Briefing Paper

Water Panel Meeting, May 3, 2012

Overview

The purpose of this meeting was to bring together the technical experts the Forest has contracted to review groundwater modeling, geochemical, and surface water issues, as well as specialists from the Forest and other federal cooperators, in order to discuss several overarching water-related issues from a multi-disciplinary perspective. This meeting was intended to provide a forum for direct communication between specialists, provide an open dialogue on technical issues, and provide documentation of these issues for consideration by the Forest Supervisor when assessing decisions on the Rosemont Copper project.

Page numbers referenced refer to the court reporter transcript from the meeting.

Who Attended

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Discussion Overview

There were three main topics on the agenda to be covered:

1. Impacts to Outstanding Arizona Waters in Davidson Canyon
2. Geochemistry
3. Impacts to Upper Cienega Creek

Road Map to the Transcript

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**Topic #1: Impacts to Outstanding Arizona Waters in Davidson Canyon**

This topic was focused on understanding the potential impacts to the Outstanding Arizona Waters in Lower Davidson Canyon. There was wide-ranging discussion that included the groundwater flow models and particularly the model boundaries, geologic data and the potential need for additional investigations, surface water flow and geomorphology, the source of water for Reach 2 Spring, and potential field work that could be conducted to further investigate water sources.

- The model discussion largely focused on the model boundaries, and particularly the western model boundary and whether it had been properly applied and tested. Concerns about boundary conditions were raised primarily by Roger Congdon (Forest) and by Stan Leake (USGS). Vladimir Ugorets and Larry Cope (SRK) both indicated that use of a no-flow boundary on the western edge of the model was inappropriate, that the models were constructed appropriately and to industry standards, and that they felt that the western boundary was unlikely to be a problem with the model, due to the geology present and the fact that available data that show flow at the boundary does not reverse directions. However, **both Larry and Vladimir also indicated they felt more documentation and testing of the boundary was entirely reasonable and necessary.** There was **some disagreement over the concept of the importance of boundary flux** from Stan and Roger, but agreement about the further testing. **There was consensus that the work recently requested from Rosemont by the Forest was necessary to answer these boundary questions.**

- There was discussion about whether the geology was adequately characterized in the area, including the potential for karst features, fault zones, and the potential for further geophysical investigation. These concerns were primarily raised by Floyd Gray (USGS) and Bev Everson (Forest). There was strong disagreement from SRK. Cori Hoag (SRK) stated that the geology was extensively investigated and was adequate, more so than in many other cases. Vladimir Ugorets (SRK) indicated that the model adequately incorporated the known fault and fracture zones. There was **no consensus on this issue,** but there was consensus around an action item: **preparation of a briefing paper for presentation to Jim Upchurch, including the available geologic evidence, the various professional viewpoints expressed, the uncertainties involved and their impact to the decision-making process.**

- Surface water and the potential for scour/aggradation was briefly discussed, primarily by George Annandale (Golder) providing his opinion. He conducted a field review of specific drainages and **believes the natural system is such that there would be no changes in the geomorphology of the channel due to the mine.**
There was much discussion about the source of water for Reach 2 Spring. Numerous lines of evidence were discussed. George Annandale (Golder) and Larry Cope (SRK) both provided their opinions that based on the available evidence, they felt it most likely the springs in Lower Davidson Canyon are not connected to the regional groundwater system, but are fed by alluvial groundwater. Both acknowledged the uncertainty in these lines of evidence. Larry further discussed possible field tests that could be conducted to provide additional evidence regarding the source of water. George further indicated that even if Reach 2 Spring arose from the alluvial system, he doubted that changes in streamflow due to the mine site (approximately 11 miles upstream) would impact flow in Reach 2 Spring.

**Topic #2: Geochemistry**

This topic focused on a discussion of the geochemical modeling and impacts from the waste rock, tailings, heap leach, and pit lake facilities. This included discussion of leaching tests, infiltration, and management of possible problems.

- Steve Day (SRK) provided his overall opinion of the potential water quality at the mine site, and described how it was fundamentally different from most porphyry copper deposits. There was a discussion of the various leaching tests, their differences, and their applicability. Cori Hoag (SRK) and Steve both indicated that taken as a whole, all of the various tests were sufficient to support the geochemical modeling.

- Infiltration scenarios were discussed, as were preferential pathways that might develop in the facilities. EPA reiterated their concern over infiltration scenarios as conducted; SWCA described work in process including SRK response to EPA concerns and request for Rosemont to remodel infiltration scenarios.

- Best Management Practices and waste rock placement were discussed as factors that would reduce risk. EPA indicated concern that once contamination occurs it would be too late, and thus the need to eliminate uncertainty. A discussion of necessary monitoring was conducted.

- Overall, no action items came out of this discussion, except for the understanding that several work requests were in process that would help answer these questions (1 – SRK response to EPA comments, 2 – request for Rosemont to remodel infiltration, 3 – SRK response to Forest geochemical questions, 4 – stormwater redesign).

**Topic #3: Upper Cienega Creek**

The discussion centered on the ability of the model to predict impacts in Upper Cienega Creek and the importance of assessing those impacts.

- Both Vladimir Ugorets (SRK) and George Annandale (Golder) indicated that the ability of these models or any other model to predict impacts at fractions of a foot many years in the future was simply not realistic. There was general consensus on this opinion, with agreement by both Floyd Gray (USGS) and Dan Moore (BLM) during the discussion.
• Elizabeth Goldman (EPA), Dan Moore (BLM), and the Forest (Jim Copeland) all discussed the idea that such small impacts are important, as small impacts to aquatic and riparian systems could have significant effects. SWCA commented that there was a disconnect between this discussion and the previous bullet point, and that the discussion by the modelers (discounting the ability to predict effects) wasn’t the same as discounting the importance of those effects.

• SWCA proposed an action item, that a memo be prepared to analyze the uncertainty of the models with respect to impacts to Cienega Creek and other aquatic resources, and to assess whether a different method could be used to do so.

Follow-up/Parking Lot Items:

• Summary of Davidson Canyon impacts: Bev asked, a reduction of 0.04 cfs and 0.29 stream miles equals what percentage of reduction in flow? Response: Chris answered this on a slide during the meeting: 0.04 cfs represents a 23% reduction from median baseflow in Lower Davidson Canyon (period of record 1968-1975).
• FS requirement? Assumption that springs are associated with groundwater, unless determined to be influenced by surface water? FS Tech memo #881? Response: Salek is aware of this memo and this discussion has taken place between the Forest and SWCA.
• EIS should write-up the different leaching procedures to show how they add confidence to results. Response: SWCA intends to add a detailed description of all geochemical tests to the FEIS.
• Can pit lake inflow models adequately predict impacts to Upper Cienega Creek 1000 years from now? Response: This was developed as an action item to produce a memo on this topic.
• Habitat impacts to Cienega Creek can be predicted with time and money. Response: None at this time, pending results of action item memos, Forest could consider additional approaches if warranted.
• Data levels- possible addition of geophysical information to understand possible groundwater flow paths. Response: This was developed as an action item to produce a memo on this topic.
• Collect data to determine if Reach 2 and Escondido Springs are connected to groundwater aquifer. Response: This was developed as an action item to produce a memo on the topic of the likely source of water for Lower Davidson Canyon, and additional data collection that could be undertaken to help determine that source.
• How would a preferential pathway through the waste, tailings or heap be dealt with? Response: SWCA intends to add a detailed description of response strategies in the FEIS, particularly as detailed in the APP, to the level of detail possible without speculating on future problems.
• Even small changes in water level and flow in surface water can have large impacts to bio/eco-system impacts. Response: SWCA intends to maintain and expand on this concept in the FEIS, particularly with respect to the functional analysis of riparian vegetation and aquatic resources.

Summary of Action Items:

• Briefing paper for Forest Supervisor on state of geologic knowledge, differing professional opinions, and potential techniques that could be employed. SWCA/Forest to prepare. Status: Draft prepared by SWCA 5/8, needs input from Bev Everson prior to presentation to Jim Upchurch.
• Technical memorandum describing uncertainty of the model and potential alternative approaches for analyzing distant impacts to aquatic/riparian resources. SWCA/Forest to prepare scope of work; SRK to conduct analysis. **Status:** Draft scope of work prepared by SWCA 5/17; need approval from Forest.

• Technical memorandum describing and analyzing all lines of evidence regarding the source of water for Lower Davidson Canyon, and potential data collection techniques. SWCA/Forest to prepare scope of work; SRK to conduct analysis. **Status:** Draft scope of work prepared by SWCA 5/17; need approval from Forest.

• Completion of outstanding work items regarding geochemistry: 1 – SRK response to EPA comments (**draft completed 4/27**), 2 – request for Rosemont to remodel infiltration (**due end of June**), 3 – SRK response to Forest geochemical questions (**draft completed 4/17**), 4 – stormwater redesign (**completed and decision made 5/8**).

**Attachments:**

- East Side Water Process Chronology (meeting handout)
- List of Consultants (meeting handout)
- Various slides (projected during meeting)
- Transcription of meeting discussion by United Court Reports
WATER PANEL DISCUSSION

May 3, 2012

Tucson, Arizona
PANEL MEMBERS:

SRK CONSULTING: Vladimir Ugorets, Ph.D.
Larry Cope, Senior Consultant
Mike Sieber, P.E.
Corolla (Cori) Hoag, P.G., C.P.G.
Stephen Day, P. Geo

GOLDER & ASSOCIATES:
George Annandale, Ph.D.

USGS: Stan Leake
Floyd Gray
Jim Leenhoats

BLM: Dan Moore

USFS: Deb Whitall
Jim Copeland
Roger Congdon
Bev Everson
Mindee Roth

EPA: Carter Jessop, via telephone
Elizabeth Goldman, via telephone

SWCA: Ben Gaddis
Chris Garrett
Dale Ortman
Melissa Polm
Jonathan Riggs
Ken Houser
Deanne Rietz, via telephone
BEN: We're here for -- we've got two main purposes to achieve. One is just to provide an opportunity for some direct face-to-face communication between all the agency folks involved in the project and the specialists, primarily from the panelists here that have been reviewing, writing memos, writing reports, et cetera.

We're also here because we want to make sure that the Forest Service has taken a hard look at the environmental consequences of the proposed action alternatives with respect to water resources and that the forest supervisor has the necessary information to make an informed decision based on the analysis.

This is part -- as far as this purpose is concerned, that's where I'll be steering us back to some of the NEPA questions that we're needing to make sure that we've got straight.

Does anybody have any comment or question on those purposes? Hopefully this was everybody's expectation basically for the meeting today.

