-FINAL-

CLOSURE PLAN
UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

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March 2011
AMEC Project No. TF1112731

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1.0 INTRODUCTION

The Province of Newfoundland and Labrador released a Waste Management Strategy in 2002 indicating that the province was moving toward a regional waste management system with three main landfills serving the majority of the provincial population. The 2002 strategy further suggested there would be 15 waste management regions, with the Avalon Peninsula as one region. In 2007, the provincial government began moving forward with this strategy. Robin Hood Bay (RHB) has been identified as the regional waste disposal site for the entire Avalon Peninsula, with a target implementation year of 2010. Currently, the majority of the communities on the Avalon Peninsula are collecting and transporting their municipal solid waste to RHB. As part of this strategy the provincial government closed the operations of the Upper Trinity South Waste Disposal Site in 2009.

AMEC Earth and Environmental, a division of AMEC Americas Limited, (AMEC) were retained by the Newfoundland and Labrador Department of Environment and Conservation (ENVC) to aid in developing a closure plan for the permanent closure of the Upper Trinity South (New Harbour) waste disposal site. It has been proposed that the closure plan for the New Harbour waste disposal site will span three years. The following report summarizes the three year closure plan.

2.0 METHODOLOGY

This report summarizes the findings to date for the New Harbour Waste Disposal Site and provides guidance for the tender and closure of this site. This closure plan deals with all work anticipated for the closure. The closure of the waste disposal site is scheduled to span three years.

The scope of work for “year one” includes the completion of the following tasks:

- Materials search/test pit program, survey, and design brief;
- Construction drawings and tender preparation for year one work;
- Consolidation, grading, compaction and interim covering of all waste disposed at the site;
- Consolidation and removal of vehicle wrecks and metal waste remaining at the site;
- Surface waster, erosion, and sediment control activities; and
- As-built drawings and documentation of activities.

The scope of work for “year two” includes the completion of the following tasks:

- Human Health and Ecological Risk Assessment;
- Groundwater, surface water, settlement, erosion, and interim cover inspections and monitoring;

- Maintenance of collection pond and ditching;
- Maintenance of interim cover and access road;
- Design and tendering for additional Geomembrane (if required); and
- Reporting.

The scope of work for "year three" includes the completion of the following tasks;

- Planning and tendering "year three" tasks;
- Groundwater, surface water, settlement, erosion, and interim cover inspections and monitoring;
- Maintenance of collection pond and ditching;
- Grading and compaction of year one cover;
- Installation of geomembrane, and associated infrastructure;
- Grading and compaction of final cover (over geomembrane);
- Hydroseeding; and
- Reporting.

3.0 SITE DESCRIPTION AND HISTORY

The Site is located south of Route 73 on the New Harbour Barrens and has operated as a domestic waste disposal facility since the early 1970s (refer to Figure 1, Appendix A). As of November 2009, the facility is no longer operational. In the past the facility has accepted domestic waste from the communities of Blaketown, Dildo, Green's Harbour, Hopeall, Markland, New Harbour, Old Shop, South Dildo, Bay Roberts and Cupids. The facility is an unlined waste disposal facility; however, potential impacts from leachate generated at the Site are now being managed by an interception ditch and leachate collection pond constructed at the Site in 2007. Until recent years, open burning was a common practice carried out at the Site to reduce waste volumes and control vermin. The surrounding area consists of vacant, undeveloped land that is comprised mostly of bogs/wetland and forested areas with several ponds and streams located upgradient and downgradient of the facility.

During the period of 1992 through 1995, the ENVC undertook a polychlorinated biphenyl (PCB) remediation program at a nearby scrap yard, located in the community of Makinsons, NL. During this program, low-level PCB-impacted scrap metal and transformer casings were transported to Upper Trinity South Waste Disposal Site and buried on-Site, within the dumpsite waste. Previous soil sampling programs carried out by AMEC and SGE Acres Limited revealed levels of PCBs in soil at the Site that exceeded the Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guideline (CSQG) of 33 mg/kg for PCBs in soil at commercial sites.

In June 2006, AMEC submitted a design for a leachate control system to the ENVC. Aspects of the design were chosen based on their ability to be constructed while the landfill continued to operate, and the level of environmental protection considered necessary at that time. Specific measures implemented at the Site to control leachate included a leachate collection pond in a low lying area to the south of the waste disposal site and three drainage ditches to intercept surface water before it could enter the waste site and direct it to natural collection areas away from the waste.

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.

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. Numerous transformer casings and scrap metal were also observed in some of the trenches.

In 2009, Clifford Cooper Construction, under the supervision of SNC, completed the work required at the Site in order to restrict access to the facility. The physical work included installing concrete barriers, improving the existing fencing and erecting the proper closure signage.

In 2010 AMEC supervised the removal of PCB impacted material from the Site. The contract for the removal of the material was awarded to Sanexen Environmental Services Inc. (Sanexen),

the material was excavated by Professional Grading and Contracting Ltd., transported off Site by Laidlaw Carriers Bulk Group Inc., and was decontaminated and destroyed (via incineration) by Horizon Environment Inc. located in Quebec. Approximately 136 tonnes of material was excavated and removed from the Site and the excavation was backfilled with clean (i.e., tested) imported fill material. Further information on the removal of PCB impacted material in 2010 is provided in the attached letter report titled "*Removal of PCB-Impacted Material, Upper Trinity South Waste Disposal Facility, New Harbour, NL, January 2011"*.

In 2011, AMEC completed inspections of the leachate control system at the Site and the geomembrane being stored at the ENVC fenced storage yard in Conception Bay South, NL. At that time, the leachate control system was observed to be in good condition with no blockages or eroded areas noted. The polyethylene tarps covering the rolls of geomembrane appeared in good condition and, no tears or areas of exposure were noted on the geomembrane during the inspection. The geomembrane manufacturer, Solmax International, was contacted to confirm the integrity of the geomembrane and storage conditions. Confirmation was made that degradation of the geomembrane would not be cause for concern. Although not required by the manufacturer, a single layer of the geomembrane may be removed prior to use should exposure be noted.

4.0 PREVIOUS INVESTIGATIONS

The following investigations have been previously conducted at the Site:

- AMEC 2011. Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site, March 2011.
- AMEC 2011. Removal of PCB Impacted Material, Upper Trinity South Waste Disposal Facility, New Harbour, NL. January 2011.
- SNC Lavalin Inc., 2010. Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site, March 2010.
- SNC Lavalin Inc., 2010. Implementation of Previous Recommendations, Upper Trinity South (New Harbour) Waste Disposal Site, May 2010.
- AMEC 2009. 2009 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site, March 2009.
- AMEC 2009. 2008 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site, February 2009.
- AMEC 2008. 2007 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site, March 2008.
- AMEC 2007. Upper Trinity South (New Harbour) Waste Disposal Site. Implementation of the Leachate Control System, March 2007.
- AMEC 2006. Upper Trinity South (New Harbour) Waste Disposal Site. Design of Leachate Control System, June 2006.

- SGE Acres Limited, 2004 (New Harbour Dump, Part 2, Phase II, Environmental Testing – Final Report.
- SGE Acres Limited, 2003. New Harbour Waste Disposal Site, Environmental Testing – Final Report.
- SGE Acres Limited, 2003. New Harbour, Part 1, Phase II, Environmental Testing – Final Report.
- Harris and Associates Limited 1996. Upper Trinity South Waste Disposal Site Study.

5.0 CLOSURE RECOMMENDATIONS

Class A sites required a site specific closure plan and monitoring program, which addresses the specific issues associated with the site. Consideration shall be given to the contaminants contained within and the adjacent land use and receptors.

In developing this plan, consideration is given to two provincial documents associated with the operation and closure of municipal solid waste landfill site. These documents are 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. The following section provides the closure recommendations for the three year closure plan.

5.1 YEAR ONE CLOSURE PLAN

The Year One closure plan includes the materials search/test pit program, survey, closure plan development, surface water control, erosion, sediment control activities, and reporting. It is anticipated that consolidation, grading, compaction and interim covering of all waste disposed at the site and consolidation/removal of all recyclable materials from the site will be included as the construction activities for the year one closure plan.

5.1.1 Test Pitting Program

A test pit and sampling program was performed on February 21 and 22, 2011 to identify potential borrow sources for cover material. A Cat 320 track mounted excavator was used to excavate 10 test pits with depths up to of 5.2 m.

A substantial deposit of glacial till was identified on the site. Incorporating the test pit data with the site survey indicates a potential for 27,000 m^3 of cover material available on the site. The soil composition consists of a surficial layer of sand and gravel fill (0.1 m to 1.0 m thick) overlying glacial till. The glacial till is a mixture of sand and gravel with a trace to some fines, cobbles, and boulders. The in-situ permeability is anticipated to range from 1×10^{-3} to 1×10^{-5} cm/sec.

5.1.2 Tender Preparation and Construction Drawings

The tender documents and constructions drawings were completed by AMEC. Quantities and location details were constructed from data collected during the 2011 site survey.

5.1.3 Site Clean-up

The site clean-up includes litter control which will involve collection of windblown litter and scattered debris along the sites access road and adjacent to the site boundaries. This work will be conducted where necessary and to the extent possible. Labourers, an excavator and a tandum dump truck will be required to conduct this work. The excavator and dump truck will clean up areas which are highly concentrated with debris; as directed by the consultant retained for the on-site supervision. In less concentrated and vegetated areas, labourers will perform the clean up. As a minimum, all hard plastics, metals or any other non-degradable or large items within a 50 m buffer of the site shall be collected. Should debris be located in high branches of trees or not able to be collected in a safe manor, the debris shall be left to biodegrade naturally. During site clean-up care must be taken to minimize the disturbance of any vegetated areas.

All accessible, recoverable scrap metal, including white metals and car wrecks, shall be picked up and consolidated in a central on-site location for collection and recycling by a metal recycler. Currently, a large quantity of scrap metal remains amongst the waste stockpiles and along the embankments. It is anticipated that 2 to 3 tractor trailer loads of scrap metal would require recycling.

