.3 Optional Pipe Removal:

.1 Remove 0.2 m of pipe insulation from lengths of pipe not exceeding 4 m using a Glove Bag Method.

.2 Clean and seal piping where asbestos was removed, and tape exposed insulation prior to removal of the glove bag.

.3 Cut each end of 4 m pipe section.

.4 Wrap pipe, with asbestos insulation intact, in two layers of 0.15 (6 mil) polyethylene and dispose in an on site landfill.

.4 Cleanup:

.1 Following the cleaning procedure specified above, and when air sampling shows that asbestos levels within the Asbestos Work Area do not exceed 0.05 fibres/cc, proceed with the final cleanup.

.2 Asbestos Work areas, Equipment Room, Decontamination Room, Shower Room and other enclosures that may be contaminated shall be included in the cleanup.

.3 Remove sealed bags, drums and all equipment used in the work from work areas, via the Material Decontamination Facility at an appropriate time in the cleaning sequence.

.4 Check to ensure that no dust or debris remains on surfaces as a result of dismantling operations. Air-monitor to ensure that asbestos levels in the building do not exceed 0.05 fibres/cc. Repeat cleaning using HEPA vacuum equipment, or wet cleaning methods where feasible, in conjunction with air sampling until levels meet this criteria.

3.4 Type 3 Asbestos Removal Procedures (Alternative)

.1 The following procedures may be used for the removal of asbestos on pipe, as an alternative to the Glove Bag Method outlined in Clause 3.3 of this Section.

.2 Preparation:

.1 Before beginning work, at each access to work area, install warning signs in accordance with Clause 1.13 of this Section.

.2 Before beginning work, remove visible dust from surfaces in the work area where dust is likely to be disturbed during the course of the work. Use HEPA vacuum, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate. Do not use compressed air to clean up or remove dust from any surface.

.3 Prevent the spread of dust from the work area using measures appropriate to the work to be done. Floors and walls need not be covered in buildings scheduled for demolition provided carpeting or other dust collecting materials are removed prior to work. Otherwise cover floor and wall surfaces with polyethylene sheeting sealed with tape. Use two layers of polyethylene on floors or one layer of rip-proof polyethylene. Cover floors first so that polyethylene extends at least 300 mm up walls, then cover walls to overlap floor sheeting.

.4 Seal off all openings such as corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting and seal with tape. Support polyethylene with wood framing, as required.

.5 Build triple contained decontamination enclosures at all entrances to and exits from work areas in accordance with Clauses 3.4.3 and 3.4.4 of this Section.

.6 Install a negative pressure system and operate continuously from the time the first polyethylene is installed to seal openings until final completion of the work including final clean up. Conduct monitoring of pressure difference between work area and remainder of building on a daily basis using an automatic recording instrument.

.7 After isolation of work area, remove heating, ventilating, and air conditioning filters, pack in sealed plastic bags, 0.15 mm minimum thickness, and treat as contaminated asbestos waste. Remove ceiling mounted objects such as lights, partitions, other fixtures not previously sealed off, and other objects that interfere with asbestos removal. Do not remove items which require disturbance of asbestos or ceilings or cladding enclosing asbestos until full protective measures are in place.

.8 Maintain emergency and fire exits from Work Areas, or establish alternative exits satisfactory to the Engineer.

.9 Where application of water is required for wetting asbestos-containing materials, shut off electrical power, provide ground fault interrupter circuits on power source for electrical tools and temporary lighting, in accordance with applicable CSA Standards. Ensure safe installation of electrical lines and equipment. After preparation of work areas and Decontamination Facilities, remove and dispose of ceiling panels, tiles and the entire suspension system within the work areas as contaminated asbestos waste.

.3 Decontamination Facilities:

.1 Prior to acquisition and installation of the Personnel and Material Decontamination Facilities, submit a general plan for the Facilities to the Engineer for review and approval. The submission shall demonstrate compliance with all codes and standards.

.4 Construction of Decontamination Facilities:

.1 Build suitable framing for Decontamination Facilities or use existing rooms where convenient, and line with polyethylene sheeting and seal with tape. Use two layers of polyethylene or one layer of rip-proof polyethylene on floors.

.2 Build curtained doorways between enclosures so that when people move through or when drums and equipment are moved through a doorway, one of the two closures comprising the doorway always remains closed.

.5 Maintenance of Enclosures:

.1 Maintain enclosures in tidy condition.

.2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

.3 Visually inspect enclosures at the beginning of each working period. Maintain a written record of inspections.

.4 Use smoke methods to test effectiveness of barriers when directed by Engineer.

.5 Do not commence asbestos removal or enclosure work until:

.1 Arrangements have been made for disposal of waste.

.2 Work areas and decontamination enclosures and parts of the building remaining in use are effectively segregated.

.3 Tools, equipment and material waste receptors are on hand.

.4 Arrangements have been made for building security.

.5 Warning signs specified in Clause 1.13 of this Section are displayed where access to contaminated areas is possible.

.6 All notifications have been completed and other preparatory steps have been taken.

.6 Asbestos Removal of Pipe and Duct Insulation:

.1 Once preparation has been approved by Engineer, remove all asbestos-containing pipe insulation in layers, while maintaining all exposed surfaces of insulation or lagging in a wet condition. Full saturation of insulation will not be required if material is immediately bagged and not allowed to fall onto floor.

.2 Remove the saturated asbestos material in small sections. Do not allow saturated asbestos to dry out. As it is being removed, pack the material in asbestos waste receptors for transport.

.3 Seal filled waste receptors and remove from immediate working area to Decontamination Room. Clean external surfaces thoroughly by wet sponging before moving to Holding Room. Place in second container and store in Holding Room pending removal to Transfer Room and outside. Ensure that waste receptors are removed from the Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.

.4 After completion of asbestos removal, wire brush and wet sponge all surfaces from which asbestos has been removed to remove all visible material. Keep surfaces wet during this work.

.5 Where Contractor determines that removal of asbestos-containing material is impossible due to obstructions such as structural members or major service elements or because asbestos-containing material was originally applied to asphaltic coating, provide written notification to the Engineer requesting approval for removal of obstructions prior to the complete removal of the asbestos-containing materials.

.1 All special provisions to be written instruction only.

.2 All care shall be taken to limit the extent of the work necessary to remove the obstruction.

.3 All obstructed waste is to be treated as asbestos waste unless direction to the contrary is given by the Engineer.

.6 Place cloths, mops, sponges, rags, wire brushes, disposable filters and protective clothing in double waste bags. Seal bags tightly.

.7 Vacuum all surfaces within work area including waste receptors, reusable equipment used to perform the work, shoes and soles of shoes.

.8 Thoroughly wash outside of respirators, eye protection, hard hats, hands and face.

.9 After Engineer has approved work, wash entire Asbestos Work Area including Equipment and Access Room, and equipment used in process. Floor and wall surfaces, ducts and similar items not covered with polyethylene sheeting must be completely washed with clean water. Following a further inspection and written acceptance, apply a slow drying sealer, at a minimum coverage rate of 12 m^2/litre, to all surfaces from which asbestos has been removed. Apply a thinned coat (sufficient to coat all surfaces) to other surfaces in the Asbestos Work Area including all polyethylene and surfaces scheduled for demolition. Allow a minimum of 12 hours for fibre settling with no disturbance of Asbestos Work Area. Operate negative pressure air units during settling period.

.10 Dispose of asbestos wastes in accordance with Clause 3.5 of this Section.

3.5 Disposal

.1 In preparation for disposal, adequately spray asbestos wastes (including asbestos wastes coated with PCB-amended paint) with a wetting agent prior to bagging in two heavy duty, 0.15 mm polyethylene bags or other suitable impermeable containers. Take special care to prevent the bags or containers of asbestos material from puncturing during placement within the containers. REPLACE ANY BAGS OR CONTAINERS THAT ARE RIPPED OR PUNCTURED DURING HANDLING OPERATIONS. Seal all waste filled bags or containers and provide identifying tags or labels clearly indicating the contents as being asbestos waste hazardous to human health. Exercise care to prevent bags or other containers from rupturing when being transported to the on-site landfill area. It is imperative that transportation of asbestos waste be conducted in a manner that does not release airborne asbestos fibres.

.2 Transport double bagged non-painted asbestos wastes to the Non-Hazardous Waste Landfill for disposal.

.3 Segregate asbestos wastes in the landfill as described in Section 02209 - Grading. Record location of asbestos wastes for inclusion on Record Drawings as indicated in Section 01720 - Project Record Documents.

.4 Place double bagged PCB-amended painted asbestos waste in waste receptors described in Clause 1.3.5 of this section. Tightly bind all sides of the waste receptors with metal strapping. Label receptors in accordance with the requirements of the TDGA for off-site transport.

.5 Transport asbestos waste receptors to the Temporary Storage Area.

.6 Within the Temporary Storage Area, store asbestos waste receptors separately from other shipping containers.

.7 Stack waste receptor containers to a maximum of two waste receptors in a staggered arrangement.

3.6 Final Cleanup and Demobilization

.1 Remove and containerize all asbestos waste at the work site.

.2 Include work areas and all areas of decontamination facilities in cleanup procedures.

.3 Vacuum and wash all asbestos control tools and equipment.

.4 Dispose of all non-reusable materials and contaminated barrier sheeting materials, as asbestos waste. Wipe down barrier sheeting used to protect walls and floor, and spray barrier sheeting with sealer.

.5 Remove polyethylene seals, tapes and enclosures, folding inwards and placing in double waste bags and into asbestos containers.

.6 Conduct inspection with Engineer upon completion of abatement operations, to ensure no dust or debris remains.

