DELOITTE & TOUCHE INC.

ANVIL RANGE MINE SITE
TAILINGS DUST CONTROL
TEST PROJECT

FARO MINE, YT

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

The Anvil Range mine site is situated roughly 20 kilometers to the north of the town of Faro and the tailings impoundments are situated adjacent to the Rose Creek Diversion on the western end of the site. The main area of concern for wind erosion has been identified as the Original and Secondary tailings impoundments with smaller contributions from parts of the Intermediate impoundment. All together these areas cover approximately 196 hectares but due to parts of the impoundments being covered by water, the maximum potential area requiring dust control was found to be 136 hectares.

Despite the fact that the tailings areas are covered by snow for a portion of the year, the potential for dust generation during the summer months is considered to be significant enough to justify investigating potential remediation methods. A number of physical and chemical control options were considered with Soil Sement, a water-soluble liquid polymer, expected to have the best results in the unique environment at Anvil Range. A test application is required to determine how effective Soil Sement will be and how long the service life for a single application is.

Sufficient Soil Sement was procured to conduct tests over approximately 16 hectares worth of the tailings and three areas on the various impoundments were identified as having the highest dust generation potential. A delivery system was developed on site based on the equipment used at the Giant mine site. All of the preparations for the test project were completed by the end of July. Due to the consistently wet conditions meaning minimal dust and to the limited window of time available for testing before cold weather and snow were expected the, actual testing has been postponed until the summer of 2009.

2.0 PROJECT BACKGROUND

2.1 Alternatives Considered

The report prepared by Brodie Consulting outlined a number of dust control methods commonly used and assessed their suitability for the tailings at the Anvil Range mine. All of the methods presented were divided into two categories: physical or chemical control.

Physical dust control methods such as increasing surface roughness or tilling in mulch or straw are not recommended for use at the Faro site because of the potential for release of oxidation products that the soil disturbance would cause. The construction of wind breaks or installation of a rip rap cover are two other commonly used methods of dust control but both are generally better suited to smaller areas than what is at the Anvil Range site. Both of these two methods are also generally longer term than what is required currently at this site where it is anticipated that a long term plan for the tailings will be

2.0 PROJECT BACKGROUND (continued)

developed in the near future. The final physical approach discussed is the planting of grass to help bind the surface material. This is not feasible as the tailings are toxic to grass.

Chemical dust control strategies fall in to two categories: water based or glues and binders. Water based dust suppression requires some sort of system that can apply water to the target area on a continuous basis. There are several wetting agents, foams and humicants that can be added to enhance the effectiveness of plain water. It was observed that because of a wetter than average summer in 2008, the rainfall provided adequate dust control for more than half of the time that the tailings weren't covered by snow anyway. Glues and binding agents work by forming the surface particles into larger masses that are less likely to become airborne or by forming a crust over top of native soil. As most of the products available in this category can typically function for a period of months to years before requiring reapplication, this was considered to be the best method of dust control for the Anvil Range mine site.

Soil Sement is applied by mixing with water and then spraying over the target area. After the water evaporates, the polymer remains in place to bind the soil and prevent dust generation. The effective service life of this product typically varies from site to site so testing at the Faro location is required to determine its effectiveness and the required re-application period.

2.2 Application Requirements

A very light application rate of 1000 L/ha was chosen for the test project primarily since the areas being considered are relatively large and it would be very costly to apply a heavier coating. The equipment that was available on site, which will be discussed further in the following section, presented some additional constraints:

1) It was observed that a full tank of water can provide continuous spray out of four nozzles for roughly 30 minutes.
2) Based on the volume of the tank it was decided that adding two barrels of product to the tank and then filling it with water would give the desired mix.
3) The spray arms mounted on the back of the tank provide roughly 6.5 metres of effective coverage when spraying.

Using these conditions it was calculated that one full tank can cover an area of roughly 4200m^2 or one strip of tailings 6.5m wide and 640m in length. To ensure that the desired thickness is achieved, the tank should travel at 1.3km/h while spraying.

3.0 PROJECT PREPARATIONS

3.1 Overview

Preparations for the test project began the week of July 13th, 2008. Over a period of four days, preliminary tests were conducted and appropriate adjustments were made to calibrate the tank and its components for the spraying of the tailings. During this time, arrangements were also made for all equipment and materials needed to be properly stationed for the spraying of the tailings. This included procuring pumps and hoses to pump fresh water from Rose Creek to where the tank would be filled and the relocation of the Soil Sement from storage to the first spraying location.

The three selected areas of the tailings impoundments, which can be seen in Appendix B, were staked out for testing. At all three of the areas identified the stakes were placed in rows spaced at intervals of 6.5m marking the path that should be followed when spraying to ensure the best coverage. Rows of stakes were placed every 25m along the bottoms of the different impoundment dams.

The spraying of the tailings was intended to take place starting the week of July 20, 2008. However, due to continuous rainfall with only brief periods of dry weather, the spraying was delayed and eventually postponed until the spring of 2009.

3.2 Equipment

Tank on Chassis

Some of the equipment needed for the spraying such as pumps and hoses for drawing fresh water from Rose Creek was readily available on site and was procured with the assistance of Anvil Range personnel. The actual tank system that holds the water and Soil Sement mixture had to be constructed specifically for the spraying project.

