SNC·LAVALIN Environment

FINAL REPORT

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

2011 – 2012 Annual Report Of Activities Upper Trinity South (New Harbour) Waste Disposal Site

Project No.: 723162

July 2012

Certified ISO 9001

FINAL REPORT

2011 – 2012 ANNUAL REPORT OF ACTIVITIES

UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

Submitted to:

Government of Newfoundland and Labrador
Department of Environment and Conservation
4th Floor West Block, Confederation Building
P.O. Box 8700
St. John's, NL A1B 4J6

Submitted by:

SNC LAVALIN INC.
5657 Spring Garden Road, Suite 200
Halifax, NS B3J 3R4

July 2012

EXECUTIVE SUMMARY

SNC-Lavalin Inc. was retained by the Newfoundland and Labrador Department of Environment and Conservation (ENVC) to provide environmental consulting services for environmental services carried out at the Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador (NL) (herein after referred to as the "Site") between November 2011 and March 2012. The scope of work as part of these services is shown below:

- Inspection of monitor wells and leachate control system;
- Inspection of geomembrane (in fenced ENVC storage yard);
- Completion of one groundwater and surface water monitoring event;
- Depth interval sampling of surface water at Three Corner Pond and Denny's Pond including the collection of water samples from the surface, mid-column, and bottom layers in conjunction with sediment samples from the deepest areas of these two ponds; and
- Preparation of a report detailing the results of all work.

It should be noted that the second last bullet task above is scheduled to be completed in the Spring 2012 and associated reporting will be produced under a separate cover.

A site visit was conducted by SNC personnel on December 12, 2011 to inspect the leachate control system. On December 14, 2011 a visit to a secure compound in Foxtrap, NL was completed to evaluate the condition of the stored linear low-density polyethylene (LLDPE) geomembrane. It was determined that the geomembrane should be acceptable for future use. However, sand bags used in the storage of the geomembrane should be replaced.

On December 14, 2011, the sampling program was completed at the site, which included groundwater sampling from the seven monitor wells on site and a background monitoring well offsite, as well as surface water sampling from the leachate pond and down gradient stream.

Groundwater Results

Metals in Groundwater

Nine (9) groundwater samples, including one (1) duplicate sample, were collected from the eight (8) monitoring wells during sampling programs and were analyzed for dissolved metals. The recent dissolved metals in groundwater concentrations did not exceed the applicable 2011 MOE Full Depth Generic SCS.

PCBs in Groundwater

The nine (9) groundwater samples including one (1) duplicate sample collected from the eight (8) monitoring wells were also analyzed for PCBs. The analytical results were compared to the applicable 2004 MOE Full Depth Generic SCS of 0.2 µg/L. PCBs were not detected (<0.05 µg/L) in any of the groundwater samples analyzed and were therefore below the applicable guidelines.

Surface Water Results

Metals in Surface Water

Three (3) surface water samples including one (1) duplicate were collected from the pond and stream were analyzed for metals. Aluminum concentrations exceeded the applicable CCME FAL guidelines for metals in surface water at both locations. Cadmium, copper and iron also exceeded guidelines at the leachate pond location.

General Chemistry in Surface Water

Surface water samples were collected from the pond and stream during the December 14, 2011 sample program and were analyzed for general chemistry in water. Nitrite exceeded the applicable CCME FAL guidelines for general chemistry in surface water at the leachate pond location.

PCBs in Surface Water

Surface water samples collected from the pond and stream during were analyzed for PCBs in water. PCBs were not detected above reportable detection limits in the surface water samples and all parameters were therefore below the applicable guidelines.

Dioxins and Furans in Surface Water

Surface water samples collected from the pond and stream were analyzed for dioxins and furans in water. CCME-FAL or MOE guidelines are not available for dioxins and furans in surface water therefore samples were analyzed for presence/absence only. The total toxic equivalency (TTE) of all dioxins and furans in the pond and stream samples analyzed during the current monitoring event were 1.97 pg/L and 1.91 pg/L, respectively.

Based on the findings of the 2011 – 2012 program carried out by SNC between December 2011 and March 2012, the following recommendations for further actions at the Site include:

- Continue with site closure activities in accordance with the Department of Environment and Conservation Guidance Documents “Guidelines for the Closure of Non-Containment Municipal Solid Waste Landfill Sites” GD-PPD-062 and “Environmental Standards for Municipal Solid Waste Landfill Sites” GD-PPD-049.1.

- Develop and implement an environmental monitoring plan to continue to monitor groundwater and surface water at the Site.

- Replace all monitoring well locks as part of the next groundwater sampling event.

- Replace all sand bags replaced to prevent uplift of the tarp covering the rolls of geomembrane material.

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1. INTRODUCTION

In November 2011, SNC-Lavalin Inc. Environment Division (SNC) was retained by the Newfoundland and Labrador Department of Environment and Conservation (ENVC), to provide Environmental Consulting Services for the New Harbour Waste Disposal Site, Newfoundland and Labrador between December 2011 and March 2012. The work performed (as described in SNC-Lavalin's Technical Proposal dated November 2011) is as follows:

The scope of work as part of these services is shown below:

- Inspection of monitor wells and leachate control system;
- Inspection of geomembrane (in fenced ENVC storage yard);
- Completion of one groundwater and surface water monitoring event;
- Depth interval sampling of surface water at Three Corner Pond and Denny's Pond including the collection of water samples from the surface, mid-column, and bottom layers in conjunction with sediment samples from the deepest areas of these two ponds; and
- Preparation of a report detailing the results of all work.

It should be noted that the second last bullet task above is scheduled to be completed in the Spring 2012 since the two ponds were frozen at the time of the December 2012 site visit. This work will be completed once the ponds thaw and associated reporting will be produced under a separate cover.

This report includes a summary of all activities completed at the New Harbour Waste Disposal site from December 2011 to March 2012. Site figures are included in Appendix A. Field Parameters and Groundwater Depth Data are included in Appendix B. Current analytical result tables are included in Appendix C and historical analytical result tables are included in Appendix D. Laboratory certificates of analysis discussed in this report are attached in Appendix E. Site photographs are included in Appendix F.

1.1. SITE DESCRIPTION AND HISTORY

The Site is located on Route 73 on the Avalon Peninsula of Newfoundland, approximately 5 km from the junction of Route 80 and Route 73 near the community of New Harbour, Newfoundland and Labrador (Figure 1, Appendix A). The Site operated as a domestic waste disposal facility from the early 1970s (exact date not known) until November 2009. The facility accepted waste from the communities of Blaketown, Dildo, Green's Harbour, Hopeall, Markland, New Harbour, Old Shope and South Dildo.

The Site is an unlined waste disposal facility; however between 2006 and 2007 interception ditches and a leachate collection pond were constructed at the Site to manage potential leachate impacts. In addition, seven monitor wells were installed to monitor potential leachate impacts.

The Site was closed in November 2009. Concrete barricades have been placed outside the entrance gate since the site ceased accepting waste. The Site is partially fenced along its northern boundary and contains an access gate. The site was operated by a local contractor (Cliff Cooper Construction) who collected waste from residents and businesses in the area and disposed of the material in excavated cells or pits at the Site. Waste delivered by private residents and businesses was often placed directly on the ground and left out in the open. Open burning was historically completed at the site to reduce the volume of garbage and to control pests. Figure 2 shows the site plan of the waste disposal site (Appendix A).

