Technical Memorandum

To: Kathy Arnold
From: Ronson Chee
Company: Rosemont Copper Company
Date: January 31, 2012
Re: Rosemont Conceptual Barrel Alternative Stormwater Control Features
Doc #: 004/12-320929-5.3
CC: David Krizek (Rosemont Copper Company)

1.0 Introduction
This Technical Memorandum summarizes the conceptual stormwater control features anticipated for the Barrel Alternative associated with the proposed Rosemont Copper Project (Project) in Pima County, Arizona. A preliminary grading scheme was prepared for this alternative as shown on Figure 1 and is referred to as the Barrel Alternative Landform (Landform). The Landform consists of a Waste Rock Storage Area, a Dry Stack Tailings Facility encapsulated with waste rock, and a closed Heap Leach Facility, also encapsulated with waste rock. The proposed Barrel Alternative is designed to drain the majority of the stormwater off the Landform. Stormwater control on the Landform is accomplished primarily by drainage benches that intercept runoff from the slopes of the landform. Stormwater collected in the drainage benches exit the Landform via rock drop structures placed at select locations.

2.0 Landform Grading Criteria
The grading criteria and hydrologic considerations for the design of the Landform is based on previous studies and methodologies as reported in the Reclamation Concept Update report by Tetra Tech (Tetra Tech, 2010b); the Site Water Management Update report by Tetra Tech (Tetra Tech, 2010d); and the Rosemont Baseline and Post-Mining Conditions – Alternatives Sediment Delivery technical memorandum by Tetra Tech (Tetra Tech, 2010c). Additionally, a technical memorandum titled Barrel Only Alternative Stormwater Assessment (Tetra Tech, 2010a) quantified the potential stormwater impacts on downstream stormwater flows (100-year storm) and average-annual runoff. The results of this analysis would apply to the conceptual stormwater control plan highlighted herein for the Barrel Alternative.

The overall final reclaimed slopes of the Barrel Alternative Landform are generally 3.5 Horizontal (H):1 Vertical (V). A drainage bench every 100 feet of vertical elevation was incorporated into the preliminary Landform grading. Maximum slope lengths were limited to approximately 320 feet. Areas with the 2H:1V slopes (areas near the Heap Leach Facility) are assumed to be armored with run-of-mine (ROM) rock.

3.0 Landform Stormwater Management Features
The principles and concepts employed in developing the preliminary grading scheme and associated stormwater control features for the Barrel Alternative are similar to features
developed for the Rosemont Ridge Landform (Tetra Tech, 2010b). The major stormwater control features planned for the reclaimed surface of the Barrel Landform include:

- Drainage benches with channels;
- Drop structures and energy dissipation pools; and
- Retention basins/ Perimeter Containment Areas (PCAs).

Drainage divides and drop structures (see Figure 1) were strategically placed based on the carrying capacity of the drainage bench channels. Stilling pools would be placed at the confluence of drainage bench flows and drop structures to dissipate flow energy. Once dissipated, storm flows would leave the drainage benches via drop structures. Drop structures would either route stormwater off the Landform to McCleary Canyon, to Trail Creek, to PCA’s located along the southern perimeter of the Landform, or to the Open Pit (Pit). Storm flows routed to the western side of the Landform either report to flow-through drains or to the Pit. Flow-through drains are large rock drains designed to convey stormwater from the up-gradient side of the Landform to the down-gradient side (Tetra Tech, 2010d). Stormwater flows routed through the flow-through drains and off portions of the Landform as shown on Figure 1 would eventually report to lower Barrel Canyon. Figure 1 shows the anticipated stormwater control features.

Drainage bench channels and drop structures would be designed to accommodate up to the 500-year, 24-hour event as defined in the Site Water Management Update report by Tetra Tech (2010d). Management of the General Probable Maximum Precipitation (PMP) event will be accommodated with the use of Perimeter Containment Areas as discussed in the Site Water Management Update report by Tetra Tech (2010d).

3.1 Dry Stack Tailings Facility

The final outer slopes of the Dry Stack Tailings Facility are designed to have 3H:1V inter-bench slopes with drainage benches placed at 100-foot elevation increments. The benches are 50 feet wide and accommodate a drainage channel, an access road and safety berm. Drainage divides will be incorporated and will determine the direction of stormwater flow that is captured by these drainage benches. Pooling of stormwater on the top surfaces of the Dry Stack Tailings Facility was limited as the majority of the water will drain to the pit area.

Drainage benches on the northern face of the Phase 1 Dry Stack Tailings Facility would route flows to a drop structure located at the northwest corner of the facility. This drop structure would direct flow into McCleary Canyon.

Drainage benches on the western face of the Dry Stack Tailings Facility (Phases 1 and 2) would eventually report to the flow-through drain system via a drop structure (see Figure 1). Flows on the western side of the Landform may possibly also report to the Pit.

Stormwater runoff generated on the top surface of the Phase 1 Dry Stack Tailings Facility will be retained. If desired, the top of the Phase 1 Dry Stack Tailings Facility could be graded to drain to the drop structure at the northwest corner. Stormwater runoff generated on the top surface of the Phase 2 Dry Stack Tailings Facility would flow to the Haul Road Drainage Channel which would report to the Pit or to the flow-through drain system.

Drainage benches on the eastern side of the Dry Stack Tailings Facility would route flows to a drop structure and into the Trail Creek area.
3.2 Waste Rock Storage Area

The Waste Rock Storage Facility is designed in the same manner as the Dry Stack Tailings Facility, with inter-bench slopes of 3H:1V and 50 foot drainage benches every 100 feet of elevation change. Stormwater control on the reclaimed surfaces of the Waste Rock Storage Area would consist primarily of drainage benches and drop structures.

Runoff on the southern sides of the Waste Rock Storage Area would be routed down drop structures at select locations and into PCAs.

Stormwater on the eastern side of the Waste Rock Storage Area will report to a drop structure and into a PCA. Stormwater will then eventually flow to the north along the toe of the Landform and into Trail Creek.

Stormwater generated on the western side of the Waste Rock Storage Area would report to the Pit or to flow-through drains via a drop structure or Haul Road Drainage Channel. The perimeter containment area to the southwest would also collect runoff from the Waste Rock Storage Area as well manage runoff from the Pit Diversion Channel.

4.0 Pre-Mining/Baseline and Post-Mining Hydrology

Pre-Mining/Baseline and Post-Mining hydrology estimates for 100-year flood-peak and the average-annual runoff volume for the Barrel Alternative will have the similar values as previously determined in the technical memorandum titled Barrel Only Alternative Stormwater Assessment (Tetra Tech, 2010a). Additionally, Baseline and Post-Mining estimates for sediment delivery will also have similar values as previously determined in the technical memorandum titled Rosemont Baseline and Post-Mining Conditions – Alternatives Sediment Delivery (Tetra Tech, 2010c).

5.0 Conclusion

Stormwater control structures associated with the Barrel Alternative would closely resemble the structures presented in the Sitewater Management Update report (Tetra Tech, 2010d). The conceptual Barrel Alternative grading scheme is designed to shed as much stormwater runoff from the reclaimed surface as possible with the use of drainage bench channels, drop structures, stilling pools, and retention basins (PCAs). Hydrology flow and sediment delivery estimates as determined in Tetra Tech (2010a) and Tetra Tech (2010c) will be similar to the estimates for the conceptual Barrel Alternative grading scheme and stormwater control plan presented in this memorandum.
REFERENCES


