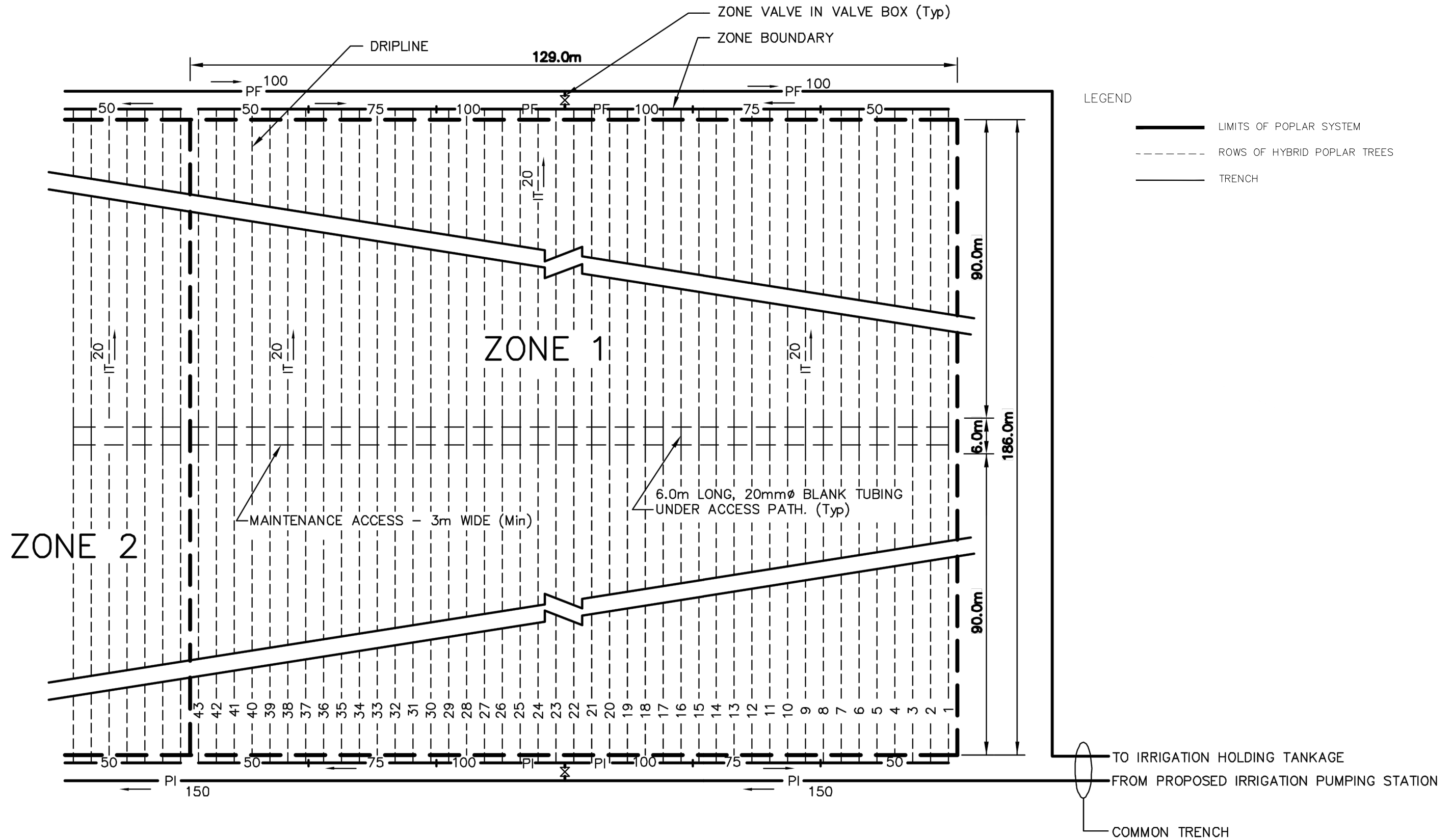
NOTE:
1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON DECEMBER 2011 SITE CONDITIONS.
2. SOURCE FIGURE PROVIDED BY GENIVAR INC., FIGURE 2, FILE REF NO. 111-53111-00-F2-SP PS2012, DATED FEBRUARY 2013.



MONITORING NETWORK
2020 POPLAR SYSTEM
TWIN CREEKS LANDFILL SITE
TOWNSHIP OF WARWICK, ONTARIO

DWN BY: DBB
CHK BY: JCL
DATE: JAN 2021
SCALE: 1:4,000
WASTE MANAGEMENT OF CANADA CORP.
PROJECT NO. 2001313

FIGURE 2



MAP SOURCE:
FIGURE PROVIDED BY GENIVAR INC., FIGURE P100, FILE REF NO. 1731813 - P100, DATED JANUARY 20, 2010.



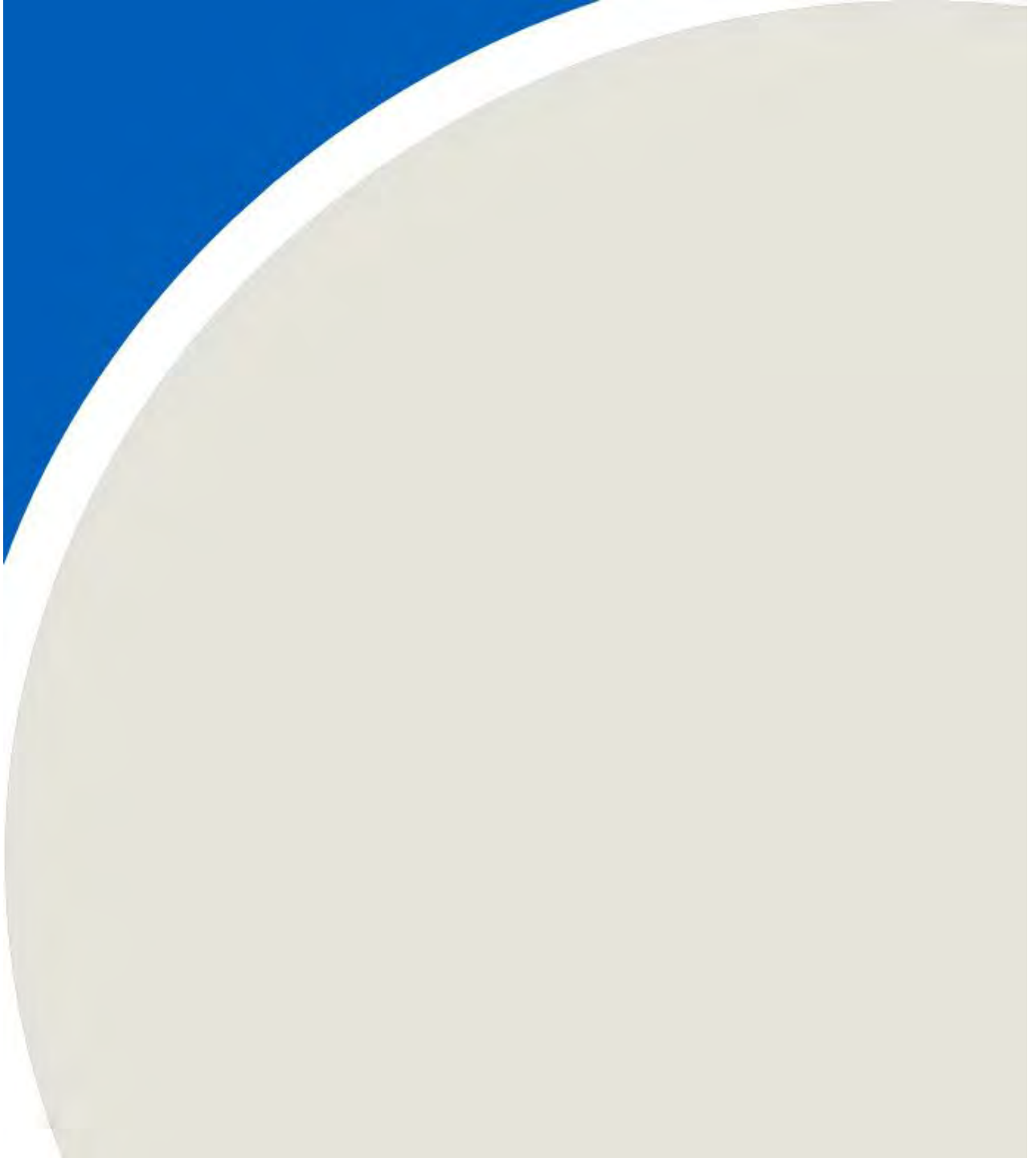
TYPICAL ZONE LAYOUT
2020 POPLAR SYSTEM
TWIN CREEKS LANDFILL SITE
TOWNSHIP OF WARWICK, ONTARIO

DWN BY: DBB
CHK BY: JCL
DATE: JAN 2021
SCALE: 1:650
WASTE MANAGEMENT OF CANADA CORP.
PROJECT NO. 2001313

FIGURE
3

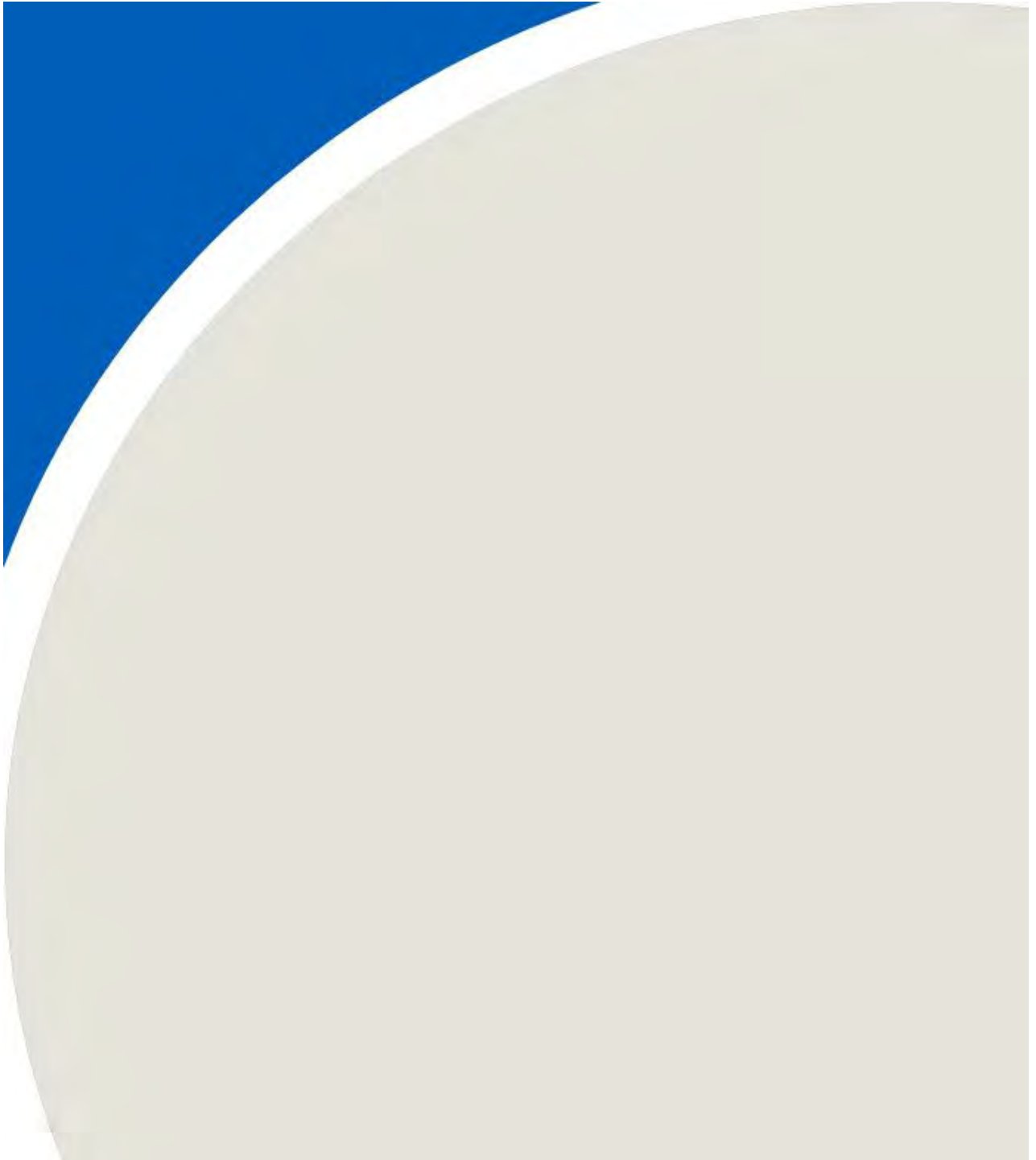
APPENDIX A:

Approval Documentation



APPENDIX A1:

Amended ECA No. A032203, dated December 13, 2011



AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Issue Date: December 13, 2011

Waste Management of Canada Corporation
117 Wentworth Crt
Brampton, Ontario
L6X 5L4

Site Location: Twin Creeks Landfill Site
Warwick Township, County Of Lambton

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares.

For the purpose of this environmental compliance approval, the following definitions apply:

"Agricultural Waste " for the purposes of this ECA, is defined as municipal yard waste, wood chips, food waste and minimal amounts of solid manure which would only be accepted or used for the purpose of seeding or operating an active aerobic compost pile and does not include liquid manure;

"AQMP " means an Air Quality Monitoring Program;

"Construction Phase " is defined as the period of time from the start of construction of Phase 1 of the expanded landfill to the date of first receipt of waste in Phase 1;

"Contaminating Lifespan" refers to the period of time, after closure until the site finally produces contaminants at concentrations below levels which have unacceptable health or environmental effects;

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

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

"District Manager " refers to the District Manager in the Ministry of the Environment's Sarnia District Office;

“District Office ” refers to the Ministry of the Environment Sarnia District Office;

“EA” refers to the document titled *“Warwick Landfill Expansion Environmental Assessment”* , dated September 2005, which includes Discussion Papers 1 through 9 included in the Appendices A to F of the Environmental Assessment. EA also includes responses from the Owner dated:

1. March 10, 2006 *“Waste Unit’s Final Comments Dated March 8, 2006”*
2. February 14, 2006 *“Leachate Recirculation”*
3. February 14, 2006 *“Response to February 1, 2006 Correspondence”*
4. January 13, 2006 *“Waste Management Response to Comments received from Warwick Landfill Expansion EA”* including attachments entitled:
 - i. Response to the Township of Warwick;
 - ii. Response to Thomson Rogers;
 - iii. Table of responses to various agencies, public and First Nations Submissions;
 - iv. Landfill Gas Assessment, Warwick Landfill Baseline Conditions Report prepared by RWDI dated January 12, 2006
 - v. Memo dated March 10, 2006
 - vi. June 12, 2006 *“Response to May 1, 2006 Ministry Review ”*

“EAA” refers to the Ontario Environmental Assessment Act as amended from time to time;

“EAB” refers to the Environmental Approvals Branch of the Ministry of the Environment;

“Environmental Compliance Approval” or “ECA” means this entire provisional Environmental Compliance Approval document, issued in accordance with Section 20.2 of the *EPA* , and includes any schedules to it, the application and the supporting documentation listed in schedule “A”;

“Environmental Inspector” refers to the individual employed by the Ministry of the Environment to inspect the Site;

“EPA ” means *Environmental Protection Act* , R.S.O. 1990, c. E. 19, as amended from time to time;

“Hydraulic Trap” indicates a situation where hydraulic gradients from the surrounding soil are inward toward the landfill waste and associated leachate collection system;

“Mini-Transfer Area” means the mini-transfer public convenience drop-off area as described and identified in the June 2009 Development & Operations Report that is identified in Item 59 of Schedule “A” and whose location is identified as “Expansion Mini-Transfer” in figure MT2 that is contained in the 2009 Development & Operations Report;

“MOE ” or “Ministry ” refers to the Ontario Ministry of the Environment;

"Operation Phase" is defined as the period of time from the date that Phase 1 of the expanded landfill area first receives waste until the landfill site reaches final capacity;

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

"Owner " means Waste Management of Canada Corporation and its successors and assigns;

"O. Reg. 101/94 " means Ontario Regulation 101/94 as amended from time to time;

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

"Preparation Report" refers to a report documenting that the subsequent stage of the landfill has been constructed in accordance with the approved design plans and specifications;

"Poplar System" is the irrigation area located on top of the cap of the Existing Site (old landfill) that is used for the phytoremediation of leachate that is generated at the *Site* per Items 63 through 65 of Schedule "A" and Figure 2 of Item 16 on Schedule "A".

"Poplar Plantation" is the irrigation area located on native soil to the south of the *Site* that is used for the phytoremediation of irrigation liquid that satisfies the Effluent Limit criteria per the *OWRA* Section Approval for the *Site*, *Item 39 of Schedule "A"*, and Appendix N11 of Item 30 on Schedule "A"

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

"PWQO" refers to the Provincial Water Quality Objective

"Recyclable Waste" means waste that are glass, plastic, aluminium or steel cans, gypsum wallboard, newspapers, cardboard and/or other materials for which there is a secured market.

"Regional Director" refers to the Director of the Ministry of the Environment's Southwestern Regional Office;

"Regulation 232 " or **"Reg. 232"** or **"O. Reg. 232/98"** means Ontario Regulation 232/98 (New Landfill Standards) made under the *EPA* , as amended from time to time;

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

"Site" refers to the Twin Creeks Landfill Site and lands owned by the Owner described as:

Firstly, Part of Lots 19 and 20, Concession 3, S.E.R., and Part of Lot 20, 21 and 22, Concession 4, S.E.R. and Part of the Road Allowance between Lots 21 and 22, Concession 4, S.E.R., shown as Parts 1,

2 and 3 on Plan 25R-9125 and Part 2 on Plan 25R-1903, Save and Except Part 1 on Plan

25R-6184,
Township of Warwick, County of Lambton; and

Secondly, Part of Lot 20, Concession 3 S.E.R., shown as Part 1 on Plan 25R-6184, Township of Warwick, County of Lambton;

"Traditional agricultural crop production" means standard crop production, nursery and horticultural crops, agro-forestry, conservation uses but not greenhouses or any accessory agricultural buildings and structures;

"Undertaking" refers to the proposed undertaking as described in the Warwick Landfill Expansion Environmental Assessment;

"WIFN" refers to Walpole Island First Nation; and

"WPLC" refers to the Warwick Public Liaison Committee.

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

TERMS AND CONDITIONS

1.0 GENERAL

Compliance

- 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.
- 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* .

In Accordance

- 1.3 Except as otherwise provided for in this *ECA* , the *Site* shall be designed, developed, constructed, operated and maintained in accordance with the application for this *ECA* , dated March 27, 2006, and the supporting documentation listed in Schedule "A".

Other Legal Obligations

- 1.4 The issuance of, and compliance with, this *ECA* does not:
 - a. relieve any person of any obligation to comply with any provision of the *EPA* or any other applicable statute, regulation or other legal requirement; or
 - b. limit in any way the authority of the *Ministry* to require certain steps be taken or to

request that any further information related to compliance with this *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* .

Adverse Effect

- 1.5 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 the adverse effect or impairment of air and/or water quality.

Furnish Information

- 1.6 Any information requested by the *Director* or a *Provincial Officer* 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.
- 1.7 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:
- 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.
- 1.8 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, RSO 1990, CF-31.

Interpretation

- 1.9 This *ECA* revokes and replaces the previous *ECA* and all subsequent amendments.
- 1.10 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.
- 1.11 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.

- 1.12 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.
- 1.13 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.

Certificate of Requirement

- 1.14 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.
- 1.15 In the event any additional land is acquired that will be included as part of the *Site*, then 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*.
- 1.16 In the event any additional land is acquired that will be included as part of the *Site* as discussed in Condition 1.15 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*.

No Transfer or Encumbrance

- 1.17 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.

Change of Owner

- 1.18 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:
- a. the ownership of the *Site* ;
 - b. the *Operator* of the *Site* ;
 - c. the address of the *Owner* or *Operator* ;
 - d. the partners, where the *Owner* or *Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act*, R. S. O. 1990, c. B.17, shall be included in the notification; and
 - e. the name of the corporation where the *Owner* or *Operator* 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.

- 1.19 In the event of any change in the ownership of the *Site* , other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *ECA* , and a copy of such notice shall be forward to the *Director* and *District Manager* .

Inspections

- 1.20 No person shall hinder or obstruct a *Provincial Officer* from carrying out any and all inspections authorized by the the *EPA* or the *PA* , of any place to which this *ECA* relates, and without limiting the foregoing:
- a. 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;
 - b. to have access to, inspect, and copy any records required to be kept by the conditions of this *ECA* ;
 - c. to inspect the *Site*, related equipment and appurtenances;
 - d. to inspect the practices, procedures, or operations required by the conditions of this *ECA* ; and
 - e. to sample and monitor for the purposes of assessing compliance with the terms and conditions of this *ECA* or the *EPA* , or the *PA* .

2.0 FINACIAL ASSURANCE

Overview

- 2.1 Financial assurance (FA) shall be provided as required by the *Director* , in an amount that is sufficient to pay for compliance with and performance of any action specified in this *ECA* , including emergency close out, monitoring and maintenance of the *Site* , planned close out whether or not the *Site* reaches approved capacity, maintenance of all required contaminant control systems including leachate management systems, contaminant monitoring for the *Contaminating Lifespan* of the *Site* and contingency plans for the *Site* in accordance with Schedule "B" of this *ECA* and Section 17 of Ontario *Regulation 232/98* .
- 2.2 Financial assurance may be provided in one or more of the following forms: cash, irrevocable letter of credit, surety bond, or some other form, all satisfactory to the *Director* .

Inflation Rate

- 2.3 The *Owner* shall ensure the methodology for calculating the inflation rate for the financial assurance re-evaluation is the current approach deemed acceptable by the *Ministry* .

Interest (Discount) Rate

- 2.4 The *Owner* shall ensure the methodology for calculating the discount rate for the financial assurance re-evaluation is the current approach deemed acceptable by the *Ministry* .

Proposed payment schedule

- 2.5 Within **thirty (30)** days of this *ECA* being issued, the *Owner* shall provide financial assurance in a form acceptable to the *Director* in the amount of **\$24,575,239.00**.
- 2.6 On the following dates, the maximum amount of financial assurance to be provided to the *Ministry* in a form acceptable to the *Director* as follows:
- a. March 31, 2012 - **\$17,599,327.00**
 - b. March 31, 2013 - **\$19,625,411.00**
- 2.7 The amount of financial assurance may be less than the above amounts provided the *Owner* can justify to the *Ministry* that the amount of waste deposited on site is less than the maximum allowed during the time interval.
- 2.8 A revised or new Financial Assurance Re-Evaluation Report is to be prepared and submitted to the *Director* every three (3) years starting on **August 1, 2013**. The report shall include:
- a. updates of the discount, interest and inflation rates associated with the requirements for financial assurance in this *ECA* including justifications and sources of the proposed rates; and
 - b. a report prepared by a qualified Professional Engineer which updates the cost estimates on which the amounts associated with the requirements for financial assurance in this *ECA* are based.
- 2.9 The report referenced in the above condition shall take into consideration the:
- a. actual amounts of waste landfilled;
 - b. projected rate of fill;
 - c. capping of completed fill areas;
 - d. empirical leachate generation rates;
 - e. empirical and theoretical landfill gas generation rates;
 - f. a recalculation of the *Contaminating Life Span* of the *Site* with respect to groundwater, surface water and landfill gas based on empirical and theoretical data;
 - g. any measures that have been carried out or need to be carried out to prevent and ameliorate any adverse effect that relates to the *Site* ; and
 - h. annual inspection, maintenance, and monitoring costs, including costs for leachate treatment and disposal and landfill gas use or discharge from the landfill gas management works.

- 2.10 No waste shall be received, accepted, disposed or transferred at the site unless appropriate financial assurance is received.
- 2.11 If any financial assurance is scheduled to expire or notice is received, indicating financial assurance will not be renewed, and satisfactory methods have not been made to replace the financial assurance at least sixty (60) days before the financial assurance terminates, the financial assurance shall forthwith be replaced by cash.

3.0 WARWICK PUBLIC LIAISON COMMITTEE and FIRST NATIONS

WPLC

- 3.1 The *Owner* shall continue and maintain the *WPLC* . The *WPLC* shall serve as a focal point for dissemination, review and exchange of information and monitoring results relevant to the operation of the undertaking. In addition, the purpose of the *WPLC* will be to provide community review of the development, operation (current and proposed) and ongoing monitoring, closure and post-closure care related to the landfill *Site* .
- 3.2 The general mandate of the *WPLC* shall include:
- a. Review operations and provide regular input to the *Owner* with respect to all matters pertaining to landfill *Site* operation, including issues pertaining to ongoing operations, monitoring, the need for contingency plans or remedial measures, response to community complaints, the need for changes to the *ECA* , post-closure monitoring and maintenance, and development of the proposed end use for the landfill *Site* ;
 - b. Review operational and monitoring reports;
 - c. Consider and make recommendations to the *Owner* regarding outside consulting advice in respect of the landfill *Site* ;
 - d. Facilitate ongoing dialogue between the *Owner* , the *Environmental Inspector* and the community, including residents and businesses in the immediate vicinity of the landfill *Site* ;
 - e. Provide reports regularly to the community on the activities of the *WPLC* , the landfill operations and landfill related issues and seek public input on these activities and issues;
 - f. Monitor the *Owner* 's complaint response program and make recommendations to the *Owner* with respect to this program; and
 - g. Provide recommendations to the *Owner* with respect to unresolved complaints.
- 3.3 The *WPLC* shall not exercise any supervisory, regulatory, approval, legal or other decision making role with respect to the operations (current and proposed) at the *Site* .
- 3.4 The *Owner* shall provide for the administrative costs of operating the *WPLC* , including the cost

of meeting places and clerical services.

- 3.5 The *WPLC* shall operate under a Terms of Reference of the committee. Suggestions to revise the *WPLC* Terms of Reference may be made at any meeting that a quorum is present. No changes to the Terms of Reference can be made until the committee members mutually agree to changes. Any changes shall be provided to the *Ministry* for information purposes.
- 3.6 The Community members shall be appointed by the *WPLC* . The community member positions are intended to be available to individuals that are not members of groups already represented on the *WPLC* and have an interest in the operation of the landfill. The *WPLC* shall encourage individuals who reside in close proximity to the landfill to participate. A community member is defined as a taxpayer and/or resident of Warwick Township.
- 3.7 The function of the *Ministry* member will be to provide advice, information and input to other members as required.
- 3.8 The *WPLC* shall determine the appropriate meeting frequency and review it on an annual basis.
- 3.9 Minutes and agendas of meetings shall be printed and distributed as per the mailing list on a timely basis.
- 3.10 The *WPLC* shall have reasonable access to the *Site* and its landfill related facilities for the purpose of carrying out its objective and mandate and the *Owner* 's consultants' reports relating to *Site* operations shall be provided to the *WPLC* .
- 3.11 The *Owner* shall provide the *WPLC* with access to the *Owner* 's consultants as required and consultants reports in accordance with protocols agreed to between the *Owner* and the *WPLC* .
- 3.12 Unless disclosure would be contrary to the Freedom of Information and Protection of Privacy Act ,the *WPLC* , the Township of Warwick and Walpole Island First Nation are to be provided all formal submissions and correspondence related to the site operations by the *Owner* at the same time as these items are submitted to the *Ministry* , the Township of Warwick Council or any other body.
- 3.13 The *Owner* shall allow access to the landfill site during normal operating hours, to enable any individual member of the *WPLC* and member of the public recommended by local representatives on the *WPLC* , to observe operations. An individual member of the *WPLC* must contact the operator to arrange for a *Site* pass, be accompanied by an operators representative at all times and follow all safety procedures.
- 3.14 All recommendations made to the *Owner* with respect to ongoing landfill operations, monitoring and the implementation of contingency measures shall be discussed at joint meetings between representatives of the *Owner* and the *WPLC* . The purpose of these meetings will be to arrive at an agreement between the *Owner* and *WPLC* with respect to implementation of the recommendations.

- 3.15 The *Owner* will disclose all monitoring results to the *WPLC* and deliver to the *WPLC* all documents and information (except as may be privileged) relevant to the operation of the landfill.

First Nation and Township of Warwick Consultation

- 3.16 During the process of submission of an application to amend any approvals for the *Site*, the *Owner* shall
- a. discuss with *WIFN* and the Township of Warwick (*Township*) the proposed application prior to submission of the application to the *Director*;
 - b. provide the same documents to *WIFN* and *Township* that are provided to the *Director* in respect of the amendments; and
 - c. provide the *Director*, either prior to or at the same time of application submission, with a statement how *WIFN* and *Township* comments were considered by the *Owner*.

4.0 CONSTRUCTION, INSTALLATION and PLANNING

Major Works

- 4.1 For the purposes of this *ECA* the following are *Major Works*:
- a. gas management system;
 - b. leachate collection system; and
 - c. liner
- 4.2 (1) A final detailed design shall be prepared for each *Major Work* to be constructed at the *Site* consistent with the conceptual design of the *Site* as presented in the Supporting Documentation, specifically Items 66, 67, and 68 of Schedule "A".
- (2) Geonet may substitute a component of the 0.3 metres of granular in the secondary drainage layer in accordance with Items 54 to 57 inclusive on Schedule "A". The *Owner* shall ensure that the Quality Assurance/Quality Control procedure detailed in Item 57 of Schedule "A" is followed during installation of the geonet material.
- 4.3 The final detailed design of each *Major Work* shall include the following:
- a. design drawings and specifications;
 - b. a detailed quality assurance / quality control (QA/QC) program for construction of the major work, including necessary precautions to avoid disturbance to the underlying soils; and
 - c. details on the monitoring, maintenance, repair and replacement of the engineered

components of the major work, if any.

- 4.4 Any design optimization or modification that is inconsistent with the conceptual design shall be clearly identified, along with an explanation of the reasons for the change.
- 4.5 The final detailed design of each *Major Work* shall be submitted to the *Director* and copied to the *District Manager* .
- 4.6 Each major work shall be constructed in accordance with the approved final detailed design and the QA/QC procedures shall be implemented as proposed by the *Owner* . Any significant variances from the conceptual design for the *Site* as detailed in Items 66, 67 and 68 of Schedule "A" shall be subject to approval by the *Director* .
- 4.7 As-built drawings for all *Major Works* shall be retained on *Site* and made available to *Ministry* staff for inspection.

Subsequent Stages

- 4.8 At least six (6) months prior to the anticipated completion of landfilling in each stage of the *Site* , a final detailed design for the subsequent stage shall be submitted to the *Director*. Any significant variances from the conceptual design for the *Site* as detailed in Items 66, 67 and 68 of Schedule "A" shall be subject to approval by the *Director* .
- 4.9 No person shall deposit any waste at the subsequent stage until a written *Preparation Report* in accordance with *O. Reg. 232/98* , Section 19 has been submitted to the *Director* and *District Manager* documenting that:
 - a. all construction;
 - b. QA/QC activities;
 - c. *Site* conditions; and,
 - d. all details of the construction of the *Site* ;

are in accordance with the approved design plans and specifications.

- 4.10 Approval to proceed with landfilling or construction of each subsequent stage shall be dependent on groundwater, air quality and surface water monitoring results acceptable to the *Director* . If monitoring results are not acceptable to the *Director* then remedial action must be taken and completed before landfilling may proceed in the subsequent stage.

Geotechnical Engineer

- 4.11 A qualified professional geotechnical engineer shall inspect the excavation and construction underlying the *Site* and provide a report addressing whether the construction proceeded in accordance with approved detailed design plans, specifications and QA/QC procedures. The report shall be included in the *Preparation Reports* for each stage of the landfill.

Environmental Inspector

- 4.12 In accordance with conditions 18 and 19 of the *EA* approval dated January 15, 2007 known as Item 1 on Schedule "A", the *Owner* shall provide funding to the *Ministry* for the provision of an *Environmental Inspector* to inspect the *Site*, at any reasonable time on such terms and conditions, as deemed appropriate by the *District Manager* of the *District Office* and outlined in a written agreement with the *Owner*. Within the agreement, the *Owner* shall commit to providing, as a minimum, the following:
- a. Adequate office facilities, communication equipment, and means of transportation for the *Environmental Inspector*; and,
 - b. Reimbursement to the *MOE* semi-annually for the costs and associated expenses of the *Environmental Inspector*.
- 4.13 The *Owner* shall provide funding for an *Environmental Inspector* on *Site* based on the following:
- a. *Construction Phase/Operations Phase* - Full-time, on-*Site* inspector with the inspector being on *Site* a full day each day for five (5) days per calendar week for the first two years of the operation phase.
- 4.14 (1) Every two (2) years commencing on **February 1, 2012**, the *Owner* shall prepare and submit a report to the *District Manager* detailing the status and need for a *Environmental Inspector* based on discussions with the Township of Warwick, *WIFN* and the *WPLC* regarding the inspection frequency for the *Environmental Inspector*. The inspection frequency of the *Environmental Inspector* shall remain as per the requirements outlined in Condition 4.13 during the operation phase until a decision is made by the *District Manager* on the appropriate inspection frequency.
- (2) Notwithstanding Conditions 4.12 to 4.14 (1) and 15.3, inclusive, the *Environmental Inspector*'s duties may, in consultation with the *Owner*, be increased, reduced, suspended or terminated on such terms and conditions as deemed appropriate by the *District Manager* and, for greater certainty, the *District Manager* may require an *Environmental Inspector* to be on-*Site* for up to seven days per week in cases of apparent significant non-compliance with the conditions of the *EA* approval or any approval issued for the *Site* under the *EPA* until such non-compliance is resolved.

5.0 OTHER WORKS

Berm Construction

- 5.1 All berm slopes associated with this approval shall be no greater than 3:1.

Diversion Area

5.2 The diversion area will be located to the east of the treated leachate storage lagoons.

Cell 12

- 5.3 (1) Cell 12 will be used as a monofil of contaminated soils until redeveloped and incorporated into the Expansion Site in accordance with Items 66 through 68 of Schedule "A".
- (2) The management of the Cell 12 monofill shall be in accordance with the procedures and practices consistent with other previous monofill operations at the *Site*.

Landscape

5.4 The *Owner* shall ensure the landscape plan is carried out in accordance with Item 72 of Schedule "A", as amended from time to time.

6.0 GENERAL OPERATIONS

Proper Operation

- 6.1 The *Site* shall be properly operated and maintained at all times. All waste shall be managed and disposed of in accordance with the *EPA* , *Regulation 347* , *Regulation 232* , and the requirements of this *ECA*. At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.
- 6.2 The *Owner* shall ensure that the *MOE* 's Guideline B-7, Reasonable Use Concept, is applied at the *Site* boundaries.
- 6.3 (1) Landfilling operations shall be conducted in accordance with Items 66 through 71 of Schedule "A" attached to this *ECA*.
- (2) The *Owner* shall ensure the operations and procedures manual for the the *Site* includes discussions on the following items.:
- a. Health and safety;
 - b. Operation and maintenance of the *Site* ;
 - c. Waste disposal area and development;
 - d. Nuisance management;
 - e. Leachate management;
 - f. Landfill gas management;
 - g. Surface water/Storm water management;
 - h. Inspections and monitoring;
 - i. Contingency plans and emergency procedures;

- j. Complaints; and,
- k. Reporting and record keeping.

(3) The operations and procedures manual shall be:

- a. retained at the *Site* ;
- b. reviewed on an annual basis and updated by the *Owner* as required; and
- c. be available for inspection by *Ministry* staff.

Waste Type

6.4 Only the following types of waste shall be accepted at the *Site* :

- i. municipal, industrial, commercial and institutional solid non-hazardous waste generated within the Province of Ontario, including non-hazardous contaminated soil.

Capacity

6.5 The *Owner* shall only accept and deposit waste at the *Site* as long as there is available capacity as defined by the final contours for the *Site* approved by this *ECA* . The approval permits disposal of waste at the *Site* to fill an air space of **26,508,000 cubic metres** (including waste, daily and interim cover material). This capacity includes the capacity of the existing and expansion landfill areas.

Yearly Waste Limit

- 6.6 (1) The *Owner* can receive up to a maximum of **750,000 tonnes per year** of waste including contaminated soil for disposal at the *Site* .
- (2) The amount of tire shred that may be received to process is **7,160 tonnes/year**.
- (3) Up to a maximum of **100 tonnes per day** of solid non-hazardous waste, white goods and metals, recyclable waste, wood waste, and leaf and yard waste that are deposited by the public using small vehicles at the *Mini-Transfer Area* of the *Site* may be transferred from the *Site* by a waste hauler or waste haulers that has an *ECA* to another waste disposal site.

Service Area

6.7 Only waste that is generated in the Province of Ontario shall be accepted at the *Site* .

Landfilling of Sludge

6.8 A thickness of at least 2 metres of compacted waste and cover material shall be maintained

between any landfilled sludge (solid non-hazardous as per *Reg. 347*) and the granular leachate collection layer.

Asbestos Waste

- 6.9 Any waste that is considered asbestos waste shall be handled in accordance with Section 17 of *O. Reg. 347* as amended from time to time.
- 6.10 A suitable sized excavation for the asbestos waste shall be made by the *Owner* in a location away from the active landfilling face.
- 6.11 All asbestos waste shall be inspected to ensure that the asbestos waste is properly bagged or contained and free from puncture, tears or leaks.
- 6.12 The asbestos waste shall be placed in the excavation to avoid damage to the containers and to prevent dust and spillage.
- 6.13 Upon completion of the unloading and deposition of the asbestos in the excavation, at least 125 centimetres of cover or waste material shall be placed over the asbestos.
- 6.14 All asbestos waste shall be deposited to a level no higher than 1.25 metres below the general elevation of the disposal area to ensure that daily cover material removal in the future does not encounter the asbestos waste.

Waste Limits

- 6.15 No waste, including daily cover, intermediate cover or final cover layer, shall be landfilled outside the limits of the base and final cover contours presented in Items 66 through 71 of Schedule "A"(the Development and Operations Plan) attached to this *ECA* .

Site Use

- 6.16 The area inside the fencing indicated in Appendix N18 of Item 30 of Schedule "A" shall be used for waste disposal purposes only. The remainder of the *Site* outside the fenced area shall be used for traditional agricultural crop production only.

Waste Inspection

- 6.17 All loads of waste must be properly inspected by trained *Site* personnel prior to disposal at the *Site* and waste vehicles must be diverted to appropriate areas for waste disposal.

Waste Deposit

- 6.18 The *Owner* shall deposit waste in a manner that minimizes exposure area at the landfill working face and waste shall be compacted before cover is applied.

Burning Waste Prohibited

6.19 Burning of waste at the *Site* is prohibited.

Signage

6.20 A sign shall be maintained at the main entrance/exit to the *Site* on which is legibly displayed the following information:

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

6.21 The *Owner* shall install and maintain signs to direct vehicles to working face and recycling areas.

6.22 The *Owner* shall maintain signs at recycling depot informing users what materials are acceptable and directing users to appropriate storage area.

Hours of Operation

6.23 Waste shall only be accepted at the *Site* during the following time periods:

- a. 7 AM to 7 PM - Monday to Saturday.

6.24 On-site equipment used for daily *Site* preparation and closing activities shall only be used during

- a. 6 AM to 8 PM - Monday to Saturday.

6.25 With prior written approval of the *District Manager* , the time periods may be extended to accommodate seasonal or unusual quantities of waste or such factors as determined to be reasonable to the *District Manager* .

6.26 The *Owner* may provide limited hours of operation provided that the hours are posted at the landfill gate and that suitable notice is provided to the public of any change in operating hours.

6.27 Upon reasonable notice to the *District Manager* , contingency actions may take place outside

normal hours of operation. Emergency response may occur at any time as required.

Site Security

- 6.28 During non-operating hours, the *Site* entrance and exit gates shall be locked and the *Site* shall be secured against access by unauthorized persons

Fencing

- 6.29 The entire area as shown in Figure 12 in Item 66 of Schedule "A" shall be fenced by the *Owner* with a 6 foot high wire woven highway-type paige fence.

Site Access

- 6.30 Access to and exit from the *Site* for the transportation of waste shall under normal circumstances be permitted from County Road 79.

Access Roads

- 6.31 (1) On-*Site* roads shall be provided and maintained in a manner that vehicles hauling waste to and on the *Site* may travel readily and safely on any operating day. During winter months, when the *Site* is in operation, roads must be maintained to ensure safe access to the landfill working face.
- (2) Access roads must be clear of mud, ice and debris which may create hazardous conditions.

Vermin, Dust, Litter, Odour, Noise, Traffic

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

Scavenging

- 6.33 The *Owner* shall ensure that there is no scavenging as defined in *O. Reg. 347* at the *Site*.

Dust

- 6.34 The *Owner* shall control fugitive dust emissions from on *Site* sources including but not limited to on-*Site* roads, stockpiled cover material and, closed landfill area prior to seeding especially during times of dry weather conditions. If necessary, major sources of dust shall be treated with water and/or dust suppression materials to minimize the overall dust emissions from the *Site*.
- 6.35 Dust shall be managed as per the Best Management Practices plan prepared by RWDI listed as Item 24 on Schedule "A".

Litter Control

- 6.36 The *Owner* shall take all practical steps to prevent escape of litter from the *Site* . All loose, windblown litter shall be collected and disposed of at the landfill working face.
- 6.37 Litter pickup will occur at least weekly on the *Owner* 's property during all weather conditions.
- 6.38 The *Owner* will respond to litter complaints within one (1) day of the complaint being received.
- 6.39 Litter shall be managed in accordance with the Best Management Practices plan prepared by RWDI listed as Item 25 on Schedule "A".

Odour

- 6.40 Odour shall be managed in accordance with the Best Management Practices plan prepared by RWDI and comments listed as Item 74 in Schedule "A".

Noise

- 6.41 The *Owner* shall comply with noise criteria in MOE Guideline entitled "*Noise Guidelines for Landfill Sites*" dated October 1998 as amended from time to time and the *Site* shall comply with the limits set in Publication NPC205. Bird bangers may be used at the *Site* for gull control provided that they produce reference impulsive sound not exceeding 125 dBAI at 5 metres from the bird banger.
- 6.42 Noise monitoring at the *Site* shall be undertaken by the *Owner* as per the document entitled "*Environmental Noise Monitoring Program for the Warwick Landfill*", dated June 15, 2007 prepared by Aercoustics Engineering Limited listed as Item 73 on Schedule "A".

Alteration of Best Management Plans for Odour, Dust and Litter

- 6.43 The *Owner* shall use the Best Management Plans (BMP's) for dust, odour and litter at the *Site* in accordance with the applicable Conditions approved by this *ECA* . The *Owner* may submit changes in writing to the *Director* for approval to amend the BMP(s). At the same time any changes to the BMP's are submitted to the *Director* , the *Owner* shall provide the proposed changes to the BMP's to the Township of Warwick, *WPLC* and *WIFN* .

Surface Water

- 6.44 The *Owner* shall take all appropriate measures to minimize surface water from coming in contact with waste. Temporary berms and ditches shall be constructed around active waste disposal areas to prevent extraneous surface water from coming in contact with the active working face.
- 6.45 The *Owner* shall not discharge surface water to receiving water bodies without an approval under

the *EPA* .

- 6.46 If surface water ponding occurs in any surface water ditches having a drainage slope less than 0.5%, the *Owner* shall regrade the ditches.

Application of Cover Material

- 6.47 Cover material shall be applied as follows:

- a. Daily Cover - At the end of each working day, the entire working face shall be covered with a minimum thickness of 150 mm of soil cover or an approved alternative cover material;
- b. Intermediate Cover - In areas where landfilling has been temporarily discontinued for six (6) months or more, a minimum thickness of 300 mm of soil cover or an approved alternative cover material shall be placed;
- c. Final Cover - In areas where landfilling has been completed to final contours, a minimum 1.85 metre thick layer of final cover soil shall be placed. Fill areas shall be progressively completed and rehabilitated as landfill development reaches final contours; and
- d. Topsoil - In areas where landfilling has been completed to final contours and where final cover has been placed, a minimum 0.15 metres thick layer of topsoil shall be placed.

Cover Materials Allowed

- 6.48 The following materials, in the corresponding thickness, may be used as an alternative to soil as a daily and intermediate cover:
- a. Contaminated soil that is less than 10% of the Toxicity Characteristic Leaching Procedure (TCLP) values as outlined in *O. Reg. 347* as amended from time to time. Notwithstanding this, contaminated soils which produce a leachate that does not exceed 0.4 mg/L of benzene shall be considered acceptable for use as daily and intermediate cover.
 - b. Wood chips (daily)
 - c. Automobile Shredder Residue (ASR) for an eighteen (18) month trial period (daily);
or
 - d. Tarps (daily)

- 6.49 The use of any other alternative materials as daily or intermediate cover material is subject to

approval by the *Director* .

- 6.50 Use of alternative daily or intermediate cover materials shall be discontinued within two (2) working days of receipt of written notification from the *District Manager* , stating that the use of the alternative daily or intermediate cover materials at the *Site* has proven to be environmentally unsuitable.

Automobile Shredder Residue as Daily Cover

- 6.51 Automobile Shredder Residue (ASR) may be used at the *Site* for an eighteen (18) month trial period. A report shall be issued after twelve (12) months to allow time for the *Director* to evaluate an extended period of usage.
- 6.52 Automobile Shredder Residue samples of the daily cover material are to be taken on a quarterly basis and submitted for analysis of *O. Reg. 347* Schedule IV Inorganics, VOC's, PAH's and PCBs. Automobile Shredder Residue is to conform with the specifications of a non-hazardous waste under *O. Reg. 347* as amended from time to time. Quarterly testing results are to be submitted to the *District Manager* upon receipt. The frequency of *O. Reg. 347* testing of the daily cover material can be reduced subject to approval of the *District Manager*.

Contaminated Soil as Daily or Intermediate Cover

- 6.53 If confirmatory testing of the contaminated soil used for daily or intermediate cover indicates an exceedance of 10% of the TCLP value and/or 0.4 mg/L of benzene, the *Owner* shall report any failed sample of the contaminated soil testing to the *District Manager* forthwith.
- 6.54 Any contaminated soil above the 10% TCLP values and/or with benzene concentrations greater than 0.4 mg/L, shall be considered waste and shall be landfilled as waste.
- 6.55 If the contaminated soil does not meet the TCLP value, the contaminated soil shall be classified as a hazardous waste and shall be disposed of at a site that is approved to receive and dispose of hazardous waste.
- 6.56 Contaminated soil for use as daily cover shall be stockpiled in areas of the *Site* that have a leachate collection system installed below.
- 6.57 Contaminated soil may be used for daily/intermediate cover but only on slopes where surface water drainage is into the waste fill and isolated from the storm water collection system.
- 6.58 Surface water run off from the contaminated soils stockpile which exceeds the Provincial Water Quality Objectives shall not be discharged through the surface water management system.
- 6.59 The *Owner* must ensure that measures are in place for the on *Site* treatment and disposal of any contaminated run off from the contaminated soils stockpile.

6.60 Prior to receipt at the *Site* , each source of contaminated soils which are to be used as daily or intermediate cover shall be tested to determine if the soils meet the criteria in this *ECA* and a copy of the test results shall be kept in the daily records for the *Site* as required.

6.61 If soils containing any contaminants other than:

- a. petroleum hydrocarbons (gasoline, diesel or heating oils); or
- b. parameters included in Schedule 4 of *Regulation 347* ;

are accepted for daily or interim cover, then these other contaminants shall be added to full testing of parameters for as long as the contaminated soil stockpile exists and for as long as portions of the *Site* (where contaminated soils have been used as daily or interim cover) remain uncapped.

7.0 SITE OPERATIONS

Landfill Reclamation

7.1 The *Owner* shall restrict stockpiling of contaminated soil from Cells 8, 10 and 12 to sections of the landfill footprint that have a liner and leachate collection system.

Waste Processing and Composting

7.2 Waste Processing and composting is allowed at the location outlined in Item 49 on Schedule "A" subject to the following conditions:

- a. Prior to the commencement of any waste processing or composting operations at the *Site* , the *Owner* shall ensure that air (Section 9 *EPA*) and noise approvals are obtained;
- b. Prior to the start of composting operations at the *Site* , the *Owner* shall submit to the *District Manager* a contingency plan for any odour problems that may occur;
- c. The total combined amount of waste that may be received at the *Site* for processing and composting shall not exceed **36,000 tonnes per year** and the maximum daily amount to be received at the *Site* shall not exceed **700 tonnes per day**;
- d. The amount of waste that may be received at the *Site* for composting shall not exceed **7,500 tonnes per year**;
- e. Material acceptable for processing and composting at the site shall include leaf, yard, agricultural waste, concrete, asphalt, wood and tires;
- f. The bins for diversion shall be emptied on an as needed basis to prevent odours and operational problems. The *Ministry* may at any time instruct that a bin be emptied;
- g. The *Owner* shall ensure that waste processing and composting is undertaken in a safe manner, and that all waste is properly handled, processed and contained so as not to pose any threat to the general public and site personnel;
- h. All noise generating processing activities in the waste diversion area including

concrete/asphalt/crushing, wood chipping and tire shredding shall only occur between 07:00 to 19:00; and

- i. Any runoff that comes into contact with waste in the waste processing/composting area shall be managed in such a fashion to ensure compliance with Condition 8.5 of this *ECA* .

7.3 The *Owner* shall ensure that composting at the *Site* is undertaken in accordance with *O.Reg. 101/94* as amended from time to time and the *Ministry* document entitled "*Interim Guidelines for the Production and Use of Aerobic Compost in Ontario* " dated November 2004 as amended from time to time and the following requirements:

- a. Only leaf and yard waste, *Agricultural Waste* as defined in Item 3 in Schedule "A" and wood (not including painted or treated wood or laminated wood) may be accepted at the compost area.
- b. Leaf and yard waste is defined as waste consisting of natural Christmas trees and other plant materials but not tree limbs or other woody materials in excess of seven (7) centimetres in diameter.
- c. The composting site shall only receive material for composting from May 1st to November 1st each year.
- d. Leaf and yard waste, *Agricultural Waste* and wood may not be stored for more than four (4) days before it is composted.
- e. During composting, the *Owner* shall provide the composting mass with adequate ventilation to ensure that aerobic conditions are maintained.
- f. Cured compost must be analyzed for the parameters listed in Table 1 of *O.Reg. 101/94* and shall not be removed from the *Site* unless it has been sampled and analyzed.
- g. Cured compost is defined as meeting the specifications in Sections 7.2 to 7.5 inclusive of the *Interim Guidelines for the Production and Use of Aerobic Compost in Ontario* dated November 2004 as amended from time to time and can be used on an unrestricted basis.
- h. Compost is designated a waste if the compost contains a substance listed in Table 1 of *O. Reg. 101/94* that has a concentration greater than the concentration listed in Column 2.
- i. Controlled compost is defined as compost that is designated a waste under the previous condition but has concentrations less than the concentrations listed in Column 3 of Table 1 in *O. Reg. 101/94* .
- j. Controlled compost may not be removed from the site except for direct shipment to the intended user.
- k. Material from the composting process that fails to meet the "*Interim Guidelines for the Production and Use of Aerobic Compost in Ontario*" dated November 2004 shall be deemed to be a waste under *O. Reg. 347* and shall be disposed of accordingly.
- l. The person to whom controlled compost is shipped shall be given a copy of the chemical analysis of the compost and a notice that states that the compost is controlled compost and that sets out the terms and conditions of the compost's exemption from Part V of the *EPA* . A copy of this notice shall be kept on file at

the *Site* .

- m. The *District Manager* may at any time and at his absolute discretion instruct that any or all of the waste materials from the composting or processing operations or the processed waste from the composting or processing operations to be either landfilled or directed to be utilized for specific uses and in specific locations.

7.4 Record keeping for the composting operation shall be kept as follows:

- a. Records about each composting mass shall be kept including temperatures of the mass, when the temperatures were measured, when the mass was turned, information about the curing process and details about significant problems that occurred during composting or curing. This information shall be kept at the *Site* for at least three years after the mass was cured;
- b. Records shall be kept of the analyses of compost. Any laboratory records shall be kept as part of the record. A record of an analysis shall be kept for at least three years after the analysis is performed; and
- c. A record shall be kept of the name, address and telephone number of each person to whom controlled compost is shipped. The record shall be kept for at least ten (10) years after the shipment.

Tire Shred

7.5 The management and placement of tire shreds at the *Site* shall be in accordance with the Fire Protection and Prevention Act as follows:

- a. No individual tire shred pile shall be more than 3 metres in height and 100 square metres in area. Six (6) metres of space shall be provided between all piles. Fifteen (15) metres is to be provided from property lines and thirty (30) metres shall be provided from tree lines;
- b. A buffer of 4.5 metres is to be provided for grass or weeds from the edge of the tire pile to the edge of the pad.
- c. A firebreak of 22 metres shall be provided between the two areas of 16 piles each.

7.6 If the total stockpiled tire shreds exceeds **300 cubic metres**, the storage period shall not exceed 90 (ninety) days.

7.7 The total amount of tire shreds stored on *Site* shall be recorded in a log book and made available to the *Ministry* for inspection.

Backup Power

7.8 The *Owner* shall maintain adequate backup power at the *Site* in order to ensure scale facility and landfill gas blower on site continue to operate and are not damaged due to an extended power outage. A power supply connection at each leachate collection pumping station shall be

maintained by the *Owner* that will permit a portable generator to be connected during a power outage.

Landfill Gas

- 7.9 All buildings are to be free of any landfill gas accumulation. The *Owner* shall provide adequate ventilation systems to relieve landfill gas accumulations in buildings if necessary.

Landfill Gas Management

- 7.10 The *Owner* shall, manage landfill gas in accordance with Items 66 through 68 of Schedule "A" and based on the landfill gas management system constructed under the authority of the *EPA* Approval issued which may be amended or replaced from time to time.

Cleaning of Leachate Collection System

- 7.11 The leachate collection system piping for each stage of the landfill shall be inspected annually for the first five years after waste placement and then as often as future inspections indicate to be necessary. Additionally, leachate collection pipes must be cleaned whenever an inspection indicates that cleaning is necessary.
- 7.12 In areas where leachate collection pipe slopes are less than 0.5%, the leachate collection pipes shall be inspected semi-annually for the first three (3) years after waste placement and then as often as future inspections indicate to be necessary. Additionally, leachate collection pipes must be cleaned whenever an inspection indicates that cleaning is necessary. After the three (3) year period, inspection and cleaning of the leachate collection pipes shall be in accordance with the previous condition.

Leachate Collection System

- 7.13 All leachate collection pipes for Cell 12 shall be sloped at a minimum of 0.5%.
- 7.14 The *Owner* shall install 250 mm diameter perforated leachate collection pipes with perforations located at the 10:30, 4:30, 1:30 and 7:30 positions.
- 7.15 The stone for the leachate collection system shall have the following specifications:
- a. D_{85} shall be greater than 37 mm where D_{85} is described as the stone diameter such that, when measured by weight, 85% of the stones in the layer have a smaller diameter;
 - b. D_{10} shall be greater than 19 mm where D_{10} is the stone diameter such that, when measured by weight, 10% of the stones in the layer have a smaller diameter;
 - c. D_{60}/D_{10} shall be less than 2; and,
 - d. One per cent (1%) of the stones may pass a #200 sieve.

- 7.16 A minimum of 50 mm of stone shall be placed below the leachate collection pipes and a minimum of 250 mm of stone shall be placed above any leachate collection pipes.
- 7.17 The *Owner* shall ensure that the leachate collection system is constructed under the supervision of a qualified consultant.

Hydraulic Trap

- 7.18 The *Owner* shall ensure that a hydraulic trap is developed and maintained beneath the Expansion Area and shall ensure that a maximum leachate head of 300 mm on the landfill liner is not exceeded.

8.0 LEACHATE MANAGEMENT

Leachate Recirculation

- 8.1 Prior to implementing the leachate recirculation program , a report on the moisture content of the incoming waste and the actual field capacity of the waste in situ shall be submitted to the *Director* .
- 8.2 The *Director* may at any time, terminate leachate recirculation at the *Site* if, in the *Ministry* 's opinion, adverse effects on the environment are observed.
- 8.3 Before starting leachate recirculation, the *Owner* shall provide to the *Director* a monitoring program to ascertain the effectiveness of the leachate recirculation process.
- 8.4 Leachate recirculation shall not occur in any above grade locations until final cover has been installed on exterior side slopes.

Leachate Management Plan

- 8.5 The *Owner* 's leachate management plan shall not include any direct discharge of leachate or treated leachate from the *Site* , even as a contingency option, to surface waters, including Bear Creek. The *Owner* shall not discharge leachate or treated leachate to surface waters, including Bear Creek from the *Site* .

Leachate Treatment Plant

- 8.6 (1) (a) Within three (3) years of placement of the first tonne of waste in the expanded portion of the landfill *Site* , the *Owner* shall ensure that a leachate treatment system is installed and operational at the *Site* .
- (b) Leachate from the *Site* not sent to the operational drip irrigation area(s) approved under Condition 8.7 shall be disposed of off-*Site* at a location approved by the *District Manager*

until the leachate treatment system required by Condition 8.6 (1)(a) is approved and operational. .

- (c) Any waste from the leachate treatment system that is to be disposed of in the landfill must be classified as a solid non-hazardous waste.
- (2) As part of the financial assurance calculation in Section 2.0, the *Owner* shall provide to the *Director* for approval, a detailed financial assurance plan including the cost of leachate transportation and disposal for the landfill site during the period preceding the initiation of the leachate treatment system. In addition, the *Owner* shall provide to the *Director* for approval a financial assurance plan detailing the capital cost of the on-*Site* leachate treatment system.

Phytoremediation of Leachate - Existing and Proposed Poplar Plantations

8.7 On-*Site* phytoremediation may occur at the *Poplar System* and *Poplar Plantation* in accordance with the following conditions:

- a. The *Owner* shall ensure that there is a 100 metre grassed buffer at all times from the *Poplar Plantation* to the Kersey drain.
- b. Irrigation of leachate onto either the *Poplar Plantation* or the *Poplar System* shall not occur in the following instances:
 - i. Between the dates of October 16 to April 30
 - ii. On frozen or snow covered ground conditions;
 - iii. Under conditions that will cause ponded water or runoff;
 - iv. Conditions where surface water ponding within the area is occurring;
 - v. Where no poplar trees are currently planted;
 - vi. In areas within a drip irrigation area where trees have been harvested more than a frequency greater than every other tree;
 - vii. In areas within a drip irrigation area that has been fully harvested clear of trees and the trees have not started to coppice.
- c. If weather forecasts indicate a rainfall storm greater than 12.5 mm/hour will occur, the *Owner* shall within 1 hour before the storm, shut off all irrigation of the poplar forest.
- d. Irrigation zones shall be individually assessed by the *Owner* for suitability of irrigation after rainfall events greater than 12.5 mm.
- e. Records shall be kept for the *Poplar System* and *Poplar Plantation* areas as follows:
 - i. quantities and dates of application of pesticides and herbicides;
 - ii. inspection notes regarding tree growth rates and health;
 - iii. inspection notes regarding condition and growth of underlying vegetative landfill cover (ie grass);
 - iv. observed pooling and/or runoff of irrigated liquid;

- v. observations of any odours; and,
 - vi. weather conditions records as may be obtained from the nearest Environment Canada Weather Office which may include daily high and low temperatures, wind velocity and direction, and precipitation quantities.

- f. Irrigation onto either the *Poplar System* or the *Poplar Plantation* shall be as follows:
 - i. Detailed records shall be kept of the quantities of irrigation liquid that are applied, including the dates of application onto either drip irrigation area;
 - ii. Operations in a given drip irrigation area must immediately stop if contamination problems in surface water or groundwater, which are attributable to the operation of the noted drip irrigation area, are found to be occurring. Recommencement of operations may proceed only upon further written notification of the *District Manager* ;
 - iii. Operations of a given drip irrigation area must be discontinued immediately if operation of the noted drip irrigation area causes surface runoff from the footprint area or if operations cause surface ponding within the drip irrigation area; operations cannot be restarted during that application day and can only be restarted after surface ponding has evaporated or infiltrated or conditions causing the runoff or ponding have been rectified;
 - iv. If there are any stoppages of operations under the requirements of items ii) or iii) above, then the *District Manager* shall be notified immediately; and,
 - v. If odours attributable to one of the drip irrigation areas become a problem at the site, then the *District Manager* shall be so informed in writing and the operation of the noted drip irrigation area shall be stopped pending further instructions from the *District Manager* ;

- g.
 - (1) Monitoring of the drip irrigation *Poplar System* and the *Poplar Plantation* shall be in accordance with Items 63 through 65 of Schedule "A".
 - (2) Monitoring frequencies and analyses for the following items shall be as follows:
 - i. Daily inspections for ponded water or saturated soil during irrigation;
 - ii. Monthly testing of irrigation liquid quality during the irrigation season;
 - iii. Soil samples should be taken annually from grade to a depth of 0.6 m minimum and 0.9 m maximum;
 - iv. Annual soil analyses shall be conducted annually per Section 3.1

of Item 63 of Schedule "A", in addition to pH, electrical conductivity, cation exchange capacity, and sodium absorption ratio

- v. Leaf Tissue analyses once per year in the fall; and
- vi. Crop inspection once per year in the fall.

- h. Reporting on the drip irrigation areas shall be part of the annual monitoring report for the *Site* and shall include but not be limited to the following:
 - i. results and an analysis of the results of the monitoring programs for the drip irrigation areas;
 - ii. assessment of the results of the vegetation as related to the stated objectives for the *Poplar System* and *Poplar Plantation* facilities construction and operations;
 - iii. assessment of the need to change the monitoring program for the drip irrigation areas and a recommendation of the required changes;
 - iv. tabulation and assessment of the volumes of leachate produced by the landfill, and those volumes which may be applied to the existing drip irrigation areas;
 - v. a report on operational problems identified during the operation of the drip irrigation areas and a discussion of each problem and details of what was done to rectify each problem;
 - vi. a *Site* plan which shows the location of the areas planted with both trees and grass cover and the vegetation used on those areas;
 - vii. an assessment of the monitoring results pertaining to the use of trees as vegetation on the final cover
- i. The *Director* retains the right to request that the *Owner* conduct additional studies, suspend operations or require the *Owner* to provide additional methods to handle leachate at the *Site* in addition to or as a replacement to the drip irrigation areas.
- j. If the *Director* requests removal of the drip irrigation areas, the *Owner* shall:
 - i. remove the irrigation equipment and the trees from the noted drip irrigation area. For the *Poplar System*, removal of trees shall include removal of tree stumps and most roots, excavate the trench to the maximum depth of root depth penetration on each tree row, and then replace, remould and recompact the excavated material;
 - ii. the landfill cover shall be restored to the same condition as it was in prior to commencement of the *Poplar System* and a blend of suitable grasses shall be seeded as necessary; and,
 - iii. within 6 months of completion of the noted drip irrigation area closure activities, submit to the *Director* a report outlining the work that has been completed.

- k. Electrical conductivity of the shallow soil (maximum depth of 0.15 m) beneath the drip irrigation areas shall be monitored on a weekly basis during irrigation.
- l. If salt levels are building up in the soil or additional irrigation with leachate is found to be detrimental to the health of the poplars, the leachate application rate shall be reduced or terminated.

Wood Waste and Leaf Litter

- m. Any wood waste or leaf litter that is produced in the *Poplar System* or *Poplar Plantation* shall be managed in accordance with Item 63 of Schedule "A".

Other Items

- n. (1) Drip irrigation rates for the *Poplar Plantation* shall be no greater than the rate specified in the *EPA* approval for the *Site* .
 (2) Drip irrigation rates for the *Poplar System* shall be no greater than the rates noted in Item 63 of Schedule "A".
- o. No drip irrigation shall occur within fifty (50) metres of any surface watercourse or drain.
- p. (1) Leachate to be used for drip irrigation on the *Poplar Plantation* shall not exceed the treated leachate effluent criteria specified in the *EPA* approval for applicable industrial sewage works for the *Site* .
 (2) Leachate to be used for drip irrigation on the *Poplar System* shall not exceed the treated leachate effluent criteria specified in the Item 63 through 65 in Schedule "A".
- q. The use of the *Poplar Plantation* to manage irrigation leachate will not be permitted without first providing the *District Manager* with at least two (2) months written notice of the anticipated irrigation liquid application date. The use of surface water to encourage tree growth will be permitted and will not be considered as irrigation liquid.
- r. Monitoring and the associated reporting for the *Poplar Plantation* will commence at least two (2) months prior to irrigation liquid application and continue until two (2) years after cessation of irrigation liquid application to the *Poplar Plantation* .

Leachate Storage Tanks

- s. The leachate storage tanks shall be inspected by a licenced plumber on an annual basis

- t. The leachate storage tanks shall be cleaned and sediment removed at least once every two (2) years.

9.0 INSPECTIONS AND RECORDS

Inspections

9.1 The *Owner* shall inspect the *Site* monthly for the following items but not limited to these items:

- a. Erosion rills;
- b. General settlement areas or depressions;
- c. Shear and tension cracks;
- d. Condition of surface water drainage works;
- e. Erosion and sedimentation in surface water drainage system;
- f. Presence of any ponded water;
- h. Adequacy of cover material;
- i. Evidence of vegetative stress, distressed poplars or side slope plantings;
- j. Condition of groundwater monitoring wells and gas wells;
- k. Presence of insects, vermin, rodents and scavenging animals;
- l. Condition of fence surrounding the *Site* ; and
- m. General *Site* appearance.

9.2 The *Owner* shall inspect the *Site* weekly for presence of leachate seeps.

Daily Inspections and Log Book

9.3 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 being operated in compliance with this *ECA* . Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the *Site* if needed.

9.4 A record of the inspections shall be kept in a daily log book or a dedicated electronic file that includes:

- i. the name and signature of person that conducted the inspection;
- ii. the date and time of the inspection;
- iii. the list of any deficiencies discovered;
- iv. the recommendations for remedial action; and
- v. the date, time and description of actions taken.

9.5 A record shall be kept in a daily log book of all refusal of waste shipments, the reason(s) for refusal, and the origin of the waste, if known.

Monthly Records

9.6 Monthly *Site* inspection records in the form of a written log or a dedicated electronic file shall include but not be limited to the following:

- a. the type, geographic source, date and time of arrival, hauler, and quantity (tonnes) of all waste received at the *Site* ;
- b. the area of the *Site* in which waste disposal operations are taking place;
- c. a calculation of the total quantity (tonnes) of waste received at the *Site* during each operating day and each operating week;
- d. Results of any test done to determine the acceptability of waste at the *Site* ;
- e. A reference for each load of solid non-hazardous industrial waste received, to the client and type of solid non-hazardous industrial waste;
- f. the amount of any leachate removed, or treated and discharged from the *Site* ;
- g. a record of litter collection activities and the application of any dust suppressants;
- h. a record of the daily inspections;
- i. 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;
- j. type and amount of daily, intermediate and final cover used;
- k. maintenance and repairs performed on equipment employed at the *Site* ;
- l. complaints received and actions taken to resolve them;
- m. emergency situations and actions taken to resolve them; and
- n. any other information required by the *District Manager* .

9.7 The *Owner* shall maintain on record at the *Site* for each client disposing of solid non-hazardous waste at the *Site* , a description of each type of solid non-hazardous waste received from the client and documentation to demonstrate that the *Owner* has taken reasonable care to ensure that waste classified as either hazardous or liquid industrial waste under *O. Reg. 347* as amended from time to time, is not disposed of at the *Site* .

Record Retention

9.8 Except as authorized in writing by the *Director* , all records required by this *ECA* shall be retained at the *Site* for a minimum of two (2) years from their date of creation.

9.9 The *Owner* shall retain all documentation listed in Schedule "A" for as long as this *ECA* is valid.

9.10 All monthly *Site* inspection records are to be kept at the *Site* until they are included in the Annual Report.

9.11 The *Owner* shall retain employee training records as long as the employee is working at the *Site* .

9.12 The *Owner* shall make all of the above documents available for inspection upon request of

Ministry staff.

- 9.13 The *Owner* shall retain, either on-*Site* or in another location and notify the *District Manager* of this location, copies of the annual reports referred to in the preceding condition and any associated documentation of compliance monitoring activities and shall continue to do so for a period of at least two (2) years after the closure of the *Site* .

10.0 TRAINING

Employees and Training

- 10.1 A training plan for all employees that operate any aspect of the *Site* shall be developed and implemented by the *Operator* . Only trained employees shall operate any aspect of the *Site* or carry out any activity required under this *ECA* . Employees must provide proof of training to the *Ministry* upon request. For the purpose of this *ECA* "trained" means knowledgeable either through instruction or practice in:
- a. the relevant waste management legislation *including EPA, O. Reg. 347 and O. Reg. 232/98* , regulations and guidelines;
 - b. major environmental and occupational health and safety concerns pertaining to the waste to be handled;
 - c. the proper handling of wastes;
 - d. the management procedures including the use and operation of equipment for the processes and wastes to be handled;
 - e. the emergency response procedures;
 - f. the specific written procedures for the control of nuisance conditions;
 - g. the *terms, conditions and operating* requirements of this *ECA* and
 - h. proper inspection, receiving and recording procedures and the activities to be undertaken during and after a load rejection.

11.0 COMPLAINTS PROCEDURES

- 11.1 If at any time, the *Owner* receives complaints regarding the operation of the *Site* , the *Owner* shall respond to these complaints according to the following procedure:
- a. The *Owner* shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information, the time and date of the complaint, specific details of operations that were occurring, any changers from normal operations, types of waste loads (including source) and other on *Site* activities;
 - b. The *Owner* , upon notification of the complaint, shall initiate appropriate steps to determine all possible causes of the complaint, proceed to take the necessary actions

to eliminate the cause of the complaint and forward a formal reply to the complainant; and

- c. The *Owner* shall complete and retain on-*Site* a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.

11.2 The *Owner* shall designate a person to receive any complaints and to respond with a written notice of action as soon as possible. The *Owner* shall post the *Site* complaints procedure at the *Site* entrance. All complaints and the *Owner*'s actions taken to remedy the complaints must be summarized in the Annual Report.

11.3 All complaints received by the *Owner* are to be reported within twenty-four (24) hours of receipt to the *District Manager*, the Township of Warwick, the *Environmental Inspector* and *WIFN*. Complaints shall be reported to the *WPLC* at the next *WPLC* meeting.

12.0 EMERGENCY SITUATIONS

12.1 In the event of a fire or discharge of a contaminant to the environment, *Site* staff shall contact the *MOE* Spills Action Centre (1-800-268-6060) and the *District Office* of the *MOE* forthwith.

12.2 The *Owner* shall submit to the *District Manager* a written report within three (3) days of the spill or incident, outlining the nature of the incident, remedial measures taken and measures taken to prevent future occurrences at the *Site*.

12.3 The *Owner* shall ensure that adequate fire fighting and contingency spill clean up equipment is available in accordance with Item 66 of Schedule "A" and that emergency response personnel are familiar with its use and location.

13.0 MONITORING

Groundwater Monitors

13.1 The *Owner* shall ensure all groundwater monitoring wells are properly capped, locked and protected from damage.

13.2 In areas where landfilling is to proceed around monitoring wells, the wells must be decommissioned in accordance with O. Reg. 903 as amended from time to time and then replaced when waste placement and capping is completed.

13.3 Any groundwater monitoring wells included in the monitoring program shall be assessed, repaired, replaced or decommissioned as required.

- 13.4 The *Owner* shall repair or replace any monitoring well which is destroyed or in any way made inoperable for sampling such that no more than one sampling event is missed.
- 13.5 All monitoring wells that are no longer required as part of the groundwater monitoring program shall be decommissioned in accordance with good standard practice that will prevent contamination through the abandoned well and in accordance with O. Reg. 903. A report on the decommissioning shall be provided in the annual monitoring report for the period during which the well was decommissioned.

Monitoring Program

- 13.6 Monitoring programs shall be carried out for groundwater, surface water, landfill gas in accordance with the Environmental Monitoring Plan, as amended from time to time listed as Item 39 and Appendix H of Item 68 of Schedule "A".
- 13.7 The *Owner* shall ensure that Biochemical Oxygen Demand, Total Suspended Solids, Total coliform, Fecal coliform and E. Coli are added to the parameter list to be sampled for surface water station SS19.
- 13.8 Air Quality, Dust, hydrocarbon, and Volatile Organic Carbon monitoring shall be undertaken in accordance with Items 27, 32 and 34 on Schedule "A".
- 13.9 Air quality monitoring shall be in accordance with the canister method (USEPA TO-14/15) .
- 13.10 Noise monitoring shall be undertaken by the *Owner* at the *Site* in accordance with Item 28 on Schedule "A" including any noise monitoring in response to noise complaints.
- 13.11 No alterations to the groundwater, air quality, noise or surface water monitoring programs shall be implemented prior to receiving written approval from the *District Manager* . The *Owner* shall give all requests to the Township of Warwick, the *WPLC* and *WIFN* at the same time or prior to the time that such request is made to the *District Manager* .

14.0 CONTINGENCY PLANS AND TRIGGER MECHANISMS

Hydraulic Containment

- 14.1 If the leachate level elevation in any of the pumping stations wells listed below rise above their respective trigger level, the *Owner* shall take additional groundwater levels within four (4) weeks as detailed in Figure 2 of Item 39 and Appendix H of Item 68 of Schedule "A".

Monitoring location Trigger Leachate Elevation (mASL)

PS1 232.7

PS3 232.6

PS5 232.8

The assessment process for leachate levels is detailed in Figure 2 of Appendix H of Item 68 on Schedule "A".

Groundwater Quality

- 14.2 The trigger concentration for groundwater quality shall be 80% of the Guideline B-7 values for parameters that have an Ontario Drinking Water Quality Standards value.
- 14.3 Groundwater chemical concentrations must be assessed with the trigger concentrations within six (6) weeks of sample collection.
- 14.4 The assessment process for groundwater quality is detailed in Figure 3 of Item 39 and Appendix H of of Item 68 of Schedule "A".

Surface Water Quality

- 14.5 The trigger mechanisms for surface water quality shall be one of the following:
- a. Where off *Site* surface water quality satisfies the *Ministry* 's *PWQO* , the respective *PWQO* shall be used as a trigger concentration; or
 - b. Where the background surface water quality naturally exceeds the *PWQO* , the background concentration should be considered in evaluating and updating the trigger concentration.
- 14.6 Surface water quality results will be assessed in accordance with the requirements established under the Industrial Sewage Works component of the *EPA* approval for the *Site*.
- 14.7 The assessment process for surface water quality is detailed in Figure 4 of Appendix H of Item 68 in Schedule "A ".

Landfill Gas

- 14.8 If landfill gas concentrations exceed 10% LEL, the *Owner* shall undertake additional monitoring, assess the source and pathway of methane to determine if the elevated concentrations are landfill related.
- 14.9 If the elevated concentrations are landfill related, the *Owner* shall undertake contingency measures.

General Contingency Measures

- 14.10 In the event a result of a monitoring test exceeds the trigger mechanisms detailed above, the

Owner shall:

- a. notify the District Manager, the *WPLC* , *WIFN* and the Township of Warwick of any trigger level exceedances within twenty four (24) hours of receipt of the results;
- b. conduct an investigation into the cause of the adverse result and submit a report to the *District Manager* that includes an assessment of whether contingency measures need to be carried out;
- c. if contingency measures are needed, submit detailed plans, specifications and descriptions for the design, operation and maintenance of the contingency measures, and a schedule as to when these measures will be implemented, to the *Director* and notify *District Manager* ; and
- d. implement the required contingency measures upon approval by the *Director* .

15.0 REPORTING

Semi Annual Volume Determination

- 15.1 The *Owner* shall undertake semi-annual air space surveys of the bottom and top waste contours to determine the estimated air space used for waste disposal in the prior six months. The air space survey shall include daily cover material and shall take into account settlement. The first air space survey shall be undertaken by no later than February 2012 with an air space survey being completed semi-annually after the completion of the first air space survey, until landfill *Site* closure.
- 15.2 Wastes which the *Owner* has been ordered to dispose of at the *Site* by any ministry, department or agency of the federal or Provincial Crown shall be excluded from the air space survey calculations.
- 15.3 Each air space survey shall be conducted by an Ontario Land Surveyor or other qualified consultant and such air space survey shall be provided to the *District Manager* . The *Owner* shall keep a copy of each air space survey on-*Site* and make them available to *MOE* personnel upon request.

Quarterly Monitoring Reports

- 15.4 The *Owner* shall submit quarterly monitoring reports to the Township of Warwick, *WIFN* , *District Manager* and the *WPLC* within sixty (60) days of the end of the calendar quarterly reporting period starting **September 30, 2012**.
- 15.5 Each report will include the following:
 - a. a summary of monitoring activities and results;
 - b. a summary of any exceedances and related operator responses;
 - c. any complaints received and operator response;

- d. a summary of mitigation activities for noise, dust, litter, air quality or other taken during the quarter in accordance with the Best Management Practices;
- e. any proposed improvements to monitoring or operating procedures; and
- f. any implemented improvements to monitoring or operating procedures that have been identified to address or reduce impacts.

Annual Report

- 15.6 A written report on the development, operation and monitoring of the *Site* , shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *Regional Director* , the *District Manager*, the Township of Warwick, *WIFN* , and the *WPLC* , by **March 31st** of each year, and shall cover the 12 month period preceding December 31st.
- 15.7 The Annual Report shall include the following:
- a. the results and an interpretive analysis of the results of all leachate, groundwater, surface water and landfill gas monitoring, including an assessment of the need to amend the monitoring programs;
 - b. 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;
 - c. an assessment of the effectiveness of the *Poplar Plantation* and the *Poplar System* for leachate;
 - d. an assessment of the effectiveness of the on *Site* leachate treatment facility;
 - e. *Site* plans showing the existing contours of the *Site*;
 - f. areas of landfilling operation during the reporting period;
 - g. areas of intended operation during the next reporting period;
 - h. areas of excavation during the reporting period;
 - i. the progress of final cover, vegetative cover, and any intermediate cover application;
 - j. previously existing site facilities;
 - k. facilities installed during the reporting period;
 - l. *Site* preparations and facilities planned for installation during the next reporting period;
 - m. 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;
 - n. a calculation of the remaining capacity of the *Site* , an estimate of the remaining *Site* life and a comparison of actual capacity used to approved *Site* capacity;
 - o. a summary of the quantity of any leachate or pre-treated leachate removed from the *Site* or leachate treated and discharged from the *Site* ;
 - p. a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the *Site* ;
 - q. a summary of any complaints received and the responses made;
 - r. a discussion of any operational problems encountered at the *Site* and corrective action taken;

- s. an update summary of the amount of financial assurance which has been provided to the *Director* ;
- t. a report on the status of all monitoring wells and a statement as to compliance with Ontario Regulation 903;
- u. any other information with respect to the site which the *District Manager* or *Regional Director* may require from time to time;
- v. a statement of compliance with all conditions of this *ECA* and other relevant *Ministry* requirements, guidelines and regulations;
- w. summary of inspections undertaken at the *Site* ;
- x. a summary of recycling, processing and composting efforts undertaken including the amount of recyclable received, amount of processed material and composted material each year;
- y. any changes in operations, equipment or procedures employed at the *Site* ; and
- z. recommendations regarding any proposed changes in operations of the *Site* .

16.0 SITE CLOSURE

Closure Plan

- 16.1 At least two (2) years prior to closure or when 90% of the site capacity is reached, whichever comes first, the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager* , the Township of Warwick, *WIFN* and the *WPLC* , 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:
- a. a plan showing *Site* appearance after closure;
 - b. a description of the proposed end use of the *Site* ;
 - c. a description of the procedures for closure of the *Site*, including:
 - 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; and
 - vi) final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
 - d. a schedule indicating the time-period for implementing sub-conditions i) to vi) above.
 - e. descriptions of the procedures for post-closure care of the *Site* , including:

- i.) operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
 - ii) record keeping and reporting; and
 - iii) complaint contact and response procedures;
- f. an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas;
- g. an updated estimate of the *contaminating life span* of the *Site* , based on the results of the monitoring programs to date; and
- h. an update of the cost estimates for financial assurance and the amount which has been provided to the *Director* to date.

16.2 The *Site* shall be closed in accordance with the closure plan as approved by the *Director*.

End Use

16.3 The *Owner* shall consult with affected stakeholders on the proposed end uses as committed to in Item 35 of Schedule "A" prior to the submission of its closure report under the *EPA* . The proposed end use activities should be consistent with the types of activities consulted upon during the *EA* .

Closure of the Site

16.4 Upon closure of the *Site* , the following features will be inspected, recorded on a quarterly basis and maintained as required on a seasonal basis :

- a. evidence of settlement;
- b. possible leachate seeps and springs;
- c. cover soil integrity;
- d. vegetative cover;
- e. surface water drainage works;
- f. erosion and sediment in surface water drainage system; and
- g. groundwater monitoring wells.

16.5 A vegetative cover consisting of vegetation that is suited to local conditions and that is capable with minimal care of providing vigorous, plentiful cover no later than its 3rd growing season shall be established over all completed areas to control erosion and maximize evapotranspiration. The *Owner* shall complete planting as soon as possible after reaching final contours.

16.6 If weather conditions do not allow timely placement of final and vegetative cover, silt curtains shall be employed to minimize silt loadings to surface water bodies.

SCHEDULE "A"

1. Document entitled "*Environmental Assessment Act Section 9 Notice of Approval to Proceed with the Undertaking*" , Re: An Environmental Assessment for Warwick Landfill Expansion, Waste Management of Canada Corporation, EA File Number: EA-02-08-02-03, dated January 15, 2007.
2. Application for a Provisional Certificate of Approval for the Warwick Landfill, dated March 27, 2006.
3. Document entitled "Development and Operations Plans Warwick Landfill Expansion Volume 1 of 2" dated March 2006 prepared by Henderson, Paddon and Associates Limited.
4. Document entitled "Development and Operations Plans Warwick Landfill Expansion Volume 2 of 2" dated March 2006 prepared by Henderson, Paddon and Associates Limited.
5. Document entitled "Assessment of Geotechnical Design Requirements New Landfill Facility Warwick, Ontario" prepared by Alston Associates Inc., dated July 31, 2006.
6. Document entitled "2006 Poplar System Monitoring Report Warwick Landfill Site Township of Warwick Ontario" prepared by Jagger Hims Limited, dated January 2007.
7. Document entitled "Warwick Landfill Expansion Contaminating Lifespan Review" prepared by Jagger Hims Limited, dated March 2006.
8. Drawing No. 105716-111 entitled " Proposed Final Contours and Stormwater Management Plan" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
9. Drawing No. 105716-112 entitled " Landfill Bottom Contours (Top of Primary Gravel)" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
10. Drawing No. 105716-113 entitled "Landfill Perimeter Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
11. Drawing No. 105716-114 entitled " Landfill Perimeter Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
12. Drawing No. 105716-115 entitled "Leachate Collection Sump Details" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
13. Drawing No. 105716-116 entitled "Proposed Primary Leachate Collection System" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
14. Drawing No. 105716-117 entitled "Proposed Secondary Leachate Collection System" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.

15. Drawing No. 105716-118 entitled "Landfill Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
16. Drawing No. 105716-119 entitled "Landfill Perimeter Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
17. Drawing No. 105716-120 entitled " Landfill Perimeter Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
18. Drawing No. 105716-125 entitled "Details and Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
19. Letter dated April 16, 2007 from Frank Ford, Henderson Paddon and Associated Limited to Wilf Ruland, Citizens Environmental Consulting.
20. Letter dated May 2, 2007 from Frank Ford, Henderson Paddon and Associated Limited to Wilf Ruland, Citizens Environmental Consulting.
21. Letter dated June 1, 2007 from Greg Washuta, P. Eng., M. Eng., Senior Waste Engineer, Ministry of the Environment to Reid Cleland, Waste Management of Canada Corporation.
22. Drawing No. 106716-127A entitled "Plough Furrow Surface Water Distribution Warwick Landfill" prepared by Henderson Paddon and Associates Limited, dated March 21, 2007.
23. Drawing No. 106716-F215 entitled "Proposed Mini-Transfer Area" prepared by Henderson Paddon and Associates Limited, dated March 29, 2007.
24. Report entitled "*Best Management Practices Plan (Dust) Warwick Landfill Watford, Ontario* " prepared by RWDI Air Inc., dated December 11, 2007.
25. Report entitled "*Best Management Practices Plan (Litter) Warwick Landfill Watford, Ontario* " prepared by RWDI Air Inc., dated December 11, 2007.
26. Report entitled "*Best Management Practices Plan (Odour) Warwick Landfill Watford, Ontario* " prepared by RWDI Air Inc., dated December 11, 2007.
27. Document entitled "*Appendix F Air Quality Monitoring Plan and Letter*", prepared by RWDI, dated November 29, 2007.
28. Document entitled "*Environmental Noise Monitoring Program for the Warwick Landfill*" , prepared by Aeroustics Engineering Limited, dated November 21, 2007.
29. Document entitled "*Proposed Expansion of WM Warwick Landfill Predicted Noise Impact*" , prepared by Aeroustics Engineering Limited, dated June 15, 2007.

30. Document entitled "*Application for Approval of ECA of Approval A032203 Warwick Township County of Lambton MOE. Reference No. 0539-6N7TRY Part 1 of 2*" , dated July 13, 2007, prepared by Henderson Paddon and Associates Limited.
31. Document entitled "*Application for Approval of ECA of Approval A032203 Warwick Township County of Lambton MOE. Reference No. 0539-6N7TRY Part 2 of 2- Financial Assurances*" , dated August 22, 2007, prepared by Henderson Paddon and Associates Limited.
32. Letter dated July 27, 2007 from Dan Toner, Assistant Director, Laboratory Services Branch to Tesfaye Gebrezghi, Supervisor- Waste Unit, MOE.
33. Table 6.1 entitled "Phasing-Analysis for Leachate Quantities WM- Warwick Landfill Expansion" prepared by Henderson Paddon and Associates Ltd., dated August 17, 2007.
34. Letter dated August 20, 2007 from John DeYoe, RWDI to Frank Ford, Henderson Paddon and Associates Limited.
35. Discussion Paper 9 entitled "Impact Management Plan" and all Appendices dated October 2005 prepared by Waste Management of Canada Corporation.
36. Letter Report and attachments dated May 10, 2001 from Frank C. Ford of Henderson, Paddon Environmental to Mark Turner, Environmental Assessment and Approvals Branch.
37. Development and Operations Report - Canadian Waste Services Inc. - Warwick Landfill, Warwick Township - Revised, dated October 1997, prepared by Henderson Paddon Environmental Inc.
38. Consolidated Report Leachate Management Plan - Canadian Waste Services Inc. - Warwick Landfill - Warwick Township dated July 2001 prepared by Henderson Paddon Environmental Inc.
39. Environmental Monitoring Plan - Warwick Landfill - Township of Warwick, Ontario dated December 2007, prepared by Jagger Hims Limited.
40. Letter dated October 11, 2007 from Brad Bergeron, RWDI to Greg Washuta, Senior Waste Engineer, Ministry of the Environment.
41. Report entitled "*Stormwater Management Plan Poplar Irrigation Area Warwick Landfill Expansion Watford, Ontario*" dated December 2007, prepared by Henderson Paddon Environmental Inc.
42. Letter dated November 21, 2007 from Kevin Smith, Aercoustics Engineering Limited to Wayne Jenken, Waste Management of Canada Corporation.

43. E-mail and attachments dated February 12, 2008 from Brad Bergeron, RWDI Air Inc. to Greg Washuta, Senior Waste Engineer, EAAB, MOE.
44. E-mail and attachments dated January 29, 2008 from Brad Bergeron RWDI Air Inc. to Greg Washuta, Senior Waste Engineer, EAAB, MOE.
45. Letter dated March 3, 2008 from Wayne Jenken, Landfill Engineer, WMCC to Ian Parrott, Manager, ECA of Approval Review Section, EAAB, MOE.
46. Letter dated June 13, 2008 from Frank Ford, Senior Environmental Engineer, Henderson Paddon and Associates Limited to Greg Washuta, P. Eng., Senior Waste Engineer, Waste Unit, EAAB, MOE.
47. Application for a Provisional Certificate of Approval for a Waste Disposal Site for the Twin Creeks Landfill Site, signed and dated December 11, 2008.
48. Letter dated December 11, 2008 from Reid Cleland, District Landfill Manager, WMCC to Doris Dumais, Approvals Director, EAAB, MOE.
49. Report entitled "Cell 12 Project and Changes Affecting The Warwick Landfill Expansion" and attached appendices, created by Henderson Paddon & Associates Limited, dated August 2008.
50. Application for a Provisional Certificate of Approval for a Waste Disposal Site for the Twin Creeks Landfill Site, dated August 11, 2008.
51. Letter dated December 18, 2008 from Greg Washuta, Senior Waste Engineer, Waste Unit, EAAB, MOE to Reid Cleland, District Landfill Manager, WMCC.
52. Letter dated December 18, 2008 from Wayne Jenken, Landfill Engineer, WMCC to Greg Washuta, Senior Waste Engineer, Waste Unit, EAAB, MOE.
53. Letter dated December 18, 2008 from Jason Balsdon and Brent Langille, Jagger Hims Limited to Wayne Jenken, Landfill Engineer, WMCC.
54. Application for a Provisional Certificate of Approval for a Waste Disposal Site for Waste Management of Canada Corporation's Twin Creeks Landfill Site, signed and dated January 16, 2009.
55. Report and Appendix A entitled "Waste Management of Canada Corporation Twin Creeks Landfill Use of Geonet for Secondary Drainage Layer" prepared by Henderson Paddon and Associates, dated January 2009.
56. Letter dated March 18, 2009 from Greg Washuta Senior Waste Engineer, Waste Unit, EAAB, MOE to Reid Cleland, Landfill Manager, WMCC.
57. Letter report and appendices A, B and C dated April 9, 2009 from Jeff Armstrong, Genivar Consultants LP to Greg Washuta, Senior Waste Engineer, Waste Unit, EAAB, MOE.

58. Application for a Waste Disposal Site Certificate of Approval dated April 28, 2009 and signed by Reid Cleland, District Manager, Waste Management of Canada Corporation.
59. Report produced by Genivar Consultants LP entitled "Development & Operations Report for a Waste Transfer Station Application" dated June 2009.
60. November 24, 2009 e-mail from Jeff Armstrong of Genivar Consultants LP to Jim Chisholm, Senior Review Engineer with the Ministry of Environment indicating that the application is for an existing mini transfer area but flexibility is being applied for to direct the waste collected at this area to alternate waste disposal sites.
61. November 24, 2009 e-mail from Jim Chisholm, Senior Review Engineer with the Ministry of Environment to Jeff Armstrong, Genivar Consultants LP, requesting information about how the *Mini-Transfer Area* already located at the landfill is covered by the existing Certificate of Approval and the December 21, 2009 e-mail response from Jeff Armstrong to Jim Chisholm to his November 24, 2009 e-mail, outlining that the *Mini-Transfer Area* is covered by the 1997 Design and Operation Report that is identified in Item 37 and attached page 7-4 of the report in which Section 7.8 dealt with the Mini-Transfer Area.
62. January 24, 2011, 12:11PM, e-mail from Wayne Jenken, Area Landfill Engineer, Waste Management of Canada Corporation to Jim Chisholm, Senior Review Engineer with the Ministry of Environment indicating that the original Mini Transfer Area moved to the new location on November 2009 and that the old location for the Mini Transfer Area has been removed. The e-mail also made suggested changes to a draft of the Notice.
63. Document entitled "Twin Creeks Landfill - Expansion of Poplar Cap Irrigation System for Existing Waste Disposal Area January 2010" prepared for Waste Management of Canada Corporation by Genivar Consultants LP dated January 2010.
64. Letter dated November 2, 2010 addressed to Mr. Reid Cleland, Waste Management of Canada Corporation from Mr. Greg Washuta, Ministry of the Environment providing comments and requesting additional information on MOE Reference File No. 1486-829MCN.
65. Document entitled "Twin Creeks Landfill, Watford, ON 091-13089-00 (91730R) - Application for Approval for Expansion of Poplar Plantation (South Fill Area) - Response to MOE Comments Letter dated November 2, 2010" prepared for Waste Management of Canada Corporation by Genivar Consultants LP dated December 2, 2010.
66. Report entitled "Development and Operations Plan - Warwick Landfill Expansion - Volume 1 of 3" prepared for WMCC by Henderson Paddon & Associates dated March 2008.
67. Report entitled "Development and Operations Plan - Warwick Landfill Expansion - Volume 2 of 3" prepared for WMCC by Henderson Paddon & Associates dated March 2008.

68. Report entitled "Development and Operations Plan - Warwick Landfill Expansion - Monitoring Plans - Volume 3 of 3" prepared for WMCC by Henderson Paddon & Associates dated March 2008.
69. Letter dated May 6, 2009 addressed to Mr. Reid Cleland, WMCC from Mr. Greg Washuta, Ministry of the Environment providing ministry review comments on the Development and Operations Plan
70. Letter dated August 19, 2009 addressed to Mr. Reid Cleland, WMCC from Mr. Greg Washuta, Ministry of the Environment providing comments from the Township of Warwick, Walpole Island First Nation and the Warwick Public Liaison Committee on the Development and Operations Plan
71. Letter dated November 12, 2009 addressed to Mr. Greg Washuta, Ministry of the Environment from Mr. Wayne Jenken, WMCC.
72. Drawing set entitled "Twin Creeks Landfill - Landscaping and Signage Detail Construction Drawings" prepared by Schollen & Company Inc. and dated July 4, 2008. The drawing set consists of the following:
- i. Cover page entitled "Twin Creeks Landfill - Landscaping and Signage Detail Construction Drawings" prepared by Schollen & Company Inc. and dated July 4, 2008;
 - ii. Drawing No. L-1 entitled "Landscape Plan - Screening Berm";
 - iii. Drawing No. L-1A entitled "Landscape Detail at Intersections - Screening Berm";
 - iv. Drawing No. L-2 entitled "Landscape Plan - Screening Berm";
 - v. Drawing No. L-3 entitled "Landscape Plan - Screening Berm & Area F";
 - vi. Drawing No. L-4 entitled "Landscape Plan - Screening Berm";
 - vii. Drawing No. L-5 entitled "Landscape Plan - Screening Berm and Area G (North)";
 - viii. Drawing No. L-6 entitled "Landscape Plan - Screen Planting Area G (South)";
 - viii. Drawing No. L-7 entitled "Landscape Plan - Screen Planting and Creek Area A and Area B";
 - ix. Drawing No. L-8 entitled "Landscape Plan - Screen Planting Areas C, D and E";
 - x. Drawing No. L-9 entitled "Landscape Plan - Restoration Planting Area H";
 - xi. Drawing No. LD-1 entitled "Landscape Detail Plan";
 - xii. Drawing No. LD-2 entitled "Landscape Notes and Master Plant List"; and
 - xiii. Drawing No. LD-3 entitled "Signage Details";
73. Application for a Certificate of Approval for a Waste Disposal Site dated April 6, 2011 submitted by Waste Management of Canada Corporation for Provisional Certificate of Approval No. A032203 requesting approval for use of an alternative daily cover material and amended Best Management Practices for Odour.. The supporting documentation for the application included the following:
- i. Cover letter dated April 7, 2011 addressed to Mr. Tes Gebrezghi, Ministry of the Environment from Mr. Reid Cleland, Waste Management of Canada Corporation;
 - ii. Report entitled "Best Management Practices Plan (Odour) Warwick Landfill" prepared for Waste Management of Canada Corporation by RWDI Air Inc. (Project No. 1100800) dated April 7, 2011;
 - iii. Letter dated March 24, 2011 addressed to Mr. Wayne Jenken, Waste Management of

- Canada Corporation from Mr. Peter Pickfield, Garrod Pickfield; and
- iv. Email dated March 22, 2011 at 3:32 p.m. sent to Mr. Peter Pickfield, Garrod Pickfield from Mr. Wayne Jenken.

SCHEDULE ``B`` : FINANCIAL ASSURANCE

Source: Ontario Regulation 232/98 as amended from time to time

Closure & Post Closure Care

$$A=B \times (C/D)$$

Where,

- A = the minimum amount of financial assurance that must be provided;
- B = the total amount of financial assurance expressed as the present value at the estimated date of closure, in dollars current at that date, of an amount sufficient to cover the estimated costs for: The planned closure of the largest area that will require final cover at any one time during the operation of the Site, including the costs of final cover and landscaping; Care and maintenance of the final cover and landscaping for the contaminating lifespan of the Site;
- C = the amount of waste that has already been deposited at the Site; and
- D = the total amount of waste that will be deposited at the Site pursuant to the conditions in this ECA of Approval.

CONTINGENCY PLANS

$$F= \$0.50 \times W \times (I2/I1)$$

Where,

- F = the total amount of the financial assurance;
- W = the number of tones of waste that have been deposited in the landfilling Site at the time the amount of financial assurance is calculated including waste that has been deposited at the site prior to this approval and waste that has been deposited after this approval has been issued.
- I1 = the 1997 Annual Average Non-Residential Building Construction Price Index for Toronto, determined with reference to the same base year as is applicable to I2, as published by Statistics Canada under the authority of the *Statistics Act* (Canada); and
- I2 = the most recent Annual Average Non-Residential Building Construction Price Index for Toronto available at the time the amount of the financial assurance is calculated, as published by Statistics Canada under the authority of the *Statistics Act* (Canada).

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

- 1. The reason for inclusion of the definitions is to define the specific meaning of terms and simplify the wording of conditions in this ECA of Approval.*
- 2. The reason for Conditions 1.1 and 1.2 is to ensure that the Site is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.*
- 3. The reason for Conditions 1.3, 1.4, 1.5, 1.9, 1.10, 1.11, 1.12 and 1.13 is to clarify the legal rights and responsibilities of the Owner under this ECA of Approval.*
- 4. Conditions 1.6 and 1.7 are included to ensure that the appropriate Ministry staff have ready access to information and the operations of the Site, which are approved under this ECA.*
- 5. Condition 1.8 has been included in order to clarify what information may be subject to the Freedom of Information Act.*
- 6. Conditions 1.14 to 1.16 inclusive are included, pursuant to subsection 197(1) of the EPA, to provide that any persons having an interest in the Site are aware that the land has been approved and used for the purposes of waste disposal.*
- 7. The reasons for Condition 1.17 are to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this ECA of Approval.*
- 8. The reasons for Conditions 1.18 and 1.19 are to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the Director is informed of any changes.*
- 9. The reason for Condition 1.20 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this ECA of Approval. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.*
- 10. The reasons for Conditions 2.1 to 2.11 inclusive are to ensure that sufficient funds are available to the Ministry to close the landfill, and to carry out all expected post-closure care activities and any contingencies. Failure to include requirements for financial assurance would not be in the public interest and may result in a hazard or nuisance to the natural environment or any person.*
- 11. Conditions 3.1 to 3.15 inclusive are necessary in order to establish a forum for the exchange of information and public dialogue on activities to be carried out at the landfill site. Open communication with the public and local authorities is important in helping to maintain high*

standards for site operation and environmental protection.

12. *Condition 3.16 has been included in order to ensure that consultation with First Nations is undertaken during the submission of any application to amend any approval required by the Ministry.*
13. *The reason for Conditions 4.1 to 4.6 inclusive, 4.8, and 4.9 is to ensure that the Site is designed, constructed and operated in an environmentally acceptable manner, based on the conceptual design and operations for the Site.*
14. *The reason for Condition 4.7 is to ensure the availability of as-built drawings for inspection and information purposes.*
15. *Condition 4.10 has been specifically included to allow for optimization of design for subsequent stages based on operating experience and monitoring results and to ensure that any necessary remedial action is undertaken before landfilling may proceed in the next stage.*
16. *Condition 4.11 has been included to ensure that the site has been constructed in accordance with the approved design plans, specifications and QA/QC procedures and to ensure that there is not an adverse impact on the environment.*
17. *The reason for Condition 4.12 are to ensure that there is a person, reporting directly to the Ministry, with associated costs reimbursed by the Owner, who is responsible for inspecting the Site, based on the requirements in this ECA of Approval to ensure that the Site is operated in an environmentally acceptable manner.*
18. *The reasons for Conditions 4.13, 4.14, 15.1, 15.2 and 15.3 is to specify the amount of days the environmental inspector is required to be on site based on the conditions in this approval and in accordance with the previously approved EA for the site.*
19. *In order to ensure safe side slopes of the berm, condition 5.1 has been added.*
20. *The reason for Condition 5.2 is to approve the diversion area based on the information submitted. This is ensure the protection of the environment and the public.*
21. *The reason for Condition 5.3 is to approve the use of Cell 12 for contaminated soil.*
22. *The reason for 5.4 is to ensure the Owner carries out the landscape plan based on the submitted information.*
23. *Conditions 6.1 and 6.18 are included in order to ensure that waste disposal at the site is undertaken in accordance with applicable Ministry of the Environment regulations and guidelines. Compliance with these regulations and guidelines will ensure that the site does not cause and adverse effect on the environment.*

24. *The reason for Conditions 6.4 and 6.7 is to specify the approved areas from which waste may be accepted at the Site and the types and amounts of waste that may be accepted for disposal at the Site, based on the Owner's application and supporting documentation.*
25. *The reason for Condition 6.5 is to specify restrictions on the extent of landfilling at this Site based on the Owner's application and supporting documentation. These limits define the approved volumetric capacity of the site. Approval to landfill beyond these limits would require an application with supporting documentation submitted to the Director.*
26. *Condition 6.6 specifies the maximum amount of waste that may be received at the site based on the previously approved Environmental Assessment for the site.*
27. *Condition 6.8 has been inserted to minimize the potential for clogging of the drainage layer and to minimize temperature effects on the leachate collection system. Failure to maintain the specified minimum thickness of waste and cover material may result in a decrease in the service life of the drainage layer.*
28. *Conditions 6.9 to 6.14 inclusive have been included in order to ensure asbestos waste is handled and disposed of in accordance with O. Reg. 347 as amended from time to time. Proper handling and disposal of asbestos waste ensures that the asbestos waste does not cause an adverse impact on the environment and also does not affect human health.*
29. *Condition 6.16 is needed to make certain that uses at the site are for waste disposal purposes only and not any other uses which may cause an adverse impact on the environment and human health.*
30. *Condition 6.17 is necessary in order to ensure that all waste loads are inspected and waste that is disposed of at the site is in accordance with the terms and conditions in this ECA of Approval.*
31. *The reason for Condition 6.19 is that open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance affects, and the potential fire hazard.*
32. *The reason for Conditions 6.20 through 6.22 inclusive is to ensure that users of the Site are fully aware of important information and restrictions related to Site operations under this ECA of Approval.*
33. *The reasons for Conditions 6.23 to 6.27 inclusive are to specify the normal hours of operation for the landfill Site and a mechanism for amendment of the hours of operation.*
34. *The reasons for Conditions 6.28 to 6.30 inclusive are to specify site access to/from the Site and to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.*

35. *Condition 6.31 is needed in order to make certain that the waste received at the site is in accordance with the ECA and O. Reg. 347.*
36. *The reason condition 6.32 has been included is to ensure that access roads are clear and do not pose a safety hazard to the general public.*
37. *The reasons for Condition 6.34 are the protection of public health and safety and minimization of the potential for damage to environmental control, monitoring and other works at the landfill Site. Scavenging is the uncontrolled removal of material from waste at a landfill site.*
38. *The reasons for Conditions 6.34 to 6.40 inclusive are to ensure that the Site is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.*
39. *The reason for Condition 6.41 is to ensure that noise from or related to the operation of the landfill is kept to within Ministry limits and does not result in a hazard or nuisance to any person.*
40. *The reason conditions 6.42 are included are to ensure that noise monitoring is undertaken in accordance with the noise monitoring program prepared and to ensure that an independent acoustic audit is completed in accordance with the Ministry's requirements.*
41. *The reason for condition 6.43 is to clarify when the Best Management Plans can be amended and the mechanism for amending the Best Management Plans.*
42. *The reason for Condition 6.44 is to ensure that appropriate measures are taken in order to prevent surface water from contacting waste so as not to cause an adverse effect on the environment.*
43. *The reason for Conditions 6.45 and 7.18 is to specify other approvals required for works and activities related to the operation of this Site as a landfill.*
44. *The reason Condition 6.46 has been included is in order to prevent ponding in on site ditches and any adverse impact on the environment and human health.*
45. *The reason for Condition 6.47 is to ensure that landfilling operations are conducted in an environmentally acceptable manner. Daily and intermediate cover is used to control potential nuisance effects, to facilitate vehicle access on the site, and to ensure an acceptable site appearance is maintained. The proper closure of a landfill site requires the application of a final cover which is aesthetically pleasing, controls infiltration, and is suitable for the end use planned for the site.*
46. *The reason for Condition 6.48 to 6.61 inclusive is to specify the approval requirements for use of alternative cover material at the Site.*

47. *Condition 7.1 is necessary so that runoff from contaminated soils does not create and adverse impact on the environment.*
48. *Conditions 7.2 and 7.3 are included in order to ensure that the composting and processing operations at the site are conducted in a fashion in accordance with Ministry's regulations, guidelines and so as not to pose a threat to human health or the environment.*
49. *The reasons for Conditions 7.4, 9.3, 9.4, 9.5, 9.6 and 9.7 are to provide for the proper assessment of effectiveness and efficiency of site design and operation, their effect or relationship to any nuisance or environmental impacts, and the occurrence of any public complaints or concerns. Record keeping is necessary to determine compliance with this ECA of Approval, the EPA and its regulations.*
50. *The reasons conditions 7.5 and 7.6 inclusive have been included are to ensure tire shred storage in accordance with the Fire Protection and Prevention Act and to protect the natural environment.*
51. *The reason for Condition 7.7 is to ensure that backup power is available so that all facilities remain operational during a power disruption thus preventing any adverse impacts on the environment.*
52. *Condition 7.8 has been inserted in order to ensure that concentrations of landfill gas do not pose a hazard to human health or the environment.*
53. *The reason for Condition 7.9 is to ensure that landfill gas is built and managed in accordance with the Ministry's requirement and regulation.*
54. *Condition 7.10 is needed in order to ensure that an adequate landfill gas management system is installed at the site in order to protect human health and the environment.*
55. *The reasons for Conditions 7.11 and 7.12 are to minimize the potential for clogging of leachate collection pipes and to ensure effective operation of the leachate collection system components for as long as they are required. Failure to clean out these components on a regular basis may result in a decrease in their service lives. Regular cleaning of the leachate collection pipes is especially important during stages of landfilling when the level of both organic and inorganic constituents in the leachate is high and, consequently, the potential for clogging due to encrustation is greatest. As the landfill reaches the more stable methane producing stage, pipe cleaning may be required less frequently.*
56. *Condition 7.13 has been added to ensure adequate flow of leachate in the leachate collection pipes.*
57. *Conditions 7.14 to 7.17 are to ensure that the leachate collection system is designed and built in accordance with Regulations and the ministry's requirements.*
58. *The reason condition 7.18 is included is in order to prevent off site migration of leachate*

which may cause an adverse effect on the environment.

59. *Conditions 8.1 to 8.4 inclusive are needed to ensure leachate recirculation is undertaken in accordance with the ministry's requirements and leachate recirculation does not pose an adverse impact on the environment.*
60. *Condition 8.5 is in accordance with EA condition 22 and protects the natural environment from any impacts due to discharge of raw or treated leachate to adjacent creeks.*
61. *The reason for condition 8.6 is to ensure that a fully functional leachate treatment system is in place on site prior to waste placement.*
62. *Condition 8.7 clarifies the responsibilities of the owner, the requirements of the ministry, the authority of the Ministry and protects the natural environment and human health.*
63. *Conditions 9.1 and 9.2 are needed to ensure regular inspections of the site are conducted in order to protect the natural environment.*
64. *The reason for Conditions 9.8 to 9.12 inclusive is to ensure that accurate waste records are maintained to ensure compliance with the conditions in this ECA of Approval (such as fill rate, site capacity, record keeping, annual reporting, and financial assurance requirements), the EPA and its regulations.*
65. *The reasons for Conditions 9.13, 15.4, 15.5 and 15.6 are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.*
66. *The reason for Condition 10.1 is to ensure that the Site is supervised and operated by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.*
67. *The reason for Conditions 11.1, 11.2 and 11.3 is to establish a forum for the exchange of information and public dialogue on activities carried out at the landfill Site. Open communication with the public and local authorities is important in helping to maintain high standards for site operation and environmental protection.*
68. *The reasons for Conditions 12.1 and 12.2 are to ensure that the Ministry is informed of any spills or fires at the Site and to provide public health and safety and environmental protection.*
69. *Condition 12.3 is contained in the ECA to guarantee that appropriate measures are taken by the County to prevent future occurrences of spills or fires at the site and to protect public health and safety and the environment.*

70. *The reasons for Conditions 13.1 to 13.5 inclusive are to ensure protection of the natural environment and the integrity of the groundwater monitoring network.*
71. *The reason for Conditions 13.6 through 13.11 inclusive is to demonstrate that the landfill site is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.*
72. *The reason for Conditions 14.1 through 14.10 inclusive is to ensure that the Owner follows a plan with an organized set of procedures for identifying and responding to unexpected but possible problems at the Site. A remedial action / contingency plan is necessary to ensure protection of the natural environment. A leachate contingency plan is a specific requirement of Reg. 232.*
73. *The reasons for Conditions 16.1 and 16.2 are to ensure that final closure of the Site is completed in an aesthetically pleasing manner and to ensure the long-term protection of the natural environment.*
74. *Condition 16.3 has been inserted in order to ensure proper public consultation about the end use of the Site is undertaken and that the end use activities are consistent with those identified during the EA process.*
75. *Conditions 16.4 to 16.6 inclusive are contained in order to ensure that certain activities are undertaken upon closure of the site in order to ensure that the closed site does not affect the natural environment.*

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A032203 issued on February 13, 2008

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

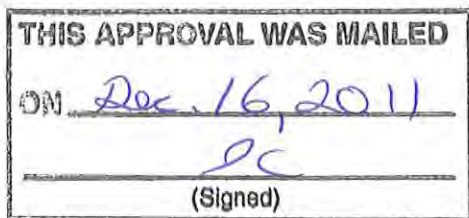
AND

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

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

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

DATED AT TORONTO this 13th day of December, 2011




Tesfaye Gebrezghi, P.Eng.

Director

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

DG/

c: District Manager, MOE Sarnia

Dwayne Reid, MOE Sarnia District Office
Dan Gaudenzi, District Engineer, MOE, Sarnia District
Bruce Harman, MOE, Technical Support, Southwestern Region
Hugh Geurts, MOE, Technical Support, Southwestern Region
Dr. Gerald Diamond, MOE, Technical Support, Southwestern Region
Jason Balsdon, GENIVAR Inc.
Wayne Jenken, Landfill Engineer, WMCC
Frank Ford, P.Eng., GENIVAR Inc.
Reid Cleland, WMCC 
Bill Day, Day and Day Chartered Accountants
Don Bruder, CAO, Township of Warwick
Peter Pickfield, Garrod Pickfield
Wilf Ruland, Citizens Consulting
Cherly Moons- WPLC
Walpole Island First Nation
Neegan Burnside

APPENDIX A2:

Amendment to ECA [No. A032203] - Notice No. 1, dated February 29, 2012



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 1

Issue Date: February 29, 2012

Waste Management of Canada Corporation
8039 Zion Line
Warwick, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares. , as follows:

Condition 8.6 is hereby amended as follows:

- 8.6 (1) (a) Within five (5) years of placement of the first tonne of waste in the expanded portion of the landfill *Site* , the *Owner* shall ensure that a leachate treatment system is installed and operational at the *Site* .
- (b) Leachate from the *Site* not sent to the operational drip irrigation area(s) approved under Condition 8.7 shall be disposed of off-*Site* at a location approved by the *District Manager* until the leachate treatment system required by Condition 8.6 (1)(a) is approved and operational. .
- (c) Any waste from the leachate treatment system that is to be disposed of in the landfill must be classified as a solid non-hazardous waste.
- (2) As part of the financial assurance calculation in Section 2.0, the *Owner* shall provide to the *Director* for approval, a detailed financial assurance plan including the cost of leachate transportation and disposal for the landfill site during the period preceding the initiation of the leachate treatment system. In addition, the *Owner* shall provide to the *Director* for approval a financial assurance plan detailing the capital cost of the on-*Site* leachate treatment system.

The following Item is hereby added to Schedule "A":

74. Letter dated October 4, 2011 addressed to Mr. Tesfaye Gebrezghi, Ministry of the Environment from Mr. Reid Cleland, Waste Management of Canada requesting an amendment to Condition 167 (a). The supporting documentation attached to the letter included the following:
- a. Application for a Certificate of Approval for a Waste Disposal Site dated October 4, 2011;
 - b. Provisional Certificate of Approval A032203 Notice No. 7 dated June 1, 2011;
 - c. Letter from Wayne Jenken, WMCC to Don Bruder, Township of Warwick dated February 23, 2011;
 - d. Letter from Wayne Jenken, WMCC to Don Bruder, Township of Warwick dated May 26, 2011;
 - e. Letter from Peter Pickfield, Garrod Pickfield LLP to Reid Cleland, WMCC dated September 14, 2011;
 - f. Letter from Wayne Jenken, WMCC to Dean Jacobs, Walpole Island First Nations dated July 14, 2011;
 - g. Email from Kent Hunter, Neegan Burnside to Wayne Jenken dated September 19, 2011 at 3:54 p.m.;
 - g. Email from Wayne Jenken, WMCC to Kent Hunter, Neegan Burnside dated September 20, 2011 at 1:52 p.m.;
 - h. Email from Kent Hunter, Neegan Burnside to Wayne Jenken dated September 27, 2011 at 10:23 a.m.;
 - i. WPLC meeting minutes dated September 15, 2011; and
 - j. WPLC meeting minutes dated April 7, 2011.

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

1. *The reason for the amendment to Condition 8.6 is to extend the time period for when the construction of the waste water treatment plant is required to be constructed.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

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

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

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

DATED AT TORONTO this 29th day of February, 2012



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

DG/

c: District Manager, MOE Sarnia
Reid Cleland, WMCC
Peter Brodzikowski, P. Eng., GENIVAR Inc.
Mike Close, MOE Sarnia District Office
Don Bruder, Township of Warwick
Dean Jacobs, Walpole Island First Nations
Lawrence Zavitz, WLPC
Peter Brodzikowski, GENIVAR Inc.
Brent Langille, RWDI
Wayne Jenken, WMCC
Angela McLachlan, WMCC ✓
Peter Pickfield, Garrod Pickfield LLB

APPENDIX A3:

Amendment to ECA [No. A032203]- Notice No. 2, dated July 24, 2012



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 2

Issue Date: July 24, 2012

Waste Management of Canada Corporation
8039 Zion Line
Rural Route, No. 4
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Rd RR # 4 Part of Lot 19 & 20, Conc. 3, Part 1, Ref Plan 25R-9125 Township of
Warwick
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

The following Conditions are hereby amended as follows:

Proposed payment schedule

- 2.5 Within **thirty (30)** days of this *ECA* being issued, the *Owner* shall provide financial assurance in a form acceptable to the *Director* in the amount of **\$25,122,851.00**
- 2.6 On the following dates, the maximum amount of financial assurance to be provided to the *Ministry* in a form acceptable to the *Director* as follows:
- a. March 31, 2013 - **\$26,746,177.00**
 - b. March 31, 2014 - **\$29,893,587.00**
- 2.7 The amount of financial assurance may be less than the above amounts provided the *Owner* can justify to the *Ministry* that the amount of waste deposited on site is less than the maximum allowed during the time interval.
- 2.8 A revised or new Financial Assurance Re-Evaluation Report is to be prepared and submitted to the *Director* every three (3) years starting on **March 31, 2014**. The report shall include:

- a. updates of the discount, interest and inflation rates associated with the requirements for financial assurance in this *ECA* including justifications and sources of the proposed rates; and
- b. a report prepared by a qualified Professional Engineer which updates the cost estimates on which the amounts associated with the requirements for financial assurance in this *ECA* are based.