1.2. SUMMARY OF PREVIOUS WORK COMPLETED AT THE SITE

Investigations have been completed at the site since 2002 including test pitting, soil sampling, soil remediation, groundwater monitor well installation, several groundwater, surface water and sediment sampling events and fish sampling. The previous work completed at the Site is outlined below:

1.2.1. Test Pitting/Soil Remediation Programs

Previous environmental test pitting programs were conducted at the Site between 2003 and 2006 in the reported area of buried transformers. PCBs were identified in soil samples ranging from <1 milligram per kilogram (mg/kg) to 66.7 mg/kg.

1.2.1.1. SGE Acres 2002

SGE Acres (SGE) conducted a test pitting program in the area of buried transformers in August 2002. PCB concentrations were detected in both of the soil samples submitted for analysis at 1.4 mg/kg and 5.7 mg/kg. The locations of the test pits were not reported and are not known.

1.2.1.2. SGE Acres 2003

SGE Acres conducted a test pitting program in the area of buried transformers in March 2003. A ‘T-shaped’ trench was excavated and five soil samples were collected from the trench and submitted to an accredited analytical laboratory for PCB analysis. PCBs were detected in one soil sample at 52 mg/kg. PCBs were not detected in the other four soil samples.

1.2.1.3. AMEC 2006

AMEC conducted a test pitting program in the area of buried transformers in November 2005. Five test pits were excavated and fifteen soil samples were collected from the test pits and submitted to an accredited analytical laboratory for PCB analysis. PCB were detected in the soil samples and ranged from 0.036 mg/kg to 21.1 mg/kg, below the CCME- CSQG of 33 mg/kg for PCBs in soil at commercial sites.

1.2.1.4. AMEC 2007

AMEC conducted a test-pitting program in the area of buried transformers in November 2006. Two test pits were excavated and 10 soil samples were collected from the test pits and submitted for PCB analysis. One soil sample was reported as having a PCB concentration of 66.7 mg/kg, which exceeds the CCME- CSQG of 33 mg/kg for PCBs in soil at commercial sites. PCB concentrations were detected in the remaining nine soil samples analyzed and ranged from 0.052 to 30.1 mg/kg.

1.2.1.5. AMEC 2009

In January 2009, AMEC conducted a supplementary PCB soil sampling program at the Site. The program included the excavation of five trenches (Trench 1 to Trench 5) adjacent to Location A and the collection of representative soil samples from each of the trenches. A total of 44 soil samples were submitted to an accredited laboratory for PCB analysis. Soil samples collected from trenches located southeast and south of the former remediation Location A (Trench 2 and Trench 3) contained PCB concentrations that exceeded the CCME-CSQG of 33 mg/kg (refer to Section 1.2.2). Numerous transformer casings and scrap metal were also observed in some of the trenches.

1.2.2. PCB Remediation Programs

1.2.2.1. AMEC 2008

In 2008, AMEC prepared an invitation to tender (ITT) for a PCB remediation program at the Site. The PCB remediation program was carried out at the Site in two phases (Phase I and Phase II). Phase I was carried out on September 9 and 10, 2008 and involved the removal of 43.57 tonnes of PCB impacted material from two locations (Location A and Location B). Phase II of the remediation program was carried out on October 25, 2009 and involved the removal of an additional 76.78 tonnes of PCB impacted material from Location A. In total 120.5 tonnes of PCB impacted material were removed from locations A and B by Edward Collins Contracting Limited and transported to the Universal Environmental Services Inc. (UESI) soil treatment facility located in Sunnyside, NL. Confirmatory soil samples collected from Location A contained PCB concentrations above the CCME-CSQG of 33 mg/kg.

PCB concentrations for overburden samples collected adjacent to Location A were below the CCME-CSQG of 33 mg/kg. At the request of ENVC, Location A was partially backfilled with PCB-impacted material including materials that was initially excavated and stockpiled from Location A during the Phase I remediation program. The excavation was lined with 6 mil polyethylene sheeting to mark the boundary of the excavation extents, for future excavation and removal of the material. The PCB impacted material was placed on top of the polyethylene sheeting then covered by a layer of polyethylene sheeting and oriented strand boards (OSBs). Surrounding overburden was then placed on top of the polyethylene sheeting and OSBs and the excavation was backfilled to match the surrounding grade.

1.2.2.2. SNC 2009

In 2009, SNC-Lavalin Inc. (SNC) prepared tender documents for the excavation, removal and treatment of the PCB contaminated material from the site. Only one tender was received, and the project bid price was significantly higher than original budget estimates. Therefore, the additional PCB removal work was postponed.

1.2.3. Groundwater, Surface Water and Sediment Monitoring Programs

One Groundwater Monitoring Program (GMP) and three Groundwater and Surface Water Monitoring Programs (GSMPs) were completed for the Site by AMEC during the period of February 2007 to January 2009. It is noted that no surface water samples were collected at the Site during the February 2007 monitoring event, as it was not part of the scope of work. Two GSMPs, one Sediment Sampling Program (SSP) and a Background Sampling Program had been completed for the Site by SNC during the period of June 2009 to March 2010. AMEC completed an additional GSMP and SSP during November and December 2010. The following subsections provide a summary of findings for each monitoring/sampling event.

1.2.3.1. AMEC February 2007

Laboratory analytical results for groundwater samples collected at the Site by AMEC during the February 2007 GMP (AMEC 2008) indicated that on-Site groundwater was impacted with metals and polycyclic aromatic hydrocarbons (PAH) (i.e. naphthalene) at concentrations above the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Freshwater Aquatic Life (FAL) (updated 2007).

It was noted in the report that the analytical results were from one set of groundwater samples collected only a few weeks after the monitoring wells were installed and before the final construction of the leachate collection pond and clean water ditches would not have had opportunity to demonstrate any positive impact on groundwater outside the perimeter of the landfill.

AMEC recommended that a longer-term sampling regime would provide better information on the success of the leachate control measures implemented at the Site.

1.2.3.2. AMEC 2008

Laboratory analytical results for groundwater and surface water samples collected at the Site by AMEC during the November 2007 GSMP (AMEC 2008) indicated that on-Site groundwater was impacted with toluene, metals and dioxins and furans and surface water within the leachate collection pond was impacted with metals and nitrite.

A comparison of the February 2007 and November 2007 groundwater analytical data revealed that concentrations of metals, PAHs and nitrite had decreased; concentrations of volatile organic compounds (VOCs), benzene, ethylbenzene, xylenes, TPH, pH had generally remained the same; and concentrations of toluene and dioxins and furans had increased since the February 2007 sampling event.

AMEC recommended that additional groundwater and surface water monitoring events be carried out to further monitor groundwater and surface water quality at the Site.

1.2.3.3. AMEC 2009 (February)

Laboratory analytical results for groundwater and surface water samples collected at the Site by AMEC during the May 2008 GSMP (AMEC 2009a) indicated that Site groundwater was impacted with toluene, metals and dioxins and furans and surface water within the leachate collection pond and downgradient stream was impacted with metals and nitrite.