.7 Submit to the Engineer a detailed asbestos removal inventory which includes building source, component description and location in building.

1.0 GENERAL

1.1 Description

.1 This section specifies the requirements for the removal, containerization, on-site transport and temporary storage of hazardous wastes.

.2 A listing of potential waste materials that may exist at the site is included in Clause 3.8 of Section 01005 - General Instructions.

1.2 Related Work

.1 Section 01545 - Safety, Medical, Security Requirements.

.2 Section 01546 - Fire Safety Requirements.

.3 Section 01560 - Environmental Protection.

.4 Section 02060 - Demolition.

.5 Section 02066 - Contaminated Soils.

.6 Section 02067 - Landfarm Operation.

.7 Section 02081 - Asbestos Abatement.

.8 Section 02209 - Grading.

.9 Section 02219 - Debris Removal.

.10 Section 02240 - Landfill Waste Excavation.

1.3 References

.1 Refer to Section 01560 - Environmental Protection.

1.4 Regulatory Agencies

.1 Environment Canada.

.2 Transport Canada.

.3 Department of Indian Affairs and Northern Development (DIAND).

.4 Government of Nunavut.

.5 Government of the Northwest Territories.

.6 Canada Coast Guard.

1.5 Definitions

.1 Hazardous Waste Materials: Wastes materials that are designated as "hazardous" under Nunavut Territorial, Northwest Territorial, or Federal legislation; or as "dangerous goods" under the TDGA. For purposes of this section the following items will be designated as "hazardous":

.1 Asbestos (refer to Section 02081 - Asbestos Abatement)
.2 Batteries
.3 Solvents
.4 PCB Containing Oils
.5 Petroleum Distillates
.6 Tank Sludge
.7 Soils containing PCBs at concentrations in excess of 50 parts per million
.8 Material identified to be hazardous as the result of testing
.9 Miscellaneous Hazardous Materials defined as those materials not classified as 1 to 8 above but suspected to fall under the definition of Hazardous Wastes and Materials as stated in Clause 1.5.1 of this Section.

.2 Loose Debris: Visible debris on the existing ground surface, or material that has been identified on the Drawings as debris, consisting of hazardous and non-hazardous material.

.3 "Processing" refers to the sampling, testing, packaging, and containerization of hazardous materials.

.4 "Packaging Container" refers to the type of container necessary to contain the hazardous material placed in it, as required by the TDGA.

.5 "Shipping Container" refers to the container into which the "packaging containers" are placed for purposes of shipping to a disposal facility.

.6 "Temporary Storage Area" refers to the designated area, approved by the Engineer, for the storage of packaging and/or shipping containers prior to transport off-site. Requirements for the Temporary Storage Area are outlined in Section 02209 - Grading.

1.6 Qualifications and Personnel Protection

.1 The Contractor shall be thoroughly familiar with and knowledgeable about existing site conditions, scope of work and requirements of the Specification.

.2 Only Contractor's personnel capable of demonstrating a history of satisfactory experience in the area of hazardous waste management and can satisfy Federal and Territorial requirements will be permitted to supervise and direct the work of this Section. The Contractor's Superintendent responsible for the work of this Section shall have a minimum of five years of experience in the area of hazardous waste management.

.3 Follow at all times, guidelines such as those established in Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: NIOSH Publication No. 85-115, or Hazardous Waste Worker Training Manual: Canadian LIUNA - Contractors Training Council, 1992.

.4 All activities involving the handling of hazardous materials shall be directly supervised by Contractor's personnel who have successfully completed a 40 hour training course for Hazardous Waste Activities in compliance with OSHA 29 CFR 1910.120 or other approved equivalent training courses such as the Canadian Hazardous Waste Workers Program.

.5 Contractor's personnel trained as described in Clause 1.6.4 of this Section shall instruct and direct all workers with respect to the waste management procedures and labour and safety practices to be followed in carrying out the work.

.6 Provide workers with protection appropriate to the potential type and level of exposure. Establish specific safety protocols prior to commencing cleanup activities, and include with the Work Methodology Plan described in Clause 1.7 of this Section.

.7 Provide suitable safety clothing and equipment as required during the course of the work. Supply sufficient quantities of protection equipment to fit all site personnel including the Engineer, Engineer's staff, and site visitors.

.8 The Contractor shall carry insurance that includes appropriate coverage for the handling and transport of hazardous material.

1.7 Work Methodology Plan

.1 The Hazardous Waste Material component of the Work Methodology Plan, as described in Clause 22 of Section 01005 - General Instructions, is to include and/or address but is not necessarily limited to:

.1 Supply of containers for handling and disposal of hazardous waste materials including all required approvals, as well as a description of the type and volume of containers;
.2 Details of the Hazardous Material Processing Area;
.3 Collection, cleaning, disposal of barrels, tanks, pipelines;
.4 Incineration or transfer of waste oil/liquids from existing barrels and/or tanks to new waste containers;
.5 Packaging of collected debris, material and wastes;
.6 Equipment to be used for debris removal;

.7 Details of health and safety contingency plans including the experience and training qualifications of personnel, training programs to be implemented prior to commencing work, and details of safety protocols;
.8 Details of the emergency response plan to be developed for response to spills and other emergencies;
.9 Temporary storage, containment and processing areas;
.10 Record keeping and reporting methods;
.11 Work Schedule;
.12 Compliance with all Federal, Provincial, Territorial or other agencies' regulations;
.13 Handling and disposal of wash water or wash solution; and
.14 Any other items that are pertinent to the work.

1.8 Measurement For Payment

.1 Costs for the following work items will be paid under the Unknown Hazardous Waste Material Collection Prime Cost Allowance, Item C.02090-1 in the Tender Form, and as described in Section 01020 - Prime Cost Allowances:

.1 Collection, sorting, and classification of unknown hazardous demolition and site debris for disposal requirements.
.2 Supply and transport to the site of containers for unknown hazardous waste materials.
.3 On-site transport of unknown hazardous waste materials following their confirmation as hazardous waste material by the Engineer.
.4 Containerization and transport of unknown hazardous waste materials to the on-site Temporary Storage Area.

Unknown hazardous material is that material designated as hazardous in accordance with the definition of hazardous waste material in Clause 1.5.1 of this Section, and which has not been specifically identified for collection and disposal as part of other work components.

.2 As part of the Prime Cost Allowance, Unknown Hazardous Material shall include:

.1 Hazardous debris scattered over the site area.
.2 Hazardous material excavated from the landfill excavation areas.
.3 Hazardous barrel contents.
.4 Hazardous material from the Module Train rubble and ash
.5 Unknown hazardous material encountered during demolition operations that is not identified in the Demolition Inventory in the Appendix.

.3 As part of the Prime Cost Allowance, Unknown Hazardous Materials shall not include:

.1 Materials from facilities to be demolished that are contaminated with PCB-amended paint at PCB concentrations in excess of 50 parts per million.
.2 Asbestos containing materials from facilities to be demolished.
.3 Fuel and fuel residual product from fuel tanks and pipelines to be demolished.

.4 Sewage and sewage sludge from sewage tanks and lines to be demolished.
.5 Hazardous Contaminated Soil as defined in Section 02066 - Contaminated Soils.
.6 Any hazardous material identified in the Demolition Inventory in the Appendix, or elsewhere in these Specifications.

Costs for the collection and containerization (including supply of containers), as required, for the above items shall be included in the demolition costs for the various facility components and the hazardous contaminated soil costs for the Hazardous Contaminated Soil.

.4 Grading associated with the removal of debris will be measured for payment as indicated in Section 02209- Grading.

.5 Preparation of the Temporary Storage Area, including the supply, placement, and compaction of granular fill, as required, will be measured for payment as described in Section 02209 - Grading.

2.0 PRODUCTS

2.1 Hazardous Waste Material Containers

.1 FOR PACKAGING AND CONTAINERIZATION REQUIREMENTS OF HAZARDOUS WASTE MATERIALS, ALL REQUIREMENTS OF THE TDG ACT AND REGULATIONS MUST BE MET. ASSUME THAT TRANSPORT OF THE WASTE FROM THE PIN-3 SITE, TO LICENSED SOUTHERN DISPOSAL FACILITIES BY OTHERS WILL BE BY GROUND AND SEA TRANSPORTATION.

.2 Contain asbestos in accordance with Section 02081 - Asbestos Abatement.

.3 Package batteries (wet, acid filled) in accordance with TDG Act and Regulations in sealed, leakproof containers for ground transport with no quantity limit per package. The batteries must be packaged upright, be incapable of short circuiting, and be securely cushioned in plastic or wooden drums or boxes. Package orientation and "This End Up" labels are required.

.4 Package solvents in sealed, leakproof containers for ground and sea transport in accordance with TDGA regulations, as required.

.5 For transport by cargo vehicle or vessel, package liquids containing PCBs at concentrations greater than 50 ppm in accordance with TDG Act and Regulations in a combination packaging where the inner package is made of earthenware, plastic or metal, and is leakproof, and the outer packaging is a drum or box made of aluminum,

plywood, fibre or plastic. Provide sufficient absorbent material between the inner and outer packagings to prevent any liquid from escaping. **The containers must satisfy the requirements of the latest edition of the Transportation of Dangerous Goods Act and Regulations.** There is no quantity limit per package for cargo vehicle or vessel transport. Label container as specified in Clauses 2.4.9 and 2.4.10 in Section 02060 - Demolition.

.6 For sea or land transport, package soils containing PCBs at concentrations greater than 50 ppm in Hazardous Contaminated Soil Containers described in Section 02066 - Contaminated Soil.