The reason(s) for this amendment to the Approval is (are) as follows:

1. *The reason for the amendment to Conditions 2.5 through 2.8 are to ensure that sufficient funds are available to the Ministry to close the landfill, and to carry out all expected post-closure care activities and any contingencies. Failure to include requirements for financial assurance would not be in the public interest and may result in a hazard or nuisance to the natural environment or any person.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Director appointed for the purposes of

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

AND

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

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

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

DATED AT TORONTO this 24th day of July, 2012



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

DG/

c: District Manager, MOE Sarnia
Peter Brodzikowski, P. Eng., Henderson Paddon & Associates (A Division of Genivar Consultants LP)

APPENDIX A4:

Amendment to ECA [No. A032203]- Notice No.3, dated September 19, 2012



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 3

Issue Date: September 19, 2012

Waste Management of Canada Corporation
8039 Zion Line
Warwick, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012 and July 24, 2012 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

The following Conditions are hereby amended as follows:

Landfill Gas Management

7.10 The *Owner* shall, manage landfill gas in accordance with Items 66 through 68 and Item 75 through 77 of Schedule "A" and based on the landfill gas management system constructed under the authority of the *EPA* Approval issued which may be amended or replaced from time to time.

The following Item is hereby to Schedule "A":

75. Letter dated May 22, 2012 addressed to Ms. Agatha Garcia Wright, Director, Ministry of the Environment from Mr. Wayne Jenken, Waste Management of Canada Corporation requesting amendment to Condition No. 7.10 (Landfill Gas Management). The letter included the following supporting documentation:
- i. Letter report entitled "Early Vertical Gas Well Collection System" dated May 2012 and addressed to Mr. Reid Cleland, Waste Management of Canada Corporation from Mr. Frank Ford, GENIVAR Inc.;
 - ii. Drawings No. 102 and G111 - Landfill Gas Collection System;
 - iii. Landfill Gas Headers, Gas Building with Blowers and Landfill Gas Flaring System Design Drawings and Design and Operations Plan for Modifications;

- iv. Description of Phase 1 of the Gas Collection System;
- v. Revised Section 4.7 of the Design and Operations Plan;
- vi. Application to Amend Environmental Compliance Approval No. A032203 and supporting documents;
- vii. Consultation Summary and Records with Stakeholders; and
- viii. Design Drawings for Amended Landfill Gas Management System.

- 76. Letter dated July 26, 2012 addressed to Mr. Reid Cleland, Waste Management of Canada Corporation from Mr. Dale Gable, Ministry of the Environment requesting additional information on the location of the proposed gas extraction wells.
- 77. Letter dated August 9, 2012 addressed to Mr. Dale Gable, Ministry of the Environment from Mr. Frank Ford, GENIVAR Inc. providing details on the location of the gas wells.

The reasons for this amendment to the Approval is as follows:

- 1. *The reason for amendment to Condition No. 7.10 is to amend the condition to reflect the proposed design change to the gas collection system. This is to ensure the system is build according to an approved design and to ensure the long-term health of the environment and the public.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

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

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

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

DATED AT TORONTO this 19th day of September, 2012



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

DG/

c: District Manager, MOE Sarnia
Frank Ford, P. Eng., GENIVAR Inc.

APPENDIX A5:

Amendment to ECA [No. A032203]– Notice No. 4, dated October 29, 2012





AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 4

Issue Date: October 29, 2012

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 for (brief reference description of the subject matter of the original approval entered by Reviewer), as follows:

The following Conditions are hereby amended as follows:

Cover Materials Allowed

6.48 The following materials, in the corresponding thickness, may be used as an alternative to soil as a daily and intermediate cover:

- a. Contaminated soil that satisfies the Schedule IV Toxicity Characteristic Leaching Procedure (TCLP) criteria as outlined in *O. Reg. 347* as amended from time to time;
- b. Wood chips (daily);
- c. Automobile Shredder Residue (ASR) for an eighteen (18) month trial period (daily); or
- d. Tarps (daily)

6.49 The use of any other alternative materials as daily or intermediate cover material is subject to approval by the *Director*.

6.50 Use of alternative daily or intermediate cover materials shall be discontinued within two (2) working days of receipt of written notification from the *District Manager*, stating that the use of the alternative daily or intermediate cover materials at the *Site* has proven to be environmentally unsuitable.

Contaminated Soil as Daily or Intermediate Cover

6.53 Contaminated soil equal to or below 10% of the TCLP value and/or 0.4 mg/L benzene may be landfilled in Cells 8, 10 and/or 12.

6.54 If confirmatory testing of the contaminated soil to be landfilled in Cells 8, 10 and/or 12 indicates an exceedance of 10% of the TCLP value and/or 0.4 mg/L of benzene, but satisfies the TCLP criteria as in *O.Reg. 347*, the soil may be used as daily and/or intermediate cover, and or landfilled as waste.

6.55 If the contaminated soil received at the Site does not meet the TCLP value, the contaminated soil shall be classified as a hazardous waste and shall be disposed of at a site that is approved to receive and dispose of hazardous waste.

6.56 Contaminated soil that satisfies the TCLP criteria may be used as daily and/or intermediate cover in the Expansion *Site* of the landfill. Contaminated soils may not be used on outside slopes which drain into the surface water system.

6.57 Contaminated soil used for daily and/or intermediate cover shall be sampled on a quarterly basis and submitted for

analysis of *O.Reg. 347* Schedule IV Inorganics, VOCs, PAHs and PCBs. Quarterly testing results shall be included in the annual report. The frequency of *O. Reg. 347* testing of the cover material may be reduced subject to agreement of the District Manager.

6.58 Contaminated soil for use as daily cover and/or intermediate cover shall be stockpiled in areas of the *Site* that have a leachate collection system installed below.

6.59 Surface water run off from the contaminated soils stockpile which exceeds the Provincial Water Quality Objectives shall not be discharged through the surface water management system.

6.60 The *Owner* must ensure that measures are in place for the on *Site* treatment and disposal of any contaminated run off from the contaminated soils stockpile.

6.61 Prior to receipt at the *Site*, each source of contaminated soils which are to be used as daily or intermediate cover shall be tested to determine if the soils meet the criteria in this *ECA* and a copy of the test results shall be kept in the daily records for the *Site* as required.

The following Item is hereby added to Schedule "A":

78. Letter Report dated May 9, 2012 addressed to Ms. Agatha Garcia Wright, Director, Ministry of the Environment from Mr. Wayne Jenken, Waste Management of Canada requesting Conditions 6.48 to 6.61 be amended. The letter report included the following Sections:

- i. Environmental Compliance Approval application signed by Reid Cleland, WMCC and dated May 9, 2012;
- ii. Proof of legal name and zoning;
- iii. Record of consultation with Township of Warwick;
- iv. Record of consultation with Walpole First Island First Nation; and
- v. Record of consultation with *WPLC*.

The reasons for this amendment to the Approval are as follows:

1. The reasons for the Amendment to Conditions 6.48, 6.49, 6.50, 6.53, 6.54, 6.55, 6.56, 6.57, 6.58, 6.59, 6.60 and 6.61 is to ensure the Owner is aware of his responsibility with regards to the use and placement of contaminated soil as daily and/or intermediate cover. This is to ensure the long-term protection of the environment and human health.

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

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

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;

CONTENT COPY OF ORIGINAL

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

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

This Notice must be served upon:

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

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

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

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

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

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

DATED AT TORONTO this 29th day of October, 2012

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

DG/
c: District Manager, MOE Sarnia
Brent Langille, RWDI Air Inc.

APPENDIX A6:

Amendment to ECA [No. A032203]– Notice No. 5, dated January 24, 2013





AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 5

Issue Date: January 24, 2013

Waste Management of Canada Corporation
 8039 Zion Line
 Watford, Ontario
 N0M 2S0

Site Location: Twin Creeks Landfill Site
 8039 Zion Line
 Warwick Township, County of Lambton
 N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012 and September 19, 2012 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares, as follows:

The following Conditions are hereby amended as follows:

Landscape

5.4 The *Owner* shall ensure the landscape plan is carried out in accordance with Item 72 and 79 of Schedule "A", as amended from time to time.

Automobile Shredder Residue as Daily Cover

6.51 (1) Automobile Shredder Residue (ASR) may be used as a daily cover at the *Site* on an on-going basis from the issuance of this notice.

(2) The *Owner* shall cease the use of ASR if written notification is received from the *District Manager* indicating that there are environmental concerns due to the use of ASR as daily cover based on the testing of the ASR required by Condition 6.52.

(3) The *Owner* may re-commence the use of ASR upon the *Owner* submitting an action plan that is acceptable to the *District Manager* that can address the environmental concerns which were raised due to the use of ASR as daily cover.

6.52 Automobile Shredder Residue samples of the daily cover material are to be taken on semi-annual basis (Spring and Fall) and submitted for analysis of *O. Reg. 347* Schedule IV Inorganics, VOC's, and PAH's. Automobile Shredder Residue is to conform with the specifications of a non-hazardous waste under *O. Reg. 347* as amended from time to time. Semi-Annually testing results are to be submitted to the *District Manager* upon receipt. The frequency of *O. Reg. 347* testing of the daily cover material can be reduced subject to approval of the *District Manager*.

The following Items are hereby added to Schedule "A":

78. Letter report dated September 26, 2012 addressed to Ms. Agatha Garcia-Wright. Director, Environmental Approvals Branch, Ministry of the Environment from Mr. Philip Janisse and Mr. Brent Langille, RWDI Inc. requesting the time frame for the use of ASR be extended and the sampling frequency for the ASR be reduced.

79. Letter dated October 15, 2012 and supporting drawings addresses to Ms. Agatha Garcia-Wright. Director,

Environmental Approvals Branch, Ministry of the Environment from Mr. Wayne Jenken, Waste Management of Canada Corporation detailing the proposed changes to the landscape plan for the Site. The supporting drawings include the following drawing prepared by Schollen and Company Inc (Contract No. 27007) dated June 2012:

- i. Cover page entitled "Twin Creeks Landfill Expansion - Landscape and Details Drawings" dated June 29, 2012
- ii. Drawing No. L-1 entitled "Landscape Plan - Screening Berm";
- iii. Drawing L-1A entitled "Landscape Detail at Intersections - Screening Berms";
- iv. Drawing L-2 entitled "Landscape Plan - Screening Berm";
- v. Drawing L-3 entitled "Landscape Plan - Screening Berm and Area F";
- vi. Drawing L-4 entitled "Landscape Plan - Screening Berm";
- vii. Drawing L-5 entitled "Landscape Plan - Screening Berm and Area G";
- viii. Drawing L-6 entitled "Landscape Plan - Area G Planting Area";
- ix. Drawing L-7 entitled "Landscape Plan - Area A and Area B Screen Planting and Creek";
- x. Drawing L-8 entitled "Landscape Plan - Area C, D and E Screen Planting";
- xi. Drawing L-9 entitled "Landscape Plan - Area H Restoration Planting";
- xii. Drawing LD-1 entitled "Landscape Detail Plan";
- xiii. Drawing LD-2 entitled "Landscape Notes and Master Plant List";
- xiv. Drawing LD-3 entitled "Signage Details";
- xv. Drawing LD-4 entitled "Details"; and
- xvi. Drawing LD-5 entitled "Details".

The reasons for this amendment to the Approval are as follows:

- 1. The reason for the amendment to Condition 5.4 is to incorporate the proposed changes to the landscape plan into the ECA.*
- 2. The reason for the amendment to Condition 6.51 is to extend the time frame for which the ASR can be used as approved by the ECA.*
- 3. The reason for the amendment to Condition 6.52 is to approve the reduced frequency of the sampling as the testing on the ASR has shown the ASR to be solid non-hazardous.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

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

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

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

DATED AT TORONTO this 24th day of January, 2013

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

DG/
c: District Manager, MOE Sarnia
Philippe E. Janisse, B.Sc., P. Geo., Rowan Williams Davies & Irwin Inc. (RWDI)

APPENDIX A7:

Request for Modification to Surface Water Monitoring/Assessment Process, dated February 27, 2014



Ministry of the Environment
Sarnia District Office
1094 London Road
Sarnia, ON N7S 1P1
Tel: 519 336-4030
Fax: 519-336-4280

Ministère de l'Environnement
Sarnia District Office
1094, chemin London
Sarnia, ON N7S 1P1
Tel: 519 336-4030
Fax: 519 336-4280



February 27, 2014

Ms. Angela McLachlan
Environnemental Compliance Manager, Twin Creeks Landfill
Waste Management of Canada Corporation
8039 Zion Line, Watford, ON N0M 2S0

Dear Ms. McLachlan,

RE: Request for Modification to Surface Water Monitoring/Assessment Process at Twin Creeks Landfill

The Ministry of the Environment has reviewed the request, dated January 13, 2014, submitted by Brent Langille, Project Director with RWDI Air Inc. (RWDI) on behalf of Waste Management of Canada Corporation for the surface water monitoring and assessment process to be changed at the Twin Creeks Landfill. This request was submitted in accordance with Condition 13.11 of Amended Environmental Compliance Approval A032202, dated December 13, 2011.

RWDI has proposed the following changes to the surface water monitoring and assessment process:

1. Use chemical data from both background monitoring stations SS10 and SS16 to calculate the trigger concentrations for the Primary Leachate Indicator Parameters (PLIPs).
2. (a) Where a PLIP naturally exceeds the Provincial Water Quality objectives (July 1994) (PWQO) use a 90th percentile of historic data for the PLIPs from background stations SS10 and SS16 to create the trigger concentrations. Note: trigger concentrations to be updated annually.
(b) Where a PLIP is less than the Provincial Water Quality Objectives (PWQO), the PWQO shall be used as the trigger concentration.
3. (a) If a trigger concentration is exceeded, and the exceedance is not landfill leachate or landfill operations related then surface water chemical and biological verification/assessment monitoring must be completed. (Examples of landfill operations that may affect the contaminant concentrations include haul roads, active tip-face, roll-off bin area, or maintenance yard. However soil covered/capped waste is considered to be related to landfill operations)
(b) If biological verification/assessment monitoring results are acceptable, regardless of any chemical parameter or concentration result noted for the verification/assessment monitoring event, the surface water is of acceptable quality for continued discharge.

The proposed updated trigger concentrations for the PLIP are as follows:

Parameter	PWQO (mg/L)	2012 Updated Trigger Concentration [SS10 -75 th percentile] (mg/L)	Updated Trigger Concentration [SS10 & SS16 -90 th percentile] (mg/L)
Chloride	210*	210*	210*
Unionized Ammonia	0.020	0.020	0.020
Phenols	0.001	0.001	0.001
Boron	0.20	0.20	0.20
Boron (SP1 only)	0.20	0.39	0.39
Chromium	0.0089	0.17	0.024
Nickel	0.025	0.025	0.027
Zinc	0.020	0.040	0.060

Notes: 1) 'mg/L' denotes milligrams per litre.

2) 'PWQO' denotes Provincial Water Quality Objectives (July 1994).

3) '*' denotes value is assumed and based on Environment Canada (2001).

4) Boron trigger concentration for SP1 per MOE May 18, 2012 letter.

5) The column entitled "2012 Updated Trigger Concentration" is what is currently approved. The data set for the 75th percentile ranges from April 2002 through October 2013 at SS10 and is formed by placing the data in order from smallest to largest. The 75th percentile is calculated by taking the lowest concentration of a parameter that is greater than 75 percent of the concentrations in the data set. This data set was used for the 2013 assessment period.

6) The column entitled "Updated Trigger Concentration" is what has been proposed. The data set for the 90th percentile ranges from March 2008 through October 2013 at SS10 and SS16 and is formed by placing data in order from smallest to largest. The 90th percentile is calculated by taking the lowest concentration of a parameter that is greater than 90 percent of the concentrations in the data set. This data set would be used for the 2014 assessment period.

In accordance with Condition 6.4 of the Site's Sewage Amended CofA, No. 3506-7M5PU3, issued on July 9, 2009, the above surface water trigger concentrations are required to be updated annually.

The proposed changes outlined above have been determined to be acceptable with the following conditions:

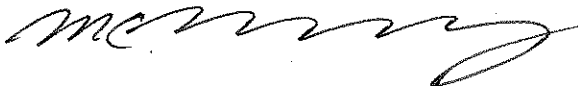
1. With the exception of this approved alteration, the Environmental Monitoring Plan (EMP), dated December 2007, remains in effect in its entirety and shall be undertaken by Waste Management of Canada Corporation.
2. Where a PLIP naturally exceeds the PWQO, and annual adjustments are made to the trigger concentrations using the 90th percentile of historic data for the PLIPs from background stations SS10 and SS16, data analysis should be done. This condition is imposed to ensure that the distribution of data points is consistent with background soil conditions and not landfill impact that is trending upward. For example, if the pond sample results are elevated year over year, they will invariably skew the trigger concentration to a higher level and possibly mask a trending upward that may suggest impact and not be a reflection of background soil conditions.

3. If a trigger concentration is exceeded, and the exceedance is not landfill leachate or landfill operations then surface water chemical and biological verification/assessment monitoring must be completed.
4. If biological verification/assessment monitoring results are acceptable, regardless of any chemical parameter or concentration result noted for the verification/assessment monitoring event, the surface water is of acceptable quality for continued discharge. However, should the Ministry not be in agreement on the source of the exceedance, the Ministry reserves the authority to impose restrictions on the discharge of surface water off-Site unless both chemical and biological verification/assessment monitoring results are of acceptable quality for continued discharge.

The Ministry also requests that Waste Management maximize practices to cover areas of exposed soil with vegetation to prevent sedimentation run-off from entering the stormwater management system, which may result in elevated concentrations of parameters (boron, zinc, chromium, aluminum, iron and nickel) in surface water due to the natural occurrence of these parameters in the Site's native soils.

Should you have any questions, or concerns, please do not hesitate to contact Environmental Officer, Jessica Levesque at (519) 383-3774 or via email at Jessica.Levesque@ontario.ca.

Yours truly,



Mike Moroney
District Manager
Sarnia/Windsor District Office

- c:
- B. Langille, RWDI Air Inc.
 - R. Cleland, Waste Management of Canada Corporation
 - W. Jenken, Waste Management of Canada Corporation
 - A. McLachlan, Waste Management of Canada Corporation
 - L. Zavitz, Warwick Public Liaison Committee
 - P. Pickfield, Township Technical Review Team Liaison
 - D. Bruder, Township of Warwick
 - D. Jacobs, Walpole Island First Nations
 - K. Hunter, Walpole Island First Nations
 - J. Levesque, Ministry of the Environment
 - M. Corda, Ministry of the Environment
 - H. Guerts, Ministry of the Environment

APPENDIX A8:

Amendment to ECA [No. A032203]– Notice No. 6, dated April 4, 2014





AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 6

Issue Date: April 4, 2014

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: 8039 Zion Line
8039 Zion Line Watford
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012, September 19, 2012 and January 24, 2013 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares, as follows:

The following Condition is hereby amended as follows:

8.6 (1) (a) Within ten (10) years of placement of the first tonne of waste in the expanded portion of the landfill *Site*, the *Owner* shall ensure that a leachate treatment system is installed and operational at the *Site*.

(b) Leachate from the *Site* not sent to the operational drip irrigation area(s) approved under Condition 8.7 shall be disposed of off-*Site* at a location approved by the *District Manager* until the leachate treatment system required by Condition 8.6 (1)(a) is approved and operational. .

(c) Any waste from the leachate treatment system that is to be disposed of in the landfill must be classified as a solid non-hazardous waste.

(2) As part of the financial assurance calculation in Section 2.0, the *Owner* shall provide to the *Director* for approval, a detailed financial assurance plan including the cost of leachate transportation and disposal for the landfill site during the period preceding the initiation of the leachate treatment system. In addition, the *Owner* shall provide to the *Director* for approval a financial assurance plan detailing the capital cost of the on-*Site* leachate treatment system.

The following Item is hereby added to Schedule "A":

80. Letter dated November 13, 2013 addressed to Agatha Garcia-Wright, Director, Ministry of the Environment from Wayne Jenken, Waste Management of Canada Corporation requesting amendment to Condition 8.6 (a). The following supporting documentation was attached to the memorandum.

- i. Amended Environmental Compliance Approval Number A032203 issued December 13, 2011
- ii. Amended Environmental Compliance Approval Number A032203 Notice No. 1 issued February 29, 2012
- iii. Application to Amend Environmental Compliance Approval No. A032203 with Signature of Reid Cleland in Section 1.4
- iv. Record of Consultations with Stakeholders

The reasons for this amendment to the Approval is as follows:

1. *The reason for the amendment to Condition 8.6 is to extend the time period for when the construction of the waste water treatment plant is required to be constructed.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

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

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

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

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

DATED AT TORONTO this 4th day of April, 2014

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

DG/
c: District Manager, MOE Sarnia
Jeff Armstrong / Ben Leno, GENIVAR Inc.

APPENDIX A9:

Amendment to ECA [No. A032203]– Notice No. 7, dated January 26, 2015



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 7

Issue Date: January 26, 2015

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012, September 19, 2012, January 24, 2013 and April 4, 2014 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

Proposed payment schedule

- 2.5 Within **thirty (30)** days of this *ECA* being issued, the *Owner* shall ensure that financial assurance in a form acceptable to the *Director* in the amount of **\$23,059,934.00** has been submitted to the .
- 2.6 On the following dates, the *Owner* shall ensure the maximum amount of financial assurance (total amount, not in addition to the requirements under Condition 2.5) has been submitted to the *Director* in a form acceptable to the *Director* as follows:
- a. March 31, 2016 - **\$24,871,687.00; and**
 - b. March 31, 2017 - **\$26,634,406.00**
- 2.7 The amount of financial assurance may be less than the above amounts provided the *Owner* can justify to the *Ministry* that the amount of waste deposited on site is less than the maximum allowed during the time interval.
- 2.8 A revised or new Financial Assurance Re-Evaluation Report is to be prepared and submitted to the *Director* every three (3) years starting on **March 31, 2017**. The report shall include:

- a. updates of the discount, interest and inflation rates associated with the requirements for financial assurance in this *ECA* including justifications and sources of the proposed rates; and
- b. a report prepared by a qualified Professional Engineer which updates the cost estimates on which the amounts associated with the requirements for financial assurance in this *ECA* are based.

The reasons for this amendment to the Approval is as follows:

1. *The reason for the amendment to Conditions 2.5 through 2.8 are to ensure that sufficient funds are available to the Ministry to close the landfill, and to carry out all expected post-closure care activities and any contingencies. Failure to include requirements for financial assurance would not be in the public interest and may result in a hazard or nuisance to the natural environment or any person.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Director appointed for the purposes of

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

AND

Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

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

DATED AT TORONTO this 26th day of January, 2015



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

DG/

c: District Manager, MOECC Sarnia
Brant J. Langille, B.Sc., P.Geo., RWDI AIR Inc. ✓

APPENDIX A10:

Amendment to ECA [No. A032203]– Notice No. 8, dated July 20, 2016





Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de
changement climatique

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 8

Issue Date: July 20, 2016

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill
8039 Zion Line, Watford
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and as subsequently amended for use and operation of a 101.8 hectare landfilling area within a total waste disposal site area of 301 hectares, as follows:

Condition 7.10 is hereby revoked and replaced with the following:

7.10 The Owner shall, manage landfill gas in accordance with Items 66 through 68, Items 75 through 77, and Item 81 of Schedule "A" and based on the landfill gas management system constructed under the authority of the EPA Approval issued which may be amended or replaced from time to time.

The following Items are hereby added to Schedule "A":

81. Application package dated May 4, 2016 and received on May 16, 2016 including all subsequently submitted supporting documentation and drawings, including the amendment to the D&O plan and associated drawings.

The reason(s) for this amendment to the Approval is (are) as follows:

To allow the construction of a landfill gas utilization header pipe system for landfill gas conveyance from the Twin Creeks Landfill Site to a neighbouring property located on Zion Line East of the landfill that will use the landfill gas to fire a boiler. The boiler will heat a hot water tank that will in turn heat greenhouses.

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

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

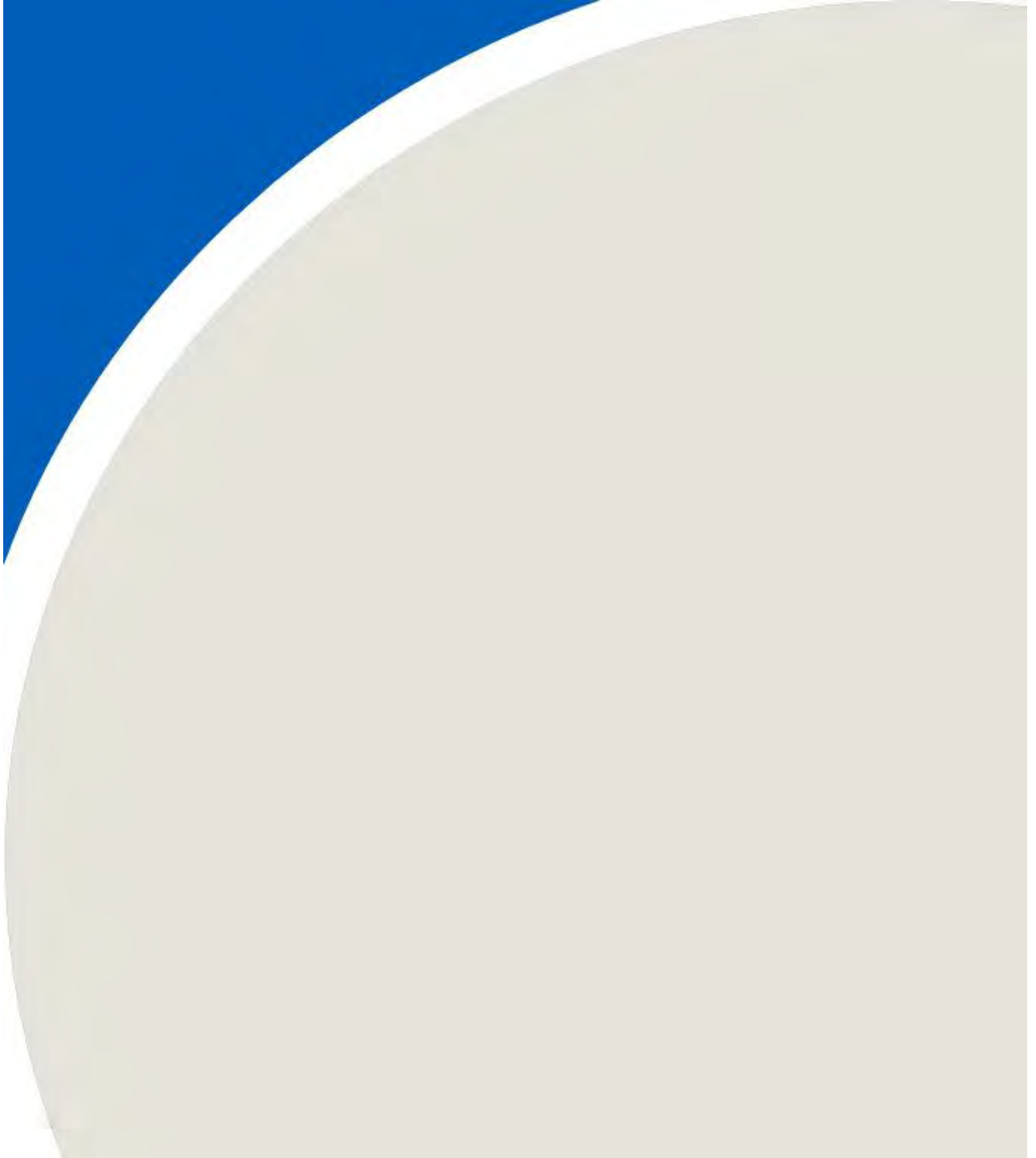
DATED AT TORONTO this 20th day of July, 2016

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

BH/
c: District Manager, MOECC Sarnia
David Barton, GHD Limited

APPENDIX A11:

Amendment to ECA [No. A032203]– Notice No. 9, dated June 1, 2017



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 9

Issue Date: June 1, 2017

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 amended on February 29, 2012, July 24, 2012, September 19, 2012, January 24, 2013, April 4, 2014 July 20, 2016 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

The following Conditions are hereby amended as follows:

2.5 The Company shall maintain Financial Assurance as defined in Section 131 of the Act, in the amount of **\$26,634,406**. This Financial Assurance shall be in a form acceptable to the Director and shall provide sufficient funds for the analysis, transportation, Site clean-up, monitoring and disposal of all quantities of waste on the Site at any one time.

2.6 The amount of financial assurance shall be updated annually in accordance with the following schedule:

Payment Date	Cumulative Amount
By March 31, 2019	\$31,389,514
By March 31, 2020	\$35,053,923

2.7 Commencing on March 31, 2020 and at intervals of three (3) years thereafter, the Owner shall submit to the Director, a re-evaluation of the amount of Financial Assurance to implement the actions required under Condition 2.5 and 2.6. The re-evaluation shall include an assessment based on any new information relating to the environmental conditions of the Site and shall include the costs of additional monitoring and/or implementation of contingency plans required by the Director upon review of the closure

plan and annual reports. The Financial Assurance must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.

- 2.8 The amount of Financial Assurance is subject to review at any time by the Director and may be amended at his/her discretion. If any Financial Assurance is scheduled to expire or notice is received, indicating Financial Assurance will not be renewed, and satisfactory methods have not been made to replace the Financial assurance at least sixty (60) days before the Financial Assurance terminates, the Financial Assurance shall forthwith be replaced by cash.

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

To approve the Financial Assurance amount currently held by the Ministry and to reflect the current standard financial assurance requirement.

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011 as amended.

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

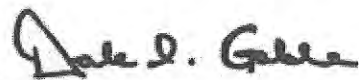
AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca

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

DATED AT TORONTO this 1st day of June, 2017



Dale Gable, P.Eng.

Director

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

MW/

c: District Manager, MOECC Sarnia
Brent Langille, RWDI

APPENDIX A12:

Amendment to ECA [No. A032203] – Notice No. 10, dated September 8, 2017



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 10

Issue Date: September 8, 2017

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012, September 19, 2012, October 29, 2012, January 24, 2013, April 4, 2014, January 26, 2015, July 20, 2016, and June 1, 2017 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

The following Conditions are hereby revoked and replaced with the following:

FINANCIAL ASSURANCE

2.5 Within **thirty (30)** days of this *ECA* Notice being issued, the *Owner* shall provide financial assurance in a form acceptable to the *Director* in the amount of **\$30,568,451**.

2.6 On the following dates, the *Owner* shall ensure the maximum amount of financial assurance (total amount, not in addition to the requirements under Condition 2.5) has been submitted to the *Director* in a form acceptable to the *Director* as follows:

Payment Date	Amount
By March 31, 2019	\$30,681,342
By March 31, 2020	\$38,515,008

2.7 Commencing on March 31, 2020 and at intervals of three (3) years thereafter, the *Owner* shall submit to the *Director*, a re-evaluation of the amount of Financial Assurance to implement the actions required under Condition 2.5 and 2.6. The re-evaluation shall include an assessment based on any new information relating to the environmental conditions of the Site and shall include the costs of additional monitoring and/or

implementation of contingency plans required by the Director upon review of the closure plan and annual reports. The Financial Assurance must be submitted to the Director within ten (10) days of written acceptance of the re-evaluation by the Director.

- 2.8 The amount of Financial Assurance is subject to review at any time by the Director and may be amended at his/her discretion. If any Financial Assurance is scheduled to expire or notice is received, indicating Financial Assurance will not be renewed, and satisfactory methods have not been made to replace the Financial assurance at least sixty (60) days before the Financial Assurance terminates, the Financial Assurance shall forthwith be replaced by cash.

YEARLY WASTE LIMIT

- 6.6 (1) The *Owner* can receive up to a maximum of **1,400,000 tonnes per year** of waste including contaminated soil for disposal at the *Site*.

DUST

- 6.35 Dust shall be managed as per the Best Management Practices Plan (Dust) prepared by RWDI listed as Item 82 in Schedule "A".

ODOUR

- 6.40 Odour shall be managed in accordance with the Best Management Practices Plan (Odour) prepared by RWDI listed as Item 83 in Schedule "A".

MONITORING PROGRAM

- 13.8 Air Quality, Dust, Hydrocarbon, and Volatile Organic Carbon monitoring shall be undertaken in accordance with Item 84 in Schedule "A".

The following Items are hereby added to Schedule "A":

- 82 Report entitled "*Twin Creeks Landfill Site: Best Management Practices Plan (Dust) - Version 7* " prepared by RWDI Air Inc., dated May 19, 2017.
- 83 Report entitled "*Twin Creeks Landfill Site: Best Management Practices Plan (Odour) - Version 8* " prepared by RWDI Air Inc., dated May 19, 2017.
- 84 Report entitled "*Twin Creeks Landfill Site: Ambient Air Quality Monitoring Plan (Revision #3)* " prepared by RWDI Air Inc., dated May 18, 2017.

The reasons for this amendment to the Approval are as follows:

1. *The reasons for Conditions 2.5 to 2.8 inclusive are to ensure that sufficient funds are available to the Ministry to close the landfill, and to carry out all expected post-closure care activities and any contingencies. Failure to include requirements for financial assurance would not be in the public interest and may result in a hazard or nuisance to the natural environment or any person.*
2. *The reason for Condition 6.6 is to specify the approved amount of waste that may be accepted for disposal at the Site.*
3. *The reasons for Conditions 6.35 and 6.40 are to ensure that the Site is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.*
4. *The reason for Condition 13.8 is to demonstrate that the landfill site is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment and Climate Change

655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca

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

DATED AT TORONTO this 8th day of September, 2017



Dale Gable, P.Eng.

Director

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

CM/

c: District Manager, MOECC Sarnia

Larry Fedec, Brad Bergeron, HDR Corporation, RWDI Air Inc., Waste Management of Canada Corporation

APPENDIX A13:

Amendment to ECA [No. A032203] – Notice No. 11, dated September 12, 2018



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 11

Issue Date: September 12, 2018

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012, September 19, 2012, October 29, 2012, January 24, 2013, April 4, 2014, January 26, 2015, July 20, 2016, June 1, 2017, and September 8, 2017 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

The following Condition is hereby amended as follows:

- 8.6 (1) (a) Within a minimum of three (3) years prior to closure of the landfill Site , the *Owner* shall ensure that a leachate treatment system is installed and operational at the Site .
- (d) The *Owner* shall implement all items within the document entitled *Leachate Management Framework*, listed as Item 85 in Schedule "A". These items include new and existing leachate monitor locations (wells, mini piezometers, and sump), leachate monitoring, leachate level reporting, Leachate Management Plan by March 31, 2020 and updated every 3 years, and the Leachate Treatment Facility Study to be completed at least 7 years prior to closure of the landfill.

The following Items are hereby added to Schedule "A":

- 85 "WM Twin Creeks Landfill Site, Leachate Management Framework " prepared by HDR, dated November 29, 2017.

The reasons for this amendment to the Approval are as follows:

1. *The reason for the amendment to Condition 8.6 is to extend the time period for when the construction of the waste water treatment plant is required to be constructed and to ensure that leachate is monitored and handled in a manner that is safe to the public and the environment.*

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND


The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment,
Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

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

DATED AT TORONTO this 12th day of September, 2018

THIS NOTICE WAS MAILED	
ON	SEP 12 2018
	
	(Signed)



Dale Gable, P.Eng.

Director

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

CM/

c: District Manager, MECP Sarnia
Larry Fedec, HDR Corporation ✓

APPENDIX A14:

Amendment to ECA [No. A032203] – Notice No. 12, dated December 20, 2018





AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 23

Issue Date: December 20, 2018

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012, September 19, 2012, October 29, 2012, January 24, 2013, April 4, 2014, January 26, 2015, July 20, 2016, June 1, 2017, September 8, 2017, and September 12, 2018 for the use and operation of a 101.8 hectare landfiling area within a total site area of 301 hectares , as follows:

The amendment incorporates the detailed design for Cell 4 as described in Item 86 of Schedule "A" and satisfies the requirement of Condition 4.8 for only this specific stage of landfiling. Condition 4.8 shall continue to apply to any additional planned landfill stages.

The following Item is hereby added to Schedule "A":

86. Application for a an amendment to ECA No. A032203 to provide detailed design for the construction of Cell 4 in response to Condition 4.8. Signed by Reid Cleland and dated October 16, 2018. The supporting documentation for the application included the drawing set titled "Waste Management of Canada Corporation, Twin Creeks Landfill Expansion, Warwick Township, Landfill Base Preparation Cell 4." Prepared by WSP Group, October, 2018. The drawing set consists of the following:

- i. Drawing No. 106716P-400 - "Title Sheet";
- ii. Drawing No. 106716P-401 - "March 2018 Existing Conditions Plan;
- iii. Drawing No. 106716P-402 - "Cell 4 - Bottom of Excavation - West";
- iv. Drawing No. 106716P-403 - "Cell 4 - Bottom of Excavation - East";
- v. Drawing No. 106716P-404 - "Cell 4 - Top of Primary Clay Liner - West";
- vi. Drawing No. 106716P-405 - "Cell 4 - Top of Primary Clay Liner - East";
- vii. Drawing No. 106716P-406 - "Cell 4 - Temporary Clay Seal - West";

- vii. Drawing No. 106716P-407 - "Cell 4 - Temporary Clay Seal - East";
- viii. Drawing No. 106716P-408 - "Cell 4 - Section and Details";
- ix. Drawing No. 106716P-409 - "Cell 4 - Section and Details";
- x. Drawing No. 106716P-410 - "Cell 4 - Section and Details";
- xi. Drawing No. 106716P-411 - "Cell 4 - Pumping Station PS5/PS6 Plans and Sections";
- xii. Drawing No. 106716P-412 - "Cell 4 - Pumping Station PS5/PS6 Plans and Sections";
- xiii. Drawing No. 106716P-413 - "Cell 4 - Sections and Details"; and
- xiv. Drawing No. 106716P-414 - "Cell 4 - Sections and Details".

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

The reason for this amendment is to update Schedule "A" with the detailed design of Cell 4.

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

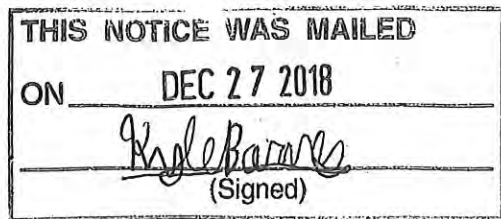
AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca

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

DATED AT TORONTO this 20th day of December, 2018



Mohsen Keyvani, P.Eng.

Director

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

CF/

c: District Manager, MECP Sarnia

Peter Brodzikiowski P. Eng., WSP Canada Inc., WSP Canada Inc.

APPENDIX A15:

Amendment to ECA [No. A032203] – Notice No. 13, dated May 24, 2019



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 24

Issue Date: May 24, 2019

Waste Management of Canada Corporation
117 Wentworth Court
Brampton, Ontario
L6T 5L4

Site Location: Twin Creeks Environmental Centre
5768 Nauvoo Rd (Watford)
Warwick Township, County of Lambton

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012, September 19, 2012, October 29, 2012, January 24, 2013, April 4, 2014, January 26, 2015, July 20, 2016, June 1, 2017, September 8, 2017, September 12, 2018, and December 20, 2018 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

Site name and Location

The Site name and location is hereby amended:

FROM: Twin Creeks Landfill Site
8039 Zion Lane
Warwick Township, County of Lambton, Ontario
N0M 2S0

TO: Twin Creeks Environmental Centre
5768 Nauvoo Rd (Watford)
Warwick Township, County of Lambton

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

To change and update the Site name and location to reflect the correct information.

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13,

2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca

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

DATED AT TORONTO this 24th day of May, 2019



Mohsen Keyvani, P.Eng.

Director

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

CF/

c: District Manager, MECP Sarnia
Larry Fedec, HDR Corporation

APPENDIX A16:

Amendment to ECA [No. A032203] – Notice No. 14, dated December 5, 2019



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Notice No. 25

Issue Date: December 5, 2019

Waste Management of Canada Corporation
117 Wentworth Court
Brampton, Ontario
L6T 5L4

Site Location: Twin Creeks Environmental Centre
5768 Nauvoo Rd Watford
Warwick Township, County of Lambton
N0M 2S0

You are hereby notified that I have amended Approval No. A032203 issued on December 13, 2011 and amended on February 29, 2012, July 24, 2012, September 19, 2012, October 29, 2012, January 24, 2013, April 4, 2014, January 26, 2015, July 20, 2016, June 1, 2017, September 8, 2017, September 12, 2018, December 20, 2018, and May 24, 2019 for the use and operation of a 101.8 hectare landfilling area within a total site area of 301 hectares , as follows:

The following Condition is hereby revoked and replaced with the following:

YEARLY WASTE LIMIT

- 6.6 (1) The *Owner* can receive up to a maximum of **1,450,000 tonnes** of waste including contaminated soil for disposal at the *Site* for the year 2019 only. For 2020, and subsequent years the maximum waste including contaminated soil approved for disposal at the *Site* shall not exceed **1,400,000 tonnes per year**.

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

The reason for Condition 6.6 is to allow for an emergency increase for the year 2019 only. For subsequent years the previously approved maximum limit of 1,400,000 tonnes shall remain in effect.

This Notice shall constitute part of the approval issued under Approval No. A032203 dated December 13, 2011

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon

me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

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

DATED AT TORONTO this 5th day of December, 2019



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

CF/

c: District Manager, MECP Sarnia
Larry Fedec P. Eng., HDR Corporation

APPENDIX A17:

Amended Environmental Compliance Approval [No. A032203], dated December 19, 2020



AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A032203

Issue Date: December 19, 2020

Waste Management of Canada Corporation
117 Wentworth Court
Brampton, Ontario
L6T 5L4

Site Location: Twin Creeks Environmental Centre
5768 Nauvoo Rd Watford
Warwick Township, County of Lambton
N0M 2S0

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the use and operation of a 101.8 hectare waste disposal site (landfill) within a total site area of 301 hectares.

For the purpose of this environmental compliance approval, the following definitions apply:

"Agricultural Waste" for the purposes of this ECA, is defined as municipal yard waste, wood chips, food waste and minimal amounts of solid manure which would only be accepted or used for the purpose of seeding or operating an active aerobic compost pile and does not include liquid manure;

"AQMP " means an Air Quality Monitoring Program;

"Construction Phase " is defined as the period of time from the start of construction of Phase 1 of the expanded landfill to the date of first receipt of waste in Phase 1;

"Contaminating Lifespan" refers to the period of time, after closure until the site finally produces contaminants at concentrations below levels which have unacceptable health or environmental effects;

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

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

“District Manager ” refers to the District Manager in the Ministry of the Environment, Conservation and Parks Sarnia District Office;

“District Office ” refers to the Ministry of the Environment, Conservation and Parks Sarnia District Office;

“EA” refers to the document titled “Warwick Landfill Expansion Environmental Assessment” , dated September 2005, which includes Discussion Papers 1 through 9 included in the Appendices A to F of the Environmental Assessment. EA also includes responses from the Owner dated:

1. March 10, 2006 “Waste Unit’s Final Comments Dated March 8, 2006”
2. February 14, 2006 “Leachate Recirculation”
3. February 14, 2006 “Response to February 1, 2006 Correspondence”
4. January 13, 2006 “Waste Management Response to Comments received from Warwick Landfill Expansion EA” including attachments entitled:
 - i. Response to the Township of Warwick;
 - ii. Response to Thomson Rogers;
 - iii. Table of responses to various agencies, public and First Nations Submissions;
 - iv. Landfill Gas Assessment, Warwick Landfill Baseline Conditions Report prepared by RWDI dated January 12, 2006
 - v. Memo dated March 10, 2006
 - vi. June 12, 2006 “Response to May 1, 2006 Ministry Review ”;

“EAA” refers to the Ontario Environmental Assessment Act, R.S.O. 1990, c.E.18, as amended;

"Environmental Compliance Approval" or "ECA" or "Approval" means this entire provisional Environmental Compliance Approval document, issued in accordance with Section 20.2 of the EPA , and includes any schedules to it, the application and the supporting documentation listed in schedule "A";

“Environmental Inspector” refers to the individual employed by the Ministry of the Environment, Conservation and Parks to inspect the Site;

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

“EPB” refers to the Environmental Permissions Branch of the Ministry of the Environment, Conservation and Parks;

"Hydraulic Trap" indicates a situation where hydraulic gradients from the surrounding soil are inward toward the landfill waste and associated leachate collection system;

"Mini-Transfer Area" means the mini-transfer public convenience drop-off area as described and identified in the June 2009 Development & Operations Report that is identified in Item 59 of Schedule "A" and whose location is identified as "Expansion Mini-Transfer" in figure MT2 that is contained in the 2009 Development & Operations Report;

“MECP” or “Ministry” refers to the Ontario Ministry of the Environment, Conservation and Parks;

"Operation Phase" is defined as the period of time from the date that Phase 1 of the expanded landfill area first receives waste until the landfill site reaches final capacity;

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

"Owner " means Waste Management of Canada Corporation and its successors and assigns;

"O. Reg. 101/94" means Ontario Regulation 101/94 as amended;

"OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended;

"PA " means the Pesticides Act , R.S.O. 1990, c.P.11, as amended;

"Preparation Report" refers to a report documenting that the subsequent stage of the landfill has been constructed in accordance with the approved design plans and specifications;

"Poplar System" is the irrigation area located on top of the cap of the Existing Site (old landfill) that is used for the phytoremediation of leachate that is generated at the Site per Items 63 through 65 of Schedule "A" and Figure 2 of Item 16 on Schedule "A";

"Poplar Plantation" is the irrigation area located on native soil to the south of the Site that is used for the phytoremediation of irrigation liquid that satisfies the Effluent Limit criteria per the OWRA Section Approval for the Site, Item 39 of Schedule "A", and Appendix N11 of Item 30 on Schedule "A";

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

"PWQO" refers to the Provincial Water Quality Objectives;

"Recyclable Waste" means waste that are glass, plastic, aluminium or steel cans, gypsum wallboard, newspapers, cardboard and/or other materials for which there is a secured market;

"Regional Director" refers to the Director of the Ministry of the Environment's Southwestern Regional Office;

"Regulation 232 " or "Reg. 232" or "O. Reg. 232/98" means Ontario Regulation 232/98 (Landfilling Sites) made under the EPA, as amended;

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

"Site" refers to the Twin Creeks Landfill Site and lands owned by the Owner described as:

Firstly, Part of Lots 19 and 20, Concession 3, S.E.R., and Part of Lot 20, 21 and 22, Concession 4, S.E.R. and Part of the Road Allowance between Lots 21 and 22, Concession 4, S.E.R., shown as Parts 1,

2 and 3 on Plan 25R-9125 and Part 2 on Plan 25R-1903, Save and Except Part 1 on Plan 25R-6184, Township of Warwick, County of Lambton; and

Secondly, Part of Lot 20, Concession 3 S.E.R., shown as Part 1 on Plan 25R-6184, Township of Warwick, County of Lambton;

"Traditional agricultural crop production" means standard crop production, nursery and horticultural crops, agro-forestry, conservation uses but not greenhouses or any accessory agricultural buildings and structures;

"Undertaking" refers to the proposed undertaking as described in the Warwick Landfill Expansion Environmental Assessment;

"WIFN" refers to Walpole Island First Nation; and

"WPLC" refers to the Warwick Public Liaison Committee.

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

TERMS AND CONDITIONS

1.0 GENERAL

Compliance

- 1.1 This Approval revokes all previous Approvals and Notices of Amendment issued under Part V of the Environmental Protection Act for this Site. The approval given herein, including the terms and conditions set out, replaces all previously issued Approvals and related terms and conditions under Part V of the Act for this Site.
- 1.2 The Owner and Operator shall ensure compliance with all the conditions of this Approval and shall ensure that any person authorized to carry out work on or operate any aspect of the Site is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
- 1.3 Any person authorized to carry out work on or operate any aspect of the Site shall comply with the conditions of this Approval.

In Accordance

- 1.4 Except as otherwise provided by this Approval, the Site shall be designed, developed, built, operated and maintained in accordance with the documentation listed in the attached Schedule "A".
- 1.5 (a) Construction and installation of aspects described in Schedule "A" must be completed within 5

years of the later of:

1. the date this Approval is issued; or
 2. if there is a hearing or other litigation in respect of the issuance of this Approval, the date that this hearing or litigation is disposed of, including all appeals.
- (b) Notwithstanding Condition 1(5)(a), ongoing constructed aspects that are pertinent to the Major Works identified in Conditions 4.1 to 4.7 including the landfill liner, landfill capping, landfill gas management infrastructure, leachate collection and recirculation infrastructure shall be constructed in accordance with the documentation in the attached Schedule "A" that pertain to the final design of the Site.
- (c) This Approval ceases to apply in respect of the aspects of the Site that have not been constructed or installed before the later of the dates identified in Conditions 1(5)(a).

Interpretation

- 1.6 Where there is a conflict between a provision of any document listed in Schedule "A" in this Approval, and the conditions of this Approval, the conditions in this Approval shall take precedence.
- 1.7 Where there is a conflict between the application and a provision in any document 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 the Ministry approved the amendment.
- 1.8 Where there is a conflict between any two documents listed in Schedule "A", the document bearing the most recent date shall take precedence.
- 1.9 The conditions of this Approval are severable. If any condition of this Approval, or the application of any condition of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

Other Legal Obligations

- 1.10 The issuance of, and compliance with, this Approval does not:
- (a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; and
 - (b) limit in any way the authority of the Ministry to require certain steps be taken or to require the Owner and Operator to furnish any further information related to compliance with this Approval.
- (c) The Owner shall ensure that:
- (i) all equipment discharging to atmosphere are approved under Section 9 of the ECA where applicable; and
 - (ii) all effluent is discharged in accordance with the OWRA where applicable.

Adverse Effect

- 1.11 The Owner and Operator shall take steps to minimize and ameliorate any adverse effect on the natural

environment or impairment of water quality resulting from the present, past and historical operations at the Site. Such steps may include accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

- 1.12 Despite an Owner, Operator, or any other person fulfilling any obligations imposed by this Approval, the person remains responsible for any contravention of any other condition of this Approval or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.
- 1.13 At no time shall the Owner or Operator allow the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

Change of Ownership

- 1.14 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:
- (a) the ownership of the Site;
 - (b) the Operator of the Site;
 - (c) the address of the Owner or Operator; and
 - (d) the partners, where the Owner or Operator is or at any time becomes a partnership and a copy of the most recent declaration filed under the Business Names Act, R. S. O. 1990, c. B.17, shall be included in the notification.
- 1.15 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 sufficient financial assurance is deposited with the Ministry to ensure that these conditions will be carried out.
- 1.16 In the event of any change in ownership of the Site, other than change to a successor municipality, the Owner shall notify the successor of and provide the successor with a copy of this Approval, and the Owner shall provide a copy of the notification to the District Manager and the Director.

Registration on Title Requirement

- 1.17 Prior to dealing with the property in any way, the Owner shall provide a copy of this Approval and any amendments, to any person who acquires an interest in the property as a result of the dealing.
- 1.18 (a) If not already completed, within ninety (90) calendar days from the date of issuance of this Approval, the Owner shall submit to the Director a completed Certificate of Requirement which shall include:
- (i) a plan of survey prepared, signed and sealed by an Ontario Land Surveyor, which shows the area of the Site where waste has been and is to be deposited at the Site;
 - (ii) proof of ownership of the Site;
 - (iii) a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the Director, verifying the legal description provided in the Certificate of Requirement;
 - (iv) the legal abstract of the property; and

- (v) any supporting documents including a registerable description of the Site.
- (b) If not already completed, within fifteen (15) calendar days of receiving a Certificate of Requirement authorized by the Director, the Owner shall:
 - (i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
 - (ii) submit to the Director and the District Manager, written verification that the Certificate of Requirement has been registered on title.

Registration on Title Requirement - Contaminant Attenuation Zone (CAZ)

- 1.19 If not already completed, or if required at any time, within thirty (30) calendar days from the date of establishing a contaminant attenuation zone (CAZ) (overburden and/or bedrock aquifers) in either fee simple or by way of a groundwater easement, the Owner shall submit to the Director a completed Certificate of Requirement which shall include:
- (a) If rights are obtained in fee simple, the Owner shall provide:
 - (i) documentation evidencing ownership of the CAZ obtained in compliance with Regulation 232, as amended;
 - (ii) a completed Certificate of Requirement and supporting documents containing a registerable description of the CAZ; and
 - (iii) a letter signed by a member of the Law Society of Upper Canada; or other qualified legal practitioner acceptable to the Director, verifying the legal description of the CAZ.
 - (b) within fifteen (15) calendar days of receiving a Certificate of Requirement signed or authorized by the Director, the Owner shall:
 - (i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
 - (ii) submit to the Director and the District Manager, a written verification that the Certificate of Requirement has been registered on title.
 - (c) If rights are obtained by way of a groundwater easement, the Applicant shall:
 - (i) provide a copy of the agreement for the easement;
 - (ii) provide a plan of survey signed and sealed by an Ontario Land Surveyor for the CAZ; and
 - (iii) submit proof of registration on title of the groundwater easement to the Director and District Manager;
 - (d) The Owner shall not amend, or remove, or consent to the removal of the easement or CAZ from title without the prior written consent of the Director.

Certificate of Withdrawal of Requirement

- 1.20 If the Applicant wants to withdraw the Certificate of Requirement, the Applicant shall:
- (a) submit to the Director, a request for a Certificate of Withdrawal of Requirement; and its supporting documents, outlining the reasons for the Withdrawal of the Requirement.
 - (b) submit to the Director:
 - (i) a plan of survey of the area where waste was deposited signed and sealed by an Ontario Land Surveyor and for the Site or CAZ;

- (ii) the legal abstract of the Site or CAZ – or area where waste was deposited;
 - (iii) completed Certificate of Withdrawal of Requirement containing a registerable description of the Site or CAZ or area where waste was deposited; and
 - (iv) a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the Director verifying the legal description of the Certificate of Withdrawal of Requirement.
- (c) within fifteen (15) calendar days of receiving a Certificate of Withdrawal of Requirement authorized by the Director, the Applicant shall:
- (i) register the Certificate of Withdrawal of Requirement in the appropriate Land Registry Office on the title to the Site or CAZ or area where waste was deposited; and
 - (ii) submit to the Director and District Manager a copy of the registered document together with a copy of the PIN Abstract confirming the registration.

Inspections by the Ministry

- 1.21 No person shall hinder or obstruct a Provincial Officer from carrying out any and all inspections authorized by the OWRA, the EPA, the PA, the SDWA or the NMA, of any place to which this Approval relates, and without limiting the foregoing:
- (a) to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this Approval are kept;
 - (b) to have access to, inspect, and copy any records required to be kept by the conditions of this Approval;
 - (c) to inspect the Site, related equipment and appurtenances;
 - (d) to inspect the practices, procedures, or operations required by the conditions of this Approval; and
 - (e) to sample and monitor for the purposes of assessing compliance with the terms and conditions of this Approval or the EPA, the OWRA, the PA, the SDWA or the NMA.

Information and Record Retention

- 1.22 (a) Except as authorized in writing by the Director, all records required by this Approval shall be retained at the Site for a minimum of two (2) years from their date of creation.
- (b) The Owner shall retain all documentation listed in Schedule “A” for as long as this Approval is valid.
- (c) All information and logs required in Condition 9.1 shall be kept at the Site until they are included in the Annual Report.
- (d) The Owner shall retain employee training records as long as the employee is working at the Site.
- (e) The Owner shall make all of the above documents available for inspection upon request of Ministry staff.
- 1.23 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 Approval or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:
- (a) an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or condition of this Approval or any statute, regulation or other legal requirement; and
 - (b) acceptance by the Ministry of the information’s completeness or accuracy.

- 1.24 The Owner shall ensure that a copy of this Approval, in its entirety and including all its Notices of Amendment, and documentation listed in Item #1 of Schedule "A", are retained at the Site or the Owner's office at all times.
- 1.25 Any information related to this Approval 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, RSO 1990, CF-31.

2.0 FINANCIAL ASSURANCE

- 2.1 a. The Financial Assurance shall be submitted as required to the Director, Financial Assurance as defined in Section 131 of the Environmental Protection Act. The Financial Assurance shall be in a form acceptable to the Director and shall provide sufficient funds for the analysis, closure, ongoing and long-term monitoring and reporting, post-closure maintenance and care of the Site.
1. On the following dates, the Owner shall ensure the maximum amount of financial assurance has been submitted to the Director in a form acceptable to the Director as follows:
- | Payment Date | Amount |
|---------------------|-----------------|
| By March 31, 2021 | \$32,459,985.00 |
| By March 31, 2022 | \$35,256,829.00 |
| By March 31, 2023 | \$37,164,501.00 |
| By March 31, 2024 | \$39,434,722.00 |
- b. Commencing on March 31, 2024 and on a four year basis thereafter, the Owner shall provide to the Director a re-evaluation of the amount of the Financial Assurance to facilitate the actions required under Condition 2.1.a. The re-evaluation shall include an assessment based on any new information relating to the environmental conditions of the Site and shall include the costs of additional monitoring and/or implementation of alternative measures required by the Director upon review of the annual reports. The Financial Assurance must be submitted to the Director within thirty (30) days of written acceptance of the re-evaluation by the Director;
- c. Commencing on March 31, 2021, the Owner shall prepare and maintain at the Site an updated re-evaluation of the amount of Financial Assurance required to implement the actions required under Condition 2.1.a for each of the intervening years in which a re-evaluation is not required to be submitted to the Director under Condition 2.1.b. The re-evaluation shall be made available to the Ministry, upon request; and
- d. The amount of Financial Assurance is subject to review at any time by the Director and may be amended at his/her discretion. If any Financial Assurance is scheduled to expire or notice is received, indicating Financial Assurance will not be renewed, and satisfactory methods have not been made to replace the Financial Assurance at least sixty (60) days before the Financial Assurance terminates, the Owner shall forthwith replace the Financial Assurance with cash.

3.0 WARWICK PUBLIC LIAISON COMMITTEE and FIRST NATIONS

WPLC

- 3.1 The Owner shall continue and maintain the WPLC. The WPLC shall serve as a focal point for dissemination, review and exchange of information and monitoring results relevant to the operation of the undertaking. In addition, the purpose of the WPLC will be to provide community review of the development, operation (current and proposed) and ongoing monitoring, closure and post-closure care related to the landfill Site.
- 3.2 The general mandate of the WPLC shall include:
- a. Review operations and provide regular input to the Owner with respect to all matters pertaining to landfill Site operation, including issues pertaining to ongoing operations, monitoring, the need for contingency plans or remedial measures, response to community complaints, the need for changes to the ECA , post-closure monitoring and maintenance, and development of the proposed end use for the landfill Site;
 - b. Review operational and monitoring reports;
 - c. Consider and make recommendations to the Owner regarding outside consulting advice in respect of the landfill Site;
 - d. Facilitate ongoing dialogue between the Owner, the Environmental Inspector and the community, including residents and businesses in the immediate vicinity of the landfill Site;
 - e. Provide reports regularly to the community on the activities of the WPLC, the landfill operations and landfill related issues and seek public input on these activities and issues;
 - f. Monitor the Owner's complaint response program and make recommendations to the Owner with respect to this program; and
 - g. Provide recommendations to the Owner with respect to unresolved complaints.
- 3.3 The WPLC shall not exercise any supervisory, regulatory, approval, legal or other decision making role with respect to the operations (current and proposed) at the Site.
- 3.4 The Owner shall provide for the administrative costs of operating the WPLC, including the cost of meeting places and clerical services.
- 3.5 The WPLC shall operate under a Terms of Reference of the committee. Suggestions to revise the WPLC Terms of Reference may be made at any meeting that a quorum is present. No changes to the Terms of Reference can be made until the committee members mutually agree to changes. Any changes shall be provided to the Ministry for information purposes.
- 3.6 The Community members shall be appointed by the WPLC. The community member positions are intended to be available to individuals that are not members of groups already represented on the WPLC and have an interest in the operation of the landfill. The WPLC shall encourage individuals who reside in close proximity to the landfill to participate. A community member is defined as a taxpayer and/or resident of Warwick Township.
- 3.7 The function of the Ministry member will be to provide advice, information and input to other

members as required.

- 3.8 The WPLC shall determine the appropriate meeting frequency and review it on an annual basis.
- 3.9 Minutes and agendas of meetings shall be printed and distributed as per the mailing list on a timely basis.
- 3.10 The WPLC shall have reasonable access to the Site and its landfill related facilities for the purpose of carrying out its objective and mandate and the Owner's consultants' reports relating to Site operations shall be provided to the WPLC.
- 3.11 The Owner shall provide the WPLC with access to the Owner's consultants as required and consultants reports in accordance with protocols agreed to between the Owner and the WPLC.
- 3.12 Unless disclosure would be contrary to the Freedom of Information and Protection of Privacy Act ,the WPLC, the Township of Warwick and Walpole Island First Nation are to be provided all formal submissions and correspondence related to the site operations by the Owner at the same time as these items are submitted to the Ministry, the Township of Warwick Council or any other body.
- 3.13 The Owner shall allow access to the landfill site during normal operating hours, to enable any individual member of the WPLC and member of the public recommended by local representatives on the WPLC, to observe operations. An individual member of the WPLC must contact the operator to arrange for a Site pass, be accompanied by an operators representative at all times and follow all safety procedures.
- 3.14 All recommendations made to the Owner with respect to ongoing landfill operations, monitoring and the implementation of contingency measures shall be discussed at joint meetings between representatives of the Owner and the WPLC. The purpose of these meetings will be to arrive at an agreement between the Owner and WPLC with respect to implementation of the recommendations.
- 3.15 The Owner will disclose all monitoring results to the WPLC and deliver to the WPLC all documents and information (except as may be privileged) relevant to the operation of the landfill.

First Nation and Township of Warwick Consultation

- 3.16 During the process of submission of an application to amend any approvals for the Site, the Owner shall
 - a. discuss with WIFN and the Township of Warwick (Township) the proposed application prior to submission of the WIFN application to the Director;
 - b. provide the same documents to WIFN and Township that are provided to the Director in respect of the amendments; and
 - c. provide the Director, either prior to or at the same time of application submission, with a statement how WIFN and Township comments were considered by the Owner.

4.0 CONSTRUCTION, INSTALLATION and PLANNING

Major Works

- 4.1 For the purposes of this ECA the following are Major Works :
- a. gas management system;
 - b. leachate collection system; and
 - c. liner
- 4.2
- a. A final detailed design shall be prepared for each Major Work to be constructed at the Site consistent with the conceptual design of the Site as presented in the Supporting Documentation, specifically Items 66, 67, and 68 of Schedule "A".
 - b. Geonet may substitute a component of the 0.3 metres of granular in the secondary drainage layer in accordance with Items 54 to 57 inclusive on Schedule "A". The Owner shall ensure that the Quality Assurance/Quality Control procedure detailed in Item 57 of Schedule "A" is followed during installation of the geonet material.
- 4.3 The final detailed design of each Major Work shall include the following:
- a. design drawings and specifications;
 - b. a detailed quality assurance / quality control (QA/QC) program for construction of the major work, including necessary precautions to avoid disturbance to the underlying soils; and
 - c. details on the monitoring, maintenance, repair and replacement of the engineered components of the major work, if any.
- 4.4 Any design optimization or modification that is inconsistent with the conceptual design shall be clearly identified, along with an explanation of the reasons for the change.
- 4.5 The final detailed design of each Major Work shall be submitted to the Director and copied to the District Manager.
- 4.6 Each major work shall be constructed in accordance with the approved final detailed design and the QA/QC procedures shall be implemented as proposed by the Owner. Any significant variances from the conceptual design for the Site as detailed in Items 66, 67 and 68 of Schedule "A" shall be subject to approval by the Director.
- 4.7 As-built drawings for all Major Works shall be retained on Site and made available to Ministry staff for inspection.

Subsequent Stages

- 4.8 At least six (6) months prior to the anticipated completion of landfilling in each stage of the Site , a final detailed design for the subsequent stage shall be submitted to the Director. Any significant variances from the conceptual design for the Site as detailed in Items 66, 67 and 68 of Schedule "A"

shall be subject to approval by the Director.

- 4.9 No person shall deposit any waste at the subsequent stage until a written Preparation Report in accordance with O. Reg. 232/98, Section 19 has been submitted to the Director and District Manager documenting that:

- a. all construction;
- b. QA/QC activities;
- c. Site conditions; and,
- d. all details of the construction of the Site;

are in accordance with the approved design plans and specifications.

- 4.10 Approval to proceed with landfilling or construction of each subsequent stage shall be dependent on groundwater, air quality and surface water monitoring results acceptable to the Director . If monitoring results are not acceptable to the Director then remedial action must be taken and completed before landfilling may proceed in the subsequent stage.

Geotechnical Engineer

- 4.11 A qualified professional geotechnical engineer shall inspect the excavation and construction underlying the Site and provide a report addressing whether the construction proceeded in accordance with approved detailed design plans, specifications and QA/QC procedures. The report shall be included in the Preparation Reports for each stage of the landfill.

Environmental Inspector

- 4.12 In accordance with conditions 18 and 19 of the EA approval dated January 15, 2007 known as Item 1 on Schedule "A", the Owner shall provide funding to the Ministry for the provision of an Environmental Inspector to inspect the Site, at any reasonable time on such terms and conditions, as deemed appropriate by the District Manager of the District Office and outlined in a written agreement with the Owner. Within the agreement, the Owner shall commit to providing, as a minimum, the following:

- a. Adequate office facilities, communication equipment, and means of transportation for the Environmental Inspector; and,
- b. Reimbursement to the MECP semi-annually for the costs and associated expenses of the Environmental Inspector.

- 4.13 The Owner shall provide funding for an Environmental Inspector on Site based on the following:

- a. Construction Phase/Operations Phase- Full-time, on-Site inspector with the inspector being on Site a full day each day for five (5) days per calendar week for the first two years of the operation phase.

- 4.14 a. Every two (2) years commencing on **February 1, 2012**, the Owner shall prepare and submit a

report to the District Manager detailing the status and need for a Environmental Inspector based on discussions with the Township of Warwick, WIFN and the WPLC regarding the inspection frequency for the Environmental Inspector. The inspection frequency of the Environmental Inspector shall remain as per the requirements outlined in Condition 4.13 during the operation phase until a decision is made by the District Manager on the appropriate inspection frequency.

- b. Notwithstanding Conditions 4.12 to 4.14 (1) and 15.3, inclusive, the Environmental Inspector's duties may, in consultation with the Owner, be increased, reduced, suspended or terminated on such terms and conditions as deemed appropriate by the District Manager and, for greater certainty, the District Manager may require an Environmental Inspector to be on-Site for up to seven days per week in cases of apparent significant non-compliance with the conditions of the EA approval or any approval issued for the Site under the EPA until such non-compliance is resolved.

5.0 OTHER WORKS

Berm Construction

- 5.1 All berm slopes associated with this approval shall be no greater than 3:1.

Diversion Area

- 5.2 The diversion area will be located to the east of the treated leachate storage lagoons.

Cell 12

- 5.3
 - a. Cell 12 will be used as a monofil of contaminated soils until redeveloped and incorporated into the Expansion Site in accordance with Items 66 through 68 of Schedule "A".
 - b. The management of the Cell 12 monofill shall be in accordance with the procedures and practices consistent with other previous monofill operations at the Site.

Landscape

- 5.4 The Owner shall ensure the landscape plan is carried out in accordance with Item 72 and 80 of Schedule "A", as amended from time to time.

6.0 GENERAL OPERATIONS

Proper Operation

- 6.1 The Site shall be properly operated and maintained at all times. All waste shall be managed and disposed of in accordance with the EPA , Regulation 347 , Regulation 232 , and the requirements of this ECA. At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

- 6.2 The Owner shall ensure that the MECP's Guideline B-7, Reasonable Use Concept, is applied at the Site boundaries.
- 6.3
- a. Landfilling operations shall be conducted in accordance with Items 66 through 71 of Schedule "A" attached to this ECA.
 - b. The Owner shall ensure the operations and procedures manual for the the Site includes discussions on the following items.:
 - a. Health and safety;
 - b. Operation and maintenance of the Site;
 - c. Waste disposal area and development;
 - d. Nuisance management;
 - e. Leachate management;
 - f. Landfill gas management;
 - g. Surface water/Storm water management;
 - h. Inspections and monitoring;
 - i. Contingency plans and emergency procedures;
 - j. Complaints; and,
 - k. Reporting and record keeping.
 - c. The operations and procedures manual shall be:
 - a. retained at the Site;
 - b. reviewed on an annual basis and updated by the Owner as required; and
 - c. be available for inspection by Ministry staff.

Waste Type

- 6.4 Only the following types of waste shall be accepted at the Site :
- a. municipal, industrial, commercial and institutional solid non-hazardous waste generated within the Province of Ontario, including non-hazardous contaminated soil.

Capacity

- 6.5 The Owner shall only accept and deposit waste at the Site as long as there is available capacity as defined by the final contours for the Site approved by this ECA . The approval permits disposal of waste at the Site to fill an air space of **26,508,000 cubic metres** (including waste, daily and interim cover material). This capacity includes the capacity of the existing and expansion landfill areas.

Yearly Waste Limit

- 6.6
- a. The Owner can receive up to a maximum of **1,400,000 tonnes per year** of waste including contaminated soil for disposal at the Site.

- b. The amount of tire shred that may be received to process is **7,160 tonnes/year**.
- c. Up to a maximum of **100 tonnes per day** of solid non-hazardous waste, white goods and metals, recyclable waste, wood waste, and leaf and yard waste that are deposited by the public using small vehicles at the Mini-Transfer Area of the Site may be transferred from the Site by a waste hauler or waste haulers that has an ECA to another waste disposal site.

Service Area

- 6.7 Only waste that is generated in the Province of Ontario shall be accepted at the Site .

Landfilling of Sludge

- 6.8 A thickness of at least 2 metres of compacted waste and cover material shall be maintained between any landfilled sludge (solid non-hazardous as per Reg. 347) and the granular leachate collection layer.

Asbestos Waste

- 6.9 Any waste that is considered asbestos waste shall be handled in accordance with Section 17 of O. Reg. 347 as amended from time to time.
- 6.10 A suitable sized excavation for the asbestos waste shall be made by the Owner in a location away from the active landfilling face.
- 6.11 All asbestos waste shall be inspected to ensure that the asbestos waste is properly bagged or contained and free from puncture, tears or leaks.
- 6.12 The asbestos waste shall be placed in the excavation to avoid damage to the containers and to prevent dust and spillage.
- 6.13 Upon completion of the unloading and deposition of the asbestos in the excavation, at least 125 centimetres of cover or waste material shall be placed over the asbestos.
- 6.14 All asbestos waste shall be deposited to a level no higher than 1.25 metres below the general elevation of the disposal area to ensure that daily cover material removal in the future does not encounter the asbestos waste.

Waste Limits

- 6.15 No waste, including daily cover, intermediate cover or final cover layer, shall be landfilled outside the limits of the base and final cover contours presented in Items 66 through 71 of Schedule "A"(the Development and Operations Plan) attached to this ECA .

Site Use

- 6.16 The area inside the fencing indicated in Appendix N18 of Item 30 of Schedule "A" shall be used for waste disposal purposes only. The remainder of the Site outside the fenced area shall be used for traditional agricultural crop production only.

Waste Inspection

- 6.17 All loads of waste must be properly inspected by trained Site personnel prior to disposal at the Site and waste vehicles must be diverted to appropriate areas for waste disposal.

Waste Deposit

- 6.18 The Owner shall deposit waste in a manner that minimizes exposure area at the landfill working face and waste shall be compacted before cover is applied.

Burning Waste Prohibited

- 6.19 Burning of waste at the Site is prohibited.

Signage

- 6.20 A sign shall be maintained at the main entrance/exit to the Site on which is legibly displayed the following information:

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

- 6.21 The Owner shall install and maintain signs to direct vehicles to working face and recycling areas.

- 6.22 The Owner shall maintain signs at recycling depot informing users what materials are acceptable and directing users to appropriate storage area.

Hours of Operation

- 6.23 Waste shall only be accepted at the Site during the following time periods:

- a. 7 AM to 7 PM - Monday to Saturday.

- 6.24 On-site equipment used for daily Site preparation and closing activities shall only be used during

- a. 6 AM to 8 PM - Monday to Saturday.

- 6.25 With prior written approval of the District Manager, the time periods may be extended to accommodate seasonal or unusual quantities of waste or such factors as determined to be reasonable to the District Manager.
- 6.26 The Owner may provide limited hours of operation provided that the hours are posted at the landfill gate and that suitable notice is provided to the public of any change in operating hours.
- 6.27 Upon reasonable notice to the District Manager, contingency actions may take place outside normal hours of operation. Emergency response may occur at any time as required.

Site Security

- 6.28 During non-operating hours, the Site entrance and exit gates shall be locked and the Site shall be secured against access by unauthorized persons

Fencing

- 6.29 The entire area as shown in Figure 12 in Item 66 of Schedule "A" shall be fenced by the Owner with a 6 foot high wire woven highway-type paige fence.

Site Access

- 6.30 Access to and exit from the Site for the transportation of waste shall under normal circumstances be permitted from County Road 79.

Access Roads

- 6.31
 - a. On-Site roads shall be provided and maintained in a manner that vehicles hauling waste to and on the Site may travel readily and safely on any operating day. During winter months, when the Site is in operation, roads must be maintained to ensure safe access to the landfill working face.
 - b. Access roads must be clear of mud, ice and debris which may create hazardous conditions.

Vermin, Dust, Litter, Odour, Noise, Traffic

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

Scavenging

- 6.33 The Owner shall ensure that there is no scavenging as defined in O. Reg. 347 at the Site.

Dust

- 6.34 The Owner shall control fugitive dust emissions from on Site sources including but not limited to on-Site roads, stockpiled cover material and, closed landfill area prior to seeding especially during times of dry weather conditions. If necessary, major sources of dust shall be treated with water and/or dust suppression materials to minimize the overall dust emissions from the Site.
- 6.35 Dust shall be managed as per the Best Management Practices Plan (Dust) prepared by RWDI listed as Item 83 in Schedule "A".

Litter Control

- 6.36 The Owner shall take all practical steps to prevent escape of litter from the Site. All loose, windblown litter shall be collected and disposed of at the landfill working face.
- 6.37 Litter pickup will occur at least weekly on the Owner's property during all weather conditions.
- 6.38 The Owner will respond to litter complaints within one (1) day of the complaint being received.
- 6.39 Litter shall be managed in accordance with the Best Management Practices plan prepared by RWDI listed as Item 25 on Schedule "A".

Odour

- 6.40 Odour shall be managed in accordance with the Best Management Practices Plan (Odour) prepared by RWDI listed as Item 84 in Schedule "A".

Noise

- 6.41 The Owner shall comply with noise criteria in MECP Guideline entitled "Noise Guidelines for Landfill Sites" dated October 1998 as amended from time to time and the Site shall comply with the limits set in Publication NPC205. Bird bangers may be used at the Site for gull control provided that they produce reference impulsive sound not exceeding 125 dBAI at 5 metres from the bird banger.
- 6.42 Noise monitoring at the Site shall be undertaken by the Owner as per the document entitled "Environmental Noise Monitoring Program for the Warwick Landfill", dated June 15, 2007 prepared by Aercoustics Engineering Limited listed as Item 73 on Schedule "A".

Alteration of Best Management Plans for Odour, Dust and Litter

- 6.43 The Owner shall use the Best Management Plans (BMP's) for dust, odour and litter at the Site in accordance with the applicable Conditions approved by this ECA. The Owner may submit changes in writing to the Director for approval to amend the BMP(s). At the same time any changes to the BMP's are submitted to the Director, the Owner shall provide the proposed changes to the BMP's to the Township of Warwick, WPLC and WIFN.

Surface Water

- 6.44 The Owner shall take all appropriate measures to minimize surface water from coming in contact with waste. Temporary berms and ditches shall be constructed around active waste disposal areas to prevent extraneous surface water from coming in contact with the active working face.
- 6.45 The Owner shall not discharge surface water to receiving water bodies without an approval under the EPA.
- 6.46 If surface water ponding occurs in any surface water ditches having a drainage slope less than 0.5%, the Owner shall regrade the ditches.

Application of Cover Material

- 6.47 Cover material shall be applied as follows:
- a. Daily Cover - At the end of each working day, the entire working face shall be covered with a minimum thickness of 150 mm of soil cover or an approved alternative cover material;
 - b. Intermediate Cover - In areas where landfilling has been temporarily discontinued for six (6) months or more, a minimum thickness of 300 mm of soil cover or an approved alternative cover material shall be placed;
 - c. Final Cover - In areas where landfilling has been completed to final contours, a minimum 1.85 metre thick layer of final cover soil shall be placed. Fill areas shall be progressively completed and rehabilitated as landfill development reaches final contours; and
 - d. Topsoil - In areas where landfilling has been completed to final contours and where final cover has been placed, a minimum 0.15 metres thick layer of topsoil shall be placed.

Cover Materials Allowed

- 6.48 The following materials, in the corresponding thickness, may be used as an alternative to soil as a daily and intermediate cover:
- a. Contaminated soil that satisfies the Schedule IV Toxicity Characteristic Leaching Procedure (TCLP) criteria as outlined in O. Reg. 347 as amended from time to time;
 - b. Wood chips (daily);
 - c. Automobile Shredder Residue (ASR) (daily); or
 - d. Tarps (daily)
- 6.49 The use of any other alternative materials as daily or intermediate cover material is subject to approval by the Director.
- 6.50 Use of alternative daily or intermediate cover materials shall be discontinued within two (2) working days of receipt of written notification from the District Manager, stating that the use of the alternative daily or intermediate cover materials at the Site has proven to be environmentally unsuitable.

Automobile Shredder Residue as Daily Cover

- 6.51 a. Automobile Shredder Residue (ASR) may be used as a daily cover at the Site on an on-going basis from the issuance of this Approval.
- b. The Owner shall cease the use of ASR if written notification is received from the District Manager indicating that there are environmental concerns due to the use of ASR as daily cover based on the testing of the ASR required by Condition 6.52.
- c. The Owner may re-commence the use of ASR upon the Owner submitting an action plan that is acceptable to the District Manager that can address the environmental concerns which were raised due to the the use of ASR as daily cover.
- 6.52 Automobile Shredder Residue samples of the daily cover material are to be taken on semi-annual basis (Spring and Fall) and submitted for analysis of O. Reg. 347 Schedule IV Inorganics, VOC's, and PAH's. Automobile Shredder Residue is to conform with the specifications of a non-hazardous waste under O. Reg. 347 as amended from time to time. Semi-Annually testing results are to be submitted to the District Manager upon receipt. The frequency of O. Reg. 347 testing of the daily cover material can be reduced subject to approval of the District Manager.

Contaminated Soil as Daily or Intermediate Cover

- 6.53 Contaminated soil equal to or below 10% of the TCLP value and/or 0.4 mg/L benzene may be landfilled in Cells 8, 10 and/or 12.
- 6.54 If confirmatory testing of the contaminated soil to be landfilled in Cells 8, 10 and/or 12 indicates an exceedance of 10% of the TCLP value and/or 0.4 mg/L of benzene, but satisfies the TCLP criteria as in O.Reg. 347, the soil may be used as daily and/or intermediate cover, and or landfilled as waste.
- 6.55 If the contaminated soil received at the Site does not meet the TCLP value, the contaminated soil shall be classified as a hazardous waste and shall be disposed of at a site that is approved to receive and dispose of hazardous waste.
- 6.56 Contaminated soil that satisfies the TCLP criteria may be used as daily and/or intermediate cover in the Expansion Site of the landfill. Contaminated soils may not be used on outside slopes which drain into the surface water system.
- 6.57 Contaminated soil used for daily and/or intermediate cover shall be sampled on a quarterly basis and submitted for analysis of O.Reg. 347 Schedule IV Inorganics, VOCs, PAHs and PCBs. Quarterly testing results shall be included in the annual report. The frequency of O. Reg. 347 testing of the cover material may be reduced subject to agreement of the District Manager.
- 6.58 Contaminated soil for use as daily cover and/or intermediate cover shall be stockpiled in areas of the

Site that have a leachate collection system installed below.

- 6.59 Surface water run off from the contaminated soils stockpile which exceeds the Provincial Water Quality Objectives shall not be discharged through the surface water management system.
- 6.60 The Owner must ensure that measures are in place for the on Site treatment and disposal of any contaminated run off from the contaminated soils stockpile.
- 6.61 Prior to receipt at the Site, each source of contaminated soils which are to be used as daily or intermediate cover shall be tested to determine if the soils meet the criteria in this ECA and a copy of the test results shall be kept in the daily records for the Site as required.

7.0 SITE OPERATIONS

Landfill Reclamation

- 7.1 The Owner shall restrict stockpiling of contaminated soil from Cells 8, 10 and 12 to sections of the landfill footprint that have a liner and leachate collection system.

Waste Processing and Composting

- 7.2 Waste Processing and composting is allowed at the location outlined in Item 49 on Schedule "A" subject to the following conditions:
 - a. Prior to the commencement of any waste processing or composting operations at the Site, the Owner shall ensure that air (Section 9 EPA) and noise approvals are obtained;
 - b. Prior to the start of composting operations at the Site, the Owner shall submit to the District Manager a contingency plan for any odour problems that may occur;
 - c. The total combined amount of waste that may be received at the Site for processing and composting shall not exceed **36,000 tonnes per year** and the maximum daily amount to be received at the Site shall not exceed **700 tonnes per day**;
 - d. The amount of waste that may be received at the Site for composting shall not exceed **7,500 tonnes per year**;
 - e. Material acceptable for processing and composting at the site shall include leaf, yard, agricultural waste, concrete, asphalt, wood and tires;
 - f. The bins for diversion shall be emptied on an as needed basis to prevent odours and operational problems. The Ministry may at any time instruct that a bin be emptied;
 - g. The Owner shall ensure that waste processing and composting is undertaken in a safe manner, and that all waste is properly handled, processed and contained so as not to pose any threat to the general public and site personnel;
 - h. All noise generating processing activities in the waste diversion area including concrete/asphalt/crushing, wood chipping and tire shredding shall only occur between 07:00 to 19:00; and
 - i. Any runoff that comes into contact with waste in the waste processing/composting area shall be managed in such a fashion to ensure compliance with Condition 8.5 of this ECA.

7.3 The Owner shall ensure that composting at the Site is undertaken in accordance with O.Reg 101/94 as amended from time to time and the Ministry document entitled "Interim Guidelines for the Production and Use of Aerobic Compost in Ontario " dated November 2004 as amended from time to time and the following requirements:

- a. Only leaf and yard waste, Agricultural Waste as defined in Item 3 in Schedule "A" and wood (not including painted or treated wood or laminated wood) may be accepted at the compost area.
- b. Leaf and yard waste is defined as waste consisting of natural Christmas trees and other plant materials but not tree limbs or other woody materials in excess of seven (7) centimetres in diameter.
- c. The composting site shall only receive material for composting from May 1st to November 1st each year.
- d. Leaf and yard waste, Agricultural Waste and wood may not be stored for more than four (4) days before it is composted.
- e. During composting, the Owner shall provide the composting mass with adequate ventilation to ensure that aerobic conditions are maintained.
- f. Cured compost must be analyzed for the parameters listed in Table 1 of O.Reg. 101/94 and shall not be removed from the Site unless it has been sampled and analyzed.
- g. Cured compost is defined as meeting the specifications in Sections 7.2 to 7.5 inclusive of the Interim Guidelines for the Production and Use of Aerobic Compost in Ontario" dated November 2004 as amended from time to time and can be used on an unrestricted basis.
- h. Compost is designated a waste if the compost contains a substance listed in Table 1 of O. Reg. 101/94 that has a concentration greater than the concentration listed in Column 2.
- i. Controlled compost is defined as compost that is designated a waste under the previous condition but has concentrations less than the concentrations listed in Column 3 of Table 1 in O. Reg. 101/94.
- j. Controlled compost may not be removed from the site except for direct shipment to the intended user.
- k. Material from the composting process that fails to meet the "Interim Guidelines for the Production and Use of Aerobic Compost in Ontario" dated November 2004 shall be deemed to be a waste under O. Reg. 347 and shall be disposed of accordingly.
- l. The person to whom controlled compost is shipped shall be given a copy of the chemical analysis of the compost and a notice that states that the compost is controlled compost and that sets out the terms and conditions of the compost's exemption from Part V of the EPA. A copy of this notice shall be kept on file at the Site.
- m. The District Manager may at any time and at his absolute discretion instruct that any or all of the waste materials from the composting or processing operations or the processed waste from the composting or processing operations to be either landfilled or directed to be utilized for specific uses and in specific locations.

7.4 Record keeping for the composting operation shall be kept as follows:

- a. Records about each composting mass shall be kept including temperatures of the mass, when the temperatures were measured, when the mass was turned, information about the

curing process and details about significant problems that occurred during composting or curing. This information shall be kept at the Site for at least three years after the mass was cured;

- b. Records shall be kept of the analyses of compost. Any laboratory records shall be kept as part of the record. A record of an analysis shall be kept for at least three years after the analysis is performed; and
- c. A record shall be kept of the name, address and telephone number of each person to whom controlled compost is shipped. The record shall be kept for at least ten (10) years after the shipment.

Tire Shred

7.5 The management and placement of tire shreds at the Site shall be in accordance with the Fire Protection and Prevention Act as follows:

- a. No individual tire shred pile shall be more than 3 metres in height and 100 square metres in area. Six (6) metres of space shall be provided between all piles. Fifteen (15) metres is to be provided from property lines and thirty (30) metres shall be provided from tree lines;
- b. A buffer of 4.5 metres is to be provided for grass or weeds from the edge of the tire pile to the edge of the pad.
- c. A firebreak of 22 metres shall be provided between the two areas of 16 piles each.

7.6 If the total stockpiled tire shreds exceeds **300 cubic metres**, the storage period shall not exceed 90 (ninety) days.

7.7 The total amount of tire shreds stored on Site shall be recorded in a log book and made available to the Ministry for inspection.

Backup Power

7.8 The Owner shall maintain adequate backup power at the Site in order to ensure scale facility and landfill gas blower on site continue to operate and are not damaged due to an extended power outage. A power supply connection at each leachate collection pumping station shall be maintained by the Owner that will permit a portable generator to be connected during a power outage.

Landfill Gas

7.9 All buildings are to be free of any landfill gas accumulation. The Owner shall provide adequate ventilation systems to relieve landfill gas accumulations in buildings if necessary.

Landfill Gas Management

7.10 The Owner shall, manage landfill gas in accordance with Items 66 through 68, Items 75 through 77, and Item 81 of Schedule "A" and based on the landfill gas management system constructed under the

authority of the EPA Approval issued which may be amended or replaced from time to time.

Cleaning of Leachate Collection System

- 7.11 The leachate collection system piping for each stage of the landfill shall be inspected annually for the first five years after waste placement and then as often as future inspections indicate to be necessary. Additionally, leachate collection pipes must be cleaned whenever an inspection indicates that cleaning is necessary.
- 7.12 In areas where leachate collection pipe slopes are less than 0.5%, the leachate collection pipes shall be inspected semi-annually for the first three (3) years after waste placement and then as often as future inspections indicate to be necessary. Additionally, leachate collection pipes must be cleaned whenever an inspection indicates that cleaning is necessary. After the three (3) year period, inspection and cleaning of the leachate collection pipes shall be in accordance with the previous condition.

Leachate Collection System

- 7.13 All leachate collection pipes for Cell 12 shall be sloped at a minimum of 0.5%.
- 7.14 The Owner shall install 250 mm diameter perforated leachate collection pipes with perforations located at the 10:30, 4:30, 1:30 and 7:30 positions.
- 7.15 The stone for the leachate collection system shall have the following specifications:
- a. D85 shall be greater than 37 mm where D85 is described as the stone diameter such that, when measured by weight, 85% of the stones in the layer have a smaller diameter;
 - b. D10 shall be greater than 19 mm where D10 is the stone diameter such that, when measured by weight, 10% of the stones in the layer have a smaller diameter;
 - c. D60/D10 shall be less than 2; and,
 - d. One per cent (1%) of the stones may pass a #200 sieve.
- 7.16 A minimum of 50 mm of stone shall be placed below the leachate collection pipes and a minimum of 250 mm of stone shall be placed above any leachate collection pipes.
- 7.17 The Owner shall ensure that the leachate collection system is constructed under the supervision of a qualified consultant.

Hydraulic Trap

- 7.18 The Owner shall ensure that a hydraulic trap is developed and maintained beneath the Expansion Area and shall ensure that a maximum leachate head of 300 mm on the landfill liner is not exceeded.

8.0 LEACHATE MANAGEMENT

Leachate Recirculation

- 8.1 Prior to implementing the leachate recirculation program , a report on the moisture content of the incoming waste and the actual field capacity of the waste in situ shall be submitted to the Director.
- 8.2 The Director may at any time, terminate leachate recirculation at the Site if, in the Ministry's opinion, adverse effects on the environment are observed.
- 8.3 Before starting leachate recirculation, the Owner shall provide to the Director a monitoring program to ascertain the effectiveness of the leachate recirculation process.
- 8.4 Leachate recirculation shall not occur in any above grade locations until final cover has been installed on exterior side slopes.

Leachate Management Plan

- 8.5 The Owner's leachate management plan shall not include any direct discharge of leachate or treated leachate from the Site, even as a contingency option, to surface waters, including Bear Creek. The Owner shall not discharge leachate or treated leachate to surface waters, including Bear Creek from the Site.

Leachate Treatment Plant

- 8.6 (1) (a) Within a minimum of three (3) years prior to closure of the landfill Site, the Owner shall ensure that a leachate treatment system is installed and operational at the Site.
- (b) Leachate from the Site not sent to the operational drip irrigation area(s) approved under Condition 8.7 shall be disposed of off-Site at a location approved by the District Manager until the leachate treatment system required by Condition 8.6 (1)(a) is approved and operational.
- (c) Any waste from the leachate treatment system that is to be disposed of in the landfill must be classified as a solid non-hazardous waste.
- (d) The Owner shall implement all items within the document entitled Leachate Management Framework, listed as Item 86 in Schedule "A". These items include new and existing leachate monitor locations (wells, mini piezometers, and sump), leachate monitoring, leachate level reporting, Leachate Management Plan by March 31, 2020 and updated every 3 years, and the Leachate Treatment Facility Study to be completed at least 7 years prior to closure of the landfill.
- (2) As part of the financial assurance calculation in Section 2.0, the Owner shall provide to the Director for approval, a detailed financial assurance plan including the cost of leachate transportation and disposal for the landfill site during the period preceding the initiation of the leachate treatment system. In addition, the Owner shall provide to the Director for approval a financial assurance plan detailing the capital cost of the on-Site leachate treatment system.

Phytoremediation of Leachate - Existing and Proposed Poplar Plantations

8.7 On-Site phytoremediation may occur at the Poplar System and Poplar Plantation in accordance with the following conditions:

- a. The Owner shall ensure that there is a 100 metre grassed buffer at all times from the Poplar Plantation to the Kersey drain.
- b. Irrigation of leachate onto the either the Poplar Plantation or the Poplar System shall not occur in the following instances:
 - i. Between the dates of October 16 to April 30
 - ii. On frozen or snow covered ground conditions;
 - iii. Under conditions that will cause ponded water or runoff;
 - iv. Conditions where surface water ponding within the area is occurring;
 - v. Where no poplar trees are currently planted;
 - vi. In areas within a drip irrigation area where trees have been harvested more than a frequency greater than every other tree;
 - vii. In areas within a drip irrigation area that has been fully harvested clear of trees and the trees have not started to coppice.
- c. If weather forecasts indicate a rainfall storm greater than 12.5 mm/hour will occur, the Owner shall within 1 hour before the storm, shut off all irrigation of the poplar forest.
- d. Irrigation zones shall be individually assessed by the Owner for suitability of irrigation after rainfall events greater than 12.5 mm.
- e. Records shall be kept for the Poplar System and Poplar Plantation areas as follows:
 - i. quantities and dates of application of pesticides and herbicides;
 - ii. inspection notes regarding tree growth rates and health;
 - iii. inspection notes regarding condition and growth of underlying vegetative landfill cover (ie grass);
 - iv. observed pooling and/or runoff of irrigated liquid;
 - v. observations of any odours; and,
 - vi. weather conditions records as may be obtained from the nearest Environment Canada Weather Office which may include daily high and low temperatures, wind velocity and direction, and precipitation quantities.
- f. Irrigation onto either the Poplar System or the Poplar Plantation shall be as follows:
 - i. Detailed records shall be kept of the quantities of irrigation liquid that are applied, including the dates of application onto either drip irrigation area;
 - ii. Operations in a given drip irrigation area must immediately stop if contamination problems in surface water or groundwater, which are attributable to the operation of the noted drip irrigation area, are found to be occurring. Recommencement of operations may proceed only upon further written notification of the District Manager;
 - iii. Operations of a given drip irrigation area must be discontinued immediately if

- operation of the noted drip irrigation area causes surface runoff from the footprint area or if operations cause surface ponding within the drip irrigation area; operations cannot be restarted during that application day and can only be restarted after surface ponding has evaporated or infiltrated or conditions causing the runoff or ponding have been rectified;
- iv. If there are any stoppages of operations under the requirements of items ii) or iii) above, then the District Manager shall be notified immediately; and,
 - v. If odours attributable to one of the drip irrigation areas become a problem at the site, then the District Manager shall be so informed in writing and the operation of the noted drip irrigation area shall be stopped pending further instructions from the District Manager;
- g. (1) Monitoring of the drip irrigation Poplar System and the Poplar Plantation shall be in accordance with Items 63 through 65 of Schedule "A".
- (2) Monitoring frequencies and analyses for the following items shall be as follows:
- i. Daily inspections for ponded water or saturated soil during irrigation;
 - ii. Monthly testing of irrigation liquid quality during the irrigation season;
 - iii. Soil samples should be taken annually from grade to a depth of 0.6 m minimum and 0.9 m maximum;
 - iv. Annual soil analyses shall be conducted annually per Section 3.1 of Item 63 of Schedule "A", in addition to pH, electrical conductivity, cation exchange capacity, and sodium absorption ratio
 - v. Leaf Tissue analyses once per year in the fall; and
 - vi. Crop inspection once per year in the fall.
- h. Reporting on the drip irrigation areas shall be part of the annual monitoring report for the Site and shall include but not be limited to the following:
- i. results and an analysis of the results of the monitoring programs for the drip irrigation areas;
 - ii. assessment of the results of the vegetation as related to the stated objectives for the Poplar System and Poplar Plantation facilities construction and operations;
 - iii. assessment of the need to change the monitoring program for the drip irrigation areas and a recommendation of the required changes;
 - iv. tabulation and assessment of the volumes of leachate produced by the landfill, and those volumes which may be applied to the existing drip irrigation areas;
 - v. a report on operational problems identified during the operation of the drip irrigation areas and a discussion of each problem and details of what was done to rectify each problem;
 - vi. a Site plan which shows the location of the areas planted with both trees and grass cover and the vegetation used on those areas;
 - vii. an assessment of the monitoring results pertaining to the use of trees as vegetation on the final cover

- i. The Director retains the right to request that the Owner conduct additional studies, suspend operations or require the Owner to provide additional methods to handle leachate at the Site in addition to or as a replacement to the drip irrigation areas.
- j. If the Director requests removal of the drip irrigation areas, the Owner shall:
 - i. remove the irrigation equipment and the trees from the noted drip irrigation area. For the Poplar System, removal of trees shall include removal of tree stumps and most roots, excavate the trench to the maximum depth of root depth penetration on each tree row, and then replace, remould and recompact the excavated material;
 - ii. the landfill cover shall be restored to the same condition as it was in prior to commencement of the Poplar System and a blend of suitable grasses shall be seeded as necessary; and,
 - iii. within 6 months of completion of the noted drip irrigation area closure activities, submit to the Director a report outlining the work that has been completed.
- k. Electrical conductivity of the shallow soil (maximum depth of 0.15 m) beneath the drip irrigation areas shall be monitored on a weekly basis during irrigation.
- l. If salt levels are building up in the soil or additional irrigation with leachate is found to be detrimental to the health of the poplars, the leachate application rate shall be reduced or terminated.

Wood Waste and Leaf Litter

- m. Any wood waste or leaf litter that is produced in the Poplar System or Poplar Plantation shall be managed in accordance with Item 63 of Schedule "A".

Other Items

- n. (1) Drip irrigation rates for the Poplar Plantation shall be no greater than the rate specified in the EPA approval for the Site.
- (2) Drip irrigation rates for the Poplar System shall be no greater than the rates noted in Item 63 of Schedule "A".
- o. No drip irrigation shall occur within fifty (50) metres of any surface watercourse or drain.
- p. (1) Leachate to be used for drip irrigation on the Poplar Plantation shall not exceed the treated leachate effluent criteria specified in the EPA approval for applicable industrial sewage works for the Site.
- (2) Leachate to be used for drip irrigation on the Poplar System shall not exceed the

treated leachate effluent criteria specified in the Item 63 through 65 in Schedule "A".

- q. The use of the Poplar Plantation to manage irrigation leachate will not be permitted without first providing the District Manager with at least two (2) months written notice of the anticipated irrigation liquid application date. The use of surface water to encourage tree growth will be permitted and will not be considered as irrigation liquid.
- r. Monitoring and the associated reporting for the Poplar Plantation will commence at least two (2) months prior to irrigation liquid application and continue until two (2) years after cessation of irrigation liquid application to the Poplar Plantation.

Leachate Storage Tanks

- s. The leachate storage tanks shall be inspected by a licenced plumber on an annual basis
- t. The leachate storage tanks shall be cleaned and sediment removed at least once every two (2) years.

9.0 INSPECTIONS AND RECORDS

Inspections

9.1 The Owner shall inspect the Site monthly for the following items but not limited to these items:

- a. Erosion rills;
- b. General settlement areas or depressions;
- c. Shear and tension cracks;
- d. Condition of surface water drainage works;
- e. Erosion and sedimentation in surface water drainage system;
- f. Presence of any ponded water;
- h. Adequacy of cover material;
- i. Evidence of vegetative stress, distressed poplars or side slope plantings;
- j. Condition of groundwater monitoring wells and gas wells;
- k. Presence of insects, vermin, rodents and scavenging animals;
- l. Condition of fence surrounding the Site; and
- m. General Site appearance.

9.2 The Owner shall inspect the Site weekly for presence of leachate seeps.

Daily Inspections and Log Book

9.3 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 being operated in compliance with this ECA . Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the Site if needed.

9.4 A record of the inspections shall be kept in a daily log book or a dedicated electronic file that includes:

- i. the name and signature of person that conducted the inspection;
- ii. the date and time of the inspection;
- iii. the list of any deficiencies discovered;
- iv. the recommendations for remedial action; and
- v. the date, time and description of actions taken.

9.5 A record shall be kept in a daily log book of all refusal of waste shipments, the reason(s) for refusal, and the origin of the waste, if known.

Monthly Records

9.6 Monthly Site inspection records in the form of a written log or a dedicated electronic file shall include but not be limited to the following:

- a. the type, geographic source, date and time of arrival, hauler, and quantity (tonnes) of all waste received at the Site;
- b. the area of the Site in which waste disposal operations are taking place;
- c. a calculation of the total quantity (tonnes) of waste received at the Site during each operating day and each operating week;
- d. Results of any test done to determine the acceptability of waste at the Site;
- e. A reference for each load of solid non-hazardous industrial waste received, to the client and type of solid non-hazardous industrial waste;
- f. the amount of any leachate removed, or treated and discharged from the Site;
- g. a record of litter collection activities and the application of any dust suppressants;
- h. a record of the daily inspections;
- i. 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;
- j. type and amount of daily, intermediate and final cover used;
- k. maintenance and repairs performed on equipment employed at the Site;
- l. complaints received and actions taken to resolve them;
- m. emergency situations and actions taken to resolve them; and
- n. any other information required by the District Manager.

9.7 The Owner shall maintain on record at the Site for each client disposing of solid non-hazardous waste at the Site, a description of each type of solid non-hazardous waste received from the client and documentation to demonstrate that the Owner has taken reasonable care to ensure that waste classified as either hazardous or liquid industrial waste under O. Reg. 347 as amended from time to time, is not disposed of at the Site.

Record Retention

9.8 Except as authorized in writing by the Director, all records required by this ECA shall be retained at

the Site for a minimum of two (2) years from their date of creation.

- 9.9 The Owner shall retain all documentation listed in Schedule "A" for as long as this ECA is valid.
- 9.10 All monthly Site inspection records are to be kept at the Site until they are included in the Annual Report.
- 9.11 The Owner shall retain employee training records as long as the employee is working at the Site.
- 9.12 The Owner shall make all of the above documents available for inspection upon request of Ministry staff.
- 9.13 The Owner shall retain, either on-Site or in another location and notify the District Manager of this location, copies of the annual reports referred to in the preceding condition and any associated documentation of compliance monitoring activities and shall continue to do so for a period of at least two (2) years after the closure of the Site.

10.0 TRAINING

Employees and Training

- 10.1 A training plan for all employees that operate any aspect of the Site shall be developed and implemented by the Operator . Only trained employees shall operate any aspect of the Site or carry out any activity required under this ECA . Employees must provide proof of training to the Ministry upon request. For the purpose of this ECA "trained" means knowledgeable either through instruction or practice in:
 - a. the relevant waste management legislation including EPA, O. Reg. 347 and O. Reg. 232/98 , regulations and guidelines;
 - b. major environmental and occupational health and safety concerns pertaining to the waste to be handled;
 - c. the proper handling of wastes;
 - d. the management procedures including the use and operation of equipment for the processes and wastes to be handled;
 - e. the emergency response procedures;
 - f. the specific written procedures for the control of nuisance conditions;
 - g. the terms, conditions and operating requirements of this ECA and
 - h. proper inspection, receiving and recording procedures and the activities to be undertaken during and after a load rejection.

11.0 COMPLAINTS PROCEDURES

- 11.1 If at any time, the Owner receives complaints regarding the operation of the Site , the Owner shall respond to these complaints according to the following procedure:

- a. The Owner shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information, the time and date of the complaint, specific details of operations that were occurring, any changes from normal operations, types of waste loads (including source) and other on Site activities;
- b. The Owner, upon notification of the complaint, shall initiate appropriate steps to determine all possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and
- c. The Owner shall complete and retain on-Site a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.

11.2 The Owner shall designate a person to receive any complaints and to respond with a written notice of action as soon as possible. The Owner shall post the Site complaints procedure at the Site entrance. All complaints and the Owner's actions taken to remedy the complaints must be summarized in the Annual Report.

11.3 All complaints received by the Owner are to be reported within twenty-four (24) hours of receipt to the District Manager, the Township of Warwick, the Environmental Inspector and WIFN. Complaints shall be reported to the WPLC at the next WPLC meeting.

12.0 EMERGENCY SITUATIONS

12.1 In the event of a fire or discharge of a contaminant to the environment, Site staff shall contact the MECP Spills Action Centre (1-800-268-6060) and the District Office of the MECP forthwith.

12.2 The Owner shall submit to the District Manager a written report within three (3) days of the spill or incident, outlining the nature of the incident, remedial measures taken and measures taken to prevent future occurrences at the Site.

12.3 The Owner shall ensure that adequate fire fighting and contingency spill clean up equipment is available in accordance with Item 66 of Schedule "A" and that emergency response personnel are familiar with its use and location.

13.0 MONITORING

Groundwater Monitors

13.1 The Owner shall ensure all groundwater monitoring wells are properly capped, locked and protected from damage.

- 13.2 In areas where landfilling is to proceed around monitoring wells, the wells must be decommissioned in accordance with O. Reg. 903 as amended from time to time and then replaced when waste placement and capping is completed.
- 13.3 Any groundwater monitoring wells included in the monitoring program shall be assessed, repaired, replaced or decommissioned as required.
- 13.4 The Owner shall repair or replace any monitoring well which is destroyed or in any way made inoperable for sampling such that no more than one sampling event is missed.
- 13.5 All monitoring wells that are no longer required as part of the groundwater monitoring program shall be decommissioned in accordance with good standard practice that will prevent contamination through the abandoned well and in accordance with O. Reg. 903. A report on the decommissioning shall be provided in the annual monitoring report for the period during which the well was decommissioned.

Monitoring Program

- 13.6 Monitoring programs shall be carried out for groundwater, surface water, landfill gas in accordance with the Environmental Monitoring Plan, as amended from time to time listed as Item 39 and Appendix H of Item 68 of Schedule "A".
- 13.7 The Owner shall ensure that Biochemical Oxygen Demand, Total Suspended Solids, Total coliform, Fecal coliform and E. Coli are added to the parameter list to be sampled for surface water station SS19.
- 13.8 Air Quality, Dust, Hydrocarbon, and Volatile Organic Carbon monitoring shall be undertaken in accordance with Item 85 in Schedule "A".
- 13.9 Air quality monitoring shall be in accordance with the canister method (USEPA TO-14/15) .
- 13.10 Noise monitoring shall be undertaken by the Owner at the Site in accordance with Item 28 on Schedule "A" including any noise monitoring in response to noise complaints.
- 13.11 No alterations to the groundwater, air quality, noise or surface water monitoring programs shall be implemented prior to receiving written approval from the District Manager. The Owner shall give all requests to the Township of Warwick, the WPLC and WIFN at the same time or prior to the time that such request is made to the District Manager.

14.0 CONTINGENCY PLANS AND TRIGGER MECHANISMS

Hydraulic Containment

- 14.1 If the leachate level elevation in any of the pumping stations wells listed below rise above their respective trigger level, the Owner shall take additional groundwater levels within four (4) weeks as detailed in Figure 2 of Item 39 and Appendix H of Item 68 of Schedule "A".

Monitoring location Trigger Leachate Elevation (mASL)

PS1 232.7
PS3 232.6
PS5 232.8
PS7 233.4

The assessment process for leachate levels is detailed in Figure 2 of Appendix H of Item 68 on Schedule "A".

Groundwater Quality

- 14.2 The trigger concentration for groundwater quality shall be 80% of the Guideline B-7 values for parameters that have an Ontario Drinking Water Quality Standards value.
- 14.3 Groundwater chemical concentrations must be assessed with the trigger concentrations within six (6) weeks of sample collection.
- 14.4 The assessment process for groundwater quality is detailed in Figure 3 of Item 39 and Appendix H of Item 68 of Schedule "A".

Surface Water Quality

- 14.5 The trigger mechanisms for surface water quality shall be one of the following:
- a. Where off Site surface water quality satisfies the Ministry's PWQO, the respective PWQO shall be used as a trigger concentration; or
 - b. Where the background surface water quality naturally exceeds the PWQO, the background concentration should be considered in evaluating and updating the trigger concentration.
- 14.6 Surface water quality results will be assessed in accordance with the requirements established under the Industrial Sewage Works component of the EPA Approval for the Site.
- 14.7 The assessment process for surface water quality is detailed in Figure 4 of Appendix H of Item 68 in Schedule "A".

Landfill Gas

- 14.8 If landfill gas concentrations exceed 10% LEL, the Owner shall undertake additional monitoring, assess the source and pathway of methane to determine if the elevated concentrations are landfill related.
- 14.9 If the elevated concentrations are landfill related, the Owner shall undertake contingency measures.

General Contingency Measures

- 14.10 In the event a result of a monitoring test exceeds the trigger mechanisms detailed above, the Owner shall:
- a. notify the District Manager, the WPLC, WIFN and the Township of Warwick of any trigger level exceedances within twenty four (24) hours of receipt of the results;
 - b. conduct an investigation into the cause of the adverse result and submit a report to the District Manager that includes an assessment of whether contingency measures need to be carried out;
 - c. if contingency measures are needed, submit detailed plans, specifications and descriptions for the design, operation and maintenance of the contingency measures, and a schedule as to when these measures will be implemented, to the Director and notify District Manager ; and
 - d. implement the required contingency measures upon approval by the Director .

15.0 REPORTING

Semi Annual Volume Determination

- 15.1 The Owner shall undertake semi-annual air space surveys of the bottom and top waste contours to determine the estimated air space used for waste disposal in the prior six months. The air space survey shall include daily cover material and shall take into account settlement. The first air space survey shall be undertaken by no later than February 2012 with an air space survey being completed semi-annually after the completion of the first air space survey, until landfill Site closure.
- 15.2 Wastes which the Owner has been ordered to dispose of at the Site by any ministry, department or agency of the federal or Provincial Crown shall be excluded from the air space survey calculations.
- 15.3 Each air space survey shall be conducted by an Ontario Land Surveyor or other qualified consultant and such air space survey shall be provided to the District Manager. The Owner shall keep a copy of each air space survey on-Site and make them available to MECP personnel upon request.

Quarterly Monitoring Reports

- 15.4 The Owner shall submit quarterly monitoring reports to the Township of Warwick, WIFN, District Manager and the WPLC within sixty (60) days of the end of the calendar quarterly reporting period starting **September 30, 2012**.
- 15.5 Each report will include the following:
- a. a summary of monitoring activities and results;
 - b. a summary of any exceedences and related operator responses;
 - c. any complaints received and operator response;
 - d. a summary of mitigation activities for noise, dust, litter, air quality or other taken during the quarter in accordance with the Best Management Practices;
 - e. any proposed improvements to monitoring or operating procedures; and

- f. any implemented improvements to monitoring or operating procedures that have been identified to address or reduce impacts.

Annual Report

- 15.6 A written report on the development, operation and monitoring of the Site , shall be completed annually (the “Annual Report”). The Annual Report shall be submitted to the Regional Director , the District Manager, the Township of Warwick, WIFN, and the WPLC, by **March 31st** of each year, and shall cover the 12 month period preceding December 31st.
- 15.7 The Annual Report shall include the following:
 - a. the results and an interpretive analysis of the results of all leachate, groundwater, surface water and landfill gas monitoring, including an assessment of the need to amend the monitoring programs;
 - b. 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;
 - c. an assessment of the effectiveness of the Poplar Plantation and the Poplar System for leachate;
 - d. an assessment of the effectiveness of the on Site leachate treatment facility;
 - e. Site plans showing the existing contours of the Site;
 - f. areas of landfilling operation during the reporting period;
 - g. areas of intended operation during the next reporting period;
 - h. areas of excavation during the reporting period;
 - i. the progress of final cover, vegetative cover, and any intermediate cover application;
 - j. previously existing site facilities;
 - k. facilities installed during the reporting period;
 - l. Site preparations and facilities planned for installation during the next reporting period;
 - m. 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;
 - n. a calculation of the remaining capacity of the Site, an estimate of the remaining Site life and a comparison of actual capacity used to approved Site capacity;
 - o. a summary of the quantity of any leachate or pre-treated leachate removed from the Site or leachate treated and discharged from the Site;
 - p. a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the Site;
 - q. a summary of any complaints received and the responses made;
 - r. a discussion of any operational problems encountered at the Site and corrective action taken;
 - s. an update summary of the amount of financial assurance which has been provided to the Director;
 - t. a report on the status of all monitoring wells and a statement as to compliance with Ontario Regulation 903;
 - u. any other information with respect to the site which the District Manager or Regional

- Director may require from time to time;
- v. a statement of compliance with all conditions of this ECA and other relevant Ministry requirements, guidelines and regulations;
- w. summary of inspections undertaken at the Site;
- x. a summary of recycling, processing and composting efforts undertaken including the amount of recyclable received, amount of processed material and composted material each year;
- y. any changes in operations, equipment or procedures employed at the Site; and
- z. recommendations regarding any proposed changes in operations of the Site.

16.0 SITE CLOSURE

Closure Plan

- 16.1 At least two (2) years prior to closure or when 90% of the site capacity is reached, whichever comes first, the Owner shall submit to the Director for approval, with copies to the District Manager, the Township of Warwick, WIFN and the WPLC, 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:
- a. a plan showing Site appearance after closure;
 - b. a description of the proposed end use of the Site ;
 - c. a description of the procedures for closure of the Site, including:
 - 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; and
 - vi) final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
 - d. a schedule indicating the time-period for implementing sub-conditions i) to vi) above.
 - e. descriptions of the procedures for post-closure care of the Site, including:
 - i.) operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
 - ii) record keeping and reporting; and
 - iii) complaint contact and response procedures;
 - f. an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas;
 - g. an updated estimate of the contaminating life span of the Site , based on the results of the monitoring programs to date; and

- h. an update of the cost estimates for financial assurance and the amount which has been provided to the Director to date.

16.2 The Site shall be closed in accordance with the closure plan as approved by the Director.

End Use

16.3 The Owner shall consult with affected stakeholders on the proposed end uses as committed to in Item 35 of Schedule "A" prior to the submission of its closure report under the EPA. The proposed end use activities should be consistent with the types of activities consulted upon during the EA.

Closure of the Site

16.4 Upon closure of the Site, the following features will be inspected, recorded on a quarterly basis and maintained as required on a seasonal basis :

- a. evidence of settlement;
- b. possible leachate seeps and springs;
- c. cover soil integrity;
- d. vegetative cover;
- e. surface water drainage works;
- f. erosion and sediment in surface water drainage system; and
- g. groundwater monitoring wells.

16.5 A vegetative cover consisting of vegetation that is suited to local conditions and that is capable with minimal care of providing vigorous, plentiful cover no later than its 3rd growing season shall be established over all completed areas to control erosion and maximize evapotranspiration. The Owner shall complete planting as soon as possible after reaching final contours.

16.6 If weather conditions do not allow timely placement of final and vegetative cover, silt curtains shall be employed to minimize silt loadings to surface water bodies.