The above tasks are in agreement with those presented in Items 1 to 4 of the Department of Environment and Conservation's Guidance Documents 'Guidelines for the Closure of Non-Containment Municipal Solid Waste Landfill Sites' GD-PP-062 and Section 7.5.3 of the Department of Environment and Conservation's Guidance Document 'Environmental Standards for Municipal Solid Waste Landfill Sites' GD-PPD-049.1.

5.1.4 Existing Infrastructure

The infrastructure remaining on site from the waste site operation and subsequent work includes a gate and chain link fence along the access road, monitoring wells installed as part of the groundwater monitoring program and ditching and a settling pond constructed as part of the leachate control program. The condition of the gate and chain link fence appears acceptable for future use and will remain in operation throughout the year one closure plan. This infrastructure shall be removed during the final phase of construction in year three.

AMEC installed seven on-site monitoring wells in 2006 to monitor groundwater quality. These monitoring wells have been monitored and are currently used for groundwater sampling. In 2009 SNC replaced one of these monitoring wells due to visible damage, and installed a background monitoring well located adjacent Route 73. Currently there are eight monitoring wells onsite and are used for long-term monitoring.

In 2006 a leachate collection pond was installed to collect any possible contaminants from the waste site. Testing of sediment and leachate is being performed by AMEC. During the closure plan any maintenance required to maintain the integrity of the collection pond shall be performed.

A ditching system exists along the west, south and east perimeter of the site. The ditching was installed to intercept any surface water from passing through the waste site. This ditching system was installed in conjunction with construction of the leachate collection pond in 2006. Maintenance of this ditching system shall be performed throughout the closure plan. Final ditching measures relating to erosion control will be installed during Year Three.

5.1.5 Consolidation and Grading

The waste is scattered throughout the site in 3 to 4 m high stockpiles. Additionally there are steep embankments in the south section of the site, which will require reshaping and grading. It is estimated that the total volume of exposed waste stockpiled on the top of the site is 16,800 m^3; see Drawings 2 and 3 in Appendix A for general locations. All waste shall be consolidated and compacted prior to cover placement, with all slopes at a grade of 3H:1V or flatter. While slopes of 3H:1V are generally stable, flatter slopes may be required in areas that are excessively wet or contain large amounts of waste. The waste in the south section of the site shall be consolidated at the toe of the embankment and graded prior to cover placement.

Test pits dug throughout the site show that a dense glacial till soil is underlying much of the site. It is anticipated that the area between the two windrows of waste (centre of the site, running north-south) can be excavated up to 4 m deep (approximately 25 m wide by 50 m long) and used as cover. This excavation would then be backfilled with waste from the adjacent windrows and covered with a minimum of 1 m of the excavated soil.

There is a small area in the northeast of the waste site that was previously used for the storage of transformer casings. This area contains PCB impacted material and is not part of the Year One closure plan. The area shall be marked out, as it will be isolated from Year One construction. Under no circumstances shall any material be excavated from this area for use as cover material. This section will be addressed in the Year Two plan upon completion of a human health and ecological risk assessment.

Excavators and dozers are anticipated to be used to conduct this work. An excavator can easily pick up and move waste while a dozer is efficient in spreading and compacting the waste. Tandem dump trucks or off road trucks may be required to assist with consolidation of the waste, particularly if the waste has to be transported to another location on the site.

5.1.6 Drainage Ditches

Ditches exist around the west, south, and east sections of the site to divert surface and groundwater away from the waste site. It is not anticipated that additional ditches will be required. Consideration shall be given to include it as a contingency plan should areas of ponding occur during construction.

As part of the erosion control measures, silt fencing will be installed in the current ditches at 20 m intervals. The total length of silt fencing required is anticipated to be 150 m.

5.1.7 Rodent, Animal and Vector Control

Due to the discontinued disposal of waste at the New Harbour site in 2009, rodents, animals and vectors are not anticipated to be cause for concern. This item shall be included as part of a contingency should rodents or other animals be noticed during construction or future inspections.

5.1.8 Site Access and Signage

In Year One, site access will remain in its current set-up. The access road shall remain until later phases of the closure plan. Currently a gate and chain link fencing impedes the general public from gaining site access.

During Year One, one Type D project site and six “No Trespassing” and “No Dumping” Type A signs, as show in Drawing 10, will be installed throughout the site. These signs will be installed to inform the public that a landfill previously existed on the site. The project sign will be installed at the entrance of the site. The Type A signs will be installed in visible areas where the public may gain access to the site such as ATV trails.

Site access will be in accordance with section 7.5.7 of the Department of Environment and Conservation’s Guidance Document ‘Environmental Standards for Municipal Solid Waste Landfill Sites’ GD-PPD049.1.

5.1.9 Interim Cover

During Year One, all waste will require interim cover. All exposed waste shall be covered with 1.0 m of cover material after consolidation and grading. In areas where waste is already covered, less cover can be used provided there is little potential for settlement and protruding

objects, and grading is not an issue. The cover and settlement will be monitored in accordance with the maintenance and monitoring program in section 6.2 of this document.

It is anticipated that an area of 24,000 m^2 of consolidated and graded waste will require cover material. This cover material will be used to cover all exposed, graded and compacted waste. This layer will consist of on-site common fill and be compacted as placed in two 0.5 m lifts and shall be graded to prevent ponding on top the waste.

5.1.10 Monitoring

During Year One, monitoring of settlement of the interim cover will be conducted quarterly. Monitoring will be conducted using survey control (see 6.2.2). Other parameters such as surface and groundwater monitoring, and leachate system inspection and monitoring shall be conducted in accordance with their ongoing monitoring program.

5.1.11 Reporting

Upon completion of the Year One closure plan construction, a summary report shall be prepared describing the work completed, including as-build drawings and the anticipated inspections required.

5.2 YEAR TWO CLOSURE PLAN

The Year Two closure plan will include a human health and ecological risk assessment, inspections, monitoring and maintenance.

5.2.1 Human Health and Ecological Risk Assessment

Human health and ecological risk assessment is a tiered process used to estimate the nature and probability of adverse health effects in both human and ecological receptors (i.e. the environment) that may be exposed to chemicals or contaminated environmental media identified at a site. Results of a risk assessment can be helpful in decision making concerning the need and nature of remedial or risk management actions required to close waste disposal facilities, support the derivation of site specific clean-up criteria, and assist in permitting new facilities and in the development of closure plans for former facilities. Risk assessment is an acceptable practice of managing contaminated sites in Newfoundland and Labrador.

Based on the findings of the previous environmental investigations completed at the former Upper Trinity South Waste Disposal Site, AMEC recommends that a Human Health Preliminary Quantitative Risk Assessment (PQRA) and Screening Level Ecological Risk Assessment (SLERA) be completed to determine whether or not the levels of PCBs in various media at the Site pose any potential risks to human and ecological receptors.

The following subsection describe the steps that shall be carried out to further characterize the environmental condition of the Site and/or to assess the potential for risks to the health of human and ecological receptors at and in the general area of the Site.

Step 1: Data Gap Analysis

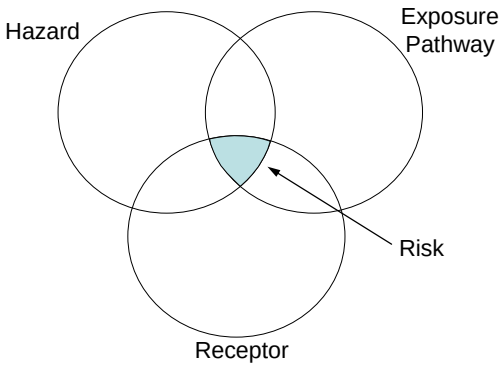
Review all the previous environment reports to determine if any additional data is required to complete a risk assessment.

Step 2: Additional Soil Sampling

Conduct a test pitting program to delineate the boundaries of the transformer disposal area. Select soil samples should be collected for PCB analysis during that time. Based on the findings of the data gap analysis, additional field work / sampling may be required to further characterize the Site.

Step 3: Quantitative Risk Assessment

The purpose of the risk assessment is to quantitatively assess the potential risks associated with exposure to PCBs in environmental media to human and ecological receptors using the site under the current land use or reasonably foreseeable potential future land use.



For a risk to exist at a site, three components must be present to contribute a risk to human health and the environment. As indicated in the diagram to the right, these are:

- An elevated chemical concentration (hazard).
- A receptor to come in contact with the chemical.
- An exposure pathway to facilitate contact between the receptor and the chemical.

The risk assessment shall be conducted using the above noted guidance and approach and includes the following four-step paradigm:

1. Problem Formulation;
2. Toxicity (Hazard) Assessment;
3. Exposure Assessment; and
4. Risk Characterization.

Problem Formulation

It is essential that a brief, but thorough problem formulation be provided, in the risk assessment report. As a minimum, the report subsections shall include:

- screening and identification of chemicals of potential concern (COPC);
- identification and description of potential receptors;
- identification of operable exposure pathways; and
- a brief summary paragraph describing the COPC, critical receptor(s), and exposure pathways.

Hazard Assessment

Hazard assessment is the process of determining whether exposure to a COPC can cause an increased potential for adverse health effects and whether the adverse health effect is likely to occur in human and ecological receptors present at a given site. In the case of chemical stressors, the process examines the available scientific data for a given chemical (or group of chemicals) and develops a weight of evidence to characterize the link between the negative effects and the COPC.

Exposure Assessment

Assessing the potential occurrence of adverse effects to human health resulting from chemical exposure is based on the fundamental principal of dose and response as the probability of an adverse effect increases with increasing exposure. The objective of the exposure assessment is to predict the extent to which human receptors (e.g., workers, Site visitors, etc.) may be exposed to COPC via various pathways such as ingestion of soil, groundwater, etc. The exposure assessment typically takes into consideration the concentration of COPCs in various media, the physical-chemical form of the contaminants of concern and how that may affect uptake and toxicity, as well as the degree to which receptors are exposed to that particular pathway.

