Giant Mine Roaster Complex Deconstruction - Waste Management Plan

Preparation Date: October 22, 2012

Effective Date of Plan: Date of licence issuance

1.0 Introduction

1.1 Project Proponents and Summary

Aboriginal Affairs and Northern Development Canada (AANDC) is applying for a Type B water licence on behalf of the Giant Mine Team consisting of AANDC and the Government of the Northwest Territories (GNWT), and supported by the federal department of Public Works and Government Services Canada (PWGSC). While AANDC will ultimately be responsible for compliance with any water licence issued, the proposed roaster complex deconstruction will be conducted by a private sector contractor procured through PWGSC.

Recent inspections of the roaster complex have revealed deteriorating structural elements and building envelopes. Due to the deteriorating condition of the buildings, there is the potential for significant impacts to the environment and injury to humans through falling cladding, partial building collapse, and arsenic and asbestos exposure to humans and wildlife. To address the human health and safety and environmental risks associated with the roaster complex, the proposed work includes abatement of all hazardous materials within the roaster complex; management of non-hazardous materials; and the safe deconstruction of the building structures. Sound waste management will be of particular importance to the proposed project and is summarized below:

- Removal and containerization of all arsenic trioxide and asbestos containing materials, and non-leachable lead paints from the Roaster buildings, and transportation to a temporary storage facility located at the Giant Mine site.
- Removal, containerization, off-site shipping and disposal of all non-arsenic containing hazardous materials from the Roaster buildings (i.e. leachable lead containing paints, PCBs, mercury, oils, petroleum products, miscellaneous designated substances, etc.) at approved facilities.
- Collection and disposal of semi-processed ores ("mineral wastes") currently located within pressure vessels to a tailings pond. Mineral wastes contaminated with arsenic trioxide dust will be treated as arsenic trioxide wastes and uncontaminated mineral wastes will be disposed of in the Northwest Tailings Pond.
- Temporary storage of clean non-hazardous wastes (wood, steel, paper, concrete rubble, plastic, glass, etc.) generated from the deconstruction of the buildings.
- Capture and filtration of any treated mine water used to clean contaminated materials or to control dust to remove asbestos fibres. Once filtered, wash water ("contact water") will be returned to the Northwest Tailings Pond in order for it to be treated in the Giant Mine effluent treatment plant to remove arsenic and other metals.

1.2 Project Location and Site Description

The Giant Mine Site (the Site) is located approximately five kilometres (km) north of Yellowknife along Highway 4 (Ingraham Trail) as depicted in Figure 1. The Site is considered to include everything within the boundaries of the former lease (Figure 2) that was in place during the operational period of the mine (i.e. Lease L-3668T, now designated as Reserve R662T). Two impacted areas immediately outside the lease area are also considered to be part of the site. They are the Giant Mine "Townsite", which was removed from the surface lease in 1999, and an area of historic tailings deposition along the shore of North Yellowknife Bay.

The Giant Mine is an abandoned mine that produced gold from 1948 until 2004, although from 1999 to 2004, gold ore was shipped off site for processing. The on-site processing of ore that occurred until 1999 created 237,000 tonnes of arsenic trioxide dust as a by-product. The arsenic trioxide dust, which is soluble in water, is stored underground in fifteen purpose-built chambers and mined out stopes. In addition to these features, other typical mining infrastructure exits on site including four tailings storage areas, eight open pits, 35 openings to the underground, and over 100 buildings. Baker Creek flows through the length of the lease area and into Great Slave Lake.

The roaster complex is a group of highly contaminated industrial process buildings located at the Site south of the B1 Pit across Highway 4 (Figure 3). The buildings considered part of the roaster complex, which were used in varying degrees from 1949 to 1999, include the following (Figure 4):

- Mill Pipe Shop/AC Roaster Building
- Cottrell Precipitator
- Roaster Stack and Roaster Stack Fan House
- Calcine Plant
- Dorrco Roaster
- Silo Load-Out and Weight Scale
- Bag House
- Exterior Flue Network

Figure 1 – Location of the Giant Mine Site and Surrounding Features

Figure 2 – Giant Mine Lease Boundary

Figure 3 – Project Infrastructure

Figure 4 – Structures of the Giant Mine Roaster Complex

1.3 Environmental Policy and Legislative Framework

All work carried out at the Giant Mine is being implemented within a framework of federal and territorial legislation, policies and guidelines. Of primary concern to the decontamination and deconstruction of the roaster complex is waste management, including the handling, storing and transporting of wastes in a manner that complies with all applicable regulatory requirements. The most pertinent legislation and guidelines for setting waste management standards are identified below:

<u>Federal Legislation, Policies and Guidelines</u>

- Contaminated Sites Environment, Health and Safety Policy prepared by Aboriginal Affairs and Northern Development Canada (April 13, 2006)[1]
- A Federal Approach to Contaminated Sites prepared by the Contaminated Sites Management Working Group (November 1999)[2]
- Northern Affairs Program Contaminated Sites Management Policy prepared by Aboriginal Affairs and Northern Development Canada (August 20, 2002)[3]
- Transportation of Dangerous Goods Act and Regulations
- Canadian Environmental Protection Act:
    - Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulation
    - Interprovincial Movement of Hazardous Waste
    - Controlled Products Regulations
    - PCB Regulations
    - Ozone Depleting Substances Regulations
- Health Canada/Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS)
- Canada Labour Code Part II - Occupational Health and Safety

Territorial Legislation, Policies and Guidelines

- Government of the Northwest Territories Policy 53.01, Environment and Natural Resources Establishment Policy (March 29, 2005)[4]
- Government of the Northwest Territories Guideline for the General Management of Hazardous Waste in the NWT (February 1998)[5]
- Government of the Northwest Territories Guideline for Contaminated Site Remediation (November 2003)[5]
- Environmental Protection Act:
    - Spill Contingency Planning and Reporting Regulations
    - Used Oil and Waste Fuel Management Regulations
    - Guidelines for the Management of Waste Batteries
    - Guideline for the Management of Waste Solvents
    - Guideline for Ambient Air Quality
    - Guideline for Dust Suppression
    - Guideline for the General Management of Hazardous Waste
    - Guideline for Ozone Depleting Substances

[1] Referenced Policy can be found using the following link: http://www.aadnc-aandc.gc.ca/eng/1100100035307
[2] Referenced document can be found using the following link: http://publications.gc.ca/collections/Collection/EN40-611-2000E.pdf
[3] Referenced policy can be found using the following link: http://www.aadnc-aandc.gc.ca/eng/1100100034643
[4] Referenced policy can be found using the following link: http://www.enr.gov.nt.ca/_live/documents/content/53_01_Establishment_Policy.pdf
[5] Referenced guidelines can be found using the following link: http://www.enr.gov.nt.ca/_live/pages/wpPages/Waste_Management_Program_publications.aspx

    - Guideline for the Management of Waste Asbestos
- Northwest Territories Mine Health and Safety Act

Taking into consideration the policies and documents noted above, the guiding principles applied to all aspects of the Giant Mine Remediation Project are as follows:

- Within the Northern Contaminated Sites Program the health and safety of employees and protection of the environment are an overriding priority. Management is committed to doing everything possible to prevent injuries and to maintain a healthy environment;
- Meeting the overall AANDC objective to contribute to a safer, healthier, sustainable environment for Aboriginal peoples and northern residents by striving to preserve and enhance the ecological integrity of the environment;
- Meeting territorial, federal and AANDC policy requirements and legal obligations regarding the management of contaminated sites; and
- Providing a scientifically valid, risk management based framework for setting priorities, planning, implementing and reporting on the management of contaminated sites.

In addition to the general principles described above, the federal government has developed a comprehensive framework to guide the management of federal contaminated sites. Beginning in 1995, the federal government recognized the need for an efficient and consistent approach to dealing with contaminated sites. As a result, the Contaminated Sites Management Working Group (CSMWG) was established to promote common approaches to management and remediation of contaminated sites. This working group now operates under the Federal Contaminated Sites Action Plan (FCSAP) which serves as the framework under which all activities at the Giant Mine are implemented.

FCSAP is a cost-shared program that helps federal custodians to address contaminated sites for which they are responsible. The primary objective of this program is to address the risks that federal contaminated sites pose to human health and the environment and to reduce the associated financial liability. The program has the complementary objectives of supporting other socioeconomic outcomes, such as training and employment of Canadians and promotion of innovative technologies. Under FCSAP, each contaminated site progresses through a systematic procedure that leads from assessment through to remediation planning, remediation and, eventually, long term monitoring.