.7 Package tank bottom sludges in sealed, leakproof containers for cargo vehicle only with no quantity limit per package in accordance with TDG Act and Regulations.

.8 Package petroleum distillates for transport by cargo vehicle or vessel in sealed barrels, drums, or rigid polyethylene containers in accordance with TDG Act and Regulations.

.9 Package miscellaneous Hazardous Waste Materials in containers in accordance with TDG Act and Regulations depending on the type of material to be transported.

3.0 EXECUTION

3.1 General Requirements

.1 Conduct all work in accordance with all appropriate Federal, Territorial and Provincial legislation, and international conventions.

.2 Individuals shipping and receiving hazardous waste materials are to be licensed under the TDGA Regulations.

.3 Only trained individuals or individuals working under the direct supervision of trained persons shall handle or transport dangerous goods.

.4 Coordinate containerization of hazardous waste materials with Waste Broker contract through the Site Engineer.

3.2 Protection

.1 Avoid releasing any hazardous materials into the environment during handling of hazardous waste materials.

.2 Develop for the Engineer's approval, an emergency response plan for response to spills and other emergencies during hazardous waste material recovery operations.

.3 In the event of a spill, invoke the emergency response plan and take appropriate action.

.4 Provide a full range of cleanup and protective equipment at the site to contain and cleanup spills, and protect personnel, as required. The cleanup equipment is to include booms (sorbent and containment), sorbents for cleanup, fire extinguishers for A-B-C fires, overpacks for contaminated soils, pumps, hand shovels, picks and containment barriers, such as plastic sheeting. Personnel protective equipment is to include clothing, protective suits, respirators, etc. to comply with potential emergency conditions and in accordance with NIOSH guidelines.

.5 Site personnel handling hazardous waste material are required to wear environmental protection equipment in accordance with NIOSH guidelines.

.6 Establish a Hazardous Material Processing Area for the placement of potentially hazardous waste materials for inspection, testing, classification and packaging, as well as for the building and packaging of barrel liquids and sediments, and for the cleaning of barrels. Refer to Clause 3.3 of this Section.

.7 Establish a Temporary Storage Area, subject to approval by the Engineer, to provide a secure area for hazardous waste material prior to shipment for disposal as described in Clause 3.9 of this Section.

.8 Handle materials containing asbestos in accordance with Section 02081 - Asbestos Abatement.

.9 The release of all water resulting from the cleaning of fuel tanks and pipelines shall conform to the Wastewater Discharge Criteria outlined in Section 01560 - Environmental Protection. Dispose of any liquid effluent not conforming to the guidelines as hazardous waste material in accordance with the requirements of this Section.

3.3 Hazardous Waste Material Processing Area

.1 Establish a Hazardous Waste Material Processing Area for the purpose of:

- .1 sorting, packaging, sampling, and processing hazardous waste materials; and
- .2 bulking of liquids and sediments, packaging for shipment, and cleaning of barrels.

.2 Establish the Hazardous Waste Material Processing Area to:

- .1 be of sufficient size and capacity to accommodate the volume of material and number of barrels to be processed at any one time;
- .2 provide for the sampling, testing, and packaging of hazardous waste materials, barrel contents and wash water;
- .3 minimize the handling of hazardous waste materials;
- .4 isolate hazardous materials, barrel contents and wash water from other work operations;

.5 provide access for bulking, packaging, cleaning of barrels, and transporting containers to the Temporary Storage Area;

.6 be leakproof and to contain all runoff water, spills, and leaks so as not to contaminate the environment.

.3 Immediately clean up any spills, leaks, or other releases of liquid or sediment from this area using appropriate techniques.

.4 Include the details of the Hazardous Waste Material Processing Area with the Work Methodology Plan described in Clause 1.7 of this Section.

3.4 Removal and Sorting of Hazardous Waste Materials

.1 Continually monitor the cleanup operation to identify potentially hazardous material.

.2 Immediately suspend the operation if suspected hazardous material or debris is identified and allow visual confirmation of the nature of the material or debris to be established.

.3 Remove hazardous waste materials classified as "loose debris" from their place of origin, place in containers, and transport containers to the Temporary Storage Area.

.4 Remove hazardous materials derived from demolition work from their place of origin in accordance with Section 02060 - Demolition, place in containers, and transport containers to the Temporary Storage Area.

.5 Remove and sort barrels as described in Clause 3.5 of this Section.

.6 Remove asbestos in accordance with Section 02081 - Asbestos Abatement.

.7 Avoid releasing any hazardous materials into the environment during the handling of hazardous waste materials.

.8 Invoke the approved emergency response plan and take the appropriate action in the event of a spill or other emergency situation.

.9 Have available, a full range of cleanup and protective equipment at the site of debris removal to contain and cleanup spills, and protect personnel as required. The cleanup is to include booms (sorbent and containment), sorbents for cleanup, overpacks for barrels and contaminated soils, pumps, hand shovels, and picks. Personnel protective equipment is to include clothing, protective suits, respirators, etc. in accordance with NIOSH Guidelines and to comply with anticipated and potential emergency conditions.

.10 Site personnel in the vicinity of the debris removal operations or handling hazardous material are required to wear environmental protection equipment in accordance with NIOSH guidelines.

.11 Advise the Engineer of any stained soils encountered during debris removal operations. Excavate stained and contaminated soil areas, identified during debris removal operations, in accordance with the requirements of Section 02066 - Contaminated Soils. Testing for classification will be carried out and paid for by the Engineer.

3.5 Barrel Processing

.1 A flow diagram for the methodology for the processing, cleanup and disposal of barrels is shown on Figure 02090-1 at the end of this Section.

.2 Inspection:

.1 All barrels shall be inspected by the Engineer. The purpose of the inspection is to identify the process for opening, sampling, testing and handling of the barrels. The inspection is to address the following items as a minimum:

.1 Symbols, words, or other marks on the barrel that identify its contents, and/or that its contents are hazardous; e.g. radioactive, explosive, corrosive, toxic, flammable.

.2 Symbols, words, or other marks on the barrel that indicate that it contains discarded laboratory chemicals, reagents, or other potentially dangerous materials in small-volume containers.

.3 Signs of deterioration such as corrosion, rust, or leaks at seams, rims, and V grooves.

.4 Evidence of spills or other contamination on the top and sides of the barrel.

.5 Signs that the barrel is under pressure such as bulging and swelling.

.3 The area around barrels that show evidence of holes, rust points, or openings shall be tested by the Contractor using a Volatile Organic Compound (VOC) instrument prior to movement. If levels exceed 20 percent Lower Explosive Limit (LEL) as measured by the VOC, the Contractor shall conduct all handling, storage, and transportation operations in accordance with the appropriate sections of the National Institute for Occupational Safety and Health (NIOSH) guidelines, National Fire Code of Canada, and the TDGA for flammable and combustible materials.

.4 Barrel opening:

.1 Pressurized barrels are extremely hazardous and shall be opened with extreme caution. Use only non-sparking equipment to open barrels. Provide all personnel responsible for opening barrels with appropriate safety equipment and clothing. Open barrels in accordance with the procedures outlined in the Occupational Safety and Health Administration (OSHA) Code of Federal Regulations Title 29, Part 1910, Section 120 (29 CFR 1910.120) Hazardous Waste Operations and Emergency Response (HAZWOPER).

.2 If the bungs of a barrel can be readily moved, then open the barrel slowly, allowing time for any pressure in the barrel to be released before the bungs are fully removed.

.3 If the bungs of a barrel cannot be readily moved, or if barrel inspection suggests that opening of the barrel may present a special hazard, vent the barrels remotely to relieve any internal pressure that may be present prior to opening. Conduct remote barrel venting using a suitable device such as a sharp weighted spear dropped from an appropriate height or released from a tube housing a spring to penetrate the barrel. Drive the spear into the barrel such that the barrel pressure is vented.

.4 Conduct the remote venting operation at a safe distance from other site operations, and from behind suitable walls or barricades.

.5 All barrels shall be clearly numbered by the Engineer, and cross-referenced to sample numbers.

.6 Do not transport barrels until it has been determined by the Engineer that they are not pressurized, do not leak, and are sufficiently sound for transport.

.5 Sampling and testing of barrel contents:

.1 Samples of the contents of all barrels shall be extracted by the Engineer using a drum thief.

.2 Combine barrel contents with less than a 50 mm depth of liquid with contents of other barrels with similar colour and viscosity prior to sampling. Do not consolidate barrel contents consisting of black oil. Barrel contents inferred to contain only water based on visual examination, shall be tested by the Engineer prior to consolidation to confirm the presence of glycol and/or alcohol.

.3 Consolidate barrel contents in the Hazardous Waste Material Processing Area.

.4 Liquid samples shall be inspected and classified by the Engineer as containing water or organic materials. Samples inferred to contain only water based on visual examination may be analyzed on site by the Engineer using a Fourier transform infrared spectroscopy (FTIR) instrument (if available) to confirm that they contain only water with less than 2 percent glycol or alcohol.

.5 The contents of barrels containing organic materials shall be tested by the Engineer at an off-site laboratory for PCBs, total chlorine, cadmium, chromium and lead, in addition to the identification of the major components (e.g. fuel oil, lubricating oil, etc.). Samples containing chlorine in concentrations greater than 1000 ppm shall be further tested by the Engineer to identify the chlorinated compounds present in the sample.

.6 The contents of barrels which contain both an organic and an aqueous phase shall be tested by the Engineer. The organic phase shall be tested as described in Clause 3.5.5.5 above. The aqueous phase shall be tested for organic compounds as described in Clause 3.5.5.4 above. Additional testing of the aqueous phase will be carried out if PCBs, chlorine, cadmium, chromium and/or lead are detected in the organic phase.