Chemical exposures for ecological receptors are estimated by considering major exposure pathways. For terrestrial wildlife, including mammals and avian species, exposure is calculated as weight-normalized whole-body doses from multimedia exposure (e.g., inhalation, ingestion of soil or groundwater, ingestion of prey, etc). Exposure models can range from simple multimedia dose calculations to sophisticated spatially explicit exposure models accounting for habitat quality, foraging range, and nutritional requirements of the Valued Ecological Components (VECs). For aquatic receptors, exposure is typically expressed on the basis of the concentration in surface water or sediment, as there are insufficient toxicological data available to support the analysis of individual exposure pathways (ingestion, dermal, etc.).

Risk Characterization

Risk characterization is the estimation of the incidence and severity of the adverse effects likely to occur in a human population or environmental compartment due to actual or predicted exposure to a COPC.

The risk characterization component of a human health risk assessment compares the predicted exposure to individual contaminants via different routes of intake to the toxicological criteria that define an “allowable,” “acceptable,” or “safe” level of exposure. For chemicals that operate via a threshold-type of dose response, the comparison most often used is termed a hazard quotient or exposure ratio. This is simply the ratio between total exposure adjusted for bioavailability divided by the exposure limit. Where predicted levels of exposure are less than the allowable limit no adverse health outcomes would be expected.

The risk characterization component of an ecological risk assessment typically characterized using an exposure ratio (analogous to a hazard quotient). Estimated concentrations or rates of exposure (from the exposure assessment) are compared to the acceptable exposure levels (from the toxicity assessment) for a COPC. Exposure ratios less than one indicate the chemical concentrations are unlikely to have adverse impacts. Exposure ratios greater than one do not necessarily indicate adverse effects have occurred, only that potential effects are possible, and that further investigation is warranted. For screening level assessments, calculation of the exposure ratios often is the only line of evidence used. A higher-tier ecological risk assessment may also evaluate evidence from toxicity tests, bioavailability (fraction of chemical available for uptake) or bioaccumulation potential (level of uptake into organisms at the site), and community survey results.

Step 4: RAP/RMP

Should the risk assessment reveal the potential for risk to human and/or ecological receptors, a Remedial Action Plan/Risk Management Plan (RAP/RMP) will be necessary to remediate or manage the risks to safe/acceptable levels. The RAP/RMP will evaluate applicable remedial (i.e. soil excavation, etc.) and risk management (i.e. capping, etc) options and recommend a preferred option (and an alternative option) for the Site findings of the RAP/RMP. The preferred option shall be incorporated into the closure plan for the Site.

Step 5: Monitoring Plan

A five year monitoring program shall be developed for the Site and implemented following site closure to monitor that concentration of any COPCs in soil, groundwater, surface water and sediment to ensure they do not exceed levels considered to be a concern for the health of human and ecological receptor at and in the general area of the Site.

5.2.2 Monitoring of Interim Cover

During Year Two, monitoring will be conducted to determine the amount and rate of settlement with the interim cover. This will be conducted on a quarterly basis, by the consultant. This work will be conducted using GSP survey equipment (GPS). A grid will be surveyed after final compaction of the interim cover noting the northing, easting, and elevation of multiple original points. This grid will be tracked via GPS and the existing elevations will be recorded during each inspection. Other parameters such as surface and groundwater monitoring, and leachate system inspection and monitoring shall be conducted in accordance with their ongoing monitoring program.

5.2.3 Maintenance

It is anticipated that some maintenance will be required during Year Two to address erosion and settlement of the interim soil cover. Along with erosion, ditches and settlement control measures, 6,000 m^3 of select common fill is anticipated to be included in the Year Two closure plan. This fill will be used for maintenance of the interim cover layer and placed in areas where substantial settlement is noted. Other maintenance requirements will include sediment removal and repair/upgrades of ditches, silt fences and collection ponds, as required.

5.2.4 Reporting

Reporting for Year Two will include a human health and ecological risk assessment report, and an annual inspection and monitoring report.

5.3 YEAR THREE CLOSURE PLAN

The final Year Three closure plan will include inspections and monitoring of groundwater and surface water, erosion, sediment, and settlement of the interim cover. Where required, maintenance of the interim cover, ditches, collection pond, and access road will be conducted prior to the installation of the final cover system.

5.3.1 Final Cover System

The site will require the installation of a low permeable cover. A final cover system was designed by AMEC in 2006 and consists of an interim soil cover layer, a bedding layer, a LLDPE geo-membrane, an overlaying drainage layer and a final cover layer. As part of the original design ENVC purchased 18 rolls of linear low-density polyethylene (LLDPE) geo-membrane in 2008. This liner is currently in storage off-site. Additional liner may have to be purchased due to the Site expanding since the original quantity of liner was purchased.

5.3.1.1 Grading and Compaction of Interim Cover

Prior to placement of the final cover system, the interim cover shall be graded to compensate for settlement and to provide drainage. The graded surface is to be compacted using a 10-tonne vibratory roller prior to the placement of the bedding layer. Should any areas of concern be noted they shall be repaired prior to placing the bedding layer.

5.3.1.2 Bedding Layer

The bedding layer will consist of a well graded clean sand material and be placed on top of the interim cover layer. This bedding layer shall be placed at a thickness of 0.2 m and compacted as placed. The bedding layer will allow for lateral movement of gases to the venting system and provide a smooth surface for placement of the LLDPE geo-membrane. It is anticipated that approximately 7,000 m^3 of bedding material will be required to cover the site.

Acceptable bedding material will be free from organics and free of particles over 12 mm in diameter. Materials should be free draining, uniformly graded and shall meet the following general specifications.

100%	passing 12 mm
70 – 100%	passing 4.75 mm
40 – 60%	passing 1.2 mm
0 – 5%	passing 75 µm

5.3.1.3 Linear Low-Density Polyethylene Geomembrane

The LLDPE geo-membrane liner shall be used to cap the site and prevent infiltration of surface water to the buried waste. The LLDPE geo-membrane shall be installed according to the specifications of the manufacture, Solmax International.

Quality control of the geo-membrane shall be conducted by the installer and monitored by AMEC for compliance with “Environmental Standards for Municipal Solid Waste Landfill Sites” GD-PPD-049.1 Appendix B – Typical Components of a Quality Control/ Quality Assurance Program For a Municipal Solid Waste Landfill. Geotextile fabric shall be placed on top and bottom of the geo-membrane to protect the geo-membrane from any puncture or abrasion.

5.3.1.4 Drainage Layer

The drainage layer will be placed on top of the geo-membrane and will consist of a bedding material to protection against puncture and tearing. The material used for the drainage layer will be similar to the underside material; and shall consist of well graded sand. The layer shall be placed at a thickness of 0.2 m. Care must be taken during the placement to not puncture or tear the geo-membrane with equipment. It is suggested that the overlying bedding layer be placed

with smaller equipment and that standard compaction effort for this layer will not be required. It is anticipated that approximately 7,000 m^3 of bedding material will be required to cover the site.

Acceptable material for the drainage layer will be free from organics and free of particles over 12 mm in diameter. Materials should be free draining, uniformly graded and shall meet the following general specifications.

100%	passing 12 mm
70 – 100%	passing 4.75 mm
40 – 60%	passing 1.2 mm
0 – 5%	passing 75 µm

5.3.1.5 Final Soil Cover

The final soil cover layer will consist of common fill. The final soil cover will be a minimum thickness of 0.8 m. To minimize damage to the geo-membrane, the final soil cover will be placed at 0.8 m in thickness and compacted by non-vibratory methods to 92% of the standard proctor maximum dry density. This layer shall be graded to prevent surface ponding. It is estimated that an area of 34,000 m^2 will require final cover. From preliminary calculations 27,000 m^3 of common fill will be required. Consideration shall also be given to hydroseeding the site upon completion to reduce erosion.

5.3.2 Gas Vents

Gas vents are recommended to be installed at 100 m intervals, at a minimum, along the crown of the membrane to allow for the venting of gases from the decaying waste layer. Additional vents may be required as per the manufacturer's recommendations and as-built site conditions.

A typical detail of a vent is shown in Appendix A, Drawing 8. It is recommended that these vents be constructed from galvanized steel pipe (a minimum of 50 mm inside diameter) with a minimum 300 mm x 300 mm steel plate welded to the base to prevent unauthorized removal and frost jacking. The pipe should be perforated below the geo-membrane to a minimum depth of 0.5 m below the liner, wrapped in geotextile, and back filled with bedding sand or gravel. The pipe should be installed to a minimum height of 1.0 m above finished grade, with a 180 degree bend and screen to prevent rainwater and foreign matter from entering. All exposed surfaces are to be painted with a highly visible paint that is resistant to rusting.

5.3.3 Site Ditching

As part of Year Two and Year Three maintenance, any sediment build up along the silt fencing, or in the collection pond will require removal and appropriate disposal. After installation of the final cover system the ditches shall be lined with geotextile fabric and rip-rap. The rip-rap shall consist of a good quality 300 mm minus clean blast rock.

Material used for rip-rap shall meet the following general specifications.

100%	passing 300 mm
40 – 60%	passing 200 mm
20 – 40%	passing 100 mm
0 – 10%	passing 50 mm

5.3.4 Site Access

After completion of Year Three construction and final inspection, the gate and chain link fence shall be removed from the site and the access road shall be ditched at its intersection with Route 73. A Type D site sign will be placed in the center of the former access road indicating to the general public that the site is permanently closed.

5.3.5 Monitoring

During Year Three, monitoring of settlement of the interim cover will be conducted semi-annually. Other parameters such as surface and groundwater monitoring, and leachate system inspection shall be conducted in accordance with their ongoing monitoring program. Gas vents shall be installed as part of the final cover system, and air samples shall be checked for methane levels. A full monitoring and maintenance plan is described in Section 7.0.