A comparison of the February 2007, November 2007 and May 2008 groundwater analytical data revealed that the concentrations of metals (with a few exceptions) and PAHs had decreased; concentrations of PCBs, VOCs (with the exception of toluene), benzene, ethylbenzene, xylenes, TPH, pH had generally remained the same; and concentrations of toluene, mercury, and dioxins and furans had increased over time.

A comparison of the November 2007 and May 2008 surface water analytical data revealed that metal concentrations had decreased in the leachate collection pond and increased in the downgradient stream; concentrations of nitrite had increased in both the leachate collection pond and downgradient stream; and concentrations of PCBs, VOCs, BTEX, modified TPH, dioxins and furans and pH had generally remained the same in the leachate collection pond and the downgradient stream (i.e. below the applicable criteria) over time.

AMEC recommended that additional groundwater and surface water monitoring events be carried out to further monitor groundwater and surface water quality at the Site.

1.2.3.4. AMEC 2009 (March)

Laboratory analytical results for groundwater and surface water samples collected at the Site by AMEC during the May 2009 GSMP (AMEC 2009b) indicated that on-Site groundwater was impacted with toluene and metals, surface water within the leachate collection pond was impacted with metals and nitrite and surface water within the downgradient stream was impacted with metals. PCBs were detected at low levels in surface water within the clean water ditch located downgradient of the PCB Remediation Area.

A comparison of the February 2007, November 2007, May 2008 and January 2009 groundwater analytical data revealed that the concentrations of metals (with a few exceptions) and PAHs had decreased; and concentrations of PCBs, VOCs (with the exception of toluene), benzene, ethylbenzene, xylenes, TPH, pH and mercury had generally remained the same. The maximum Total Toxic Equivalent (TTE) concentrations of dioxins and furans reported for two of the seven groundwater samples (MW-04 and MW-05) collected at the Site during the November 2007 and May 2008 sampling events exceeded the Ontario Ministry of the Environment (MOE) Site Condition Standards (SCS), since then the concentrations of dioxins and furans has decreased over time.

A comparison of the November 2007, May 2008 and March 2009 surface water analytical data revealed that metal concentrations (with the exception of copper) had decreased in the leachate collection pond and in the downgradient stream while the concentrations of nitrite had decreased in both the leachate collection pond and downgradient stream, however the concentrations of nitrite remained above the applicable criteria. The concentrations of PCBs, VOCs, BTEX, modified TPH, dioxins and furans and pH had generally remained the same in the leachate collection pond and the downgradient stream (i.e. below the applicable criteria) over time.

To further characterize the environmental condition of the Site AMEC recommended the following actions:

- Conduct additional groundwater and surface water monitoring events to further monitor groundwater and surface water quality at the Site.

- Collect sediment samples from the leachate collection pond, clean water ditch and the downgradient stream for metals, dioxins and furans and PCB analyses.

- Conduct a test pitting program along the perimeter of the landfill, in the vicinity of the existing monitoring wells, to assess the levels of PCBs in surface and subsurface soil at that area of the Site.

- Obtain the services of a survey contractor to survey the “top of casing” and “ground surface” elevations for the existing monitoring wells to further evaluate the direction of groundwater flow throughout the Site.

- Repair or re-install monitoring well MW-05.

- Conduct a background assessment of metals in groundwater, surface water and sediment in the general area of the Site to assess whether or not the metals impacted media identified at the Site are attributed to metals leaching from the landfill or from the natural surficial and bedrock geology of the area. This assessment would consist of a literature review (i.e. aerial photograph, surficial geology mapping, bedrock geology mapping, land use maps, land ownership maps, etc.) and groundwater, surface water and sediment sampling.

1.2.3.5. SNC 2010

Laboratory analytical results for groundwater and surface water samples collected at the Site by SNC during September 2009 and January 2010 (SNC 2010) indicated that Site groundwater was impacted with toluene, metals, nitrates and nitrites and pH levels were outside of the CCME-FAL guideline range of 6.5 - 9.0 (which is typical for pH in NL). Surface water within the leachate collection pond was impacted with metals and nitrite and surface water within the downgradient stream was impacted with metals, nitrite and pH levels outside of the CCME-FAL guideline range of 6.5 - 9.0. There are no CCME-FAL or MOE guidelines available for dioxins and furans in surface water therefore samples were assessed based on presence/absence only. The TTE of dioxins and furans in the stream and pond samples analyzed were between 1.77 pg/L and 2.63 pg/L.

A comparison of the February 2007, November 2007, May 2008, January 2009, October 2009, January 2010 groundwater analytical data revealed that the concentrations of metals had either decreased or shown no consistent trends over time. Concentrations of nitrates, nitrites and pH levels had generally remained the same (exceeding the CCME-FAL guidelines). Concentrations of PCBs, PAHs, VOCs (with the exception of toluene), benzene, ethylbenzene, xylenes and TPH had generally remained the same (below the applicable guidelines). The maximum TTE concentrations of dioxins and furans reported for two of the seven groundwater samples (MW-04 and MW-05) collected at the Site during the November 2007 and May 2008 sampling events exceeded the MOE SCS, since then the concentrations of dioxins and furans have decreased over time (no exceedances).

A comparison of the November 2007, May 2008, January 2009, September 2009, January 2010 surface water analytical data revealed that metal and nitrite concentrations had fluctuated (exceeded CCME-FAL guidelines) and therefore, shown no consistent trends over time in the leachate collection pond and in the downgradient stream. The pH levels in the downgradient

stream were usually within the CCME-FAL guideline range of 6.5 - 9.0, however it was detected at a low level in January 2010. The concentrations of PCBs, PAHs, VOCs, BTEX, modified TPH, and dioxins and furans had generally remained the same in the leachate collection pond and the downgradient stream (i.e. below the applicable criteria) over time.

As recommended by AMEC (AMEC 2010) SNC conducted a background sampling program of sediment, groundwater and surface water and a sediment sampling program at the Site in March 2010. A monitoring well (MW-08) was installed Northeast (upgradient) of the Site to be used as a background well.

Background Sampling Program

Results of the background groundwater sampling program revealed that the groundwater sample collected from background monitoring well MW-08 (installed north of the Site by SNC) contained concentrations of aluminum (626 µg/L), cadmium (0.018 µg/L), copper (8.8 µg/L), iron (411 µg/L) and lead (1.2 µg/L) that exceeded the CCME-FAL guidelines. The pH (5.42) measured in sample MW-08 was outside of the CCME-FAL guideline range of 6.5 to 9.0. Results of the background surface water samples (BACK-SW-1 and BACK-SW-2) revealed that concentrations of aluminum (150 µg/L) and iron (540 µg/L) in the background sample collected from a pond located northeast of the Site (BACK-SW-2) and aluminum (130 µg/L) and chromium (20 µg/L) in the background sample collected from a pond located northwest (BACKSW-1) of the Site exceeded the applicable CCME-FAL guidelines. The pH (5.45 and 4.92) measured in both samples was outside of the CCME-FAL range of 6.5 to 9.0. Results of the background sediment samples (BACKPOND-SED1 and BACKPOND-SED-2) revealed that the concentration of arsenic (9 mg/kg) in the background sample collected from a pond located northwest (BACKPOND-SED1) of the Site exceeded the CCME-ISQGs and toluene (0.04 mg/kg) was detected in the background sample collected from a pond located northeast (BACKPOND-SED-2) of the Site.

