



TABLE OF CONTENTS

TABLE OF CONTENTS	1
1.0 OVERVIEW.....	3
2.0 FACILITY DESCRIPTION	4
2.1 Bioremediation Cell Design	4
3.0 WASTE ACCEPTANCE PROTOCOL.....	5
3.1 Acceptable Wastes	5
3.2 Analytical Requirements	5
3.3 Waste Approval Application.....	6
3.4 Waste Transportation Manifests.....	7
3.4.1 Tervita Waste Manifests	7
3.4.2 Provincial Transportation of Dangerous Goods Manifests	8
3.5 Screening for Unacceptable Wastes.....	8
3.6 Discovery of Unacceptable Waste	10
4.0 GENERAL OPERATING PROCEDURES	12
4.1 Inspections	12
4.2 Employee Health and Safety	12
4.3 Employee Training Plan	13
4.4 Soil Receiving	14
4.5 Treatment Procedure	14
4.5.1 Fertility.....	14
4.5.1.1 Moisture	14
4.5.1.2 pH.....	14
4.5.1.3 Electroconductivity.....	14
4.5.1.4 Carbon, Nitrogen and C : N	14
4.5.2 Temperature	15
4.5.3 Oxygen.....	15
4.5.4 Surfactants	15
4.6 Soil Treatment Regime.....	15
4.7 Soil Interim Analysis.....	15
4.8 Soil Reclassification Sampling and Quality Control.....	15
4.9 Relocation of Treated Soil.....	16
4.10 Precipitation Run-On.....	16
4.11 Water Treatment.....	16
4.12 Soil Leachate	17
5.0 CONTINGENCY PLAN.....	18
5.1 Fire	18
5.2 Severe Storms.....	19



5.3	Contaminant Release	19
5.4	Earthquake	20
5.5	Medical Emergencies	20
6.0	RECORD KEEPING AND REPORTING	21
6.1	Record Keeping.....	21
6.2	Reporting.....	21
7.0	ENVIRONMENTAL MONITORING PLANS	22
7.1	Groundwater Monitoring.....	22
7.1.1	Water Treatment and Disposal System	23
7.2	Closure and Post-Closure Plans	23
8.0	RISK MANAGEMENT	24
8.1	Waste Ownership	24
8.2	Insurance	24
8.2.1	WCB Insurance	24
8.3	Contacts	24

APPENDICES

APPENDIX A	Facility Location, Description & Monitoring Well Locations
APPENDIX B	Cell Design and As Builts
APPENDIX C	Organic Parameters in Soil
APPENDIX D	Waste Approval Process Forms
APPENDIX E	TERVITA Soil Manifests
APPENDIX F	Waste Discrepancy Report
APPENDIX G	Facility Inspection Report
APPENDIX H	PPE Determination & Headspace Procedure
APPENDIX I	Health & Safety/Training Documents
APPENDIX J	Not used in this Manual
APPENDIX K	Interim/Final Reclassification Report, and Internal Log Sheets
APPENDIX L	Cell Water Management Information
APPENDIX M	Emergency Response List
APPENDIX N	Route to Hospital
APPENDIX O	Liability Insurance



1.0 OVERVIEW

Since 1989, Tervita Corporation's Environmental Services Division (TERVITA) has been providing business, industry and government agencies with timely, cost effective and responsible environmental services and products to meet a wide range of environmental challenges. Tervita is a progressive company with a strong combination of environmental expertise, project management skills, hands-on experience and an extensive list of assets.

TERVITA has extensive and proven expertise in the bioremediation of hydrocarbon contaminated soils, waste management, transportation and logistics. Our corporate head office is located in Calgary, Alberta, with our British Columbia office at 13511 Vulcan Way, Richmond, BC. There are also two satellite offices located in Kelowna and Malahat, BC. Tervita presently manages and operates numerous bioremediation facilities in British Columbia.

Bioremediation Facilities (BF) are designed to treat hydrocarbon-contaminated soils in a lined treatment cell. The soils are treated to a level below the standards sited in the contract between Tervita and the landfill owner. The analytical results of the treated material are compared to Schedules 4 and 5 of the *Contaminated Sites Regulation* (CSR) for the parameters of concern. Following treatment, the soils are typically placed in the landfill as per the requirements of the landfill authorization. The remediated soils are used for daily, intermediate or final cover, but may also be used as fire breaks, berm construction and road building. In the event that the soils are not used in the landfill, the soils will be managed as per the requirements of the BC Contaminated Sites Regulation.

Prominent examples of acceptable wastes for bioremediation include the following:

- Gasoline contaminated soil from service stations,
- Emergency Response to spills and motor vehicle accidents, and
- Diesel and heating oil contaminated soils from leaking fuel storage tanks

The purpose of this Operations Manual is to provide detailed information on the facility, to provide operating procedures to ensure the safety of employees, and to ensure appropriate environmental control measures are taken. This manual covers those areas, which are unique to the handling of contaminated soils.



2.0 FACILITY DESCRIPTION

The attached maps in Appendix A detail the location of the facility within the province. Additional maps detailing the facility location within the landfill, and the position of the groundwater monitoring wells, are also attached.

The location within the landfill for constructing the cell takes into account the following factors at a minimum:

- Native soil is preferred to closed portion of the landfill (settling concern),
- Future landfill design and landfilling operations (decommission and re-build cell),
- High ground or ability to construct berms/swales (surface water management), and
- Existing landfill infrastructure and maintenance (health and safety, operational costs).

The bioremediation facility is secured by the existing landfill security system. This includes a single access road with two gates that enters the landfill from the west. The lockable gate at the landfill entrance is also monitored by a security camera that is connected to the scale house. The remainder of the property is surrounded by relatively impassable natural barriers including sloped geography, thick forest, bedrock outcrops and berms and swales. In the event that these natural barriers change in the future due to site development, additional fencing may be installed as required to prevent unauthorized access.

Additional details regarding security, landfill hours of operation, services on site, etc. can be found in Table 1 in Appendix A.

2.1 Bioremediation Cell Design

Below is a description of a typical Tervita bioremediation cell design. Actual construction design and materials will take into account the type and level of contamination, expected volume, and if the cell is temporary (a onetime use) or permanent. The proposed cell design is based on the plans attached in Appendix B.

Based on the initial site survey and access to the scale house and infrastructure, this facility will be constructed on a native area outside the landfill footprint but within the property boundaries. The final design may be modified to accommodate any unforeseen issues once the sub-grade is prepared. Once constructed, the as-builts will be completed and included in the final version of the manual.

Prior to construction, the sub-base will be graded at a 2% slope. The cell construction begins with a 150 mm layer of sand. The liner system, which typically includes geotextile layers and oil resistant liner(s), are then installed. An additional 150 mm layer of sand is placed under the final working surface (150 mm layer of crushed aggregate or an asphalt pad). Lock blocks or soil berms are used to secure the liners in place and to create the cell. A small berm is used at the entrance to the cell to prevent precipitation from running into the cell.

Precipitation and leachate from the soils undergoing bioremediation runs along the surface of the cell and is collected in a sump(s) in the low corner of the cell. Details of the Water Management Systems can be found in Sections 4.10 and 4.11 of this Manual.

The soils undergoing remediation will remain covered with a low permeable material, such as 15 mil RPE tarp or equivalent. Soils that have completed treatment may remain uncovered. The treatment cell is identified by signage around the perimeter.



3.0 WASTE ACCEPTANCE PROTOCOL

The TERVITA Bioremediation Facility is capable of managing hazardous waste soils which meet Section 41.1 of the Hazardous Waste Regulations, and other contaminants which are amendable to bioremediation. The contaminants that may be hazardous waste are limited to benzene, toluene, ethylbenzene and xylenes and waste oil and may not exceed the concentrations listed in Section 41.1 of the BC Hazardous Waste Regulation as amended from time to time (See Table 1 below for levels as of September 13, 2012). All other contaminants, such as metals or PAH's, must be present in low enough concentrations that would not classify the soil as hazardous waste.

Due to a February 20, 2008 amendment in the definition of Class 9 in the Federal Transportation of Dangerous Goods, hazardous waste in BC is longer regulated on total concentration for the BTEX compounds. Hazardous waste must be determined by leachability (TCLP) as per the definition of "Leachable Toxic Waste" before Section 41.1 of the Regulation applies. If the TCLP benzene, toluene, ethylbenzene or xylenes exceed the Leachate Quality Standards from Table 1 of Schedule 4 in the BC Hazardous Waste Regulation, then the total benzene, toluene, ethylbenzene and xylenes (Total BTEX) in Section 41.1 of the BC Hazardous Waste Regulation also apply.

In the event that the TCLP benzene, toluene, ethylbenzene and xylenes deem the soil to be non-hazardous, then the total benzene, toluene, ethylbenzene and xylenes in Section 41.1 of the BC Hazardous Waste Regulation DO NOT apply.

3.1 Acceptable Wastes

The maximum concentration of hydrocarbon contaminated soils acceptable for bioremediation must meet the following criteria:

Table 1 – Maximum Hazardous Waste Concentrations

Parameter	Maximum Value (dry weight basis)
Total Benzene	25 mg/kg
Total Ethylbenzene	250 mg/kg
Total Toluene	150 mg/kg
Total Xylenes	250 mg/kg
Total Oil (determined by Waste Oil methodology)	<10%

Ignitable or reactive waste soils, liquids, or soils containing free liquids other than water are not acceptable.

When treated, the residues must meet the disposal criteria for this landfill based on the Operational Certificate. Soils that are not placed in the landfill will be managed under the requirements of the BC Contaminated Sites Regulation.

3.2 Analytical Requirements

Specific analytical requirements for incoming soil are based on the source of contamination, and typically include:

- LEPH (Light Extractable Petroleum Hydrocarbons) or EPH₁₀₋₁₉
- HEPH (Heavy Extractable Petroleum Hydrocarbons) or EPH₁₉₋₃₂
- VPH (Volatile Petroleum Hydrocarbons)
- BETX (Benzene, Ethylbenzene, Toluene, Xylenes)
- Total Metals
- Applicable parameters in the TCLP leachate

Additional testing may be required at the discretion of TERVITA, based on the origin of the waste and its description. The table of Organic Parameters in Soil in Appendix C outlines the test methods and detection limits for the analytical requirements. If the total concentrations analysed for the BC



Contaminated Sites Regulation exceed certain trigger values, the parameter must also be analysed for TCLP to determine if the material is a hazardous waste. Tervita has prepared both internal and external technical memos on this topic. A copy of these documents is attached in Appendix D. A letter certifying the soil is not hazardous waste from the Generator or their consultant may be acceptable in lieu of additional data.

Soils may be classified as hazardous waste due to Total Oil content (i.e. Waste Oil) that is greater than 3% when analysed using the Waste Oil Methodology in the BC Laboratory Manual. Tervita will use the sum of the EPH (or LEPH and HEPH) as a gross indicator for the waste oil content based on the following triggers:

Source of Contaminant	Trigger Concentration (mg/kg)	Rationale
Gas and/or diesel	40,000	Gas and Diesel do not contain significant hydrocarbons that exceed the EPH19-32 range. Documents published by the BC MOE in the Laboratory Manual state that the upper content of waste oil in gas and diesel is 5% and 75% respectively.
Transformer oil Hydraulic oil	30,000	Transformer and Hydraulic oils do not contain significant hydrocarbons that exceed the EPH19-32 range. Documents published by the BC MOE in the Laboratory Manual state that these products would be 100% oil content. In addition, Tervita has seen a significant amount of data historically that would suggest this trigger would be conservative for this characterization.
Bunker oil Other waste oils Mixtures of oil	20,000	Bunker and other waste oils potentially contain significant hydrocarbons that exceed the EPH19-32 range. Tervita has seen a significant amount of data historically that would suggest this trigger would be conservative for the characterization of this waste stream.

3.3 Waste Approval Application

The first step in the waste acceptance procedure is completion of a Waste Approval Application (WAA) (see Appendix D). Before waste soil is shipped to the Bioremediation Facility, a signed WAA must be submitted and approved.

Section I of the form is the generator section and it provides generator names and contact information.

Section II of the form is the consultant section and it provides names and contact information for the consultant.

Section III is the Waste Characterization section. This section provides background information on the site and describes the physical and chemical characteristics of the soil or water. Soils accepted at the facility have undergone a characterization in accordance with the BC Ministry of Environment, Contaminated Sites Regulation, Technical Guidance Document 1.

Section IV of the WAA is a certification by the generator or the consultant that the soils are as described in **Section III** and the supporting documentation.

The WAA's and supporting information (such as MSDS's, samples, and analytical results) are then sent to Tervita to determine whether the waste is suitable for treatment at the Bioremediation Facility or disposal at the landfill.

Instructions for completion of the WAA are contained in the attached Waste Approval Application Procedure form. (Appendix D).



All WAA's are sent to Tervita's approval group who will evaluate the application by completing the Tervita Approval Policy (Appendix D). The approval group has been trained in appropriate waste characterization will sign the WAA if it meets the waste acceptance criteria. While Tervita prefers that the generator or their consultant is a Qualified Professional, this is not a requirement of the BC Hazardous Waste Regulation. To ensure that the in the event that the generator or their consultant is not a Qualified Professional, then the WAA must be approved by a Qualified Professional on behalf of Tervita.

After all applicable data has been reviewed by the approval group and compared to the allowable criteria, the signed WAA and supporting documents are then sent to the Landfill Supervisor or Manager for final review. The Landfill Supervisor or Manager may reject the material for any reason.

Upon approval, Tervita will notify the waste generator of the acceptability of the waste. Records of all waste rejections will be maintained on file. In most cases, the approval will be valid for the duration of the project as defined by the WAA. One year after approval, the project may continue with a letter from the generator confirming that the waste has not changed. Current analytical information may also be required.

3.4 Waste Transportation Manifests

3.4.1 Tervita Waste Manifests

Each truckload of material delivered to the facility must be accompanied by a completed and signed Tervita Waste Soil manifest (Appendix E). Waste Soil will not be accepted at the Bioremediation Facility without a Tervita manifest. These manifests have been prepared based on the approved contaminants and levels of contamination, and indicates that the project has been approved by both Tervita and the landfill manager. Any manifests that have been edited will not be accepted by the receiver, and the Regulatory Coordinator and Tervita Project Manager will be contacted to confirm acceptance.

The Tervita manifest is divided into three sections:

Section 1 must be completed by the generator and includes information about the generating location, waste type, and waste code. This section also has a certification, which must be signed by the generator's representative on site.

Section 2 contains details regarding the transporter and must be signed by the driver.

Section 3 is completed by the Tervita representative receiving the soil at the Bioremediation Facility. It includes an acceptance signature, receipt date, storage location within the treatment cell(s) and any comments Facility Coordinator may have.

All soils arriving at the Bioremediation Facility must have the following:

- A project approval, via the Waste Approval Application process
- A scheduled arrival time
- A Tervita Waste Soil Manifest and Project number
- A hazardous waste manifest, if required

When the truck arrives at the landfill the driver will present the manifest to the scale operator. The truck is weighed then directed to the cell. When the truck arrives at Tervita's bioremediation facility within the landfill, the Tervita personnel will accept the manifest. Upon confirmation that the soils have been pre-approved and match the description on the WAA, the truck driver will be directed to the designated off-loading area within the cell(s).



A system is in place that tracks the waste from the time a WAA is issued through to the final reclassification and removal from the cell(s). Any supporting data relating to the waste stream is also stored within this system. Records are retained for a minimum of seven years from the acceptance date.

3.4.2 Provincial Manifests

For soil designated as hazardous waste by the BC Hazardous Waste Regulation, Provincial Manifests must also accompany each load. Hazardous waste soils will not be received at the facility without the completed manifest. The generator, or the generator's representative, shall complete the manifest at the time of loading. The transporter shall carry the manifest for the duration of the delivery of the wastes. Once the material has reached the facility and the waste deemed acceptable, the Tervita representative will review and complete the manifest. Manifests will be handled only by Tervita employees who have received Transportation of Dangerous Goods training so that they are aware of the requirements of the forms. Copies of the completed manifest will be distributed as follows:

Copy 1	Mailed to the BC MOE
Copy 2	Retained by the Generator (Consignor)

Copies 1 and 2 are detached and retained by the Generator's representative prior to reaching the Facility.

Copy 3	Mailed to the BC MOE
Copy 4	Retained by the Transporter (Carrier)
Copy 5	Retained by the Receiving Facility (Consignee)
Copy 6	Mailed to the Generator (Consignor)

Tervita shall ensure that copies 3 – 6 are complete, accurate and distributed as required. Copy 5 of the Provincial Manifests will either be kept on file at the Regional Office, or returned to the Richmond office for storage.

