Underground Stabilization Detailed Project Description

1.0 Introduction

1.1 Application Type and Scope

Aboriginal Affairs and Northern Development Canada (AANDC) is applying for a Type B water licence to undertake underground stabilization work on behalf of the Giant Mine Team consisting of (AANDC) and the Government of the Northwest Territories (GNWT), 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 deconstruction work will be conducted by private sector contractors procured through PWGSC.

The proposed underground stabilization work will mitigate the potential for failure of the underground stopes and chambers and migration of arsenic trioxide stored underground through the following actions:

- Reinforcing and constructing new bulkheads;
- Increasing the support under arsenic trioxide chamber crown pillars by backfilling voids with lightly cemented tailings paste or cementitious foam; and
- Stabilizing non-arsenic trioxide filled chambers by backfilling with waste rock, surface sourced materials such as quarried rock, lightly cemented tailings paste, or cementitious foam.

1.2 Rationale for Submitting Application

The underground stabilization work is part of the ongoing environmental assessment (EA0809-001) for the Giant Mine Remediation Project (GMRP). However, recent events at the Site and assessments by independent engineers continue to identify evidence of deteriorating/weakening conditions in the underground, including:

- Surface tension cracks in the area of arsenic stopes B2-12/13/14 (Golder, 2011) and B208 (Golder, 2012);
- Level survey data indicating subsidence of the ground surface along the B1 Pit Access Road (Golder, 2011);
- Observed deterioration of accessible bulkheads (AECOM, 2012) which could lead to increased seepage of arsenic sludge through the bulkheads;
- Thin crown pillars above non-arsenic stope B3-06; and
- Loss of fill material in C5-09.

This evidence builds upon the risks to the environment and human health and safety identified by SRK Consulting (Canada) Inc. in 2005, 2006 and 2010, which are summarized below:

- Continued deterioration over time or failure of bulkheads, which are concrete or cemented tailings plugs designed to contain arsenic trioxide dust within chambers, may result in arsenic trioxide dust or arsenic contaminated water migrating deeper into the underground workings and/or into Baker Creek and ultimately Great Slave Lake.

- Cracking or failure of crown pillars, the masses of rock situated above underground workings, increases the risk of surface waters entering the underground workings and loss of arsenic from the underground chambers to the environment. Sinkholes or cracks may also form on the surface, which create a physical hazard to people travelling through or working in the area. Arsenic Trioxide Chamber B208 is of particular concern because it is adjacent to Highway 4 – Ingraham Trail. These risks were acknowledged as well by Golder Associates in 2011 and 2012.

In addition to these environmental and human health and safety risks, an underground collapse resulting in arsenic being released into deeper portions of the mine could also put the viability of the frozen block method at risk. A new approach to stabilizing the underground arsenic trioxide would have to be developed (AANDC, 2011). Reports from independent engineers that describe the condition of the underground stopes and chambers are provided under Tab XX in the application package.

Due to the urgent and serious nature of these risks to human health and safety and the environment, an accelerated regulatory timeline is considered necessary. Therefore, using the provisions of Section 119 of the *Mackenzie Valley Resource Management Act*, AANDC is requesting that the Mackenzie Valley Land and Water Board (MVLWB) proceed to the licensing of the underground stabilization work prior to the completion of the environmental assessment. This application has been timed to allow the underground stabilization work to advance through the environmental assessment process for as long as possible while still ensuring sufficient time to complete the Type B licensing process prior to the anticipated start date of the work (approximately May 2013).

2.0 Detailed Project Description

2.1 Project Location

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 is now under City Lease 17889T, and an area of historic tailings deposition along the shore of North Yellowknife Bay.

The underground elements that will be stabilized include underground stopes, chambers and bulkheads that are clustered near the B1 and B2 open pits; on the west side of the Mill near Highway 4; and at the north end of the roaster complex as shown on Figures 3, 4a and 4b. Site infrastructure is shown on Figure 5.

AANDC recognizes the *Standards for Geographic Information Systems (GIS) Submissions* issued by the MVLWB on March 1, 2012 and the requirement to submit electronic data in ArcView compatible formats. 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.