.6 Disposal of barrel contents:

.1 Dispose of barrels containing rust and sediment as empty barrels as described in Clause 3.5.7.4 below.

.2 Transfer the contents of barrels containing only water with less than 2 percent glycol or alcohol to an open vessel such as a half-barrel. Agitate the liquid with oil-absorbent material to remove any organic material. Drain the water onto the ground at a location that is a minimum of 30 metres from natural drainage courses.

.3 The used oil-absorbent material shall be tested by the Contractor to determine treatment and disposal requirements. Incinerate oil-absorbent material meeting the following criteria on-site (in accordance with site permit requirements) or package for disposal off-site at a licensed disposal facility:

.1 PCBs < 2 ppm
.2 Chlorine < 1000 ppm
.3 Cadmium < 2 ppm
.4 Chromium < 10 ppm
.5 Lead < 100 ppm

Package oil-absorbent material containing contaminants in excess of the above criteria in accordance with TDGA regulations, as required, and package for disposal off-site at a licensed disposal facility.

.4 Incinerate the contents of barrels containing water with glycol and/or alcohol or organic phases, and meeting the criteria indicated in Clause 3.5.6.3 above, on-site or package for off-site disposal at a licensed disposal facility.

.5 Package the contents of barrels containing materials in excess of the concentrations indicated in Clause 3.5.6.3 above, in accordance with TDGA regulations, as required, for disposal at an off-site licensed disposal facility. Contents may be combined with compatible materials for shipping purposes in accordance with TDGA regulations, as required.

.6 A leachate extraction test shall be carried out by the Engineer on the solid residual material resulting from the incineration process. The leachate toxicity of the material will be determined in accordance with Table 2 of the Schedule to the Alberta User Guide for Waste Managers based on the Toxicity Characteristic Leaching Procedure (TCLP). Landfill materials found not to be leachate toxic as Tier II contaminated soil as described in Section 02066 - Contaminated Soils. Package leachate toxic material in accordance with TDGA regulations, as required.

.7 Cleaning and disposal of barrels:

.1 Triple rinse empty barrels resulting from the consolidation of barrel contents consisting of materials in excess of the concentrations indicated in Clause 3.5.6.3 above with solvent prior to steam cleaning. Solvent rinsate material shall be tested by the Engineer to determine disposal requirements. If the solvent rinsate

meets the criteria indicated in Clause 3.5.6.3 above, incinerate the material on site. If the solvent rinsate is in excess of the criteria, package the material in accordance with TDGA regulations, as required, for disposal off-site at a licensed disposal facility.

.2 Steam clean only the empty barrels resulting from the consolidation of small volumes of barrel contents as described in Clause 3.5.5.2 above, and from the incineration of barrel contents (as described in Clause 3.5.6.4 above), as well as barrels that have been triple rinsed with solvent (as described in Clause 3.5.7.1 above). Recycling of steam cleaning rinsate is permitted. Agitate the final rinsate from the steam cleaning operation with oil-absorbent material to remove any organic material. The resulting rinsate shall be tested by the Engineer for cadmium, chromium and lead.

If the concentrations of these inorganic elements are less than 0.01, 0.10, and 0.05 ppm, respectively, then drain the rinsate onto the ground at a location that is a minimum distance of 30 metres from natural drainage courses. If the concentrations of these elements are greater than the indicated levels, then package the rinsate in accordance with TDGA regulations, as required, for disposal off-site at a licensed disposal facility.

.3 Dispose of the used oil-absorbent material in excess of the concentrations indicated in Clause 3.5.6.3 above.

.4 Crush or shred all empty barrels. Dispose of crushed barrels at the Non-Hazardous Waste Landfill. Crush the barrels in a manner to reduce the total original barrel volume by a minimum of 75 percent. Dispose of crushed/ shredded barrels in the Non-Hazardous Waste Landfill.

3.6 Cleaning of Fuel Tanks and Pipelines

.1 THE CONTRACTOR IS ADVISED THAT FUEL TANKS TO BE DEMOLISHED MAY CONTAIN FUEL.

.2 Prior to the demolition and removal of fuel tanks and pipelines:

.1 Drain and flush all products in connected piping in a manner as to prevent spillage.

.2 After initial draining, remove all residual fuel by passing a "Teflon Ring Pig" through the line.

.3 Isolate the line to prevent the passage of vapours using a standard plumber's plug on the end of a tee handle.

.4 Cut the pipe for eventual disposal in an on-site landfill.

.5 Incinerate all liquids contained in the piping and tank. Incinerate in a container to prevent ground or water contamination, in an oxygen-rich environment to promote complete combustion, and in accordance with Section 01546 - Fire Safety Requirements.

.6 Rinse tanks with water to remove any residual product. Filter the wash water through an oil-absorbent material.

.7 The used oil-absorbent material shall be tested by the Contractor to determine disposal requirements. Incinerate oil-absorbent material meeting the following criteria on-site or package for disposal off-site at a licensed disposal facility:

.1 PCBs < 2 ppm
.2 Chlorine < 1000 ppm
.3 Cadmium < 2 ppm
.4 Chromium < 10 ppm
.5 Lead < 100 ppm

Dispose of remaining waste wash water in accordance with the Wastewater Discharge Criteria outlined in Section 01560 - Environmental Protection.

.8 Package oil-absorbent material containing contaminants in excess of the above criteria in accordance with TDGA regulations, as required, for disposal off-site at a licensed disposal facility.

.9 Degas all tanks in accordance with the requirements of Report 88-5 (December 1988) of the Petroleum Association for Conservation of the Canadian Environment (PACE). Use dry ice or nitrogen for degassing, as required, if ventilation and purging methods fail. Monitor area surrounding tanks and pipelines for vapour build up during degassing.

.10 Following degassing, interior explosive vapour concentrations, as determined by the Contractor, shall be less than 20 percent LEL prior to demolition.

3.7 Cleaning of Sewage Tanks and Lines

.1 Prior to demolition of sewage lines, rinse lines with wash water. Sample and analyze the liquids, including wash water, in accordance with the Wastewater Discharge Criteria outlined in Section 01560 - Environmental Protection. Package material in excess of these criteria in accordance with TDGA Regulations, as required.

.2 Analyze sewage sludge in accordance with the DCC contaminated soil criteria described in Section 02066 - Contaminated Soils. Dispose of this material in accordance with the requirements of Section 02066 - Contaminated Soils.

3.8 Packaging and Labelling

.1 Package and label each "hazardous material" in accordance with the "Class" and "Packaging Group" as per the TDGA.

.2 Asbestos - See Section 02081 - Asbestos Abatement for packaging requirements.

.3 Batteries (wet, acid filled) - TDGA Class 8, Packaging Group III.

.4 Solvents - TDGA Class 6.1, Packaging Group II.

.5 Liquids containing PCBs at concentrations greater than 50 ppm - TDGA Class 9.3, Packaging Group I.

.6 Tank Bottom Sludges - TDGA Waste Type 78, Class 6.1, 4.1, Packaging Group II.

.7 Petroleum Distillates - TDGA Class 3.3, Packaging Group III.

.8 Miscellaneous Hazardous Waste Materials - To be classified in accordance with the TDGA and Regulations for packaging and labelling.

3.9 Temporary Storage Area

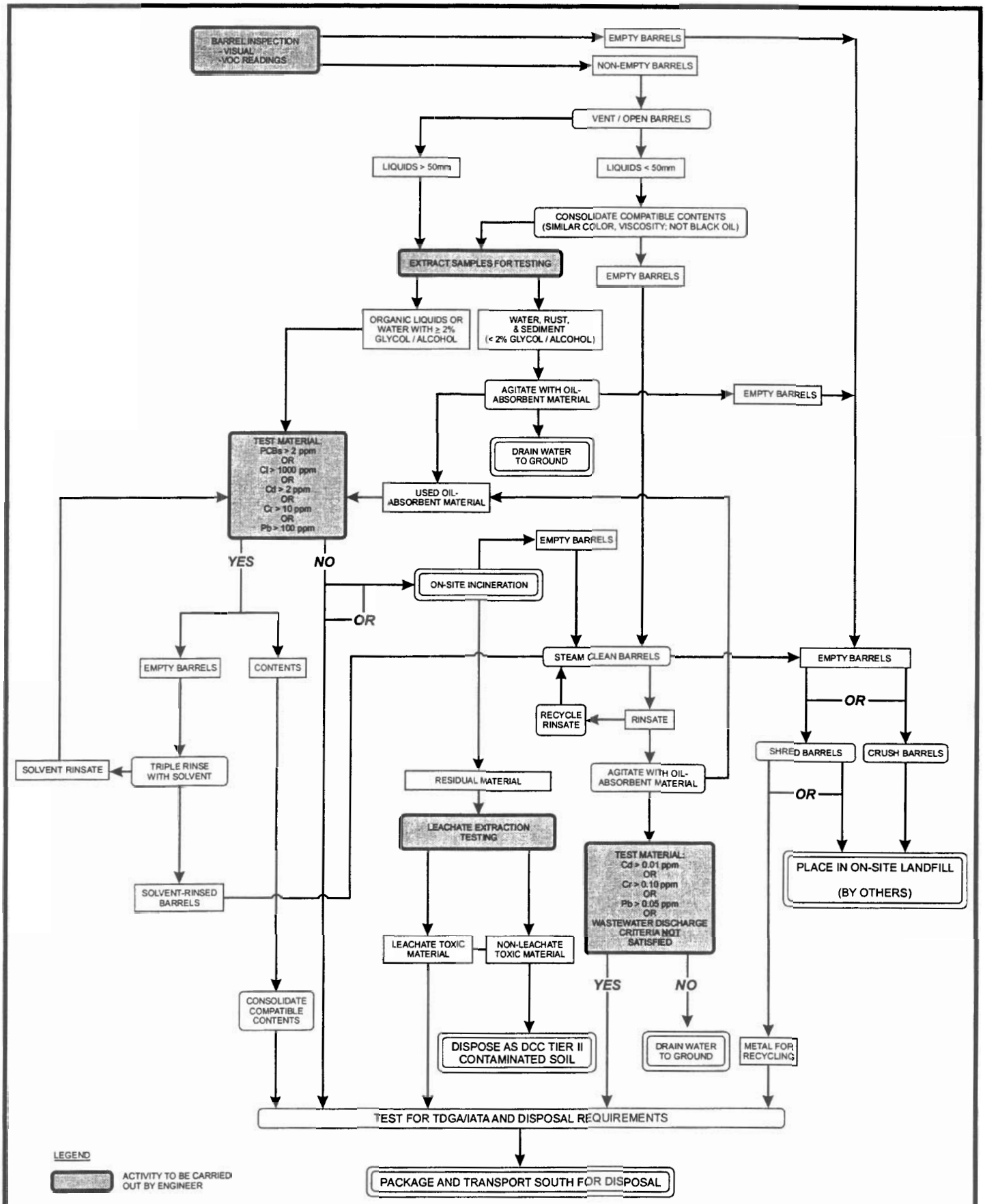
.1 Refer to Section 02209 - Grading and Section 02060 - Demolition, for the requirements of the Temporary Storage Area.