1.4 Purpose, Scope and Objectives of the Waste Management Plan

Appropriate waste management is key to minimizing impacts of a development on the environment and human health and safety, which is AANDC's overriding policy for work undertaken at the Giant Mine site. This waste management plan, which will become effective upon issuance of the water licence, details the guiding principles and procedures for waste management that will be adhered to during the proposed deconstruction of the Giant Mine roaster complex.

As indicated in Section 1.3 above, the proposed waste management procedures contained within this plan meet the standards set in applicable federal and territorial legislation and guidelines. In addition,

AANDC factored in the following considerations when setting the waste management procedures associated with roaster complex deconstruction:

- The remediation options for the Site currently subject to environmental assessment must not be interfered with by the waste management procedures associated with roaster complex deconstruction; and
- The waste management procedures associated with roaster complex deconstruction must align with waste management procedures for the greater Giant Mine Remediation Project (GMRP) given that deconstruction, which may take up to four years to complete, may overlap with the implementation of the GMRP (subject to receipt of the necessary regulatory authorizations).

To prevent any interference with the Site remediation options currently undergoing environmental assessment and waste management procedures for the GMRP, waste management for the roaster complex deconstruction primarily involves the containerization of waste materials for either off-site disposal/recycling or temporary storage on-site until such time that the main Type A water licence and other applicable regulatory authorizations are issued for the greater Giant Mine Remediation Project.

These proposed waste management practices also align with AANDC's commitment to adhere to the conditions of former Water Licence N1L2-0043 to the greatest extent possible, including the umbrella policy that all wastes are to remain on site unless they can be recycled or disposed of at appropriate off-site facilities at this time. Since all wastes are to remain at the Site unless they can be recycled, minimizing the amount of waste generated and reusing and recycling wastes wherever possible are very important. This is demonstrated by the commitment to use treated mine water from the Polishing Pond rather than fresh water for decontamination and dust control purposes. Used contact water generated during the deconstruction activities will then be filtered to remove asbestos fibres, and returned to the on-site water management system for treatment in the existing Effluent Treatment Plant. The treated mine water will then be reused for the proposed project.

2.0 Waste Types and Management

2.1 Waste Types

The roaster complex is known to contain many different types of non-hazardous waste, hazardous waste, and hazardous waste impacted by arsenic trioxide. Recent inventories identified the following approximate volumes of specific waste types that will be generated by the proposed deconstruction work:

- Non-hazardous waste – 2,300 m^3
- Mineral waste – 140 m^3
- Oils and liquids – 18 m^3
- PCB containing materials – 12 m^3
- Chemicals and mercury containing materials – 26 m^3
- Materials coated with leachable lead containing paint – 1 m^3

- Non-leachable lead painted materials – 2 m^3
- Arsenic trioxide dust and waste impacted by arsenic – 3,600 m^3
- Non-arsenic contaminated asbestos waste – 3 m^3

It should be noted that in May 2010, the Giant Mine Remediation Project was assigned Hazardous Waste Receiver Registration Number NTR000125 by the GNWT. The Giant Mine is also applying to the GNWT to be recognized as a hazardous waste generator.

The waste types listed above and other wastes that will be generated during the course of the proposed project have been grouped into eight categories described in detail below. The locations of waste management infrastructure are identified in Figure 3 and geographic coordinates are provided in Section 2.2 below.

1. Domestic refuse – Due to the close proximity of Yellowknife, a camp does not need to be established. This will limit domestic refuse to lunch remnants (food and paper or plastic food containers) brought to the site on a daily basis by crew members which will be temporarily disposed of in specially designated garbage bins located within the temporary lunch facilities that will be set up as part of the project. This segregation is necessary to reduce the wildlife attractant potential of the domestic refuse. The refuse in the bins will be collected regularly and permanently disposed of in the Northwest Pond Non-Hazardous Waste Area for immediate burial, as is currently done for all domestic refuse generated on the Site during care and maintenance operations (Figure3).

2. Sewage and greywater – Due to the need to prevent the spread of any hazardous materials, including arsenic trioxide and asbestos dusts, any workers assisting with the deconstruction works will be required to use portable toilets and washing facilities that will be set up at the deconstruction site. The sewage wastes from these facilities will be collected and disposed off off-site at a licensed facility to be confirmed by the selected contractor. Water from showering and washing facilities within the decontamination trailer and office trailer will be treated as contact water, as described below.

