INFORMATION REQUEST RESPONSE

EA No: 0809-001 **Information Request No: Alternatives North #05**

Date Received:

February 28, 2011

Linkage to Other IRs

Review Board IR #18

Date of this Response

June 17, 2011

Request:

Preamble:
There is some discussion in the DAR of underground infrastructure and waste, demolition of buildings on the surface, and removal of contaminated materials on the surface into pits or possibly underground. There is no overall inventory of waste on site and what its ultimate disposition will be as part of this Development.

Question:

1. Please provide a current inventory (quantities and location) of infrastructure, equipment and waste materials found underground and how this will be disposed of as part of this Development.

2. Please provide an inventory (quantities and location) of anticipated demolition debris from the surface infrastructure and any contaminated materials on surface (including how such materials will be classified as hazardous or non-hazardous). Indicate what the ultimate disposition of this material will be including where it will be located and how it will be managed.

3. In discussing the calcine pond on site (pg. 5-48), it is not clear whether excavation removal was considered as a closure option for this mine component. Please provide details on the closure options for the calcine pond, and how and why the option of leaving the calcine sludge in place was reached.

Reference to DAR (relevant DAR Sections):

S.5.2.3 Underground Infrastructure and Equipment;
S.6.6.8 Calcine Pond

Reference to the EA Terms of Reference:

S.3.2.3 (9, 10) Description of Existing Environment;
S.3.2.4 (7) Development Description

Response 1 Summary

The infrastructure, equipment and types of waste materials underground are described in general terms in accordance with the Terms of Reference (ToR) s.3.2.3 (10b). The underground locations where hazardous materials might still be present have been identified. There are small quantities of hazardous waste in the active maintenance shops on and above the dewatered 750 Level that vary as work is performed. Prior to allowing areas to become inaccessible, the hazardous materials are removed.

Response 1

Section 5.2.3 of the Developer's Assessment Report (DAR) identifies the equipment and types of waste materials underground. The infrastructure is described in general terms in accordance with ToR s.3.2.3 (10b). Salvageable equipment in the maintenance shops on the 1500 and 1650 Levels has been removed and the remaining equipment drained of fuel and oil prior to the flooding of these Levels.

The DAR identifies the locations in the underground mine where hazardous materials might still be present. The Giant Mine Remediation Project Team (Project Team) will proceed to do an inventory and remove the hazardous materials prior to allowing the areas to become inaccessible. Areas to be inspected are the maintenance shops, fuel/oil storage areas, explosives storage and electrical systems. There are small quantities of hazardous waste in the active maintenance shops on and above the dewatered 750 Level that vary as work is performed. The underground diesel storage facilities located on the 750 Level has been removed. There are also small varying quantities of lubricating and hydraulic oils in dedicated facilities adjacent to the active maintenance shops and the volumes vary with maintenance requirements.

Since much of the remaining underground electrical system dates from the period when PCB compounds were extensively used, small electrical components may potentially contain PCB's. For example, most of the lighting in the maintenance shops is provided by fluorescent strip lights. Depending on the date of manufacturing, the light ballasts may contain small amounts of PCB compounds in solid form.

Section 6.12.2 of the DAR commits to handling and disposing of such hazardous materials in accordance with applicable regulations as set out in the *Guideline for the General Management of Hazardous Waste in the NWT*. The disposal methods are further discussed in the response to Question 5.2.

Response 2 Summary

The Giant Mine Remediation Project includes the demolition and removal of site structures and utilities as well as the collection of surface debris. On site wastes include non-hazardous materials (wood,

demolition rubble, concrete), as well as hazardous materials (asbestos, mercury, PCB containing electrical equipment, arsenic containing materials and chemicals, etc.). The long term management program for the non-hazardous wastes, asbestos wastes, as well as sludge generated from the Waste Water Treatment Plant (WTP) includes the disposal of these wastes in an engineered landfill constructed on the property. All arsenic trioxide dusts will be managed by transporting the wastes underground into one of the arsenic containing chambers that is planned to be frozen. Once underground, this material will be managed and monitored according to the programs established for the frozen blocks. All other hazardous wastes (PCB, mercury, leachable lead, etc.) will be hauled offsite for disposal according to federal and territorial regulations. The preliminary design includes the construction of an onsite engineered landfill on top of the Central Tailings pond. This location was chosen for the following reasons including:

- Central location on site and close to major mine infrastructure to minimize haul distances for disposal.
- An eastern site location is preferred to minimize or reduce haul roads crossing Highway No. 4.
- The Central Tailings pond provides a single location with enough area to be able to accommodate the volume of waste requiring disposal that could blend into the natural topography and provide adequate drainage pathways.