3.5 Screening for Unacceptable Wastes

It is the responsibility of the Tervita employee receiving the soil to ensure, to the best of their ability, that the material when delivered resembles the physical description offered in the WAA. If there is any question as to the material's acceptability, the operator is to contact the Tervita person responsible for the waste approval. Tervita may sample truckloads on a spot check basis as required.

Tervita employees are trained to look for evidence of potentially unacceptable wastes. Arriving trucks may be randomly selected for inspection. The contents of soil trucks will be spread in a lined holding area. The Tervita personnel will visually examine the waste and inspect it. Such evidence includes the following:

- Containers with TDG labels
- Sealed Drums
- Leaking containers
- Wastes with strong and unusual odours
- Sludges
- Loads with unusual/unfamiliar paperwork

QA/QC Program

BC MoE correspondence for the Highwest Soil Facility requested a QA/QC program for confirmation of incoming wastes. In response, Tervita retained a Qualified Professional to prepare a QA/QC Sampling Plan that is representative of the tonnages, contaminants and potential environmental risk. A copy of this Sampling Plan can be found in Appendix D.

Every 250 tonnes of soil received for the facility will be segregated and marked with the project number and QA/QC sample. From this segregated load, a composite sample will be prepared and



submitted to an accredited laboratory for analysis based on the parameters in Table 2 on a rotating basis. Every fourth sample (or 1000 tonnes), the testing will be expanded to the parameters in Package 1 or 2 on an alternating basis.

Table 2 – QA/QC Sampling Frequency and Parameters for Incoming Soil

Frequency (Tonnes)	Potential Contaminants of Concern	
250	BTEX/VPH EPH PAH CSR Metals Other (non-routine parameters as required per WAA)	
1000	Package 1	Package 2
	TCLP Metals	BTEX/VPH
	TCLP BTEX TCLP PAH	LEPH/HEPH CSR Metals

When the results of the QA/QC are received from the laboratory, the results will be compared to the information in the Waste Acceptance Policy. If materials are deemed to be acceptable the soil will be managed as per the standard facility procedures. If the material is deemed to be unacceptable, it will be managed as per Section 3.6 – Discovery of Unacceptable Waste.

3.6 Discovery of Unacceptable Waste

If any unacceptable waste or suspected unacceptable waste is identified, or if the operator has any concerns, the following procedures are implemented:

1. The truck is held and the Tervita supervisor and the generator are contacted.
2. Following discussions with the generator the waste may be returned or redirected to a holding area within the cell for further evaluation.
3. A Waste Discrepancy Report (Appendix F) is completed. This report contains information with respect to the nature of the waste, where it originated and the generator's name and telephone number.
4. Samples are taken for analysis if there is any reason to suspect that the waste is not as per the description on the WAA.

If any unacceptable or suspected unacceptable wastes are found, the area will be roped off and the waste contained as required. Properly trained personnel will be directed to the site to conduct sampling and cleanup. All efforts must be made to minimize leachate generation, including but not limited to the waste being placed in leak-proof, sealed containers or covered with low permeable material, such as 15 mil RPE tarp or equivalent. If the waste is proven to be unacceptable, the waste will be transferred with appropriate documentation to an approved waste disposal or treatment facility. A log of unacceptable materials is maintained indicating the type of material, generation source and disposition.

The following protocols are to be performed if unacceptable waste is discovered after the material has passed the scale house:

AT THE ENTRANCE TO THE BF PRIOR TO UNLOADING:

- Refuse the load and hold for inspection or further instructions
- Complete a Waste Discrepancy Report
- Contact the BF Manager

DURING THE UNLOADING AT THE FACILITY:

- Stop the unloading of further material
- Follow 'Unacceptable Waste' procedure
- Isolate and secure the immediate area
- Contain the material if there is the potential that it could spread
- Contact the BF Manager



WITHIN THE BIOREMEDIATION CELL AFTER UNLOADING:

- The material will be set aside, and placed in leak-proof containers if required
- Cordon off the area, and notify the BF Manager, the landfill Contact, and appropriate regulatory agencies immediately
- Samples will be taken and sent to an approved laboratory for analysis
- Based on the analytical results, a final decision will be made on whether the waste is unacceptable.

Unacceptable waste may be returned to the generator. Unacceptable wastes, which are also dangerous or hazardous wastes, will be properly manifested in accordance with regulations upon return to generator or approved processing facility.



4.0 GENERAL OPERATING PROCEDURES

Operation of the site will be conducted in accordance with this Operations Manual, and more specifically the general operating procedures.

The Landfill hours of operation can be found in Table 1 of Appendix A. At least one operating employee should be available "on call" with prior notification. The bioremediation facility may be opened outside of these hours, including weekends and Statutory Holidays, with prior notification of the Landfill Supervisor and Manager.

Wastes are delivered to the facility by truck. The loads are tight tarped, with the end gates sealed shut. Vehicles entering the facility are weighed in at the scale (if applicable) where specific information is checked such as: manifests, weight, waste type, waste code, and waste generator.

The procedures for receiving the soils are detailed in Sections 3.4 and 3.5.

4.1 Inspections

The Bioremediation Facility and equipment are maintained regularly. Routine equipment maintenance, road grading, repair cover replacement, and inspections of operating systems are examples of typical maintenance activities. The facility will have an inspection once per week while soil is being remediated in the cell and in the event of extreme weather events (storms greater than 1 in 25 year events) and natural disasters (such as earthquakes detected in the District of Highlands). The findings will be recorded on the Facility Inspection Report (Appendix G). These inspections include the following:

- Perimeter walk around of all cells
- Documentation of water levels in sump(s)
- Inspection of covers for perforations and tie downs
- Inspection of road access
- Inspect liner for evidence of deterioration, malfunction, leaks, or improper operation.
- Inspect leachate collection system to ensure proper functioning and to determine if leachate is being generated or is accumulating
- Inspection of water treatment system

4.2 Employee Health and Safety

The soils handled at the facility are by their nature of concern to health and/or the environment. Therefore, hard hats, safety boots and work gloves are not sufficient. Strict Health and Safety practices are required. Adherence to Tervita's Health, Safety and Environmental Management Guide allows the work to be performed quickly, cost effectively and above all safely. Employees will make use of a decontamination facility when entering or leaving the work area. A copy of Tervita's Health, Safety and Environmental Management Guide is kept on site in the scale house. The BF is a non-smoking area.

Employees who may be in contact with contaminated soils will be required to wear at a minimum hydrocarbon resistant gloves, steel toed rubber boots, hard hats, safety glasses, high visibility vests, and Tyvek coveralls. All employees will have half mask respirators available and they will be trained in their use. The matrix for Personal Protective Equipment (PPE) determination and Headspace monitoring procedures can be found in Appendix H.

Several independent and uncontrollable variables, most notably temperature and weather conditions, can affect airborne contaminant concentrations. These factors must also be considered when implementing site activities and when analysing data. Some variables to consider include:



- **Temperature.** An increase in temperature increases the vapour pressure of most chemicals.
- **Wind speed.** An increase in wind speed can affect vapour concentrations near a freestanding liquid surface. Dusts and particulate-bound contaminants are also affected.
- **Rainfall.** Water from rainfall can essentially cap or plug vapour emission routes from open or closed containers, saturated soil, or lagoons, thereby reducing airborne emissions of certain substances.
- **Moisture.** Dusts, including finely divided hazardous solids, are highly sensitive to moisture content. This moisture content can vary significantly with respect to location and time, and may also affect the accuracy of some field sampling results.
- **Vapour Emissions.** The physical displacement of saturated vapours can produce short-term, relatively high vapour concentrations. Continuing evaporation and/or diffusion may produce long-term low vapour concentrations and may involve large areas.
- **Work Activities.** Work activities often require the mechanical disturbance of contaminated materials, which may change the concentration and composition of airborne contaminants.

TERVITA field staff participates in a medical monitoring program specifically designed for work on hazardous waste sites

4.3 Employee Training Plan

TERVITA employees receive safety and operations training as part of a regular schedule of employee training. Employee training is conducted in accordance with Tervita's Health, Safety and Environmental Management Guide. Tervita employs Job-Specific training where employees are trained to a level that will allow them to complete their tasks safely and efficiently. BF job-specific training includes instruction to prevent injury, illness and damage to equipment or the environment.

In 2009, Tervita initiated a program called "TERVITA U". This program provides a framework for employees to see the Tervita and client specific training to be able to work safely on various sites. This system also tracks the training/certification and has automated reminders prior to the expiry of certification.

The required safety training is outlined in the training matrix of Tervita's Health, Safety and Environmental Management Guide. A copy of Tervita's training matrix for the bioremediation facilities is included in Appendix I.

Prior to commencing work at the BF the On-Site Supervisor will review with the employee the duties and responsibilities listed in the Training Procedure Checklist (Appendix I). The Training Procedure Checklist includes required training elements established in the Tervita Health, Safety and Environmental Management Guide plus additional training specific to the BF. The training elements include:

- First Aid
- WHMIS and TDG
- 40 hr OSHA Training for work on Hazardous Waste Sites (for supervisors only)
- Recognition of potentially unacceptable wastes
- Emergency notification procedures
- Emergency Response

Additionally, employees are in a medical surveillance program specifically designed for work on hazardous waste sites. The Surveillance Program is part of the Occupational Health Program. Specifics of the Occupational Health Program can be found in Tervita's Health, Safety and Environmental Management Guide.



4.4 Soil Receiving

The contaminated soils will be unloaded from trucks directly into the cell, where an excavator will assist in distributing the soils. When the preparation of the windrow is complete, the material will be covered with low permeable material, such as 15 mil RPE tarp or equivalent. Soils that have completed treatment may remain uncovered.

In general, soil from each project (generating location) is individually stockpiled. However, for small projects, soils of like classification may be combined into a single stockpile to allow for more efficient operations and use of space in the Bioremediation cell.

The weight of soil received, and levels and the contaminants of concern are then recorded for each windrow on the facility daily load logs. A copy of the daily load log can be found in Appendix K. The diagram of the biocell(s) is then updated, indicating the location of the material received within the cell. Each pile will be identified by a stake placed in the pile that has the cross reference of the generator.

Soils which are hazardous waste must be treated in individual windrows. No hazardous waste soils will be stockpiled outside the cell.

4.5 Treatment Procedure

Bioremediation is the process where naturally occurring microbes convert the hydrocarbon contamination in the soil to non-hazardous degradation products. Optimum conditions for bioremediation are very similar to those that promote crop growth. Consequently, a fertility analysis may be performed to determine conditions, which must be altered to enhance the bioremediation process. When the materials are actively treated or sampled for analyses, the date and activity shall be recorded on the bioremediation log for that windrow. A copy of the bioremediation log is attached in Appendix K.

4.5.1 Fertility

The fertility of a soil is the measurement of moisture, pH, EC (electro conductivity), carbon, nitrogen, and carbon to nitrogen ratio, phosphorous, calcium, magnesium and potassium.

4.5.1.1 Moisture

The ideal moisture content of the soil is between 15% and 25%. Excess moisture restricts airflow within the pile, causes the windrows to slump, and can cause the pile to become anaerobic. Too little moisture will not allow the carbon and nitrogen to dissolve. Tervita personnel subjectively evaluate moisture content throughout the treatment process. Basically moisture is added or maintained as long as the soil is not slumping or soggy.

4.5.1.2 pH

The pH of the soil should be relatively neutral. If the pH is too low, lime or limestone may be added. If the pH is too high, sulphur may be added.

4.5.1.3 Electroconductivity

Electro conductivity may be monitored to ensure it does not get excessively high. Electro conductivity is increased when high salt fertilizers are added (Ca, Mg, Na and K).

4.5.1.4 Carbon, Nitrogen and C : N



The correct carbon to nitrogen ratio is key to enhancing bioremediation. The ideal ratio is between 20:1 and 30:1. The ratio can be altered through the addition of nitrogen rich manure or fertilizers.

4.5.2 Temperature

Ideal temperature is 30 to 40 degrees Celsius. Ambient conditions and the bioremediation process govern temperature. The process is exothermic. The soil may be cooled through the addition of water or through aeration. Temperature is increased through the addition of manure, or through reduced aeration or moisture addition. The outside of the windrow will naturally have a lower temperature than the inside. However if there is an abnormally high temperature variation this is an indication of excessive aeration. The temperature of the windrows may be measured by inserting the TERVITA temperature probe 4 feet into the centre of the windrow. If the temperature is monitored, it shall be recorded on the windrow bioremediation log.

4.5.3 Oxygen

Bioremediation is an aerobic process. Aerobic bacteria require oxygen in air in order to survive. Air is approximately 20% oxygen. The oxygen content of the air in the pile should be maintained between 5% and 20%. Too frequent aeration is detrimental to the remedial process, as it will cause the moisture content and temperature to decrease.

The soil windrows are mechanically aerated with an excavator and mixing bucket (or similar) no more than once per week.

4.5.4 Surfactants

TERVITA does not usually use surfactants. However, use in soil contaminated with some long chain hydrocarbons can improve degradation through emulsification. Emulsification increases the surface area of the hydrocarbon molecules in soil thereby enhancing degradation.

4.6 Soil Treatment Regime

The selected treatment regime and amendments is a compromise of optimizing all of the above elements. It is never possible to achieve the ideal levels of each of these factors. Each batch of soil behaves differently and optimum results are sometimes achieved optimizing one of the above criteria detailed in the previous section.

4.7 Soil Interim Analysis

Soil may be sampled and analyzed by an appropriate laboratory periodically during the remediation process. The data acquired may be used to monitor the progress of remediation and/or soil chemistry. Total remediation periods are one to twelve months to reduce the contaminants to below the commercial level.

4.8 Soil Reclassification Sampling and Quality Control

When interim sampling and analysis indicate the bioremediation goal may be complete, samples representative of the final treatment conditions are collected from the soil in the cell.

TERVITA follows the BC MOE, Technical Guidance 1: *Contaminated Sites, Site Characterization and Confirmation Testing* protocol for ex-situ characterization of suspect Waste I Quality soils for delisting hydrocarbon contaminated soil (HW<Section 41.1) and confirming the remediation of waste level soils. Samples are taken at a frequency of one sample per 30m³, plus a Field Replicate for material classified as HW<41.1 during the characterization process, for all parameters of concern being remediated.



The operator completes an Interim/Final Reclassification Sample Report. (Appendix K) The sample report contains the following information:

- Project number
- Generator
- Date soil received and tonnage of soil
- Contaminants of Concern
- Collectors name and sampling date
- Diagram illustrating soil location within the cell, sampling locations and quality control sampling locations within the soil stockpile.

The samples collected are placed into soil sample jars supplied by an accredited laboratory. The sample jars are labelled with the following information:

- Project number and sample number
- Date sample collected
- Analysis for Contaminants of Concern

The collected samples are placed into a travel cooler complete with ice or ice packs to ensure proper shipping of samples to lab.

4.9 Relocation of Treated Soil

All treated soil must be approved by Tervita's approval group and the Landfill Supervisor or Manager before being removed from the cells. Once the soil has been treated and approved by the Landfill Supervisor or Manager for disposal, the soil will be excavated out of the cell, loaded onto site dump trucks and trucked to areas requiring cover within the landfill. This will be performed under the direction of the landfill operator. In the event that soils are transported off site, they will be managed as per the requirements of the BC Contaminated Sites Regulation and the receiving facility.

Treated soils stockpiled outside of the bioremediation facility prior to final placement will be managed to minimize soil erosion. Any runoff from these stockpiles will be managed as surface water and diverted to the approved Landfill Surface Water Management System (LSWM). The LSWM was engineered based on industry best management practices to manage a 1 in 200 year storm event and includes features such as ditch systems with vegetative cover, berms and swales and two storm water settling ponds designed to allow for settling of the solids prior to infiltration to the environment. Additional works will be installed as required.

4.10 Precipitation Run-On

Piles will be shaped and covered to maximize clean water diversion from the cell. Any precipitation that occurs will run off the sloped tarps to the cell perimeter and to the surrounding landfill. If the precipitation pools on the tarps, it will be pumped off to the surrounding landfill. In the event that the cells are not full, any precipitation will be contained within the cell collection sump(s). The biocell(s) is bordered by a berm at the entrance and lock blocks that keep soil leachate or precipitation run-off contained in the cell, and landfill surface run-on out of the facility cell.