5.3.6 Reporting

Reporting for Year Three will include the annual inspection and monitoring and a summary of the Year Three construction. Included in the report will be a project summary, as-built drawings, and contingency plan.

5.4 POST-DECOMMISSIONING MONITORING AND MAINTENANCE PROGRAM PLAN

The monitoring and maintenance program will be conducted in accordance with Section 7.5.4 of the Department of Environment and Conservation's Guidance Document 'Environmental Standards for Municipal Solid Waste Landfill Sites' GD-PPD049.1, and includes: groundwater monitoring, surface water monitoring, gas monitoring, leachate system monitoring, and monitoring and maintenance of settlement and final cover on the site. The monitoring and maintenance program shall cover a minimum of 25 years post-decommissioning.

The groundwater monitoring plan shall be in accordance with Appendix C – Typical Surface and Groundwater monitoring Program, section 2.1 Groundwater Monitoring of the Department of Environment and Conservation's Guidance Document 'Environmental Standards for Municipal Solid Waste Landfill Sites' GD-PPD049.1. Currently a total of eight monitoring wells exist (seven on-site and one background).

The proposed groundwater monitoring plan includes collecting representative samples from the existing monitoring wells and analyzing them for the parameters listed in Column 1 in Appendix D. Following closure representative samples are to be collected from the existing monitoring wells quarterly and analyzing for the parameters listed in Column 2 in Appendix D. Currently no domestic drinking water wells are identified within 500 m of the site.

The surface water monitoring plan shall be in accordance with Appendix C – Typical surface and Groundwater monitoring Program, section 2.2 Surface water monitoring of the Department of Environment and Conservation's Guidance Document 'Environmental Standards for Municipal Solid Waste Landfill Sites' GD-PPD049.1; and includes representative sampling of surface water being discharged from the site and of any water body, including upstream control locations, which may be affected by leachate, storm water runoff, or sediment from the site. Samples shall be: collected twice a year and be analyzed for the parameters listed in Column 3 of Appendix D and for other parameters of concern identified in the surface water assessment; and collected quarterly to be analyzed for the parameters listed in Column 4 of Appendix D. Additionally, annual monitoring of biological features to assess the composition and any changes to the benthic community present in any water body, located downstream of storm water discharges, that may be affected by leachate, storm water runoff, or sediment from the site.

Methane gas sampling shall be conducted on a annual basis for each gas vent. It is proposed that an air sample be taken at the vented area and methane levels be compared to the most recent regulatory guidelines.

The monitoring of the existing sediment pond has been conducted on an annual basis and it is proposed to continue. During this inspection, the ditches and sediment pond shall be visually inspected for any deterioration or faults in the system. Any maintenance which is required from the inspection shall be assessed on a case by case basis.

The monitoring and maintenance of settlement on the site shall be performed on a quarterly basis during the three year closure plan and semi-annually for the first three years post closure to accumulate a settlement rate for pre- and post- final cover installation. Annual inspections shall be conducted thereafter until site conditions remain consistent. Any settlement that may pose a problem with the cap or site drainage shall be addressed at that time.

In addition to the settlement monitoring, the final cover shall be visually inspected for any waste exposure, washout, or deterioration in the final cover system. Any non-compliance observed in the final cover system shall be assessed on a case by case basis.

As stipulated in section 7.5.4 of the Department of Environment and Conservation's Guidance Document 'Environmental Standards for Municipal Solid Waste Landfill Sites' GD-PPD049.1, Post-Decommissioning Monitoring and Maintenance Program, regular inspections shall be carried out at least twice per year; during the spring and fall. The monitoring and maintenance

plan shall be carried out for a period of 30 years; however, at the department's approval, testing parameters may be decreased or eliminated based on test results.

Additionally, as per section 7.5.8 of the Department of Environment and Conservation's Guidance Document 'Environmental Standards for Municipal Solid Waste Landfill Sites' GD-PPD049.1, annual reports shall be submitted to ENVC outlining the monitoring and maintenance activities and summarizing results of all inspections.

6.0 CLOSURE

This closure plan was prepared for the exclusive use of the Department of Environment and Conservation for specific application to the project site and was conducted in accordance with the work plan developed for this site and verbal requests from the client. The work was performed using generally accepted engineering practices and procedures commonly used in the industry. The limitations of this report are stated in Appendix F.

Respectfully Submitted,

AMEC Earth & Environmental,
A division of AMEC Americas Limited

Prepared by:

Stephen Cutcliffe, EIT
Junior Project Engineer

Kevin Penney, MScEng, P. Eng
GeoEnvironmental Engineer

Reviewed by:

Clifford Smith, P. Eng
Civil (Waste Management) Engineer

7.0 REFERENCES

AMEC 2011. Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site, March 2011.

AMEC 2011. Removal of PCB Impacted Material, Upper Trinity South Waste Disposal Facility, New Harbour, NL. January 2011.

AMEC 2009. 2009 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site, March 2009.

AMEC 2009. 2008 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site, February 2009.

AMEC 2008. 2007 Groundwater and Surface Water Sampling Program at the Upper Trinity South (New Harbour) Waste Disposal Site, March 2008.

AMEC 2007. Upper Trinity South (New Harbour) Waste Disposal Site. Implementation of the Leachate Control System, March 2007.

AMEC 2006. Upper Trinity South (New Harbour) Waste Disposal Site. Design of Leachate Control System, June 2006.

Government of Newfound and Labrador Department of Environment, Newfound and Labrador Waste Management Strategy April 2002, Document number GD-PPD-062 - Closure of Non-containment Municipal Solid Waste Landfills/Waste Disposal Sites.

Government Of Newfound And Labrador Department of Environment, Newfound and Labrador Waste Management Strategy April 2002, Document number GD-PPD-049.1 – Environmental Standards for Municipal Solid Waste Landfill Sites.

Harris and Associates Limited 1996. Upper Trinity South Waste Disposal Site Study.

SGE Acres Limited, 2004 (New Harbour Dump, Part 2, Phase II, Environmental Testing – Final Report.

SGE Acres Limited, 2003. New Harbour Waste Disposal Site, Environmental Testing – Final Report.

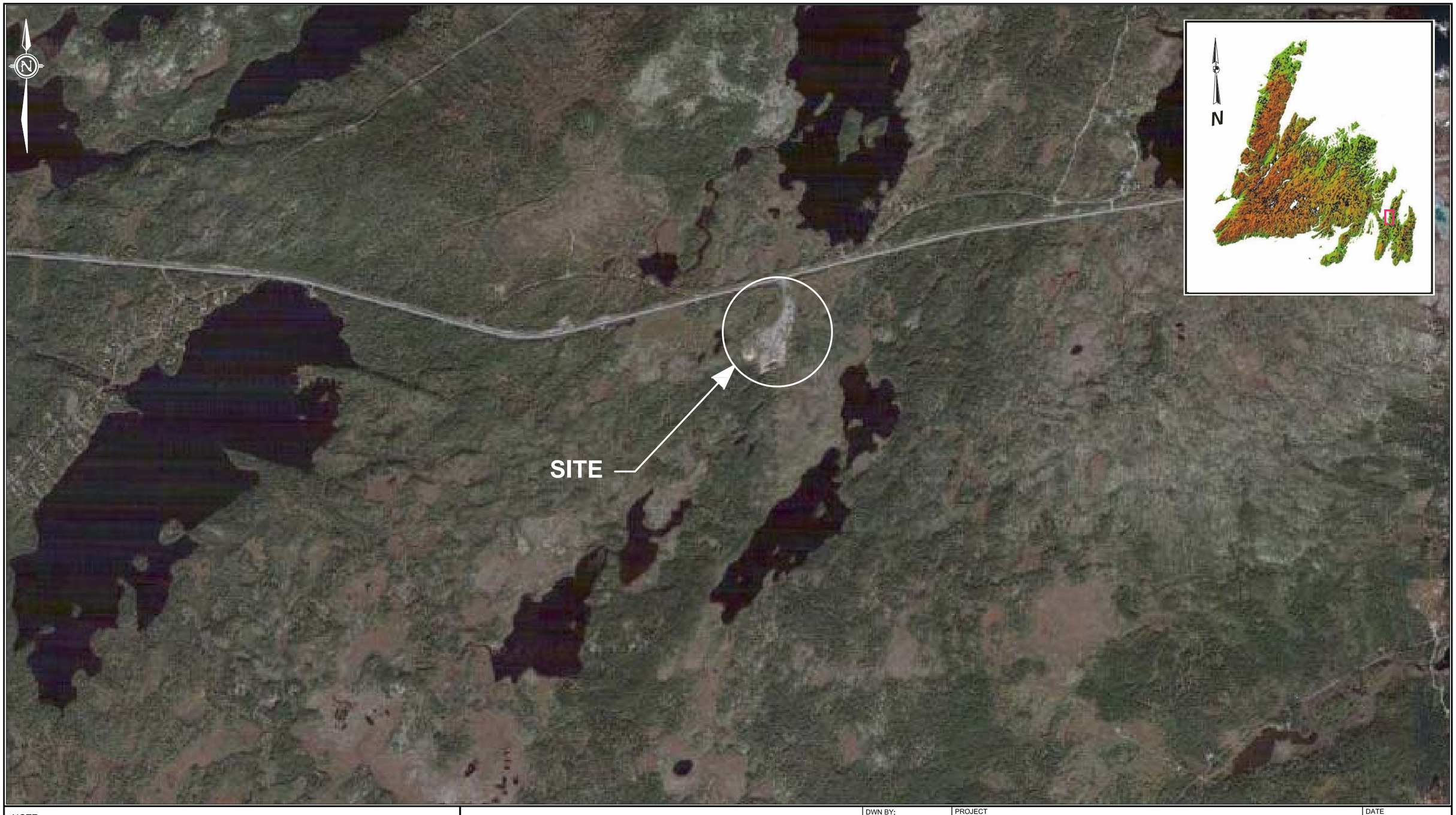
SGE Acres Limited, 2003. New Harbour, Part 1, Phase II, Environmental Testing – Final Report.