Surface Water Results (On-Site) Compared to Background Data

A comparison of the February 2007, November 2007, May 2008, January 2009, September 2009, January 2010 surface water analytical data revealed that metal and nitrite concentrations had fluctuated (exceeding CCME-FAL guidelines) and therefore, shown no consistent trends over time in the leachate collection pond and in the downgradient stream. The pH levels in the downgradient stream were usually within the CCME-FAL range of 6.5 - 9.0, however it was detected at a low level in January 2010. The concentrations of PCBs, PAHs, VOCs, BTEX, modified TPH, and dioxins and furans had generally remained the same in the leachate collection pond and the downgradient stream (i.e. below the applicable criteria) over time.

Sediment Results (On-Site) Compared to Background Data

Results of the sediment samples collected on Site (POND-SED, STREAM-SED and DITCH-SED) revealed that toluene (0.06 mg/kg) and total xylene (0.25 mg/kg) were detected in

sediment, and that the concentration of mercury (0.2 mg/kg) exceeded the CCME- Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Levels (PELs) in the sediment sample collected from the stream located directly downgradient of the waste disposal site (STREAM-SED). Concentrations of Modified TPH (27 mg/kg) were detected in the sediment sample collected from the clean water ditch located west of the PCB Remediation Area (DITCH-SED). Guidelines are not available for dioxins and furans in sediment however the results for the sediment samples collected on Site ranged from 0.815 to 2.01 pg/L.

1.2.3.6. AMEC 2010

Laboratory analytical results for groundwater and surface water samples collected at the Site by AMEC during November and December 2010.

Groundwater Quality

Concentrations of BTEX detected in groundwater during all seven sampling events did not exceed ten times (10x) the Canadian Council of Ministers of the Environment Fresh Water Aquatic Life (CCME-FAL) guidelines, 2003 Atlantic PIRI Tier I Risk Based Corrective Action (RBCA) Risk Based Screening Levels (RBSLs) or the Ontario Ministry of the Environment (MOE) Site Condition Standards (SCSs). Concentrations of modified TPH detected in groundwater during all seven sampling events did not exceed the applicable or 2003 Atlantic PIRI Tier I RBCA RBSLs. BTEX and TPH are not considered to be contaminants of potential concern (COPCs) in groundwater at the Site. AMEC recommended that BTEX/TPH be removed from any future groundwater monitoring events carried out at the Site.

Concentrations of metals (i.e. arsenic, aluminum, cadmium, chromium, copper, iron and zinc) detected in groundwater during the current and previous sampling events at the Site exceeded the 10x CCME-FAL guidelines. Concentrations of copper, lead and mercury detected in groundwater at the Site during previous sampling events also exceeded the exceeded the MOE SCSs.

A comparison of on-Site and background metals data revealed that background levels in metals in groundwater in the general area of the Site are elevated; however, it is possible that the landfill is contributing to the levels of metals in on-Site groundwater. Therefore, metals are considered to be COPCs in groundwater at the Site at this time. AMEC recommended that all monitoring wells (including the background monitoring well MW-08) be sampled for the analyses of metals during any future groundwater monitoring events carried out at the Site.

Concentration of VOCs detected in all groundwater samples collected at the Site during all sampling events did not exceed the applicable MOE SCSs. The majority of VOC parameters in groundwater were not detected in groundwater samples collected at the Site during all sampling events. VOCs are not considered to be COPCs in groundwater at the Site. AMEC recommended that VOCs be removed from any future groundwater monitoring events carried out at the Site.

Concentrations of PAHs, dioxins and furans and general water chemistry parameters (with the exception of pH in MW-07) in groundwater were either non-detect or detected at levels below 10x the CCME-FAL guidelines and MOE SCSs. These parameters are not considered to be COPCs in groundwater at this Site at this time. AMEC recommended that these parameters be removed from any future groundwater monitoring events carried out at the Site.

PCBs have not been detected in groundwater samples collected at the Site during all sampling events. Given that soil remediation programs have been carried out at the Site, AMEC recommended that all monitoring wells, with the exception of monitoring wells MW-07 and MW-08 (i.e. located upgradient of the PCB Remediation Area), be analyzed for PCBs during any future groundwater monitoring events carried out at the Site.

Surface Water Quality

Concentrations of metals (i.e. aluminum, cadmium and copper) and nitrite (nitrite as N) detected in surface water samples collected from the leachate collection pond and downgradient stream exceeded the CCME-FAL guidelines.

A comparison of on-Site and the background metals data revealed that background levels in metals in surface water in the general area of the Site are elevated; however, it is possible that the landfill is contributing to the levels of cadmium and copper in on-Site surface water and surface water in a stream located directly downgradient of the waste disposal site. AMEC recommended that surface water samples be collected from the leachate collection pond, clean water ditches and the downgradient stream for the analyses of metals and general water chemistry (i.e. for use in the selection of CCME-FAL guidelines for aluminum, copper, lead and nickel) during any future surface water monitoring events carried out at the Site.

PCBs were not detected in the surface water samples collected from the leachate collection pond and downgradient stream, but were detected at low levels in the clean water ditch located downgradient of the PCB Remediation Area. AMEC recommended that surface water samples be collected from the leachate collection pond, clean water ditches and the downgradient stream for the analyses of PCBs during any future surface water monitoring events carried out at the Site.

Concentrations of BTEX/TPH, PAHs and VOCs detected in all surface water samples collected at the Site were either non-detect or detected at levels below the applicable criteria. These parameters are not considered to be COPCs in surface water at this Site at this time. AMEC recommended that these parameters be removed from any future groundwater monitoring events carried out at the Site.

Concentrations of the Total Toxic Equivalent (TTE) of the dioxins and furans (194 pg / L and 210 pg / L) were detected in surface water samples collected from the leachate collection pond and downgradient stream. Given that dioxins and furans are generated from a variety of sources, AMEC recommended that background surface water samples from nearby streams

and ponds be analyzed for dioxins and furans during any future surface water monitoring events to assess whether or not the dioxins and furans are likely sourced from the Site, or possibly from other external sources.

Sediment Quality

Concentrations of BTEX/TPH, metals, PCBs, PAHs and VOCs detected in the sediment sample collected from the leachate collection pond were either non-detect or detected at levels below the applicable CCME - Interim Sediment Quality Guidelines (ISQGs) or Probable Effects Level (PELs).

Concentrations of modified TPH in sediment samples collected from the downgradient stream and clean water ditch were detected; however, the laboratory reported that the petroleum hydrocarbons detected in sediment at the Site and background sample location do not represent petroleum products. These values are likely a result of organic interference from vegetation present within the samples. Therefore, petroleum hydrocarbons are not considered to be a concern in sediment at the Site.

Concentrations of metals (i.e. arsenic, copper, lead, mercury and zinc) detected in sediment samples collected from the downgradient stream and clean water ditch exceeded the CCME-ISQGs and/or PELs.

A comparison of on-Site and background metals data revealed that background levels in metals in sediment in the general area of the Site are elevated; however, it is possible that the landfill is contributing to the levels of metals in on-Site sediment collected from a stream located directly downgradient of the waste disposal site.