Figure 1 – Location of Giant Mine and Surrounding Features

Figure 2 – Giant Mine Lease Boundary

Figure 3 – Underground Chambers and Stopes
please note that an updated map is being prepared to reflect the stope names used in the text

Figure 4a – Existing Upper Bulkheads
Note: Not all bulkheads shown require reinforcement. Further drilling and investigation will confirm the target bulkheads

Figure 4b – Existing Lower Bulkheads
Note: Not all bulkheads shown require reinforcement. Further drilling and investigation will confirm the target bulkheads

Figure 5 – Site Infrastructure

2.2 Giant Mine Site History

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 (Figure 3). 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 (Figure 2).

The Site is currently under care and maintenance as the GMRP undergoes environmental assessment (EA0809-001). Care and maintenance activities adhere to the conditions set out in former Water Licence N1L2-0043.

2.3 Detailed Description of the Underground Stabilization Work

2.3.1 Description of the Underground Elements Targeted for Stabilization

The underground elements targeted for stabilization include arsenic filled chambers and stopes, empty (i.e. non-arsenic filled) stopes, and bulkheads connected to arsenic filled stopes as identified below (Figures 3, 4a and 4b):

- Arsenic filled stopes and chambers B2-08 and B2-12/13/14;
- Non-arsenic filled stopes C3-12/5-09, B3-06 and B2-02/18 that are immediately adjacent to arsenic filled stopes;
- Non-arsenic filled stopes B3-01/3-02, 3-70, 2-18/19 and 1-18/19 that are under and adjacent to Baker Creek;
- Non-arsenic stopes A2-01 and 1-43 that are under and adjacent to publicly accessible areas including Highway 4; and
- Up to 33 bulkheads, including Bulkheads 11, 22, 33, 35, 47, 48 and 49. The remaining bulkheads will be confirmed through the drilling investigation program.

2.3.2 Stabilization Program

Award of the contract to carry out the underground stabilization work is anticipated to occur in late winter/early spring 2013 which will be immediately followed by an engineering review/planning period, mobilization to the Site, and on-the-ground work as discussed below. The primary objectives of the work include:

- Reinforcing existing and construction of new bulkheads to prevent arsenic trioxide within the chambers from spreading deeper into the underground workings or into the environment;
- Filling the voids between the arsenic trioxide dust and the crown pillars in the underground chambers and stopes to prevent failure or collapse;
- Filling empty stopes adjacent to arsenic trioxide filled chambers to prevent a “domino effect” Failure that releases arsenic trioxide dust deeper into the mine or to the environment; and
- Filling empty stopes in sensitive areas such as those under Highway 4 and Baker Creek to prevent sinkholes, surface cracks and other surface deformations from forming that may either permit water to enter the underground workings or create physical risks to worker and public safety.

In general terms, underground stabilization activities include:

a) **Engineering Review/Planning –** Since the current condition of the crown pillars and bulkheads are not known in detail, the data generated by drilling, and borehole camera and cavity monitoring surveys carried out under Land Use Permit MV2012S0019 will first need to be reviewed before beginning any on-the-ground work. This engineering review will result in the development of a Stabilization Plan that describes in detail the stabilization needs for each targeted stope, chamber and bulkhead as listed below. Development of the Stabilization Plan may be sequenced to correspond with the timing of data availability for each targeted stope and chamber, resulting in individual plans for each underground element.

   The selected contractor will be responsible for preparing the Stabilization Plan(s) that includes the following content at a minimum:

- Type of backfill material required which may be one or a combination of tailings paste, cementitious foam, waste rock from mine development, or surface sourced inert material (e.g., quarried rock);
- Volume of each backfill material required;
- Detailed methodologies for carrying out backfilling of the chambers and repairing/reinforcing bulkheads;
- Health and safety plans;
- Detailed plans to mitigate potential effects to the environment and issues related to tailings excavation including:
    - Effect on future tailings cover geometry and drainage
    - Management of wet or frozen tailings if encountered
    - Ensuring acceptable grain size range of tailings as there can be no slimes used in making paste
    - Seasonal effects (during freshet and rainfall events water collecting in the excavated areas within the South and Central tailings ponds will need to be pumped away from the excavation)
    - Operational dust control (wetting of tailings during excavation and paste production using treated minewater)
    - Operational water management (treated minewater usage associated with dust control and wash down of equipment)
    - Disposal of waste materials such as wood, barrels and scrap metal encountered in the tailings
    - Cross-highway transport of tailings to temporary stockpiles (trucked or piped); and
- Spill contingency plans specific to the underground stabilization work that align where appropriate with the Emergency and Spill Contingency Plan prepared by the current Care and Maintenance Contractor, Nuna/Deton Cho Joint Venture .