SCHEDULE “A”

1. Document entitled “Environmental Assessment Act Section 9 Notice of Approval to Proceed with the Undertaking” , Re: An Environmental Assessment for Warwick Landfill Expansion, Waste Management of Canada Corporation, EA File Number: EA-02-08-02-03, dated January 15, 2007.
2. Application for a Provisional Certificate of Approval for the Warwick Landfill, dated March 27, 2006.
3. Document entitled “Development and Operations Plans Warwick Landfill Expansion Volume 1 of 2” dated March 2006 prepared by Henderson, Paddon and Associates Limited.
4. Document entitled “Development and Operations Plans Warwick Landfill Expansion Volume 2 of 2” dated March 2006 prepared by Henderson, Paddon and Associates Limited.
5. Document entitled “Assessment of Geotechnical Design Requirements New Landfill Facility Warwick, Ontario” prepared by Alston Associates Inc., dated July 31, 2006.
6. Document entitled “2006 Poplar System Monitoring Report Warwick Landfill Site Township of Warwick Ontario” prepared by Jagger Hims Limited, dated January 2007.
7. Document entitled “Warwick Landfill Expansion Contaminating Lifespan Review” prepared by Jagger Hims Limited, dated March 2006.
8. Drawing No. 105716-111 entitled “ Proposed Final Contours and Stormwater Management Plan” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
9. Drawing No. 105716-112 entitled “ Landfill Bottom Contours (Top of Primary Gravel)” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
10. Drawing No. 105716-113 entitled “Landfill Perimeter Sections” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
11. Drawing No. 105716-114 entitled “ Landfill Perimeter Sections” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
12. Drawing No. 105716-115 entitled “Leachate Collection Sump Details” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
13. Drawing No. 105716-116 entitled “Proposed Primary Leachate Collection System” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
14. Drawing No. 105716-117 entitled “Proposed Secondary Leachate Collection System” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
15. Drawing No. 105716-118 entitled “Landfill Sections” prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.

16. Drawing No. 105716-119 entitled "Landfill Perimeter Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
17. Drawing No. 105716-120 entitled " Landfill Perimeter Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
18. Drawing No. 105716-125 entitled "Details and Sections" prepared by Henderson Paddon and Associates Limited, dated February 24, 2006.
19. Letter dated April 16, 2007 from Frank Ford, Henderson Paddon and Associated Limited to Wilf Ruland, Citizens Environmental Consulting.
20. Letter dated May 2, 2007 from Frank Ford, Henderson Paddon and Associated Limited to Wilf Ruland, Citizens Environmental Consulting.
21. Letter dated June 1, 2007 from Greg Washuta, P. Eng., M. Eng., Senior Waste Engineer, Ministry of the Environment to Reid Cleland, Waste Management of Canada Corporation.
22. Drawing No. 106716-127A entitled "Plough Furrow Surface Water Distribution Warwick Landfill" prepared by Henderson Paddon and Associates Limited, dated March 21, 2007.
23. Drawing No. 106716-F215 entitled "Proposed Mini-Transfer Area" prepared by Henderson Paddon and Associates Limited, dated March 29, 2007.
24. Report entitled "Best Management Practices Plan (Dust) Warwick Landfill Watford, Ontario " prepared by RWDI Air Inc., dated December 11, 2007.
25. Report entitled "Best Management Practices Plan (Litter) Warwick Landfill Watford, Ontario " prepared by RWDI Air Inc., dated December 11, 2007.
26. Report entitled "Best Management Practices Plan (Odour) Warwick Landfill Watford, Ontario " prepared by RWDI Air Inc., dated December 11, 2007.
27. Document entitled "Appendix F Air Quality Monitoring Plan and Letter", prepared by RWDI, dated November 29, 2007.
28. Document entitled "Environmental Noise Monitoring Program for the Warwick Landfill" , prepared by Aeroustics Engineering Limited, dated November 21, 2007.
29. Document entitled "Proposed Expansion of WM Warwick Landfill Predicted Noise Impact" , prepared by Aeroustics Engineering Limited, dated June 15, 2007.
30. Document entitled "Application for Approval of ECA of Approval A032203 Warwick Township County of Lambton MOE. Reference No. 0539-6N7TRY Part 1 of 2" , dated July 13, 2007, prepared by Henderson Paddon and Associates Limited.

31. Document entitled "Application for Approval of ECA of Approval A032203 Warwick Township County of Lambton MOE. Reference No. 0539-6N7TRY Part 2 of 2- Financial Assurances" , dated August 22, 2007, prepared by Henderson Paddon and Associates Limited.
32. Letter dated July 27, 2007 from Dan Toner, Assistant Director, Laboratory Services Branch to Tesfaye Gebrezghi, Supervisor- Waste Unit, MOE.
33. Table 6.1 entitled "Phasing-Analysis for Leachate Quantities WM- Warwick Landfill Expansion" prepared by Henderson Paddon and Associates Ltd., dated August 17, 2007.
34. Letter dated August 20, 2007 from John DeYoe, RWDI to Frank Ford, Henderson Paddon and Associates Limited.
35. Discussion Paper 9 entitled "Impact Management Plan" and all Appendices dated October 2005 prepared by Waste Management of Canada Corporation.
36. Letter Report and attachments dated May 10, 2001 from Frank C. Ford of Henderson, Paddon Environmental to Mark Turner, Environmental Assessment and Approvals Branch.
37. Development and Operations Report - Canadian Waste Services Inc. - Warwick Landfill, Warwick Township - Revised, dated October 1997, prepared by Henderson Paddon Environmental Inc.
38. Consolidated Report Leachate Management Plan - Canadian Waste Services Inc. - Warwick Landfill - Warwick Township dated July 2001 prepared by Henderson Paddon Environmental Inc.
39. Environmental Monitoring Plan - Warwick Landfill - Township of Warwick, Ontario dated December 2007, prepared by Jagger Hims Limited.
40. Letter dated October 11, 2007 from Brad Bergeron, RWDI to Greg Washuta, Senior Waste Engineer, Ministry of the Environment.
41. Report entitled "Stormwater Management Plan Poplar Irrigation Area Warwick Landfill Expansion Watford, Ontario" dated December 2007, prepared by Henderson Paddon Environmental Inc.
42. Letter dated November 21, 2007 from Kevin Smith, Aercoustics Engineering Limited to Wayne Jenken, Waste Management of Canada Corporation.
43. E-mail and attachments dated February 12, 2008 from Brad Bergeron, RWDI Air Inc. to Greg Washuta, Senior Waste Engineer, EAAB, MOE.
44. E-mail and attachments dated January 29, 2008 from Brad Bergeron RWDI Air Inc. to Greg Washuta, Senior Waste Engineer, EAAB, MOE.
45. Letter dated March 3, 2008 from Wayne Jenken, Landfill Engineer, WMCC to Ian Parrott, Manager, ECA of Approval Review Section, EAAB, MOE.

46. Letter dated June 13, 2008 from Frank Ford, Senior Environmental Engineer, Henderson Paddon and Associates Limited to Greg Washuta, P. Eng., Senior Waste Engineer, Waste Unit, EAAB, MOE.
47. Application for a Provisional Certificate of Approval for a Waste Disposal Site for the Twin Creeks Landfill Site, signed and dated December 11, 2008.
48. Letter dated December 11, 2008 from Reid Cleland, District Landfill Manager, WMCC to Doris Dumais, Approvals Director, EAAB, MOE.
49. Report entitled "Cell 12 Project and Changes Affecting The Warwick Landfill Expansion" and attached appendices, created by Henderson Paddon & Associates Limited, dated August 2008.
50. Application for a Provisional Certificate of Approval for a Waste Disposal Site for the Twin Creeks Landfill Site, dated August 11, 2008.
51. Letter dated December 18, 2008 from Greg Washuta, Senior Waste Engineer, Waste Unit, EAAB, MOE to Reid Cleland, District Landfill Manager, WMCC.
52. Letter dated December 18, 2008 from Wayne Jenken, Landfill Engineer, WMCC to Greg Washuta, Senior Waste Engineer, Waste Unit, EAAB, MOE.
53. Letter dated December 18, 2008 from Jason Balsdon and Brent Langille, Jagger Hims Limited to Wayne Jenken, Landfill Engineer, WMCC.
54. Application for a Provisional Certificate of Approval for a Waste Disposal Site for Waste Management of Canada Corporation's Twin Creeks Landfill Site, signed and dated January 16, 2009.
55. Report and Appendix A entitled "Waste Management of Canada Corporation Twin Creeks Landfill Use of Geonet for Secondary Drainage Layer" prepared by Henderson Paddon and Associates, dated January 2009.
56. Letter dated March 18, 2009 from Greg Washuta Senior Waste Engineer, Waste Unit, EAAB, MOE to Reid Cleland, Landfill Manager, WMCC.
57. Letter report and appendices A, B and C dated April 9, 2009 from Jeff Armstrong, Genivar Consultants LP to Greg Washuta, Senior Waste Engineer, Waste Unit, EAAB, MOE.
58. Application for a Waste Disposal Site Certificate of Approval dated April 28, 2009 and signed by Reid Cleland, District Manager, Waste Management of Canada Corporation.
59. Report produced by Genivar Consultants LP entitled "Development & Operations Report for a Waste Transfer Station Application" dated June 2009.
60. November 24, 2009 e-mail from Jeff Armstrong of Genivar Consultants LP to Jim Chisholm, Senior Review Engineer with the Ministry of Environment indicating that the application is for an existing mini

transfer area but flexibility is being applied for to direct the waste collected at this area to alternate waste disposal sites.

61. November 24, 2009 e-mail from Jim Chisholm, Senior Review Engineer with the Ministry of Environment to Jeff Armstrong, Genivar Consultants LP, requesting information about how the Mini-Transfer Area already located at the landfill is covered by the existing Certificate of Approval and the December 21, 2009 e-mail response from Jeff Armstrong to Jim Chisholm to his November 24, 2009 e-mail, outlining that the Mini-Transfer Area is covered by the 1997 Design and Operation Report that is identified in Item 37 and attached page 7-4 of the report in which Section 7.8 dealt with the Mini-Transfer Area.
62. January 24, 2011, 12:11PM, e-mail from Wayne Jenken, Area Landfill Engineer, Waste Management of Canada Corporation to Jim Chisholm, Senior Review Engineer with the Ministry of Environment indicating that the original Mini Transfer Area moved to the new location on November 2009 and that the old location for the Mini Transfer Area has been removed. The e-mail also made suggested changes to a draft of the Notice.
63. Document entitled "Twin Creeks Landfill - Expansion of Poplar Cap Irrigation System for Existing Waste Disposal Area January 2010" prepared for Waste Management of Canada Corporation by Genivar Consultants LP dated January 2010.
64. Letter dated November 2, 2010 addressed to Mr. Reid Cleland, Waste Management of Canada Corporation from Mr. Greg Washuta, Ministry of the Environment providing comments and requesting additional information on MOE Reference File No. 1486-829MCN.
65. Document entitled "Twin Creeks Landfill, Watford, ON 091-13089-00 (91730R) - Application for Approval for Expansion of Poplar Plantation (South Fill Area) - Response to MOE Comments Letter dated November 2, 2010" prepared for Waste Management of Canada Corporation by Genivar Consultants LP dated December 2, 2010.
66. Report entitled "Development and Operations Plan - Warwick Landfill Expansion - Volume 1 of 3" prepared for WMCC by Henderson Paddon & Associates dated March 2008.
67. Report entitled "Development and Operations Plan - Warwick Landfill Expansion - Volume 2 of 3" prepared for WMCC by Henderson Paddon & Associates dated March 2008.
68. Report entitled "Development and Operations Plan - Warwick Landfill Expansion - Monitoring Plans - Volume 3 of 3" prepared for WMCC by Henderson Paddon & Associates dated March 2008.
69. Letter dated May 6, 2009 addressed to Mr. Reid Cleland, WMCC from Mr. Greg Washuta, Ministry of the Environment providing ministry review comments on the Development and Operations Plan
70. Letter dated August 19, 2009 addressed to Mr. Reid Cleland, WMCC from Mr. Greg Washuta, Ministry of the Environment providing comments from the Township of Warwick, Walpole Island First Nation and the Warwick Public Liaison Committee on the Development and Operations Plan

71. Letter dated November 12, 2009 addressed to Mr. Greg Washuta, Ministry of the Environment from Mr. Wayne Jenken, WMCC.
72. Drawing set entitled "Twin Creeks Landfill - Landscaping and Signage Detail Construction Drawings" prepared by Schollen & Company Inc. and dated July 4, 2008. The drawing set consists of the following:
- i. Cover page entitled "Twin Creeks Landfill - Landscaping and Signage Detail Construction Drawings" prepared by Schollen & Company Inc. and dated July 4, 2008;
 - ii. Drawing No. L-1 entitled "Landscape Plan - Screening Berm";
 - iii. Drawing No. L-1A entitled "Landscape Detail at Intersections - Screening Berm";
 - iv. Drawing No. L-2 entitled "Landscape Plan - Screening Berm";
 - v. Drawing No. L-3 entitled "Landscape Plan - Screening Berm & Area F";
 - vi. Drawing No. L-4 entitled "Landscape Plan - Screening Berm";
 - vii. Drawing No. L-5 entitled "Landscape Plan - Screening Berm and Area G (North)";
 - viii. Drawing No. L-6 entitled "Landscape Plan - Screen Planting Area G (South)";
 - ix. Drawing No. L-7 entitled "Landscape Plan - Screen Planting and Creek Area A and Area B";
 - x. Drawing No. L-8 entitled "Landscape Plan - Screen Planting Areas C, D and E";
 - xi. Drawing No. L-9 entitled "Landscape Plan - Restoration Planting Area H";
 - xii. Drawing No. LD-1 entitled "Landscape Detail Plan";
 - xiii. Drawing No. LD-2 entitled "Landscape Notes and Master Plant List"; and
 - xiii. Drawing No. LD-3 entitled "Signage Details";
73. Application for a Certificate of Approval for a Waste Disposal Site dated April 6, 2011 submitted by Waste Management of Canada Corporation for Provisional Certificate of Approval No. A032203 requesting approval for use of an alternative daily cover material and amended Best Management Practices for Odour.. The supporting documentation for the application included the following:
- i. Cover letter dated April 7, 2011 addressed to Mr. Tes Gebrezghi, Ministry of the Environment from Mr. Reid Cleland, Waste Management of Canada Corporation;
 - ii. Report entitled "Best Management Practices Plan (Odour) Warwick Landfill" prepared for Waste Management of Canada Corporation by RWDI Air Inc. (Project No. 1100800) dated April 7, 2011;
 - iii. Letter dated March 24, 2011 addressed to Mr. Wayne Jenken, Waste Management of Canada Corporation from Mr. Peter Pickfield, Garrod Pickfield; and
 - iv. Email dated March 22, 2011 at 3:32 p.m. sent to Mr. Peter Pickfield, Garrod Pickfield from Mr. Wayne Jenken.
74. Letter dated October 4, 2011 addressed to Mr. Tesfaye Gebrezghi, Ministry of the Environment from Mr. Reid Cleland, Waste Management of Canada requesting an amendment to Condition 167 (a). The supporting documentation attached to the letter included the following:
- a. Application for a Certificate of Approval for a Waste Disposal Site dated October 4, 2011;
 - b. Provisional Certificate of Approval A032203 Notice No. 7 dated June 1, 2011;
 - c. Letter from Wayne Jenken, WMCC to Don Bruder, Township of Warwick dated February

- 23, 2011;
- d. Letter from Wayne Jenken, WMCC to Don Bruder, Township of Warwick dated May 26, 2011;
- e. Letter from Peter Pickfield, Garrod Pickfield LLP to Reid Cleland, WMCC dated September 14, 2011;
- f. Letter from Wayne Jenken, WMCC to Dean Jacobs, Walpole Island First Nations dated July 14, 2011;
- g. Email from Kent Hunter, Neegan Burnside to Wayne Jenken dated September 19, 2011 at 3:54 p.m.;
- g. Email from Wayne Jenken, WMCC to Kent Hunter, Neegan Burnside dated September 20, 2011 at 1:52 p.m.;
- h. Email from Kent Hunter, Neegan Burnside to Wayne Jenken dated September 27, 2011 at 10:23 a.m.;
- i. WPLC meeting minutes dated September 15, 2011; and
- j. WPLC meeting minutes dated April 7, 2011.

75. Letter dated May 22, 2012 addressed to Ms. Agatha Garcia Wright, Director, Ministry of the Environment from Mr. Wayne Jenken, Waste Management of Canada Corporation requesting amendment to Condition No. 7.10 (Landfill Gas Management). The letter included the following supporting documentation:
- i. Letter report entitled "Early Vertical Gas Well Collection System" dated May 2012 and addressed to Mr. Reid Cleland, Waste Management of Canada Corporation from Mr. Frank Ford, GENIVAR Inc.;
 - ii. Drawings No. 102 and G111 - Landfill Gas Collection System;
 - iii. Landfill Gas Headers, Gas Building with Blowers and Landfill Gas Flaring System Design Drawings and Design and Operations Plan for Modifications;
 - iv. Description of Phase 1 of the Gas Collection System;
 - v. Revised Section 4.7 of the Design and Operations Plan;
 - vi. Application to Amend Environmental Compliance Approval No. A032203 and supporting documents;
 - vii. Consultation Summary and Records with Stakeholders; and
 - viii. Design Drawings for Amended Landfill Gas Management System.
76. Letter dated July 26, 2012 addressed to Mr. Reid Cleland, Waste Management of Canada Corporation from Mr. Dale Gable, Ministry of the Environment requesting additional information on the location of the proposed gas extraction wells.
77. Letter dated August 9, 2012 addressed to Mr. Dale Gable, Ministry of the Environment from Mr. Frank Ford, GENIVAR Inc. providing details on the location of the gas wells.
78. Letter Report dated May 9, 2012 addressed to Ms. Agatha Garcia Wright, Director, Ministry of the Environment from Mr. Wayne Jenken, Waste Management of Canada requesting Conditions 6.48 to 6.61 be amended. The letter report included the following Sections:
- i. Environmental Compliance Approval application signed by Reid Cleland, WMCC and

- dated May 9, 2012;
- ii. Proof of legal name and zoning;
- iii. Record of consultation with Township of Warwick;
- iv. Record of consultation with Walpole First Island First Nation; and
- v. Record of consultation with WPLC.

79. Letter report dated September 26, 2012 addressed to Ms. Agatha Garcia-Wright. Director, Environmental Approvals Branch, Ministry of the Environment from Mr. Philip Janisse and Mr. Brent Langille, RWDI Inc. requesting the time frame for the use of ASR be extended and the sampling frequency for the ASR be reduced.

80. Letter dated October 15, 2012 and supporting drawings addresses to Ms. Agatha Garcia-Wright. Director, Environmental Approvals Branch, Ministry of the Environment from Mr. Wayne Jenken, Waste Management of Canada Corporation detailing the proposed changes to the landscape plan for the Site. The supporting drawings include the following drawing prepared by Schollen and Company Inc (Contract No. 27007) dated June 2012:

- i. Cover page entitled "Twin Creeks Landfill Expansion - Landscape and Details Drawings" dated June 29, 2012
- ii. Drawing No. L-1 entitled "Landscape Plan - Screening Berm";
- iii. Drawing L-1A entitled "Landscape Detail at Intersections - Screening Berms";
- iv. Drawing L-2 entitled "Landscape Plan - Screening Berm";
- v. Drawing L-3 entitled "Landscape Plan - Screening Berm and Area F";
- vi. Drawing L-4 entitled "Landscape Plan - Screening Berm";
- vii. Drawing L-5 entitled "Landscape Plan - Screening Berm and Area G";
- viii. Drawing L-6 entitled "Landscape Plan - Area G Planting Area";
- ix. Drawing L-7 entitled "Landscape Plan - Area A and Area B Screen Planting and Creek";
- x. Drawing L-8 entitled "Landscape Plan - Area C, D and E Screen Planting";
- xi. Drawing L-9 entitled "Landscape Plan - Area H Restoration Planting";
- xii. Drawing LD-1 entitled "Landscape Detail Plan";
- xiii. Drawing LD-2 entitled "Landscape Notes and Master Plant List";
- xiv. Drawing LD-3 entitled "Signage Details";
- xv. Drawing LD-4 entitled "Details"; and
- xvi. Drawing LD-5 entitled "Details".

81. Letter dated November 13, 2013 addressed to Agatha Garcia-Wright, Director, Ministry of the Environment from Wayne Jenken, Waste Management of Canada Corporation requesting amendment to Condition 8.6 (a). The following supporting documentation was attached to the memorandum.

- i. Amended Environmental Compliance Approval Number A032203 issued December 13, 2011
- ii. Amended Environmental Compliance Approval Number A032203 Notice No. 1 issued February 29, 2012
- iii. Application to Amend Environmental Compliance Approval No. A032203 with Signature of Reid Cleland in Section 1.4
- iv. Record of Consultations with Stakeholders

82. Application package dated May 4, 2016 and received on May 16, 2016 including all subsequently submitted supporting documentation and drawings, including the amendment to the D&O plan and associated drawings.
83. Report titled "Twin Creeks Landfill Site: Best Management Practices Plan (Dust) - Version 7" prepared by RWDI Air Inc., dated May 19, 2017.
84. Report titled "Twin Creeks Landfill Site: Best Management Practices Plan (Odour) - Version 8" prepared by RWDI Air Inc., dated May 19, 2017.
85. Report titled "Twin Creeks Landfill Site: Ambient Air Quality Monitoring Plan (Revision #3)" prepared by RWDI Air Inc., dated May 18, 2017.
86. "WM Twin Creeks Landfill Site, Leachate Management Framework" prepared by HDR, dated November 29, 2017.
87. Application for a an amendment to ECA No. A032203 to provide detailed design for the construction of Cell 4 in response to Condition 4.8. Signed by Reid Cleland and dated October 16, 2018. The supporting documentation for the application included the drawing set titled "Waste Management of Canada Corporation, Twin Creeks Landfill Expansion, Warwick Township, Landfill Base Preparation Cell 4." Prepared by WSP Group, October, 2018. The drawing set consists of the following:
 - i. Drawing No. 106716P-400 - "Title Sheet";
 - ii. Drawing No. 106716P-401 - "March 2018 Existing Conditions Plan;
 - iii. Drawing No. 106716P-402 - "Cell 4 - Bottom of Excavation - West";
 - iv. Drawing No. 106716P-403 - "Cell 4 - Bottom of Excavation - East";
 - v. Drawing No. 106716P-404 - "Cell 4 - Top of Primary Clay Liner - West";
 - vi. Drawing No. 106716P-405 - "Cell 4 - Top of Primary Clay Liner - East";
 - vii. Drawing No. 106716P-406 - "Cell 4 - Temporary Clay Seal - West";
 - vii. Drawing No. 106716P-407 - "Cell 4 - Temporary Clay Seal - East";
 - viii. Drawing No. 106716P-408 - "Cell 4 - Section and Details";
 - ix. Drawing No. 106716P-409 - "Cell 4 - Section and Details";
 - x. Drawing No. 106716P-410 - "Cell 4 - Section and Details";
 - xi. Drawing No. 106716P-411 - "Cell 4 - Pumping Station PS5/PS6 Plans and Sections";
 - xii. Drawing No. 106716P-412 - "Cell 4 - Pumping Station PS5/PS6 Plans and Sections";
 - xiii. Drawing No. 106716P-413 - "Cell 4 - Sections and Details"; and
 - xiv. Drawing No. 106716P-414 - "Cell 4 - Sections and Details".

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

Conditions 1.1, 1.2, 1.3, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.14, 1.15, 1.23, and 1.24 are to clarify the legal rights and responsibilities of the Owner and Operator under this Approval.

Conditions 1.4 and 1.5 are to ensure that the Site is designed, operated, monitored and maintained in accordance

with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.

Condition 1.12 is to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the Director is informed of any changes.

Condition 1.14 is to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this Approval.

Conditions 1.15 and 1.16 are to ensure that the successor is aware of its legal responsibilities.

Conditions 1.17, 1.18, 1.19, and 1.20 clarify that the Part II.1 Director is an individual with authority pursuant to Section 197 of the Environmental Protection Act to require registration on title and provide any person with an interest in property before dealing with the property in any way to give a copy of the Approval to any person who will acquire an interest in the property as a result of the dealing.

Condition 1.21 is to ensure that appropriate Ministry staff has ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Approval. This Condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the Act, the OWRA, the PA, the NMA and the SDWA.

Condition 1.25 clarifies what information may be subject to the Freedom of Information Act.

Condition 2.1 is to require Financial Assurance for this company to ensure that sufficient funds are available to the Ministry to clean up the Site in the event that the Owner is unable or unwilling to do so.

Conditions 3.1 to 3.15 inclusive are necessary in order to establish a forum for the exchange of information and public dialogue on activities to be carried out at the landfill site. Open communication with the public and local authorities is important in helping to maintain high standards for site operation and environmental protection.

Condition 3.16 has been included in order to ensure that consultation with First Nations is undertaken during the submission of any application to amend any approval required by the Ministry.

Conditions 4.1 to 4.6 inclusive, 4.8, and 4.9 is to ensure that the Site is designed, constructed and operated in an environmentally acceptable manner, based on the conceptual design and operations for the Site.

Condition 4.7 is to ensure the availability of as-built drawings for inspection and information purposes.

Condition 4.10 has been specifically included to allow for optimization of design for subsequent stages based on operating experience and monitoring results and to ensure that any necessary remedial action is undertaken before landfilling may proceed in the next stage.

Condition 4.11 has been included to ensure that the site has been constructed in accordance with the approved design plans, specifications and QA/QC procedures and to ensure that there is not an adverse impact on the environment.

Condition 4.12 is to ensure that there is a person, reporting directly to the Ministry, with associated costs reimbursed by the Owner, who is responsible for inspecting the Site, based on the requirements in this ECA of Approval to ensure that the Site is operated in an environmentally acceptable manner.

Conditions 4.13, 4.14, 15.1, 15.2 and 15.3 is to specify the amount of days the environmental inspector is required to be on site based on the conditions in this approval and in accordance with the previously approved EA for the site.

Condition 5.1 is to ensure safe side slopes of the berm.

The reason for Condition 5.2 is to approve the diversion area based on the information submitted. This is ensure the protection of the environment and the public.

Condition 5.3 is to approve the use of Cell 12 for contaminated soil.

Condition 5.4 is to ensure the Owner carries out the landscape plan based on the submitted information.

Conditions 6.1 and 6.18 are included in order to ensure that waste disposal at the site is undertaken in accordance with applicable Ministry of the Environment regulations and guidelines. Compliance with these regulations and guidelines will ensure that the site does not cause and adverse effect on the environment.

Conditions 6.4 and 6.7 is to specify the approved areas from which waste may be accepted at the Site and the types and amounts of waste that may be accepted for disposal at the Site, based on the Owner's application and supporting documentation.

Condition 6.5 is to specify restrictions on the extent of landfilling at this Site based on the Owner's application and supporting documentation. These limits define the approved volumetric capacity of the site. Approval to landfill beyond these limits would require an application with supporting documentation submitted to the Director.

Condition 6.6 specifies the maximum amount of waste that may be received at the site based on the previously approved Environmental Assessment for the site.

Condition 6.8 has been inserted to minimize the potential for clogging of the drainage layer and to minimize temperature effects on the leachate collection system. Failure to maintain the specified minimum thickness of waste and cover material may result in a decrease in the service life of the drainage layer.

Conditions 6.9 to 6.14 inclusive have been included in order to ensure asbestos waste is handled and disposed of in accordance with O. Reg. 347 as amended from time to time. Proper handling and disposal of asbestos waste ensures that the asbestos waste does not cause an adverse impact on the environment and also does not affect human health.

Condition 6.16 is needed to make certain that uses at the site are for waste disposal purposes only and not any other uses which may cause an adverse impact on the environment and human health.

Condition 6.17 is necessary in order to ensure that all waste loads are inspected and waste that is disposed of at the site is in accordance with the terms and conditions in this ECA of Approval.

Condition 6.19 is to ensure that open burning of municipal waste is not permitted because of concerns with air emissions, smoke and other nuisance affects, and the potential fire hazard.

Conditions 6.20 through 6.22 inclusive are to ensure that users of the Site are fully aware of important information and restrictions related to Site operations under this ECA of Approval.

Conditions 6.23 to 6.27 inclusive are to specify the normal hours of operation for the landfill Site and a mechanism for amendment of the hours of operation.

Conditions 6.28 to 6.30 inclusive are to specify site access to/from the Site and to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.

Condition 6.31 is needed in order to make certain that the waste received at the site is in accordance with the ECA and O. Reg. 347.

Condition 6.32 has been included is to ensure that access roads are clear and do not pose a safety hazard to the general public.

Condition 6.33 is for the protection of public health and safety and minimization of the potential for damage to environmental control, monitoring and other works at the landfill Site. Scavenging is the uncontrolled removal of material from waste at a landfill site.

Conditions 6.34 to 6.40 inclusive are to ensure that the Site is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.

Condition 6.41 is to ensure that noise from or related to the operation of the landfill is kept to within Ministry limits and does not result in a hazard or nuisance to any person.

Condition 6.42 is included to ensure that noise monitoring is undertaken in accordance with the noise monitoring program prepared and to ensure that an independent acoustic audit is completed in accordance with the Ministry's requirements.

Condition 6.43 is to clarify when the Best Management Plans can be amended and the mechanism for amending the Best Management Plans.

Condition 6.44 is to ensure that appropriate measures are taken in order to prevent surface water from contacting waste so as not to cause an adverse effect on the environment.

Conditions 6.45 and 7.18 is to specify other approvals required for works and activities related to the operation of this Site as a landfill.

Condition 6.46 has been included in order to prevent ponding in on site ditches and any adverse impact on the environment and human health.

Condition 6.47 is to ensure that landfilling operations are conducted in an environmentally acceptable manner. Daily and intermediate cover is used to control potential nuisance effects, to facilitate vehicle access on the site, and to ensure an acceptable site appearance is maintained. The proper closure of a landfill site requires the application of a final cover which is aesthetically pleasing, controls infiltration, and is suitable for the end use planned for the site.

Condition 6.48 to 6.61 inclusive is to specify the approval requirements for use of alternative cover material at the Site.

Condition 7.1 is necessary so that runoff from contaminated soils does not create an adverse impact on the environment.

Conditions 7.2 and 7.3 are included in order to ensure that the composting and processing operations at the site are conducted in a fashion in accordance with Ministry's regulations, guidelines and so as not to pose a threat to human health or the environment.

Conditions 7.4, 9.3, 9.4, 9.5, 9.6 and 9.7 are to provide for the proper assessment of effectiveness and efficiency of site design and operation, their effect or relationship to any nuisance or environmental impacts, and the occurrence of any public complaints or concerns. Record keeping is necessary to determine compliance with this ECA of Approval, the EPA and its regulations.

Conditions 7.5 and 7.6 inclusive have been included are to ensure tire shred storage in accordance with the Fire Protection and Prevention Act and to protect the natural environment.

Condition 7.7 is to ensure that backup power is available so that all facilities remain operational during a power disruption thus preventing any adverse impacts on the environment.

Condition 7.8 has been inserted in order to ensure that concentrations of landfill gas do not pose a hazard to human health or the environment.

Condition 7.9 is to ensure that landfill gas is built and managed in accordance with the Ministry's requirement and regulation.

Condition 7.10 is needed in order to ensure that an adequate landfill gas management system is installed at the site in order to protect human health and the environment.

Conditions 7.11 and 7.12 are to minimize the potential for clogging of leachate collection pipes and to ensure effective operation of the leachate collection system components for as long as they are required. Failure to clean out these components on a regular basis may result in a decrease in their service lives. Regular cleaning of the leachate collection pipes is especially important during stages of landfilling when the level of both organic and inorganic constituents in the leachate is high and, consequently, the potential for clogging due to encrustation is greatest. As the landfill reaches the more stable methane producing stage, pipe cleaning may be required less frequently.

Condition 7.13 has been added to ensure adequate flow of leachate in the leachate collection pipes.

Conditions 7.14 to 7.17 are to ensure that the leachate collection system is designed and built in accordance with Regulations and the ministry's requirements.

Condition 7.18 is included in order to prevent off site migration of leachate which may cause an adverse effect on the environment.

Conditions 8.1 to 8.4 inclusive are needed to ensure leachate recirculation is undertaken in accordance with the ministry's requirements and leachate recirculation does not pose an adverse impact on the environment.

Condition 8.5 is in accordance with EA condition 22 and protects the natural environment from any impacts due to discharge of raw or treated leachate to adjacent creeks.

Condition 8.6 is to ensure that a fully functional leachate treatment system is in place on site prior to waste placement.

Condition 8.7 clarifies the responsibilities of the owner, the requirements of the ministry, the authority of the Ministry and protects the natural environment and human health.

Conditions 9.1 and 9.2 are needed to ensure regular inspections of the site are conducted in order to protect the natural environment.

Conditions 9.8 to 9.12 inclusive is to ensure that accurate waste records are maintained to ensure compliance with the conditions in this ECA of Approval (such as fill rate, site capacity, record keeping, annual reporting, and financial assurance requirements), the EPA and its regulations.

Conditions 9.13, 15.4, 15.5 and 15.6 are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

Condition 10.1 is to ensure that the Site is supervised and operated by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.

Conditions 11.1, 11.2 and 11.3 is to establish a forum for the exchange of information and public dialogue on activities carried out at the landfill Site. Open communication with the public and local authorities is important in helping to maintain high standards for site operation and environmental protection.

Conditions 12.1 and 12.2 are to ensure that the Ministry is informed of any spills or fires at the Site and to provide public health and safety and environmental protection.

Condition 12.3 is contained in the ECA to guarantee that appropriate measures are taken by the County to prevent future occurrences of spills or fires at the site and to protect public health and safety and the environment.

Conditions 13.1 to 13.5 inclusive are to ensure protection of the natural environment and the integrity of the groundwater monitoring network.

Conditions 13.6 through 13.11 inclusive are to demonstrate that the landfill site is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.

Conditions 14.1 through 14.10 inclusive are to ensure that the Owner follows a plan with an organized set of procedures for identifying and responding to unexpected but possible problems at the Site. A remedial action / contingency plan is necessary to ensure protection of the natural environment. A leachate contingency plan is a specific requirement of Reg. 232.

Conditions 16.1 and 16.2 are to ensure that final closure of the Site is completed in an aesthetically pleasing manner and to ensure the long-term protection of the natural environment.

Condition 16.3 ensures proper public consultation about the end use of the Site is undertaken and that the end use activities are consistent with those identified during the EA process.

Conditions 16.4 to 16.6 ensure that certain activities are undertaken upon closure of the site in order to ensure that the closed site does not affect the natural environment.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A032203 issued on December 13, 2011

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

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

DATED AT TORONTO this 19th day of December, 2020



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

CF/

c: District Manager, MECP Sarnia
Brent J. Langille, RWDI

APPENDIX A18:

Amended Certificate of Approval [Industrial Sewage Works] No. 3506-7M5PU3, dated July 9, 2009



AMENDED CERTIFICATE OF APPROVAL
INDUSTRIAL SEWAGE WORKS
NUMBER 3506-7M5PU3
Issue Date: July 9, 2009

Waste Management of Canada Corporation (WM)
5045 South Service Rd, Suite 300
Burlington, Ontario L6L 5Y7

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton, Ontario N0M 2S0

- Firstly, Part of Lot 19 & 20, Concession 3, S.E.R., and Part of Lots 20, 21 & 22, Concession 4, S.E.R., and Part of the Road Allowance between Lots 21 and 22, Concession 4, S.E.R., shown as Parts 1, 2, and 3 on Plan 25R-9125 and Part 2 on Plan 25R-1903, Save and Except Part 1 on Plan 25R-6184.
- Secondly, Part of Lot 20, Concession 3 S.E.R., shown as Part 1 on Plan 25R-6184.

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Establishment of a leachate collection, treatment, and disposal facility and a stormwater management facility to service the Twin Creeks Landfill Site located in the Township of Warwick, County of Lambton, consisting of the following:

STORMWATER MANAGEMENT FACILITY

Establishment of a stormwater management facility to service a 146.5 ha drainage area of the Twin Creeks Landfill Site Expansion within the 300 ha area of the Twin Creeks Landfill Site consisting of the following:

Stormwater Management Pond - SWM Pond #1:

a stormwater management facility (**SWM Pond #1**) to service a total drainage area of 33.7 ha consisting of the eastern part of the existing landfill site and future excess soil stockpile area, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:100 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- one (1) approximately 1,300 m long perimeter trapezoidal ditch along the toe of the eastern side of the closed landfill having a 0.6 m wide bottom and 2H:1V side slopes, discharging collected stormwater to an extended detention wet pond described below;

- one (1) ditch along the south and west side of the leachate storage lagoon collecting runoff from the excess soil stockpile area, discharging collected stormwater to a forebay described below;
- one (1) forebay with approximate dimensions of 19 m long X 16 m wide bottom, and 4H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 294.0 m long bottom, 23.5 m wide bottom and 4H:1V side slopes, equipped with a permanent vertical baffle with a minimum elevation of 238.7 m ASL, providing a total storage capacity of 21,429 m³ consisting of a permanent pool storage volume of 3,651 m³ with an average depth of 0.5 m, and an extended storage volume of 17,778 m³ with an extended storage depth of 1.91 m, equipped with an outlet structure described below;
- an outlet structure consisting of two (2) 1500 mm diameter concrete manholes discharging through two (2) 750 mm diameter outlet pipes, each pipe equipped with a 1200 mm X 1200 mm concrete valve chamber and a sluice gate valve, to a perimeter ditch flowing towards a roadside ditch along County Road 79;
- one (1) 8.0 m wide emergency overflow structure with weir elevation of 239.55 m ASL discharging to a perimeter ditch flowing towards County Road 79 roadside ditch; and
- including all controls and appurtenances.

Stormwater Management Pond - SWM Pond #2:

a stormwater management facility (**SWM Pond #2**) to service a total drainage area of 67.9 ha consisting of southwestern part of the expanded landfill site, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:100 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- two (2) approximately 400 m and 1500 m long perimeter ditches along the southern part of the landfill having a minimum depth of 1.0 m, and 3H:1V & 4H:1V side slopes discharging collected stormwater through two (2) culverts, 3000 mm X 1200 mm concrete box and 1390 X 970 mm CSPA, to a forebay described below;
- one (1) forebay with approximate dimensions of 47 m long X 30 m wide bottom and 4H:1V and 3H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 391.0 m long X 44.0 m wide bottom and 4H:1V and 3H:1V side slopes, providing a total storage capacity of 48,954 m³ consisting of a permanent pool storage volume of 10,856 m³ with a average depth of 0.60 m, and an extended storage volume of 38,098 m³ with an extended storage depth of 1.75 m, equipped with an outlet structure described below;
- an outlet structure consisting of one (1) 1800 mm diameter and one (1) 2400 mm diameter concrete

manholes discharging through a 1050 mm and a 1200 mm diameter outlet pipes, each pipe equipped with a 2000 mm X 2000 mm concrete valve chamber and a sluice gate valve, to a roadside ditch along County Road 79;

- one (1) 18 m wide emergency overflow structure with weir elevation of 234.05 m ASL discharging to a roadside ditch along County Road 79; and
- including all controls and appurtenances.

Stormwater Management Pond - SWM Pond #3:

a stormwater management facility (**SWM Pond #3**) to service a total drainage area of 30.5 ha consisting of northwestern part of the expanded landfill site, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:00 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- one (1) approximately 650 m long perimeter ditch along the northern part of the expanded landfill and one (1) approximately 500 m long perimeter ditch along the western part of the expanded landfill, each having a minimum of 1.0 m depth and 3H:1V & 4H:1V side slopes, discharging collected stormwater through a 3000 mm X 1200 mm concrete box culvert to a forebay described below;
- one (1) forebay with approximate dimensions of 33 m long X 25 m wide bottom and 4H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 255.0 m long, 36.0 m wide bottom and 3H:1V and 4H:1V side slopes, providing a total storage capacity of 24,996 m³ consisting of a permanent pool storage volume of 4,843 m³ with an average depth of 0.50 m, and an extended storage volume of 20,053 m³ with an extended storage depth of 1.67 m, equipped with an outlet structure described below;
- an outlet structure consisting of three (3) 1200 mm diameter concrete manholes discharging through two (2) 600 mm diameter and one (1) 450 mm diameter outlet pipes, each pipe equipped with 1200 mm X 1200 mm box concrete valve chamber and a sluice gate valve, to a roadside ditch along County Road 79;
- one (1) 9 m wide emergency overflow structure with a weir elevation of 238.00 m ASL discharging to a roadside ditch along County Road 79; and
- including all controls and appurtenances.

Stormwater Management Pond - SWM Pond #4:

a stormwater management facility (**SWM Pond #4**) to service a total drainage area of 14.4 ha consisting of the north eastern part of the expanded landfill site and northern part of the existing landfill site, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:100 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- four (4) perimeter ditches collecting runoff from the northern side of the expanded landfill and from the northwestern portion of the existing landfill, having a minimum of 1.0 m depth and 3H:1V & 4H:1V side slopes, discharging collected stormwater through two (2) inlet structures to a forebay described below;
- one (1) forebay with approximate dimensions of 16 m long X 16 m wide bottom and 4H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 165.0 m long bottom, 20.0 m wide bottom and 3H:1V and 4H:1V side slopes, providing a total storage capacity of 8,328 m³ consisting of a permanent pool storage volume of 1,812 m³ with an average depth of 0.50 m, and an extended storage volume of 6,516 m³ with an extended storage depth of 1.32 m, equipped with an outlet structure described below;
- an outlet structure consisting of one (1) 1800 mm diameter concrete manhole discharging through one (1) 1050 mm diameter outlet pipe equipped with 2000 mm X 2000 mm concrete valve chamber and a sluice gate valve to a perimeter ditch along Zion Line to a roadside ditch along Zion Line;
- one (1) 8 m wide emergency overflow structure with a weir elevation of 242.00 m ASL discharging to a road side ditch along Zion Line; and
- including all controls and appurtenances.

all in accordance with the Application for Approval of Industrial Sewage Works dated July 21, 2006 submitted by Waste Management of Canada Corporation, design specifications and drawings prepared by Henderson Paddon and Associates Limited, Owen Sound, Ontario and the following documents:

1. "Development and Operations Plans - Warwick Landfill Expansion - Volumes 1 and 2" dated March 2006, prepared by Henderson Paddon and Associates Limited, Owen Sound, Ontario.
2. Letter from Mr. J. Pullen, Waste Management of Canada Corporation, dated August 1, 2006 written in response to an additional information request letter from Stefanos Habtom, P.Eng., MOE dated July 17, 2006.
3. Letter and attachments from Mr. J. Pullen, Waste Management of Canada Corporation, dated December 14, 2006 written in response to an additional information request letter from Stefanos Habtom, P.Eng., MOE dated November 7, 2006.

LEACHATE TREATMENT AND DISPOSAL FACILITY

Establishment of a leachate collection, treatment, and disposal facility with a *Rated Capacity* of 300 m³/day to service Phases 1 to 4 and **with a plan to upgrade the facility** to a *Rated Capacity* 400 m³/day to service Phases 5 to 9 and during closure and post closure period of the Twin Creeks Landfill Site expansion, consisting of the following:

Raw Leachate Pumping Stations

- four (4) 7.3 L/sec capacity primary raw leachate pumps and four (4) 3.5 L/sec secondary leachate pumps together with their associated forcemains discharging to the equalization tank described below.

Equalization Tank

- one (1) 2,300 m³ capacity steel and glass lined tank enclosed with a clay berm containment area, receiving raw leachate from the landfill leachate collection system, equipped with three (3) 9.6 L/sec capacity variable frequency drive (VFD) recirculation pumps during Phases 1 to 4 and a total of three (3) 9.6 L/sec capacity VFD raw leachate pumps (two duty, one standby) during Phases 5 to 9, all pumping leachate to the leachate treatment system described below; and
- two (2) 27.7 L/sec capacity VFD raw leachate pumps (one duty, one standby) to be used in combination to fill the Sequencing Batch Reactor (SBR) reactors at a faster rate.

Chemical Feed System

- one (1) 1.0 m³ capacity phosphoric acid solution storage tank equipped with two (2) 32.0 L/hr capacity metering pumps (one duty for each SBR reactor with with interconnecting piping for redundancy) dosing phosphoric acid into the SBR reactors as required;
- one (1) 1.0 m³ capacity flocculant storage tank equipped with two (2) 363 L/hr capacity metering pumps (one duty for each SBR reactor with with interconnecting piping for redundancy) dosing flocculant upstream of the SBR reactors as required;
- one (1) 1.0 m³ capacity anti-foam agent storage tank equipped with two (2) 32.0 L/hr capacity metering pumps (one duty for each SBR reactor with with interconnecting piping for redundancy) dosing anti-foam agent upstream of the SBR reactors as required;
- one (1) 10.0 m³ capacity methanol storage tank equipped with a spill containment structure and two (2) 144 L/hr capacity metering pumps (one duty for each SBR reactor with with interconnecting piping for redundancy) dosing methanol upstream of the SBR reactors as required; and
- one (1) 88 m³ capacity in-ground high strength carbon waste storage tank equipped with two (2) 288 L/hr capacity metering pumps (one duty for each SBR reactor with with interconnecting piping for redundancy) dosing high strength carbon waste upstream of the SBR reactors as required.

Sequencing Batch Reactor (SBR)

- a sequencing batch reactor consisting of two (2) reactors each with approximate dimensions of 6.4 m long x 16.2 m wide x 5.5 m SWD providing active reactor volume of 572 m³, each tank equipped with a jet aeration header and one 227 L/sec capacity dry pit jet pumps and a decanter system capable of decanting 69.4 L/sec; and
- three (3) 50 hp positive displacement air blowers each with VFD control and with a capacity of 462 L/sec at 65.5 kPa supplying the air required for SBR aeration.

Effluent and Sludge Pumps

- two (2) effluent transfer pumps (one duty for each SBR reactor with with interconnecting piping for redundancy) each with 69.4 L/sec capacity transferring effluent from the SBR units to an effluent holding tank described below; and
- two (2) activated sludge wasting pumps (one duty for each reactor) each with 22 L/sec capacity transferring activated wasted sludge to aerated sludge tanks described below.

Effluent and Sludge Holding Tanks

- one (1) 400 m³ storage capacity effluent holding tank with approximate dimensions of 9.75 m long x 8.5 m wide x 5.5 m SWD equipped with coarse bubble diffusers, discharging to a reverse osmosis membrane filtration system described below;
- two (2) aerated sludge tanks operating in either parallel or series mode, each with approximate dimensions of 11.8 m long x 3 m wide x 5.5 m SWD providing a storage capacity of 200 m³ equipped with coarse bubble diffusers, two (2) supernatant pumps returning supernatant to the SBR units described above, and two (2) sludge pumps discharging settled sludge to a sludge dewatering press described below; and
- three (3) 141 L/sec at 65.5 kPa capacity 20 hp positive displacement air blowers with VFD control providing air required for the effluent tank and sludge holding tanks.

Reverse Osmosis Membrane Filtration System

- one (1) 15.0 m³ capacity treated effluent storage tank equipped with one (1) 8.3 L/sec pump discharging to a cartridge sand filtration unit described below;
- one (1) 7,000 L capacity sulphuric acid storage tank for pH adjustment of effluent at the effluent storage tank described above;
- two (2) dual redundant 3.47 L/sec capacity cartridge sand filtration unit discharging to a reverse osmosis membrane filtration system described below;
- one (1) three-staged reverse osmosis membrane filtration system with an overall treatment capacity of 3.47 L/sec consisting of three (3) filtration units, equipped with a 32 piece ST-RO membrane modules, a 20 piece ST-RO membranes modules, a 15 piece ST-NF membrane modules and the following pumps:
 1. four (4) high pressure plunger pumps with capacity of 1.8 L/s each (1st and 2nd stage RO);
 2. five (5) multistage centrifugal booster pumps with under water motor with capacity of 2.8 L/s each (1st and 2nd stage RO);
 3. one (1) multi stage vertical centrifugal pump (cleaning pump) with the capacity of 3.47 L/s;
 4. one (1) high pressure plunger pump with the capacity of 1.06 L/s (3rd stage NF);
 5. three (3) multistage centrifugal booster pumps with under water motor with the capacity of 2.8 L/s each (3rd stage NF); and

6. one (1) multi stage vertical centrifugal pump (cleaning pump) with the capacity of 1,06 L/s.

all discharging final permeate to a treated effluent storage pond described below and final concentrate to a concentrate storage tank described below;

Standby Power

- two (2) independent electric power sources from Hydro One to the landfill site;
- contingency plans, including off-site disposal of leachate, shall be in place to address issues associated with the leachate treatment system arising out of extended power outages from the dual source Hydro One power line;

Treated Effluent Storage Ponds

- one (1) 2,200 m³ capacity clay lined pond (**Inlet cell**) equipped with a floating aerator and one (1) pumping station manhole with one (1) 30 m³/hr capacity submersible pump;
- one (1) 53,900 m³ capacity clay lined pond (**Cell 1**) equipped with one (1) interconnecting manhole with a gate valve; and
- one (1) 28,400 m³ capacity clay lined pond (**Cell 2**) providing storage for treated effluent from the membrane filtration system, equipped with one (1) interconnecting manhole with a gate valve, a pumping station (**Pumping Station 11**) equipped with one (1) 56.9 L/sec 40 hp VFD submersible pump to be used for truck loading purposes, one (1) 7.3 L/sec capacity 5 hp submersible effluent return pump, and two (2) 45.7 L/sec capacity 50 hp VFD submersible irrigation pumps (one duty, one standby) discharging to a poplar tree land irrigation area described below;

Concentrate Evaporator and Dryer

- one (1) 102 m³ concentrate storage tank with approximate dimensions of 4.4 m long x 4.8 m wide and 5.5 m SWD equipped with one (1) 9.5 L/sec capacity pumps for off-site disposal, also used for off-site disposal slurry, and one (1) 0.63 L/sec capacity pumps for transferring concentrate to an evaporator treatment system described below;
- one (1) 0.63 L/sec capacity mechanical vapor compression evaporator equipped with electric heating element and heat exchangers to remove moisture from concentrate and produce a slurry discharging to a slurry holding tank described below;
- one (1) 102.0 m³ capacity slurry holding tank with approximate dimensions of 4.4 m long x 4.8 m wide and 5.5 m SWD equipped with one (1) 1.57 L/sec capacity slurry pump discharging to a slurry dryer described below; and
- one (1) 0.035 L/sec capacity slurry dryer with approximate dimensions of 4.7 m long x 2.1 m wide x 1.5 m high discharging to a salt cake disposal bin (water vapour will be evaporated through the slurry dryer exhaust).

Treated Effluent On-Site Disposal

Upon substantial completion of the Works, treated leachate effluent will be disposed as follows:

- one (1) 21.7 ha poplar tree irrigation land established to handle (during Phases 1 to 4) an average of 909 m³/day of treated leachate effluent during suitable irrigation days between the period extending from May 1st to October 15th, consisting of six (6) 3.62 ha treated effluent drip-irrigation zones using approximately 250 m long drip-irrigation tubing installed in each zone;
- one (1) 6.62 ha poplar tree irrigation land established to handle (during Phases 5 to 9) an additional 278 m³/day (bringing the total to 1,187 m³/day) of treated leachate effluent during suitable irrigation days between the period extending from May 1st to October 15th, consisting of two (2) 3.31 ha treated effluent drip-irrigation zones using approximately 250 m long drip-irrigation tubing installed in each zone;
- a stormwater management system to control the quality of stormwater runoff from the poplar tree irrigation land to Kersey Drain (Brown Creek), consisting of one (1) west furrow approximately 710 m long and 200 mm deep and one (1) east furrow approximately 510 m long and 200 mm deep, running parallel to each other with a grassed area in between, each equipped with a 200 mm high berm for distributing stormwater runoff across the entire length of the furrow, discharging by sheet flow to Kersey Drain; and
- including all controls and associated appurtenances.

Raw/Diluted Leachate Effluent Disposal

- one (1) existing 3.33 ha poplar tree irrigation system identified as the South Fill Area (SFA) Poplar System, of approximately 150 m length for each poplar row. Leachate is applied through pressure drip-irrigation tubing at a rate not to exceed 476 mm/m², or 149,000 L/day, during the growing season. The system is subject to conditions as specified in the *EPA* Section 27 approval for the site.
- a system of maintenance holes, collector system and leachate sump accross the existing site to transfer leachate to the leachate holding tanks via two methods: 1) down-hole leachate pumps transfer leachate through portable piping units directly to the leachate holding tanks; and 2) the use of a tanker truck, which tranfers the leachate via gravity drainage into the leachate holding tanks.

all in accordance with the Application for Approval of Industrial Sewage Works submitted by Waste Management of Canada Corporation, conceptual design specification and drawings prepared by Conestoga-Rovers & Associates, Waterloo, Ontario and the following documents:

1. "Technical Design Brief On-Site Leachate Treatment Facility - Warwick Landfill Site Expansion - Waste Management of Canada Corporation, Watford, Ontario" dated August 2007, prepared by Conestoga-Rovers & Associates, Waterloo, Ontario.
2. "Development and Operations Plans - Warwick Landfill Expansion - Volumes 1 and 2", prepared by Henderson Paddon and Associates Limited, Owen Sound, Ontario.
3. Additional information provided by Conestoga-Rovers dated September 20, 2007 in response to items #1 and #2 of MOE letter dated September 18, 2007 regarding proposed leachate treatment facility.
4. Additional information provided by Henderson Paddon & Associates Limited dated September 19,

2007 in response to item #3 of MOE letter dated September 18, 2007 regarding the proposed effluent storage ponds.

5. Additional information provided by Jagger Hims Limited dated September 25, 2007 in response to items #4, #5, and #6 of MOE letter dated September 18, 2007 regarding the operation and monitoring of the proposed poplar tree irrigation area.
6. "Stormwater Management Plan, Poplar Irrigation Area, Warwick Landfill Expansion, Watford Ontario" dated December 2007, prepared by Henderson Paddon & Associates Limited, Owen Sound, Ontario.
7. "Environmental Monitoring Plan, Warwick Landfill Expansion, Township of Warwick, Ontario" dated December 2007, prepared by Jagger Hims Limited, Newmarket, Ontario.
8. "Stormwater Management Plan Poplar Irrigation Area, Warwick Landfill Expansion, Watford Ontario" dated December 2007, prepared by Henderson Paddon & Associates Limited, Owen Sound, Ontario.
9. "Application for Approval of Industrial Sewage Works submitted by Waste Management of Canada Corporation for site name change from Warwick Landfill Site to Twin Creeks Landfill Site" dated July 10, 2008.
10. Application for Approval of Industrial Sewage Works submitted by Waste Management of Canada Corporation for update of leachate STP components" dated October 27, 2008, and supporting documents.
11. Appendix Q of the Development & Operations Report - Warwick Landfill Expansion, Volume 1 of 3, prepared by Henderson Paddon & Associates Ltd., dated March 2008.
12. Letter from Jagger Hims Limited of Windsor, ON to Reid Cleland of Waste Management of Canada Corporation, dated December 12, 2008, in response to comments provided by Edgardo Tovilla of the MOE on letter dated December 11, 2008.
13. Letters from Wayne Jenken of Waste Management of Canada Corporation to Edgardo Tovilla of the MOE, dated December 15, 2008, with comments to draft CofA.
14. Documents titled "Groundwater Contingency and Remedial Action Plan" and "Surface Water, Contingency Remedial Action Plan, Warwick Landfill Site", prepared by Jagger Hims Limited, dated April 2008 and contained in Appendix N.26 and 27 respectively, in the Operations and Maintenance Manual, Warwick Landfill Expansion, WM, May 2008.
15. Letter from Peter C. Pickfield of Garrod Pickfield LLP Lawyers on behalf of the Township of Warwick to Edgardo Tovilla of the MOE, dated June 26, 2009, in response to request for comments on the WM application for approval.

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

“Act ” means the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended;

"Average Daily Flow " means the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year;

“BOD5 ” (also known as TBOD₅) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand;

"*CBOD5* " means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"*Certificate* " means this entire certificate of approval document, issued in accordance with Section 53 of the *Act* , and includes any schedules;

"*Daily Concentration* " means the concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required;

"*Director* " means any *Ministry* employee appointed by the Minister pursuant to section 5 of the *Act* ;

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

"*District Manager* " means the District Manager of the Sarnia District Office of the Ministry;

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

"*Monthly Average Concentration* " means the arithmetic mean of all *Daily Concentrations* of a contaminant in the effluent sampled or measured, or both, during a calendar month;

"*Owner* " means Waste Management of Canada Corporation and includes its successors and assignees;

"*Proposed Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* ;

"*Rated Capacity* " means the *Average Daily Flow* for which the *Works* are approved to handle;

"*Substantial Completion* " has the same meaning as "*substantial performance* " in the Construction Lien Act;

"*Township* " refers to the Township of Warwick;

"*Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* and includes both *Previous Works* and *Proposed Works* ;

"*WIFN* " refers to Walpole Island First Nation; and

"*WPLC* " refers to the Warwick Public Liaison Committee.

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

TERMS AND CONDITIONS

PART I - GENERAL

1. GENERAL PROVISIONS

- (1) The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Certificate* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
- (2) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate* , the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate* .
- (3) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate* , the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.
- (4) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
- (5) The requirements of this *Certificate* are severable. If any requirement of this *Certificate* , or the application of any requirement of this *Certificate* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this certificate shall not be affected thereby.

2. CHANGE OF OWNER

- (1) The *Owner* shall notify the *District Manager* and the *Director* , in writing, of any of the following changes within 30 days of the change occurring:
 - (a) change of *Owner* ;
 - (b) change of address of the *Owner* ;
 - (c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager* ;
 - (d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations

Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager* ;

- (2) In the event of any change in ownership of the *Works* , other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *Certificate* , and a copy of such notice shall be forwarded to the *District Manager* and the *Director* .

PART II - STORMWATER MANAGEMENT FACILITY

3. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

- (1) Upon the *Substantial Completion* of the *Proposed Works* , the Owner shall prepare a statement, certified by a Professional Engineer, that the works are constructed in accordance with this *Certificate* , and upon request, shall make the written statement available for inspection by Ministry personnel.
- (2) Within one (1) year of the *Substantial Completion* of the *Proposed Works* , a set of as-built drawings showing the works “as constructed” shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the *Works* for the operational life of the *Works* .

4. OPERATIONS MANUAL

- (1) The *Owner* shall prepare an operations manual prior to the commencement of operation of the *Works* , that includes, but not necessarily limited to, the following information:
 - (a) operating procedures for routine operation of the works;
 - (b) inspection programs, including frequency of inspection, for the works and the methods or tests employed to detect when maintenance is necessary;
 - (c) repair and maintenance programs, including the frequency of repair and maintenance for the works;
 - (d) contingency plans and procedures for dealing with potential spill, bypasses and any other abnormal situations and for notifying the *District Manager* ; and
 - (e) complaint procedures for receiving and responding to public complaints.
- (2) The *Owner* shall maintain the operations manual up to date through revisions undertaken from time to time and retain a copy at the location of the sewage works. Upon request, the *Owner* shall make the manual available for inspection and copying by *Ministry* personnel.
- (3) The *Owner* shall notify and provide the *Township*, *WPLC* and *WIFN* with a copy of the

proposed operations manual required under Condition 4(1).

5. MONITORING AND RECORDING

The *Owner* shall carry out the following monitoring program:

- (1) All samples and measurements taken for the purposes of this *Certificate* shall be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.
- (2) The *Owner* shall collect grab samples of stormwater from the pond outlets at **SWM Pond #1 (SP1), SWM Pond #2 (SP2), SWM Pond #3 (SP3), and SWM Pond #4 (SP4)** and **Poplar Irrigation Area sampling locations SS17A, SS17B, SS18A and SS18B** at least at **a quarterly frequency***^{NOTE} and analyse for the parameters listed in Table 1 below:

Table 1 - Stormwater Monitoring Sampling Locations: SWM Pond Outlets - SP1, SP2, SP3, SP4. Irrigation Area - SS17A, SS17B, SS18A and SS18B.			
Parameter	Parameter	Parameter	Field -Parameter
Alkalinity	Magnesium	Toluene	Conductivity
Total Ammonia Nitrogen	Potassium	Ethylbenzene	Dissolved Oxygen
Un-ionized Ammonia	Sodium	Xylene	pH (Field)
Chloride	Arsenic	Vinyl Chloride	Temperature
Conductivity (Lab)	Barium	1,2,4-Trichlorobenzene	Turbidity
Nitrate Nitrogen	Boron	1,2-Dichlorobenzene	
Nitrite Nitrogen	Cadmium	1,3-Dichlorobenzene	
TKN	Chromium (Total)	1,4-Dichlorobenzene	
pH (Lab)	Copper	Hexachlorobenzene	
Total Phosphorus	Iron	Diethylphthalate	
Total Suspended Solids	Lead	Dimethylphthalate	
Total Dissolved Solids	Mercury	Di-n-butyl phthalate	
Sulphate	Nickel	Phenol	
BOD5	Zinc	Benzo(a)pyrene	
Chemical Oxygen Demand	Benzene	2,4,6-Trichlorophenol	
Phenols	1,4-Dichlorobenzene	2,4-Trichlorophenol	
Calcium	Dichloromethane	Pentachlorophenol	

* **Note:** Samples shall be collected within twenty four hours after a rainfall event (more than 10 mm rainfall in 24 hour period) resulting in a stormwater discharge from each SWM Pond or Poplar Tree Irrigation Area at a minimum interval of one (1) month between consecutive sampling events.

- (3) The methods and protocols for sampling, analysis, and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

- (a) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (August 1994), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions; and
 - (b) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition) as amended from time to time by more recently published editions.
- (4) The measurement frequencies specified in Condition 5 (2) in respect to any parameter are minimum requirements which may, after 24 months of monitoring in accordance with this Condition, be modified by the *District Manager* in writing from time to time.
 - (5) The *Owner* shall provide to the *Township*, *WPLC*, and *WIFN* a copy of all requests to be submitted to the *District Manager* for any changes to the monitoring program specified in Condition 5 (2) at the same time or prior to the time such request is made to the *District Manager*.
 - (6) The *Owner* shall provide to the *District Manager* as part of the next quarterly report after issuance of this Certificate a detailed calendar for the proposed completion schedule of the stormwater management works. Updated calendars will be submitted to the *District Manager* on quarterly basis as construction progresses until the completion of the stormwater management works. This process will provide a reasonable construction schedule that accounts for construction delays due to weather and other unforeseen delays.

6. OPERATION AND MAINTENANCE.

- (1) The *Owner* shall apply the "Stormwater Contingency and Remedial Action Plan" as included in Appendix N.27 of the Operations and Maintenance Manual, Warwick Landfill Expansion, WM, May 2008.
- (2) Within one (1) year of the commencement of operation of the *Works* (**SWM Ponds and Poplar Tree Irrigation Area**), the *Owner* shall prepare an annual report establishing revised trigger levels for allowing stormwater discharges from the *Works* (**SWM Pond and Poplar Tree Irrigation Area**). The revised trigger levels shall be established for the trigger parameters outlined in Table 2 under Condition 6 (4) based on 75 percentile of the annual surface water monitoring results from surface water sampling location **SS10** upstream of the landfill.
- (3) The *Owner* shall operate the *Works* (**SWM Ponds**) with the outlet sluice gate valve in a **Normally Open Position** during normal operation period.
- (4) The *Owner* shall compare monitoring results obtained under Condition 5 (2) for the trigger parameters listed in Table 2 with their respective trigger levels listed in Table 2 to identify any potential leachate impact to stormwater.

Table 2	
Trigger Parameter	Trigger Level (mg/L)
Ammonia (unionized)	0.020*
Boron	0.20*
Chloride	210*
Chromium (Total)	0.0089*
Nickel	0.025*
Phenols	0.001*
Zinc	0.020*

Note: * The above shown trigger levels are based on PWQO and will be used until adequate monitoring data is collected from Sampling Location SS10 to calculate the corresponding 75 percentile of background surface water concentration levels. Annually, a trigger level for a parameter listed above will be replaced by the corresponding 75 percentile of background surface water concentration where background surface water concentrations collected upstream of the landfill (Sampling Location SS10) exceed the PWQO or the trigger value set for chloride.

- (5) In the event that a monitoring result for any parameter that is listed in Table 2 for any of the **SWM Ponds** exceeds its trigger level, the *Owner* shall conduct sampling of the contents of the affected **SWM Pond** within one (1) week to confirm the exceedence of the trigger level for that parameter and identify potential source of contamination. Upon confirmation of the exceedence of any trigger level for any parameter that is listed in Table 2, the *Owner* shall close the outlet sluice gate valve of the affected *Works* (**SWM Pond**) and implement an approved "Stormwater Contingency and Remedial Action Plan".
- (6) The *Owner* shall dispose of the contents of an affected *Work* (**SWM Pond**) which failed to meet the quality requirements outlined in Condition 6 (5) in accordance with an approved "Stormwater Contingency and Remedial Action Plan".
- (7) In the event that a monitoring result for any parameter that is listed in Table 2 for the **Poplar Tree Irrigation Area** exceeds its trigger level, the *Owner* shall conduct sampling of the stormwater runoff from the affected part of **Poplar Tree Irrigation Area** as soon as possible to confirm the exceedence of the trigger level for that parameter and identify potential source of contamination. Upon confirmation of the exceedence of any trigger level for any parameter that is listed in Table 2, the *Owner* shall implement an approved "Stormwater Contingency and Remedial Action Plan".
- (8) The *Owner* shall inspect the *Works* (**SWM Ponds**) at least once a year and, if necessary, clean and maintain the Works to prevent the excessive build-up of sediments and/or vegetation.

- (9) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site or *Owner* 's operational head quarter for inspection by the *Ministry* . The logbook shall include the following:
- (a) the name of the Works (SWM Pond #1, SWM Pond #2, SWM Pond #3, and SWM Pond #4);
 - (b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed; and
 - (c) the occurrence date of each spill within the catchment area of a given SWM Pond, including follow-up actions / remedial measures undertaken.
- (10) The *Owner* shall notify and provide the *Township, WPLC* and *WIFN* with a copy of the proposed "Stormwater Contingency and Remedial Action Plan" required under Condition 6 (1).

7. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance and monitoring activities required by this *Certificate* .

PART III - LEACHATE TREATMENT FACILITY

8. EFFLUENT LIMITS

- (1) The *Owner* shall design and construct the *Proposed Works* and operate and maintain the *Works* such that the concentrations of the materials named below as effluent parameters are not exceeded in the effluent discharged from the **Treated Effluent Storage Pond** (Cell 2) to the poplar plant irrigation area.

Table 3 - Effluent Limits	
Sampling Location: Discharge Point from Treated Effluent Storage Pond	
Effluent Parameter	Average Monthly Concentration (milligrams per litre unless otherwise indicated)
Column 1	Column 2
Total Ammonia Nitrogen	68.7
Total Phosphorus	0.72
Phenols	0.2
Chlorides	247
Copper	0.014
Iron	27.0
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times	

- (2) For the purposes of determining compliance with and enforcing subsection (1):

- (a) The *Average Monthly Concentration* of a parameter named in Column 1 of subsection (1) shall not exceed the corresponding maximum concentration set out in Column 2 of subsection (1);
 - (b) The pH of the effluent shall be maintained within the limits outlined in subsection (1), at all times.
- (3) The effluent limit set out in subsection (2) shall apply upon the commencement of operation of the proposed poplar forest irrigation area.

9. OPERATION AND MAINTENANCE

- (1) The *Owner* shall exercise due diligence in ensuring that, at all times, the *Works* and the related equipment and appurtenances used to achieve compliance with this *Certificate* are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this *Certificate* and the *Act* and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances in the *Works*.
- (2) The *Owner* shall prepare an operations manual prior to the commencement of operation of the *Proposed Work*, that includes, but not necessarily limited to, the following information:
 - (a) operating procedures for routine operation of the *Works* ;
 - (b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;
 - (c) repair and maintenance programs, including the frequency of repair and maintenance for the *Works* ;
 - (d) procedures for the inspection and calibration of monitoring equipment;
 - (e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager* ; and
 - (f) procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.
- (3) The *Owner* shall maintain the operations manual current and retain a copy at the location of the *Works* for the operational life of the *Works*. Upon request, the *Owner* shall make the manual available to *Ministry* staff.

- (4) The *Owner* shall notify and provide the *Township, WPLC* and *WIFN* with a copy of the proposed operations manual required under Condition 9(2).

10. MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works* , carry out the following monitoring program:

- (1) All samples and measurements taken for the purposes of this *Certificate* are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.
- (2) For the purposes of this condition, the following definitions apply:
 - (a) Daily means once each day;
 - (b) Weekly means once each week;
 - (c) Monthly means once every month;
 - (d) Semi-annually means once every six months.
- (3) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analysed for each parameter listed and all results recorded:

Table 4 - Leachate Monitoring Sampling Location: Equalization Tank		
Parameters	Sample Type	Frequency
<i>BOD5</i>	Grab	Quarterly
Dissolved Organic Carbon (DOC)	Grab	Quarterly
Total Phosphorus	Grab	Quarterly
Total Kjeldahl Nitrogen	Grab	Quarterly
BTEX	Grab	Quarterly
pH	Grab	Quarterly
VOCs ^{Note 1}	Grab	Semi-Annually
Semi-VOCs ^{Note 2}	Grab	Semi-Annually
Metals ^{Note 3}	Grab	Semi-Annually
General Chemistry ^{Note 4}	Grab	Semi-Annually

Table 5 - Leachate Treatment Plant Effluent Monitoring Sampling Location: Discharge to Treated Effluent Storage Pond		
Parameters	Sample Type	Frequency
<i>CBOD5</i>	Grab	Weekly
Dissolved Organic Carbon (DOC)	Grab	Weekly
Total Ammonia Nitrogen	Grab	Weekly
Chloride	Grab	Weekly
BTEX	Grab	Weekly
pH	Grab	Weekly
VOCS ^{Note 1}	Grab	Monthly
Semi-VOCS ^{Note 2}	Grab	Monthly
Metals ^{Note 3}	Grab	Monthly
General Chemistry ^{Note 4}	Grab	Monthly
PCB	Grab	Semi-Annually
Organochlorides	Grab	Semi-Annually

Table 6 - Treated Effluent Storage Pond Effluent Monitoring Sampling Location: Discharge to Poplar Plant Irrigation Area		
Parameters	Sample Type	Frequency
<i>CBOD5</i>	Grab	Weekly
Dissolved Organic Carbon (DOC)	Grab	Weekly
Total Ammonia Nitrogen	Grab	Weekly
Chloride	Grab	Weekly
BTEX	Grab	Weekly
pH	Grab	Weekly
VOCS ^{Note 1}	Grab	Monthly
Semi-VOCS ^{Note 2}	Grab	Monthly
Metals ^{Note 3}	Grab	Monthly
General Chemistry ^{Note 4}	Grab	Monthly

Note 1: VOCs: Benzene, 1,4-Dichlorobenzene, Dichloromethane, Toluene, Ethylbenzene, Xylenes, and Vinyl Chloride.

Note 2: Semi-VOCS: 1,2,4-Trichlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Hexachlorobenzene, Diethylphthalate, Dimethylphthalate, Di-n-butyl phthalate, Phenol, Benzo(a)pyrene, 2,4,6- Trichlorophenol, 2,4-Dichlorophenol, Pentachlorophenol.

Note 3: Metals: Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Zinc.

Note 4: G. Chemistry: Alkalinity, Calcium, Chloride, Conductivity, COD, Nitrate, Nitrite, Magnesium, pH, Potassium, Sodium, Sulphate, Total Dissolved Solids, TKN, Temperature, Turbidity, Total Phosphorus, TSS, Phenols, Dissolved Oxygen.

- (4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
 - (a) the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;
 - (b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions; and
 - (c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;
- (5) The measurement frequencies specified in Condition 10 (3) in respect to any parameter are minimum requirements which may, after 24 months of monitoring in accordance with this Condition, be modified by the *District Manager* in writing from time to time.
- (6) The *Owner* shall provide to the *Township*, *WPLC*, and *WIFN* a copy of all requests to be submitted to the *District Manager* for any changes to the monitoring program specified in Condition 10 (3) at the same time or prior to the time such request is made to the *District Manager*.
- (7) The *Owner* shall install and maintain (a) continuous flow measuring device(s), to measure the flowrate of the effluent from the *Works* with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at a daily frequency.
- (8) The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this *Certificate*.
- (9) The *Owner* shall visually inspect the existing and proposed drip-irrigation pipeline systems at least once per week during operation period to look for leaking and/or failed (broken) lines that would otherwise produce runoff. The inspection should be supported by a log book documenting routine inspection and notes on repair as required.

11. GROUNDWATER MONITORING - POPLAR TREE LAND IRRIGATION AREA

- (1) The Owner shall establish at least four (4) groundwater monitoring wells designated as OW16, OW40, OW60 and OW79 (for Effluent Storage Ponds), OW61 and OW62 (for Poplar Forest Irrigation Area).
- (2) The Owner shall collect grab samples during May and November from the sampling locations outlined in subsection (1) at the frequency indicated in Table 7 and analyze for the parameters listed in Table 7 below.

Table 7 - Groundwater Monitoring Sampling Location: OW40, OW60 and OW79 - at Annual Frequency Sampling Location: OW16, OW61, and OW62 - at Semi-Annual Frequency		
Parameters	Parameters	Field Parameters
Alkalinity	Boron	pH
Conductivity	Cadmium	Conductivity
Chloride	Lead	Turbidity
pH	Iron	
Dissolved Organic Carbon	Barium	
Total Dissolved Solids	Benzene	
Total Ammonia	1,4-Dichlorobenzene	
Total Kjeldahl Nitrogen	Dichloromethane	
Sulphate	Ethylbenzene	
Nitrate	Vinyl Chloride	
Calcium	Toluene	
Potassium	Xylenes	
Sodium		
Magnesium		

- (3) Notwithstanding subsection (2), the *Owner* shall collect at least one groundwater sample from each of the locations in subsection (1) prior to the initial land application event and have these samples analysed for the same parameters as outlined in subsection (2).
- (4) The methods and protocols for sampling, analysis and recording shall conform to that outlined in Condition 10(4).
- (5) The measurement frequencies specified in Condition 11 (2) in respect to any parameter are minimum requirements which may, after 24 months of monitoring in accordance with this Condition, be modified by the *District Manager* in writing from time to time.
- (6) The *Owner* shall provide to the *Township* , *WPLC* , and *WIFN* a copy of all requests to be submitted to the *District Manager* for any changes to the monitoring program specified in Condition 11 (2) at the same time or prior to the time such request is made to the *District*

Manager.

12. OPERATION - POPLAR TREE LAND IRRIGATION

- (1) The *Owner* shall apply the "Groundwater Contingency and Remedial Action Plan" for any potential groundwater impact caused by Effluent Storage Ponds and the Poplar Forest Irrigation Area, as included in Appendix N.26 of the Operations and Maintenance Manual, Warwick Landfill Expansion, WM, May 2008.
- (2) The *Owner* shall compare monitoring results obtained under Condition 11 (2) for the trigger parameters listed in Table 8 with their respective trigger levels listed in Table 8 to identify any potential leachate impact to groundwater.

Table 8			
Trigger Parameter	Trigger Level (mg/L)		
	Active Aquitard	Interstadial Silt and Sand	Interface Aquifer
Chloride	106	116	134
Nitrate	2.3	2.3	2.3
Boron	1.1	2.1	2.6
Cadmium	0.001	0.001	0.001
Lead	0.002	0.002	0.002
Benzene	0.001	0.001	0.001
1,4-Dichlorobenzene	0.001	0.001	0.001
Dichloromethane	0.01	0.01	0.01
Vinyl Chloride	0.0004	0.0004	0.0004

- (3) In the event that a monitoring result for any parameter that is listed in Table 8 exceeds its trigger level, the *Owner* shall re-sample within one (1) month to confirm the exceedence of the trigger level for that parameter. Upon confirmation of the exceedence of any trigger level for any parameter that is listed in Table 8, the *Owner* shall conduct a second round re-sampling within six (6) months to re-confirm the exceedence of the trigger level for the parameter of concern.
- (4) In the event that the presence of the parameter(s) of concern is (are) not confirmed after the second round of sampling conducted under Condition 12 (3), then, normal groundwater monitoring shall be resumed.
- (5) In the event that the presence of the parameter(s) of concern is confirmed after the second round of sampling conducted under Condition 12 (3), then, it shall constitute as a confirmation of leachate impact to groundwater and the *Owner* shall immediately implement the "Groundwater Contingency and Remedial Action Plan" approved under Condition 12 (1).

- (6) The *Owner* shall notify the *District Manager* orally, as soon as possible, and in writing within seven days of the confirmation of leachate impact to groundwater including an assessment of the relative severity and extent of leachate impact and proposed remedial actions.
- (7) The *Owner* shall record and report a summary of all trigger exceedence incidents and all remedial action measures taken under Condition 12 (5) in the Annual Report prepared under Condition 14.
- (8) The *Owner* shall dispose of **only** treated leachate effluent that meets the effluent limits requirements outlined under Condition 8 (1) for treatment and disposal by drip-irrigation on the approved poplar tree land area during the period between May 1st and October 15th.
- (9) The *Owner* shall not allow under any circumstance (including as emergency contingency plan) any direct discharge of leachate or treated leachate effluent from the *Works* to any receiving surface water including Bear Creek;
- (10) The *Owner* shall record the total volume of treated leachate effluent drip-irrigated on the poplar tree land irrigation area on a daily basis.
- (11) The *Owner* shall ensure that treated leachate effluent is disposed of via drip-irrigation in the designated six (6) poplar tree drip-irrigation zones initially, and ultimately on eight (8) poplar tree drip-irrigation zones on a planned rotation basis.
- (12) The *Owner* shall visually inspect drip-irrigation operations at least twice each day during operation period to ensure that no surface ponding or surface run-off is taking place.
- (13) The *Owner* shall retain records of inspections and drip-irrigation operation data collected under subsections (10), (11) and (12) and make them available for inspection *Ministry* staff upon request.
- (14) No drip irrigation is to take place:
 - a) on frozen or snow covered ground conditions;
 - b) with the occurrence of surface ponding in any area subjected to drip irrigation;
 - c) within 100 m of any surface watercourse or drain; and
 - d) at an average daily application rate greater than 4.8 mm;
- (15) The *Owner* shall notify and provide the *Township*, *WPLC* and *WIFN* with a copy of the proposed "Groundwater Contingency and Remedial Action Plan" required under Condition 12(1).

PART IV - GENERAL

13. REPORTING

- (1) One week prior to the start up of the operation of the *Proposed Work* , the *Owner* shall notify the *District Manager* (in writing) of the pending start up date.
- (2) In addition to the obligations under Part X of the Environmental Protection Act, the *Owner* shall, within 10 working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the *District Manager* describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.
- (3) The *Owner* shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to *Ministry* staff.
- (4) The *Owner* shall prepare and submit to the *District Manager* a performance report on an annual basis before March 31st . The first such report shall cover the first annual period following the commencement of operation of the *Works* and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:
 - (a) a summary and interpretation of all monitoring data and a comparison to the effluent objectives outlined in Condition 8, including an overview of the success and adequacy of the *Works* ;
 - (b) a summary and interpretation of all monitoring data and a comparison to the trigger levels outlined in Condition 6, including an overview of the success and adequacy of the *Works* ;
 - (c) a description of any operating problems encountered and corrective actions taken;
 - (d) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the *Works* ;
 - (e) a summary of any effluent quality assurance or control measures undertaken in the reporting period;
 - (f) a summary of the calibration and maintenance carried out on all effluent monitoring equipment;
 - (g) a tabulation of the amount of dry salt cake generated in the reporting period, an

outline of anticipated amount of dry salt cake to be generated in the next reporting period and a summary of the locations to where the cake was disposed;

(h) a summary of any complaints received during the reporting period and any steps taken to address the complaints; and

(i) any other information the *District Manager* requires from time to time.

(5) The *Owner* shall provide one (1) copy of all reports and plans required by Condition 13 (4) of this *Certificate* to the *Township*, *WPLC* and *WIFN* in a timely manner.

(6) During the process of submission of an application to amend this *Certificate*, the *Owner* shall

(a) discuss with *WIFN* and the *WPLC* the proposed application prior to submission of the application to the *Director* ;

(b) provide the same documents to *WIFN* that is provided to the *Director* in respect of the amendment; and

(c) provide the *Director* with a statement how *WIFN*'s comments were considered by the *Owner* before it submitted the application to the *Ministry* .

14. REVOCATION

This Certificate of Approval revokes and replaces Certificate of Approval No. 3-0218-98-006 issued on May 8, 1998, upon commencement of operation of the Works approved by this Certificate.

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

1. Condition 1 is imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.
2. Condition 2 is included to ensure that the *Ministry* records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the *Works* are made aware of the *Certificate* and continue to operate the *Works* in compliance with it.
3. Condition 3 is included to ensure that the *Works* are constructed in accordance with the approval and that record drawings of the *Works* “as constructed” are maintained for future references.
4. Conditions 4, 6, 9 and 12 are included to require that the *Works* be properly operated,

maintained, funded, staffed and equipped such that the environment is protected and injury to any person or deterioration, loss and damage to property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the *Ministry* . Such a manual is an integral part of the operation of the *Works* . Its compilation and use should assist the *Owner* in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for *Ministry* staff when reviewing the *Owner*' s operation of the work.

5. Conditions 5, 10 and 11 are included to require the owner to demonstrate on a continual basis that the quality and quantity of the effluent from the approved *Works* is consistent with the effluent limits specified in the certificate and that the approved *Works* does not cause any impairment to the receiving watercourse and/or the groundwater.
6. Condition 7 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works* .
7. Condition 8 is imposed to ensure that the effluent irrigated from the *Works* to the poplar irrigation area meets the *Ministry* 's effluent quality requirements thus minimizing environmental impact on groundwater and receiving surface water.
8. Condition 13 is included to provide a performance record for future references to ensure that the *Ministry* is made aware of problems as they arise and to provide a compliance record for all the terms and conditions outlined in this *Certificate* so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.
9. Condition 14 is included to ensure that Certificate of Approval No. 3-0218-98-006, which was issued for the site to operate as a municipal sewage works - stormwater management works is revoked and replaced by this Certificate issued appropriately to operate as an industrial sewage works.

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 2209-7HURTP issued on August 28, 2008.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

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

This Notice must be served upon:

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

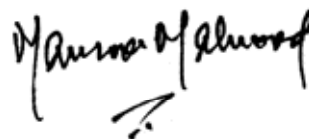
AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 9th day of July, 2009



Mansoor Mahmood, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

ET/

c: District Manager, MOE Sarnia District Office
Andrew Lugowski, Conestoga-Rovers & Associates Limited

APPENDIX A19:

Amendment to ECA No. 3506-7M5PU3 – Notice No. 1, dated February 20, 2013



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 3506-7M5PU3

Notice No. 1

Issue Date: February 20, 2013

Waste Management of Canada Corporation (WM)
8039 Zion Line R.R. #4
Watford, Ontario
N0M 2S0

Site Location: Twin Creeks Landfill Site

8039 Zion Line

Warwick Township, County of Lambton, Ontario N0M 2S0

- Firstly, Part of Lot 19 & 20, Concession 3, S.E.R., and Part of Lots 20, 21 & 22, Concession 4, S.E.R., and Part of the Road Allowance between Lots 21 and 22, Concession 4, S.E.R., shown as Parts 1,2, and 3 on Plan 25R-9125 and Part 2 on Plan 25R-1903, Save and Except Part 1 on Plan 25R-6184.
- Secondly, Part of Lot 20, Concession 3 S.E.R., shown as Part 1 on Plan 25R-6184.

You are hereby notified that I have amended Approval No. 3506-7M5PU3 issued on July 9, 2009 for a leachate collection, treatment, and disposal facility and a stormwater management facility to service the Twin Creeks Landfill Site located in the Township of Warwick, County of Lambton, as follows:

Part I - Additional Sewage Works

The said *Approval* is hereby amended to include the approval of the following additional sewage *Works*:

Stormwater Management Pond - SWM Pond #2:

Modifications to the outlet from the existing SWM Pond #2 to resolve leakage problems at the sluice gate valve. The following items represent the existing Pond 2 structures updated with the proposed works.

- one (1) extended detention wet pond with approximate dimensions of 413 m long X 44.0 m wide bottom and 4H:1V and 3H:1V side slopes, providing a total storage capacity of 51,725 m³ consisting of a permanent pool storage volume of 11,427 m³ with a average depth of 0.60 m, and an extended storage volume of 40,298 m³ with an extended storage depth of 1.75 m, equipped with an outlet structure described below;
- a new outlet structure to replace the existing one consisting of one (1) 1800 mm diameter and one (1) 2400 mm diameter concrete manholes discharging through a 1050 mm and a 1200 mm diameter outlet pipes, each pipe equipped with a 2000 mm X 2000 mm concrete valve chamber, to a roadside ditch

along County Road 79.

All other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage *Works* .

Part II - Definitions

The following definitions on the said Approval are modified to include the following additional conditions:

“Poplar System” is the irrigation area of 9.3 hectares located on top of the cap of the Existing Site (old landfill) that is used for the phytoremediation of leachate that is generated at the *Site*.

“Poplar Plantation” is the irrigation area located on native soil to the south of the *Site* that is used for the phytoremediation of irrigation liquid that satisfies the Effluent Limit criteria.

With the above definitions any reference in the Approval to "Poplar Tree Irrigation Area" is now changed to *Poplar Plantation*.

Part III - Documentation

The said *Approval* is hereby amended to include the following additional supporting documents:

1. Application for Approval of Sewage Works dated December 6, 2011 submitted by Waste Management of Canada Corporation, design specifications and drawings prepared by GENIVAR of Owen Sound, ON.
2. Development & Operations Report Warwick Landfill Expansion, Volumes 1, 2 and 3, prepared by Henderson Paddon & Associates Limited, dated March 2008.
3. Letter from Brent J. Langille of RWDI Air Inc. to Edgar Tovilla of the MOE, dated July 17, 2012.
4. Amendment to the application for sewage works Approval No. 3506-7M5PU3, dated August 28, 2011, Revision 2, dated November 19, 2012.

The reason(s) for this amendment to the Approval is (are) as follows:

The purpose of this amendment is to approve sewage works designed to repair and modify the existing SWM Pond #2 and realignment of some of its existing berms and drainage ditches. These modifications include the pond enlargement and rebuild the outlet at a new location, having the ultimate location of pond discharge to remain unchanged draining off-site along County Road 79 (Nauvoo Road)

This Notice shall constitute part of the approval issued under Approval No. 3506-7M5PU3 dated July 9, 2009.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon

me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

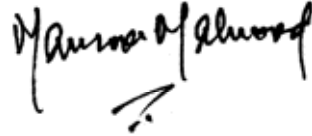
The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

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

DATED AT TORONTO this 20th day of February, 2013



Mansoor Mahmood, P.Eng.

Director

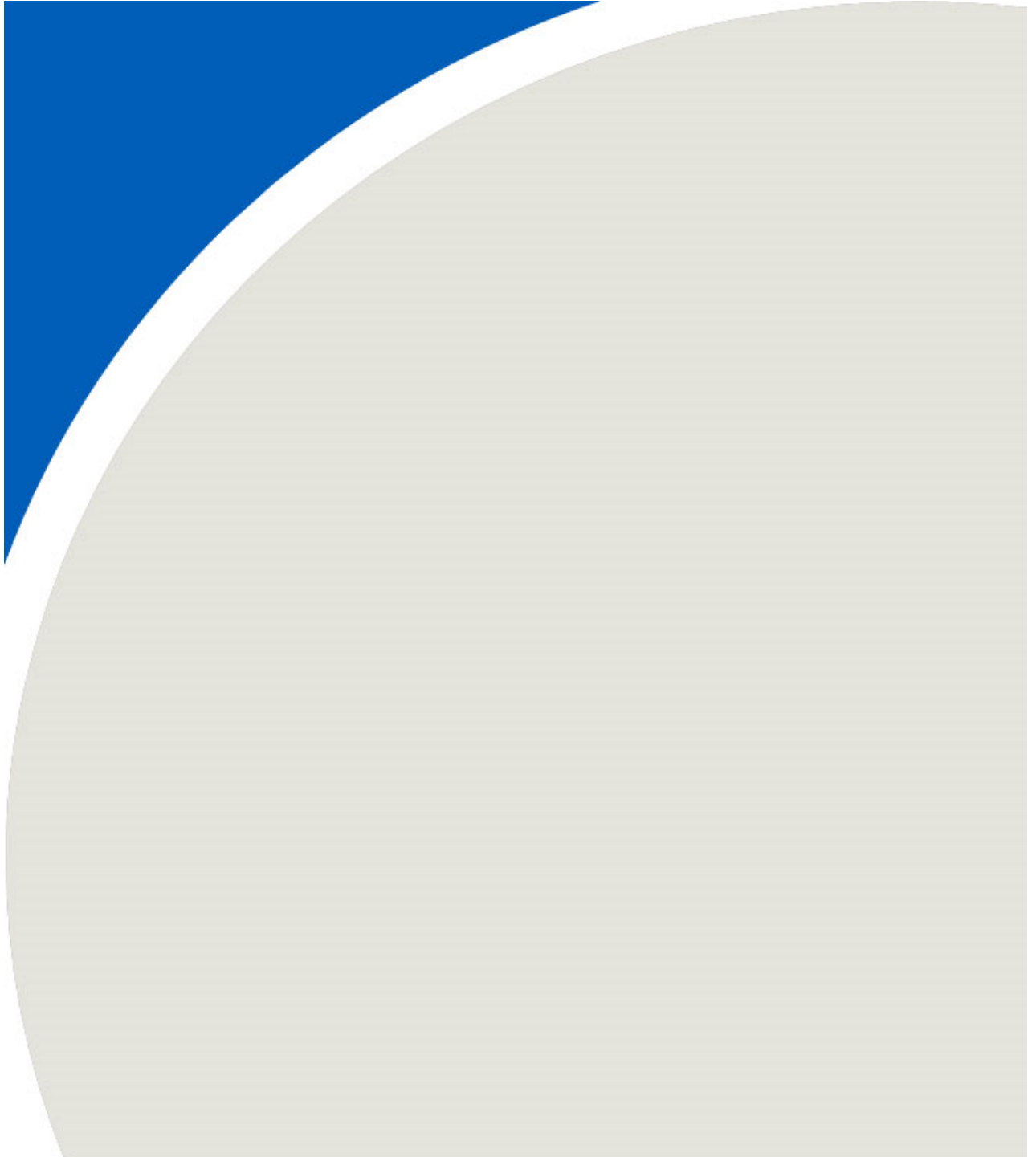
appointed for the purposes of Part II.1 of the
Environmental Protection Act

ET/

c: District Manager, MOE Sarnia District Office
Peter Brodzikowski, P.Eng., GENIVAR Inc.

APPENDIX A20:

Amended ECA [Industrial Sewage Works] No. 3506-7M5PU3, dated August 21, 2019



AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 2403-BE6LZ4

Issue Date: August 21, 2019

Waste Management of Canada Corporation
117 Wentworth Court
Brampton, Ontario
L6T 5L4

Site Location: Twin Creeks Environmental Centre
5768 Nauvoo Road, Watford
Township of Warwick, County of Lambton

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Usage and operation of a leachate collection, treatment, and disposal facility and a stormwater management facility to service the Twin Creeks Landfill Site located in the Township of Warwick, County of Lambton, consisting of the following:

Proposed Works (previously approved by ECA number 3506-7M5PU3)

LEACHATE TREATMENT AND DISPOSAL FACILITY

use and operation of a leachate collection, treatment, and disposal facility with a *Rated Capacity* of 400 m³/day to service Phases 1 to 9 and during closure and post closure period of the Twin Creeks Landfill Site expansion, consisting of the following:

Raw Leachate Pumping Stations

- two (2) primary leachate pumps (one for each PS5 and PS7) and each rated at 7.3 L/sec, together with their associated forcemains discharging to the equalization tank described below.

Secondary Drainage Layer Pumping Stations

- two (2) secondary drainage layer pumps (one for each PS6 and PS8) each rated at 3.5 L/sec, together with their associated forcemains discharging to the equalization tank described below.

Equalization Tank

- Three (3) additional variable frequency drive (VFD) recirculation pumps each rated at approximately 9.6 L/sec proposed to be pumping leachate to the leachate treatment system;
- two (2) VFD raw leachate pumps (one duty, one standby) each rated at 27.7 L/sec, to be used in combination to fill the Sequencing Batch Reactor (SBR) reactors at a faster rate.

Chemical Feed System

- one (1) 1.0 m³ capacity phosphoric acid solution storage tank equipped with two (2) metering pumps (one duty for each SBR reactor with interconnecting piping for redundancy) each rated at 32.0 L/hr, dosing phosphoric acid into the SBR reactors as required;
- one (1) 1.0 m³ capacity flocculant storage tank equipped with two (2) metering pumps (one duty for each SBR reactor with interconnecting piping for redundancy) each rated at 363 L/hr, dosing flocculant upstream of the SBR reactors as required;
- one (1) 1.0 m³ capacity anti-foam agent storage tank equipped with two (2) metering pumps (one duty for each SBR reactor with interconnecting piping for redundancy) each rated at 32.0 L/hr, dosing anti-foam agent upstream of the SBR reactors as required;
- one (1) 10.0 m³ capacity methanol storage tank equipped with a spill containment structure and two (2) metering pumps (one duty for each SBR reactor with interconnecting piping for redundancy) each rated at 144 L/hr, dosing methanol upstream of the SBR reactors as required; and
- one (1) 88 m³ capacity in-ground high strength carbon waste storage tank equipped with two (2) metering pumps (one duty for each SBR reactor with interconnecting piping for redundancy) each rated at 288 L/hr, dosing high strength carbon waste upstream of the SBR reactors as required.

Sequencing Batch Reactor (SBR)

- a sequencing batch reactor system consisting of two (2) reactors each with approximate dimensions of 6.4 m long x 16.2 m wide x 5.5 m SWD providing active reactor volume of 572 m³, each tank equipped with a jet aeration header and one (1) dry pit jet pump rated at 227 L/sec and a decanter system capable of decanting 69.4 L/sec; and
- three (3) 50 hp positive displacement air blowers each with VFD control and rated at of 462 L/sec at 65.5 kPa supplying the air required for SBR aeration.

Effluent and Sludge Pumps

- two (2) effluent transfer pumps (one duty for each SBR reactor with interconnecting piping for redundancy) each rated at 69.4 L/sec, transferring effluent from the SBR units to an effluent holding tank, as described below; and
- two (2) activated sludge wasting pumps (one duty for each reactor) each rated at 22 L/sec, transferring activated wasted sludge to aerated sludge tanks, as described below.

Effluent and Sludge Holding Tanks

- one (1) 400 m³ storage capacity effluent holding tank with approximate dimensions of 9.75 m long x 8.5 m wide x 5.5 m SWD equipped with coarse bubble diffusers, discharging to a reverse osmosis membrane filtration system, as described below;
- two (2) aerated sludge tanks operating in either parallel or series mode, each with approximate dimensions of 11.8 m long x 3 m wide x 5.5 m SWD providing a storage capacity of 200 m³ equipped with coarse bubble diffusers, two (2) supernatant pumps returning supernatant to the SBR units described above, and two (2) sludge pumps discharging settled sludge to a sludge dewatering press, as described below; and
- three (3) positive displacement air blowers each rated at 141 L/sec and at 65.5 kPa with VFD control providing air required for the effluent tank and sludge holding tanks.

Reverse Osmosis Membrane Filtration System

- one (1) treated effluent storage tank with a capacity of 15.0 m³, equipped with one (1) pump rated at 8.3 L/sec discharging to a cartridge sand filtration unit, as described below;
- one (1) sulphuric acid storage tank with a capacity of 7,000 L for pH adjustment of effluent at the effluent storage tank, as described above;
- two (2) dual redundant 3.47 L/sec capacity cartridge sand filtration unit discharging to a reverse osmosis membrane filtration system described below;
- one (1) three-staged reverse osmosis membrane filtration system with an overall treatment capacity of 3.47 L/sec consisting of three (3) filtration units, equipped with a 32-piece ST-RO membrane modules, a 20-piece ST-RO membranes modules, a 15 piece ST-NF membrane modules and the following pumps:
 - a. four (4) high pressure plunger pumps each rated at 1.8 L/s (1st and 2nd stage RO);
 - b. five (5) multistage centrifugal booster pumps with under water motor each rated at 8 L/s (1st and 2nd stage RO);
 - c. one (1) multi stage vertical centrifugal pump (cleaning pump) rated at 3.47 L/s;
 - d. one (1) high pressure plunger pump with a capacity of 1.06 L/s (3rd stage NF);
 - e. three (3) multistage centrifugal booster pumps with under water motor rated at 2.8 L/s each (3rd

stage NF); and

- f. one (1) multi stage vertical centrifugal pump (cleaning pump) rated at 1,06 L/s.

all discharging final permeate to a treated effluent storage pond described below and final concentrate to a concentrate storage tank described below;

Treated Effluent Storage Ponds

- one (1) clay lined pond (**Inlet cell**) with a capacity of 2,200 m³, equipped with a floating aerator and one (1) pumping station manhole with a submersible pump rated at 30 m³/hr;
- one (1) clay lined pond (**Cell 1**) with a capacity of 53,900 m³ equipped with one (1) interconnecting manhole with a gate valve; and
- one (1) clay lined pond (**Cell 2**) with a capacity of 28,400 m³, providing storage for treated effluent from the membrane filtration system, equipped with one (1) interconnecting manhole with a gate valve, a pumping station (**Pumping Station 11**) equipped with one (1) VFD submersible pump rated at 56.9 L/sec to be used for truck loading purposes, one (1) submersible effluent return pump rated at 7.3 L/sec , and two (2) VFD submersible irrigation pumps each rated at 45.7 L/sec (one duty, one standby) discharging to a poplar tree land irrigation area described below;

Concentrate Evaporator and Dryer

- one (1) concentrate storage tank with approximate dimensions of 4.4 m long x 4.8 m wide and 5.5 m SWD (total capacity of 102 m³), equipped with a submersible pump for off-site disposal rated at 9.5 L/sec, also used for off-site disposal slurry, and a pump for transferring concentrate to an evaporator treatment system, as described below, rated at 0.63 L/sec;
- one (1) mechanical vapor compression evaporator rated at 0.63 L/sec, equipped with electric heating element and heat exchangers to remove moisture from concentrate and produce a slurry discharging to a slurry holding tank described below;
- one (1) slurry holding tank with approximate dimensions of 4.4 m long x 4.8 m wide and 5.5 m SWD (total capacity of 102.0 m³) equipped with one (1) slurry pump rated at 1.57 L/sec, discharging to a slurry dryer described below; and
- one (1) slurry dryer rated at 0.035 L/sec with approximate dimensions of 4.7 m long x 2.1 m wide x 1.5 m high discharging to a salt cake disposal bin (water vapour will be evaporated through the slurry dryer exhaust).

Treated Effluent On-Site Disposal

Upgrades to the disposal system of the treated leachate effluent, as follows:

- two (2) 3.31 ha treated effluent drip-irrigation zones using approximately 250 m long drip-irrigation tubing installed in each zone;

Previous Works:

STORMWATER MANAGEMENT FACILITY

a stormwater management facility to service a 146.5 ha drainage area of the Twin Creeks Landfill Site Expansion within the 300 ha area of the Twin Creeks Landfill Site consisting of the following:

Stormwater Management Pond - SWM Pond #1

a stormwater management facility (**SWM Pond #1**) to service a total drainage area of 33.7 ha consisting of the eastern part of the existing landfill site and future excess soil stockpile area, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:100 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- one (1) approximately 1,300 m long perimeter trapezoidal ditch along the toe of the eastern side of the closed landfill having a 0.6 m wide bottom and 2H:1V side slopes, discharging collected stormwater to an extended detention wet pond described below;
- one (1) ditch along the south and west side of the leachate storage lagoon collecting runoff from the excess soil stockpile area, discharging collected stormwater to a forebay described below;
- one (1) forebay with approximate dimensions of 19 m long x 16 m wide bottom, and 4H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 294.0 m long bottom, 23.5 m wide bottom and 4H:1V side slopes, equipped with a permanent vertical baffle with a minimum elevation of 238.7 m ASL, providing a total storage capacity of 21,429 m³ consisting of a permanent pool storage volume of 3,651 m³ with an average depth of 0.5 m, and an extended storage volume of 17,778 m³ with an extended storage depth of 1.91 m, equipped with an outlet structure described below;
- an outlet structure consisting of two (2) 1500 mm diameter concrete manholes discharging through two (2) 750 mm diameter outlet pipes, each pipe equipped with a 1200 mm x 1200 mm concrete valve chamber and a sluice gate valve, to a perimeter ditch flowing towards a roadside ditch along County Road 79; and

- one (1) 8.0 m wide emergency overflow structure with weir elevation of 239.55 m ASL discharging to a perimeter ditch flowing towards County Road 79 roadside ditch.

Stormwater Management Pond - SWM Pond #2

a stormwater management facility (**SWM Pond #2**) to service a total drainage area of 67.9 ha consisting of southwestern part of the expanded landfill site, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:100 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- two (2) approximately 400 m and 1500 m long perimeter ditches along the southern part of the landfill having a minimum depth of 1.0 m, and 3H:1V & 4H:1V side slopes discharging collected stormwater through two (2) culverts, 3000 mm X 1200 mm concrete box and 1390 x 970 mm CSPA, to a forebay described below;
- one (1) forebay with approximate dimensions of 47 m long x 30 m wide bottom and 4H:1V and 3H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 413.0 m long x 44.0 m wide bottom and 4H:1V and 3H:1V side slopes, providing a total storage capacity of 51,725 m³ consisting of a permanent pool storage volume of 11,427 m³ with a average depth of 0.60 m, and an extended storage volume of 38,098 m³ with an extended storage depth of 1.75 m, equipped with an outlet structure described below;
- an outlet structure consisting of one (1) 1800 mm diameter and one (1) 2400 mm diameter concrete manholes discharging through a 1,050 mm and a 1,200 mm diameter outlet pipes, each pipe equipped with a 2000 mm x 2000 mm concrete valve chamber and a sluice gate valve, to a roadside ditch along County Road 79; and
- one (1) 18 m wide emergency overflow structure with weir elevation of 234.05 m ASL discharging to a roadside ditch along County Road 79.

Stormwater Management Pond - SWM Pond #3

a stormwater management facility (**SWM Pond #3**) to service a total drainage area of 30.5 ha consisting of northwestern part of the expanded landfill site, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:00 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- one (1) approximately 650 m long perimeter ditch along the northern part of the expanded landfill and one (1) approximately 500 m long perimeter ditch along the western part of the expanded landfill, each having a minimum of 1.0 m depth and 3H:1V & 4H:1V side slopes, discharging collected stormwater through a 3000 mm x 1200 mm concrete box culvert to a forebay described below;

- one (1) forebay with approximate dimensions of 33 m long x 25 m wide bottom and 4H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 255.0 m long, 36.0 m wide bottom and 3H:1V and 4H:1V side slopes, providing a total storage capacity of 24,996 m³ consisting of a permanent pool storage volume of 4,843 m³ with an average depth of 0.50 m, and an extended storage volume of 20,053 m³ with an extended storage depth of 1.67 m, equipped with an outlet structure described below;
- an outlet structure consisting of three (3) 1200 mm diameter concrete manholes discharging through two (2) 600 mm diameter and one (1) 450 mm diameter outlet pipes, each pipe equipped with 1200 mm x 1200 mm box concrete valve chamber and a sluice gate valve, to a roadside ditch along County Road 79; and
- one (1) 9 m wide emergency overflow structure with a weir elevation of 238.00 m ASL discharging to a roadside ditch along County Road 79.

Stormwater Management Pond - SWM Pond #4

a stormwater management facility (**SWM Pond #4**) to service a total drainage area of 14.4 ha consisting of the north eastern part of the expanded landfill site and northern part of the existing landfill site, designed to provide quantity and quality control by attenuating peak stormwater flows from storm events up to 1:100 year return frequency including regional storm (Hazel) at or below pre-development levels, consisting of the following:

- four (4) perimeter ditches collecting runoff from the northern side of the expanded landfill and from the northwestern portion of the existing landfill, having a minimum of 1.0 m depth and 3H:1V & 4H:1V side slopes, discharging collected stormwater through two (2) inlet structures to a forebay described below;
- one (1) forebay with approximate dimensions of 16 m long x 16 m wide bottom and 4H:1V side slopes, discharging to an extended detention wet pond described below;
- one (1) extended detention wet pond with approximate dimensions of 165.0 m long bottom, 20.0 m wide bottom and 3H:1V and 4H:1V side slopes, providing a total storage capacity of 8,328 m³ consisting of a permanent pool storage volume of 1,812 m³ with an average depth of 0.50 m, and an extended storage volume of 6,516 m³ with an extended storage depth of 1.32 m, equipped with an outlet structure described below;
- an outlet structure consisting of one (1) 1800 mm diameter concrete manhole discharging through one (1) 1050 mm diameter outlet pipe equipped with 2000 mm X 2000 mm concrete valve chamber and a sluice gate valve to a perimeter ditch along Zion Line to a roadside ditch along Zion Line;
- one (1) 8 m wide emergency overflow structure with a weir elevation of 242.00 m ASL discharging to a road side ditch along Zion Line; and

all other controls, electrical equipment, instrumentation, piping, valves and appurtenances essential for the proper operation of the aforementioned sewage Works;

all in accordance with the following submitted supporting documents listed in Schedule A.

LEACHATE TREATMENT AND DISPOSAL FACILITY

use and operation of a leachate collection, treatment, and disposal facility with a *Rated Capacity* of 400 m³/day to service Phases 1 to 9 and during closure and post closure period of the Twin Creeks Landfill Site expansion, consisting of the following:

Raw Leachate Pumping Stations

- two (2) primary raw leachate pumps (one for each PS1 and PS3) each rated at 7.3 L/sec, together with their associated forcemains discharging to the equalization tank described below.

Secondary Drainage Layer Pumping Stations

- two (2) secondary drainage layer pumps (one for each PS2 and PS4) each rated at 3.5 L/sec, together with their associated forcemains discharging to the equalization tank described below.

Equalization Tank

- one (1) 2,300 m³ capacity steel and glass lined tank enclosed with a clay berm containment area, receiving raw leachate from the landfill leachate collection system, equipped with three (3) variable frequency drive (VFD) recirculation pumps (two duty and one standby) each rated at 9.6 L/sec, all pumping leachate to the leachate treatment system, as described below; and

Treated Effluent On-Site Disposal (Poplar Plantation)

Upon substantial completion of the Works, treated leachate effluent will be disposed as follows:

- one (1) 28.32 ha poplar tree irrigation land established to handle an average of 1,187 m³/day of treated leachate effluent during suitable irrigation days between the period extending from May 1st to October 15th, consisting of six (6) 3.62 ha treated effluent drip-irrigation zones using approximately 250 m long drip-irrigation tubing installed in each zone;
- a stormwater management system to control the quality of stormwater runoff from the poplar tree irrigation land to Kersey Drain (Brown Creek), consisting of one (1) west furrow approximately 710 m long x 200 mm deep and one (1) east furrow approximately 510 m long x 200 mm deep, running parallel to each other with a grassed area in between, each equipped with a 200 mm high berm for distributing stormwater runoff across the entire length of the furrow, discharging by sheet flow to Kersey Drain; and

Raw/Diluted Leachate Effluent Disposal (Poplar System)

- one (1) existing 9.3 ha poplar tree irrigation system identified as the Poplar System, of approximately 150 m length for each poplar row. Leachate is applied through pressure drip-irrigation tubing at a rate not to exceed 476 mm/m², or 44,000 L/day, during the growing season. The system is subject to conditions as specified in the *EPA* Section 27 approval for the site. Revised to a 9.3 ha area with a rate of 476 mm/m² or 44,000 m³/year.
- a system of maintenance holes, collector system and leachate sump across the existing site to transfer leachate to the leachate holding tanks via two methods: 1) down-hole leachate pumps transfer leachate through piping units directly to the leachate holding tanks and the Equalization Tank; and 2) the use of a tanker truck, which transfers the leachate via gravity drainage into the leachate holding tanks or maintenance holes of the leachate conveyance system.

all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage Works;

all in accordance with the following submitted supporting documents listed in Schedule A.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this entire document and any schedules attached to it, and the application;
2. "District Manager" means the District Manager of the Sarnia District Office of the Ministry;
3. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;
4. "EPA" means the *Environmental Protection Act*, R.S.O. 1990, c.E.19, as amended;
5. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;
6. "Owner" means Waste Management of Canada Corporation and its successors and assignees;
7. "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O.40, as amended;
8. "Poplar System" is the irrigation area of 9.3 hectares located on top of the cap of the Existing Site (old landfill) that is used for the phytoremediation of leachate that is generated at the Site.

9. "Poplar Plantation" is the irrigation area located on native soil to the south of the Site that is used for the phytoremediation of irrigation liquid that satisfies the Effluent Limit criteria.
10. "Previous Works" means those portions of the sewage works previously constructed and approved under an Approval;
11. "Proposed Works" means the sewage works described in the Owner's application, this Approval, to the extent approved by this Approval;
12. "Township" means the Township of Warwick;
13. "Works" means the sewage works described in the Owner's application, and this Approval, and includes both Proposed Works and Previous Works;
14. "WIFN" refers to Walpole Island First Nation; and
15. "WPLC" refers to the Warwick Public Liaison Committee.

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

TERMS AND CONDITIONS

PART I - GENERAL

1. GENERAL CONDITION

1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
2. Except as otherwise provided by these conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.
3. Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the Conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.
4. Where there is a conflict between the documents listed in the Schedule A, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
5. The Conditions of this Approval are severable. If any Condition of this Approval, or the application

of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. CHANGE OF OWNER

1. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:
 - a. change of Owner or operating authority, or both;
 - b. change of address of Owner or operating authority or address of new Owner or operating authority;
 - c. change of partners where the Owner or operating authority is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Partnerships Registration Act*;
 - d. change of name of the corporation where the Owner or operator is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (Form 1, 2 or 3 of O. Reg. 189, R.R.O. 1980, as amended from time to time), filed under the *Corporations Information Act* , shall be included in the notification to the District Manager;
2. In the event of any change in ownership of the Works, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager.
3. The Owner shall ensure that all communications made pursuant to this condition will refer to this Approval's number.

PART II - STORMWATER MANAGEMENT FACILITY

3. OPERATIONS MANUAL

1. The Owner shall maintain the operations manual up to date through revisions undertaken from time to time and retain a copy at the location of the sewage works. Upon request, the Owner shall make the manual available for inspection and copying by Ministry personnel.

4. EFFLUENT MONITORING AND RECORDING

1. The Owner shall carry out a monitoring program and all samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

2. Samples shall be collected and analyzed at the sampling point(s), at the sampling frequencies and using the sample type specified for each parameter listed in the effluent monitoring table included in **Schedule B**:
3. The methods and protocols for sampling, analysis, toxicity testing, and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
 - a. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;
 - b. the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition) as amended from time to time by more recently published editions; and
 - c. in respect of any parameters not mentioned in (a) - (b), the written approval of the District Manager, which approval shall be obtained prior to sampling.
4. The temperature and pH of the effluent from the Works shall be determined in the field at the time of sampling for total ammonia. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended, for ammonia (un-ionized).
5. The measurement frequencies specified in Condition 4 (2) in respect to any parameter are minimum requirements which may, after 24 months of monitoring in accordance with this Condition, be modified by the District Manager in writing from time to time.
6. The Owner shall provide to the Township, WPLC, WIFN a copy of all requests to be submitted to the District Manager for any changes to the monitoring program specified in Condition 4 (5) at the same time or prior to the time such request is made to the District Manager.

5. OPERATION AND MAINTENANCE

1. The Owner shall apply the "Stormwater Contingency and Remedial Action Plan as included in Appendix N.27 of the Operations and Maintenance manual, Warwick Landfill Expansion, WM, May 2008.
2. The Owner shall operate the Works (**SWM Ponds**) with the outlet sluice gate valve in a **Normally Open Position** during normal operation period.
3. The Owner shall compare monitoring results obtained under Condition 4 (2) for the trigger parameters listed in Table 2 in **Schedule B** with respective trigger levels listed in Table 2 in **Schedule B** to identify any potential leachate impact to stormwater.

4. In the event that a monitoring result for any parameter that is listed in Table 2 of **Schedule B** for any of **SWM Ponds** exceeds its trigger level, the Owner shall conduct sampling of the contents of the affected **SWM Pond** within one (1) week to confirm the exceedance of the trigger level for that parameter and identify potential source of contamination. Upon confirmation of the exceedance of the trigger level for any parameter that is listed in Table 2 of **Schedule B**, the Owner shall close the outlet sluice gate valve of the affected Works (**SWM Pond**) and implement an approved "Stormwater Contingency and Remedial Action Plan".
5. The Owner shall dispose of the contents of an affected Work (**SWM Pond**) which failed to meet the quality requirements outlined in Condition 5 (5) in accordance with an approved "Stormwater Contingency and Remedial Action Plan".
6. In the event that a monitoring result for any parameter that is listed in Table 2 for the **Poplar Plantation** exceeds its trigger level, the Owner shall conduct sampling of the stormwater runoff from the affected part of the **Poplar Plantation** as soon as possible to confirm the exceedance of the trigger level for that parameter and identify potential source of contamination. Upon confirmation of the exceedance of any trigger level for any parameter that is listed in Table 2, the Owner shall implement an approved "Stormwater Contingency and Remedial Action Plan".
7. The Owner shall inspect the Works (**SWM Ponds**) at least once a year and, if necessary, clean and maintain the Works to prevent the excessive build-up of sediments and/or vegetation.
8. The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site or Owner's operational head quarter for inspection by the Ministry. The logbook shall include the following:
 - a. the name of the Works (SWM Pond #1, SWM Pond #2, SWM Pond #3, and SWM Pond #4);
 - b. the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed; and
 - c. the occurrence date of each spill within the catchment area of a given SWM Pond, including follow-up action/ remedial measures undertaken.

6. RECORD KEEPING

1. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance and monitoring activities required by this Approval.

PART III - LEACHATE TREATMENT FACILITY

7. EFFLUENT LIMITS

1. The Owner shall design, construct and operate the Works such that the concentrations of the materials listed as effluent parameters in the effluent limits table in **Schedule B** are not exceeded in the effluent from the **Treated Effluent Storage Pond** (Cell 2).
2. For the purposes of determining compliance with and enforcing subsection (1):
 - a. The Average Monthly Concentration of a parameter named in Column 1 of Table 3 in **Schedule B** shall not exceed the corresponding maximum concentration set out in Column 2 of Table 3 in **Schedule B**;
 - b. non-compliance with respect to pH is deemed to have occurred when any single measurement is outside of the indicated range.

8. OPERATION AND MAINTENANCE

1. The Owner shall exercise due diligence in ensuring that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training procedures and other requirements of this Approval and OWRA and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances in the Works.
2. The Owner shall main the operations manual current and retain a copy at the location of the Works for the operational life of the Works. Upon request, the Owner shall make the manual available to Ministry staff.

