TETRA TECH

Tucson Office
3031 West Ina Road
Tucson, AZ 85741
Tel 520.297.7723 Fax 520.297.7724
www.tetratech.com

Technical Memorandum

To:	Kathy Arnold	**From:**	Amy L. Hudson, REM
Company:	Rosemont Copper Company	**Date:**	June 9, 2011
Re:	Response to Comments – Infiltration, Seepage, Fate and Transport Modeling	**Doc #:**	121/11-320878-5.3
CC:	David Krizek (Rosemont Copper Company); and Paul Ridlen, P.E. (Tetra Tech)		

1.0 Introduction

This Technical Memorandum provides responses to comments made by SRK Consulting (SRK) on behalf of the Coronado Forest Service (CNF) concerning the Infiltration, Seepage, Fate and Transport modeling performed by Tetra Tech for Rosemont Copper Company (Rosemont). This is the third review cycle related to this work.

Tetra Tech prepared the original documentation titled *Infiltration, Seepage, and Fate and Transport Modeling Report* dated February 2010 (Tetra Tech, 2010a).

SRK provided the first review comments to the original documentation in a Technical Memorandum titled *Technical Review of Infiltration, Seepage, and Fate and Transport Modeling Report, Tetra Tech, 2010, Prepared for Rosemont Copper Company* dated April 30, 2010 (SRK, 2010).

In response, Tetra Tech prepared a revised report titled *Infiltration, Seepage, Fate and Transport Modeling Report – Revision 1*, dated August 2010 (Tetra Tech, 2010b) and a Technical Memorandum titled *Rosemont Infiltration and Seepage Modeling Response to Comments* dated November 30, 2010 (Tetra Tech, 2010c).

SRK provided additional comments in the following documents:

- Technical Memorandum titled *Technical Review of Infiltration, Seepage, Fate and Transport Modeling Report -– Revision 1 – Part 1 Infiltration and Seepage Model Components*, dated February 14, 2011 (SRK, 2011a); and
- Technical Memorandum titled *Technical Review of Infiltration, Seepage, Fate and Transport Modeling Report -– Revision 1, Part 2 Geochemical Fate and Transport Modeling*, dated April 14, 2011 (SRK, 2011b).

In response, Tetra Tech prepared the following documents:

- Tetra Tech Technical Memorandum titled *Rosemont Facility Infiltration and Seepage Modeling Response to Comments*, dated April 22, 2011 (Tetra Tech, 2011a); and

- Tetra Tech Technical Memorandum titled *Rosemont Facility Fate and Transport Modeling Response to Comments*, dated May 16, 2011 (Tetra Tech, 2011b).

SRK provided additional questions detailed in a Technical Memorandum titled *Response to Tetra Tech Memorandum dated 22 April 2011, Infiltration and Seepage Model* dated May 23, 2011 (SRK, 2011c), included as Attachment 1.

This Technical Memorandum addresses the comments from the May 23, 2011 SRK Technical Memorandum.

2.0 Responses to SRK Comments

The following sections address the remaining issues related to the infiltration and seepage modeling work with all pertinent information provided herein. Responses are made in red letter text following the original review question/comment.

2.1 Input Data – Climate and Site Material Soil

No further questions.

2.2 Heap Leach Facility Conceptual Model

Tetra Tech stated that moisture content and hydraulic properties for site waste materials were provided in the laboratory reports for test work completed by Advanced Terra Testing. The attached laboratory data from Advanced Terra Testing are for geotechnical tests (Atterberg Limits, Proctor, density, sieve analysis etc.). There are no moisture content or hydraulic properties tests in these laboratory reports (porosity, moisture characteristics, saturated hydraulic conductivity, and unsaturated hydraulic properties). Are there are other laboratory reports that provide these data?