b) **Backfill of Underground Elements –** The detailed methodologies presented in the Stabilization Plan(s) will be implemented as appropriate by the selected contractor and will depend on the type of backfill material selected for each underground element. General methodologies for each type of backfill material are provided below.

<u>Lightly Cemented Tailings Paste</u> – *see Figure 6 for a conceptual flow sheet*
Lightly cemented tailings paste will be used in the backfilling of both arsenic and non-arsenic stopes. Tailings for paste production will be obtained from the South and Central Tailings Ponds (Figure 5), which are expected to have relatively dry material, at an approximate ratio of one third from the South Pond and two thirds from the Central Pond. The specific volume of tailings to be excavated will be determined by the selected contractor.

A 40- to 50-tonne excavator, or equivalent equipment, will be used to transfer material from the tailings ponds to two 40-tonne rock trucks, which will then transport the tailings to a temporary local stockpile adjacent to each target location. Dust covers will be used during all transport and temporary stockpiling of tailings and local stockpiles will be underlain by a geotextile to prevent the spreading of tailings to surrounding lands. Local stockpiles will contain sufficient tailings for approximately two days of operation, except at locations requiring transport across Highway 4 which will need larger stockpiles to minimize highway crossing by heavy equipment.

A 35-tonne excavator, or equivalent equipment, will work with a mobile paste production system consisting of a mixer truck with an operating rate of 100 m^3/hour, a water truck or tank (30,000 litre capacity most likely but will be confirmed by the contractor), and a cement truck to produce the tailings paste. Laboratory tests are currently being undertaken to determine final paste mix design, including binder content (i.e. cement). A quality assurance/quality control program will be developed to test the material at each pour to make sure objectives are being met. Should the material coming out of the tailings ponds be significantly wetter than anticipated some blending, dewatering or extra solids addition may be required in addition to increased binder content.

Once the paste consistency is within target, the paste will be pumped into the underground through boreholes using a pumper truck with an operating rate of 100 m^3/hour or via gravity flow if distances are sufficiently short. The pump and piping will be instrumented with pressure transmitters wired to a laptop to record pressure fluctuations in the line and pump to monitor the filling of the targeted underground voids and to alert the operator when the void is nominally full. In addition, cameras will be used in adjacent boreholes to help verify the "tight-filling" that is required to fully stabilize the underground elements.

<u>Cementitious Foam</u> – *see Figure 7 for a conceptual flow sheet*
Cementitous foam will be used in the backfilling of arsenic and non-arsenic filled stopes. The specific production process for cementitious foam to be used at the Site will be determined by the contractor and will depend on the formulation selected. The basic process involves aeration and stabilization of a cement slurry using chemical admixtures that is then pumped into the targeted void space.

<u>Mine Development Rock or Surface Sourced Inert Material</u>
Bulk fill materials such as mine development rock and surface sourced inert material such as quarried rock will be used in the stabilization of empty or non-arsenic stopes. For safety reasons, rock will not be used to fill the arsenic trioxide chambers. The mine development rock will be generated during the excavation and rehabilitation of the underground workings needed to access some of the bulkheads (see item d below). Quarried rock will be sourced primarily from existing stockpiles on site but fresh rock may need to be quarried, depending on the ultimate volume of bulk fill material required. The volume of fresh quarried rock required and

potential source locations will be determined by the contractor. Quarry permits from the GNWT will be applied for as appropriate.