Water in the sump is re-circulated back into the soil, or stored until it is required to increase moisture in the soils. If the quantity of water exceeds the storage capacity, it will be treated through a water treatment system on site for discharge or stored in a storage tank. A Cell Water Management Flow Chart with decision paths for handling water is attached. (Appendix L)

4.11 Water Treatment

Our water treatment system has been applied to the treatment of biocell run-off successfully for more than 15 years. The Water Management System and associated infrastructure, including the sumps, Oil/Water Separators, pumps, piping, etc. will be designed to meet the peak flow from a 1 in 25 year – 24 hour rain or rain on snow storm event, whichever is larger, as requested by the BC Ministry of



Environment. The final design and location of the equipment is subject to change based on the underlying ground conditions which will be evaluated during construction. The final design and as-builts will be included in later versions of this Manual.

Typically, run-off contains suspended solids components from the silt in the soils as well as the obvious hydrocarbon contaminated component. The water from the cell at the Highwest Bioremediation Facility will be treated and discharged on a continuous basis. Monthly compliance sampling will be performed at the Carbon Vessel outlet for the parameters outlined in Table 3.

The first stage of the treatment system is the collection sumps. The collection sumps are designed to gravimetrically remove sediments. The sediment accumulates on the bottom of the separator and the hydrocarbons accumulate on the surface. Any product accumulating in the sump is removed with absorbent pads. The contaminated pads are then drummed and managed as a hazardous waste. If required, pH adjustment or flocculation may be employed at this stage.

From the sumps, the water will be pumped to an oil/water separator for further gravimetric separation before flowing to a bag filter system. The bag filter is designed to filter out suspended solids. A combination of 100 micron and 50-micron (nominal) filters are employed. Suspended solids become trapped on the filter mesh and are removed from the water stream. The water is then pumped through Granular Activated Carbon (GAC) canister(s). The GAC active sites have an affinity for hydrocarbons while remaining hydrophobic. The treatment equipment is mobile; however, dedicated water treatment equipment will remain on the site.

Table 3 – Treated Water Monitoring Frequency and Parameters

	BTEX/VPH	LEPH/HEPH	Dissolved Metals	Other
Carbon Vessel Outlet	M	M	M	TBD
Leak Detection System	W	W	W	TBD

M - Tested monthly when water is flowing, a minimum of 10 calendar days apart

W - Visually inspected weekly, tested monthly only if water is found in the system

TBD - To be determined - based on the other hydrocarbons being remediated (i.e. PCP, VOC, etc.)

The results of the treated water testing from the Carbon Vessel Outlet will be compared to the Aquatic Life criteria of the BC Contaminated Sites Regulation (See Appendix L). The supporting analytical data will be reviewed and filed electronically on the Tervita shared drive. The water will be discharged from the treatment system to the infiltration pond for the Landfill Surface Water Management system under the direction of the landfill manager.

Should the results of testing exceed the Aquatic Life criteria, the landfill manager, operations manager and BC Ministry of Environment will be notified immediately. The infiltration pond will be tested for the parameters of concern and any water within the cell will be placed in tanks while the GAC is changed. Once the system is operational, the newly treated water will be re-tested to confirm the system is again compliant. As a contingency measure, the water from the cell may be introduced into the landfill leachate management system, where it will be treated and transported off site to an authorized water treatment plant.

4.12 Soil Leachate

Leachate generated from soil stored in the cells is minimized using the techniques outlined in Section 4.10. Any leachate accumulated in the sumps may be placed into tanks and re-circulated back into the soil, or in the case of excess moisture, the water will be stored until it is required to increase moisture in the soils. In the event that the quantity of water exceeds the storage capacity, the leachate and precipitation run-on will be treated through the water treatment system described above.



5.0 CONTINGENCY PLAN

The Tervita Bioremediation Facility contingency plan addresses emergency responses to the following areas:

- Fire
- Contaminant Release
- Severe storms or rapid snowmelt events
- Earthquake
- Medical or personnel injury emergency

This plan identifies and details procedures to be followed to deal with all reasonable foreseeable emergencies. In the event of an emergency, the appropriate authorities would be notified immediately by telephone. The emergency contact list can be found in Appendix M.

5.1 Fire

The burning of any material at the facility is prohibited. Tervita will comply with all municipal fire safety requirements.

Routine fire prevention measures are employed in buildings and on equipment. These measures include maintaining cleanliness and proper storage of oily rags and flammable materials. Portable fire extinguishing equipment is available to allow for quick response time. Soil will also be used for smothering/extinguishing any fires.

Fire prevention at the Facility includes inspection for waste that may be burning or smouldering at the time of delivery ('hot loads'). It also involves compaction and covering wastes to reduce oxygen intrusion into the waste.

Fires will be recognized by employees through the detection of elevated temperature, smoke, smell and/or open flame. The procedures that are followed in the case of a fire at the BF are as follows:

Equipment fire:

1. Move to an isolated area.
2. Shut down the equipment, and extinguish the fire.
3. Drench the machine with water to ensure that the fire is completely out.

Building fires:

1. Call 911 or 0.
2. Attempt to extinguish the fire.

Fire in the Bioremediation Cell:

1. Cut out the burning material from the windrow and move it to an isolated area.
2. Cover the fire with the nearest available cover material.

For response to a fire at the active face of the landfill:

Tervita will follow the landfill's contingency plan as instructed by the landfill operator. If Tervita is present outside of regular operating hours and no landfill personnel are on site, personnel should:

1. Contact 911 and the Contractor's representative.
2. Cut out the burning material from the active face and move it to an isolated area.
3. Cover the fire with the nearest available cover material.

In the event of a fire, all parties listed in the emergency response list will be notified as required.



5.2 Severe Storms

Severe storms may include intense rainfall, extreme winds, electrical storms, or rapid snowmelt. During such events, Facility operations will cease and personnel will take shelter.

Intense rainfall/Rapid Snowmelt

The soils in the landfill may not be permeable to accommodate flows from the runoff originating from either intense rainfall or rapid snowmelt. The Bioremediation Cell has been designed to prevent run on and run off.

Electrical Storms

During any electrical storm, office personnel and scale checkers will stay indoors. While indoors, employees will stay away from doors, windows, radiators, stoves, metal pipes, sinks or other metallic objects. Electrical appliances such as computers and radios will be disconnected.

Outside workers will relocate to an indoor location, staying away from any metal objects such as fences, metal pipes, or rails which may conduct electricity. Heavy equipment operators will shut down the equipment and move indoors. If not possible, they will stay inside the cab and move to an area of lower elevation.

If in a car, they will stay there, as it will provide protection from lightning. The car will be moved away from any trees or other objects, which have potential to fall on it.

Extreme winds

Employees seek shelter immediately during wind storms. If heavy equipment operators cannot evacuate, they will move to lower elevations. As a last resort, they will lay flat on the ground in a ditch, excavation or culvert.

5.3 Contaminant Release

There are several scenarios where spills or releases can occur at or near the Facility. Although extremely unlikely, situations may include:

Soils with free liquids arriving at the Facility and a spill or release occurs.

This is a remote possibility as no free liquids can be accepted at the Facility. If a spill were to occur in this situation, it would be contained and collected using absorbents. A waste discrepancy report would be completed, and the supervisor notified.

Liquids spilling from equipment (oil, antifreeze, fuel) during their operation.

In the event this occurs, the spill would be mitigated using absorbents. The material would then be placed in an appropriate container for storage until it is sampled and analyzed to determine the most appropriate disposal method.

Leakage from Cell.

If a visual inspection indicates a potential leak in the cell by the presence of hydrocarbon contaminated waters in the leak detection sump, all contents from the active cell would be moved to an alternate cell. Once the soil is removed, Tervita would then inspect the liner to find and repair the damaged portion of the liner or install an additional liner.

In the event that the liner system cannot be repaired, an ongoing Leak Detection System Monitoring Plan will be implemented to ensure that there are no impacts to the environment. The Leak Detection System Monitoring Plan would include sampling of the water in the Leak Detection System at the same frequency and parameters as the Water Treatment Monitoring found in Section 4.11 of this Manual. The Leak Detection System Monitoring Plan can be seen in Table 3.



In any instance of contaminant release that requires reporting based on the Provincial Spill Reporting Regulation, PEP will be notified immediately.

5.4 Earthquake

In the event of an earthquake, facility employees will shut down all equipment and get clear of buildings and wires, which could fall on them. Due to the nature of the landfill, there are few structures and overhead wires.

Employees will remain in the protected place until the shaking stops. Anticipate aftershocks as they may occur soon after the first quake.

Once the earthquake and aftershocks have ceased, facility operators will do the following:

- Check and treat (if possible) each other for injuries sustained during the shaking
- If evacuation is required, locate the emergency pack of supplies and proceed down evacuation routes.
- Inspect the cell(s), facility structures and utilities for structural damage and contact a Tervita supervisor or Facility Manager with the findings.
- Begin repairs as appropriate to ensure soils are contained and spillage, if occurred, is contained and cleaned up.

5.5 Medical Emergencies

Personnel injury could occur in accidents on heavy equipment, exposure to dangerous waste, or exposure to oxygen-deficient atmospheres in enclosed spaces. In any event, First aid will be given onsite by trained staff and an ambulance will be called immediately. Immediate medical care for minor injuries will be provided at the closest Emergency Health Center, or nearest Hospital (Appendix N).

In an emergency situation, the following sequence will be followed:

- Take charge of the situation
- Call out for help to attract others
- Assess the hazard
- Notify appropriate authorities



6.0 RECORD KEEPING AND REPORTING

6.1 Record Keeping

Records are kept on file and are available for review by clients or local, provincial or federal regulators (as appropriate). Records for all soil received at the BF are kept filed at the Tervita Richmond office or Regional Office for a minimum of seven years from the acceptance date. Records include:

- Waste Approval Application and Pre-Acceptance Lab Data
- Waste Approval Checklist
- Waste Soil Manifest
- Certification of Bioremediation and Disposal (if requested)
- Types of wastes received and rejected
- Discrepancy Reports identifying the disposition of any rejected wastes
- Reclassification and interim sampling results
- Results of environmental monitoring performed by Tervita
- Investigation reports and associated follow up for all Environmental Incidents
- Training conducted

Regional Office:

- Facility Operations Plan
- Tervita Health, Safety and Environmental Management Guide
- Inspection Reports
- Discrepancy Reports
- WCB and 1st Aid reports
- Daily safety meetings
- Monthly soil summaries

6.2 Reporting

The following information will be reported to the BC Ministry of Environment by March 31 of every year for the previous calendar year:

- A record of the amount and type of wastes received, disposed, stored and treated.
- Volume of "clean" soil transferred from the BF to the Landfill.
- A record of public complaints and response actions
- Summary of the Leachate monitoring (complete with laboratory reports)
- Summary of inspection results (along with completed forms)
- Surface water and groundwater monitoring results with interpretation



7.0 ENVIRONMENTAL MONITORING PLANS

7.1 Groundwater and Surface Water Monitoring

Groundwater and Surface Water quality is monitored by the existing landfill Environmental Monitoring Plan and associated monitoring wells and surface sampling locations. The location of the bioremediation cell in reference to these monitoring points can be seen in Appendix A. All wells installed are routinely monitored by the landfill as part of the sampling program based on the frequency in Tables 3 and 4 below.

Table 4 – Groundwater Monitoring Frequency and Parameters

Wells	General Parameters	VOC's	EPH	PAH
OW2-95 and OW3-95	Hydraulic Testing Only			
OW8-95	3	1	1	1
SP8-03	3	1	1	
Other wells	2	1	1	
New well(s)	2	1	1	1
Offsite Residential wells	1			

- 1 - Tested annually in the fourth quarter
- 2 - Tested annually in the second and fourth quarters
- 3 - Tested annually in the first, second and fourth quarters

General Parameters for groundwater includes Field Parameters, Anions, Physical parameters, Nutrients and Total and Dissolved Metals

Table 5 – Surface Water Monitoring Frequency and Parameters

SW location	General Parameters	EPH	PAH
SW1-95 (Background)	4		
All other locations	4	1	1

- 1 - Tested annually in the fourth quarter
- 4 - Tested four times a year when water is surface water flowing (Typically February, May, October and December)

General Parameters for groundwater includes Field Parameters, Anions, Physical parameters, Nutrients and Total Metals

The landfill Environmental Monitoring Program is subject to annual review and may be modified based on current landfill conditions. The information in the above tables has been provided from the 2012 Environmental Monitoring Program. The most up to date sampling program will be on file at the Tervita Office and is available for review upon request by the BC MoE.

Based on the results of the Landfill Gas Monitoring wells, significant groundwater is not expected to be present in the area of the bioremediation cell.

In addition to the existing Landfill Groundwater Monitoring Program, Tervita will install a minimum of one additional Groundwater Monitoring Well in the area immediately down gradient of the Bioremediation Cell. This well will be placed in highest hydraulic gradient at a location and depth to be determined by a Qualified Professional and the location will be included on future facility drawings. A baseline sampling event for the monitoring well will be performed before soils are placed into the bioremediation cell. This well will be monitored as a minimum according to table 4 or as recommended by a Qualified Professional. Monitoring frequency may change in the event that the weekly inspections of the Leak Detection System indicate that the cell may be compromised.

If groundwater is not found in this location, then the well will be monitored quarterly over a minimum of 1 year to confirm that there is no groundwater in the area. If the lack of groundwater is confirmed, then the monitoring frequency will be every two years, at a time when the groundwater is known to be at its highest elevation. Should groundwater be present at one sampling event, the sampling



program should return to bi-annual frequency and should be conducted in the second and fourth quarters for a full year. The Landfill Groundwater Monitoring Plan will continue independently.

7.1.1 Water Treatment and Disposal System

As discussed in Section 4.10 and 4.12, water from within the treatment cells will be collected and re-used on the cell to enhance the moisture content of the soils. If excess precipitation and leachate water is accumulated, it will be treated per the procedures outlined in section 4.11.

7.2 Closure and Post-Closure Plans

The bioremediation cell is constructed in a native area within the landfill. Prior to construction a sampling event will be performed by an independent environmental consultant. This will provide a baseline for the existing conditions prior to the start of operations and provide information for the final closure plan for the facility. The BC Ministry of Environment will be notified a minimum of 45 days prior to the date of closure.

When the cell is nearing closure, all remediated soils will be disposed as per the existing operating plan. The first step will be to cease accepting soils. All existing soils in the cells will be treated as per our operating plan. This step would be complete within 12 months. Next, the cells will be dismantled and the components (lock blocks, liners, cover, etc.) disposed of at an appropriate facility. This task would be complete within four weeks of final soil treatment and disposal.

A qualified environmental consultant will be hired to ensure there has been no impact to the areas directly surrounding the facility as a result of its operation based on the requirements of the BC Hazardous Waste Regulation at the time of decommissioning. While the exact scope will be determined by the qualified environmental consultant at the time of closure, it is expected that there will be a requirement to perform post closure soil monitoring underneath the removed liners to ensure that the area meets the requirements of the BC Contaminated Sites Regulation using the zoning of the property at the time of closure. The final closure report will be submitted to the BC Ministry of Environment within 90 days following the bioremediation site closure date.

Any surficial and sub-surface soil sampling required by the qualified environmental consultant would be complete within four weeks of cell dismantling. If surrounding soils have been impacted, they will be removed, under the supervision of a qualified environmental consultant and disposed of at an appropriate facility. The area will be graded and returned to pre-construction conditions.

In the event that the paved area is retained for other industrial uses on site, such as storage of scrap metal, recycling, transfer station, etc., a revised Closure Plan will be submitted to the BC Ministry of Environment detailing how the soil beneath the cell will be sampled. This may include drilling, coring, or other techniques determined by the independent environmental consultant.

This property is an operating landfill that has an expected life span until 2034. Under the landfill Design and Operating Plans, it is estimated that the Surface Water and Groundwater monitoring programs and leachate management system will be required until approximately 2059. Any additional post closure water monitoring requirements for the soil facility will be incorporated into the existing Landfill Monitoring Program at the time that Tervita ceases either the landfill or soil remediation operations.



8.0 RISK MANAGEMENT

8.1 Waste Ownership

Title to any soils delivered to TERVITA's facility will pass to TERVITA Environmental Services upon acceptance of the material, provided the soil material is "conforming". Conforming soil is defined as any soil, which matches the characteristics on the Waste Approval Application and the analytical data provided which has been assigned a TERVITA Project Number. Title to any non-conforming soils will not pass to TERVITA Environmental Services and will remain the responsibility of the generator.