Concentrations of PAHs (chrysene and fluoranthene) and detected in the sediment sample collected from the clean water ditch exceeded the CCME-ISQGs. Concentrations of PAHs in all the remaining sediment samples analyzed were either non-detect or were detected at levels below the applicable CCME-ISQGs, concentrations of PAHs in all sediment samples analyzed were detected at levels below the applicable CCME-PELs.

Concentrations of VOCs in sediment samples collected from the downgradient stream and clean water ditch were either non-detect or detected at levels below the applicable criteria.

Concentrations of the TTE of the dioxins and furans (1.67 pg/g to 11.8 pg/g) were detected in sediment samples collected from the leachate collection pond and downgradient stream. Given that dioxins and furans are generated from a variety of sources, AMEC recommended that background sediment samples from nearby streams and ponds be analyzed for dioxins and furans during any future sediment monitoring events to assess whether or not the dioxins and furans are likely sourced from the Site, or possibly from other external sources.

The concentration of PCBs detected in sediment sample DITCH-SED exceeded the CCME-ISQG and CCME-PEL for PCBs in freshwater sediment. PCBs were non-detect and therefore below the CCME-ISQG and CCME-PEL in the remaining sediment samples analyzed.

1.2.4. Geomembrane Storage and Inspections

Eighteen rolls of geomembrane liner were previously purchased for future use at the Site at the request of the Department of Environment and Conservation (ENVC) as part of proposed Site closure activities. The liner was delivered to an ENVC storage compound located on Incinerator Road near Foxtrap, NL on March 25, 2008. Prior to the delivery of the liner to the storage compound, AMEC arranged snow and ice removal at the compound and construction of a level gravel pad to ensure proper drainage. The rolls of geomembrane liner were placed over 2" x 6" wood boards, and 4' x 8' sheets of oriented strand board. Polyethylene tarps were placed over the geomembrane rolls and sand bags were placed on the top and around the sides of the tarps to hold them in place. SNC and AMEC have completed annual inspections of the geomembrane since 2009.

2. WORK COMPLETED BY SNC LAVALIN 2011 – 2012

2.1. OBJECTIVES AND SCOPE OF WORK

The objectives/ scope of work as part of these services is shown below:

- Inspection of monitor wells and leachate control system;
- Inspection of geomembrane (in fenced ENVC storage yard);
- Completion of one groundwater and surface water monitoring event;
- Depth interval sampling of surface water at Three Corner Pond and Denny's Pond including the collection of water samples from the surface, mid-column, and bottom layers in conjunction with sediment samples from the deepest areas of these two ponds; and
- Preparation of a report detailing the results of all work.

It should be noted that the second last bullet task above is scheduled to be completed in the Spring 2012 and associated reporting will be produced under a separate cover.

2.2. REGULATORY FRAMEWORK

The Site is considered to be a commercial property based on past site use activities (i.e. waste disposal site). Site soils are considered to be coarse-grained and groundwater resources are not used for human consumption and therefore considered to be non-potable.

The work completed during the groundwater and surface water sampling programs were conducted in accordance with the recommended requirements of the CSA Phase II Environmental Site Assessment Protocol Z769 and the Provincial Guidance Document for the Management of Impacted Sites, version 1.01, September 2005. In addition, the following regulatory guidance documents were applied:

2.2.1. Groundwater

Analytical chemistry data for groundwater samples collected at the Site during the current monitoring program were assessed and evaluated using the following federal and provincial regulatory guidelines:

The analytical results for metals, PCBs and dioxins and furans in groundwater were compared to the Ontario Ministry of Environment (MOE) Site Condition Standards (SCSs) for Use Under Part XV.1 of the Environmental Protection Act (April 2011) for a full depth generic site in a non-potable groundwater condition. It is noted that these guidelines account for the concentration dilution that occurs when groundwater discharges into surface water.

2.2.2. Surface Water

The analytical chemical data for metals and general water chemistry in surface water were compared against the CCME-CWQGs FAL (updated 2007). There are no CCME-FAL guidelines available for PCBs and dioxins and furans in water. Commercial, coarse grained criteria were used.

2.3. METHODOLOGY

2.3.1. Groundwater Sampling

Groundwater samples were collected from the eight monitoring wells (MW-01 to MW-08) during a sampling event on December 14, 2011. Samples were collected using dedicated Waterra™ tubing and foot valves. Prior to purging and sampling, all monitoring wells present at the Site were gauged using a Heron TM oil/water interface meter to determine static groundwater depth and the presence/absence of free phase petroleum hydrocarbon product. Gauging was conducted by lowering the clean probe down the monitoring wells until a tone was obtained indicating a liquid had been contacted. Information from the groundwater sampling program is presented in Tables 2-1 and 2-2. The locations of all monitor wells are shown on Figure 3 of Appendix A.

Prior to sampling, the monitoring wells were purged by removing three well volumes of groundwater from each well. Following the third purge event, the pH, temperature, dissolved oxygen and specific conductivity of the groundwater being removed from the wells were recorded. Field parameters for monitor wells for the previous and current sampling programs

are located in Appendix B. Groundwater depth data for the previous and current sampling program is also located in Appendix B. Based on the groundwater elevations calculated the groundwater flow is towards the south. The groundwater contours and flow direction are shown on Figure 5 of Appendix A.

The groundwater samples collected were submitted for analysis of metals and PCBs. The groundwater samples were placed in laboratory supplied bottles and vials (with preservatives as necessary), maintained in cool storage with ice and transported to the laboratory for select chemical analysis.

2.3.2. Surface Water Sampling

On December 14, 2011, surface water samples were collected from the two sampling locations during a sampling event. Samples were collected from the leachate pond and the stream downgradient of the site. Information from the surface water-sampling program is presented in Table 2-1.

Surface water samples were collected directly into laboratory supplied bottles and vials (with preservative as necessary). Samples were collected by positioning the laboratory supplied sampling bottles into the water column at an approximate depth of 0 – 0.15 m below the water's surface. Caution was used to prevent the bottles from disturbing the sediment on the bottom of the pond and stream. Samples were maintained in cool storage with ice and transported to the laboratory for select chemical analysis. The surface water samples collected were submitted for analysis of metals, general chemistry, dioxins and furans and PCBs. The surface water sampling locations are shown on Figure 4 of Appendix A. Field parameters for surface water sampling events are located in Appendix B.

2.3.3. Quality Assurance/Quality Control (QA/QC) Program

The SNC QA/QC Program is based on its ISO 9001 Certification, the foundation of which is the eight Quality Management System standards of the revised ISO 9000 series. The quality control policy and documented Standard Operating Procedures can be summarized in four key points.

1. Understand the requirements of the client and provide services which satisfy the client's specified requirements for quality, cost and schedule;

2. Provide appropriately qualified and trained personnel and resources to fulfill the client's requirements;

3. Ensure implementation of the QC System by SNC personnel in conformity with ISO 9001 requirements; and

4. Establish and periodically review and update key quality objectives for continuous improvement of the quality of the product delivered.

The sampling Quality Assurance/Quality Control (QA/QC) Program consisted of the collection of duplicate field samples, laboratory duplicates, cleaning of sampling equipment between each sampling event, and the use of new nitrile gloves for each sample. All samples collected during the sampling program were given unique sample identifications (ID's), logged onto a chain-of-custody form, placed inside a cooler at a temperature of approximately 4°C to 6°C, and transported to the laboratory for analysis. Any samples collected that did not require analysis were stored at the laboratory in the event that further analysis was required.

