

**COME BY CHANCE SECURE LANDFILL
OPERATIONS, MAINTENANCE AND
MONITORING (OMM) MANUAL**

Newfoundland and Labrador
Department of Environment and Conservation
Pollution Prevention Division

June 2012

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1.0 SITE INFORMATION

This manual has been prepared to provide details on maintenance and monitoring at the Come By Chance Secure Landfill. The site was constructed between 1994 and 1996 by the Department of Environment and Conservation in order to facilitate the clean-up of hazardous waste sites left by the original operators of the Come By Chance refinery, and is filled with industrial waste and contaminated soil. It is understood the landfill was closed in 1996.

The landfill is approximately 19,778 m² (4.9 acres) in size, located approximately 2.5 km west of the TransCanada Highway and approximately 4 km south of the town of Come by Chance. A dirt access road followed by a gravel pit is located north of the site and the Come By Chance Oil Refinery is located to the south. To the west of the site is Arnolds Cove, and to the east is a forested area followed by the Trans-Canada Highway.

The landfill is constructed with a double liner consisting of a primary liner containment system (PLCS) and secondary liner containment system (SLCS) which capture and contain landfill leachate. Leachate that is held above the liners is collected by a drainage pipe system. The pipes direct the leachate to access points, or manholes, where the end of the drainage pipes are equipped with a valve. Both the PLCS and SLCS have independent pipe systems and manholes or valve chambers. Water is held in the containment systems until the valves are opened and water is either transferred to an alternate containment system or discharged.

A groundwater drainage system was installed in March 2009 adjacent to the north and east sides of the landfill. The system consists of 140 m of perforated pipe, 150 mm in diameter, installed within 600 mm x 600 mm of washed stone, 25 mm in diameter, wrapped in filter fabric and 110 m of storm pipe, 200 mm in diameter. The French drain and storm pipe were installed with a one percent slope which is maintained to a drainage outlet.

In general, the maintenance and monitoring program at the site consists of: inspection and survey of the landfill cap; inspection of the groundwater drainage system; groundwater sampling/analysis; surface water sampling/analysis; sampling/analysis of leachate from the PLCS and the SLCS; and pumping and discharge of leachate.

2.0 REGULATORY REQUIREMENTS

The following sub-sections outline the appropriate criteria to be used for comparison to site analytical results. However, it is important to ensure that the most up-to-date criteria are used for comparison. Should more appropriate criteria become available, these criteria shall be used and the OMM shall be updated.

2.1 GROUNDWATER

Groundwater analytical results shall be compared to the following:

For benzene, toluene, ethylbenzene, and xylenes (BTEX) and modified Total Petroleum Hydrocarbons (mTPH)

- Atlantic RBCA Risk-Based Corrective Action (RBCA) Version 2.0 (March 2007) Tier I Risk-Based Screening Levels (RBSLs) for a commercial site with non-potable water and coarse-grained soil.

For Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), Volatile Organic Compounds (VOCs), metals, and general chemistry

- Ontario Ministry of the Environment (MOE) “Soil, Ground Water, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act”, March 9, 2004, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.

2.2 SURFACE WATER

Surface water analytical results shall be compared to the following:

For BTE, PAHs, VOCs, metals, and general chemistry

- Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Freshwater Aquatic Life (FAL) (Updated 2007).

For TPH

- British Columbia Contaminated Site Regulation (B.C. Reg. 275/96) Schedule 6 Generic Numerical Water Standards for Aquatic Life (Aquatic Life Generic Standards – freshwater).

There is no known guideline for xylenes or PCBs in surface water.

2.3 LEACHATE

Leachate analytical results shall be compared to the following:

- Newfoundland and Labrador Regulation 65/03, *Environmental Control Water and Sewage Regulations, 2003, Schedule “A”, under the Water Resources Act.* (May 23, 2003) (herein referred to as Schedule “A”).

As the pumped leachate eventually discharges into a stream downgradient of the site, parameters not specified in the NL Schedule “A” shall be compared to the following:

- Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQGs) for the Protection of Freshwater Aquatic Life (FAL) (updated 2007).

Leachate from the Come by Chance secure landfill shall comply with the above-noted criteria in order to be approved for discharge into a water body without treatment.

3.0 ROUTINE MAINTENANCE AND MONITORING ACTIVITIES

3.1 LANDFILL CAP MAINTENANCE AND MONITORING

An inspection of the integrity of the landfill cap should be conducted on an annual basis. The inspection should include:

- A comprehensive walkover of the cap;
- A record of evidence of erosion or slope instability, cracks in the cap, animal burrows, ponding water, problems with the landfill vent;
- A survey of a minimum of two control points on the landfill cap in order to monitor landfill settlement or consolidation; and
- Checks on the landfill lateral drainage system surrounding the landfill to ensure the drains are working properly. There should be no standing water in the drains and there should be evidence that landfill surface infiltration is collected by the drains. Erosion of the drainage base material should be assessed.

Any deficiencies in the landfill cap or lateral drains should be repaired in a timely manner.

The vegetation on the landfill cap protects the soils from the effects of erosion. However, roots can penetrate the soil layers and affect the integrity of the landfill cap. The vegetation covering the landfill cap must not exceed 0.6 m in height. Any vegetation in excess of 0.6 m should be cut to a maximum of 0.3 m height on an as-needed basis.

3.2 SAMPLING AND ANALYSIS OF PRIMARY AND SECONDARY LEACHATE, GROUNDWATER AND SURFACE WATER

The water quality monitoring program will consist of leachate, hydraulic head, surface water and groundwater monitoring. Initially, the monitoring and sampling events will be conducted on a Tier III schedule (i.e. three times a year, see Section 5.0). Both the SLCS and PLCS leachate shall be sampled from the valves in the valve chambers on an annual basis.

