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<b>Cc:</b>	Javier Toro (Vice President, Technical Services), Aaron Vesladahl (Senior Field Engineer), and Isabel Felipe (Environmental Engineer)
<b>From:</b>	Samantha Valentine (Mine Planning Engineer)
<b>Date:</b>	October 30, 2023
<b>Subject:</b>	Typical Closure Methods for Underground Workings - Copper World Project – Item 10a of ADEQ's June 23, 2023 Information Request, Revision 1

## Purpose

This memo provides closure concepts for historic mine adits and shafts (mine workings/features) that may be encountered within the footprint of planned infrastructure at the Copper World Project (CWP). In addition to the goal of protecting both the planned infrastructure and groundwater resources, this memo also lays out a framework for a safe and sustainable approach to dealing with these historic mine workings - during both construction and mining operations.

Appendix B of the September 2022 aquifer protection permit (APP) application for the Copper World Project contained the following memorandum by Wood Environment & Infrastructure Solutions, Inc. (Wood):

- Preliminary Geologic Hazard Assessment, Rosemont Copper World Project dated January 12, 2022

As part of Woods assessment, historic mine workings were identified within the footprint of Tailings Facility No. 1 (TSF-1), the waste rock facility (WRF), and the open pit areas. Most of the features are small surface prospect workings that are no more than a few feet in diameter and depth and would likely have little impact on construction or mining activity. Others are more extensive in nature, especially those within the planned open pit areas. Figure 2 was provided in Appendix B.1 Preliminary Geologic Hazards Assessment (Wood, 2022b) of the September 2022 APP application showing the locations of these historic mine workings. No historic mine features were noted within the footprint of TSF-2, the heap leach facility area, or the plant site area.

## General Closure Approach

The following general closure approach applies to historic mine workings having the potential for affecting facility construction, the environment, or operations.

- ✓ **Survey and Assessment:** Before initiating closure, a detailed survey and assessment of the mine workings are conducted to gather information about its dimensions, stability, and any potential hazards. This assessment helps determine the appropriate closure method and any necessary precautions.
- ✓ **Safety Preparations:** Safety measures are implemented to protect workers involved in the closure process. This includes creating a safe work area around the shaft or adit, etc. Entry into the mine workings is not planned.
- ✓ **Removal of Debris:** As needed for effective closure operations and considering equipment reach limitations, debris present in the adit or shaft entrance is removed prior to closure. The final condition of the entrance may require adjustments to the planned closure strategy.

- ✓ Backfilling: Where required, backfilling the mine workings with non-acid generating (NAG) material will be employed at the Copper World Project site. Differences in the backfilling approach and final surface preparation will depend on the size and location of the mine feature, including the final condition of the entrance. Detailed design of the closure method and approach will be required as part of foundation preparation where required, such as for the TSF-1 area. Backfilling is a common method for closing mine shafts. It involves filling the shaft with suitable materials to provide structural stability and to prevent access. The backfill material can vary depending on the site, but it is typically a combination of compacted soil, crushed rock, or a mixture of cement and aggregate known as grout.

## General Closure Approach

The general closure approach for underground workings in the following areas is provided:

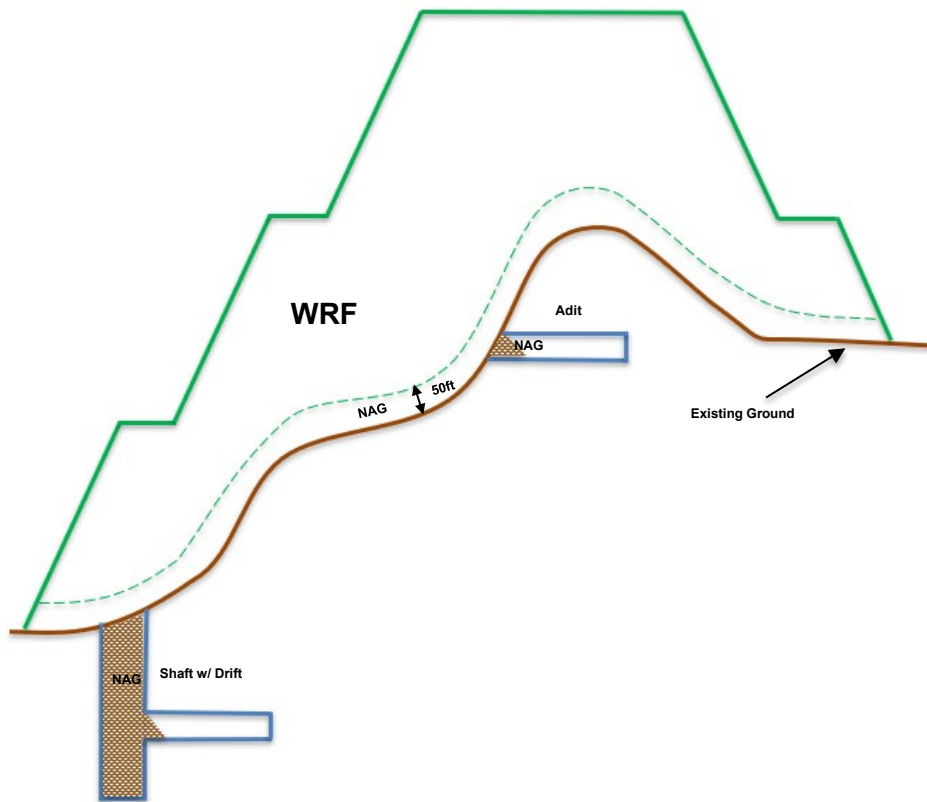
- Open Pit Area
- Waste Rock Facility
- Tailings Storage Facility No. 1 (TSF-1)
- Tailings Storage Facility No. 1 (TSF-2)
- Heap Leach Facility
- Plant Site Area