Okay. So in a second we'll do introductions and a little bit of stage setting. We'll start with a summary of what's been done, Chris will do that, so that everybody's kind of on the same page about all the different studies et cetera that have been completed as
part of this NEPA process. I'll talk about some of the
NEPA backdrop for just a few minutes that will be a lot
of what we return back to here and there. And then
we've got the rest of the discussion set up as a series
of sort of discussion sessions.

The first will be impacts to Outstanding
Arizona Waters in Davidson Canyon and the second one
will impacts to upper Cienega Creek and then the third
one is geochemical impacts. And we have about an hour
set up for each of these. We'll do -- we need to
really stick to that hour and a half if we're to cover
at least something in every category but I'll check in
with you guys, too, and if there's a feeling we need to
stay on something a little longer, we can adjust
obviously.

The way each session will work generally is
for Chris to provide a summary of impact that was in
the draft EIS and then a summary of methods that were
used to do that analysis. We'll have some time that's
just question and discussion and then the wrap-up will
be largely the specialists/panelists who are here that
will kind of take what they heard from everybody and
wrap that up into a relatively brief summary hitting
the key points that came out of that discussion.

So that's basically how each of those sessions
will work. We've got three breaks planned, five
minutes each, and one lunch that's at noon. We figured
everybody would probably generally stay here but I
think that's an on-your-own lunch.

All right. Any questions about the agenda?

Purposes? Comments? All right. Sounds good.

Why don't we start with moving on to
introductions and why don't we start with you, Larry,
if that's all right. And we've got about a minute per
introduction, if not a little bit less than that. So
go fast.

LARRY: Morning. My name is Larry Cope.

I'm a hydrogeologist with SRK Consulting. Our task has
been to provide guidance and technical review to the
authors of the models throughout the process; we've
been involved since 2010.

My experience encompasses about, as you can
tell from how I look, quite a few years. I have about
35 years of experience, 30 to 35 years of experience;
about 25 to 30 of that is mining related.

I'm a physical hydrogeologist, been working on
mining sites for those three decades, typically in
characterization work, in mine water management work,
underground and open pit, basin characterization. I
guess you would say that my particular technical
expertise is in aquifer hydraulics, pumping analysis, and that's what I hope to do some talking about today.

VLADIMIR: I'm Vladimir Ugorets, hydrogeologist, with SRK Consultants. I have 34 years experience working as hydrogeologist. My experience related to the mine, devoted open pit and underground mine, and I'm specialized in the groundwater modelling. I have participated in this project in the reviewing Montgomery and Tetra Tech groundwater models.

GEORGE: My name is George Annandale. I'm a principal of Golder and Associates. I'm a civil engineer with 38 years of experience. I specialize mainly in fluvial hydraulics and sedimentation. That is -- and I worked in the mining industry for almost all my entire career. I'm from South Africa and you can't help but work in the mining industry if you're from there.

I've also authored one of the first books on reservoir sedimentation in 1997, co-authored another book on sustainable management of water infrastructure, which focuses on sedimentation; that was published by the World Bank in 2003. And I -- recently McGraw-Hill published a book on Scour Technology that I authored in 2006.

With the risk of sounding boastful, I think
that I am internationally acknowledged for those 
expertise and experience in sedimentation and scour. 
And I work in the United States and across the world on 
a regular basis.

STAN: I'm Stan Leake with US Geological 
Survey, worked for the USGS for over 40 years. I'm a 
research hydrologist kind of specializing in methods of 
simulating groundwater flow. I've developed a few of 
the capabilities that are in mock flow that we used for 
all of these problems.

A lot of my work over the last decade or so 
had to do with the effects of -- a lot of my work over 
the last decade or so has had to do with looking at 
effects of groundwater development on connected streams 
and rivers and springs and things like that. And I've 
written papers and reports on that subject.

FLOYD: Hi, I'm Floyd Gray with the US 
Geological Survey. I'm in the geology, minerals, 
energy, and geophysics research science center, and 
I've been with the USGS about 38 years working 
principally on mineral deposits in the Southwest US, 
principally porphyry copper deposits.

And we've worked on global mineral assessments 
in Venezuela, in the Amazon, in Southwestern US, 
Mexico. Recently published a mineral assessment of
Mexico porphyry coppers. We also published -- I also
principally published a mineral assessment of the
Caribbean Basin as well for porphyry copper deposits.
I've recently, in the last 15 years, worked on
acid rock drainage and baseline background studies
with -- regarding porphyry copper systems in the US.

ROGER: I'm Roger Congdon with the
Forest Service. I got my Ph.D. in magma physics so
naturally I went directly into groundwater issues and
worked with USGS for three years and then Bureau of
Land Management for nine years on the Carlin Trend,
working directly with and being critical of modulars on
dewatering projects on the Carlin Trend. Worked with
Fish and Wildlife Service for four and half years in
various hydrological problems and last five years
worked with Forest Service.

And for that whole five years have been
involved with this project and have had extensive
training in groundwater modelling and developed my own
models as part of our projects and have looked at quite
a few mine dewatering type models.

JIM L: I'm Jim Leenhoats. I'm a
hydrologist with US Geological Survey, been working for
the USGS about 12 years. And I also serve as what's
called as the investigations section chief for the USGS
Arizona Water Science, which is our branch of water here for USGS here in Arizona.

My background is in isotope hydrology but I spent a lot of my working career looking at issues of sustainability of groundwater resources and the effects of groundwater withdrawals on connected streams, particularly the San Pedro River.

DAN: I'm Dan Moore, geologist with the Bureau of Land Management in Tucson. My background has been with Bureau of Land Management for 12 years as hydrologist and now as a geologist. Part of that I worked for six years as a CERCLA regulator working on mainly uranium enrichment plant and Department of Defense type sites.

BEV: I'm Bev Everson. I'm a Coronado National Forest Service geologist and I've been involved with the Rosemont project for about six years, since our -- since they originally came to us with an initial proposal for mining and then in summer of 2006 a very preliminary plan of operations for the mine.

I've been with Forest Service for 21 years in minerals administration, worked a lot with locatable minerals, and total have 30 years experience as a geologist in industry, state government, and federal government and in teaching and undergraduate classes.
JIM: Morning. My name is Jim Copeland and I'm the district ranger of Nogales. And I'm here to listen to what you have to say and ponder.

DEB: Good morning. I'm Deb Whitall. I'm the acting deputy forest supervisor on the Coronado National Forest and last Friday I was given a promotion to acting forest supervisor. Jim is on vacation in Belize, so I'm very happy to be here, very interested to soak up all the wonderful -- there's a lot of brain power in this room, so I'm really excited to be here.

So my background. I've worked for the Forest Service 30 years. I have degrees in hydrology and soil science. The first 20 years of my career was as a forest hydrologist and that was mostly in the Sierra Nevada Mountains and in southwest Oregon. My doctorate is in public policy. I've written extensively on social networks. When I'm not acting, I'm the social scientist for the Forest Service in California. So, again, very, very happy to be here.

MINDEE: Hi, this is Mindee Roth with the Forest Service. And my role in the Rosemont project is as a special assistant to the forest supervisor. And in that role, I'm primarily a project manager, just keeping a pulse on all the ins and outs of the project and helping Jim and Deb get answers to
their questions, report upward, that sort of thing.

I have almost 30 years with various agencies in the federal government as a natural resource manager and I don't really bring a technical expertise to the project like most of you do. I'm more of a generalist. I've done a number of things in my career but I'm also glad to be here and was thinking I should have been tallying up the years of experience in this room. It's quite an impressive group and I really appreciate everybody being here.

DALE: Dale Ortman. I'm a subcontractor to SWCA. I've been working on this project since late '08. I was asked to fill a role to bring mining experience into the SWCA group. I've got 35 years experience as both consultant and working directly in the industry throughout the west US, from Alaska to Arizona. I've started mines, I've run mines, I've designed lots of waste facilities, I've closed mines, including the engineer of record and earthworks construction oversight for the closure of San Manuel, the world's largest mine closure we completed in '08. I retired from SRK late in '08 and carry a fairly small independent practice now.

STEPHEN: Good morning, everybody. My name's Steve Day. I'm a practice leader at SRK
Consulting and I'm a specialist in mine waste geochemistry.

And that's been my role in the Rosemont project is to review those aspects of the project. I have a geological science background, bachelor and master's in that. I've been working since 1989 continuously in the area of mine waste geochemistry. My involvement in projects is to understand the characteristics of materials and then provide input into engineering designs and environmental impact assessments.

I was considering this morning how many projects like this I've worked on and I believe it's roughly 20 open pit copper sulfide mines over the years, some are porphrys and some are skarns.

CORI: Hello. I'm Cori Hoag. I'm a practice leader as well in geology for SRK Consulting. I'm a manager of the Tucson office. I got my degree, master's degree, here locally at the University of Arizona in economic geology. Prior to my work with SRK -- I've been working with SRK for 11 years. I previously worked for BHP Copper and Magma Copper at the San Manuel Mine and also the Florence in-situ leave project. I've worked at Copperstone in Western Arizona, at Cypress Tohono, which is another porphyry
copper with skarn. So as with SRK, I've also worked at Bagdad, Sierrita, Carlotta, a number of the other operations in Arizona. So I feel very well grounded in making statements about analogs of Rosemont to other operations in Arizona.

So, in addition to mining geology, I also do environmental geology. I'm a specialist in groundwater permits, have helped with closure and start-up operations for groundwater permitting, which includes baseline characterization, geochemical characterization; the submittals that are required for meeting our state requirements for groundwater permitting.

MIKE: I am Mike Sieber with SRK from the Tucson office. I have about 18 years experience in ecogeology. I do a lot of field work, groundwater characterization, and prefeasibility work. I worked at San Manuel and have been reviewing the documents here with some of the modelling in the Davidson Canyon and the other documents.

CHRIS: My name's Chris Garrett and I work for SWCA. We're the third-party NEPA contractor working for the Forest. I'm a registered professional hydrologist specializing in groundwater but on this project I'm mostly the project manager.
BEN: All right. I'm going to take the -- there are a few people that I guess are more in the audience but I think everybody should know that they're here so I'm going to pass it back to them.

MELISSA: I'm Melissa Polm. I'm the assistant project manager for the Rosemont Copper Project for SWCA NEPA process, and I've been working on this project for about five years. And the only expertise I could say that I might have would only be in the knowledge of all of the documents that have traveled past my desk on their way into the record and just a general knowledge of the project and the evolution of all the work that's been done on the project thus far 'cause I got in right at the very beginning of the NEPA process.

JONATHAN: My name is Jonathan Rigg and I'm also with SWCA. I'm kind of the team lead for our -- all of our specialists and I'm here to kind of listen in and I'll go back and inform all the specialists that, you know, water plays a big role in their fields. So just here to get the briefing on this meeting and bring it back to our team.