The monitoring wells to be sampled are MW93-1A, MW93-2A and if possible MW93-3A. If at anytime either of these monitoring wells do not perform properly the well should be replaced. The groundwater level in each monitoring well shall be recorded prior to sampling from the wells. The two surface water sample locations (SURF-UP and SURF-DOWN) are located upgradient and downgradient of the landfill. Monitoring well and surface water sampling locations are shown on Figure 1 (Appendix A).

The analyses to be conducted on the SLCS and PLCS leachate, groundwater and surface water samples are BTEX/mTPH, PAHs, VOCs, PCBs, metals, and general chemistry. Toxicity testing shall also be conducted on the SLCS and PLCS leachate samples. Consideration can be given to reducing the analysis conducted on either the groundwater or surface water if results indicate that analysis of a parameter is no longer necessary.

Samples shall be taken from both the primary and secondary landfill liner system. Analytical results must be reviewed prior to pumping out the SLCS and PLCS. The leachate and groundwater samples shall be submitted for analysis at a CAEAL certified laboratory. If the leachate complies with the criteria as outlined in Section 2.0, results shall be reviewed by NLDEC for approval to discharge to the drainage ditch down gradient of the landfill. If the leachate does not comply and exceeds the background levels (i.e. surface water location

SURF-UP and monitor well MW93-1) then the leachate shall not be disposed directly into a water body.

3.3 GROUNDWATER DRAINAGE SYSTEM MAINTENANCE AND MONITORING

An inspection of the groundwater drainage system should be conducted on an annual basis. The inspection should include:

- A general inspection of the ground surface above the French drain and the section of corrugated steel piping leading from the French drain to the discharge for excessive settlement;
- An inspection of the four groundwater cleanouts to ensure the absence of blockages. Should blockages be encountered, removal will be required. Possible options for removal may include manual removal using conventional tools or the employment of agitated cleaning using a vacuum truck. Visual inspection using robotics and video equipment may be employed should the blockage persist;
- An inspection of the groundwater drainage system outflow; and
- A measurement of the water discharge rate by filling a container of known volume and calculating the flow rate based on the volume and the time to fill the container.

3.4 OTHER MONITORING AND MAINTENANCE REQUIREMENTS

The head of water from the PLCS and SLCS valve chambers shall be recorded prior to the pumping of the SLCS and PLCS. The head on the PLCS outlet and SLCS outlet is taken by first attaching translucent, flexible tubing to the valve in the chamber, holding the tubing vertically out of the valve chamber and then recording the water level relative to the top of the valve chamber. The elevation of the top of each valve chamber is provided on the inspection forms appended to this manual. The valves in the PLCS and SLCS drain chambers shall be inspected on a yearly basis for defects, wear, corrosion and operating effectiveness.

The overall site shall be kept in good condition by assuring the access road is maintained, the fence and locked gate are in good repair.

Landfill gas is generated by methanogenic bacteria during decomposition of organic material under anaerobic conditions. The rate of landfill gas production depends on the interrelationship of many factors. The principal factors include waste composition and age, temperature, moisture content, pH, and quantity and quality of available nutrients and microbial populations.

While the exact nature and quantity of the waste is not known, the site is located in an isolated setting and it is not anticipated that buildings will be located on this site or the existing buildings will be restored for future use. As such, the potential for hazards from gas migration from landfill areas is considered negligible and a landfill gas monitoring program is not considered necessary at this time.

3.5 LEACHATE PUMPING FROM PLCS AND SLCS VALVE CHAMBERS

The leachate from both the PLCS and SLCS shall be pumped out initially on a three times a year basis (Tier III schedule) (see Section 5.0). The SLCS and PLCS valve chambers shall be pumped until the flow rate from each valve is reduced to a maximum of 15 L/min (4 gallons/min) on two successive days of pumping. The methodology used to conduct this work is described in Section 5.0.

4.0 FIELD DATA COLLECTION REQUIREMENTS

The field data collection requirements for the inspection, monitoring and maintenance of the landfill are provided in Appendix A of this manual. The following list of inspection sheets are provided in Appendix A:

- Come By Chance Secure Landfill, Routine Site Inspection Form- Landfill Cap;
- Come By Chance Secure Landfill, PLCS Sampling, Analysis and Pumping Form;
- Come By Chance Secure Landfill, SLCS Sampling, Analysis and Pumping Form;
- Come By Chance, Secure Landfill, Surface Water Sampling and Analysis Form; and
- Come By Chance, Secure Landfill, Groundwater Sampling and Analysis Form.

5.0 PROCEDURES FOR SAMPLING AND PUMPING

5.1 HEALTH AND SAFETY PROCEDURES

Field personnel shall be trained in project Health and Safety procedures and must have confined space training. A site-specific Health and Safety Plan shall be prepared prior to completing field work and shall be followed when conducting field sampling, pumping, and any other activities at the site. The plan must be in compliance with applicable Federal and Provincial requirements and legislation, specifically the *Occupational Health and Safety Act RSNL1990 Chapter O-3* and its regulations. The plan must be reviewed by the Project Manager, Department of Environment and Conservation prior to project implementation.

Some of the hazards related to the field activities at the site involve exposure to chemicals, working around water, and confined space entry (in the event that leachate samples cannot be collected from outside the valve chambers). Additionally, it is important to note that the presence of harmful fumes inside the valve chambers is possible, as hydrogen sulphide (H₂S) and lower explosive limit (LEL) have been detected in previous sampling events.

An example site-specific Health and Safety Plan prepared by CBCL for the 2011-12 monitoring and maintenance program is included in Appendix B.