3. Non-hazardous materials – Approximately 2,300 m^3 of non-hazardous building materials and equipment will be generated during building deconstruction, including the following:

    - Structural steel
    - Plastic materials
    - Steel piping, machinery, tanks and spare parts
    - Steel exterior siding
    - Glass
    - Rubber hose and gaskets
    - Electrical panels and wiring
    - Furniture

- Paper products
- Fibreglass insulation
- Concrete (raised pads on floor slabs)
- Tools
- Scrap metals, pipe and pipe fittings

Non-hazardous materials will be stored on-site at the Temporary Waste Storage Area (Figure 6) until such time that they are relocated to a permanent disposal area in accordance with any future regulatory approvals for the greater GMRP.

The non-hazardous material does not pose a risk to the environment as it will be decontaminated (e.g., washing with water; mechanical means such as industrial vacuuming) prior to being transported from the active work area to the storage site. Testing for decontamination completion will follow the same procedures and criteria for high risk (level 3) asbestos abatement as set out in the GNWT's General Guidelines for Asbestos Removal and Disposal, but with inclusion of testing for arsenic in addition to asbestos[6]. To guard against creation of physical hazards, the non-hazardous waste materials will be bundled, stacked neatly and organized. This will also improve the aesthetics of the waste piles, although the Temporary Waste Storage Area will not be visible to the public.

Figure 6 – Temporary Waste Storage Location
(Labelled as Material Storage Area Location)

4. Hazardous or potentially hazardous materials – Approximately 3,700 m^3 of hazardous or potentially hazardous materials are within the roaster complex and include the following:

    - Arsenic trioxide dust
    - Asbestos containing insulation coated with arsenic trioxide dust
    - Asbestos containing wall and ceiling insulation and exterior siding coated with arsenic trioxide dust
    - Asbestos containing pipe and process vessel insulation coated with arsenic trioxide dust
    - Asbestos containing floor products coated with arsenic trioxide dust
    - Sodium cyanide dusts co-mingled with arsenic trioxide dust
    - Wooden and steel building materials and process equipment stained with chemicals/mill process residues including sodium cyanide and arsenic trioxide
    - Refractory brick contaminated with arsenic trioxide
    - Personal protective equipment (PPE) coated with asbestos and arsenic trioxide dusts
    - Non-arsenic contaminated asbestos containing floor products and gaskets
    - Sodium cyanide containers potentially containing residual quantities

[6] Criteria for decontamination completion are based on air quality testing and require that final air monitoring results indicate asbestos fibre levels of less than 0.01 fibres per cubic centimeter and arsenic levels of less than 0.001 mg/m^3 for all samples taken.

- Containers of motor oil and grease
- Cans of paint and spray paint
- De-greasers, misc. cleaning products
- Cans of glue/adhesives
- Mercury containing control valves
- Mercury containing light tubes
- Dielectric fluids in transformers (potentially PCB containing)
- PCB containing light ballasts
- Fuel storage tank and piping with residual contents
- Granular sulphur
- Barrels of sodium hydroxide
- Barrels of penetrating asbestos encapsulate
- Antifreeze
- Small quantities of lab chemicals (silver nitrate, potassium iodide, potassium permanganate, pH buffer solutions)
- Citrex cleaner
- Partially full barrels of unknown liquids
- Water coolers potentially containing chlorofluorocarbons (CFCs)/ozone depleting substances (ODS)
- Lead-acid batteries
- Lead sheeting

The hazardous or potentially hazardous materials will be managed based on whether they are contaminated by arsenic trioxide dust and contain asbestos as follows:

- Hazardous or potentially hazardous materials uncontaminated by arsenic trioxide dust or asbestos will be containerized at the source area during decontamination and transported off-site to licensed disposal or recycling facilities. The Temporary Waste Storage Area (Figure 6) may be used as a staging area for off-site shipment of these wastes, which will be done in accordance with the GNWT General Management of Hazardous Waste Guidelines.
- Arsenic trioxide dust and any other hazardous waste item contaminated with arsenic trioxide dust including asbestos will be stored on-site at the Temporary Waste Storage Area (Figure 6) for eventual disposal with the rest of the arsenic trioxide waste at the Site as approved under the Type A water licence and other applicable regulatory authorizations for the GMRP.