**Open Pit Areas:** There is no action required for mine workings located in the pit shell areas as they will be generally mined out. The main consideration will be safety while mining in and around these features. Additionally, some of the planned pits will be backfilled. These pits will be backfilled with NAG material to a minimum of 50 feet above the anticipated groundwater recovery level. Any exposed mine workings in these pits would be covered during pit backfill operations. The following pits will be backfilled as part of the project:

- Heavy Weight
- Copper World
- Broadtop Butte

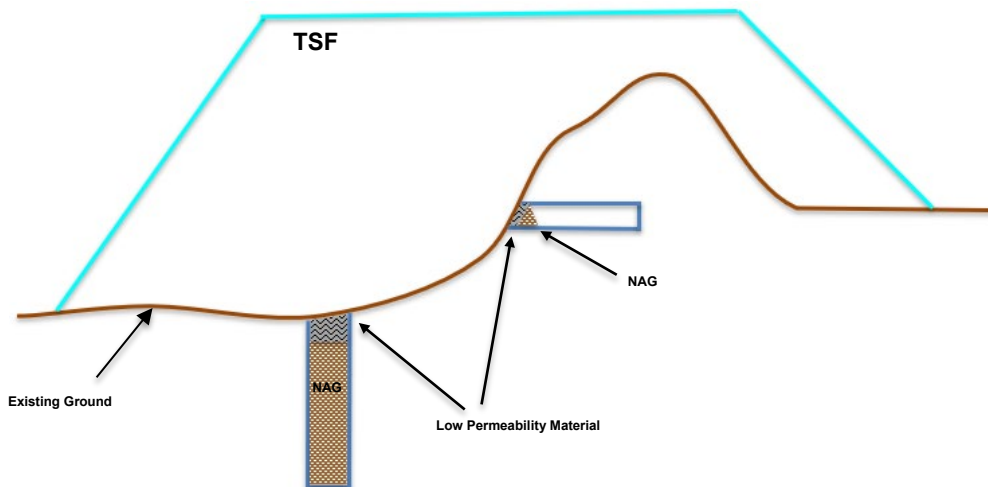
**Waste Rock Facility:** Significant shafts and adits encountered within the footprint of the waste rock facility (WRF) will be either fully or partially backfilled with NAG material as indicated in **Illustration 1**. Additionally, an approximate 50-foot layer of NAG material will also be placed on natural ground within the WRF footprint as part of Copper World's overall waste rock management strategy.

NAG material would generally be either directly dumped or dozer pushed into shafts and dozer pushed into adits. Depending on the depth of the shaft, the material may also be settled, such as with adding water via water trucks, etc. Additional NAG material may also be placed over the mine feature location, such as a large shaft, where excessive settlement may be anticipated.



**Illustration 1: Typical Closure Concept for Shafts and Adits Located within the Footprint of the WRF**

**Tailings Storage Facility No. 1 (TSF-1):** Adits or shafts found within the TSF-1 footprint will be either fully or partially backfilled with NAG material as indicated by **Illustration 2**. Material placed in the shafts will also be settled, such as with adding water via water trucks, etc. A low-permeability cap will be placed at the entrance. Detailed design of the closure (backfill and seal) will be prepared as part of TSF-1 foundation design. A more in-depth design and process of the shaft closure can be seen in **Exhibit 1**. In the illustration there are two potential shaft closure options based on the depth of underground workings. In addition, **Exhibit 2** shows a more detailed design for adit closures.

