

Memorandum

To: File

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From: Chris Garrett, SWCA

Date: August 30, 2013

Re: Summary of Review Conducted on Surface Water Modeling and Stormwater Management Design, Rosemont Copper Project

Public comments were received on the Draft EIS, as well as on the Preliminary Administrative FEIS that was distributed to the cooperating agencies on July 1, 2013, concerning various aspects of stormwater management on the Rosemont Copper Project. These comments included specific criticisms of the surface water modeling, and specific criticisms of the design storms used to size various stormwater management features. The purpose of this memo is to document the process that was undertaken by the Forest in order to review and assess the stormwater management for the Rosemont Copper Project.

Cooperating Agency Comments

Some of the cooperating agency comments regarding stormwater management and modeling from the review on the July 1, 2013 PAFEIS are attached. Comments fall into several categories:

- Criticism of the design storm criteria used for sizing stormwater management facilities.
- Criticism of the assumptions used in the surface water or sediment transport modeling. These criticisms have been brought up since before the release of the DEIS.

- Criticism of the Golder surface water modeling conducted in 2012, which was contracted by the Coronado after receipt of public comments on the DEIS in order to help assess the validity of previous modeling.

Site Water Management Peer Review Process

With respect to the first two categories—criticism of design storms used for sizing stormwater management facilities and criticism of stormwater and sediment modeling—from August 2010 through June 2011 the Forest undertook an iterative peer review process in order to ensure that the Rosemont Copper designs were professionally prepared, used reasonable and appropriate assumptions, and to identify any red flags with the analysis that should be discussed, reviewed, and possibly modified. The Forest contracted Golder Associates to conduct this peer review, based on company qualifications as well as review of the individual qualifications of professionals expected to work on the project. The following summarizes the peer review process undertaken for the site water management. All reports are contained in the project record:

- June 2007. Site Water Management Plan prepared by Tetra Tech (Tetra Tech 2007)
- April 2010. Site Water Management Update prepared by Tetra Tech (Tetra Tech 2010)
- August 2010. Golder Associates review of Site Water Management Update (Annandale, Patterson, and Baxter 2010)
- November 2010. Tetra Tech response to Golder review of Site Water Management Update (Krizek 2010)
- April 2011. Golder review of Tetra Tech responses (Annandale, Patterson, and Baxter 2011)
- May 2011. Rosemont Copper response to Golder review of Tetra Tech responses (Krizek 2011a)
- May 2011. Golder final review of Tetra Tech responses (Annandale 2011).
- June 2011. Rosemont Copper response to Golder final review (Krizek 2011b).
- June 2012. Preliminary Site Water Management Plan for the Barrel Alternative prepared by Tetra Tech (Tetra Tech 2012).

The iterative peer review process that took place from August 2010 through June 2011 included review of surface flow models, assumptions and parameters used for surface flow models, sediment models, assumptions and parameters used for sediment models, stormwater facility design parameters, and specific conceptual elements of stormwater

design, notably the storage of water on the landform and the type of drop chutes used to move water off the landform.

At the conclusion of the peer review (May 2011), the technical aspects of the modeling and design were considered to be sufficient and reasonable by Golder, although several fundamental conceptual disagreements remained. These included the advisability of storing water on the landform and the use of rip-rap drop chutes.

After selection of a preferred alternative by the Forest Supervisor, publication of the DEIS, and receipt of public comments, stormwater management for the preferred alternative was redesigned in collaboration between the Forest and Rosemont. This was conducted in part in an attempt to incorporate "landforming" aspects into the final landform, and in part from a desire to allow as much water as possible to flow downstream to support riparian vegetation. Among the outcomes of the stormwater redesign was the removal of all storage from the top and benches of the waste rock and tailings facilities, and the replacement of rip-rap down chutes with concrete down chutes. The redesign was also successful in reducing the amount of post-closure runoff lost to the downstream watershed.

The technical aspects of both design and modeling were determined by the Forest to be sufficient, based on the professional review provided by Golder Associates.

Purpose of Golder 2012 Surface Water Modeling

Despite the peer review undertaken, public comments were received on the DEIS questioning the assumptions used for the surface water modeling as well as questioning the type of model used. While the professional review process had indicated that the surface water analysis was reasonable, the Forest felt that in response to public comments there was still a responsibility to understand a) what changes would occur if different modeling assumptions were selected, and b) whether the model itself was appropriate.

The public comments were provided for review by Golder, and an approach was selected to help assess the concerns raised. Golder was contracted to conduct new surface water modeling. The purpose of the Golder surface water modeling in 2012 was not to conduct new modeling to replace the surface water modeling conducted by Rosemont, which had been determined to be reasonable and appropriate through a process of professional review. The purpose of the Golder surface water modeling was to run specific sensitivity analyses, using the model suggested in comments by Pima

County (PC-Hydro), to assess how varying different hydrologic parameters (i.e., precipitation and curve number) could affect the results of the model. Golder conducted the modeling and provided the final results in October 2012 (Baxter and Patterson 2012).

It should be noted that two additional memos also were available to the Forest for review, one conducted in January 2011 by Tetra Tech (Chee and Hemmen 2011) and one conducted in August 2011 by Tetra Tech (Zeller 2011). Both of these memos were prepared at the request of Rosemont Copper in response to criticisms levied by Pima County on the models used.

Available Sensitivity Analyses

The purpose of both the Golder modeling in 2012 (Baxter and Patterson 2012) and the modeling runs conducted by Tetra Tech in 2011 (Chee and Hemmen 2011) was to provide sensitivity analyses to compare the effect of using different models and modeling assumptions. The following sensitivity analyses have been utilized in assessing the applicability of the surface flow models:

- Use of the NRCS model (used by Tetra Tech) versus the PC-Hydro model (requested by Pima County) (Chee and Hemmen 2011).
- Change of curve number, which reflects the amount of runoff per a given amount of rainfall (Patterson and Baxter 2012)
- Change of precipitation amount (Patterson and Baxter 2012)

Conclusions of Peer Review

In their comments on the July 1, 2013 version of the FEIS, Pima County correctly points out that the Golder modeling shows the variability in predictions that could occur if different parameters were chosen. This was fully acknowledged in the FEIS and indeed was the purpose of conducting the modeling. The demonstration that a different result could occur if assumptions were changed does not invalidate the modeling approach that was selected, reviewed, and accepted by the Forest for use; rather, it demonstrates that the Forest has fulfilled their responsibility to understand the full context in which the models were being used.

Based on the strength of the iterative peer review process, the assessment of sensitivity analyses (Chee and Hemmen 2011, Patterson and Baxter 2012), and other reviews of the work conducted by Rosemont (Zeller 2011), the Coronado has determined that the surface flow and sediment modeling used in the FEIS is reasonable and appropriate to provide an informed analysis in the FEIS, and that the sizing and design of stormwater control features is reasonable and appropriate to provide an informed analysis in the FEIS.

Responsibility for proper design and implementation of any stormwater management feature would ultimately still lie with Rosemont Copper.

REFERENCES

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Krizek, D. 2010. Technical Memorandum: Rosemont Site Water Management Update Review Responses. November 30.

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Tetra Tech. 2007. Site Water Management Plan, Rosemont Copper. June.

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Tetra Tech. 2012. Preliminary Site Water Management Plan for the Barrel Alternative. July.

Zeller, M. 2011. Response to PCRFCO Comments Regarding Hydrology. August 18.