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**GENERAL DESCRIPTION OF WORK – ARSENIC STOPE BACKFILLING – FY 2014/2015 BACKFILL
TENDER ADDENDUM, GIANT MINE, NT**

Dear Mr. Thompson,

Golder Associates Ltd. (Golder), at the request of Public Works and Government Services Canada (PWGSC) has developed a general work description for paste backfilling of arsenic stopes B2-08 and B2-12/13/14 at the Giant Mine Remediation Project site. We understand this work may form a portion of an addendum to the Interim Underground Stabilisation Activities (IUSA), Giant Mine, Yellowknife, NT (EW702-131876/F).

This information represents a general work description for backfilling arsenic stopes for the purpose of informing bidders of potential additional work to the IUSA contract. Detailed drawings, conceptual mitigation plans, and specifications will be provided at a later date once the approach to the work has been agreed upon and additional investigations and assessments related to the current drilling program are complete.

1.0 GENERAL PROGRAM OBJECTIVES

The general objective of this program is to mitigate the identified risks of underground stability associated with arsenic stope B2-12/13/14 and B2-08 at the Giant Mine with the specific goals of:

- 1) Backfilling the defined individual voids associated with a specific arsenic stope complex with paste (i.e., tailings, water, and binder) to a defined level (fullness criteria) with a specified strength (uniaxial compressive strength).
- 2) Completing the arsenic stope backfill program by March 31, 2016.



2.0 DESCRIPTION OF WORK

Arsenic stopes B2-12/13/14 and B2-08 are situated near the B1 pit on the Giant Mine site as shown in Figure 1.

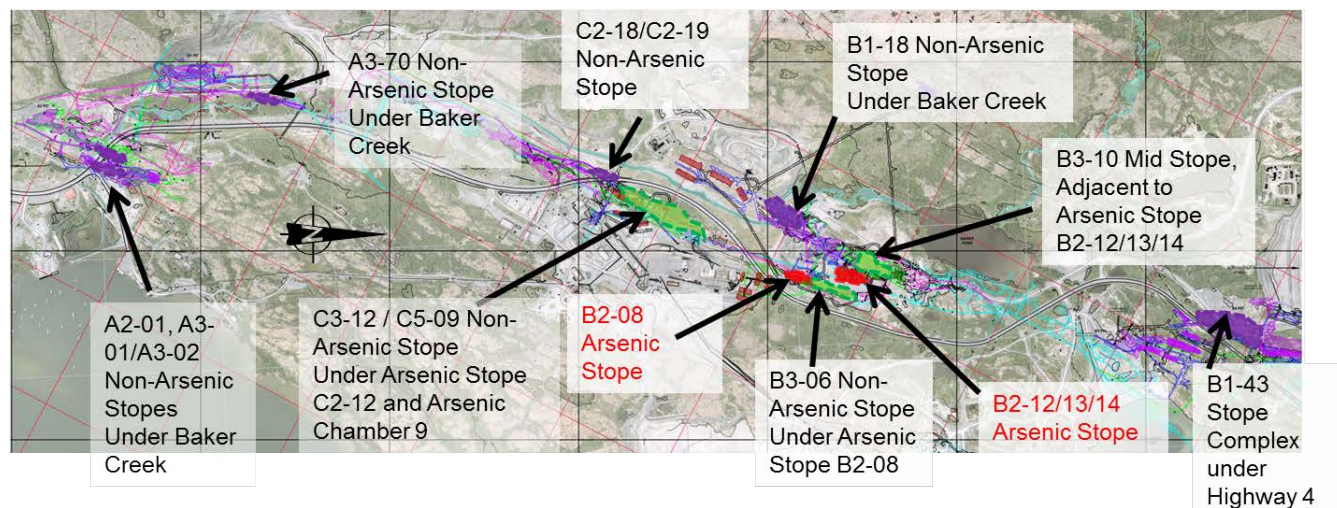


Figure 1: Location of Arsenic Stopes B2-12/13/14 and B2-08 Relative to Other Stopes to be Mitigated

The total volume of backfill required for the two (2) arsenic stopes is approximately 16,500 m³. The volume of backfill required to be added to stope void above the dust (topping up) is relatively low as the voids were mostly filled with arsenic dust during production. However the lower and intermediate arsenic bulkheads may need to be reinforced prior to placement of topping up the void above the arsenic dust and additional paste backfill will be required for this. The decision will depend on the results of an ongoing arsenic stope characterisation program, which includes drilling.