SNC Lavalin Inc., 2010. Annual Report of Activities, Upper Trinity South (New Harbour) Waste Disposal Site, March 2010.

SNC Lavalin Inc., 2010. Implementation of Previous Recommendations, Upper Trinity South (New Harbour) Waste Disposal Site, May 2010.

APPENDIX A

DRAWINGS



NOTE:

1. ALL DIMENSIONS ARE IN METERS.
2. DO NOT SCALE FROM DRAWING.
3. THIS DRAWING IS INTENDED TO SHOW RELATIVE LOCATIONS AND CONFIGURATION OF THE STUDY AREA IN SUPPORT OF THIS REPORT.
4. ALL LOCATIONS, DIMENSIONS, AND ORIENTATIONS ARE APPROXIMATE.
5. THIS DRAWING SHOULD NOT BE USED FOR PURPOSES OTHER THAN THOSE OUTLINED ABOVE.
6.

Government of Newfoundland and Labrador

Department of Environment Conservation

AMEC Earth & Environmental
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709-722-7023

DWN BY: A. Hollett

CHK'D BY: C. Smith

SCALE: 0 75 m

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

TITLE: SITE LOCATION PLAN (AERIAL PHOTO)

DATE: August 2011

PROJECT No.: TF1112731

REV. No.: 0

DRAWING No.: 1

LEGEND:

- TREELINE
- TOP OF EXPOSED WASTE
- TOE OF EXPOSED WASTE
- DITCH

SCALE

0 m 100 m

NOTE:

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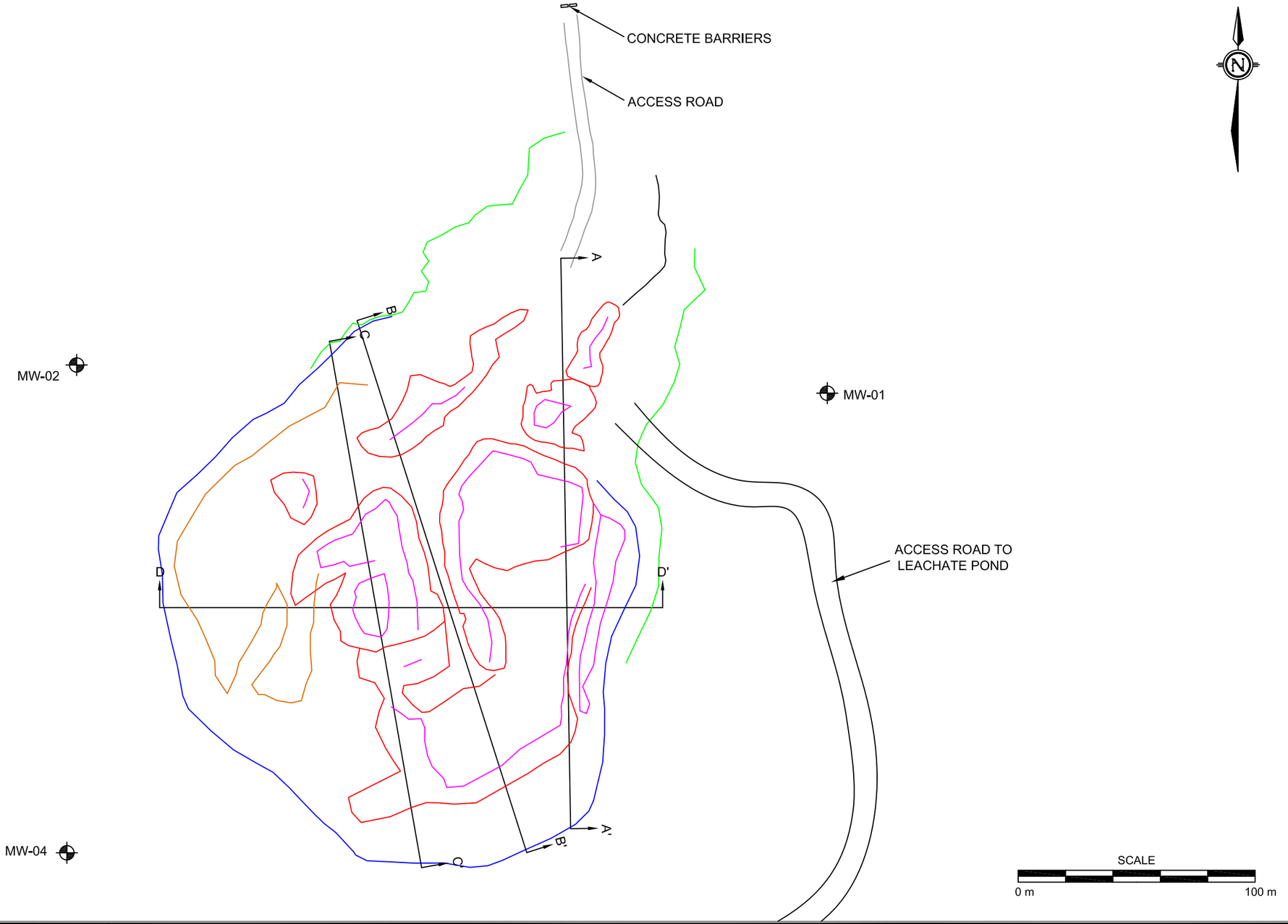
DWN BY:	A. Hollett
CHK'D BY:	C. Smith
SCALE:	As Shown
PROJECT	CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
TITLE	EXISTING TOPOGRAPHIC PLAN
DATE	August 2011
PROJECT No.	TF1112731
REV. No.	0
DRAWING No.	2



LEGEND:

- TREELINE
- TOP OF EXPOSED WASTE
- TOE OF EXPOSED WASTE
- DITCH

NOTE:

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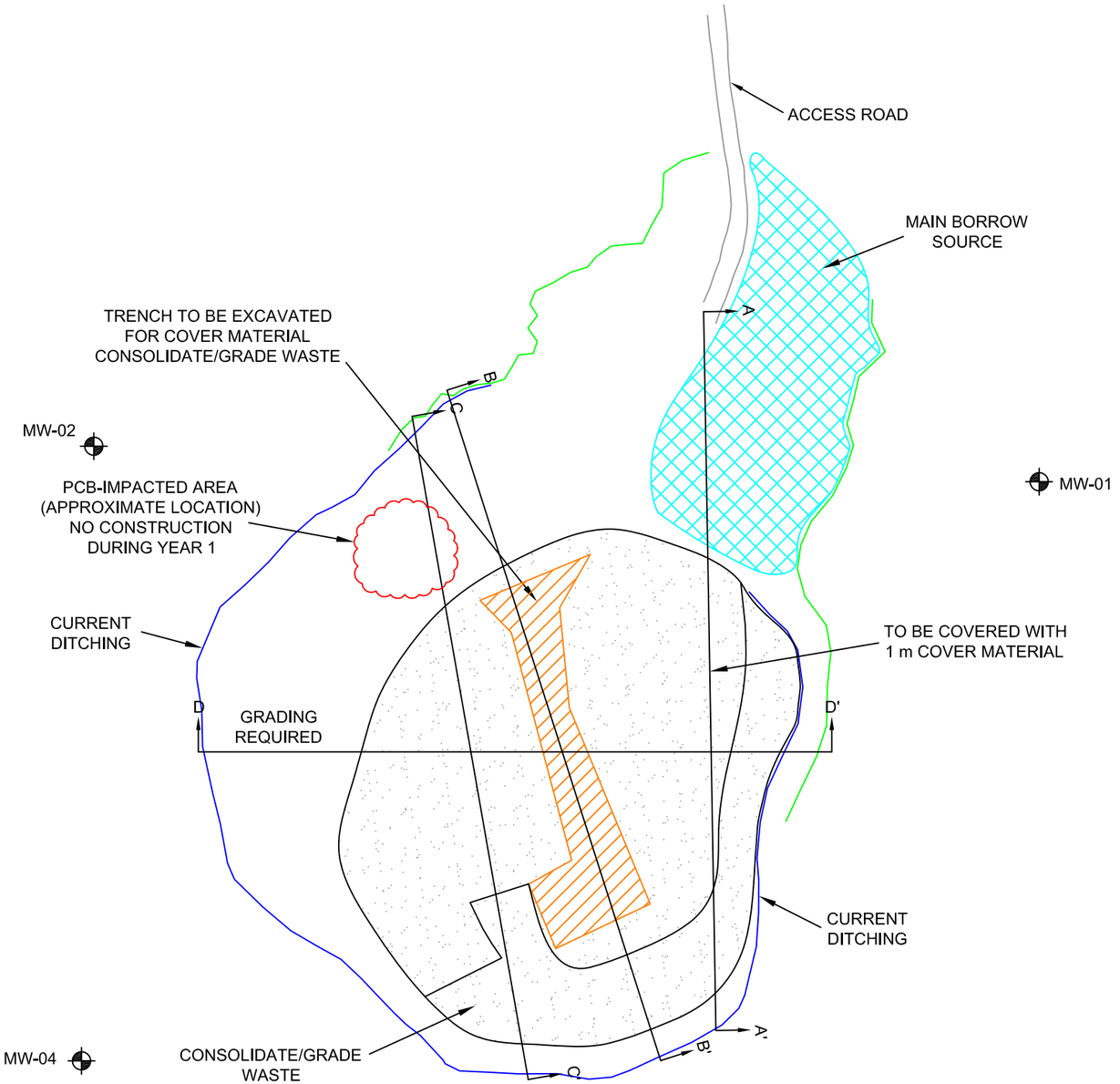
DWN BY:	A. Hollett
CHK'D BY:	C. Smith
SCALE:	As Shown