9. EFFLUENT MONITORING AND RECORDING

The Owner shall carry out a monitoring program:

1. all samples and measurements taken for the purposes of this Approval are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.
2. For the purpose of this condition, the following definitions apply:
 - a. Daily means once each day;
 - b. Weekly means once each week;
 - c. Monthly means once every month; and

- d. Semi-annually means once every six months.
- 3. Samples shall be collected and analyzed at the sampling point(s), at the sampling frequencies and using the sample type specified for each parameter listed in the effluent monitoring table included in **Schedule B**:
- 4. The methods and protocols for sampling, analysis, toxicity testing, and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
 - a. the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only)", as amended from time to time by more recently published editions;
 - b. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;
 - c. the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition) as amended from time to time by more recently published editions; and
 - d. in respect of any parameters not mentioned in (a) - (c), the written approval of the District Manager, which approval shall be obtained prior to sampling.
- 5. The measurement frequencies specified in **Schedule B** in respect to any parameter are minimum requirements which may, after 24 months of monitoring in accordance with this Condition, be modified by the District Manager in writing from time to time.
- 6. The Owner shall provide to the Township, WPLC and WIFN a copy of all requests to be submitted to the District Manager for any changes to the monitoring program specified in **Schedule B** at the same time or prior to the time such request is made to the District Manager.
- 7. A continuous flow measuring device(s) shall be installed and maintained to measure the flowrate of the effluent from the sewage works, with an accuracy to within plus or minus fifteen (15) per cent of the actual flowrate for the entire design range of the flow measuring device and the Owner shall measure, record and calculate the flowrate for each effluent stream on each day of sampling.
- 8. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.
- 9. The Owner shall visually inspect the drip-irrigation pipeline systems at least once per week during operation period to look for leaking and/or failed (broken) lines that would otherwise produce run-off. The inspection should be supported by a log book documenting routine inspection and notes on repair as required.

10. GROUNDWATER MONITORING - POPLAR PLANTATION LAND IRRIGATION AREA

1. The Owner shall collect grab samples during May and November from the sampling location outlined in Table 7 of **Schedule B** and analyze for the parameters listed in Table 7 of **Schedule B**.
2. The methods and protocols for sampling, analysis and recording shall conform to that outlined in Condition 9 (4).
3. The measurement frequencies specified in Condition 10 (2) in respect to any parameter are minimum frequencies which may, after 24 months of monitoring in accordance with this Condition, be modified by the District Manager, in writing from time to time.
4. The Owner shall provide to the Township, WPLC, and WIFN a copy of all requests to be submitted to the District Manager for any changes to the monitoring program specified in Condition 10 (2) at the same time or prior to the time such request is made to the District Manager.

11. OPERATION - POPLAR PLANTATION LAND IRRIGATION

1. The Owner shall apply the "Groundwater Contingency and Remedial Action Plan" for any potential groundwater impact caused by Effluent Storage Ponds and the Poplar Forest Irrigation Area, as included in Appendix N.26 of the Operation and Maintenance Manual, Warwick Landfill Expansion, WM, May 2008.
2. The Owner shall compare monitoring results obtained under condition 10 (2) for the trigger parameter listed in Table 8 of **Schedule B** with their respective trigger levels listed in Table 8 of **Schedule B** to identify any potential leachate impact to groundwater.
3. In the event that a monitoring result for any parameter that is listed in Table 8 of **Schedule B** exceeds its trigger level, the Owner shall re-sample within one (1) month to confirm the exceedence of the trigger level for that parameter. Upon confirmation of the exceedence of any trigger level for any parameter that is listed in Table 8 of **Schedule B**, the Owner shall conduct a second round re-sampling within six (6) months to re-confirm the exceedence of the trigger level for the parameter of concern.
4. In the event that the presence of the parameter(s) of concern is (are) not confirmed after the second round of sampling conducted under Condition 11 (3), then, normal groundwater monitoring shall be resumed.
5. In the event that the presence of the parameter(s) of concern is confirmed after the second round of sampling conducted under Condition 11 (3), then, it shall constitute as a confirmation of leachate impact to groundwater and the *Owner* shall immediately implement the "Groundwater Contingency and Remedial Action Plan" approved under Condition 11 (1).

6. The Owner shall notify the District Manager orally, as soon as possible, and in writing within seven days of the confirmation of leachate impact to groundwater including an assessment of the relative severity and extent of leachate impact and proposed remedial actions.
7. The Owner shall record and report a summary of all trigger exceedence incidents and all remedial action measures taken under Condition 11 (5) in the Annual Report prepared under Condition 13.
8. The Owner shall dispose of **only** treated leachate effluent that meets the effluent limits requirements outlined under Condition 7 (1) for treatment and disposal by drip-irrigation on the approved poplar tree land area during the period between May 1st and October 15th of each calendar year.
9. The Owner shall not allow under any circumstance (including as emergency contingency plan) any direct discharge of leachate or treated leachate effluent from the Works to any receiving surface water including Bear Creek;
10. The Owner shall record the total volume of treated leachate effluent drip-irrigated on the poplar tree land irrigation area on a daily basis.
11. The Owner shall ensure that treated leachate effluent is disposed of via drip-irrigation in the designated six (6) poplar tree drip-irrigation zones initially, and ultimately on eight (8) poplar tree drip-irrigation zones on a planned rotation basis.
12. The Owner shall visually inspect drip-irrigation operations at least twice each day during operation period to ensure that no surface ponding or surface run-off is taking place.
13. The *Owner* shall retain records of inspections and drip-irrigation operation data collected under subsections (10), (11) and (12) and make them available for inspection Ministry staff upon request.
14. No drip irrigation is to take place:
 - a. on frozen or snow covered ground conditions;
 - b. with the occurrence of surface ponding in any area subjected to drip irrigation;
 - c. within 100 m of any surface watercourse or drain; and
 - d. at an average daily application rate greater than 4.8 mm;
15. The Owner shall notify and provide the Township, WPLC and WIFN with a copy of the proposed "Groundwater Contingency and Remedial Action Plan" required under Condition 11 (1).

PART IV - GENERAL

12. REPORTING

1. In addition to the obligations under Part X of the EPA, the Owner shall, within ten (10) working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.
2. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.
3. The Owner shall prepare and submit a performance report to the District Manager on an annual basis within before March 31 of each calendar year. The reports shall contain, but shall not be limited to, the following information:
 - a. a summary and interpretation of all monitoring data and a comparison to the effluent objectives outlined in Condition 7, including an overview of the success and adequacy of the Works;
 - b. a summary and interpretation of all monitoring data and a comparison to the trigger limits outlined in Condition 5, including an overview of the success and adequacy of the Works;
 - c. a description of any operating problems encountered and corrective actions taken;
 - d. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the sewage works;
 - e. a summary of any effluent quality assurance or control measures undertaken in the reporting period;
 - f. a summary of the calibration and maintenance carried out on all effluent monitoring equipment;
 - g. a tabulation of dry salt cake generated in the reporting period, an outline of anticipated amount of dry salt cake to be generated in the next reporting period and a summary of the locations to where the cake was disposed;
 - h. a summary of any complaints received during the reporting period and any steps taken to address the complaints; and
 - i. any other information the District Manager requires from time to time.

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

1. Condition 1 is imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.
2. Condition 2 is included to ensure that the Ministry records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.
3. Conditions 3, 5, 8 and 11 are included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and injury to any person or deterioration, loss and damage to property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the Ministry. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the *Owner* in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for *Ministry* staff when reviewing the Owner's operation of the work.
4. Conditions 4, 9 and 10 are included to require the owner to demonstrate on a continual basis that the quality and quantity of the effluent from the approved Works is consistent with the effluent limits specified in the certificate and that the approved Works does not cause any impairment to the receiving watercourse and/or the groundwater.
5. Condition 6 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.
6. Condition 7 is imposed to ensure that the effluent irrigated from the Works to the poplar irrigation area meets the Ministry's effluent quality requirements thus minimizing environmental impact on groundwater and receiving surface water.
7. Condition 12 is included to provide a performance record for future references to ensure that the *Ministry* is made aware of problems as they arise and to provide a compliance record for all the terms and conditions outlined in this Approval so that the Ministry can work with the Owner in resolving any problems in a timely manner.

Schedule A

1. Application for Environmental Compliance Approval submitted by Reid Cleland, Director of Operations- Eastern Canada Landfills of Waste Management of Canada Corporation received on March 5, 2019 and all supporting documentation and information submitted during the review process.

Schedule B

Table 1 - Stormwater Monitoring Sampling Locations: SWM Pond Outlets - SP1, SP2, SP3, SP4. Irrigation Area - SS17A, SS17B, SS18A and SS18B.			
Parameter	Parameter	Parameter	Field -Parameter
Alkalinity	Magnesium	Toluene	Conductivity
Total Ammonia Nitrogen	Potassium	Ethylbenzene	Dissolved Oxygen
Un-ionized Ammonia	Sodium	Xylene	pH (Field)
Chloride	Arsenic	Vinyl Chloride	Temperature
Conductivity (Lab)	Barium	1,2,4-Trichlorobenzene	Turbidity
Nitrate Nitrogen	Boron	1,2-Dichlorobenzene	
Nitrite Nitrogen	Cadmium	1,3-Dichlorobenzene	
TKN	Chromium (Total)	1,4-Dichlorobenzene	
pH (Lab)	Copper	Hexachlorobenzene	
Total Phosphorus	Iron	Diethylphthalate	
Total Suspended Solids	Lead	Dimethylphthalate	
Total Dissolved Solids	Mercury	Di-n-butyl phthalate	
Sulphate	Nickel	Phenol	
BOD5	Zinc	Benzo(a)pyrene	
Chemical Oxygen Demand	Benzene	2,4,6-Trichlorophenol	
Phenols	1,4-Dichlorobenzene	2,4-Trichlorophenol	
Calcium	Dichloromethane	Pentachlorophenol	

Note: Samples shall be collected within twenty four hours after a rainfall event (more than 10 mm rainfall in 24 hour period) resulting in a stormwater discharge from each SWM Pond or Poplar Plantation Irrigation Area at a minimum interval of one (1) month between consecutive sampling events.

Table 2	
Trigger Parameter	Trigger Level [SS10 & SS16 - 90th percentile] (mg/L)
Ammonia (unionized)	0.020
Boron	0.20
Boron (SP1 only)	0.39
Chloride	210
Chromium (Total)	0.024
Nickel	0.027
Phenols	0.001
Zinc	0.06

Note: Annually, a trigger level for a parameter listed above will be replaced by the corresponding 90th percentile of background surface water concentration where background surface water concentrations collected upstream of the landfill (Sampling Locations SS10 and SS16).

Table 3 - Effluent Limits	
Sampling Location: Discharge Point from Treated Effluent Storage Pond	
Effluent Parameter	Average Monthly Concentration (milligrams per litre unless otherwise indicated)
Column 1	Column 2
Total Ammonia Nitrogen	68.7
Total Phosphorus	0.72
Phenols	0.2
Chlorides	247
Copper	0.014
Iron	27.0
pH of the effluent maintained between 6.0 to 9.5, inclusive, at all times	

Table 4 - Leachate Monitoring Sampling Location: Equalization Tank		
Parameters	Sample Type	Frequency
<i>BOD5</i>	Grab	Quarterly
Dissolved Organic Carbon (DOC)	Grab	Quarterly
Total Phosphorus	Grab	Quarterly
Total Kjeldahl Nitrogen	Grab	Quarterly
BTEX	Grab	Quarterly
pH	Grab	Quarterly
VOCs ^{Note 1}	Grab	Semi-Annually
Semi-VOCs ^{Note 2}	Grab	Semi-Annually
Metals ^{Note 3}	Grab	Semi-Annually
General Chemistry ^{Note 4}	Grab	Semi-Annually

Table 5 - Leachate Treatment Plant Effluent Monitoring Sampling Location: Discharge to Treated Effluent Storage Pond		
Parameters	Sample Type	Frequency
<i>CBOD5</i>	Grab	Weekly
Dissolved Organic Carbon (DOC)	Grab	Weekly
Total Ammonia Nitrogen	Grab	Weekly
Chloride	Grab	Weekly
BTEX	Grab	Weekly
pH	Grab	Weekly
VOCs ^{Note 1}	Grab	Monthly
Semi-VOCs ^{Note 2}	Grab	Monthly
Metals ^{Note 3}	Grab	Monthly
General Chemistry ^{Note 4}	Grab	Monthly
PCB	Grab	Semi-Annually
Organochlorides	Grab	Semi-Annually

Table 6 - Treated Effluent Storage Pond Effluent Monitoring Sampling Location: Discharge to Poplar Plant Irrigation Area		
Parameters	Sample Type	Frequency
<i>CBOD5</i>	Grab	Weekly
Dissolved Organic Carbon (DOC)	Grab	Weekly
Total Ammonia Nitrogen	Grab	Weekly
Chloride	Grab	Weekly
BTEX	Grab	Weekly
pH	Grab	Weekly
VOCS ^{Note 1}	Grab	Monthly
Semi-VOCS ^{Note 2}	Grab	Monthly
Metals ^{Note 3}	Grab	Monthly
General Chemistry ^{Note 4}	Grab	Monthly

Note 1: VOCs: Benzene, 1,4-Dichlorobenzene, Dichloromethane, Toluene, Ethylbenzene, Xylenes, and Vinyl Chloride.

Note 2: Semi-VOCS: 1,2,4-Trichlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, Hexachlorobenzene, Diethylphthalate, Dimethylphthalate, Di-n-butyl phthalate, Phenol, Benzo(a)pyrene, 2,4,6- Trichlorophenol, 2,4-Dichlorophenol, Pentachlorophenol.

Note 3: Metals: Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Zinc.

Note 4: G. Chemistry: Alkalinity, Calcium, Chloride, Conductivity, COD, Nitrate, Nitrite, Magnesium, pH, Potassium, Sodium, Sulphate, Total Dissolved Solids, TKN, Temperature, Turbidity, Total Phosphorus, TSS, Phenols, Dissolved Oxygen.

Table 7 - Groundwater Monitoring Sampling Location: OW40, OW60 and OW79 - at Annual Frequency Sampling Location: OW16, OW61, and OW62 - at Semi-Annual Frequency		
Parameters	Parameters	Field Parameters
Alkalinity	Boron	pH
Conductivity	Cadmium	Conductivity
Chloride	Lead	Turbidity
pH	Iron	
Dissolved Organic Carbon	Barium	
Total Dissolved Solids	Benzene	
Total Ammonia	1,4-Dichlorobenzene	
Total Kjeldahl Nitrogen	Dichloromethane	
Sulphate	Ethylbenzene	
Nitrate	Vinyl Chloride	
Calcium	Toluene	
Potassium	Xylenes	
Sodium		
Magnesium		

Table 8 - Trigger Limits for Poplar Plantation Land Irrigation			
Trigger Parameter	Trigger Level		
	(mg/L)		
	Active Aquitard	Interstadial Silt and Sand	Interface Aquifer
Chloride	106	116	134
Nitrate	2.3	2.3	2.3
Boron	1.1	2.1	2.6
Cadmium	0.001	0.001	0.001
Lead	0.002	0.002	0.002
Benzene	0.001	0.001	0.001
1,4-Dichlorobenzene	0.001	0.001	0.001
Dichloromethane	0.01	0.01	0.01
Vinyl Chloride	0.0004	0.0004	0.0004

**Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s).
3506-7M5PU3 issued on July 9, 2009**

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director appointed for the purposes of Part II.1
of the Environmental Protection Act
Ministry of the Environment, Conservation and
Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

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

DATED AT TORONTO this 21st day of August, 2019



Youssouf Kalogo, P.Eng.

Director

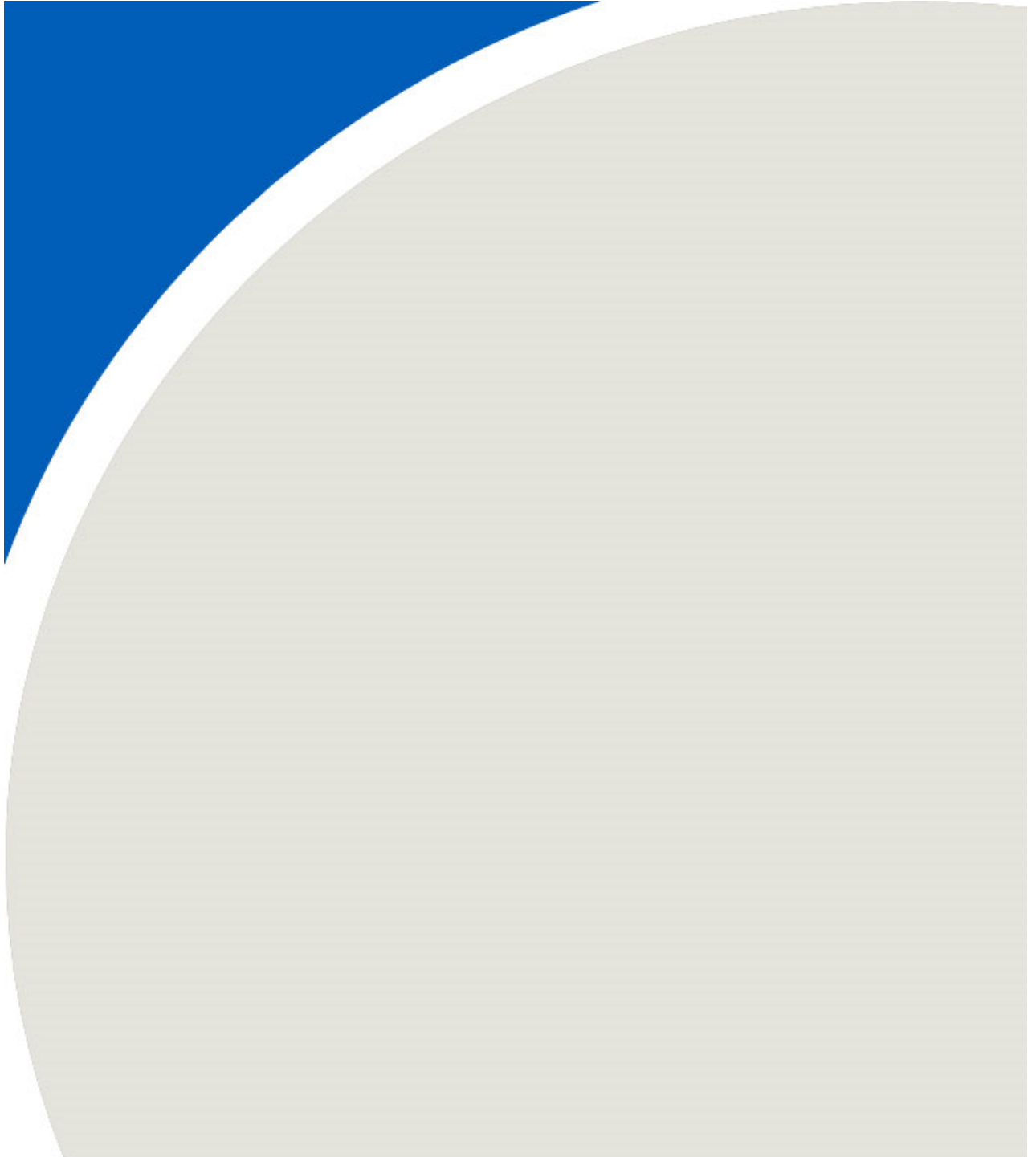
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SO/

c: District Manager, MECP Sarnia District Office
Larry Fedec, HDR Corporation

APPENDIX A21:

Amended Certificate of Approval [Air] No. 4365-7VXJ5G, dated November 10, 2009



AMENDED CERTIFICATE OF APPROVAL

AIR

NUMBER 4365-7VXJ5G

Issue Date: November 10, 2009

Waste Management of Canada Corporation
117 Wentworth Court
Brampton, Ontario
L6T 5L4

Site Location: Twin Creeks Landfill Site
8039 Zion Rd RR # 4 Part of Lot 19 & 20, Conc. 3, Part 1, Ref Plan 25R-9125 Township of
Warwick
Warwick Township, County of Lambton
N0M 2S0

You have applied in accordance with Section 9 of the Environmental Protection Act for approval of:

- three (3) enclosed flare systems, used principally to incinerate the landfill gas from a landfill gas collection system, each having a maximum inlet capacity of 2.08 cubic metres per second of landfill gas. The flare systems are also used to control the off-gases from the enclosed building housing the leachate treatment facility and to maintain a negative pressure on the leachate collection system on an as-needed basis. The flare systems are to be installed in phases, with one (1) system installed initially and the others installed when the landfill gas generation increases. Each flare system consists of one (1) blower and one (1) enclosed flare, exhausting into the atmosphere through a stack, having an exit diameter of 3.7 metres, extending 15.2 metres above grade;
- One (1) diesel fuel fired emergency generator rated at 1,000 kilowatts that will be used to provide back-up power for the landfill gas plant; exhausting into the atmosphere at a maximum volumetric flow rate of 3.56 cubic metres per second; having an exit diameter of 0.25 metre, extending 3.6 metres above grade;
- One (1) diesel fuel fired generator rated at 50 kilowatts that will be used to provide regular power to the leachate pumping system; exhausting into the atmosphere at a maximum volumetric flow rate of 0.24 cubic metres per second; having an exit diameter of 0.10 metre, extending 3.6 metres above grade;
- One (1) diesel fuel fired emergency generator rated at 250 kilowatts that will be used to provide back-up power for the office buildings; exhausting into the atmosphere at a maximum volumetric flow rate of 0.97 cubic metres per second; having an exit diameter of 0.15 metre, extending 3.6 metres above grade;

- Two (2) passive exhaust louvres serving two (2) sequencing batch reactors (SBR) and two (2) aeration tanks; exhausting into the atmosphere individually at a maximum volumetric flow rate of 1.96 cubic metres per second; each having an exit dimension of 1.22 x 1.22 metres, extending 2.13 metres above grade;
- One (1) process exhaust fan serving the reverse osmosis system area; exhausting into the atmosphere at a maximum volumetric flow rate of 1.71 cubic metres per second; having an exit dimension of 0.45 x 0.45 metres, extending 4.0 metres above grade;
- One (1) exhaust fan serving slurry dryer; exhausting into the atmosphere at a maximum volumetric flow rate of 0.24 cubic metres per second; having an exit diameter of 0.3 metre, extending 5.0 metres above grade;

all in accordance with the Application for Approval (Air & Noise), dated January 06, 2009 and signed by Reid Cleland, Waste Management of Canada Corporation, and all supporting information associated with the application including an ESDM provided by RWDI AIR Inc. dated January 06, 2009 and signed by Brad Bergeron; and an email update provided by Brad Bergeron of RWDI AIR Inc on July 31, 2009 and October 01, 2009; and email updates provided by Sarah Pellatt of RWDI AIR Inc on August 19 & 24, September 14, 15, 21, 23 and 25 and October 19, 2009.

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

- (1) "Acoustic Audit" means an investigative procedure consisting of measurements of all noise emissions due to the operation of the Facility, assessed in comparison to the performance limits for the Facility regarding noise emissions, completed in accordance with the procedures set in Publication NPC-103 and reported in accordance with Publication NPC-233;
- (2) "Acoustic Audit Report" means a report presenting the results of an Acoustic Audit, prepared in accordance with Publication NPC-233;
- (3) "Acoustical Consultant" means a person currently active in the field of environmental acoustics and noise/vibration control, who is familiar with Ministry noise guidelines and procedures and has a combination of formal university education, training and experience necessary to assess noise emissions from a Facility;
- (4) "Act" means the *Environmental Protection Act* ;
- (5) "Air Standards Manager" means the Manager, Human Toxicology and Air Standards Section, Standards Development Branch, or any other person who represents and carries out the duties of the Manager, Human Toxicology and Air Standards Section, Standards Development Branch, as those duties relate to the conditions of this Certificate;

- (6) "CEM System" means the continuous monitoring and recording system, one for each of the flare system, used to optimize the operation of the flare systems, as described in this Certificate, including Schedule "A", to the extent approved by this Certificate;
- (7) "Certificate" means this Certificate of Approval, including Schedules, issued in accordance with Section 9 of the Act;
- (8) "Company" means Waste Management of Canada Corporation;
- (9) "Director" means any Ministry employee appointed by the Minister pursuant to Section 5 of the Act;
- (10) "District Manager" means the District Manager, Sarnia District Office, South-western Region of the Ministry;
- (11) "Equipment" means the equipment or processes described in the Company's application, this Certificate and in the supporting documentation submitted with the application, to the extent approved by this Certificate;
- (12) "Facility" means the entire operation located on the property where the Equipment is located;
- (13) "Independent Acoustical Consultant" means an Acoustical Consultant not representing the Company, and not involved in the noise impact assessment or the design/implementation of noise control measures for the Facility/Equipment. The Independent Acoustical Consultant shall not be retained by the consultant involved in the noise impact assessment or the design/implementation of noise control measures for the Facility/Equipment;
- (14) "Manager" means the Manager, Technology Standards Section, Standards Development Branch of the Ministry, or any other person who represents and carries out the duties of the Manager, as those duties relate to the conditions of this Certificate;
- (15) "Manual" means a document or a set of documents that provide written instructions to staff of the Company;
- (16) "Ministry" means the Ontario Ministry of the Environment;
- (17) "Pre-Test Information" means the information outlined in Section 1. of the Source Testing Code;
- (18) "Publication NPC-103" means Publication NPC-103 of the Model Municipal Noise Control By-Law, Final Report, August, 1978, as amended;
- (19) "Publication NPC-205" means the Ministry Publication NPC-205, "Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October, 1995, as amended;
- (20) "Publication NPC-233" means Publication NPC-233, Information to be Submitted for Approval of Stationary Sources of Sound, October 1995, as amended; and

- (21) "Schedules" means the following schedules attached to the Certificate and forming part of the Certificate namely:

Schedule A - Continuous Monitoring and Recording System for Temperature

Schedule B - Source Testing Requirement

Schedule C - Procedures for Calculation of 10-minute Average Concentration of Odour;

- (22) "Sensitive Receptor" means any location where routine or normal activities occurring at reasonably expected times would experience adverse effect(s) from odour discharges from the Facility, including one or a combination of:
- (a) private residences or public facilities where people sleep (e.g. single and multi-unit dwellings, nursing homes, hospitals, trailer parks, camping grounds, etc.),
 - (b) institutional facilities (e.g.: schools, places of worship, community centres, day care centres, recreational centres, etc.),
 - (c) outdoor public recreational areas (e.g.: trailer parks, play grounds, picnic areas, etc.), and
 - (d) other outdoor public areas where there are continuous human activities (e.g.: commercial plazas and office buildings);

- (23) "Site" means the Twin Creeks Landfill Site and lands owned by the Company described as:

8039 Zion Line, R.R. #4, Watford

Lots 19 and 20, Concession 3 and Lots 20 and 21, Concession 4, SER, Reference Plan 25R-9125

Township of Warwick, County Of Lambton, Ontario

N0M 2S0

- (24) "Source Testing" means sampling and testing to measure emissions resulting from operating the Equipment under conditions which yield the worst case emissions within the approved operating range of the Equipment;
- (25) "Source Testing Code" means the Source Testing Code, Version 2, dated November 1980, prepared by the Ministry, as amended, or the latest version.

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

TERMS AND CONDITIONS

NOTIFICATION

1. The Company shall notify the District Manager in writing at least one (1) month prior to the expected date of installation of the second and third enclosed flare system in the Facility.

PERFORMANCE

2. The Company shall, at all times, ensure that the noise emissions from the Facility comply with the limits set in Ministry Publication NPC-205.
3. The Company shall restrict the testing of the two emergency diesel generators (1,000 kilowatts and 250 kilowatts) to a maximum of 30 minutes per hour each during the daytime period between 07:00 and 19:00 hours.
4. The Company shall operate the Equipment in such a manner that a minimum temperature, as recorded by the CEM System, shall be 875 degrees Celsius at a point representing a minimum retention time of 0.7 second, at all times when the landfill gas incineration is in progress.

OPERATION AND MAINTENANCE

5. The Company shall ensure that the Equipment, including the CEM System, is properly operated and maintained at all times. The Company shall:
 - (1) prepare, not later than three (3) months after the date of this Certificate, a Manual outlining the operating procedures and a maintenance program for the Equipment. These operating procedures and the maintenance program in the Manual shall be updated as necessary. The Manual shall include, as a minimum, the following:
 - (a) routine operating and maintenance procedures in accordance with good engineering practices and as recommended by the Equipment and the CEM System suppliers;
 - (b) the calibration procedures of the CEM System;
 - (c) emergency procedures and procedures to prevent upset conditions;
 - (d) the operator training which is to be provided by qualified and experienced individuals, for example, staff associated with the Equipment and the CEM System suppliers or personnel with equivalent qualification;
 - (e) the procedures for optimizing the operation of the Equipment to minimize emissions from the Equipment;
 - (f) the periodic, at a minimum weekly, inspection of the Equipment which is to be conducted by individuals trained with the Equipment; and timetables for work to be carried out;
 - (g) procedures for any record keeping activities relating to operation and maintenance of the Equipment, including but not limited to the quantity and quality of the landfill gas collected and fed to the Equipment for incineration;
 - (h) procedures to record process upsets/upset conditions and the remedial actions taken to respond to the upsets;

- (i) all appropriate measures to minimize noise, dust and odorous emissions from all potential sources;
 - (j) the procedures for recording and responding to complaints regarding the operation of the Equipment;
- (2) implement the procedures of the Manual.

ACOUSTIC AUDIT

- 6. The Company shall carry out Acoustic Audit measurements on the actual noise emissions due to the operation of the Facility, in accordance with the procedures in Publication NPC-103.
- 7. The Company shall submit Acoustic Audit Reports, prepared by an Independent Acoustical Consultant, in accordance with Publication NPC-233, to the District Manager and the Director not later than three (3) months after the commencement of operation of each of the three flare systems in the Facility.
- 8. The Director may not accept the results of an Acoustic Audit if the requirements of Publication NPC-233 were not followed.
- 9. If the Director does not accept the results of an Acoustic Audit, the Director may:
 - (1) require the Company to repeat the Acoustic Audit, and/or
 - (2) revoke this Certificate, or
 - (3) in accordance with the Act, impose additional conditions to the Company's Certificate of Approval.

RECORD RETENTION

- 10. The Company shall retain, for a minimum of two (2) years from the date of their creation, all records and information related to or resulting from the recording activities required by this Certificate, and make these records available for review by staff of the Ministry upon request. The Company shall retain:
 - (1) all records on the maintenance, repair and inspection of the Equipment and the CEM System;
 - (2) all records produced by the CEM System;
 - (3) all records on the quality and quantity of landfill gas collected and fed to the Equipment;
 - (4) all records on the ambient air monitoring;
 - (5) all records generated in the acoustic audit measurements;
 - (6) all records of process upsets/upset conditions and remedial actions taken to respond to the upsets;

- (7) all records of any environmental complaints; including:
 - (a) a description, time and date of each incident to which the complaint relates,
 - (b) wind direction at the time of the incident to which the complaint relates, and
 - (c) a description of the measures taken to address the cause of the incident to which the complaint relates and to prevent a similar occurrence in the future.

NOTIFICATION OF COMPLAINTS

- 11. The Company shall notify the District Manager, in writing, of each environmental complaint within two (2) business days of the complaint. The notification shall include:
 - (1) this Certificate number;
 - (2) a description of the nature of the complaint;
 - (3) the time and date of the incident to which the complaint relates;
 - (4) a description of the measures taken to address the cause of the incident to which the complaint relates and to prevent a similar occurrence in the future.

CONSULTATION

- 12. During the process of submission of an application to amend any approvals for the Site, the Company shall:
 - (1) discuss with Walpole Island First Nation (WIFN), Township of Warwick and Warwick Public Liaison Committee (WPLC) the proposed application prior to submission of the application to the Director;
 - (2) provide the same documents to WIFN, Township of Warwick and WPLC that are provided to the Director in respect of the amendment; and
 - (3) provide the Director with a statement indicating how WIFN, Township of Warwick and WPLC's comments were considered by the Company before it submitted the application to the Ministry.

13. SOURCE TESTING

- 13.1 The Company shall monitor the emissions from the operation of the Facility as follows:
 - (a) The Company shall perform Source Testing for the sources and contaminants outlined in Schedule B.

- (b) The Company shall submit, within the three (3) months following the date of this Certificate, to the Manager a test protocol, including the Pre-Test Information for the Source Testing required by the Source Testing Code.
- (c) The Company shall finalize the test protocol in consultation with the Manager.
- (d) The Company shall not commence the Source Testing until the Manager has accepted the test protocol.
- (e) The Company shall complete the Source Testing within three (3) months after the commencement of the leachate treatment facility. The source testing will be repeated within 90 days of the start of each new phase as outlined in Table 6.1 of the Design and Operations Plan for the site.

NOTIFICATION OF UPCOMING SOURCE TESTING

- 13.2 The Company shall notify the District Manager and the Manager in writing of the location, date and time of any impending Source Testing required by this Certificate, at least fifteen (15) business days prior to the Source Testing or as approved by the Manager.

REPORT ON SOURCE TESTING

- 13.3 The Company shall submit a report on the Source Testing to the District Manager and the Manager, as stated in the test protocol, but no later than two (2) months after completing the Source Testing. The report shall be in the format described in the Source Testing Code, and shall also include:
- (a) an executive summary including the results from the Source Testing;
 - (b) records of all operating conditions including any upset conditions during the Source Testing; and
 - (c) the results of dispersion calculations using the maximum emission rate for odour for the Equipment, indicating the maximum concentration of the odour, 10 minute-average, calculated in accordance with the procedures outlined in Schedule C, at the nearby Sensitive Receptors and the yearly frequency of exceedance of 1 odour unit at the Sensitive Receptors.

REFUSAL OF SOURCE TESTING

- 13.4 The Director may not accept the results of the Source Testing if:
- (a) the Source Testing Code or the requirements of the Manager were not followed; or
 - (b) the Company did not notify the District Manager and the Manager of the Source

Testing; or

(c) the Company failed to provide a complete report on the Source Testing.

13.5 If the Director does not accept the results of the Source Testing, the Director may require re-testing.

SCHEDULE "A"

PARAMETER: Temperature

LOCATION:

The sample point for the Continuous Temperature Monitor shall be located in the combustion chamber where the minimum retention time of the combustion gases at a minimum temperature of 875 degrees Celsius for at least 0.7 second is achieved.

PERFORMANCE:

The Continuous Temperature Monitor shall meet the following minimum performance specifications for the following parameters.

PARAMETER	SPECIFICATION
1. Type:	shielded "K" type thermocouple or equivalent
2. Accuracy:	± 1.5 percent of the minimum gas temperature

RECORDER:

The recorder must be capable of registering continuously the measurement of the monitor without a significant loss of accuracy and with a time resolution of 5 minutes or better.

RELIABILITY:

The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time, on a monthly basis, when the enclosed flare systems are in operation.

SCHEDULE "B"

Source Testing Requirement

Source ID	Description	Test Parameters
L3	Exhaust serving sequencing a batch reactor (SBR) and an aeration tank	Odour, hydrogen sulfide, total mercaptans and a complete scan for volatile organic compounds
L4	Exhaust serving sequencing a batch reactor (SBR) and an aeration tank	
EF-2	Exhaust serving reverse osmosis system area	
SD-1	Exhaust serving slurry dryer	

SCHEDULE "C"

Procedures for the Calculation of 10-minute Average Concentration of Odour

1. The one-hour average concentration of odour at the Point of Impingement and at the most impacted Sensitive Receptor can be calculated using the Procedure described as follows:
 - (a) Calculate one-hour average concentration of odour at the Point of Impingement and at the most impacted Sensitive Receptor, employing the AERMOD atmospheric dispersion model employing at least five (5) years of hourly local meteorological data and provide results as individual one- hour odour concentrations;
 - (b) Convert each of the one-hour average concentrations predicted over the five (5) years of hourly local meteorological data to a 10-minute average concentration using the One-hour Average to 10-Minute Average Conversion described below;
 - (c) Present the 10-Minute Average concentrations predicted to occur over a five (5) year period at the Point of Impingement and at the most impacted Sensitive Receptor in a histogram. The maximum 10-minute average concentration of odour at the Sensitive Receptor will be considered to be the maximum odour concentration at the most impacted Sensitive Receptor that occurs and is represented in the histogram; and
2. For AERMOD, use the following formula to convert one-hour average Point of Impingement concentration to 10-minute average Point of Impingement concentration:

$$X_{10min} = X_{60min} \times 1.65$$

where

X_{10min} = 10-minute average concentration

X_{60min} = one-hour average concentration

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

1. Condition No. 1 is included to assist the Ministry with the inspection of the Facility so that the environmental impact and subsequent compliance with the Act, the regulations and this Certificate can be verified.
2. Conditions No. 2 and 4 are included to provide the minimum performance requirements considered necessary to prevent an adverse effect resulting from the operation of the Facility.
3. Condition No. 3 is included to ensure that the testing of the emergency diesel generators is not extended beyond the stated hours. Operations outside these hours, when ambient sound levels are significantly lower, may result in non-compliance with the established sound level limits.
4. Condition No. 5 is included to emphasize that the Equipment including the CEM System must be maintained and operated according to a procedure that will result in compliance with the Act, the regulations and this Certificate.
5. Conditions Nos. 6, 7 and 13 are included to require the Company to gather accurate information so that the environmental impact and subsequent compliance with the Act, the regulations and this Certificate can be verified.
6. Conditions Nos. 8 and 9 are included to ensure that the Acoustic Audit is carried out in accordance with procedures set in the Ministry's noise guidelines.
7. Condition No. 10 is included to require the Company to keep records and to provide information to staff of the Ministry so that compliance with the Act, the regulations and this Certificate can be verified.
8. Condition No. 11 is included to require the Company to notify staff of the Ministry so as to assist the Ministry with the review of the site's compliance.
9. Condition No. 12 is included in order to ensure that consultation with Walpole Island First Nation (WIFN), Township of Warwick and Warwick Public Liaison Committee (WPLC) is undertaken during the submission of any application to amend any approval required by the Ministry.

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 0531-7HRPWF issued on August 29, 2008

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, S.O. 1993, Chapter 28, the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the

Environmental Protection Act, provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

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

This Notice must be served upon:

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

AND

The Environmental Commissioner
1075 Bay Street, 6th Floor
Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director
Section 9, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

This instrument is subject to Section 38 of the Environmental Bill of Rights, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ene.gov.on.ca, you can determine when the leave to appeal period ends.

The above noted works are approved under Section 9 of the Environmental Protection Act.

DATED AT TORONTO this 10th day of November, 2009



Ian Greason, P.Eng.
Director
Section 9, *Environmental Protection Act*

BS/

c: District Manager, MOE Sarnia
Brad Bergeron, RWDI AIR Inc.

APPENDIX A22:

Amended ECA [Air] No. 9488-AMPH4Y, dated July 6, 2017





AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 9488-AMPH4Y

Issue Date: July 6, 2017

Waste Management of Canada Corporation
117 Wentworth Court
Brampton, Ontario
L6T 5L4

Site Location: Twin Creeks Landfill Site
8039 Zion Line
Warwick Township, County of Lambton
N0M 2S0

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Three (3) enclosed flare systems, each having a maximum inlet capacity of 2.08 cubic metres per second of landfill gas, exhausting into the air at a maximum volumetric flow rate of 61.3 cubic metres per second through individual stacks, each having an exit diameter of 3.7 metres, extending 15.2 metres above grade; used to:

- incinerate the landfill gas from a landfill gas collection system;

control the off-gases from the enclosed building housing the leachate treatment facility; and

maintain a negative pressure on the leachate collection system on an as-needed basis;

one (1) enclosed flare system having a maximum inlet capacity of 0.94 cubic metres per second of landfill gas, exhausting into the air at a maximum volumetric flow rate of 25.8 cubic metres per second through a stack having an exit diameter of 3.2 metres, extending 12.2 metres above grade; used to:

- incinerate the landfill gas from a landfill gas collection system;

control the off-gases from the enclosed building housing the leachate treatment facility; and

maintain a negative pressure on the leachate collection system on an as-needed basis;

One (1) diesel fuel fired emergency generator rated at 1,000 kilowatts that will be used to provide back-up power for the landfill gas plant; exhausting into the air at a maximum volumetric flow rate of 3.56 cubic metres per second; having an exit diameter of 0.25 metre, extending 3.6 metres above grade;

One (1) diesel fuel fired generator rated at 50 kilowatts that will be used to provide regular power to the leachate pumping system; exhausting into the air at a maximum volumetric flow rate of 0.24 cubic metres per second; having an exit diameter of 0.10 metre, extending 3.6 metres above grade;

One (1) diesel fuel fired emergency generator rated at 250 kilowatts that will be used to provide

back-up power for the office buildings; exhausting into the air at a maximum volumetric flow rate of 0.97 cubic metres per second; having an exit diameter of 0.15 metre, extending 3.6 metres above grade;

Two (2) passive exhaust louvres serving two (2) sequencing batch reactors (SBR) and two (2) aeration tanks; exhausting into the air individually at a maximum volumetric flow rate of 1.96 cubic metres per second; each having an exit dimension of 1.22 x 1.22 metres, extending 2.13 metres above grade;

One (1) process exhaust fan serving the reverse osmosis system area; exhausting into the air at a maximum volumetric flow rate of 1.71 cubic metres per second; having an exit dimension of 0.45 x 0.45 metres, extending 4.0 metres above grade;

One (1) exhaust fan serving slurry dryer; exhausting into the air at a maximum volumetric flow rate of 0.24 cubic metres per second; having an exit diameter of 0.3 metre, extending 5.0 metres above grade;

all in accordance with the Application for an Approval, dated February 15, 2017 and signed by Reid Cleland of the *Company* and all information and documentation associated with the application including ESDM Report prepared by RWDI AIR Inc. dated February 15, 2017 and signed by Brad Bergeron; and email updates provided by Brad Bergeron of RWDI AIR Inc. on May 10, 18, 24 and 26, 2017.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Acoustic Audit*" means an investigative procedure consisting of measurements of all noise emissions due to the operation of the *Facility*, assessed in comparison to the performance limits for the *Facility* regarding noise emissions, completed in accordance with the procedures set in *Publication NPC-103* and reported in accordance with *Publication NPC-233*.
2. "*Acoustic Audit Report*" means a report presenting the results of an *Acoustic Audit*, prepared in accordance with *Publication NPC-233*.
3. "*Acoustical Consultant*" means a person currently active in the field of environmental acoustics and noise/vibration control, who is familiar with Ministry noise guidelines and procedures and has a combination of formal university education, training and experience necessary to assess noise emissions from a *Facility*.
4. "*CEM System*" means the continuous monitoring and recording system, one for each of the flare system, used to optimize the operation of the flare systems, as described in this *Approval*, including Schedule "A", to the extent approved by this *Approval*.
5. "*Approval*" means this Environmental Compliance *Approval*, including the application and supporting documentation listed above.
6. "*Company*" means Waste Management of Canada Corporation that is responsible for the construction or operation of the *Facility* and includes any successors and assigns.
7. "*Director*" means a person appointed for the purpose of section 20.3 of the *EPA* by the Minister pursuant to section 5 of the *EPA*.
8. "*District Manager*" means the District Manager of the appropriate local district office of the Ministry, where the *Facility* is geographically located.
9. "*EPA*" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.
10. "*Equipment*" means the equipment described in the *Company's* application, this *Approval* and in

the supporting documentation submitted with the application, to the extent approved by this *Approval*.

11. "*Facility*" means the entire operation located on the property where the *Equipment* is located.
12. "*Independent Acoustical Consultant*" means an *Acoustical Consultant* not representing the *Company*, and not involved in the noise impact assessment or the design/implementation of noise control measures for the *Facility/Equipment*. The *Independent Acoustical Consultant* shall not be retained by the consultant involved in the noise impact assessment or the design/implementation of noise control measures for the *Facility/Equipment*.
13. "*Manager*" means the Manager, Technology Standards Section, Standards Development Branch of the Ministry, or any other person who represents and carries out the duties of the Manager, as those duties relate to the conditions of this *Approval*.
14. "*Manual*" means a document or a set of documents that provide written instructions to staff of the *Company*.
15. "*Pre-Test Information*" means the information outlined in Section 1. of the *Source Testing Code*.
16. "*Publication NPC-103*" means Publication NPC-103 of the Model Municipal Noise Control By-Law, Final Report, August, 1978, as amended.
17. "*Publication NPC-205*" means the Ministry Publication NPC-205, "Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October, 1995, as amended.
18. "*Publication NPC-233*" means Publication NPC-233, Information to be Submitted for *Approval* of Stationary Sources of Sound, October 1995, as amended.
19. "*Sensitive Receptor*" means any location where routine or normal activities occurring at reasonably expected times would experience adverse effect(s) from odour discharges from the *Facility*, including one or a combination of:
 1. private residences or public facilities where people sleep (e.g. single and multi-unit dwellings, nursing homes, hospitals, trailer parks, camping grounds, etc.),
 2. institutional facilities (e.g.: schools, places of worship, community centres, day care centres, recreational centres, etc.),
 3. outdoor public recreational areas (e.g.: trailer parks, play grounds, picnic areas, etc.), and
 4. other outdoor public areas where there are continuous human activities (e.g.: commercial plazas and office buildings).
20. "*Schedules*" means the following schedules attached to the *Approval* and forming part of the *Approval* namely:
 - Schedule A - Continuous Monitoring and Recording System for Temperature
 - Schedule B - Source Testing Requirement
 - Schedule C - Procedures for Calculation of 10-minute Average Concentration of Odour.
21. "*Site*" means the Twin Creeks Landfill Site and lands owned by the *Company* described as:

8039 Zion Line, R.R. #4, Watford

Lots 19 and 20, Concession 3 and Lots 20 and 21, Concession 4, SER, Reference Plan 25R-9125

Township of Warwick, County Of Lambton, Ontario

N0M 2S0.

22. "*Source Testing*" means sampling and testing to measure emissions resulting from operating the *Equipment* under process conditions which yield the worst case emissions within the approved operating range of the *Facility* and satisfies paragraph 1 of subsection 11(1) of O. Reg. 419/05.

23. "Source Testing Code" means the Ontario *Source Testing Code*, dated June 2010, prepared by the Ministry, as amended.

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

TERMS AND CONDITIONS

1. NOTIFICATION

1. The *Company* shall notify the *District Manager* in writing at least one (1) month prior to the expected date of installation of the second, third and fourth enclosed flare system in the *Facility*.

2. PERFORMANCE

1. The *Company* shall, at all times, ensure that the noise emissions from the *Facility* comply with the limits set in Ministry *Publication NPC-205*.
2. The *Company* shall restrict the testing of the two (2) emergency diesel generators (1,000 kilowatts and 250 kilowatts) to a maximum of 30 minutes per hour each during the daytime period between 07:00 and 19:00 hours.
3. The *Company* shall operate all four enclosed flare systems in such a manner that a minimum temperature, as recorded by the *CEM System*, shall be 875 degrees Celsius at a point representing a minimum retention time of 0.7 second, at all times when the landfill gas incineration is in progress.

3. OPERATION AND MAINTENANCE

1. The *Company* shall ensure that the *Equipment*, including the *CEM System*, is properly operated and maintained at all times. The *Company* shall:
2. prepare, not later than three (3) months after the date of this *Approval*, a *Manual* outlining the operating procedures and a maintenance program for the *Equipment*. These operating procedures and the maintenance program in the *Manual* shall be updated as necessary. The *Manual* shall include, as a minimum, the following:
3. routine operating and maintenance procedures in accordance with good engineering practices and as recommended by the *Equipment* and the *CEM System* suppliers;
4. the calibration procedures of the *CEM System*;
5. emergency procedures and procedures to prevent upset conditions;
6. the operator training which is to be provided by qualified and experienced individuals, for example, staff associated with the *Equipment* and the *CEM System* suppliers or personnel with equivalent qualification;
7. the procedures for optimizing the operation of the *Equipment* to minimize emissions from the *Equipment*;
8. the periodic, at a minimum weekly, inspection of the *Equipment* which is to be conducted by individuals trained with the *Equipment*; and timetables for work to be carried out;
9. procedures for any record keeping activities relating to operation and maintenance of the *Equipment*, including but not limited to the quantity and quality of the landfill gas collected and fed to the *Equipment* for incineration;
10. procedures to record process upsets/upset conditions and the remedial actions taken to respond to the upsets;

11. all appropriate measures to minimize noise, dust and odorous emissions from all potential sources;
12. the procedures for recording and responding to complaints regarding the operation of the *Equipment*;
13. implement the procedures of the *Manual*.

4. ACOUSTIC AUDIT

1. The *Company* shall carry out *Acoustic Audit* measurements on the actual noise emissions due to the operation of the *Facility*. The:
 - a. shall carry out *Acoustic Audit* measurements in accordance with the procedures in *Publication NPC-103*;
 - b. shall submit an *Acoustic Audit* Report on the results of the *Acoustic Audit*, prepared by an *Independent Acoustical Consultant*, in accordance with the requirements of *Publication NPC-233*, to the *District Manager* and the *Director* not later than three (3) months after the commencement of operation of each of the proposed three (3) flare systems in the *Facility*.
2. The *Director*:
 - a. may not accept the results of the *Acoustic Audit* if the requirements of *Publication NPC-233* were not followed;
 - b. may require the *Company* to repeat the *Acoustic Audit* if the results of the *Acoustic Audit* are found unacceptable to the *Director*.

5. RECORD RETENTION

1. The *Company* shall retain, for a minimum of two (2) years from the date of their creation, all records and information related to or resulting from the recording activities required by this *Approval*, and make these records available for review by staff of the Ministry upon request. The *Company* shall retain:
 2. all records on the maintenance, repair and inspection of the *Equipment* and the *CEM System*;
 3. all records produced by the *CEM System*;
 4. all records on the quality and quantity of landfill gas collected and fed to the *Equipment*;
 5. all records on the ambient air monitoring;
 6. all records generated in the *Acoustic Audit* measurements;
 7. all records of process upsets/upset conditions and remedial actions taken to respond to the upsets;
 8. all records of any environmental complaints; including:
 9. a description, time and date of each incident to which the complaint relates,
 10. wind direction at the time of the incident to which the complaint relates, and
 11. a description of the measures taken to address the cause of the incident to which the complaint relates and to prevent a similar occurrence in the future.

6. NOTIFICATION OF COMPLAINTS

1. The *Company* shall notify the *District Manager*, in writing, of each environmental complaint within two (2) business days of the complaint. The notification shall include:
 2. this *Approval* number;
 3. a description of the nature of the complaint;
 4. the time and date of the incident to which the complaint relates;
 5. a description of the measures taken to address the cause of the incident to which the complaint relates and to prevent a similar occurrence in the future.

7. CONSULTATION

1. During the process of submission of an application to amend any *Approval* for the *Site*, the *Company* shall:
 2. discuss with Walpole Island First Nation (WIFN), Township of Warwick and Warwick Public

Liaison Committee (WPLC) the proposed application prior to submission of the application to the *Director*;

3. provide the same documents to WIFN, Township of Warwick and WPLC that are provided to the *Director* in respect of the amendment; and
4. provide the *Director* with a statement indicating how WIFN, Township of Warwick and WPLC's comments were considered by the *Company* before it submitted the application to the Ministry.

8. SOURCE TESTING

1. The *Company* shall monitor the emissions from the operation of the *Facility* as follows:
 - a. The *Company* shall perform Source Testing for the sources and contaminants outlined in Schedule B.
 - b. The *Company* shall submit, within the three (3) months following the date of this *Approval*, to the Manager a test protocol, including the *Pre-Test Information* for the Source Testing required by the *Source Testing Code*.
 - c. The *Company* shall finalize the test protocol in consultation with the Manager.
 - d. The *Company* shall not commence the Source Testing until the Manager has accepted the test protocol.
 - e. The *Company* shall notify the *District Manager* and the Manager in writing of the location, date and time of any impending Source Testing required by this *Approval*, at least fifteen (15) business days prior to the Source Testing or as approved by the Manager.
 - f. The *Company* shall complete the Source Testing within three (3) months after the commencement of the leachate treatment facility. The source testing will be repeated within 90 days of the start of each new phase as outlined in Table 6.1 of the Design and Operations Plan for the *Site*.

9. REPORT ON SOURCE TESTING

1. The *Company* shall submit a report on the Source Testing to the *District Manager* and the *Manager*, as stated in the test protocol, but no later than two (2) months after completing the *Source Testing*. The report shall be in the format described in the *Source Testing Code*, and shall also include:
 - a. an executive summary including the results from the *Source Testing*;
 - b. records of all operating conditions including any upset conditions during the *Source Testing*; and
 - c. the results of dispersion calculations using the maximum emission rate for odour for the *Equipment*, indicating the maximum concentration of the odour, 10 minute-average, calculated in accordance with the procedures outlined in Schedule C, at the nearby Sensitive Receptors and the yearly frequency of exceedance of 1 odour unit at the Sensitive Receptors.

10. REFUSAL OF SOURCE TESTING

1. The *Director* may not accept the results of the *Source Testing* if:
 - a. the *Source Testing Code* or the requirements of the Manager were not followed; or
 - b. the *Company* did not notify the *District Manager* and the Manager of the *Source Testing*; or
 - c. the *Company* failed to provide a complete report on the *Source Testing*.
2. If the *Director* does not accept the results of the *Source Testing*, the *Director* may require re-testing.

SCHEDULE "A"

PARAMETER: Temperature

LOCATION:

The sample point for the continuous temperature monitoring and recording system shall be shall be

installed in the combustion chamber of each flare where the minimum retention time of the combustion gases at a minimum temperature of 875 degrees Celsius for at least 0.7 second is achieved.

PERFORMANCE:

The Continuous Temperature Monitor shall meet the following minimum performance specifications for the following parameters.

PARAMETER SPECIFICATION

1. Type: shielded "K" type thermocouple or equivalent
2. Accuracy: + 1.5 percent of the minimum gas temperature
3. Response Time (95%): 60 sec. (max)
4. Operating Range (Full Scale): 1.5 times approval limit
5. Standard Tolerance: $\pm 2.2^{\circ}\text{C}$ or $\pm 0.75\%$
6. Resolution: 0.1°C
7. Calibration: Per manufacturer's recommendations

RECORDER:

The recorder must be capable of registering continuously the measurement of the monitor without a significant loss of accuracy and with a time resolution of 5 minutes or better.

RELIABILITY:

The monitor shall be operated and maintained so that accurate data is obtained during a minimum of 90 percent of the time for each calendar quarter during the first full year of operation, and 95 percent, thereafter when the enclosed flare systems are in operation.

SCHEDULE "B"

Source Testing Requirement

Source ID	Description	Test Parameters
L3	Exhaust serving sequencing a batch reactor (SBR) and an aeration tank	Odour, hydrogen sulfide, total Mercaptans and a complete scan for volatile organic compounds
L4	Exhaust serving sequencing a batch reactor (SBR) and an aeration tank	Odour, hydrogen sulfide, total Mercaptans and a complete scan for volatile organic compounds
EF-2	Exhaust serving reverse osmosis system area	Odour, hydrogen sulfide, total Mercaptans and a complete scan for volatile organic compounds
SD-1	Exhaust serving slurry dryer	Odour, hydrogen sulfide, total Mercaptans and a complete scan for volatile organic compounds

SCHEDULE "C"

Procedures for the Calculation of 10-minute Average Concentration of Odour

1. The one-hour average concentration of odour at the Point of Impingement and at the most impacted *Sensitive Receptor* can be calculated using the Procedure described as follows:
 1. Calculate one-hour average concentration of odour at the Point of Impingement and at the most impacted *Sensitive Receptor*, employing the AERMOD atmospheric dispersion model employing at least five (5) years of hourly local meteorological data and provide results as individual one- hour odour concentrations;

2. Convert each of the one-hour average concentrations predicted over the five (5) years of hourly local meteorological data to a 10-minute average concentration using the One-hour Average to 10-Minute Average Conversion described below;
3. Present the 10-Minute Average concentrations predicted to occur over a five (5) year period at the Point of Impingement and at the most impacted *Sensitive Receptor* in a histogram. The maximum 10-minute average concentration of odour at the *Sensitive Receptor* will be considered to be the maximum odour concentration at the most impacted *Sensitive Receptor* that occurs and is represented in the histogram; and
2. For AERMOD, use the following formula to convert one-hour average Point of Impingement concentration to 10-minute average Point of Impingement concentration:

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

1. Condition No. 1 is included to assist the Ministry with the inspection of the *Facility* so that the environmental impact and subsequent compliance with the *EPA*, the regulations and this *Approval* can be verified.
2. Condition Nos. 2.1 and 2.3 are included to provide the minimum performance requirements considered necessary to prevent an adverse effect resulting from the operation of the *Facility*.
3. Condition No. 2.2 is included to ensure that the operation of the two (2) emergency diesel generators, excluding emergency situations, is not extended beyond the specified hours to prevent an adverse effect resulting from the operation of the Equipment.
4. Condition No. 3 is included to emphasize that the *Equipment* including the *CEM System* must be maintained and operated according to a procedure that will result in compliance with the *EPA*, the regulations and this *Approval*.
5. Condition No. 4 is included to require the Company to gather accurate information and submit an Acoustic Audit Report in accordance with procedures set in the Ministry's noise guidelines, so that the environmental impact and subsequent compliance with this *Approval* can be verified.
6. Condition No. 5 is included to require the *Company* to keep records and to provide information to staff of the Ministry so that compliance with the *EPA*, the regulations and this *Approval* can be verified.
7. Condition No. 6 is included to require the *Company* to notify staff of the Ministry so as to assist the Ministry with the review of the *Facility's* compliance.
8. Condition No. 7 is included in order to ensure that consultation with Walpole Island First Nation (WIFN), Township of Warwick and Warwick Public Liaison Committee (WPLC) is undertaken during the submission of any application to amend any *Approval* required by the Ministry.
9. Condition Nos. 8 to 10 are included to require the *Company* to gather accurate information so that the environmental impact and subsequent compliance with the *EPA*, the regulations and this *Approval* can be verified.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 4365-7VXJ5G issued on November 10, 2009.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner,

within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Environmental
Commissioner
1075 Bay Street, Suite
605
Toronto, Ontario
M5S 2B1

The Director appointed for the
purposes of Part II.1 of the
Environmental Protection Act
Ministry of the Environment and
Climate Change
AND 135 St. Clair Avenue West, 1st
Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

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

DATED AT TORONTO this 6th day of July, 2017

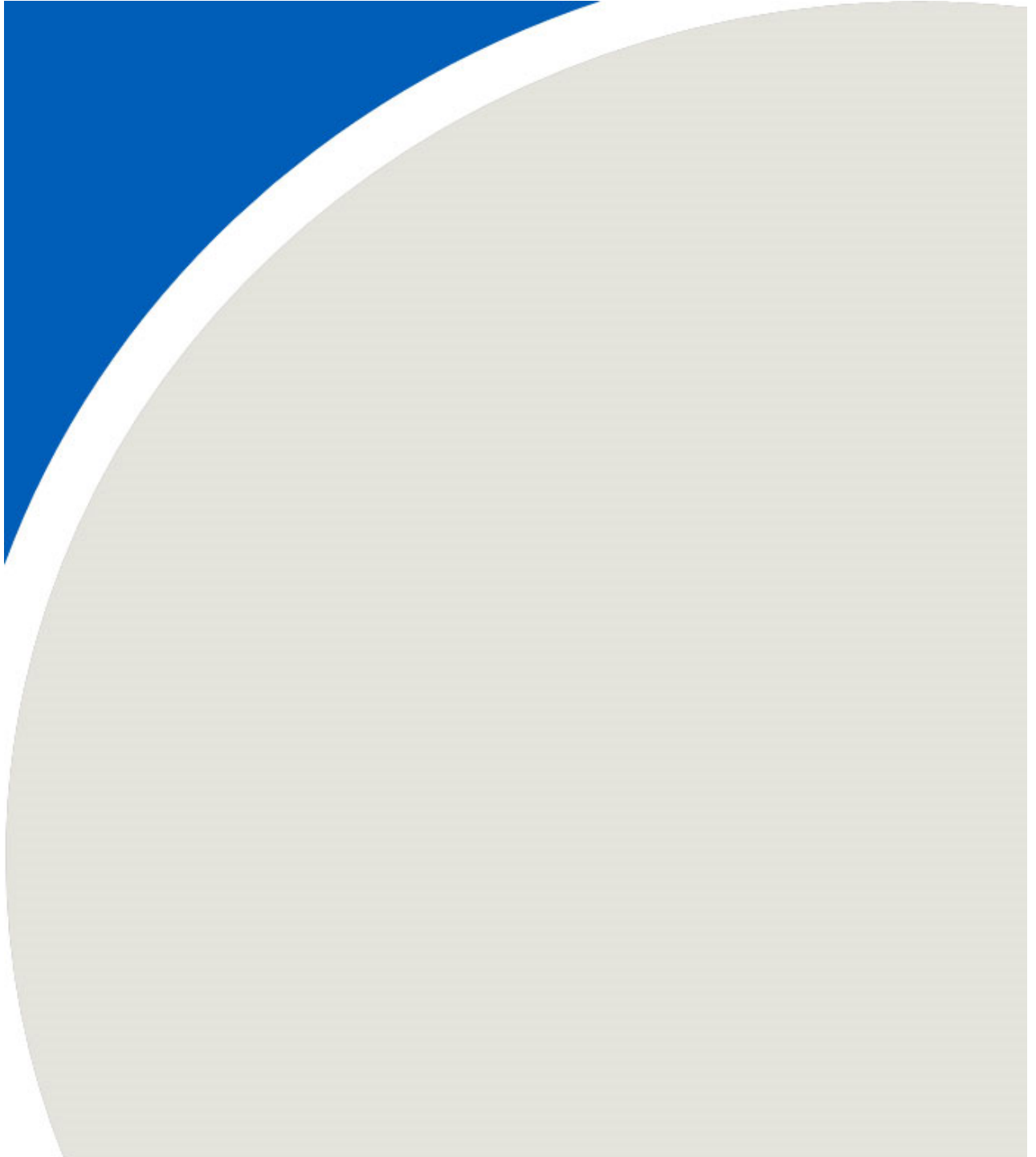
Rudolf Wan, P.Eng.

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

BS/
c: District Manager, MOECC Sarnia
Brad Bergeron, RWDI AIR Inc.

APPENDIX A23:

Amended Permit to Take Water [Surface Water] No. 4430-8PLMKV, dated January 17, 2012



AMENDED PERMIT TO TAKE WATER
Surface Water
NUMBER 4430-8PLMKV

Pursuant to Section 34 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:

Waste Management of Canada Corporation
8039 Zion Line
Watford, Ontario, N0M 2S0
Canada

For the water taking from: Twin Creeks Landfill-
Stormwater Sedimentation Ponds (Ponds 1,2,3,4),
Secondary Drainage Layer (SDL),
Pumping Stations (PS2, PS4, PS6, PS8)

Located at: 8039 Zion Line
Warwick, County of Lambton

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

DEFINITIONS

- (a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the OWRA for the purposes of section 34, OWRA.
- (b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.
- (c) "Ministry" means Ontario Ministry of the Environment.
- (d) "District Office" means the Sarnia District Office.
- (e) "Permit" means this Permit to Take Water No. 4430-8PLMKV including its Schedules, if any, issued in accordance with Section 34 of the OWRA.
- (f) "Permit Holder" means Waste Management of Canada Corporation.
- (g) "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O. 40, as amended.

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

TERMS AND CONDITIONS

1. Compliance with Permit

- 1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated October 25, 2011 and signed by Reid Cleland, and all Schedules included in this Permit.
- 1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.
- 1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.
- 1.4 This Permit is not transferable to another person.
- 1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.
- 1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.
- 1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

2. General Conditions and Interpretation

- 2.1 Inspections
The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act*, R.S.O. 1990, the *Pesticides Act*, R.S.O. 1990, or the *Safe Drinking Water Act*, S. O. 2002.
- 2.2 Other Approvals
The issuance of, and compliance with this Permit, does not:
 - (a) relieve the Permit Holder or any other person from any obligation to comply with any other

applicable legal requirements, including the provisions of the *Ontario Water Resources Act* , and the *Environmental Protection Act* , and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

2.3 Information

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

2.4 Rights of Action

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

2.5 Severability

The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

2.6 Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

3. Water Takings Authorized by This Permit

3.1 Expiry

This Permit expires on **April 15, 2020**. No water shall be taken under authority of this Permit after the expiry date.

3.2 Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	Pond 1	Pond Online	Other - Industrial	Industrial	2,400	10	82,700	105	17 429230 4757320
2	Pond 2	Pond Online	Other - Industrial	Industrial	2,400	10	246,700	105	17 428370 4757850
3	Pond 3	Pond Online	Other - Industrial	Industrial	2,400	10	110,100	105	17 428380 4758670
4	Pond 4	Pond Online	Other - Industrial	Industrial	2,400	10	41,200	105	17 429390 4758620
5	SDL	Well Dug	Other - Dewatering	Dewatering	4,921	24	7,085,520	215	17 428500 4758400
6	PS2	Well Dug	Other - Dewatering	Dewatering	1,325	24	1,907,640	365	17 428500 4758400
7	PS4	Well Dug	Other - Dewatering	Dewatering	1,325	24	1,907,640	365	17 428500 4758400
8	PS6	Well Dug	Other - Dewatering	Dewatering	1,325	24	1,907,640	365	17 428500 4758400
9	PS8	Well Dug	Other - Dewatering	Dewatering	1,325	24	1,907,640	365	17 428500 4758400
						Total Taking:	15,196,780		

4. Monitoring

- 4.1 The Permit Holder shall, on each day water is taken under the authorization of this Permit, record the date, the volume of water taken on that date and the rate at which it was taken. The daily volume of water taken shall be measured by a flow meter or calculated in accordance with the method described in the application for this Permit or as otherwise accepted by the Director. A separate record shall be maintained for each source. The Permit Holder shall keep all records required by this condition current and available at or near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request. The Permit Holder, unless otherwise required by the Director, shall submit, on or before March 31st in every year, the daily water taking data collected and recorded for the previous year to the ministry's Water Taking Reporting System.

5. Impacts of the Water Taking

5.1 Notification

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

5.2 For Surface-Water Takings

The taking of water (including the taking of water into storage and the subsequent or simultaneous withdrawal from storage) shall be carried out in such a manner that streamflow is not stopped and is not reduced to a rate that will cause interference with downstream uses of water or with the natural functions of the stream.

5.3 The Permit Holder must ensure that if water is discharged directly to a watercourse, the discharge water shall be controlled in such a way as to avoid erosion and sedimentation in the receiving watercourse.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act*, Section 100 (4).

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

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.
2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.
3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written notice served upon me, the Environmental Review Tribunal and the Environmental Commissioner, Environmental Bill of Rights, R.S.O. 1993, Chapter 28, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 101 of the Ontario Water Resources Act, as amended provides that the Notice requiring a hearing shall state:

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

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

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
7. The name of the Director;
8. The municipality within which the works are located;

This notice must be served upon:

*The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5
Fax: (416) 314-4506*

AND

*The Environmental Commissioner
1075 Bay Street
6th Floor, Suite 605
Toronto, Ontario M5S 2W5*

AND

*The Director, Section 34
Ministry of the Environment
733 Exeter Rd
London ON N6E 1L3
Fax: (519)873-5020*

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

by telephone at (416) 314-4600

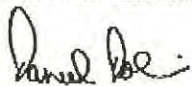
by fax at (416) 314-4506

by e-mail at www.ert.gov.on.ca

This instrument is subject to Section 38 of the Environmental Bill of Rights that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek to appeal for 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry, you can determine when the leave to appeal period ends.

This Permit cancels and replaces Permit Number 7433-849HTE, issued on 2010/04/16.

Dated at London this 17th day of January, 2012.



*Dan Dobrin
Director, Section 34
Ontario Water Resources Act , R.S.O. 1990*

Schedule A

This Schedule "A" forms part of Permit To Take Water 4430-8PLMKV, dated January 17, 2012.

Ministry of the Environment

Southwestern Region
Technical Support Section
Water Resources
733 Exeter Rd
London ON N6E 1L3
Fax: (519)873-5020
Tel: 519-873-5000

Ministère de l'Environnement

Direction régionale du Sud-Ouest
Bureau du Directeur Adjoint
733 Exeter Rd
London ON N6E 1L3
Télécopieur: (519)873-5020
Tél: 519-873-5000



January 17, 2012

Reid Cleland
Waste Management of Canada Corporation
8039 Zion Line
Watford, ON N0M 2S0

Dear Mr. Cleland,

RE: Permit to Take Water 4430-8PLMKV
Amendment to Permit to Take Water No. 7433-849HTE
Twin Creeks Landfill Site
Warwick, County of Lambton
Reference Number 3142-8N8JE9

Please find attached a Permit to Take Water which authorizes the withdrawal of water in accordance with the application for this Permit to Take Water, dated October 25, 2011 and signed by Reid Cleland.

This Permit to Take Water expires on **April 15, 2020**. Authorized rates and volumes of water taking are given in Table A.

Take notice that in issuing this Permit, terms and conditions pertaining to the taking of water and to the results of the taking have been imposed. The terms and conditions have been designed to allow for the development of water resources, while providing reasonable protection to existing water uses and users.

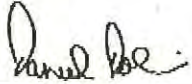
Please ensure that prior to discharging any secondary drainage layer (SDL) water taken under the authority of this Permit to stormwater ditches, you refer to Section 4.5 of your Development and Operations Plan, dated March, 2008, which requires that samples of the SDL liquid be analyzed for the primary and secondary leachate indicator parameters (PLIL-SW and SLIL-SW), as defined in the Environmental Monitoring Plan.

Ontario Regulation 387/04 (Water Taking) requires all water takers to report daily water taking amounts to the Water Taking Reporting System (WTRS) electronic database:
<http://www.ene.gov.on.ca/envision/water/pttw.htm>. Daily water taking must be reported on a calendar year basis. If no water is taken, then a "no taking" report must be entered. Please consult the Regulation and Section 4 of this Permit for monitoring requirements.

If you have questions about reporting requirements, please call the WTRS Help Desk at 416-235-6322 (toll free: 1-877-344-2011) or by email, WTRSHelpdesk@ontario.ca. It is preferred that you submit your

data directly and electronically to the WTRS. Where this is impracticable, please use the Water Taking Submission Form (included as Appendix C of the *Technical Bulletin: Permit To Take Water (PTTW) - Monitoring and Reporting of Water Takings*), which can be downloaded from the above web site, and fax your completed forms to 416-235-6549 or mail them to: Water User Reporting Section, 125 Resources Rd. Toronto, ON M9P 3V6.

Yours truly,



Dan Dobrin
Supervisor, Water Resources
Southwestern Region

File Storage Number: SILAWAZI.220

APPENDIX B:

Climate Data



Table B-1
Historical Precipitation Data Summary
Twin Creeks Environmental Centre - Poplar System

Year	Climatological Station Precipitation Total (mm/a)	On-site Precipitation Total (mm/a)
30-Year Normal (1961-1990)	711.9	-
30-Year Normal (1971-2000)	935.5	-
30-Year Normal (1981-2010)	959.2	-
1995	868.7	-
1996, 1997	Complete annual data not available	-
1998	788.8	-
1999	805.1	-
2000	1,140.6	-
2001	867.2	-
2002	682.6	472.0
2003	982.8	726.7
2004	954.8	729.2
2005	898.3	577.0
2006	1,245.8	853.3
2007	804.4	699.8
2008	1,241.8	852.2
2009	1,001.8	729.1
2010	927.1	676.7
2011	1255.0	812.3
2012	860.2	592.7
2013	1,194.4	911.4
2014	895.6	829.5
2015	828.0	724.0
2016	1,012.8	816.5
2017	972.2	843.3
2018	1,169.6	951.3
2019	1007.6	808.6
2020	966.6	725.4

Notes

- 1) Dash (-) denotes climatological station not operational
- 2) On-site precipitation data collected from the automated RWDI Envision climatological station since 2019 instead of manual rain gauge readings, as in years prior.



STRATHROY-MULLIFARRY
ONTARIO

[Latitude:](#) 42°58'50.022" N [Longitude:](#) 81°38'34.086" W [Elevation:](#) 243.00 m
[Climate ID:](#) 6148122 [WMO ID:](#) [TC ID:](#)

Daily Data Report for January 2020

Daily Data Report for January 2026											
	<u>Max Temp</u>	<u>Min Temp</u>	<u>Mean Temp</u>	<u>Heat Deg</u>	<u>Cool Deg</u>	<u>Total Rain</u>	<u>Total Snow</u>	<u>Total Precip</u>	<u>Snow on</u> <u>Grnd</u>	<u>Dir of Max</u> <u>Gust</u>	<u>Spd of Max</u> <u>Gust</u>
	°C	°C	°C	Days	Days	mm	cm	mm	cm	10's deg	km/h
DAY											
01 †	3.5	-3	0.3	17.7	0	0	0	0	3		
02 †	6	-2	2	16	0	0	0	0	2		
03 †	6	3.5	4.8	13.2	0	0	0	0	0		
04 †	2.5	-0.5	1	17	0	0	0	0	0		
05 †	2	-2	0	18	0	0	5	5	0		
06 †	3	-2	0.5	17.5	0	0	0	0	4		
07 †	4	-9	-2.5	20.5	0	0	3	3	2		
08 †	-5	-7	-6	24	0	0	1	1	4		
09 †	7.5	-10.5	-1.5	19.5	0	0	0	0	5		
10 †	12	-0.5	5.8	12.2	0	12.8	0	12.8	0		
11 †	12	2.5	7.3	10.7	0	60	0	60	0		
12 †	-1	-4	-2.5	20.5	0	0	0	0	0		
13 †	2	-4	-1	19	0	0	0	0	0		
14 †	4	-0.5	1.8	16.2	0	0	0	0	0		
15 †	5	-0.5	2.3	15.7	0	0	0	0	0		
16 †	0	-2	-1	19	0	0	7	7	0		
17 †	-5.5	-9	-7.3	25.3	0	0	4	4	7		
18 †	3	-9.5	-3.3	21.3	0	3.4	11	14.4	9		
19 †	-4.5	-6	-5.3	23.3	0	0	5	5	16		
20 †	-5	-20.5	-12.8	30.8	0	0	1	1	17		
21 †	-4	-8.5	-6.3	24.3	0	0	0	0	17		
22 †	-1.5	-9.5	-5.5	23.5	0	0	0	0	15		
23 †	3	-8.5	-2.8	20.8	0	0	0	0	15		
24 †	4.5	-5	-0.3	18.3	0	8	0	8	14		
25 †	2.5	1.5	2	16	0	1	0	1	7		
26 †	2	0	1	17	0	3.2	0	3.2	6		
27 †	0.5	0	0.3	17.7	0	0	2	2	4		
28 †	0	-1	-0.5	18.5	0	0	1	1	4		
29 †	-0.5	-2	-1.3	19.3	0	0	0	0	4		
30 †	-0.5	-4.5	-2.5	20.5	0	0	0	0	4		
31 †	-0.5	-3	-1.8	19.8	0	0	0	0	3		
Sum				593.1	0	88.4	40	128.4	162		
Avg	1.8	-4.1	-1.1								
Xtrm	12.0	-20.5									
Summary: average and extreme values are based on the data above.											



**STRATHROY-MULLIFARRY
ONTARIO**

Climate ID: 6148122 WMO ID: TC ID:

Daily Data Report for February 2020

[illegible]



STRATHROY-MULLIFARRY
ONTARIO

Latitude: 42°58'50.022" N **Longitude:** 81°38'34.086" W **Elevation:** 243.00 m
Climate ID: 6148122 **WMO ID:** **TC ID:**

Daily Data Report for March 2020

[illegible]

Summary, average and extreme values are based on the data above.



**STRATHROY-MULLIFARRY
ONTARIO**

Latitude: 42°58'50.022" N **Longitude:** 81°38'34.086" W **Elevation:** 243.00 m
Climate ID: 6148122 **WMO ID:** **TC ID:**

Daily Data Report for April 2020

[illegible]



**STRATHROY-MULLIFARRY
ONTARIO**

Climate ID: 6148122

WMO ID:

TC ID:

Daily Data Report for May 2020

[illegible]

Summary, average and extreme values are based on the data above.



**STRATHROY-MULLIFARRY
ONTARIO**

Latitude: 42°58'50.022" N Longitude: 81°38'34.086" W Elevation: 243.00 m
Climate ID: 6148122 WMO ID: TC ID:

Daily Data Report for June 2020

Daily Data Report for June 2020											
	<u>Max Temp</u>	<u>Min Temp</u>	<u>Mean Temp</u>	<u>Heat Deg</u>	<u>Cool Deg</u>	<u>Total Rain</u>	<u>Total Snow</u>	<u>Total Precip</u>	<u>Snow on</u>	<u>Dir of Max</u>	<u>Spd of Max</u>
	°C	°C	°C	<u>Days</u>	<u>Days</u>	mm	cm	mm	Grnd cm	Gust 10's deg	Gust km/h
DAY											
01 ↑	23.5	7	15.3	2.7	0	6.4	0	6.4	0		
02 ↑	29.5	12	20.8	0	2.8	1.4	0	1.4	0		
03 ↑	28	18	23	0	5	0	0	0	0		
04 ↑	29.5	13.5	21.5	0	3.5	0	0	0	0		
05 ↑	31.5	15	23.3	0	5.3	0	0	0	0		
06 ↑	25	12.5	18.8	0	0.8	0	0	0	0		
07 ↑	21.5	9	15.3	2.7	0	0	0	0	0		
08 ↑	27	8	17.5	0.5	0	0	0	0	0		
09 ↑	32.5	14	23.3	0	5.3	13.6	0	13.6	0		
10 ↑	30	21	25.5	0	7.5	15	0	15	0		
11 ↑	23.5	15	19.3	0	1.3	0	0	0	0		
12 ↑	16	10	13	5	0	0	0	0	0		
13 ↑	19	5.5	12.3	5.7	0	0	0	0	0		
14 ↑	20	7.5	13.8	4.2	0	0	0	0	0		
15 ↑	24.5	10	17.3	0.7	0	0	0	0	0		
16 ↑	26.5	9	17.8	0.2	0	0	0	0	0		
17 ↑	29	10	19.5	0	1.5	0	0	0	0		
18 ↑	31	13	22	0	4	0	0	0	0		
19 ↑	30.5	16	23.3	0	5.3	0	0	0	0		
20 ↑	31	16	23.5	0	5.5	0	0	0	0		
21 ↑	32.5	18	25.3	0	7.3	0	0	0	0		
22 ↑	28	20	24	0	6	0	0	0	0		
23 ↑	26	18	22	0	4	4.6	0	4.6	0		
24 ↑	22.5	13	17.8	0.2	0	0	0	0	0		
25 ↑	26	9.5	17.8	0.2	0	0	0	0	0		
26 ↑	28.5	14	21.3	0	3.3	8	0	8	0		
27 ↑	28	19	23.5	0	5.5	0	0	0	0		
28 ↑	27	16	21.5	0	3.5	0	0	0	0		
29 ↑	30	15	22.5	0	4.5	0	0	0	0		
30 ↑	30.5	16	23.3	0	5.3	0	0	0	0		
Sum				22.1	87.2	49	0	49	0		
Avg	26.9	13.4	20.2								
Xtrm	32.5	5.5									
Summary, average and extreme values are based on the data above.											



**STRATHROY-MULLIFARRY
ONTARIO**

[Latitude:](#) 42°58'50.022" N [Longitude:](#) 81°38'34.086" W [Elevation:](#) 243.00 m
[Climate ID:](#) 6148122 [WMO ID:](#) [TC ID:](#)

[illegible]



Daily Data Report for August 2020

Latitude: 42°58'50.022" N Longitude: 81°38'34.086" W Elevation: 243.00 m
Climate ID: 6148122 WMO ID: TC ID:

[illegible]



Daily Data Report for September 2020

Latitude: 42°58'50.022" N Longitude: 81°38'34.086" W Elevation: 243.00 m
Climate ID: 6148122 WMO ID: TC ID:

[illegible]



**STRATHROY-MULLIFARRY
ONTARIO**

[Latitude:](#) 42°58'50.022" N [Longitude:](#) 81°38'34.086" W [Elevation:](#) 243.00 m
[Climate ID:](#) 6148122 [WMO ID:](#) [TC ID:](#)

Daily Data Report for October 2020

[illegible]



Daily Data Report for November 2020

Latitude: 42°58'50.022" N Longitude: 81°38'34.086" W Elevation: 243.00 m
Climate ID: 6148122 WMO ID: TC ID:

[illegible]



STRATHROY-MULLIFARRY
ONTARIO

Latitude: 42°58'50.022" N Longitude: 81°38'34.086" W Elevation: 243.00 m
Climate ID: 6148122 WMO ID: TC ID:

Daily Data Report for December 2020

[illegible]

Legend

Daily Data Report for January 2018

M = Missing

E = Estimated

A = Accumulated

C = Precipitation occurred, amount uncertain

L = Precipitation may or may not have occurred

F = Accumulated and estimated

N = Temperature missing but known to be > 0

Y = Temperature missing but known to be < 0

S = More than one occurrence

T = Trace

* = The value displayed is based on incomplete data

† = Data for this day has undergone only preliminary quality checking

‡ = Partner data that is not subject to review by the National Climate Archives

Table B-3
Precipitation Event Monitoring - RWDI Envision Rain Gauge Report
Twin Creeks Environmental Centre - Poplar System

Year:	2020											
Month:	January	February	March	April	May	June	July	August	September	October	November	December
Day	Amount Recorded											
1	0.2	0.4	0.2			3		14.8	15.2	12.2	0.6	6.4
2		3.2	0.6			4.0		8.6		3.2		1.6
3			0.4					35.8		3.0		
4				0.4				3.2		5.8		1.4
5	1.8								4.4			0.8
6	1.4		0.8						29.4	1.6		
7		0.2		12.8					2.0			0.2
8		0.4		8.0					5.2			
9		1.0	8.4	2.2		7.8						
10	14.4		0.6		11.2	7.2	10.2				4.2	
11	61.8					2.4						5.6
12			0.4	3.0			1.2		0.8	16.4		13.8
13	0.2	1.2										
14					6.2					0.8	12.6	
15					1.2		1.4			3.6	6.4	
16			0.6				2.4	33.4			0.2	
17	0.2	0.4		0.8	15.0			0.6		0.2		
18	5.2		2.2		11.8					5.8		0.4
19			2.8	0.2	0.8		0.2			4.0		0.6
20	0.6		3.4							7.2		
21				0.2						1.8		2.4
22			0.4	1.6	0.6		0.2				4.6	
23			3.4	3.8		6.8				3.6	0.6	
24	8.8	1.4				3.6		6.8		0.8	1.6	0.6
25	1.8	0.2		0.8		0.6				0.2	13.4	
26	2.4	1.2				1.4		0.6			0.2	
27			10.4		0.6	1.6	2.6	27.0	15.2	6.4		6.6
28		0.2	15.8	2.6	3.6	0.2	5.2	7.2	0.8			
29	0.4		0.6	5.0	1.8	4.4			0.8	0.2	1.4	
30			0.8	3.2					1.8	5.6	10.2	4.2
31	0.4		0.2							3.6		
Total	99.6	9.8	52.0	44.6	52.8	43.0	23.4	138.0	75.6	86.0	56.0	44.6
										Total	725.4	

Notes:

1) Units are in millimetres (mm) of liquid and/or liquid equivalent (i.e. snow melt)

APPENDIX C:

Field Protocols



GENERAL FIELD SAMPLING PROTOCOLS

LAST UPDATED: FEBRUARY 11, 2019

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1 SURFACE WATER MONITORING

Surface water flow is typically precipitation dependent. When sufficient precipitation occurs to produce flowing conditions within the surface water drainage network, flowing water is monitored to assess potential effects from leachate to runoff flowing over the landfill cap and/or waste disposal area. Surface water sampling will typically consist of the general protocols noted below.

- If sampling is occurring within a drainage ditch, the surface water flow rate should be measured in the field. The flow rate may be determined by measuring the approximate width and depth of the ditch and/or channel. To measure velocity, a floating object may be used to measure the time it takes it to travel (float) a specified distance. Thus, the cross-sectional area of the ditch and/or channel (width X depth) times the velocity per distance gives a flow rate. The floating object may be used several times and an average water velocity may be calculated. Care should be taken to account for windy conditions and that the floating object is not influenced by wind or hindered by ancillary vegetative growth and/or debris.
- An unpreserved sampling bottle typically used as part of the sampling suite of bottles may be used to scoop water from the ditch/channel and to fill the required bottle set.
- Field chemical assessment may be completed within the ditch/channel. If the ditch/channel depth does not allow proper submergence of the field equipment, it is recommended that an inert, non-preserved sampling bottle be filled to perform the field testing. Field measurement for dissolved oxygen may not be possible during low flow conditions.
- During water retrieval, care should be taken as to minimize the collection of floating detritus/debris and the disturbance of bottom sediment. If the sampler is able to stand within the ditch/channel to conduct the sampling, water should be collected upstream to minimize impacts from disturbed sediment.
- Sample preservation and volatile organic sampling protocols should adhere to Sections 6.2 and 6.3, respectively, of this protocol.
- Sample handling and sampling equipment decontamination protocols should adhere to Sections 7 and 9, respectively, of this protocol.

1.1 Sampling DOC in Surface Water

- Attach a decontaminated funnel to a new unused piece of Waterra® tubing that is approximately 1 meter in length.
- Connect a QED filter to the Waterra® tubing using a QED discharge tube as a connector.
- Slowly pour sample water into funnel from sampling container and permit approximately 425 mL of water to gravity drain out through the filter and discard.
- Do not force the water through the filter by blowing or using pressurized air since sediment or filter media may be forcibly passed through the filter and affect sample analytical results.
- Collect a sample for DOC into the dedicated preserved bottle (approximately 125 ml) after discarding approximately 425 mL of water through the filter.

2 WELL DEVELOPMENT

Monitoring wells should be developed to remove drilling fluids and sediment introduced during drilling. Development would continue until the discharge water is relatively sediment free. If properly performed, development will improve the hydraulic properties of the filter pack.

The procedure is as noted below.

- Wells will be developed by one of the two methods noted below.
 - Pumping with an inertial lift pump assemblage. The pump consisting of dedicated polyethylene tubing with a check valve at the downhole end.
 - Pumping with a small diameter submersible pump.
- Equipment will be assembled and decontaminated prior to installation in the well. Care will be taken not to introduce sediment or contamination with the equipment during installation.
- Develop the well by purging/pumping water from the well until three (3) well volumes are measured or until purged/pumped to dryness. The effectiveness of the development is monitored at regular intervals by observing the turbidity of the discharge water. Additionally, electrical conductance, temperature and pH measurements will also be taken periodically during development. These measurements along with the volume of water removed will be recorded in the field.

3 LIQUID LEVEL MONITORING

Water level and fluid pressure transducers can be used to determine groundwater flow directions and, when combined with hydraulic gradient data, flow rates. Water levels are measured in wells using a portable water level meter consisting of an electronic probe attached to a coaxial graduated cable. When the probe makes contact with the liquid, a circuit is completed and an alarm sounds.

The depth to water can be read from the probe's graduated cable. Pressure transducer information can be downloaded from the datalogger to a laptop computer on a routine basis.

The procedure for obtaining water level information is as noted below.

- Carefully remove the well cap to avoid introduction of foreign material into the well.
- Lower the pre-cleaned water level probe slowly down the monitoring well until an audible alarm sounds. This indicates that the probe has contacted the liquid.
- Determine the depth to the top of liquid in the monitoring well from the graduated cable. Use the highest point on the well riser to reference the depth to liquid. Repeat the measurement a second time for confirmation.
- Record the water level to the nearest 0.01 m in the project designated Field Book.
- Check historical liquid level measurements for the well, if available. If liquid level varies more than 0.1 m from the previous reading, re-check liquid level for confirmation.
- Slowly remove the probe from the monitoring well and dry the cable and probe with clean tissue as they are removed. Decontaminate the probe between monitoring wells following the decontamination protocols presented in Section 9.

4 FIELD HYDRAULIC CONDUCTIVITY TESTING

A Hydraulic Conductivity Test (or Slug Test) is a common method used to determine the in-situ hydraulic conductivity of the hydrostratigraphic unit adjacent to a monitoring well screen. This is accomplished by analyzing the water level response with time in the monitor following either an induced decrease (Rising Head Test) or induced increase (Falling Head Test) in water level.

4.1 Rising Head Test

The procedure for completing a Rising Head Test is as noted below.

- Measure and record the static water level as outlined in Section 2. Only wells that have fully recovered to static level conditions should be slug tested.
- Calibrate and setup a pressure transducer into the monitoring well at a point below any inertial lift or submersible pump. If the well is thought to have a high hydraulic conductivity (based on observed lithology during drilling), it is preferable to use a direct read cable so that real time data may be observed during testing. Otherwise, the pressure transducer should be hung on an inert down borehole cable.
- Prepare the apparatus for removing the water column from the monitor. Equipment could include a dedicated inertial lift pump, if previously in place in the well, a bailer or a submersible pump.
- Remove water from the well as quickly as possible.
- Upon removal of the desired volume of water from the well, start a stopwatch, and record the actual time and initial water level.
- Record the water level response versus time at 10 second intervals for the first 5 minutes of the test.
- Examine the collected data and establish an approximate rate of water level recovery. By noting levels and completing the calculations on the Hydraulic Conductivity Field Data Record, estimate the time required for the water level to achieve a pre-determined level. From this estimate, establish a schedule of water level measurements such that a sufficient database is available for analysis.
- Terminate the test the pre-determined head level is attained.

4.2 Falling Head Test

With respect to leachate wells it is preferable not to draw contaminated liquid to surface. In such instances it would be preferable to complete a falling head test where a slug of water is introduced to the well and the rate of liquid level decrease is measured over time.

It should be noted that any leachate characterization work should be completed prior to commencing with a falling head test.

The procedure for completing a Falling Head Test is as noted below.

- Measure and record the static water level as outlined in Section 2. Only wells that have fully recovered to static level conditions should be slug tested.
- Calibrate and setup a pressure transducer into the monitoring well. If the well is thought to have a high hydraulic conductivity (based on observed lithology during drilling), it is preferable to use a direct read cable so that real time data may be observed during testing. Otherwise, the pressure transducer should be hung on an inert down borehole cable.
- Prepare a measured amount of potable water, sufficient enough to raise the head in the well by a minimum of 2 m above the sand pack within the well.
- Introduce water from the well as quickly as possible.
- Upon introduction of the desired volume of water into the well, start a stopwatch, and record the actual time and initial water level.
- Record the water level response versus time at 10 second intervals for the first 5 minutes of the test.
- Examine the collected data and establish an approximate rate of water level recovery. By noting levels and completing the calculations on the Hydraulic Conductivity Field Data Record, estimate the time required for the water level to achieve a pre-determined level. From this estimate, establish a schedule of water level measurements such that a sufficient database is available for analysis.
- Terminate the test when the pre-determined head level is attained.

5 GROUNDWATER AND LEACHATE SAMPLING

5.1 Monitoring Well Purging

Monitoring wells should be purged prior to sampling such that groundwater and leachate samples are representative of the formation being assessed. Purging involves the removal of at least three volumes of liquid in those monitoring wells with moderate yields and at least one well volume from monitoring wells with low yields (slow water level recovery). Purging can be accomplished by a number of methods including pumping with a submersible pump or an individually dedicated inertial lift pump assemblage.

Selection of purging equipment will depend on the anticipated water level recovery rate as outlined in the third step of the procedure noted below.

- Carefully remove the well cap to avoid introducing foreign materials into the well.
- Determine the depth to water in the monitoring well per Section A.8 of this document. Calculate the volume of liquid in the well using the following formula:

$$V_c = \pi (D - W)l^2 \times 1000$$

Where, V_c = Volume in well casing (litres)
 l = inside radius of casing (m)
 D = well depth (m)
 W = depth to water from top of riser (m)
 π = 3.1415

- Purge the well by pumping. For deep wells with large volumes of liquid and quick level response, pumping is the most effective method of well purging. Bailing is appropriate for shallow wells with slow liquid level recovery rates.
- Measure the purged volume of liquid using a graduated container and record the volume of water and number of well volumes removed.
- Continue purging until the predetermined volume of liquid is removed. Record electrical conductance, pH, temperature, and turbidity observations during purging. The stability of these measurements with time can be used to guide the decision to discontinue purging.
- Well purging data should be recorded in the project designated Field Notebook on the Development/Purging Record.
- Collect groundwater/leachate samples as soon as there is sufficient volume of liquid in the well, in accordance with the protocol specified in Section 5.2.
- Typically, a dedicated water level tape is used for leachate monitoring wells only.
- Leachate sampling from maintenance holes is typically completed using a dedicated bailer per sampling location.

5.2 Sampling with Inertial Lift Pump

An inertial lift pump can be used to collect groundwater samples from most wells. A typical inertial lift pump consists of a length of high density polyethylene tubing with a foot valve on the downhole end of the tubing.

By rapid up-and-down movement of the tubing, the groundwater is drawn through the foot valve and up the tubing to the surface where it can be collected for chemical analysis.

The procedure is as noted below.

- Wearing disposable nitrile gloves, attach the foot valve to the downhole end of the tubing and test that the connection is tight by pulling vigorously on the foot valve. Only new polyethylene tubing and foot valves should be used. The tubing and foot valve should be dedicated to the monitoring well.
- Place the foot valve and tubing down the monitoring well to the desired sampling depth and cut the tubing approximately 1.2 metres above the top of the well casing.
- Rapidly raise and lower the tubing, thus lifting a water column in the tubing an equal distance to each stroke length. Repeat the up-and-down motion, at a rate of approximately 90 strokes per minute, until water discharges from the tubing.
- If the monitoring well has not been purged, the inertial lift pump can be used for purging prior to sample collection, as outlined in Section 5.1 of this document. Discharge water from the inertial lift pump should be collected into a graduated container to monitor the volume of water removed.
- Once the monitoring well has been purged and recovered sufficiently, repeat the third step to retrieve a sample of groundwater from the monitoring well. Samples should be collected from the pump's discharge directly into sample bottles. Refer to Section 6.1, for the protocol to field filter aqueous metal samples. Refer to Section 6.3 for the protocol to collect volatile organic samples with the inertial lift pump.

The sample handling and collection order should be in accordance with the protocol specified in Section 7.1 of this document.

5.3 Sampling with a Bladder Pump

Groundwater samples at WM sites are collected via QED bladder pumps equipped with high density polyethylene tubing that are dedicated to each individual monitoring well to minimize cross contamination and to encourage the reuse of equipment/supplies and minimize waste. To further minimize cross contamination between wells, clean nitrile gloves should be worn during sample collection activities.

A representative groundwater sample is collected from the groundwater monitoring well locations following the minimal purge sampling method. The minimal purge sampling method requires that a minimum volume of standing water be removed from the pumping system prior to collecting a sample. Thus, the volume of water to be purged consists of one volume of the bladder plus one volume of the discharge tubing.

The field methodology noted below may be utilized to conduct minimal purge groundwater sampling.

- Carefully remove the well cap to avoid introducing foreign materials into the well.
- Before sampling groundwater, determine the depth to water in the monitoring well using a water level contact meter. The meter should be cleaned using phosphate-free detergent between monitoring locations before taking a reading to minimize cross-contamination.
- Calculate the volume of liquid in the discharge line using the following formula:

$$V_d = ((\pi (L)r^2) * 1000) + VB$$

Where, V_d = Volume in discharge line (L)
 r = inside radius of discharge line (m)
 L = length of discharge tubing (m)
 VB = volume of bladder in pump (L)
 π = 3.1415

- Initiate minimal purge sampling.
- Measure the purged volume of liquid using a graduated container and record the volume of water removed.
- Begin the collection of groundwater samples following the removal of the pre-determined minimal volume as calculated above. The field personnel should be aware of any special sampling procedures prior to initiating the groundwater sampling program (e.g., filtering metals/DOC, parameter order of sampling sequencing, etc.).
- Record electrical conductance, pH, temperature, and turbidity measurements after sample collection.
- Well purging data is recorded in the dedicated WM Sampling Field Sheets provided by the laboratory.

5.4 Potable Water Supply Well Sampling

Samples from potable supply wells are typically collected from a cold water tap as close to the wellhead or pump as reasonably practical. It is critical that the sampling location is upstream of any water treatment processes in the water supply system.

The procedure is as noted below.

- Ensure a clean pair of new, non-powdered disposable nitrile gloves are donned prior to collecting each sample.
- Disconnect any hoses, filters or aerators attached to the tap prior to sampling.
- Purge the water supply by running the tap using a smooth flowing water stream at moderate pressure for at least 15 minutes. Note: it may be necessary to open a separate tap downstream of the sampling location to prevent backflow to the sampling location. Field parameters pH, temperature and electrical conductance should be measured at 5 minute intervals. The well is considered purged following stability of the field parameters. If the field parameters are not stable after 15 minutes discretion should be used in collecting the sample.

- Collect the sample directly from the tap using a laboratory supplied unpreserved sample bottle. Decant the sample aliquot from the unpreserved bottle into all bottles containing preservative (to avoid splashing preservative onto the tap used for sampling). Continue to collect sample in this manner until all laboratory provided bottles are filled.
- Record the field parameters noted below for a sample aliquot immediately following sample collection.
 - Label the water sample with the physical address from which the sample was collected.
 - Record the following information in the field notebook.
 - Name of residents or water supply owner/operator.
 - The physical address from which the sample was collected.
 - Contact information for the resident or water supply owner/operator.
 - Time the sample was collected.
 - Detailed location from where the sample was collected.
- The sample handling and collection order should be in accordance with the protocol specified in Section 7.1 of this document.

5.5 Sampling DOC in Groundwater

This section discusses the methodology for sampling the parameter dissolved organic carbon (DOC) in groundwater and surface water at Waste Management facilities. Prior to sampling for DOC, please verify that a dedicated DOC sampling bottle is used for the sampling event. These bottles are typically a 125 mL amber glass bottle with sulfuric acid preservative.

The procedure is as noted below.

- Attach filter to dedicated well sampling tube and discard approximately 100 mL of water through the filter.
- Do not force the water through the filter by blowing or using pressurized air since sediment or filter media may be forcibly passed through the filter and affect sample analytical results.
- Collect a sample approximately 125 mL for metals into the dedicated preserved bottle after discarding 100 mL of water sample through the filter.
- Discard an additional approximately 200 mL of water through the filter.
- Collect a sample for DOC into the dedicated preserved bottle after discarding the additional 200 mL of water through the filter. However, if the well does not require a sample for metals analyses, then discard approximately 425 mL of sample through the filter then fill the dedicated preserved bottle for DOC with filtered sample.

5.6 Filter Blank Preparation for DOC (if required)

As samples for metals are not field filtered when sampling for a DOC field blank, at least 225 mL of distilled water must pass through the filter prior to the collection of the DOC sample for the filter blank.

Follow procedures noted above in Section 5.5 using the laboratory prepared and supplied field blank sample water.

6 SAMPLING REQUIREMENTS

6.1 Field Filtration

Aqueous samples for analysis of dissolved (soluble) metals should ideally be filtered in the field. If laboratory filtering is required, it should be performed immediately after sample collection (within a few hours of sample collection).

The procedure is as noted below.

- Aqueous metals samples collected with an inertial lift pump will be filtered using an inline 0.45 micron disposable filter assemblage. Attach the filter assemblage to the pump's discharge to collect samples.
- Raise and lower the tubing, thus lifting a column of water in the tubing a distance equal to the stroke length. Repeat the up-and-down motion at a rate of approximately 90 strokes per minute, until water discharges from the filter.
- Collect samples directly from the filter's discharge into sample bottles. Bottles for metals analysis should be pre-charged with preservative by the laboratory prior to receiving the bottles.
- In-line filters will not be reused.

6.2 Sample Preservation

Preservatives for samples are typically pre-charged into the sample bottles provided by the laboratory.

Preservatives are used to keep the parameters of interest as close to their sampling conditions as possible until the analysis can be completed.

The preservation requirements for common analytes are summarized below. It is intended as a guide, as each laboratory may use different sample bottles and preservatives.

Parameter	Container Type	Holding Time	Preservation
General Chemistry	HDPE	7 - 28 Days	None
DOC (field filtered)	Glass Amber	10 Days	H ₂ SO ₄ to pH<2
Metals (Total and Dissolved)	HDPE	60 Days	HNO ₃ to pH<2
Mercury	Glass	28 Days	K ₂ Cr ₂ O ₇ + HNO ₃ to pH<2
Nutrients	HDPE	7 - 14 Days	H ₂ SO ₄ to pH<2
Phenols (4-AAP)	Glass Amber	30 Days	H ₂ SO ₄ to pH<2
VOCs	40 mL Glass Vials	14 Days	HCl to pH<2
PAHs	1 L Glass Amber	14 Days	None

6.3 Sampling for Volatile Organic Compounds

Many organic compounds volatilize readily and thus, added care is required during sample collection to minimize aeration. The steps outlined below when used in conjunction with standard groundwater sampling protocols, enhance the accuracy to determine organic compounds content of a liquid. The protocol presents a method for collecting organic samples with the inertial lift pump. Alternatively, organic samples can be collected using a low flow pumping assemblage (where possible).

- Follow the procedure outlined in Section 5.1 for purging monitoring wells with an inertial lift pump.
- Once the monitoring well has been purged and recovered sufficiently to yield a sample, insert approximately 2 m of narrow diameter clean polyethylene tubing into the inertial lift pump assemblage, leaving about 0.5 m of the narrow tubing extending from the discharge end of the pump.
- Raise and lower the inertial lift pump, thus lifting a water column in both the narrow diameter inner tubing and the inertial lift pump assemblage, a distance equal to each stroke length. Repeat the up-and-down motion until water discharges from both the inner tubing and the inertial lift pump assemblage.
- Once water is discharging from both the inner tubing and the inertial lift pump assemblage stop pumping. Water should continue to discharge from the narrow diameter tubing.
- Collect volatile organic compound samples from the discharge of the narrow tubing directly into the laboratory provided sample containers. Follow protocols identified below and in Section A.6 for sampling handling.
- In addition to the standard sample handling protocols, consider the protocols noted below.
 - Keep sample vials cool prior to and following sampling.
 - Minimize the interval of time that the sample is in contact with the air.
 - Completely fill sample vials, eliminating any air space between the sample and the cap.
 - Seal sample containers tightly and immediately place vials in an upright position in a sample cooler containing ice packs.

6.4 Duplicate Sample Collection

Duplicates are used to assess the reproducibility of the analytical results and assess sampling handling techniques. The typical procedure for duplicate sample collection is detailed below.

- Determine the sample identification that is distinct from all monitoring well identifiers used in the sampling program (e.g., GWDUP2, etc.).
- Record the duplicate sample ID and the primary sample ID in the field notebook.
- Proceed with the sampling sequence provided above, collecting the sample in a laboratory provided unpreserved sample bottle.

- Decant the sample into the primary sample container and the duplicate sample container as noted below.
 - Add sample to the primary sample container to one half of the container volume.
 - Add sample to the duplicate sample container to one half of the container volume.
 - Continue adding sample to each container in increments until the required sample volume is achieved.
- Continue the sample collection sequence noted above for each laboratory provided container.
- To prevent VOC volatilization from the sample during collection, VOC samples should be collected by filling one primary sample vial, followed by any duplicate sample vials, filling in sequential order.

One field-prepared duplicate sample is typically collected for every ten samples collected. The field-duplicate is a split sample from a randomly selected sampling location. The field duplicate analytical results are compared to the original sample results. For the field-prepared duplicate samples, the results for the required parameters of analysis are evaluated for the relative percent difference (RPD) of parameter concentrations using the USEPA National Functional Guidelines (USEPA 540-R-10-011) as a general QA/QC RPD screening mechanism. The RPD screening mechanism is such that for concentrations greater than five times the laboratory reportable detection limit (RDL), a concentration difference of less than or equal to 20% would be deemed acceptable. For concentrations less than or equal to five times the RDL, a concentration difference of equal to or less than the RDL would be deemed acceptable. Where an exceedance of the general QA/QC RPD screening mechanism is identified, the results for the required parameters of analysis are evaluated against the applicable performance standards for sample duplicates noted in Tables 5.1 to 5.15 of the *Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*, as prepared by the Ministry of the Environment, dated March 8, 2004, and amended to July 1, 2011.

The RPD is calculated as follows:

$$\left| \frac{(X_1 - X_2)}{\left(\frac{X_1 + X_2}{2} \right)} \right| * 100$$

X₁ represents a chemical parameter concentration from the original sample, while X₂ represents a chemical parameter concentration from the duplicate sample.

6.5 Field Blanks

During groundwater sampling, a field blank may be prepared at a randomly selected monitoring location. The location in the field should be representative of average sampling conditions (i.e. not at a well near a haul road where that well represents <5% of locations). The field blank is generally prepared as noted below.

- Place a set of bottles identical to that which will be used to collect an original sample, for the sample with the greatest number of parameters in its analytical suite, onto a platform or stable surface. The bottles of the field blank set should be placed away from potential adverse influences (e.g., exhaust pipe of a vehicle, road dust, etc.).
- The bottles of the field blank set are to be opened and filled with distilled water, as provided by the laboratory.
- The bottles of the field blank set will remain opened while sample collection is occurring.
- Upon completion of sample collection, the field blank bottle set should be capped immediately.
- The field blank bottle set should be appropriately labeled and placed into the cooler with the original sample(s).

6.6 Trip Blanks

Trip blanks are utilized to assess whether or not influences to sample bottles occur during transportation from and to the laboratory. Typically, trip blanks are laboratory-prepared solutions of water. The trip blanks are generally provided in 40 ml vials. Upon receipt from the laboratory, a trip blank should be placed immediately on ice or in a refrigerator and held for no more than 14 days prior to its usage. Once sampling is complete, the trip blank may be placed into a cooler along with natural water samples collected (groundwater and surface water) for shipping to the laboratory. A trip blank should not be placed into a cooler with liquids that may have the potential to influence its chemistry (e.g., leachate, sludge, odorous soils, etc.). If a laboratory-prepared trip blank is held more than 14 days, it should be discarded and a new laboratory-prepared solution be requested from the laboratory.

Trip blanks differ from spiked travel blanks. Spiked travel blanks contain one or more chemical parameter(s) (typically VOCs) of known concentration. Similar to the trip blank, the spiked travel blank is placed into a cooler for transport from and to the laboratory. The spiked travel blank is analyzed at the laboratory for the specified chemicals of known concentration to assess whether or not volatile chemicals are released during transport, as identified by a decreased concentration.

The results of the original sample's volatile chemical concentration may be adjusted by the difference in volatile concentration noted for the trip blank and/or spiked travel blank (i.e., if the spiked travel blank VOC concentration increases by 2 ppm during transport, then it is likely that the original sample would be subject to the same increase in concentration during transport).

7 SAMPLE HANDLING

7.1 General Considerations

Groundwater samples are to be collected after the monitoring well has been purged and has recovered sufficiently to yield a sample. Sampling of monitoring wells will be typically performed using an inertial lift pump. The protocol for inertial lift pump is outlined in Section 5.2.

The general procedures used when handling water samples, to help maintain their integrity and representativeness of site conditions, are outlined below.

- Sampling should be completed immediately after purging. If the well recovers slowly and does not yield sufficient quantities to sample immediately, the well may be sampled within 24 hours after purging, or until a sufficient volume of groundwater is recovered to conduct proper sampling at an interval of time that may be determined based on field observations and historic purging records.
- Samples will be placed in laboratory pre-cleaned bottles pre-charged with preservative. Care should be taken to avoid overfilling the bottle thereby diluting the preservative.
- Samples should be collected following an order which accounts for the volatilization sensitivity of the parameters to be analyzed, as noted below.
 - Volatile organic compounds.
 - Semi-volatile organic compounds.
 - Total and dissolved metals.
 - Nutrients.
 - General chemical parameters.
 - Field parameters (pH, conductivity, turbidity, and temperature).
- Prepare labels for sample bottles in accordance with the requirements specified in Section 7.2.
- Affix a security seal to the lid of the sample container. If the bottle is opened after being sealed, it will be evident from the broken seal;
- Take or ship samples to the laboratory within 48 hours of sampling. For shipment, mark sample coolers with "WATER SAMPLES – DO NOT FREEZE";
- Record well sampling data within a dedicated field book. The order in which wells were sampled should also be recorded in the field.

7.2 Sample Labeling

To prevent the misidentification of environmental samples and to aid in the handling of samples, the protocols outlined below should be followed when labeling samples. Each sample should be assigned an alphanumeric identification code that will appear on the sample bottle label and will be recorded on the Chain of Custody forms and Water Sampling Field Data Sheet.

- Attach a non-removable, water resistant label to each sample container (if not provided by laboratory).
- Assign each sample a unique alphanumeric identification code.
- Secure label with tape as required.
- Record the sample identification code on the Water Sampling Field Data Sheet and the Chain of Custody forms.

7.3 Sample Storage and Shipping

The protocol noted below presents a method for packaging and shipping environmental samples to minimize the potential for sample destruction, loss, and tampering.

- Fill out the Chain of Custody form with all relevant information as outlined in Section 7.4. Place the original form in a plastic bag and secure to the inside of the sample cooler lid. A second completed copy of the Chain of Custody form should be retained by the sampler for inclusion in the project file.
- Place approximately 10 cm of inert cushioning materials (e.g., styrofoam peanuts, bubble pack) in the bottom of the cooler. Place bottles in cooler with volatile organic compound vials near the center of the cooler.
- Cover bottles, especially volatile organic compound vials, with ice in plastic bags, or ice packs. Pack cooler with additional cushioning materials.
- Tape drain shut and wrap cooler with tape to secure lid.
- Place laboratory address on top of cooler. To protect the coolers from tampering, the cooler lid should be taped to the cooler body. Place an initialed chain of custody seal over the tape. A broken seal will indicate that the contents may have been tampered with. Specify that the contents of the cooler are Fragile and place "This Side Up" labels, with the arrow pointing to the cooler lid, on all four sides of the cooler. "This Side Up" labels should not be affixed to the cooler lid or the cooler bottom. Also mark the cooler with "Water Samples – Do Not Freeze".
- All samples must be shipped or delivered in order to arrive at the laboratory within 48 hours of collection.

7.4 Chain of Custody Procedures

Chain of Custody procedures include the documentation of sample collection methods and the methods used to control the documents. These procedures are used when transporting environmental samples to track sample shipments, to minimize the loss or misidentification of samples, and to minimize unauthorized persons tampering with collected samples. Adherence to chain of custody procedures is essential if sample analytical chemistry results are to be used as evidence in litigation or at administrative hearings held by regulatory agencies.

General procedures to be used are outlined below.

- Sample bottles must be transported to the sampling location by designated personnel. When samples have been collected, completed sample labels must be attached as required to the sample bottles by designated personnel. Each label must be filled out as specified in Section 7.2.
- Once samples have been collected, seal bottles and affix a security seal to the lid. The seal, if broken, will indicate that the bottles have been opened after sampling.
- After sampling, the sample identification code must be recorded on the Chain of Custody form and the Water Sampling Field Data Sheet. Sample information such as difficulties encountered during sampling should also be recorded on the Water Sampling Field Data sheets.
- The original Chain of Custody form must accompany the filled sample bottles to the laboratory. The form, once filled out, should be sealed in a plastic bag and taped to the inside of the sample cooler lid. A second copy of the Chain of Custody should be retained by the sampler for inclusion in the project file.
- Mark the liquid level on the sample container with a grease pencil. A discrepancy in the marked liquid level and the received liquid level may signal sample tampering.
- Pack samples for transport/shipment to the analytical laboratory following the protocol outlined in Section 7.3. Seal the cooler with tape and an initialed Chain of Custody seal. A broken seal will indicate that the cooler contents may have been tampered with.
- Transport/ship samples to the analytical laboratory. The laboratory will be required to sign for the samples and note any evidence of tampering on the Chain of Custody form.

8 FIELD WATER AND LEACHATE QUALITY ANALYSIS

8.1 Collection of Field Quality Analysis Samples

Field analysis of pH, electrical conductance, and temperature should be performed on samples from each monitoring well following the collection of samples for chemical analysis. Field analysis should also be used to monitor the progress of purging and well development.

The procedure is as noted below.

- Samples for field water quality analysis should be collected into a pre-cleaned glass or PET beaker with an approximate volume of 200 mL.
- Sample collection order should be in accordance with the protocol specified in Section 7.1.
- To account for parameter sensitivity, measure field parameters in the following order: electrical conductivity, pH, and temperature.
- For individual parameter measurement procedures, refer to the methodologies listed below.

8.2 Calibration and Maintenance of Field Equipment

Field meters should be checked prior to use in the field such that the batteries are charged and that the meters are functioning properly. Instrument calibration should adhere to the manufacturer-provided maintenance manual for each individual meter to be used. Calibration should occur prior to the day's sampling activities, and may be completed by mid-day during extensive sampling events.

Decontaminate instrument probes between measurements in accordance with manufacturer's specifications.

Record the sample readings on the pertinent form in the Field Notebook.

9 SAMPLING EQUIPMENT DECONTAMINATION

9.1 Sampling Equipment Decontamination

The decontamination of sampling equipment used in the collection of environmental samples is important in minimizing the potential of cross contamination between sampling points. All sampling equipment used must be clean and free from residue of previous samples. Decontaminated equipment must not come in contact with soil and other potential sources of contamination between each use.

General procedures to be used are outlined below.

- Wash equipment thoroughly with non-phosphate detergent (e.g., Liquinox) and deionized water. Use a brush to remove any particulate matter or surface film, if recommended by manufacturer. Rinse with deionized water.
- Rinse equipment again with a deionized water that is demonstrated analyte free.
- Air dry.
- Seal the equipment in plastic bags for transportation and storage.

10 FIELD NOTEBOOK DOCUMENTATION

Cerlox bound Field Notebooks with numbered pages will be provided to record all field work details. Separate notebooks will be established for the tasks noted below.

- Summarize daily activities and equipment/supply usage.
- Document field measurements and sampling activities.
- Record drilling observations and well construction details.

The notebooks will be documents in their own right and will be maintained such that a third party reviewing the notebooks will be able to understand the work practices that were followed in the field.

A variety of forms will be used in the process of the field investigation to record data and observations. The forms will be maintained such that data and observations are presented in an organized and useful manner. The forms required to facilitate the data management process are alphabetically listed below. Example forms and a description of their uses follow.

10.1 Chain of Custody

Sample custody from the time of sample bottle preparation, through sample collection and return of sample to the laboratory for analysis is documented on the Chain of Custody Form. One completed Chain of Custody form is required for each shipment of bottles received from or sent to the laboratory.

10.2 Daily Activity Log Sheet

Completed for each day of investigation the Daily Activity Log summarizes field activities performed, weather, and any other pertinent observations.

10.3 Development / Purging Record

Use to record field parameters measured during development and/or purging a well, as well as the purging/development methodology employed and the volume of water removed.

10.4 Drilling Inventory Sheet

Used to track the usage of materials and supplies.

10.5 Equipment Calibration Record

Used to track the daily calibration of field instruments. This record must be updated as required by the instruments protocols.

10.6 Field Borehole Log

Used during drilling activities to record a variety of information concerning site subsurface conditions including, but not limited to stratigraphy, ease of drilling, water levels, etc. A Field Borehole Log will be completed for each borehole drilled on site.

10.7 Field Monitor Installation Form

This form is used to record the construction details of piezometers, including but not limited to screen length, total depth, thickness of filter, filter material types, etc. The form must be completed at the time of monitor installation.

10.8 Groundwater Level Monitoring Field Record

Used to document water levels observed in wells. Water level data should be recorded for wells as directed in the Study Work Plan.