KEN: Hello. My name's Ken Houser. I'm also with SWCA; I'm a principal. I'm Chris Garrett's boss and I'm a principal on this project from the very
beginning. And I'm here today in case you guys get
tired of Ben keeping you on task and focusing on the
NEPA goals and run him out of the room, I'm here to
take over and do the same thing for the rest of the
day.

I've got about 30 years experience of the
40 years of NEPA and have become a pretty savvy NEPA
contractor, as well as a master's degree in geology and
hydrogeology.

BEN: And how about the folks on the
phone? Let's start with the EPA.

CARTER: My name is Carter Jessop. I'm
with EPA Region 9 environmental review office. I have
been working on the Rosemont project for about two and
a half years now. And I've been with EPA for about two
and a half years. I am the project lead so I'm the
contact person for all the various folks within EPA who
are involved with this project from Super Funds to
water to air. I'm the lead contact and sort of the
project manager on the EPA side of things.

BEN: Okay. Deanne?

DEANNE: Yes, I'm Deanne Rietz with SWCA
out of the Phoenix office, and I am a hydrologist
working on the Rosemont project, been involved since
the beginning. And writing mostly the surface water
BEN: Is Elizabeth on also? Carter?

CARTER: I don't believe so. She'll have to do her introduction once she gets on.

BEN: Okay. Did I miss anybody on the phone? I'll take that as a no.

So that was a good introduction. I think I was -- definitely what was impressed upon me there was the amount of experience in the room in general. So I think while we stand -- we should be able to meet our second goal there with all the voices in the room.

I'll make the next part quick but I do want to point out a couple of things. I think there's a good chance that, at some point along the way, we'll get into a topic we really don't or shouldn't discuss right now and we'll put those right here. You'll notice that I put some Post-it notes around the room. If we're on a subject or we start to get on a subject that we just don't need to talk about now, I may ask you to stop, please write it down to address at a later time. And then I'll come grab it from you and put it up here.

And I'm also going to need to have you help me to an extent to recognize those conversations that are not best dealt with in this venue and should be deferred to a later meeting or a different way of
dealing with them. So keep in mind that while I'm sort of the one moving around the room and keeping everybody on task and on topic, don't be shy about interjecting yourself and saying: Wait a second. We're off topic. And helping me out with that. That would be great.

I would like to also, before we get started, talk about kind of what to expect from the panel of folks from SRK and Golder, what also not to expect from them, and then, after that, to set up some basic ground rules which are always helpful to have so that we are moving on the same page.

So the things to expect from the panel are to provide some perspective or context to quantify impacts within the larger frame of natural variation, right, so they'll bring that experience to bear. You heard from a lot of the folks from SRK and Golder about the number of different mine sites they've worked on, et cetera, and you would -- we can expect them to bring to bear that experience.

Also, interpretation of systems existing within the areas of analysis. So there are lines of evidence that they're seeing that we may discuss. Local familiarity, particularly Cori and Mike who work in the local SRK office and have a lot of experience with Arizona mines. And then obviously you can expect
them to provide independent and unbiased input to the conversation today.

Things that I wouldn't expect are for them to defend the scopes of work that they got or, for that matter, to defend the things that they weren't asked to do. And I expect you guys to sort of pipe up about that, that, "I can't go there because I didn't -- wasn't asked to do that and, therefore, I didn't do that," for example.

And I also would not expect to get into the weeds of some of these analyses. We're -- this is probably not the right venue to discuss the fine details, so keep that in mind. And I'm going to need your help to recognize when, whoa, we're talking about something where we need to look at the actual model in more detail or whatever happens to be that might be too fine a detail.

Is this -- any questions about this? Anything to add? Anything you want to see from the panel that's not here? Okay.

Now, the last thing. And then I'll mention just a couple more things about how I typically like to work with this and then we'll move on. Is the ground rules. So I like to just leave this up to you guys. To make this a productive conversation, how do we need
to agree to operate as a group?

    DEB: I have one request and that's that
    we don't use acronyms.

    BEN: Okay. In general, I think that
    would be helpful, too, so that's a good idea. Anything
    else?

    CORI: Speak clearly with good volume
    and one at a time.

    DEANNE: When other people are talking
    right now -- I don't know what you were doing; before
    it was great, now it's going out.

    BEN: Okay. We were passing around the
    phone and we quit doing that. So when it's quick back
    and forth, we may have a hard time with that. Maybe
    I'll just carry it with me and then I'll hand it to
    people when we talk.

    The one at a time is also important, by the
    way, because of the people on the phone. So when
    people are talking over each other, it's very hard for
    them to hear, and the court reporter, too, so there are
    multiple reasons why we'd want to do that.

    Bev, and then Cori.

    BEV: Keep discussion succinct.

    BEN: Do you mind if I just say "be
    succinct"?
BEV: Yep. I mean, no, that's fine.

BEN: Okay. Cori?

CORI: Minimize sidebar discussions.

BEN: Okay. Is it all right if I say "no sidebar discussions"?

CORI: Well, I mean, we're going to be here an entire day and there's going to be some temptation to get in little discussions and everything should be available for the group.

BEN: Okay. If it's okay with you, I'm going to say "no sidebar discussions".

CORI: Okay.

BEN: There are breaks, which is a good time to have sidebar discussions. Post-it notes could be useful if you want to pass a question to somebody, too.

Anything else from the group?

CORI: Do you think it's necessary for us to identify ourselves first for the people on the phone, they won't know who's speaking?

BEN: Yes.

CORI: I'll say: This is Cori. I think such and such.

BEN: Okay. And this is pretty basic operations but, yeah, identify yourself before
speaking. Basic things so that this can operate well, especially since we do have people on the phone and people in the room.

One thing that I would like to add is just that it was very much impressed upon me the amount of experience that's in the room that is going to be discussing some of the things we're discussing today. So it's probably also an opinionated group. Floyd says, no, not at all. So, to me, what that says is I think we need to be sort of extra mindful to respect each other's experience and backgrounds and sort of talk to each other as you would expect to be talked to concerning the matters we're going to be discussing.

So I just want to state that out front. Like we're all adults so I hope that that just happens, but I'm sure you've all been in meetings where, even as adults, we end up getting sort of snooty, or whatever word you want to use, and it just doesn't work for a productive meeting. So please remember that whoever you're talking to is a person, too, with a lot of experience, and we want to operate with each other as professionals. Is that all right? I'm just going to sum that up as respect; respect each other and be polite.

And Cori mentioned something before that I
think is useful and that is -- perfect timing. For iPads, phones, and things like that, turn them off. That was almost on cue. Turn them off so that we don't have those interruptions where you're in the middle of a thought, you hear a ding, and you're like, whoa, I don't know what I was going to say. So I'll just sum that up as electronics muted.

Okay. So pretty basic stuff. Now, you probably noticed already -- is there anything to add, I guess? Bev?

BEV: Are we trying to work towards consensus today?

BEN: That -- another good segue. That's a good question. What is the perception of the people that are in the room? I'd like to start with that. Did you come to today thinking we all, as a group, need to come to consensus on these things or what was your expectation?

I'm going to turn it over to the Forest Service representatives really and say to make -- to achieve these purposes, particularly the second one, in your opinions, do we need to have complete consensus? Consensus, by the way, is -- I think everybody is typically aware of the definition of consensus. It doesn't mean you're all jumping out of your seats
saying, "yeah", it means at a minimum you can live with it, right, that you're not going to -- you're not actively opposed to that direction or that point of view.

BEV: I think it might also mean that we don't resolve everything today but that we have a strategy for resolving whatever is outstanding.

BEN: Okay.

MINDEE: I -- this is Mindee. I wouldn't expect that there would be consensus on everything but I think that on points where there is consensus versus points that there is still some dissension or disagreement or, you know, different opinions professionally, that identifying what we don't agree on are points that we really need to keep in the forefront and continue to ask ourselves have we explained it, is it -- how do we -- how do we represent that in the public document that we're preparing for decision-making and for public review.

BEN: Okay. I think -- for those on the phone, there's a phone going off in the back room that is not related to us, apparently.

So what I got out of that is the things that we can come to consensus on today, let's go ahead and do that. And let's note the things that we can't come
to consensus on and then why not and then approach those, moving forward with more of the focus. Deb.

DEB: This is Deb and I just wanted to build on that. And I know for Jim to make the most appropriate decision, it would be very helpful to understand where there is consensus, where there isn't, what it would take to get there, if that's possible, and if not, why. So being very clear about that range would be helpful to him.

BEN: And, Bev, did you have something to add?

BEV: That's what I was saying earlier, is a strategy for developing consensus if we're not in consensus on something today. So you just worded it in another way, a better way.

BEN: So I think what I'll probably need to do, and moving on, is think about the best way to note that sort of consensus versus not consensus and where are the differences. So I'm -- I kind of want to see the conversation before I decide on the method to record that. But we will have a way to have that sort of be set.

And, actually, I like what you said, too, because that -- I mean, again, we're here not to -- because we want to make sure that we've taken a hard
look. We're talking about the NEPA analysis, right?

Floyd?

FLOYD: Floyd with the USGS. We're invited observers, so we probably can't participate in the consensus or not consensus; we can make observations --

BEN: And provide input into the discussion.

FLOYD: Yeah.

BEN: I think that was my understanding behind your intent. I'm looking at the Forest Service mostly because, obviously, you're the lead agency. So is that what you were expecting from the USGS folks?

MINDEE: Well, I guess -- this is Mindee. We want full participation from the group that is here and, you know, to hear your professional opinions and the questions that you have about or the criticism that you have about what was done, what wasn't done, and then possibly, you know, what would be next steps to improve reliability or those types of things. So I think full participation and the consensus piece is, it's really consensus. If we get consensus or direction from that, it's just additional information about how experts feel about our studies and our analysis and how it's documented and how it's
stated. And all of that is important to the
decisionmaker. So I really don't have a distinction
here.

BEN: Okay. Deb?

DEB: This -- I guess I keep saying my
name over again.

BEN: Sorry.

DEB: I appreciate not having to feel
like you need to reach consensus on anything; that's
fine with me. But what I would really hope is that in
those places where we haven't reached consensus but
we're looking for solutions that might help us get
there, that you could really help weigh in there and
help us look for what those solutions might be.

BEN: Okay. So we're going to try to
achieve consensus and, where we can't, we'll note that
and we'll move forward to resolve that in the future.

Before we get into the -- so this is the last
couple of little bits. Housekeeping. Bathrooms, I
think you've got to go out and around and they're sort
of on the other side is the ones I'm aware of. Does
everybody know where they are?

CORI: There's one through the bar, turn
left.

BEN: Okay. So both that direction if
you need to step out to the bathroom.