Protecting human health and safety and the environment are top priorities for this project and the contractor will be required to prepare a detailed deconstruction plan (Section 2.4.2 in the Roaster Complex Deconstruction Detailed Project Description), with review by PWGSC, prior to beginning any work that outlines the health and safety procedures; mitigations for potential environmental effects; decontamination, abatement and deconstruction methodologies; and spill contingency plans. At a minimum, the measures that the contractor will be required to implement are as follows:

- Provide confirmation that licensed waste disposal or recycling facilities have agreed to accept waste from the deconstruction activities prior to shipping wastes off-site.
- Provide disposal certificates showing the types and quantities of each waste shipped to each off-site waste disposal or recycling facility.
- During arsenic and asbestos decontamination activities, the buildings will be sealed to prevent release of airborne contaminants to the surrounding environment.
- Workers completing decontamination work will be supplied with the necessary PPE to protect them from exposure.
- Containerization and transport of all hazardous or potentially hazardous wastes will be in accordance with the requirements of the Transportation of Dangerous Goods Regulation (TDGR) and the Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulation. This will provide stringent, environmentally protective containment standards, regardless of whether the material is being transported off-site.
- Where possible, suspected hazardous waste will be tested to confirm classification and containerization requirements as per TDGR, but most suspected materials that cannot be readily sampled will be simply treated as hazardous waste.
- Weekly inspections during active waste placement and, at minimum, monthly inspections during all other periods. Inspection records will be kept at the Site.
- Air quality monitoring will be ongoing inside and outside the building during work that will generate airborne contaminants (dust removal and asbestos abatement).
- Storage of PCB hazardous waste for a period of greater than 30 days will comply with the PCB Regulations.

5. Mineral wastes – The roaster complex contains some mineral wastes remaining from ore processing activities, including:

    - Residual semi-processed ore materials located in process vessels, tanks and piping;
    - Water located in floor sumps; and
    - Calcine.

    These three materials are chemically similar to the ore itself or the tailings, and is therefore suitable for disposal in the Northwest Tailings Pond. However, due to their location within the roaster complex, some of the mineral wastes are contaminated with arsenic trioxide dust. Mineral waste contaminated with arsenic trioxide dust will be considered arsenic-containing hazardous waste and will be stored at the Temporary Waste Storage Area (Figure 6) for eventual disposal with the rest of the arsenic trioxide waste at the Site under the Type A water licence and other applicable regulatory authorizations. Only mineral waste that is not contaminated with arsenic trioxide will be disposed of in Northwest Tailings Pond.

6. Contact water – Contact, or wash water refers to any water used in the decontamination process, including the showering water in the worker decontamination trailer, to control or

remove arsenic trioxide and/or asbestos dust and will be obtained from the Polishing Pond (Figure 3) which holds treated minewater. No fresh water from local surface water bodies will be used for decontamination or dust control. Any water used in decontamination and dust control will be captured, filtered to remove asbestos fibres, and then pumped into the Northwest Tailings Pond (Figure 3) for treatment to remove arsenic and other contaminants in the existing effluent treatment plant (ETP) which is described in Section 2.2 below. The volume of water pumped into the Northwest Tailings Pond will be tracked.

Treated water from the ETP is discharged to the Settling Pond where it then flows through a permeable dyke to the Polishing Pond. Treated water within the Polishing Pond will either be reused in the proposed work or will be discharged to Baker Creek. Until such time that the Type A water licence for the GMRP is issued, AANDC commits to continuing adhering to the effluent quality criteria (Table 1), sampling requirements and Surveillance Network Program set out in Water Licence N1L2-0043.

Table 1 – Effluent Quality Criteria in Former Water Licence N1L2-0043

PARAMETER	MAXIMUM AVERAGE CONCENTRATION	MAXIMUM CONCENTRATION OF ANY GRAB SAMPLE
Total Ammonia	12 mg/L	N/A
Total Arsenic	0.50	1.00
Total Copper	0.30	0.60
Total Cyanide	0.80	1.60
Total Lead	0.20	0.40
Total Nickel	0.50	1.00
Oil and Grease	N/A	5.0
Total Suspended Solids	15.0	30.0
Total Zinc	0.20	0.40
pH	N/A	6-9.5

7. Hydrocarbon contaminated soils – Any soil that becomes contaminated as a result of hydrocarbon spills will be stored in sealed drums that are clearly labeled as hydrocarbon contaminated soil. Drums will be stored upright, placed four to a pallet, and transported to an area northwest of the Mobile Equipment Garage (Figure 3). These soils will ultimately be treated or disposed of along with all other similarly contaminated soils during implementation of the Remediation Plan for the Site, which is currently undergoing environmental assessment. The Spill and Emergency Response Plan identifies the procedures for responding to hydrocarbon spills, including the need to set criteria for determining when clean up of a spill is considered complete. The criteria are dependent on location and type of spill; therefore, they are developed as part of the response to specific events. For larger spills this may involve soil and/or water sampling for comparison against specific standards (e.g., GNWT Industrial Standards).