Accessible lower and intermediate arsenic bulkheads will be reinforced by either placing rockfill against them or by building fill barricades and injecting paste in front of the barricades. Inaccessible lower and intermediate arsenic bulkheads will be reinforced by adding paste backfill to the non-arsenic side (clean side) of the bulkhead. Some of the non-arsenic stope backfill to be placed as part of the EW702-131876/F tender will reinforce several of the arsenic bulkheads. The remainder will be dealt with in this scope of work.

Future remedial plans include drilling freeze holes near the arsenic stopes and backfilling openings close to them are beneficial to drilling and ultimately freeze efficiency.

Multiple individual voids associated with each arsenic stope that requires backfilling and the approximate volume of each is listed in Table 1.

Table 1: Estimated Backfill Volumes for Individual Voids Associated With Arsenic Stopes

Arsenic Stope	Individual Void	Void Volumes (m ³)
B2-12/13/14	Void on top of arsenic dust	2,000
	2 nd / 3 rd level drift and raise backfill to support lower arsenic bulkheads	500
	1 st level drift and raise backfill to support intermediate arsenic bulkheads	1,500
	Arsenic distribution drift and raise backfill to support upper arsenic bulkheads and block inspection ports	1,000
	Fill non-arsenic stope B2-06/07 to reinforce intermediate arsenic bulkheads	3,000
	Sub-total for B2-12/13/14	8,000

Arsenic Stope	Individual Void	Void Volumes (m³)
B2-08	Void on top of arsenic dust	3,000
	2 nd level drift backfill to support lower arsenic bulkheads	3,000
	1 st level backfill to support intermediate arsenic bulkheads	1,500
	Arsenic distribution drift backfill to support upper arsenic bulkheads and block inspection ports	1000
	Sub-total for B2-08	8,500

Approximately ten (10) conventional and remotely (borehole) constructed fill barricades are required to complete the backfilling as summarised in Table 2. Each barricade will be between approximately 100m³ and 300m³ in volume.

Table 2: Estimated Number of Barricades, by Type, Required to Backfill Arsenic Stopes

Barricade Type	Arsenic Stope B2-12/13/14	Arsenic Stope B2-08
Conventional barricade for accessible arsenic bulkheads	3	3
Low slump paste tailings drift barricades delivered via. boreholes required for placement of paste to reinforcement of inaccessible arsenic bulkheads	3	1

The physical work will eventually be detailed in the tender document specifications to achieve the program objectives, but it will include the following site activities (not necessarily in order). Other work required to support these physical activities is outlined in the tender specification document. Many of the activities listed below are identical to those required for the EW702-131876/F IUSA tender backfilling of non-arsenic stopes (40,000 m³) and can likely be carried out in parallel.

- Excavate and process tailings from any of the south, central, and north tailings ponds to produce paste of sufficient quantity to meet the required material specification.
- Deliver processed tailings to the various paste production areas.
- Execute infill drilling of required backfill delivery boreholes (i.e. most boreholes will be in place).
- Determine required upgrades to underground ground control system and infrastructure (to be completed by C&M contractor) required to support underground activities by contractor (work anticipated would be construction of fill barricades).
- Design, install, and operate any required underground paste delivery slick lines (pipelines).
- Design and install conventional barricades to reinforce existing accessible arsenic bulkheads prior to backfilling the arsenic voids.
- Design and install remote (via boreholes) barricades to contain paste that will be later injected for the purposes of reinforcing inaccessible arsenic bulkheads (see point below).

- Design, install, and operate an underground backfill monitoring system to measure the level of paste in the targeted voids to be backfilled and to monitor drifts connected to arsenic bulkheads.
- Design and construct required surface pads and liners required for paste delivery areas.
- Mix paste from tailings, water, and binder.
- Execute QC testing of the paste material to ensure it meets the material specification.
- Inject paste into existing boreholes to backfill voids associated with arsenic stopes to a level outlined in the specifications.
- Manage (i.e. filter) air exhaust from boreholes during backfilling of arsenic stope voids holes.
- Verify that voids are full to determined level.
- Restore tailings excavation areas.

Other tasks associated with development of Health, Safety, and Environment plans and emergency preparedness planning are outlined in detail in the tender documentation.