8.2 Insurance

TERVITA maintains a comprehensive insurance coverage program tailored specifically to the needs of an environmental contractor. All of our insurance is placed with Marsh Canada Limited. A copy of TERVITA's insurance is located in Appendix O.

8.2.1 WCB Insurance

TERVITA is in good standing with the Workers' Compensation Board, and as of January 2012 the current WCB Number is 715228.

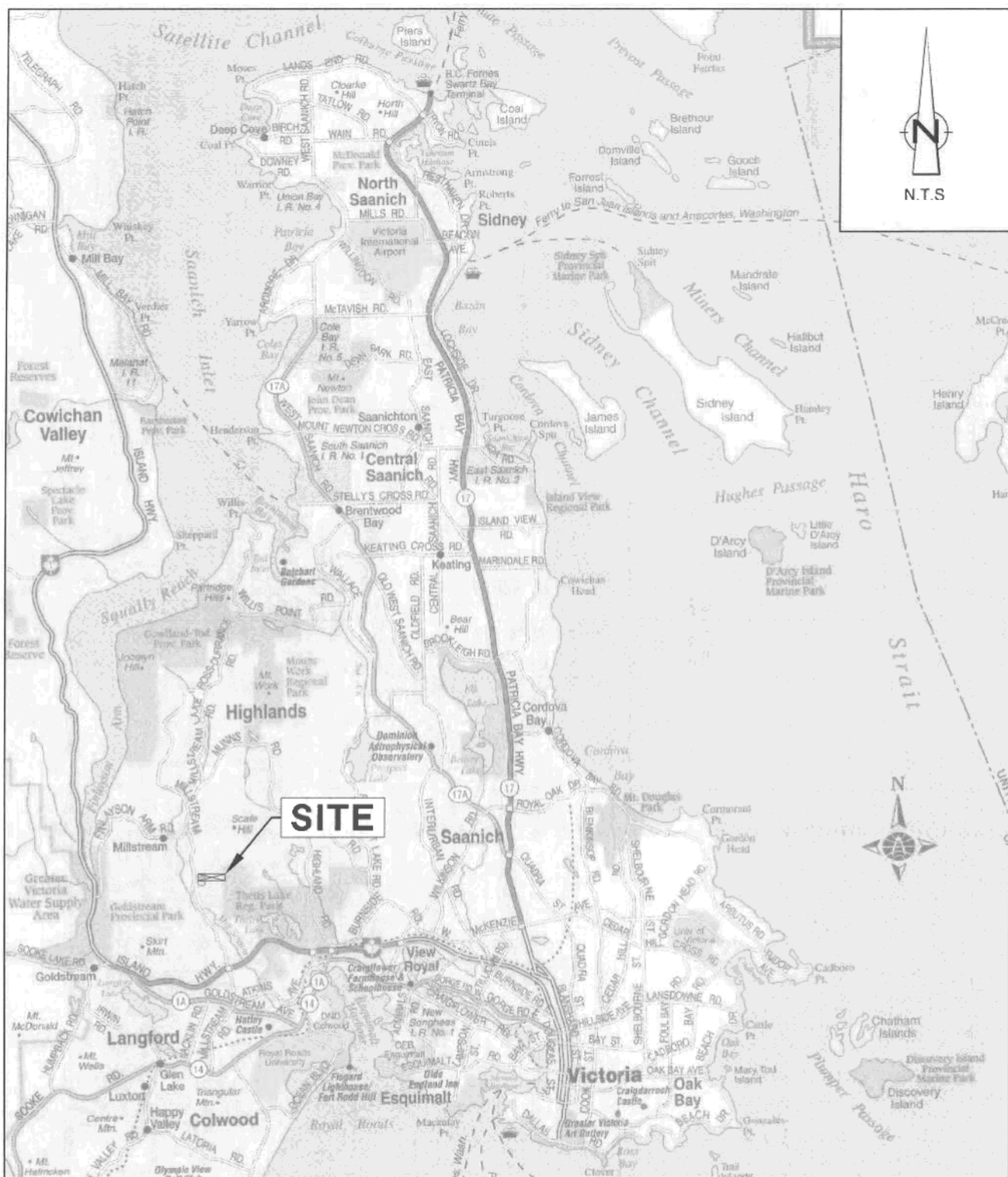
8.3 TERVITA Environmental Services Contacts

Mr. Scott Hoekstra – Landfill and Soil Remediation Specialist
13511 Vulcan Way
Richmond, BC
V6V 1K4
Phone: 604-214-7000
Fax: 604-214-7017

Mr. Brian Fagan – Operations Manager – TERVITA Vancouver Island
700 South Shawnigan Lake Road
Malahat, BC
V0R 2L0
Phone: 250-743-4200
Fax: 250-743-4217

Appendix A

Facility Location, Description & Monitoring Well Locations



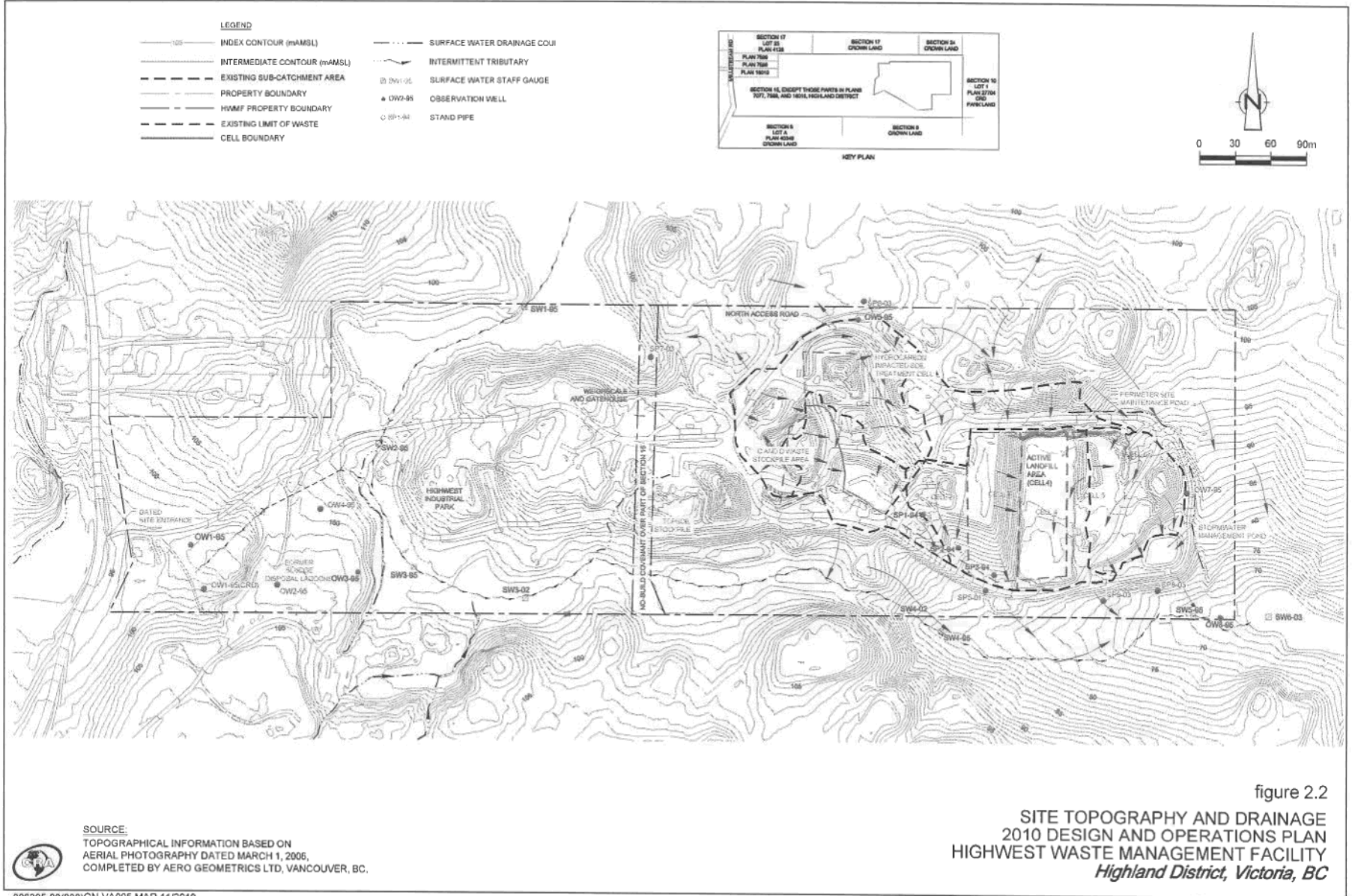
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ALLMAPS CANADA LIMITED, 2000

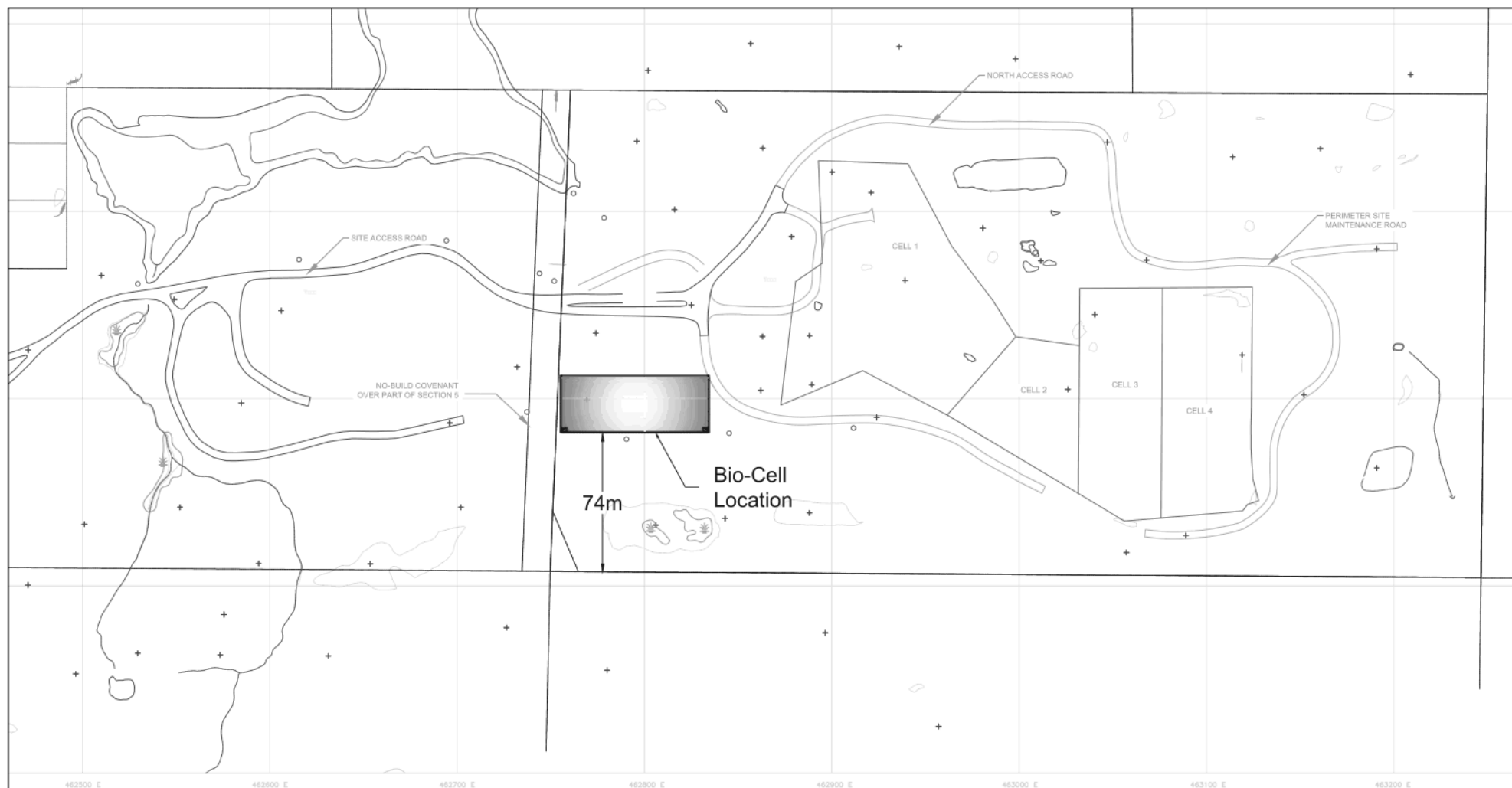
figure 1.1

SITE LOCATION MAP
2010 DESIGN AND OPERATIONS PLAN
HIGHWEST WASTE MANAGEMENT FACILITY
Highland District, Victoria, B.C.



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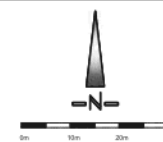
ENVIRONMENTAL SERVICES
A CCS Company