10.9 Hydraulic Conductivity Testing Field Data Sheet

Used to record observations (time vs. water level measurements) made during a hydraulic conductivity test. The form provides space for noting the type of test performed (rising head or falling head test), equipment use, and field analysis parameters. One form should be filled out per well per hydraulic conductivity test.



10.10 Visitor Log Record

Ensure that each visitor to the site is logged on the visitors' log record and that exact records of all conversations are maintained.

10.11 Water Sampling Field Data Sheet

Used to record sampling times and methods, sample identification codes, sample handling procedures, and field analysis data. One form must be completed per sample location per sample event.

APPENDIX D:

Irrigation



Table D-1
Summary of Irrigation Volumes
Twin Creeks Environmental Centre - Poplar System

Year	Month						Annual Total
	May	June	July	August	September	October	
2017	Poplar System not operating due to expansion construction.				1,107,199	1,049,988	2,157,187
2018	861,921	1,614,383	2,074,983	909,447	148,710		5,609,444
2019	851,704	2,252,526	4,024,733	3,419,266	2,385,383	659,700	13,593,312
2020	2,676,780	5,035,945	2,927,744	1,178,358	1,154,070		12,972,897
Overall Total	4,390,405	8,902,854	9,027,460	5,507,071	4,795,362	1,709,688	34,332,840

- Notes:
- 1) Volumes in litres (L).
 - 2) Volume represents total liquid (water & leachate) applied via irrigation

Table D-2
Summary of Irrigation Rates
Twin Creeks Environmental Centre - Poplar System

Date	Precipitation Total (mm)	Poplar System	
		Irrigation Rates (mm/m ²)	Total Liquid Applied (mm/m ²)*
	Poplar System not operating due to expansion construction.		
May-17			
Jun-17			
Jul-17			
Jul-18	77.8	22.3	100.1
Aug-18	158.0	9.8	167.8
Sep-18	95.8	1.6	97.4
Oct-18**	32.6	0.0	32.6
	364.2	33.7	397.9
May-19**	92.0	9.2	101.2
Jun-19	64.0	24.2	88.2
Jul-19	37.4	43.3	80.7
Aug-19	57.0	36.8	93.8
Sep-19	48.4	25.6	74.0
Oct-19**	62.8	7.1	69.9
	361.6	146.2	507.8
May-20**	52.8	28.8	81.6
Jun-20	43.0	54.1	97.1
Jul-20	23.4	31.5	54.9
Aug-20	138.0	12.7	150.7
Sep-20	75.6	12.4	88.0
Oct-20**	Poplar system was not operating during the month of October.		
	332.8	139.5	472.3

- Notes:**
- 1) "*" denotes total liquid applied: precipitation + irrigation.
 - 2) "***" denotes precipitation total during application period.
 - 3) Following expansion of the Poplar System in 2017 the area of application is approximately 9.3 ha.
 - 4) Precipitation totals assume that trace precipitation is equivalent to 0.25 mm.
 - 5) Differences for precipitation total from on-site precipitation measurements are a result of the timing of measurements.

Table D-3
Annual Leachate Volumes Managed
Twin Creeks Environmental Centre - Poplar System

Year	Annual Volume of Leachate Applied to Poplar System	Annual Volume of Leachate Removed Off-Site	Annual Total Leachate Removed and Treated from Waste
Initial Poplar System			
2003	0	1,732,391	1,732,391
2004	641,208	3,666,721	4,307,929
2005	3,469,037	8,285,564	11,754,601
2006	4,686,000	8,194,072	12,880,072
2014	Poplar System not operating due to expansion construction.		
2015			
2016			
Expanded Poplar System			
2017	1,121,372	22,033,900	23,155,272
2018	4,303,435	26,681,859	30,985,294
2019	13,549,542	42,141,697	55,691,239
2020	10,823,172	38,972,220	49,795,392
Sub-Total Expanded	29,797,521	129,829,676	159,627,197
Overall Total	38,593,766	151,708,424	190,302,190

Notes:

1) Volumes in litres (L).

APPENDIX E:

Leachate

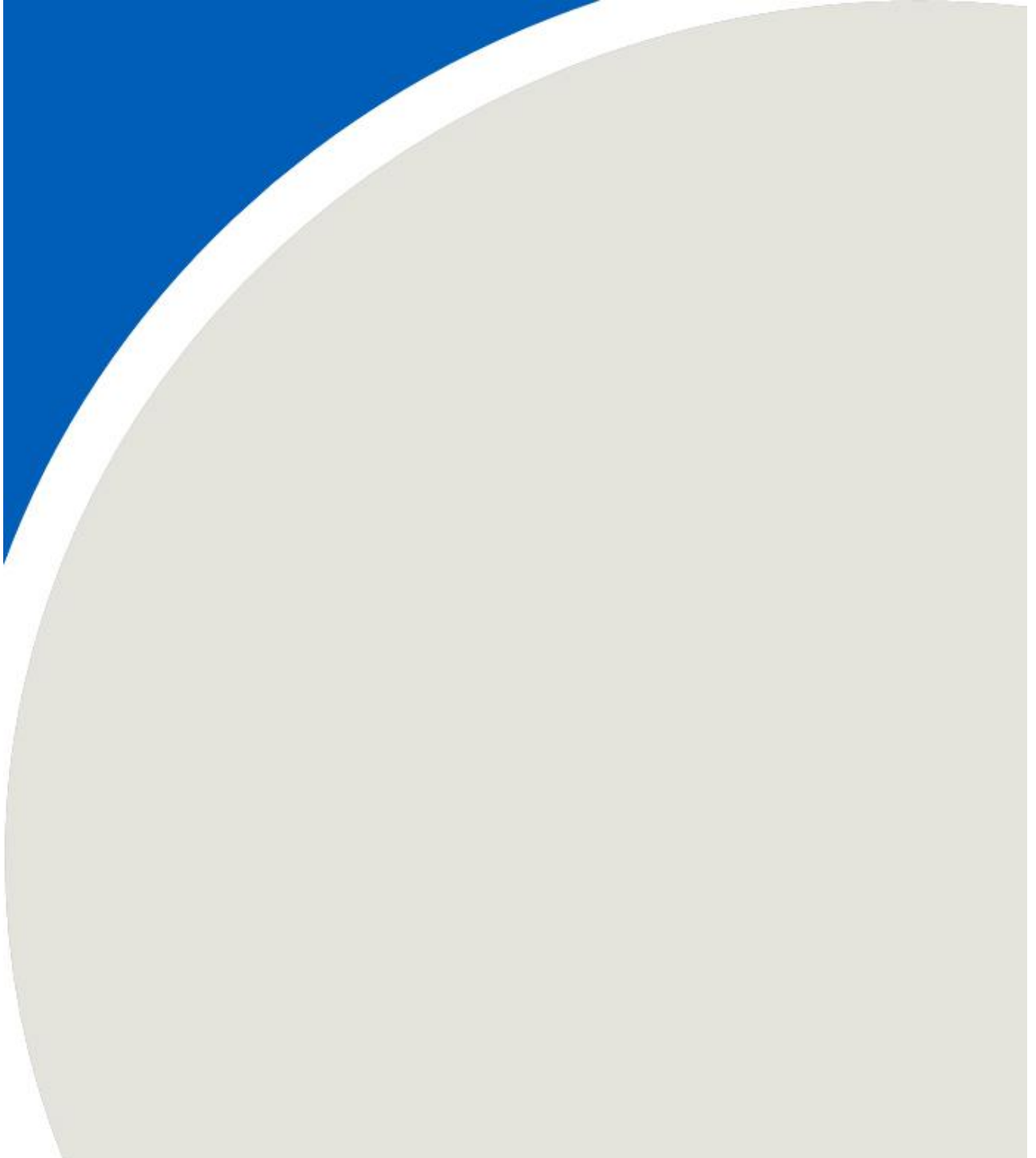


Table E-1
General Chemical Results - Irrigation Liquid
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Target Concentration 100% Leachate	CCME Guideline	Concentration																
				28-Sep-17	28-May-18	11-Jun-18	17-Jul-18	22-Aug-18	27-Sep-18	24-May-19	26-Jun-19	5-Jul-19	7-Aug-19	11-Sep-19	7-Oct-19	20-May-20	9-Jun-20	21-Jul-20	31-Aug-20	15-Sep-20
Alkalinity as CaCO ₃	mg/L	9,150	-	5000	1800	4800	2700	990	4600	1700	3700	1800	3700	3800	2800	1600	2400	3400	4800	1800
Chloride	mg/L	1,241	700 to 14,000*	1400	370	1200	760	240	730	310	720	500	1200	670	700	510	540	950	1100	520
Conductivity	uS/cm	10,616	-	9100	3600	8200	5500	3300	980	4700	9200	4600	10000	7900	8200	4830	5690	6110	9770	5910
N-NH ₃ (Ammonia)	mg/L	554	-	988	155	682	17	153	533	161	478	207	607	464	473	201	292	604	719	221
N-NO ₂ (Nitrite)	mg/L		-	<0.20	0.13	<0.20	0.033	0.01	<0.10	<0.050	<0.10	<0.010	<0.10	0.145	<0.10	0.057	<0.050	<0.10	<0.10	0.068
N-NO ₃ (Nitrate)	mg/L		-	<2.0	<1.0	<2.0	<0.10	<0.10	<1.0	<0.50	<1.0	<0.10	<1.0	<0.10	<1.0	0.36	<0.50	<1.0	<1.0	<0.10
pH	pH units		6.0-8.5	8.0	6.9	7.2	7.8	7.9	7.2	6.9	7.1	7.1	7.6	7.4	7.4	7.3	7.0	8.0	7.6	7.0
Sulphate	mg/L		-	<20	370	99	90	140	210	330	77	560	300	250	380	420	270	<50	480	290
Total Kjeldahl Nitrogen	mg/L	2,948	-	890	150	670	360	150	570	160	500	220	700	440	420	190	280	590	900	220
Total Phosphorus	mg/L	2.37	-	5.70	0.45	3.70	2.20	0.77	3.60	0.66	1.90	0.90	3.50	1.80	2.10	0.59	1.10	3.00	3.30	0.68
Calcium	mg/L		-	67	260	160	45	51	840	180	150	190	140	170	200	200	160	59	180	200
Magnesium	mg/L	347	-	170	140	230	88	53	330	130	200	200	170	190	180	110	140	100	180	130
Potassium	mg/L	238	-	380	74	380	190	78	270	79	230	110	290	180	190	78	120	300	330	120
Sodium	mg/L	921	-	1300	300	1200	560	240	820	370	770	550	940	650	740	350	530	850	1200	520
Aluminum	mg/L		20.0	0.4	0.3	0.3	1.2	0.2	56.0	0.2	0.1	0.5	1.3	0.3	0.7	0.15	0.09	0.55	0.4	2.6
Arsenic	mg/L		2.0	0.050	0.004	0.039	0.030	0.013	0.078	<0.005	0.009	0.004	0.050	0.008	0.021	0.005	0.007	0.049	0.05	0.012
Barium	mg/L		-	0.25	0.13	0.36	0.14	0.058	1.4	0.14	0.28	0.12	0.21	0.22	0.18	0.12	0.18	0.15	0.22	0.18
Beryllium	mg/L		0.1	<0.006	<0.0006	<0.003	<0.003	<0.0006	<0.003	<0.003	<0.003	<0.0006	<0.006	<0.0006	<0.0006	<0.0006	<0.0006	<0.003	<0.006	<0.0006
Bismuth	mg/L		-	<0.01	<0.001	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.005	<0.01	<0.001
Boron	mg/L	25.3	6.0	21.0	3.9	18.0	7.0	3.8	19.0	7.9	15.0	4.1	7.3	4.4	7.9	3.1	4.4	6.7	20.0	5.0
Cadmium	mg/L		0.01	<0.001	<0.0001	<0.0005	<0.0005	<0.0001	0.0016	<0.0005	<0.0005	<0.0001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.001	<0.0001
Chromium	mg/L	0.12	0.1	0.22	0.01	0.17	0.11	0.04	0.24	<0.03	0.04	0.02	0.18	0.05	0.10	0.03	0.032	0.24	0.23	0.06
Cobalt	mg/L		5.0	0.024	0.007	0.022	0.011	0.0045	0.099	0.004	0.011	0.0057	0.017	0.0089	0.011	0.0057	0.0069	0.019	0.019	0.0092
Copper	mg/L	0.43	5.0	<0.02	0.005	<0.01	<0.01	0.003	0.32	<0.01	<0.01	0.002	<0.02	<0.002	0.004	0.002	<0.002	<0.01	<0.02	0.007
Iron	mg/L	25	20.0	3.0	3.7	2.3	1.7	0.6	210.0	2.7	1.0	3.5	5.0	2.0	4.5	4.1	2.7	1.9	5.0	7.0
Lead	mg/L	0.33	2.0	<0.005	0.0008	<0.003	<0.003	0.0006	0.15	<0.003	<0.003	0.0025	<0.005	0.0015	0.0021	0.0008	0.0007	<0.003	<0.005	0.004
Molybdenum	mg/L	1.82	0.05	<0.02	0.003	<0.01	0.02	0.019	0.05	<0.01	<0.01	0.017	0.05	0.008	0.018	0.02	0.013	0.05	0.05	0.013
Nickel	mg/L	29.3	2.0	0.23	0.044	0.19	0.094	0.036	0.37	0.027	0.093	0.046	0.16	0.082	0.1	0.044	0.062	0.16	0.17	0.081
Selenium	mg/L		0.05	<0.05	<0.005	<0.03	<0.03	<0.005	<0.03	<0.03	<0.03	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.03	<0.05	<0.005
Silver	mg/L		-	<0.004	<0.0004	<0.002	<0.002	<0.0004	<0.002	<0.002	<0.002	<0.0004	<0.004	<0.0004	<0.0004	<0.0004	<0.0004	<0.002	<0.004	<0.0004
Strontium	mg/L		-	0.88	1.4	1.6	0.6	0.51	3.5	1.3	1.7	1.7	1.3	1.6	1.9	1.6	1.6	0.58	1.7	1.6
Tin	mg/L		-	0.02	0.003	0.02	0.02	0.006	0.04	<0.01	<0.01	0.004	<0.02	0.005	0.008	<0.002	0.003	0.02	<0.02	0.003
Titanium	mg/L		-	0.15	0.016	0.11	0.09	0.031	0.77	<0.03	0.06	0.022	0.18	0.05	0.07	0.026	0.036	0.14	0.16	0.069
Vanadium	mg/L		1.0	0.030	0.004	0.026	0.018	0.006	0.120	0.005	0.015	0.005	0.030	0.011	0.016	0.006	0.009	0.027	0.03	0.014
Zinc	mg/L	0.043	5.0	<0.1	0.020	0.080	0.070	0.030	1.800	<0.05	<0.05	0.030	0.100	0.020	0.040	<0.01	<0.01	0.050	<0.1	0.03

- NOTES:** 1) Blank denotes data not available.
- 2) Target Concentrations derived from LMP and "Expansion of Poplar Cap Irrigation System for Existing Waste Disposal Area" report by Genivar Consultants LP dated January 2010.
- 3) CCME Guidelines denotes maximum concentration for negative effects to vegetation for irrigation water as per Canadian Water Quality Guidelines (2004).
- 4) '*' denotes concentration estimated based on poplar tree tolerance and vegetable crops of > 710 mg/L (CCME, 2004), and salty water irrigation for poplars at 400 to 14,000 mg/L (Shanon et al, 1998).
- 5) '-' denotes no CCME Guideline.
- 6) µs/cm denotes microsiemens per centimeter.
- 7) mg/L denotes milligrams per litre.
- 8) "***" denotes parameter not analysed due to log in error at laboratory.
- 9) Shading indicates exceedances of the target concentrations.
- 10) Bolding indicates exceedances of CCME guideline.

Table E-2
Organic VOC Chemical Results - Irrigation Liquid
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Target Concentration 100% Leachate	Concentration																
			28-Sep-17	28-May-18	11-Jun-18	17-Jul-18	22-Aug-18	27-Sep-18	24-May-19	26-Jun-19	5-Jul-19	7-Aug-19	11-Sep-19	7-Oct-19	20-May-20	9-Jun-20	21-Jul-20	31-Aug-20	15-Sep-20
BTEX (Total)	µg/L	127*	36.0	17.3	91.8	25.4	11.9	50.2	8.3	79.9	57.3	61.0	55.0	59.3	42.9	30.3	31.9	74.8	42.0
Acetone (2-Propanone)	ug/L		710.0	20.0	490.0	410.0	75.0	44.0	<100	23.0	<200	330.0	<500	45.0	39	38	800	640	100
Benzene	ug/L		<5.0	1.6	4.8	0.9	0.4	3.1	<2.0	6.7	5.0	4.2	10.0	2.3	1.7	3	<2.0	3	3.6
Bromodichloromethane	ug/L		<5.0	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.50	<0.50	<5.0	<5.0	<0.50
Bromoform	ug/L		<10	<1.0	<10	<1.0	<1.0	<1.0	<10	<1.0	<20	<1.0	<50	<1.0	<1.0	<1.0	<10	<10	<1.0
Bromomethane	ug/L		<25	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.50	<0.50	<5.0	<5.0	<0.50
Carbon Tetrachloride	ug/L		<5.0	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	<0.20	<10	<0.20	<0.19	<0.19	<1.9	<1.9	<0.19
Chlorobenzene	ug/L		<5.0	2.6	5.4	<0.20	<0.20	3.1	<2.0	3.4	<4.0	1.0	<10	2.8	<0.20	3.2	<2.0	<2.0	1.3
Chloroethane	ug/L		<10	1.5	<10	<1.0	<1.0	2.4	<10	2.0	<20	<1.0	<50	<1.0	1.7	<1.0	<10	<10	1.2
Chloroform	ug/L		7.8	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	0.9	<10	<0.20	<0.20	<0.20	18.0	<2.0	<0.20
Chloromethane	ug/L		<25	<5.0	<50	<5.0	<5.0	<5.0	<50	<5.0	<100	<5.0	<250	<5.0	<5.0	<5.0	<50	<50	<5.0
Dibromochloromethane	ug/L		<10	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.50	<0.50	<5.0	<5.0	<0.50
1,2-Dichlorobenzene	ug/L		<10	<0.50	<5.0	<2.0	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.40	<0.40	<4.0	<4.0	<0.40
1,3-Dichlorobenzene	ug/L		<10	<0.50	<5.0	<2.0	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.40	<0.40	<4.0	<4.0	<0.40
1,4-Dichlorobenzene	ug/L		<10	2.0	<5.0	<2.0	<0.50	2.5	<5.0	3.2	<10	1.1	<25	1.9	0.65	1.2	<4.0	<4.0	2.6
1,1-Dichloroethane	ug/L		<5.0	0.7	<2.0	<0.20	<0.20	1.5	2.1	2.1	<4.0	0.5	<10	0.5	0.88	0.26	<2.0	<2.0	0.88
1,2-Dichloroethane	ug/L		<10	<0.50	<5.0	1.1	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.40	<0.49	<4.9	<4.9	<0.49
1,1-Dichloroethylene	ug/L		<5.0	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	<0.20	<10	<0.20	<0.20	<0.20	<2.0	<2.0	<0.20
cis-1,2-Dichloroethylene	ug/L		<5.0	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.50	<0.50	<5.0	<5.0	<0.50
trans-1,2-Dichloroethylene	ug/L		<5.0	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.50	<0.50	<5.0	<5.0	<0.50
1,2-Dichloropropane	ug/L		<5.0	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	<0.20	<10	<0.20	<0.20	<0.20	<2.0	<2.0	<0.20
cis-1,3-Dichloropropene	ug/L		<10	<0.30	<3.0	<0.30	<0.30	<0.30	<3.0	<0.30	<6.0	<0.30	<15	<0.30	<0.30	<0.30	<3.0	<3.0	<0.30
trans-1,3-Dichloropropene	ug/L		<10	<0.40	<4.0	<0.40	<0.40	<0.40	<4.0	<0.40	<8.0	<0.40	<20	<0.40	<0.40	<0.40	<4.0	<4.0	<0.40
Ethylbenzene	ug/L		<5.0	<0.20	16.0	2.3	1.2	5.9	<2.0	26.0	13.0	6.8	14.0	11.0	1.2	5.3	2.9	7.8	6.4
Ethylene Dibromide	ug/L		<10	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	<0.20	<10	<0.20	<0.19	<0.19	<1.9	<1.9	<0.19
Methylene Chloride(Dichloromethane)	ug/L		<25	<2.0	<20	<2.0	<2.0	<2.0	<20	<2.0	<40	<2.0	<100	<2.0	<2.0	<2.0	<20	<20	<2.0
Methyl Ethyl Ketone (2-Butanone)	ug/L		1000.0	<10	600.0	730.0	150.0	27.0	<100	<10	<200	100.0	<500	25.0	<10	12	1000	840	110
Methyl Isobutyl Ketone	ug/L		<250	<5.0	<50	18.0	5.5	<5.0	<50	<5.0	<100	12.0	<250	6.8	<5.0	<5.0	<50	<50	<5.0
Methyl t-butyl ether (MTBE)	ug/L		<10	1.1	<5.0	1.9	0.6	1.1	<5.0	1.1	<10	1.9	<25	1.1	<0.50	0.69	<5.0	<5.0	1.3
Styrene	ug/L		<10	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.40	<0.40	<4.0	<4.0	<0.40
1,1,1,2-Tetrachloroethane	ug/L		<10	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.50	<0.50	<5.0	<5.0	<0.50
1,1,2,2-Tetrachloroethane	ug/L		<10	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.40	<0.40	<4.0	<4.0	<0.40
Tetrachloroethylene	ug/L		<5.0	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	<0.20	<10	<0.20	<0.20	<0.20	<2.0	<2.0	<0.20
Toluene	ug/L		25.0	1.5	21.0	13.0	6.4	6.2	<2.0	4.2	4.3	21.0	10.0	11.0	4	3	17	35	6
1,1,1-Trichloroethane	ug/L		<5.0	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	<0.20	<10	<0.20	<0.20	<0.20	<2.0	<2.0	<0.20
1,1,2-Trichloroethane	ug/L		<10	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.40	<0.40	<4.0	<4.0	<0.40
Trichloroethylene	ug/L		<5.0	<0.20	<2.0	<0.20	<0.20	<0.20	<2.0	<0.20	<4.0	<0.20	<10	<0.20	<0.20	<0.20	<2.0	<2.0	<0.20
Trichlorofluoromethane (FREON 11)	ug/L		<10	<0.50	<5.0	<0.50	<0.50	<0.50	<5.0	<0.50	<10	<0.50	<25	<0.50	<0.50	<0.50	<5.0	<5.0	<0.50
Vinyl Chloride	ug/L		<10	0.3	<2.0	0.3	0.2	0.3	<2.0	0.5	<4.0	0.5	<10	0.4	<0.20	0.23	<2.0	<2.0	0.28
p+m-Xylene	ug/L		11.0	7.8	38.0	6.2	2.7	23.0	2.3	30.0	25.0	20.0	21.0	25.0	23	14	7.5	20	20
o-Xylene	ug/L		<5.0	6.2	13.0	3.0	1.2	12.0	3.0	12.0	10.0	9.1	<10	11.0	14	5.4	3.7	9	6.6
Total Xylenes	ug/L		11.0	14.0	50.0	9.2	3.9	35.0	5.3	43.0	35.0	29.0	21.0	35.0	36	19	11	29	26

- NOTES:** 1) Blank denotes data not available.
2) < - denotes parameter concentration is below the estimated quantitation limit or method reporting limit.
3) µg/L denotes microgram per litre.
4) VOCs for leachate holding tank not analysed in July 2007 due to an error at laboratory.
5) "*" denotes composite concentration of benzene, ethylbenzene, toluene, and xylene (BTEX); where a concentration was less than the Reported Detection Limit (RDL), the concentration was considered to be equal to one half of the RDL.
6) Shading denotes exceedances of the target concentration.

Table E-3
Organic EPA 625 Chemical Results - Irrigation Liquid
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Target Concentration 100% Leachate	Concentration																
			28-Sep-17	28-May-18	11-Jun-18	17-Jul-18	22-Aug-18	27-Sep-18	24-May-19	26-Jun-19	5-Jul-19	14-Aug-19	11-Sep-19	7-Oct-19	20-May-20	9-Jun-20	21-Jul-20	31-Aug-20	15-Sep-20
Acenaphthene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	0	<0.80	<0.80	<0.80
Acenaphthylene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Anthracene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Benzo(a)anthracene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Benzo(a)pyrene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Benzo(b,j)fluoranthene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Benzo(g,h,i)perylene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Benzo(k)fluoranthene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
1-Chloronaphthalene	ug/L		<20	<1.0	<4.0	<4.0	<4.0	<10	<1.0	<4.0	<4.0	<4.0	<4.0	<4.0	<1.0	<1.0	<4.0	<4.0	<4.0
2-Chloronaphthalene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Chrysene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Dibenz(a,h)anthracene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Fluoranthene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Fluorene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	0	<0.80	<0.80	<0.80
Indeno(1,2,3-cd)pyrene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
1-Methylnaphthalene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	0	<0.80	<0.80	<0.80
2-Methylnaphthalene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	0.93	<0.80	<1.0	1.1	<0.20	0	<0.80	<0.80	<0.80
Naphthalene	ug/L		<4.0	<0.20	3.8	1.7	<0.80	4.4	<0.20	5.0	7.7	1	4.8	4	<0.20	<0.61	<2.0	<2.5	3
Perylene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
Phenanthrene	ug/L		<4.0	<0.20	<0.80	0.91	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	0	<0.80	<0.80	<0.80
Pyrene	ug/L		<4.0	<0.20	<0.80	<0.80	<0.80	<2.0	<0.20	<0.80	<0.80	<0.80	<0.80	<0.80	<0.20	<0.20	<0.80	<0.80	<0.80
1,2-Dichlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
1,3-Dichlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
1,4-Dichlorobenzene	ug/L		<10	1.1	<2.0	<2.0	<2.0	<5.0	1.0	<2.5	<2.0	<2.0	<2.0	<2.0	<0.50	1	<2.0	<2.0	<2.0
Hexachlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Pentachlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
1,2,3,5-Tetrachlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
1,2,4,5-Tetrachlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
1,2,3-Trichlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
1,2,4-Trichlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
1,3,5-Trichlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2-Chlorophenol	ug/L		<6.0	<0.30	<1.2	<1.2	<1.2	<3.0	<0.30	<1.2	<1.2	<1.2	<1.2	<1.2	<0.30	<0.30	<1.2	<1.2	<1.2
4-Chloro-3-Methylphenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
m/p-Cresol	ug/L		45.0	<0.50	9.5	57.0	<2.0	<5.0	<0.50	8.5	16.0	7.2	<2.0	6.1	<0.50	<0.50	340	190	18
o-Cresol	ug/L		<10	<0.50	3.9	7.6	<2.0	<5.0	<0.50	<2.0	<2.0	2.7	2.4	2.5	<0.50	0.79	5	7.1	<2.0
1,2,3,4-Tetrachlorobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,3-Dichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,4-Dichlorophenol	ug/L		<6.0	<0.30	<1.2	<1.2	<1.2	<3.0	<0.30	<1.2	<1.2	<1.2	<1.2	<1.2	<0.30	<0.30	<1.2	<1.2	<1.2
2,5-Dichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,6-Dichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
3,4-Dichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
3,5-Dichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,4-Dimethylphenol	ug/L		<10	1.0	2.1	<3.0	<2.0	5.2	<0.50	5.5	2.6	<2.0	<2.0	<2.0	<0.80	<1.0 (1)	<2.0	3.5	<2.0
2,4-Dinitrophenol	ug/L		<40	<6.3	<50	<25	<8.0	<25	<2.5	<8.0	<40	<8.0	<8.0	<8.0	<2.0	<2.0	<8.0	<8.0	<8.0
4,6-Dinitro-2-methylphenol	ug/L		<40	<2.0	<50	<8.0	<8.0	<20	<2.0	<8.0	<20	<8.0	<8.0	<8.0	<2.0	<2.0	<8.0	<8.0	<8.0
2-Nitrophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
4-Nitrophenol	ug/L		<28	<1.4	<5.6	<5.6	<5.6	<14	<1.4	<5.6	<5.6	<5.6	<5.6	<5.6	<1.4	<1.4	<5.6	<5.6	<5.6
Pentachlorophenol	ug/L		<20	<1.0	<4.0	<4.0	<4.0	<10	<2.5	<4.0	<20	<4.0	<4.0	<4.0	<1.0	<1.0	<4.0	<4.0	<4.0
Phenol	ug/L		22.0	<0.50	<2.0	2.3	<2.0	<5.0	<0.50	<2.0	8.6	56.0	<2.0	<2.0	<0.50	<0.50	32	16	2.6
2,3,4,5-Tetrachlorophenol	ug/L		<8.0	<0.40	<1.6	<1.6	<1.6	<4.0	<0.40	<1.6	<1.6	<1.6	<1.6	<1.6	<0.40	<0.40	<1.6	<1.6	<1.6
2,3,4,6-Tetrachlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,3,5,6-Tetrachlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,3,4-Trichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,3,5-Trichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,3,6-Trichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,4,5-Trichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
2,4,6-Trichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
3,4,5-Trichlorophenol	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0

Table E-3
Organic EPA 625 Chemical Results - Irrigation Liquid
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Target Concentration 100% Leachate	Concentration																
			28-Sep-17	28-May-18	11-Jun-18	17-Jul-18	22-Aug-18	27-Sep-18	24-May-19	26-Jun-19	5-Jul-19	14-Aug-19	11-Sep-19	7-Oct-19	20-May-20	9-Jun-20	21-Jul-20	31-Aug-20	15-Sep-20
Benzyl butyl phthalate	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Biphenyl	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Bis(2-chloroethyl)ether	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Bis(2-chloroethoxy)methane	ug/L		<10	<0.60	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Bis(2-chloroisopropyl)ether	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Bis(2-ethylhexyl)phthalate	ug/L		<40	<2.0	12.0	24.0	<8.0	22.0	<2.0	<8.0	<8.0	12.0	<8.0	<8.0	2	<2.0	14	17	<8.0
4-Bromophenyl phenyl ether	ug/L		<6.0	<0.30	<1.2	<1.2	<1.2	<3.0	<0.30	<1.2	<1.2	<1.2	<1.2	<1.2	<0.30	<0.30	<1.2	<1.2	<1.2
p-Chloroaniline	ug/L		<20	<1.0	<4.0	<4.0	<4.0	<10	<1.0	<4.0	<4.0	<4.0	<4.0	<4.0	<1.0	<1.0	<4.0	<4.0	<4.0
4-Chlorophenyl phenyl ether	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Di-N-butyl phthalate	ug/L		<40	<2.0	<8.0	<8.0	<8.0	<20	<2.0	<8.0	<8.0	<8.0	<8.0	<8.0	<2.0	<2.0	<8.0	<8.0	<8.0
Di-N-octyl phthalate	ug/L		<16	<0.80	<3.2	<3.2	<3.2	<8.0	<0.80	<3.2	<3.2	<3.2	<3.2	<3.2	<0.80	<0.80	<3.2	<3.2	<3.2
2,4-Dinitrotoluene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Diethyl phthalate	ug/L		<20	<1.0	<4.0	<4.0	<4.0	<10	<1.0	<4.0	<4.0	<4.0	<4.0	<4.0	<1.0	<1.0	<4.0	<4.0	<4.0
3,3'-Dichlorobenzidine	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Dimethyl phthalate	ug/L		<20	<1.0	<4.0	<4.0	<4.0	<10	<1.0	<4.0	<4.0	<4.0	<4.0	<4.0	<1.0	<1.0	<4.0	<4.0	<4.0
2,6-Dinitrotoluene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Diphenyl Ether	ug/L		<6.0	<0.30	<1.2	<1.2	<1.2	<3.0	<0.30	<1.2	<1.2	<1.2	<1.2	<1.2	<0.30	<0.30	<1.2	<1.2	<1.2
Hexachlorobutadiene	ug/L		<8.0	<0.40	<1.6	<1.6	<1.6	<4.0	<0.40	<1.6	<1.6	<1.6	<1.6	<1.6	<0.40	<0.40	<1.6	<1.6	<1.6
Hexachlorocyclopentadiene	ug/L		<40	<2.0	<8.0	<8.0	<8.0	<20	<2.0	<8.0	<8.0	<8.0	<8.0	<8.0	<2.0	<2.0	<8.0	<8.0	<8.0
Hexachloroethane	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Isophorone	ug/L		<10	<0.50	<2.0	<7.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<6.0	<2.0
Nitrobenzene	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0
Nitrosodiphenylamine/Diphenylamine	ug/L		<20	<1.0	<4.0	<4.0	<4.0	<10	<1.0	<4.0	<4.0	<4.0	<4.0	<4.0	<1.0	<1.0	<4.0	<4.0	<4.0
N-Nitroso-di-n-propylamine	ug/L		<10	<0.50	<2.0	<2.0	<2.0	<5.0	<0.50	<2.0	<2.0	<2.0	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<2.0

NOTES: 1) Blank denotes data not available.
2) < - denotes parameter concentration is below the estimated quantitation limit or method reporting limit.
3) µg/L denotes microgram per litre.



Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: na

Report Date: 2020/06/02
Report #: R6194645
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0C5398

Received: 2020/05/22, 10:33

Sample Matrix: Leachate
Samples Received: 1

Analyses	Date		Laboratory Method	Analytical Method
	Quantity	Extracted	Analyzed	
ABN Compounds in Water by GC/MS	1	2020/05/27	2020/05/28 CAM SOP-00301	EPA 8270 m
Alkalinity	1	N/A	2020/05/27 CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	1	N/A	2020/05/27 CAM SOP-00463	SM 23 4500-Cl E m
Conductance in Water - On-site	1	N/A	2020/05/29	
Field Measured Dissolved Oxygen in Water	1	N/A	2020/05/29	
Total Metals by ICPMS	1	N/A	2020/05/27 CAM SOP-00447	EPA 6020B m
Ammonia-N	1	N/A	2020/05/28 CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/05/27 CAM SOP-00440	SM 23 4500-NO3I/NO2B
Field Measured pH (2)	1	N/A	2020/05/22	Field pH Meter
Sulphate by Automated Colourimetry	1	N/A	2020/05/27 CAM SOP-00464	EPA 375.4 m
Field Temperature (2)	1	N/A	2020/05/22	Field Thermometer
Total Kjeldahl Nitrogen in Water	1	2020/05/27	2020/05/29 CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2020/05/28	2020/05/28 CAM SOP-00407	SM 23 4500 B F m
Turbidity - On-site	1	N/A	2020/05/29	
Un-ionized Ammonia	1	2020/05/23	2020/05/29 PWQO	PWQO
Volatile Organic Compounds in Water	1	N/A	2020/05/25 CAM SOP-00228	EPA 8260C m

Remarks:

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All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.



Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: na

Report Date: 2020/06/02
Report #: R6194645
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0C5398

Received: 2020/05/22, 10:33

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

(2) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas Laboratories.

Encryption Key

a Rieth

Andrea Rieth
Pricing Analyst
03 Jun 2020 14:41:27

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Keshani Vijh, Supervisor – Environmental Customer Service

Email: Keshani.Vijh@bvlabs.com

Phone# (905)817-5733

=====

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Total Cover Pages : 2

Page 2 of 17



BUREAU
VERITAS

BV Labs Job #: COC5398

Report Date: 2020/06/02

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

RESULTS OF ANALYSES OF LEACHATE

BV Labs ID		MRR012		
Sampling Date		2020/05/20		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Calculated Parameters				
Total Un-ionized Ammonia	mg/L	1.3	0.019	6741035
Field Measurements				
Field Conductivity	uS/cm	4.83	N/A	ONSITE
Field Dissolved Oxygen	mg/L	3.78	N/A	ONSITE
Field Temperature	Celsius	14.5	N/A	ONSITE
Field Turbidity	NTU	45.4	N/A	ONSITE
Field Measured pH	pH	7.3		ONSITE
Inorganics				
Total Ammonia-N	mg/L	201 (1)	3.0	6754600
Total Kjeldahl Nitrogen (TKN)	mg/L	190 (1)	5	6753895
Total Phosphorus	mg/L	0.59	0.10	6754093
Dissolved Sulphate (SO4)	mg/L	420	2.0	6750184
Alkalinity (Total as CaCO3)	mg/L	1600	1.0	6749543
Dissolved Chloride (Cl-)	mg/L	510	5.0	6750178
Nitrite (N)	mg/L	0.057	0.010	6749644
Nitrate (N)	mg/L	0.36	0.10	6749644
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable (1) TKN < NH4: Both values fall within acceptable RPD limits for duplicates and are likely equivalent.				



BUREAU
VERITAS

BV Labs Job #: COC5398
Report Date: 2020/06/02

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: JCL

ELEMENTS BY ATOMIC SPECTROSCOPY (LEACHATE)

BV Labs ID		MRR012		
Sampling Date		2020/05/20		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Metals				
Total Aluminum (Al)	mg/L	0.15	0.02	6752520
Total Arsenic (As)	mg/L	0.005	0.001	6752520
Total Barium (Ba)	mg/L	0.12	0.005	6752520
Total Beryllium (Be)	mg/L	<0.0006	0.0006	6752520
Total Bismuth (Bi)	mg/L	<0.001	0.001	6752520
Total Boron (B)	mg/L	3.1	0.02	6752520
Total Cadmium (Cd)	mg/L	<0.0001	0.0001	6752520
Total Calcium (Ca)	mg/L	200	0.2	6752520
Total Chromium (Cr)	mg/L	0.030	0.005	6752520
Total Cobalt (Co)	mg/L	0.0057	0.0005	6752520
Total Copper (Cu)	mg/L	0.002	0.002	6752520
Total Iron (Fe)	mg/L	4.1	0.1	6752520
Total Lead (Pb)	mg/L	0.0008	0.0005	6752520
Total Magnesium (Mg)	mg/L	110	0.05	6752520
Total Molybdenum (Mo)	mg/L	0.020	0.002	6752520
Total Nickel (Ni)	mg/L	0.044	0.001	6752520
Total Potassium (K)	mg/L	78	0.2	6752520
Total Selenium (Se)	mg/L	<0.005	0.005	6752520
Total Silver (Ag)	mg/L	<0.0004	0.0004	6752520
Total Sodium (Na)	mg/L	350	0.1	6752520
Total Strontium (Sr)	mg/L	1.6	0.003	6752520
Total Tin (Sn)	mg/L	<0.002	0.002	6752520
Total Titanium (Ti)	mg/L	0.026	0.005	6752520
Total Vanadium (V)	mg/L	0.006	0.001	6752520
Total Zinc (Zn)	mg/L	<0.01	0.01	6752520
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0C5398
Report Date: 2020/06/02

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: JCL

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		MRR012		
Sampling Date		2020/05/20		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Semivolatile Organics				
Acenaphthene	ug/L	<0.20	0.20	6752758
Acenaphthylene	ug/L	<0.20	0.20	6752758
Anthracene	ug/L	<0.20	0.20	6752758
Benzo(a)anthracene	ug/L	<0.20	0.20	6752758
Benzo(a)pyrene	ug/L	<0.20	0.20	6752758
Benzo(b/j)fluoranthene	ug/L	<0.20	0.20	6752758
Benzo(g,h,i)perylene	ug/L	<0.20	0.20	6752758
Benzo(k)fluoranthene	ug/L	<0.20	0.20	6752758
1-Chloronaphthalene	ug/L	<1.0	1.0	6752758
2-Chloronaphthalene	ug/L	<0.50	0.50	6752758
Chrysene	ug/L	<0.20	0.20	6752758
Dibenzo(a,h)anthracene	ug/L	<0.20	0.20	6752758
Fluoranthene	ug/L	<0.20	0.20	6752758
Fluorene	ug/L	<0.20	0.20	6752758
Indeno(1,2,3-cd)pyrene	ug/L	<0.20	0.20	6752758
1-Methylnaphthalene	ug/L	<0.20	0.20	6752758
2-Methylnaphthalene	ug/L	<0.20	0.20	6752758
Naphthalene	ug/L	<0.20	0.20	6752758
Perylene	ug/L	<0.20	0.20	6752758
Phenanthrene	ug/L	<0.20	0.20	6752758
Pyrene	ug/L	<0.20	0.20	6752758
1,2-Dichlorobenzene	ug/L	<0.50	0.50	6752758
1,3-Dichlorobenzene	ug/L	<0.50	0.50	6752758
1,4-Dichlorobenzene	ug/L	<0.50	0.50	6752758
Hexachlorobenzene	ug/L	<0.50	0.50	6752758
Pentachlorobenzene	ug/L	<0.50	0.50	6752758
1,2,3,5-Tetrachlorobenzene	ug/L	<0.50	0.50	6752758
1,2,4,5-Tetrachlorobenzene	ug/L	<0.50	0.50	6752758
1,2,3-Trichlorobenzene	ug/L	<0.50	0.50	6752758
1,2,4-Trichlorobenzene	ug/L	<0.50	0.50	6752758
1,3,5-Trichlorobenzene	ug/L	<0.50	0.50	6752758
2-Chlorophenol	ug/L	<0.30	0.30	6752758
4-Chloro-3-Methylphenol	ug/L	<0.50	0.50	6752758
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0C5398
Report Date: 2020/06/02

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: JCL

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		MRR012		
Sampling Date		2020/05/20		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
m/p-Cresol	ug/L	<0.50	0.50	6752758
o-Cresol	ug/L	<0.50	0.50	6752758
1,2,3,4-Tetrachlorobenzene	ug/L	<0.50	0.50	6752758
2,3-Dichlorophenol	ug/L	<0.50	0.50	6752758
2,4-Dichlorophenol	ug/L	<0.30	0.30	6752758
2,5-Dichlorophenol	ug/L	<0.50	0.50	6752758
2,6-Dichlorophenol	ug/L	<0.50	0.50	6752758
3,4-Dichlorophenol	ug/L	<0.50	0.50	6752758
3,5-Dichlorophenol	ug/L	<0.50	0.50	6752758
2,4-Dimethylphenol	ug/L	<0.80 (1)	0.80	6752758
2,4-Dinitrophenol	ug/L	<2.0	2.0	6752758
4,6-Dinitro-2-methylphenol	ug/L	<2.0	2.0	6752758
2-Nitrophenol	ug/L	<0.50	0.50	6752758
4-Nitrophenol	ug/L	<1.4	1.4	6752758
Pentachlorophenol	ug/L	<1.0	1.0	6752758
Phenol	ug/L	<0.50	0.50	6752758
2,3,4,5-Tetrachlorophenol	ug/L	<0.40	0.40	6752758
2,3,4,6-Tetrachlorophenol	ug/L	<0.50	0.50	6752758
2,3,5,6-Tetrachlorophenol	ug/L	<0.50	0.50	6752758
2,3,4-Trichlorophenol	ug/L	<0.50	0.50	6752758
2,3,5-Trichlorophenol	ug/L	<0.50	0.50	6752758
2,3,6-Trichlorophenol	ug/L	<0.50	0.50	6752758
2,4,5-Trichlorophenol	ug/L	<0.50	0.50	6752758
2,4,6-Trichlorophenol	ug/L	<0.50	0.50	6752758
3,4,5-Trichlorophenol	ug/L	<0.50	0.50	6752758
Benzyl butyl phthalate	ug/L	<0.50	0.50	6752758
Biphenyl	ug/L	<0.50	0.50	6752758
Bis(2-chloroethyl)ether	ug/L	<0.50	0.50	6752758
Bis(2-chloroethoxy)methane	ug/L	<0.50	0.50	6752758
Bis(2-chloroisopropyl)ether	ug/L	<0.50	0.50	6752758
Bis(2-ethylhexyl)phthalate	ug/L	2.0	2.0	6752758
4-Bromophenyl phenyl ether	ug/L	<0.30	0.30	6752758
p-Chloroaniline	ug/L	<1.0	1.0	6752758
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
(1) Detection limit was raised due to matrix interference.				



BUREAU
VERITAS

BV Labs Job #: C0C5398

Report Date: 2020/06/02

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		MRR012		
Sampling Date		2020/05/20		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
4-Chlorophenyl phenyl ether	ug/L	<0.50	0.50	6752758
Di-N-butyl phthalate	ug/L	<2.0	2.0	6752758
di-n-octyl phthalate	ug/L	<0.80	0.80	6752758
2,4-Dinitrotoluene	ug/L	<0.50	0.50	6752758
Diethyl phthalate	ug/L	<1.0	1.0	6752758
3,3'-Dichlorobenzidine	ug/L	<0.50	0.50	6752758
Dimethyl phthalate	ug/L	<1.0	1.0	6752758
2,6-Dinitrotoluene	ug/L	<0.50	0.50	6752758
Diphenyl Ether	ug/L	<0.30	0.30	6752758
Hexachlorobutadiene	ug/L	<0.40	0.40	6752758
Hexachlorocyclopentadiene	ug/L	<2.0	2.0	6752758
Hexachloroethane	ug/L	<0.50	0.50	6752758
Isophorone	ug/L	<0.50	0.50	6752758
Nitrobenzene	ug/L	<0.50	0.50	6752758
Nitrosodiphenylamine/Diphenylamine	ug/L	<1.0	1.0	6752758
N-Nitroso-di-n-propylamine	ug/L	<0.50	0.50	6752758
Surrogate Recovery (%)				
2,4,6-Tribromophenol	%	91		6752758
2-Fluorobiphenyl	%	58		6752758
2-Fluorophenol	%	30		6752758
D14-Terphenyl	%	75		6752758
D5-Nitrobenzene	%	60		6752758
D5-Phenol	%	23		6752758
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: COC5398

Report Date: 2020/06/02

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		MRR012		
Sampling Date		2020/05/20		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Volatile Organics				
Acetone (2-Propanone)	ug/L	39	10	6740771
Benzene	ug/L	1.7	0.20	6740771
Bromodichloromethane	ug/L	<0.50	0.50	6740771
Bromoform	ug/L	<1.0	1.0	6740771
Bromomethane	ug/L	<0.50	0.50	6740771
Carbon Tetrachloride	ug/L	<0.19	0.19	6740771
Chlorobenzene	ug/L	<0.20	0.20	6740771
Chloroethane	ug/L	1.7	1.0	6740771
Chloroform	ug/L	<0.20	0.20	6740771
Chloromethane	ug/L	<5.0	5.0	6740771
Dibromochloromethane	ug/L	<0.50	0.50	6740771
1,2-Dichlorobenzene	ug/L	<0.40	0.40	6740771
1,3-Dichlorobenzene	ug/L	<0.40	0.40	6740771
1,4-Dichlorobenzene	ug/L	0.65	0.40	6740771
1,1-Dichloroethane	ug/L	0.88	0.20	6740771
1,2-Dichloroethane	ug/L	<0.40	0.40	6740771
1,1-Dichloroethylene	ug/L	<0.20	0.20	6740771
cis-1,2-Dichloroethylene	ug/L	<0.50	0.50	6740771
trans-1,2-Dichloroethylene	ug/L	<0.50	0.50	6740771
1,2-Dichloropropane	ug/L	<0.20	0.20	6740771
cis-1,3-Dichloropropene	ug/L	<0.30	0.30	6740771
trans-1,3-Dichloropropene	ug/L	<0.40	0.40	6740771
Ethylbenzene	ug/L	1.2	0.20	6740771
Ethylene Dibromide	ug/L	<0.19	0.19	6740771
Methylene Chloride(Dichloromethane)	ug/L	<2.0	2.0	6740771
Methyl Ethyl Ketone (2-Butanone)	ug/L	<10	10	6740771
Methyl Isobutyl Ketone	ug/L	<5.0	5.0	6740771
Methyl t-butyl ether (MTBE)	ug/L	<0.50	0.50	6740771
Styrene	ug/L	<0.40	0.40	6740771
1,1,1,2-Tetrachloroethane	ug/L	<0.50	0.50	6740771
1,1,2,2-Tetrachloroethane	ug/L	<0.40	0.40	6740771
Tetrachloroethylene	ug/L	<0.20	0.20	6740771
Toluene	ug/L	4.0	0.20	6740771
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0C5398
Report Date: 2020/06/02

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: JCL

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		MRR012		
Sampling Date		2020/05/20		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
1,1,1-Trichloroethane	ug/L	<0.20	0.20	6740771
1,1,2-Trichloroethane	ug/L	<0.40	0.40	6740771
Trichloroethylene	ug/L	<0.20	0.20	6740771
Trichlorofluoromethane (FREON 11)	ug/L	<0.50	0.50	6740771
Vinyl Chloride	ug/L	<0.20	0.20	6740771
p+m-Xylene	ug/L	23	0.20	6740771
o-Xylene	ug/L	14	0.20	6740771
Total Xylenes	ug/L	36	0.20	6740771
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	98		6740771
D4-1,2-Dichloroethane	%	123		6740771
D8-Toluene	%	92		6740771
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0C5398
Report Date: 2020/06/02

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: JCL

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.7°C
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Sample MRR012 [PS HOLDING TANK] : TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.



BUREAU
VERITAS

BV Labs Job #: C0C5398

Report Date: 2020/06/02

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6740771	4-Bromofluorobenzene	2020/05/25	102	70 - 130	102	70 - 130	96	%				
6740771	D4-1,2-Dichloroethane	2020/05/25	113	70 - 130	108	70 - 130	117	%				
6740771	D8-Toluene	2020/05/25	103	70 - 130	105	70 - 130	92	%				
6752758	2,4,6-Tribromophenol	2020/05/27	96	10 - 130	94	10 - 130	81	%				
6752758	2-Fluorobiphenyl	2020/05/27	77	30 - 130	82	30 - 130	81	%				
6752758	2-Fluorophenol	2020/05/27	50	10 - 130	55	10 - 130	51	%				
6752758	D14-Terphenyl	2020/05/27	96	30 - 130	94	30 - 130	91	%				
6752758	D5-Nitrobenzene	2020/05/27	81	30 - 130	86	30 - 130	77	%				
6752758	D5-Phenol	2020/05/27	37	10 - 130	38	10 - 130	37	%				
6740771	1,1,1,2-Tetrachloroethane	2020/05/25	102	70 - 130	104	70 - 130	<0.50	ug/L				
6740771	1,1,1-Trichloroethane	2020/05/25	99	70 - 130	101	70 - 130	<0.20	ug/L				
6740771	1,1,2,2-Tetrachloroethane	2020/05/25	108	70 - 130	106	70 - 130	<0.40	ug/L				
6740771	1,1,2-Trichloroethane	2020/05/25	106	70 - 130	105	70 - 130	<0.40	ug/L				
6740771	1,1-Dichloroethane	2020/05/25	99	70 - 130	98	70 - 130	<0.20	ug/L				
6740771	1,1-Dichloroethylene	2020/05/25	103	70 - 130	104	70 - 130	<0.20	ug/L				
6740771	1,2-Dichlorobenzene	2020/05/25	91	70 - 130	92	70 - 130	<0.40	ug/L				
6740771	1,2-Dichloroethane	2020/05/25	122	70 - 130	118	70 - 130	<0.40	ug/L				
6740771	1,2-Dichloropropane	2020/05/25	93	70 - 130	93	70 - 130	<0.20	ug/L				
6740771	1,3-Dichlorobenzene	2020/05/25	88	70 - 130	90	70 - 130	<0.40	ug/L				
6740771	1,4-Dichlorobenzene	2020/05/25	95	70 - 130	98	70 - 130	<0.40	ug/L				
6740771	Acetone (2-Propanone)	2020/05/25	115	60 - 140	107	60 - 140	<10	ug/L				
6740771	Benzene	2020/05/25	100	70 - 130	99	70 - 130	<0.20	ug/L	NC (1)	30		
6740771	Bromodichloromethane	2020/05/25	101	70 - 130	100	70 - 130	<0.50	ug/L				
6740771	Bromoform	2020/05/25	108	70 - 130	106	70 - 130	<1.0	ug/L				
6740771	Bromomethane	2020/05/25	102	60 - 140	100	60 - 140	<0.50	ug/L				
6740771	Carbon Tetrachloride	2020/05/25	98	70 - 130	101	70 - 130	<0.19	ug/L				
6740771	Chlorobenzene	2020/05/25	90	70 - 130	92	70 - 130	<0.20	ug/L				
6740771	Chloroethane	2020/05/25	99	70 - 130	99	70 - 130	<1.0	ug/L				
6740771	Chloroform	2020/05/25	97	70 - 130	96	70 - 130	<0.20	ug/L				
6740771	Chloromethane	2020/05/25	107	60 - 140	104	60 - 140	<5.0	ug/L				

BUREAU
VERITAS

BV Labs Job #: C0C5398

Report Date: 2020/06/02

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6740771	cis-1,2-Dichloroethylene	2020/05/25	94	70 - 130	94	70 - 130	<0.50	ug/L				
6740771	cis-1,3-Dichloropropene	2020/05/25	106	70 - 130	103	70 - 130	<0.30	ug/L				
6740771	Dibromochloromethane	2020/05/25	105	70 - 130	104	70 - 130	<0.50	ug/L				
6740771	Ethylbenzene	2020/05/25	86	70 - 130	90	70 - 130	<0.20	ug/L	NC (1)	30		
6740771	Ethylene Dibromide	2020/05/25	104	70 - 130	102	70 - 130	<0.19	ug/L				
6740771	Methyl Ethyl Ketone (2-Butanone)	2020/05/25	118	60 - 140	112	60 - 140	<10	ug/L				
6740771	Methyl Isobutyl Ketone	2020/05/25	113	70 - 130	111	70 - 130	<5.0	ug/L				
6740771	Methyl t-butyl ether (MTBE)	2020/05/25	90	70 - 130	90	70 - 130	<0.50	ug/L				
6740771	Methylene Chloride(Dichloromethane)	2020/05/25	97	70 - 130	94	70 - 130	<2.0	ug/L				
6740771	o-Xylene	2020/05/25	87	70 - 130	95	70 - 130	<0.20	ug/L	NC (1)	30		
6740771	p+m-Xylene	2020/05/25	95	70 - 130	100	70 - 130	<0.20	ug/L	NC (1)	30		
6740771	Styrene	2020/05/25	94	70 - 130	102	70 - 130	<0.40	ug/L				
6740771	Tetrachloroethylene	2020/05/25	88	70 - 130	91	70 - 130	<0.20	ug/L				
6740771	Toluene	2020/05/25	93	70 - 130	96	70 - 130	<0.20	ug/L	NC (1)	30		
6740771	Total Xylenes	2020/05/25					<0.20	ug/L	NC (1)	30		
6740771	trans-1,2-Dichloroethylene	2020/05/25	98	70 - 130	98	70 - 130	<0.50	ug/L				
6740771	trans-1,3-Dichloropropene	2020/05/25	116	70 - 130	112	70 - 130	<0.40	ug/L				
6740771	Trichloroethylene	2020/05/25	96	70 - 130	98	70 - 130	<0.20	ug/L				
6740771	Trichlorofluoromethane (FREON 11)	2020/05/25	105	70 - 130	107	70 - 130	<0.50	ug/L				
6740771	Vinyl Chloride	2020/05/25	99	70 - 130	99	70 - 130	<0.20	ug/L				
6749543	Alkalinity (Total as CaCO3)	2020/05/27			97	85 - 115	<1.0	mg/L	10 (1)	20		
6749644	Nitrate (N)	2020/05/27	95	80 - 120	96	80 - 120	<0.10	mg/L	NC (1)	20		
6749644	Nitrite (N)	2020/05/27	106	80 - 120	106	80 - 120	<0.010	mg/L				
6750178	Dissolved Chloride (Cl-)	2020/05/27	118	80 - 120	103	80 - 120	<1.0	mg/L	1.8 (1)	20		
6750184	Dissolved Sulphate (SO4)	2020/05/27	NC	75 - 125	102	80 - 120	<1.0	mg/L	1.3 (1)	20		
6752520	Total Aluminum (Al)	2020/05/27	102	80 - 120	98	80 - 120	<0.02	mg/L	NC (1)	20		
6752520	Total Arsenic (As)	2020/05/27	100	80 - 120	98	80 - 120	<0.001	mg/L	NC (1)	20		
6752520	Total Barium (Ba)	2020/05/27	99	80 - 120	94	80 - 120	<0.005	mg/L	2.5 (1)	20		
6752520	Total Beryllium (Be)	2020/05/27	98	80 - 120	94	80 - 120	<0.0006	mg/L	NC (1)	20		
6752520	Total Bismuth (Bi)	2020/05/27	94	80 - 120	94	80 - 120	<0.001	mg/L				



BUREAU
VERITAS

BV Labs Job #: C0C5398

Report Date: 2020/06/02

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6752520	Total Boron (B)	2020/05/27	93	80 - 120	88	80 - 120	<0.02	mg/L	5.9 (1)	20		
6752520	Total Cadmium (Cd)	2020/05/27	97	80 - 120	97	80 - 120	<0.0001	mg/L	NC (1)	20		
6752520	Total Calcium (Ca)	2020/05/27	NC	80 - 120	96	80 - 120	<0.2	mg/L				
6752520	Total Chromium (Cr)	2020/05/27	95	80 - 120	94	80 - 120	<0.005	mg/L	NC (1)	20		
6752520	Total Cobalt (Co)	2020/05/27	98	80 - 120	98	80 - 120	<0.0005	mg/L	NC (1)	20		
6752520	Total Copper (Cu)	2020/05/27	99	80 - 120	98	80 - 120	<0.002	mg/L	NC (1)	20		
6752520	Total Iron (Fe)	2020/05/27	97	80 - 120	96	80 - 120	<0.1	mg/L	3.6 (1)	20		
6752520	Total Lead (Pb)	2020/05/27	96	80 - 120	95	80 - 120	<0.0005	mg/L				
6752520	Total Magnesium (Mg)	2020/05/27	98	80 - 120	99	80 - 120	<0.05	mg/L				
6752520	Total Molybdenum (Mo)	2020/05/27	94	80 - 120	93	80 - 120	<0.002	mg/L				
6752520	Total Nickel (Ni)	2020/05/27	95	80 - 120	95	80 - 120	<0.001	mg/L	6.5 (1)	20		
6752520	Total Potassium (K)	2020/05/27	101	80 - 120	99	80 - 120	<0.2	mg/L	2.3 (1)	20		
6752520	Total Selenium (Se)	2020/05/27	100	80 - 120	97	80 - 120	<0.005	mg/L	NC (1)	20		
6752520	Total Silver (Ag)	2020/05/27	96	80 - 120	97	80 - 120	<0.0004	mg/L	NC (1)	20		
6752520	Total Sodium (Na)	2020/05/27	100	80 - 120	98	80 - 120	<0.1	mg/L	2.7 (1)	20		
6752520	Total Strontium (Sr)	2020/05/27	93	80 - 120	93	80 - 120	<0.003	mg/L				
6752520	Total Tin (Sn)	2020/05/27	98	80 - 120	98	80 - 120	<0.002	mg/L				
6752520	Total Titanium (Ti)	2020/05/27	99	80 - 120	95	80 - 120	<0.005	mg/L				
6752520	Total Vanadium (V)	2020/05/27	96	80 - 120	94	80 - 120	<0.001	mg/L				
6752520	Total Zinc (Zn)	2020/05/27	100	80 - 120	100	80 - 120	<0.01	mg/L	NC (1)	20		
6752758	1,2,3,4-Tetrachlorobenzene	2020/05/27	74	30 - 130	73	30 - 130	<0.50	ug/L				
6752758	1,2,3,5-Tetrachlorobenzene	2020/05/27	63	30 - 130	66	30 - 130	<0.50	ug/L				
6752758	1,2,3-Trichlorobenzene	2020/05/27	64	30 - 130	69	30 - 130	<0.50	ug/L				
6752758	1,2,4,5-Tetrachlorobenzene	2020/05/27	60	30 - 130	63	30 - 130	<0.50	ug/L				
6752758	1,2,4-Trichlorobenzene	2020/05/27	61	30 - 130	68	30 - 130	<0.50	ug/L				
6752758	1,2-Dichlorobenzene	2020/05/27	59	30 - 130	65	30 - 130	<0.50	ug/L				
6752758	1,3,5-Trichlorobenzene	2020/05/27	69	30 - 130	73	30 - 130	<0.50	ug/L				
6752758	1,3-Dichlorobenzene	2020/05/27	53	30 - 130	60	30 - 130	<0.50	ug/L				
6752758	1,4-Dichlorobenzene	2020/05/27	53	30 - 130	58	30 - 130	<0.50	ug/L				
6752758	1-Chloronaphthalene	2020/05/27	73	30 - 130	73	30 - 130	<1.0	ug/L				



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VERITAS

BV Labs Job #: C0C5398

Report Date: 2020/06/02

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6752758	1-Methylnaphthalene	2020/05/27	81	30 - 130	81	30 - 130	<0.20	ug/L				
6752758	2,3,4,5-Tetrachlorophenol	2020/05/27	105	10 - 130	101	10 - 130	<0.40	ug/L				
6752758	2,3,4,6-Tetrachlorophenol	2020/05/27	89	10 - 130	89	10 - 130	<0.50	ug/L				
6752758	2,3,4-Trichlorophenol	2020/05/27	87	10 - 130	88	10 - 130	<0.50	ug/L				
6752758	2,3,5,6-Tetrachlorophenol	2020/05/27	71	10 - 130	68	10 - 130	<0.50	ug/L				
6752758	2,3,5-Trichlorophenol	2020/05/27	104	10 - 130	101	10 - 130	<0.50	ug/L				
6752758	2,3,6-Trichlorophenol	2020/05/27	94	10 - 130	93	10 - 130	<0.50	ug/L				
6752758	2,3-Dichlorophenol	2020/05/27	82	10 - 130	81	10 - 130	<0.50	ug/L				
6752758	2,4,5-Trichlorophenol	2020/05/27	99	10 - 130	104	10 - 130	<0.50	ug/L				
6752758	2,4,6-Trichlorophenol	2020/05/27	90	10 - 130	90	10 - 130	<0.50	ug/L				
6752758	2,4-Dichlorophenol	2020/05/27	87	10 - 130	94	10 - 130	<0.30	ug/L				
6752758	2,4-Dimethylphenol	2020/05/27	39	10 - 130	47	10 - 130	<0.50	ug/L				
6752758	2,4-Dinitrophenol	2020/05/27	126	10 - 130	120	10 - 130	<2.0	ug/L				
6752758	2,4-Dinitrotoluene	2020/05/27	103	30 - 130	97	30 - 130	<0.50	ug/L				
6752758	2,5-Dichlorophenol	2020/05/27	88	10 - 130	90	10 - 130	<0.50	ug/L				
6752758	2,6-Dichlorophenol	2020/05/27	83	10 - 130	86	10 - 130	<0.50	ug/L				
6752758	2,6-Dinitrotoluene	2020/05/27	92	30 - 130	91	30 - 130	<0.50	ug/L				
6752758	2-Chloronaphthalene	2020/05/27	85	30 - 130	86	30 - 130	<0.50	ug/L				
6752758	2-Chlorophenol	2020/05/27	79	10 - 130	81	10 - 130	<0.30	ug/L				
6752758	2-Methylnaphthalene	2020/05/27	78	30 - 130	77	30 - 130	<0.20	ug/L				
6752758	2-Nitrophenol	2020/05/27	84	10 - 130	84	10 - 130	<0.50	ug/L				
6752758	3,3'-Dichlorobenzidine	2020/05/27	89	30 - 130	99	30 - 130	<0.50	ug/L				
6752758	3,4,5-Trichlorophenol	2020/05/27	103	10 - 130	100	10 - 130	<0.50	ug/L				
6752758	3,4-Dichlorophenol	2020/05/27	93	10 - 130	90	10 - 130	<0.50	ug/L				
6752758	3,5-Dichlorophenol	2020/05/27	111	10 - 130	109	10 - 130	<0.50	ug/L				
6752758	4,6-Dinitro-2-methylphenol	2020/05/27	108	10 - 130	102	10 - 130	<2.0	ug/L				
6752758	4-Bromophenyl phenyl ether	2020/05/27	96	30 - 130	92	30 - 130	<0.30	ug/L				
6752758	4-Chloro-3-Methylphenol	2020/05/27	83	10 - 130	81	10 - 130	<0.50	ug/L				
6752758	4-Chlorophenyl phenyl ether	2020/05/27	89	30 - 130	87	30 - 130	<0.50	ug/L				
6752758	4-Nitrophenol	2020/05/27	30	10 - 130	35	10 - 130	<1.4	ug/L				



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BV Labs Job #: C0C5398

Report Date: 2020/06/02

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6752758	Acenaphthene	2020/05/27	88	30 - 130	89	30 - 130	<0.20	ug/L				
6752758	Acenaphthylene	2020/05/27	84	30 - 130	87	30 - 130	<0.20	ug/L				
6752758	Anthracene	2020/05/27	89	30 - 130	87	30 - 130	<0.20	ug/L				
6752758	Benzo(a)anthracene	2020/05/27	102	30 - 130	101	30 - 130	<0.20	ug/L				
6752758	Benzo(a)pyrene	2020/05/27	100	30 - 130	98	30 - 130	<0.20	ug/L				
6752758	Benzo(b,j)fluoranthene	2020/05/27	99	30 - 130	98	30 - 130	<0.20	ug/L				
6752758	Benzo(g,h,i)perylene	2020/05/27	93	30 - 130	90	30 - 130	<0.20	ug/L				
6752758	Benzo(k)fluoranthene	2020/05/27	101	30 - 130	105	30 - 130	<0.20	ug/L				
6752758	Benzyl butyl phthalate	2020/05/27	99	30 - 130	97	30 - 130	<0.50	ug/L				
6752758	Biphenyl	2020/05/27	82	30 - 130	83	30 - 130	<0.50	ug/L				
6752758	Bis(2-chloroethoxy)methane	2020/05/27	75	30 - 130	79	30 - 130	<0.50	ug/L				
6752758	Bis(2-chloroethyl)ether	2020/05/27	81	30 - 130	84	30 - 130	<0.50	ug/L				
6752758	Bis(2-chloroisopropyl)ether	2020/05/27	80	30 - 130	81	30 - 130	<0.50	ug/L				
6752758	Bis(2-ethylhexyl)phthalate	2020/05/27	97	30 - 130	96	30 - 130	<2.0	ug/L	NC (1)	40		
6752758	Chrysene	2020/05/27	103	30 - 130	101	30 - 130	<0.20	ug/L				
6752758	Dibenzo(a,h)anthracene	2020/05/27	97	30 - 130	96	30 - 130	<0.20	ug/L				
6752758	Diethyl phthalate	2020/05/27	97	30 - 130	97	30 - 130	<1.0	ug/L				
6752758	Dimethyl phthalate	2020/05/27	99	30 - 130	99	30 - 130	<1.0	ug/L				
6752758	Di-N-butyl phthalate	2020/05/27	101	30 - 130	102	30 - 130	<2.0	ug/L	NC (1)	40		
6752758	di-n-octyl phthalate	2020/05/27	102	30 - 130	101	30 - 130	<0.80	ug/L				
6752758	Diphenyl Ether	2020/05/27	79	30 - 130	81	30 - 130	<0.30	ug/L				
6752758	Fluoranthene	2020/05/27	96	30 - 130	94	30 - 130	<0.20	ug/L				
6752758	Fluorene	2020/05/27	94	30 - 130	94	30 - 130	<0.20	ug/L				
6752758	Hexachlorobenzene	2020/05/27	90	30 - 130	91	30 - 130	<0.50	ug/L				
6752758	Hexachlorobutadiene	2020/05/27	48	30 - 130	49	30 - 130	<0.40	ug/L				
6752758	Hexachlorocyclopentadiene	2020/05/27	54	30 - 130	51	30 - 130	<2.0	ug/L				
6752758	Hexachloroethane	2020/05/27	46	30 - 130	48	30 - 130	<0.50	ug/L				
6752758	Indeno(1,2,3-cd)pyrene	2020/05/27	95	30 - 130	94	30 - 130	<0.20	ug/L				
6752758	Isophorone	2020/05/27	75	30 - 130	78	30 - 130	<0.50	ug/L				
6752758	m/p-Cresol	2020/05/27	63	10 - 130	65	10 - 130	<0.50	ug/L				

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BV Labs Job #: C0C5398

Report Date: 2020/06/02

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6752758	Naphthalene	2020/05/27	75	30 - 130	75	30 - 130	<0.20	ug/L				
6752758	Nitrobenzene	2020/05/27	83	30 - 130	86	30 - 130	<0.50	ug/L				
6752758	Nitrosodiphenylamine/Diphenylamine	2020/05/27	96	30 - 130	96	30 - 130	<1.0	ug/L				
6752758	N-Nitroso-di-n-propylamine	2020/05/27	86	30 - 130	89	30 - 130	<0.50	ug/L				
6752758	o-Cresol	2020/05/27	61	10 - 130	64	10 - 130	<0.50	ug/L				
6752758	p-Chloroaniline	2020/05/27	65	30 - 130	74	30 - 130	<1.0	ug/L				
6752758	Pentachlorobenzene	2020/05/27	79	30 - 130	74	30 - 130	<0.50	ug/L				
6752758	Pentachlorophenol	2020/05/27	70	10 - 130	66	10 - 130	<1.0	ug/L				
6752758	Perylene	2020/05/27	103	30 - 130	100	30 - 130	<0.20	ug/L				
6752758	Phenanthrene	2020/05/27	96	30 - 130	95	30 - 130	<0.20	ug/L				
6752758	Phenol	2020/05/27	39	10 - 130	39	10 - 130	<0.50	ug/L				
6752758	Pyrene	2020/05/27	103	30 - 130	98	30 - 130	<0.20	ug/L				
6753895	Total Kjeldahl Nitrogen (TKN)	2020/05/29	102	80 - 120	105	80 - 120	<0.7	mg/L	NC (1)	20	96	80 - 120
6754093	Total Phosphorus	2020/05/28	98	80 - 120	98	80 - 120	<0.030	mg/L	5.9 (1)	25	97	80 - 120
6754600	Total Ammonia-N	2020/05/28	95	75 - 125	97	80 - 120	<0.15	mg/L	NC (1)	20		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID



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BV Labs Job #: C0C5398
Report Date: 2020/06/02

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: JCL

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

**Attention: Brent Langille**

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: TCEC-LCHCM-JUN

Report Date: 2020/06/17
Report #: R6213714
Version: 1 - Final

CERTIFICATE OF ANALYSIS**BV LABS JOB #: C0E2849****Received: 2020/06/10, 11:09**

Sample Matrix: Leachate
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ABN Compounds in Water by GC/MS	1	2020/06/11	2020/06/12	CAM SOP-00301	EPA 8270 m
Alkalinity	1	N/A	2020/06/11	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	1	N/A	2020/06/12	CAM SOP-00463	SM 23 4500-Cl E m
Conductance in Water - On-site	1	N/A	2020/06/15		
Field Measured Dissolved Oxygen in Water	1	N/A	2020/06/15		
Total Metals by ICPMS	1	N/A	2020/06/16	CAM SOP-00447	EPA 6020B m
Ammonia-N	1	N/A	2020/06/15	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/06/11	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Field Measured pH (2)	1	N/A	2020/06/10		Field pH Meter
Sulphate by Automated Colourimetry	1	N/A	2020/06/12	CAM SOP-00464	EPA 375.4 m
Field Temperature (2)	1	N/A	2020/06/10		Field Thermometer
Total Kjeldahl Nitrogen in Water	1	2020/06/11	2020/06/16	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2020/06/11	2020/06/11	CAM SOP-00407	SM 23 4500 B F m
Turbidity - On-site	1	N/A	2020/06/15		
Un-ionized Ammonia	1	2020/06/10	2020/06/15	PWQO	PWQO
Volatile Organic Compounds in Water	1	N/A	2020/06/12	CAM SOP-00228	EPA 8260C m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.



Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: TCEC-LCHCM-JUN

Report Date: 2020/06/17
Report #: R6213714
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: COE2849

Received: 2020/06/10, 11:09

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

(2) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas Laboratories.

Encryption Key

Keshani Vijh
Supervisor - Environmental
Customer Service
17 Jun 2020 17:03:59

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Keshani Vijh, Supervisor – Environmental Customer Service

Email: Keshani.Vijh@bvlabs.com

Phone# (905)817-5733

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



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VERITAS

BV Labs Job #: COE2849
Report Date: 2020/06/17

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

RESULTS OF ANALYSES OF LEACHATE

BV Labs ID		MVK943			MVK943		
Sampling Date		2020/06/09			2020/06/09		
COC Number		TCEC-LCHCM-JUN			TCEC-LCHCM-JUN		
	UNITS	PS HOLDING TANK	RDL	QC Batch	PS HOLDING TANK Lab-Dup	RDL	QC Batch
Calculated Parameters							
Total Un-ionized Ammonia	mg/L	1.1	0.011	6779807			
Field Measurements							
Field Conductivity	uS/cm	5.69	N/A	ONSITE			
Field Dissolved Oxygen	mg/L	2.01	N/A	ONSITE			
Field Temperature	Celsius	16.7	N/A	ONSITE			
Field Turbidity	NTU	54.4	N/A	ONSITE			
Field Measured pH	pH	7.0		ONSITE			
Inorganics							
Total Ammonia-N	mg/L	292 (1)	3.0	6784613			
Total Kjeldahl Nitrogen (TKN)	mg/L	280 (1)	10	6782810	300	10	6782810
Total Phosphorus	mg/L	1.1	0.10	6781662	0.96	0.10	6781662
Dissolved Sulphate (SO ₄)	mg/L	270	20	6782144	270	20	6782144
Alkalinity (Total as CaCO ₃)	mg/L	2400	2.0	6780674			
Dissolved Chloride (Cl ⁻)	mg/L	540	20	6782138	530	20	6782138
Nitrite (N)	mg/L	<0.050	0.050	6780432			
Nitrate (N)	mg/L	<0.50	0.50	6780432			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable (1) TKN < NH ₄ : Both values fall within acceptable RPD limits for duplicates and are likely equivalent.							



BUREAU
VERITAS

BV Labs Job #: COE2849
Report Date: 2020/06/17

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

ELEMENTS BY ATOMIC SPECTROSCOPY (LEACHATE)

BV Labs ID		MVK943		
Sampling Date		2020/06/09		
COC Number		TCEC-LCHCM-JUN		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Metals				
Total Aluminum (Al)	mg/L	0.09	0.02	6783463
Total Arsenic (As)	mg/L	0.007	0.001	6783463
Total Barium (Ba)	mg/L	0.18	0.005	6783463
Total Beryllium (Be)	mg/L	<0.0006	0.0006	6783463
Total Bismuth (Bi)	mg/L	<0.001	0.001	6783463
Total Boron (B)	mg/L	4.4	0.02	6783463
Total Cadmium (Cd)	mg/L	<0.0001	0.0001	6783463
Total Calcium (Ca)	mg/L	160	0.2	6783463
Total Chromium (Cr)	mg/L	0.032	0.005	6783463
Total Cobalt (Co)	mg/L	0.0069	0.0005	6783463
Total Copper (Cu)	mg/L	<0.002	0.002	6783463
Total Iron (Fe)	mg/L	2.7	0.1	6783463
Total Lead (Pb)	mg/L	0.0007	0.0005	6783463
Total Magnesium (Mg)	mg/L	140	0.05	6783463
Total Molybdenum (Mo)	mg/L	0.013	0.002	6783463
Total Nickel (Ni)	mg/L	0.062	0.001	6783463
Total Potassium (K)	mg/L	120	0.2	6783463
Total Selenium (Se)	mg/L	<0.005	0.005	6783463
Total Silver (Ag)	mg/L	<0.0004	0.0004	6783463
Total Sodium (Na)	mg/L	530	0.1	6783463
Total Strontium (Sr)	mg/L	1.6	0.003	6783463
Total Tin (Sn)	mg/L	0.003	0.002	6783463
Total Titanium (Ti)	mg/L	0.036	0.005	6783463
Total Vanadium (V)	mg/L	0.009	0.001	6783463
Total Zinc (Zn)	mg/L	<0.01	0.01	6783463
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0E2849

Report Date: 2020/06/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		MVK943		
Sampling Date		2020/06/09		
COC Number		TCEC-LCHCM-JUN		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Semivolatile Organics				
Acenaphthene	ug/L	0.27	0.20	6782250
Acenaphthylene	ug/L	<0.20	0.20	6782250
Anthracene	ug/L	<0.20	0.20	6782250
Benzo(a)anthracene	ug/L	<0.20	0.20	6782250
Benzo(a)pyrene	ug/L	<0.20	0.20	6782250
Benzo(b/j)fluoranthene	ug/L	<0.20	0.20	6782250
Benzo(g,h,i)perylene	ug/L	<0.20	0.20	6782250
Benzo(k)fluoranthene	ug/L	<0.20	0.20	6782250
1-Chloronaphthalene	ug/L	<1.0	1.0	6782250
2-Chloronaphthalene	ug/L	<0.50	0.50	6782250
Chrysene	ug/L	<0.20	0.20	6782250
Dibenzo(a,h)anthracene	ug/L	<0.20	0.20	6782250
Fluoranthene	ug/L	<0.20	0.20	6782250
Fluorene	ug/L	0.25	0.20	6782250
Indeno(1,2,3-cd)pyrene	ug/L	<0.20	0.20	6782250
1-Methylnaphthalene	ug/L	0.26	0.20	6782250
2-Methylnaphthalene	ug/L	0.24	0.20	6782250
Naphthalene	ug/L	0.61	0.20	6782250
Perylene	ug/L	<0.20	0.20	6782250
Phenanthrene	ug/L	0.25	0.20	6782250
Pyrene	ug/L	<0.20	0.20	6782250
1,2-Dichlorobenzene	ug/L	<0.50	0.50	6782250
1,3-Dichlorobenzene	ug/L	<0.50	0.50	6782250
1,4-Dichlorobenzene	ug/L	0.74	0.50	6782250
Hexachlorobenzene	ug/L	<0.50	0.50	6782250
Pentachlorobenzene	ug/L	<0.50	0.50	6782250
1,2,3,5-Tetrachlorobenzene	ug/L	<0.50	0.50	6782250
1,2,4,5-Tetrachlorobenzene	ug/L	<0.50	0.50	6782250
1,2,3-Trichlorobenzene	ug/L	<0.50	0.50	6782250
1,2,4-Trichlorobenzene	ug/L	<0.50	0.50	6782250
1,3,5-Trichlorobenzene	ug/L	<0.50	0.50	6782250
2-Chlorophenol	ug/L	<0.30	0.30	6782250
4-Chloro-3-Methylphenol	ug/L	<0.50	0.50	6782250
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: COE2849
Report Date: 2020/06/17

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		MVK943		
Sampling Date		2020/06/09		
COC Number		TCEC-LCHCM-JUN		
	UNITS	PS HOLDING TANK	RDL	QC Batch
m/p-Cresol	ug/L	<0.50	0.50	6782250
o-Cresol	ug/L	0.79	0.50	6782250
1,2,3,4-Tetrachlorobenzene	ug/L	<0.50	0.50	6782250
2,3-Dichlorophenol	ug/L	<0.50	0.50	6782250
2,4-Dichlorophenol	ug/L	<0.30	0.30	6782250
2,5-Dichlorophenol	ug/L	<0.50	0.50	6782250
2,6-Dichlorophenol	ug/L	<0.50	0.50	6782250
3,4-Dichlorophenol	ug/L	<0.50	0.50	6782250
3,5-Dichlorophenol	ug/L	<0.50	0.50	6782250
2,4-Dimethylphenol	ug/L	<1.0 (1)	1.0	6782250
2,4-Dinitrophenol	ug/L	<2.0	2.0	6782250
4,6-Dinitro-2-methylphenol	ug/L	<2.0	2.0	6782250
2-Nitrophenol	ug/L	<0.50	0.50	6782250
4-Nitrophenol	ug/L	<1.4	1.4	6782250
Pentachlorophenol	ug/L	<1.0	1.0	6782250
Phenol	ug/L	<0.50	0.50	6782250
2,3,4,5-Tetrachlorophenol	ug/L	<0.40	0.40	6782250
2,3,4,6-Tetrachlorophenol	ug/L	<0.50	0.50	6782250
2,3,5,6-Tetrachlorophenol	ug/L	<0.50	0.50	6782250
2,3,4-Trichlorophenol	ug/L	<0.50	0.50	6782250
2,3,5-Trichlorophenol	ug/L	<0.50	0.50	6782250
2,3,6-Trichlorophenol	ug/L	<0.50	0.50	6782250
2,4,5-Trichlorophenol	ug/L	<0.50	0.50	6782250
2,4,6-Trichlorophenol	ug/L	<0.50	0.50	6782250
3,4,5-Trichlorophenol	ug/L	<0.50	0.50	6782250
Benzyl butyl phthalate	ug/L	<0.50	0.50	6782250
Biphenyl	ug/L	<0.50	0.50	6782250
Bis(2-chloroethyl)ether	ug/L	<0.50	0.50	6782250
Bis(2-chloroethoxy)methane	ug/L	<0.50	0.50	6782250
Bis(2-chloroisopropyl)ether	ug/L	<0.50	0.50	6782250
Bis(2-ethylhexyl)phthalate	ug/L	<2.0	2.0	6782250
4-Bromophenyl phenyl ether	ug/L	<0.30	0.30	6782250
p-Chloroaniline	ug/L	<1.0	1.0	6782250
RDL = Reportable Detection Limit QC Batch = Quality Control Batch (1) Detection limit was raised due to matrix interference.				



BUREAU
VERITAS

BV Labs Job #: COE2849

Report Date: 2020/06/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		MVK943		
Sampling Date		2020/06/09		
COC Number		TCEC-LCHCM-JUN		
	UNITS	PS HOLDING TANK	RDL	QC Batch
4-Chlorophenyl phenyl ether	ug/L	<0.50	0.50	6782250
Di-N-butyl phthalate	ug/L	<2.0	2.0	6782250
di-n-octyl phthalate	ug/L	<0.80	0.80	6782250
2,4-Dinitrotoluene	ug/L	<0.50	0.50	6782250
Diethyl phthalate	ug/L	<1.0	1.0	6782250
3,3'-Dichlorobenzidine	ug/L	<0.50	0.50	6782250
Dimethyl phthalate	ug/L	<1.0	1.0	6782250
2,6-Dinitrotoluene	ug/L	<0.50	0.50	6782250
Diphenyl Ether	ug/L	<0.30	0.30	6782250
Hexachlorobutadiene	ug/L	<0.40	0.40	6782250
Hexachlorocyclopentadiene	ug/L	<2.0	2.0	6782250
Hexachloroethane	ug/L	<0.50	0.50	6782250
Isophorone	ug/L	<0.50	0.50	6782250
Nitrobenzene	ug/L	<0.50	0.50	6782250
Nitrosodiphenylamine/Diphenylamine	ug/L	<1.0	1.0	6782250
N-Nitroso-di-n-propylamine	ug/L	<0.50	0.50	6782250
Surrogate Recovery (%)				
2,4,6-Tribromophenol	%	100		6782250
2-Fluorobiphenyl	%	57		6782250
2-Fluorophenol	%	40		6782250
D14-Terphenyl	%	76		6782250
D5-Nitrobenzene	%	61		6782250
D5-Phenol	%	27		6782250
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: COE2849

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RWDI Inc.

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Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		MVK943		
Sampling Date		2020/06/09		
COC Number		TCEC-LCHCM-JUN		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Volatile Organics				
Acetone (2-Propanone)	ug/L	38	10	6782716
Benzene	ug/L	3.0	0.20	6782716
Bromodichloromethane	ug/L	<0.50	0.50	6782716
Bromoform	ug/L	<1.0	1.0	6782716
Bromomethane	ug/L	<0.50	0.50	6782716
Carbon Tetrachloride	ug/L	<0.19	0.19	6782716
Chlorobenzene	ug/L	3.2	0.20	6782716
Chloroethane	ug/L	<1.0	1.0	6782716
Chloroform	ug/L	<0.20	0.20	6782716
Chloromethane	ug/L	<5.0	5.0	6782716
Dibromochloromethane	ug/L	<0.50	0.50	6782716
1,2-Dichlorobenzene	ug/L	<0.40	0.40	6782716
1,3-Dichlorobenzene	ug/L	<0.40	0.40	6782716
1,4-Dichlorobenzene	ug/L	1.2	0.40	6782716
1,1-Dichloroethane	ug/L	0.26	0.20	6782716
1,2-Dichloroethane	ug/L	<0.49	0.49	6782716
1,1-Dichloroethylene	ug/L	<0.20	0.20	6782716
cis-1,2-Dichloroethylene	ug/L	<0.50	0.50	6782716
trans-1,2-Dichloroethylene	ug/L	<0.50	0.50	6782716
1,2-Dichloropropane	ug/L	<0.20	0.20	6782716
cis-1,3-Dichloropropene	ug/L	<0.30	0.30	6782716
trans-1,3-Dichloropropene	ug/L	<0.40	0.40	6782716
Ethylbenzene	ug/L	5.3	0.20	6782716
Ethylene Dibromide	ug/L	<0.19	0.19	6782716
Methylene Chloride(Dichloromethane)	ug/L	<2.0	2.0	6782716
Methyl Ethyl Ketone (2-Butanone)	ug/L	12	10	6782716
Methyl Isobutyl Ketone	ug/L	<5.0	5.0	6782716
Methyl t-butyl ether (MTBE)	ug/L	0.69	0.50	6782716
Styrene	ug/L	<0.40	0.40	6782716
1,1,1,2-Tetrachloroethane	ug/L	<0.50	0.50	6782716
1,1,2,2-Tetrachloroethane	ug/L	<0.40	0.40	6782716
Tetrachloroethylene	ug/L	<0.20	0.20	6782716
Toluene	ug/L	3.0	0.20	6782716
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0E2849
Report Date: 2020/06/17

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		MVK943		
Sampling Date		2020/06/09		
COC Number		TCEC-LCHCM-JUN		
	UNITS	PS HOLDING TANK	RDL	QC Batch
1,1,1-Trichloroethane	ug/L	<0.20	0.20	6782716
1,1,2-Trichloroethane	ug/L	<0.40	0.40	6782716
Trichloroethylene	ug/L	<0.20	0.20	6782716
Trichlorofluoromethane (FREON 11)	ug/L	<0.50	0.50	6782716
Vinyl Chloride	ug/L	0.23	0.20	6782716
p+m-Xylene	ug/L	14	0.20	6782716
o-Xylene	ug/L	5.4	0.20	6782716
Total Xylenes	ug/L	19	0.20	6782716
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	105		6782716
D4-1,2-Dichloroethane	%	102		6782716
D8-Toluene	%	87		6782716
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0E2849
Report Date: 2020/06/17

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
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Sampler Initials: MSA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.3°C
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Sample MVK943 [PS HOLDING TANK] : Nitrite/Nitrate: Due to colour interferences, sample required dilution. Detection limit was adjusted accordingly.

TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

BUREAU
VERITAS

BV Labs Job #: C0E2849

Report Date: 2020/06/17

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6782250	2,4,6-Tribromophenol	2020/06/12	88	10 - 130	93	10 - 130	86	%				
6782250	2-Fluorobiphenyl	2020/06/12	68	30 - 130	67	30 - 130	77	%				
6782250	2-Fluorophenol	2020/06/12	40	10 - 130	45	10 - 130	45	%				
6782250	D14-Terphenyl	2020/06/12	89	30 - 130	94	30 - 130	93	%				
6782250	D5-Nitrobenzene	2020/06/12	65	30 - 130	71	30 - 130	79	%				
6782250	D5-Phenol	2020/06/12	28	10 - 130	30	10 - 130	30	%				
6782716	4-Bromofluorobenzene	2020/06/12	108	70 - 130	108	70 - 130	101	%				
6782716	D4-1,2-Dichloroethane	2020/06/12	100	70 - 130	95	70 - 130	105	%				
6782716	D8-Toluene	2020/06/12	101	70 - 130	102	70 - 130	89	%				
6780432	Nitrate (N)	2020/06/11	NC	80 - 120	101	80 - 120	<0.10	mg/L	0.070 (1)	20		
6780432	Nitrite (N)	2020/06/11	102	80 - 120	105	80 - 120	<0.010	mg/L	NC (1)	20		
6780674	Alkalinity (Total as CaCO3)	2020/06/11			98	85 - 115	<1.0	mg/L	0.47 (1)	20		
6781662	Total Phosphorus	2020/06/11	88 (2)	80 - 120	92	80 - 120	<0.030	mg/L	14 (3)	25	90	80 - 120
6782138	Dissolved Chloride (Cl-)	2020/06/12	NC (4)	80 - 120	103	80 - 120	<1.0	mg/L	0.35 (5)	20		
6782144	Dissolved Sulphate (SO4)	2020/06/12	NC (4)	75 - 125	103	80 - 120	<1.0	mg/L	2.0 (5)	20		
6782250	1,2,3,4-Tetrachlorobenzene	2020/06/12	69	30 - 130	65	30 - 130	<0.50	ug/L				
6782250	1,2,3,5-Tetrachlorobenzene	2020/06/12	61	30 - 130	59	30 - 130	<0.50	ug/L				
6782250	1,2,3-Trichlorobenzene	2020/06/12	56	30 - 130	54	30 - 130	<0.50	ug/L				
6782250	1,2,4,5-Tetrachlorobenzene	2020/06/12	56	30 - 130	51	30 - 130	<0.50	ug/L				
6782250	1,2,4-Trichlorobenzene	2020/06/12	57	30 - 130	52	30 - 130	<0.50	ug/L				
6782250	1,2-Dichlorobenzene	2020/06/12	54	30 - 130	49	30 - 130	<0.50	ug/L				
6782250	1,3,5-Trichlorobenzene	2020/06/12	57	30 - 130	62	30 - 130	<0.50	ug/L				
6782250	1,3-Dichlorobenzene	2020/06/12	52	30 - 130	45	30 - 130	<0.50	ug/L				
6782250	1,4-Dichlorobenzene	2020/06/12	50	30 - 130	45	30 - 130	<0.50	ug/L				
6782250	1-Chloronaphthalene	2020/06/12	60	30 - 130	71	30 - 130	<1.0	ug/L				
6782250	1-Methylnaphthalene	2020/06/12	65	30 - 130	70	30 - 130	<0.20	ug/L				
6782250	2,3,4,5-Tetrachlorophenol	2020/06/12	93	10 - 130	105	10 - 130	<0.40	ug/L				
6782250	2,3,4,6-Tetrachlorophenol	2020/06/12	82	10 - 130	97	10 - 130	<0.50	ug/L				
6782250	2,3,4-Trichlorophenol	2020/06/12	77	10 - 130	86	10 - 130	<0.50	ug/L				
6782250	2,3,5,6-Tetrachlorophenol	2020/06/12	71	10 - 130	79	10 - 130	<0.50	ug/L				



BUREAU
VERITAS

BV Labs Job #: C0E2849

Report Date: 2020/06/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6782250	2,3,5-Trichlorophenol	2020/06/12	92	10 - 130	99	10 - 130	<0.50	ug/L				
6782250	2,3,6-Trichlorophenol	2020/06/12	87	10 - 130	89	10 - 130	<0.50	ug/L				
6782250	2,3-Dichlorophenol	2020/06/12	70	10 - 130	73	10 - 130	<0.50	ug/L				
6782250	2,4,5-Trichlorophenol	2020/06/12	88	10 - 130	97	10 - 130	<0.50	ug/L				
6782250	2,4,6-Trichlorophenol	2020/06/12	82	10 - 130	81	10 - 130	<0.50	ug/L				
6782250	2,4-Dichlorophenol	2020/06/12	71	10 - 130	80	10 - 130	<0.30	ug/L				
6782250	2,4-Dimethylphenol	2020/06/12	40	10 - 130	67	10 - 130	<0.50	ug/L				
6782250	2,4-Dinitrophenol	2020/06/12	105	10 - 130	109	10 - 130	<2.0	ug/L				
6782250	2,4-Dinitrotoluene	2020/06/12	94	30 - 130	99	30 - 130	<0.50	ug/L				
6782250	2,5-Dichlorophenol	2020/06/12	77	10 - 130	77	10 - 130	<0.50	ug/L				
6782250	2,6-Dichlorophenol	2020/06/12	74	10 - 130	75	10 - 130	<0.50	ug/L				
6782250	2,6-Dinitrotoluene	2020/06/12	87	30 - 130	91	30 - 130	<0.50	ug/L				
6782250	2-Chloronaphthalene	2020/06/12	67	30 - 130	81	30 - 130	<0.50	ug/L				
6782250	2-Chlorophenol	2020/06/12	65	10 - 130	69	10 - 130	<0.30	ug/L				
6782250	2-Methylnaphthalene	2020/06/12	61	30 - 130	66	30 - 130	<0.20	ug/L				
6782250	2-Nitrophenol	2020/06/12	68	10 - 130	72	10 - 130	<0.50	ug/L				
6782250	3,3'-Dichlorobenzidine	2020/06/12	1.8 (6)	30 - 130	110	30 - 130	<0.50	ug/L				
6782250	3,4,5-Trichlorophenol	2020/06/12	90	10 - 130	103	10 - 130	<0.50	ug/L				
6782250	3,4-Dichlorophenol	2020/06/12	89	10 - 130	95	10 - 130	<0.50	ug/L				
6782250	3,5-Dichlorophenol	2020/06/12	108	10 - 130	95	10 - 130	<0.50	ug/L				
6782250	4,6-Dinitro-2-methylphenol	2020/06/12	90	10 - 130	103	10 - 130	<2.0	ug/L				
6782250	4-Bromophenyl phenyl ether	2020/06/12	89	30 - 130	91	30 - 130	<0.30	ug/L				
6782250	4-Chloro-3-Methylphenol	2020/06/12	73	10 - 130	79	10 - 130	<0.50	ug/L				
6782250	4-Chlorophenyl phenyl ether	2020/06/12	80	30 - 130	84	30 - 130	<0.50	ug/L				
6782250	4-Nitrophenol	2020/06/12	36	10 - 130	39	10 - 130	<1.4	ug/L				
6782250	Acenaphthene	2020/06/12	75	30 - 130	83	30 - 130	<0.20	ug/L				
6782250	Acenaphthylene	2020/06/12	72	30 - 130	80	30 - 130	<0.20	ug/L				
6782250	Anthracene	2020/06/12	82	30 - 130	90	30 - 130	<0.20	ug/L				
6782250	Benzo(a)anthracene	2020/06/12	92	30 - 130	100	30 - 130	<0.20	ug/L				
6782250	Benzo(a)pyrene	2020/06/12	93	30 - 130	100	30 - 130	<0.20	ug/L				



BUREAU
VERITAS

BV Labs Job #: C0E2849

Report Date: 2020/06/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6782250	Benzo(b,j)fluoranthene	2020/06/12	91	30 - 130	97	30 - 130	<0.20	ug/L				
6782250	Benzo(g,h,i)perylene	2020/06/12	100	30 - 130	99	30 - 130	<0.20	ug/L				
6782250	Benzo(k)fluoranthene	2020/06/12	93	30 - 130	97	30 - 130	<0.20	ug/L				
6782250	Benzyl butyl phthalate	2020/06/12	90	30 - 130	95	30 - 130	<0.50	ug/L				
6782250	Biphenyl	2020/06/12	69	30 - 130	75	30 - 130	<0.50	ug/L				
6782250	Bis(2-chloroethoxy)methane	2020/06/12	62	30 - 130	65	30 - 130	<0.50	ug/L				
6782250	Bis(2-chloroethyl)ether	2020/06/12	63	30 - 130	69	30 - 130	<0.50	ug/L				
6782250	Bis(2-chloroisopropyl)ether	2020/06/12	61	30 - 130	66	30 - 130	<0.50	ug/L				
6782250	Bis(2-ethylhexyl)phthalate	2020/06/12	92	30 - 130	95	30 - 130	<2.0	ug/L	NC (1)	40		
6782250	Chrysene	2020/06/12	94	30 - 130	103	30 - 130	<0.20	ug/L				
6782250	Dibenzo(a,h)anthracene	2020/06/12	97	30 - 130	103	30 - 130	<0.20	ug/L				
6782250	Diethyl phthalate	2020/06/12	92	30 - 130	96	30 - 130	<1.0	ug/L				
6782250	Dimethyl phthalate	2020/06/12	92	30 - 130	95	30 - 130	<1.0	ug/L				
6782250	Di-N-butyl phthalate	2020/06/12	95	30 - 130	102	30 - 130	<2.0	ug/L	NC (1)	40		
6782250	di-n-octyl phthalate	2020/06/12	96	30 - 130	99	30 - 130	<0.80	ug/L				
6782250	Diphenyl Ether	2020/06/12	70	30 - 130	71	30 - 130	<0.30	ug/L				
6782250	Fluoranthene	2020/06/12	88	30 - 130	95	30 - 130	<0.20	ug/L				
6782250	Fluorene	2020/06/12	82	30 - 130	91	30 - 130	<0.20	ug/L				
6782250	Hexachlorobenzene	2020/06/12	87	30 - 130	91	30 - 130	<0.50	ug/L				
6782250	Hexachlorobutadiene	2020/06/12	58	30 - 130	46	30 - 130	<0.40	ug/L				
6782250	Hexachlorocyclopentadiene	2020/06/12	54	30 - 130	37	30 - 130	<2.0	ug/L				
6782250	Hexachloroethane	2020/06/12	53	30 - 130	44	30 - 130	<0.50	ug/L				
6782250	Indeno(1,2,3-cd)pyrene	2020/06/12	93	30 - 130	97	30 - 130	<0.20	ug/L				
6782250	Isophorone	2020/06/12	62	30 - 130	67	30 - 130	<0.50	ug/L				
6782250	m/p-Cresol	2020/06/12	56	10 - 130	61	10 - 130	<0.50	ug/L				
6782250	Naphthalene	2020/06/12	72	30 - 130	75	30 - 130	<0.20	ug/L				
6782250	Nitrobenzene	2020/06/12	65	30 - 130	73	30 - 130	<0.50	ug/L				
6782250	Nitrosodiphenylamine/Diphenylamine	2020/06/12	81	30 - 130	88	30 - 130	<1.0	ug/L				
6782250	N-Nitroso-di-n-propylamine	2020/06/12	70	30 - 130	78	30 - 130	<0.50	ug/L				
6782250	o-Cresol	2020/06/12	52	10 - 130	61	10 - 130	<0.50	ug/L				



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BV Labs Job #: C0E2849

Report Date: 2020/06/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6782250	p-Chloroaniline	2020/06/12	30	30 - 130	65	30 - 130	<1.0	ug/L				
6782250	Pentachlorobenzene	2020/06/12	73	30 - 130	69	30 - 130	<0.50	ug/L				
6782250	Pentachlorophenol	2020/06/12	58	10 - 130	75	10 - 130	<1.0	ug/L				
6782250	Perylene	2020/06/12	92	30 - 130	100	30 - 130	<0.20	ug/L				
6782250	Phenanthrene	2020/06/12	86	30 - 130	94	30 - 130	<0.20	ug/L				
6782250	Phenol	2020/06/12	29	10 - 130	32	10 - 130	<0.50	ug/L				
6782250	Pyrene	2020/06/12	92	30 - 130	99	30 - 130	<0.20	ug/L				
6782716	1,1,1,2-Tetrachloroethane	2020/06/12	111	70 - 130	112	70 - 130	<0.50	ug/L	NC (1)	30		
6782716	1,1,1-Trichloroethane	2020/06/12	101	70 - 130	101	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	1,1,2,2-Tetrachloroethane	2020/06/12	104	70 - 130	102	70 - 130	<0.40	ug/L	NC (1)	30		
6782716	1,1,2-Trichloroethane	2020/06/12	97	70 - 130	95	70 - 130	<0.40	ug/L	NC (1)	30		
6782716	1,1-Dichloroethane	2020/06/12	93	70 - 130	92	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	1,1-Dichloroethylene	2020/06/12	99	70 - 130	99	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	1,2-Dichlorobenzene	2020/06/12	98	70 - 130	99	70 - 130	<0.40	ug/L	NC (1)	30		
6782716	1,2-Dichloroethane	2020/06/12	114	70 - 130	109	70 - 130	<0.49	ug/L	NC (1)	30		
6782716	1,2-Dichloropropane	2020/06/12	91	70 - 130	88	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	1,3-Dichlorobenzene	2020/06/12	96	70 - 130	99	70 - 130	<0.40	ug/L	NC (1)	30		
6782716	1,4-Dichlorobenzene	2020/06/12	102	70 - 130	105	70 - 130	<0.40	ug/L	NC (1)	30		
6782716	Acetone (2-Propanone)	2020/06/12	99	60 - 140	91	60 - 140	<10	ug/L	NC (1)	30		
6782716	Benzene	2020/06/12	99	70 - 130	99	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	Bromodichloromethane	2020/06/12	100	70 - 130	98	70 - 130	<0.50	ug/L	NC (1)	30		
6782716	Bromoform	2020/06/12	118	70 - 130	116	70 - 130	<1.0	ug/L	NC (1)	30		
6782716	Bromomethane	2020/06/12	100	60 - 140	101	60 - 140	<0.50	ug/L	NC (1)	30		
6782716	Carbon Tetrachloride	2020/06/12	101	70 - 130	102	70 - 130	<0.19	ug/L	1.1 (1)	30		
6782716	Chlorobenzene	2020/06/12	99	70 - 130	101	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	Chloroethane	2020/06/12	96	70 - 130	94	70 - 130	<1.0	ug/L				
6782716	Chloroform	2020/06/12	96	70 - 130	95	70 - 130	<0.20	ug/L	1.2 (1)	30		
6782716	Chloromethane	2020/06/12	102	60 - 140	95	60 - 140	<5.0	ug/L				
6782716	cis-1,2-Dichloroethylene	2020/06/12	96	70 - 130	94	70 - 130	<0.50	ug/L	NC (1)	30		
6782716	cis-1,3-Dichloropropene	2020/06/12	105	70 - 130	101	70 - 130	<0.30	ug/L	NC (1)	30		

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BV Labs Job #: C0E2849

Report Date: 2020/06/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6782716	Dibromochloromethane	2020/06/12	111	70 - 130	110	70 - 130	<0.50	ug/L	NC (1)	30		
6782716	Ethylbenzene	2020/06/12	91	70 - 130	94	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	Ethylene Dibromide	2020/06/12	109	70 - 130	105	70 - 130	<0.19	ug/L	NC (1)	30		
6782716	Methyl Ethyl Ketone (2-Butanone)	2020/06/12	102	60 - 140	95	60 - 140	<10	ug/L	NC (1)	30		
6782716	Methyl Isobutyl Ketone	2020/06/12	100	70 - 130	96	70 - 130	<5.0	ug/L	NC (1)	30		
6782716	Methyl t-butyl ether (MTBE)	2020/06/12	91	70 - 130	90	70 - 130	<0.50	ug/L	NC (1)	30		
6782716	Methylene Chloride(Dichloromethane)	2020/06/12	111	70 - 130	106	70 - 130	<2.0	ug/L	NC (1)	30		
6782716	o-Xylene	2020/06/12	93	70 - 130	101	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	p+m-Xylene	2020/06/12	99	70 - 130	104	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	Styrene	2020/06/12	100	70 - 130	107	70 - 130	<0.40	ug/L	NC (1)	30		
6782716	Tetrachloroethylene	2020/06/12	101	70 - 130	103	70 - 130	<0.20	ug/L	2.0 (1)	30		
6782716	Toluene	2020/06/12	96	70 - 130	97	70 - 130	<0.20	ug/L	NC (1)	30		
6782716	Total Xylenes	2020/06/12					<0.20	ug/L	NC (1)	30		
6782716	trans-1,2-Dichloroethylene	2020/06/12	95	70 - 130	94	70 - 130	<0.50	ug/L	NC (1)	30		
6782716	trans-1,3-Dichloropropene	2020/06/12	136 (7)	70 - 130	131 (7)	70 - 130	<0.40	ug/L	NC (1)	30		
6782716	Trichloroethylene	2020/06/12	108	70 - 130	109	70 - 130	<0.20	ug/L	0.87 (1)	30		
6782716	Trichlorofluoromethane (FREON 11)	2020/06/12	104	70 - 130	104	70 - 130	<0.50	ug/L	NC (1)	30		
6782716	Vinyl Chloride	2020/06/12	95	70 - 130	94	70 - 130	<0.20	ug/L	NC (1)	30		
6782810	Total Kjeldahl Nitrogen (TKN)	2020/06/16	NC (2)	80 - 120	98	80 - 120	<0.7	mg/L	6.2 (3)	20	104	80 - 120
6783463	Total Aluminum (Al)	2020/06/16	103	80 - 120	96	80 - 120	<0.02	mg/L				
6783463	Total Arsenic (As)	2020/06/16	99	80 - 120	98	80 - 120	<0.001	mg/L	7.9 (1)	20		
6783463	Total Barium (Ba)	2020/06/16	94	80 - 120	95	80 - 120	<0.005	mg/L				
6783463	Total Beryllium (Be)	2020/06/16	101	80 - 120	100	80 - 120	<0.0006	mg/L				
6783463	Total Bismuth (Bi)	2020/06/16	88	80 - 120	92	80 - 120	<0.001	mg/L				
6783463	Total Boron (B)	2020/06/16	NC	80 - 120	86	80 - 120	<0.02	mg/L				
6783463	Total Cadmium (Cd)	2020/06/16	96	80 - 120	97	80 - 120	<0.0001	mg/L	NC (1)	20		
6783463	Total Calcium (Ca)	2020/06/16	NC	80 - 120	95	80 - 120	<0.2	mg/L				
6783463	Total Chromium (Cr)	2020/06/16	94	80 - 120	96	80 - 120	<0.005	mg/L	0.57 (1)	20		
6783463	Total Cobalt (Co)	2020/06/16	92	80 - 120	95	80 - 120	<0.0005	mg/L	7.2 (1)	20		
6783463	Total Copper (Cu)	2020/06/16	97	80 - 120	95	80 - 120	<0.002	mg/L	14 (1)	20		



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BV Labs Job #: C0E2849

Report Date: 2020/06/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6783463	Total Iron (Fe)	2020/06/16	92	80 - 120	94	80 - 120	<0.1	mg/L				
6783463	Total Lead (Pb)	2020/06/16	92	80 - 120	95	80 - 120	<0.0005	mg/L	NC (1)	20		
6783463	Total Magnesium (Mg)	2020/06/16	NC	80 - 120	94	80 - 120	<0.05	mg/L				
6783463	Total Molybdenum (Mo)	2020/06/16	101	80 - 120	97	80 - 120	<0.002	mg/L	NC (1)	20		
6783463	Total Nickel (Ni)	2020/06/16	89	80 - 120	92	80 - 120	<0.001	mg/L	2.8 (1)	20		
6783463	Total Potassium (K)	2020/06/16	NC	80 - 120	94	80 - 120	<0.2	mg/L				
6783463	Total Selenium (Se)	2020/06/16	98	80 - 120	102	80 - 120	<0.005	mg/L	NC (1)	20		
6783463	Total Silver (Ag)	2020/06/16	95	80 - 120	94	80 - 120	<0.0004	mg/L				
6783463	Total Sodium (Na)	2020/06/16	NC	80 - 120	96	80 - 120	<0.1	mg/L				
6783463	Total Strontium (Sr)	2020/06/16	NC	80 - 120	93	80 - 120	<0.003	mg/L				
6783463	Total Tin (Sn)	2020/06/16	98	80 - 120	95	80 - 120	<0.002	mg/L				
6783463	Total Titanium (Ti)	2020/06/16	95	80 - 120	94	80 - 120	<0.005	mg/L				
6783463	Total Vanadium (V)	2020/06/16	96	80 - 120	96	80 - 120	<0.001	mg/L				
6783463	Total Zinc (Zn)	2020/06/16	94	80 - 120	99	80 - 120	<0.01	mg/L	0.030 (1)	20		

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VERITAS

BV Labs Job #: C0E2849

Report Date: 2020/06/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6784613	Total Ammonia-N	2020/06/15	NC	75 - 125	100	80 - 120	<0.15	mg/L	0.79 (1)	20		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [MVK943-03]

(3) Duplicate Parent ID [MVK943-03]

(4) Matrix Spike Parent ID [MVK943-02]

(5) Duplicate Parent ID [MVK943-02]

(6) The recovery was below the lower control limit. This may represent a low bias in some results for this specific analyte.

(7) The recovery was above the upper control limit. This may represent a high bias in some results for this specific analyte. For results that were not detected (ND), this potential bias has no impact.



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BV Labs Job #: C0E2849
Report Date: 2020/06/17

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

**Attention: Brent Langille**

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: TCEC-LCHCM-JUL

Report Date: 2020/08/06
Report #: R6281680
Version: 1 - Final

CERTIFICATE OF ANALYSIS**BV LABS JOB #: C0I5111****Received: 2020/07/23, 10:30**

Sample Matrix: Leachate
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ABN Compounds in Water by GC/MS	1	2020/07/28	2020/07/29	CAM SOP-00301	EPA 8270 m
Alkalinity	1	N/A	2020/07/27	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	1	N/A	2020/07/27	CAM SOP-00463	SM 23 4500-Cl E m
Conductance in Water - On-site	1	N/A	2020/07/27		
Field Measured Dissolved Oxygen in Water	1	N/A	2020/07/27		
Total Metals by ICPMS	1	N/A	2020/07/28	CAM SOP-00447	EPA 6020B m
Ammonia-N	1	N/A	2020/07/29	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/07/27	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Field Measured pH (2)	1	N/A	2020/07/23		Field pH Meter
Sulphate by Automated Colourimetry	1	N/A	2020/07/27	CAM SOP-00464	EPA 375.4 m
Field Temperature (2)	1	N/A	2020/07/23		Field Thermometer
Total Kjeldahl Nitrogen in Water	1	2020/07/27	2020/07/29	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2020/07/27	2020/07/28	CAM SOP-00407	SM 23 4500 B F m
Turbidity - On-site	1	N/A	2020/08/04		
Un-ionized Ammonia	1	2020/07/24	2020/07/28	PWQO	PWQO
Volatile Organic Compounds in Water	1	N/A	2020/07/26	CAM SOP-00228	EPA 8260C m
Non-Routine Volatile Organic Compounds	1	N/A	2020/08/06	CAM SOP-00226	EPA 8260 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.



Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: TCEC-LCHCM-JUL

Report Date: 2020/08/06
Report #: R6281680
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0I5111

Received: 2020/07/23, 10:30

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

(2) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas Laboratories.

Encryption Key

Keshani Vijh
Supervisor - Environmental
Customer Service
06 Aug 2020 18:11:06

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Keshani Vijh, Supervisor – Environmental Customer Service

Email: Keshani.Vijh@bvlabs.com

Phone# (905)817-5733

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



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BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

RESULTS OF ANALYSES OF LEACHATE

BV Labs ID		NEL097		
Sampling Date		2020/07/21		
COC Number		TCEC-LCHCM-JUL		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Calculated Parameters				
Total Un-ionized Ammonia	mg/L	42	0.52	6853844
Field Measurements				
Field Conductivity	uS/cm	6110	N/A	ONSITE
Field Dissolved Oxygen	mg/L	4.63	N/A	ONSITE
Field Temperature	Celsius	26	N/A	ONSITE
Field Turbidity	NTU	98.6	N/A	ONSITE
Field Measured pH	pH	8		ONSITE
Inorganics				
Total Ammonia-N	mg/L	604 (1)	7.5	6858910
Total Kjeldahl Nitrogen (TKN)	mg/L	590 (1)	20	6857425
Total Phosphorus	mg/L	3.0	0.40	6857427
Dissolved Sulphate (SO ₄)	mg/L	<50 (2)	50	6855857
Alkalinity (Total as CaCO ₃)	mg/L	3400	5.0	6855775
Dissolved Chloride (Cl ⁻)	mg/L	950	50	6855853
Nitrite (N)	mg/L	<0.10	0.10	6855812
Nitrate (N)	mg/L	<1.0	1.0	6855812
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable (1) TKN < NH ₄ : Both values fall within acceptable RPD limits for duplicates and are likely equivalent. (2) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.				



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BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

ELEMENTS BY ATOMIC SPECTROSCOPY (LEACHATE)

BV Labs ID		NEL097		
Sampling Date		2020/07/21		
COC Number		TCEC-LCHCM-JUL		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Metals				
Total Aluminum (Al)	mg/L	0.55	0.08	6856571
Total Arsenic (As)	mg/L	0.049	0.005	6856571
Total Barium (Ba)	mg/L	0.15	0.03	6856571
Total Beryllium (Be)	mg/L	<0.003	0.003	6856571
Total Bismuth (Bi)	mg/L	<0.005	0.005	6856571
Total Boron (B)	mg/L	6.7	0.1	6856571
Total Cadmium (Cd)	mg/L	<0.0005	0.0005	6856571
Total Calcium (Ca)	mg/L	59	1	6856571
Total Chromium (Cr)	mg/L	0.24	0.03	6856571
Total Cobalt (Co)	mg/L	0.019	0.003	6856571
Total Copper (Cu)	mg/L	<0.01	0.01	6856571
Total Iron (Fe)	mg/L	1.9	0.5	6856571
Total Lead (Pb)	mg/L	<0.003	0.003	6856571
Total Magnesium (Mg)	mg/L	100	0.3	6856571
Total Molybdenum (Mo)	mg/L	0.05	0.01	6856571
Total Nickel (Ni)	mg/L	0.16	0.005	6856571
Total Potassium (K)	mg/L	300	1	6856571
Total Selenium (Se)	mg/L	<0.03	0.03	6856571
Total Silver (Ag)	mg/L	<0.002	0.002	6856571
Total Sodium (Na)	mg/L	850	0.5	6856571
Total Strontium (Sr)	mg/L	0.58	0.02	6856571
Total Tin (Sn)	mg/L	0.02	0.01	6856571
Total Titanium (Ti)	mg/L	0.14	0.03	6856571
Total Vanadium (V)	mg/L	0.027	0.005	6856571
Total Zinc (Zn)	mg/L	0.05	0.05	6856571
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NEL097		
Sampling Date		2020/07/21		
COC Number		TCEC-LCHCM-JUL		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Semivolatile Organics				
Acenaphthene	ug/L	<0.80	0.80	6859866
Acenaphthylene	ug/L	<0.80	0.80	6859866
Anthracene	ug/L	<0.80	0.80	6859866
Benzo(a)anthracene	ug/L	<0.80	0.80	6859866
Benzo(a)pyrene	ug/L	<0.80	0.80	6859866
Benzo(b/j)fluoranthene	ug/L	<0.80	0.80	6859866
Benzo(g,h,i)perylene	ug/L	<0.80	0.80	6859866
Benzo(k)fluoranthene	ug/L	<0.80	0.80	6859866
1-Chloronaphthalene	ug/L	<4.0	4.0	6859866
2-Chloronaphthalene	ug/L	<2.0	2.0	6859866
Chrysene	ug/L	<0.80	0.80	6859866
Dibenzo(a,h)anthracene	ug/L	<0.80	0.80	6859866
Fluoranthene	ug/L	<0.80	0.80	6859866
Fluorene	ug/L	<0.80	0.80	6859866
Indeno(1,2,3-cd)pyrene	ug/L	<0.80	0.80	6859866
1-Methylnaphthalene	ug/L	<0.80	0.80	6859866
2-Methylnaphthalene	ug/L	<0.80	0.80	6859866
Naphthalene	ug/L	<2.0 (1)	2.0	6859866
Perylene	ug/L	<0.80	0.80	6859866
Phenanthrene	ug/L	<0.80	0.80	6859866
Pyrene	ug/L	<0.80	0.80	6859866
1,2-Dichlorobenzene	ug/L	<2.0	2.0	6859866
1,3-Dichlorobenzene	ug/L	<2.0	2.0	6859866
1,4-Dichlorobenzene	ug/L	<2.0	2.0	6859866
Hexachlorobenzene	ug/L	<2.0	2.0	6859866
Pentachlorobenzene	ug/L	<2.0	2.0	6859866
1,2,3,5-Tetrachlorobenzene	ug/L	<2.0	2.0	6859866
1,2,4,5-Tetrachlorobenzene	ug/L	<2.0	2.0	6859866
1,2,3-Trichlorobenzene	ug/L	<2.0	2.0	6859866
1,2,4-Trichlorobenzene	ug/L	<2.0	2.0	6859866
1,3,5-Trichlorobenzene	ug/L	<2.0	2.0	6859866
2-Chlorophenol	ug/L	<1.2	1.2	6859866
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
(1) Detection limit was raised due to matrix interference.				



BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NEL097		
Sampling Date		2020/07/21		
COC Number		TCEC-LCHCM-JUL		
	UNITS	PS HOLDING TANK	RDL	QC Batch
4-Chloro-3-Methylphenol	ug/L	<2.0	2.0	6859866
m/p-Cresol	ug/L	340	2.0	6859866
o-Cresol	ug/L	5.0	2.0	6859866
1,2,3,4-Tetrachlorobenzene	ug/L	<2.0	2.0	6859866
2,3-Dichlorophenol	ug/L	<2.0	2.0	6859866
2,4-Dichlorophenol	ug/L	<1.2	1.2	6859866
2,5-Dichlorophenol	ug/L	<2.0	2.0	6859866
2,6-Dichlorophenol	ug/L	<2.0	2.0	6859866
3,4-Dichlorophenol	ug/L	<2.0	2.0	6859866
3,5-Dichlorophenol	ug/L	<2.0	2.0	6859866
2,4-Dimethylphenol	ug/L	<2.0	2.0	6859866
2,4-Dinitrophenol	ug/L	<8.0	8.0	6859866
4,6-Dinitro-2-methylphenol	ug/L	<8.0	8.0	6859866
2-Nitrophenol	ug/L	<2.0	2.0	6859866
4-Nitrophenol	ug/L	<5.6	5.6	6859866
Pentachlorophenol	ug/L	<4.0	4.0	6859866
Phenol	ug/L	32	2.0	6859866
2,3,4,5-Tetrachlorophenol	ug/L	<1.6	1.6	6859866
2,3,4,6-Tetrachlorophenol	ug/L	<2.0	2.0	6859866
2,3,5,6-Tetrachlorophenol	ug/L	<2.0	2.0	6859866
2,3,4-Trichlorophenol	ug/L	<2.0	2.0	6859866
2,3,5-Trichlorophenol	ug/L	<2.0	2.0	6859866
2,3,6-Trichlorophenol	ug/L	<2.0	2.0	6859866
2,4,5-Trichlorophenol	ug/L	<2.0	2.0	6859866
2,4,6-Trichlorophenol	ug/L	<2.0	2.0	6859866
3,4,5-Trichlorophenol	ug/L	<2.0	2.0	6859866
Benzyl butyl phthalate	ug/L	<2.0	2.0	6859866
Biphenyl	ug/L	<2.0	2.0	6859866
Bis(2-chloroethyl)ether	ug/L	<2.0	2.0	6859866
Bis(2-chloroethoxy)methane	ug/L	<2.0	2.0	6859866
Bis(2-chloroisopropyl)ether	ug/L	<2.0	2.0	6859866
Bis(2-ethylhexyl)phthalate	ug/L	14	8.0	6859866
4-Bromophenyl phenyl ether	ug/L	<1.2	1.2	6859866
p-Chloroaniline	ug/L	<4.0	4.0	6859866
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NEL097		
Sampling Date		2020/07/21		
COC Number		TCEC-LCHCM-JUL		
	UNITS	PS HOLDING TANK	RDL	QC Batch
4-Chlorophenyl phenyl ether	ug/L	<2.0	2.0	6859866
Di-N-butyl phthalate	ug/L	<8.0	8.0	6859866
di-n-octyl phthalate	ug/L	<3.2	3.2	6859866
2,4-Dinitrotoluene	ug/L	<2.0	2.0	6859866
Diethyl phthalate	ug/L	<4.0	4.0	6859866
3,3'-Dichlorobenzidine	ug/L	<2.0	2.0	6859866
Dimethyl phthalate	ug/L	<4.0	4.0	6859866
2,6-Dinitrotoluene	ug/L	<2.0	2.0	6859866
Diphenyl Ether	ug/L	<1.2	1.2	6859866
Hexachlorobutadiene	ug/L	<1.6	1.6	6859866
Hexachlorocyclopentadiene	ug/L	<8.0	8.0	6859866
Hexachloroethane	ug/L	<2.0	2.0	6859866
Isophorone	ug/L	<2.0	2.0	6859866
Nitrobenzene	ug/L	<2.0	2.0	6859866
Nitrosodiphenylamine/Diphenylamine	ug/L	<4.0	4.0	6859866
N-Nitroso-di-n-propylamine	ug/L	<2.0	2.0	6859866
Surrogate Recovery (%)				
2,4,6-Tribromophenol	%	97		6859866
2-Fluorobiphenyl	%	64		6859866
2-Fluorophenol	%	32		6859866
D14-Terphenyl	%	102		6859866
D5-Nitrobenzene	%	64		6859866
D5-Phenol	%	37		6859866
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		NEL097		
Sampling Date		2020/07/21		
COC Number		TCEC-LCHCM-JUL		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Volatile Organics				
Acetone (2-Propanone)	ug/L	800	100	6855574
Benzene	ug/L	<2.0	2.0	6855574
Bromodichloromethane	ug/L	<5.0	5.0	6855574
Bromoform	ug/L	<10	10	6855574
Bromomethane	ug/L	<5.0	5.0	6855574
Carbon Tetrachloride	ug/L	<1.9	1.9	6855574
Chlorobenzene	ug/L	<2.0	2.0	6855574
Chloroethane	ug/L	<10	10	6855574
Chloroform	ug/L	18	2.0	6855574
Chloromethane	ug/L	<50	50	6855574
Dibromochloromethane	ug/L	<5.0	5.0	6855574
1,2-Dichlorobenzene	ug/L	<4.0	4.0	6855574
1,3-Dichlorobenzene	ug/L	<4.0	4.0	6855574
1,4-Dichlorobenzene	ug/L	<4.0	4.0	6855574
1,1-Dichloroethane	ug/L	<2.0	2.0	6855574
1,2-Dichloroethane	ug/L	<4.9	4.9	6855574
1,1-Dichloroethylene	ug/L	<2.0	2.0	6855574
cis-1,2-Dichloroethylene	ug/L	<5.0	5.0	6855574
trans-1,2-Dichloroethylene	ug/L	<5.0	5.0	6855574
1,2-Dichloropropane	ug/L	<2.0	2.0	6855574
cis-1,3-Dichloropropene	ug/L	<3.0	3.0	6855574
trans-1,3-Dichloropropene	ug/L	<4.0	4.0	6855574
Ethylbenzene	ug/L	2.9	2.0	6855574
Ethylene Dibromide	ug/L	<1.9	1.9	6855574
Methylene Chloride(Dichloromethane)	ug/L	<20	20	6855574
Methyl Ethyl Ketone (2-Butanone)	ug/L	1000	100	6855574
Methyl Isobutyl Ketone	ug/L	<50	50	6855574
Methyl t-butyl ether (MTBE)	ug/L	<5.0	5.0	6855574
Styrene	ug/L	<4.0	4.0	6855574
1,1,1,2-Tetrachloroethane	ug/L	<5.0	5.0	6855574
1,1,2,2-Tetrachloroethane	ug/L	<4.0	4.0	6855574
Tetrachloroethylene	ug/L	<2.0	2.0	6855574
1,3,5-Trimethylbenzene	ug/L	<1.0	1.0	6872295
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		NEL097		
Sampling Date		2020/07/21		
COC Number		TCEC-LCHCM-JUL		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Toluene	ug/L	17	2.0	6855574
1,1,1-Trichloroethane	ug/L	<2.0	2.0	6855574
1,1,2-Trichloroethane	ug/L	<4.0	4.0	6855574
Trichloroethylene	ug/L	<2.0	2.0	6855574
Trichlorofluoromethane (FREON 11)	ug/L	<5.0	5.0	6855574
Vinyl Chloride	ug/L	<2.0	2.0	6855574
p+m-Xylene	ug/L	7.5	2.0	6855574
o-Xylene	ug/L	3.7	2.0	6855574
Total Xylenes	ug/L	11	2.0	6855574
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	92		6855574
D4-1,2-Dichloroethane	%	110		6855574
D8-Toluene	%	93		6855574
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: C0I5111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C
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Sample NEL097 [PS HOLDING TANK] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

ABN analysis: Due to the nature of the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Nitrite/Nitrate: Due to colour interferences, sample required dilution. Detection limit was adjusted accordingly.

Metals Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

VOC-WTR-X Analysis: Due to foaming, sample required dilution. The detection limits were adjusted accordingly.

VOC-WTR-X Analysis: The sample was analyzed after the 14 day holding time specified by the method had expired.

Results relate only to the items tested.

BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6855574	4-Bromofluorobenzene	2020/07/26	99	70 - 130	99	70 - 130	94	%				
6855574	D4-1,2-Dichloroethane	2020/07/26	104	70 - 130	98	70 - 130	107	%				
6855574	D8-Toluene	2020/07/26	105	70 - 130	107	70 - 130	94	%				
6859866	2,4,6-Tribromophenol	2020/07/29	86	10 - 130	84	10 - 130	86	%				
6859866	2-Fluorobiphenyl	2020/07/29	76	30 - 130	73	30 - 130	75	%				
6859866	2-Fluorophenol	2020/07/29	46	10 - 130	48	10 - 130	53	%				
6859866	D14-Terphenyl	2020/07/29	91	30 - 130	102	30 - 130	98	%				
6859866	D5-Nitrobenzene	2020/07/29	74	30 - 130	85	30 - 130	76	%				
6859866	D5-Phenol	2020/07/29	33	10 - 130	34	10 - 130	36	%				
6855574	1,1,1,2-Tetrachloroethane	2020/07/26	99	70 - 130	100	70 - 130	<0.50	ug/L				
6855574	1,1,1-Trichloroethane	2020/07/26	94	70 - 130	97	70 - 130	<0.20	ug/L				
6855574	1,1,2,2-Tetrachloroethane	2020/07/26	105	70 - 130	97	70 - 130	<0.40	ug/L				
6855574	1,1,2-Trichloroethane	2020/07/26	104	70 - 130	100	70 - 130	<0.40	ug/L				
6855574	1,1-Dichloroethane	2020/07/26	96	70 - 130	96	70 - 130	<0.20	ug/L				
6855574	1,1-Dichloroethylene	2020/07/26	99	70 - 130	103	70 - 130	<0.20	ug/L				
6855574	1,2-Dichlorobenzene	2020/07/26	91	70 - 130	93	70 - 130	<0.40	ug/L				
6855574	1,2-Dichloroethane	2020/07/26	117	70 - 130	111	70 - 130	<0.49	ug/L				
6855574	1,2-Dichloropropane	2020/07/26	94	70 - 130	92	70 - 130	<0.20	ug/L				
6855574	1,3-Dichlorobenzene	2020/07/26	90	70 - 130	94	70 - 130	<0.40	ug/L				
6855574	1,4-Dichlorobenzene	2020/07/26	94	70 - 130	100	70 - 130	<0.40	ug/L	NC (1)	30		
6855574	Acetone (2-Propanone)	2020/07/26	109	60 - 140	100	60 - 140	<10	ug/L				
6855574	Benzene	2020/07/26	95	70 - 130	96	70 - 130	<0.20	ug/L	NC (1)	30		
6855574	Bromodichloromethane	2020/07/26	95	70 - 130	94	70 - 130	<0.50	ug/L				
6855574	Bromoform	2020/07/26	101	70 - 130	96	70 - 130	<1.0	ug/L				
6855574	Bromomethane	2020/07/26	92	60 - 140	95	60 - 140	<0.50	ug/L				
6855574	Carbon Tetrachloride	2020/07/26	91	70 - 130	95	70 - 130	<0.19	ug/L				
6855574	Chlorobenzene	2020/07/26	93	70 - 130	95	70 - 130	<0.20	ug/L				
6855574	Chloroethane	2020/07/26	94	70 - 130	97	70 - 130	<1.0	ug/L				
6855574	Chloroform	2020/07/26	91	70 - 130	91	70 - 130	<0.20	ug/L				
6855574	Chloromethane	2020/07/26	88	60 - 140	94	60 - 140	<5.0	ug/L				

BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6855574	cis-1,2-Dichloroethylene	2020/07/26	89	70 - 130	89	70 - 130	<0.50	ug/L				
6855574	cis-1,3-Dichloropropene	2020/07/26	88	70 - 130	90	70 - 130	<0.30	ug/L				
6855574	Dibromochloromethane	2020/07/26	101	70 - 130	99	70 - 130	<0.50	ug/L				
6855574	Ethylbenzene	2020/07/26	91	70 - 130	96	70 - 130	<0.20	ug/L	NC (1)	30		
6855574	Ethylene Dibromide	2020/07/26	100	70 - 130	95	70 - 130	<0.19	ug/L				
6855574	Methyl Ethyl Ketone (2-Butanone)	2020/07/26	112	60 - 140	101	60 - 140	<10	ug/L				
6855574	Methyl Isobutyl Ketone	2020/07/26	115	70 - 130	104	70 - 130	<5.0	ug/L				
6855574	Methyl t-butyl ether (MTBE)	2020/07/26	91	70 - 130	88	70 - 130	<0.50	ug/L				
6855574	Methylene Chloride(Dichloromethane)	2020/07/26	105	70 - 130	104	70 - 130	<2.0	ug/L	NC (1)	30		
6855574	o-Xylene	2020/07/26	92	70 - 130	101	70 - 130	<0.20	ug/L	NC (1)	30		
6855574	p+m-Xylene	2020/07/26	100	70 - 130	107	70 - 130	<0.20	ug/L	NC (1)	30		
6855574	Styrene	2020/07/26	96	70 - 130	103	70 - 130	<0.40	ug/L				
6855574	Tetrachloroethylene	2020/07/26	85	70 - 130	91	70 - 130	<0.20	ug/L				
6855574	Toluene	2020/07/26	94	70 - 130	98	70 - 130	<0.20	ug/L	NC (1)	30		
6855574	Total Xylenes	2020/07/26					<0.20	ug/L	NC (1)	30		
6855574	trans-1,2-Dichloroethylene	2020/07/26	94	70 - 130	98	70 - 130	<0.50	ug/L				
6855574	trans-1,3-Dichloropropene	2020/07/26	92	70 - 130	94	70 - 130	<0.40	ug/L				
6855574	Trichloroethylene	2020/07/26	93	70 - 130	97	70 - 130	<0.20	ug/L				
6855574	Trichlorofluoromethane (FREON 11)	2020/07/26	94	70 - 130	99	70 - 130	<0.50	ug/L				
6855574	Vinyl Chloride	2020/07/26	94	70 - 130	98	70 - 130	<0.20	ug/L	NC (1)	30		
6855775	Alkalinity (Total as CaCO3)	2020/07/27			95	85 - 115	<1.0	mg/L	0.94 (1)	20		
6855812	Nitrate (N)	2020/07/27	90	80 - 120	92	80 - 120	<0.10	mg/L	NC (1)	20		
6855812	Nitrite (N)	2020/07/27	109	80 - 120	110	80 - 120	<0.010	mg/L				
6855853	Dissolved Chloride (Cl-)	2020/07/27	NC	80 - 120	102	80 - 120	<1.0	mg/L	0.097 (1)	20		
6855857	Dissolved Sulphate (SO4)	2020/07/27	NC	75 - 125	103	80 - 120	<1.0	mg/L	0.20 (1)	20		
6856571	Total Aluminum (Al)	2020/07/28	97	80 - 120	97	80 - 120	<0.02	mg/L	NC (1)	20		
6856571	Total Arsenic (As)	2020/07/28	96	80 - 120	96	80 - 120	<0.001	mg/L				
6856571	Total Barium (Ba)	2020/07/28	95	80 - 120	97	80 - 120	<0.005	mg/L				
6856571	Total Beryllium (Be)	2020/07/28	98	80 - 120	100	80 - 120	<0.0006	mg/L				
6856571	Total Bismuth (Bi)	2020/07/28	102	80 - 120	102	80 - 120	<0.001	mg/L	NC (1)	20		



BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6856571	Total Boron (B)	2020/07/28	NC	80 - 120	98	80 - 120	<0.02	mg/L	6.4 (1)	20		
6856571	Total Cadmium (Cd)	2020/07/28	97	80 - 120	97	80 - 120	<0.0001	mg/L	NC (1)	20		
6856571	Total Calcium (Ca)	2020/07/28	NC	80 - 120	96	80 - 120	<0.2	mg/L				
6856571	Total Chromium (Cr)	2020/07/28	90	80 - 120	92	80 - 120	<0.005	mg/L	NC (1)	20		
6856571	Total Cobalt (Co)	2020/07/28	97	80 - 120	97	80 - 120	<0.0005	mg/L	1.0 (1)	20		
6856571	Total Copper (Cu)	2020/07/28	102	80 - 120	98	80 - 120	<0.002	mg/L	NC (1)	20		
6856571	Total Iron (Fe)	2020/07/28	92	80 - 120	97	80 - 120	<0.1	mg/L				
6856571	Total Lead (Pb)	2020/07/28	97	80 - 120	100	80 - 120	<0.0005	mg/L	NC (1)	20		
6856571	Total Magnesium (Mg)	2020/07/28	NC	80 - 120	96	80 - 120	<0.05	mg/L				
6856571	Total Molybdenum (Mo)	2020/07/28	98	80 - 120	93	80 - 120	<0.002	mg/L	NC (1)	20		
6856571	Total Nickel (Ni)	2020/07/28	91	80 - 120	93	80 - 120	<0.001	mg/L	4.1 (1)	20		
6856571	Total Potassium (K)	2020/07/28	NC	80 - 120	102	80 - 120	<0.2	mg/L				
6856571	Total Selenium (Se)	2020/07/28	94	80 - 120	95	80 - 120	<0.005	mg/L				
6856571	Total Silver (Ag)	2020/07/28	92	80 - 120	92	80 - 120	<0.0004	mg/L	NC (1)	20		
6856571	Total Sodium (Na)	2020/07/28	NC	80 - 120	96	80 - 120	<0.1	mg/L				
6856571	Total Strontium (Sr)	2020/07/28	NC	80 - 120	96	80 - 120	<0.003	mg/L				
6856571	Total Tin (Sn)	2020/07/28	104	80 - 120	100	80 - 120	<0.002	mg/L	NC (1)	20		
6856571	Total Titanium (Ti)	2020/07/28	98	80 - 120	98	80 - 120	<0.005	mg/L	NC (1)	20		
6856571	Total Vanadium (V)	2020/07/28	93	80 - 120	93	80 - 120	<0.001	mg/L	7.5 (1)	20		
6856571	Total Zinc (Zn)	2020/07/28	92	80 - 120	101	80 - 120	<0.01	mg/L	NC (1)	20		
6857425	Total Kjeldahl Nitrogen (TKN)	2020/07/28	NC	80 - 120	103	80 - 120	<0.7	mg/L	6.2 (1)	20	104	80 - 120
6857427	Total Phosphorus	2020/07/28	100	80 - 120	101	80 - 120	<0.030	mg/L	2.3 (1)	25	101	80 - 120
6858910	Total Ammonia-N	2020/07/29	98	75 - 125	100	80 - 120	<0.15	mg/L	13 (1)	20		
6859866	1,2,3,4-Tetrachlorobenzene	2020/07/29	72	30 - 130	66	30 - 130	<0.50	ug/L				
6859866	1,2,3,5-Tetrachlorobenzene	2020/07/29	78	30 - 130	66	30 - 130	<0.50	ug/L				
6859866	1,2,3-Trichlorobenzene	2020/07/29	60	30 - 130	58	30 - 130	<0.50	ug/L				
6859866	1,2,4,5-Tetrachlorobenzene	2020/07/29	45	30 - 130	49	30 - 130	<0.50	ug/L				
6859866	1,2,4-Trichlorobenzene	2020/07/29	61	30 - 130	61	30 - 130	<0.50	ug/L				
6859866	1,2-Dichlorobenzene	2020/07/29	56	30 - 130	52	30 - 130	<0.50	ug/L				
6859866	1,3,5-Trichlorobenzene	2020/07/29	63	30 - 130	68	30 - 130	<0.50	ug/L				



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VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6859866	1,3-Dichlorobenzene	2020/07/29	50	30 - 130	46	30 - 130	<0.50	ug/L				
6859866	1,4-Dichlorobenzene	2020/07/29	59	30 - 130	52	30 - 130	<0.50	ug/L				
6859866	1-Chloronaphthalene	2020/07/29	66	30 - 130	77	30 - 130	<1.0	ug/L				
6859866	1-Methylnaphthalene	2020/07/29	81	30 - 130	76	30 - 130	<0.20	ug/L				
6859866	2,3,4,5-Tetrachlorophenol	2020/07/29	83	10 - 130	103	10 - 130	<0.40	ug/L				
6859866	2,3,4,6-Tetrachlorophenol	2020/07/29	87	10 - 130	71	10 - 130	<0.50	ug/L				
6859866	2,3,4-Trichlorophenol	2020/07/29	87	10 - 130	77	10 - 130	<0.50	ug/L				
6859866	2,3,5,6-Tetrachlorophenol	2020/07/29	75	10 - 130	64	10 - 130	<0.50	ug/L				
6859866	2,3,5-Trichlorophenol	2020/07/29	97	10 - 130	86	10 - 130	<0.50	ug/L				
6859866	2,3,6-Trichlorophenol	2020/07/29	90	10 - 130	87	10 - 130	<0.50	ug/L				
6859866	2,3-Dichlorophenol	2020/07/29	83	10 - 130	86	10 - 130	<0.50	ug/L				
6859866	2,4,5-Trichlorophenol	2020/07/29	98	10 - 130	92	10 - 130	<0.50	ug/L				
6859866	2,4,6-Trichlorophenol	2020/07/29	85	10 - 130	85	10 - 130	<0.50	ug/L				
6859866	2,4-Dichlorophenol	2020/07/29	95	10 - 130	91	10 - 130	<0.30	ug/L				
6859866	2,4-Dimethylphenol	2020/07/29	82	10 - 130	56	10 - 130	<0.50	ug/L				
6859866	2,4-Dinitrophenol	2020/07/29	94	10 - 130	106	10 - 130	<2.0	ug/L				
6859866	2,4-Dinitrotoluene	2020/07/29	92	30 - 130	93	30 - 130	<0.50	ug/L				
6859866	2,5-Dichlorophenol	2020/07/29	91	10 - 130	78	10 - 130	<0.50	ug/L				
6859866	2,6-Dichlorophenol	2020/07/29	82	10 - 130	80	10 - 130	<0.50	ug/L				
6859866	2,6-Dinitrotoluene	2020/07/29	89	30 - 130	90	30 - 130	<0.50	ug/L				
6859866	2-Chloronaphthalene	2020/07/29	85	30 - 130	77	30 - 130	<0.50	ug/L				
6859866	2-Chlorophenol	2020/07/29	72	10 - 130	75	10 - 130	<0.30	ug/L				
6859866	2-Methylnaphthalene	2020/07/29	79	30 - 130	73	30 - 130	<0.20	ug/L				
6859866	2-Nitrophenol	2020/07/29	78	10 - 130	87	10 - 130	<0.50	ug/L				
6859866	3,3'-Dichlorobenzidine	2020/07/29	50	30 - 130	128	30 - 130	<0.50	ug/L				
6859866	3,4,5-Trichlorophenol	2020/07/29	95	10 - 130	99	10 - 130	<0.50	ug/L				
6859866	3,4-Dichlorophenol	2020/07/29	90	10 - 130	88	10 - 130	<0.50	ug/L				
6859866	3,5-Dichlorophenol	2020/07/29	88	10 - 130	69	10 - 130	<0.50	ug/L				
6859866	4,6-Dinitro-2-methylphenol	2020/07/29	95	10 - 130	103	10 - 130	<2.0	ug/L				
6859866	4-Bromophenyl phenyl ether	2020/07/29	82	30 - 130	87	30 - 130	<0.30	ug/L				



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BV Labs Job #: C015111

Report Date: 2020/08/06

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6859866	4-Chloro-3-Methylphenol	2020/07/29	89	10 - 130	83	10 - 130	<0.50	ug/L				
6859866	4-Chlorophenyl phenyl ether	2020/07/29	79	30 - 130	76	30 - 130	<0.50	ug/L				
6859866	4-Nitrophenol	2020/07/29	47	10 - 130	46	10 - 130	<1.4	ug/L				
6859866	Acenaphthene	2020/07/29	86	30 - 130	80	30 - 130	<0.20	ug/L				
6859866	Acenaphthylene	2020/07/29	83	30 - 130	80	30 - 130	<0.20	ug/L				
6859866	Anthracene	2020/07/29	80	30 - 130	86	30 - 130	<0.20	ug/L				
6859866	Benzo(a)anthracene	2020/07/29	96	30 - 130	103	30 - 130	<0.20	ug/L				
6859866	Benzo(a)pyrene	2020/07/29	87	30 - 130	94	30 - 130	<0.20	ug/L				
6859866	Benzo(b,j)fluoranthene	2020/07/29	98	30 - 130	102	30 - 130	<0.20	ug/L				
6859866	Benzo(g,h,i)perylene	2020/07/29	91	30 - 130	97	30 - 130	<0.20	ug/L				
6859866	Benzo(k)fluoranthene	2020/07/29	102	30 - 130	104	30 - 130	<0.20	ug/L				
6859866	Benzyl butyl phthalate	2020/07/29	90	30 - 130	105	30 - 130	<0.50	ug/L				
6859866	Biphenyl	2020/07/29	86	30 - 130	82	30 - 130	<0.50	ug/L				
6859866	Bis(2-chloroethoxy)methane	2020/07/29	75	30 - 130	74	30 - 130	<0.50	ug/L				
6859866	Bis(2-chloroethyl)ether	2020/07/29	77	30 - 130	76	30 - 130	<0.50	ug/L				
6859866	Bis(2-chloroisopropyl)ether	2020/07/29	73	30 - 130	76	30 - 130	<0.50	ug/L				
6859866	Bis(2-ethylhexyl)phthalate	2020/07/29	88	30 - 130	99	30 - 130	<2.0	ug/L	NC (1)	40		
6859866	Chrysene	2020/07/29	94	30 - 130	102	30 - 130	<0.20	ug/L				
6859866	Dibenzo(a,h)anthracene	2020/07/29	96	30 - 130	101	30 - 130	<0.20	ug/L				
6859866	Diethyl phthalate	2020/07/29	87	30 - 130	91	30 - 130	<1.0	ug/L				
6859866	Dimethyl phthalate	2020/07/29	89	30 - 130	92	30 - 130	<1.0	ug/L				
6859866	Di-N-butyl phthalate	2020/07/29	90	30 - 130	101	30 - 130	<2.0	ug/L	NC (1)	40		
6859866	di-n-octyl phthalate	2020/07/29	99	30 - 130	105	30 - 130	<0.80	ug/L				
6859866	Diphenyl Ether	2020/07/29	75	30 - 130	72	30 - 130	<0.30	ug/L				
6859866	Fluoranthene	2020/07/29	92	30 - 130	100	30 - 130	<0.20	ug/L				
6859866	Fluorene	2020/07/29	87	30 - 130	85	30 - 130	<0.20	ug/L				
6859866	Hexachlorobenzene	2020/07/29	88	30 - 130	92	30 - 130	<0.50	ug/L				
6859866	Hexachlorobutadiene	2020/07/29	45	30 - 130	42	30 - 130	<0.40	ug/L				
6859866	Hexachlorocyclopentadiene	2020/07/29	28 (2)	30 - 130	43	30 - 130	<2.0	ug/L				
6859866	Hexachloroethane	2020/07/29	42	30 - 130	43	30 - 130	<0.50	ug/L				

BUREAU
VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6859866	Indeno(1,2,3-cd)pyrene	2020/07/29	96	30 - 130	102	30 - 130	<0.20	ug/L				
6859866	Isophorone	2020/07/29	81	30 - 130	87	30 - 130	<0.50	ug/L				
6859866	m/p-Cresol	2020/07/29	78	10 - 130	69	10 - 130	<0.50	ug/L				
6859866	Naphthalene	2020/07/29	67	30 - 130	67	30 - 130	<0.20	ug/L				
6859866	Nitrobenzene	2020/07/29	73	30 - 130	85	30 - 130	<0.50	ug/L				
6859866	Nitrosodiphenylamine/Diphenylamine	2020/07/29	87	30 - 130	94	30 - 130	<1.0	ug/L				
6859866	N-Nitroso-di-n-propylamine	2020/07/29	94	30 - 130	95	30 - 130	<0.50	ug/L				
6859866	o-Cresol	2020/07/29	70	10 - 130	69	10 - 130	<0.50	ug/L				
6859866	p-Chloroaniline	2020/07/29	24 (2)	30 - 130	74	30 - 130	<1.0	ug/L				
6859866	Pentachlorobenzene	2020/07/29	69	30 - 130	71	30 - 130	<0.50	ug/L				
6859866	Pentachlorophenol	2020/07/29	84	10 - 130	57	10 - 130	<1.0	ug/L				
6859866	Perylene	2020/07/29	90	30 - 130	99	30 - 130	<0.20	ug/L				
6859866	Phenanthrene	2020/07/29	90	30 - 130	91	30 - 130	<0.20	ug/L				
6859866	Phenol	2020/07/29	34	10 - 130	36	10 - 130	<0.50	ug/L				
6859866	Pyrene	2020/07/29	93	30 - 130	101	30 - 130	<0.20	ug/L				
6872295	1,3,5-Trimethylbenzene	2020/08/06	109	60 - 140	106	60 - 140	<0.20	ug/L	NC (1)	30		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

(1) Duplicate Parent ID

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



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VERITAS

BV Labs Job #: C015111

Report Date: 2020/08/06

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

Brad Newman, Scientific Service Specialist

Keshani Vijn, Supervisor – Environmental Customer Service

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: na

Report Date: 2020/09/17
Report #: R6334186
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON3550

Received: 2020/09/10, 11:08

Sample Matrix: Leachate
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ABN Compounds in Water by GC/MS	1	2020/09/14	2020/09/15	CAM SOP-00301	EPA 8270 m
Alkalinity	1	N/A	2020/09/11	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	1	N/A	2020/09/11	CAM SOP-00463	SM 23 4500-Cl E m
Conductance in Water - On-site	1	N/A	2020/09/15		
Field Measured Dissolved Oxygen in Water	1	N/A	2020/09/15		
Total Metals by ICPMS	1	N/A	2020/09/16	CAM SOP-00447	EPA 6020B m
Ammonia-N	1	N/A	2020/09/14	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/09/11	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Field Measured pH (2)	1	N/A	2020/09/10		Field pH Meter
Sulphate by Automated Colourimetry	1	N/A	2020/09/11	CAM SOP-00464	EPA 375.4 m
Field Temperature (2)	1	N/A	2020/09/10		Field Thermometer
Total Kjeldahl Nitrogen in Water	1	2020/09/14	2020/09/14	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2020/09/14	2020/09/14	CAM SOP-00407	SM 23 4500 B F m
Turbidity - On-site	1	N/A	2020/09/15		
Un-ionized Ammonia	1	2020/09/10	2020/09/15	PWQO	PWQO
Volatile Organic Compounds in Water	1	N/A	2020/09/11	CAM SOP-00228	EPA 8260C m
Non-Routine Volatile Organic Compounds	1	N/A	2020/09/14	CAM SOP-00226	EPA 8260 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.



Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: na

Report Date: 2020/09/17
Report #: R6334186
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON3550

Received: 2020/09/10, 11:08

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

(2) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas Laboratories.

Encryption Key

Keshani Vijh
Supervisor - Environmental
Customer Service
17 Sep 2020 14:34:18

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Keshani Vijh, Supervisor – Environmental Customer Service

Email: Keshani.Vijh@bvlabs.com

Phone# (905)817-5733

=====

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BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

RESULTS OF ANALYSES OF LEACHATE

BV Labs ID		NOY570		
Sampling Date		2020/08/31		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Calculated Parameters				
Total Un-ionized Ammonia	mg/L	12	0.12	6936326
Field Measurements				
Field Conductivity	uS/cm	9770	N/A	ONSITE
Field Dissolved Oxygen	mg/L	2.1	N/A	ONSITE
Field Temperature	Celsius	17.7	N/A	ONSITE
Field Turbidity	NTU	117	N/A	ONSITE
Field Measured pH	pH	7.6		ONSITE
Inorganics				
Total Ammonia-N	mg/L	719	7.5	6942165
Total Kjeldahl Nitrogen (TKN)	mg/L	900	20	6942167
Total Phosphorus	mg/L	3.3	0.40	6941944
Dissolved Sulphate (SO ₄)	mg/L	480	20	6938403
Alkalinity (Total as CaCO ₃)	mg/L	4800	5.0	6938406
Dissolved Chloride (Cl ⁻)	mg/L	1100	20	6938400
Nitrite (N)	mg/L	<0.10	0.10	6938430
Nitrate (N)	mg/L	<1.0	1.0	6938430
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
N/A = Not Applicable				



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VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

ELEMENTS BY ATOMIC SPECTROSCOPY (LEACHATE)

BV Labs ID		NOY570		
Sampling Date		2020/08/31		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Metals				
Total Aluminum (Al)	mg/L	0.4	0.2	6944649
Total Arsenic (As)	mg/L	0.05	0.01	6944649
Total Barium (Ba)	mg/L	0.22	0.05	6944649
Total Beryllium (Be)	mg/L	<0.006	0.006	6944649
Total Bismuth (Bi)	mg/L	<0.01	0.01	6944649
Total Boron (B)	mg/L	20	0.2	6944649
Total Cadmium (Cd)	mg/L	<0.001	0.001	6944649
Total Calcium (Ca)	mg/L	180	2	6944649
Total Chromium (Cr)	mg/L	0.23	0.05	6944649
Total Cobalt (Co)	mg/L	0.019	0.005	6944649
Total Copper (Cu)	mg/L	<0.02	0.02	6944649
Total Iron (Fe)	mg/L	5	1	6944649
Total Lead (Pb)	mg/L	<0.005	0.005	6944649
Total Magnesium (Mg)	mg/L	180	0.5	6944649
Total Molybdenum (Mo)	mg/L	0.05	0.02	6944649
Total Nickel (Ni)	mg/L	0.17	0.01	6944649
Total Potassium (K)	mg/L	330	2	6944649
Total Selenium (Se)	mg/L	<0.05	0.05	6944649
Total Silver (Ag)	mg/L	<0.004	0.004	6944649
Total Sodium (Na)	mg/L	1200	1	6944649
Total Strontium (Sr)	mg/L	1.7	0.03	6944649
Total Tin (Sn)	mg/L	<0.02	0.02	6944649
Total Titanium (Ti)	mg/L	0.16	0.05	6944649
Total Vanadium (V)	mg/L	0.03	0.01	6944649
Total Zinc (Zn)	mg/L	<0.1	0.1	6944649
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: CON3550
Report Date: 2020/09/17

RWDI Inc.
Client Project #: 2001313-1000
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: JCL

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NOY570		
Sampling Date		2020/08/31		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Semivolatile Organics				
Acenaphthene	ug/L	<0.80	0.80	6941586
Acenaphthylene	ug/L	<0.80	0.80	6941586
Anthracene	ug/L	<0.80	0.80	6941586
Benzo(a)anthracene	ug/L	<0.80	0.80	6941586
Benzo(a)pyrene	ug/L	<0.80	0.80	6941586
Benzo(b/j)fluoranthene	ug/L	<0.80	0.80	6941586
Benzo(g,h,i)perylene	ug/L	<0.80	0.80	6941586
Benzo(k)fluoranthene	ug/L	<0.80	0.80	6941586
1-Chloronaphthalene	ug/L	<4.0	4.0	6941586
2-Chloronaphthalene	ug/L	<2.0	2.0	6941586
Chrysene	ug/L	<0.80	0.80	6941586
Dibenzo(a,h)anthracene	ug/L	<0.80	0.80	6941586
Fluoranthene	ug/L	<0.80	0.80	6941586
Fluorene	ug/L	<0.80	0.80	6941586
Indeno(1,2,3-cd)pyrene	ug/L	<0.80	0.80	6941586
1-Methylnaphthalene	ug/L	<0.80	0.80	6941586
2-Methylnaphthalene	ug/L	<0.80	0.80	6941586
Naphthalene	ug/L	<2.5 (1)	2.5	6941586
Perylene	ug/L	<0.80	0.80	6941586
Phenanthrene	ug/L	<0.80	0.80	6941586
Pyrene	ug/L	<0.80	0.80	6941586
1,2-Dichlorobenzene	ug/L	<2.0	2.0	6941586
1,3-Dichlorobenzene	ug/L	<2.0	2.0	6941586
1,4-Dichlorobenzene	ug/L	<2.0	2.0	6941586
Hexachlorobenzene	ug/L	<2.0	2.0	6941586
Pentachlorobenzene	ug/L	<2.0	2.0	6941586
1,2,3,5-Tetrachlorobenzene	ug/L	<2.0	2.0	6941586
1,2,4,5-Tetrachlorobenzene	ug/L	<2.0	2.0	6941586
1,2,3-Trichlorobenzene	ug/L	<2.0	2.0	6941586
1,2,4-Trichlorobenzene	ug/L	<2.0	2.0	6941586
1,3,5-Trichlorobenzene	ug/L	<2.0	2.0	6941586
2-Chlorophenol	ug/L	<1.2	1.2	6941586
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
(1) Detection limit was raised due to matrix interference.				



BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NOY570		
Sampling Date		2020/08/31		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
4-Chloro-3-Methylphenol	ug/L	<2.0	2.0	6941586
m/p-Cresol	ug/L	190	2.0	6941586
o-Cresol	ug/L	7.1	2.0	6941586
1,2,3,4-Tetrachlorobenzene	ug/L	<2.0	2.0	6941586
2,3-Dichlorophenol	ug/L	<2.0	2.0	6941586
2,4-Dichlorophenol	ug/L	<1.2	1.2	6941586
2,5-Dichlorophenol	ug/L	<2.0	2.0	6941586
2,6-Dichlorophenol	ug/L	<2.0	2.0	6941586
3,4-Dichlorophenol	ug/L	<2.0	2.0	6941586
3,5-Dichlorophenol	ug/L	<2.0	2.0	6941586
2,4-Dimethylphenol	ug/L	3.5	2.0	6941586
2,4-Dinitrophenol	ug/L	<8.0	8.0	6941586
4,6-Dinitro-2-methylphenol	ug/L	<8.0	8.0	6941586
2-Nitrophenol	ug/L	<2.0	2.0	6941586
4-Nitrophenol	ug/L	<5.6	5.6	6941586
Pentachlorophenol	ug/L	<4.0	4.0	6941586
Phenol	ug/L	16	2.0	6941586
2,3,4,5-Tetrachlorophenol	ug/L	<1.6	1.6	6941586
2,3,4,6-Tetrachlorophenol	ug/L	<2.0	2.0	6941586
2,3,5,6-Tetrachlorophenol	ug/L	<2.0	2.0	6941586
2,3,4-Trichlorophenol	ug/L	<2.0	2.0	6941586
2,3,5-Trichlorophenol	ug/L	<2.0	2.0	6941586
2,3,6-Trichlorophenol	ug/L	<2.0	2.0	6941586
2,4,5-Trichlorophenol	ug/L	<2.0	2.0	6941586
2,4,6-Trichlorophenol	ug/L	<2.0	2.0	6941586
3,4,5-Trichlorophenol	ug/L	<2.0	2.0	6941586
Benzyl butyl phthalate	ug/L	<2.0	2.0	6941586
Biphenyl	ug/L	<2.0	2.0	6941586
Bis(2-chloroethyl)ether	ug/L	<2.0	2.0	6941586
Bis(2-chloroethoxy)methane	ug/L	<2.0	2.0	6941586
Bis(2-chloroisopropyl)ether	ug/L	<2.0	2.0	6941586
Bis(2-ethylhexyl)phthalate	ug/L	17	8.0	6941586
4-Bromophenyl phenyl ether	ug/L	<1.2	1.2	6941586
p-Chloroaniline	ug/L	<4.0	4.0	6941586
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NOY570		
Sampling Date		2020/08/31		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
4-Chlorophenyl phenyl ether	ug/L	<2.0	2.0	6941586
Di-N-butyl phthalate	ug/L	<8.0	8.0	6941586
di-n-octyl phthalate	ug/L	<3.2	3.2	6941586
2,4-Dinitrotoluene	ug/L	<2.0	2.0	6941586
Diethyl phthalate	ug/L	<4.0	4.0	6941586
3,3'-Dichlorobenzidine	ug/L	<2.0	2.0	6941586
Dimethyl phthalate	ug/L	<4.0	4.0	6941586
2,6-Dinitrotoluene	ug/L	<2.0	2.0	6941586
Diphenyl Ether	ug/L	<1.2	1.2	6941586
Hexachlorobutadiene	ug/L	<1.6	1.6	6941586
Hexachlorocyclopentadiene	ug/L	<8.0	8.0	6941586
Hexachloroethane	ug/L	<2.0	2.0	6941586
Isophorone	ug/L	<6.0 (1)	6.0	6941586
Nitrobenzene	ug/L	<2.0	2.0	6941586
Nitrosodiphenylamine/Diphenylamine	ug/L	<4.0	4.0	6941586
N-Nitroso-di-n-propylamine	ug/L	<2.0	2.0	6941586
Surrogate Recovery (%)				
2,4,6-Tribromophenol	%	96		6941586
2-Fluorobiphenyl	%	49		6941586
2-Fluorophenol	%	30		6941586
D14-Terphenyl	%	97		6941586
D5-Nitrobenzene	%	55		6941586
D5-Phenol	%	29		6941586
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
(1) Detection limit was raised due to matrix interference.				



BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		NOY570		
Sampling Date		2020/08/31		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Volatile Organics				
Acetone (2-Propanone)	ug/L	640	100	6935814
Benzene	ug/L	3.0	2.0	6935814
Bromodichloromethane	ug/L	<5.0	5.0	6935814
Bromoform	ug/L	<10	10	6935814
Bromomethane	ug/L	<5.0	5.0	6935814
Carbon Tetrachloride	ug/L	<1.9	1.9	6935814
Chlorobenzene	ug/L	<2.0	2.0	6935814
Chloroethane	ug/L	<10	10	6935814
Chloroform	ug/L	<2.0	2.0	6935814
Chloromethane	ug/L	<50	50	6935814
Dibromochloromethane	ug/L	<5.0	5.0	6935814
1,2-Dichlorobenzene	ug/L	<4.0	4.0	6935814
1,3-Dichlorobenzene	ug/L	<4.0	4.0	6935814
1,4-Dichlorobenzene	ug/L	<4.0	4.0	6935814
1,1-Dichloroethane	ug/L	<2.0	2.0	6935814
1,2-Dichloroethane	ug/L	<4.9	4.9	6935814
1,1-Dichloroethylene	ug/L	<2.0	2.0	6935814
cis-1,2-Dichloroethylene	ug/L	<5.0	5.0	6935814
trans-1,2-Dichloroethylene	ug/L	<5.0	5.0	6935814
1,2-Dichloropropane	ug/L	<2.0	2.0	6935814
cis-1,3-Dichloropropene	ug/L	<3.0	3.0	6935814
trans-1,3-Dichloropropene	ug/L	<4.0	4.0	6935814
Ethylbenzene	ug/L	7.8	2.0	6935814
Ethylene Dibromide	ug/L	<1.9	1.9	6935814
Methylene Chloride(Dichloromethane)	ug/L	<20	20	6935814
Methyl Ethyl Ketone (2-Butanone)	ug/L	840	100	6935814
Methyl Isobutyl Ketone	ug/L	<50	50	6935814
Methyl t-butyl ether (MTBE)	ug/L	<5.0	5.0	6935814
Styrene	ug/L	<4.0	4.0	6935814
1,1,1,2-Tetrachloroethane	ug/L	<5.0	5.0	6935814
1,1,2,2-Tetrachloroethane	ug/L	<4.0	4.0	6935814
Tetrachloroethylene	ug/L	<2.0	2.0	6935814
1,3,5-Trimethylbenzene	ug/L	<2.0	2.0	6938083
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		NOY570		
Sampling Date		2020/08/31		
COC Number		na		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Toluene	ug/L	35	2.0	6935814
1,1,1-Trichloroethane	ug/L	<2.0	2.0	6935814
1,1,2-Trichloroethane	ug/L	<4.0	4.0	6935814
Trichloroethylene	ug/L	<2.0	2.0	6935814
Trichlorofluoromethane (FREON 11)	ug/L	<5.0	5.0	6935814
Vinyl Chloride	ug/L	<2.0	2.0	6935814
p+m-Xylene	ug/L	20	2.0	6935814
o-Xylene	ug/L	9.0	2.0	6935814
Total Xylenes	ug/L	29	2.0	6935814
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	97		6935814
D4-1,2-Dichloroethane	%	104		6935814
D8-Toluene	%	93		6935814
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.0°C
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Sample NOY570 [PS HOLDING TANK] : Nitrite/Nitrate: Due to colour interferences, sample required dilution. Detection limit was adjusted accordingly.

VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

ABN analysis: Due to the nature of the sample matrix, a smaller than usual portion of the sample was used for extraction. Detection limits were adjusted accordingly.

Metals Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6935814	4-Bromofluorobenzene	2020/09/11	101	70 - 130	101	70 - 130	95	%				
6935814	D4-1,2-Dichloroethane	2020/09/11	99	70 - 130	103	70 - 130	112	%				
6935814	D8-Toluene	2020/09/11	106	70 - 130	105	70 - 130	93	%				
6941586	2,4,6-Tribromophenol	2020/09/14	100	10 - 130	92	10 - 130	75	%				
6941586	2-Fluorobiphenyl	2020/09/14	73	30 - 130	74	30 - 130	82	%				
6941586	2-Fluorophenol	2020/09/14	43	10 - 130	52	10 - 130	46	%				
6941586	D14-Terphenyl	2020/09/14	98	30 - 130	98	30 - 130	95	%				
6941586	D5-Nitrobenzene	2020/09/14	74	30 - 130	84	30 - 130	83	%				
6941586	D5-Phenol	2020/09/14	29	10 - 130	37	10 - 130	28	%				
6935814	1,1,1,2-Tetrachloroethane	2020/09/11	101	70 - 130	94	70 - 130	<0.50	ug/L				
6935814	1,1,1-Trichloroethane	2020/09/11	96	70 - 130	88	70 - 130	<0.20	ug/L				
6935814	1,1,2,2-Tetrachloroethane	2020/09/11	99	70 - 130	95	70 - 130	<0.40	ug/L				
6935814	1,1,2-Trichloroethane	2020/09/11	101	70 - 130	95	70 - 130	<0.40	ug/L				
6935814	1,1-Dichloroethane	2020/09/11	97	70 - 130	90	70 - 130	<0.20	ug/L				
6935814	1,1-Dichloroethylene	2020/09/11	103	70 - 130	95	70 - 130	<0.20	ug/L				
6935814	1,2-Dichlorobenzene	2020/09/11	92	70 - 130	87	70 - 130	<0.40	ug/L				
6935814	1,2-Dichloroethane	2020/09/11	99	70 - 130	95	70 - 130	<0.49	ug/L				
6935814	1,2-Dichloropropane	2020/09/11	94	70 - 130	88	70 - 130	<0.20	ug/L				
6935814	1,3-Dichlorobenzene	2020/09/11	92	70 - 130	86	70 - 130	<0.40	ug/L				
6935814	1,4-Dichlorobenzene	2020/09/11	98	70 - 130	92	70 - 130	<0.40	ug/L				
6935814	Acetone (2-Propanone)	2020/09/11	99	60 - 140	98	60 - 140	<10	ug/L				
6935814	Benzene	2020/09/11	98	70 - 130	91	70 - 130	<0.20	ug/L				
6935814	Bromodichloromethane	2020/09/11	95	70 - 130	90	70 - 130	<0.50	ug/L				
6935814	Bromoform	2020/09/11	98	70 - 130	95	70 - 130	<1.0	ug/L				
6935814	Bromomethane	2020/09/11	101	60 - 140	90	60 - 140	<0.50	ug/L				
6935814	Carbon Tetrachloride	2020/09/11	93	70 - 130	85	70 - 130	<0.19	ug/L				
6935814	Chlorobenzene	2020/09/11	95	70 - 130	88	70 - 130	<0.20	ug/L				
6935814	Chloroethane	2020/09/11	98	70 - 130	90	70 - 130	<1.0	ug/L				
6935814	Chloroform	2020/09/11	92	70 - 130	86	70 - 130	<0.20	ug/L				
6935814	Chloromethane	2020/09/11	101	60 - 140	95	60 - 140	<5.0	ug/L				

BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6935814	cis-1,2-Dichloroethylene	2020/09/11	89	70 - 130	84	70 - 130	<0.50	ug/L				
6935814	cis-1,3-Dichloropropene	2020/09/11	100	70 - 130	91	70 - 130	<0.30	ug/L				
6935814	Dibromochloromethane	2020/09/11	100	70 - 130	95	70 - 130	<0.50	ug/L				
6935814	Ethylbenzene	2020/09/11	95	70 - 130	87	70 - 130	<0.20	ug/L				
6935814	Ethylene Dibromide	2020/09/11	99	70 - 130	96	70 - 130	<0.19	ug/L				
6935814	Methyl Ethyl Ketone (2-Butanone)	2020/09/11	104	60 - 140	104	60 - 140	<10	ug/L				
6935814	Methyl Isobutyl Ketone	2020/09/11	106	70 - 130	106	70 - 130	<5.0	ug/L				
6935814	Methyl t-butyl ether (MTBE)	2020/09/11	87	70 - 130	83	70 - 130	<0.50	ug/L				
6935814	Methylene Chloride(Dichloromethane)	2020/09/11	91	70 - 130	86	70 - 130	<2.0	ug/L				
6935814	o-Xylene	2020/09/11	96	70 - 130	92	70 - 130	<0.20	ug/L				
6935814	p+m-Xylene	2020/09/11	104	70 - 130	95	70 - 130	<0.20	ug/L				
6935814	Styrene	2020/09/11	100	70 - 130	95	70 - 130	<0.40	ug/L				
6935814	Tetrachloroethylene	2020/09/11	93	70 - 130	84	70 - 130	<0.20	ug/L				
6935814	Toluene	2020/09/11	98	70 - 130	90	70 - 130	<0.20	ug/L	NC (1)	30		
6935814	Total Xylenes	2020/09/11					<0.20	ug/L				
6935814	trans-1,2-Dichloroethylene	2020/09/11	97	70 - 130	89	70 - 130	<0.50	ug/L				
6935814	trans-1,3-Dichloropropene	2020/09/11	109	70 - 130	95	70 - 130	<0.40	ug/L				
6935814	Trichloroethylene	2020/09/11	98	70 - 130	90	70 - 130	<0.20	ug/L				
6935814	Trichlorofluoromethane (FREON 11)	2020/09/11	97	70 - 130	88	70 - 130	<0.50	ug/L				
6935814	Vinyl Chloride	2020/09/11	97	70 - 130	89	70 - 130	<0.20	ug/L				
6938083	1,3,5-Trimethylbenzene	2020/09/14	115 (2)	60 - 140	108	60 - 140	<0.20	ug/L				
6938400	Dissolved Chloride (Cl-)	2020/09/11	NC	80 - 120	106	80 - 120	<1.0	mg/L	2.5 (1)	20		
6938403	Dissolved Sulphate (SO4)	2020/09/11	NC	75 - 125	106	80 - 120	<1.0	mg/L	1.1 (1)	20		
6938406	Alkalinity (Total as CaCO3)	2020/09/11			99	85 - 115	<1.0	mg/L	1.2 (1)	20		
6938430	Nitrate (N)	2020/09/11	93	80 - 120	100	80 - 120	<0.10	mg/L	0.71 (1)	20		
6938430	Nitrite (N)	2020/09/11	99	80 - 120	106	80 - 120	<0.010	mg/L	NC (1)	20		
6941586	1,2,3,4-Tetrachlorobenzene	2020/09/14	74	30 - 130	74	30 - 130	<0.50	ug/L				
6941586	1,2,3,5-Tetrachlorobenzene	2020/09/14	68	30 - 130	67	30 - 130	<0.50	ug/L				
6941586	1,2,3-Trichlorobenzene	2020/09/14	60	30 - 130	63	30 - 130	<0.50	ug/L				
6941586	1,2,4,5-Tetrachlorobenzene	2020/09/14	57	30 - 130	56	30 - 130	<0.50	ug/L				



BUREAU
VERITAS

BV Labs Job #: CON3550

Report Date: 2020/09/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6941586	1,2,4-Trichlorobenzene	2020/09/14	64	30 - 130	67	30 - 130	<0.50	ug/L				
6941586	1,2-Dichlorobenzene	2020/09/14	56	30 - 130	60	30 - 130	<0.50	ug/L				
6941586	1,3,5-Trichlorobenzene	2020/09/14	69	30 - 130	69	30 - 130	<0.50	ug/L				
6941586	1,3-Dichlorobenzene	2020/09/14	45	30 - 130	51	30 - 130	<0.50	ug/L				
6941586	1,4-Dichlorobenzene	2020/09/14	55	30 - 130	59	30 - 130	<0.50	ug/L				
6941586	1-Chloronaphthalene	2020/09/14	80	30 - 130	77	30 - 130	<1.0	ug/L				
6941586	1-Methylnaphthalene	2020/09/14	84	30 - 130	86	30 - 130	<0.20	ug/L				
6941586	2,3,4,5-Tetrachlorophenol	2020/09/14	115	10 - 130	113	10 - 130	<0.40	ug/L				
6941586	2,3,4,6-Tetrachlorophenol	2020/09/14	109	10 - 130	109	10 - 130	<0.50	ug/L				
6941586	2,3,4-Trichlorophenol	2020/09/14	92	10 - 130	92	10 - 130	<0.50	ug/L				
6941586	2,3,5,6-Tetrachlorophenol	2020/09/14	100	10 - 130	92	10 - 130	<0.50	ug/L				
6941586	2,3,5-Trichlorophenol	2020/09/14	99	10 - 130	96	10 - 130	<0.50	ug/L				
6941586	2,3,6-Trichlorophenol	2020/09/14	99	10 - 130	101	10 - 130	<0.50	ug/L				
6941586	2,3-Dichlorophenol	2020/09/14	89	10 - 130	96	10 - 130	<0.50	ug/L				
6941586	2,4,5-Trichlorophenol	2020/09/14	109	10 - 130	113	10 - 130	<0.50	ug/L				
6941586	2,4,6-Trichlorophenol	2020/09/14	104	10 - 130	100	10 - 130	<0.50	ug/L				
6941586	2,4-Dichlorophenol	2020/09/14	109	10 - 130	121	10 - 130	<0.30	ug/L				
6941586	2,4-Dimethylphenol	2020/09/14	48	10 - 130	69	10 - 130	<0.50	ug/L				
6941586	2,4-Dinitrophenol	2020/09/14	129	10 - 130	130	10 - 130	<2.0	ug/L				
6941586	2,4-Dinitrotoluene	2020/09/14	101	30 - 130	97	30 - 130	<0.50	ug/L				
6941586	2,5-Dichlorophenol	2020/09/14	74	10 - 130	87	10 - 130	<0.50	ug/L				
6941586	2,6-Dichlorophenol	2020/09/14	85	10 - 130	89	10 - 130	<0.50	ug/L				
6941586	2,6-Dinitrotoluene	2020/09/14	99	30 - 130	98	30 - 130	<0.50	ug/L				
6941586	2-Chloronaphthalene	2020/09/14	80	30 - 130	82	30 - 130	<0.50	ug/L				
6941586	2-Chlorophenol	2020/09/14	71	10 - 130	86	10 - 130	<0.30	ug/L				
6941586	2-Methylnaphthalene	2020/09/14	85	30 - 130	84	30 - 130	<0.20	ug/L				
6941586	2-Nitrophenol	2020/09/14	90	10 - 130	89	10 - 130	<0.50	ug/L				
6941586	3,3'-Dichlorobenzidine	2020/09/14	129	30 - 130	125	30 - 130	<0.50	ug/L				
6941586	3,4,5-Trichlorophenol	2020/09/14	122	10 - 130	119	10 - 130	<0.50	ug/L				
6941586	3,4-Dichlorophenol	2020/09/14	101	10 - 130	96	10 - 130	<0.50	ug/L				

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BV Labs Job #: CON3550

Report Date: 2020/09/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6941586	3,5-Dichlorophenol	2020/09/14	97	10 - 130	95	10 - 130	<0.50	ug/L				
6941586	4,6-Dinitro-2-methylphenol	2020/09/14	110	10 - 130	111	10 - 130	<2.0	ug/L				
6941586	4-Bromophenyl phenyl ether	2020/09/14	95	30 - 130	90	30 - 130	<0.30	ug/L				
6941586	4-Chloro-3-Methylphenol	2020/09/14	90	10 - 130	94	10 - 130	<0.50	ug/L				
6941586	4-Chlorophenyl phenyl ether	2020/09/14	85	30 - 130	88	30 - 130	<0.50	ug/L				
6941586	4-Nitrophenol	2020/09/14	33	10 - 130	43	10 - 130	<1.4	ug/L				
6941586	Acenaphthene	2020/09/14	90	30 - 130	89	30 - 130	<0.20	ug/L				
6941586	Acenaphthylene	2020/09/14	88	30 - 130	92	30 - 130	<0.20	ug/L				
6941586	Anthracene	2020/09/14	92	30 - 130	92	30 - 130	<0.20	ug/L				
6941586	Benzo(a)anthracene	2020/09/14	108	30 - 130	110	30 - 130	<0.20	ug/L				
6941586	Benzo(a)pyrene	2020/09/14	96	30 - 130	100	30 - 130	<0.20	ug/L				
6941586	Benzo(b,j)fluoranthene	2020/09/14	113	30 - 130	111	30 - 130	<0.20	ug/L				
6941586	Benzo(g,h,i)perylene	2020/09/14	105	30 - 130	101	30 - 130	<0.20	ug/L				
6941586	Benzo(k)fluoranthene	2020/09/14	102	30 - 130	113	30 - 130	<0.20	ug/L				
6941586	Benzyl butyl phthalate	2020/09/14	108	30 - 130	108	30 - 130	<0.50	ug/L				
6941586	Biphenyl	2020/09/14	88	30 - 130	89	30 - 130	<0.50	ug/L				
6941586	Bis(2-chloroethoxy)methane	2020/09/14	76	30 - 130	84	30 - 130	<0.50	ug/L				
6941586	Bis(2-chloroethyl)ether	2020/09/14	74	30 - 130	82	30 - 130	<0.50	ug/L				
6941586	Bis(2-chloroisopropyl)ether	2020/09/14	71	30 - 130	75	30 - 130	<0.50	ug/L				
6941586	Bis(2-ethylhexyl)phthalate	2020/09/15	104	30 - 130	104	30 - 130	<2.0	ug/L	NC (1)	40		
6941586	Chrysene	2020/09/14	105	30 - 130	108	30 - 130	<0.20	ug/L				
6941586	Dibenzo(a,h)anthracene	2020/09/14	103	30 - 130	105	30 - 130	<0.20	ug/L				
6941586	Diethyl phthalate	2020/09/14	102	30 - 130	101	30 - 130	<1.0	ug/L				
6941586	Dimethyl phthalate	2020/09/14	99	30 - 130	103	30 - 130	<1.0	ug/L				
6941586	Di-N-butyl phthalate	2020/09/15	106	30 - 130	107	30 - 130	<2.0	ug/L	NC (1)	40		
6941586	di-n-octyl phthalate	2020/09/14	107	30 - 130	107	30 - 130	<0.80	ug/L				
6941586	Diphenyl Ether	2020/09/14	78	30 - 130	80	30 - 130	<0.30	ug/L				
6941586	Fluoranthene	2020/09/14	111	30 - 130	110	30 - 130	<0.20	ug/L				
6941586	Fluorene	2020/09/14	96	30 - 130	98	30 - 130	<0.20	ug/L				
6941586	Hexachlorobenzene	2020/09/14	94	30 - 130	93	30 - 130	<0.50	ug/L				

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BV Labs Job #: CON3550

Report Date: 2020/09/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6941586	Hexachlorobutadiene	2020/09/14	40	30 - 130	43	30 - 130	<0.40	ug/L				
6941586	Hexachlorocyclopentadiene	2020/09/14	43	30 - 130	40	30 - 130	<2.0	ug/L				
6941586	Hexachloroethane	2020/09/14	39	30 - 130	43	30 - 130	<0.50	ug/L				
6941586	Indeno(1,2,3-cd)pyrene	2020/09/14	104	30 - 130	107	30 - 130	<0.20	ug/L				
6941586	Isophorone	2020/09/14	83	30 - 130	89	30 - 130	<0.50	ug/L				
6941586	m/p-Cresol	2020/09/14	72	10 - 130	90	10 - 130	<0.50	ug/L				
6941586	Naphthalene	2020/09/14	75	30 - 130	82	30 - 130	<0.20	ug/L				
6941586	Nitrobenzene	2020/09/14	80	30 - 130	85	30 - 130	<0.50	ug/L				
6941586	Nitrosodiphenylamine/Diphenylamine	2020/09/14	96	30 - 130	93	30 - 130	<1.0	ug/L				
6941586	N-Nitroso-di-n-propylamine	2020/09/14	83	30 - 130	101	30 - 130	<0.50	ug/L				
6941586	o-Cresol	2020/09/14	68	10 - 130	84	10 - 130	<0.50	ug/L				
6941586	p-Chloroaniline	2020/09/14	79	30 - 130	91	30 - 130	<1.0	ug/L				
6941586	Pentachlorobenzene	2020/09/14	79	30 - 130	75	30 - 130	<0.50	ug/L				
6941586	Pentachlorophenol	2020/09/14	101	10 - 130	97	10 - 130	<1.0	ug/L				
6941586	Perylene	2020/09/14	101	30 - 130	106	30 - 130	<0.20	ug/L				
6941586	Phenanthrene	2020/09/14	100	30 - 130	98	30 - 130	<0.20	ug/L				
6941586	Phenol	2020/09/14	33	10 - 130	41	10 - 130	<0.50	ug/L				
6941586	Pyrene	2020/09/14	106	30 - 130	104	30 - 130	<0.20	ug/L				
6941944	Total Phosphorus	2020/09/14	93	80 - 120	95	80 - 120	<0.030	mg/L	1.0 (1)	25	93	80 - 120
6942165	Total Ammonia-N	2020/09/14	99	75 - 125	99	80 - 120	<0.15	mg/L	NC (1)	20		
6942167	Total Kjeldahl Nitrogen (TKN)	2020/09/14	NC	80 - 120	101	80 - 120	<0.7	mg/L	0.62 (1)	20	105	80 - 120
6944649	Total Aluminum (Al)	2020/09/16	NC	80 - 120	99	80 - 120	<0.02	mg/L	0.99 (1)	20		
6944649	Total Arsenic (As)	2020/09/16	99	80 - 120	100	80 - 120	<0.001	mg/L				
6944649	Total Barium (Ba)	2020/09/16	94	80 - 120	96	80 - 120	<0.005	mg/L				
6944649	Total Beryllium (Be)	2020/09/16	88	80 - 120	92	80 - 120	<0.0006	mg/L				
6944649	Total Bismuth (Bi)	2020/09/16	92	80 - 120	94	80 - 120	<0.001	mg/L				
6944649	Total Boron (B)	2020/09/16	92	80 - 120	94	80 - 120	<0.02	mg/L	NC (1)	20		
6944649	Total Cadmium (Cd)	2020/09/16	98	80 - 120	99	80 - 120	<0.0001	mg/L				
6944649	Total Calcium (Ca)	2020/09/16	NC	80 - 120	99	80 - 120	<0.2	mg/L				
6944649	Total Chromium (Cr)	2020/09/16	93	80 - 120	95	80 - 120	<0.005	mg/L	NC (1)	20		



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BV Labs Job #: CON3550

Report Date: 2020/09/17

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6944649	Total Cobalt (Co)	2020/09/16	96	80 - 120	98	80 - 120	<0.0005	mg/L				
6944649	Total Copper (Cu)	2020/09/16	94	80 - 120	97	80 - 120	<0.002	mg/L				
6944649	Total Iron (Fe)	2020/09/16	95	80 - 120	96	80 - 120	<0.1	mg/L	2.8 (1)	20		
6944649	Total Lead (Pb)	2020/09/16	94	80 - 120	95	80 - 120	<0.0005	mg/L				
6944649	Total Magnesium (Mg)	2020/09/16	90	80 - 120	98	80 - 120	<0.05	mg/L				
6944649	Total Molybdenum (Mo)	2020/09/16	96	80 - 120	96	80 - 120	<0.002	mg/L				
6944649	Total Nickel (Ni)	2020/09/16	94	80 - 120	97	80 - 120	<0.001	mg/L	9.8 (1)	20		
6944649	Total Potassium (K)	2020/09/16	98	80 - 120	98	80 - 120	<0.2	mg/L	3.3 (1)	20		
6944649	Total Selenium (Se)	2020/09/16	101	80 - 120	104	80 - 120	<0.005	mg/L				
6944649	Total Silver (Ag)	2020/09/16	95	80 - 120	95	80 - 120	<0.0004	mg/L				
6944649	Total Sodium (Na)	2020/09/16	95	80 - 120	99	80 - 120	<0.1	mg/L				
6944649	Total Strontium (Sr)	2020/09/16	95	80 - 120	96	80 - 120	<0.003	mg/L				
6944649	Total Tin (Sn)	2020/09/16	99	80 - 120	99	80 - 120	<0.002	mg/L				
6944649	Total Titanium (Ti)	2020/09/16	94	80 - 120	95	80 - 120	<0.005	mg/L				
6944649	Total Vanadium (V)	2020/09/16	93	80 - 120	95	80 - 120	<0.001	mg/L				
6944649	Total Zinc (Zn)	2020/09/16	96	80 - 120	100	80 - 120	<0.01	mg/L				

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [NOY570-06]



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BV Labs Job #: CON3550

Report Date: 2020/09/17

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: JCL

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

**Attention: Brent Langille**

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: TCEC-LCHEM-SEP

Report Date: 2020/09/28

Report #: R6348693

Version: 1 - Final

CERTIFICATE OF ANALYSIS**BV LABS JOB #: C002036****Received: 2020/09/17, 11:46**

Sample Matrix: Leachate
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ABN Compounds in Water by GC/MS	1	2020/09/21	2020/09/22	CAM SOP-00301	EPA 8270 m
Alkalinity	1	N/A	2020/09/18	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	1	N/A	2020/09/18	CAM SOP-00463	SM 23 4500-Cl E m
Conductance in Water - On-site	1	N/A	2020/09/21		
Field Measured Dissolved Oxygen in Water	1	N/A	2020/09/21		
Total Metals by ICPMS	1	N/A	2020/09/23	CAM SOP-00447	EPA 6020B m
Ammonia-N	1	N/A	2020/09/23	CAM SOP-00441	USGS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (1)	1	N/A	2020/09/18	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Field Measured pH (2)	1	N/A	2020/09/17		Field pH Meter
Sulphate by Automated Colourimetry	1	N/A	2020/09/18	CAM SOP-00464	EPA 375.4 m
Field Temperature (2)	1	N/A	2020/09/17		Field Thermometer
Total Kjeldahl Nitrogen in Water	1	2020/09/18	2020/09/21	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2020/09/21	2020/09/22	CAM SOP-00407	SM 23 4500 B F m
Turbidity - On-site	1	N/A	2020/09/21		
Un-ionized Ammonia	1	2020/09/17	2020/09/23	PWQO	PWQO
Volatile Organic Compounds in Water	1	N/A	2020/09/21	CAM SOP-00228	EPA 8260C m
Non-Routine Volatile Organic Compounds	1	N/A	2020/09/22	CAM SOP-00226	EPA 8260 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.



Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Your P.O. #: 9199062861
Your Project #: 2001313-1000
Site#: 500
Site Location: ON07
Your C.O.C. #: TCEC-LCHEM-SEP

Report Date: 2020/09/28
Report #: R6348693
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C002036

Received: 2020/09/17, 11:46

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

(2) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas Laboratories.

Encryption Key

Keshani Vijh
Supervisor - Environmental
Customer Service
28 Sep 2020 15:15:27

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Keshani Vijh, Supervisor – Environmental Customer Service

Email: Keshani.Vijh@bvlabs.com

Phone# (905)817-5733

=====

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BV Labs Job #: COO2036

Report Date: 2020/09/28

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

RESULTS OF ANALYSES OF LEACHATE

BV Labs ID		NQR286			NQR286		
Sampling Date		2020/09/15			2020/09/15		
COC Number		TCEC-LCHEM-SEP			TCEC-LCHEM-SEP		
	UNITS	PS HOLDING TANK	RDL	QC Batch	PS HOLDING TANK Lab-Dup	RDL	QC Batch
Calculated Parameters							
Total Un-ionized Ammonia	mg/L	0.89	0.006	6949642			
Field Measurements							
Field Conductivity	uS/cm	5910	N/A	ONSITE			
Field Dissolved Oxygen	mg/L	9.01	N/A	ONSITE			
Field Temperature	Celsius	17.5	N/A	ONSITE			
Field Turbidity	NTU	254	N/A	ONSITE			
Field Measured pH	pH	7.0		ONSITE			
Inorganics							
Total Ammonia-N	mg/L	221	1.5	6953027	220	1.5	6953027
Total Kjeldahl Nitrogen (TKN)	mg/L	220	10	6952174			
Total Phosphorus	mg/L	0.68	0.10	6955119			
Dissolved Sulphate (SO ₄)	mg/L	290	1.0	6949301			
Alkalinity (Total as CaCO ₃)	mg/L	1800	1.0	6951304	1800	1.0	6951304
Dissolved Chloride (Cl ⁻)	mg/L	520	5.0	6949299			
Nitrite (N)	mg/L	0.066	0.010	6951307	0.068	0.010	6951307
Nitrate (N)	mg/L	<0.10	0.10	6951307	<0.10	0.10	6951307
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable							



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VERITAS

BV Labs Job #: COO2036

Report Date: 2020/09/28

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

ELEMENTS BY ATOMIC SPECTROSCOPY (LEACHATE)

BV Labs ID		NQR286		
Sampling Date		2020/09/15		
COC Number		TCEC-LCHEM-SEP		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Metals				
Total Aluminum (Al)	mg/L	2.6	0.02	6957966
Total Arsenic (As)	mg/L	0.012	0.001	6957966
Total Barium (Ba)	mg/L	0.18	0.005	6957966
Total Beryllium (Be)	mg/L	<0.0006	0.0006	6957966
Total Bismuth (Bi)	mg/L	<0.001	0.001	6957966
Total Boron (B)	mg/L	5.0	0.02	6957966
Total Cadmium (Cd)	mg/L	<0.0001	0.0001	6957966
Total Calcium (Ca)	mg/L	200	0.2	6957966
Total Chromium (Cr)	mg/L	0.060	0.005	6957966
Total Cobalt (Co)	mg/L	0.0092	0.0005	6957966
Total Copper (Cu)	mg/L	0.007	0.002	6957966
Total Iron (Fe)	mg/L	7.0	0.1	6957966
Total Lead (Pb)	mg/L	0.0040	0.0005	6957966
Total Magnesium (Mg)	mg/L	130	0.05	6957966
Total Molybdenum (Mo)	mg/L	0.013	0.002	6957966
Total Nickel (Ni)	mg/L	0.081	0.001	6957966
Total Potassium (K)	mg/L	120	0.2	6957966
Total Selenium (Se)	mg/L	<0.005	0.005	6957966
Total Silver (Ag)	mg/L	<0.0004	0.0004	6957966
Total Sodium (Na)	mg/L	520	0.1	6957966
Total Strontium (Sr)	mg/L	1.6	0.003	6957966
Total Tin (Sn)	mg/L	0.003	0.002	6957966
Total Titanium (Ti)	mg/L	0.069	0.005	6957966
Total Vanadium (V)	mg/L	0.014	0.001	6957966
Total Zinc (Zn)	mg/L	0.03	0.01	6957966
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



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VERITAS

BV Labs Job #: C002036

Report Date: 2020/09/28

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NQR286		
Sampling Date		2020/09/15		
COC Number		TCEC-LCHEM-SEP		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Semivolatile Organics				
Acenaphthene	ug/L	<0.80	0.80	6954644
Acenaphthylene	ug/L	<0.80	0.80	6954644
Anthracene	ug/L	<0.80	0.80	6954644
Benzo(a)anthracene	ug/L	<0.80	0.80	6954644
Benzo(a)pyrene	ug/L	<0.80	0.80	6954644
Benzo(b/j)fluoranthene	ug/L	<0.80	0.80	6954644
Benzo(g,h,i)perylene	ug/L	<0.80	0.80	6954644
Benzo(k)fluoranthene	ug/L	<0.80	0.80	6954644
1-Chloronaphthalene	ug/L	<4.0	4.0	6954644
2-Chloronaphthalene	ug/L	<2.0	2.0	6954644
Chrysene	ug/L	<0.80	0.80	6954644
Dibenzo(a,h)anthracene	ug/L	<0.80	0.80	6954644
Fluoranthene	ug/L	<0.80	0.80	6954644
Fluorene	ug/L	<0.80	0.80	6954644
Indeno(1,2,3-cd)pyrene	ug/L	<0.80	0.80	6954644
1-Methylnaphthalene	ug/L	<0.80	0.80	6954644
2-Methylnaphthalene	ug/L	<0.80	0.80	6954644
Naphthalene	ug/L	3.0	0.80	6954644
Perylene	ug/L	<0.80	0.80	6954644
Phenanthrene	ug/L	<0.80	0.80	6954644
Pyrene	ug/L	<0.80	0.80	6954644
1,2-Dichlorobenzene	ug/L	<2.0	2.0	6954644
1,3-Dichlorobenzene	ug/L	<2.0	2.0	6954644
1,4-Dichlorobenzene	ug/L	<2.0	2.0	6954644
Hexachlorobenzene	ug/L	<2.0	2.0	6954644
Pentachlorobenzene	ug/L	<2.0	2.0	6954644
1,2,3,5-Tetrachlorobenzene	ug/L	<2.0	2.0	6954644
1,2,4,5-Tetrachlorobenzene	ug/L	<2.0	2.0	6954644
1,2,3-Trichlorobenzene	ug/L	<2.0	2.0	6954644
1,2,4-Trichlorobenzene	ug/L	<2.0	2.0	6954644
1,3,5-Trichlorobenzene	ug/L	<2.0	2.0	6954644
2-Chlorophenol	ug/L	<1.2	1.2	6954644
4-Chloro-3-Methylphenol	ug/L	<2.0	2.0	6954644
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



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VERITAS

BV Labs Job #: COO2036

Report Date: 2020/09/28

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NQR286		
Sampling Date		2020/09/15		
COC Number		TCEC-LCHEM-SEP		
	UNITS	PS HOLDING TANK	RDL	QC Batch
m/p-Cresol	ug/L	18	2.0	6954644
o-Cresol	ug/L	<2.0	2.0	6954644
1,2,3,4-Tetrachlorobenzene	ug/L	<2.0	2.0	6954644
2,3-Dichlorophenol	ug/L	<2.0	2.0	6954644
2,4-Dichlorophenol	ug/L	<1.2	1.2	6954644
2,5-Dichlorophenol	ug/L	<2.0	2.0	6954644
2,6-Dichlorophenol	ug/L	<2.0	2.0	6954644
3,4-Dichlorophenol	ug/L	<2.0	2.0	6954644
3,5-Dichlorophenol	ug/L	<2.0	2.0	6954644
2,4-Dimethylphenol	ug/L	<2.0	2.0	6954644
2,4-Dinitrophenol	ug/L	<8.0	8.0	6954644
4,6-Dinitro-2-methylphenol	ug/L	<8.0	8.0	6954644
2-Nitrophenol	ug/L	<2.0	2.0	6954644
4-Nitrophenol	ug/L	<5.6	5.6	6954644
Pentachlorophenol	ug/L	<4.0	4.0	6954644
Phenol	ug/L	2.6	2.0	6954644
2,3,4,5-Tetrachlorophenol	ug/L	<1.6	1.6	6954644
2,3,4,6-Tetrachlorophenol	ug/L	<2.0	2.0	6954644
2,3,5,6-Tetrachlorophenol	ug/L	<2.0	2.0	6954644
2,3,4-Trichlorophenol	ug/L	<2.0	2.0	6954644
2,3,5-Trichlorophenol	ug/L	<2.0	2.0	6954644
2,3,6-Trichlorophenol	ug/L	<2.0	2.0	6954644
2,4,5-Trichlorophenol	ug/L	<2.0	2.0	6954644
2,4,6-Trichlorophenol	ug/L	<2.0	2.0	6954644
3,4,5-Trichlorophenol	ug/L	<2.0	2.0	6954644
Benzyl butyl phthalate	ug/L	<2.0	2.0	6954644
Biphenyl	ug/L	<2.0	2.0	6954644
Bis(2-chloroethyl)ether	ug/L	<2.0	2.0	6954644
Bis(2-chloroethoxy)methane	ug/L	<2.0	2.0	6954644
Bis(2-chloroisopropyl)ether	ug/L	<2.0	2.0	6954644
Bis(2-ethylhexyl)phthalate	ug/L	<8.0	8.0	6954644
4-Bromophenyl phenyl ether	ug/L	<1.2	1.2	6954644
p-Chloroaniline	ug/L	<4.0	4.0	6954644
4-Chlorophenyl phenyl ether	ug/L	<2.0	2.0	6954644
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



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Sampler Initials: MSA

SEMI-VOLATILE ORGANICS BY GC-MS (LEACHATE)

BV Labs ID		NQR286		
Sampling Date		2020/09/15		
COC Number		TCEC-LCHEM-SEP		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Di-N-butyl phthalate	ug/L	<8.0	8.0	6954644
di-n-octyl phthalate	ug/L	<3.2	3.2	6954644
2,4-Dinitrotoluene	ug/L	<2.0	2.0	6954644
Diethyl phthalate	ug/L	<4.0	4.0	6954644
3,3'-Dichlorobenzidine	ug/L	<2.0	2.0	6954644
Dimethyl phthalate	ug/L	<4.0	4.0	6954644
2,6-Dinitrotoluene	ug/L	<2.0	2.0	6954644
Diphenyl Ether	ug/L	<1.2	1.2	6954644
Hexachlorobutadiene	ug/L	<1.6	1.6	6954644
Hexachlorocyclopentadiene	ug/L	<8.0	8.0	6954644
Hexachloroethane	ug/L	<2.0	2.0	6954644
Isophorone	ug/L	<2.0	2.0	6954644
Nitrobenzene	ug/L	<2.0	2.0	6954644
Nitrosodiphenylamine/Diphenylamine	ug/L	<4.0	4.0	6954644
N-Nitroso-di-n-propylamine	ug/L	<2.0	2.0	6954644
Surrogate Recovery (%)				
2,4,6-Tribromophenol	%	84		6954644
2-Fluorobiphenyl	%	57		6954644
2-Fluorophenol	%	40		6954644
D14-Terphenyl	%	78		6954644
D5-Nitrobenzene	%	55		6954644
D5-Phenol	%	30		6954644
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



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Sampler Initials: MSA

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		NQR286		
Sampling Date		2020/09/15		
COC Number		TCEC-LCHEM-SEP		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Volatile Organics				
Acetone (2-Propanone)	ug/L	100	10	6954167
Benzene	ug/L	3.6	0.20	6954167
Bromodichloromethane	ug/L	<0.50	0.50	6954167
Bromoform	ug/L	<1.0	1.0	6954167
Bromomethane	ug/L	<0.50	0.50	6954167
Carbon Tetrachloride	ug/L	<0.19	0.19	6954167
Chlorobenzene	ug/L	1.3	0.20	6954167
Chloroethane	ug/L	1.2	1.0	6954167
Chloroform	ug/L	<0.20	0.20	6954167
Chloromethane	ug/L	<5.0	5.0	6954167
Dibromochloromethane	ug/L	<0.50	0.50	6954167
1,2-Dichlorobenzene	ug/L	<0.40	0.40	6954167
1,3-Dichlorobenzene	ug/L	<0.40	0.40	6954167
1,4-Dichlorobenzene	ug/L	2.6	0.40	6954167
1,1-Dichloroethane	ug/L	0.88	0.20	6954167
1,2-Dichloroethane	ug/L	<0.49	0.49	6954167
1,1-Dichloroethylene	ug/L	<0.20	0.20	6954167
cis-1,2-Dichloroethylene	ug/L	<0.50	0.50	6954167
trans-1,2-Dichloroethylene	ug/L	<0.50	0.50	6954167
1,2-Dichloropropane	ug/L	<0.20	0.20	6954167
cis-1,3-Dichloropropene	ug/L	<0.30	0.30	6954167
trans-1,3-Dichloropropene	ug/L	<0.40	0.40	6954167
Ethylbenzene	ug/L	6.4	0.20	6954167
Ethylene Dibromide	ug/L	<0.19	0.19	6954167
Methylene Chloride(Dichloromethane)	ug/L	<2.0	2.0	6954167
Methyl Ethyl Ketone (2-Butanone)	ug/L	110	10	6954167
Methyl Isobutyl Ketone	ug/L	<5.0	5.0	6954167
Methyl t-butyl ether (MTBE)	ug/L	1.3	0.50	6954167
Styrene	ug/L	<0.40	0.40	6954167
1,1,1,2-Tetrachloroethane	ug/L	<0.50	0.50	6954167
1,1,2,2-Tetrachloroethane	ug/L	<0.40	0.40	6954167
Tetrachloroethylene	ug/L	<0.20	0.20	6954167
1,3,5-Trimethylbenzene	ug/L	<1.0	1.0	6949785
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



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BV Labs Job #: COO2036

Report Date: 2020/09/28

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VOLATILE ORGANICS BY GC/MS (LEACHATE)

BV Labs ID		NQR286		
Sampling Date		2020/09/15		
COC Number		TCEC-LCHEM-SEP		
	UNITS	PS HOLDING TANK	RDL	QC Batch
Toluene	ug/L	6.0	0.20	6954167
1,1,1-Trichloroethane	ug/L	<0.20	0.20	6954167
1,1,2-Trichloroethane	ug/L	<0.40	0.40	6954167
Trichloroethylene	ug/L	<0.20	0.20	6954167
Trichlorofluoromethane (FREON 11)	ug/L	<0.50	0.50	6954167
Vinyl Chloride	ug/L	0.28	0.20	6954167
p+m-Xylene	ug/L	20	0.20	6954167
o-Xylene	ug/L	6.6	0.20	6954167
Total Xylenes	ug/L	26	0.20	6954167
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	94		6954167
D4-1,2-Dichloroethane	%	123		6954167
D8-Toluene	%	92		6954167
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				



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BV Labs Job #: C002036

Report Date: 2020/09/28

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.3°C
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Sample NQR286 [PS HOLDING TANK] : ABN Analysis: Due to the sample matrix, a smaller amount was used for extraction. Detection limits were adjusted accordingly.

Trimethylbenzene analysis: Due to foaming, sample required dilution. The detection limit was adjusted accordingly

Results relate only to the items tested.



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BV Labs Job #: C002036

Report Date: 2020/09/28

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6954167	4-Bromofluorobenzene	2020/09/21	99	70 - 130	101	70 - 130	92	%				
6954167	D4-1,2-Dichloroethane	2020/09/21	111	70 - 130	108	70 - 130	120	%				
6954167	D8-Toluene	2020/09/21	108	70 - 130	110	70 - 130	95	%				
6954644	2,4,6-Tribromophenol	2020/09/21	86	10 - 130	72	10 - 130	62	%				
6954644	2-Fluorobiphenyl	2020/09/21	52	30 - 130	38	30 - 130	77	%				
6954644	2-Fluorophenol	2020/09/21	37	10 - 130	28	10 - 130	44	%				
6954644	D14-Terphenyl	2020/09/21	99	30 - 130	82	30 - 130	98	%				
6954644	D5-Nitrobenzene	2020/09/21	53	30 - 130	39	30 - 130	75	%				
6954644	D5-Phenol	2020/09/21	27	10 - 130	19	10 - 130	31	%				
6949299	Dissolved Chloride (Cl-)	2020/09/18	109	80 - 120	101	80 - 120	<1.0	mg/L	5.0 (1)	20		
6949301	Dissolved Sulphate (SO4)	2020/09/18	NC	75 - 125	101	80 - 120	<1.0	mg/L	1.0 (1)	20		
6949785	1,3,5-Trimethylbenzene	2020/09/22	113	60 - 140	98	60 - 140	<0.20	ug/L				
6951304	Alkalinity (Total as CaCO3)	2020/09/18			94	85 - 115	<1.0	mg/L	0.051 (2)	20		
6951307	Nitrate (N)	2020/09/18	98 (3)	80 - 120	95	80 - 120	<0.10	mg/L	NC (2)	20		
6951307	Nitrite (N)	2020/09/18	105 (3)	80 - 120	103	80 - 120	<0.010	mg/L	3.3 (2)	20		
6952174	Total Kjeldahl Nitrogen (TKN)	2020/09/21	NC	80 - 120	105	80 - 120	<0.7	mg/L	3.2 (1)	20	100	80 - 120
6953027	Total Ammonia-N	2020/09/23	NC (4)	75 - 125	100	80 - 120	<0.15	mg/L	0.64 (5)	20		
6954167	1,1,1,2-Tetrachloroethane	2020/09/21	100	70 - 130	98	70 - 130	<0.50	ug/L	NC (1)	30		
6954167	1,1,1-Trichloroethane	2020/09/21	95	70 - 130	95	70 - 130	<0.20	ug/L	1.8 (1)	30		
6954167	1,1,2,2-Tetrachloroethane	2020/09/21	103	70 - 130	97	70 - 130	<0.40	ug/L	NC (1)	30		
6954167	1,1,2-Trichloroethane	2020/09/21	104	70 - 130	99	70 - 130	<0.40	ug/L	NC (1)	30		
6954167	1,1-Dichloroethane	2020/09/21	94	70 - 130	93	70 - 130	<0.20	ug/L	1.4 (1)	30		
6954167	1,1-Dichloroethylene	2020/09/21	97	70 - 130	97	70 - 130	<0.20	ug/L	4.5 (1)	30		
6954167	1,2-Dichlorobenzene	2020/09/21	88	70 - 130	86	70 - 130	<0.40	ug/L	NC (1)	30		
6954167	1,2-Dichloroethane	2020/09/21	102	70 - 130	98	70 - 130	<0.49	ug/L	NC (1)	30		
6954167	1,2-Dichloropropane	2020/09/21	87	70 - 130	85	70 - 130	<0.20	ug/L	NC (1)	30		
6954167	1,3-Dichlorobenzene	2020/09/21	85	70 - 130	84	70 - 130	<0.40	ug/L	NC (1)	30		
6954167	1,4-Dichlorobenzene	2020/09/21	91	70 - 130	89	70 - 130	<0.40	ug/L	NC (1)	30		
6954167	Acetone (2-Propanone)	2020/09/21	98	60 - 140	91	60 - 140	<10	ug/L	NC (1)	30		
6954167	Benzene	2020/09/21	95	70 - 130	93	70 - 130	<0.20	ug/L	0.91 (1)	30		

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BV Labs Job #: C002036

Report Date: 2020/09/28

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6954167	Bromodichloromethane	2020/09/21	94	70 - 130	92	70 - 130	<0.50	ug/L	NC (1)	30		
6954167	Bromoform	2020/09/21	102	70 - 130	97	70 - 130	<1.0	ug/L	NC (1)	30		
6954167	Bromomethane	2020/09/21	99	60 - 140	96	60 - 140	<0.50	ug/L	NC (1)	30		
6954167	Carbon Tetrachloride	2020/09/21	93	70 - 130	94	70 - 130	<0.19	ug/L	NC (1)	30		
6954167	Chlorobenzene	2020/09/21	88	70 - 130	86	70 - 130	<0.20	ug/L	NC (1)	30		
6954167	Chloroethane	2020/09/21	96	70 - 130	97	70 - 130	<1.0	ug/L				
6954167	Chloroform	2020/09/21	92	70 - 130	90	70 - 130	<0.20	ug/L	NC (1)	30		
6954167	Chloromethane	2020/09/21	103	60 - 140	102	60 - 140	<5.0	ug/L				
6954167	cis-1,2-Dichloroethylene	2020/09/21	NC	70 - 130	87	70 - 130	<0.50	ug/L	2.1 (1)	30		
6954167	cis-1,3-Dichloropropene	2020/09/21	92	70 - 130	85	70 - 130	<0.30	ug/L	NC (1)	30		
6954167	Dibromochloromethane	2020/09/21	102	70 - 130	97	70 - 130	<0.50	ug/L	NC (1)	30		
6954167	Ethylbenzene	2020/09/21	82	70 - 130	82	70 - 130	<0.20	ug/L	NC (1)	30		
6954167	Ethylene Dibromide	2020/09/21	99	70 - 130	93	70 - 130	<0.19	ug/L	NC (1)	30		
6954167	Methyl Ethyl Ketone (2-Butanone)	2020/09/21	99	60 - 140	90	60 - 140	<10	ug/L	NC (1)	30		
6954167	Methyl Isobutyl Ketone	2020/09/21	99	70 - 130	92	70 - 130	<5.0	ug/L	NC (1)	30		
6954167	Methyl t-butyl ether (MTBE)	2020/09/21	83	70 - 130	80	70 - 130	<0.50	ug/L	NC (1)	30		
6954167	Methylene Chloride(Dichloromethane)	2020/09/21	101	70 - 130	98	70 - 130	<2.0	ug/L	NC (1)	30		
6954167	o-Xylene	2020/09/21	84	70 - 130	87	70 - 130	<0.20	ug/L	NC (1)	30		
6954167	p+m-Xylene	2020/09/21	91	70 - 130	91	70 - 130	<0.20	ug/L	NC (1)	30		
6954167	Styrene	2020/09/21	88	70 - 130	92	70 - 130	<0.40	ug/L	NC (1)	30		
6954167	Tetrachloroethylene	2020/09/21	89	70 - 130	90	70 - 130	<0.20	ug/L	NC (1)	30		
6954167	Toluene	2020/09/21	90	70 - 130	89	70 - 130	<0.20	ug/L	0.44 (1)	30		
6954167	Total Xylenes	2020/09/21					<0.20	ug/L	NC (1)	30		
6954167	trans-1,2-Dichloroethylene	2020/09/21	NC	70 - 130	95	70 - 130	<0.50	ug/L	2.2 (1)	30		
6954167	trans-1,3-Dichloropropene	2020/09/21	103	70 - 130	93	70 - 130	<0.40	ug/L	NC (1)	30		
6954167	Trichloroethylene	2020/09/21	NC	70 - 130	92	70 - 130	<0.20	ug/L	1.6 (1)	30		
6954167	Trichlorofluoromethane (FREON 11)	2020/09/21	98	70 - 130	100	70 - 130	<0.50	ug/L	NC (1)	30		
6954167	Vinyl Chloride	2020/09/21	96	70 - 130	97	70 - 130	<0.20	ug/L	2.0 (1)	30		
6954644	1,2,3,4-Tetrachlorobenzene	2020/09/21	48	30 - 130	37	30 - 130	<0.50	ug/L				
6954644	1,2,3,5-Tetrachlorobenzene	2020/09/21	44	30 - 130	33	30 - 130	<0.50	ug/L				

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BV Labs Job #: C002036

Report Date: 2020/09/28

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6954644	1,2,3-Trichlorobenzene	2020/09/21	39	30 - 130	30	30 - 130	<0.50	ug/L				
6954644	1,2,4,5-Tetrachlorobenzene	2020/09/21	37	30 - 130	29 (6)	30 - 130	<0.50	ug/L				
6954644	1,2,4-Trichlorobenzene	2020/09/21	37	30 - 130	31	30 - 130	<0.50	ug/L				
6954644	1,2-Dichlorobenzene	2020/09/21	34	30 - 130	28 (6)	30 - 130	<0.50	ug/L				
6954644	1,3,5-Trichlorobenzene	2020/09/21	41	30 - 130	32	30 - 130	<0.50	ug/L				
6954644	1,3-Dichlorobenzene	2020/09/21	29 (6)	30 - 130	25 (6)	30 - 130	<0.50	ug/L				
6954644	1,4-Dichlorobenzene	2020/09/21	30 (6)	30 - 130	25 (6)	30 - 130	<0.50	ug/L				
6954644	1-Chloronaphthalene	2020/09/21	54	30 - 130	39	30 - 130	<1.0	ug/L				
6954644	1-Methylnaphthalene	2020/09/21	54	30 - 130	40	30 - 130	<0.20	ug/L				
6954644	2,3,4,5-Tetrachlorophenol	2020/09/21	87	10 - 130	65	10 - 130	<0.40	ug/L				
6954644	2,3,4,6-Tetrachlorophenol	2020/09/21	88	10 - 130	75	10 - 130	<0.50	ug/L				
6954644	2,3,4-Trichlorophenol	2020/09/21	74	10 - 130	61	10 - 130	<0.50	ug/L				
6954644	2,3,5,6-Tetrachlorophenol	2020/09/21	66	10 - 130	59	10 - 130	<0.50	ug/L				
6954644	2,3,5-Trichlorophenol	2020/09/21	81	10 - 130	62	10 - 130	<0.50	ug/L				
6954644	2,3,6-Trichlorophenol	2020/09/21	74	10 - 130	61	10 - 130	<0.50	ug/L				
6954644	2,3-Dichlorophenol	2020/09/21	60	10 - 130	46	10 - 130	<0.50	ug/L				
6954644	2,4,5-Trichlorophenol	2020/09/21	77	10 - 130	66	10 - 130	<0.50	ug/L				
6954644	2,4,6-Trichlorophenol	2020/09/21	73	10 - 130	58	10 - 130	<0.50	ug/L				
6954644	2,4-Dichlorophenol	2020/09/21	66	10 - 130	41	10 - 130	<0.30	ug/L				
6954644	2,4-Dimethylphenol	2020/09/21	32	10 - 130	39	10 - 130	<0.50	ug/L				
6954644	2,4-Dinitrophenol	2020/09/21	104	10 - 130	83	10 - 130	<2.0	ug/L				
6954644	2,4-Dinitrotoluene	2020/09/21	84	30 - 130	71	30 - 130	<0.50	ug/L				
6954644	2,5-Dichlorophenol	2020/09/21	63	10 - 130	50	10 - 130	<0.50	ug/L				
6954644	2,6-Dichlorophenol	2020/09/21	64	10 - 130	43	10 - 130	<0.50	ug/L				
6954644	2,6-Dinitrotoluene	2020/09/21	69	30 - 130	69	30 - 130	<0.50	ug/L				
6954644	2-Chloronaphthalene	2020/09/21	64	30 - 130	50	30 - 130	<0.50	ug/L				
6954644	2-Chlorophenol	2020/09/21	53	10 - 130	39	10 - 130	<0.30	ug/L				
6954644	2-Methylnaphthalene	2020/09/21	51	30 - 130	38	30 - 130	<0.20	ug/L				
6954644	2-Nitrophenol	2020/09/21	56	10 - 130	40	10 - 130	<0.50	ug/L				
6954644	3,3'-Dichlorobenzidine	2020/09/21	28 (6)	30 - 130	29 (6)	30 - 130	<0.50	ug/L				

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RWDI Inc.

Client Project #: 2001313-1000

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6954644	3,4,5-Trichlorophenol	2020/09/21	100	10 - 130	81	10 - 130	<0.50	ug/L				
6954644	3,4-Dichlorophenol	2020/09/21	81	10 - 130	64	10 - 130	<0.50	ug/L				
6954644	3,5-Dichlorophenol	2020/09/21	67	10 - 130	51	10 - 130	<0.50	ug/L				
6954644	4,6-Dinitro-2-methylphenol	2020/09/21	98	10 - 130	81	10 - 130	<2.0	ug/L				
6954644	4-Bromophenyl phenyl ether	2020/09/21	72	30 - 130	65	30 - 130	<0.30	ug/L				
6954644	4-Chloro-3-Methylphenol	2020/09/21	58	10 - 130	52	10 - 130	<0.50	ug/L				
6954644	4-Chlorophenyl phenyl ether	2020/09/21	63	30 - 130	54	30 - 130	<0.50	ug/L				
6954644	4-Nitrophenol	2020/09/21	37	10 - 130	28	10 - 130	<1.4	ug/L				
6954644	Acenaphthene	2020/09/21	62	30 - 130	50	30 - 130	<0.20	ug/L				
6954644	Acenaphthylene	2020/09/21	60	30 - 130	47	30 - 130	<0.20	ug/L				
6954644	Anthracene	2020/09/21	77	30 - 130	68	30 - 130	<0.20	ug/L				
6954644	Benzo(a)anthracene	2020/09/21	99	30 - 130	84	30 - 130	<0.20	ug/L				
6954644	Benzo(a)pyrene	2020/09/21	85	30 - 130	94	30 - 130	<0.20	ug/L				
6954644	Benzo(b,j)fluoranthene	2020/09/21	97	30 - 130	87	30 - 130	<0.20	ug/L				
6954644	Benzo(g,h,i)perylene	2020/09/21	99	30 - 130	83	30 - 130	<0.20	ug/L				
6954644	Benzo(k)fluoranthene	2020/09/21	83	30 - 130	92	30 - 130	<0.20	ug/L				
6954644	Benzyl butyl phthalate	2020/09/21	95	30 - 130	82	30 - 130	<0.50	ug/L				
6954644	Biphenyl	2020/09/21	59	30 - 130	45	30 - 130	<0.50	ug/L				
6954644	Bis(2-chloroethoxy)methane	2020/09/21	52	30 - 130	39	30 - 130	<0.50	ug/L				
6954644	Bis(2-chloroethyl)ether	2020/09/21	52	30 - 130	40	30 - 130	<0.50	ug/L				
6954644	Bis(2-chloroisopropyl)ether	2020/09/21	49	30 - 130	37	30 - 130	<0.50	ug/L				
6954644	Bis(2-ethylhexyl)phthalate	2020/09/21	91	30 - 130	77	30 - 130	<2.0	ug/L	NC (1)	40		
6954644	Chrysene	2020/09/21	97	30 - 130	83	30 - 130	<0.20	ug/L				
6954644	Dibenzo(a,h)anthracene	2020/09/21	99	30 - 130	82	30 - 130	<0.20	ug/L				
6954644	Diethyl phthalate	2020/09/21	83	30 - 130	79	30 - 130	<1.0	ug/L				
6954644	Dimethyl phthalate	2020/09/21	76	30 - 130	72	30 - 130	<1.0	ug/L				
6954644	Di-N-butyl phthalate	2020/09/21	95	30 - 130	85	30 - 130	<2.0	ug/L	NC (1)	40		
6954644	di-n-octyl phthalate	2020/09/21	94	30 - 130	83	30 - 130	<0.80	ug/L				
6954644	Diphenyl Ether	2020/09/21	57	30 - 130	43	30 - 130	<0.30	ug/L				
6954644	Fluoranthene	2020/09/21	89	30 - 130	76	30 - 130	<0.20	ug/L				

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Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6954644	Fluorene	2020/09/21	68	30 - 130	60	30 - 130	<0.20	ug/L				
6954644	Hexachlorobenzene	2020/09/21	71	30 - 130	64	30 - 130	<0.50	ug/L				
6954644	Hexachlorobutadiene	2020/09/21	27 (6)	30 - 130	23 (6)	30 - 130	<0.40	ug/L				
6954644	Hexachlorocyclopentadiene	2020/09/21	27 (6)	30 - 130	20 (6)	30 - 130	<2.0	ug/L				
6954644	Hexachloroethane	2020/09/21	23 (6)	30 - 130	38	30 - 130	<0.50	ug/L				
6954644	Indeno(1,2,3-cd)pyrene	2020/09/21	94	30 - 130	82	30 - 130	<0.20	ug/L				
6954644	Isophorone	2020/09/21	62	30 - 130	53	30 - 130	<0.50	ug/L				
6954644	m/p-Cresol	2020/09/21	49	10 - 130	39	10 - 130	<0.50	ug/L				
6954644	Naphthalene	2020/09/21	59	30 - 130	44	30 - 130	<0.20	ug/L				
6954644	Nitrobenzene	2020/09/21	54	30 - 130	39	30 - 130	<0.50	ug/L				
6954644	Nitrosodiphenylamine/Diphenylamine	2020/09/21	76	30 - 130	59	30 - 130	<1.0	ug/L				
6954644	N-Nitroso-di-n-propylamine	2020/09/21	64	30 - 130	50	30 - 130	<0.50	ug/L				
6954644	o-Cresol	2020/09/21	44	10 - 130	35	10 - 130	<0.50	ug/L				
6954644	p-Chloroaniline	2020/09/21	35	30 - 130	7.9 (6)	30 - 130	<1.0	ug/L				
6954644	Pentachlorobenzene	2020/09/21	52	30 - 130	42	30 - 130	<0.50	ug/L				
6954644	Pentachlorophenol	2020/09/21	66	10 - 130	70	10 - 130	<1.0	ug/L				
6954644	Perylene	2020/09/21	93	30 - 130	85	30 - 130	<0.20	ug/L				
6954644	Phenanthrene	2020/09/21	81	30 - 130	71	30 - 130	<0.20	ug/L				
6954644	Phenol	2020/09/21	27	10 - 130	20	10 - 130	<0.50	ug/L				
6954644	Pyrene	2020/09/21	103	30 - 130	84	30 - 130	<0.20	ug/L				
6955119	Total Phosphorus	2020/09/22	98	80 - 120	101	80 - 120	<0.030	mg/L	0.26 (1)	25	97	80 - 120
6957966	Total Aluminum (Al)	2020/09/23	100	80 - 120	102	80 - 120	<0.02	mg/L	NC (1)	20		
6957966	Total Arsenic (As)	2020/09/23	99	80 - 120	98	80 - 120	<0.001	mg/L	8.7 (1)	20		
6957966	Total Barium (Ba)	2020/09/23	107	80 - 120	100	80 - 120	<0.005	mg/L	8.0 (1)	20		
6957966	Total Beryllium (Be)	2020/09/23	95	80 - 120	94	80 - 120	<0.0006	mg/L	NC (1)	20		
6957966	Total Bismuth (Bi)	2020/09/23	93	80 - 120	97	80 - 120	<0.001	mg/L	NC (1)	20		
6957966	Total Boron (B)	2020/09/23	104	80 - 120	92	80 - 120	<0.02	mg/L	6.6 (1)	20		
6957966	Total Cadmium (Cd)	2020/09/23	100	80 - 120	101	80 - 120	<0.0001	mg/L	NC (1)	20		
6957966	Total Calcium (Ca)	2020/09/23	NC	80 - 120	101	80 - 120	<0.2	mg/L	14 (1)	20		
6957966	Total Chromium (Cr)	2020/09/23	96	80 - 120	96	80 - 120	<0.005	mg/L	NC (1)	20		



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Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6957966	Total Cobalt (Co)	2020/09/23	100	80 - 120	102	80 - 120	<0.0005	mg/L	7.8 (1)	20		
6957966	Total Copper (Cu)	2020/09/23	98	80 - 120	99	80 - 120	<0.002	mg/L	NC (1)	20		
6957966	Total Iron (Fe)	2020/09/23	103	80 - 120	100	80 - 120	<0.1	mg/L	10 (1)	20		
6957966	Total Lead (Pb)	2020/09/23	96	80 - 120	99	80 - 120	<0.0005	mg/L	NC (1)	20		
6957966	Total Magnesium (Mg)	2020/09/23	NC	80 - 120	105	80 - 120	<0.05	mg/L	10 (1)	20		
6957966	Total Molybdenum (Mo)	2020/09/23	100	80 - 120	99	80 - 120	<0.002	mg/L	NC (1)	20		
6957966	Total Nickel (Ni)	2020/09/23	97	80 - 120	99	80 - 120	<0.001	mg/L	1.5 (1)	20		
6957966	Total Potassium (K)	2020/09/23	NC	80 - 120	98	80 - 120	<0.2	mg/L	9.1 (1)	20		
6957966	Total Selenium (Se)	2020/09/23	100	80 - 120	102	80 - 120	<0.005	mg/L	NC (1)	20		
6957966	Total Silver (Ag)	2020/09/23	96	80 - 120	98	80 - 120	<0.0004	mg/L	NC (1)	20		
6957966	Total Sodium (Na)	2020/09/23	NC	80 - 120	100	80 - 120	<0.1	mg/L	9.1 (1)	20		
6957966	Total Strontium (Sr)	2020/09/23	NC	80 - 120	96	80 - 120	<0.003	mg/L	10 (1)	20		
6957966	Total Tin (Sn)	2020/09/23	102	80 - 120	101	80 - 120	<0.002	mg/L	NC (1)	20		
6957966	Total Titanium (Ti)	2020/09/23	99	80 - 120	100	80 - 120	<0.005	mg/L	NC (1)	20		
6957966	Total Vanadium (V)	2020/09/23	99	80 - 120	97	80 - 120	<0.001	mg/L	NC (1)	20		



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Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6957966	Total Zinc (Zn)	2020/09/23	99	80 - 120	102	80 - 120	<0.01	mg/L	NC (1)	20		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

(1) Duplicate Parent ID

(2) Duplicate Parent ID [NQR286-02]

(3) Matrix Spike Parent ID [NQR286-02]

(4) Matrix Spike Parent ID [NQR286-06]

(5) Duplicate Parent ID [NQR286-06]

(6) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



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Your P.O. #: 9199062861

Sampler Initials: MSA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

APPENDIX F:

Elevations

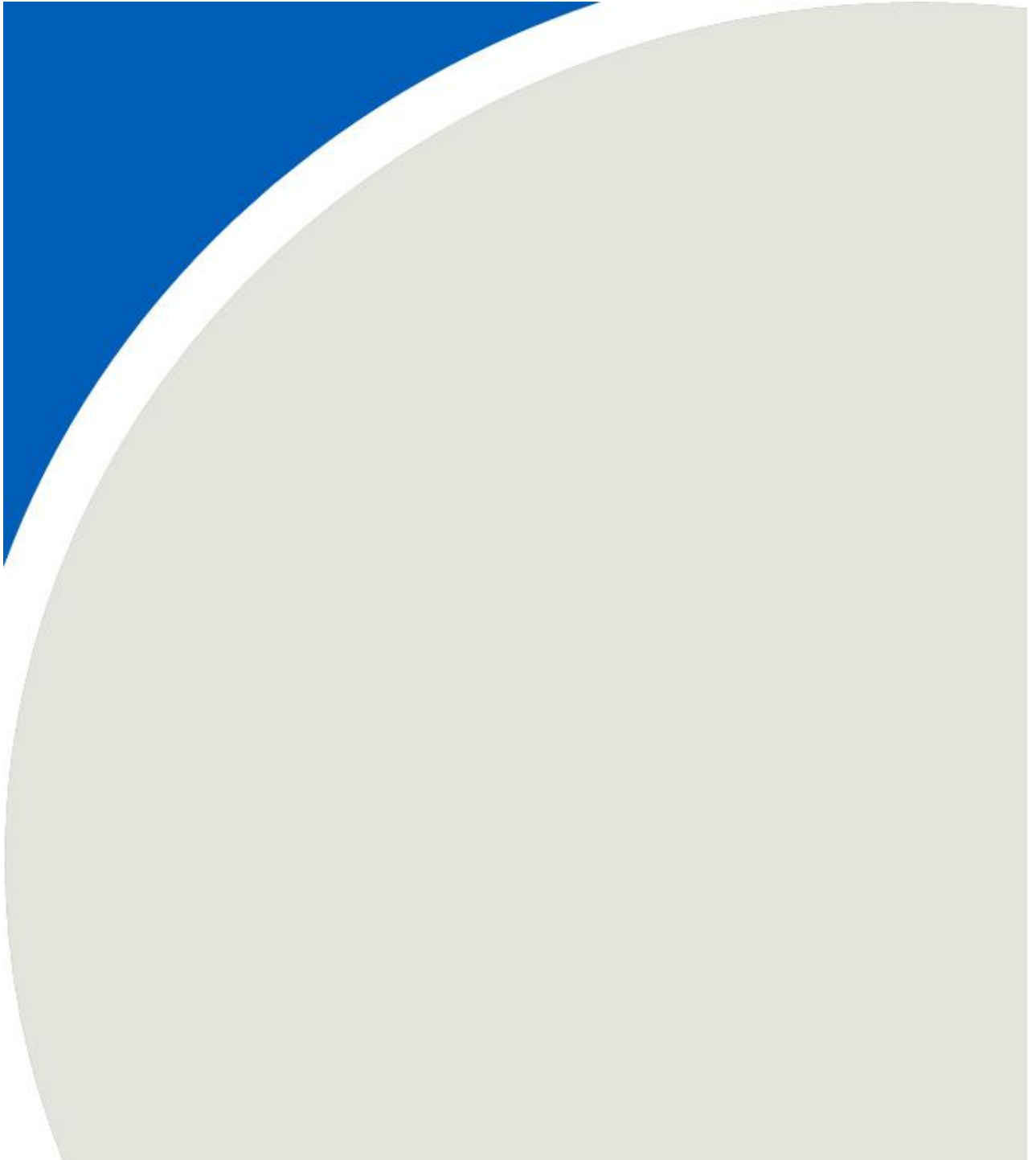
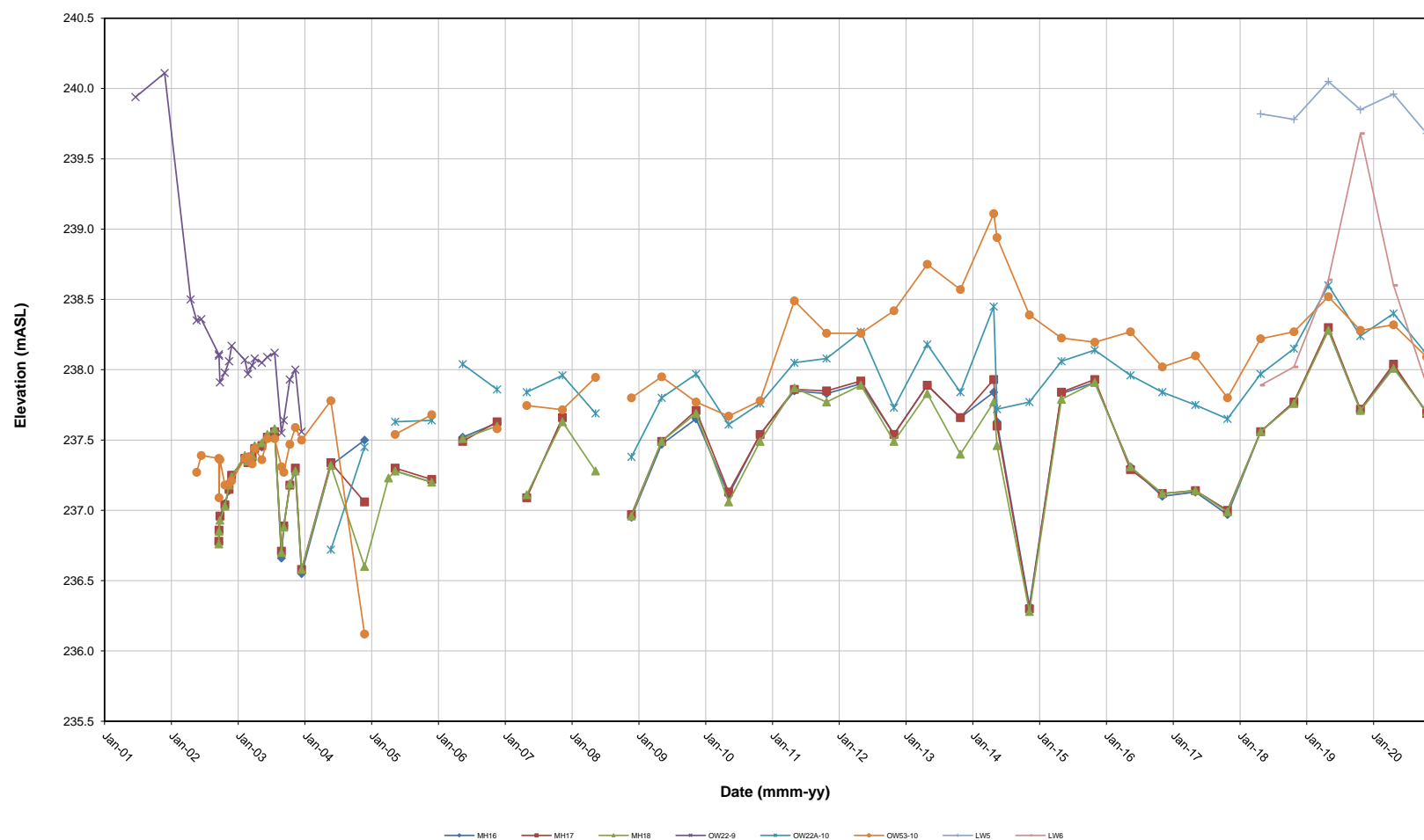


Table F-1
Liquid Elevations
Twin Creeks Environmental Centre - Poplar System

Monitoring Area	Poplar System																		
	South Cell								Cell 3S						Cell 3	Cell 4			West Cell
Monitoring Locations	MH16	MH17	MH18	OW22-9	OW22A-10	OW53-10	LW5	LW6	MH3SA	MH3SB	MH3SC	MH3SD	MH3SE	MH3SF	OW51A-15	MH4A	MH4B	LW4	Sump
Measuring Point	239.69	239.6	239.23	243.98	243.66	244.55	247.20	247.76	241.27	241.19	239.8	239.9	249.99	249.02	250.45	241.07	245.64	248.24	248.9
Invert	235.41	235.1	234.93	NA	NA	NA	NA	NA	237.2	237.15	235.8	235.75	236.45	236.5	NA			NA	
20-Jun-01				239.94															
26-Nov-01				240.11															
18-Apr-02				238.50															
21-May-02				238.35		237.27			Dry	Dry	236.56	236.54	237.81	239.50		239.46	238.78		239.16
15-Jun-02				238.36		237.39			Dry	Dry	236.49	236.46	237.71	239.13		238.15	238.75		239.37
19-Sep-02	236.77	236.78	236.76	238.11		237.37													
20-Sep-02	236.85	236.86	236.85	238.10		237.09													
25-Sep-02	236.94	236.96	236.93	237.91		237.36													
22-Oct-02	237.05	237.04	237.03	237.98		237.18			Dry	Dry	236.11	236.22	237.57	238.82		238.42	238.93		239.48
14-Nov-02	237.14	237.15	237.18	238.06		237.19													
28-Nov-02	237.25	237.25	237.24	238.17		237.21													
9-Feb-03	237.36	237.37	237.39	238.07		237.37													
26-Feb-03	237.35	237.34	237.35	237.97		237.38													
21-Mar-03	237.38	237.38	237.39	238.03		237.33													
4-Apr-03	237.45	237.44	237.46	238.08		237.44													
13-May-03	237.45	237.46	237.48	238.05		237.36			Dry	Dry	236.92	237.03	238.61	241.87		239.65	239.02		240.10
12-Jun-03	237.52	237.52	237.54	238.09		237.51													
22-Jul-03	237.57	237.56	237.58	238.12		237.51													
28-Aug-03	236.66	236.71	236.70	237.55		237.31													
10-Sep-03	236.89	236.89	236.88	237.64		237.27													
13-Oct-03	237.18	237.18	237.19	237.93		237.47													
12-Nov-03	237.27	237.30	237.28	238.00		237.59			237.59	Dry	236.78	236.79	239.66	242.40		238.56	238.85		239.86
17-Dec-03	236.55	236.58	236.58	237.56		237.50													
25-May-04	237.32	237.34	237.32		236.72	237.78			238.34	Dry	236.75	236.76				239.86	238.89		239.68
26-Nov-04	237.50	237.06	236.60		237.45	236.12			238.20	238.04	235.89	235.44	239.85	242.34		238.36	238.87		
6-Apr-05			237.23									236.93				239.19			239.40
12-May-05	237.28	237.30	237.28		237.63	237.54			239.14	238.73	236.82	236.83	241.85	244.56		239.15	239.15		239.27
29-Nov-05	237.20	237.22	237.20		237.64	237.68			Dry	Dry	236.68	236.60	246.08	246.80	235.97	237.59	239.19		239.40
27-Mar-06											236.75					238.26			239.15
17-May-06	237.52	237.49	237.51		238.04				237.65	Dry	236.35	236.36	242.00	245.02	236.16	238.66	239.68		239.45
22-Nov-06	237.62	237.63	237.60		237.86	237.58			237.47	Dry	236.90	237.03	242.46	244.99	236.40	238.19	240.08		239.38
4-Apr-07												236.90				238.89			239.54
3-May-07	237.10	237.09	237.11		237.84	237.75			237.82	238.09	236.64	236.75	242.69	244.93	235.98	238.68	238.63		239.15
15-Nov-07	237.65	237.66	237.63		237.96	237.72			237.54	<237.18	236.90	236.93	241.07	243.17	235.78	237.71	238.98		239.31
15-May-08			237.28		237.69	237.95			237.87	237.85	236.65	236.77	242.61	244.20	235.93	238.51	240.29		239.51
4-Nov-08									237.63	237.73	236.86	237.82	242.49	245.14	237.98*	237.52	238.40		239.47
27-Nov-08	236.95	236.97	236.96		237.38	237.80													
12-May-09	237.47	237.49	237.49		237.80	237.95			238.47	237.92	236.56	236.72	240.44	243.79	236.18	237.87	240.62		239.40
16-Nov-09	237.65	237.71	237.69		237.97	237.77			237.83	Dry	236.07	236.07	241.34	243.39	236.03	236.34	240.61		239.15
14-May-10	237.11	237.13	237.06		237.61	237.67			237.73	Dry	233.17	Dry		243.38	235.85	238.06	240.33		239.59
2-Nov-10	237.54	237.54	237.49		237.76	237.78			237.67	Dry	233.38	235.59	240.85	243.20	235.90	238.06	240.39		239.63
9-May-11	237.85	237.86	237.87		238.05	238.49			237.96	237.41	234.43	235.64	242.79	244.89	236.03	238.29	241.56		240.20
1-Nov-11	237.83	237.85	237.77		238.08	238.26			237.86	Dry	234.83	234.97	242.38	244.45	235.91	236.52	237.12		238.83
7-May-12	237.90	237.92	237.89		238.27	238.26			238.19	237.41	233.09	Dry	242.43	244.31	236.07	238.38	237.57		239.89
5-Nov-12	237.54	237.54	237.49		237.73	238.42			237.95	237.19	234.83	Dry	241.86	243.53	235.98	238.19	237.57		238.69
6-May-13	237.89	237.89	237.83		238.18	238.75			238.88	238.67	232.95	Dry	243.04	245.01	236.05	238.54	238.35		240.91
4-Nov-13	237.66	237.66	237.40		237.84	238.57			237.99	237.16	234.79	235.29	242.68	242.72	236.47	238.37	237.66		239.03
5-May-14	237.84	237.93	237.77		238.45	239.11			238.89	238.76	233.00	<235.32	242.97	245.06	236.71	238.60	238.38		240.86
23-May-14	237.63	237.60	237.46		237.72	238.94			237.91	237.24	234.61	235.31	242.70	242.82	236.50	238.24	237.73		238.99
17-Nov-14	236.32	236.30	236.28		237.77	238.39			238.18	<237.29	234.21	<233.65	243.58	243.08	236.32	237.27	238.80		238.65
11-May-15	237.83	237.84	237.79		238.06	238.23			238.60	237.72	233.90	<234.67	244.08	241.34	236.23	237.99	240.32		238.34
10-Nov-15	237.91	237.93	237.91		238.14	238.20			238.05	237.05	233.64	<234.67	242.82	242.97	236.23	237.71	238.74		237.31
24-May-16	237.31	237.29	237.31		237.96	238.27			238.30	237.05	233.72	<234.69	243.19	244.04	236.03	238.39	239.61		241.40
14-Nov-16	237.10	237.12	237.12		237.84	238.02			238.78	237.44	233.72	<234.69	242.78	242.88	236.05	237.64	239.66		240.26
15-May-17	237.13	237.14	237.14		237.75	238.10			238.99	237.32	234.46	<234.36	243.35	244.04	236.02	238.38	239.63		242.01
6-Nov-17	236.97	237.00	236.99		237.65	237.80			238.56	238.00	236.01	<234.36	243.99	242.01	236.27	235.92	239.58		242.05
7-May-18	237.56	237.56	237.56		237.97	238.22	239.82	237.89	239.53	239.32	236.03	235.74	243.98	244.04	236.05	234.58	238.91	240.44	243.26
5-Nov-18	237.77	237.77	237.76		238.15	238.27	239.78	238.02	240.25	240.30	234.83	234.36	243.89	243.92	236.04	234.48	239.74	240.29	244.12
13-May-19	238.28	238.30	238.28		238.60	238.52	240.05	238.64	239.01	239.60	237.44	237.11	243.89	243.92	236.26	238.49	239.62	240.54	245.14
4-Nov-19	237.71	237.72	237.71		238.24	238.28	239.85	239.68	239.00	238.57	237.40	238.11	243.90	243.92	236.20	238.79	238.93	240.49	242.54
4-May-20	238.02	238.04	238.01		238.40	238.32	239.96	238.60	237.93	238.06	235.54	235.51	243.94	243.99	236.14	239.24	239.32	240.96	240.37
2-Nov-20	237.70	237.69	237.70		238.11	238.09	239.68	237.89	238.67	237.99	233.69	235.55	243.43	243.66	236.34	235.89	239.43	241.39	241.03

- Notes:
- 1) NA indicates not applicable.
 - 2) Blank indicates data not available.
 - 3) Monitoring well OW22-9 was decommissioned and reinstalled as OW22A-10 in March 2004.
 - 4) Elevations in metres above sea level.
 - 5) Measuring point elevations for MW16, MW17, and MW18 updated based on a June 2015 survey.