See Section 2.11 and Appendix G for further discussion and comparison of QA/QC Results.

The Laboratory QA/QC program consists of duplicates, matrix spikes, and blanks (See Appendix H). QA/QC samples for the laboratory are analyzed at a frequency of 15%. Maxxam Analytics Inc. does not specifically run QA/QC samples on a client-specific basis. Therefore, the laboratory does not specifically report sample ID numbers on their QA/QC results.

2.4. FIELD PROGRAM/OBSERVATIONS

All field work associated with sampling and monitoring completed at the site was as follows:

- December 12, 2011 – Inspection of leachate control system.
- December 14, 2011 – Inspection of the geomembrane.
- December 14, 2011 – Groundwater and surface water sampling event.

Table 2-1 provides a summary of coordinates for the monitor wells, surface water sampling locations. Table 2-2 provides field observations of groundwater samples and Table 2-3 provides field observations of surface water samples.

Table 2-1: Sample Location Coordinates (NAD83 datum, UTM Zone 21)

Sample	Northing	Easting
MW-01	5271860	315781
MW-02	5271887	315459
MW-03	5271509	315345
MW-04	5271706	315467
MW-05	5271505	315652
MW-06	5271686	315705
MW-07	5272017	315749
MW-08	5272974	317012
MW-09	Duplicate of MW-01 (Dec 2011)	
SW-POND	5271699	315578
SW-POND-1	Duplicate of SW-POND (Dec 2011)	
SW-STREAM	5271330	315372

Table 2-2: Field Observations for Groundwater Samples

Well ID	Sample Date	Depth of Well (m)	Depth to Water (mbtoc)	Elevation (masl)	Elevation of Water Table (masl)
MW-01	Dec 14, 2011	3.41	1.11	120.666	119.556
MW-02	Dec 14, 2011	3.93	3.68	122.201	118.521
MW-03	Dec 14, 2011	3.62	1.13	101.323	100.193
MW-04	Dec 14, 2011	3.61	1.0	117.108	116.108
MW-05	Dec 14, 2011	4.53	0.91	106.325	105.415
MW-06	Dec 14, 2011	3.42	1.5	111.300	109.800
MW-07	Dec 14, 2011	3.56	1.28	125.215	123.935
MW-08	Dec 14, 2011	5.62	1.37	n/a	n/a

Notes:

1. mbtoc = metres below top of casing
2. masl = metres above sea level
3. Field data for monitoring wells for all sampling events is shown in Appendix B.

2.5. LABORATORY ANALYTICAL RESULTS

Laboratory analysis for groundwater and surface water samples were analyzed by the Bedford, NS laboratories of Maxxam Analytics Inc. The laboratory is accredited by the Canadian Association Laboratory Accreditation (CALA), and complies with ISO standard 17025. The results of the laboratory analysis for the groundwater and surface water samples collected at the Site during the current monitoring programs are summarized in Tables C1 to C2 (groundwater) and Tables C3 to C6 (surface water). The analytical results were compared to the referenced guidelines and criteria identified in Section 2.2.1. The analytical results of historical monitoring programs are provided in Appendix D. Certificates of analysis for current monitoring programs are provided in Appendix E.

2.5.1. Groundwater Results

2.5.1.1. Metals in Groundwater

Nine (9) groundwater samples, including one (1) duplicate sample, were collected from the eight (8) monitoring wells during sampling programs and were analyzed for dissolved metals. Samples were collected on December 14, 2011. The recent dissolved metals in groundwater concentrations did not exceed the applicable 2011 MOE Full Depth Generic SCS. The laboratory analytical results for metals in groundwater are presented in Table C1 of Appendix C.

2.5.1.2. PCBs in Groundwater

The nine (9) groundwater samples including one (1) duplicate sample collected from the eight (8) monitoring wells were also analyzed for PCBs. MW-09 is the duplicate of MW-07 collected in December 2011. The analytical results were compared to the applicable 2011 MOE Full Depth Generic SCS of 0.2 µg/L. PCBs were not detected (<0.05 µg/L) in any of the groundwater samples analyzed and were therefore below the applicable guidelines.

The laboratory analytical results for PCBs in groundwater are presented in Table C-2 of Appendix C.

2.5.2. Surface Water Results

2.5.2.1. Metals in Surface Water

Three (3) surface water samples including one (1) duplicate were collected from the pond and stream during the December 14th 2011 sample program and analyzed for metals. The following metal parameters exceeded the applicable CCME FAL guidelines for metals in surface water:

SW-POND

- Aluminum concentrations of 202 ug/L exceeded the CCME FAL of 5-100 ug/L.
- Cadmium concentrations of 0.063 ug/L exceeded the CCME FAL of 0.017 ug/L.
- Copper concentrations of 6.4 ug/L exceeded the CCME FAL of 2 - 4 ug/L.
- Iron concentrations of 523 ug/L exceeded the CCME FAL of 300 ug/L.

SW-POND-1 (Duplicate of SW-POND)

- Aluminum concentrations of 262 ug/L exceeded the CCME FAL of 5-100 ug/L.
- Cadmium concentrations of 0.065 ug/L exceeded the CCME FAL of 0.017 ug/L.
- Copper concentrations of 6.7 ug/L exceeded the CCME FAL of 2 - 4 ug/L.
- Iron concentrations of 682 ug/L exceeded the CCME FAL of 300 ug/L.

SW-STREAM

- Aluminum concentrations of 155 ug/L exceeded the CCME FAL of 5-100 ug/L.

The laboratory analytical results for metals in surface water are presented in Table C-3 of Appendix C.

2.5.2.2. General Chemistry in Surface Water

Surface water samples were collected from the pond and stream during the December 14, 2011 sample program and were analyzed for general chemistry in water. The laboratory analytical results for general chemistry in surface water are presented in Table C-6 of Appendix C.

The following metal parameters exceeded the applicable CCME FAL guidelines for general chemistry in surface water:

SW-POND

- Nitrite concentration of 110 ug/L exceeded the CCME FAL of 60 ug/L.
- SW-POND-1, the duplicate of SW-POND also exceeded the CCME FAL guideline with a concentration of 90 ug/L.

2.5.2.3. PCBs in Surface Water

Surface water samples were collected from the pond and stream during the December 14, 2011 sample program and were analyzed for PCBs in water. One duplicate sample was also collected. SW-POND-1 is a duplicate of SW-POND. PCBs were not detected above reportable

detection limits in the surface water samples and all parameters were therefore below the applicable guidelines.

The laboratory analytical results for PCBs in surface water are presented in Table C-4 of Appendix C.

2.5.2.4. Dioxins and Furans in Surface Water

Surface water samples were collected from the stream and pond during the December 14, 2011 sample program and were analyzed for dioxins and furans in water. The laboratory analytical results for dioxins and furans in surface water are presented in Table C-5 of Appendix C.

There are no CCME-FAL or MOE guidelines available for dioxins and furans in surface water therefore samples were analyzed for presence/absence only.

The total toxic equivalency (TTE) of all dioxins and furans in the pond and stream samples analyzed during the current monitoring event were 1.97 pg/L and 1.91 pg/L respectively.