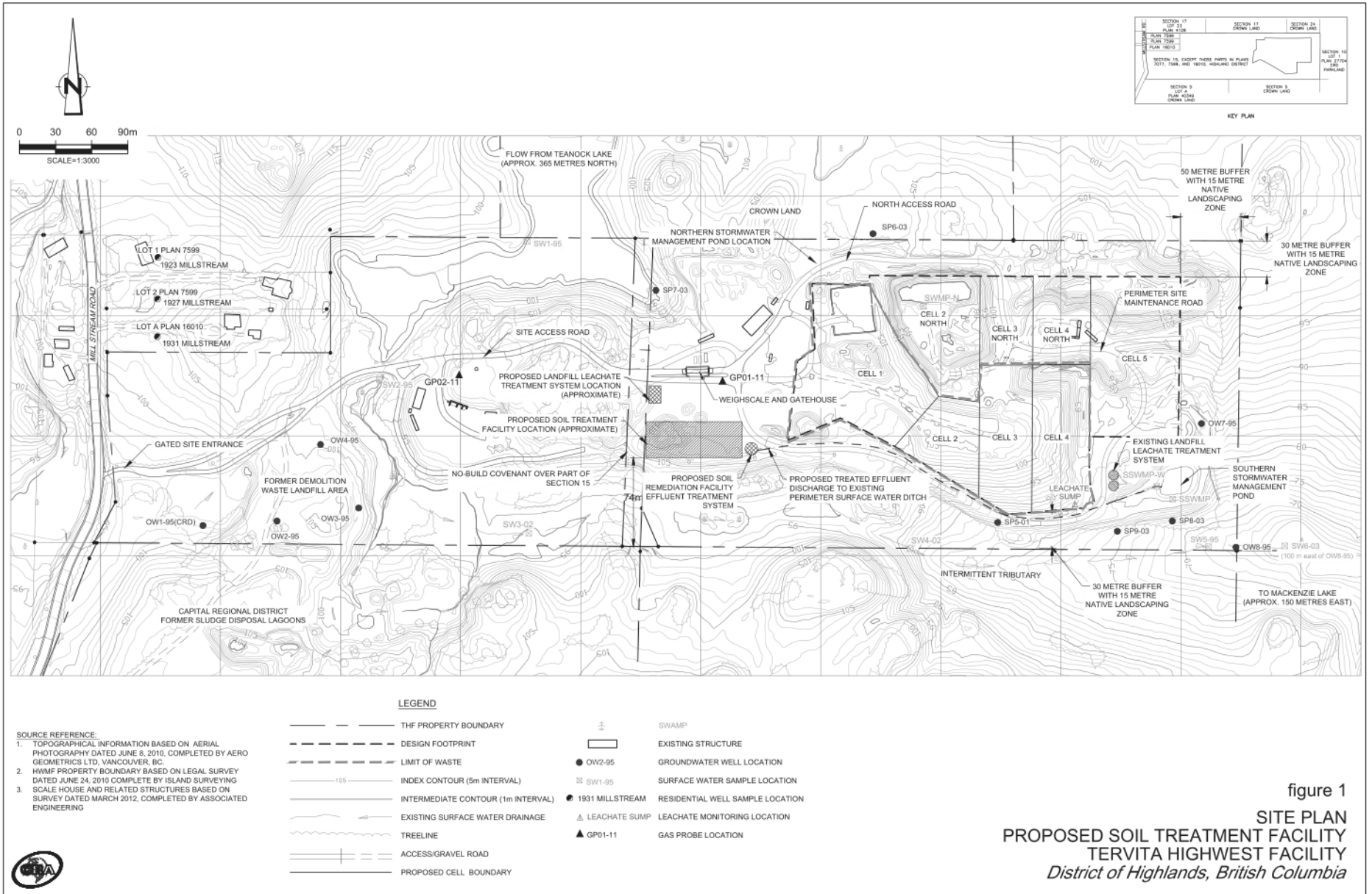
DATE: JUNE 23, 2012

DRAWN BY: GHH

SCALE: AS SHOWN

Bioremediation Cell
Accumulation Cell





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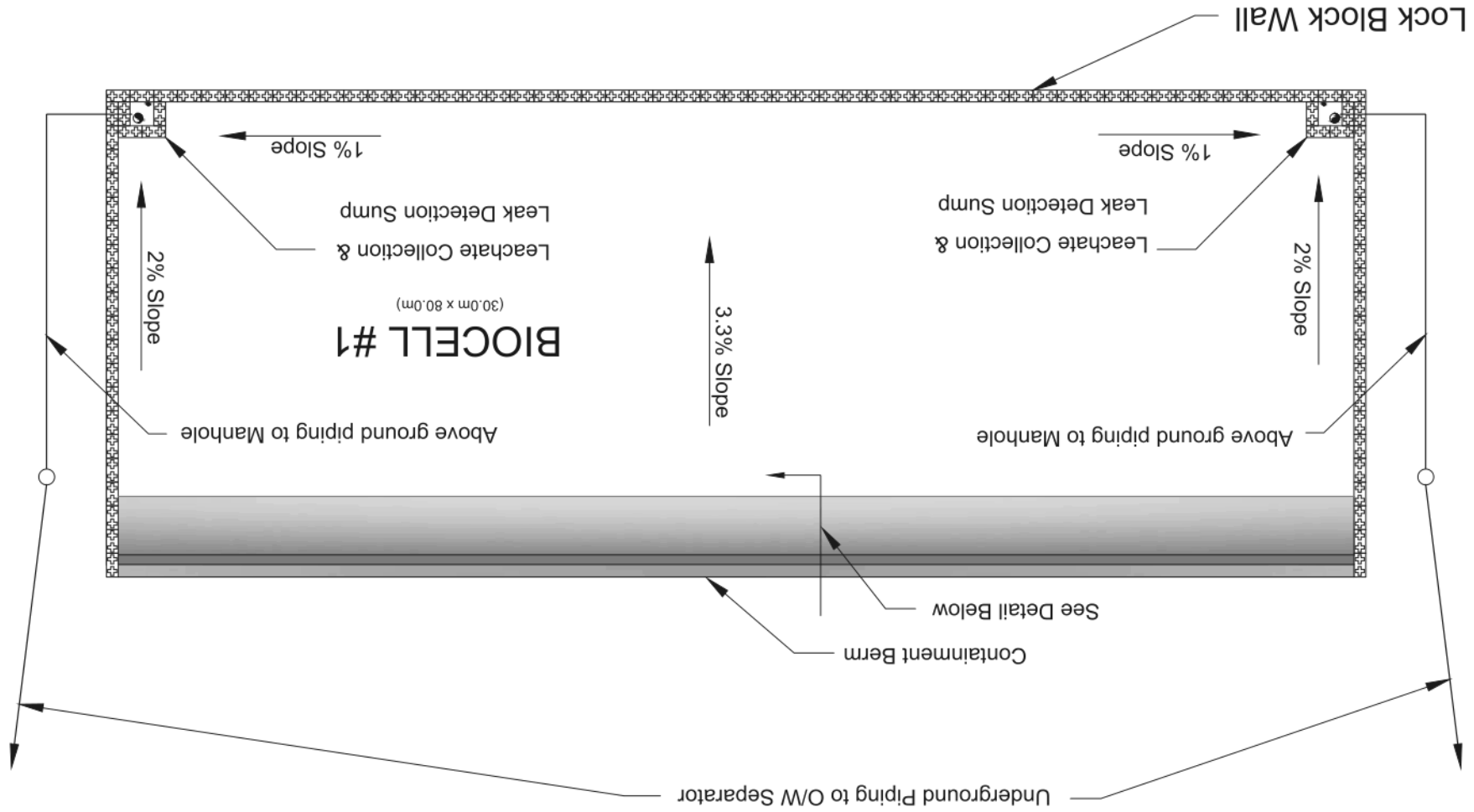
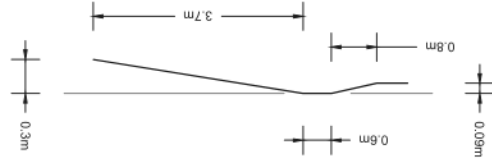


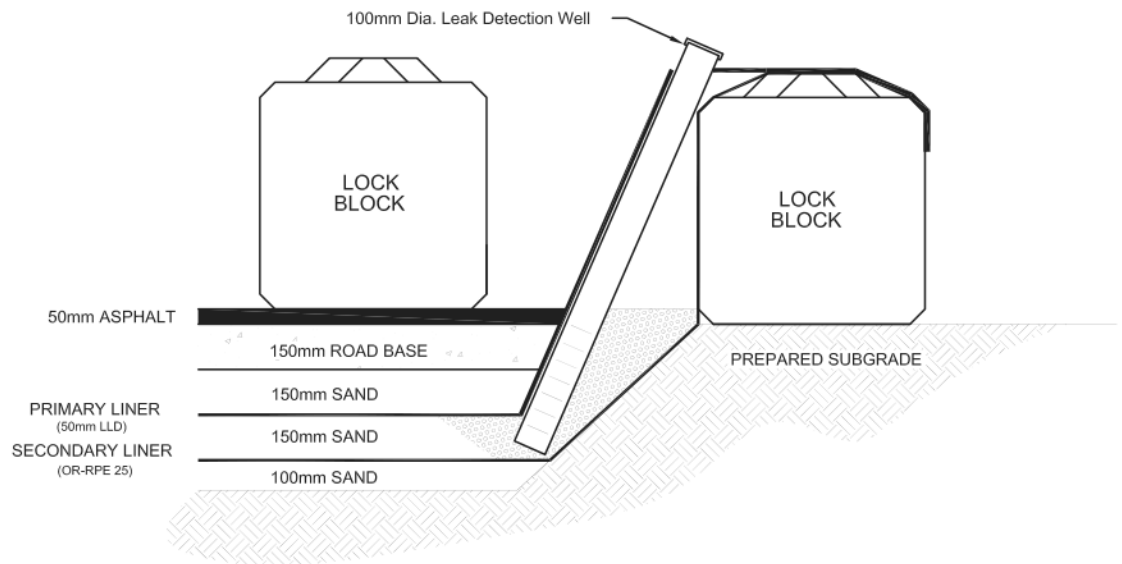
Table 1 – Appendix A Highwest Landfill Specific Information

Operational Certificate Number	100193
Landfill Address	1943 Millstream Road, Victoria, BC
Declared End Use	Waste only (to be re-declared near closure)
Surrounding area use	Greenbelt, Residential and Industrial zoned properties
Scale house, available and staffed	Yes
Available on site services	Electrical and phone/internet No sewer or water service
Landfill hours of operation (routine and holiday schedule)	Monday to Friday (8:00 – 1600) Closed weekends and holidays Maybe opened outside business hours
Site security (Fences, electric fences, lockable gates, ditches, berms, guards, surveillance, alarms, etc.)	The landfill (and by extension the facility) is secured by fences, gates, berms, swales, and ditches.
Landfill Operator	TERVITA Environmental Services Reinhard Trautmann (Landfill Manager) Phone: 250-478-9886 Cell: s.22
Acceptable levels for treated Hydrocarbon soil for remediation	CL+/IL+ and HW <41.1 accepted for bioremediation
Acceptable levels for contaminated soil	IL+ for cover and berm IL- for final cover <Schedule 7 for general use
Biocell setting (on native soil or closed landfill?)	Native section of property
Baseline sampling performed (y/n & Include date)	To be scheduled
Approximate cell dimensions	80m x 30m
Primary and secondary liner material	To be determined
Working surface	Asphalt
Fire/ Ambulance/ First Aid / Hospital	911 – See ERP and Scale house for map to hospital

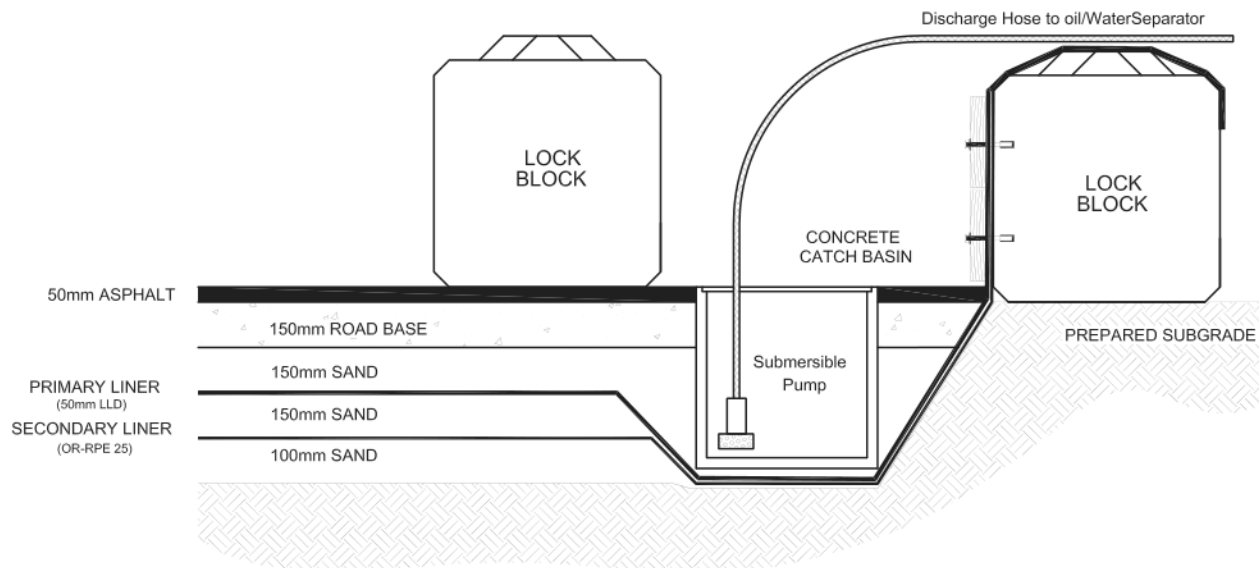
HAZCO ENVIRONMENTAL SERVICES A CCS Company		
DATE: Nov. 20, 2011	DRAWN BY: GNM	SCALE: AS SHOWN
Highwest Bioremediation Facility Proposed Cell #1 Plan View & Details		

Containment Berm
Detail X-Section (nts)





LEAK DETECTION SUMP DETAIL



LEACHATE SUMP DETAIL

HAZCO

ENVIRONMENTAL SERVICES
A CCS Company

DATE: Nov. 20, 2011

DRAWN BY: GNH

SCALE: AS SHOWN

*Highest Bioremediation Facility
Proposed Cell #1 Leachate Sump Details*

Appendix C – Organic Parameters In Soil



Organic Parameters In Soil

Parameters	Reference Method	Detection Limits (mg/kg)
Volatile Organic Compounds	EPA 5030/8260	0.010
BETX	EPA 3810/8021 EPA 5030/8260	0.050 0.010
Volatile Petroleum Hydrocarbons VPH (C ₆ -C ₁₀)	EPA 3810/3510 & 8015 Modified BC MOE (Calculation)	100
Waste Oil	BC Laboratory Manual - Determination of Waste Oil Content in Solids and Liquids for Hazardous Waste Regulation - PBM	0.5%
EPH(C ₁₀₋₁₉), EPH(C ₁₉₋₃₂)	EPA 3540/3550/ & 8015 Modified	200
LEPH/LEPH (see EPH & PAH)	EPA 3540/3550/3570 & 8270/8015 & BC MOE (Calculation)	200
Chlorophenols (tri, tetra, & penta only)	EPA 3550/8040	0.020
Phenolics (CMCS list)	EPA 3550/8270	0.050
Polychlorinated Biphenyls (PCB)	EPA 3550/8082	0.050
Polycyclic Aromatic Hydrocarbons (PAH)	EPA 3540/3550/3570 & 8270	0.020
Pesticides		
Organochlorine (OCP)	EPA 3550/8081 & 8270	0.001
Organophosphate (OPP)	EPA 3550/8140 & 8270	0.02

Last updated June 12, 2012

Appendix D – Waste Approval Application Forms And Documents

OPERATIONS

REGULATORY

CLIENT

WAA form for [redacted]
Client [redacted]

Enter [redacted] Client [redacted]
WAA [redacted] Summary [redacted]
[redacted] [redacted]

HAZCO review WAA
[redacted] [redacted] HAZCO
Approval [redacted] Client [redacted]



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[redacted] HAZCO modification [redacted] [redacted]
Client (Project Modification
Requirement for HAZCO Waste)

Client [redacted] [redacted] HAZCO
Modification [redacted] [redacted] [redacted]

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Regulatory [redacted] Project Manager
for [redacted] [redacted]

WASTE [redacted] HAZCO
Modification [redacted] form [redacted] WAA

Training [redacted] [redacted]

Training [redacted] [redacted] [redacted]
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Training [redacted] [redacted] [redacted]
[redacted] [redacted] [redacted]

Training [redacted] [redacted] [redacted]

Write Approval [redacted] (WAA)
HAZCO Approval [redacted]
Signing Document
Data Log Log
Bioremediation Log

**QA/QC SAMPLING PROGRAM FOR INCOMING SOILS
Tervita HIGHWEST FACILITY
Millstream Road, The District of Highlands, BC**

The following Quality Assurance / Quality Control (QA/QC) Sampling Program For Incoming Soils has been completed as part of the requirements for the authorization of a HW41.1 Soil Remediation Facility at the Tervita HIGHWEST Facility on Millstream Road in The District of Highlands, BC. This QA/QC Sampling Program For Incoming Soils is to be included in the Operational Plan and in support of the overall application submission to the BC Ministry of Environment (MOE).

Tervita Internal Screening Prior to Facility Arrival

Tervita currently uses a screening system (WAA - waste approval application, supplementary data) for incoming soil at all authorized facilities. The screening system utilizes a review of analytical chemistry reports provided by the site owner via the professional environmental consultant. The review of the analytical data isolates potential contaminants of concern (PCOCs) for the incoming soil. As part of this QA/QC Sampling Program, the PCOCs as identified by the WAA for each project and will determine the list of parameters to be analyzed.

QA/QC Sampling Frequency

The following table outlines the sampling frequency and sampling parameters for all soils destined for the proposed Soil Remediation Facility (i.e. soil >CSR CL and <HW41.1).

Table 1: Sampling Frequency for Incoming Soils

Frequency (MT)	Potential Contaminants of Concern	
250*	EPHs BETX/VPBs PAHs Metals Other (non-routine parameters as required per WAA)	
1000**	<u>Package 1</u> TCLP metals TCLP PAHs TCLP BETX	<u>Package 2</u> BETX/VPB LEPH/HEPB metals

Notes:

- MT - metric tonnes
- * - one parameter will be randomly selected from the list of PCOCs for that project on a rotating basis
- ** - one of the two packages will be tested on an alternating basis
- EPHs - extractable petroleum hydrocarbons
- BETX - benzene, ethylbenzene, toluene, xylenes
- VPBs - volatile petroleum hydrocarbons
- VOCs - volatile organic compounds
- LEPH/HEPB - light and heavy extractable petroleum hydrocarbons
- PAHs - polycyclic aromatic hydrocarbons
- TCLP - toxicity characteristic leaching procedure



250MT - Random Sampling Program

Tervita will carry out random testing on a rotational basis for every 250MT (roughly every 10th truck and pup load crossing the scales). The incoming load of contaminated soil would be isolated within the remediation cell and clearly tagged with project information. One composite soil sample would be collected from the approximate 25MT stockpile and submitted to an accredited laboratory for one of the parameters identified for the project. Once confirmation of analyses is received showing the soil meets the HW41.1 standards and the project screening information from the WAA, the tagged isolated soil would be re-introduced into the remediation stream process. The parameter for the next 250MT would be randomly selected from the PCOCs list for that project, and so on. Additional PCOCs not noted in Table 1 may be identified during the Tervita screening process and would be introduced into the 250MT random sampling program.

1000MT - Full Screening Sampling Program

Following every 1000MT of contaminated soil received at the facility (roughly every 40th truck and pup load crossing the scales), Tervita would carry out a full screening of all PCOCs identified for that project. The contaminated soil would be isolated within the remediation cell and clearly tagged with project information. One composite soil sample would be collected from the approximate 25MT stockpile and submitted to an accredited laboratory for each of the PCOCs identified in Package 1 or 2 on an alternating basis. Once confirmation of analyses is received showing the soil meets the HW41.1 standards and the project screening information from the WAA, the tagged soil would be re-introduced into the remediation process. Additional PCOCs not noted in Table 1 may be identified during the Tervita screening process and would be included in the 1000MT full screening sampling program.

