



July 22, 2019

Brent Martellaro  
Division Mining, Land and Water  
Department of Natural Resources  
3700 Airport Way  
Fairbanks, AK 99709-4699

Dear Mr. Martellaro:

**RE: Red Dog Mine Reclamation and Closure Plan Amendment Request for an amended the Cover Design on the Main Waste Dump**

Teck Alaska Incorporated Red Dog Mine is requesting an amendment to the Reclamation and Closure Plan (RCP), Approval F20169958 to modify the Main Waste Dump (MWD) current closure design from an engineered compacted soil cover to a geosynthetic liner and soil cover design. The main reason for the design change request is to reduce the amount of meteoric water infiltration through the MWD by replacing the compacted soil layer with a geosynthetic liner and composite. The proposed modification to the current design should significantly reduce meteoric (precipitation and snowmelt) infiltration through the MWD thus reducing the amount of acid rock drainage (ARD) currently treated year round in WTP3.

**Project Development**

Geosyntec Consultants, Inc. (Geosyntec) was selected by Teck to engineer the proposed geosynthetic cover design for the MWD. Note: Geosyntec refers to the MWD as the Main Waste Stockpile (MWS) in their plans, MWD and MWS refer to the same entity. Geosyntec engineered two separate cover test designs which were constructed as pilot tests by Teck in 2016 and 2017. The designs included performance monitoring for both cover test projects. A copy of the monitoring performance report was included with the 2018 annual WMP/RPA report under *Appendix H: Test Plot Monitoring Main Waste Stockpile Cover System*.

The initial cover test was constructed during 2016 and encompassed 2.1 acres. The second cover test, completed in 2017, comprised an additional 13 acres and included additional performance monitoring. The main purpose of the second cover test was to gauge constructability costs. Both cover tests have undergone continuous monitoring and considered successful tests to date. The same design as the cover tests is proposed in this amendment request for the remaining uncovered area of the MWD. The existing 15 acres of cover tests will be "tied into" the scope of this project since the design plan assuming this amendment has been approved.

## **Project Documents**

Geosyntec Consultants prepared the Final Design Report (FDR) and Project Execution Plan (PEP), both are included with this amendment request. The FDR provides the engineering details of the proposed design.

The primary objective of this PEP is to provide information about project scheduling, execution, and monitoring for successful planning and management for the proposed MWD cover project. The PEP provides the tools and basis for Teck to allocate resources over a multi-year timeframe to complete the MWD cover project. It also presents various performance monitoring methods to evaluate if the performance of the cover system is meeting its design objective of reducing meteoric water infiltration through the MWD.

## **Project Overview**

As mentioned earlier, the goal of the geosynthetic cover is to improve upon the current design by reducing the amount of meteoric water and oxygen that can infiltrate into the MWD, thereby decreasing the amount of acid rock drainage (ARD) from the MWD.

The proposed final design will cover approximately 125 acres of the MWD (includes the 15 acres from the pilot test). The slope of the MWD sidewalls will remain at 3:1, the upper portion of the MWD has been graded to promote drainage to the center of the MWD. Collected stormwater from the upper portion of the MWD will be transferred utilizing the existing Smart Ditch. All storm water collection from the MWD cover will be directed to the Tailings Storage Facility (TSF). The 2021 RCP renewal will address possible storm water diversion from the covered MWD areas for final closure.

Additional outlying waste rock dump areas not covered in the FDR may be addressed in the upcoming RCP renewal scheduled for 2021 should Teck decide to look at this type of cover design for other waste rock dump areas.

## **Cover Material Modifications**

The current cover design for the MWD incorporates two 20" layers of cover material (shale); a compacted lower zone and an upper uncompacted zone to support vegetation. Figure 1 depicts cross sectional layout for this design. Figure 2 depicts a cross section of the proposed design; essentially the lower compacted soil layer is replaced with geosynthetic materials.

With the geosynthetic material replacing the lower 20" compacted layer in the current design, 24" cover material will be placed on the geosynthetic materials, this will be accomplished in two uncompacted 12" lifts. No "hold time" is necessary to allow the material to weather to achieve sufficient compaction. Once the final lift of cover material has been placed the area will be seeded.