2.6. COMPARISON OF CURRENT AND PREVIOUS DATA

This section provides a general comparison of the current round of data and previous groundwater data available for the Site (2007 – 2011). Any decreasing or increasing trends observed are noted in the applicable sections. It is noted that in most cases only those parameters that have exceeded applicable guidelines during at least one sampling event were considered for this comparison. The current analytical results are presented in Tables C-1 to C-2 (groundwater), C-3 to C-5 (surface water) of Appendix C. Historical analytical data is provided in Appendix D.

2.6.1. Groundwater

Metals

Concentrations of arsenic, cadmium, chromium, iron and lead in MW-01 have decreased over time and concentrations appear to be moving towards stabilization. Concentrations of aluminum, cobalt, copper and zinc have fluctuated over time with no trend observed. Concentrations of cadmium, chromium and lead in MW-02 have decreased over time and concentrations appear to be moving towards stabilization. Concentrations of aluminum, copper and iron have fluctuated over time with no trend observed.

Concentrations of cadmium and iron in MW-03 have fluctuated over time with no trend observed. Concentrations of aluminum have decreased since initial sampling, but have since fluctuated over time with no trend observed.

Concentrations of aluminum, cadmium, chromium, copper and lead in MW-04 have decreased since initial sampling, but have since fluctuated over time with no trend observed. Concentrations of iron have fluctuated over time with no trend observed.

Concentrations of aluminum cadmium, copper and iron in MW-05 have decreased since the first two initial sampling events but have since fluctuated over time with no trend observed. Concentrations of chromium and lead have decreased over time and concentrations appear to be moving towards stabilization.

Concentrations of copper and iron in MW-06 have decreased since the first two initial sampling events but have since fluctuated over time with no trend observed. Concentrations of aluminum have decreased initially but concentrations have elevated over the last three sampling events. Concentrations of cadmium, chromium and lead have decreased over time and concentrations appear to be moving towards stabilization.

Concentrations of aluminum in MW-07 have all shown fluctuations over time with no general trend observed.

Concentrations of aluminum in MW-08 have all shown an increasing trend over the three sampling events available for this background monitoring well.

A comparison of on-Site (MW-01 to MW-07) and background (MW-08) metals groundwater data revealed that on-site metals concentrations in the landfill area of the Site are considered to be elevated compared to background metal concentrations

PCBs

All monitor wells (MW-01 to MW-08) showed results that were consistently below detection limits, or detected at low levels below guidelines.

2.6.2. Surface Water

Metals

For SW-POND aluminum and iron concentrations fluctuate over time with no trend observed. Copper concentrations have varied (increases and decreases) since sampling commenced. Cadmium consistently exceeds the guideline with one exception of September 2009, when it was below detection limits. Chromium is consistently below detection limits with one exception in January 2010, when it exceeded the respective guideline.

For SW-STREAM, concentrations of aluminum, cadmium, copper and iron have fluctuated since sampling commenced.

General Chemistry

Nitrite in SW-POND has shown consistent exceedances that fluctuate with time. Nitrite has also fluctuated in SW-STREAM with select exceedances. The pH in SW-STREAM was usually within the allowable pH range, however it was detected at a low level (outside the acceptable limits) in January 2010.

PCBs

PCB has not detected above the reportable detection limits, since sampling commenced in November 2007 in the SW-POND and SW-STREAM sample locations. In March 2009, a PCB concentration of 0.05 ug/L was reported at the Ditch sampling location. This surface water concentration of 0.05 ug/L is at the reportable detection limit of the laboratory at the time of testing.

Dioxins and Furans

Levels of dioxins and furans in SW-POND and SW-STREAM both varied slightly from sampling event to sampling event. The total toxic equivalency (TTE) of all dioxins and furans in the pond and stream samples analyzed during the current monitoring event were 1.97 pg/L and 1.91 pg/L respectively. Dioxins and furans concentrations presented are for information purposes only as there are no applicable guidelines for surface water.

2.7. QUALITY ASSURANCE / QUALITY CONTROL (QA/QC) DISCUSSION

The QA/QC program for the New Harbour Waste Disposal site during the December 2011 sampling event consisted of the following:

- Collection of one field duplicate groundwater sample for analysis of Metals and PCBs;
- Collection of one field duplicate surface water sample for analysis of Metals, General Chemistry and PCBs;
- Analysis of lab duplicate, blank and reference samples as part of Maxxam Analytics' internal QA/QC procedures. Approximately 15% of samples analyzed by the laboratory are randomly selected for duplicate analysis; and
- Comparison and interpretation of analytical results of regular samples and their corresponding duplicates.
- A list of all field duplicate samples and the corresponding original sample, along with analysis is shown below in Table 2-3.

Table 2-3: Duplicate Field Samples

Duplicate Sample	Original Sample	Date	Analysis of Duplicate Sample
MW-09	MW-07	December 14, 2011	Metals, PCBs
SW-POND-1	SW-POND	December 14, 2011	Metals, PCBs, General Chemistry

The Laboratory QA/QC program consists of duplicates, matrix spikes, and blanks. QA/QC samples for the laboratory are analyzed at a frequency of 15%. Maxxam Analytics Inc. does not specifically run QA/QC samples on a client-specific basis. Therefore, the laboratory does not specifically report sample ID numbers on their QA/QC results. Analytical results of the Maxxam QA/QC program are provided in Appendix E.

The comparison of all duplicate samples collected for the New Harbour Sampling Program resulted in a mean percent difference of 7.0%. Differences in sample duplicates may be due to the characteristics of the contaminants or the concentrations may not have been homogeneous throughout the sample. There are no firm guidelines for the degree of correlation expected between field duplicates due to natural heterogeneity in the samples. However, the results are considered to be an acceptable duplicate correlation and therefore meet the objectives for this sampling program. The comparison tables for of all duplicate samples collected for the New Harbour are presented in Appendix F (Tables F1 to F5).

3. INSPECTION OF LEACHATE CONTROL SYSTEM AND GEOMEMBRANE

3.1. INSPECTION OF LEACHATE CONTROL SYSTEM

A site visit was conducted by SLE personnel on December 12, 2011. The landfill is physically closed to the public and is currently being closed out and capped. At the time of the inspection, closure work was underway at the site. Work underway in the southwest corner of the site and appeared to be related to the placement and grading of the interim landfill cover system.

The site inspection work consisted of a visual inspection of the landfill cap side-slopes, perimeter ditch orientation and grading, ditch condition and the inspection of the leachate collection pond located at the southwest corner of the landfill.

The landfill perimeter ditches serve to collect both storm water runoff, as well as any leachate that may have migrated out of the landfill deposit.

The placement of the landfill cap has resulted in the re-grading of the landfill side slopes. The slopes appear to be graded at a 1:1 slope and stabilized with pit run stone. All side slopes appear to be stable and in good condition. There were no observed leachate springs along the side slopes. Landfill de-gassing odours were evident along the southern perimeter of the landfill, these odours were likely a result of the capping activities underway directly up-wind of this location. Inspection of the western, eastern and southern collection ditches revealed all ditches to be in good condition with no obstructions to flow. There was no flow observed during the inspection, however evidence of storm water flow was evident (channelled erosion and scour). A healthy seasonal vegetation growth was observed in the drainage ditches. All perimeter ditches were observed to be working effectively and in good condition.