5.2 SAMPLING PROCEDURES

The groundwater and leachate sampling program shall be conducted using standard sampling procedures, which are described below. Leachate will be sampled from the PLCS and SLCS valves in the valve chambers. Pumping from the PLCS and SLCS shall not proceed until analytical results from a CAEAL certified laboratory have been reviewed and a decision made by NLDEC whether the leachate can be safely disposed of on site or will be collected for disposal by an approved disposal firm.

Groundwater samples shall be taken from MW93-2A, MW93-1A and if possible MW93-3A. The static water levels in all wells (MW93-1A, MW93-2A and MW93-3A) shall be measured using an electric water level meter and recorded in the inspection sheets prior to sampling.

During sampling the pH, temperature and specific conductance of the groundwater and leachate being removed from the wells and valves will be recorded. Prior to field work, the pH and specific conductance meters will be calibrated according to the manufacturer's instructions.

These calibrations will be re-checked periodically during and at the end of each day to ensure that no significant drifting of the instrument calibration had occurred.

Samples will be placed in laboratory supplied amber glass and clear plastic containers and maintained in cool storage with ice. Appropriate preservatives shall be used in the sample containers to preserve the groundwater and leachate samples.

Quality Assurance and Quality Control Program

- One blind field duplicate groundwater or leachate sample should be sent to the laboratory during each field program.
- In order to minimize cross contamination during sampling, disposable surgical gloves shall be worn during all sampling (new gloves for each sample).

5.3 PUMPING PROCEDURES

Proper procedures must be followed in each valve chamber to allow for pumping in an explosive environment. A shut-off valve must be secured to the outflow above the level of the valve chamber, such that field personnel can shut off the valve without entering the valve chamber. Periodic flow measurements shall be taken from the outflow and a hand held gas detector shall be used to monitor air conditions (oxygen, toxicity, carbon monoxide and explosivity) in the chamber before entry and during the pumping of the SLCS and PLCS. The pumping of the chambers will be ceased when air quality in the chamber is hazardous.

A number of safety procedures shall be adopted in order to work in the potentially explosive environment, and shall be included in the site-specific health and safety plan. A list of these safety procedures is provided below:

- Ensure site personnel are tied off when working in or around the valve chamber;
- Wear a respirator with H₂S cartridge when working around the valve chamber;
- Keep the sump pump submerged in the water;
- Ensure the electrical cord for the sump pump is spark proof;
- Ensure non ferrous material is used within the valve chamber;
- Place the generator a reasonable distance from the valve chamber;
- Vent the valve chamber periodically; and
- Conduct a visual, olfactory, pH and conductivity check of the condition of the water in the valve chamber every two hours.

5.4 SITE INSPECTION, SAMPLING AND PUMPING SCHEDULE

The inspection, sampling and pumping schedule for the Come By Chance secure landfill is provided in Table 5.1. The initial recommended schedule is Tier III with three times a year pumping and annual sampling of groundwater and surface water. This schedule can be changed depending on analytical and pumping results.

Table 5.1: Inspection, Sampling and Pumping Schedule

Task	Frequency		
	Tier I	Tier II	Tier III
Site Inspection	Summer	Summer and Winter	Spring, Summer, and Winter
Leachate Sampling	Summer	Summer and Winter	Spring, Summer, and Winter
Groundwater Sampling	Summer	Summer	Spring
Surface Water Sampling	Summer	Summer	Spring
Pumping SLCS	Summer	Summer and Winter	Spring, Summer, and Winter
Pumping PLCS	Summer	Summer and Winter	Spring, Summer, and Winter

Note: The leachate head measured at the SLCS and PLCS valves shall remain lower than 0.3 m below the top of each valve chamber.

6.0 PERFORMANCE INDICATORS AND TRIGGER LEVELS

6.1 FLOW RATE FROM SLCS AND PLCS OUTLETS

If the flow rate in the SLCS is consistently low then the majority of leachate held in the SLCS has been removed. As it takes time for the leachate to migrate through the SLCS, this liner system should be pumped on consecutive days. The SLCS should be pumped until the flow is reduced to below 15 L/min (4 gal/min) for two consecutive days.

If the secure landfill is operating as designed the only water in the PLCS will be from water in the soil when the landfill was constructed and filled. There may be a small amount of infiltration through the landfill cap. Even with defects in the geomembrane of the landfill cap it is expected that the infiltration would be low, as there is virtually no hydraulic head on infiltrating surface water. The migration of the leachate through the soil in the landfill could be very slow depending on the nature of the landfilled soils. The PLCS should be pumped until the flow rate from the valve is less than 15 L/min (4 gal/min) for two consecutive days.

6.2 HYDRAULIC HEAD ON LEACHATE

The head of the leachate in the SLCS and PLCS valve chamber should be at least 0.3 m below top of the concrete valve chamber. This prevents leachate from overflowing the chamber if there is a valve malfunction in either chamber. The schedule for pumping will depend on time required for the leachate level to reach this level in the valve chambers. Initially, the SLCS and PLCS will be pumped three times a year (Tier III - schedule). The following guidelines can be used to determine when the leachate pumping schedule can be changed.

- If the initial leachate head is lower than 0.3 m below the top of the valve chamber for two consecutive site visits, the pumping (sampling) frequency can be dropped back to twice a year (Tier II - schedule).
- If when pumping twice a year the leachate head is lower than 0.3 m below the top of the valve chamber for two consecutive site visits, the pumping (sampling) frequency can be reduced to once annually (Tier I - schedule).
- If during the Tier I – schedule, the leachate head is higher than 0.3 m below the top of the valve chamber, pumping (and sampling) frequency will revert back to Tier II, once every six months.
- With the Tier II - schedule, if the leachate head is still higher than 0.3 m above the top of the valve chamber then the Tier III pumping schedule will be implemented.