NOTES:

1. mASL denotes metres above sea level

LEACHATE ELEVATION HYDROGRAPH South Cell

2020 FOURTH QUARTER AND ANNUAL MONITORING REPORT

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER

F-1

DATE REVISED

17-Dec-20

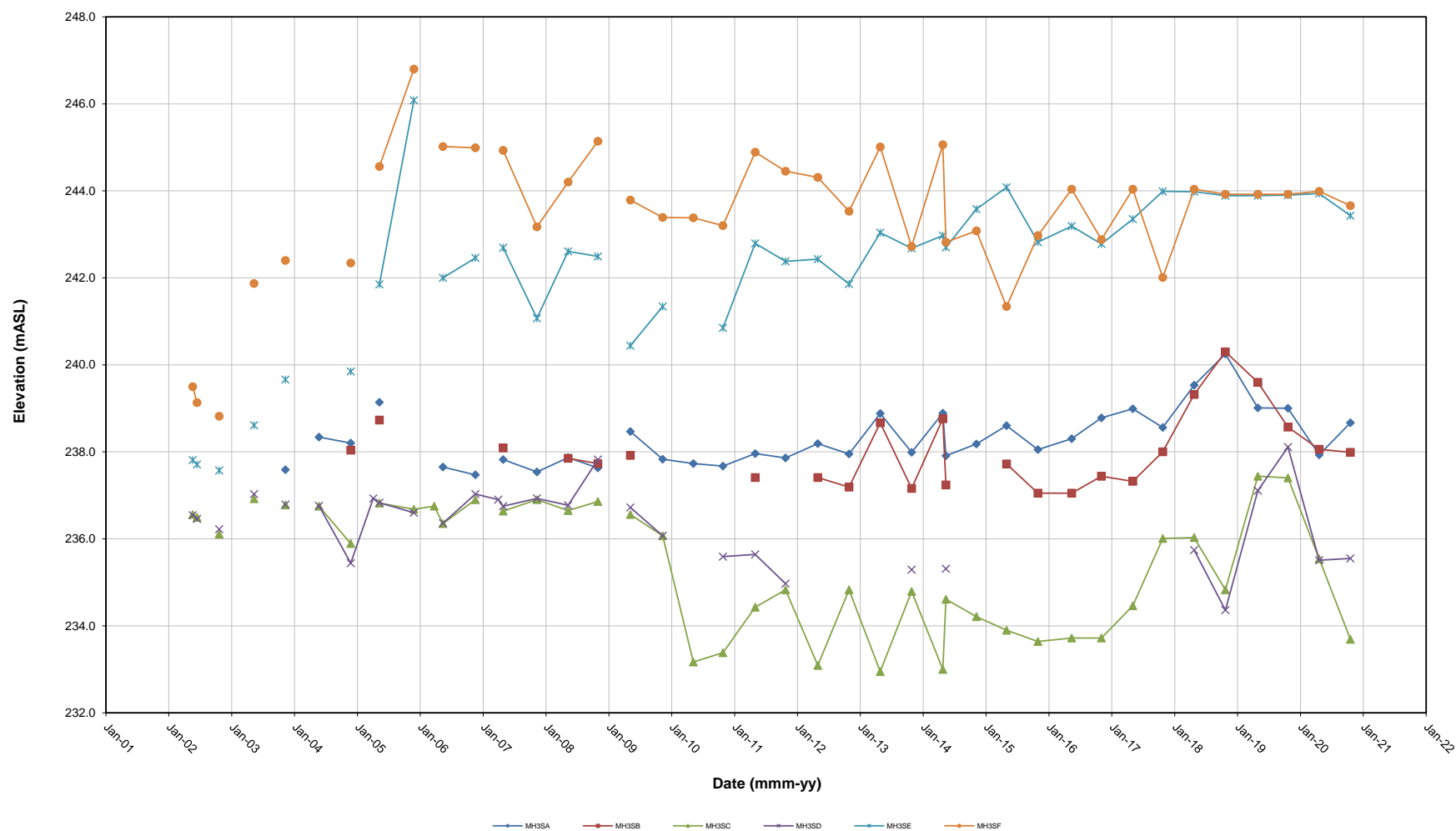
PROJECT NUMBER

2001313

REVISED BY

MSA





NOTES:

1. mASL denotes metres above sea level

**LEACHATE ELEVATION HYDROGRAPH
Cell 3S**

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

*TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION*

FIGURE NUMBER

F-2

DATE REVISED

17-Dec-20

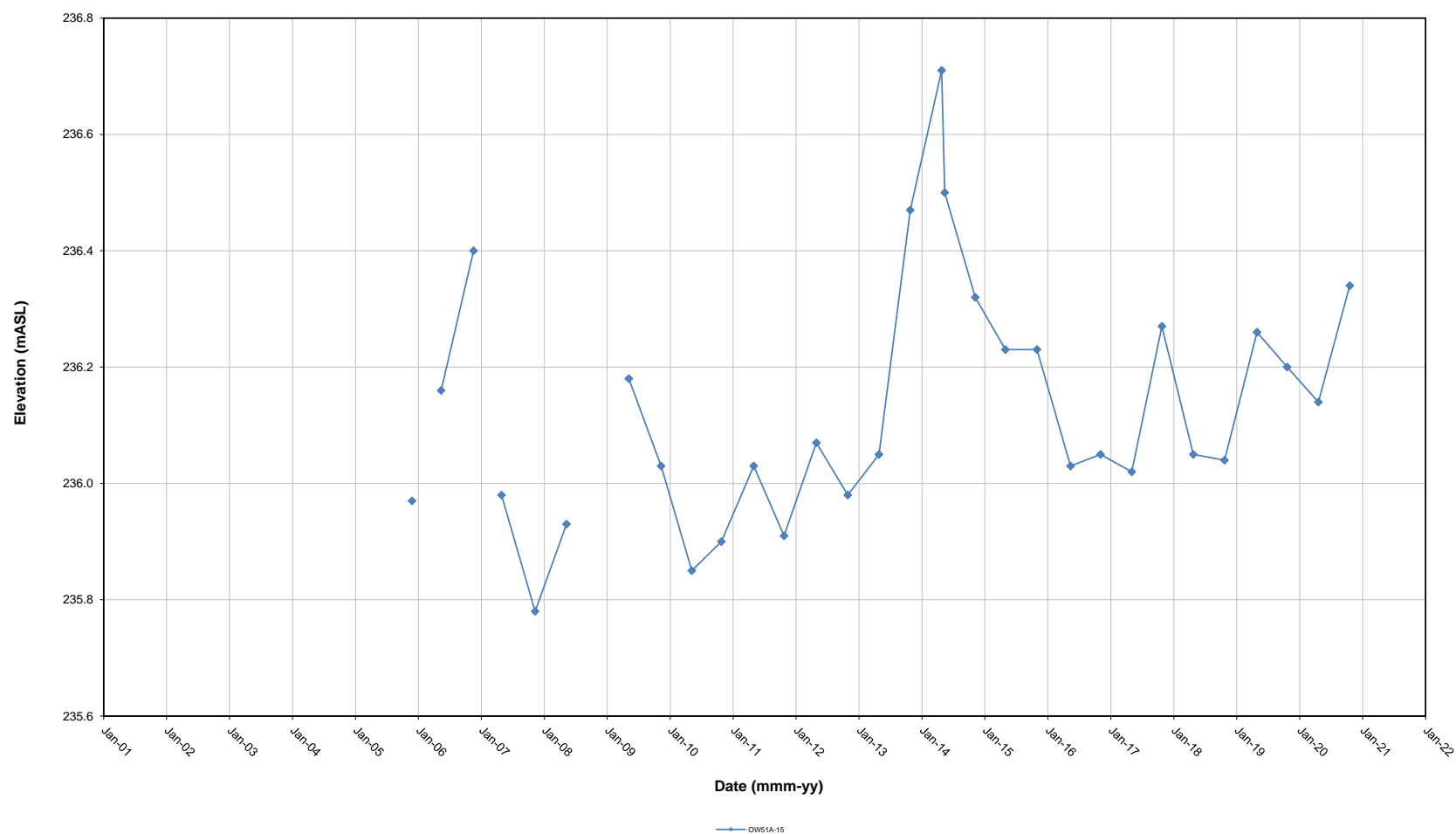
PROJECT NUMBER

2001313

REVISED BY

MSA





NOTES:

1. mASL denotes metres above sea level

**LEACHATE ELEVATION HYDROGRAPH
Cell 3**

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER

F-3

DATE REVISED

17-Dec-20

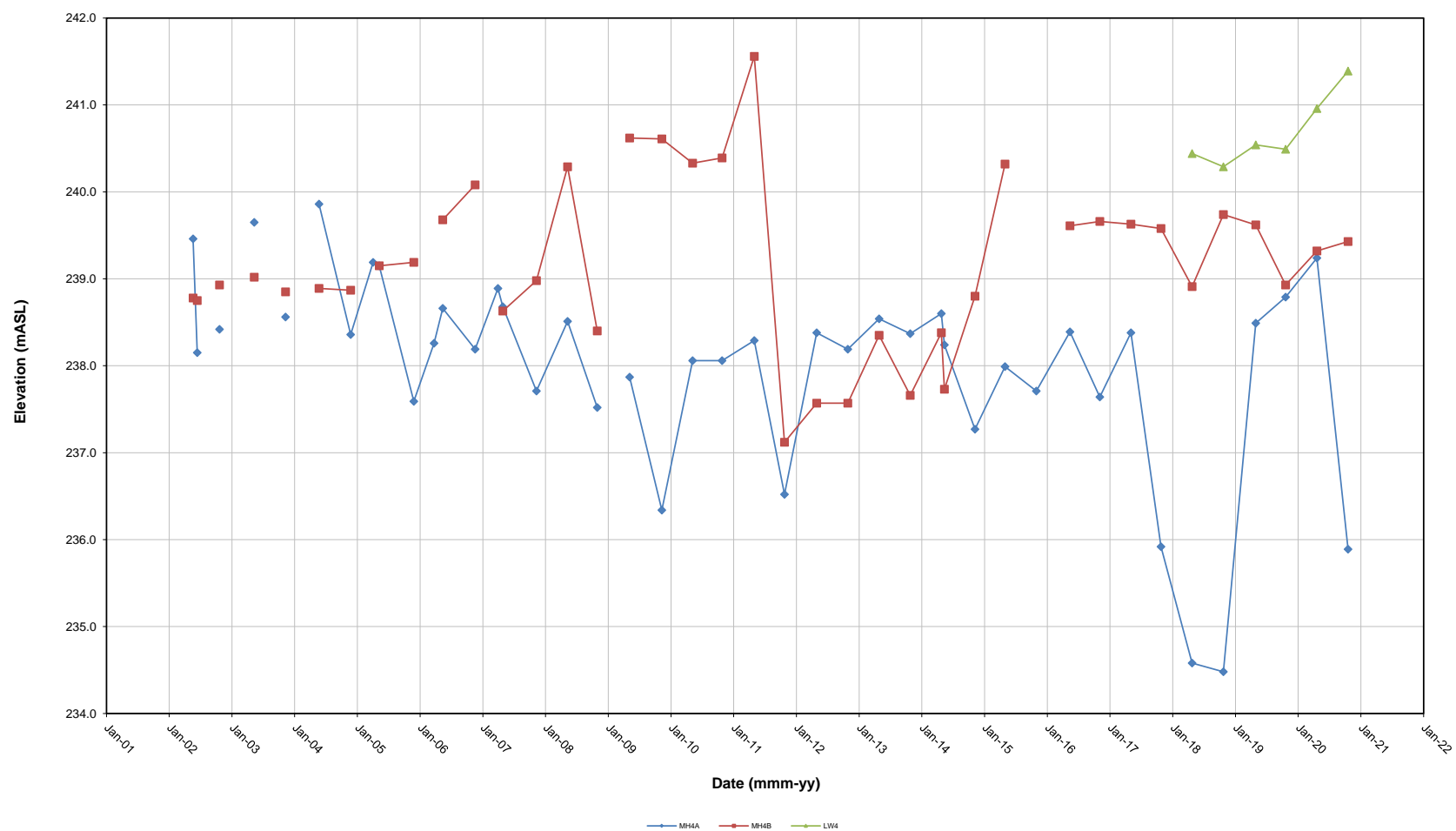
PROJECT NUMBER

2001313

REVISED BY

MSA





NOTES:

1. mASL denotes metres above sea level

**LEACHATE ELEVATION HYDROGRAPH
Cell 4**

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER

F-4

DATE REVISED

17-Dec-20

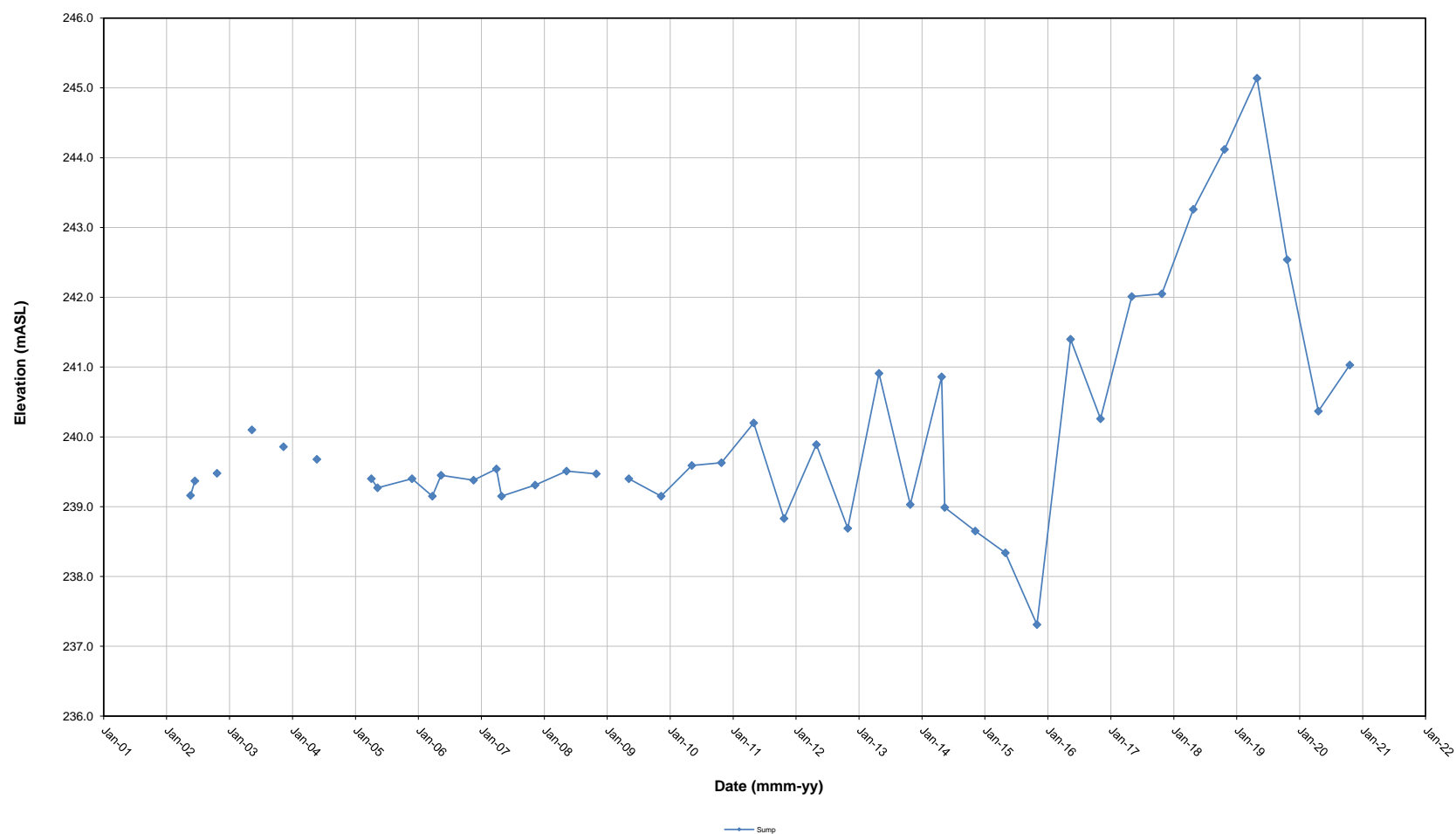
PROJECT NUMBER

2001313

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NOTES:

1. mASL denotes metres above sea level

**LEACHATE ELEVATION HYDROGRAPH
West Cell**

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

*TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION*

FIGURE NUMBER

F-5

DATE REVISED

17-Dec-20

PROJECT NUMBER

2001313

REVISED BY

MSA



APPENDIX G:

Soil



Table G-1

Soil - General Chemical Results - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Soil Concentration Indicators	Poplar System										
			S1 (Zone 1)										
			28-Sep-17	27-Sep-18	10-Sep-19	4-Sep-20							
Total Ammonia	ug/g		<20	29	<20	<20							
Total Organic Carbon	mg/kg		17000	13000	16000	15000							
Calculated Total Kjeldahl Nitrogen	ug/g		1730	1330	1820	1790							
Chloride (Cl)	ug/g	0.2-0.3%	58	273	183	36							
Nitrate (N)	ug/g		<4	69	19	3							
Sulphate (SO4)	ug/g		160	90	172	92							
Hot Water Ext. Boron (B)	ug/g	>5	4.7	8.2	3.2	1.3							
Acid Extractable Aluminum (Al)	ug/g		16000	16000	18000	16000							
Acid Extractable Arsenic (As)	ug/g	14*	6.7	7.2	7.6	6.8							
Acid Extractable Barium (Ba)	ug/g		81	85	88	82							
Acid Extractable Beryllium (Be)	ug/g		0.76	0.74	0.85	0.77							
Acid Extractable Bismuth (Bi)	ug/g		<1.0	<1.0	<1.0	<1.0							
Acid Extractable Cadmium (Cd)	ug/g	1.6*	0.19	0.19	0.19	0.17							
Acid Extractable Chromium (Cr)	ug/g		28	28	30	28							
Acid Extractable Cobalt (Co)	ug/g	20*	13	14	14	14							
Acid Extractable Lead (Pb)	ug/g	60*	16	15	17	17							
Acid Extractable Molybdenum (Mo)	ug/g	4*	2.7	3.3	2.7	3.1							
Acid Extractable Nickel (Ni)	ug/g	32*	29	37	34	32							
Acid Extractable Selenium (Se)	ug/g	1.6*	<0.50	<0.50	<0.50	<0.50							
Acid Extractable Silver (Ag)	ug/g		<0.20	<0.20	<0.20	<0.20							
Acid Extractable Strontium (Sr)	ug/g		29	81	53	39							
Acid Extractable Tin (Sn)	ug/g		<1.0	<1.0	<1.0	<1.0							
Acid Extractable Titanium (Ti)	ug/g		71	84	69	50							
Acid Extractable Vanadium (V)	ug/g		35	32	34	34							
Acid Extractable Zinc (Zn)	ug/g	200/220*	59	68	73	59							
P (NaHCO ₃ Extractable)	µg/g		10	9	7	8							
Calcium (NH ₄ Acetate Extractable)	mg/L		310	270	490	81							
Magnesium (NH ₄ Acetate Extractable)	mg/L		29	35	31	12							
Potassium (NH ₄ Acetate Extractable)	mg/L		7.8	19	12	110							
Sodium (NH ₄ Acetate Extractable)	mg/L		16	36	27	52							
Ammonia (KCl Extractable)	mg/kg	>500 kg/ha	<2.0	25	<2.0	<2.0							
SAR - Sodium Absorption Ratio (calculated)		<10-low;10-18 - medium;18-26-high	1.2	2.9	1.7	7.6							

NOTES:

- 1) Blank indicates data not available.
- 2) ** Indicates Maximum Permissible Metal Content in Soils Receiving Waste Materials (MOE, 1996).
- 3) Shading indicates exceedances of Maximum Permissible Metal Content in Soils Receiving Waste Materials.
- 4) IS indicates insufficient sample.
- 5) ppm indicates parts per million, ug/g indicates micrograms per gram, and kg/ha indicates kilograms per hectare.
- 6) Italics denotes parameter concentration is presented as half the laboratory RDL for SAR calculation purposes.

Table G-1

Soil - General Chemical Results - Poplar System

Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Soil Concentration Indicators	Poplar System											
			S2 (Zone 2)											
			28-Sep-17	27-Sep-18	10-Sep-19	4-Sep-20								
Total Ammonia	ug/g		<20	<20	<20	<20								
Total Organic Carbon	mg/kg		17000	14000	16000	15000								
Calculated Total Kjeldahl Nitrogen	ug/g		1410	1470	1690	1580								
Chloride (Cl)	ug/g	0.2-0.3%	73	47	<10	11								
Nitrate (N)	ug/g		8	6	<2	<2								
Sulphate (SO4)	ug/g		98	50	<20	31								
Hot Water Ext. Boron (B)	ug/g	>5	0.99	0.49	0.58	0.84								
Acid Extractable Aluminum (Al)	ug/g		17000	19000	18000	17000								
Acid Extractable Arsenic (As)	ug/g	14*	7.4	7.6	6.9	7.4								
Acid Extractable Barium (Ba)	ug/g		84	92	84	84								
Acid Extractable Beryllium (Be)	ug/g		0.79	0.92	0.87	0.80								
Acid Extractable Bismuth (Bi)	ug/g		<1.0	<1.0	<1.0	<1.0								
Acid Extractable Cadmium (Cd)	ug/g	1.6*	0.24	0.17	0.18	0.19								
Acid Extractable Chromium (Cr)	ug/g		29	32	30	28								
Acid Extractable Cobalt (Co)	ug/g	20*	15	16	14	15								
Acid Extractable Lead (Pb)	ug/g	60*	18	18	17	18								
Acid Extractable Molybdenum (Mo)	ug/g	4*	2.6	3.1	2.5	2.8								
Acid Extractable Nickel (Ni)	ug/g	32*	33	37	32	32								
Acid Extractable Selenium (Se)	ug/g	1.6*	<0.50	<0.50	<0.50	<0.50								
Acid Extractable Silver (Ag)	ug/g		<0.20	<0.20	<0.20	<0.20								
Acid Extractable Strontium (Sr)	ug/g		39	32	34	34								
Acid Extractable Tin (Sn)	ug/g		<1.0	<1.0	<1.0	<1.0								
Acid Extractable Titanium (Ti)	ug/g		64	62	47	57								
Acid Extractable Vanadium (V)	ug/g		35	37	35	35								
Acid Extractable Zinc (Zn)	ug/g	200/220*	69	67	64	59								
P (NaHCO ₃ Extractable)	µg/g		8	10	11	9								
Calcium (NH ₄ Acetate Extractable)	mg/L		330	330	520	43								
Magnesium (NH ₄ Acetate Extractable)	mg/L		23	22	26	6								
Potassium (NH ₄ Acetate Extractable)	mg/L		8.2	13	14	120								
Sodium (NH ₄ Acetate Extractable)	mg/L		8.4	2.2	1	29								
Ammonia (KCl Extractable)	mg/kg	>500 kg/ha	<2.0	<2.0	<2.0	<2.0								
SAR - Sodium Adsorption Ratio (calculated)		<10-low;10-18-medium;18-26-high	0.6	0.2	0.03	5.88								

NOTES:

- Blank indicates data not available.
- * Indicates Maximum Permissible Metal Content in Soils Receiving Waste Materials (MOE, 1996).
- Shading indicates exceedances of Maximum Permissible Metal Content in Soils Receiving Waste Materials.
- IS indicates insufficient sample.
- ppm indicates parts per million, ug/g indicates micrograms per gram, and kg/ha indicates kilograms per hectare.
- Italics* denotes parameter concentration is presented as half the laboratory RDL for SAR calculation purposes.

Table G-1

Soil - General Chemical Results - Poplar System

Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Soil Concentration Indicators	Poplar system											
			S3 (Zone 3)											
			28-Sep-17	27-Sep-18	10-Sep-19	4-Sep-20								
Total Ammonia	ug/g		<20	<20	<20	<20								
Total Organic Carbon	mg/kg		16000	14000	20000	11000								
Calculated Total Kjeldahl Nitrogen	ug/g		1640	1420	1700	1160								
Chloride (Cl)	ug/g	0.2-0.3%	11	40	20	193								
Nitrate (N)	ug/g		<4	3	<2	44								
Sulphate (SO4)	ug/g		47	791	152	339								
Hot Water Ext. Boron (B)	ug/g	>5	0.48	2.8	2	4.2								
Acid Extractable Aluminum (Al)	ug/g		18000	16000	16000	14000								
Acid Extractable Arsenic (As)	ug/g	14*	7.4	6.9	6.7	6.2								
Acid Extractable Barium (Ba)	ug/g		87	81	72	81								
Acid Extractable Beryllium (Be)	ug/g		0.86	0.78	0.76	0.65								
Acid Extractable Bismuth (Bi)	ug/g		<1.0	<1.0	<1.0	<1.0								
Acid Extractable Cadmium (Cd)	ug/g	1.6*	0.26	0.16	0.2	0.19								
Acid Extractable Chromium (Cr)	ug/g		30	29	28	26								
Acid Extractable Cobalt (Co)	ug/g	20*	16	14	12	12								
Acid Extractable Lead (Pb)	ug/g	60*	18	16	18	16								
Acid Extractable Molybdenum (Mo)	ug/g	4*	2.7	3.4	2.8	3.2								
Acid Extractable Nickel (Ni)	ug/g	32*	34	36	31	33								
Acid Extractable Selenium (Se)	ug/g	1.6*	<0.50	<0.50	<0.50	<0.50								
Acid Extractable Silver (Ag)	ug/g		<0.20	<0.20	<0.20	<0.20								
Acid Extractable Strontium (Sr)	ug/g		30	82	55	73								
Acid Extractable Tin (Sn)	ug/g		<1.0	<1.0	<1.0	<1.0								
Acid Extractable Titanium (Ti)	ug/g		62	78	62	74								
Acid Extractable Vanadium (V)	ug/g		37	34	33	30								
Acid Extractable Zinc (Zn)	ug/g	200/220*	65	64	71	59								
P (NaHCO ₃ Extractable)	µg/g		9	4	6	5								
Calcium (NH ₄ Acetate Extractable)	mg/L		330	310	480	300								
Magnesium (NH ₄ Acetate Extractable)	mg/L		24	33	39	82								
Potassium (NH ₄ Acetate Extractable)	mg/L		8.8	9.6	10	90								
Sodium (NH ₄ Acetate Extractable)	mg/L		2	8.2	7	170								
Ammonia (KCl Extractable)	mg/kg	>500 kg/ha	<2.0	<2.0	<2.0	<2.0								
SAR - Sodium Adsorption Ratio (calculated)		<10-low;10-18-medium;18-26-high	0.2	0.6	0.5	12.3								

NOTES:

- Blank indicates data not available.
- * Indicates Maximum Permissible Metal Content in Soils Receiving Waste Materials (MOE, 1996).
- Shading indicates exceedances of Maximum Permissible Metal Content in Soils Receiving Waste Materials.
- IS indicates insufficient sample.
- ppm indicates parts per million, ug/g indicates micrograms per gram, and kg/ha indicates kilograms per hectare.
- Italics* denotes parameter concentration is presented as half the laboratory RDL for SAR calculation purposes.

Table G-1

Soil - General Chemical Results - Poplar System

Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Soil Concentration Indicators	Poplar system											
			S4 (Zone 4)											
			28-Sep-17	27-Sep-18	10-Sep-19	4-Sep-20								
Total Ammonia	ug/g		<20	<20	<20	<20								
Total Organic Carbon	mg/kg		24000	26000	23000	20000								
Calculated Total Kjeldahl Nitrogen	ug/g		2290	2380	2190	2430								
Chloride (Cl)	ug/g	0.2-0.3%	47	57	<10	214								
Nitrate (N)	ug/g		7	25	6	140								
Sulphate (SO4)	ug/g		56	38	<20	125								
Hot Water Ext. Boron (B)	ug/g	>5	1.4	0.72	0.4	4.6								
Acid Extractable Aluminum (Al)	ug/g		16000	11000	16000	16000								
Acid Extractable Arsenic (As)	ug/g	14*	6.7	6.1	6.8	6.2								
Acid Extractable Barium (Ba)	ug/g		76	57	79	77								
Acid Extractable Beryllium (Be)	ug/g		0.77	0.51	0.84	0.76								
Acid Extractable Bismuth (Bi)	ug/g		<1.0	<1.0	<1.0	<1.0								
Acid Extractable Cadmium (Cd)	ug/g	1.6*	0.25	0.24	0.21	0.16								
Acid Extractable Chromium (Cr)	ug/g		29	21	28	27								
Acid Extractable Cobalt (Co)	ug/g	20*	13	7.5	13	12								
Acid Extractable Lead (Pb)	ug/g	60*	20	23	18	15								
Acid Extractable Molybdenum (Mo)	ug/g	4*	2.9	1.4	2.6	3								
Acid Extractable Nickel (Ni)	ug/g	32*	31	19	30	31								
Acid Extractable Selenium (Se)	ug/g	1.6*	<0.50	<0.50	<0.50	<0.50								
Acid Extractable Silver (Ag)	ug/g		<0.20	<0.20	<0.20	<0.20								
Acid Extractable Strontium (Sr)	ug/g		45	23	30	37								
Acid Extractable Tin (Sn)	ug/g		<1.0	<1.0	<1.0	<1.0								
Acid Extractable Titanium (Ti)	ug/g		67	100	47	61								
Acid Extractable Vanadium (V)	ug/g		34	26	35	34								
Acid Extractable Zinc (Zn)	ug/g	200/220*	73	83	66	59								
P (NaHCO ₃ Extractable)	µg/g		9	10	8	8								
Calcium (NH ₄ Acetate Extractable)	mg/L		330	390	520	200								
Magnesium (NH ₄ Acetate Extractable)	mg/L		32	17	28	40								
Potassium (NH ₄ Acetate Extractable)	mg/L		11	7.8	15	140								
Sodium (NH ₄ Acetate Extractable)	mg/L		5.8	2.2	0.2	270								
Ammonia (KCl Extractable)	mg/kg	>500 kg/ha	<2.0	<2.0	<2.0	<2.0								
SAR - Sodium Adsorption Ratio (calculated)	<10-low;10-18-medium;18-26-high		0.4	0.2	0.01	24.65								

NOTES:

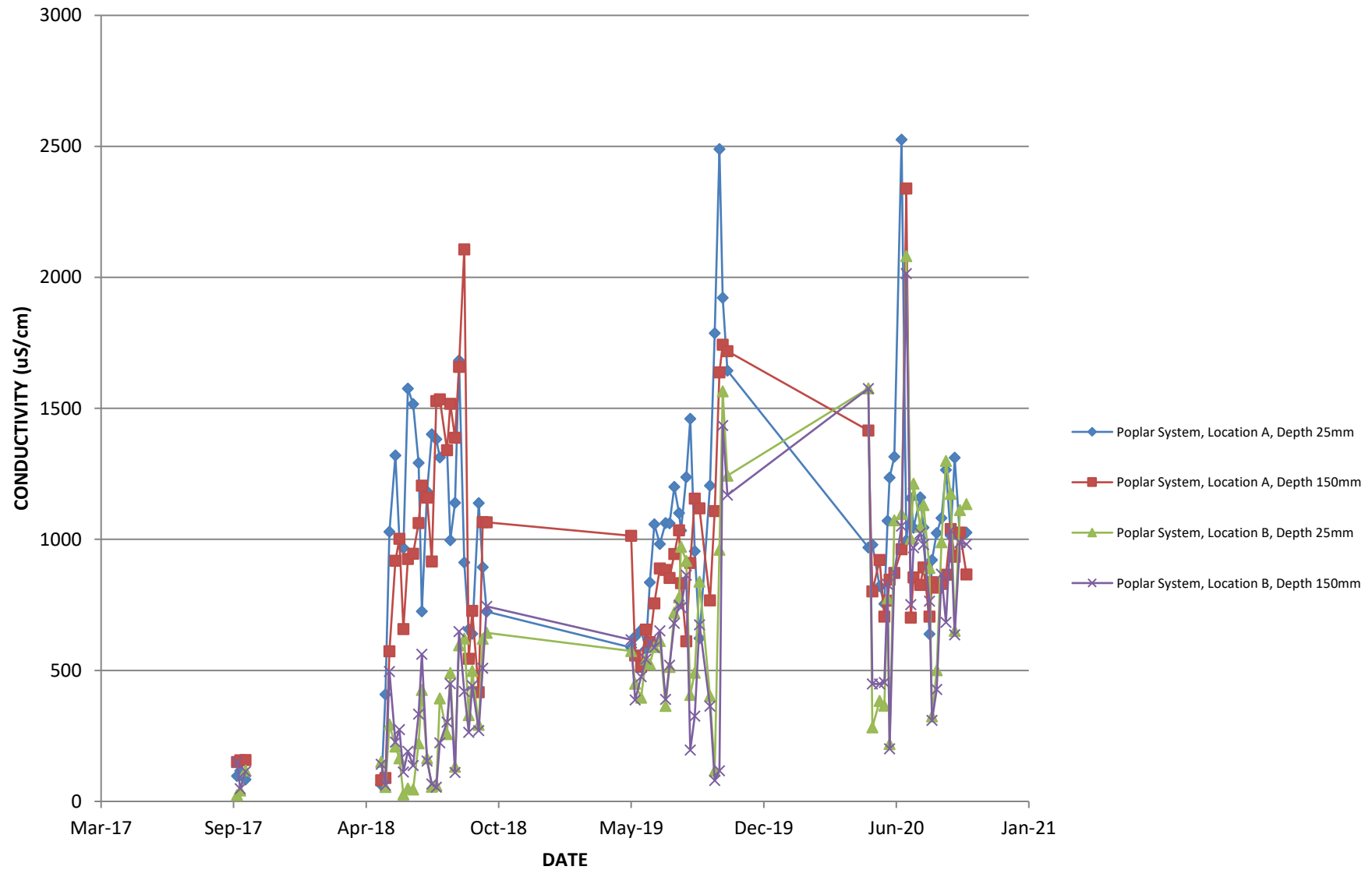
- Blank indicates data not available.
- * Indicates Maximum Permissible Metal Content in Soils Receiving Waste Materials (MOE, 1996).
- Shading indicates exceedances of Maximum Permissible Metal Content in Soils Receiving Waste Materials.
- IS indicates insufficient sample.
- ppm indicates parts per million, ug/g indicates micrograms per gram, and kg/ha indicates kilograms per hectare.
- Italics* denotes parameter concentration is presented as half the laboratory RDL for SAR calculation purposes.

Table G-2
Soil - Electrical Conductivity Results
Twin Creeks Environmental Centre - Poplar System

Location	Depth (mm)	Conductivity (µS/cm)																							
		30-Sep-19	7-Oct-19	7-May-20	13-May-20	24-May-20	31-May-20	5-Jun-20	8-Jun-20	15-Jun-20	26-Jun-20	3-Jul-20	10-Jul-20	14-Jul-20	24-Jul-20	29-Jul-20	7-Aug-20	11-Aug-20	18-Aug-20	25-Aug-20	1-Sep-20	8-Sep-20	14-Sep-20	22-Sep-20	2-Oct-20
1-A	25	2,260	1,630	890	1,000	850	970	1,140	1,460	970	2,620	1,040	1,130	1,140	1,170	1,350	690	1,330	1,140	1,520	1,440	1,570	2,140	1,150	1,130
	150	1,290	1,380	840	1,250	810	1,020	1,380	1,060	790	2,940	650	840	840	770	760	800	900	1,060	1,350	1,310	1,200	1,010	860	1,070
1-B	25	1,360	1,640	190	370	360	720	130	1,850	1,070	2,190	1,120	1,430	1,440	1,150	1,320	980	1,000	1,070	1,370	1,630	640	2,020	1,400	1,140
	150	1,250	1,500	720	580	600	1,050	150	930	1,250	2,330	1,140	1,060	1,730	1,070	960	870	690	800	890	1,420	680	1,150	930	980
2-A	25	1,640	1,860	1,140	1,170	1,040	1,060	950	1,350	1,060	2,520	850	1,080	1,210	1,110	590	250	240	820	440	650	460	960	630	710
	150	1,430	1,270	870	1,100	1,000	920	820	810	870	2,530	690	790	760	960	450	640	420	690	300	650	540	950	600	510
2-B	25	1,680	1,750	950	1,060	1,250	1,050	1,170	1,230	1,120	2,240	840	1,030	1,140	1,170	590	460	450	750	700	420	440	760	770	500
	150	1,910	1,270	900	1,050	1,300	1,070	1,210	960	1,100	2,220	600	890	1,070	1,180	470	220	700	730	190	410	450	960	810	560
3-A	25	1,640	1,600	1,450	1,030	720	970	920	1,310	1,550	2,790	970	1,400	1,100	1,260	1,310	1,050	1,490	940	1,540	2,000	1,370	1,290	1,070	1,240
	150	2,120	1,610	860	1,050	670	800	830	860	1,160	2,500	760	1,000	1,060	940	900	1,040	1,030	980	1,320	1,580	1,090	1,100	970	910
3-B	25	2,340	1,270	180	220	160	830	80	850	1,500	2,120	1,160	1,260	770	1,290	740	180	300	870	1,360	1,390	770	1,080	1,220	1,350
	150	1,400	1,920	200	250	170	750	70	800	1,260	2,060	620	1,110	800	900	960	140	230	830	1,260	1,320	690	1,180	1,040	1,490
4-A	25	1,760	1,510	830	900	840	360	1,250	1,160	1,960	2,470	1,140	1,030	920	1,160	1,050	560	1,280	1,280	1,370	1,160	1,130	1,200	1,150	1,100
	150	2,050	1,250	700	730	460	550	920	900	1,250	2,150	720	740	780	870	660	800	920	680	1,010	860	1,210	1,090	910	1,120
4-B	25	1,590	1,700	220	150	150	740	100	1,130	1,280	2,030	760	1,170	1,100	960	930	220	1,670	1,100	2,170	1,410	870	1,090	1,090	870
	150	1,390	1,490	400	220	200	770	80	1,110	1,090	1,910	620	980	1,100	850	690	500	920	910	1,400	1,210	770	1,080	880	1,350
5-A	25	2,450	1,640	700	830	700	680	1,130	960	1,260	2,260	1,000	1,180	890	1,110	1,140	1,050	1,090	1,000	1,050	1,490	960	1,220	1,170	1,040
	150	1,870	1,610	750	630	700	640	770	760	830	1,750	690	930	730	940	860	960	1,010	810	900	1,050	830	990	1,070	940
5-B	25	350	1,570	250	640	600	600	410	650	690	1,850	1,220	1,210	910	1,110	1,050	200	140	1,230	1,310	1,660	620	940	1,310	1,010
	150	470	1,780	350	540	730	600	320	640	680	1,630	910	830	690	940	870	210	140	1,110	500	1,270	640	670	1,320	1,321
Geometric Mean of A Locations	25	1,922	1,644	969	979	822	754	1,071	1,235	1,315	2,526	995	1,157	1,044	1,161	1,045	639	921	1,024	1,082	1,265	1,014	1,311	1,008	1,026
	150	1,719	1,415	801	921	705	766	846	872	963	2,339	701	855	826	893	705	836	816	830	866	1,040	934	1,026	866	878
Geometric Mean of B Locations	25	1,244	1,576	282	383	365	774	219	1,073	1,097	2,081	1,002	1,213	1,048	1,131	891	324	501	989	1,300	1,174	651	1,112	1,134	925
	150	1,169	1,575	448	448	454	828	201	873	1,051	2,014	751	968	1,024	981	764	309	428	867	683	1,034	636	988	981	1,078

- Notes:
- 1) µS/cm denotes microsiemens per centimetre.
 - 2) mm denotes millimetre.
 - 3) 'A' denotes sample collected near drip emitter.
 - 4) 'B' denotes sample collected between irrigation lines.

FIGURE G-1
SOIL CONDUCTIVITY DISTRIBUTION
EXPANDED POPLAR SYSTEM





Your P.O. #: 9199062861
Your Project #: TWIN CREEK LF S
Site Location: ON07
Your C.O.C. #: tcps-ss-sep

Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Report Date: 2020/09/29
Report #: R6350622
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON0286

Received: 2020/09/05, 12:38

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Anions	5	2020/09/10	2020/09/11	CAM SOP-00435	SM 23 4110 B m
Hot Water Extractable Boron	3	2020/09/10	2020/09/10	CAM SOP-00408	R153 Ana. Prot. 2011
Hot Water Extractable Boron	2	2020/09/10	2020/09/11	CAM SOP-00408	R153 Ana. Prot. 2011
Strong Acid Leachable Metals by ICPMS	5	2020/09/10	2020/09/11	CAM SOP-00447	EPA 6020B m
Moisture	5	N/A	2020/09/10	CAM SOP-00445	Carter 2nd ed 51.2 m
Ammonia-N	5	2020/09/10	2020/09/11	CAM SOP-00441	Carter, SS&A
Nitrogen	5	N/A	2020/09/11	CAM SOP-00460	EN0000:2003 TC WI
Nitrate (NO3) and Nitrite (NO2) in Soil	5	2020/09/10	2020/09/11	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Additional Subcontracted Analysis (1)	5	N/A	N/A		
Calculated Total Kjeldahl Nitrogen	5	N/A	2020/09/15	CAM SOP-00460	EN0000:2003 Horiz.16
Total Organic Carbon in Soil	5	N/A	2020/09/14	CAM SOP-00468	BCMOC TOC Aug 2014

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Sub from Campo to Env. Testing Canada (Eurofins)



Your P.O. #: 9199062861
Your Project #: TWIN CREEK LF S
Site Location: ON07
Your C.O.C. #: tcps-ss-sep

Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Report Date: 2020/09/29
Report #: R6350622
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON0286

Received: 2020/09/05, 12:38

Encryption Key

Keshani Vijh
Supervisor - Environmental
Customer Service
29 Sep 2020 17:12:30

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keshani Vijh, Supervisor – Environmental Customer Service
Email: Keshani.Vijh@bvlabs.com
Phone# (905)817-5733

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BUREAU
VERITAS

BV Labs Job #: CON0286
Report Date: 2020/09/29

RWDI Inc.
Client Project #: TWIN CREEK LF S
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

RESULTS OF ANALYSES OF SOIL

BV Labs ID		NOG076	NOG077	NOG078	NOG079			NOG079		
Sampling Date		2020/09/04	2020/09/04	2020/09/04	2020/09/04			2020/09/04		
COC Number		tcps-ss-sep	tcps-ss-sep	tcps-ss-sep	tcps-ss-sep			tcps-ss-sep		
	UNITS	S1	S2	S3	S4	RDL	QC Batch	S4 Lab-Dup	RDL	QC Batch
Inorganics										
Total Ammonia-N	ug/g	<20	<20	<20	<20	20	6936783	<20	20	6936783
Moisture	%	16	16	18	19	1.0	6936803			
Nitrogen (N)	%	0.18	0.16	0.12	0.26	0.010	6937130	0.24	0.010	6937130
Total Organic Carbon	mg/kg	15000	15000	11000	20000	500	6937076			
Calculated Total Kjeldahl Nitrogen	ug/g	1790	1580	1160	2430	100	6930112			
Chloride (Cl-)	ug/g	36	11	193	214	10	6936625	241	10	6936625
Nitrate (N)	ug/g	3	<2	44	140	2	6936631	150	2	6936631
Sulphate (SO4)	ug/g	92	31	339	125	20	6936625	152	20	6936625
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate										

BV Labs ID		NOG080			NOG080		
Sampling Date		2020/09/04			2020/09/04		
COC Number		tcps-ss-sep			tcps-ss-sep		
	UNITS	SODUP	RDL	QC Batch	SODUP Lab-Dup	RDL	QC Batch
Inorganics							
Total Ammonia-N	ug/g	<20	20	6936783			
Moisture	%	16	1.0	6936803			
Nitrogen (N)	%	0.18	0.010	6937130			
Total Organic Carbon	mg/kg	14000	500	6937076	13000	500	6937076
Calculated Total Kjeldahl Nitrogen	ug/g	1810	100	6930112			
Chloride (Cl-)	ug/g	<10	10	6936625			
Nitrate (N)	ug/g	<2	2	6936631			
Sulphate (SO4)	ug/g	33	20	6936625			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							



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BV Labs Job #: CON0286

Report Date: 2020/09/29

RWDI Inc.

Client Project #: TWIN CREEK LF S

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

BV Labs ID		NOG076	NOG077	NOG078	NOG079	NOG080		
Sampling Date		2020/09/04	2020/09/04	2020/09/04	2020/09/04	2020/09/04		
COC Number		tcps-ss-sep	tcps-ss-sep	tcps-ss-sep	tcps-ss-sep	tcps-ss-sep		
	UNITS	S1	S2	S3	S4	SODUP	RDL	QC Batch
Metals								
Hot Water Ext. Boron (B)	ug/g	1.3	0.84	4.2	4.6	0.80	0.050	6936184
Acid Extractable Aluminum (Al)	ug/g	16000	17000	14000	16000	18000	50	6936145
Acid Extractable Arsenic (As)	ug/g	6.8	7.4	6.2	6.2	7.1	1.0	6936145
Acid Extractable Barium (Ba)	ug/g	82	84	81	77	85	0.50	6936145
Acid Extractable Beryllium (Be)	ug/g	0.77	0.80	0.65	0.76	0.84	0.20	6936145
Acid Extractable Bismuth (Bi)	ug/g	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6936145
Acid Extractable Cadmium (Cd)	ug/g	0.17	0.19	0.19	0.16	0.15	0.10	6936145
Acid Extractable Chromium (Cr)	ug/g	28	28	26	27	29	1.0	6936145
Acid Extractable Cobalt (Co)	ug/g	14	15	12	12	14	0.10	6936145
Acid Extractable Lead (Pb)	ug/g	17	18	16	15	18	1.0	6936145
Acid Extractable Molybdenum (Mo)	ug/g	3.1	2.8	3.2	2.7	2.9	0.50	6936145
Acid Extractable Nickel (Ni)	ug/g	32	32	33	31	34	0.50	6936145
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	6936145
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	6936145
Acid Extractable Strontium (Sr)	ug/g	39	34	73	37	35	1.0	6936145
Acid Extractable Tin (Sn)	ug/g	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6936145
Acid Extractable Titanium (Ti)	ug/g	50	57	74	61	47	5.0	6936145
Acid Extractable Vanadium (V)	ug/g	34	35	30	34	35	5.0	6936145
Acid Extractable Zinc (Zn)	ug/g	59	59	59	59	64	5.0	6936145
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								



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BV Labs Job #: CON0286

Report Date: 2020/09/29

RWDI Inc.

Client Project #: TWIN CREEK LF S

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.0°C
Package 2	4.3°C

Results relate only to the items tested.



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BV Labs Job #: CON0286

Report Date: 2020/09/29

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: TWIN CREEK LF S

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6936145	Acid Extractable Aluminum (Al)	2020/09/11	NC	75 - 125	99	80 - 120	<50	ug/g				
6936145	Acid Extractable Arsenic (As)	2020/09/11	88	75 - 125	101	80 - 120	<1.0	ug/g	3.1 (1)	30		
6936145	Acid Extractable Barium (Ba)	2020/09/11	NC	75 - 125	95	80 - 120	<0.50	ug/g	6.3 (1)	30		
6936145	Acid Extractable Beryllium (Be)	2020/09/11	86	75 - 125	93	80 - 120	<0.20	ug/g	0.37 (1)	30		
6936145	Acid Extractable Bismuth (Bi)	2020/09/11	88	75 - 125	101	80 - 120	<1.0	ug/g				
6936145	Acid Extractable Cadmium (Cd)	2020/09/11	88	75 - 125	99	80 - 120	<0.10	ug/g	27 (1)	30		
6936145	Acid Extractable Chromium (Cr)	2020/09/11	89	75 - 125	98	80 - 120	<1.0	ug/g	0.26 (1)	30		
6936145	Acid Extractable Cobalt (Co)	2020/09/11	85	75 - 125	101	80 - 120	<0.10	ug/g	0.25 (1)	30		
6936145	Acid Extractable Lead (Pb)	2020/09/11	NC	75 - 125	102	80 - 120	<1.0	ug/g	1.6 (1)	30		
6936145	Acid Extractable Molybdenum (Mo)	2020/09/11	90	75 - 125	103	80 - 120	<0.50	ug/g	9.9 (1)	30		
6936145	Acid Extractable Nickel (Ni)	2020/09/11	92	75 - 125	102	80 - 120	<0.50	ug/g	0.64 (1)	30		
6936145	Acid Extractable Selenium (Se)	2020/09/11	88	75 - 125	103	80 - 120	<0.50	ug/g	2.6 (1)	30		
6936145	Acid Extractable Silver (Ag)	2020/09/11	89	75 - 125	102	80 - 120	<0.20	ug/g	NC (1)	30		
6936145	Acid Extractable Strontium (Sr)	2020/09/11	NC	75 - 125	102	80 - 120	<1.0	ug/g				
6936145	Acid Extractable Tin (Sn)	2020/09/11	98	75 - 125	101	80 - 120	<1.0	ug/g				
6936145	Acid Extractable Titanium (Ti)	2020/09/11	NC	75 - 125	103	80 - 120	<5.0	ug/g				
6936145	Acid Extractable Vanadium (V)	2020/09/11	90	75 - 125	99	80 - 120	<5.0	ug/g	0.71 (1)	30		
6936145	Acid Extractable Zinc (Zn)	2020/09/11	NC	75 - 125	100	80 - 120	<5.0	ug/g	2.1 (1)	30		
6936184	Hot Water Ext. Boron (B)	2020/09/10	98	75 - 125	93	75 - 125	<0.050	ug/g	5.7 (1)	40		
6936625	Chloride (Cl-)	2020/09/11	101 (2)	70 - 130	98	70 - 130	<10	ug/g	12 (3)	35		
6936625	Sulphate (SO4)	2020/09/11	102 (2)	75 - 125	98	75 - 125	<20	ug/g	19 (3)	35		
6936631	Nitrate (N)	2020/09/11	123 (2)	75 - 125			<2	ug/g	7.3 (3)	25		
6936783	Total Ammonia-N	2020/09/11	106 (2)	80 - 120	113	80 - 120	<20	ug/g	NC (3)	35		
6936803	Moisture	2020/09/10							4.7 (1)	20		
6937076	Total Organic Carbon	2020/09/14					<500	mg/kg	2.6 (4)	35	85	75 - 125



BUREAU
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BV Labs Job #: CON0286

Report Date: 2020/09/29

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: TWIN CREEK LF S

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6937130	Nitrogen (N)	2020/09/11					<0.010	%	5.6 (3)	35	98	95 - 105

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [NOG079-01]

(3) Duplicate Parent ID [NOG079-01]

(4) Duplicate Parent ID [NOG080-01]



BV Labs Job #: CON0286
Report Date: 2020/09/29

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.
Client Project #: TWIN CREEK LF S
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6937130	Nitrogen (N)	2020/09/11					<0.010	%	5.6 (3)	35	98	95 - 105
<p>Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.</p> <p>Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.</p> <p>QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.</p> <p>Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.</p> <p>Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.</p> <p>NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)</p> <p>NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).</p> <p>(1) Duplicate Parent ID</p> <p>(2) Matrix Spike Parent ID [NOG079-01]</p> <p>(3) Duplicate Parent ID [NOG079-01]</p> <p>(4) Duplicate Parent ID [NOG080-01]</p>												



BUREAU
VERITAS

BV Labs Job #: CON0286

Report Date: 2020/09/29

RWDI Inc.

Client Project #: TWIN CREEK LF S

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Client: Bureau Veritas Canada (2019) Inc.
6740 Campobello Road
Mississauga, ON
L5N 2L8
Attention: Keshani Vijn
PO#:
Invoice to: Bureau Veritas Canada (2019) Inc.

Report Number: 1938460
Date Submitted: 2020-09-10
Date Reported: 2020-09-16
Project: C0N0286
COC #: 862945

Page 1 of 3

Dear Keshani Vijn:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:



Addrine Thomas
2020.09.16
15:20:17 -04'00'

APPROVAL:

Addrine Thomas, Inorganics Supervisor

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <http://www.cala.ca/scopes/2602.pdf>.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Certificate of Analysis

Client: Bureau Veritas Canada (2019) Inc.
6740 Campobello Road
Mississauga, ON
L5N 2L8
Attention: Keshani Viji
PO#:
Invoice to: Bureau Veritas Canada (2019) Inc.

Report Number: 1938460
Date Submitted: 2020-09-10
Date Reported: 2020-09-16
Project: C0N0286
COC #: 862945

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1515808 Soil 2020-09-04 NOG076-S1	1515809 Soil 2020-09-04 NOG077-S2	1515810 Soil 2020-09-04 NOG078-S3	1515811 Soil 2020-09-04 NOG079-S4
Soil - Extractable	P (NaHCO ₃ Extractable)	2	ppm			8	9	5	8

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Soil - Extractable	P (NaHCO ₃ Extractable)	2	ppm		1515812 Soil 2020-09-04 NOG080-SODUP

Guideline = * = **Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

Client: Bureau Veritas Canada (2019) Inc.
6740 Campobello Road
Mississauga, ON
L5N 2L8
Attention: Keshani Viji
PO#:
Invoice to: Bureau Veritas Canada (2019) Inc.

Report Number: 1938460
Date Submitted: 2020-09-10
Date Reported: 2020-09-16
Project: C0N0286
COC #: 862945

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 389419 Analysis/Extraction Date 2020-09-16 Analyst SKH Method AG Soil			
P (NaHCO ₃ Extractable)	<2 ppm	143	

Guideline = * = **Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range



Your Project #: C0N0286
Site Location: TWIN CREEK LF S
Your C.O.C. #: 1 of 1

Attention: Keshani Viih

BUREAU VERITAS
CAMPOBELLO
6740 CAMPOBELLO ROAD
MISSISSAUGA, ON
CANADA L5N 2L8

Report Date: 2020/09/14
Report #: R2928450
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C065065

Received: 2020/09/10, 10:05

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Potassium (Available)	5	2020/09/14	2020/09/14	CAL SOP-00153 / AB SOP-00042	EPA 6010d R5 m
Moisture	5	N/A	2020/09/13	AB SOP-00002	CCME PHC-CWS m
Ammonia-N (Available)	5	2020/09/14	2020/09/14	AB SOP-00027 / AB SOP-00007	SM 23 4500 NH3 A G m
Soluble Ions	5	2020/09/13	2020/09/13	AB SOP-00033 / AB SOP-00042	EPA 6010d R5 m
Soluble Paste	5	2020/09/13	2020/09/13	AB SOP-00033	Carter 2nd ed 15.2 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



Your Project #: CON0286
Site Location: TWIN CREEK LF S
Your C.O.C. #: 1 of 1

Attention: Keshani Vijh

BUREAU VERITAS
CAMPOBELLO
6740 CAMPOBELLO ROAD
MISSISSAUGA, ON
CANADA L5N 2L8

Report Date: 2020/09/14
Report #: R2928450
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C065065

Received: 2020/09/10, 10:05

Encryption Key



**AUTHORIZED REPORT
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Bureau Veritas Laboratories

14 Sep 2020 17:42:59

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Customer Solutions, Western Canada Customer Experience Team
Email: customersolutionswest@bvlabs.com
Phone# (403) 291-3077

=====

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BUREAU
VERITASBV Labs Job #: C065065
Report Date: 2020/09/14BUREAU VERITAS
Client Project #: CON0286
Site Location: TWIN CREEK LF S
Sampler Initials: MSA

RESULTS OF CHEMICAL ANALYSES OF SOIL

BV Labs ID		YK4975	YK4976	YK4977			YK4977		
Sampling Date		2020/09/04	2020/09/04	2020/09/04			2020/09/04		
COC Number		1 of 1	1 of 1	1 of 1			1 of 1		
	UNITS	S1 (NOG076)	S2 (NOG077)	S3 (NOG078)	RDL	QC Batch	S3 (NOG078) Lab-Dup	RDL	QC Batch
Nutrients									
Available (KCl) Ammonia (N)	mg/kg	<2.0	<2.0	<2.0	2.0	9997723			
Available (NH ₄ OAc) Potassium (K)	mg/kg	110	120	90	2.0	9998322	96	2.0	9998322
Soluble Parameters									
Soluble Calcium (Ca)	mg/L	81	43	300	1.5	9997371			
Soluble Magnesium (Mg)	mg/L	12	5.7	82	1.0	9997371			
Soluble Sodium (Na)	mg/L	52	29	170	2.5	9997371			
Saturation %	%	59	59	71	N/A	9997043			
RDL = Reportable Detection Limit Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable									

BV Labs ID		YK4978	YK4979		
Sampling Date		2020/09/04	2020/09/04		
COC Number		1 of 1	1 of 1		
	UNITS	S4 (NOG079)	SODUP (NOG080)	RDL	QC Batch
Nutrients					
Available (KCl) Ammonia (N)	mg/kg	<2.0	2.0	2.0	9997723
Available (NH ₄ OAc) Potassium (K)	mg/kg	140	110	2.0	9998322
Soluble Parameters					
Soluble Calcium (Ca)	mg/L	200	50	1.5	9997371
Soluble Magnesium (Mg)	mg/L	40	5.5	1.0	9997371
Soluble Sodium (Na)	mg/L	270	24	2.5	9997371
Saturation %	%	62	57	N/A	9997043
RDL = Reportable Detection Limit N/A = Not Applicable					



BUREAU
VERITAS

BV Labs Job #: C065065
Report Date: 2020/09/14

BUREAU VERITAS
Client Project #: CON0286
Site Location: TWIN CREEK LF S
Sampler Initials: MSA

PHYSICAL TESTING (SOIL)

BV Labs ID		YK4975	YK4976	YK4977	YK4978	YK4979		
Sampling Date		2020/09/04	2020/09/04	2020/09/04	2020/09/04	2020/09/04		
COC Number		1 of 1	1 of 1	1 of 1	1 of 1	1 of 1		
	UNITS	S1 (NOG076)	S2 (NOG077)	S3 (NOG078)	S4 (NOG079)	SODUP (NOG080)	RDL	QC Batch
Physical Properties								
Moisture	%	16	17	17	20	15	0.30	9997019
RDL = Reportable Detection Limit								



BV Labs Job #: C065065
Report Date: 2020/09/14

BUREAU VERITAS
Client Project #: CON0286
Site Location: TWIN CREEK LF S
Sampler Initials: MSA

TEST SUMMARY

BV Labs ID: YK4975
Sample ID: S1 (NOG076)
Matrix: Soil

Collected: 2020/09/04
Shipped: 2020/09/09
Received: 2020/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Potassium (Available)	ICPA	9998322	2020/09/14	2020/09/14	Mary Anne Dela Cruz
Moisture	BAL	9997019	N/A	2020/09/13	Margarita Aguilera
Ammonia-N (Available)	KONE/NH4	9997723	2020/09/14	2020/09/14	Shanna McKort
Soluble Ions	ICPA	9997371	2020/09/13	2020/09/13	Jason Bao
Soluble Paste	BAL	9997043	2020/09/13	2020/09/13	Julia Mangaly

BV Labs ID: YK4976
Sample ID: S2 (NOG077)
Matrix: Soil

Collected: 2020/09/04
Shipped: 2020/09/09
Received: 2020/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Potassium (Available)	ICPA	9998322	2020/09/14	2020/09/14	Mary Anne Dela Cruz
Moisture	BAL	9997019	N/A	2020/09/13	Margarita Aguilera
Ammonia-N (Available)	KONE/NH4	9997723	2020/09/14	2020/09/14	Shanna McKort
Soluble Ions	ICPA	9997371	2020/09/13	2020/09/13	Jason Bao
Soluble Paste	BAL	9997043	2020/09/13	2020/09/13	Julia Mangaly

BV Labs ID: YK4977
Sample ID: S3 (NOG078)
Matrix: Soil

Collected: 2020/09/04
Shipped: 2020/09/09
Received: 2020/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Potassium (Available)	ICPA	9998322	2020/09/14	2020/09/14	Mary Anne Dela Cruz
Moisture	BAL	9997019	N/A	2020/09/13	Margarita Aguilera
Ammonia-N (Available)	KONE/NH4	9997723	2020/09/14	2020/09/14	Shanna McKort
Soluble Ions	ICPA	9997371	2020/09/13	2020/09/13	Jason Bao
Soluble Paste	BAL	9997043	2020/09/13	2020/09/13	Julia Mangaly

BV Labs ID: YK4977 Dup
Sample ID: S3 (NOG078)
Matrix: Soil

Collected: 2020/09/04
Shipped: 2020/09/09
Received: 2020/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Potassium (Available)	ICPA	9998322	2020/09/14	2020/09/14	Mary Anne Dela Cruz

BV Labs ID: YK4978
Sample ID: S4 (NOG079)
Matrix: Soil

Collected: 2020/09/04
Shipped: 2020/09/09
Received: 2020/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Potassium (Available)	ICPA	9998322	2020/09/14	2020/09/14	Mary Anne Dela Cruz
Moisture	BAL	9997019	N/A	2020/09/13	Margarita Aguilera
Ammonia-N (Available)	KONE/NH4	9997723	2020/09/14	2020/09/14	Shanna McKort
Soluble Ions	ICPA	9997371	2020/09/13	2020/09/13	Jason Bao
Soluble Paste	BAL	9997043	2020/09/13	2020/09/13	Julia Mangaly



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BV Labs Job #: C065065
Report Date: 2020/09/14

BUREAU VERITAS
Client Project #: CON0286
Site Location: TWIN CREEK LF S
Sampler Initials: MSA

TEST SUMMARY

BV Labs ID: YK4979
Sample ID: SODUP (NOG080)
Matrix: Soil

Collected: 2020/09/04
Shipped: 2020/09/09
Received: 2020/09/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Potassium (Available)	ICPA	9998322	2020/09/14	2020/09/14	Mary Anne Dela Cruz
Moisture	BAL	9997019	N/A	2020/09/13	Margarita Aguilera
Ammonia-N (Available)	KONE/NH4	9997723	2020/09/14	2020/09/14	Shanna McKort
Soluble Ions	ICPA	9997371	2020/09/13	2020/09/13	Jason Bao
Soluble Paste	BAL	9997043	2020/09/13	2020/09/13	Julia Mangaly



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BV Labs Job #: C065065

Report Date: 2020/09/14

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Client Project #: CON0286

Site Location: TWIN CREEK LF S

Sampler Initials: MSA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.3°C
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Results relate only to the items tested.



BUREAU
VERITAS

BV Labs Job #: C065065

Report Date: 2020/09/14

QUALITY ASSURANCE REPORT

BUREAU VERITAS

Client Project #: CON0286

Site Location: TWIN CREEK LF S

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9997019	Moisture	2020/09/13					<0.30	%	1.3	20		
9997043	Saturation %	2020/09/13							1.7	12	101	75 - 125
9997371	Soluble Calcium (Ca)	2020/09/13	99	75 - 125	99	80 - 120	<1.5	mg/L	0.89	30	86	75 - 125
9997371	Soluble Magnesium (Mg)	2020/09/13	98	75 - 125	98	80 - 120	<1.0	mg/L	5.1	30	83	75 - 125
9997371	Soluble Sodium (Na)	2020/09/13	96	75 - 125	97	80 - 120	<2.5	mg/L	3.6	30	91	75 - 125
9997723	Available (KCl) Ammonia (N)	2020/09/14	98	75 - 125	94	80 - 120	<2.0	mg/kg	NC	35		
9998322	Available (NH ₄ OAc) Potassium (K)	2020/09/14	103	75 - 125	105	80 - 120	<2.0	mg/kg	6.4	35		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).



BUREAU
VERITAS

BV Labs Job #: C065065
Report Date: 2020/09/14

BUREAU VERITAS
Client Project #: CON0286
Site Location: TWIN CREEK LF S
Sampler Initials: MSA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Jared Wiseman, B.Sc., P.Chem., QP, Senior Analyst, Organics

Harry (Peng) Liang, Senior Analyst

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APPENDIX H:

Tissue Assessment



Table H-1
Leaf Tissue - General Chemical Results - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Indicator Values	Poplar System										
28-Sep-17			Lower Canopy					Upper Canopy					Geomean: LC=UC
			Z1	Z2	Z3	Z4	geom	Z1	Z2	Z3	Z4	geom	geom
Phosphorus	%	0.45	0.0558	0.0468	0.055	0.0569	0.0535	0.0544	0.0546	0.0529	0.0557	0.0544	0.0539
TKN	%	3.20	2.7	2.8	2.8	2.7	2.7	3	2.9	2.8	2.7	2.8	2.8
Potassium	%	3	0.556	0.455	0.477	0.417	0.474	0.525	0.556	0.429	0.469	0.492	0.483
Chloride	ppm		2900	2500	2600	2400	2593	3000	3300	<2000	3000	3097	2834
Boron	ppm	65	120	125	122	76.5	109	146	150	117	69.4	115	112
Copper	ppm	30	3.6	2.9	2.7	3.1	3.1	3.5	3.6	2.7	3.1	3.2	3.1
Iron	ppm	350	50	49	54	48	50	60	62	43	51	53	51.8
Manganese	ppm	175	28.6	16.6	17.7	26.4	21.7	22.7	16	19.1	29.2	21.2	21.5
Zinc	ppm	55	28	20	14	21	20	22	19	20	16	19	19.6
18-Sep-18			Z1	Z2	Z3	Z4	geom	Z1	Z2	Z3	Z4	geom	geom
Phosphorus	%	0.45	0.0662	0.067	0.0662	0.073	0.0680	0.0728	0.0742	0.0672	0.0667	0.0701	0.0691
TKN	%	3.20	2.7	2.9	3.1	2.9	2.9	3.2	3.2	3.3	2.9	3.1	3.0
Potassium	%	3	0.258	0.259	0.198	0.265	0.243	0.271	0.3	0.378	0.414	0.336	0.286
Chloride	ppm		5100	5200	6500	3700	5025	10000	6700	6100	9900	7976	6331
Boron	ppm	65	121	121	101	119	115	123	122	90.6	99.7	108	111
Copper	ppm	30	3.9	3.9	3.8	4.4	4.0	3.9	3.9	3.9	3.8	3.9	3.9
Iron	ppm	350	60	69	78	89	73	63	75	57	64	64	68.7
Manganese	ppm	175	37.5	26.2	39.4	33.3	34	32.6	23.7	22.8	19.7	24	28.6
Zinc	ppm	55	28	14	12	32	20	15	19	18	18	17	18.5
9-Sep-19			Z1	Z2	Z3	Z4	geom	Z1	Z2	Z3	Z4	geom	geom
Phosphorus	%	0.45	0.0683	0.0678	0.0644	0.0862	0.0712	0.0839	0.0695	0.0866	0.0691	0.0769	0.0740
TKN	%	3.20	3	2.7	3	3.1	2.9	3.3	3.2	3.5	2.7	3.2	3.1
Potassium	%	3	0.339	0.420	0.479	0.428	0.413	0.362	0.426	0.520	0.419	0.400	0.407
Chloride	ppm		6000	3500	4900	2900	4156	4500	4300	5100	3500	4311	4233
Boron	ppm	65	179	177	177	160	173.1	181	166	194	132	167	170
Copper	ppm	30	3.2	3	3.4	3.6	3.3	3.2	3.2	3.8	3.4	3.4	3.3
Iron	ppm	350	61	56	71	102	71	60	58	57	101	67	68.7
Manganese	ppm	175	23.4	24.2	19.0	24.8	23	24.4	20.5	20.1	34.3	24	23.5
Zinc	ppm	55	18	19	17	16	17.5	20	19	17	18	18	18.0
2-Sep-20			Z1	Z2	Z3	Z4	geom	Z1	Z2	Z3	Z4	geom	geom
Phosphorus	%	0.45	0.0575	0.0616	0.0617	0.0641	0.06	0.0684	0.0647	0.0639	0.0577	0.0636	0.0624
TKN	%	3.20	2.6	2.9	2.7	2.9	2.8	2.6	2.9	3.1	3.1	2.9	2.8
Potassium	%	3	0.411	0.404	0.351	0.403	0.391	0.370	0.351	0.436	0.401	0.400	0.396
Chloride	ppm		4000	4100	6400	5300	4857	3200	3300	4200	4100	3672	4223
Boron	ppm	65	153	134	103	178	139.2	150	119	170	154	147	143
Copper	ppm	30	3.6	3.6	3.2	3.5	3.5	3.7	3.6	4.0	3.5	3.7	3.6
Iron	ppm	350	32	38	30	55	38	35	27	30	35	32	34.5
Manganese	ppm	175	26	30.6	24.9	27.4	27	28.1	28.1	24.5	26.2	27	26.9
Zinc	ppm	55	22	18	27	14	19.7	33	24	22	18	24	21.6

Table H-2
Leaf Tissue - General Chemical Results Assessment - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	Indicator Values	Poplar System													
			28-Sep-17	18-Sep-18	9-Sep-19	2-Sep-20										
Phosphorus	%	0.45	0.0539	0.0691	0.0740	0.0624										
Total Kjeldahl Nitrogen	%	3.20	2.8	3.0	3.1	2.8										
Potassium	%	3	0.483	0.286	0.407	0.396										
Chloride	ppm		2834	6331	4233	4223										
Boron	ppm	65	112	111	170	143										
Copper	ppm	30	3.1	3.9	3.3	3.6										
Iron	ppm	350	51.8	68.7	68.7	34.5										
Manganese	ppm	175	21.5	28.6	23.5	26.9										
Zinc	ppm	55	19.6	18.5	18.0	21.6										

- NOTES:**
- 1) Shading denotes concentration greater than indicator value.
 - 2) Parameter concentration was calculated for each area as geometrical mean of concentrations for upper and lower canopy.
 - 3) ppm denotes parts per million.
 - 4) Blank denotes data not available
 - 4) Under the Amendment to the Waste CofA Notice 7, dated June 1, 2011, the former "SFA Poplar System" became Zone 1 of the "Poplar System".
 - 5) Zone 2, 3 and 4 of the Poplar System have not yet been planted.

Table H-3**Stem Core - General Chemical Results - Poplar System****Twin Creeks Environmental Centre - Poplar System**

Parameter	Units	Poplar System								
		Zone 1								
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20					
Aluminum	µg/g	23	14	129	11.5					
Arsenic	µg/g	<0.1	<0.1	0.149	<0.040					
Barium	µg/g	1.5	1.9	7.71	2.97					
Beryllium	µg/g	<0.05	<0.05	<0.010	<0.020					
Bismuth	µg/g	<0.05	<0.05	<0.010	<0.020					
Boron	µg/g	10.1	6.3	20.6	22.3					
Boron (H.W.E.)	µg/g	2.3	1.4	1.9	6.7					
Cadmium	µg/g	0.27	0.63	0.73	0.64					
Calcium	µg/g	2210	3250	10600	2520					
Chromium	µg/g	1.3	<0.3	43.2	<0.20					
Cobalt	µg/g	0.066	0.087	0.065	0.104					
Copper	µg/g	3.5	3	7.51	2.17					
Lead	µg/g	0.07	0.15	2.33	0.058					
Magnesium	µg/g	417	850	1320	462					
Molybdenum	µg/g	<0.05	<0.05	0.926	<0.040					
Nickel	µg/g	0.24	0.21	21.20	0.14					
Phosphorus	µg/g	583	925	887	363					
Potassium	µg/g	1860	1470	2700	2610					
Selenium	µg/g	<0.1	<0.1	<0.050	<0.10					
Silver	µg/g	<0.05	<0.05	0.01	<0.010					
Sodium	µg/g	72	60	320	925					
Strontium	µg/g	9.0	18.4	30.5	10.0					
Tin	µg/g	<0.3	<0.3	0.51	<0.20					
Titanium	µg/g	0.8	1	3.03	<1.0					
Vanadium	µg/g	0.06	<0.05	0.55	<0.05					
Zinc	µg/g	15	24	62	11					
Chloride	µg/g	<400	<200	<200	990					

NOTES:

- 1) ug/g denotes micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.

Table H-3**Stem Core - General Chemical Results - Poplar System****Twin Creeks Environmental Centre - Poplar System**

Parameter	Units	Poplar System							
		Zone 2							
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20				
Aluminum	µg/g	44	8	64.9	15.6				
Arsenic	µg/g	<0.1	<0.1	0.123	<0.040				
Barium	µg/g	1.3	1.3	5.1	2.1				
Beryllium	µg/g	<0.05	<0.05	<0.010	<0.020				
Bismuth	µg/g	<0.05	<0.05	<0.010	<0.020				
Boron	µg/g	6.8	8.8	20.1	8.8				
Boron (H.W.E.)	µg/g	1.4	2.8	3.4	1.4				
Cadmium	µg/g	0.20	0.30	0.76	0.38				
Calcium	µg/g	1820	1350	5160	1650				
Chromium	µg/g	0.5	0.4	15.6	<0.20				
Cobalt	µg/g	0.088	0.088	0.078	0.055				
Copper	µg/g	3.8	5.8	4.5	2.1				
Lead	µg/g	0.09	0.07	1.40	0.12				
Magnesium	µg/g	401	572	820	339				
Molybdenum	µg/g	<0.05	<0.05	0.362	<0.040				
Nickel	µg/g	0.31	0.15	8.15	0.17				
Phosphorus	µg/g	652	732	707	868				
Potassium	µg/g	1710	2940	2270	1630				
Selenium	µg/g	<0.1	<0.1	<0.050	<0.10				
Silver	µg/g	<0.05	<0.05	0.0053	<0.010				
Sodium	µg/g	<50	127	558	50				
Strontium	µg/g	5.1	9.9	14.1	8.3				
Tin	µg/g	<0.3	<0.3	0.21	<0.20				
Titanium	µg/g	1.4	0.8	1.5	<1.0				
Vanadium	µg/g	0.10	<0.05	0.25	0.05				
Zinc	µg/g	11	19	27	12				
Chloride	µg/g	<400	610	300	<1000				

NOTES:

- 1) ug/g denotes micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.

Table H-3**Stem Core - General Chemical Results - Poplar System****Twin Creeks Environmental Centre - Poplar System**

Parameter	Units	Poplar System								
		Zone 3								
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20					
Aluminum	µg/g	7	10	46	605					
Arsenic	µg/g	<0.1	<0.1	0.054	0.095					
Barium	µg/g	1.1	2.0	5.0	7.8					
Beryllium	µg/g	<0.05	<0.05	<0.010	<0.020					
Bismuth	µg/g	<0.05	<0.05	<0.010	<0.020					
Boron	µg/g	6.8	6.8	19.0	29.2					
Boron (H.W.E.)	µg/g	1.1	2.4	4.6	2.2					
Cadmium	µg/g	0.56	0.4	0.901	0.686					
Calcium	µg/g	2320	2530	5520	7630					
Chromium	µg/g	<0.3	<0.3	12.2	0.7					
Cobalt	µg/g	0.065	0.095	0.089	0.07					
Copper	µg/g	3.00	3.20	4.39	4.49					
Lead	µg/g	<0.03	0.16	2.97	0.23					
Magnesium	µg/g	497	535	801	907					
Molybdenum	µg/g	<0.05	<0.05	0.234	0.191					
Nickel	µg/g	0.12	0.16	5.93	0.63					
Phosphorus	µg/g	627	1020	711	1520					
Potassium	µg/g	2140	1390	2310	6090					
Selenium	µg/g	<0.1	<0.1	<0.050	<0.10					
Silver	µg/g	<0.05	<0.05	<0.0050	<0.010					
Sodium	µg/g	<50	111	210	534					
Strontium	µg/g	8.6	8.6	15.1	23.7					
Tin	µg/g	<0.3	<0.3	0.3	<0.20					
Titanium	µg/g	0.6	1.0	1.0	5.6					
Vanadium	µg/g	<0.05	<0.05	<0.20	<0.05					
Zinc	µg/g	15	13	31	30					
Chloride	µg/g	<400	410	660	<1000					

NOTES:

- 1) ug/g denotes micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.

Table H-3**Stem Core - General Chemical Results - Poplar System****Twin Creeks Environmental Centre - Poplar System**

Parameter	Units	Poplar System								
		Zone 4								
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20					
Aluminum	µg/g	20	13	48	12					
Arsenic	µg/g	<0.1	<0.1	0.049	0.045					
Barium	µg/g	0.9	2.6	5.4	1.7					
Beryllium	µg/g	<0.05	<0.05	<0.010	<0.020					
Bismuth	µg/g	<0.05	<0.05	<0.010	<0.020					
Boron	µg/g	9.6	7	14.9	11.8					
Boron (H.W.E.)	µg/g	1.3	2.7	2.7	2.3					
Cadmium	µg/g	0.21	0.85	0.971	0.448					
Calcium	µg/g	1910	2150	7610	2670					
Chromium	µg/g	<0.3	<0.3	12	<0.20					
Cobalt	µg/g	0.139	0.082	0.052	0.071					
Copper	µg/g	3.2	2.8	5.3	2.4					
Lead	µg/g	0.06	0.18	1.24	0.056					
Magnesium	µg/g	635	487	882	633					
Molybdenum	µg/g	<0.05	0.06	0.27	<0.040					
Nickel	µg/g	0.24	0.16	6.05	0.25					
Phosphorus	µg/g	469	831	1020	587					
Potassium	µg/g	2250	1460	2880	2020					
Selenium	µg/g	<0.1	<0.1	<0.050	<0.10					
Silver	µg/g	<0.05	<0.05	<0.0050	<0.010					
Sodium	µg/g	60	361	166	166					
Strontium	µg/g	14.5	9.7	16.9	22.4					
Tin	µg/g	<0.3	<0.3	<0.10	<0.20					
Titanium	µg/g	0.7	0.9	1.0	<1.0					
Vanadium	µg/g	<0.05	<0.05	<0.20	<0.05					
Zinc	µg/g	14	13	29	20					
Chloride	µg/g	<400	840	<200	1000					

NOTES:

- 1) ug/g denotes micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.

Table H-4**Root Tissue - General Chemical Results - Poplar System****Twin Creeks Environemntal Centre - Poplar System**

Parameter	Units	Poplar System						
		Zone 1						
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20			
Aluminum	µg/g	310	41	306	2160			
Arsenic	µg/g	0.2	<0.1	0.2	1.0			
Barium	µg/g	4.0	1.1	5.5	28.6			
Beryllium	µg/g	<0.05	<0.05	0.01	0.096			
Bismuth	µg/g	<0.05	<0.05	<0.010	0.023			
Boron	µg/g	15.3	5	16.5	84.8			
Boron (H.W.E.)	µg/g	13	2.1	2.9	9.5			
Cadmium	µg/g	0.14	0.22	0.42	2.49			
Calcium	µg/g	3400	933	10800	20500			
Chromium	µg/g	0.9	0.3	32.8	3.5			
Cobalt	µg/g	0.385	0.121	0.443	3.840			
Copper	µg/g	4.1	3.4	6.6	10.7			
Lead	µg/g	0.35	0.21	0.807	1.86			
Magnesium	µg/g	743	346	1260	3850			
Molybdenum	µg/g	0.18	0.07	0.52	0.45			
Nickel	µg/g	0.83	0.27	15.70	4.19			
Phosphorus	µg/g	596	688	1810	1810			
Potassium	µg/g	4090	3880	5850	18600			
Selenium	µg/g	<0.1	<0.1	<0.050	0.3			
Silver	µg/g	<0.05	<0.05	0.006	<0.010			
Sodium	µg/g	305	263	408	4650			
Strontium	µg/g	11.5	10.5	33.9	52.3			
Tin	µg/g	<0.3	<0.3	0.1	<0.20			
Titanium	µg/g	5.3	1.3	5.6	28.1			
Vanadium	µg/g	0.71	0.09	0.80	6.51			
Zinc	µg/g	9.0	10.0	49.1	77.5			
Chloride	µg/g	INS	390	340	3900			

NOTES:

- 1) ug/g indicates micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.
- 3) INS denotes insufficient sample aliquot to complete analysis.

Table H-4**Root Tissue - General Chemical Results - Poplar System****Twin Creeks Environemntal Centre - Poplar System**

Parameter	Units	Poplar System						
		Zone 2						
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20			
Aluminum	µg/g	500	70	3540	2200			
Arsenic	µg/g	0.3	<0.1	1.5	0.9			
Barium	µg/g	5.7	1.3	36.3	20.3			
Beryllium	µg/g	<0.05	<0.05	0.16	0.096			
Bismuth	µg/g	<0.05	<0.05	0.04	0.024			
Boron	µg/g	10.7	4.8	62.8	51.7			
Boron (H.W.E.)	µg/g	6.3	1.6	18.0	3.6			
Cadmium	µg/g	0.11	0.16	0.86	0.68			
Calcium	µg/g	3000	1100	15500	14900			
Chromium	µg/g	1.0	0.7	24.3	3.3			
Cobalt	µg/g	0.652	0.140	0.987	0.379			
Copper	µg/g	4.5	4.3	10.9	6.7			
Lead	µg/g	0.60	0.19	3.07	1.78			
Magnesium	µg/g	722	470	3560	2270			
Molybdenum	µg/g	0.21	0.08	1.41	0.46			
Nickel	µg/g	1.29	0.43	15.60	3.51			
Phosphorus	µg/g	561	687	1060	1600			
Potassium	µg/g	4040	4220	7830	8700			
Selenium	µg/g	<0.1	<0.1	0.32	0.10			
Silver	µg/g	<0.05	<0.05	0.0184	<0.0050			
Sodium	µg/g	189	439	3010	1870			
Strontium	µg/g	6.3	9.5	44.7	37.5			
Tin	µg/g	<0.3	<0.3	0.3	0.2			
Titanium	µg/g	6.9	1.9	39.2	14.5			
Vanadium	µg/g	1.1	0.2	7.7	0.7			
Zinc	µg/g	9.0	10.0	49.8	35.7			
Chloride	µg/g	460	870	5700	2100			

NOTES:

- 1) ug/g indicates micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.
- 3) INS denotes insufficient sample aliquot to complete analysis.

Table H-4**Root Tissue - General Chemical Results - Poplar System****Twin Creeks Environemntal Centre - Poplar System**

Parameter	Units	Poplar System						
		Zone 3						
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20			
Aluminum	µg/g	160	41	3700	2910			
Arsenic	µg/g	<0.1	<0.1	1.7	1.6			
Barium	µg/g	3.1	1	34.5	38.8			
Beryllium	µg/g	<0.05	<0.05	0.17	0.14			
Bismuth	µg/g	<0.05	<0.05	0.05	0.038			
Boron	µg/g	7.1	28.6	71.3	164.0			
Boron (H.W.E.)	µg/g	3.2	0.8	13.0	10.0			
Cadmium	µg/g	0.24	0.26	0.91	0.53			
Calcium	µg/g	2890	3440	18300	12300			
Chromium	µg/g	0.6	0.4	26.0	6.1			
Cobalt	µg/g	0.193	0.209	0.923	1.060			
Copper	µg/g	3.5	6.6	12.7	11.8			
Lead	µg/g	0.16	0.11	3.34	3.43			
Magnesium	µg/g	641	955	4220	2290			
Molybdenum	µg/g	0.09	0.12	1.87	1.18			
Nickel	µg/g	0.45	0.47	17.5	6.82			
Phosphorus	µg/g	504	1350	1450	881			
Potassium	µg/g	3680	6090	11900	2970			
Selenium	µg/g	<0.1	<0.1	0.21	0.45			
Silver	µg/g	<0.05	<0.05	0.0172	<0.010			
Sodium	µg/g	136	2430	2540	2410			
Strontium	µg/g	7.6	17.1	47.3	40.5			
Tin	µg/g	<0.3	<0.3	0.2	0.3			
Titanium	µg/g	2.70	1.5	38.2	27.1			
Vanadium	µg/g	0.33	0.10	8.61	2.09			
Zinc	µg/g	10.0	10.0	42.5	25.1			
Chloride	µg/g	<400	<400	5900	3700			

NOTES:

- 1) ug/g indicates micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.
- 3) INS denotes insufficient sample aliquot to complete analysis.

Table H-4**Root Tissue - General Chemical Results - Poplar System****Twin Creeks Environemntal Centre - Poplar System**

Parameter	Units	Poplar System						
		Zone 4						
		28-Sep-17	28-Sep-18	13-Sep-19	2-Sep-20			
Aluminum	µg/g	180	130	2940	2430			
Arsenic	µg/g	<0.1	<0.1	1.1	1.1			
Barium	µg/g	2.6	3.9	43.4	21.8			
Beryllium	µg/g	<0.05	<0.05	0.12	0.11			
Bismuth	µg/g	<0.05	<0.05	0.04	0.03			
Boron	µg/g	8.8	7.3	83.7	61.1			
Boron (H.W.E.)	µg/g	2.1	1.7	17.0	4.0			
Cadmium	µg/g	0.11	0.67	1.28	1.23			
Calcium	µg/g	2830	5440	14600	12000			
Chromium	µg/g	0.5	0.6	16.2	3.8			
Cobalt	µg/g	0.297	0.183	0.548	0.955			
Copper	µg/g	3.6	7.1	10.9	6.9			
Lead	µg/g	0.22	0.16	2.16	2.03			
Magnesium	µg/g	688	713	2570	2420			
Molybdenum	µg/g	0.12	0.12	2.41	0.58			
Nickel	µg/g	0.77	0.42	10.10	4.34			
Phosphorus	µg/g	498	1890	1740	956			
Potassium	µg/g	5090	6350	9580	3670			
Selenium	µg/g	<0.1	<0.1	0.428	0.19			
Silver	µg/g	<0.05	<0.05	0.0141	<0.010			
Sodium	µg/g	153	1110	2480	3330			
Strontium	µg/g	11.2	10.8	37.6	29.6			
Tin	µg/g	<0.3	<0.3	0.3	<0.20			
Titanium	µg/g	3.10	3.3	30.4	26.2			
Vanadium	µg/g	0.38	0.26	6.72	1.41			
Zinc	µg/g	9.0	16.0	32.7	24.8			
Chloride	µg/g	<400	3100	5300	3300			

NOTES:

- 1) ug/g indicates micrograms per gram.
- 2) Boron (H.W.E.) denotes boron that is analysed using the Hot Water Extraction laboratory method.
- 3) INS denotes insufficient sample aliquot to complete analysis.



Your P.O. #: 9199062861
Your Project #: TWIN CREEK LF TI
Site Location: ON07
Your C.O.C. #: tcps-lt-sep

Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Report Date: 2020/09/21
Report #: R6339228
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON0281

Received: 2020/09/05, 12:38

Sample Matrix: Tissue
Samples Received: 8

Analyses	Date		Date Analyzed	Laboratory Method	Analytical Method
	Quantity	Extracted			
Chloride (20:1 extract)	8	2020/09/16	2020/09/17	CAM SOP-00463	SM 23 4500-Cl E m
Metals in Vegetation by ICPMS	8	N/A	2020/09/14	CAM SOP-00447	EPA 6020/200.3 m
Moisture	8	N/A	2020/09/11	CAM SOP-00445	Carter 2nd ed 51.2 m
Nitrogen	8	N/A	2020/09/15	CAM SOP-00460	EN0000:2003 TC WI
Sulphate (20:1 Extract)	8	2020/09/16	2020/09/17	CAM SOP-00464	EPA 375.4 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



Your P.O. #: 9199062861
Your Project #: TWIN CREEK LF TI
Site Location: ON07
Your C.O.C. #: tcps-lt-sep

Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Report Date: 2020/09/21
Report #: R6339228
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON0281

Received: 2020/09/05, 12:38

Encryption Key

Keshani Vijh
Supervisor - Environmental
Customer Service
21 Sep 2020 16:56:50

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keshani Vijh, Supervisor – Environmental Customer Service
Email: Keshani.Vijh@bvlabs.com
Phone# (905)817-5733

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BUREAU
VERITAS

BV Labs Job #: CON0281

Report Date: 2020/09/21

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

RESULTS OF ANALYSES OF TISSUE

BV Labs ID		NOG022	NOG023	NOG024	NOG025	NOG026	NOG027	NOG028		
Sampling Date		2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02		
COC Number		tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep		
	UNITS	Z1-UC	Z1-LC	Z2-UC	Z2-LC	Z3-UC	Z3-LC	Z4-UC	RDL	QC Batch
Inorganics										
Soluble (20:1) Chloride (Cl-)	ug/g	3200	4000	3300	4100	4200	6400	4100	1000	6946737
Moisture	%	62	65	63	65	67	67	64	1.0	6939535
Nitrogen (N)	%	2.6	2.6	2.9	2.9	3.1	2.7	3.1	0.010	6942861
Soluble (20:1) Sulphate (SO4)	ug/g	<1000 (1)	<1000 (1)	<1000 (1)	<1000 (1)	<1000 (1)	<1000 (1)	<1000 (1)	1000	6946767
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.										

BV Labs ID		NOG029		
Sampling Date		2020/09/02		
COC Number		tcps-lt-sep		
	UNITS	Z4-LC	RDL	QC Batch
Inorganics				
Soluble (20:1) Chloride (Cl-)	ug/g	5300	1000	6946737
Moisture	%	65	1.0	6939535
Nitrogen (N)	%	2.9	0.010	6942861
Soluble (20:1) Sulphate (SO4)	ug/g	<1000 (1)	1000	6946767
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.				



BUREAU
VERITAS

BV Labs Job #: CON0281
Report Date: 2020/09/21

RWDI Inc.
Client Project #: TWIN CREEK LF TI
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

ELEMENTS BY ICP/MS (TISSUE)

BV Labs ID		NOG022	NOG023	NOG024	NOG025	NOG025	NOG026	NOG027		
Sampling Date		2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02		
COC Number		tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep	tcps-lt-sep		
	UNITS	Z1-UC	Z1-LC	Z2-UC	Z2-LC	Z2-LC Lab-Dup	Z3-UC	Z3-LC	RDL	QC Batch

Metals										
Boron (B)	ug/g	150	153	119	134	135	170	103	0.5	6941574
Copper (Cu)	ug/g	3.7	3.6	3.6	3.6	3.7	4.0	3.2	0.5	6941574
Iron (Fe)	ug/g	35	32	27	38	40	30	30	3	6941574
Manganese (Mn)	ug/g	28.1	26.0	28.1	30.6	31.3	24.5	24.9	0.3	6941574
Phosphorus (P)	ug/g	684	575	647	616	639	617	577	50	6941574
Potassium (K)	ug/g	3700	4110	3510	4040	4200	4360	3510	100	6941574
Zinc (Zn)	ug/g	33	22	24	18	19	22	27	2	6941574

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

BV Labs ID		NOG028	NOG029		
Sampling Date		2020/09/02	2020/09/02		
COC Number		tcps-lt-sep	tcps-lt-sep		
	UNITS	Z4-UC	Z4-LC	RDL	QC Batch

Metals					
Boron (B)	ug/g	154	178	0.5	6941574
Copper (Cu)	ug/g	3.5	3.5	0.5	6941574
Iron (Fe)	ug/g	35	55	3	6941574
Manganese (Mn)	ug/g	26.2	27.4	0.3	6941574
Phosphorus (P)	ug/g	641	579	50	6941574
Potassium (K)	ug/g	4010	4030	100	6941574
Zinc (Zn)	ug/g	18	14	2	6941574

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch



BUREAU
VERITAS

BV Labs Job #: CON0281

Report Date: 2020/09/21

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.0°C
Package 2	4.3°C

Results relate only to the items tested.



BUREAU
VERITAS

BV Labs Job #: CON0281

Report Date: 2020/09/21

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6939535	Moisture	2020/09/11							0 (1)	20		
6941574	Boron (B)	2020/09/14	NC (2)	75 - 125	87	80 - 120	<0.5	ug/g	0.73 (4)	30	79	70 - 130
6941574	Copper (Cu)	2020/09/14	98 (2)	75 - 125	93	80 - 120	<0.5	ug/g	2.8 (4)	30	91	70 - 130
6941574	Iron (Fe)	2020/09/14	99 (2)	75 - 125	92	80 - 120	<3	ug/g	5.5 (4)	30		
6941574	Manganese (Mn)	2020/09/14	NC (2)	75 - 125	92	80 - 120	<0.3	ug/g	2.3 (4)	30	95	70 - 130
6941574	Phosphorus (P)	2020/09/14	NC (2)	75 - 125	132 (3)	80 - 120	<50	ug/g	3.7 (4)	30	96	70 - 130
6941574	Potassium (K)	2020/09/14	NC (2)	75 - 125	94	80 - 120	<100	ug/g	3.8 (4)	30	93	70 - 130
6941574	Zinc (Zn)	2020/09/14	NC (2)	75 - 125	94	80 - 120	<2	ug/g	6.6 (4)	30	88	70 - 130
6942861	Nitrogen (N)	2020/09/15					<0.010	%	13 (1)	35	98	95 - 105
6946737	Soluble (20:1) Chloride (Cl-)	2020/09/17	119	70 - 130	106	70 - 130	<20	ug/g	NC (1)	35		
6946767	Soluble (20:1) Sulphate (SO4)	2020/09/17	NC	70 - 130	102	70 - 130	<20	ug/g	8.1 (1)	35		

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [NOG025-01]

(3) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(4) Duplicate Parent ID [NOG025-01]



BUREAU
VERITAS

BV Labs Job #: CON0281

Report Date: 2020/09/21

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Your P.O. #: 9199062861
 Your Project #: TWIN CREEK LF TI
 Site Location: ON07
 Your C.O.C. #: tcps-scrst-sep

Attention: Brent Langille

RWDI Inc.
 Windsor, ON
 CANADA N8W 5K5

Report Date: 2020/10/06
 Report #: R6360283
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON0283

Received: 2020/09/05, 12:38

Sample Matrix: Solid
 # Samples Received: 8

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Hot Water Extractable Boron	7	2020/09/11	2020/09/11	CAM SOP-00408	R153 Ana. Prot. 2011
Hot Water Extractable Boron	1	2020/09/16	2020/09/16	CAM SOP-00408	R153 Ana. Prot. 2011
Chloride (20:1 extract)	7	2020/09/11	2020/09/14	CAM SOP-00463	SM 23 4500-Cl E m
Chloride (20:1 extract)	1	2020/09/16	2020/09/17	CAM SOP-00463	SM 23 4500-Cl E m
Metals in Vegetation by ICPMS	7	N/A	2020/09/11	CAM SOP-00447	EPA 6020/200.3 m
Metals in Vegetation by ICPMS	1	N/A	2020/09/14	CAM SOP-00447	EPA 6020/200.3 m
Elements in Plants by CRC ICPMS -Dry Wt (1)	8	2020/09/23	2020/09/25		
Moisture in Tissue (Subcontracted) (1, 2)	8	2020/10/01	2020/10/03		

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by BVLabs Burnaby via Mississauga

(2) Offsite analysis requires that subcontracted moisture be reported.



Your P.O. #: 9199062861
Your Project #: TWIN CREEK LF TI
Site Location: ON07
Your C.O.C. #: tcps-scrt-sep

Attention: Brent Langille

RWDI Inc.
Windsor, ON
CANADA N8W 5K5

Report Date: 2020/10/06
Report #: R6360283
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: CON0283

Received: 2020/09/05, 12:38

Encryption Key

Keshani Vijh
Supervisor - Environmental
Customer Service
06 Oct 2020 17:59:02

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keshani Vijh, Supervisor – Environmental Customer Service
Email: Keshani.Vijh@bvlabs.com
Phone# (905)817-5733

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BUREAU
VERITAS

BV Labs Job #: CON0283

Report Date: 2020/10/06

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

RESULTS OF ANALYSES OF SOLID

BV Labs ID		NOG040			NOG041		NOG042		NOG043		
Sampling Date		2020/09/02			2020/09/02		2020/09/02		2020/09/02		
COC Number		tcps-scr-t-sep			tcps-scr-t-sep		tcps-scr-t-sep		tcps-scr-t-sep		
	UNITS	Z1-ROOT	RDL	QC Batch	Z2-ROOT	RDL	Z3-ROOT	RDL	Z4-ROOT	RDL	QC Batch
Inorganics											
Soluble (20:1) Chloride (Cl-)	ug/g	3900	400	6946737	2100	400	3700	1000	3300	400	6939106
Metals											
Total (Dry Wt) Aluminum (Al)	mg/kg	2160	2.0	6982667	2200	1.0	2910	2.0	2430	2.0	6982667
Total (Dry Wt) Arsenic (As)	mg/kg	0.957	0.040	6982667	0.918	0.020	1.63	0.040	1.06	0.040	6982667
Total (Dry Wt) Barium (Ba)	mg/kg	28.6	0.10	6982667	20.3	0.050	38.8	0.10	21.8	0.10	6982667
Total (Dry Wt) Beryllium (Be)	mg/kg	0.096	0.020	6982667	0.096	0.010	0.139	0.020	0.110	0.020	6982667
Total (Dry Wt) Bismuth (Bi)	mg/kg	0.023	0.020	6982667	0.024	0.010	0.038	0.020	0.030	0.020	6982667
Total (Dry Wt) Boron (B)	mg/kg	84.8	2.0	6982667	51.7	1.0	164	2.0	61.1	2.0	6982667
Total (Dry Wt) Cadmium (Cd)	mg/kg	2.49	0.010	6982667	0.682	0.0050	0.531	0.010	1.23	0.010	6982667
Total (Dry Wt) Calcium (Ca)	mg/kg	20500	20	6982667	14900	10	12300	20	12000	20	6982667
Total (Dry Wt) Chromium (Cr)	mg/kg	3.53	0.20	6982667	3.31	0.10	6.12	0.20	3.81	0.20	6982667
Total (Dry Wt) Copper (Cu)	mg/kg	10.7	0.10	6982667	6.69	0.050	11.8	0.10	6.89	0.10	6982667
Total (Dry Wt) Lead (Pb)	mg/kg	1.86	0.030	6982667	1.78	0.015	3.43	0.030	2.03	0.030	6982667
Total (Dry Wt) Magnesium (Mg)	mg/kg	3850	10	6982667	2270	5.0	2290	10	2420	10	6982667
Total (Dry Wt) Molybdenum (Mo)	mg/kg	0.450	0.040	6982667	0.458	0.020	1.18	0.040	0.584	0.040	6982667
Total (Dry Wt) Nickel (Ni)	mg/kg	4.19	0.10	6982667	3.51	0.050	6.82	0.10	4.34	0.10	6982667
Total (Dry Wt) Phosphorus (P)	mg/kg	1810	20	6982667	1600	10	881	20	956	20	6982667
Total (Dry Wt) Potassium (K)	mg/kg	18600	20	6982667	8700	10	2970	20	3670	20	6982667
Total (Dry Wt) Selenium (Se)	mg/kg	0.30	0.10	6982667	0.101	0.050	0.45	0.10	0.19	0.10	6982667
Total (Dry Wt) Silver (Ag)	mg/kg	<0.010	0.010	6982667	<0.0050	0.0050	<0.010	0.010	<0.010	0.010	6982667
Total (Dry Wt) Sodium (Na)	mg/kg	4650	20	6982667	1870	10	2410	20	3330	20	6982667
Total (Dry Wt) Strontium (Sr)	mg/kg	52.3	0.10	6982667	37.5	0.050	40.5	0.10	29.6	0.10	6982667
Total (Dry Wt) Tin (Sn)	mg/kg	<0.20	0.20	6982667	0.16	0.10	0.28	0.20	<0.20	0.20	6982667
Total (Dry Wt) Titanium (Ti)	mg/kg	28.1	1.0	6982667	14.5	0.50	27.1	1.0	26.2	1.0	6982667
Total (Dry Wt) Vanadium (V)	mg/kg	4.05	0.40	6982667	4.36	0.20	6.75	0.40	4.74	0.40	6982667
Total (Dry Wt) Zinc (Zn)	mg/kg	77.5	0.40	6982667	35.7	0.20	25.1	0.40	24.8	0.40	6982667
PHYSICAL PROPERTIES											
Moisture-Subcontracted	%	63	0.30	6982668	25	0.30	49	0.30	28	0.30	6982668
RDL = Reportable Detection Limit											
QC Batch = Quality Control Batch											



BUREAU
VERITAS

BV Labs Job #: CON0283
Report Date: 2020/10/06

RWDI Inc.
Client Project #: TWIN CREEK LF TI
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

RESULTS OF ANALYSES OF SOLID

BV Labs ID		NOG044		NOG045	NOG046	NOG047		
Sampling Date		2020/09/02		2020/09/02	2020/09/02	2020/09/02		
COC Number		tcps-scr-t-sep		tcps-scr-t-sep	tcps-scr-t-sep	tcps-scr-t-sep		
	UNITS	Z1-STEM	RDL	Z2-STEM	Z3-STEM	Z4-STEM	RDL	QC Batch
Inorganics								
Soluble (20:1) Chloride (Cl-)	ug/g	990	400	<1000 (1)	<1000 (1)	1000 (1)	1000	6939106
Metals								
Total (Dry Wt) Aluminum (Al)	mg/kg	11.5	2.0	15.6	605	12.4	2.0	6982667
Total (Dry Wt) Arsenic (As)	mg/kg	<0.040	0.040	<0.040	0.095	0.045	0.040	6982667
Total (Dry Wt) Barium (Ba)	mg/kg	2.97	0.10	2.10	7.81	1.73	0.10	6982667
Total (Dry Wt) Beryllium (Be)	mg/kg	<0.020	0.020	<0.020	<0.020	<0.020	0.020	6982667
Total (Dry Wt) Bismuth (Bi)	mg/kg	<0.020	0.020	<0.020	<0.020	<0.020	0.020	6982667
Total (Dry Wt) Boron (B)	mg/kg	22.3	2.0	8.8	29.2	11.8	2.0	6982667
Total (Dry Wt) Cadmium (Cd)	mg/kg	0.640	0.010	0.379	0.686	0.448	0.010	6982667
Total (Dry Wt) Calcium (Ca)	mg/kg	2520	20	1650	7630	2670	20	6982667
Total (Dry Wt) Chromium (Cr)	mg/kg	<0.20	0.20	<0.20	0.65	<0.20	0.20	6982667
Total (Dry Wt) Copper (Cu)	mg/kg	2.17	0.10	2.12	4.49	2.36	0.10	6982667
Total (Dry Wt) Lead (Pb)	mg/kg	0.058	0.030	0.115	0.228	0.056	0.030	6982667
Total (Dry Wt) Magnesium (Mg)	mg/kg	462	10	339	907	633	10	6982667
Total (Dry Wt) Molybdenum (Mo)	mg/kg	<0.040	0.040	<0.040	0.191	<0.040	0.040	6982667
Total (Dry Wt) Nickel (Ni)	mg/kg	0.14	0.10	0.17	0.63	0.25	0.10	6982667
Total (Dry Wt) Phosphorus (P)	mg/kg	363	20	868	1520	587	20	6982667
Total (Dry Wt) Potassium (K)	mg/kg	2610	20	1630	6090	2020	20	6982667
Total (Dry Wt) Selenium (Se)	mg/kg	<0.10	0.10	<0.10	<0.10	<0.10	0.10	6982667
Total (Dry Wt) Silver (Ag)	mg/kg	<0.010	0.010	<0.010	<0.010	<0.010	0.010	6982667
Total (Dry Wt) Sodium (Na)	mg/kg	925	20	50	534	166	20	6982667
Total (Dry Wt) Strontium (Sr)	mg/kg	9.96	0.10	8.27	23.7	22.4	0.10	6982667
Total (Dry Wt) Tin (Sn)	mg/kg	<0.20	0.20	<0.20	<0.20	<0.20	0.20	6982667
Total (Dry Wt) Titanium (Ti)	mg/kg	<1.0	1.0	<1.0	5.6	<1.0	1.0	6982667
Total (Dry Wt) Vanadium (V)	mg/kg	<0.40	0.40	<0.40	0.53	<0.40	0.40	6982667
Total (Dry Wt) Zinc (Zn)	mg/kg	11.0	0.40	12.4	30.4	20.0	0.40	6982667
PHYSICAL PROPERTIES								
Moisture-Subcontracted	%	43	0.30	33	35	26	0.30	6982668
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.								



BUREAU
VERITAS

BV Labs Job #: CON0283
Report Date: 2020/10/06

RWDI Inc.
Client Project #: TWIN CREEK LF TI
Site Location: ON07
Your P.O. #: 9199062861
Sampler Initials: MSA

ELEMENTS BY ICP/MS (SOLID)

BV Labs ID		NOG040	NOG041	NOG042	NOG043	NOG044	NOG045		
Sampling Date		2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02	2020/09/02		
COC Number		tcps-scr-t-sep	tcps-scr-t-sep	tcps-scr-t-sep	tcps-scr-t-sep	tcps-scr-t-sep	tcps-scr-t-sep		
	UNITS	Z1-ROOT	Z2-ROOT	Z3-ROOT	Z4-ROOT	Z1-STEM	Z2-STEM	RDL	QC Batch
Metals									
Cobalt (Co)	ug/g	3.84	0.379	1.06	0.955	0.104	0.055	0.005	6938324
Vanadium (V)	ug/g	6.51	0.70	2.09	1.41	<0.05	0.05	0.05	6938324
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									

BV Labs ID		NOG046	NOG047		
Sampling Date		2020/09/02	2020/09/02		
COC Number		tcps-scr-t-sep	tcps-scr-t-sep		
	UNITS	Z3-STEM	Z4-STEM	RDL	QC Batch
Metals					
Cobalt (Co)	ug/g	0.070	0.071	0.005	6938324
Vanadium (V)	ug/g	<0.05	<0.05	0.05	6938324
RDL = Reportable Detection Limit					
QC Batch = Quality Control Batch					



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VERITAS

BV Labs Job #: CON0283

Report Date: 2020/10/06

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

BV Labs ID		NOG040		NOG041		NOG042		NOG043	NOG044		
Sampling Date		2020/09/02		2020/09/02		2020/09/02		2020/09/02	2020/09/02		
COC Number		tcps-scr-t-sep		tcps-scr-t-sep		tcps-scr-t-sep		tcps-scr-t-sep	tcps-scr-t-sep		
	UNITS	Z1-ROOT	QC Batch	Z2-ROOT	RDL	Z3-ROOT	RDL	Z4-ROOT	Z1-STEM	RDL	QC Batch

Metals											
Hot Water Ext. Boron (B)	ug/g	9.5	6946667	3.6	0.10	10	1.0	4.0	6.7	0.10	6938407

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

BV Labs ID		NOG045	NOG046	NOG047		
Sampling Date		2020/09/02	2020/09/02	2020/09/02		
COC Number		tcps-scr-t-sep	tcps-scr-t-sep	tcps-scr-t-sep		
	UNITS	Z2-STEM	Z3-STEM	Z4-STEM	RDL	QC Batch

Metals						
Hot Water Ext. Boron (B)	ug/g	1.4	2.2	2.3	0.10	6938407

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.0°C
Package 2	4.3°C

Sample NOG040 [Z1-ROOT] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

B-HOT-EXTR: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Sample NOG041 [Z2-ROOT] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

Sample NOG042 [Z3-ROOT] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

Metals: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Sample NOG043 [Z4-ROOT] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

Sample NOG044 [Z1-STEM] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

Sample NOG045 [Z2-STEM] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

Sample NOG046 [Z3-STEM] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

Sample NOG047 [Z4-STEM] : B-HOT-EXTR analysis: The Sample entirely absorbed the extraction fluid when 1:2 ratio was used. Due to the absorbent nature of the sample, the sample/fluid ratio was changed to 1:4.

RESULTS OF ANALYSES OF SOLID

Sample NOG040 [Z1-ROOT] Elements in Plants by CRC ICPMS -Dry Wt: RDL raised due to limited initial sample amount.

Sample NOG042 [Z3-ROOT] Elements in Plants by CRC ICPMS -Dry Wt: RDL raised due to limited initial sample amount.

Sample NOG043 [Z4-ROOT] Elements in Plants by CRC ICPMS -Dry Wt: RDL raised due to limited initial sample amount.