2.1 Arsenic Drift Backfill and Arsenic Void Backfill

During production arsenic dust was pneumatically injected into purpose built arsenic stopes and chambers. The dust was contained in these mined out voids by constructing bulkheads in the development openings used to create them. Ongoing assessments will determine if the lower and intermediate bulkheads need to be reinforced prior to injecting paste in the arsenic void on top of the dust.

Many of the arsenic bulkheads connected to arsenic stopes B2-12/13/14 and B2-08 are currently inaccessible. Some arsenic bulkheads are only accessible via timbered manways and areas that do not have active ventilation and construction of conventional barricades would require extensive ground support rehabilitation and mine infrastructure upgrades.

If a decision is made to reinforce some of these bulkheads by injecting paste backfill into the drifts they are connected to (on the non-arsenic side of the bulkhead) it will be added using boreholes drilled from surface.

Once the drifts connected to lower or intermediate arsenic bulkheads are filled with paste (if so determined), the voids above the arsenic dust will be filled with paste via boreholes drilled from surface.

Work required to secure upper arsenic bulkhead inspection hatches prior to backfilling the arsenic stope voids will be carried out by the C&M contractor.

Because the arsenic stopes were purposely sealed to allow the pneumatic placement of arsenic trioxide dust it is anticipated that injection of paste will cause differential atmospheric pressure within the chamber which will dissipate through connected drillholes and open upper arsenic drift bulkhead inspection hatches.

The proponent will be responsible for containment of arsenic dust that might exit the arsenic stope void during backfilling through boreholes connected to surface. Measures may include the use of filters connected to observation / ventilation boreholes drilled into the arsenic stope voids and the borehole being drilled.

It is anticipated that the arsenic dust may consolidate under the added mass of the paste backfill but the extent of this potential consolidation is unknown at this time. Some contingency paste volumes relative to the surveyed arsenic stope void volume have been included in estimates provided in Table 1.

3.0 ARSENIC STOPE DESCRIPTIONS

Descriptions of the arsenic stopes to be backfilled and the bulkheads connected to them including discussion on potential mitigation approaches is outlined in the following sections.

3.1 B2-12/13/14 Arsenic Stope

This mitigation is aimed at providing support to crown pillar above the B2-12/13/14 arsenic stope void.

Mine plans provide various interpretations of the geometry of this arsenic stope void which include some indications that pillars between the three stope voids were mined or have failed. Therefore this arsenic stope is commonly described as one opening – the B2-12/13/14 arsenic stope.

The 2D mine plans for this stope have not yet been fully developed and the 3D digital model requires significant updates. Limited on-site investigation and inspection of the area has been carried out. For these reasons, no conceptual mitigation plan has been developed for the area and the void volume assessments are rough at this time.

The void on top of the dust placed in the B2-12/13/13 arsenic stope has been assessed previously via borehole cavity monitoring surveys as no safe physical access to the void is possible.

There are total of fourteen (14) arsenic bulkheads located on multiple levels connected to arsenic stope B2-12/13/14. Many of the arsenic bulkheads connected to arsenic stope B2-12/13/14 are currently inaccessible. Some arsenic bulkheads are only accessible via timbered manways and areas that do not have active ventilation and construction of conventional barricades would require extensive ground support rehabilitation and mine infrastructure upgrades.

3.2 B2-08 Arsenic Stope

This mitigation is aimed at providing support to crown pillar above the B2-08 arsenic stope void.

The void on top of the dust placed in the B2-08 arsenic stope has been assessed previously via borehole cavity monitoring surveys as no safe physical access to the void is possible.

The upper arsenic distribution drift through which the arsenic dust was deposited into the stope is still accessible and with rehabilitation could provide access to the inspection hatches at the arsenic injection locations. These locations could possibly be used for fill placement through a pipe fill distribution system as an alternative to drill holes from the surface. At this time the plan is to backfill the stope via surface boreholes.

There are a total of nine (9) arsenic bulkheads located on multiple levels connected to arsenic stope B2-08. As outlined in the criteria discussed previously, lower and intermediate arsenic bulkheads may need to be reinforced with cemented paste prior to injection of paste in the arsenic chamber.

4.0 CLOSURE

We trust this general work description for paste backfilling of arsenic stopes B2-08 and B2-12/13/14 at the Giant Mine Remediation Project site satisfies your requirements at this time.

Yours very truly,

GOLDER ASSOCIATES LTD.



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