6.3 LEACHATE QUALITY

If leachate samples taken from both PLCS and SLCS comply with the criteria as outlined in Section 2.0, then with NLDEC approval the effluent from both liners can be discharged to the drainage ditch west of the landfill. If leachate samples from the PLCS or SLCS exceed one or more of the parameters listed in the criteria outlined in Section 2.0 and exceed the background levels (i.e. from SURF UP and MW93-1A) then effluent from that liner shall not be disposed directly into a water body. The leachate may be collected and disposed of by an approved liquid waste management company. An exceedance of Total Suspended Solids (TSS) in the leachate may be able to be managed through conventional construction site practices.

If the leachate quality in SLCS and PLCS are different in analytical concentrations this could indicate that source water other than the PLCS is affecting the leachate in the SLCS.

6.4 GROUNDWATER QUALITY AND SURFACE WATER QUALITY

The groundwater and surface water quality downgradient of the site shall comply with the criteria as described in Section 2.0. If at any time groundwater or surface water quality appears to be affected by the leachate from the landfill then a second suite of groundwater samples will be collected and analysed to verify the results. If the confirmatory analyses indicate groundwater or surface water may be affected by the landfill leachate a detailed investigation into the landfill integrity is warranted.

6.5 CAP INTEGRITY AND DRAINAGE TRENCH

The cap integrity shall be maintained and the lateral drainage trench integrity shall be maintained. If at any time the cap integrity is compromised then immediate action will be taken to repair the cap. The lateral drainage ditch will be maintained on an as needed basis.

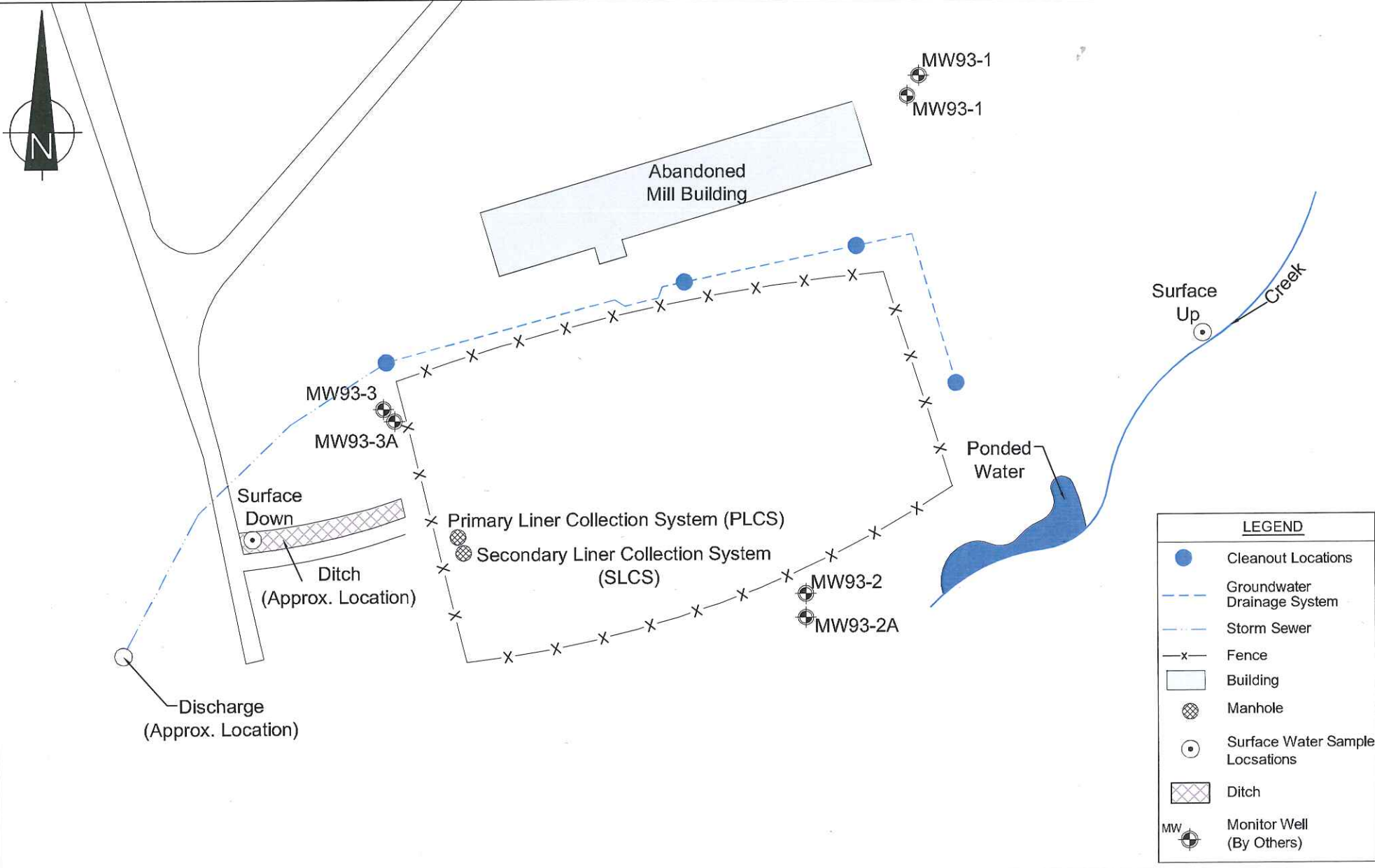
7.0 ANNUAL REPORTING

An annual monitoring and inspection report will be prepared for the site. The report will present a summary and detailed evaluation of all data collected for the monitoring program. The following information will be included in the report:

- Date of inspections and water/leachate quality monitoring;
- Results of inspections (copies of data collection forms);
- Results of groundwater, surface water and leachate analysis;
- Results of SLCS and PLCS pumping events and hydraulic head measurements;
- Comments on site maintenance;
- Any additional relevant observations; and
- Any proposed changes in the site inspection or water/leachate quality monitoring program.