8. Hazardous materials contaminated soils and personal protective equipment - Soils and personal protective equipment (PPE) that become contaminated with hazardous materials during the course of the proposed deconstruction work will be managed in the same way as Item 4 – Hazardous and potentially hazardous materials and summarized below:

    - Soils and PPE contaminated with hazardous or potentially hazardous materials uncontaminated by arsenic trioxide dust or asbestos will be containerized at the source area during decontamination and transported off-site to licensed disposal or recycling facilities. The Temporary Waste Storage Area (Figure 6) may be used as a staging area for off-site shipment of these wastes.
    - Soils and PPE contaminated with arsenic trioxide dust and asbestos will be stored on-site at the Temporary Waste Storage Area (Figure 6) for eventual disposal with the rest of the arsenic trioxide waste at the Site as approved under the Type A water licence and other applicable regulatory authorizations.
    - The soils mixed with small deconstruction debris left at the work area footprint will be scraped up and stored on-site at the Temporary Waste Storage Area (Figure 6) for eventual disposal with the rest of the arsenic trioxide waste at the Site as approved under the Type A water licence and other applicable regulatory authorizations.

2.2 Waste Management Infrastructure

The infrastructure required for the waste management system is described below and shown on Figures 3 and 6 above. Electronic mapping is currently based on a unique grid system called the Giant Mine Remediation Grid System but plans are being developed to convert to a more standard system. AANDC commits to providing electronic data in accordance with the MVLWB's *Standards for Geographic Information Systems (GIS) Submissions* when it becomes available.

1. Northwest Pond Non-Hazardous Waste Area (UTM Zone 11V, 636209.750 mE and 6935448.28 mN) – A disposal site for non-hazardous waste has been operated at the north end of the Northwest Tailing Pond since the pond was commissioned in 1987. Food wastes, paper, wood, plastics, rubber and steel waste, and used air filters are placed in the Northwest Pond Non-Hazardous Waste Area.

    While tailings disposal was active, the waste was covered with tailings discharged from the Mill. Shortly after the Mill shutdown and tailings were no longer produced, the accumulated waste was pushed out onto the dry tailings to form a berm, effectively creating a landfill site contained by Dam 22B on the north side and the circumference of the berm on the south side. Exposed wastes are regularly leveled and capped with waste rock.

    At this time, water within the Northwest Pond seeps directly into the underground workings where it is captured by the underground water management system, treated using the existing water treatment facility and discharged to Baker Creek if the effluent quality criteria set out in

former Water Licence N1L2-0043 are met (Table 1). Any water seeping through Dam 22B is captured on the downstream side of the dam, sampled to monitor chemistry and pumped directly back to the pond. Pumped water volumes are monitored using a flow metre. Additional monitoring of the facility includes annual inspections of the tailings dams and five year dam safety reviews.

Remedial options for the Northwest Pond and associated non-hazardous waste area will be implemented under the Remediation Plan for the Site, which is currently undergoing environmental assessment.

2. Mobile Equipment Garage Laydown Area (UTM Zone 11V, 636176.41 mE and 6932596.05 mN) – The large, accessible space located to the northwest of the Mobile Equipment Garage is being used as a laydown area for storing hydrocarbon contaminated soils until they are either taken off site for recycling or until final disposal methods are approved through the Type A licensing process to occur following completion of environmental assessment EA0809-001. Storage containers are appropriately labelled and inventoried. In the event of a spill, the procedures described in the Emergency Spill Response Plan provided under Tab XX in the application package will be followed.