Currently a geotechnical engineering evaluation is being completed to determine if this location is capable of supporting a disposal cell that is suitable for the long term management of waste. In the event that this site cannot provide adequate environment protection and cannot be utilized, an alternate location will be selected.

Management of the landfilled wastes will include routine inspections of the containment berms, landfill cap and the surrounding drainage ditching. If deficiencies are noted, repairs/improvements will be completed in areas that show signs of erosion or settlement. In order to confirm that there is no detrimental impact to the environment, groundwater monitoring wells will be installed. Upon completion of the final design the location of monitoring wells, the monitoring frequency, and the monitored parameters will be determined.

Response 2

Summary of Demolition and Site Debris Wastes

The Giant Mine Remediation Project includes the demolition and removal of all site structures and utilities as well as the disposal of surface debris. To identify landfill disposal requirements, an estimate of the wastes that would be generated from the demolition of onsite buildings as well as from the removal of all surface debris was completed. This estimate was developed based on a survey of the buildings, identification and quantification of hazardous materials, and the collection and analysis of building materials. Wastes are separated into two main waste types (non-hazardous, including, wood, demolition rubble, concrete), as well as hazardous (asbestos, mercury, PCB containing electrical equipment, arsenic containing materials and chemicals, oils, etc.). The following table presents a summary of the estimated demolition and debris wastes at Giant Mine.

Table 1: Summary of Waste Volumes

Non-Hazardous Wastes	Hazardous Wastes				
General Demolition Waste (m^3)	Oils/Fuels/Liquids (m^3)	Asbestos (m^3)	Chemicals, PCBs, Mercury, ODS (m^3)	Leachable Lead Amended Paint (m^3)	Arsenic Dust/Wastes Impacted with Arsenic (m^3)
66,533	309	3,234	133	674	8,279

Classification Criteria

Wastes at the Giant Mine site are classified as being hazardous or non-hazardous by the following regulations and guidelines.

1. **Asbestos -** Materials containing asbestos greater than one percent (1%) by weight are considered asbestos containing materials in accordance with the Northwest Territories *Guideline for the Management of Waste Asbestos, September 1998*. Disposal of asbestos waste is governed by the *Environmental Protection Act – R.S.N.W.T. 1988, c. E-7, Guideline for the General Management of Hazardous Waste in the NWT* and the *Guideline for the Management of Asbestos Waste*.

2. **Mercury Containing Equipment -** Disposal of mercury waste falls under the *NWT Environmental Protection Act 1988* and the *Guideline for the General Management of Hazardous Wastes in the NWT*. According to the *General Safety Regulations* of the Northwest Territories, special precautions are required during demolition activities to ensure that worker exposure to mercury does not exceed the limits outlined in the regulations. Mercury is commonly found in pressure regulated valves, switches, thermostats, high intensity lamps and fluorescent light tubes.

3. **Ozone Depleting Substances -** The federal guideline for the use and disposal of ozone depleting substances (ODS) is the *Canadian Environmental Protection Act, Ozone Depleting Substances Regulations, 1998*. The Northwest Territories regulation related to ODS is the *Guideline for Ozone Depleting Substance, 1998*.

4. **PCB Containing Equipment** - According to the *Canadian Environmental Protection Act*, equipment and paints containing PCBs with a concentration of greater than 50 ppm are considered to be PCB containing. PCB containing items need to be treated as hazardous wastes and will require disposal at an approved location.