FIGURE 1

SITE PLAN WITH SAMPLING LOCATIONS



NEWFOUNDLAND AND LABRADOR DEPARTMENT OF ENVIRONMENT & CONSERVATION
 ANNUAL SUMMARY REPORT
 COME BY CHANCE, NEWFOUNDLAND

SITE PLAN

DATE: MARCH 2010
 PROJECT NO: 02 - 01 - 00060
 DRAWN BY: P. LOWERY
 SOURCE: PINCHIN SITE SURVEY

FIGURE: 2
 SCALE: NTS
 CHECKED BY: T. HARDY

APPENDIX A

FIELD DATA COLLECTION FORMS

Come by Chance, Secure Landfill, PLCS Sampling and Pumping Form

PLCS Leachate Sampling					PLCS Pumping Event			
Date	Weather	Valve Condition	Initial Head (m)	PLCS, Analysis Conducted (circle) Sample Condition	Date	Weather	Final Flow Rate gal/min	Pumping Time hours
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				

Notes: Containers Required For Analysis

- BTEX: 3x 40 ml amber glass vials (filled with no headspace)
 - TPH: 2x 250 ml amber glass
 - Gen Chem: 1x1 L plastic
 - PAHs: 2x 250 ml amber glass
 - VOCs: 3x 40 ml amber glass vials (filled with no headspace)
 - PCBs: 2x 250 ml glass
 - Metals: 1x 50 ml plastic tube or 1x 250 ml plastic
 - Toxicity: 2x 20L plastic food grade
 - Always maintains samples at 4 °C.
 - Plan to deliver samples to analytical laboratory within 3 days of sampling.
- Elevation of Top of PLCS Valve Chamber = 15.96 m**

Come by Chance, Secure Landfill, SLCS Sampling and Pumping Form

SLCS Leachate Sampling					SLCS Pumping Event			
Date	Weather	Valve Condition	Initial Head (m)	SLCS, Analysis Conducted (circle) Sample Condition	Date	Weather	Final Flow Rate gal/min	Pumping Time hours
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				
				BTEX, TPH, Gen. Chem, Metals, PAH, VOC, PCB, toxicity				

Notes: Containers Required For Analysis

- BTEX: 3x 40 ml amber glass vials (filled with no headspace)
 - TPH: 2x 250 ml amber glass
 - Gen Chem: 1x1 L plastic
 - PAHs: 2x 250 ml amber glass
 - VOCs: 3x 40 ml amber glass vials (filled with no headspace)
 - PCBs: 2x 250 ml glass
 - Metals: 1x 50 ml plastic tube or 1x 250 ml plastic
 - Toxicity: 2x 20L plastic food grade
 - Always maintains samples at 4 °C.
 - Plan to deliver samples to analytical laboratory within 3 days of sampling.
- Elevation of Top of SLCS Valve Chamber = 15.95 m**

Come by Chance, Secure Landfill, SW Sampling and Analysis Form

Date	Weather	Surface Water Sample	
		SURF UP (circle) Sample Condition	SURF DOWN (circle) Sample Condition
		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB	BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB	BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB	BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB	BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB	BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB	BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB	BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB

Notes: Containers Required For Analysis

- BTEX: 3x 40 ml amber glass vials (filled with no headspace)
- TPH: 2x 250 ml amber glass
- Gen Chem: 1x1 L plastic
- PAHs: 2x 250 ml amber glass
- VOCs: 3x 40 ml amber glass vials (filled with no headspace)
- PCBs: 2x 250 ml glass
- Metals: 1x 50 ml plastic tube or 1x 250 ml plastic
- Always maintains samples at 4 °C.
- Plan to deliver samples to analytical laboratory within 3 days of sampling.

Come by Chance, Secure Landfill, GW Sampling and Analysis Form

Date	Weather	Groundwater Samples				
		MW93-3A Water Level (m)	MW93-1A Water Level (m)	MW93-1A, Analysis (circle) Sample Condition	MW93-2A Water Level (m)	MW93-2A, Analysis (circle) Sample Condition
				BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
				BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
				BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
				BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
				BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
				BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB
				BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB		BTEX/TPH, Gen. Chem, Metals, PAH, VOC, PCB

Notes: Containers Required For Analysis

- BTEX: 3x 40 ml amber glass vials (filled with no headspace)
- TPH: 2x 250 ml amber glass
- Gen Chem: 1x1 L plastic
- PAHs: 2x 250 ml amber glass
- VOCs: 3x 40 ml amber glass vials (filled with no headspace)
- PCBs: 2x 250 ml glass
- Metals: 1x 50 ml plastic tube or 1x 250 ml plastic
- Always maintains samples at 4 °C.
- Plan to deliver samples to analytical laboratory within 3 days of sampling.

APPENDIX B

EXAMPLE SITE-SPECIFIC HEALTH AND SAFETY PLAN

(CBCL Limited, 2011)

HEALTH AND SAFETY PLAN

2011/2012 Monitoring and Maintenance Program
Come By Chance Secure Landfill
Come By Chance, Newfoundland and Labrador

CBCL Project # 113080.00

August 25, 2011

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Attachments

Hospital Directions

Acknowledgement Form

Chapter 1 Project Summary

At the request of the Newfoundland and Labrador Department of Environment and Conservation (DOEC), CBCL Limited (CBCL) will conduct a monitoring and maintenance program in 2011/2012 at the Come By Chance Secure Landfill in Come By Chance, NL.