Additional Control Measures

During daily facility activities (trucks crossing scales, loading into remediation cell), additional control will be implemented. Any unusual soil (i.e. not meeting WAA descriptions, or higher than expected odours/discolouration, soil type, moisture content, etc.) will be targeted, set aside and isolated within the remediation cell. Each suspect load/stockpile would be tagged (clearly marked with placards) with project number and date. Further soil characterization may occur but as a minimum Tervita's Project Manager would be contacted by site personnel to confirm project screening findings and further consultation with property owner's consultant may be considered to determine if there has been a change in the scope of the project. No soil exceeding the HW41.1 standards will be accepted at the Soil Remediation Facility. Any materials rejected would be managed per the facility's existing Standard Operating Procedures.

Soil Sampling

Quality Control/Quality Assurance: In order to provide confidence in the data obtained, a QA/QC component will be included in the sampling program. The field QA/QC component is summarized below. The laboratory has its own internal QA/QC program, which is briefly summarized below.



Field QA/QC: New nitrile gloves will be used for each sample collected. All sample containers will be provided by the laboratory (clean and sterile), and appropriate for the parameters analysed. All sampling tools (shovels, trowels, etc.) will be cleaned/rinsed with an Alconox/water mixture prior to the collection of each sample. All sample containers will be labelled with their respective sampling location, date and project number. Samples will be kept cool by storing and transporting them in a cooler with ice.

Laboratory QA/QC: Routine QA/QC by the project laboratory will be undertaken and includes the following for every 10 samples: analytical method blank, laboratory duplicate, spike blank and matrix blank.

Regulatory Framework

The PCOCs analytical chemistry results will be compared to current standards contained in the CSR, B.C. Reg. 375/96, including amendments up to B.C. Reg. 343/2008, January 1, 2009 for the site specific factors used at the Landfill and the limits in the BC Hazardous Waste Regulation.

Tervita will keep records of sampling events on file electronically or at the facility office which will be available for review at all times.

This QA/QC Sampling Plan has been prepared by:

SOUTH ISLAND ENVIRONMENTAL



Per: Eric Gauvin, P.Eng.
Senior Environmental Engineer



WASTE APPROVAL APPLICATION

Section I		GENERATOR INFORMATION													
a. Generator: _____ c. Address: _____ e. Contact Name : _____ g. Contact Title: _____ i. Phone No: _____ k. Email Address: _____ m. Billing Address: _____	b. Generating Site: _____ d. Site Address: _____ f. Site Contact Name: _____ h. Site Contact Title: _____ j. Site Phone No: _____ l. BCG # <div style="text-align: right; font-size: 0.8em;">(if applicable)</div>														
Section II		CONSULTANT INFORMATION													
a. Consultant: _____ c. Address: _____ e. Contact Name: _____	b. Phone No: _____ d. Email Address: _____ f. Contact Title: _____														
Section III		WASTE CHARACTERIZATION													
Prior Uses of Site: _____ Current Use of Site: _____ Source of Contamination: _____ Reason for Soil Removal: _____ Type of Contamination _____ <div style="margin-left: 20px;">(eg. metal, gasoline, diesel, waste oil): _____</div> Type of Soils (eg. grain size): _____ Debris in Waste: _____ Moisture Content (safe for transport?): _____ Estimated Volume (m ³ , tonnes, drums): _____ Date/Title of applicable Environmental Consultant's Reports: _____ Attach laboratory analytical report which accurately portrays the nature and quantity of the contaminants.															
Section IV		CERTIFICATION (completed by Generator or Consultant)													
I hereby certify that the above and attached description is complete and accurate to the best of my knowledge that no deliberate or willful omissions of composition or properties exist, that all known or suspected hazards have been disclosed, and that the waste has been characterized as per BC Environment Guidelines or equivalent															
Date _____	Name _____	Signature _____	Title _____												
Section V		APPROVAL (completed by Tervita)													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">SBF</td><td style="padding: 2px;"></td><td style="padding: 2px;">Strathcona</td></tr> <tr><td style="padding: 2px;">MWBF</td><td style="padding: 2px;"></td><td style="padding: 2px;">Mt Waddington</td></tr> <tr><td style="padding: 2px;">HWBF</td><td style="padding: 2px;"></td><td style="padding: 2px;">Highwest</td></tr> <tr><td style="padding: 2px;">Other</td><td style="padding: 2px;"></td><td style="padding: 2px;">Specify-</td></tr> </table>	SBF		Strathcona	MWBF		Mt Waddington	HWBF		Highwest	Other		Specify-		Tervita Project# _____ Waste Classification: _____ PCOC: _____	<div style="text-align: right; font-size: 0.8em;">Landfill and Soil Remediation Specialist</div> <div style="text-align: right; font-weight: bold;">Tervita Environmental Services</div>
SBF		Strathcona													
MWBF		Mt Waddington													
HWBF		Highwest													
Other		Specify-													
Date _____	<u>Scott Hoekstra, PChem</u> Name	Signature _____													



TERVITA BIOREMEDIATION FACILITY WASTE APPROVAL APPLICATION PROCEDURE

Before any contaminated soil can be disposed of at **Tervita Bioremediation Facility or Landfill**, a thorough evaluation and approval process must take place. This process will be utilized to determine if the waste may be transported, treated, stored or disposed in a legal, safe, and environmentally sound fashion. *Each Tervita Bioremediation Facility or Landfill has unique acceptance criteria and may have different Waste Approval Applications and analytical requirements. Contact your Tervita Project Manager for details.*

The evaluation begins with a representative of the waste generator completing and submitting the **Waste Approval Application (WAA)** to Tervita's Project Manager's or the Approvals Group. All sections of the WAA must be complete in full, and must be printed in ink or typed. A response of not applicable (N/A) may be made if suitable. All information will be maintained in strict confidence.

Prior to a full approval of any WAA, Tervita must receive the following items from a representative of the waste generator:

- Completed WAA signed by a representative of the waste generator; and
- Supporting current analytical data representative of the waste soil, signed by an accredited analytical laboratory (all parameters and test methods must follow provincial guidelines), OR
- Provide the Material Safety Data Sheet (MSDS) for the waste, or other documents which adequately describe the composition of the waste. This may include Phase 1 Environmental Reports, Geotechnical Reports or Site Development Plans noting the area is native fill and that there is no contamination present.
- Some analytical requirements may be waived with a certified letter from a qualified professional.

The following steps outline the WAA forms:

Section I WASTE GENERATOR INFORMATION

- Generator Name and Address - For the company generating/owner of the waste.
- Contact Name and information for the generator's employee for the project
- Billing Address - indicate if the invoice should be sent to the generator, the consultant, or to the generator care of the consultant
- Generator Location - Name of location of waste.
- Site Address - actual location of the waste.
- Site Contact Name and information for the generator's representative on site.
- BCG # - British Columbia Generator Number (for hazardous waste if applicable)

Section II CONSULTANT INFORMATION

- Consultant company name, address, and phone number
- Name, title, and email address of the Consultant's representative, who is typically a Qualified Professional.

SECTION III WASTE CHARACTERIZATION

- Prior Uses of Site - Indicate the prior uses of the site e.g. type of industry. The proposed and historical zoning and land use designations are not required.
- Current Use of Site - Indicate current activities at the site
- Source of Contamination - e.g. pipeline, UST, spill



- Reason for Soil Removal – e.g. ministry order, redevelopment, risk management, remedial action, property maintenance or upgrades, etc.
- Type of Contamination – e.g. metals, gasoline, diesel, PAH's
- Type of Soils – e.g. clay, sand, silt, gravel
- Debris in Waste – e.g. wood, brick, timbers, rocks; indicate type, size and quantity in %
- Moisture Content – e.g. Is soil safe for transport? Is there potential for free liquids?
- Estimated Quantity - Enter the amount of waste in drums, tonnes, or m³

SECTION IV CERTIFICATION

- The generator or their authorized representative must sign the WAA generator's certification. By signing the WAA form, the generator certifies that all information is true and accurate with respect to the waste soil described.

In the event that the soils received do not match the information provided with the WAA, the generator will be responsible for any additional costs of management and disposal of the soil. This would include any administrative or legal costs incurred by Tervita.

SECTION V APPROVAL INFORMATION

- This section is to be completed by Tervita Corporation's Approvals Group. The section will contain the assigned Tervita waste classification and authorizing signatures.

Once the WAA form is complete and supporting analytical compiled a Tervita Approval Checklist is filled out. The checklist is a short form that contains landfill criteria and sections for questions or comments concerning the waste stream being disposed. If there are any questions regarding the potential contaminants, background information, process descriptions or additional sampling requirements, notify the waste generator and put the approval on hold until the additional requests have been fulfilled.

After all the appropriate paper work has been compiled a copy of the signed WAA is sent to the generator as confirmation of approval of the waste soil. All files will be kept by Tervita for a minimum of 7 years.

After receipt of the waste at the Facility a copy of the waste manifest will be returned to Tervita offices to be placed in the appropriate approval file. Upon receipt, the storage location within the facility will be recorded on the soil manifest by the Facility operator. When the soil disposal is complete, all project files will contain, at a minimum, the completed WAA, supporting analytical, completed approval check list, and Tervita manifests with cell location.



TERVITA WASTE APPROVAL POLICY

Prior to approval of a particular WAA, Tervita must receive the following items from the generator of the waste:

- A completed WAA signed by the generator
- Supporting current analytical information
- MSDS's or other relevant supporting documentation

Tervita's approval's group will then evaluate and verify the application by completing the **TERVITA Approval checklist**. If there are any questions with respect to potential contaminants, background information, process descriptions or additional sampling requirements, notify customer and put the approval on hold until the additional requests have been fulfilled. When all the information is complete, the waste will be assigned a Tervita Waste Classification.

Section 1 – APPLICATION AND WASTE INFORMATION:

	Y/N		Dates or Comments	TERVITA	
WAA signed?		WAA Dated received?		Date	
Analytical data supplied?		WAA Dated?		Project Number	
Analytical data signed?		Report Date?		Representative	
Field QA/QC Supplied?		QP Sign off?		Signature	
Are Liquids Present?		Generator & BCG #			

Section 2 – APPROVAL CHECKLIST

INORGANIC SUBSTANCES (TCLP Trigger)	CSR (ug/g)	TCLP (mg/L)	ORGANIC SUBSTANCES (TCLP Trigger)	CSR (ug/g)	TCLP (mg/L)
Antimony	40		Pentachlorophenol (120)	50 (HW at 60)	6
Arsenic (50)	100	2.5	Other chlorinated phenols	5	Various see HWR
Barium (2000)	1500		Non-chlorinated phenols	10	
Beryllium	8		PCB	15	
Cadmium (10)	100	0.5	Benzene * (10)	150/25	0.5
Chromium (III) (100)	700	5	Toluene * (48)	25/150	2.4
Chromium (VI) (100)	300	5	Ethylbenzene * (4.8)	20/250	0.24
Cobalt	300		Xylene * (600)	50/250	30
Copper (2000)	250	100	VPHs	200	
Lead (100)	1000	5	Naphthalene	50	
Mercury (2)	40	0.1	Phenanthrene	50	
Molybdenum	40		Pyrene	100	
Nickel	500		Other PAHs (Benzo(a)pyrene= 0.020)	10	0.001
Selenium (20)	10	1	Chlorinated benzenes	10	Various see HWR
Silver (100)	40	5	Chlorinated Aliphatics	50	Various see HWR
Tin	300		Tetrachloroethylene (60)	50	3
Uranium (200)		10	Trichloroethylene (100)	50	5
Vanadium	NA				
Zinc (10000)	600	100	LEPHs	2000	
			HEPHs	5000	
Other Contaminants?	Y/N		Waste Oil (2 – 4 % EPH = SWOG)	<10%	

Approval Information:

Comments: (ex. requests for additional information, pre-treatment/storage requirements, sampling concerns or instructions for landfill operator etc.)

BOLD = Hazardous Waste 41.1 Parameters

No groundwater – landfill leachate captured and treated

BC CSR Schedule 4 and 5 (Mandatory Site Specific Factors)

*BTEX = CSR for disposal/BC HWR for remediation (must fail TCLP for S41.1 to apply)

Appendix E – Example Manifests And Instructions



HIGHWEST BIOREMEDIATION FACILITY SOIL MANIFEST

PCOC

Classification:

CL+	
HW<41.1	

FOR BIOREMEDIATION

EPH (10-19)	
EPH (19-32)	
BTEX/VPH	
PAH	

Project Number **H2F-**

Expiry date:

--

Section I

GENERATOR

Generator Name:	_____	Site Location:	_____
Generator Address:	_____	Site Address:	_____
_____		_____	
Generator Phone No:	_____	Site Phone No:	_____
Description of Waste	Contaminated Soil	HW Manifest #:	_____
_____		_____	
Generator's Representative Name	Signature	Shipment Date	

Section II

TRANSPORTER

TRANSPORTER

Tandem

LOAD SIZE: Truck&Pony

Truck & Transfer

Hydro Vac

Tailgate Secured (Pinned or Chained)

Drivers Initials

Name: _____

Address: _____

Driver Name/Title: _____

Phone No.: _____ Truck No: _____

Vehicle License No./Prov.: _____

Acknowledgment of Receipt of Materials.

Driver Signature

Shipment Date

Section III

DESTINATION

Tervita Highwest Landfill

1943 Millstream Meadows, Victoria, BC

Phone No: (250) 478-9886

Receiver Comments: _____

Cell

WR#

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate

Name of Authorized Agent

Signature

Receipt Date



HIGHWEST BIOREMEDIATION FACILITY SOIL MANIFEST

Classification:

< CSR S7

☒**FOR DIRECT DISPOSAL****Project Number** **R2F-****Expiry Date:****Section I****GENERATOR**

Generator Name: _____

Site Location: _____

Generator Address: _____

Site Address: _____

Generator Phone No: _____

Site Phone No: _____

Description of Was Non-contaminated Soil

Generator's Representative Name _____

Signature _____

Shipment Date _____

Section II**TRANSPORTER****TRANSPORTER** Tandem

LOAD SIZE Truck & Pony

Truck & Transfer

Tailgate Secured (Pinned or Chained)

Drivers Initials _____

Name: _____

Address: _____

Driver Name/Title: _____

Phone No.: _____ Truck No: _____

Vehicle License No./Prov.: _____

Acknowledgment of Receipt of Materials.

Driver Signature _____

Shipment Date _____

Section III**DESTINATION****Tervita Highwest Landfill**

1943 Millstream Meadows, Victoria, BC

Phone No: (250) 478-9886

Receiver Comments: _____

Cell _____

Sector: _____

-

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate

Name of Authorized Agent _____

Signature _____

Receipt Date _____



HIGHWEST BIOREMEDIATION FACILITY
SOIL MANIFEST

Classification:

CL+	x
-----	----------

For Storage

PCOC

Metals	
--------	--

Project Number:

S2F

Expiry date:

--

Section I

GENERATOR

Generator Name: _____ Site Location: _____

Generator Address: _____ Site Address: _____

Generator Phone No: _____ Site Phone No: _____

Description of Waste: Contaminated Soil

Generator's Representative Name _____

Signature _____

--	--	--

Shipment Date

Section II

TRANSPORTER

TRANSPORTER

LOAD SIZE: Tandem
Truck&Pony
Truck & Transfer
Hydro Vac

Tailgate Secured (Pinned or Chained)

--

Drivers Initials

Name: _____

Address: _____

Driver Name/Title: _____

Phone No.: _____ Truck No: _____

Vehicle License No./Prov.: _____

Acknowledgment of Receipt of Materials.

--	--	--

Driver Signature Shipment Date

Section III

DESTINATION

Tervita Highwest Landfill

1943 Millstream Meadows, Victoria, BC

Phone No: (250) 478-9886

Receiver Comments: _____

Cell

--	--

RW#

--

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate

Name of Authorized Agent

Signature

--	--	--

Receipt Date



HIGHWEST BIOREMEDIATION FACILITY
SOIL MANIFEST

Classification:

RL-/RL+ ☒ **FOR DIRECT DISPOSAL**

Project Number:

T2F-

Expiry date:

Section I

GENERATOR

Generator Name: _____ Site Location: _____
Generator Address: _____ Site Address: _____

Generator Phone No: _____ Site Phone No: _____
Description of Waste: Contaminated Soil

Generator's Representative Name

Signature

Shipment Date

Section II

TRANSPORTER

TRANSPORTER

LOAD SIZE:

Tandem
Truck&Pony
Truck & Transfer
Hydro Vac

Tailgate Secured (Pinned or Chained)

Drivers Initials

Name: _____

Address: _____

Driver Name/Title: _____

Phone No.: _____ Truck No: _____

Vehicle License No./Prov.: _____

Acknowledgment of Receipt of Materials.