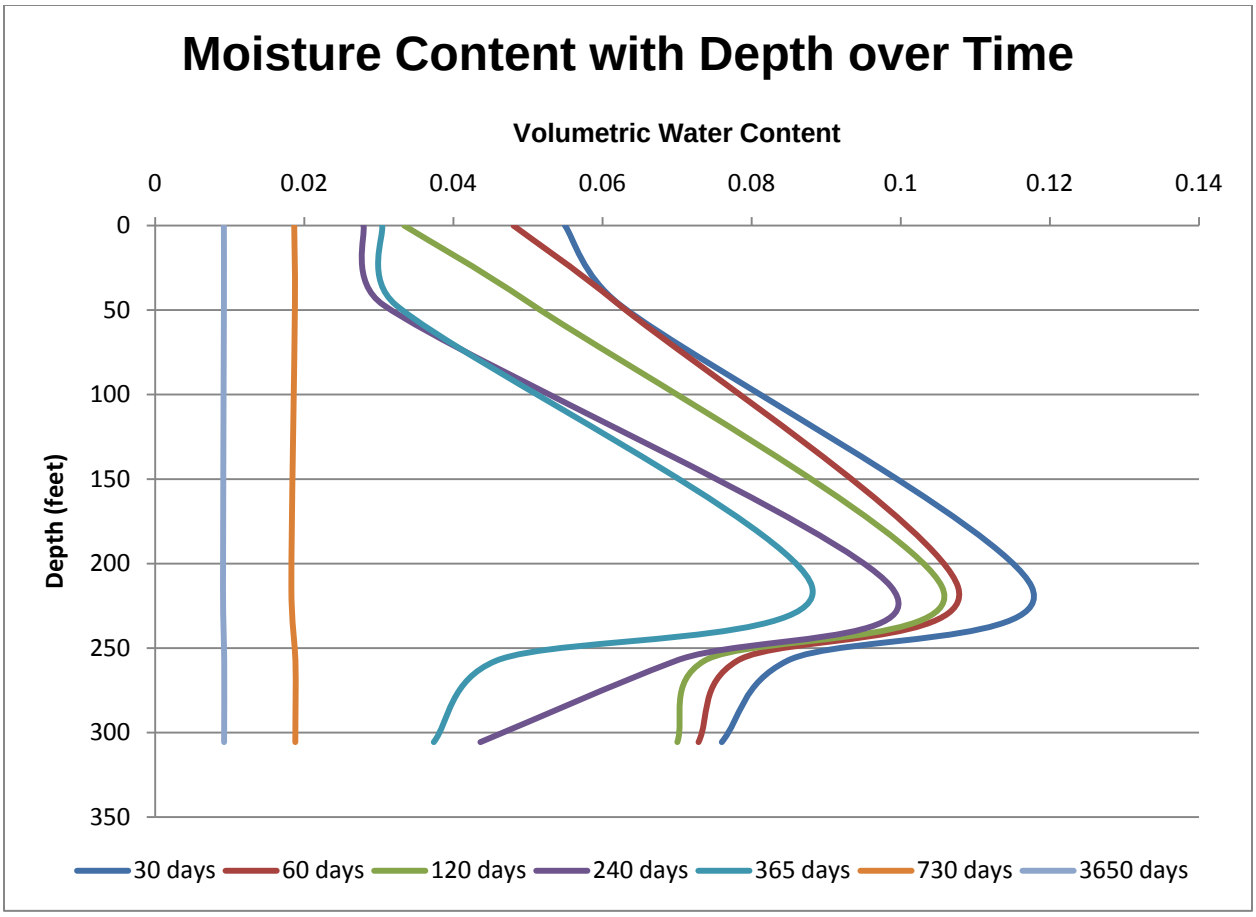
There were no other tests performed on the material. However, the grain size results from the laboratory testing were sufficient to allow the hydraulic properties to be estimated and used in the modeling.

2.3 Steady-State and Transient Solutions

1. The figure indicates that the heap is 1,400 feet high. Please clarify the depth shown for the height of the Heap.

An error occurred during the data extraction used to construct the previously supplied chart. The model was constructed using a finite difference mesh made up of triangles, and neighboring nodes were inadvertently used to make the graph. This resulted in a longer length because horizontal distances were included along with the vertical distances.