The monitoring and maintenance program will generally involve the following scope of work:

- Inspection and survey of the existing landfill cap (August 2011)
- Inspection of the existing groundwater drainage system, including the outflow drainage and clean-out pipes (August 2011)
- Collection of leachate samples from the primary and secondary leachate collection systems (August 2011 and January 2012)
- Pumping of the leachate (pending acceptable laboratory results) from the collection chambers to a drainage ditch (August 2011 and January 2012)
- Collection of surface water samples from a creek and a ditch located southeast and west of the landfill, respectively (August 2011)
- Collection of groundwater samples from three (3) existing monitor wells (August 2011)
- Submission of the leachate, surface water and groundwater samples for laboratory analysis of various parameters including petroleum hydrocarbons, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), general chemistry and metals plus hydrides (RCAp + MS) and toxicity (leachate samples only)

The following health and safety plan (HSP) has been completed to mitigate potential hazards which may be encountered during the progression of field activities.

Chapter 2 Methodology

CBCL personnel will complete all field work following CBCL Standard Operating Procedures (SOPs) and Safe Work Practices (SWPs). Project team members will be required to review all applicable SOPs and SWPs prior to completing project activities. In addition, project team members conducting the field work will first complete all required site-specific training.

The method for sample collection will follow appropriate health/safety and decontamination protocols as per CBCL SOPs and industry standards.

Chapter 3 Key Position Contact List

<i>Position</i>	<i>Name</i>	<i>Phone Number</i>	<i>Fax Number</i>	<i>Cellular Phone Number</i>
CBCL Project Manager	Kelly MacDougall	(709) 364-8623	(709) 364-8627	(902) 223-8405
CBCL Corporate Health and Safety Officer (HSO)	Conrad LeLievre	(902) 421-7241	(902) 423-3938	-
CBCL On-site Field Coordinators	Kelly MacDougall	(709) 364-8623	(709) 364-8627	(902) 223-8405
	Colin Lefrense	(709) 364-8623	(709) 364-8627	(709) 730-1832
CBCL On-site Health and Safety Representative (HSR)	Colin Lefrense	(709) 364-8623	(709) 364-8627	(902) 223-8405
DOEC PM	Christa Curnew	(709) 729-2648	(709) 729-6969	-

Chapter 4 Health and Safety Plan Responsibilities

<i>Position</i>	<i>Responsibilities</i>
CBCL On-site Field Coordinators	<ul style="list-style-type: none"> • Ensure all site activities are performed in compliance with the HSP; • Ensure all site activities are performed in compliance with CBCL SWP procedures and SOPs; and • Implement the HSP.
CBCL On-site Health and Safety Representative (HSR)	<ul style="list-style-type: none"> • Provide routine inspection to determine if activities are performed in compliance with the HSP; • Ensure all on-site activities meet the requirements as described in the HSP; and • Has complete authority to close down any site activities that pose an unacceptable risk to site workers or the public.
CBCL Project Manager	<ul style="list-style-type: none"> • Comply with the HSP for all activities conducted on-site; and • Address any concerns the NL DOEC representatives or CBCL on-site field staff may have.
Visitors	<ul style="list-style-type: none"> • Comply with the HSP for all activities conducted on-site.

Chapter 5 Training

All personnel entering the site must recognize and understand the potential hazards to health and safety associated with the site. Personnel actively involved in on-site activities must be thoroughly familiar with programs and procedures contained in the HSP and must be trained to work safely in areas containing potentially hazardous materials. ***All project personnel including any subcontractors visiting the site are required to review this project HSP. In signing the attached form, project personnel are acknowledging that they have reviewed and understand the contents herein.***

Anyone commencing an activity shall have sufficient knowledge to complete the activity in a safe and technically competent manner. All on-site staff shall have demonstrated ability in the use of equipment or application of specialized knowledge, which may include the following activities:

- activities which may disturb hazardous materials;
- first aid;
- PPE use;
- confined space entry; and
- WHMIS knowledge specific to the site.

Training Requirements include:

<i>Position</i>	<i>Training to be Received</i>
CBCL On-site Field Coordinator(s)	Detailed review of all HSP requirements, WHMIS, Newfoundland and Labrador Occupational Health and Safety regulations, first aid, confined space entry and emergency response.
CBCL On-site Health and Safety Representative (HSR)	Detailed review of all HSP requirements, WHMIS, Newfoundland and Labrador Occupational Health and Safety regulations, first aid and emergency response.
CBCL Project Manager	Detailed review of all HSP requirements, WHMIS, Newfoundland and Labrador Occupational Health and Safety regulations, first aid and emergency response.

Chapter 6 Site Emergency Plan

Emergency Contact List

<i>Organization</i>	<i>Contact Name</i>	<i>Office Number</i>	<i>Cell Number</i>
Fire Department	-	911 / (709) 542-3322	-
Ambulance	-	911 / (709) 466-3468	-
GB Cross Memorial Hospital (Directions attached)	-	(709) 466-3411	-
Poison Control	-	(709) 722-1110	-
CANUTEC	-	1-613-996-6666	-
Police Department	-	(709) 466-3211	-
Environment Canada	Environmental Protection Emergency Response	1-800-426-6200	-
NL Environment	Emergency Measures	1-800-563-6181	-
Fire and Emergency Services - NL	25 Hallett Crescent P.O. Box 8700 St. John's, NL A1B 4J6	Fire Service: 1-709-729-1608 Emergency Management: 1-709-729-3703	-
CBCL Corporate HSO	Conrad LeLievre	(902) 421-7241	-
CBCL Project Manager	Kelly MacDougall	(709) 364-8623	(902) 223-8405
CBCL Field Coordinator / HSR	Colin Lefrense	(709) 364-8623	(709) 730-1832
DOEC Project Manager	Christa Curnew	(709) 729-2648	-

FIRST AID RESPONSES

Contaminant Ingestion: Give water if patient is conscious. Call Poison Control - follow instructions. Administer CPR, if necessary. Seek medical attention.