3. Temporary Waste Storage Area (UTM Zone 11V, 636969.04 mE and 6933427.92 mN) – With the exception of mineral wastes, all wastes generated by the deconstruction of the roaster complex, which is expected to be approximately 6,100 m^3 of waste including hazardous and non-hazardous materials, will be stored in one location at the northeast corner of the Central Tailings Pond (i.e. Temporary Waste Storage Area; Figure 6) in accordance with applicable legislation and guidelines listed in section 1.3 above. Individual waste streams will be segregated within the Temporary Waste Storage Area to ensure proper management, tracking and inspection, and to facilitate the logistics of shipping the hazardous materials off-site for recycling or disposal. Additional measures to mitigate health, safety and environmental risks include:

    - Restricting access to the hazardous waste with fencing and posting signs identifying the area as containing hazardous waste at all possible access points.
    - Maintenance of a detailed inventory of the wastes which will be kept at the Site.
    - Written confirmation that licensed waste disposal or recycling facilities have agreed to accept waste from the deconstruction activities prior to shipping wastes off-site.
    - Provision of disposal certificates showing the types and quantities of each waste shipped to each off-site waste disposal or recycling facility.
    - Weekly inspections during active waste placement and, at minimum, monthly inspections during all other periods. Inspection records will be kept at the Site.
    - Grading and covering the Temporary Waste Storage Area with 0.6 m of compacted granular fill obtained from on-site sources of borrow materials, including crushed waste rock from a section of road bed and small existing stockpiles on the Site near the

northeast corner of the Central Tailings Pond and Freeze Optimization Study area to create a secure pad.

- Construction of drainage re-routing measures, primarily along the east side of the area (i.e. the up-gradient area), to prevent erosion and to control run-on from the adjacent native ground and bedrock outcrops. The facility itself will be graded to drain towards the centre of the tailings pond and connect with the existing drainage channels.

The Temporary Waste Storage Area was selected after examining potential areas across the Site and comparing each area to the following criteria:

i. Size – The required size of the temporary storage facility will be a function of the total volume of deconstruction materials and the height to which the material can be stacked. Assuming that we will have approximately 7,000 m^3 of waste and the material will be 1 m high, we will require a storage area of approximately 7,000 m^2. This represents a conservative estimate.

ii. Location – This includes the storage areas proximity to the designated work area as well as its road access. A good storage location would be within a reasonable distance of the designated work area and will have road access that is adequate for the types of equipment on site.

iii. Surface Conditions – This refers to the conditions of the subgrade. The subgrade must be relatively level, dry, and compact to allow for both material storage and equipment traffic. A good storage location would require minimal grading and drainage control.

iv. Visibility by Public – For aesthetic reasons, limited visibility from the public highway or other public roads, and across the water from Latham Island/N'Dilo.

v. Proximity to Water Body – Try to maximize the distance between the storage area and nearby natural water bodies. This would not apply to tailings ponds.

vi. Future Operations – It is important to choose a temporary storage location that will not impede any future mine remediation operations or get in the way of any current operations.

The location identified in Figure 6 was selected as the preferred Temporary Waste Storage Area because it is sufficiently large enough to accommodate all wastes; is in a secure location not visible to the public; is well removed from any water bodies; is a relatively short haul along mine roads requiring no upgrades; is fairly dry, topographically high, and level; and is near the expected final disposal location for non-hazardous waste[7].

5. Effluent Treatment Plant (UTM Zone 11V, 636907.00 mE and 6934168.02 mN) – Water is reclaimed from the Northwest and North Ponds for treatment in the Effluent Treatment Plant (ETP) during the open water season, usually from July through September. The ETP consists of a

[7] AANDC recognizes that the final disposal location for non-hazardous waste requires approval through the Type A licensing process but considers it prudent to take into consideration the current proposed plans.

primary and secondary circuit. The primary circuit consists of three agitating tanks in series and is fully automated; under normal operating conditions only this circuit is operated. A backup or secondary circuit consists of three agitator tanks in series, with the middle tank bypassed and is operated manually. Influent water from the Northwest Pond and North Pond is normally blended to optimize reagent consumption.

A 60% solution of ferric sulphate is added to the influent water prior to entering the first agitator tank. The ferric iron combines with arsenic to form amorphous ferric arsenate precipitates. Arsenic species are also removed from solution by absorption on amorphous ferrihydrite (iron hydroxide) precipitates.

Lime slurry is added to the first tank to neutralize the acid generated by hydrolysis of the iron and maintain optimal pH for arsenic precipitation. A polymeric flocculent is also added to increase the efficiency of solids settling. The overflow from the last of the three tanks in each circuit, containing water and precipitates, drains through a short pipeline to the north end of the Settling Pond. The lime slurry and flocculent solution are prepared from dry reagents in the ETP building next to the tanks. The ferric sulphate is received at the site as solution ready for addition to the circuit, and is stored in large tanks adjacent to and inside the ETP.