c) **Exhaust Air Control and Treatment** – As the voids above arsenic trioxide dust are filled, the air within the voids will be displaced. To prevent the displaced air from moving into other part of the underground workings and potentially carrying arsenic dust into underground work spaces, exhausted air will need to be controlled and directed to the surface. Design of and operating procedures for the exhaust air system (flow, pressure, filtration and dust disposal) will be developed by the selected contractor.

d) **Reinforcement of Bulkheads** - Bulkheads are concrete or cemented tailings plugs designed to contain arsenic trioxide dust within underground chambers and many of them are exhibiting signs of deterioration (Figure 4). Bulkheads will be reinforced or constructed as necessary using materials such as cement, tailings paste, or cementitious foam. Remote technologies may be used to place materials at inaccessible bulkheads to eliminate human safety risks

While some of the bulkheads are accessible, some of the bulkheads are currently blocked or are located in unsafe sections of the underground workings. To reach these inaccessible bulkheads, short sections of the underground workings may need to be rehabilitated or newly excavated. This underground mine development work will generate waste rock but all of it will be relocated to the non-arsenic trioxide chambers without ever being brought to the surface.

Figure 6 – Conceptual Flowsheet for Tailing Paste Manufacture

Figure 7 – Conceptual Flowsheet for Cementitious Foam Manufacture

2.3.3 Water Usage and Management

The use of recycled water is an important part of the proposed project design to limit the volume of freshwater required, although freshwater will be required. Recycled water will be used in paste production and freshwater will be used for domestic sanitation purposes and possibly in the production of cementitious foam. Further details on the two water use needs are provided below:

a) **Recycled Water** – Treated mine water will be obtained at a rate of less than 200 m^3/day from the Polishing Pond (Figure 5) to manufacture paste and cementitious foam and to control dust. This rate will vary significantly over the year because the work is limited to the warmer months and water requirements depend on the type of fill being manufactured. Tailings paste manufacturing requires significantly less water than cementitious foam manufacturing. Water sampling results for the Polishing Pond, as shown in Table 1 demonstrate that the quality of treated mine water meets the effluent quality criteria set out in the former Water Licence N1L2-0043, which are provided in Table 2.

b) **Freshwater -** Fresh water for domestic sanitation purposes (washing and toilet facilities) will be obtained from water storage tanks to be installed by the selected contractor and filled with trucked water from the City of Yellowknife on an as needed basis. The size, configuration and exact location of the water storage tanks will be determined by the selected contractor and the daily water use rate will vary depending on the types of backfill being used each day. However, maximum daily water use will not exceed approximately 10 m^3 per day.

Table 1 – 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

Parameter	Units	Average Concentration	Maximum Concentration
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.

Table 2 – 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 mg/L	1.0 mg/L
Total Copper	0.30 mg/L	0.60 mg/L
Total Cyanide	0.80 mg/L	1.60 mg/L
Total Lead	0.02 mg/L	0.40 mg/L
Total Nickel	0.50 mg/L	1.0 mg/L
Oil and Grease	N/A	5.0 mg/L
Total Suspended Solids	15.0 mg/L	30.0 mg/L
Total Zinc	0.20 mg/L	0.40 mg/L
pH	N/A	6-9.5

2.3.4 Fuel Use

Only diesel is required for the proposed project for fuelling machinery and will be obtained from the existing one 100,000 litre double-walled diesel tank located at the Site (Figure 5; UTM Zone 11V 636098.25 mE and 6932528.76 mN). Heavy machinery will either be fuelled directly from the double walled diesel tank or from Tidy Tanks located in the back of up to 10 light vehicles (i.e. pick-ups) that may be on the Site at any one time. The Tidy Tanks will be filled from the double-walled diesel tank as required.

The existing tankfarm, which is registered with Environment Canada and conforms to the *Petroleum and Allied Petroleum Products Storage Tanks Regulations,* is underlain by an existing pad and will be inspected daily to confirm the absence of leaks. In addition, drip pans and spill pads as required will be used during refuelling and a spill kit rated to deal with a 1000 litre spill will be located near the double walled tanks at all times. All light vehicles will also be equipped with spill response equipment (absorbent materials, shovels and empty drum) sufficient to manage a 450 litre spill and the light vehicle beds will be inspected at each refuelling event or daily (whichever is more frequent).