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

TITLE: EXISTING SITE PLAN

DATE	August 2011
PROJECT No.	TF1112731
REV. No.	0
DRAWING No.	3



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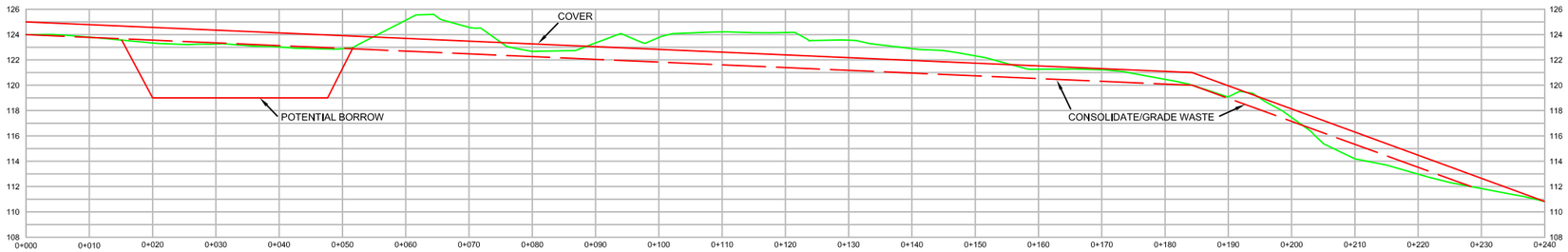
709-722-7023

DWN BY: A. Hollett
CHK'D BY: C. Smith
SCALE: As Shown

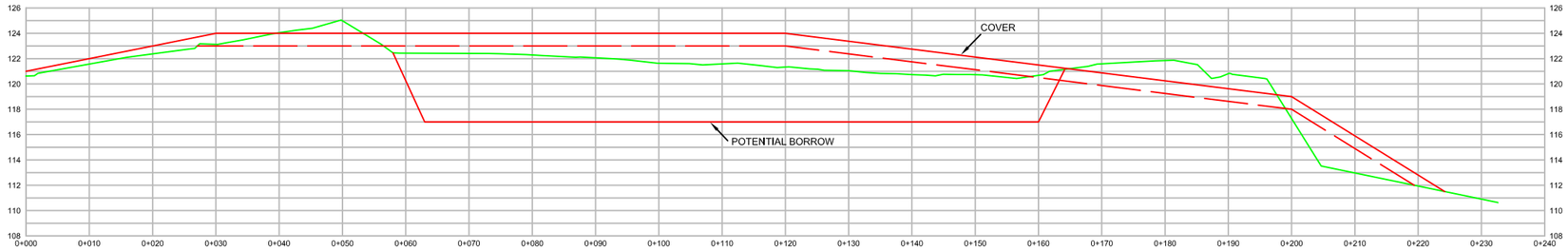
PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

TITLE: POST-YEAR 1 CLOSURE SITE PLAN

DATE: August 2011
PROJECT No.: TF1112731
REV. No.: 0
DRAWING No.: 4



SECTION A-A'



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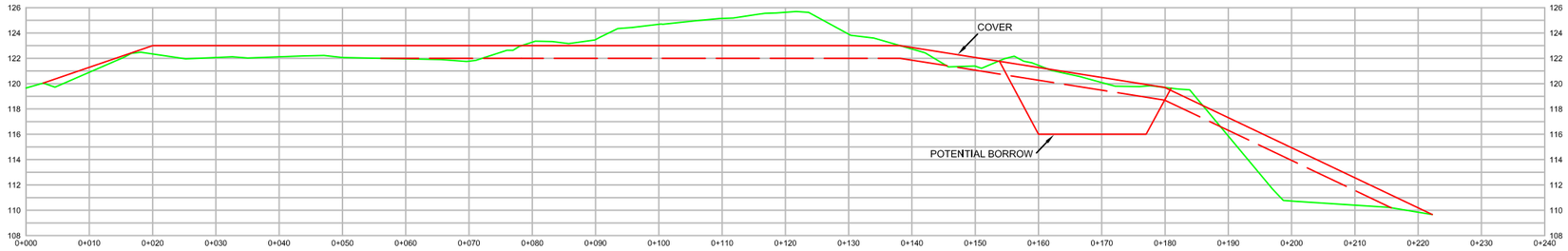
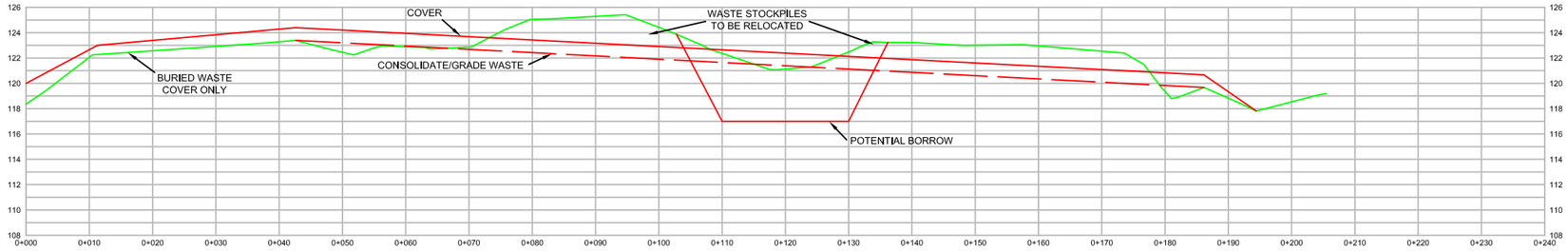


SECTION C-C'



SECTION D-D'

LEGEND:

- EXISTING GROUND SURFACE
- PROPOSED GROUND SURFACE
- PROPOSED WASTE SURFACE

NOTE:

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amec

DWN BY: A. Hollett

CHK'D BY: C. Smith

SCALE: As Shown

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

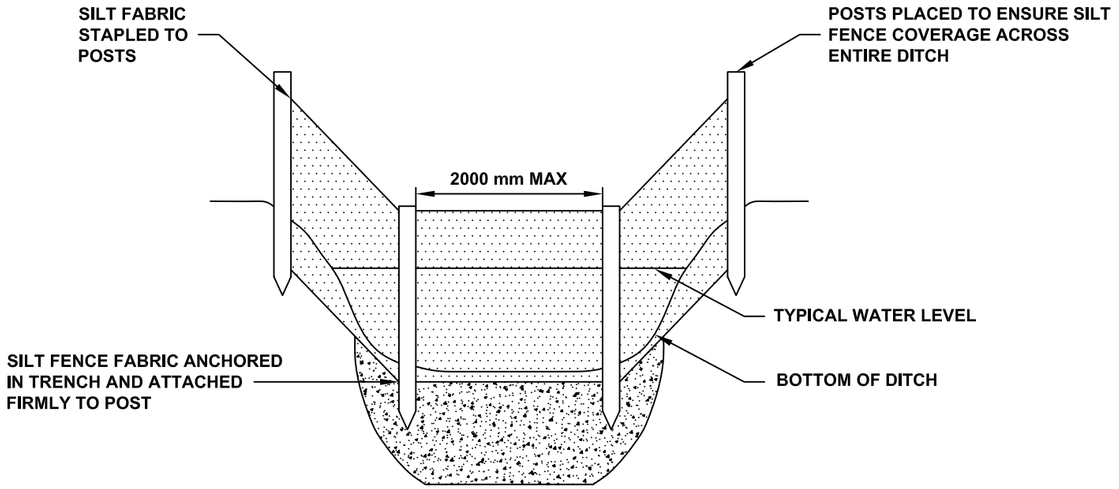
TITLE: CROSS SECTIONS

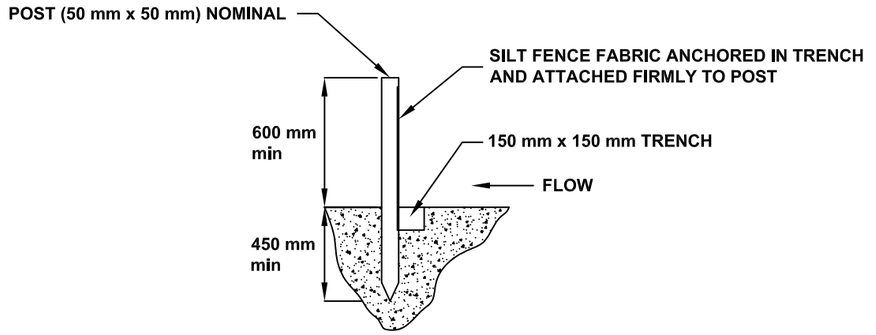
DATE: August 2011

PROJECT No.: TF1112731

REV. No.: 0

DRAWING No.: 5





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DWN BY: A. Hollett

CHK'D BY: C. Smith

SCALE: NTS

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

TITLE: TYPICAL SILT FENCE DETAIL

DATE: August 2011

PROJECT No.: TF1112731

REV. No.: 0

DRAWING No.: 6

LEGEND:

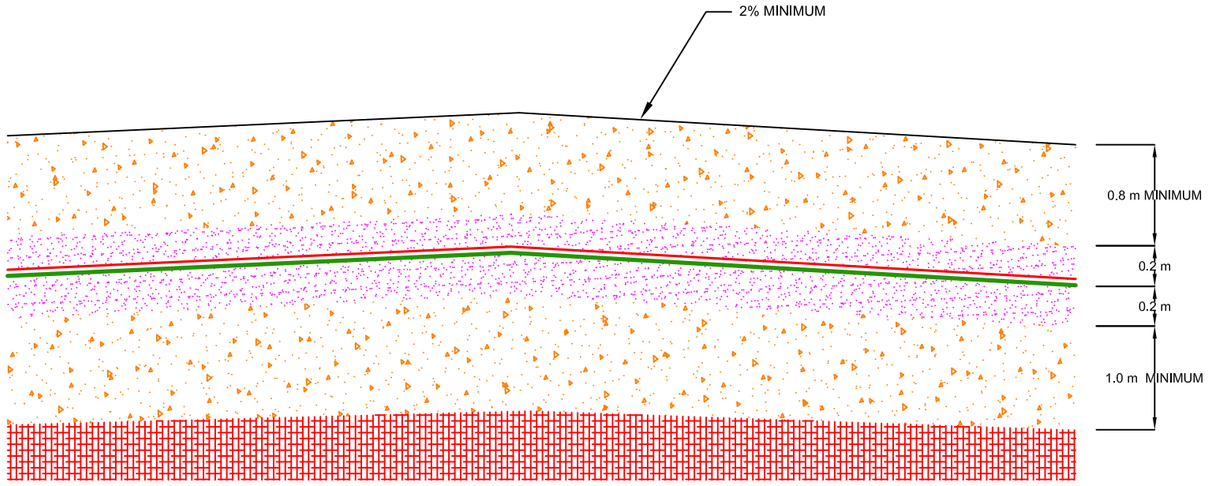
BEDDING -

COMMON FILL -

WASTE -

LLDPE GEOMEMBRANE -

GEOTEXTILE -



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DWN BY: A. Hollett

CHK'D BY: C. Smith

SCALE: NTS

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

TITLE: FINAL COVER SYSTEM CROSS SECTION

DATE: August 2011

PROJECT No.: TF1112731

REV. No.: 0

DRAWING No.: 7

LEGEND:

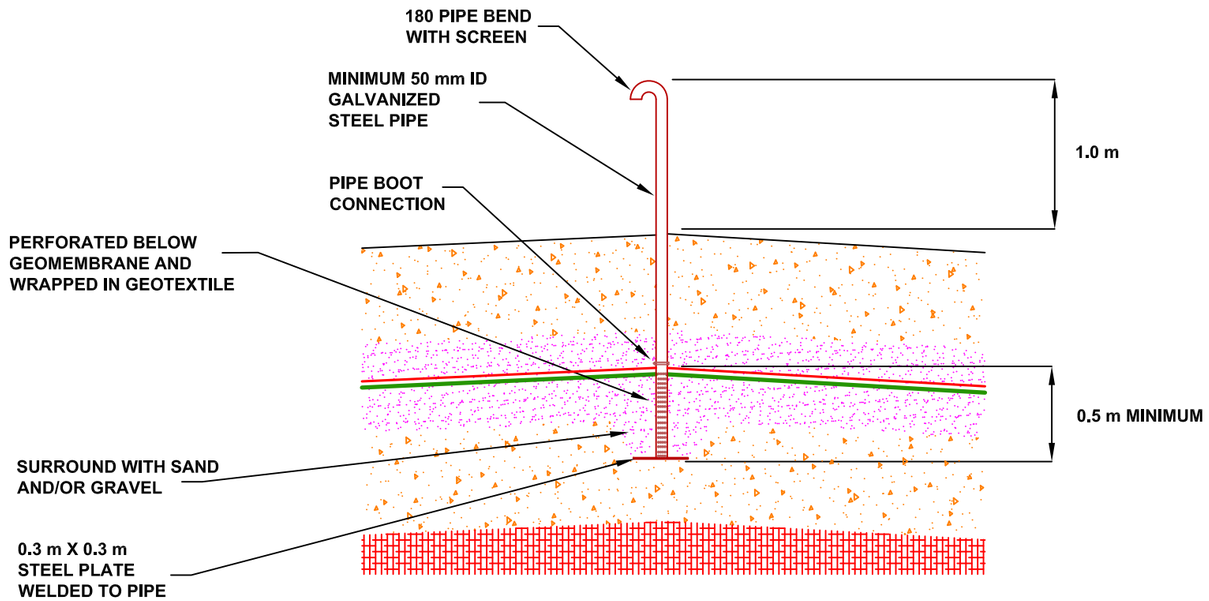
BEDDING -

COMMON FILL -

WASTE -

LLDPE GEOMEMBRANE -

GEOTEXTILE -



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DWN BY: A. Hollett

CHK'D BY: C. Smith

SCALE: NTS

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

TITLE: TYPICAL GAS VENT DETAIL

DATE: August 2011

PROJECT No.: TF1112731

REV. No.: 0

DRAWING No.: 8

LEGEND:

500 mm RIP RAP -

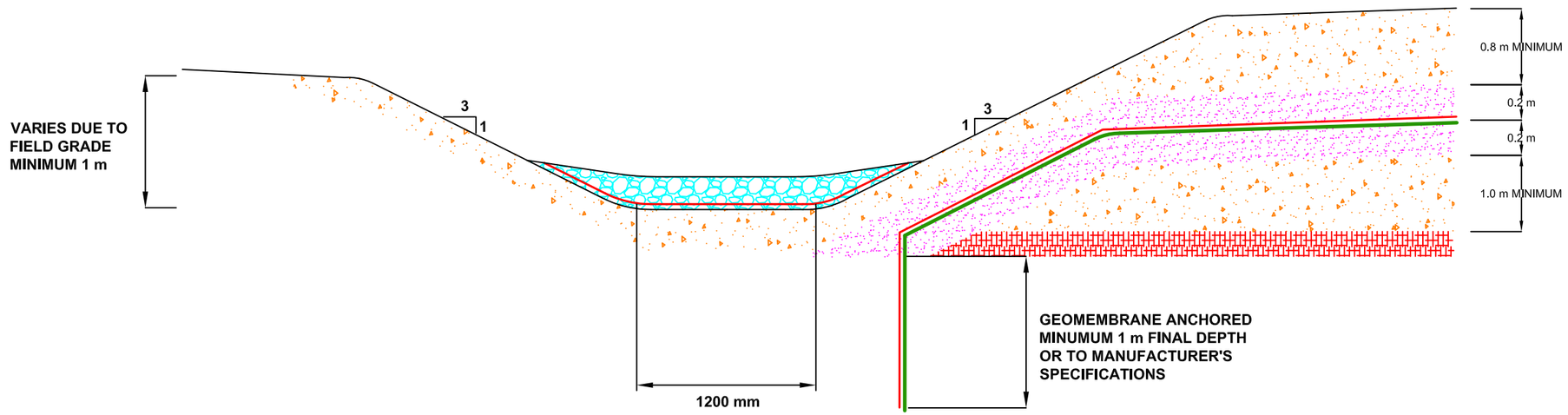
BEDDING -

COMMON FILL -

WASTE -

LLDPE GEOMEMBRANE -

GEOTEXTILE -



NOTE:

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amec

DWN BY: A. Hollett

CHK'D BY: C. Smith

SCALE: NTS

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

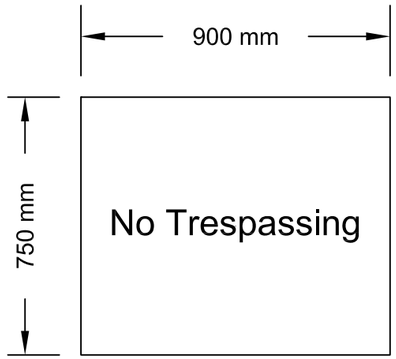
TITLE: TYPICAL DITCH CROSS SECTION

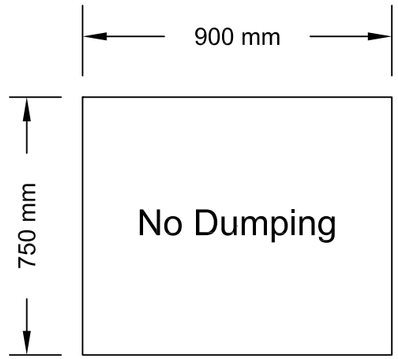
DATE: August 2011

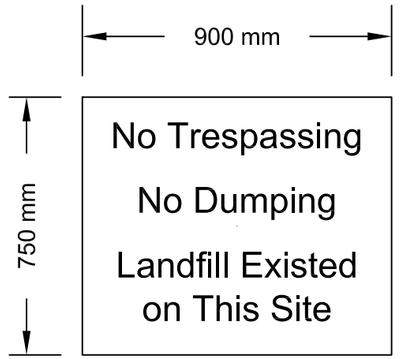
PROJECT No.: TF1112731

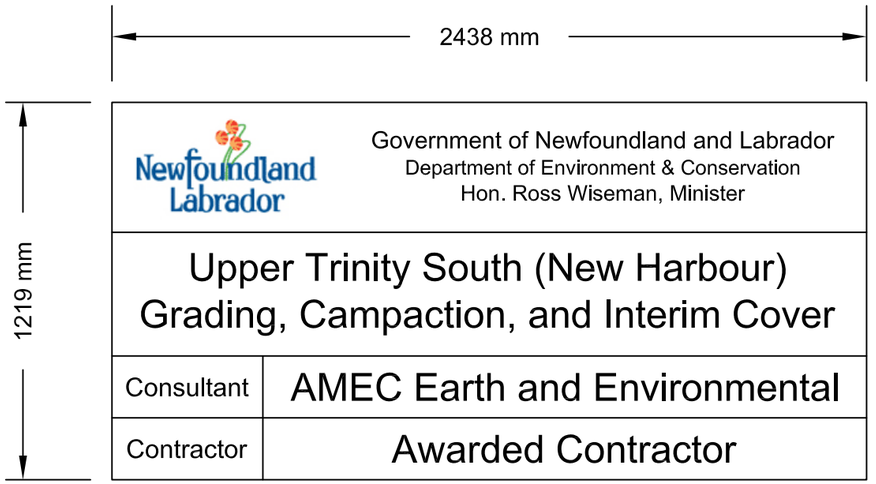
REV. No.: 0

DRAWING No.: 9









NOTE:
1. Project signs to have white reflective background and red lettering.
2. Bottom of Project sign to be 2.0m above ground level.
3. Project sign material to be 6mm thick aluminum with rounded corners.
4. Site sign size 1219mm x 2438mm x 19mm thick.
5. Site sign to be pressure treated plywood with a white reflective sheeting background and black lettering.