5. **Lead Materials and Lead Amended Paints -** Disposal of lead waste falls under the *NWT Environmental Protection Act – R.S.N.W.T.1988* c. E-7, Guidelines *for the General Management of Hazardous Wastes in the NWT and Guideline for the Management of Waste Lead and Lead Paint*. For additional information purposes, selected paint samples were also analyzed for leachable lead toxicity characteristic leaching procedure (TCLP method) in order to confirm leachable levels. There are currently no NWT acts or guidelines related to the disposal of wastes that contains leachable lead. Waste disposal regulations in many jurisdictions in Canada dictate that waste that contains leachable lead concentrations greater than 5 µg/L needs to be considered as hazardous waste. The remedial project is currently evaluating whether the guidelines adopted in other jurisdictions are applicable to the Giant Mine site.

6. **Non-Hazardous Wastes -** Non-hazardous wastes consist of solid waste that, when disposed of in a landfill or re-used, is not expected to undergo physical, chemical or biological changes to an extent as to produce substances that may cause an adverse effect. Non-hazardous wastes at the Giant Mine site consist of demolition debris, scrap metal, wood, glass, concrete, fibreglass insulation, paper products, etc.

Opportunities for material recycling and salvage are being identified and will be included in the final design.

Waste Disposal

The Giant Mine Remediation Project includes the construction of an on-site engineered landfill. Currently the preliminary design of an onsite landfill is being completed. The preliminary design includes the construction of a landfill on top of the Central Tailings pond. This location was chosen for many reasons including:

- Central location on site and close to major mine infrastructure to minimize haul distances for disposal.
- An eastern site location is preferred to minimize or reduce haul roads crossing Highway No. 4.
- The Central Tailings pond provides a single location with enough area to be able to accommodate the volume of waste requiring disposal that could blend into the natural topography and provide adequate drainage pathways.

Currently a geotechnical engineering evaluation is being completed to determine if this location is capable of supporting the proposed waste disposal facility. The main objective of the investigation is to determine the subsurface soil/groundwater conditions, the engineering properties of the underlying tailings, and to provide geotechnical recommendations to support the design and construction of the landfill. The soil testing program will include particle size distribution (sieve analysis), Atterberg limits, moisture content, density, shear strength parameters, permeability, and consolidation.

The landfill will be designed based on the volume estimates for the following materials:

<u>Non-hazardous Demolition Waste and Surface Debris</u>

All on-site buildings will be demolished and wastes will be moved for permanent disposal in the new on-site engineered landfill. Hazardous materials removed during demolition will be segregated from the non-hazardous waste and disposed of following territorial and federal regulations.

Within the mine lease boundary there are numerous areas with surface debris which include barrels, tires, pipe and used mine and mill process equipment. All non-hazardous surface debris located within the mine lease boundary will be collected and disposed of in the on-site engineered landfill.

<u>Asbestos Wastes</u>

All materials containing asbestos will be removed prior to the completion of the building demolition program. All asbestos wastes will be double bagged and placed in a dedicated portion of the new on-site engineered landfill.

Arsenic Trioxide Dusts

Arsenic trioxide dusts are known to exist in some of the onsite structures. Prior to building demolition, this dust will be collected and removed. All material surfaces will be cleaned to allow for the disposal of the waste materials to be disposed of in the on-site engineered landfill. All recovered arsenic trioxide dust, as well as materials impacted with arsenic trioxide dust that cannot be cleaned, will be placed underground in one of the existing arsenic trioxide storage chambers of the frozen zone. All water that is impacted with arsenic trioxide will be treated prior to discharge to the environment. Detailed design will determine which chamber will be utilized for the disposal of this material and how it will be transported underground.

WTP Sludge

As part of the water treatment process, sludge containing iron hydroxides with ferric arsenate, ferric antimonite, and calcium sulphate will be generated. This waste material will be deposited in a separate stand-alone facility or in a separate cell located within the on-site engineered landfill. The detailed design of this cell will be completed once the characteristics of the waste material are confirmed.