3.0 Potential Effects of Proposed Project

The fundamental objective of the GMRP is to improve the environment and prevent adverse effects that would otherwise occur if no remediation activities were undertaken. The proposed activities within this application are inherently positive as they will ultimately prevent emergencies from occurring at the Site that could endanger human health and safety and the environment. In addition, the Giant Mine is a recognized contaminated site and all activities will take place in areas previously disturbed by intensive mining activities. However, the implementation of the proposed activities may result in short term and local effects to the environment (including biophysical, cultural, social and economic aspects). The potential effects and proposed mitigations are identified in Table 3.

Table 3: Potential Impacts of the Proposed Project and Mitigations

Potential Project Effect	Proposed Mitigations
Land disturbance	• No new land disturbance is expected as all activities will occur on areas previously disturbed by over 50 years of mining activity.
Surface water quantity – None expected	• No impacts to surface water quantity and flows are expected as water use will be limited to recycled water and trucked water from City. • A smaller volume of water will be returned to Baker Creek but this would be returning Baker Creek to its natural hydrological regime.
Impacts to soil and surface water quality - Hydrocarbon spills to the environment Refuelling machinery, failure of machinery	• Maintaining spill kits at each work site will ensure small spills can be cleaned up immediately and impacts are localized and temporary. • Development of and training in the use of a spill

components (e.g., hoses), or failure of fuel tanks may impact surface water and soil quality if releases occur.	contingency plan will ensure spills are responded to effectively, in a timely manner, and appropriate notifications are made. • Double-walled tanks are used at the main fuel tank farm. • Contractors on site must wear appropriate personal protective equipment to protect their health.
Impacts to soils and surface water quality – tailings or tailings paste spills to the environment During transport of tailings to the temporary stockpiles and during injection of paste into the underground, tailings may spread to surrounding lands and waters.	• The selected contractor will be required to develop operational procedures that minimize the risk of spills. • Development of and training in the use of a spill contingency plan will ensure spills are responded to effectively, in a timely manner, and appropriate notifications are made. • Spilled tailings will be returned to the source tailings ponds or placed in one of the larger underground chambers. • Equipment used in the tailings ponds and to manufacture tailings paste will be washed as necessary to prevent the spread of tailings around the Site.
Air quality impacts – emissions from combustion engines and tailings dust generated during the transport and temporary stockpiling of tailings may be released to the atmospheric environment.	• Contractors brought to site are responsible for using well-maintained equipment, which will help to minimize combustion engine emissions. • The selected contractor will be required to use dust covers during transport of tailings and on inactive temporary stockpiles near the target backfill locations. • Overall impacts to air quality will be outweighed by the positive effects resulting from stabilizing the underground.
Air quality impacts – Contaminated dust plume generated during backfilling of arsenic trioxide filled chambers. Air displaced during the filling of void space in arsenic trioxide filled chambers will be exhausted to the surface.	• A specialized contractor will design and develop the operating procedures for an exhaust air system based on negative air pressure to capture and filter displaced air prior to releasing it to the atmosphere. This will prevent displaced air contaminated with arsenic dust from entering the underground workings or the atmosphere. • Current operational and spill response procedures related to arsenic trioxide dust are provided under Tab XX in the application package. • Air quality monitoring requirements and criteria that will be adhered to during backfilling work are provided under Tab XX in the application package (note, these remain underdevelopment). • Ambient air quality monitoring will be carried out according to the plan provided under Tab XX in the application package. (note, these remain underdevelopment).
Noise emissions – equipment use will result in	• Contractors on site must have appropriate personal