.2 Store hazardous waste materials in their appropriate packaging containers in accordance with the TDGA and CEPA requirements.

.3 Keep an inventory of container contents and location. Provide a copy of the inventory to the Engineer.

.4 Store the containers in the Temporary Storage Area prior to transport off-site.

.5 For storage of hazardous waste material, no stacking of containers will be allowed.



CLEANUP.CDR / IVB

BARREL CLEAN UP PROCESS

Figure 02090-1

1.0 GENERAL

1.1 Description

.1 This Section specifies requirements for:

.1 the grading of designated areas including existing landfills, granular borrow areas, site debris areas, depressions created by the removal of debris and contaminated soil, and general site areas requiring regrading and reshaping;

.2 the supply and placement of granular fill materials;

.2 Individual Drawings should be referred to for a description of the designated area(s), design grades, contours, elevations or cover soil thicknesses.

.3 Refer to Table 02209-1 at the end of this Section for a summary of grading work items for Payment Items A.02209-2 to -9 of the Schedule of Unit Prices.

1.2 Definitions

.1 Reshaping: The levelling and grading, to a maximum depth of 600 mm, of designated areas to blend in with the natural terrain and provide positive drainage. Reshaping does not require the supply and placement of additional granular fill material. Excavation of the terrain to a depth greater than 600 mm during reshaping operations shall be considered as unclassified excavation.

.2 Scarifying: The disturbance or loosening of a soil to a minimum depth of 30 cm to allow for compaction or aeration.

.3 Regrading: The supply and placement of granular fill in designated areas to blend in with the natural terrain and provide positive drainage.

.4 Unclassified Excavation: Excavation of materials of whatever nature encountered in the work to a depth greater than 600 mm.

.5 Granular Fill: Type 2, Type 2 Select, Type 3, Type 4, Type 5 and Type 6 material.

.6 Berm: Type 2 granular fill placed above the original ground up to the design elevation.

.7 Intermediate Cover: Type 6 granular fill used to cover each waste layer and fill void spaces within the landfilled waste.

.8 Final Cover: Type 2 and Type 2 Select granular fill placed over the existing landfills to be regraded and over landfilled waste.

.9 Surficial Boulders: visible rocks with a nominal diameter of 300 mm or greater.

.10 General Fill: Type 3 granular fill used for regrading low areas and to replace excavated contaminated soil.

.11 Erosion Protection: Type 2 Select granular fill used for erosion protection in landfill areas.

.12 Waste Material: Excavated material unsuitable for use in work or surplus to requirements.

.13 Borrow Material: Material obtained from approved areas and required for regrading requirements.

.14 Specific classifications of granular materials are described in Clause 2.1 of this Section.

.15 Maximum Dry Density is determined by the Standard Proctor Method in accordance with ASTM D698. It is applicable if less than 30% of the material is retained on the ASTM 19 mm sieve.

.16 Corrected maximum dry density is applicable if more than 30% of the material is retained on the ASTM 19 mm sieve. It is defined as:

.1 $$D = \frac{D1 \times D2}{(F1)(D2) + (F2)(D1)}$$

.2 Where:

D = corrected maximum dry density kg/m³
F1 = fraction (decimal) of total field sample passing ASTM 19.0 mm sieve
F2 = fraction (decimal) of total field sample retained on ASTM 19.0 mm sieve (equal to 1.00 - F1)
D1 = maximum dry density, kg/m³ of material passing ASTM 19.0 mm sieve determined in accordance with Method C of ASTM D698 or latest edition thereof.
D2 = bulk density, kg/m³ of material retained on ASTM 19.0 mm sieve, equal to 1000 G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127-84, or latest edition thereof.

1.3 Site Conditions

.1 Suspend operations whenever climatic conditions are unsatisfactory for grading to conform with this Specification.

.2 Do not operate equipment in work areas until the material has dried sufficiently to prevent excessive rutting.

.3 Areas to be graded are to be free from debris and excessive snow, ice or standing water.

.4 The Contractor is advised that soft ground conditions may be prevalent at the site during periods of maximum thaw of the permafrost. Schedule and carry out work to minimize disturbance to permafrost soils.

1.4 Protection

.1 Prevent damage to benchmarks, existing buildings, surface or underground service or utility lines which are to remain. Immediately repair any damage to the above or replace the above in the event of damage, at no cost to the Owner.

.2 Protect all monitoring wells, pneumatic piezometers, and thermistors. Repair or replace, at no cost to the Owner, any monitoring wells, pneumatic piezometers, or thermistors damaged by the Contractor's operations.

.3 Protect archaeological sites from construction and construction traffic.

.4 Protect unanticipated archaeological resources encountered during construction, suspend all activities in that area and notify the Engineer immediately.

.5 Protect and do not disturb spawning beds and breeding grounds during construction.

.6 Environmental protection measures shall be in accordance with the requirements specified in Section 01560 - Environmental Protection.

1.5 Samples

.1 Submit samples in accordance with Section 01340 - Shop Drawings, Product Data, Samples and Mock-ups.

.2 At least four weeks prior to commencing work, inform Engineer of proposed source of fill materials and provide access for sampling.

1.6 Work Methodology Plan

.1 The Landfilling of Non-Hazardous Material Waste of the Work Methodology Plan, as described in Section 01005 (Clause 22), is to address, but is not necessarily limited to:

.1 Method and equipment to be used for the transport, placement, and compaction of non-hazardous waste within the on-site landfill.
.2 METHODS AND EQUIPMENT TO BE USED FOR THE PLACEMENT OF ASBESTOS WASTES TO MITIGATE AGAINST THE INADVERTENT RELEASE OF ASBESTOS FIBRES;
.3 Method and equipment to be used for the placement of intermediate and final cover material within and over the landfill;
.4 Record keeping and reporting methods;
.5 Work Schedule;
.6 Any other items that are pertinent to the work.

.2 The Construction of the Tier II Disposal Facility component of the Work Methodology Plan, as described in Section 01005 (Clause 22), is to address, but is not necessarily limited to:

.1 Method and equipment to be used for the transport, placement, and compaction of the various types of granular fill materials within the Disposal Facility, including the method and equipment to be used to saturate the containment berms;
.2 Proposed construction details of haul road;
.3 Method and equipment to be used for the installation and protection of liner materials within the Disposal Facility;
.4 Method and equipment to be used for the placement of DCC Tier II Contaminated Soil within the facility;
.5 Method and equipment to be used for the installation of monitoring wells and thermistors within the facility, including a description of the type of materials to be used;
.6 Record keeping and reporting methods;
.7 Work Schedule;
.8 Any other items that are pertinent to the work.

1.7 Measurement For Payment

.1 The unit of measurement for reshaping within designated areas and to authorized limits indicated on the Drawings or as directed by the Engineer will be the square metre as measured by survey. RESHAPING ASSOCIATED WITH REGRADING OPERATIONS WILL NOT BE INCLUDED IN THE SQUARE METRE MEASUREMENT FOR RESHAPING. Reshaping will be paid under Item A.02209-1 of the Schedule of Unit Prices. Reshaping will include any scarifying requirements, as indicated on the Drawings.

.2 The excavation of the South Beach and Main Landfills will be measured for payment as described in Section 02240 - Landfill Waste Excavation.

.3 The supply, placement and compaction of all granular fill material (Type 2, Type 2 Select, Type 3, Type 4 and Type 5) above existing ground at the Main Landfill will be measured for payment by the cubic metre as determined by survey measurements (refer to Clause 1.7.11), and will be paid under Item A.02209-2 of the Schedule of Unit Prices in the Tender Form.

.4 The excavation and granular backfill of the trench at the perimeter of the Main Landfill will be measured for payment by the lineal metre of excavation as measured by survey and paid under Item A.02209-3 of the Schedule of Unit Prices in the Tender Form as follows:

.1 A.02209-3: Trench Excavation, 1.5 metre depth, 2.5 metre width.
.2 For excavation depths that vary from the specified depth of 1.5 m by more than 0.1 m, as directed by the Engineer, the Unit Cost for trench excavation will be pro-rated by the following factor:

Factor = [1.1 x Depth of Excavation] - 0.6
An example is provided in the following table:

Depth of Excavation (metres)	Multiplication Factor 2.5 metre Wide Trench Excavation
0.8 m	0.28
1.2 m	0.72
1.8 m	1.38

.3 The depth of excavation shall be taken as the average of four equally spaced measurements over a lineal distance of 30 metres from existing ground to the base of the excavation.