The leachate collection pond was visually inspected for signs of slope failure, and short circuiting around, or through the detention pond. The ponds spillway was repaired last year and was observed to be stable and operating effectively. A small flow pathway was observed at the northern end of the ponds berm. This discharge did not appear to be significant, however it should be checked annually, and if necessary the berm should be repaired.

3.2. INSPECTION OF GEOMEMBRANE

A site visit was conducted by SLE personnel on December 14, 2011 at the secure compound (lock and key) in Foxtrap, NL to evaluate the condition of the stored linear low-density polyethylene (LLDPE) geomembrane. The rolls of geomembrane were stored in two separate areas in the compound in a single layer with no roll stacking, and they were covered with tarps and weighted with sandbags. Several sand bags were observed to be broken open as a result of weathering of the plastic bag material. Most of the sand bags remain intact, however several were observed to have degraded and the sand has been released onto the tarp. The balance of the sand bags are likely degrading as well and they should be replaced to prevent uplift of the tarp.

The rolls stored on the south side of the compound had a small area where the surface of one roll was uncovered and the geomembrane exposed. Similarly, the rolls stored on the north side were exposed at the base of the tarped section along the fence line. As the geomembrane rolls were appropriately covered at the time of inspection, it could not be seen if the ends of the rolls were plugged to prevent water migration into the cardboard cores. Where visible under the tarps, it appears that the rolls were placed on pallets.

Based on the previous correspondence with a representative of Solmax (2009 inspection), the manufacturer of the geomembrane, indicated that the storage was satisfactory and that the geomembrane should be acceptable for use. It was noted that a single wrap of the impacted rolls may be removed and discarded at the time of deployment if the Owner prefers not to use the geomembrane that had been exposed; however, this is not required. In the event that the ends of the rolls were not plugged before storage, it will not impact the integrity of the

membrane, however, the cores may become soft and deployment may be more difficult as a result.

In general, the storage is acceptable; however, the sandbags should be replaced due to their degradation over time.

4. CONCLUSIONS

4.1. MONITORING PROGRAM

4.1.1. Groundwater

Although concentrations of metals in groundwater did not exceed the MOE SCSs as part of the current sampling event, concentrations of cobalt, copper, lead and mercury detected in groundwater exceeded the MOE SCSs during previous sampling events at the Site.

A comparison of on-Site and background metals groundwater data revealed that on-site metals concentrations in the landfill area of the Site are considered to be elevated compared to background metal concentrations. SNC recommends that all monitoring wells (including the background monitoring well MW-08) be sampled for the analyses of metals (including mercury) during any future groundwater monitoring events carried out at the Site.

PCBs have not been detected in groundwater samples collected at the Site during any sampling events. Given that PCB soil remediation programs have been carried out at the Site, SNC recommends that all monitoring wells, with the exception of monitoring wells MW-07 and MW-08 (i.e. located upgradient of the PCB Remediation Area), continue to be analyzed for PCBs during any future groundwater monitoring events carried out at the Site.

4.1.2. Surface Water

Previous and current concentrations of metals (i.e. aluminum, cadmium chromium, copper and iron) and nitrite (nitrite as N) detected in surface water samples collected from the leachate collection pond and/or the downgradient stream exceeded the CCME-FAL guidelines. Current concentrations of metals (i.e. aluminum, cadmium, copper and iron) and nitrite (nitrite as N) detected in surface water samples collected from the leachate collection pond and/or the downgradient stream exceeded the CCME-FAL guidelines.

A comparison of on-Site and the background metals data revealed that background levels in metals in surface water in the general area of the Site are elevated; however, it is possible that the landfill is contributing to the levels of cadmium and copper in on-Site surface water and surface water in a stream located directly downgradient of the waste disposal site. SNC recommends that surface water samples be collected from the leachate collection pond, ditches

and the downgradient stream for the analyses of metals (including mercury) and general water chemistry (i.e. for use in the selection of CCME-FAL guidelines for aluminum, copper, lead and nickel) during any future surface water monitoring events carried out at the Site.

PCBs were not detected in the surface water samples collected from the leachate collection pond and downgradient stream. SNC recommends that surface water samples continue to be collected from the leachate collection pond, clean water ditches and the downgradient stream for the analyses of PCBs during any future surface water monitoring events carried out at the Site.

Concentrations of the TTE of the dioxins and furans (197 pg / L and 191 pg / L) were detected in surface water samples collected from the leachate collection pond and downgradient stream. Given that dioxins and furans are generated from a variety of sources, SNC recommends that background surface water samples from nearby streams and ponds be analyzed for dioxins and furans during future surface water monitoring events to further assess trends associated with these chemicals of concern.

4.2. LEACHATE CONTROL SYSTEM

The leachate control system, consisting of ditches and a leachate collection pond, was observed to be in good condition with no blockages or eroded areas noted.

The rip rap repair was observed to be in good condition and the liner is covered.

4.3. GEOMEMBRANE STORAGE

The LLDPE rolls appeared to be in good condition with no evidence of material degradation.
The polyethylene tarps covering the rolls appeared in good condition, no tears or areas of exposure were noted during the inspection. Wear of the sand bags which covered the polyethylene tarps was noted and it is suggested the sand bags be replaced in the spring 2012.

5. RECOMMENDATIONS

Based on the findings of the activities completed at the site during the 2011-2012 period, recommendations for further actions at the Site include:

- Continue with site closure activities in accordance with the Department of Environment and Conservation Guidance Documents “Guidelines for the Closure of Non-Containment Municipal Solid Waste Landfill Sites” GD-PPD-062 and “Environmental Standards for Municipal Solid Waste Landfill Sites” GD-PPD-049.1.

- Develop and implement an environmental monitoring plan to continue to monitor groundwater and surface water at the Site.

- Replace all monitoring well locks as part of the next groundwater sampling event.

- Replace all sand bags replaced to prevent uplift of the tarp covering the rolls of geomembrane material.

6. LIMITATIONS AND CLOSURE

This report has been prepared by SNC-Lavalin for the NL Department of Environment and Conservation (ENVC). It is intended for the sole and exclusive use of ENVC, their affiliated companies and partners, and their respective insurers, agents, employees and advisors. Any use, reliance on or decision made by any person other than ENVC based on this report is the sole responsibility of such other person. ENVC and SNC-Lavalin make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, and decision made or any action taken based on this report or the work referred to in this report.

The investigation undertaken by SNC-Lavalin with respect to this report and any conclusions or recommendations made in this report reflect SNC-Lavalin's judgment based on the Site conditions observed at the time of the Site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to this Site and it is based, in part, upon visual observation of the Site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future Site conditions, portions of the Site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the Site, substances addressed by the investigation may exist in areas of the Site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken.

If Site conditions or applicable standards change or if any additional information becomes available at a future date, SNC-Lavalin requests notification so that we may decide if modifications to the findings, conclusions and recommendations in this report may be necessary.

Other than by ENVC, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of SNC-Lavalin. Nothing in this report is intended to constitute or provide a legal opinion.

As required under the Guidance Document for the Management of Impacted Sites (September 2005), SNC-Lavalin acknowledges that the persons signing this report have demonstrable experience, and are familiar with completing the work as described for the type of contamination at this property.

7. REFERENCES

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