Therefore, the following graph (below) was generated to represent the volumetric water content (VWC) within the Heap Leach Pad at section through the maximum depth over time. The graph illustrates the VWC within the heap at the maximum section using a single vertical string of nodes and does not consider horizontal distances.



2. AMEC's Figure 6.9 (2009) (Tetra Tech's Figure 5.26) for the dry stack tailings are what would be expected for an infiltration simulation with one material type, as the Heap Leach simulation was. The drastic change of the slope of the curve seen in the Tetra Tech figure indicates a change in materials with different hydraulic properties. The discontinuity between the first 365 days and 730 and 3650 days indicates that there is something wrong with the model formulation. Again look at Figure 5.26; this illustration is more typical for infiltration models assuming one material type.

An error occurred during the data extraction used to construct the previously supplied chart. The model was constructed using a finite difference mesh made up of triangles, and neighboring nodes were inadvertently used to make the graph. This caused the graph to resemble different material properties being encountered.

The revised figure (above) does not include neighboring nodes, and does not appear to include multiple material layers. As would be expected, the earliest lines represent the wettest conditions, and the later periods have less and less water, until the near dry conditions develop after year two (2). Also, please note that AMEC's Figure 6.9 (2009) was reproduced as Tetra Tech Illustration 5.30, not Figure 5.26, in the Technical report titled *Infiltration, Seepage, and Fate and Transport Modeling Report – Revision 1*, dated August 2010 (Tetra Tech, 2010).

Are the results from the simulation for 0 to 365 days used for the model shown for 730 to 3650 days? Was this simulation for the Heap alone or one of the closure options with a waste rock cover?

The results presented are from one (1) continuous model run for an entire simulation length of 3650 days. The simulation presented in the drain-down curve and for the moisture content graph (above) represent the beginning of closure, but does not include the waste rock or soil cover that will be placed over the facility.

2.4 Illustrations and Tables

No further questions.

REFERENCES

SRK, Sieber, M.; Day, S.; and Ugorets, V.; (2010). *Technical Review of Infiltration, Seepage, and Fate and Transport Modeling Report, Tetra Tech, 2010, Prepared for Rosemont Copper Company.* Technical Memorandum to Dale Ortman. Technical Memorandum dated April 30, 2010.

SRK, Sieber, M. (2011a). *Technical Review of Infiltration, Seepage, Fate and Transport Modeling Report -– Revision 1 – Part 1 Infiltration and Seepage Model Components*. Technical Memorandum to Dale Ortman. Technical Memorandum dated February 14, 2011.

SRK, Day, S.; Hoag, C. (2011b). *Technical Review of Infiltration, Seepage, Fate and Transport Modeling Report -– Revision 1, Part 2 Geochemical Fate and Transport Modeling*. Technical Memorandum to Dale Ortman. Technical Memorandum dated April 14, 2011.

SRK, Sieber, M. (2011c). *Response to Tetra Tech Memorandum dated 22 April 2011, Infiltration and Seepage Model*. Technical Memorandum to Dale Ortman. Technical Memorandum dated May 23, 2011.

Tetra Tech (2010a). *Infiltration, Seepage, and Fate and Transport Modeling Report.* Prepared for Rosemont Copper Company. Dated February 2010.

Tetra Tech (2010b). *Infiltration, Seepage, Fate and Transport Modeling Report – Revision 1*. Prepared for Rosemont Copper Company. Dated August 2010;

Tetra Tech, Hudson, A.L. (2010c). *Rosemont Infiltration and Seepage Modeling Response to Comments.* Technical Memorandum to Kathy Arnold, Rosemont Copper Company. Technical Memorandum dated November 30, 2010.

Tetra Tech, Hudson, A.L. (2011a). *Rosemont Facility Infiltration and Seepage Modeling Response to Comments*. Technical Memorandum to Kathy Arnold, Rosemont Copper Company. Technical Memorandum dated April 22, 2011.

Tetra Tech, Hudson, A.L.; and Williamson, M.A. (2011b). *Rosemont Facility Fate and Transport Modeling Response to Comments*. Technical Memorandum to Kathy Arnold, Rosemont Copper Company. Technical Memorandum dated May 16, 2011.