CLIENT:
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Department of Environment Conservation

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St. John's, NL.
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DWN BY: A. Hollett
CHK'D BY: C. Smith
SCALE: NTS

PROJECT: CLOSURE PLAN FOR UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

TITLE: SIGNAGE DETAILS

DATE: August 2011
PROJECT No.: TF1112731
REV. No.: 0
DRAWING No.: 10

APPENDIX B

TEST PIT LOGS

Test Pit: TP-01

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271977	E 315708	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 0.4	FILL – Trace organic debris, SAND and GRAVEL, dry to moist, loose, brown.	N/A	N/A	N/A
0.4 – 3.1	GLACIAL TILL - SAND and GRAVEL, trace fines, cobbles and small boulders, moist, dense, grey.	N/A	N/A	N/A
3.1	Test Pit terminated at 3.1 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 8:15 am	End Time: 8:40 am	

General Notes

1. Groundwater not encountered.
2. Possible large boulder or bedrock.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-02

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271909	E 315684	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 0.5	FILL – metal debris, SAND and GRAVEL, moist, loose, dark grey / black.	N/A	N/A	N/A
0.5 – 5.0	GLACIAL TILL - SAND and GRAVEL, trace fines, cobbles and small boulders, moist, dense, grey.	N/A	N/A	N/A
5.0	Test Pit terminated at 5.0 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 9:00 am	End Time: 9:25 am	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-03

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271868	E 315656	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 0.1	FILL – silty SAND and GRAVEL, moist, loose, brown.	N/A	N/A	N/A
0.1 – 5.2	GLACIAL TILL - SAND and GRAVEL, trace fines, cobbles and large boulders, moist, dense, grey.	N/A	N/A	N/A
5.2	Test Pit terminated at 5.2 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 10:00 am	End Time: 10:30 am	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-04

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271829	E 315619	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 5.1	GLACIAL TILL - SAND and GRAVEL, trace fines, cobbles and large boulders, moist, dense, grey.	N/A	N/A	N/A
5.1	Test Pit terminated at 5.1 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 10:50 am	End Time: 11:20 am	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-05

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271762	E 315626	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 0.4	FILL – organic debris, silty SAND and GRAVEL, moist, loose, brown.	N/A	N/A	N/A
0.4 – 5.1	GLACIAL TILL - SAND and GRAVEL, trace fines, cobbles and boulders, moist, dense, grey.	N/A	N/A	N/A
5.1	Test Pit terminated at 5.1 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 11:45 am	End Time: 12:15 pm	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-06

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271826	E 315579	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 1.5	FILL – rootlets and organic debris, trace sand and gravel, boulders, moist to wet, loose, brown / black, strong odour.	N/A	N/A	N/A
1.5	Test Pit terminated at 1.5 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.5
Start Time: 1:00 pm	End Time: 1:25 pm	

General Notes

1. Perched water encountered at 1.2 m.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-07

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271797	E 315516	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 2.0	FILL – garbage, moist, loose, brown / black.	N/A	N/A	N/A
2.0	Test Pit terminated at 2.0 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 1:40 pm	End Time: 1:55 pm	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-08

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271780	E 315522	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 1.0	FILL – silty SAND and GRAVEL, trace organics, moist, loose, brown.	N/A	N/A	N/A
1.0 – 2.0	FILL – garbage, moist, loose, brown / black.	N/A	N/A	N/A
2.0	Test Pit terminated at 2.0 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 2:15 pm	End Time: 2:30 pm	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-09

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271880	E 315596	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 1.0	FILL – trace organics, silty SAND and GRAVEL, moist, loose, boulders, brown / black.	N/A	N/A	N/A
1.0	Test Pit terminated at 1.0 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 2:50 pm	End Time: 3:15 pm	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

Test Pit: TP-10

Firm:	Department of Environment and Conservation				Date: February 21, 2011
Project:	New Harbour Closure Plan - 2011				
Contract No.	TF1112731	Location	N 5271804	E 315612	Inspector: C. Taylor

PHOTOGRAPHS

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID.	Sample Depth (m)	Sample Type
0.0 – 0.2	FILL – silty SAND and GRAVEL, moist, loose, cobbles, brown.	N/A	N/A	N/A
0.2 – 4.5	GLACIAL TILL - SAND and GRAVEL, trace fines, cobbles and large boulders, moist, dense, grey.	N/A	N/A	N/A
4.5	Test Pit terminated at 4.5 m.			

Estimated Cobbles (%) 10 - 15	Estimated Boulders (%) 5 - 10	Estimated Max Diameter (m) 0.3
Start Time: 3:45 pm	End Time: 4:15 pm	

General Notes

1. Groundwater not encountered.
2. Bedrock not encountered.
3. North and East coordinates obtained using a hand-held Garmin GPS – UTM; Zone 22; NAD 83.
4. Test pit excavated with a CAT 320 track mounted excavator.

APPENDIX C

SITE PHOTOS

Photo 1 – Exposed waste on north of site.

Photo 2 – Exposed waste on north of site looking west.

Photo 3 – Potential fill between waste piles, consolidate waste in excavation.

Photo 4 – Exposed waste on top section of site.

Photo 5 – Exposed waste in west section.

Photo 6 – Current gate and chain link fencing.

Photo 7 – Top of site looking southwest

Photo 8 – Top of site looking west.

Photo 9 – Collection pond.

Photo 10 – Windblown debris along access road to collection pond.

APPENDIX D

GROUNDWATER, LEACHATE AND SURFACE WATER MONITORING PARAMETERS

Groundwater, Leachate and Surface Water Monitoring Parameters*
* (Parameter limits to be specified in the Certificate of Approval)

	Groundwater		Surface Water	
Parameter Group	**Column 1 – Comprehensive List for Groundwater and Leachate**	**Column 2 – Indicator List for Groundwater**	**Column 3 – Comprehensive List for Surface Water**	**Column 4 – Indicator List for Surface Water**
Inorganics				
	Alkalinity	Alkalinity	Alkalinity	Alkalinity
	Aluminum	Aluminum	Aluminum	Aluminum
	Ammonia	Ammonia	Ammonia	Ammonia
	Antimony		Antimony	
	Arsenic		Arsenic	
	Barium		Barium	
	Boron		Boron	
	Cadmium	Cadmium	Cadmium	Cadmium
	Calcium	Calcium	Calcium	Calcium
	Chloride	Chloride	Chloride	Chloride
	Chromium	Chromium	Chromium	Chromium
	Cobalt		Cobalt	
	Copper	Copper	Copper	Copper
	Total Cyanide		Total Cyanide	
	Fluoride	Fluoride	Fluoride	Fluoride
	Iron	Iron	Iron	Iron
	Lead	Lead	Lead	Lead
	Magnesium	Magnesium	Magnesium	Magnesium
	Manganese	Manganese	Manganese	Manganese
	Mercury	Mercury	Mercury	Mercury
	Molybdenum		Molybdenum	
	Nickel	Nickel	Nickel	Nickel
	Nitrate	Nitrate	Nitrate	Nitrate
	Nitrite	Nitrite	Nitrite	Nitrite
	Total Kjeldahl Nitrogen		Total Kjeldahl Nitrogen	Total Kjeldahl Nitrogen
	Orthophosphate		Orthophosphate	
	Total Phosphorous	Total Phosphorous	Total Phosphorous	Total Phosphorous
	Potassium	Potassium	Potassium	Potassium
	Selenium		Selenium	
	Sodium	Sodium	Sodium	Sodium
	Total and Reactive Silica		Total and Reactive Silica	
	Silver		Silver	
	Sulphate	Sulphate	Sulphate	Sulphate
	Tin		Tin	
	Titanium		Titanium	
	Vanadium		Vanadium	
	Zinc	Zinc	Zinc	Zinc

	Groundwater		Surface Water	
Parameter Group	**Column 1 – Comprehensive List for Groundwater and Leachate**	**Column 2 – Indicator List for Groundwater**	**Column 3 – Comprehensive List for Surface Water**	**Column 4 – Indicator List for Surface Water**
Organics				
	Dissolved Organic Carbon	Dissolved Organic Carbon	Dissolved Organic Carbon	
	Total Organic Carbon	Total Organic Carbon	Total Organic Carbon	Total Organic Carbon
	Benzene	Benzene		
	Dichlorobenzene	Dichlorobenzene	Dichlorobenzene	Dichlorobenzene
	1,4 Dichlorobenzene	1,4 Dichlorobenzene		
	Dichloromethane		Dichloromethane	
	Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons	Total Petroleum Hydrocarbons
	Biochemical Oxygen Demand (BOD_5)	Biochemical Oxygen Demand (BOD_5)	Biochemical Oxygen Demand (BOD_5)	Biochemical Oxygen Demand (BOD_5)
	Chemical Oxygen Demand	Chemical Oxygen Demand	Chemical Oxygen Demand	Chemical Oxygen Demand
	Phenol		Phenol	Phenol
	Toluene	Toluene	Toluene	
	Vinyl Chloride	Vinyl Chloride		
Field Parameters				
	Colour	Colour	Colour	Colour
	Conductivity	Conductivity	Conductivity	Conductivity
			Dissolved Oxygen	Dissolved Oxygen
			Flow	Flow
	pH	pH	pH	pH
	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids
	Total Dissolved Solids	Total Dissolved Solids	Total Dissolved Solids	Total Dissolved Solids
			Temperature	Temperature
	Turbidity	Turbidity	Turbidity	Turbidity

Note: The indicator list(s) may be altered, depending on the specific site.

APPENDIX E

LIMITATIONS

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LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on conditions observed during site visits. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions may differ from those encountered during site investigations, and conditions may become apparent during construction, which could not be detected or anticipated the time of the site investigation. It is recommended practice that the Geoenvironmental Consultant be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those previously encountered.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

Any comments made in this report on potential construction problems and possible methods are intended only for guidance. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geoenvironmental engineering practices and information provided in the various guideline documents presented in this report. No other warranty is expressed or implied.

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