Contaminated Soils

Surficial materials around the mine infrastructure show impacts of the operation and are contaminated with arsenic and other metals (antimony, chromium, copper, lead, nickel, vanadium and zinc) as well as petroleum hydrocarbons. Soils that are identified as being contaminated above federal industrial standards and confirmed through analytical testing to be non-hazardous will be placed in the landfill as intermediate fill. Any soils classified as containing metal concentrations at hazardous levels will be hauled off site for disposal.

The following table presents a summary of the proposed disposal methods for each waste type.

Table 2: Proposed Disposal Methods

Waste Type	Proposed Disposal Method
Arsenic Trioxide Dust	On-Site – Underground Frozen Block Zone
Asbestos	On-Site - Engineered Landfill
Leachable Lead Painted Materials	Off-Site - Approved Facility
PCB containing materials and PCB amended paint products	Off-Site - Approved Facility
Chemicals and liquids including oils, greases, fuels, mercury, ozone depleting substances,	Off-Site - Approved Facility
Fuel/oil	Used on site, recycled and/or disposed offsite
Non-hazardous demolition and surface debris including; wood, steel, glass, brick, concrete, plastic, etc.	On-Site - Engineered Landfill
Water Treatment Plant Sludge	On-Site - Engineered Landfill

Note: Due to government regulations, approved offsite facilities, located outside of the NWT, will be utilized for the disposal of hazardous wastes that cannot be landfilled on the property.

Landfill Design

- Waste will be placed inside a bermed area.
- Intermediate fill consisting of granular material or contaminated soil will be used between each layer and to fill voids in the placed material. Lifts of waste will not exceed 2 m and will be compacted.
- Surface water run-off from the landfill cap will be directed to ditches surrounding the landfill. Surface water in general will be directed away from the landfill by the use of permanent ditching and berms to prevent flooding of the landfill development area. Surface water run-off and run-on will be handled in the same ditch system. Final engineering design will determine the size/capacity of the ditch system, ditch slopes as well as areas requiring armouring to prevent erosion.
- All non-hazardous lead painted debris will be placed in a dedicated portion of the landfill. To prevent infiltration through this area, a geo-membrane will be utilized as part of the landfill cap design to help prevent the migration of water into this area.
- Once all the waste is placed within the landfill it will be capped. The landfill cap will consist of a minimum of 1 m of granular material and will tie into the top of the surrounding berms.
- The final capped elevation will be limited to fit into the existing surrounding topography.

Monitoring and Long Term Management

Routine inspections of the containment berms, landfill cap, and surrounding ditching will be required to identify areas of erosion, settlement and slope failure. Ongoing maintenance will be required to address these areas.

In order to confirm that there is no detrimental impact to the environment, groundwater monitoring wells will be installed to monitor groundwater levels. Upon completion of the final design, the location of monitoring wells, the monitoring frequency and the monitored parameters will be determined.

Response 3 Summary

The calcine material is to remain in place as it is not considered a major source of current or future arsenic loadings to the creek. Should it be determined during closure activities that the clayey silt overburden material is required elsewhere on the site or that remediation options selected for Baker Creek require it, the calcine layer could be excavated and disposed with other soils identified as contaminated.

Response 3

Section 6.6.8 of the DAR presents the current proposed measures for the Calcine Pond. The bulk of the Calcine Pond and its contents were removed several decades ago and the area covered with clay material 1 to 11 m thick (DAR s.5.5.4). Studies have shown that, although the remaining material is a potential source of arsenic and antimony, the soluble concentrations of these elements are moderate, and seepage flows to Baker Creek are low due to the low permeability of the surrounding soils. The acid-

base accounting indicates that the calcine is unlikely to be acid-generating, and that major changes to the chemistry in the future are unlikely. Therefore, the calcine is not considered a major source of current or future arsenic loadings to the creek (DAR s.5.5.5.3).

The calcine material is to remain in place as it is not considered a major source of current or future arsenic loadings to the creek. However, some of the options under consideration for remediating the adjacent reach of Baker Creek would require excavation of the Calcine Pond. Also, should it be determined during closure activities that the clayey silt overburden material is required elsewhere on the site, the calcine layer could be excavated. The calcine material would then be disposed with other soils identified as contaminated.