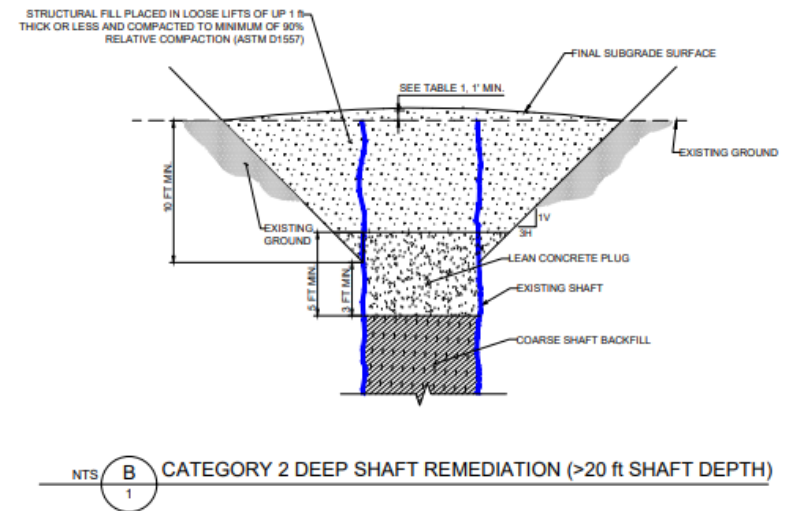
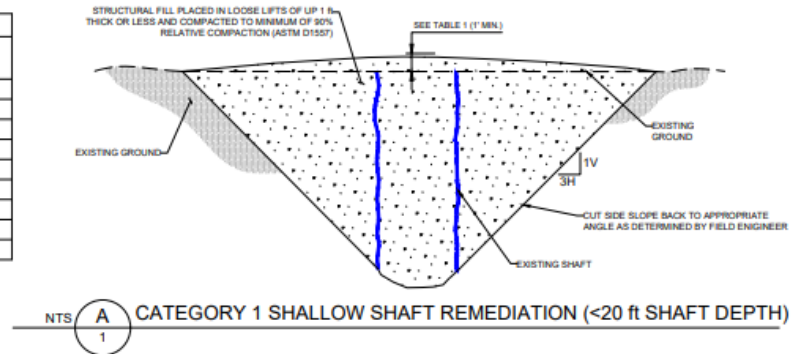
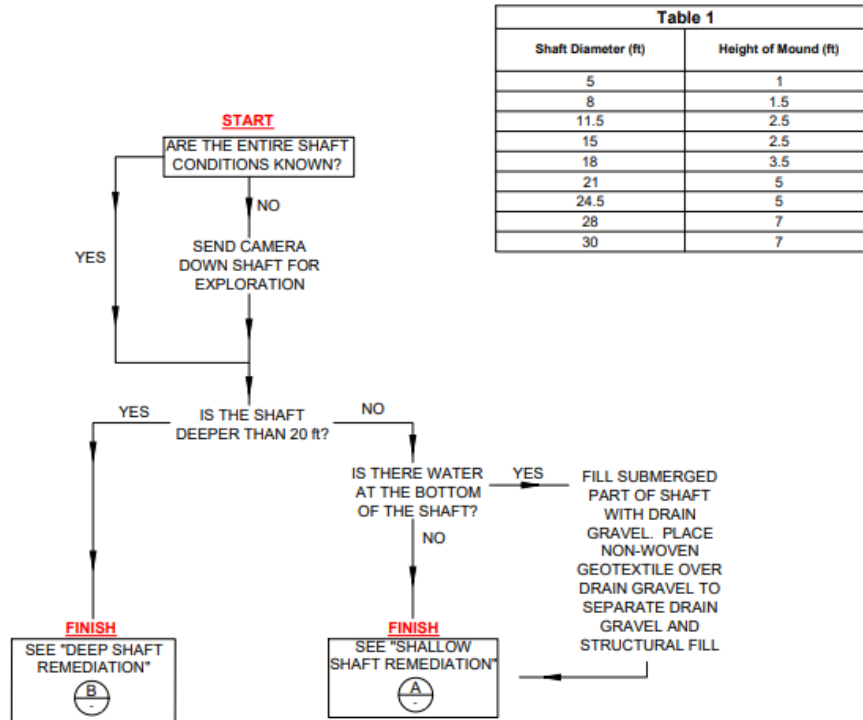


**Illustration 2: Typical Closure Concept for Shafts and Adits Located within the Footprint of TSF-1**

**Tailings Storage Facility No. 2 (TSF-2):** TSF-2 has no known underground workings. However, if any were found they would be closed in a similar manner to those found within the TSF-1 footprint described above.

**Heap Leach Facility:** The heap leach facility area has no known underground workings. However, if any were found they would be closed in a similar manner to those found within the TSF-1 footprint described above.

**Plant Site Area:** The plant site area has no known underground workings. However, if any were found they would be closed in a similar manner to those found within the TSF-1 footprint described above.



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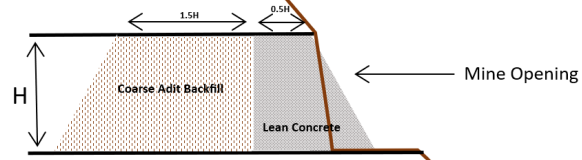
**HUBBAY**

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COPPER WORLD PROJECT  
APP APPLICATION  
UNDERGROUND MINE WORKING  
BACKFILL REMEDIATION

CONTRACTOR DOWNSIDE NO.  
1720214024  
DOWNSIDE NO.  
FIGURE 10-1  
REVISION DATE  
A 10-27-2023

Exhibit 1: Underground mine working backfill remediation



Not to Scale

**Exhibit 2- Underground Adit Closure**