ATTACHMENT 1
TECHNICAL MEMORANDUM TITLED
RESPONSE TO TETRA TECH MEMORANDUM DATED 22 APRIL 2011, INFILTRATION AND SEEPAGE MODEL
(SRK, 2011C)

0153O4
2011 05 23

srk consulting

SRK Tucson
Suite 240, 3275 West Ina Road
Tucson, AZ 85741

T: 520 544 3688
F: 520 544 9853

msieber@srk.com
www.srk.com

Memo

To:	Dale Ortman, P.E.	**Date:**	May 23, 2011
Copy To:	Chris Garrett, SWCA	**From:**	Mike Sieber, P.E.
Copy To	SRK, File	**Project #:**	183101
Subject:	Response to Tetra Tech Memorandum dated 22 April 2011, Infiltration and Seepage Model		

Tetra Tech prepared a technical memorandum *Rosemont Facility Infiltration and Seepage – Response to Comments* dated April 22, 2011. It was prepared in response to a technical review *Infiltration, Seepage, Fate and Transport Modeling, Revision 1- Part 1 Infiltration and Seepage Model Components* prepared by SRK Consulting on February 14, 2011. The Tetra Tech memorandum provided acceptable responses to all questions with the exception of two items below. We request clarification on Items 2 and 3.

1 Input Data – Climate and Site Material Soil

No further questions.

2 Heap Leach Facility Conceptual Model

Tetra Tech stated that moisture content and hydraulic properties for site waste materials were provided in the laboratory reports for test work completed by Advanced Terra Testing. The attached laboratory data from Advanced Terra Testing are for geotechnical tests (Atterberg Limits, Proctor, density, sieve analysis etc.). There are no moisture content or hydraulic properties tests in these laboratory reports (porosity, moisture characteristics, saturated hydraulic conductivity, and unsaturated hydraulic properties). Are there are other laboratory reports that provide these data?

3 Steady-State and Transient Solutions

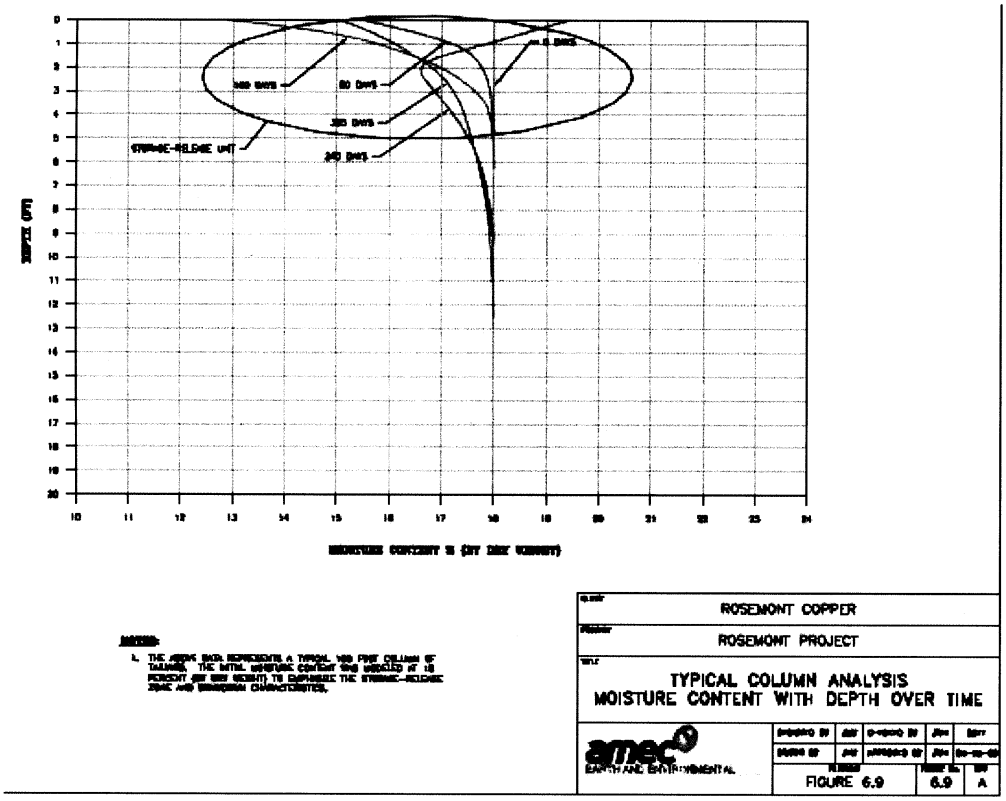
SRK has the following questions about the figure showing moisture content vs. depth:

1. The figure indicates that the heap is 1,400 feet high. Please clarify the depth shown for the height of the Heap.

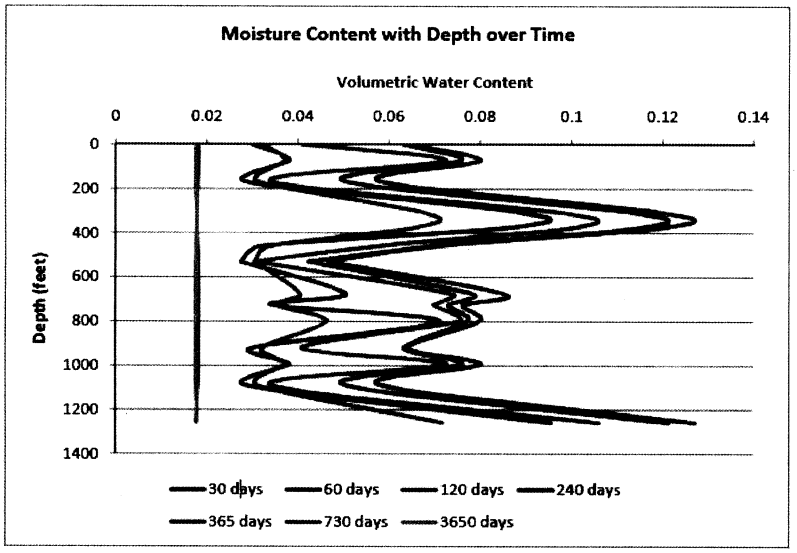
2. AMEC's Figure 6.9 (2009) (Tetra Tech's Figure 5.26) for the dry stack tailings are what would be expected for an infiltration simulation with one material type, as the Heap Leach simulation was. The drastic change of the slope of the curve seen in the Tetra Tech figure indicates a change in materials with different hydraulic properties. The discontinuity between the first 365 days and 730 and 3650 days indicates that there is something wrong with the model formulation. Again look at Figure 5.26; this illustration is more typical for infiltration models assuming one material type.

   Are the results from the simulation for 0 to 365 days used for the model shown for 730 to 3650 days? Was this simulation for the Heap alone or one of the closure options with a waste rock cover?

Document for Deliberative Purposes Only – Not for Public Distribution



AMEC, 2009, Figure 6.9 (Tetra Tech, Figure 5.26)



Tetra Tech figure

4 Illustrations and Tables

No further questions.

Document for Deliberative Purposes Only – Not for Public Distribution

ROSEMONT COPPER
A Bridge to a Sustainable Future.

Memorandum

To: Beverly Everson

Cc: Chris Garrett

From: Kathy Arnold

Doc #: 066/11 – 15.3.2

Subject: **Transmittal of Technical Memoranda**

Date: June 27, 2011

Rosemont Copper is transmitting the attached memoranda responding to questions raised in technical review memos and at meetings.

- *Response to Comments – Infiltration, Seepage, Fate and Transport Modeling*, Tetra Tech technical memorandum dated June 9, 2011
- *Response to Golder Comments on Drop Chutes – Site Water Management Update Report,* Rosemont Copper memorandum dated June 8, 2011
- *Empire CAT Letter Addressing Haul Truck Engines and Emissions,* Empire CAT letter dated June 27, 2011

These memoranda are being transmitted in electronic form via email only. Please let me know if you require additional hardcopy versions of these documents.