Tailings Impoundment Closure Enhancement
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Outline

Project Overview
Tailings Characterization
Closure Cap
Closure Enhancement
Summary
Project Overview
Stillwater Mine, Montana

- Stillwater County
- 5 miles southeast of Nye, MT
- Underground Platinum and Palladium mine

Stillwater Mine, Montana

- Plant Site
- East Waste Dump
- Nye Tailings Impoundment
- Hertzler Tailings Impoundment
Stillwater Mine, Montana
Project Overview

East Waste Dump
Hwy 419
Plant Site
Stillwater River
Nye Tailings Impoundment

Knight Piésold
Nye Tailings Impoundment

Impoundment Section

- Embankment Height: 138 ft.
- Crest Width: 40 to 50 ft
- Downstream Slope: 1.7H:1V to 2H:1V (overall)
- 100 mil HDPE geomembrane to minimize seepage and contain tailings
Nye Tailings Impoundment

Closure Objectives

- Long-term public safety
- Protect air, surface water and groundwater resources
- Stable cover with long-term vegetation community
- Provide operational flexibility until final closure of the mine site
Nye Tailings Impoundment

Existing Closure Arrangement (for bonding)

- 4 ft. thick closure cap
- Surface water from closure cap reports to closure spillway at north end of impoundment
- Surface of facility revegetated
Nye Tailings Impoundment

‘New’ Closure Opportunities

- Provide storage for waste rock
- Reduce the need for additional disturbance
- Promote further consolidation, densification, and dewatering of the tailings
Tailings Characterization
Site Investigation Locations

- 24 SCPTs
- 10 geotechnical drillholes
- 2 vibrating wire piezometers
Site Investigations
SCPTs, Insitu Testing, Undisturbed Sampling

Amphibious SI Program
- Exposed tailings surface
- 12 SCPTs, 4 Drillholes, 2 WVP’s

Barge SI Program
- Operating pond area
- 12 SCPTs, 6 Drillholes
Tailings Characterization

In Situ Conditions

South

North
Tailings Characterization

In Situ Conditions

Tailings slimes sample from SCPT-18-08, 33 ft. to 53 ft. below tailings surface
Tailings Characterization

Downhole Plot – Slimes Tailings (SCPT18-08)

- 63 psf (3 kPa) at 23 ft (7 m) depth
- 230 psf (11 kPa) at 56 ft (17 m) depth
Closure Cap

Tailings Response

- Increase effective stress on tailings (weight of waste rock)
- Tailings consolidate as pore pressures dissipate
- Increased density and decrease in water content

*Data based on experience at other projects*
Tailings Characterization

CPT Downhole Plot – Sandy Tailings (CPT16-12)

167 psf (8 kPa) at 16 ft (5 m) depth

376 psf (18 kPa) at 49 ft (15 m) depth
Closure Cap
Closure Cap

‘New’ Closure Cap Arrangement
Closure Cap

Typical Section

- 4 ft. thick waste rock cap placed over geosynthetic reinforcement layer
- Geomembrane protection layer to be installed over the existing HDPE geomembrane liner
Closure Cap Staging

Stage 1

Stage 2
Closure Cap Staging
Closure Enhancement
Closure Enhancement

Objectives and Opportunities

- Waste rock currently stored at the East Waste Dump
- Waste rock can be used to cap the Nye Tailings Impoundment to develop a stable post-closure landform
- Potential to store additional waste rock on and/or adjacent to the closed Nye Tailings Impoundment
- Provide further tailings consolidation, increase density of in place tailings and enhance stability of the post closure landform
Closure Enhancement

Conceptual Arrangement

Additional Waste Rock adjacent to the Tailings Impoundment

Additional Waste Rock overtop of the Tailings Impoundment Closure Cap
Closure Enhancement

Waste Rock Consolidation Loading

- Increase density at depth
- Consolidation will be a function of time and drainage (accelerated with wick drains)
- Improved drainage will enhance stability during ongoing waste rock placement
Closure Enhancement

Effect of Additional Waste Rock Placement

- Further reduction in moisture content and increase in density
- Higher loads required to achieve similar effect as Closure Cap at depth
Summary

- The Nye Tailings Impoundment continues to provide secure storage of fine grained tailings
- Placement of the Closure Cap will consolidate and densify the saturated fine grained tailings.
- Increasing the Closure Cap thickness will enhance the stability of tailings impoundment and allow for additional waste rock to be integrated into the post closure landform.
- Key benefits include:
  - Reduced mine footprint due to waste dump integration with closed tailings impoundment
  - Dense non-flowable tailings result in Low consequence dam safety classification for a hypothetical dam breach post closure
- Closure of the impoundment is being developed with Sibanye-Stillwater and their stakeholders. This is recognized as the best technology and best practice for closure of the Nye Tailings Impoundment.
Q&A

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