Driver Signature

Shipment Date

Section III

DESTINATION

Tervita Highwest Landfill

1943 Millstream Meadows, Victoria, BC

Phone No: (250) 478-9886

Receiver Comments: _____

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate

Name of Authorized Agent

Signature

Receipt Date



HIGHWEST BIOREMEDIATION FACILITY SOIL MANIFEST

Classification:

CL+	x
-----	----------

FOR DIRECT DISPOSAL**Project Number:** **W2A-****Expiry date:****Section I****GENERATOR**

Generator Name: _____ Site Location: _____
Generator Address: _____ Site Address: _____
Generator Phone No: _____ Site Phone No: _____
Description of Waste: Contaminated Soil

Generator's Representative Name

Signature

Shipment Date

Section II**TRANSPORTER****TRANSPORTER**

LOAD SIZE: Tandem
Truck&Pony
Truck & Transfer
Hydro Vac

Tailgate Secured (Pinned or Chained)

Drivers Initials

Name: _____
Address: _____

Driver Name/Title: _____

Phone No.: _____ Truck No: _____

Vehicle License No./Prov.: _____

Acknowledgment of Receipt of Materials.

Driver Signature

Shipment Date

Section III**DESTINATION****Tervita Highwest Landfill**

1943 Millstream Meadows, Victoria, BC

Phone No: (250) 478-9886

Receiver Comments: _____

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate

Name of Authorized Agent

Signature

Receipt Date



HIGHWEST BIOREMEDIATION FACILITY

RECEIVING HOURS

Open 8:00 am to 4:00 pm Monday to Friday. The facility can be open evenings, weekends and holidays upon request. There may be surcharges for special openings.

MANIFESTING

All trucks arriving at the facility with clean soil, RL-/RL+, CL+ and Hazardous Waste (<41.1) Soils must have a Highwest Bioremediation Facility (HWBF) Manifest. These manifests have a Tervita Project # which is unique to the Project. This project number also identifies whether the truckload is to be direct landfilled or placed in a bioremediation cell. If the consultant wishes, they may also send a copy of their own paperwork with the truckload but this is not required. Tervita will return the completed HWBF Manifest with the invoice to the generator. The HWBF Manifest may be photocopied and/or serialized by the consultant but the information in section one may not be changed. There may be up to four different types of HWBF Manifests for a project, as per table below. Each type of soils has the same job # but a different prefix.

Due to landfill internal requirements, metals data should be reviewed and the Tervita Project coordinator can assist with selecting the appropriate manifest.

Soil Classification		Letter shown before Project Number
< Schedule 7	Direct Disposal	R
RL-/RL+	Direct disposal	T
CL+	Metals - direct disposal	W
CL+/HW<41.1	Bioremediation	H
unknown	Suspect for Storage	S

Shipment of Hazardous Waste soils must have both a Highwest Bioremediation Facility Manifest and a BC MOE Hazardous Waste Manifest.

Intended Consignee: Tervita Highwest Bioremediation Facility

Provincial ID No.: To be Determine

Mailing Address: 13511 Vulcan Way, Richmond, B.C. V6V 1K4

Receiving Site Address: 1943 Millstream Road, Victoria, B.C.

The shipping name for hazardous waste soils are:

Gasoline Impacted Soil

Leachable Toxic Waste (Soil with Benzene, Toluene, Ethylbenzene or Xylene) BCHW

PIN: N/A

Classification: N/A

Packing Group: N/A

Waste Oil Impacted Soil

Waste Oil (Soil with Waste Oil) BCHW

PIN: N/A

Classification: N/A

Packing Group: N/A

TEMPORARY STORAGE

Soils which are not completely characterized, but which have been demonstrated to be within our permit acceptance criteria, may be accepted for temporary storage.

ADDITIONAL INFORMATION AND CONTACTS

For further information please contact your Tervita Project Coordinator or one of the following personnel:

Brian Fagan – Operations Manager

250-897-8370

Reinhard Trautmann – Landfill Manager

250-883-1999

Scott Hoekstra – Landfill And Soil Remediation Specialist : 604-828-2746

Appendix F – Discrepancy Form



HIGHWEST BIOREMEDIATION FACILITY

DISCREPANCY REPORT

Date: _____

WAA _____ Generator _____

Waste Description _____

Problem: Wet _____ Odour _____ Waste Description _____

Paperwork _____ Approval _____ Labels _____

Incorrect Identification _____ Other _____

Solution: Isolate _____ New Information _____

Action Items: Notify Supervisor _____ Take Sample _____

Receive laboratory report _____ Date _____

Comments: _____

Operator: _____ Date: _____

Appendix G – Inspection Form



Date _____

Inspected by: _____

Signature _____

HWBF INSPECTION REPORT	CELL 1	Comments/Repairs
Detection Sumps Dry		
Leachate Sump Level		
Perimeter Cell Inspection		
Interior Cell Inspection		
Perimeter Access Road		
Lock Blocks Intact		
Asphalt Surface in good order		
Stockpile Tarps/Tarp Webbing		
Pump/pipes Functioning		
Cell Drawing updated		
Visual Inspection of Liner		
Cell Water Accumulating		
Oil/Water Separator functioning/maintained		
Water Treatment Equipment functioning		
Storage Tanks		
Photos taken		
Additional Comments		
Foot Notes		
√- Good working condition, no issues noted N/A = Not Applicable		
A- Walking boards and planks need replacing		
B- Pavement chipped or small hole, repairs to be scheduled		
C- Required maintenance performed		
If water is detected in the leak detection sumps, pump into a clean bucket, record the volume, and contact facility manager regarding sampling		

Appendix H – Headspace and PPE Determination Procedures

Field Headspace Screening for Volatile Petroleum Hydrocarbons in Soil

Purpose

The purpose of this procedure is to determine the presence of volatile petroleum hydrocarbons in soil at Hazco Bioremediation Facilities. During the remediation process, workers and excavator operators may be exposed to volatile petroleum hydrocarbons. Therefore, determination of volatile petroleum hydrocarbons levels before work commences is essential for worker safety. The results of the field headspace screening test can be used to determine the appropriate level of PPE that will be required by workers to remediate to soil.

This procedure is also used during the remediation process to monitor the progress of remediation. During interim and final classification sampling field headspace are taken and results are recorded. The headspace results are tabulated and are used for delisting of soil.

Limitations

This procedure is suitable for measuring volatile petroleum hydrocarbons only such as gasoline contaminated soil, and is not suitable for measuring tetrachloroethylene and semi-volatile or non-volatile petroleum hydrocarbons such as diesel, PAH or oil contaminated soil.

Required Equipment and Materials

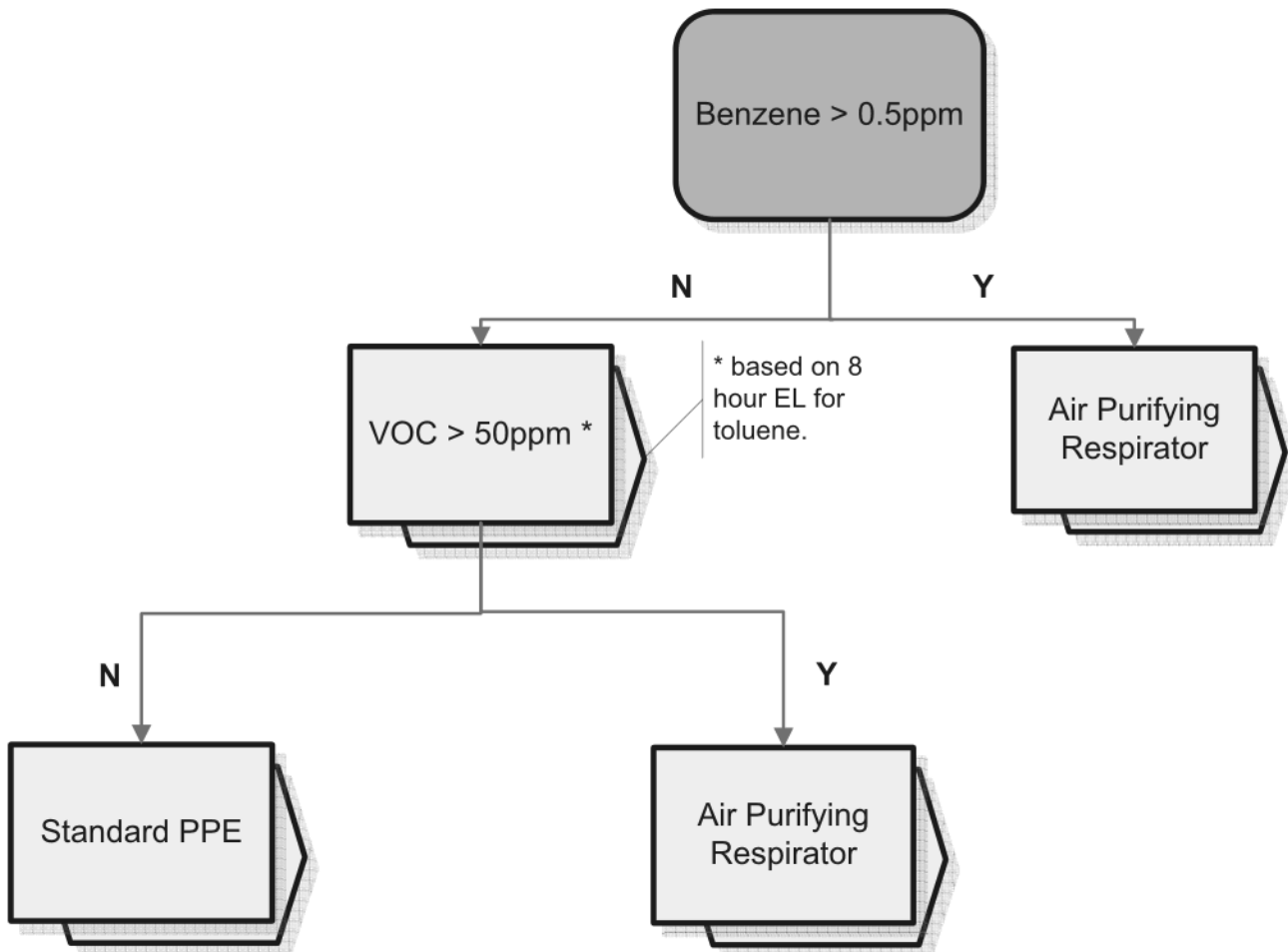
- Standard PPE: hard hat, high-visibility vest, safety glasses, steel toed boots, long sleeved shirt
- Nitrile gloves
- Respirator with organic vapour cartridges
- Shovel
- Hand trowel
- Ziploc Bags (Large Size)
- GasTech "Gastechtor 1238ME"
- Calibration gas
- Pen and Permanent Felt Marker
- Note book

Procedure

1. Ensure the instrument has sufficiently warmed up (approximately 5 minutes). Check calibration of the instrument with the calibration gas. Calibrate in accordance with the manufacture's specifications if readings vary +/- 5% from the calibration standard. During continuous use periodically check the calibration.
2. Prior to starting remediation of a stockpile, or when volatile petroleum hydrocarbon levels are unknown, a half-face respirator with organic vapour cartridges is put on.
3. Dig a hole into the stockpile approximately 1 metre. Using a clean trowel, scoop the soil into the Ziploc bag. Fill the bag approximately one third full. Ensure there is sufficient air in the bag for the GasTech to extract, then seal it.

4. Break up any large soil clumps then shake the bag for approximately 2 to 3 minutes.
5. Insert the end of the GasTech probe into the bag.
6. Record the maximum hydrocarbon concentration observed.
7. Empty the contents of the bag back onto the stockpile and place the used Ziploc bag in a Hazco bag for proper disposal.

Determination of PPE Requirements for Remediation of Volatile Petroleum Hydrocarbons in Soil using Headspace Screening.



All values based on 8 hour EL

Appendix I – Training Requirements



TERVITA BIOREMEDIATION FACILITY TRAINING PROCEDURE CHECKLIST

DUTIES AND RESPONSIBILITIES

CHECK

MANIFESTING

- ACCEPT MANIFEST AND CONFIRM COMPLETENESS
- SIGN OFF AS RECEIVER (DESTINATION) ON MANIFEST
- DIRECT SOIL TO APPROPRIATE CELL (AS PER FACILITY COORDINATOR)
- HAND IN MANIFEST WHEN DAY/PROJECT IS COMPLETE
- RANDOM INSPECTION OF LOADS

TARPING

- ALL HAZARDOUS WASTE PILES MUST BE COVERED AT ALL TIMES
- UNLESS SOIL IS BEING TREATED
- SANDBAG SURROUND EDGE TARP TO PREVENT TARP BLOWING OFF
- INSTRUCTED ON WHICH PILES ARE SPECIAL WASTE
- ROUTINELY INSPECT TARPS FOR HOLES OR RIPS

- PPE** LOCATION AND USE OF RESPIRATORS, SAFETY GLASSES, HARD HATS,
GLOVES AND BOOTS
FITTED FOR RESPIRATOR

- FIRE AND EXPLOSION** AS PER CONTINGENCY PLAN

--

- SPILL RESPONSE** AS PER CONTINGENCY PLAN

--

WASTE ACCEPTANCE PROTOCOL

- REVIEW PROCEDURES FOR DISCOVERY OF UNACCEPTABLE WASTES

--

COMMUNICATIONS AND ALARM

- ISSUED RADIO OR CELL PHONE - TRAINED ON USAGE
- EMERGENCY AIRHORN USE

EQUIPMENT DECONTAMINATION

- INSPECTION FOR & REMOVAL OF CONTAMINATED SOIL FROM EQUIPMENT
- ENSURE ALL TOOLS/EQUIPMENT STORED AWAY

SHUT DOWN OPERATIONS

--

HAZARDS OF HYDROCARBON CONTAMINATED SOIL/WATER

--

I, _____ HEREBY ACKNOWLEDGE RECEIPT OF THIS TRAINING PROCEDURE
(Name) _____

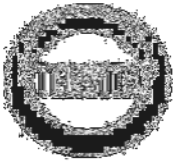
PRESENTED TO ME BY: _____ DATE: _____
(Facility Manager)

**I UNDERSTAND THAT MY WORK ACTIVITIES SHOULD BE CONDUCTED IN ACCORDANCE WITH
THE PRACTICES OUTLINED IN THE OPERATION MANUAL FOR THE FOLLOWING FACILITIES:**

BIOREMEDIATION FACILITY TRAINING REQUIREMENTS

JOB CLASSIFICATION	FIRST AID	WHMIS	TDG	H2S ALIVE	OSHA 40	CONFINED SPACE
	(3YR. REN.)	(3YR. REN.)	(3YR. REN.)	(3YR. REN.)	(3YR. REN.)	(3YR. REN.)
1. TRUCK DRIVER	X	X	X			
2. BIOREMEDIATION FACILITY PERSONNEL						
A. Facility Coordinator	X	X	X		X	
B. Facility Equipment Operator	X	X	X			
C. Facility Labourer	X	X	X			
3. FIELD PROJECTS						
A. Supervisor/Manager/Foreman	X	X	X		X	X
B. Operator	X	X	X			
C. Labourer	X	X	X			
4. ADMINISTRATION						
A. Facility Administrator		X	X			

Appendix K – Receiving and Remediation Logs



HIGHWEST BIOREMEDIATION FACILITY DAILY LOADS LOG

PROJECT #: _____

WINDROW #: _____

DATE: _____

LOAD #	TIME	WEIGHT	TRUCK	CLASS.	CELL #	TOTAL
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						



HIGHWEST BIOREMEDIATION FACILITY BIOREMEDIATION LOG

PROJECT # _____

WR # : _____

DATE:	ACTIVITY:

Record sampling, mixing, addition of fertilizer, relocation, etc.