Contaminant Inhalation: Remove person from contaminated environment. Administer CPR if necessary. Seek medical attention.

Contaminant Skin Contact: Brush off dry material, remove contaminated clothing. Wash skin with soap and water. Seek medical attention if irritation develops.

Contaminant Eye Contact: Flush eyes and surrounding tissue with water for 15 minutes. Seek medical attention.

Contaminant Exposure Symptoms: Headache, dizziness, nausea, drowsiness, irritation of eyes, nose, throat, breathing difficulties.

Report incident to the Project Manager after emergency procedures have been implemented.

Chapter 7 Site Safety Requirements

Hazard Determination: Medium

Hazards that may be encountered during the completion of this project include: driving long distances, using sharp hand tools for sample collection, confined space entry, rough terrain/dense vegetation, possible exposure to landfill gas and/or contaminants in groundwater, surface water and leachate as related to the sampling program (i.e. metals, petroleum hydrocarbons, etc.).

The CBCL PM and field personnel will make contact with the DOEC PM prior to the field program. At this time safety requirements will be reviewed and a schedule will be established to minimize the potential for site conflicts. The CBCL PM will then provide notification to the DOEC PM a minimum of two (2) days prior to the field program.

Good housekeeping and strict decontamination procedures will be followed during the entire field program.

Potential Contaminants: Metals (including aluminum, cadmium, copper, cobalt, iron, lead and zinc, etc.), petroleum hydrocarbons, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and other general chemistry parameters.

*Personal Protective Equipment:
(Modified Level D)* Nitrile and/or abrasion resistant gloves, eye protection (safety glasses), steel toed boots, full length protective clothing, hard hat and reflective safety vest, respirator with H₂S cartridge (when working around valve chambers)

Emergency Equipment: First aid kit and fire extinguisher.

Chapter 8 Hazard Evaluations

The potential for unknown hazards cannot be eliminated. The following are potential hazards and the corresponding procedures for hazard reduction. Personnel encountering a hazardous situation shall notify other field personnel and the CBCL PM immediately. CBCL believes in a behaviour based safety (BBS) program. The BBS program provides tools designed to encourage managers and employees to complete an effective risk analysis before launching into an activity. Included in this program is the completion of a Field Level Risk Assessment (FLRA) Form, in addition to the completion of the formal Health and Safety plan. CBCL project personnel will follow all aspects of the BBS program as outlined in Section 6.0 of the Company Safety Manual.

Site Conditions

Field personnel shall review any information related to the Come By Chance Secure Landfill prior to the site visit, and should prepare for potential H&S hazards. Site specific questions related to safety may be addressed to the DOEC PM.

It is understood that several areas of the site are heavily vegetated and the terrain is uneven. All field personnel will be alert and observe terrain while walking to minimize slips and falls. Steel toed boots will be worn to provide additional support and stability. In addition, a brightly colored reflective vest will be worn at all times, and the buddy system will be used (two field personnel will be present on-site at all times).

Good housekeeping practices will be employed throughout the field work. All sampling/field equipment will be placed in dedicated areas and all items that are not needed to perform the immediate task at hand will be put away.

Chemicals

Care should be taken during the sampling activities as not to make skin and/or eye contact with any hazardous contaminants being assessed. Ensuring the use of appropriate PPE and following available safe work practices will minimize the potential for chemical exposure.

Confined Space Entry

No confined space shall be entered until the space has been evaluated for the hazards present and a specific entry procedure has been developed. Consideration will be given, but not limited to, the following types of hazards:

- The presence of possible airborne contaminants at concentrations exceeding the established occupational exposure limited (OELs);
- The atmosphere may become oxygen deficient;
- The presence of any physical hazards;
- The presence of flammable or explosive conditions;
- The presence of any potential for rapid flooding or engulfment; and,
- Configurations/positioning that may cause an entrant to become trapped.

All field personnel required to enter the confined spaces (i.e. valve chambers) during the field activities will have valid Confined Space Entry training. Prior to entering the valve chambers, the valves will be shut off and a hand held gas detector will be used to ensure the air quality within the chambers is not hazardous (i.e., oxygen, toxicity, carbon monoxide and explosivity) are not at hazardous levels. The formal written procedures provided in CBCL's SWP for Confined Space Entry, as well as the pumping procedures outlined in Section 4.3 of the 2010 Operations, Maintenance and Monitoring Manual (Pinchin Leblanc, 2010).

Mechanical

All motorized vehicles shall be driven and ridden safely to and from the site. Vehicles shall not be overloaded with riders or supplies. Seat belts shall be worn by all personnel. No one shall be allowed to ride in the back of pick-ups. Ensure all laws and statues under are followed.

Noise

Control of noise hazards shall be in accordance with the Occupational Health and Safety Act. Hearing protection shall be worn in noise hazard areas (where normal conversation cannot be heard at a distance of 2 ft or where noise pulses over 140 decibels occur).

Heat Stress

Symptoms of heat stress may include may include any of the following:

- Heat Rash (red rash on the skin);
- Heat Cramps (muscle spasms, pain in the hands, feet, and abdomen);
- Heat Exhaustion (pale, cool, moist skin, heavy sweating, dizziness, nausea, fainting); and
- Heat Stroke (life threatening)
 - Red, hot, usually dry, skin;
 - Little sweat;
 - Nausea;
 - Dizziness and confusion;
 - Strong, rapid pulse; and
 - Coma.

Prevention: Allow for rest periods in cool place. Push fluids during work day.

Treatment: Cool the person, have worker rest and push fluids, remove extra clothing and cool person with water. If symptoms do not improve, seek medical attention immediately.

Heat Stress Monitoring: Heart rates shall be monitored by taking a 30-second wrist pulse at the beginning of a rest period. If the heart rate exceeds 110 beats per minute, shorten the next work cycle by one-third. Continue this procedure if heart rate is not reduced at next rest break.