A 1000 U.S. gallon tank was available on site and was mounted onto a chassis with a hitch and axel to provide mobility for the tank when spraying, and when moving to and from site. Two spray arms with several nozzles that can be opened and closed individually as required were mounted to a valve at the back end of the tank. These bars, when not in use, can be detached and placed on the side of the tank along with any hoses. A pump sits on the back end of the chassis where the spray bars connect to the tank.

Spray Pattern of Nozzles

3.3 Preliminary Testing

On Monday, July 14th, 2008, the dimensions of the tank were measured and the preferred sections of the tailings impoundments to be sprayed were chosen. The tank was hitched to the hiab and brought

3.0 PROJECT PREPARATIONS (continued)

down to the lime bay at the mill where the tank was filled with water. It was then relocated behind bay 14 and a test run was performed to

determine the effectiveness of the spray pattern. The results showed that the spray pattern provided adequate coverage along the length of the spray bars, although there was substantial overlap of the water coming out of each of the nozzles. Half-inch spray valves and plugs were added to solve this issue by allowing for fine-tuning of the spray and the tank was then filled again with water from the lime bay. The tank was placed behind bay 14 for continued testing the next day.

Spray Valve

The morning of July 16th, the valves were installed on the spray nozzles and various combinations of open and closed valves were tested to determine what would provide minimal overlap while still maintaining sufficient coverage. It was found that having 4 of the 10 valves full open with the remainder closed was the optimal arrangement. Next a test run was performed to determine the volumetric flow rate with this configuration of nozzles. A pump was then brought down to Rose Creek and set up to pump water up to the first tailings impoundment. The tank was also placed by the turnoff to the first tailings impoundment from the main road. The hiab was then loaded up with 8 skids of Soil Sement barrels, which were delivered to the first tailings impoundment. All of the Soil Sement was later moved to the Yates guest house for storage over the winter months when the project was postponed.

The staking out of the three areas began on July 17th, and carried on into the following week. One at the toe of the first impoundment has a length of 600m resulting in a 6ha area. Another along the toe of the damn at the second impoundment running 300m, contributes another 3ha of test area. The final area was staked out alongside the main road to the Guard House going past the first tailings impoundment at a length of 300m. The total area identified for test coverage is 12ha.

4.0 CONTINUING OPERATION

In order for the spraying of the tailings to take place, certain conditions must be satisfied prior to operation.

1) The Soil Sement must be brought to the site where spraying will take place.
2) A supply of water must be made available.
3) The tank system requires some form of machinery that can pull it across the tailings.

Currently, 80 barrels of Soil Sement are in storage at the Yates guest house and should be brought to the mine site where the spraying will occur. A pump and a sufficient length of hose may be set up to draw water out of Rose Creek and into the tailings impoundment, where

4.0 CONTINUING OPERATION (continued)

the tank can be filled up. Alternatively, the vacuum truck located on site could be used to collect water and then fill up the tank. This second option although more difficult will likely be required for the spraying of the area located on the Intermediate impoundment. A second pump is required to draw the Soil Sement out from the barrels and into the tank. With the selected test areas already staked out, it is then just a matter of spraying these areas with the appropriate application rate (see preliminary calculations in Appendix A). The rate of application can be adjusted both with the spray valves and the pump. Recirculating the tank contents with the pump can accomplish the required mixing in the tank.

5.0 CLOSURE

This report summarizes the process leading to the selection of Soil Sement as the dust control method of choice for the Anvil Range Mine site as previously discussed in greater detail in the report submitted by Brodie Consulting Ltd. It also outlines the preparations made on site for a test application prior to the project being postponed because of ongoing unfavorable weather conditions. Recommendations and guidance for operation have also been discussed in this report. All of the preparations should allow for the testing to begin as soon as the snow cover recedes from the tailings in the summer of 2009.

We trust that the information presented herein meets your current requirements. If you have any questions or require further information, please contact the undersigned.

Respectively submitted,

Michael Brewer, BASc	Chris Croy
Civil Engineer	Environmental Technician

6.0
REFERENCES

Brodie, J. Brodie Consulting Limited. (2008). *Tailings Dust Control*. Retrieved July 7th, 2008

APPENDIX A:

PRELIMINARY CALCULATIONS

Required Application Rate:	1000 L/ha undilute	
Dilution when adding 2 barrels per tank:	(2 x 55 gal)/(1000 gal) x 100% = 11%	
	→ 9000 L/ha dilute	(2377 gal/ha)
	→ 0.9 L/m²	(0.24 gal/m²)
Observed Spray Rate:	1000 gal/30 min	(33 gal/min)
Spray Arm:	21 ft	(assume 6.5 m coverage)
Coverage Per Tank:	(1000 gal/tank)/(0.24 gal/m²) = 4167 m²/tank	
	→ 641 m x 6.5 m	
Required Speed of tank and machine	(641 m)/(30 min) = 1.3 km/h	

APPENDIX B:

TAILINGS PERIMETERS


100m x 600m
100m x 300m
100m x 300m