.5 The scope of work for Payment Item A.02209-3 (Trench Excavation for Liner Installation - Main Landfill) shall include:

.1 Excavation for installing and anchoring the geotextile and geomembrane below ground surface to the depth of excavation as indicated on the Drawings.
.2 Dewatering of the excavation, as required. Discharge of water shall conform to the wastewater discharge guidelines in Section 01560 - Environmental Protection.
.3 Disposal of the excavated material in a location as directed by the Engineer.
.4 Supply, placement, and compaction of Type 4 and Type 2 granular fill to the specified depth as indicated on the Drawings.

.6 The supply, placement and compaction of Type 2, Type 4 and Type 5 granular fill material above grade at the Tier II Disposal Facility will be measured for payment by the cubic metre as determined by survey measurements (refer to Clause 1.7.11), and will be paid under Item A.02209-4 in Schedule A, Schedule of Unit Prices in the Tender Form.

.7 The excavation and granular backfill of the trench at the perimeter of the Tier II Disposal Facility will be measured for payment by the lineal metre of excavation as measured by survey and paid under Item A.02209-5 of the Schedule of Unit Prices in the Tender Form as follows:

.1 A.02209-5: Trench Excavation, 1.5 metre depth, 4.0 metre width.
.2 For excavation depths that vary from the specified depth of 1.5 m by more than 0.1 m, as directed by the Engineer, the Unit Cost for trench excavation will be pro-rated by the following factor:

Factor = [0.9 x Depth of Excavation] - 0.30

An example is provided in the following table:

Depth of Excavation (metres)	Multiplication Factor 4.0 metre Wide Trench Excavation
0.8 m	0.42
1.2 m	0.76
1.8 m	1.32

.3 The depth of excavation shall be taken as the average of four equally spaced measurements over a lineal distance of 30 metres from original ground to the base of the excavation.

.8 The scope of work for payment Item A.02209-5 (Trench Excavation for Tier II Disposal Facility) shall include:

.1 Excavation below ground surface to the depth of excavation as indicated on the Drawings, or as directed by the Engineer.
.2 Dewatering the excavation, as required.
.3 Disposal of the excavated material in a location as directed by the Engineer.
.4 Supply, placement, and compaction of Type 4 granular fill to the original ground as indicated on the Drawings.

.9 No extra payment will be made for soil excavated from beyond the specified limits of the trench excavation as described in Clauses 1.7.4 and 1.7.7, unless such removal has been specifically directed by the Engineer. No extra payment will be made for the disposal of soil resulting from the over-excavation of the trench, and/or backfilling of the excavation to the specified depth.

.10 The supply, placement, and compaction of granular fill for the following work items will be measured according to Clauses 1.7.12 to 1.7.15 and paid under Items A.02209-6, A.02209-7, A.02209-8, and A.02209-9, respectively, of the Schedule of Unit Prices for Type 2, Type 2 Select, Type 3 and Type 6 granular fill, respectively, including:

.1 Supply, placement and compaction to the specified limits of Type 2 granular fill material for construction of levelling course, perimeter berms and cover for the Landfarm.
.2 Supply, placement and compaction to the specified limits of Type 2 granular fill material for construction of perimeter berms and cover course for the Non-Hazardous Waste Landfill.
.3 Supply, placement and compaction to the specified limits of Type 2 and Type 2 Select granular fill material for the construction of regraded areas at the NWS, North and South Landfill areas.
.4 Supply, placement and compaction of Type 2 Granular Fill Material as directed by the Engineer, for construction of the Temporary Storage Area.
.5 Supply, placement and compaction of Type 3 granular fill material as directed by the Engineer for closure of the Landfarm, backfill of landfill excavations, and to facilitate demolition requirements including backfilling of holes from which timber piles were removed.

.6 Supply, placement and compaction of Type 6 intermediate fill for the non-hazardous waste landfill and the Tier II Disposal Facility.

.7 Supply, placement and compaction of granular fill not outlined in Clauses 1.7.10.1 to 1.7.10.6 above.

.11 The in-place compacted granular fill quantities for Payment Items A.02209-2 and A.02209-4 shall be calculated by the average end area method. The basis of measurement shall be surveyed cross-sections of the areas to receive granular fill taken after stripping (as required), and the surveyed cross-sections of the constructed embankment. Cross-sections shall be surveyed by the Contractor at significant breaks in original ground surface grade, incorporating at minimum, those cross-sections indicated on the Drawings. The maximum distance between cross-sections shall not exceed 20 metres unless otherwise indicated by the Engineer. Survey measurements of elevation and horizontal distance shall be to the nearest 0.1 metre.

.12 Except as indicated in Clauses 1.7.13, 1.7.14 and 1.7.15 below, the basis of measurement for the volume of granular fill for general regrading operations as per Clause 1.7.10 of this section will be by truck box measurement. The capacity of the gravel hauling vehicles will be measured by the Engineer. The measurements will be to the nearest 0.1 m^3 capacity, and the capacity of the vehicle once measured shall not be changed without the consent of the Engineer. The gravel shall be levelled, using a strike-off method, by the Contractor before measurement. No heaping or mounding of the load above the top of the box level will be allowed. Once the capacities of the truck boxes have been established, the Engineer may, at his own discretion, determine the granular material volume without enforcing the strike-off method. Truck boxes used in the haul of gravel shall be thoroughly cleaned when unloading.

.13 The basis of measurement for the berms of the Non-Hazardous Waste Landfill shall be calculated by the average end area method as described in Clause 1.7.11 above.

.14 The basis of measurement for the volume of landfill cover at the Non-Hazardous Waste Landfills shall be the product of the surveyed surface area and the depth of granular fill placement as indicated on the Drawings.

.15 The basis of measurement for the levelling course and perimeter berms of the landfarm shall be calculated by survey as described in Clause 1.7.11 above.

.16 The basis of measurement for additional Type 3 granular fill for the closure of the Landfarm shall be calculated by Truck Box Measurement as described in Clause 1.7.12 above.

.17 Excavation required for the following work items will be measured for payment by the cubic metre as determined by survey measurement, and paid under Item A.02209-10 - Unclassified Excavation, of the Schedule of Unit Prices:

.1 Excavation of the terrain to a depth greater than 600 mm during reshaping operations.

.2 Excavation inside the key trench area of the Tier II Facility.

.3 Excavation required for the closure or development of on-site landfills.

.4 Excavation as specifically indicated on the Drawings or as directed by the Engineer.
.5 Excavation of clean soil over contaminated soil at depth.
.6 Excavation of buried and partially buried debris areas.

.18 The excavation of test pits, using adequate mechanical excavating equipment, to a maximum of 3.0 metres, as required for the following work items, will be measured for payment by the operating hours for the excavating equipment utilized, and paid under Item A.02209-11 of the Schedule of Unit Prices:

.1 Test pits to confirm the location of the liner anchor trench at the Main Landfill and Tier II Disposal Facility.
.2 Test pits for the installation of vertical thermistors at the Main Landfill and Tier II Disposal Facility.
.3 Any other test pits as directed by the Engineer.

The unit price for the excavation equipment is to include all ownership, operating and supervisory costs including costs for the equipment operator, fuel, lubricants, labour, and parts necessary to maintain the equipment.

.19 The supply, transport to the site and on-site storage of bentonite will be measured for payment by the kilogram of bentonite, and paid under Item A.02209-12 in the Schedule of Unit Prices.

.20 The placement/application of the water bentonite slurry within trench excavations where bedrock fractures are encountered will be measured for payment by the square metre based on the product of the pre-determined width of the base of the trench excavation and the surveyed lineal metre. Application of the water bentonite slurry will be paid under Item A.02209-12 of the Schedule of Unit Prices.

.21 The scope of work for Payment Item A.02209-13 (Water-Bentonite Slurry Application) shall include:

.1 Preparation of the rock foundation, including cleaning and dental excavation.
.2 Mixing of the water / bentonite slurry to a uniform consistency by approved mixing methods.
.3 Application of the slurry to the trench foundation at a application rate as directed by the Engineer. The Contractor must have the capability of pressure injecting slurry into fractures, if necessary, as directed by the Engineer.

.22 The placement of the sand-bentonite levelling course within trench excavation will be measured for payment by the cubic metre based on the product of the pre-determined width of the base of the trench excavation, specified depth of placement and the surveyed lineal metre. Placement of the sand bentonite levelling course will be paid under Item A.02209-14 of the Schedule of Unit Prices.

.23 The scope of work for Payment Item A.02209-14 (Sand-Bentonite Levelling Course) shall include:

.1 Supply of Type 5 granular fill and water.
.2 Mixing of the Type 5 granular fill, bentonite, and water to a uniform consistency.
.3 Placement and compaction of the sand-bentonite levelling course.

.24 The unit price items, as described in Clauses 1.7.1, 1.7.3, 1.7.4, 1.7.6, 1.7.10, 1.7.17, 1.7.18, 1.7.19, 1.7.20 and 1.7.22 above, shall include direct costs only. All indirect costs associated with the work described in Clauses 1.7.1, 1.7.3, 1.7.4, 1.7.6, 1.7.10, 1.7.17, 1.7.19, 1.7.20 and 1.7.22 above, including profit, camp, supervision, overhead, etc., shall be included in Schedule D – Balance of Project Complete in the Tender Form.