6. Settling Pond (UTM Zone 11V, 636665.01 mE and 6934132.7 mN) – The Settling Pond provides quiescent conditions to allow precipitates to settle out of the water. The Settling Pond is separated from the downstream Polishing Pond by a permeable rock-fill dyke, which retains precipitates within the Settling Pond, while allowing the clarified water to seep through. Settling efficiency is greatly improved by the addition of flocculent in the ETP. Efficient settling within the pond reduces the build-up of precipitates on the upstream face of the dyke, thus reducing the hydraulic gradient required across the dyke to push water from the Settling Pond to the Polishing Pond. A larger hydraulic gradient would encourage the infiltration of precipitates to the Polishing Pond, which could result in unacceptably high concentrations of arsenic in the final effluent. The potential for this effect limits the maximum practical treatment rate to approximately 7,000 m^3 per day.

7. Polishing Pond (UTM Zone 11V, 636508.75 mE and 6934023.76 mN) – The Polishing Pond has a large capacity (230,000 m^3) and residence time of approximately one month. The pond provides the last opportunity for settling any precipitates carried over from the Settling Pond. The Polishing Pond also allows some mixing of the water, smoothing out variations in the water quality, and allowing brief ETP process upsets to occur without producing water that is unacceptable for discharge. In the event of more lengthy treatment problems, the large capacity of the basin also allows an opportunity to contain water that does not meet the discharge limits and, if necessary, to pump the water back to the ETP for retreatment. Treated water that is not recycled from the Polishing Pond and that meets the effluent quality criteria in Table 1 is discharged through a siphon line from the south end of the Polishing Pond that runs under mine access roads and Highway 4 prior to discharging into Baker Pond. Typical water quality results

over the year for the Polishing Pond at the discharge point to Baker Creek are summarized in Table 2 below.

Table 2 – Polishing Pond Water Quality Results

PARAMETER	UNITS	AVERAGE CONCENTRATION	MAXIMUM CONCENTRATION
Total Alkalinity, as CaCo3	mg/L	69.3	92.1
Aluminum	mg/L	0.0155	0.201
Antimony	mg/L	0.362	1.09
Arsenic	mg/L	0.288	0.433
Barium	mg/L	0.015	0.020
Beryllium	mg/L	ND[1]	
Bismuth	mg/L	ND	
Boron	mg/L	0.33	0.40
Bromide	mg/L	3.09	6.30
Cadmium	mg/L	0.00008	0.0005
Calcium	mg/L	418	464
Cesium	mg/L	0.0001	0.0003
Chloride	mg/L	313	410
Chromium	mg/L	0.0007	0.0011
Cobalt	mg/L	0.0114	0.0802
Copper	mg/L	0.0111	0.0111
Cyanide, Total	mg/L	0.0063	0.0145
Dissolved Organic Carbon	mg/L	4.56	5.14
Hardness	mg/L	1416	1520
Iron	mg/L	0.032	0.161
Lead	mg/L	0.0004	0.0070
Lithium	mg/L	0.027	0.056
Magnesium	mg/L	89.5	100
Manganese	mg/L	0.0241	0.499
Mercury	mg/L	ND	
Molybdenum	mg/L	0.0231	0.0305
Nickel	mg/L	0.0401	0.0687
Nitrate/Nitrite, as N	mg/L	6.74	9.45
Oil and Grease	mg/L	ND	
pH	unitless	7.76	8.01
Phosphorous	mg/L	ND	
Potassium	mg/L	11.9	13.3
Rubidium	mg/L	0.0074	0.0111
Selenium	mg/L	0.0011	0.0019
Silicon	mg/L	1.5776	1.8500
Silver	mg/L	0.0001	0.0002
Sodium	mg/L	160.6	191
Specific Conductivity	uS/cm	2961	3180
Strontium	mg/L	2.83	3.88
Sulphate	mg/L	1098	1170
Thallium	mg/L	0.0001	0.0001
Titanium	mg/L	0.0051	0.016

Total Ammonia, as N	mg/L	0.0176	0.04
Total Dissolved Solids	mg/L	2426	2760
Total Kjeldahl Nitrogen	mg/L	0.432	0.732
Total Organic Carbon	mg/L	4.54	5.32
Total Phosphate, as P	mg/L	0.0054	0.0076
Total Suspended Solids	mg/L	<1	1.9
Turbidity	NTU	0.41	1
Uranium	mg/L	0.00226	0.0061
Vanadium	mg/L	0.0016	0.0031
Zinc	mg/L	0.0055	0.0713

[1] ND is the acronym for not detected.