We are -- I think it probably is a good idea to take a very short break after this and then come back and push through the break that would have otherwise been at 10:30 to 10:45, given that we're behind schedule. Would anybody be opposed to taking that break after we finish this part? Okay. And I think we're going to go -- we need to go to ten-minute breaks to make up the time that we lost. So hopefully everybody's all right with that.

You'll notice that my style in general is to move around the room a lot. I'm going to have to do that anyway now because of needing to cart this thing around. I might throw it at you to avoid having to walk too much. Also, I apologize in advance if I appear sort of curt or rude. I may, due to time or to keep us on task or whatever, ask you to get to your point or something of that nature. So understand that it's not about you, it's about me; I'm trying to just do my job as a facilitator. Hopefully, everybody's good with that. And you can beat me up in the parking lot later if it really just didn't sit well with you.

And I think that takes care of it for all the introductory stuff setting the stage. We'll come back with Chris in about ten minutes, and I've got 9:53 so
10:03, and we will start on time. All right. Thanks.

(A break was taken.)

BEN: The next thing we have is summary of work conducted and we'll probably not need as much time.

CHRIS: Everybody on the phone, this is Chris Garrett talking. Okay. So I'm going to make up time here because I can be very brief and succinct about this.

There are two or three things I want to go over with you guys just to kind of lay the groundwork for what's been going on, especially for those who haven't been involved in this process to date or only marginally involved.

So the first thing I want to go over is kind of where we're at in the overall NEPA process, and right now the draft EIS was published, it was published in October 2011, last year. The public comment period was fairly long. It closed January 31st of this year. We collected something like 25,000 individual comments, and that's where we're at right now is we're sifting through those comments, we're reading them, and we're drafting responses to those comments, and we're trying to get our arms around the technical analyses that need to go forward to answer those comments and to make the
next iteration of the EIS a stronger document.

So this particular meeting is a direct outgrowth of response to comments. We've heard from the public and we've heard from many -- all of the cooperating agencies more or less in one way or another. And we're taking those comments very seriously and we are trying to make our analysis a hard look that's required under NEPA and we're using those comments to guide us to find the weaknesses and where it needs to be improved. So this meeting is part of that.

My last little point, what I meant there, I should have clarified. The next step in the NEPA process past response to comments, just to clarify, that's not decided at this time, and that's the question of supplemental, final, whatever. We don't know yet. That's a decision for Jim; he has not made that decision yet. So as far as we're concerned, we've got the comments in front of us and we're working through them, responding to them, analyzing them.

Okay. I wanted to give you guys a quick overview of all the different consultants that their names will pop up today because I know it's confusing sometimes who's working for who. There are kind of three general categories I listed here. The first
category are those consultants that were contracted
directly by Rosemont, there's a whole bunch of them no
doubt, but these are the four that will probably come
up today: Montgomery & Associates, they worked on both
the west side model -- what we call the west side
model, that's the water supply model in the Santa Cruz
basin. They also worked on a mine site model, what we
would call an east side model. We're going to be
talking mostly about east side stuff today, east side
water issues.

Tetra Tech has done the lion's share of the
analysis for Rosemont on a variety of issues. They also
produced an east side groundwater model. They did most
of the geotech or geochemical models, infiltration and
seepage; not all of them, but a lot of them.

Engineering Analytics is one you probably
haven't heard yet. That's actually -- the guy at Tetra
Tech who did the model is Grady O'Brien. He moved to
Engineering Analytics after the model was produced. So
we call it the Tetra Tech model, we're going to keep
calling it the Tetra Tech model. Grady is the guy who
did it, so Engineering Analytics.

And AMEC did some of the work with the
tailings facility. They don't pop up that often but
you might see their logo on some stuff.
So all of those parties were contracted by Rosemont. They produced reports and technical documents that were submitted to the Forest.

So the Forest then needed to make sure that those technical documents were valid or applicable or appropriate. And there are a suite of consultants that the Forest has hired to help do that.

Now, SWCA, my company, we're the project management team for all that. So one of Dale's jobs in particular is to be the traffic cop to make all of this happen and wrangle all of these consultants. So SWCA really wasn't involved in some of this hard core technical review. We were more bringing in the people who have the expertise to help the Forest make sure that Rosemont's documents, Rosemont's analyses are appropriate. So those parties, MWH, they were involved in a peer review of the west side models -- model, singular.

SRK, we have five people from SRK sitting here -- four, five, five. SRK was involved in a variety of aspects, conducted peer review of the east side groundwater flow models, geochemical models, the pit lake model, infiltration and seepage, fate and transport, also alternatives analysis, just a wide variety of mine-related issues. SRK has the experience
and the expertise that the Forest needed to analyze those.

Golder and Associates, George, sitting across from me here, Golder and Associates was involved on surface water issues on the east side and site water management review, storm water review.

All of those consultants worked for the Forest in a peer review capacity to make sure that what Rosemont was submitting and doing was correct or at least appropriate.

The other consultants that might pop up and, like I said, there's lots of them, but the one that may come up today is Dr. Tom Myers. Dr. Myers is a groundwater hydrologist who produced a model that was commissioned by Pima County and that model was provided to the Forest as another model to look at to use -- to use to analyze the east side hydrology. So Dr. -- we're not -- I should be clear about Dr. Myers' model. SRK was not involved in any review of that. So it very well might not come up today much, but be aware that it's out there.

BEN: You'll notice, by the way, we had the no-acronyms. With consulting firms, it's very hard to find them without them. So we may say SWCA or SRK just because it's our names. Hopefully, everybody's
okay with that at least.

CHRIS: So the only other thing I wanted to go over, and most of you picked up when you walked in the door, a color-coded kind of chronology of all east side water stuff. I just want to kind of give you a real quick overview of the work that's brought us to this point.

And I guess my take-home point here is this is not a stand-alone meeting by any means. There has been a back and forth peer review process underway since January 2009. And this is an interactive process. It's involved the Forest specialists, SRK specialists, Rosemont's consultants, their specialists, Tetra Tech and Montgomery in particular, it's involved Golder, it's involved SWCA. And basically we’re three years into this process making sure that the experts from all -- or the specialists from all different parties here are talking to each other, are exchanging ideas, are making sure that what's been done meets some reasonable standards.

That -- a lot of that has been back and forth with memos, review memos, reports, and that's a bulk of what you'll see in that bibliography in front of you. But there are actually a fair number of face-to-face meetings where we would just say, you know what, we're
at a point where we need to get everybody into a room
to talk directly.

And so we had meetings. I know Roger came
down for meetings, Salek, a forest specialist here in
Tucson, came down to meetings. We had Rosemont, Tetra
Tech, and Montgomery in the room, we had SRK in the
room, and we all talked about issues, what should be
done with these models, what could be done with these
models. It was all later codified and written up in
documents. But we all had interaction.

The only take-home, we're at the apex of a
three-year process that's had a lot of back and forth,
a lot of review work, a lot of input.

MINDEE: Chris, excuse me. I think with
a little bit of looking I could figure this out, I'm
already starting to.

BEN: This is just so everybody knows,
Mindee talking right now, real quick. Sorry.

MINDEE: Chris, can you just briefly
explain the color coding in the table?

BEN: Okay. Color coding in the table.

CHRIS: Yeah, I think I can, and Melissa
will correct me if I get it wrong.

The yellow -- yellow represents -- and I
actually -- Carter, I apologize. I don't know if you
got this hand-out.

MELISSA: I'm going to be sending it to him shortly.

CARTER: I didn't but it's okay. Maybe you can provide it to me afterwards.

CHRIS: We're sending it right now.

So yellow represents written documentation. This would be memos, reports, technical documents. The blue represents the meetings, the face-to-face meetings with all the different parties.

MELISSA: The yellow is written documentation from Rosemont or Rosemont consultants.

CHRIS: Okay. Yellow is written documentation from Rosemont or Rosemont consultants; blue is meetings with multiple parties; green are review documents that -- from SRK or Golder or other consultants that would be back to Rosemont, you know, with opinions about what was done.

MELISSA: And that's it.

CHRIS: That's it. All right. So three colors. All right. That's all I have.

BEN: Okay. So we're just about ready to get going on the first session. What I wanted to talk about for a few minutes, again, is this sort of NEPA backdrop, right? Chris already explained the
draft EIS was published, 25,000-ish individual
comments. Right now what's being worked on is response
to comments. Some of these relate to water resource
issues. So the question comes up, how are we doing,
are we meeting the hard look requirements that NEPA
puts on us?

So I wanted to review quickly a couple of
things from CEQ. You'll find these in the Forest
Service NEPA guidance as well. The first thing is just
the basics of NEPA, right? I mean, when you boil it
down, it's about public disclosure and informed
decision-making. We're mostly going to be talking
about the informed decision-making right now so I just
want to keep that in mind, informed decision-making.

The question comes up, what does hard look
mean? And, generally speaking, you can boil it down to
it's a good faith analysis with sufficient information
to allow for a firm basis for weighing the risks and
benefits of proposed actions and alternatives, right?
And part of that hard look is: How complete is the
information? How detailed is it? Was it a sound
analysis that was done? Do we have a thorough
discussion of the alternatives? And what -- did we
disclose the sources of information? Those are a few
things, right?
Now, notice we don't have anything in here: Is it a perfect analysis? There is no such thing as a perfect analysis in a NEPA document, and I think that's important to keep in mind because I don't think that, for NEPA, we have to or probably should -- and I'll let you guys from the Forest Service editorialize my statement here or modify it -- collect endless amounts of data in a NEPA process; it is not necessary to make an informed decision. But we do need to take a hard look, and those are four bullets to keep in mind.

This section of CEQ says that: Agencies shall ensure the professional integrity, including scientific integrity of the discussions and analyses in EISs. They should make sure that they identify methods and make explicit reference to sources relied on for conclusions. That's part of the reason we're meeting, right? We want to make sure that we've have professional integrity and scientific integrity. This is in CEQ's regulations.

CHRIS: Could you define CEQ real quick?

BEN: Oh, thank you. I just used an acronym. Sorry about that. Council on Environmental Quality. And I'll try to spell that out when it comes up, but I'll probably be referring back to the hard look requirements more than Council on Environmental Quality.
Quality regulations, per se.

Go ahead. I think it's also important to note that there are allowances within the regulations for incomplete or unavailable information. And we do have the references here if we actually need to look them up specifically and plus Internet access, so that makes things easy.

But the first question you ask yourself is: Is the information essential to a reasonable choice of alternatives? If the answer is "yes", and it's not too expensive to get that information then, generally speaking, the regulations tell you you should include it in your EIS.

Expensive can take many forms, right? I mean, there's pure money, there's schedule as it translates to money, there's a lot of ways we can interpret that. I don't know that it means strictly dollar cost, per se. So keep that in mind.