.25 The following work items will be incidental to the work described in this Section, and will not be measured separately:

.1 Stripping, stockpiling and replacement or placement to a new location of organic material from the borrow areas as directed by the Engineer. Disposal of waste material from the borrow areas.
.2 Removal of surficial boulders over 300 mm in diameter from landfill construction areas.
.3 Mining, separating, processing, screeding, and stockpiling of borrow materials.
.4 Grading of borrow area upon completion.
.5 Removal and disposal or burial of utility lines exposed by the Contractor during the excavation of granular materials.
.6 Loading, hauling and haul road construction, maintenance and rehabilitation.
.7 Water for compaction and dust control.
.8 Supply and installation of witness grade stakes to monitor the depth of granular material placement.
.9 Surveying and calculation of granular material quantities for progress payment purposes.
.10 Reshaping and regrading of Contractor's laydown areas including the supply, placement and compaction of granular material.
.11 Draining of wet areas prior to regrading operations.
.12 Removal and disposal, or burial of abandoned utility lines.

.26 No measurement for payment will be made for:

.1 Rejected material.
.2 Surplus material.
.3 Excavation and stripping and replacement of material beyond the limits and depths specified, unless specifically authorized by the Engineer.

.27 The placement in layers and compaction of contaminated soils, non-hazardous waste and painted materials into the on-site landfills will be measured separately or included in a lump sum pay item under one of the following sections:

.1 Section 02060 - Demolition.
.2 Section 02066 - Contaminated Soils.

2.0 PRODUCTS

2.1 Granular Materials

.1 Fill materials require the approval of the Engineer.

.2 Fill materials shall be pit-run or screened stone, gravel or sand consisting of hard durable particles free from clay lumps, cementation, organic material, snow, ice and other deleterious materials. It is anticipated that there will be no requirement for crushing of granular materials to satisfy gradation specifications. There is a requirement to select, blend and/or screen granular materials to satisfy gradation specifications.

.3 Type 2 Granular Fill:

.1 Type 2 Granular Fill is to be well-graded gravel, and is to be used for landfill berm and cover and regrading requirements.

.2 Gradations to be within the following limits when tested to ASTM C136 and ASTM C117, sieve sizes to CAN/CGSB-8.1:

Sieve Designation (mm)	% Passing by Weight
150	100
25	60 - 100
5	25 - 80
0.425	3 - 45
0.08	2 - 25

.4 Type 2 Select:

.1 Type 2 Select is to be erosion-resistant gravel, and is to be used as shown on the drawings.

.2 Gradations to be within the following limits when tested to ASTM C136 and ASTM C117, sieve sizes to CAN/CGSB-8.1:

Sieve Designation (mm)	% Passing by Weight
200	100
50	60 - 100
5	20 - 40
0.425	5 - 25

.5 Type 3 Granular Fill:

.1 Type 3 Granular Fill is selected material from excavations or other sources approved by the Engineer, generally consisting of pit-run, screened stone, gravel or sand in an unfrozen state and free from rocks larger than 200 mm, waste or other deleterious material.

.2 Type 3 Granular Fill is generally used for:
- .1 regrading low areas as indicated on the Drawings;
- .2 backfill for contaminated soil excavations;
- .3 general site grading requirements.

.3 Type 3 Granular Fill may be designated by the Engineer as a suitable alternative for other material types.

.4 Type 2 Granular Fill may be designated by the Engineer as a suitable alternative for Type 3 Granular Fill.

.6 Type 4 Granular Fill:

.1 Type 4 Granular Fill is to be a non-saline, well-graded sand with gravel and fines generally used for the construction of landfill containment structures and within the key trench for the Geomembrane Liner System.

.2 The water content of Type 4 Granular Fill is to be adjusted to achieve a minimum degree of saturation of 90%.

.3 The water content shall be maintained after placement to ensure that the material does not dry out.

.4 The material shall have a corrected salinity of less than 5 ppt in accordance with ASTM D4542. The corrected salinity is determined as the product of the measured salinity and the ratio of the tested in-place water content.

.5 Gradations to be within the following limits when tested to ASTM C136 and ASTM C117; sieve sizes to CAN/CGSB-8.1.

Sieve Designation (mm)	% Passing by Weight
75	100
12.5	45 - 100
5	35 - 95
2	25 - 40
0.425	13 - 70
0.08	8 - 40

.7 Type 5 Granular Fill:

.1 Well-graded granular fill with a maximum particle size of 30 mm and from 4 to 15 percent of the material, by weight, passing a 0.080 mm sieve.

.2 The material shall be composed of rounded particles. TYPE 5 MATERIAL REQUIRES SCREENING FROM EXISTING SOURCES TO MEET GRADATION SPECIFICATIONS. Crushed particles will not be allowed.

.3 Used as embedment material for geomembranes.

.8 Type 6 Granular Fill:

.1 Type 6 Granular Fill is selected material from excavations or other sources approved by the Engineer, generally consisting of screened stone, gravel or sand in an unfrozen state and free from waste or other deleterious material.

.2 Type 6 Granular Fill is generally used as an intermediate cover within landfills.

.3 The maximum size of the material is to be 75 mm with less than 8 percent of the material, by weight, passing the 0.08 mm sieve.

.4 Tier I or Type A contaminated should be used as Type 6 fill as directed by the Engineer.

.9 Materials classified as unsuitable will include:

.1 Non-uniform material of widely varying moisture density characteristics.
.2 Soils with moisture content exceeding optimum moisture by 5% or more.
.3 Soils containing organic material, snow, ice or other deleterious material.

2.2 Liner Materials

.1 Geotextile as per Section 02498 - Geotextiles.

.2 Geomembrane as per Section 02499 - Geomembranes.

2.3 Bentonite

.1 The bentonite shall be a natural colloidal clay constituted of sodium montmorillonite.

.2 The bentonite shall be delivered to the site in original containers showing the composition, supplier and net mass.

.3 The bentonite transported to the site shall remain the property of the Owner.

2.4 Water

.1 To be free of impurities that would affect the permeability of the sand bentonite bedding.

2.5 Water Bentonite Slurry

.1 Prepare the water bentonite slurry by thoroughly blending the bentonite and water until a uniform mix is achieved. Blending/mixing of the water bentonite slurry and sand bentonite levelling course must be done using an approved mechanical mixer, as directed by the Engineer.

.2 The minimum bentonite content shall be 10 percent by weight

.3 Allow Engineer to sample and test mix prior to placement, if required.

2.6 Sand Bentonite Levelling Course Material

.1 Provide to the Engineer for review, a mix design for the sand bentonite levelling course based on the proposed materials and preparation methods. The mix design shall serve to determine the quantity of bentonite required to achieve the specified permeability.

.2 Prepare the sand bentonite levelling course material by thoroughly blending the sand, bentonite and water with a mechanical mixer until a uniform mix is achieved.

.3 The sand shall consist of Type 5 fill as described in Clause 2.1.7 of this section.

.4 The minimum bentonite content shall be 15 percent by weight, or as specified by the Engineer.

.5 Allow Engineer to sample and test mix prior to placement.

3.0 EXECUTION

3.1 Site Preparation

.1 Unless specifically indicated on the Drawings, do not remove existing topsoil or organic materials from embankment construction areas other than exposed surface boulders over 300 mm in diameter that are located in areas to receive granular fill. Dispose of boulders by placing on embankment side slopes.

.2 Borrow Excavation:

.1 Obtain from potential borrow areas shown on Drawings, or provide from own sources, all required fill material.

.2 THE EXISTING AIRSTRIP, APRON, HANGAR PAD, INFRASTRUCTURE PAD, AND TAXIWAY AREA AT THE PIN-3 SITE IS NOT TO BE USED AS A GRANULAR MATERIAL BORROW SOURCE.

.3 Advise Engineer of selected borrow areas seven days in advance of excavation operations for appropriate testing to be performed.

.4 Notify Engineer whenever unsuitable materials are encountered in borrow areas.

.5 Borrow material cannot be obtained from existing granular pads beneath facilities to remain or facilities to be demolished, unless authorized in writing by the Engineer.

.1 Remove and dispose of any abandoned utility lines in these areas in accordance with Section 02060 - Demolition; or

.2 Cap and bury the exposed utility lines as directed by the Engineer.

Costs for the removal and disposal, or burial of these utility lines shall be considered incidental to the work described in this Section, and will not be measured or paid for separately.

.6 Stripping, stockpiling and replacement or placement to a new location of organic material and stripping and disposal of waste material found when excavating existing granular fills to be as directed by the Engineer.

.7 Final grading of borrow area upon completion to be tidy, in a well drained condition, free of standing water to the satisfaction of the Engineer.

.8 Upon completion of final grading, leave all slopes in a stable condition and spread all stripped organics.

.9 Transport aggregate from borrow areas to the work areas via existing access routes where available. Maintain and provide for dust control on the access route between the borrow area and the work areas.

3.2 Protection of Existing Utilities

.1 Pay for all costs of repairs or replacement of buried culverts, utilities or surface utilities that are to remain and which were damaged by the Contractor's work.

3.3 Placement and Compaction of Granular Fill Material

.1 Set grades and lay out work in detail from control points in areas of granular fill placement. Advise Engineer sufficiently in advance of granular fill placement operations to enable original ground cross-sections to be surveyed and verified.

.2 Haul granular fill material from borrow sites to designated areas.

.3 Place granular fill material to the lines, grades, elevations and dimensions indicated on the Drawings, or agreed to with the Engineer.

.4 Do not place granular fill on snow, surface ice or appreciable organics.