Figure 1 Current 2016 Approved MWD Cover Design

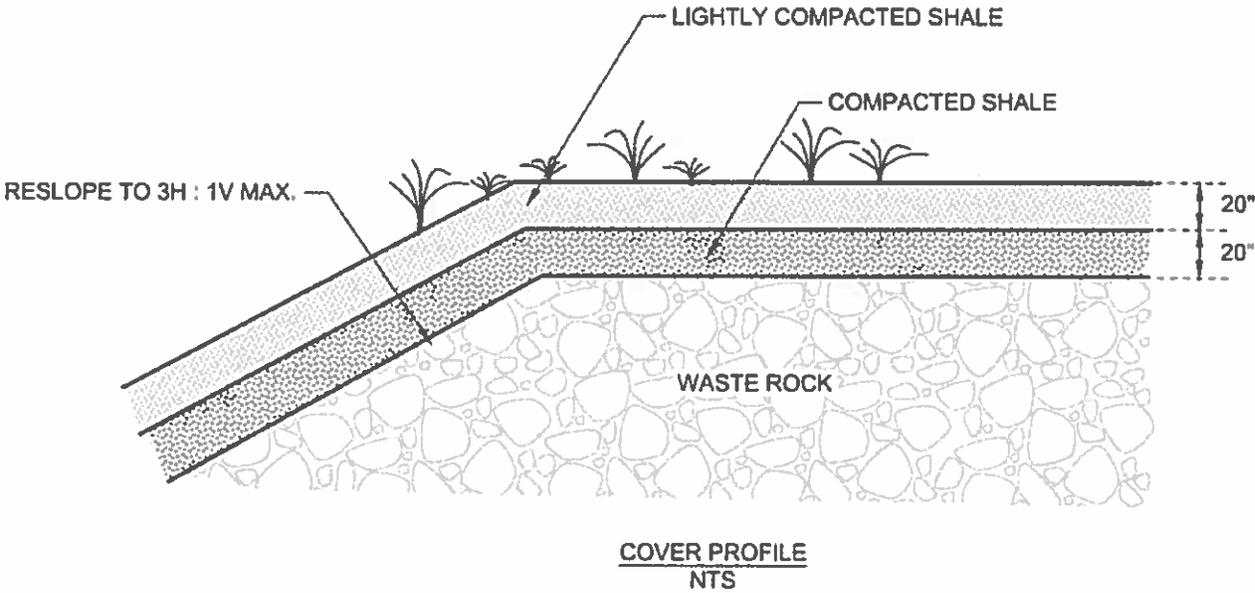
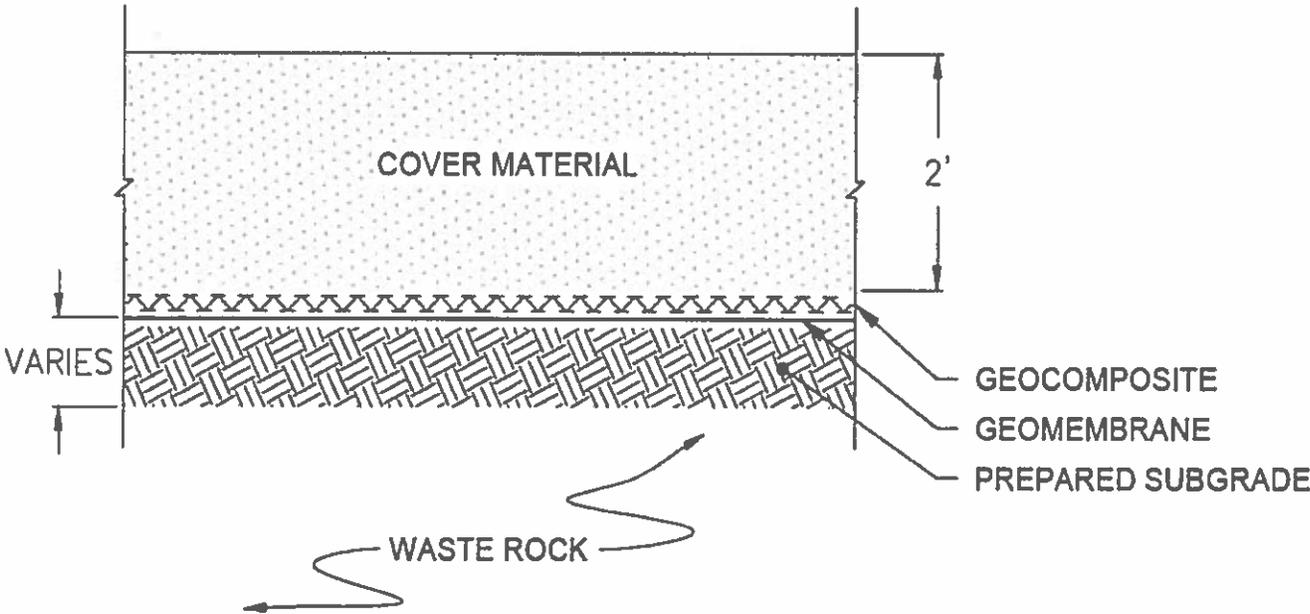