If "no" or if the information can't be obtained -- so it's not necessary to make an informed decision or may not be -- or if the information cannot be obtained for cost or other reasons that are valid, then these are the four things that the regulations ask you to do: Provide a statement that the information is incomplete or unavailable; a statement of the relevance
of the information to evaluating the impacts; a summary
of existing credible scientific evidence that's
relevant to evaluating those impacts; and then, last,
the Agency's evaluation of the impacts based on methods
that are generally accepted in the scientific
community.

So I'm guessing that there are things that are
going to come up today that relate to things that we
just don't have and may or may not be able to get in
either a timely or a cost efficient manner. And I
think these are good things to keep in mind because
they should get into the EIS, if they're not already,
for things where we're not going to be adding them. So
I think that's the last one.

So I wanted to just provide that briefly for
everybody to understand that that's the background,
right? This whole discussion is related to the Forest
Service complying with NEPA essentially. And it's
important to keep that in mind. I'm going to probably
bring us back to that as part of this conversation. So
part of my job is to say things like, "Do we have to
have that for the Forest supervisor to make an informed
decision? Or is there another way to make that
decision? Would it make a difference to the ability to
make a reasonable choice between alternatives if we
added that component to the model or whatever it happens to be?"

But your opinion matters to the outcomes of those questions that I'll prompt you with. Is everybody sort of on the same page with respect to some of the NEPA things that we're looking at today? And NEPA is another acronym that I really would rather not say over and over again.

ROGER: It's a word now.

BEN: That's right. I should wear a T-shirt: I heart NEPA.

Particularly from the Forest Service, do you guys have any thoughts on that? Since you are the lead agency, it's your document, it's your decision that's going to be made here.

MS. WHITHALL: It was a really good frame.

BEN: Okay. That's good. Bev?

BEV: I want to make sure I'm following you. You're saying that these are things that don't necessarily be decided -- need to be decided today or --

BEN: Those are things that, when it comes up related to our discussions on consensus, I may refer us back to some of those regulations so that we
understand really how far do we need to go in the next steps in this process so that informed decision-making occurs. So that, at the end of the day, the Forest Service can say: We took a hard look at the potential environmental consequences with respect to water resources, and this is our decision following that process.

BEV: Okay.

BEN: So does that help?

BEV: Yes, thank you.

BEN: So we will be referencing it, but the conversation is solidly going to be based in these questions related to impacts to the Outstanding Water of Arizona in Davidson Creek (sic), for example, or Davidson Canyon.

Mindee, do you have anything to add?

MINDEE: No.

BEN: Okay. So I think we're ready to go. The idea here, again, is to start with impacts to Outstanding Arizona Waters in Davidson Canyon. Chris will do a summary of impacts and methods. We'll have a discussion and summary and some wrap-up, and this is where I presume it gets more interesting for everybody.

Go ahead.

CHRIS: All right. So as has been
mentioned, we have three sessions planned and those relate to three issues that we kind of pulled out as being big picture issues. These are not the 25,000 public comments. We're trying to look at maybe the big stuff that needs a lot of brains to look at it from a lot of different directions. We found three of those for today's purposes. And I have a map to clarify where all of these relate to.

The first one is the lower reach of Davidson Canyon, which is downstream of the mine site. Approximately 11 miles away is an Outstanding Arizona Water. That's a regulatory designation. That Outstanding Arizona Water is fed by two springs, Reach 2 Spring and Escondido Springs, that are springs within the kind of the channel of Davidson Canyon. Impacting an Outstanding Arizona Water, degrading an Outstanding Arizona Water is a regulatory problem if that -- we need to demonstrate or show what the impact will be to the Outstanding Arizona Water. So the discussion today will relate to that question.

Now, the other question is, the next one is upper Cienega Creek. And this is not downstream of the mine site. This is kind of lateral from the mine site. It's out in the middle of the Cienega Basin. Upper Cienega Creek will not be impacted by surface run-off.
because it's in a different watershed. However, it could be affected by groundwater drawdown. And that's the issue that we'll talk about today or that we're worried about today.

And then geochemistry is kind of our third catchall category, and this would be the geochemistry from seepage from tailings, waste rock, the facility, as well the pit lake that will develop in the mine pit and the water quality. So those are kind of the three general categories.

Let me show a couple of quick maps. I'm going to stand up so the -- I know the people on the phone won't be able to tell this. So just so we're all on the same page, north is up, as usual. This is the mine site. These are the Santa Rita Mountains. The ridge line -- this, actually, green boundary is the watershed divide. Mine site is on the east side of the Santa Ritas. You can see that the mine pit is right up against the ridge line.

Important areas. Davidson Canyon runs all the way down to about here. It keeps going, but Barrell Canyon comes in from the mine site and joins Davidson right about this area. Davidson flows a distance from the mine site to the confluence with Cienega Creek. Davidson Canyon is about 11 miles to Reach 2 Spring,
about 13 miles to the confluence. And, you know, it's hard to measure river miles, so that's a ballpark. All right. Davidson, this area right here, these last two miles or approximately two miles, that's the Outstanding Arizona Water in Davidson.

Now, Cienega Creek is in a different watershed out here. And I'm using "watershed" as a loose term because I'm not using the technical definition, but there is a surface water divide. Barrell Canyon flows this way. All the water that flows to Cienega is not affected by the surface disturbance of the mine. All right. So Cienega Creek flows kind of in this big U shape and joins Davidson Canyon.

So what we're worried about is propagation of any groundwater impacts eastward from the mine site that might affect upper Cienega Creek. Now, we're using this as kind of a proxy because it's not just Cienega Creek. Empire Gulch is right here; there's springs there. Gardner Canyon is right here; there's some perennial flow here. There are wetlands areas strung out along the creek here. We're not trying to minimize those or dismiss them, we're using upper Cienega Creek as just a catchall because, you know, it's a useful place to point on the map, but recognize that there are a variety of sensitive water resources.
that we are analyzing in the EIS that are important.

So that's a quick overview. I was just playing with Google this morning and I did a little oblique view of that kind of Reach 2 Spring looking down towards Cienega. So, again, north is kind of that way. In the background you see the Rincon Mountains. Catalina Mountains are over to your left. This kind of nice dark green, that's the riparian canopy along Cienega Creek. Now, this would be lower Cienega Creek. Upper Cienega Creek would be way out here. Cienega Creek flows this way. Davidson flows into it. This is I-10 right here, right in the middle of the picture. So Reach 2 Spring starts right here. And this stretch from here all the way down to the confluence is Outstanding Arizona Water. So this is the critical area that we're -- we want to talk about today because degrading or impacting that area is a very important question.

So everybody good with the overview? Any questions about where we're at, where we're looking?

Okay. So recognize that I'm not going to cover things in all the gory detail that's in the EIS. My job is to give you a quick, punchy summary of what the impacts are as described in the EIS, the draft EIS, and what methods were used to get there
BEN: But -- sorry for interrupting, but
I think we do have multiple copies of the EIS here if
you find yourself dozing off and want -- am I correct,
Melissa?

MELISSA: We have at least one copy.

BEN: Okay. So if you do want to look
at the gory details, there is -- we do have it
available to us.

CHRIS: Right. Okay. So topic number
one, session number one, issue number one is the
Outstanding Arizona Water in lower Davidson Canyon. So
in the EIS we recognize the fact that we don't exactly
know what the source of water is to Reach 2 Spring and
Escondido Springs. We recognize that it could be from
a variety of sources. It could be connected to the
regional aquifer in which drawdown will occur resulting
from the mine site. We recognize that it very well
could come from a shallow alluvial system.

Now, Tetra Tech did some work. They used a
variety of sources to try and answer that question.
Their opinion was that it arises from a shallow
alluvial source. We did not go with that solely. What
we looked at in the EIS was -- well, let's look at what
the impacts would be under each of those scenarios.

Scenario one, if it arises from a shallow
alluvial system, the impact to it would be from the
reduction in ephemeral stream flow, maybe not the only
impact, but the major impact that we felt would occur.
The estimate is that, because of the mine site cutting
off the head waters of Barrell Canyon, the estimate
based on the work that was done by Tetra Tech primarily
is that you'd have about a 10 percent ephemeral --
reduction in ephemeral stream flow at Reach 2 Spring.

Now, that -- there's a lot of assumptions that
go into that. Anybody that does surface water
modelling, I'm not going to talk about that because
that will be maybe part of the discussion. Carter, did
you have a question?

CARTER: Yeah. The line just went dead
like the mike just died or something.

BEN: You're back now though, right?
You can hear us?

CARTER: Yeah, I can hear you.

BEN: All right. Go ahead.

CHRIS: All right. So that was scenario
one. If it's connected to shallow alluvial aquifer, we
would expect a 10 percent model reduction in ephemeral
stream flow that would be the impact to spring.

Now, scenario two, what if this connected to
the regional aquifer in this drawdown that will result
from the mine pit? We have three models that we used in this EIS. We reached out and we took every model that we had at our -- had available to us: Montgomery, Tetra Tech, Myers.

Now, Myers doesn't extend this far so we don't have an answer from Myers. Tetra Tech or Montgomery estimated that there would be one foot of drawdown 1,000 years in the future. Now, the drawdown would start about 40 years after the closure of the mine. At that point, it's like .01, very small number; gradually grows to one foot of drawdown after a thousand years.

I should note that the models were run a thousand years in the future because the impacts propagate very slowly.

Tetra Tech, they provided a hydrograph and the scale is such that I can't tell exactly what fraction of a foot it is, but it's less than one foot of drawdown a thousand years in the future.

Now, Montgomery also took this a step farther, and Montgomery included in their model if there was perennial flow in lower Davidson Canyon that was directly connected to the aquifer, not necessarily arising from a specific spring but just the whole Reach, what if the whole Reach were connected? They estimated what the effect would be and they modelled
that there would be a reduction of .04 CFS, and that
would reduce the perennial flow by about .29 miles,
which is a significant fraction of lower Davidson
Canyon.

For what it's worth -- let me just get through the methods and then let's open it up.

BEN: I think that would -- write it down if you don't mind or whatever if you don't mind. I think it may be smoother to do a summary of impact, summary of methods, and then go to questions and discussions.

CHRIS: Just to get to these results, here's what we have. We had a report from Tetra Tech that looked at a wide variety of lines of evidence to try and decide where the water does arise from Reach 2 and Escondido Springs. They included water quality data, isotope data, geologic mapping, water levels, observed flow data; everything they could get their hands on.

We had two groundwater models, both were MODFLOW models. They were done independently. They both relied on the same suite of information, you know, geological, hydrological information, pump tests. They had the same model boundaries. Other than that, how those two companies approached them was left up to
those two companies with peer review injected into that. That was the groundwater models.

    Surface water models, they used the PSIAC method for the impacts in Barrell Canyon, and then there was kind of a regression extrapolation downstream just to figure out what that reduction would mean 11 miles downstream at Reach 2.