HIGHWEST BIOREMEDIATION FACILITY INTERIM/FINAL RECLASSIFICATION SAMPLE REPORT

GENERATOR: _____
Tervita JOB # _____
DATE RECEIVED: _____

CONTAMINATES OF CONCERN:

MARK ALL THAT APPLY

BTEX/VPH

EPH

PAH

Total Metals

Other -describe

INITIAL CONTAMINATION LEVEL

HW<41.1

CL+

RL+

Suspect

QA/QC

250 Tonne

1000 Tonne

BTEX/VPH

EPH

PAH

Total Metals

Other -describe

Package 1

Package 2

DATE SAMPLE TAKEN

SAMPLER'S NAME:

SIGNATURE:

SAMPLE LABELLING

ATTACH CURRENT ANALYTICAL

CELL SAMPLING SCHEMATIC

SAMPLE SHOULD BE LABELLED
AS FOLLOWS

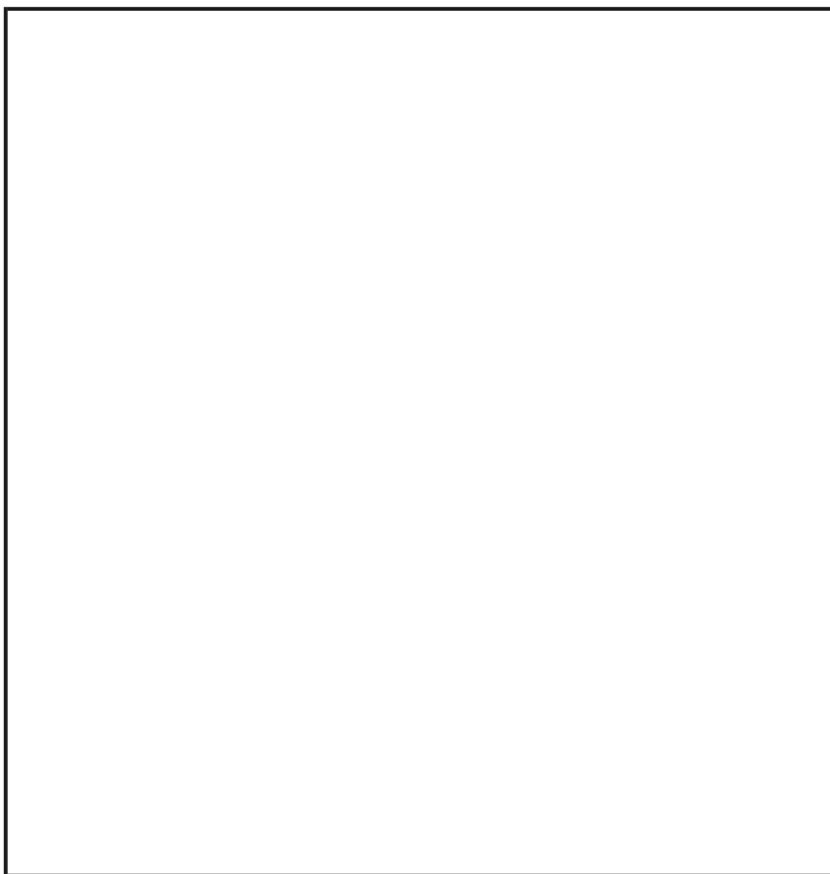
Job #

Cell #

Windrow #

Discrete or Composite #:

Sample Date:



→
N

I hereby certify the above named hydrocarbon contaminated soil has been bioremediated to below Industrial criteria
as defined in the BC MOE Contaminated Sites Regulation and in accordance with approved protocols

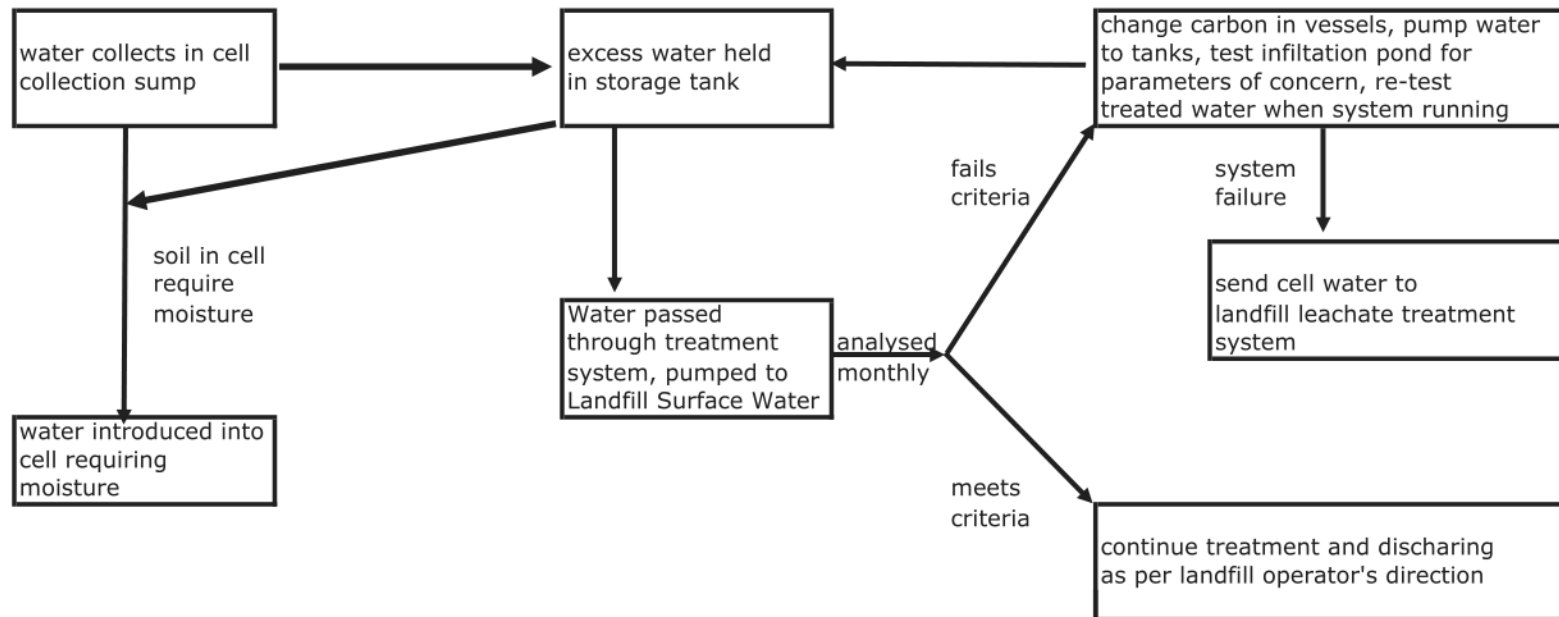
Date:

Gregory Campbell, P.Eng., President

Appendix L – Water Management Flowcharts and Logs

HIGHWEST BIOREMEDIATION FACILITY

Cell Water Management Flow Chart



Received: April 4, 2002



Tervita HIGHWEST <41.1 BIOREMEDIATION FACILITY

WATER DISCHARGE CRITERIA

APPLICABLE CRITERIA	Analytical result Lab ID	MOST STRINGENT CRITERIA	AQUATIC LIFE	BC HWR SCHEDULE 4 or Schedule 1.2 Column 3
Monocyclic Aromatic Hydrocarbons				
benzene		500	1000	500
ethylbenzene		240	2500	240
toluene		2400	3300	2400
xylenes		30000	n/a	30000
General Hydrocarbons				
VPH		1500	1500	
EPH (10-19)		5000	5000	
EPH (19-32)				
LEPH		500	500	
HEPH				
Polycyclic Aromatic Hydrocarbons				
Naphthalene		10	10	
Acenaphthylene				
Acenaphthene		60	60	
Fluorene		120	120	
Phenanthrene		3	3	
Anthracene		1	1	
Acridine		0.5	0.5	
Fluoranthene		2	2	
Pyrene		0.2	0.2	
Benzo(a)anthracene		1	1	
Crysene		1	1	
Benzo(b)fluoranthene				
Benzo(k)fluoranthene				
Benzo(a)pyrene		0.1	0.1	1
Indeno(1,2,3,-cd)pyrene				
Dibenz(a,h)anthracene				
Benzo(g,h,i,)perylene				
Quinoline		34	34	
Metals				
Aluminum D-Al		2000		2000
Antimony D-Sb		200	200	500
Arsenic D-As		50	50	300
Barium D-Ba		2500	5 000	2500
Beryllium D-Be		53	53	
Boron D-B		15000	50 000	15000
Cadmium D-Cd *		0.1	0.1	100
Calcium D-Ca				
Chromium D-Cr **,#		10	10	200
Chromium TOTAL				1000
Cobalt D-Co		40	40	300
Copper D-Cu *		20	20	300
Iron D-Fe				
Lead D-Pb *		40	40	300
Lithium D-Li				
Magnesium D-Mg				
Manganese D-Mn				1000
Mercury D-Hg		1	1	
Mercury TOTAL				10
Molybdenum D-Mo		1000	10 000	1000
Nickel D-Ni *		250	250	1000
Selenium D-Se		10	10	100
Silver D-Ag *		0.5	0.5	
Sodium D-Na				
Thallium D-Tl		3	3	
Tin D-Sn		1000		1000
Titanium D-Ti		1000	1 000	
Uranium D-U		3000	3 000	
Vanadium D-V				
Zinc D-Zn *		75	75	500

bold - most stringent criteria

Other contaminants of concern may also be analysed based on the contents of the Bioremediation Cells

All results are ug/L unless otherwise specified

bold = most stringent criteria

* = Hardness dependant, most conservative number listed

= For the CSR, Lowest of Dissolved, D-VI or D-III

** = For Schedule 1.2 D-Cr is Chrome VI

Date

Reviewed by:

Appendix M – Emergency Contact List

TERVITA ENVIRONMENTAL SERVICES EMERGENCY CONTACT LIST

NAME	POSITION	CELL or Business	Home	HOME FAX
TERVITA PERSONNEL: Highwest Bioremediation Facility				
Brian Fagan	Operations Manager -Van Island	s.22		
Reinhard Trautmann	Landfill Manager		s.22	
Cameron McLean	Director of Projects			
Lance Robson	Superintendent			
EMERGENCY SERVICES				
FIRE, AMBULANCE		911		
RCMP		911		
Capital Regional District		250-727-3331	s.22	
BC ENVIRONMENT - EMERGENCY PROGRAM		1-800-663-3456		
TERVITA EMERGENCY		1-800-667-0444		
TERVITA PERSONNEL:				
Richmond Office		604-214-7000		s.22
Malahat Office		250-743-4200		
Highwest Office		250-478-9886		
Gregory Campbell	Executive VP-Pacific Region	s.22	s.22	
Keith Magnus	Operations Manager			
Vince Maruca	Equipment Manager			
Scott Hoekstra	Regulatory/Landfill Specialist			
KamI Aujla	Regulatory Assistant			
Jeff Kellner	Safety Coordinator			
WESTERN LINERS				
Andrew Sanderson	Sales	s.22		
Vacuum Trucks				
Walco - Ed Walcott	office & 24 hr	250-723-6919		
Coast Environmental	Christine (Dispatcher)	1-888-228-2211		
PWWS	Victoria - Michelle Strong	s.22		
Earth Moving Equipment Mobilization				
Phy Bulldozing		s.22		
Corrigall Excavating				
Dan Larison	Lowbed Service			
Trucks				
Phy Bulldozing		s.22		
Corrigall Excavating				
Small Tools & Equipment				
United Rentals		250-287-4888		
Pilon Rentals		250-338-5361		

Updated 2011 07 18

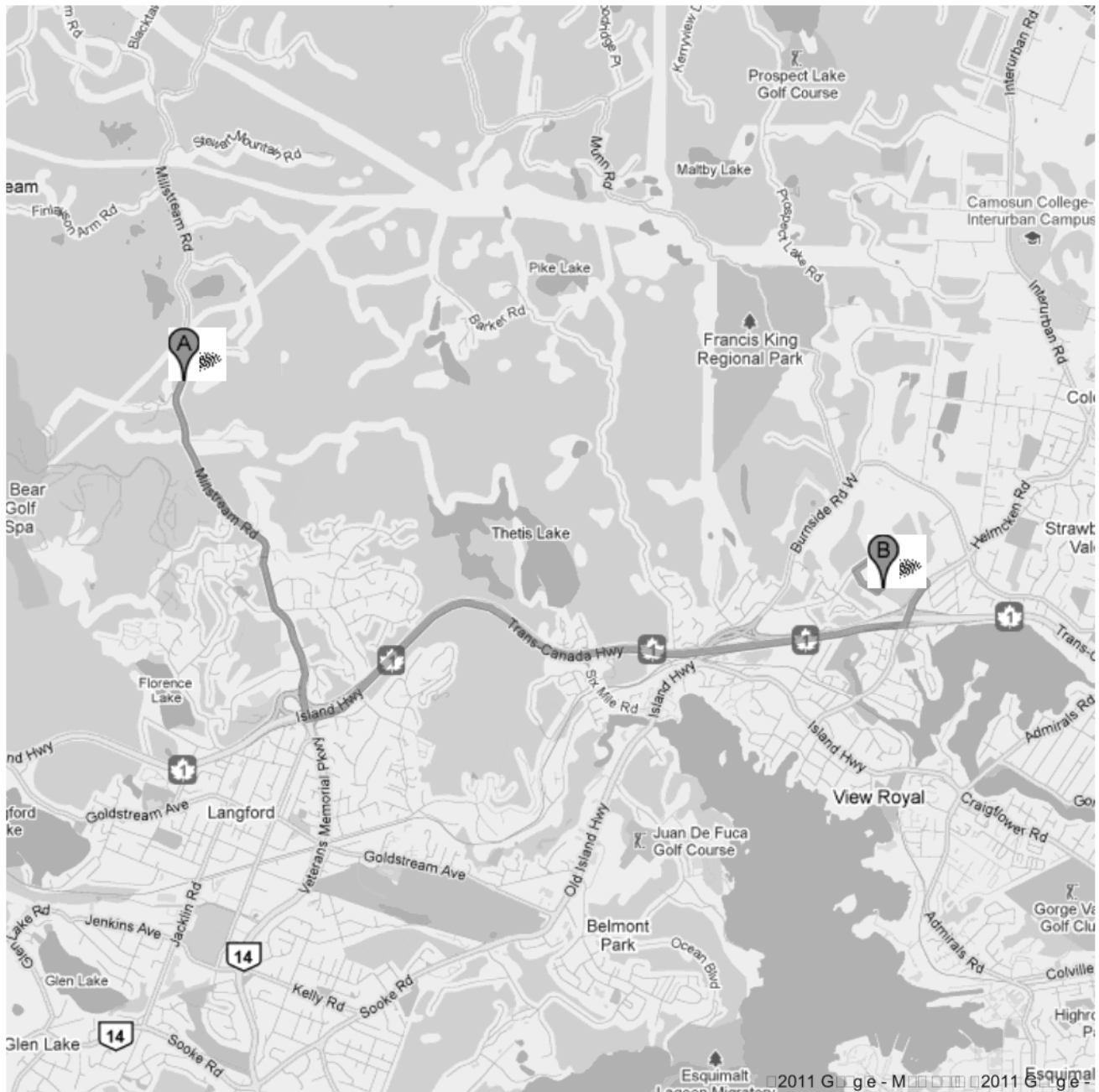
Revised: June, 2004



Directions to Victoria General Hospital

1 Highway 1, Victoria, BC V8Z 6R5 - (250) 727-4212

10.0 km 16 mins



A 1943 Millstream Rd, Victoria, BC V9B 6H1

1. Head south on Millstream Rd toward Hanington Rd
Approach 5 miles g 3.1 m
3.1 m
2. Turn left onto the Trans Canada Highway/BC-1 S from Victoria
Approach 1 mile g 400 m
3.5 m
3. Merge onto Island Hwy/Trans-Canada Hwy/BC-1 S
Continue on former Trans-Canada Hwy/BC-1 S
Approach 4 miles g 4.6 m
8.1 m
4. Take exit 8 toward View Royal g 400 m
8.5 m
5. Turn left onto Helmcken Rd N (right for View Royal)
Approach 2 miles g 350 m
8.9 m
6. Turn left onto Watkiss Way g 750 m
9.6 m
7. Turn left onto Hospital Way g 260 m
9.9 m
8. Take the 1st left onto Hospital Way
Destination is on the left g 64 m
10.0 m

B **Victoria General Hospital**
1 Hospital Way, Victoria, BC V8Z 6R5 - (250) 727-4212

These directions are for driving purposes only. You may find alternative routes, traffic, weather, or other circumstances that may differ from the map route, so you should use your route accordingly. You must be logged in or signed regarding your route.

Map data ©2011 Google

Directions were originally posted on our route on maps.google.ca. If you have a problem with the map, please

Page 74 to/à Page 75

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s.21