Sample NOG044 [Z1-STEM] Elements in Plants by CRC ICPMS -Dry Wt: RDL raised due to limited initial sample amount.

Sample NOG045 [Z2-STEM] Elements in Plants by CRC ICPMS -Dry Wt: RDL raised due to limited initial sample amount.

Sample NOG046 [Z3-STEM] Elements in Plants by CRC ICPMS -Dry Wt: RDL raised due to limited initial sample amount.

Sample NOG047 [Z4-STEM] Elements in Plants by CRC ICPMS -Dry Wt: RDL raised due to limited initial sample amount.

Results relate only to the items tested.



BUREAU
VERITAS

BV Labs Job #: CON0283

Report Date: 2020/10/06

QUALITY ASSURANCE REPORT

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6938324	Cobalt (Co)	2020/09/11	91	75 - 125	91	80 - 120	<0.005	ug/g	27 (1)	30	84	70 - 130
6938324	Vanadium (V)	2020/09/11	93	75 - 125	93	80 - 120	<0.05	ug/g	NC (1)	30	38	28 - 52
6938407	Hot Water Ext. Boron (B)	2020/09/11	108	75 - 125	104	75 - 125	<0.050	ug/g	5.2 (1)	40		
6939106	Soluble (20:1) Chloride (Cl-)	2020/09/14	NC	70 - 130	104	70 - 130	<20	ug/g	0.73 (1)	35		
6946667	Hot Water Ext. Boron (B)	2020/09/16	99	75 - 125	99	75 - 125	<0.050	ug/g	15 (1)	40		
6946737	Soluble (20:1) Chloride (Cl-)	2020/09/17	119	70 - 130	106	70 - 130	<20	ug/g	NC (1)	35		
6982667	Total (Dry Wt) Aluminum (Al)	2020/09/25			114	80 - 120	<1.0	mg/kg			42	17 - 93
6982667	Total (Dry Wt) Arsenic (As)	2020/09/25			101	80 - 120	<0.020	mg/kg			60	42 - 199
6982667	Total (Dry Wt) Barium (Ba)	2020/09/25			105	80 - 120	<0.050	mg/kg				
6982667	Total (Dry Wt) Beryllium (Be)	2020/09/25			111	80 - 120	<0.010	mg/kg				
6982667	Total (Dry Wt) Bismuth (Bi)	2020/09/25			95	80 - 120	<0.010	mg/kg				
6982667	Total (Dry Wt) Boron (B)	2020/09/25			110	80 - 120	<1.0	mg/kg			110	75 - 125
6982667	Total (Dry Wt) Cadmium (Cd)	2020/09/25			99	80 - 120	<0.0050	mg/kg			92	75 - 125
6982667	Total (Dry Wt) Calcium (Ca)	2020/09/25			101	80 - 120	<10	mg/kg			95	75 - 125
6982667	Total (Dry Wt) Chromium (Cr)	2020/09/25			102	80 - 120	<0.10	mg/kg				
6982667	Total (Dry Wt) Copper (Cu)	2020/09/25			99	80 - 120	<0.050	mg/kg			90	75 - 125
6982667	Total (Dry Wt) Lead (Pb)	2020/09/25			100	80 - 120	<0.015 (3)	mg/kg				
6982667	Total (Dry Wt) Magnesium (Mg)	2020/09/25			109	80 - 120	<5.0	mg/kg				
6982667	Total (Dry Wt) Molybdenum (Mo)	2020/09/25			105	80 - 120	<0.020	mg/kg				
6982667	Total (Dry Wt) Nickel (Ni)	2020/09/25			102	80 - 120	<0.050	mg/kg			81	75 - 125
6982667	Total (Dry Wt) Phosphorus (P)	2020/09/25			103	80 - 120	<10	mg/kg			101	75 - 125
6982667	Total (Dry Wt) Potassium (K)	2020/09/25			103	80 - 120	<10	mg/kg			97	75 - 125
6982667	Total (Dry Wt) Selenium (Se)	2020/09/25			102	80 - 120	<0.050	mg/kg			95	75 - 125
6982667	Total (Dry Wt) Silver (Ag)	2020/09/25			73 (2)	80 - 120	<0.0050	mg/kg				
6982667	Total (Dry Wt) Sodium (Na)	2020/09/25			104	80 - 120	<10	mg/kg			94	75 - 125
6982667	Total (Dry Wt) Strontium (Sr)	2020/09/25			108	80 - 120	<0.050	mg/kg			104	75 - 125
6982667	Total (Dry Wt) Tin (Sn)	2020/09/25			108	80 - 120	<0.10	mg/kg				
6982667	Total (Dry Wt) Titanium (Ti)	2020/09/25			104	80 - 120	<0.50	mg/kg				
6982667	Total (Dry Wt) Vanadium (V)	2020/09/25			100	80 - 120	<0.20	mg/kg				



BUREAU
VERITAS

BV Labs Job #: CON0283

Report Date: 2020/10/06

QUALITY ASSURANCE REPORT(CONT'D)

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6982667	Total (Dry Wt) Zinc (Zn)	2020/09/25			127 (2)	80 - 120	0.60, RDL=0.20 (4)	mg/kg			97	75 - 125
6982668	Moisture-Subcontracted	2020/10/03					<0.30	%				

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times$ RDL).

(1) Duplicate Parent ID

(2) Blank Spike outside acceptance criteria - re-analysis yields similar results.

(3) Blank outside acceptance criteria - detection limit adjusted accordingly

(4) Method Blank exceeds acceptance limits for Xx. Sample values for Xx are $>10 \times$ the concentration of the method blank and the contamination is considered irrelevant.



BUREAU
VERITAS

BV Labs Job #: CON0283

Report Date: 2020/10/06

RWDI Inc.

Client Project #: TWIN CREEK LF TI

Site Location: ON07

Your P.O. #: 9199062861

Sampler Initials: MSA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

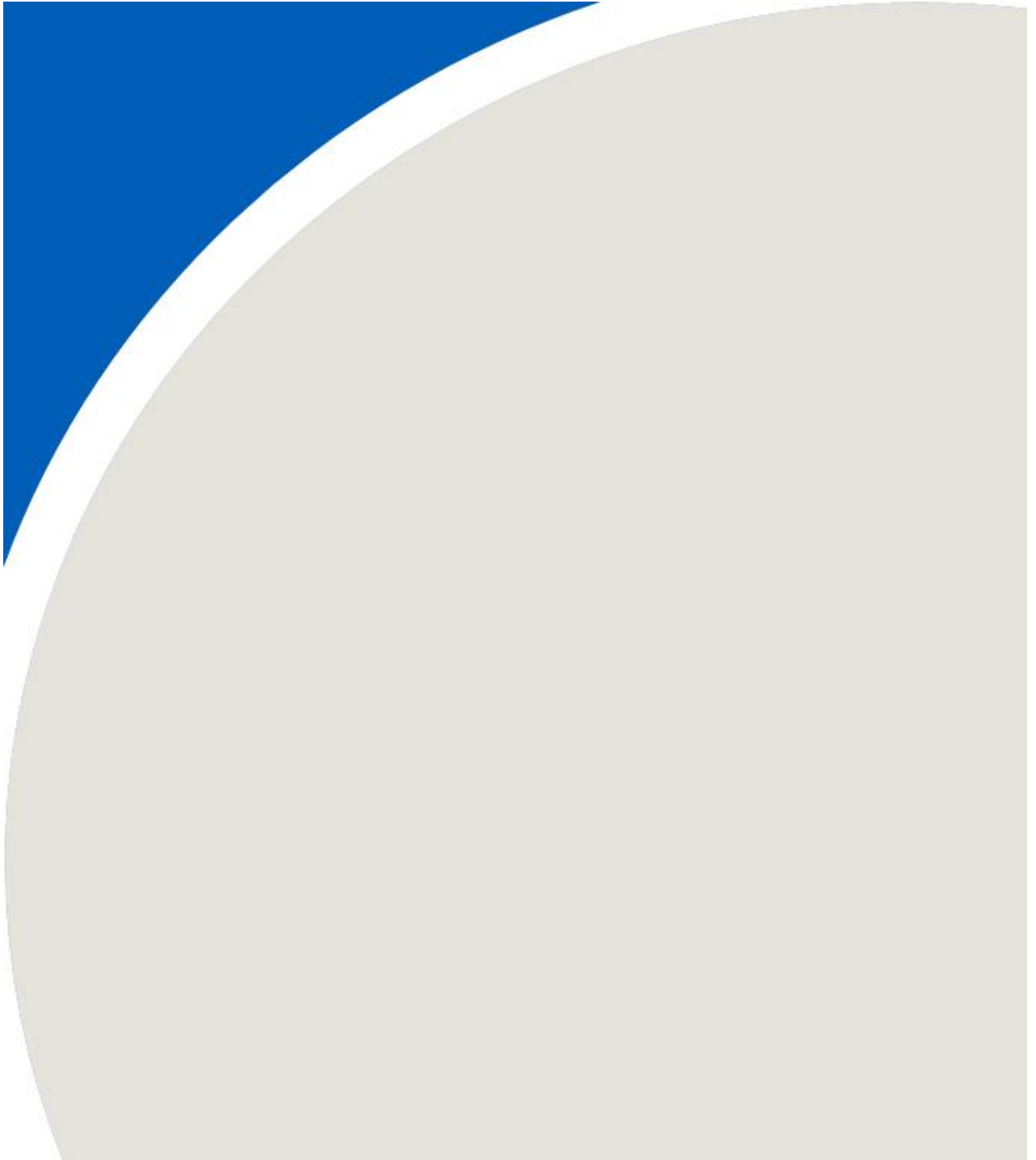
Anastassia Hamanov, Scientific Specialist

David Huang, BBY Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

APPENDIX I:

Tree Growth



Monitoring of Poplar Tree Treatment System

Task	Monitoring Parameter	ZONE 1 - Leachate Application Area					
		Row 1	Row 4	Row 21	Row 32	Row 38	Geometric Mean
Visual Assessment	Tree Diameter (cm)	2.0	3.4	4.2	3.6	5.0	3.5
	Tree Height (m)	2.1	2.9	3.8	2.8	3.6	3.0
	Tree Mortality (%)	8					
	Crown Dieback (%)	0	0	0	0	0	0
	Foliage Transparency (%)	70	40	30	40	60	46
	Crown Density (%)	30	60	70	60	40	50
	Leaf Size (cm) (length/width)	<u>7.0</u>	<u>8.0</u>	<u>6.5</u>	<u>5.0</u>	<u>9.0</u>	
		6.0	7.5	5.0	5.0	8.0	
		<u>6.0</u>	<u>7.0</u>	<u>6.0</u>	<u>7.0</u>	<u>8.0</u>	
		7.0	6.0	5.0	5.0	7.0	
		<u>5.0</u>	<u>7.0</u>	<u>8.0</u>	<u>6.0</u>	<u>9.0</u>	<u>6.7</u>
		4.0	6.0	7.0	6.0	8.0	6.0
		<u>7.0</u>	<u>7.0</u>	<u>7.0</u>	<u>6.0</u>	<u>9.0</u>	
		7.0	6.0	7.0	5.0	7.0	
		<u>7.0</u>	<u>7.0</u>	<u>5.0</u>	<u>5.5</u>	<u>5.0</u>	
		7.0	6.5	5.0	5.0	4.0	
	Discolouration of Leaves (%)	<5	0	<5	30	<5	8
	Abnormally Shaped Leaves (%)	0	0	0	0	0	0
		17.0	14.0	38.0	17.0	29.0	
	Length of New Tree	40.0	28.0	26.0	24.0	14.0	
	Branch Extension Shoots (cm)	24.0	13.0	23.0	9.0	13.0	21.0
		10.0	8.0	24.0	46.0	36.0	
		15.0	15.0	26.0	55.0	31.0	
	Deformed Growth (%)	0	0	0	0	0	0
	Insect Infestation (%)	<5	<5	<5	<5	<5	2.5
Root Depth	Depth of Root Penetration (m)	0.42					
Inspections	Brace Root Inspection	0	0	0	0	0	0
	for Animal Damage						

NOTES:

- 1) Blank denotes data is not available.
- 2) "m" denotes metre.
- 3) "cm" denotes centimetre.

Table I-1
Poplar System Inspection Records
Twin Creeks Environmental Centre - Poplar System

Date: 3-Sep-20
Weather: Partly cloudy, 25°C, NW 28 km/h

Monitoring of Poplar Tree Treatment System

Task	Monitoring Parameter	ZONE 2 - Leachate Application Area					
		Row 5	Row 11	Row 27	Row 38	Row 42	Geometric Mean
Visual Assessment	Tree Diameter (cm)	3.5	3.3	3.6	3.7	3.1	3.4
	Tree Height (m)	3.2	23.2	3.1	3.0	3.2	4.7
	Tree Mortality (%)	9					
	Crown Dieback (%)	0	0	0	0	0	0
	Foliage Transparency (%)	40	60	60	60	60	55
	Crown Density (%)	60	40	40	40	40	43
	Leaf Size (cm) (length/width)	<u>9.0</u>	<u>5.0</u>	<u>5.0</u>	<u>5.5</u>	<u>9.0</u>	
		8.0	3.0	4.0	5.0	8.0	
		<u>4.0</u>	<u>7.5</u>	<u>6.0</u>	<u>8.0</u>	<u>9.0</u>	
		4.0	7.5	6.0	7.0	8.0	
		<u>5.0</u>	<u>7.0</u>	<u>7.0</u>	<u>7.0</u>	<u>7.0</u>	<u>6.6</u>
		4.0	8.5	7.0	6.0	6.0	6.2
		<u>7.0</u>	<u>6.0</u>	<u>6.0</u>	<u>8.0</u>	<u>6.0</u>	
		8.0	7.0	5.0	8.0	7.0	
		<u>7.0</u>	<u>7.0</u>	<u>7.0</u>	<u>9.5</u>	<u>5.0</u>	
		7.0	7.0	7.0	7.0	5.0	
	Discolouration of Leaves (%)	5	<5	<5	<5	<5	3.0
	Abnormally Shaped Leaves (%)	0	0	0	0	0	0
		7.0	12.0	20.0	10.0	15.0	
	Length of New Tree	10.0	9.0	10.0	20.0	19.0	
	Branch Extension Shoots (cm)	4.0	20.0	12.0	20.0	8.0	11.1
		6.0	12.0	8.0	8.0	17.0	
		8.0	14.0	9.0	11.0	12.0	
	Deformed Growth (%)	0	0	0	0	0	0
	Insect Infestation (%)	<5	0	<5	<5	<5	2
Root Depth	Depth of Root Penetration (m)	0.41					
Inspections	Brace Root Inspection	0	0	0	0	0	0
	for Animal Damage						

NOTES:

- 1) Blank denotes data is not available.
- 2) "m" denotes metre.
- 3) "cm" denotes centimetre.

Monitoring of Poplar Tree Treatment System

Task	Monitoring Parameter	ZONE 3 - Leachate Application Area					
		Row 2	Row 6	Row 15	Row 26	Row 39	Geometric Mean
Visual Assessment	Tree Diameter (cm)	4.2	6.1	5.2	15.5	4.8	6.3
	Tree Height (m)	4.1	5.2	4.8	4.2	3.9	4.4
	Tree Mortality (%)	4					
	Crown Dieback (%)	0	0	0	0	0	0
	Foliage Transparency (%)	40	20	50	50	40	38
	Crown Density (%)	60	80	50	50	60	59
	Leaf Size (cm) (length/width)	<u>7.0</u>	<u>9.0</u>	<u>6.0</u>	<u>6.0</u>	<u>8.0</u>	
		6.0	8.0	6.0	6.0	7.5	
		<u>7.0</u>	<u>7.0</u>	<u>9.0</u>	<u>7.0</u>	<u>8.0</u>	
		5.0	7.0	10.0	7.0	6.0	
		<u>7.0</u>	<u>8.0</u>	<u>8.0</u>	<u>8.0</u>	<u>8.0</u>	7.1
		6.0	8.0	7.0	7.5	7.0	6.7
		<u>9.0</u>	<u>7.0</u>	<u>4.0</u>	<u>6.0</u>	<u>7.0</u>	
		10.0	7.0	4.0	7.0	6.0	
		<u>9.0</u>	<u>7.0</u>	<u>5.0</u>	<u>7.0</u>	<u>7.0</u>	
		9.0	6.0	4.0	7.0	7.0	
	Discolouration of Leaves (%)	10	<5	30	10	<5	11
	Abnormally Shaped Leaves (%)	0	0	0	0	0	0
		10.0	15.0	17.0	21.0	11.0	
	Length of New Tree	22.0	38.0	13.0	4.0	14.0	
	Branch Extension Shoots (cm)	16.0	47.0	8.0	28.0	20.0	15.8
		19.0	8.0	12.0	32.0	12.0	
		20.0	11.0	9.0	21.0	25.0	
	Deformed Growth (%)	0	0	0	0	0	0
	Insect Infestation (%)	<5	<5	<5	<5	<5	3
Root Depth	Depth of Root Penetration (m)	0.58					
Inspections	Brace Root Inspection	0	0	0	0	0	0
	for Animal Damage						

- NOTES:
- 1) Blank denotes data is not available.
 - 2) "m" denotes metre.
 - 3) "cm" denotes centimetre.

Monitoring of Poplar Tree Treatment System

Task	Monitoring Parameter	ZONE 4 - Leachate Application Area					
		Row 6	Row 11	Row 24	Row 37	Row 42	Geometric Mean
Visual Assessment	Tree Diameter (cm)	3.4	5.1	4.7	4.6	6.1	4.7
	Tree Height (m)	3.6	5.2	4.9	4.6	4.5	4.5
	Tree Mortality (%)	10					
	Crown Dieback (%)	0	0	0	0	0	0
	Foliage Transparency (%)	40	20	30	50	20	30
	Crown Density (%)	60	80	70	50	80	67
	Leaf Size (cm) (length/width)	<u>6.0</u>	<u>10.0</u>	<u>8.0</u>	<u>8.0</u>	<u>8.0</u>	
		6.0	10.0	9.0	8.0	8.0	
		<u>8.0</u>	<u>9.0</u>	<u>9.0</u>	<u>10.0</u>	<u>6.0</u>	
		8.0	8.0	9.0	8.0	6.0	
		<u>7.5</u>	<u>9.0</u>	<u>9.0</u>	<u>9.0</u>	<u>9.0</u>	<u>8.2</u>
		8.0	9.0	8.0	8.0	8.0	8.0
		<u>6.0</u>	<u>11.0</u>	<u>9.0</u>	<u>8.0</u>	<u>4.5</u>	
		5.0	10.0	9.0	8.0	6.0	
		<u>8.0</u>	<u>11.0</u>	<u>8.0</u>	<u>9.0</u>	<u>9.0</u>	
		7.0	11.0	8.0	9.0	8.0	
	Discolouration of Leaves (%)	15	<5	<5	<5	15	8
	Abnormally Shaped Leaves (%)	0	0	0	0	0	0
		52.0	25.0	30.0	14.0	58.0	
	Length of New Tree	30.0	24.0	32.0	17.0	22.0	
	Branch Extension Shoots (cm)	28.0	33.0	38.0	14.0	13.0	24.1
		23.0	32.0	21.0	22.0	25.0	
		18.0	50.0	28.0	8.0	12.0	
	Deformed Growth (%)	0	0	0	0	0	0
	Insect Infestation (%)	<5	<5	5	<5	<5	3
Root Depth	Depth of Root Penetration (m)	0.45					
Inspections	Brace Root Inspection	0	0	0	0	0	0
	for Animal Damage						

NOTES:

1) Blank denotes data is not available.

2) "m" denotes metre.

3) "cm" denotes centimetre.

Table I-2
Poplar System Inspection Records - Historical Summary
Twin Creeks Environmental Centre - Poplar System

Task	Inspection Parameter	Poplar System							
		S1 (Zone 1)							
		28-Sep-17	27-Sep-18	9-Sep-19	3-Sep-20				
Visual Assessment	Tree Diameter (cm)	3.1	4.0	2.7	3.5				
	Tree Height (m)	2.1	2.3	2.9	3.0				
	Tree Mortality (%)	0.0	0.0	18.0	8				
	Crown Density (%)	58	50	40	50				
	Leaf Size (cm) (length/width)	9.2	7.0	8.0	6.7				
		8.9	6.2	7.8	6.0				
	Discolouration Of Leaves (%)	38	25	5	8				
	Length Of New Tree Branch Extension Shoots (cm)	25.3	27.0	41.5	21.0				
	Insect Infestation (%)	<1.0	5.0	<5.0	2.5				

- NOTES:**
- 1) Blank denotes data is not available.
 - 2) "m" denotes metre.
 - 3) "cm" denotes centimetre.

Table I-2
Poplar System Inspection Records - Historical Summary
Twin Creeks Environmental Centre - Poplar System

Task	Inspection Parameter	Poplar System							
		S2 (Zone 2)							
		28-Sep-17	27-Sep-18	9-Sep-19	3-Sep-20				
Visual Assessment	Tree Diameter (cm)	1.9	3.7	3.0	3.4				
	Tree Height (m)	1.6	2.2	2.8	4.7				
	Tree Mortality (%)	0.0	0.0	3.0	9.0				
	Crown Density (%)	49	52	50	43				
	Leaf Size (cm) (length/width)	8.9	7.1	9.0	6.6				
		8.4	6.8	9.0	6.2				
	Discolouration Of Leaves (%)	37	24	3	3				
	Length Of New Tree Branch Extension Shoots (cm)	26.9	32.3	45.9	11.1				
	Insect Infestation (%)	<1.0	5.0	4.0	2.0				

- NOTES:**
- 1) Blank denotes data is not available.
 - 2) "m" denotes metre.
 - 3) "cm" denotes centimetre.

Table I-2
Poplar System Inspection Records - Historical Summary
Twin Creeks Environmental Centre - Poplar System

Task	Inspection Parameter	Poplar system							
		S3 (Zone 3)							
		28-Sep-17	27-Sep-18	9-Sep-19	3-Sep-20				
Visual Assessment	Tree Diameter (cm)	2.6	5.0	3.7	6.3				
	Tree Height (m)	2.1	2.5	4.1	4.4				
	Tree Mortality (%)	3.0	0.0	3.0	4.0				
	Crown Density (%)	50	55	49	59				
	Leaf Size (cm) (length/width)	9.5	7.0	10.3	7.1				
		9.2	6.8	9.3	6.7				
	Discolouration Of Leaves (%)	33	16	3	11				
	Length Of New Tree Branch Extension Shoots (cm)	29.4	25.1	44.7	15.8				
	Insect Infestation (%)	<1.0	5.7	2.0	2.5				

- NOTES:**
- 1) Blank denotes data is not available.
 - 2) "m" denotes metre.
 - 3) "cm" denotes centimetre.

Table I-2
Poplar System Inspection Records - Historical Summary
Twin Creeks Environmental Centre - Poplar System

Task	Inspection Parameter	Poplar system							
		S4 (Zone 4)							
		28-Sep-17	27-Sep-18	9-Sep-19	3-Sep-20				
Visual Assessment	Tree Diameter (cm)	3.2	5.1	3.7	4.7				
	Tree Height (m)	2.2	2.8	3.9	4.5				
	Tree Mortality (%)	0.0	3.0	5.0	10.0				
	Crown Density (%)	57	45	53	67				
	Leaf Size (cm) (length/width)	11.2	8.1	9.2	8.2				
		10.7	7.7	8.6	8.0				
	Discolouration Of Leaves (%)	14	16	5	8				
	Length Of New Tree Branch Extension Shoots (cm)	31.0	29.6	49.3	24.1				
	Insect Infestation (%)	<1.0	2.0	<5.0	3.0				

- NOTES:**
- 1) Blank denotes data is not available.
 - 2) "m" denotes metre.
 - 3) "cm" denotes centimetre.

APPENDIX J:

Surface Water



Table J-1

Precipitation Event Surface Water Quality - Field Analytical Results
Twin Creeks Environmental Centre - Poplar System

Station Number	Location	pH	Conductivity	Temperature	Turbidity	Dissolved Oxygen	Estimated Flow Rate
		(pH units)	(mS/cm)	(°C)	(NTU)	(mg/L)	(m³/s)
First Quarter							
January 11, 2020 (routine monitoring for January 10, 2020 precipitation event)							
SS14A	On-Site Flow into East Ditch Line, Upstream of Poplar System	8.2	456	2.2	97.3	11.0	0.205
SS14B	On-Site Flow into West Ditch Line, Background of Poplar System	8.2	555	4.3	>1000	11.4	0.076
SS15A	On-Site Flow into Sedimentation Pond 1, intersecting point of East and West Ditch Line South of the Poplar System	8.3	406	4.8	N/A	11.5	0.391
Second Quarter							
May 18, 2020 (routine monitoring for May 17, 2020 precipitation event)							
SS14A	On-Site Flow into East Ditch Line, Upstream of Poplar System	8.2	546	13.4	91.0	9.2	0.0097
SS14B	On-Site Flow into West Ditch Line, Background of Poplar System	8.3	899	13.2	623	9.5	0.0132
SS15A	On-Site Flow into Sedimentation Pond 1, intersecting point of East and West Ditch Line South of the Poplar System	8.1	668	12.9	259	8.8	0.0254
Third Quarter							
SS14A	On-Site Flow into East Ditch Line, Upstream of Poplar System	NR	NR	NR	NR	NR	NR
SS14B	On-Site Flow into West Ditch Line, Background of Poplar System	NR	NR	NR	NR	NR	NR
SS15A	On-Site Flow into Sedimentation Pond 1, intersecting point of East and West Ditch Line South of the Poplar System	NR	NR	NR	NR	NR	NR
Fourth Quarter							
November 15, 2020 (routine and storm monitoring for November 14, 2020 precipitation event)							
SS14A	On-Site Flow into East Ditch Line, Upstream of Poplar System	7.8	1129	8.9	72.6	9.3	0.027
SS14B	On-Site Flow into West Ditch Line, Background of Poplar System	8.1	904	9.3	447	9.9	0.023
SS15A	On-Site Flow into Sedimentation Pond 1, intersecting point of East and West Ditch Line South of the Poplar System	7.9	403	10.9	248	9.0	0.023

NOTES:

- 1) INS denotes insufficient volume to sample.
- 2) mS/cm denotes milliSeimens per centimetre.
- 3) °C denotes degrees Celsius.
- 4) NTU denotes nephelometric turbidity unit.
- 5) mg/L denotes milligrams per litre.
- 6) m³/s denotes cubic metres per second.
- 7) Estimated Flow Rate = Average flow velocity (m/s) x channel width (m) x channel depth (m)
- 8) NR denotes monitoring not required, as there were no precipitation events greater than 10 mm in a 24 hr period recorded in that quarter that produced an observable flow.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	East Ditch Line (Poplar System) - SS14 / SS14A										
Date			9-Apr-02	4-Apr-03	13-Jun-03	15-Sep-03	3-May-04	31-Jul-04	23-Sep-05	9-Nov-05	18-Jan-06	9-Mar-06	3-Aug-06
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Storm
Laboratory			Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Alkalinity (as CaCO ₃)	mg/L	<25%***	102	91	42	66	74	82	129	69	227	105	98
Chloride	mg/L		19	11	8	18	8	9	51	25	21	14	22
Sulphate	mg/L		155	193	443	340	426	178	244	103	163	78	318
Ammonia (as N)	mg/L		0.14	0.08	0.04	0	0.17	0.11	0.06	0.35	1.94	0.61	0.09
Ammonia Unionized	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate	mg/L		2.42	1.70	1.37	0.15	0.77	0.81	6.02	7.85	0.54	0.74	0.37
Nitrite	mg/L								0.18				<0.10
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.18	0.12	0.08	0.22	0.14	0.17	0.32	0.16	0.38	0.14	0.24
Calcium	mg/L		62	74	119	116	112	65	102	66	94	46	106
Chromium	mg/L	0.0089	<0.01	<0.005	<0.005	<0.005	<0.005	0.003	0.002	0.026	0.003	0.002	0.005
Iron	mg/L	0.300		1.24	0.93	0.22	1.97	1.21	0.64	19.4	0.66	0.83	3.08
Magnesium	mg/L		23	27	58	33	53	22	32	21	32	15	38
Potassium	mg/L		4	3	3	6	3	5	6	4	5	4	5
Sodium	mg/L		21	12	21	21	20	13	17	9	19	10	21
Nickel	mg/L	0.025	<0.01	<0.005	<0.005	<0.005	0.006	0.004	0.007	0.024	0.006	0.005	0.013
Zinc	mg/L	0.02	<0.01	0.008	<0.005	<0.005	<0.01	<0.01	0.01	0.06	0.01	<0.01	0.02
pH	(pH units)	6.5-8.5							7.42	7.84	7.73	7.48	7.49
Total Organic Carbon	mg/L								13.3		9.4	5.8	11.2
Aluminum	mg/L	0.075*							0.73				2.56
Arsenic	mg/L	0.100*							0.001				0.003
Barium	mg/L								0.03				0.04
Beryllium	mg/L	1.100							<0.001				<0.001
Bismuth	mg/L								<0.005				<0.005
Cadmium	mg/L	0.0002							<0.0001				0.0002
Cobalt	mg/L	0.0009							0.0009				0.0034
Dissolved Oxygen	mg/L								9.7				
Lead	mg/L	0.005							<0.001				0.001
Molybdenum	mg/L	0.040*							0.013				0.012
Selenium	mg/L	0.100							0.003				0.004
Silver	mg/L	0.0001							<0.0001				<0.0001
Strontium	mg/L								0.491				0.627
Tin	mg/L								<0.01				<0.01
Titanium	mg/L								0.03				<0.01
Total Kjeldahl Nitrogen (TKN)	mg/L								1.35				0.74
Total Phosphorus	mg/L	0.02*							0.20				2.68
Vanadium	mg/L	0.006*							0.004				0.006
Ion Percentage	%		2.5	2.8	3.4	35.8	1.1	2.0	0.0	8.2	2.0	2.3	1.6

NOTES:

- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
- 2) * denotes interim PWQO.
- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	East Ditch Line (Poplar System) - SS14 / SS14A										
Date			5-Oct-06	17-Nov-06	2-Mar-07	9-Jan-08	19-Mar-08	14-Jun-08	17-Jul-08	9-Sep-08	4-Nov-08	12-Feb-09	6-Apr-09
Routine/Storm Monitoring			Routine	Storm	Routine	Routine	Routine	Storm	Storm	Storm	Storm	Routine	Routine
Laboratory			Accutest	Accutest	Accutest	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	117	56	121	239	129		78	98	145	139	153
Chloride	mg/L		52	19	9	26	10	23	27	17	24	5	13
Sulphate	mg/L		108	25	72	242	70		257	216	251	69	180
Ammonia (as N)	mg/L		0.02	0.07	0.66		0.41	0.075	0.075	0.075	0.17	0.11	0.075
Ammonia Unionized	mg/L	0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate	mg/L		53.2	7.24	1.72	0.05	0.6	0.05	0.1	0.2	1.8	1.3	1.1
Nitrite	mg/L		<0.10	<0.10			0.02	<0.01	0.04	0.02	0.03	0.03	
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.23	0.09	0.11	0.51	0.23	0.25	0.15	0.16	0.24	0.13	0.16
Calcium	mg/L		130	32	56	130	58	130	100	100	98	66	130
Chromium	mg/L	0.0089	0.002	<0.001	<0.001	0.010	0.010	0.020	0.008	0.015	0.009	0.013	0.030
Iron	mg/L	0.300	0.16	0.47	0.27	4.6	5.6	20	7.8	10	4.7	13	29
Magnesium	mg/L		38	10	17	39	19	45	37	36	35	20	43
Potassium	mg/L		7	4	4	5	5.2	6.9	5	8.5	8.4	4.8	7.2
Sodium	mg/L		20	7	10	20	11	22	21	16	15	6.6	13
Nickel	mg/L	0.025	<0.005	<0.005	<0.005	0.008	0.008	0.032	0.012	0.015	0.006	0.017	0.045
Zinc	mg/L	0.02	<0.01	<0.01	<0.01	0.02	0.02	0.07	0.025	0.03	0.02	0.036	0.097
pH	(pH units)	6.5-8.5	7.89	7.33	7.79	7.83	6.87	8.32	7.82	7.32	7.98	6.77	8.44
Total Organic Carbon	mg/L		8.9	7.7	7.1	10.0	7.4	13.5	9.7	6.1	12.5	9.4	17
Aluminum	mg/L	0.075*		1.77				11	4.5	9.4	7.9		
Arsenic	mg/L	0.100*		<0.001				0.007	0.004	0.004	0.002		
Barium	mg/L			0.05				0.098	0.05	0.085	0.063		
Beryllium	mg/L	1.100		<0.001				0.0007	<0.0006	<0.0006	<0.0006		
Bismuth	mg/L			<0.005					<0.001	<0.001	<0.001		
Cadmium	mg/L	0.0002		<0.0001				0.0002	<0.0001	<0.0001	<0.0001		
Cobalt	mg/L	0.0009		0.0008				0.0088	0.0033	0.0044	0.0019		
Copper	mg/L	0.005		0.004				0.020	0.009	0.009	0.006		
Lead	mg/L	0.005		0.002				0.011					
Molybdenum	mg/L	0.040*		<0.005				0.025	0.027	0.023	0.011		
Selenium	mg/L	0.100		<0.001				<0.002	<0.05	<0.005	<0.005		
Silver	mg/L	0.0001		<0.0001				0.0002		<0.0001	<0.0001		
Strontium	mg/L			0.086				0.52	0.44	0.50	0.43		
Tin	mg/L			<0.01				<0.001	<0.002	<0.002	<0.002		
Titanium	mg/L			<0.01				0.22		0.27	0.25		
Total Kjeldahl Nitrogen (TKN)	mg/L		0.92	1.91				3	1	0.8	1.5		
Total Phosphorus	mg/L	0.02*	0.11	0.87				0.33	0.21	<0.15	0.15		
Vanadium	mg/L	0.006*		0.002				0.025	0.009	0.022	0.016		
Ion Percentage	%		15.6	9.1	6.1	2.6	7.1		5.1	7.4	1.1	8.4	12.0
Benzene	ug/L							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L							<0.2	<0.2	<0.3	<0.2	<0.3	<0.3
Ethylbenzene	ug/L							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L							<0.2	<0.2	<0.3	<0.2	<0.3	<0.3
p+m-Xylene	ug/L							<0.4	<0.4	<0.6	<0.4	<0.6	<0.6
Total Xylenes	ug/L							<0.4	<0.4	<0.6	<0.4	<0.6	<0.6
Total Oil & Grease	mg/L							<0.5	<0.5	<0.5	<0.5		

NOTES:

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- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	East Ditch Line (Poplar System) - SS14 / SS14A										
Date			9-Aug-09	10-Oct-09	24-Oct-09	25-Jan-10	6-Apr-10	6-Jun-10	14-Oct-10	28-Feb-11	20-Apr-11	7-Jun-11	8-Aug-11
Routine/Storm Monitoring			Routine	Storm	Routine	Routine	Routine	Storm	Storm	Routine	Routine	Storm	Storm
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	80		120	126	91		95	122	179		132
Chloride	mg/L		22	32	31	8	8	9	18	11	17	3	13
Sulphate	mg/L		210		350	99	150		220	89	210		290
Ammonia (as N)	mg/L		0.075	0.075	0.075	0.075	0.270	0.230	0.075	0.570	0.075	0.150	0.075
Ammonia Unionized	mg/L	0.02	<0.02		<0.02	<0.02	<0.02		<0.02	<0.02	<0.02		<0.02
Nitrate	mg/L		0.5	0.9	0.3	1.3	0.7	0.7	0.05	2.3	0.3	0.02	0.05
Nitrite	mg/L			0.03					0.01			0.3	<0.01
Phenols	mg/L	0.001	<0.001		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001		
Boron	mg/L	0.200	0.08	0.14	0.10	0.12	0.4	0.14	0.09	0.17	0.31	0.13	0.25
Calcium	mg/L		66	120	130	64	670	180	95	60	100	51	120
Chromium	mg/L	0.0089	<0.005	<0.005	<0.005	0.006	0.26	0.073	<0.005	<0.005	<0.005	0.045	<0.005
Iron	mg/L	0.300	1.8	1.0	1.4	3.0	260	76	2.5	1.5	3.6	45	0.8
Magnesium	mg/L		22	40	44	19	160	48	23	20	34	18	27
Potassium	mg/L		3.9	4.3	7.1	5.0	41	11	7.7	4.6	4.2	7.5	6.7
Sodium	mg/L		12	19	20	7.3	16	9.1	11	8.3	15	4.3	14
Nickel	mg/L	0.025	0.004	<0.001	0.003	0.004	0.36	0.11	0.003	0.002	0.006	0.056	0.002
Zinc	mg/L	0.02	0.009	<0.01	0.031	0.012	0.78	0.16	0.010	0.012	0.019	0.12	<0.005
pH	(pH units)	6.5-8.5	7.48	8.24	7.88	8.65	7.94	7.94	7.85	7.85	7.91	7.23	7.35
Total Organic Carbon	mg/L		6.9		8.2	5.8	14.8		10.7	6.0	13.2		11.1
Aluminum	mg/L	0.075*		0.91				40	4.1			28	0.72
Arsenic	mg/L	0.100*		<0.001				0.019	0.001			0.011	0.003
Barium	mg/L			0.039				0.23	0.048			0.17	0.053
Beryllium	mg/L	1.100		<0.0006				0.0024	<0.0006			0.0014	<0.0005
Bismuth	mg/L			<0.001				<0.001	<0.001			<0.001	0.001
Cadmium	mg/L	0.0002		<0.0001				0.0003	<0.0001			0.0003	<0.0001
Cobalt	mg/L	0.0009		0.0005				0.032	0.0008			0.016	0.0007
Copper	mg/L	0.005		0.003				0.055	0.003			0.028	0.004
Lead	mg/L	0.005		<0.0005				0.029	0.0012			0.019	<0.0005
Molybdenum	mg/L	0.040*		0.014				0.022	0.008			0.010	0.019
Selenium	mg/L	0.100		<0.005				<0.005	<0.005			<0.005	<0.002
Silver	mg/L	0.0001		<0.0001				<0.0001	<0.0001			<0.0001	
Strontium	mg/L			0.52				0.46	0.33			0.16	0.44
Tin	mg/L			<0.002				<0.002	<0.002			<0.002	<0.001
Titanium	mg/L			0.026				0.75	0.16			0.51	0.021
Total Kjeldahl Nitrogen (TKN)	mg/L			0.9				5	1.2			11	1
Total Phosphorus	mg/L	0.02*		0.05				1.3	0.11			0.10	0.10
Vanadium	mg/L	0.006*		0.002				0.079	0.009			0.053	0.002
Ion Percentage	%		2.4		2.4	4.6	40.9	2.4	2.4	2.7	0.2		0.3
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		<0.3	<0.2	<0.3	<0.3	<0.3	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		<0.3	<0.2	<0.3	<0.3	<0.3	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3
p+m-Xylene	ug/L		<0.6	<0.4	<0.6	<0.6	<0.6	<0.4	<0.4	<0.6	<0.6	<0.4	<0.6
Total Xylenes	ug/L		<0.6	<0.4				<0.4	<0.4			<0.4	<0.6
Total Oil & Grease	mg/L			<0.5				<0.5	<1			<0.5	

NOTES:

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- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	East Ditch Line (Poplar System) - SS14A										
Date			13-Oct-11	13-Mar-12	4-May-12	28-Jul-12	30-Oct-12	13-Jan-13	10-Apr-13	29-May-13	5-Jul-13	28-Aug-13	7-Oct-13
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Routine	Storm	Routine	Storm	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	176	140	92	92	74	150	130		81		160
Chloride	mg/L		20	12	12	12	6	7	9	7	6	5	15
Sulphate	mg/L		210	170	250	190	94	120	120		130		110
Ammonia (as N)	mg/L		0.075	0.075	0.075	0.075	0.200	0.075	0.075	0.150	0.075	0.075	0.075
Ammonia Unionized	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.021		<0.0076
Nitrate	mg/L		0.7	1.6	1.8	0.99	2.4	0.56	1.0	0.17	0.05	0.05	0.05
Nitrite	mg/L									0.032		<0.010	
Phenols	mg/L	0.001	0.015	0.0013	<0.0010	0.0035	<0.0010	<0.0010	<0.0010		<0.0010		0.0012
Boron	mg/L	0.200	0.20	0.19	0.18	0.22	0.093	0.14	0.14	0.23	1.5	0.49	0.39
Calcium	mg/L		120	88	100	95	51	79	80	87	92	58	80
Chromium	mg/L	0.0089	0.007	0.013	0.0051	0.0094	0.026	0.0064	0.0063	<0.005	<0.005	0.006	<0.0050
Iron	mg/L	0.300	5.6	11	3.2	9.0	25	6.1	3.3	1.2	3.8	4.1	2.2
Magnesium	mg/L		28	26	26	24	18	23	21	22	32	15	22
Potassium	mg/L		13	6.6	4.7	5.1	8.2	5.0	5.8	5.1	9	7.7	9.1
Sodium	mg/L		14	10	12	12	5.9	8.7	8.5	9.4	68	10	13
Nickel	mg/L	0.025	0.011	0.015	0.005	0.013	0.029	0.0081	0.0051	0.004	0.013	0.006	0.0041
Zinc	mg/L	0.02	0.044	0.032	0.019	0.030	0.061	0.018	0.012	0.02	0.016	0.01	0.01
pH	(pH units)	6.5-8.5	7.10	7.92	8.12	7.22	7.69	7.82	7.00		8.37	8.33	8.21
Total Organic Carbon	mg/L		33.3	16	23	14	9.4	10	9.5		8.1		14
Aluminum	mg/L	0.075*								0.80		6.1	
Arsenic	mg/L	0.100*								0.001		0.003	
Barium	mg/L									0.035		0.061	
Beryllium	mg/L	1.100								<0.0006		<0.0006	
Bismuth	mg/L									<0.0010		<0.0010	
Cadmium	mg/L	0.0002								<0.0001		<0.0001	
Cobalt	mg/L	0.0009								0.0007		0.0017	
Copper	mg/L	0.005								0.007		0.008	
Lead	mg/L	0.005								0.001		0.0019	
Molybdenum	mg/L	0.040*								0.011		0.017	
Selenium	mg/L	0.100								<0.005		<0.005	
Silver	mg/L	0.0001								<0.00010		<0.00010	
Strontium	mg/L									0.29		0.25	
Tin	mg/L									<0.002		<0.002	
Titanium	mg/L									0.017		0.26	
Total Kjeldahl Nitrogen (TKN)	mg/L									1.3		1.3	
Total Phosphorus	mg/L	0.02*								0.093		0.10	
Vanadium	mg/L	0.006*								0.002		0.014	
Ion Percentage	%		2.2	1.6	1.2	4.6	5.6	2.7	3.9		20.1		2.8
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.2	<0.20	<0.2
Toluene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20	<0.3	<0.20	<0.3
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.2	<0.20	<0.2
o-Xylene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20	<0.3	<0.20	<0.3
p+m-Xylene	ug/L		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.40	<0.6	<0.40	<0.6
Total Xylenes	ug/L												
Total Oil & Grease	mg/L												

NOTES:

- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
- 2) * denotes interim PWQO.
- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	East Ditch Line (Poplar System) - SS14A										
Date			11-Jan-14	8-Apr-14	7-Jul-14	15-Oct-14	4-Jan-15	10-Apr-15	25-Oct-15	25-Feb-16	7-Apr-16	21-Oct-16	12-Jan-17
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	64		52	200	70	220	180	180	180	91	120
Chloride	mg/L		7	140	5	24	10	15	35	11	7.4	33	21
Sulphate	mg/L		37	190	23	96	37	110	250	160	93	290	56
Ammonia (as N)	mg/L		0.58	0.075	0.08	0.075	0.45	0.075	0.075	0.075	0.24	0.075	0.49
Ammonia Unionized	mg/L	0.02	0.009	<0.0013	<0.0073	<0.0028	0.0051	<0.009	<0.00076	<0.0021	0.0019	<0.0048	0.0014
Nitrate	mg/L		1.4	0.05	0.31	0.05	1.22	0.05	0.1	0.37	0.12	4.64	1.81
Nitrite	mg/L												
Phenols	mg/L	0.001	0.002	0.005	0.002	0.0097	0.0077	<0.0010	<0.0010	<0.0010	<0.0010	<0.0040	<0.0040
Boron	mg/L	0.200	0.06	1.5	0.10	0.18	0.063	0.10	0.54	0.16	0.10	0.07	0.13
Calcium	mg/L		30	100	25	85	33	91	110	89	73	120	120
Chromium	mg/L	0.0089	<0.0050	<0.0050	0.027	<0.0050	<0.0050	<0.0050	<0.005	<0.0050	0.011	<0.005	0.061
Iron	mg/L	0.300	0.33	0.21	24.0	3.3	2.2	0.58	0.60	0.32	6.2	0.90	58
Magnesium	mg/L		7.8	36	9	29	8.7	26	24	26	22	27	34
Potassium	mg/L		7.3	8.4	7.8	13	8.3	5.2	5.9	4.1	5.8	3.7	17
Sodium	mg/L		3.4	110	2	9.5	3.3	8.9	31	11	8.2	16	7.1
Nickel	mg/L	0.025	<0.0010	0.010	0.031	0.0056	0.0033	0.002	0.002	0.0013	0.0078	0.006	0.077
Zinc	mg/L	0.02	0.0089	0.0059	0.065	0.023	0.013	0.006	<0.01	0.0077	0.027	<0.01	0.15
pH	(pH units)	6.5-8.5	8.07	7.73	7.97	7.85	7.99	8.45	7.46	8.21	7.72	8.24	7.40
Total Organic Carbon	mg/L		7.5	12	16	33	9.2	9.7	10	5.9	9.5	10	8.6
Aluminum	mg/L	0.075*											
Arsenic	mg/L	0.100*											
Barium	mg/L												
Beryllium	mg/L	1.100											
Bismuth	mg/L												
Cadmium	mg/L	0.0002											
Cobalt	mg/L	0.0009											
Copper	mg/L	0.005											
Lead	mg/L	0.005											
Molybdenum	mg/L	0.040*											
Selenium	mg/L	0.100											
Silver	mg/L	0.0001											
Strontium	mg/L												
Tin	mg/L												
Titanium	mg/L												
Total Kjeldahl Nitrogen (TKN)	mg/L												
Total Phosphorus	mg/L	0.02*											
Vanadium	mg/L	0.006*											
Ion Percentage	%		2.5		8.0	2.6	2.7	0.3	2.4	0.4	0.9	0.5	20.3
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.10	<0.10
Toluene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.10	<0.20
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.10
o-Xylene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.10	<0.10
p+m-Xylene	ug/L		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.10	<0.10
Total Xylenes	ug/L											<0.10	<0.10
Total Oil & Grease	mg/L												

NOTES:

- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
- 2) * denotes interim PWQO.
- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.
- 12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	East Ditch Line (Poplar System) - SS14A										
Date			6-Apr-17	13-Jul-17	28-Oct-17	23-Jan-18	4-Apr-18	8-Aug-18	8-Aug-18	31-Oct-18	7-Feb-19	17-Apr-19	2-Oct-19
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas
Alkalinity (as CaCO ₃)	mg/L	<25%***	220	98	120	160	170	84		140	190	230	150
Chloride	mg/L		33	4.4	17	13	13	4.6	4.7	13	13	15	6.3
Sulphate	mg/L		160	26	200	150	110	97		72	95	210	180
Ammonia (as N)	mg/L		0.075	0.075	0.03	0.22	0.13	0.025	0.025	0.057	0.025	0.025	0.025
Ammonia Unionized	mg/L	0.02	<0.0005	<0.013	<0.0005	0.0061	<0.0005	<0.0005		<0.00061	<0.00061	<0.0079	<0.0015
Nitrate	mg/L		0.55	0.05	1.28	1.84	1.22	0.05		0.9	1.5	0.05	0.11
Nitrite	mg/L								<0.010				
Phenols	mg/L	0.001	<0.0040	<0.0040	<0.0010	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	0.001
Boron	mg/L	0.200	0.19	0.1	0.09	0.11	0.29	0.07	0.07	0.06	0.06	0.1	0.16
Calcium	mg/L		110	53	86	79	83	57	58	60	74	110	87
Chromium	mg/L	0.0089	<0.005	0.016	<0.005	<0.005	0.013	0.011	0.01	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.300	1.8	18	1.8	3.3	13	9.2	8.4	4.4	<0.1	0.1	1.6
Magnesium	mg/L		34	11	23	27	26	14	14	18	26	43	28
Potassium	mg/L		7.5	6.2	6.3	4.4	5.9	0.014	6	11	5.5	4.9	4.4
Sodium	mg/L		18	7	10	9.6	12	6.1	5.2	4.3	7.5	13	10
Nickel	mg/L	0.025	0.004	0.028	0.003	0.006	0.016	5.2	0.012	0.007	0.001	0.001	0.004
Zinc	mg/L	0.02	0.02	0.14	0.02	<0.01	0.04	0.02	0.02	0.02	<0.01	<0.01	<0.01
pH	(pH units)	6.5-8.5	7.19	8.17	7.25	8.4	7.21	7.06	7.06	6.72	7.85	8.53	7.86
Total Organic Carbon	mg/L		11	12	10	6.2	12	11		15	9.9	9.7	10
Aluminum	mg/L	0.075*							5.3				
Arsenic	mg/L	0.100*							0.003				
Barium	mg/L								0.045				
Beryllium	mg/L	1.100							<0.0006				
Bismuth	mg/L								<0.001				
Cadmium	mg/L	0.0002							<0.0001				
Cobalt	mg/L	0.0009							0.0034				
Copper	mg/L	0.005							0.01				
Lead	mg/L	0.005							0.0035				
Molybdenum	mg/L	0.040*							0.007				
Selenium	mg/L	0.100							<0.005				
Silver	mg/L	0.0001							<0.0004				
Strontium	mg/L								0.18				
Tin	mg/L								<0.002				
Titanium	mg/L								0.075				
Total Kjeldahl Nitrogen (TKN)	mg/L								<0.7				
Total Phosphorus	mg/L	0.02*							0.18				
Vanadium	mg/L	0.006*							0.011				
Ion Percentage	%		1.7	11.1	1.1	0.1	3.6	2.7	47.1	1.5	0.6	0.8	0.9
Benzene	ug/L		<0.10	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.20	<0.25	<0.50
Toluene	ug/L		<0.20	<0.20	<0.10	<0.20	<0.50	<0.20	<0.20	<0.50	<0.40	<0.50	<1.0
Ethylbenzene	ug/L		<0.10	<0.10	<0.20	<0.10	<0.25	<0.20	<0.20	<0.25	<0.20	<0.25	<0.50
o-Xylene	ug/L		<0.10	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.20	<0.25	<0.50
p+m-Xylene	ug/L		<0.10	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.20	<0.25	<0.50
Total Xylenes	ug/L		<0.10	<0.10	<0.10	<0.10	<0.25	<0.20	<0.20	<0.25	<0.20	<0.25	<0.50
Total Oil & Grease	mg/L												

NOTES:

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- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.
- 12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	East Ditch Line (Poplar System) - S514A										
Date			2-Oct-19	11-Jan-20	18-May-20	15-Nov-20							
Routine/Storm Monitoring			Storm	Routine	Routine	Routine							
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas							
Alkalinity (as CaCO ₃)	mg/L	<25%***		120	170	170							
Chloride	mg/L		6.9	8.6	5.6	210							
Sulphate	mg/L			74	140	200							
Ammonia (as N)	mg/L		0.025	0.025	0.078	0.064							
Ammonia Unionized	mg/L	0.02		0.00048	0.0035	0.00083							
Nitrate	mg/L		0.16	0.49	0.22	23.7							
Nitrite	mg/L		0.019										
Phenols	mg/L	0.001		0.0005	<0.0010	<0.0010							
Boron	mg/L	0.200	0.15	0.03	0.06	1.30							
Calcium	mg/L		86	55	72	130							
Chromium	mg/L	0.0089	0.0025	0.0025	<0.005	<0.005							
Iron	mg/L	0.300	1.60	2.50	1.90	1.80							
Magnesium	mg/L		29	17	22	42							
Potassium	mg/L		4.4	0.004	3.5	18							
Sodium	mg/L		10	4.4	6.8	120							
Nickel	mg/L	0.025	0.004	0.004	0.004	0.017							
Zinc	mg/L	0.02	<0.01	0.01	<0.01	0.01							
pH	(pH units)	6.5-8.5	8.01	8.21	8.2	7.8							
Total Organic Carbon	mg/L			7.5	18.0	23							
Aluminum	mg/L	0.075*	1										
Arsenic	mg/L	0.100*	0.001										
Barium	mg/L		0.043										
Beryllium	mg/L	1.100	<0.0006										
Bismuth	mg/L		<0.001										
Cadmium	mg/L	0.0002	<0.0001										
Cobalt	mg/L	0.0009	0.0008										
Copper	mg/L	0.005	0.005										
Lead	mg/L	0.005	0.001										
Molybdenum	mg/L	0.040*	0.012										
Selenium	mg/L	0.100	<0.005										
Silver	mg/L	0.0001	<0.0004										
Strontium	mg/L		0.4										
Tin	mg/L		<0.002										
Titanium	mg/L		0.021										
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.7										
Total Phosphorus	mg/L	0.02*	0.088										
Vanadium	mg/L	0.006*	0.003										
Ion Percentage	%		47.4	0.9	3.0	3.7							
Benzene	ug/L		<0.20	<0.10	<0.25	<0.25							
Toluene	ug/L		<0.20	<0.20	<0.50	<0.50							
Ethylbenzene	ug/L		<0.20	<0.10	<0.25	<0.25							
o-Xylene	ug/L		<0.20	<0.10	<0.25	<0.25							
p+m-Xylene	ug/L		<0.20	<0.10	<0.25	<0.25							
Total Xylenes	ug/L		<0.20	<0.10	<0.25	<0.25							
Total Oil & Grease	mg/L												

- NOTES:
- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
 - 2) * denotes interim PWQO.
 - 3) *** denotes change from background concentrations.
 - 4) Historic chemical anomalies retained in database.
 - 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
 - 6) mg/L denotes milligrams per litre.
 - 7) umho/cm denotes microsiemens per centimeter.
 - 8) BOD denotes biological oxygen demand.
 - 9) COD denotes chemical oxygen demand.
 - 10) Blank denotes parameter not analyzed.
 - 11) Bolded text and shading denotes concentration exceeds criterion.
 - 12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	West Ditch Line (Poplar System) - SS15 / SS14B										
Date			9-Apr-02	4-Apr-03	13-Jun-03	15-Sep-03	3-May-04	31-Jul-04	23-Sep-05	9-Nov-05	18-Jan-06	9-Mar-06	3-Aug-06
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Storm
Laboratory			Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Alkalinity (as CaCO ₃)	mg/L	<25%***	105	89	148	76	166	84	131	75	141	97	102
Chloride	mg/L		13	13	16	20	8	10	48	26	14	11	32
Sulphate	mg/L		169	183	322	277	226	163	241	132	120	60	364
Ammonia (as N)	mg/L		0.12	0.07	0.06	0.03	0.35	0.08	0.05	0.11	0.39	0.60	0.03
Ammonia Unionized	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Nitrate	mg/L		2.86	6.01	7.19	0.39	3.01	0.34	7.56	5.63	1.81	0.89	2.38
Nitrite	mg/L								0.14				<0.10
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.48	0.21	0.51	0.35	0.37	0.20	0.63	0.26	0.37	0.15	0.26
Calcium	mg/L		68	78	126	122	93	57	107	71	67	39	119
Chromium	mg/L	0.0089	<0.01	<0.005	<0.005	<0.005	<0.005	0.012	0.002	0.074	0.002	0.001	0.002
Iron	mg/L	0.300	1.01	1.33	1.28	0.52	0.75	8.42	0.51	59.0	0.47	0.65	0.21
Magnesium	mg/L		23	26	47	28	28	21	31	22	21	12	37
Potassium	mg/L		4	3	3	10	4	4	6	4	3	4	7
Sodium	mg/L		20	12	19	18	15	11	26	16	12	8	26
Nickel	mg/L	0.025	<0.01	<0.005	<0.005	<0.005	<0.005	0.037	0.009	0.083	<0.005	<0.005	0.005
Zinc	mg/L	0.020	<0.01	0.012	0.027	<0.005	0.03	0.34	<0.01	0.15	0.01	<0.01	<0.01
pH	(pH units)	6.5-8.5							12.4	7.89	7.68	7.84	7.45
Total Organic Carbon	mg/L								12.4		7.7	5.5	8.3
Aluminum	mg/L	0.075*							0.68				0.20
Arsenic	mg/L	0.100*							0.001				0.001
Barium	mg/L								0.04				0.04
Beryllium	mg/L	1.100							<0.001				<0.001
Bismuth	mg/L								<0.005				<0.005
Cadmium	mg/L	0.0002							<0.0001				<0.0001
Cobalt	mg/L	0.0009							0.0009				0.0005
Copper													
Lead	mg/L	0.005							<0.001				0.006
Molybdenum	mg/L	0.040*							0.012				0.025
Selenium	mg/L	0.100							0.003				0.003
Silver	mg/L	0.0001							<0.0001				<0.0001
Strontium	mg/L								0.461				0.533
Tin	mg/L								<0.01				<0.01
Titanium	mg/L								0.02				<0.01
Total Kjeldahl Nitrogen (TKN)	mg/L								1.29				0.73
Total Phosphorus	mg/L	0.02*							0.19				0.07
Vanadium	mg/L	0.006*							0.003				0.001
Ion Percentage	%		2.8	4.1	3.6	4.7	0.1	0.5	1.9	6.7	2.3	2.0	0.3

- NOTES:
- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
 - 2) * denotes interim PWQO.
 - 3) *** denotes change from background concentrations.
 - 4) Historic chemical anomalies retained in database.
 - 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
 - 6) mg/L denotes milligrams per litre.
 - 7) umho/cm denotes microsiemens per centimeter.
 - 8) BOD denotes biological oxygen demand.
 - 9) COD denotes chemical oxygen demand.
 - 10) Blank denotes parameter not analyzed.
 - 11) Bolded text and shading denotes concentration exceeds criterion.
 - 12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station adjacent to the Poplar System in late spring of 2011.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	West Ditch Line (Poplar System) - SS15 / SS14B										
Date			5-Oct-06	17-Nov-06	2-Mar-07	9-Jan-08	19-Mar-08	14-Jun-08	17-Jul-08	9-Sep-08	4-Nov-08	12-Feb-09	6-Apr-09
Routine/Storm Monitoring			Routine	Storm	Routine	Routine	Routine	Storm	Storm	Storm	Storm	Routine	Routine
Laboratory			Accutest	Accutest	Accutest	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	140	169	101	123	99		100	85	118	101	111
Chloride	mg/L		51	28	16	33	12	21	27	17	25	10	16
Sulphate	mg/L		111	139	68	145	59		216	192	173	48	120
Ammonia (as N)	mg/L		0.04	0.20	0.76		0.33	0.075	0.075	0.075	0.23	0.1	0.075
Ammonia Unionized	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate	mg/L		26.3	2.88	1.92	3.5	0.8	1.0	0.8	0.5	1.4	1.5	2.0
Nitrite	mg/L		<0.10	<0.10			0.02	0.03	0.04	0.03	0.03	0.02	
Phenols	mg/L	0.001	0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.200	0.36	0.43	0.16	0.33	0.18	0.19	0.19	0.14	0.23	0.16	0.20
Calcium	mg/L		110	80	48	73	45	79	95	88	79	48	86
Chromium	mg/L	0.0089	0.002	0.001	<0.001	0.017	<0.005	0.009	<0.005	0.017	0.008	0.02	0.014
Iron	mg/L	0.300	0.37	0.35	0.27	7.8	2.1	9.2	1.4	11	8.6	22	14
Magnesium	mg/L		30	25	14	22	14	23	29	31	26	16	27
Potassium	mg/L		7	5	5	5	3.8	5.2	4.3	8.9	7.8	6	4.9
Sodium	mg/L		20	19	14	19	10	16	19	15	14	8.2	13
Nickel	mg/L	0.025	<0.005	<0.005	<0.005	0.014	0.003	0.015	0.003	0.017	0.011	0.026	0.022
Zinc	mg/L	0.020	<0.01	<0.01	<0.01	0.03	0.01	0.03	0.008	0.04	0.04	0.058	0.10
pH	(pH units)	6.5-8.5	7.86	7.96	7.75	7.83	6.84	7.66	7.41	7.32	8.08	6.70	8.45
Total Organic Carbon	mg/L		10.5	9.8	7.7	10.6	7.1	8.2	7.6	6.9	11.1	12.7	17
Aluminum	mg/L	0.075*		0.80				5.9	0.93	11	5.5		
Arsenic	mg/L	0.100*		<0.001				0.004	0.001	0.004	0.003		
Barium	mg/L			0.04				0.058	0.04	0.088	0.055		
Beryllium	mg/L	1.100		<0.001				<0.0006	<0.0006	<0.0006	<0.0006		
Bismuth	mg/L			<0.005				<0.001	<0.001	<0.001	<0.001		
Cadmium	mg/L	0.0002		<0.0001				0.0005	<0.0001	<0.0001	<0.0001		
Cobalt	mg/L	0.0009		0.0005				0.0038	0.0006	0.0047	0.0033		
Copper	mg/L	0.005		0.003				0.010	0.004	0.010	0.008		
Lead	mg/L	0.005		<0.001				0.0044	0.0007	0.005	0.0034		
Molybdenum	mg/L	0.040*		<0.005				0.015	0.02	0.023	0.009		
Selenium	mg/L	0.100		<0.001				<0.002	<0.005	<0.005	<0.005		
Silver	mg/L	0.0001		<0.0001				<0.0001		<0.0001	<0.0001		
Strontium	mg/L			0.291				0.30	0.39	0.42	0.31		
Tin	mg/L			<0.01				<0.001	<0.002	<0.002	<0.002		
Titanium	mg/L			0.01				0.10		0.39	0.096		
Total Kjeldahl Nitrogen (TKN)	mg/L		1.18	1.28				2	0.7	1	1.8		
Total Phosphorus	mg/L	0.02*	0.13	0.20				0.21	0.07	0.23	0.78		
Vanadium	mg/L	0.006*		0.001				0.012	0.002	0.025	0.011		
Ion Percentage	%		10.0	2.2	5.1	1.9	5.4		3.9	7.1	2.5	9.2	10.3
Benzene	ug/L							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L							<0.2	<0.2	<0.3	<0.2	<0.3	<0.3
Ethylbenzene	ug/L							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L							<0.2	<0.2	<0.3	<0.2	<0.3	<0.3
p+m-Xylene	ug/L							<0.4	<0.4	<0.6	<0.4	<0.6	<0.6
Total Xylenes	ug/L							<0.4	<0.4	<0.6	<0.4		
Total Oil & Grease	mg/L							<0.5	<0.5	<0.5	<0.5		

NOTES:

- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
- 2) * denotes interim PWQO.
- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.
- 12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station adjacent to the Poplar System in late spring of 2011.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	West Ditch Line (Poplar System) - SS14B										
Date			7-Jun-11	9-Aug-11	29-Nov-11	13-Jan-13	10-Apr-13	5-Jul-13	28-Aug-13	7-Oct-13	11-Jan-14	8-Apr-14	7-Jul-14
Routine/Storm Monitoring			Storm	Storm	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***		56	98	200	110	130		250	60		64
Chloride	mg/L		6	28	28	110	48	85	21	130	7	130	12
Sulphate	mg/L			220	46	210	95	150		170	24	180	120
Ammonia (as N)	mg/L		0.15	0.075	0.075	0.075	0.21	0.075	0.075	0.075	0.83	0.075	0.075
Ammonia Unionized	mg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.014		<0.0079	0.0075	<0.0034	<0.0013
Nitrate	mg/L		0.02	1.2	0.2	0.37	0.58	0.05	0.05	0.05	0.99	0.05	0.05
Nitrite	mg/L		0.3	<0.01					<0.010				
Phenols	mg/L	0.001		0.001	<0.001	<0.0010	<0.0010	<0.0010		<0.0010	0.0024	0.005	0.003
Boron	mg/L	0.200	0.16	0.41	0.67	1.4	0.75	1.5	0.3	2.0	0.042	1.4	0.23
Calcium	mg/L		52	74	30	110	250	92	77	120	26	100	80
Chromium	mg/L	0.0089	0.029	<0.005	<0.005	<0.0050	0.092	<0.0050	0.01	<0.0050	<0.0050	<0.0050	0.013
Iron	mg/L	0.300	30	3.2	4.3	0.86	94	3.8	7	1.8	3.3	0.14	12
Magnesium	mg/L		16	23	11	35	57	21	19	36	6.2	33	19
Potassium	mg/L		6.3	5.4	6.2	8.3	13	9	9.8	10	8.4	8.1	5.9
Sodium	mg/L		4.7	31	34	100	45	68	18	110	2.3	100	13
Nickel	mg/L	0.025	0.039	0.006	0.007	0.0080	0.13	0.013	0.011	0.012	0.005	0.0096	0.018
Zinc	mg/L	0.020	0.08	0.008	0.022	0.0067	0.45	0.016	0.02	0.0077	0.018	<0.0050	0.03
pH	(pH units)	6.5-8.5	7.21	6.92	7.10	7.47	7.09	8.19	8.22	8.11	7.84	8.12	7.16
Total Organic Carbon	mg/L			7.8	8.2	11	7.9	16		17	9.3	12	10
Aluminum	mg/L	0.075*	18	1.9					8.4				
Arsenic	mg/L	0.100*	0.008	0.002					0.004				
Barium	mg/L		0.14	0.031					0.078				
Beryllium	mg/L	1.100	0.0010	<0.0005					<0.0006				
Bismuth	mg/L		<0.001	<0.001					<0.0010				
Cadmium	mg/L	0.0002	0.0002	<0.0001					<0.0001				
Cobalt	mg/L	0.0009	0.011	0.0015					0.0039				
Copper	mg/L	0.005	0.021	0.005					0.01				
Lead	mg/L	0.005	0.015	0.0013					0.0037				
Molybdenum	mg/L	0.040*	0.009	0.02					0.016				
Selenium	mg/L	0.100	<0.005	0.004					<0.005				
Silver	mg/L	0.0001	<0.0001						<0.00010				
Strontium	mg/L		0.16	0.36					0.39				
Tin	mg/L		<0.002	<0.001					<0.002				
Titanium	mg/L		0.34	0.047					0.2				
Total Kjeldahl Nitrogen (TKN)	mg/L		5	2					1.5				
Total Phosphorus	mg/L	0.02*	0.8	0.092					0.18				
Vanadium	mg/L	0.006*	0.035	0.004					0.017				
Ion Percentage	%			2.0	2.2	3.0	28.3	4.0	41.6	3.5	3.0	12.2	10.5
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		<0.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.2	<0.3	<0.3	<0.3	<0.3
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		<0.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.2	<0.3	<0.3	<0.3	<0.3
p+m-Xylene	ug/L		<0.4	<0.6	<0.6	<0.6	<0.6	<0.6	<0.4	<0.6	<0.6	<0.6	<0.6
Total Xylenes	ug/L		<0.4	<0.6									
Total Oil & Grease	mg/L		<0.5										

- NOTES:
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 - 2) * denotes interim PWQO.
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 - 6) mg/L denotes milligrams per litre.
 - 7) umho/cm denotes microsiemens per centimeter.
 - 8) BOD denotes biological oxygen demand.
 - 9) COD denotes chemical oxygen demand.
 - 10) Blank denotes parameter not analyzed.
 - 11) Bolded text and shading denotes concentration exceeds criterion.
 - 12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station adjacent to the Poplar System in late spring of 2011.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	West Ditch Line (Poplar System) - SS14B										
Date			4-Jan-15	10-Apr-15	25-Oct-15	7-Apr-16	14-Jul-16	21-Oct-16	12-Jan-17	6-Apr-17	13-Jul-17	28-Oct-17	23-Jan-18
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	70	250	77	210	100	97	120	220	65	130	180
Chloride	mg/L		10	48	30	21	22	33	21	33	13	33	39
Sulphate	mg/L		38	250	150	130	110	310	62	160	98	240	70
Ammonia (as N)	mg/L		0.44	0.075	0.075	0.075	0.075	0.075	0.51	0.075	0.075	0.056	0.089
Ammonia Unionized	mg/L	0.02	0.0076	<0.0061	<0.0014	<0.0019	<0.0068	<0.0037	0.0013	<0.0014	<0.013	<0.0005	0.0021
Nitrate	mg/L		1.19	1.15	0.57	0.65	0.05	4.28	1.89	0.54	1.46	0.75	1.26
Nitrite	mg/L												
Phenols	mg/L	0.001	0.0084	<0.0010	<0.0010	<0.0010	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0010	0.0015
Boron	mg/L	0.200	0.064	0.28	0.10	0.15	0.13	0.08	0.14	0.20	0.1	0.09	0.46
Calcium	mg/L		33	150	62	94	64	130	110	120	200	100	66
Chromium	mg/L	0.0089	<0.0050	0.0057	<0.005	<0.0050	0.007	<0.005	0.052	<0.005	0.11	<0.005	<0.005
Iron	mg/L	0.300	2.2	5.2	1.4	1.6	3.5	1.7	52	2.4	110	0.7	1.5
Magnesium	mg/L		9	48	15	27	16	28	31	35	51	27	16
Potassium	mg/L		8.3	5.5	11	4.2	9.9	4.7	15	6.7	26	5.5	6.9
Sodium	mg/L		3.3	29	16	14	12	16	6.7	18	9	19	30
Nickel	mg/L	0.025	0.0035	0.014	0.004	0.0029	0.006	0.004	0.072	0.005	0.15	0.003	0.005
Zinc	mg/L	0.020	0.012	0.032	0.020	0.011	0.010	<0.01	0.14	0.020	0.4	<0.01	0.01
pH	(pH units)	6.5-8.5	8.14	8.27	7.71	8.02	7.93	8.09	7.36	7.81	8.16	7.35	8.32
Total Organic Carbon	mg/L		11	11	6.9	9.2	9.5	12	8.6	11	8.2	8.6	9.8
Aluminum	mg/L	0.075*											
Arsenic	mg/L	0.100*											
Barium	mg/L												
Beryllium	mg/L	1.100											
Bismuth	mg/L												
Cadmium	mg/L	0.0002											
Cobalt	mg/L	0.0009											
Copper	mg/L	0.005											
Lead	mg/L	0.005											
Molybdenum	mg/L	0.040*											
Selenium	mg/L	0.100											
Silver	mg/L	0.0001											
Strontium	mg/L												
Tin	mg/L												
Titanium	mg/L												
Total Kjeldahl Nitrogen (TKN)	mg/L												
Total Phosphorus	mg/L	0.02*											
Vanadium	mg/L	0.006*											
Ion Percentage	%		2.7	2.6	1.1	0.4	1.8	0.6	17.7	3.2	30.8	1.2	0.3
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Toluene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.10	<0.10	<0.20	<0.20	<0.20	<0.10	<0.20
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.20	<0.20	<0.10	<0.10	<0.10	<0.20	<0.10
o-Xylene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
p+m-Xylene	ug/L		<0.6	<0.6	<0.6	<0.6	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Xylenes	ug/L						<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Oil & Grease	mg/L												

- NOTES:
- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
 - 2) * denotes interim PWQO.
 - 3) *** denotes change from background concentrations.
 - 4) Historic chemical anomalies retained in database.
 - 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
 - 6) mg/L denotes milligrams per litre.
 - 7) umho/cm denotes microsiemens per centimeter.
 - 8) BOD denotes biological oxygen demand.
 - 9) COD denotes chemical oxygen demand.
 - 10) Blank denotes parameter not analyzed.
 - 11) Bolded text and shading denotes concentration exceeds criterion.
 - 12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station adjacent to the Poplar System in late spring of 2011.
 - 13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	West Ditch Line (Poplar System) - SS14B										
Date			4-Apr-18	8-Aug-18	8-Aug-18	2-Oct-18	7-Feb-19	19-Apr-19	2-Oct-19	2-Oct-19	11-Jan-20	18-May-20	15-Nov-20
Routine/Storm Monitoring			Routine	Routine	Storm	Routine	Routine	Routine	Routine	Storm	Routine	Routine	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas
Alkalinity (as CaCO ₃)	mg/L	<25%***	170	49		240	180	180	140		150	200	130
Chloride	mg/L		13	7.7	9.5	120	45	33	150	150	49	94	140
Sulphate	mg/L		120	63		180	84	93	240		48	150	190
Ammonia (as N)	mg/L		0.13	0.13	0.086	0.092	0.19	0.025	0.76	0.93	0.11	0.62	0.17
Ammonia Unionized	mg/L	0.02	0.0009	0.0025		0.0018	0.0019	<0.0024	0.081		0.0026	0.034	0.0046
Nitrate	mg/L		1.19	1.07	1.07	8.63	2.23	0.99	5.16	5.15	6.15	6.00	12
Nitrite	mg/L				0.026					0.915			
Phenols	mg/L	0.001	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	0.001		0.0005	<0.0010	<0.0010
Boron	mg/L	0.200	0.24	0.06	0.06	0.02	0.16	0.11	0.77	0.78	0.43	0.77	1
Calcium	mg/L		83	45	44	0.2	80	160	130	130	120	100	110
Chromium	mg/L	0.0089	0.013	0.008	0.007	0.005	<0.005	0.052	<0.005	<0.005	0.041	0.012	0.009
Iron	mg/L	0.300	12	6.6	6.2	0.1	0.8	51	1.4	1.3	41	11	6.2
Magnesium	mg/L		26	16	16	0.05	24	41	40	40	32	33	35
Potassium	mg/L		5.7	4.1	3.9	0.2	5.5	10	10	10	14	10	21
Sodium	mg/L		12	7.6	7.6	0.1	21	17	63	62	37	63	86
Nickel	mg/L	0.025	0.015	0.01	0.009	0.001	0.003	0.072	0.014	0.014	0.06	0.022	0.02
Zinc	mg/L	0.020	0.04	0.01	0.01	0.01	<0.01	0.14	0.01	0.01	0.14	0.04	0.02
pH	(pH units)	6.5-8.5	7.71	7.5	7.5	7.67	7.96	8.43	8.43	8.43	8.23	8.30	8.1
Total Organic Carbon	mg/L		12	4.9		16	7.3	18	18		7.1	0.4	27
Aluminum	mg/L	0.075*			4.4					0.77			
Arsenic	mg/L	0.100*			0.002					0.001			
Barium	mg/L				0.038					0.063			
Beryllium	mg/L	1.100			<0.0006					<0.0006			
Bismuth	mg/L				<0.001					<0.001			
Cadmium	mg/L	0.0002			<0.0001					0.0002			
Cobalt	mg/L	0.0009			0.0026					0.0022			
Copper	mg/L	0.005			0.007					0.01			
Lead	mg/L	0.005			0.0021					0.0009			
Molybdenum	mg/L	0.040*			0.018					0.021			
Selenium	mg/L	0.100			<0.005					<0.005			
Silver	mg/L	0.0001			<0.0004					<0.0004			
Strontium	mg/L				0.16					0.56			
Tin	mg/L				<0.002					<0.002			
Titanium	mg/L				0.054					0.018			
Total Kjeldahl Nitrogen (TKN)	mg/L				<0.7					2.4			
Total Phosphorus	mg/L	0.02*			0.087					0.11			
Vanadium	mg/L	0.006*			0.009					0.002			
Ion Percentage	%		2.7	11.7	43.7	54.1	1.5	16.2	1.5	25.2	16.9	2.3	4.7
Benzene	ug/L		<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50
Toluene	ug/L		<0.50	<0.20	<0.20	<0.50	<0.20	<0.50	<1.0	<0.20	<0.20	<0.50	<1.0
Ethylbenzene	ug/L		<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50
o-Xylene	ug/L		<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50
p+m-Xylene	ug/L		<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50
Total Xylenes	ug/L		<0.25	<0.20	<0.20	<0.25	<0.10	<0.25	<0.50	<0.20	<0.10	<0.25	<0.50
Total Oil & Grease	mg/L												

- NOTES:
- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
 - 2) * denotes interim PWQO.
 - 3) *** denotes change from background concentrations.
 - 4) Historic chemical anomalies retained in database.
 - 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
 - 6) mg/L denotes milligrams per litre.
 - 7) umho/cm denotes microsiemens per centimeter.
 - 8) BOD denotes biological oxygen demand.
 - 9) COD denotes chemical oxygen demand.
 - 10) Blank denotes parameter not analyzed.
 - 11) Bolded text and shading denotes concentration exceeds criterion.
 - 12) Downstream station SS15 redesignated as background station SS14B as a result of grading modifications in September 2009, and was further redesignated as a station adjacent to the Poplar System in late spring of 2011.
 - 13) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	Inlet Point to Sedimentation Pond 1 (Poplar System) - S515A										
Date			3-Oct-09	10-Oct-09	25-Jan-10	6-Apr-10	6-Jun-10	5-Aug-10	14-Oct-10	28-Feb-11	20-Apr-11	7-Jun-11	9-Aug-11
Routine/Storm Monitoring			Routine	Storm	Routine	Routine	Storm	Routine	Storm	Routine	Routine	Storm	Storm
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	118		101	116		167	88	115	160		123
Chloride	mg/L		24	39	15	18	8	18	14	19	20	5	12
Sulphate	mg/L		260		73	180		230	180	91	140		310
Ammonia (as N)	mg/L		0.075	0.075	0.075	0.870	0.240	0.075	0.075	0.640	0.075	0.075	0.075
Ammonia Unionized	mg/L	0.02	<0.02		<0.02	<0.02		<0.02	<0.02	<0.02	<0.02		<0.02
Nitrate	mg/L		0.4	1.8	1.7	2.4	0.9	0.05	0.4	1.9	0.8	0.02	0.1
Nitrite	mg/L			0.02					0.01			0.3	0.03
Phenols	mg/L	0.001	<0.001		<0.001	<0.001		<0.001	<0.001	<0.001	<0.001		
Boron	mg/L	0.200	0.11	0.21	0.17	0.5	0.15	0.31	0.16	0.26	0.38	0.14	0.32
Calcium	mg/L		100	94	50	530	150	120	250	56	88	48	130
Chromium	mg/L	0.0089	<0.005	<0.005	<0.005	0.31	0.057	<0.005	0.080	<0.005	0.007	0.030	<0.005
Iron	mg/L	0.300	2.2	2.7	2.5	310	59	1.0	84	1.4	3.6	31	0.4
Magnesium	mg/L		32	28	15	150	40	29	61	19	29	16	27
Potassium	mg/L		5.4	5.8	5.2	41	10	6.8	16	4.5	5.5	6.9	6.6
Sodium	mg/L		17	19	12	22	8.9	16	9.2	16	21	4.5	16
Nickel	mg/L	0.025	0.004	0.004	0.004	0.42	0.083	0.002	0.11	0.003	0.011	0.041	0.002
Zinc	mg/L	0.020	0.006	<0.01	0.013	0.76	0.13	<0.005	0.20	0.012	0.025	0.08	<0.005
pH	(pH units)	6.5-8.5	7.72	8.26	8.83	7.94	7.98	7.73	8.10	7.70	8.01	7.23	8.16
Total Organic Carbon	mg/L		6.6		6.5	16.7		13.2	9.3	6.5	14.0		10.4
Aluminum	mg/L	0.075*		2.0			32		45			19	0.45
Arsenic	mg/L	0.100*		0.001			0.015		0.019			0.009	0.001
Barium	mg/L			0.043			0.18		0.26			0.12	0.05
Beryllium	mg/L	1.100		<0.0006			0.0017		0.0022			0.0011	<0.0005
Bismuth	mg/L			<0.001			<0.001		<0.001			<0.001	<0.001
Cadmium	mg/L	0.0002		<0.001			0.0002		0.0005			0.0002	<0.0001
Cobalt	mg/L	0.0009		0.0010			0.025		0.033			0.012	<0.0005
Copper	mg/L	0.005		0.005			0.044		0.054			0.021	0.005
Lead	mg/L	0.005		0.0011			0.022		0.033			0.014	<0.0005
Molybdenum	mg/L	0.040*		0.009			0.020		0.017			0.008	0.014
Selenium	mg/L	0.100		<0.005			<0.005		<0.005			<0.005	<0.002
Silver	mg/L	0.0001		<0.0001			<0.0001		0.0001			<0.0001	
Strontium	mg/L			0.39			0.39		0.47			0.15	0.43
Tin	mg/L			<0.002			<0.002		<0.002			<0.002	<0.001
Titanium	mg/L			0.037			0.66		0.72			0.35	0.015
Total Kjeldahl Nitrogen (TKN)	mg/L			1.5			4		5			7	1.5
Total Phosphorus	mg/L	0.02*		0.12			1.0		1.6			1.0	0.086
Vanadium	mg/L	0.006*		0.004			0.063		0.085			0.037	0.0014
Ion Percentage	%		1.4		5.1	36.9		3.6	26.6	2.2	4.1		0.7
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/L		<0.3	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3	<0.2	<0.3
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	ug/L		<0.3	<0.2	<0.3	<0.3	<0.2	<0.6	<0.2	<0.3	<0.3	<0.2	<0.3
p+m-Xylene	ug/L		<0.6	<0.4	<0.6	<0.6	<0.4	<0.3	<0.4	<0.6	<0.6	<0.4	<0.6
Total Xylenes	ug/L		<0.6	<0.4			<0.4		<0.4			<0.4	<0.6
Total Oil & Grease	mg/L			<0.5			<0.5		<1			<0.5	

NOTES:

- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
- 2) * denotes interim PWQO.
- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A										
Date			13-Oct-11	13-Mar-12	4-May-12	28-Jul-12	30-Oct-12	13-Jan-13	10-Apr-13	29-May-13	5-Jul-13	28-Aug-13	7-Oct-13
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Routine	Storm	Routine	Storm	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	191	140	95	82	81	120	100		82		180
Chloride	mg/L		20	15	28	11	19	14	11	10	13	21	44
Sulphate	mg/L		140	130	200	120	84	87	79		110		110
Ammonia (as N)	mg/L		0.075	0.075	0.075	0.075	0.20	0.075	0.075	0.70	0.075	0.075	1.69
Ammonia Unionized	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.015		0.12
Nitrate	mg/L		0.5	1.2	4.9	1.1	2.3	0.62	0.82	1.6	0.34	0.05	0.42
Nitrite	mg/L									0.11		<0.010	
Phenols	mg/L	0.001	0.012	0.0023	<0.0010	0.0041	<0.0010	<0.0010	<0.0010		<0.0010		0.0011
Boron	mg/L	0.200	0.26	0.29	0.38	0.21	0.18	0.20	0.26	0.32	0.29	0.39	0.91
Calcium	mg/L		93	78	86	73	56	59	110	59	60	63	78
Chromium	mg/L	0.0089	0.005	0.012	<0.0050	0.015	0.027	0.0073	0.042	<0.005	<0.0050	<0.005	<0.0050
Iron	mg/L	0.300	4.0	12	2.7	15	27	6.8	43	3.6	3.9	2.8	2.1
Magnesium	mg/L		24	24	24	19	19	18	30	15	16	22	23
Potassium	mg/L		13	6.5	5.7	6.2	8.7	5.5	8.9	5.7	6.5	5.2	11
Sodium	mg/L		14	14	15	11	13	13	12	11	13	12	41
Nickel	mg/L	0.025	0.016	0.016	0.005	0.021	0.033	0.0090	0.059	0.007	0.0065	0.005	0.0065
Zinc	mg/L	0.020	0.021	0.031	0.010	0.039	0.070	0.021	0.11	0.02	0.015	<0.01	0.011
pH	(pH units)	6.5-8.5	6.87	8.28	7.39	7.36	7.65	7.88	7.16		8.2	7.9	8.13
Total Organic Carbon	mg/L		29.5	17	14.0	12.0	17	11	8.8		8.7		15
Aluminum	mg/L	0.075*								2.6		4.5	
Arsenic	mg/L	0.100*								0.002		0.002	
Barium	mg/L									0.036		0.054	
Beryllium	mg/L	1.100								<0.0006		<0.0006	
Bismuth	mg/L									<0.0010		<0.0010	
Cadmium	mg/L	0.0002								<0.0001		<0.0001	
Cobalt	mg/L	0.0009								0.0015		0.0012	
Copper	mg/L	0.005								0.007		0.007	
Lead	mg/L	0.005								0.0017		0.0011	
Molybdenum	mg/L	0.040*								0.007		0.014	
Selenium	mg/L	0.100								<0.005		<0.005	
Silver	mg/L	0.0001								<0.00010		<0.00010	
Strontium	mg/L									0.18		0.33	
Tin	mg/L									<0.002		<0.002	
Titanium	mg/L									0.045		0.16	
Total Kjeldahl Nitrogen (TKN)	mg/L									1.9		1.5	
Total Phosphorus	mg/L	0.02*								0.10		0.2	
Vanadium	mg/L	0.006*								0.005		0.01	
Ion Percentage	%		0.9	2.9	0.7	6.9	7.0	2.8	19.3		4.0		2.4
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.2	<0.20	<0.2
Toluene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20	<0.3	<0.20	<0.3
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20	<0.2	<0.20	<0.2
o-Xylene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20	<0.3	<0.20	<0.3
p+m-Xylene	ug/L		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.40	<0.6	<0.40	<0.6
Total Xylenes	ug/L												
Total Oil & Grease	mg/L												

NOTES:

- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
- 2) * denotes interim PWQO.
- 3) *** denotes change from background concentrations.
- 4) Historic chemical anomalies retained in database.
- 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
- 6) mg/L denotes milligrams per litre.
- 7) umho/cm denotes microsiemens per centimeter.
- 8) BOD denotes biological oxygen demand.
- 9) COD denotes chemical oxygen demand.
- 10) Blank denotes parameter not analyzed.
- 11) Bolded text and shading denotes concentration exceeds criterion.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	Inlet Point to Sedimentation Pond 1 (Poplar System) - S515A										
Date			11-Jan-14	8-Apr-14	7-Jul-14	15-Oct-14	4-Jan-15	10-Apr-15	25-Oct-15	25-Feb-16	7-Apr-16	14-Jul-16	12-Jan-17
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	60		61	150	71	170	51	130	150	77	110
Chloride	mg/L		11	26	6	28	9	11	8.2	6.9	5.8	8.4	13
Sulphate	mg/L		46	120	68	56	33	60	900	92	70	120	40
Ammonia (as N)	mg/L		0.58	0.075	0.19	0.075	0.27	0.075	0.35	0.08	0.075	0.075	0.42
Ammonia Unionized	mg/L	0.02	0.0055	<0.0019	0.0085	<0.0021	0.0031	<0.0057	0.0051	<0.0013	<0.0018	<0.0044	0.0009
Nitrate	mg/L		1.60	0.79	0.47	0.05	1.02	0.35	1.67	1.00	0.37	1.15	1.23
Nitrite	mg/L												
Phenols	mg/L	0.001	0.002	0.006	0.002	0.013	0.0083	<0.0010	<0.0010	<0.0010	<0.0010	<0.0040	<0.0040
Boron	mg/L	0.200	0.095	0.28	0.19	0.19	0.099	0.12	0.13	0.11	0.12	0.18	0.13
Calcium	mg/L		30	80	41	67	32	63	250	63	64	62	50
Chromium	mg/L	0.0089	<0.0050	0.005	0.033	0.0057	<0.0050	<0.0050	<0.005	<0.0050	0.013	0.009	0.027
Iron	mg/L	0.300	0.36	2.90	30	4.7	2.0	3.2	0.20	2.4	6.6	7.9	23
Magnesium	mg/L		8.3	24	14	27	8.4	17	88	18	19	14	16
Potassium	mg/L		7.8	6.2	8.4	17	9.3	5.2	2.6	4.8	6.3	4.6	12
Sodium	mg/L		6.3	17	4.9	8.0	4	5.8	14	6.6	6.7	8.0	4.8
Nickel	mg/L	0.025	0.001	0.0078	0.038	0.0079	0.003	0.0047	0.002	0.0038	0.0086	0.012	0.030
Zinc	mg/L	0.020	0.012	0.011	0.077	0.021	0.014	0.010	<0.02	0.0069	0.019	0.020	0.060
pH	(pH units)	6.5-8.5	7.82	7.87	7.88	7.74	8.02	8.27	7.84	7.99	7.98	7.76	7.29
Total Organic Carbon	mg/L		7.4	10	18.0	42	11	9.9	7.6	6.4	10	6.7	15
Aluminum	mg/L	0.075*											
Arsenic	mg/L	0.100*											
Barium	mg/L												
Beryllium	mg/L	1.100											
Bismuth	mg/L												
Cadmium	mg/L	0.0002											
Cobalt	mg/L	0.0009											
Copper	mg/L	0.005											
Lead	mg/L	0.005											
Molybdenum	mg/L	0.040*											
Selenium	mg/L	0.100											
Silver	mg/L	0.0001											
Strontium	mg/L												
Tin	mg/L												
Titanium	mg/L												
Total Kjeldahl Nitrogen (TKN)	mg/L												
Total Phosphorus	mg/L	0.02*											
Vanadium	mg/L	0.006*											
Ion Percentage	%		1.9		6.6	6.5	3.5	0.2	0.3	1.7	3.1	2.4	6.4
Benzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.10	<0.10
Toluene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.20	<0.20
Ethylbenzene	ug/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.10	<0.10
o-Xylene	ug/L		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.10	<0.10
p+m-Xylene	ug/L		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.10	<0.10
Total Xylenes	ug/L											<0.10	<0.10
Total Oil & Grease	mg/L												

- NOTES:
- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
 - 2) * denotes interim PWQO.
 - 3) *** denotes change from background concentrations.
 - 4) Historic chemical anomalies retained in database.
 - 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
 - 6) mg/L denotes milligrams per litre.
 - 7) umho/cm denotes microsiemens per centimeter.
 - 8) BOD denotes biological oxygen demand.
 - 9) COD denotes chemical oxygen demand.
 - 10) Blank denotes parameter not analyzed.
 - 11) Bolded text and shading denotes concentration exceeds criterion.
 - 12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	Inlet Point to Sedimentation Pond 1 (Poplar System) - S515A										
Date			6-Apr-17	13-Jul-17	28-Oct-17	23-Jan-18	4-Apr-18	8-Aug-18	8-Aug-18	26-Sep-18	2-Oct-18	24-Jan-19	17-Apr-19
Routine/Storm Monitoring			Routine	Routine	Routine	Routine	Routine	Routine	Storm	Storm	Routine	Routine	Routine
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Alkalinity (as CaCO ₃)	mg/L	<25%***	220	84	100	120	170	80			180	77	210
Chloride	mg/L		33	2.9	15	10	12	7.6	7.4	7.9	28	12	28
Sulphate	mg/L		160	77	160	110	120	150			110	26	160
Ammonia (as N)	mg/L		0.075	0.55	0.03	0.13	0.16	0.025	0.025	0.025	0.025	0.9	0.025
Ammonia Unionized	mg/L	0.02	<0.0016	0.04	<0.0005	0.0032	0.0006	<0.0005			<0.00061	0.00087	<0.008
Nitrate	mg/L		0.52	1.04	2.73	3.14	1.22	5.28	4.83	0.05	2.75	0.88	0.90
Nitrite	mg/L								0.196	<0.010			
Phenols	mg/L	0.001	<0.0040	<0.0040	<0.0010	0.001	<0.0010	<0.0010			<0.0010	0.0014	<0.0010
Boron	mg/L	0.200	0.19	0.25	0.15	0.12	0.26	0.33	0.34	0.16	0.26	0.06	0.29
Calcium	mg/L		110	76	81	64	86	79	78	59	78	26	92
Chromium	mg/L	0.0089	<0.005	0.037	0.008	0.008	0.012	0.008	0.009	<0.005	<0.005	<0.005	<0.005
Iron	mg/L	0.300	2.00	38	5.5	7.7	12	7.3	7.3	1.60	3.8	0.6	0.7
Magnesium	mg/L		33	21	22	21	27	19	18	16	23	7.1	32
Potassium	mg/L		6.8	7.6	5.6	4.5	5.6	6	6.4	5.5	6.5	10	4.6
Sodium	mg/L		18	5.8	10	7.8	12	9.9	9.4	7.1	14	4.2	16
Nickel	mg/L	0.025	0.004	0.051	0.008	0.01	0.015	0.0110	0.011	0.003	0.007	0.001	0.003
Zinc	mg/L	0.020	0.020	0.10	0.02	0.02	0.04	0.020	0.02	<0.01	0.01	0.01	<0.01
pH	(pH units)	6.5-8.5	7.81	8.1	7.05	8.31	7.49	7.1	7.1	7.14	7.15	6.98	8.63
Total Organic Carbon	mg/L		11	14	10	8.4	12	11			13	12	10
Aluminum	mg/L	0.075*							5.8	1			
Arsenic	mg/L	0.100*							0.003	0.001			
Barium	mg/L								0.052	0.028			
Beryllium	mg/L	1.100							<0.0006	<0.0006			
Bismuth	mg/L								<0.001	<0.001			
Cadmium	mg/L	0.0002							<0.0001	<0.0001			
Cobalt	mg/L	0.0009							0.0028	0.0006			
Copper	mg/L	0.005							0.008	0.004			
Lead	mg/L	0.005							0.0029	0.0007			
Molybdenum	mg/L	0.040*							0.009	0.007			
Selenium	mg/L	0.100							<0.005	<0.005			
Silver	mg/L	0.0001							<0.0004	<0.0004			
Strontium	mg/L								0.26	0.22			
Tin	mg/L								<0.002	<0.002			
Titanium	mg/L								0.15	0.016			
Total Kjeldahl Nitrogen (TKN)	mg/L								<0.7	<0.7			
Total Phosphorus	mg/L	0.02*							0.18	0.066			
Vanadium	mg/L	0.006*							0.012	0.003			
Ion Percentage	%		1.4	14.4	2.8	2.0	3.6	5.3	46.6	45.5	0.5	1.1	1.0
Benzene	ug/L		<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25
Toluene	ug/L		<0.20	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.50	<0.50	<0.50
Ethylbenzene	ug/L		<0.10	<0.20	<0.20	<0.10	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25
o-Xylene	ug/L		<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25
p+m-Xylene	ug/L		<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25
Total Xylenes	ug/L		<0.10	<0.10	<0.10	<0.10	<0.20	<0.20	<0.20	<0.20	<0.25	<0.25	<0.25
Total Oil & Grease	mg/L												

NOTES:

1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.

2) * denotes interim PWQO.

3) *** denotes change from background concentrations.

4) Historic chemical anomalies retained in database.

5) Unionized ammonia values are calculated based on field determined pH and temperature values.

6) mg/L denotes milligrams per litre.

7) umho/cm denotes microsiemens per centimeter.

8) BOD denotes biological oxygen demand.

9) COD denotes chemical oxygen demand.

10) Blank denotes parameter not analyzed.

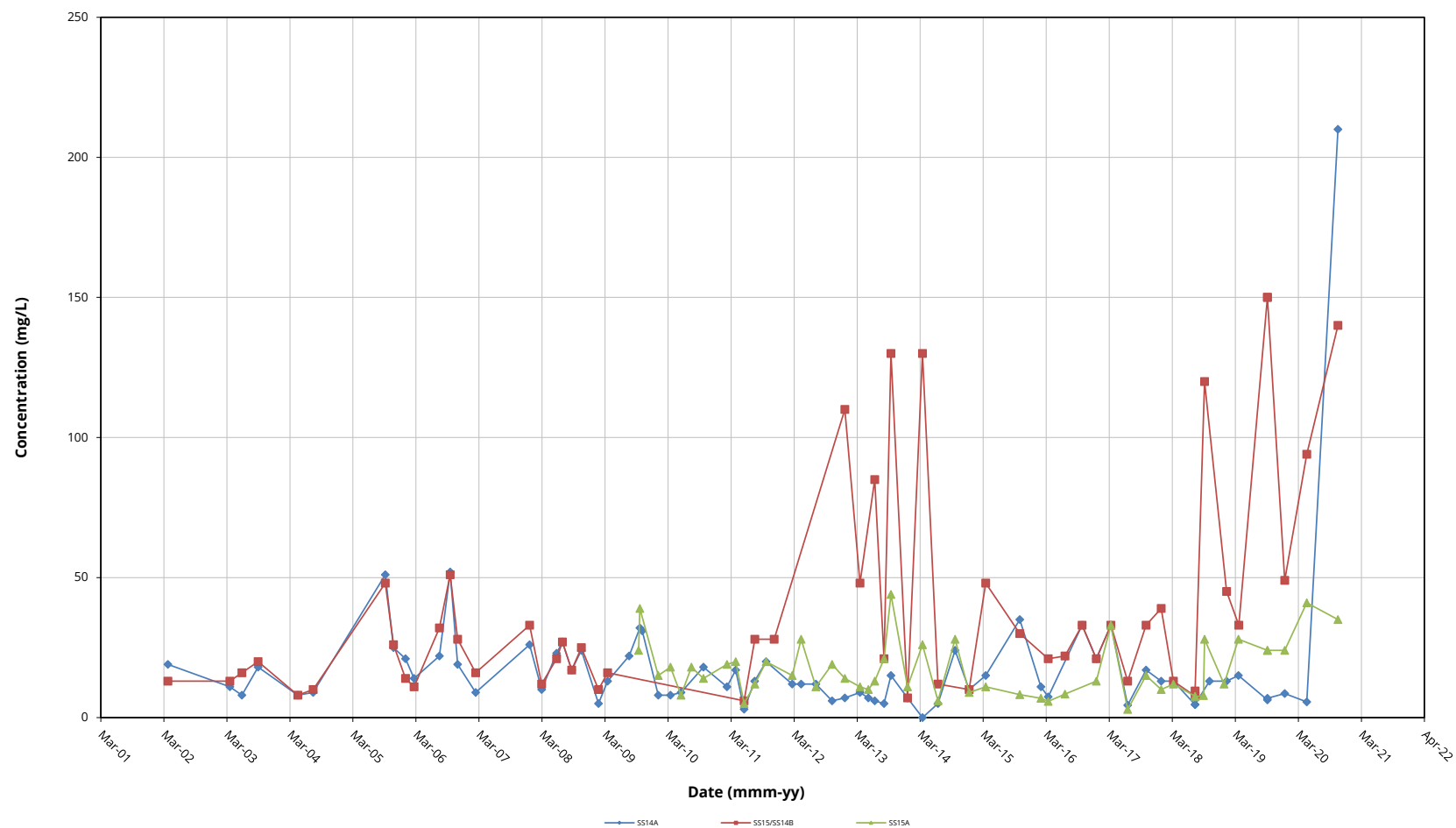
11) Bolded text and shading denotes concentration exceeds criterion.

12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.

Table J-2
Precipitation Event Surface Water Quality - Poplar System
Twin Creeks Environmental Centre - Poplar System

Parameter	Units	PWQO	Inlet Point to Sedimentation Pond 1 (Poplar System) - SS15A											
Date			2-Oct-19	2-Oct-19	11-Jan-20	18-May-20	15-Nov-20							
Routine/Storm Monitoring			Routine	Storm	Routine	Routine	Routine							
Laboratory			Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas	Bureau Veritas							
Alkalinity (as CaCO ₃)	mg/L	<25%***	120		120	170	100							
Chloride	mg/L		24	24	24	41	35							
Sulphate	mg/L		90		50	110	63							
Ammonia (as N)	mg/L		0.12	0.03	0.099	0.39	0.42							
Ammonia Unionized	mg/L	0.02	0.01		0.003	0.014	0.008							
Nitrate	mg/L		1.21	1.13	1.95	4.36	7.61							
Nitrite	mg/L			0.28										
Phenols	mg/L	0.001	<0.0010		0.0005	<0.0010	<0.0010							
Boron	mg/L	0.200	0.34	0.33	0.210	0.560	0.17							
Calcium	mg/L		61	61	62	64	57							
Chromium	mg/L	0.0089	<0.0050	<0.0050	0.0370	0.006	0.007							
Iron	mg/L	0.300	2.30	2.30	36.0	5.3	6.1							
Magnesium	mg/L		17	17	22	20	16							
Potassium	mg/L		8.1	8.3	12.0	6.6	19							
Sodium	mg/L		15	14	14.0	33	9.3							
Nickel	mg/L	0.025	0.005	0.005	0.044	0.012	0.01							
Zinc	mg/L	0.020	0.010	0.010	0.1	0.030	0.040							
pH	(pH units)	6.5-8.5	8.0	7.9	8.3	8.1	7.9							
Total Organic Carbon	mg/L		11		9.7	20	34							
Aluminum	mg/L	0.075*		1.40										
Arsenic	mg/L	0.100*		0.002										
Barium	mg/L			0.035										
Beryllium	mg/L	1.100		<0.0006										
Bismuth	mg/L			<0.001										
Cadmium	mg/L	0.0002		<0.0001										
Cobalt	mg/L	0.0009		0.0011										
Copper	mg/L	0.005		0.005										
Lead	mg/L	0.005		0.001										
Molybdenum	mg/L	0.040*		0.009										
Selenium	mg/L	0.100		<0.005										
Silver	mg/L	0.0001		<0.0004										
Strontium	mg/L			0.22										
Tin	mg/L			<0.002										
Titanium	mg/L			0.027										
Total Kjeldahl Nitrogen (TKN)	mg/L			0.8										
Total Phosphorus	mg/L	0.02*		0.11										
Vanadium	mg/L	0.006*		0.003										
Ion Percentage	%		1.7	38.7	9.0	1.7	4.2							
Benzene	ug/L		<0.50	<0.20	<0.10	<0.25	<0.50							
Toluene	ug/L		<1.0	<0.20	<0.20	<0.50	<1.0							
Ethylbenzene	ug/L		<0.50	<0.20	<0.10	<0.25	<0.50							
o-Xylene	ug/L		<0.50	<0.20	<0.10	<0.25	<0.50							
p+m-Xylene	ug/L		<0.50	<0.20	<0.10	<0.25	<0.50							
Total Xylenes	ug/L		<0.50	<0.20	<0.10	<0.25	<0.50							
Total Oil & Grease	mg/L													

- NOTES:
- 1) PWQO denotes Provincial Water Quality Objectives (1994) with updates.
 - 2) * denotes interim PWQO.
 - 3) *** denotes change from background concentrations.
 - 4) Historic chemical anomalies retained in database.
 - 5) Unionized ammonia values are calculated based on field determined pH and temperature values.
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 - 8) BOD denotes biological oxygen demand.
 - 9) COD denotes chemical oxygen demand.
 - 10) Blank denotes parameter not analyzed.
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 - 12) Italics denotes parameter concentration was below the laboratory RDL, where the RDL exceeds the relevant PWQO.



NOTES:

1. mg/L denotes milligrams per litre.

**CONCENTRATION VS. TIME PLOT
Chloride**

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

*TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION*

FIGURE NUMBER

J-1

DATE REVISED

18-Dec-20

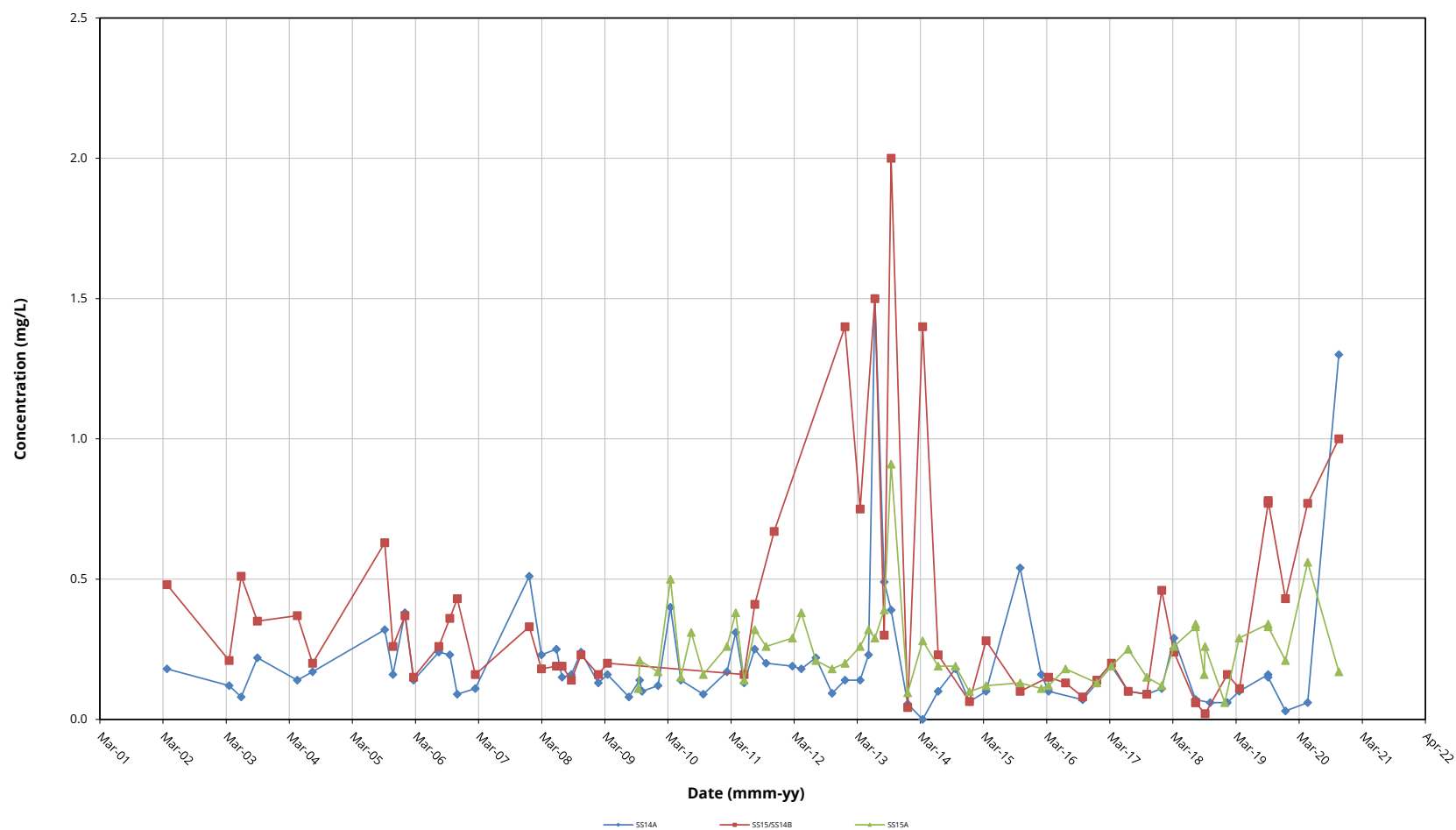
PROJECT NUMBER

2001313

REVISED BY

MSA





NOTES:

1. mg/L denotes milligrams per litre.

CONCENTRATION VS. TIME PLOT

Boron

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER

J-2

DATE REVISED

18-Dec-20

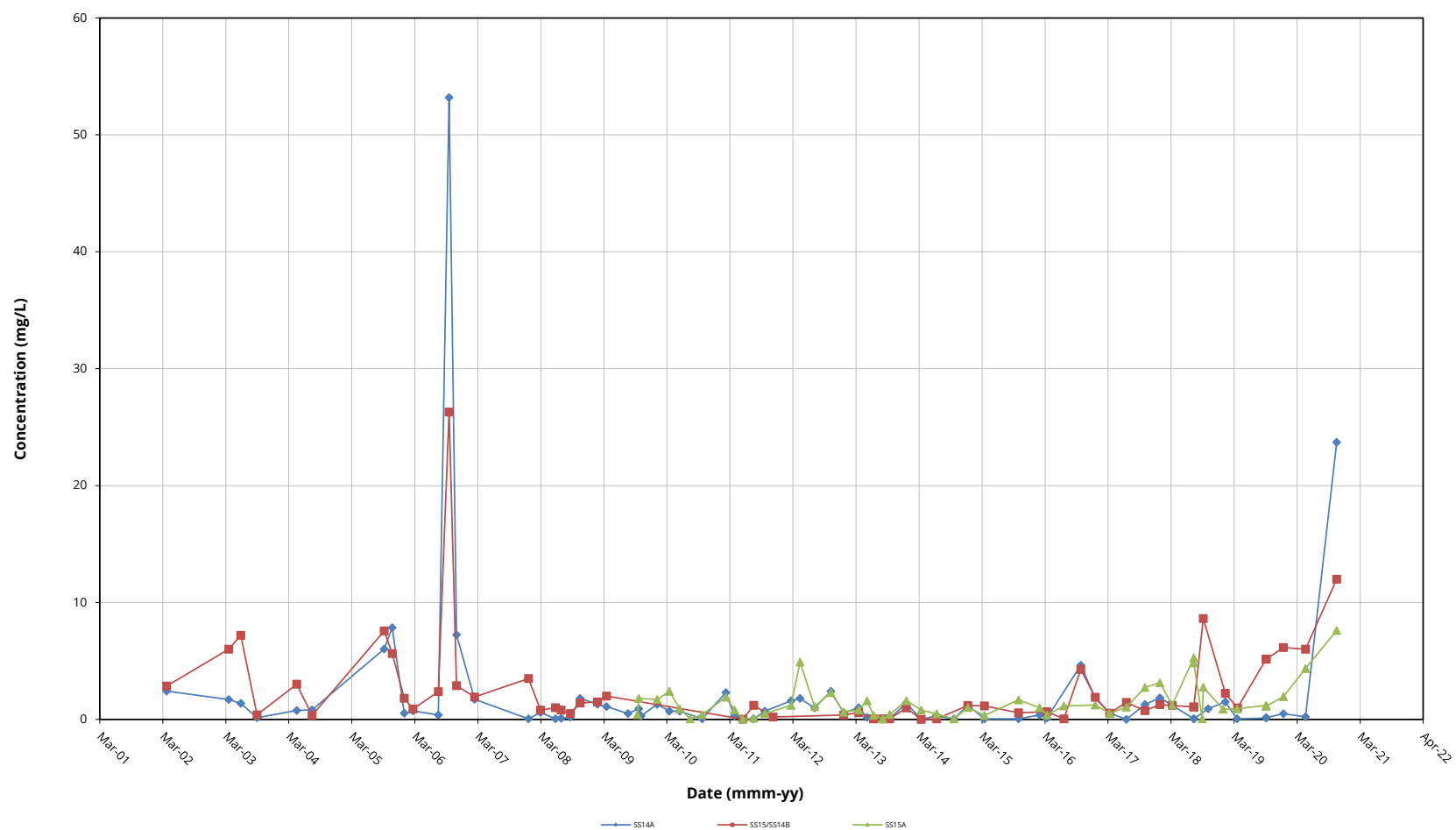
PROJECT NUMBER

2001313

REVISED BY

MSA





NOTES:

1. mg/L denotes milligrams per litre.

CONCENTRATION VS. TIME PLOT

Nitrate

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER

J-3

DATE REVISED

18-Dec-20

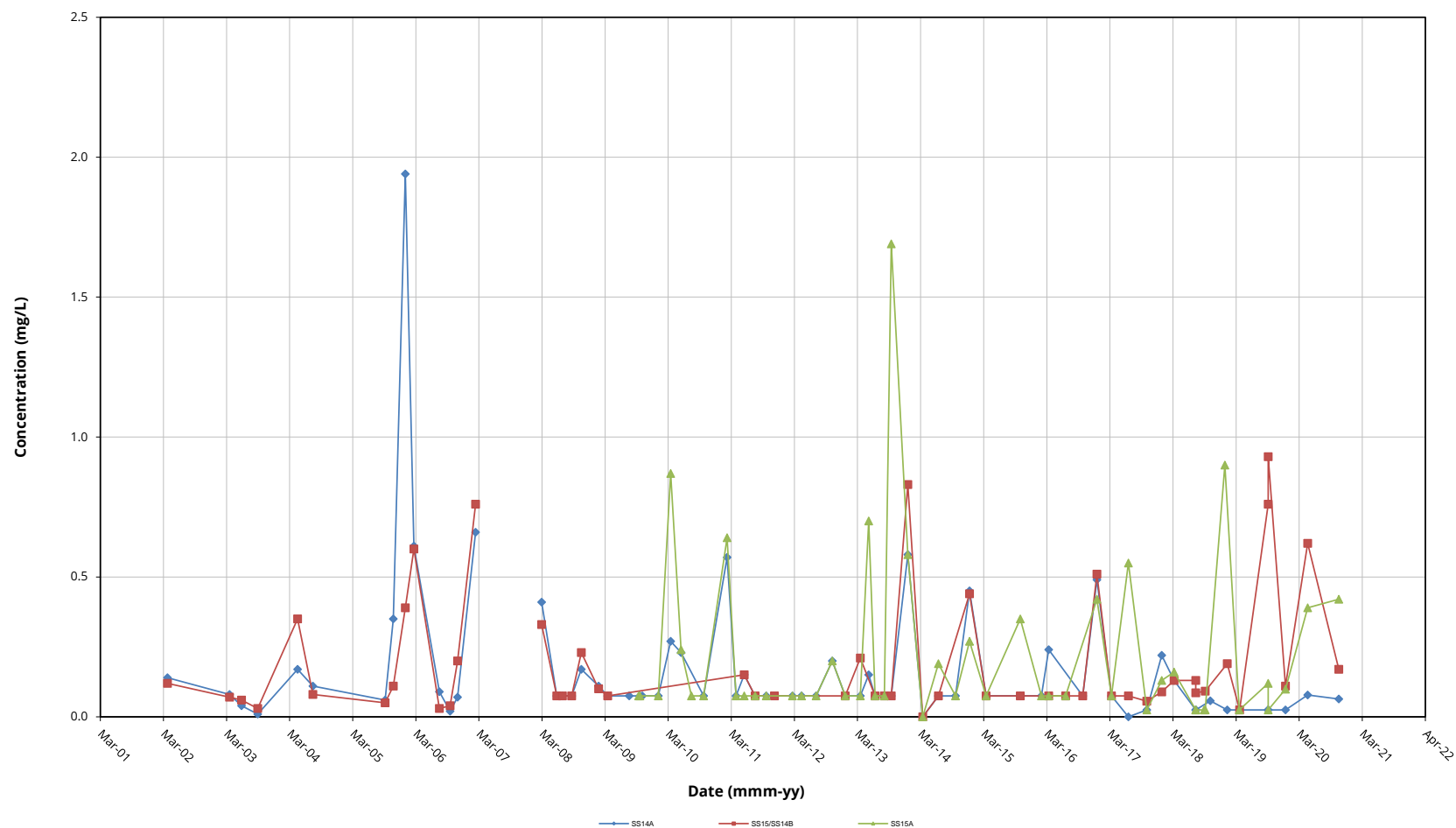
PROJECT NUMBER

2001313

REVISED BY

MSA





NOTES:

1. mg/L denotes milligrams per litre.

CONCENTRATION VS. TIME PLOT

Ammonia

**2020 FOURTH QUARTER AND ANNUAL MONITORING
REPORT**

TWIN CREEKS ENVIRONMENTAL CENTRE
WASTE MANAGEMENT OF CANADA CORPORATION

FIGURE NUMBER

J-4

DATE REVISED

18-Dec-20

PROJECT NUMBER

2001313

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