    So real quick overview. And --

BEN: Is there any significance to the PSIAC acronym?

CHRIS: Oh, yes. I actually don't know what that stands for off the top of my head.

GEORGE: It was a method that was developed in the Pacific regions so-called to estimate sediment yield from the actual water. But, actually, what PSIAC stands for, it stands for Pacific Sediment something, but I'm not sure. I can't remember.

BEN: And not significant, in other words?

CHRIS: Right.

BEN: I just want to make sure.

CHRIS: And I would note that we received many comments on that method, and one thing going forward that George is working on in particular is perhaps requesting changes to that modelling. I'll
just acknowledge that right now.

BEN: Okay. Bev, you had a question, so I'll bring the phone over to you.

BEV: Just a quick question on the summary of impacts. The last part says Montgomery reduction of .04 CFS and the top part talks about percentage of modelled reduction. Is there a percentage for the .04 CFS reduction so we can compare apples and apples?

CHRIS: I'll have to dig it up.

BEV: Okay.

BEN: Okay. Would you mind writing that down on a Post-it note real quick and I think that's a good question.

CHRIS: That's a good question.

BEN: Okay. So -- okay, Mindee?

MINDEE: I am wondering what this group would conclude based on the analysis about whether or not these springs and this Outstanding Arizona Water Reach are influenced by the underlying groundwater or is it one or the other or both?

And I believe that the Forest Service has a policy -- and you can weigh in on this, Roger -- that if we really don't know if it's only surface water and not groundwater, we are to assume it's groundwater.
connected. Is that -- it's Technical Memo 822 or something like that. It's just kind of come up in our discussion lately.

ROGER: Is that a new memo?

BEN: So the question is can we -- I guess, tell me if this is not a good summary. Can we make any more conclusive determinations about if it's connected to shallow -- the shallow alluvial aquifer or the bedrock aquifer; is that correct?

MINDEE: Or both.

BEN: Do we have any evidence to indicate that it's one or the other, yeah, or both? And then the follow-up as part of that was directed toward Roger and that is, if we don't have the information, the thought is that maybe there is current Forest Service guidance that directs the analysis to be done assuming that it's connected to the bedrock aquifer, I guess. And there's a memo about that.

So I'm going to put it in front of Roger to --

ROGER: I'm not acquainted with the memo but it's certainly -- it would be prudent to assume there is a connection. That's something that generally, in the legal sense with water rights and all that, they have a dysfunction with connecting groundwater and surface water. But in terms of
springs, yeah, it's kind of inseparable.

But my concern, though, was that the model may not be entirely appropriate for this kind of determination, especially the 1,000 years in the future, because of inappropriate boundary conditions, which is something I was hoping to get into as we go along here.

The boundary conditions as they're given in both models are essentially infinite supplies of water. And there's been some review by Vladimir who acceded that, well, the model is good enough. And I'm not really entirely convinced. And the one foot of drawdown after 1,000 years, we're still looking at disequilibrium and I think it would have been more appropriate to look at the one foot of drawdown under steady state conditions.

But I'm not quite sure exactly how to respond to Mindee because I'm not aware of the memo she was --

BEN: So, I'm going to write that down, too, or I guess if you wouldn't mind on a quick Post-it note, that seems like something we need to look up related to assumptions that, given lack of information, we may need to make certain assumptions based on current Forest Service guidance and that's, I think, important to note.
ROGER: But that brings up another issue about guidance in that part of Vladimir's assessment of the models said that they met standard industry practices, and I have never seen these guidelines and I've been told that they're not written guidelines, and I don't know how we can compare anything to guidelines that are not written. And that's also a concern.

BEN: So let's break this down into smaller questions. And maybe the first one is the question about boundary conditions that were set in the model. It seems like -- let's try to isolate in smaller bits and then maybe, by attacking those, we can start to get at the larger question of standard industry practice in this field. Does that sound okay?

ROGER: Very good.

BEN: So could you restate your, I guess, question or concern related to the boundary conditions that were set in the model?

ROGER: Well, basically, we need to evaluate those conditions to determine that they are appropriate indeed and that they don't over-constrain the model and force it to behave essentially.

And I believe Stan has a comment.

BEN: Okay. We'll go to Stan and then Mindee had another, sounded like, question or comment.
STAN: Yeah. This is Stan Leake with USGS. Both of these models use what we call artificial boundaries. So there's a boundary in the model that doesn't exist in the real world, and in the Tetra Tech model there's -- I think there's constant head notes around much of the model perimeter, and sometimes you have to do this; you can't model the whole aquifer so you have to limit it in some way. But when you do that, you need to be sure that that artificial boundary that you put in does not affect what you're trying to calculate.

And it's quite possible that both of these models are useful for many things, but if there's any question about it -- their usefulness -- it would be in how well can they project effects at distance. Will the drawdown hit these artificial boundaries that will affect the drawdown that's being computed? It's quite possible in that in the mine these boundaries don't come into play because you're looking at effects right around where the water's being withdrawn.

So, at a very minimum, I would think that the modelers should do some evaluation on what effect do these artificial boundaries have on distant connected features, not only Davidson Canyon but Cienega and other springs throughout the whole domain.
So some sort of analysis is just a good standard practice in modelling to see, you've done something artificial, you want to make sure that this does not affect what you're trying to calculate. And if you can make that argument with -- by analyzing the boundary conditions, then you've justified using those artificial boundaries.

I haven't seen that. And what I've seen, the write-ups of these two models, I haven't seen where they've paid a lot of attention to that.

BEN: It seems like I would be turning this over to Vladimir or Larry soon.

MINDEE: Well, can I interject a comment? I like the way that we're going but I wanted to point out that the Forest asked SRK a number of additional questions recently about these boundary conditions and maybe -- Chris, maybe I'll ask you to just briefly explain that because we're in the process of another step to run some different analyses and ask some different questions of these models. That's -- it's been requested of Rosemont just like today so, anyway, Chris, if you can kind of explain that if it's relevant.

CHRIS: It is relevant.

BEN: So that's a good note. This is
Ben again. Chris is -- maybe Chris, if I could tack on to what you were just saying, there's a few things that are happening, not just this. So I wonder, Chris, can you address that and the other things that you know are going on?

CHRIS: Yes.

BEN: And then we'll come back to you, Vladimir.

CHRIS: This definitely needs to go to Vladimir next.

What Stan mentioned and what Roger mentioned are actually concerns that SRK brought up during their review process. And the documentation, the full documentation of the western boundary has not been presented fully to SRK.

Just recently, based on the latest review that we had SRK conduct, we have requested a list of information from Rosemont that includes the following: vector maps for the model in the western boundary; potentially metric surface maps for the same; water balance, you know, for the steady state, and the transient models. And I'm going to forget a few things.

MINDEE: Sensitivity analysis.

CHRIS: Right. And then, in addition to
that, and, Roger, I believe this was an idea that you put forth, an additional sensitivity analysis in which you analyzed how much flow is coming in or going out of that western boundary under a steady state condition. That was requested of Rosemont to conduct that.

So at this point, that additional documentation that you guys are saying that, you know, you feel is needed, I'm not going to put words in SRK's mouth, but they might very well agree with that, and that request is in to Rosemont right now so there is additional data coming on that topic.

BEN: And with that -- so there are a few things that it may not be worth our talking a lot about knowing that those answers are coming and will be memos that come up later.

CHRIS: Yeah, but just -- I don't want to put that out there as a reason to not talk about the western boundary because what I'm hearing is, as a general comment, is whether or not that boundary is an appropriate boundary to use in general as a concept. And I think that's worth talking about.

BEN: All right. And before I hand this over to Vladimir, I -- so now we're talking about the western boundary. This is on the west side of the Santa Ritas. I thought we were talking about east side
models.

CHRIS: We're talking about the western boundary of the groundwater flow models. It does occur -- it occurs on the western side of the Santa Ritas, but we're talking about the east side model.

BEN: Okay. I just wanted to make sure because obviously I was a little bit confused for a second.

So do you need -- I'm just putting the microphone in front of Vladimir. Do you need any recap or are you good to go with kind of jumping into this boundary question?

VLADIMIR: This is Vladimir and I look at both Montgomery and Tetra Tech groundwater model. The western boundary condition is very big issue for the modelling, and I totally agree with other opinions that this boundary condition, how it was incorporated and how it's resulted in the predictive simulation, it should be significantly better reported by the author of the model, better reported as a result of the predictive simulation.

When we look at this model and boundary condition, first of all, we figure out that because of the location of the Rosemont Mine -- Rosemont Mine so close to the surface water divide, it's not easy to
choose a right location of the boundary condition. Normally hydrogeologist, if this were far away, will use surface water divide as no-flow boundary condition. This surface water divide are located fraction of a mile of the center of the pit.

In our opinion, it's not appropriate to use this no-flow boundary condition at this current location. It means this boundary condition should be moved to the west and some kind -- I agree, it's artificial boundary condition should be established there, assuming that it would not significantly impact predictive simulations.

What Montgomery and Tetra Tech did, they assigned general head boundary conditions -- it was discussed during the meeting with author of the models that this boundary condition should be placed at the distance of the mine that effect of this boundary condition should not cause any changes in the predictive simulation.

Montgomery choose location one and a half mile away from current model domain. It's very important to notice two things. First, hydrogeological unions between western boundary condition and open pit is basement rock which is very tight union, it's one of the tightest unions within model domain. It's about
three to ten to minus three feet per day. And when you will look propagation of the drawdown, first direction would be shape of the drawdown. Shape of the drawdown affect boundary condition. But, in reality, probably 90 percent it's reflect to the low hydraulic conductivity of the basement rock.

The second very important issue that this general head boundary condition was with elevation allowing groundwater leave the model domain. This boundary condition never serve as source of the water. It's working as boundary condition. We taking groundwater -- taking groundwater from the model domain during premining condition, during mining condition, and during post mining condition. It's meant yes, this is artificial boundary condition but, again, a road between pit and this artificial condition is very tight.

The second groundwater outflow for this western boundary condition all the time during premining, mining, and post mining condition. We totally disagree that this boundary condition serves an ultimate source of the water. It's not happening. This water from this boundary condition will never flow over to the open pit or pit lake which happens after this mining is completed.
Still, when we review Tetra Tech and Montgomery report, we found very nice corners of drawdown propagation in the different levels. We did not find very good map of the predictive water table, just proving what I said before. Also, we did not find a very detailed groundwater budget simulations indicating component of the groundwater flow from -- which normally --

BEN: Sorry. Could you -- just so that she can keep up, you said component. Start back --

VLADIMIR: Component of the groundwater flow from the different part of the model, and this was requested by SRK as well.