increased noise in the area, potentially disturbing wildlife in the area and creating human health hazard.	protective equipment, including ear plugs. • Heavy machinery will be equipped with standard industrial noise suppression devices. • Increases in noise levels will be short term and will be outweighed by the positive effects of stabilizing the underground.
Wildlife disturbances – presence of machinery and people on site may disturb terrestrial species that might otherwise be on site or their on-site living spaces.	• Workers will be prohibited from harassing or feeding wildlife. • Domestic refuse and other potential wildlife attractants will be managed in accordance with the Waste Management Plan to minimize potential human-wildlife interactions.
Effect on Future Tailings Cover Geometry and Drainage – excavation of tailings from the South and Central Ponds will change the current topography and sediment profile of the source tailings ponds which will have to be taken into consideration during detailed engineering design of the tailings covers.	• The volume of tailings excavated will be insignificant compared to the volume of tailings within the South and Central Tailings Ponds. • The current topography of the source tailings ponds is far from what final grades will be; therefore, future reclamation work can address any surficial changes resulting from the excavation.
Management of Wet or Frozen Tailings – wet or frozen tailings may be encountered during excavation in the South and Central Tailings Ponds.	• Water within the South and Central tailings ponds currently seeps into the underground workings which is captured by the underground water management system. This water management system ultimately directs all captured water to the surface for treatment in the effluent treatment plant.
Groundwater quality – none expected	• The use of cementitious foam will produce zero bleed water. • Very little bleed water will be generated by the paste because the backfill material needs to be dry in order to be successfully used as a stabilizing material. Any water that is produced during fill placement will be captured by the underground water management system currently in place and be directed to the surface for treatment through the effluent treatment plant. • Failure of a bulkhead or crown pillar during the work may release arsenic to groundwater, which could then reach the surface environment. The selected contractor is required to develop spill and emergency response procedures that will address this possibility. These procedures will be provided to the MVLWB when they are completed.
Economic impacts – the socio-economic impacts accruing from the remediation program are expected to be largely positive due to the tendering process.	To enhance regional socio-economic benefits, all contractors bidding on the remediation project will be required to submit Aboriginal Opportunity Considerations (AOC). Each AOC will specify the commitment of the contractor to Aboriginal

	employment, sub-contracting and training. AOCPs with greater commitments to Aboriginal content will receive higher scores. The AOC commitments will be enforced through contractual obligations.
Disturbance to cultural and heritage resources – a search of the Prince of Wales Northern Heritage Centre's Archeological Sites Database in April 2012 revealed the presence of four prehistoric sites within the Giant Mine lease area. In addition, a number of on-site buildings have been identified as having potential heritage value.	• Contractors will be informed that encountering cultural sites is possible and will be instructed to not disturb any artefacts or sites that may be of cultural value. The Yellowknives Dene First Nation and the Prince of Wales Northern Heritage Centre will be contacted immediately for direction if a cultural resource is suspected. None of the buildings identified as having potential heritage value will be disturbed by the proposed activities. • All proposed activities will take place in areas previously disturbed by over 50 years of mining activity. • The ongoing archaeological studies being carried out by the YKDFN will add to the knowledge of culturally important areas within the Site.

4.0 Proposed Remediation Plan for the Underground Stabilization Work

Remediation activities associated with proposed underground stabilization activities will take place progressively as work advances, at seasonal closures if applicable, and at the end of the project. The core activities undertaken at each of these stages will be similar and include the following:

(i) Removal and disposal of garbage and spent consumables generated as part of the underground stabilization activities in accordance with the Waste Management Plan provided under Tab XX in the application package.

(ii) Any spills at the work sites or the fuel tank farm will be dealt with immediately upon their occurrence in accordance with the Emergency and Spill Response Plan provided under Tab XX in the application package and subsequent plans provided by the contractor. A final inspection of the project work area will occur to identify any additional actions that need to be taken to clean up soils contaminated by the proposed activities.

If seasonal hiatuses in the work occur, the actions listed above will be taken and a final inspection will take place to ensure the project work area has been fully cleaned up. In addition, the heavy machinery and light vehicles used as part of the proposed project may be removed from the Site as the equipment is not owned by AANDC. The contractors are responsible for supplying the necessary machinery to complete the proposed project and the machinery may be required for unrelated projects in which the contractors are involved.

At the end of the proposed project, a final inspection of the Site will take place to ensure that the two actions (i and ii) listed above were properly carried out and all machinery has been removed. Since the project work area is within the geographic scope of the GMRP, the work areas will also undergo remediation in accordance with Giant Mine Remediation Plan once it receives the necessary approvals.

5.0 References

Provided under Tab XX in the application package.

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