.5 Maintain natural drainage patterns, unless otherwise directed, and fill depressions to avoid any ponding of water adjacent to embankments.

.6 All fill material shall be placed in an unfrozen state. Fill material to be free from debris, snow and ice. Do not place granular fill if the outside air temperature is below 0°C, unless otherwise directed by the Engineer.

.7 Maintain a crowned surface during construction to ensure ready runoff of surface water. Do not place material in free standing water. Drain low areas, before placing material. Do not place fill material in natural drainage courses or water bodies. Follow all requirements specified in the Water Use License and Land Use Permit.

.8 Do not dump fill material over the side slopes of berms.

.9 Place and compact fill material in horizontal lifts.

.10 Cease construction at any sign of movement or bulging in the embankments to allow assessment by the Engineer.

.11 For fill depths greater than 500 mm, place granular material in lifts not exceeding 250 mm in loose thickness. For fill depths greater than 200 mm and less than 500 mm, place material in two lifts of equal depth. For fill depths less than 200 mm, place material in one lift. Place intermediate fill as described in Clauses 3.10.5.9 to 3.10.5.14 of this Section.

.12 Compact Type 2, Type 3 and Type 5 granular fill material to 95 percent of Maximum Dry Density in accordance with ASTM D698 or as determined from a Control Strip Density. Compact Type 2 Select Granular Fill to the lines and dimensions indicated. The method for determining the maximum dry density will be established by the Engineer.

.13 Control Strip Density:

.1 A Control Strip is a lift of granular material placed over a minimum 300 m² area that requires regrading.

.2 To determine the Control Density, moisture and density readings shall be taken by the Engineer during the compaction process until a maximum dry density is attained.

.3 The density and moisture content of the Control Strip shall be measured by the Engineer after each pass of the compaction equipment to determine the type of equipment and number of passes required to obtain the specified density.

.4 A new Control Strip will be required if, as established by the Engineer, the material type, moisture content, or subgrade of the area to be regraded is significantly different than that of the Control Strip.

.5 Proofroll areas compacted in accordance with the Control Strip Density upon completion of grading and compaction or as requested by the Engineer.

.6 Use a fully loaded tandem axle gravel truck for the proofrolling operation. The speed of the vehicle is not to exceed 4 kilometres per hour during proofrolling. The Engineer may authorize the use of alternative proofrolling equipment.

.7 Make sufficient passes with the proofrolling equipment to subject every point on the surface to three separate passes of a loaded tire.

.8 Where proofrolling reveals areas of defective granular fill, remove and recompact the granular fill, and modify the compaction process, as required.

.9 The Control Strip Density method for compaction is not intended to relax the specified compaction requirements, but to reduce compaction testing requirements.

.14 Compact Type 4 Granular Fill material to a minimum of 95% of Maximum Dry Density wet of optimum. Water content to achieve a minimum 90 percent degree of saturation in accordance with ASTM D698. Moisture condition the granular fill prior to compaction to the required water content to achieve the specified degree of saturation. LIMIT THE LIFT THICKNESS TO A MAXIMUM OF 200 mm. Do not allow the Type 4 material to dry out after compaction. TYPE 4 MATERIAL MUST NOT BE LEFT EXPOSED FOR MORE THAN 1 DAY.

.15 If it is exposed longer or has dried out prematurely due to weather conditions, the Contractor may have to scarify surface, adjust moisture condition and recompact at the Engineer's discretion. No extra payment will be made for extra costs incurred as a result of any extra work.

.16 Compaction equipment must be capable of obtaining required densities uniformly in materials on project. Hand equipment must be available for compaction in areas where large equipment can not access and around instrumentation.

.17 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

.18 FOLLOWING COMPACTION OF TYPE 2 AND TYPE 3 MATERIAL PLACED ON SLOPES, TRAVEL IN A DIRECTION PERPENDICULAR TO THE TOE OF THE SLOPE WITH A CAT-TRACK TO CREATE SMALL RIDGES IN THE SLOPE. IN SOFT GROUND, TRAVEL IN A DIRECTION PARALLEL TO THE TOE OF THE SLOPE WITH A CAT TRACK.

.19 Shape finished surface to required cross-section and grade, or as directed by the Engineer.

3.4 Regrading

.1 Supply place, blade and trim Type 2, Type 2 Select or Type 3 granular fill material to elevation, grades, and cross-section dimensions indicated or directed by the Engineer.

.2 SUPPLY AND INSTALL WITNESS GRADE STAKES IN AREAS TO BE REGRADED TO MONITOR THE DEPTH OF GRANULAR MATERIAL. THE GRADE STAKES SHALL BE PLACED ON A GRID SPACING APPROVED BY THE ENGINEER FOR EACH SPECIFIC REGRADING AREA. IMMEDIATELY REPLACE ALL GRADE STAKES THAT ARE DAMAGED OR DISPLACED BY CONTRACTOR OPERATIONS.

.3 Compact Type 2 or Type 3 granular fill material to obtain specified density.

.4 Dry out material or apply water as necessary during compaction to obtain specified density.

3.5 Reshaping

.1 Blade and trim material to elevation, grades, and cross-section dimensions indicated or directed by the Engineer.

.2 Make use of material within the area designated for reshaping to provide a surface that is smooth and compact with firm slopes.

.3 Remove or cover debris exposed during reshaping with a minimum depth of Type 2 granular fill as directed by the Engineer.

.4 Blend the final reshaped surface with the natural terrain and provide positive drainage.

3.6 Excavating

.1 Lay out work in detail from control points in areas of excavation. Advise Engineer sufficiently in advance of excavation operations to enable original ground cross-sections to be surveyed and verified.

.2 Excavate to lines, grades, elevations and dimensions as indicated on the Drawings or designated by the Engineer.

.3 Keep excavations free of water while work is in progress. Protect open excavations against flooding and damage due to surface run-off. Dispose of water in a manner not detrimental to work completed or under construction. The release of all water resulting from the dewatering of open excavations shall conform to the Wastewater Discharge Criteria outlined in Section 01560 - Environmental Protection.

.4 Dispose of excavated material at approved locations. Do not obstruct flow of surface drainage or natural watercourses. USE SUITABLE EXCAVATED MATERIAL FROM WITHIN THE KEY TRENCH AREA OF THE TIER II DISPOSAL FACILITY FOR CONSTRUCTION OF THE TIER II DISPOSAL FACILITY BERMS.

.5 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.6 Notify Engineer when bottom of excavation is reached. Obtain Engineer's approval of completed excavation. Do not backfill until Engineer has given approval to do so based on the results of the confirmatory testing.

.7 Where required due to unauthorized over-excavation, fill under areas with Type 2 or Type 4 granular material, as directed by the Engineer, compacted to a minimum 95 percent of Maximum Dry Density in accordance with ASTM D698.

.8 Hand trim, make firm, and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

.9 DO NOT LEAVE EXCAVATIONS OPEN FOR A PERIOD IN EXCESS OF 4 DAYS UNLESS DIRECTED BY THE ENGINEER. SHORTER OPEN PERIODS MAY BE REQUIRED TO CONTROL INGRESSING WATER. NOTE THAT THIS WILL BE STRICTLY ENFORCED. ANY EXTRA WORK CAUSED AS A RESULT OF LEAVING EXCAVATIONS OPEN LONGER WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

3.7 Bedrock Foundation Preparation

.1 Remove all soil, loose rock, debris and other foreign materials from the bedrock liner contact area.

.2 Clean and dental excavate to remove all soil, and loose, broken, detached slabby rock fragments, as well as unsound, weathered, slaked, deteriorated and closely fractured rock that remains in cracks, fissures, seams, and other narrow openings.

.3 Cleaning and dental excavation may require the use of hand held pneumatic tools, shovels, bars, trowels, compressed air jets, high velocity water jets, brooms, brushes, and other hand tools.

.4 Do not commence application of water bentonite slurry until the prepared foundation has been inspected by the Engineer.

.5 Place water bentonite slurry to fill joints, fractures and other narrow openings in the foundation. Pressure inject slurry into rock fractures, as required by the Engineer.

.6 Finish the surface of the water bentonite slurry approximately flush with the adjoining rock, and with no abrupt changes or breaks in the finished slope.

.7 Place sand bentonite levelling course material over the prepared foundation following the application of the bentonite slurry.

.8 Place the levelling course material to provide a smooth pad on which the liners and granular materials will be placed.

.9 Place the levelling course material to eliminate abrupt changes in excavated slope, and to produce a smooth and level foundation surface with even slope transitions.

.10 The minimum depth of levelling course to be placed shall be 100 mm. Place the levelling course at a moisture content wet of optimum, and compact to a minimum of 95 percent of Maximum Dry Density in accordance with ASTM D698 or as directed by the Engineer.

3.8 Backfilling

.1 For backfilling operations, use compaction equipment capable of obtaining required densities in materials on project.

.2 Do not proceed with backfilling operations until Engineer has inspected and approved excavation.

.3 Areas to be backfilled are to be free from debris, snow, ice and water.

.4 Place specified backfill material in uniform horizontal layers in depths as indicated in Clause 3.3.11 of this Section up to grades indicated. Compact each layer before placing succeeding layer.

.5 No trenches or excavations are to be left open during the winter.

3.9 Temporary Storage Area

.1 Develop a Temporary Storage Area for the storage of containerized hazardous waste materials and contaminated soil.

.2 Prepare the Temporary Storage Area to comply with the requirements of the Environmental Protection Plan, Clause 3.11 of Section 02060 - Demolition, and to the following standards.

.1 Provide easy access to the off-site transport equipment.
.2 Allow the containers to be level and distribute the weight of the containers evenly to the supporting surface.