I would like to say that both reports, both reports, indicated in words, without presentation of the figures and requested tables, that groundwater will continue flow through the western boundary condition. It would be very small reduction of the groundwater outflow through the western boundary condition. It would not cause any additional inflow for this western boundary condition during post mining scenario.

Considering -- considering importance of the western boundary condition, we read recommendation from Roger about different way to simulate this boundary condition, just calculate for premining condition as
constant head or general head allow for groundwater outflow and keep this flow as constant flux during mining and post mining condition.

I think it's good idea. In my personal opinion, I do not think that it's significantly change the result of the prediction, but to increase the different stability of the numerical model, it's worth it to do it as additional scientific analysis.

BEN: And this is Ben for those on the phone that can't hear me 'cause I was way over there. That what my understanding is, that is happening right now. So that request has been put in to do it this way as part of this sensitivity analysis.

CHRIS: Correct, correct.

CORI: Can you explain that figure?

BEN: So while -- for those on the phone, while Vladimir was talking, Larry drew a picture to kind of convey what was intended. So I'm going to let Larry just walk through that as a brief wrap-up to this particular -- these particular statements and then there may be more discussion.

LARRY: Okay. Simply -- Larry Cope, SRK.

Little bit of elaboration on the detail that Vladimir gave. First and foremost, in looking at the
cone of depression, say, the thousand-year cone of
depression on the map, what strikes everybody
immediately is that you have an asymmetric cone
juxtaposed to the western boundary and it doesn't feel
right. And that can lead to feelings of a boundary
condition problem. It's natural to think that you've
got some sort of boundary condition problem.

Two things to make -- two points to make here.
One, the outflow, the model -- by the way, Montgomery
did -- Tetra Tech -- Montgomery, did produce a vector
map of the domain showing vectors -- the flow vectors.
This is in response to requests over the period of
reviews, but we've just received this. This is a
vector map showing outflow in a steady state premining
and at a thousand years that are consistently and
without change outward to that western boundary.

Two, the point that Vladimir made, the second
point that Vladimir made is simply that the very low
permeability, exceedingly low permeability of the
mountain core also affects the shape of the drainage if
this were the shape of the cone of depression. So that
first image that you get of something wrong about a
cone of depression that's asymmetric against the
boundary has a couple of reasons why it is shaped the
way it is.
STAN: Yeah. Stan Leake. I'd like to address a few of these points. First of all, while the western boundary is probably of the biggest concern 'cause it's the closest, virtually all of the boundaries on the perimeter are artificial. So any analysis that's done should look at all the boundaries.

So I think what Roger was proposing that be done was to impose a stress at the site of the mine, and you would hope that that stress would not change any inflow or outflow from these artificial boundaries, either on the west side or other places.

So you would look at these boundaries around the whole perimeter and what is the effect on the -- of the stress on the mine on these artificial boundaries. You'd hope that the effect would be on real features. So if you have streams, springs, wetlands, whatever you have, ET -- evaporative transportation -- you want the model to compute the effect on those. But if it's computing an effect on the artificial boundaries, you have to assume that that is affecting the real calculations that you want to do. So I'm glad to see that this has been proposed as a test and I hope that that's -- they carry through on that.

The question will be what -- if you do see an
effect on artificial boundaries by imposing a stress on
that, then what do you do? Go back and redo the model
in some way perhaps? That would be a question that
you'll have to think about as a Forest, you know, as --
for your consideration of this. What would be the next
step if you found some deficiency in the model and its
ability to compute effects on distant connected
features?

The second point I wanted to make is with
regard to the flow directions. That's completely
irrelevant. The direction -- the fact that water is
flowing to the west has absolutely no bearing on the
effect of the mine on connected features

LARRY: Connected features being --

STAN: Being like streams or springs.

LARRY: That's right.

STAN: There's something called the
Principle of Super Position. The directions of flow
don't matter, and if anyone's interested, I wrote a
little technical commentary on this. It was in the
Journal of Groundwater last, I think, August or
September. I'd be glad to send it to you. But -- so
the argument that water's going this way or that way
doesn't matter in this -- for this question at all.

LARRY: In terms of -- Larry Cope. In
terms of surface features, connected surface features?

STAN: Yes.

LARRY: We absolutely agree, we agree. And that's a separate issue. It's addressing the concern of or -- the question of the direction of flow at the boundary addresses specifically the point that had been brought up by Roger previously and that we addressed in our response to comments that there was water coming in to the boundary at the nearest most western section of that boundary. This is simply -- this is separate from the point you're making, Stan.

STAN: Okay.

LARRY: This is simply to point out that gradients are not reversed, that water continues to flow outward to that boundary. It's a fairly trivial one, but one that needs to be made, to show that there's not the generation of new water coming into the boundary at that point.

VLADIMIR: Alternative to this it can be, yes, we agree additional sensitivity analysis would increase the feasibility of the defensibility of the model.

And, second, unfortunately, with these hydrological settings, in my opinion, we will start with this artificial boundary condition. Those
artificial boundary condition need to be placed at the necessary distance away from the mine that there is not any significant changes of the flow through those boundary conditions happening during predictive simulations.

BEN: So I'm going to go to Bev and then to Roger.

BEV: I know that Rosemont is currently doing some drilling and testing on the backbone faults and I wonder how that consideration, the faulting in the area and close to or in the basement rock, has been considered in the evaluation of the boundary on the west side.

VLADIMIR: This is Vladimir. For me, really difficult to answer your question, but I will try. Montgomery model incorporated three major fault or fracture system into the model based on available information. Those features were incorporated as more permeable compared to surrounding rock. Those features include flat fault, backbone fault, and also not directly, but they incorporated potential of the fracture zone connected through -- from the pit area over to the Davidson Canyon looking on the hydraulic conductivity, and model was calibrated to the measure of the level. They enhanced hydraulic conductivity
along this direction.

   It was some kind of the question about fractured flow model and prediction. In our opinion, all known fault zone and fracture zone were incorporated into the Montgomery model and they interpreted relatively conservative as hydraulic conductivity feature. And what is why, if you compare Montgomery model and Tetra Tech model, you will see much more extent of the drawdown over to Davidson Canyon.

   But generally talking about the two and, again, I do a lot of the numerical groundwater modelling, I would like to say that this model first geologically based, second, relatively well calibrated to the premining and premining state condition and the conditions which were conditions during the stress.

   I will just put numbers. They have about 400 water levels measured at the different location and model was calibrated to the 400 water levels. They incorporated the result into the model a result of about 30 short-term pump tests, including five long-term pump tests, during which they tried to create as much stress to the groundwater system as is possible. They operate with very detailed model, calibrated to the numerous water level measurement.
Generally -- generally, a model calibrated to the transient condition with some kind of the difficulties, and a result -- and this is the best possible predictive tool right now with a lot of the limitation. And we look at one foot of the drawdown after one years, is it correct prediction? No, it's -- no one groundwater model can predict one foot or half of the foot of the drawdown 100 years away. It's outside of the possibility of the model. It's still within uncertainty.

BEV: Thank you.

BEN: Do you have a follow-up question, Bev, or did you get your question answered?

BEV: No, thanks.

BEN: Okay. Roger.

ROGER: I just wanted to clarify one point that I think Stan forgot to say was this stress that we were proposing was on the steady state model. So that's running the steady state model, adding a stress and, of course, it can't be too big or the model will crash, and seeing what proportion of the additional flow for -- to balance that comes from artificial boundaries. And that's something I did on Stan's suggestion. So that's one of the main reasons we want that to be done by Montgomery & Associates.
because they probably would not accept the results that
I achieved.

And I think that in some respects Vladimir's
hands were tied because he was not given the
opportunity to look at the model files in detail and
especially to run the models. You did not run the
models, did you, Vladimir?

VLADIMIR: No.

ROGER: So that's my concern. And I
think we did have that in this recent letter we just
sent out was for them to do this test. And basically,
as Stan told me, only a small proportion of additional
flow for that stress should come from artificial
boundaries. And if that mountain backbone there is of
sufficiently low conductivity, then it should not be a
problem.

And I had something else and now I've
forgotten it.

BEN: We'll come back. Okay. We'll go
to Dan and then Chris.

DAN: Okay. Roger, when you ran your
stress test on the --

BEN: Sorry. But this is --

DAN: This is Dan Moore, BLM.

Roger, when you ran your stress test, did
you -- maybe we can come back to this when we get to the Cienega Creek portion, but did you look at the flows across the eastern boundaries based west of the Whetstone boundaries and do you recall what you saw there if you did?

ROGER: That would be a good thing to do but I merely looked at the overall mass boundary.

DAN: Okay. Let's come back to that at the Cienega time then.

BEN: Chris?

CHRIS: Yeah. I just wanted to follow up on what Roger just said about, you know, what SRK did or did not review. And I just wanted to point out that SRK was requested to review, for the most part review Tetra Tech and Montgomery's reports. You know, the scopes of work were directed by the Forest to SRK to do, you know, these specific reviews. The Forest did not direct them to actually run the model or review those detailed numeric files. So I just wanted to clarify that that wasn't an oversight, that was specifically what the Forest requested SRK to do.

BEN: Is there -- Mindee. I saw -- okay. Never mind. I thought I saw a hand but I guess it was a figment of my imagination. Is there --

I'd like to briefly go back to Stan's question
about the what if. What happens if, when Rosemont does
do this test and basically complies with the request
that's put before them for how to modify the way the
modelling is done to satisfy the request that the
Forest Service has had, what if -- and I can't remember
exactly how you stated it, but --

STAN: Yeah, what if the stress does --
what if the stress does show a significant impact of
artificial boundaries? How would you proceed from that
point in using the models for this purpose here of
looking at impact on different distant connected
features?

BEN: That strikes me as a relevant
question because it relates to the next steps, but I
want to check in with the group. Should we just note
that or should we actually talk about it?

MINDEE: That question sounds to me a
little bit like -- I'll wait for the mike.

BEN: Sorry.

MINDEE: This is Mindee. If we see that
situation, I think that's a material event that needs
to be given to the decisionmaker, fully understand the
pros and the cons, the, you know, the next steps, the
reliability, just a whole lot of information, and a
decision then about do we do something different or do
we rely on what we have because we can explain it and it's good enough, just to pick a term. That's how the answer to that question feels to me.

Now, certainly Jim needs to understand how would the experts answer that in coming to the conclusion with what to do with this new information.

BEN: So, with that in mind, does that mean that we should discuss it now or we'd rather wait and see what happens and then, when that happens, some subset of this group might need to convene to have a discussion about that? Vladimir.