Figure 2 –Proposed MWD Cover Design



**Vegetation**

A mixture of native grass seeds and forbs will be applied to the cover material using either an aerial seeder or broadcast type seeder. Fertilizer will be applied once the seed has germinated and sufficient growth is noticed. Seeding will follow the proposed Table 4 listed below which replaces the Table 4 in the current 2016 RCP. Minor changes to the original seed mix were incorporated in the proposed Table 4 depicted below.

Changes to the grass and forbs below were based on recent pilot test vegetation results, the availability to obtain sufficient quantities of seed and recommendations from Peter Johnson (former agronomist with ADNR) and Alison Kelly (contractor with NANA). Post-closure vegetation monitoring and maintenance requirements will remain the same as listed in the current RCP. Table 4 below is proposed to replace the current Table 4 2016 RCP.

Table 4 Proposed Revegetation Species for the MWD

| Plant Species   |   | Planting Specifications  |
|---|---|--|
| <b>Primary List:</b><br>Slender wheatgrass<br>Tundra bluegrass<br>Alpine bluegrass<br>Spike trisetum<br>Polargrass<br>Bluejoint<br>Red Fescue | <b>Secondary List:</b><br>Bering hairgrass  | Seeding Rate 20 lb/acre (final mixture).<br>Ratio of species will depend on availability, but may include predominantly tundra bluegrass and alpine bluegrass for drier areas and polargrass and bluejoint for mesic sites.  |
| <b>Native forbs:</b><br>Alpine milkvetch<br>Alpine sweetvetch   | <b>Other potential species:</b><br>Tall fireweed<br>Siberian aster<br>Artic bladderpod<br>Field oxytrope<br>Boreal yarrow | Seeding rate 40 seeds/yd <sup>2</sup> for each species.<br>Ration of species will depend on availability, but mix may include alpine milkvetch, artic bladderpod and Siberian aster for dry areas; and tilesy sage, boreal sweetvetch, alpine sweetvetch, tall fireweed for mesic areas. |

**Bonding Modifications**

No modification to the existing bond are expected for the proposed design changes prior to the 2021 renewal. Per the PEP, the proposed cover project will overlap the 2021 RCP and Waste Management Permit renewal period. The renewal submission will address updated bonding calculations for the proposed design should it be approved.

**Community Engagement**

In order to build awareness of stakeholders about the proposed change to the main waste rock stockpile cover design and approach, members of the Red Dog Community Relations Department and the Tailing, Water, and Environment Department prepared and provided a presentation to seek feedback through discussion on the proposed approach. Three separate meetings were

held with the Red Dog Subsistence Advisory Committee, the Noatak IRA Council, and the Kivalina IRA Council. Meetings were conducted on June 4, July 18, and July 19 respectively.

The presentation described the history of the presently approved cover design and approach utilizing a complex soil cover that is included within the current Red Dog Reclamation and Closure Plan. Information was shared on the large scale performance testing of the complex soil cover that was conducted utilizing the oxide stock pile. Approaches to measuring and determining cover performance (% infiltration) and results of the large scale testing was covered. Similar information was provided on the proposed alternate waste rock stockpile cover proposal utilizing a geomembrane. Liner material examples, visually aids, design, and performance testing approach and results were covered noting the performance of the geomembrane was superior to the complex soil cover in preventing infiltration, which would have a positive effect on water quality reporting to the tailings facility from the main waste rock stockpile.

It was further explained that Red Dog Operations would be seeking an amendment to the current Reclamation and Closure Plan to allow for the new geomembrane design rather the complex soil.

If you have any questions regarding this amendment request, please feel free to contact Frank Bendrick at (907) 754-5138, [frank.bendrick@teck.com](mailto:frank.bendrick@teck.com). For technical questions, please contact Tyler Oester (project engineer) at (907) 754-5820, [tyler@oesterteck.com](mailto:tyler@oesterteck.com).

Sincerely,  
Teck Alaska Incorporate



Les Yesnik  
General Manager

cc: Tim Pilon, ADEC, Fairbanks  
Lance Miller , NANA