Heat Stress Prevention: Provide rest periods. Do not rely on thirst - push fluids; water, juice, or Gatorade are excellent choices. Monitor worker's heart rate and adjust length of work periods accordingly.

Wear loose-fitting cotton underwear and/or clothing to absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.

Cold Stress

When workers experience cold temperatures, the two primary injuries of concern are frostbite and hypothermia.

Symptoms of Cold Stress: Shivering, numbness, pale and cold skin, disorientation and weakness.

Prevention: Avoid being outside for extended periods during the coldest part of the day.

Cover hands and head. Encourage workers to dress in layers and change wet clothes immediately. Arrange temporary wind blocks on windy days.

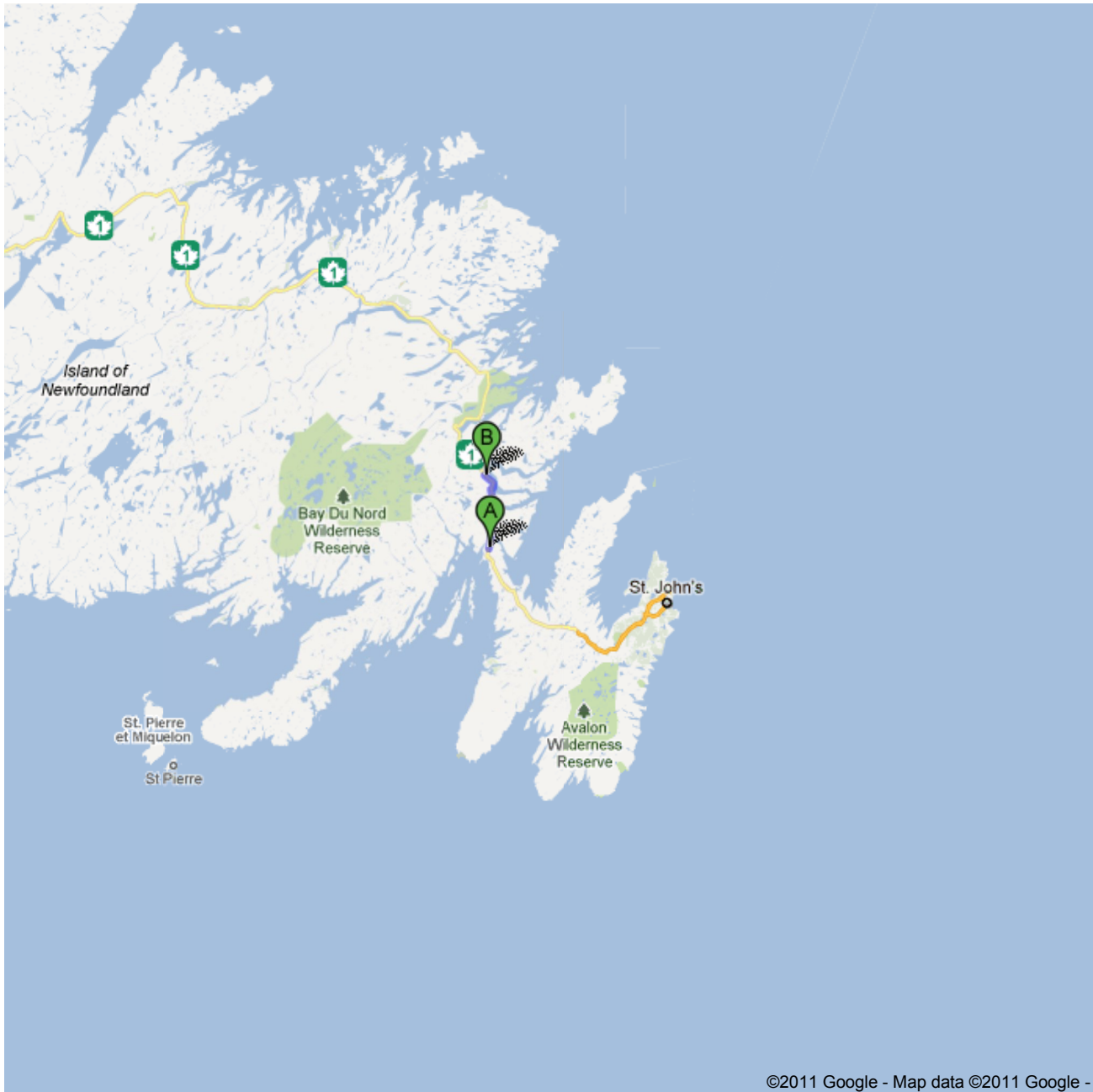
Avoid dehydration by consuming plenty of fluids. Avoid caffeine and alcohol. Consume water if warm fluids are not available.

Use the buddy system to allow workers to observe each other for early signs of cold stress and react safely.



Hospital Directions



Directions to DR.G.B Cross Memorial Hospital
Clareville, NL A5A 1Y9
45.7 km – about 41 mins



 Come By Chance, NL

-
- | | |
|--|-----------------------------|
| 1. Head north on Trans-Canada Hwy/NL-1 W
About 39 mins | go 44.8 km
total 44.8 km |
|  2. Turn right onto Manitoba Dr/NL-230A N (signs for Clareville/Georges Brook/ Newfoundland and Labrador 230 Alternate)
About 1 min | go 750 m
total 45.6 km |
|  3. Turn left
Destination will be on the left
About 1 min | go 140 m
total 45.7 km |

 **DR.G.B Cross Memorial Hospital**
Clareville, NL A5A 1Y9

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2011 Google

Directions weren't right? Please find your route on maps.google.ca and click "Report a problem" at the bottom left.

Acknowledgement Form