VLADIMIR: I think the answer is very simple. This artificial boundary condition should be placed at a distance which allow no changes happen in the flow. If it's for any reason impossible, I suggest -- I suggest and totally support Roger approach. Fix boundaries into, artificial boundaries, calculate -- calculate flux during the premining condition and keep this flux constant, do not allow change of this flux out, actually, it's outcoming. It's outcoming through the model boundary. It's mean during all predictive simulations it should be fixed outflow. In this case, you will have conservative prediction what will happen without any changes along the boundary conditions.

BEN: I'm seeing Stan nodding his head,
so we'll go to you in a second and then here's Roger.

    ROGER: And, once again, actually, believe it or not, I did run that scenario and it did run to completion, which I believe you said was a potential issue with that. And it wasn't that difficult, but -- okay. I think we're on the same page.

    VLADIMIR: Yeah.

    MINDEE: Do we have the information from you, Roger?

    ROGER: I have it, distilling it down to something that's readily understandable. It would probably take me two or three days, but I do have it all. I'm rapidly using up the memory in my computer. But, yes, I have it all.

    MINDEE: So I guess I would leave that to the experts about is that information that needs to come into our analysis.

    BEN: And so I don't know if the folks on the phone, Mindee just asked -- Roger had done what has been asked of Rosemont, it sounds like, if I've understood right. And Mindee asked do you have that information available to Roger and Roger said: Yes, I need to put it into some more usable report, take a couple of days. And Mindee's question was: Is that
something we feel like we need at this stage or should we just wait until we get the information back from Rosemont? Correct?

MINDEE: (Mindee nodded.)

BEN: So --

VLADIMIR: This is Vladimir. I suggest, and again, this is my opinion, for consistency with previous simulation, it should be done by Rosemont, it should be done by Montgomery, it should be done by Tetra Tech. I respect your expertise and your knowledge in the modelling, but it should be -- it should be done by same group of the authors which produced previous results.

ROGER: I agree.

VLADIMIR: In my opinion.

ROGER: I agree. But to have a base at which to instruct Montgomery and Tetra Tech, I almost had to do it myself to ensure that that was a worthwhile track.

VLADIMIR: Did you find any significant changes in the predictive results when you do your simulation?

ROGER: There were changes and --

VLADIMIR: What kind of changes?

ROGER: Actually, I have them on a thumb
drive with me if you have a laptop.

LARRY: At some point.

BEN: Let's stop for a minute.

CORI: We're getting in the weeds now.

BEN: So she's suggesting putting it in the parking lot.

CORI: That's a job for a specialist group, I think.

ROGER: That's probably true.

BEN: I like that suggestion. We do have a lot more stuff to cover. This has been, from my observation, a good discussion, and knowing that, one, it's to an extent already been done and is going to be done by Tetra Tech, I kind of -- it seems like it means, okay, well, we've -- hopefully, we're all on the same page now about this and it sounds like everybody is. Let's review those things when we get them and hopefully we got what we needed, correct?

JIM: Yeah. This is Jim Copeland. Just curious. I see a lot of raw impacts just listed. Are there associated conclusions? Do you understand what I'm saying?

BEN: So I think what -- I'm going to paraphrase just a little bit. The numbers mean so much but there should also be a qualitative inference of so
what? Why do we care about this amount of drawdown or what?

JIM: So what is very important, and there's going to be a lot of questions and what we have to answer is so, so what?

BEN: And I gave the question to Chris because I think you're probably the best person to say that.

CHRIS: It's a very good question and it's a comment we received particularly from EPA and that was all you guys have done. Take a spring, for example, and Reach 2 is one example, but there are many others. All you guys have done is count up the springs. You haven't actually analyzed what the impact on the vegetation around the spring, on the floor of the spring.

The terminology came up and I've latched on to it and I'm not sure if EPA brought it up but the idea of a functional assessment of riparian vegetation, of springs, of surface waters, which is you don't just say that there's a foot of drawdown or, you know, or there will be an impact here. You say -- and here is what's here as far as flow, standing water, riparian vegetation, and here's what the impact on those different components will be. We've taken that to
heart. We intend to do that for both riparian areas
and for springs in the next iteration.

BEN: So I think the answer is yes,
basically.

Okay. Is there any other discussion about
this specific component of impacts to Outstanding
Arizona Waters in lower Davidson Canyon? Hearing none,
what are the other questions that are out there about
these particular impacts or the methods associated with
them? Melissa.

MELISSA: Well, did we -- this is
Melissa. So now that we actually have some consensus
on the specialists' understanding how the model was
conducted and boundaries and things like that, can we
-- have we touched yet -- 'cause I haven't heard it, I
don't think -- on how that model feeds into -- to
answer this question of, you know, the effects of
Outstanding Arizona Water? Have we answered the
question of whether or not that model is even the right
or most effective approach to answer the question as
far as what the effects are to lower Davidson Canyon
and Reach 2 and Escondido Springs?

ROGER: Well, just as a parting shot, I
just think we need to ensure that the model is going to
be an appropriate tool for what we have to predict.
And the Forest Service is, you know, in spite of Montgomery & Associates doing the model and SWCA reviewing the model, the Forest Service is the agency that's ultimately responsible for what we do with that. So we just have to ensure that that model is an appropriate tool in this case.

BEN: And so I guess I have a question that might be being asked by others at the same time but I'll turn it over to Dan and then to Deb and to Dale.

DAN: The question I asked on tying back to the springs, I think Chris brought up an important point -- this is Dan, by the way, with BLM -- about functional, function of the springs is that we have an Outstanding Water designation. Under state law there is a process for getting that designation, I think. But what we probably need to do is go back and see if we can get the nomination package from that Reach from the Department of Water Resources and take a look at what was in there, why it got that rating in the first place, and then take a look at the expected impacts to that Reach from the mine and say: Okay, Davidson Canyon was nominated for this, this, and this reason. And here is why -- how the mine may impact or this water drawdown may impact those features of the canyon.
I think that would be a way to approach it, to basically look: Are you degrading in any way the features of that canyon that got it the designation in the first place?

BEN: So thank goodness we have a court reporter here because otherwise I'd be really scrambling right now to get all this down, for sure. Deb.

DEB: Stan, you said something. I just want to check and make sure I got it right. What I thought I heard you say is that you have done some work that suggests the direction of outflow has no effect on distant connected features. Did I get that right?

STAN: Correct. The effect of the development; it's independent on the flow system.

MS. WHITHALL: Okay. I just wanted to make sure I had that right. Thanks.

BEN: Okay. Dale.

DALE: Yeah, Dale Ortman here. Just to hopefully direct us to the question which is most pertinent is what evidence do we have that leads us to conclude the impact to the water, which is, in this case, Reach 2 Spring and Escondido Springs, 'cause that is the water in the Outstanding Waters that's there all the time?
We've had a lot of discussion about a series of numerical groundwater models projected over 10 miles, projected hundreds to a thousand years in the future. We have not discussed the likelihood that the spring, in fact, arises from the regional groundwater system.

So I think we need to look at the information we have about the spring itself and try to come to at least a recognition of the various uncertainties around what actually creates the spring.

One more thing. To bring George's part into it, we need to also discuss surface water impacts and potential sediment and geomorphological impacts in that area. Let's not forget that area.

BEN: So before I hand this to you, Larry, if that's okay, one thing I heard Roger mention is being sure that this is the right tool to evaluate impacts. And I just want to pause for a moment because we've been using this tool to evaluate these impacts for three years, correct? Three years, plus. So I feel like that is a question we need to answer, or maybe it's already been answered. That's -- that strikes me as a big uncertainty. If we've been using a tool for three years that we're still not certain is going to allow the Forest supervisor to make an
informed decision based on a hard look at the
environmental consequences, that kind of strikes me as
a big deal. Am I totally off base in that?

KEN: No.

BEN: So I want to go back to the NEPA
backdrop just briefly, right? Are -- in the assessment
of this group, are the methods that were used,
understanding that there are some changes that are
going to be made based on public comments and some of
the comments that the folks here have had, are those
methods generally methods that you would say are used
in accordance with accepted scientific practices in
this community? And you guys represent some of the
finest minds in this from what I heard before. Is that
true or not?

LARRY: Certainly the best in the room.

BEN: Yeah, the best in the room. Maybe
I misstated that, but you knew what I meant.

So is this the proper application of this tool
or have we been doing the wrong thing for three years?

MINDEE: I am not the expert but from
what I understand from a lay standpoint, that question
has been asked and --

BEN: Sorry. This is Mindee, and Larry
was just reminding me that I was shirking my duties.
MINDEE: That question has been asked and I believe the conclusion is it might not be the best tool but it's an acceptable tool. Is that -- is it true that we asked and we decided to ride the horse and we feel comfortable that it can adequately predict or answer the so what questions that we have regarding Outstanding Arizona Water?

BEN: Okay. So, yeah, who's --

LARRY: I can -- Larry Cope. I can. In general, the modelling that has been done, that is, the modelling methods are the generally accepted, industry wide generally accepted methods that I think most of us agree that in general the methods were correct and commonly used methods.

Now, in terms of the what if question or the so what question in terms of impacts to the Reach, there's a big if there. And the big if is whether those springs occur as expressions of potential -- a water level in the bedrock or whether they occur as alluvium that is saturated as a perc system disconnected from dry bedrock underneath.

It's a big question because the if -- if it's connected to the bedrock, then the predictions given here by the models suggest that there is a quantifiable
modelled decrease in the level of water in the bedrock that, if connected intimately to the spring, relates to a corresponding, an equal decrease in the spring level and its spring flow.

However, if it's not connected to the bedrock and it's perched, then the results of the modelling are moot and irrelevant to -- that is, the bedrock flow system is irrelevant to the impacts to the spring. And that's because it could be that the bedrock water levels are somewhat deeper than the level of the spring.

Now, speaking as having seen it, having walked it, and just looking at that spring, having looked at the Tetra Tech report that did the analysis as far as relating surface water elevations to surface topography to well depths, well water depths, there was concern in my mind that, when I look at that profile that Tetra Tech provided, the wells that were used to equate water level in the groundwater in the bedrock to the spring elevations were wells that were projected from some distance away and, in one case, at lowermost Davidson, down near the Cienega Creek, it's a very shallow well for which I -- we have no -- saw no evidence of what the construction was. So there's a question there.

Now, in terms of general experience and the
way it's handled, this kind of question is handled, to
demonstrate the connectivity between surface and
bedrock systems is to simply put parallel wells in or
paired wells in into that alluvium or adjacent to it,
measure the level of saturation in the alluvium,
measure the level of saturation in the rock. If the
water level in the rock is significantly -- is below
the base of the alluvium, they're not connected. So
whatever happens to bedrock at depth does -- has no
bearing on the stream.

And this is a demonstration that has only been
done indirectly through data that are perhaps less than
certain or comfortable. And the common way to do it in
the industry is simply put some drive point piezometers
into your sand alluvium at several places along or many
places along the reach of the stream and then put
corresponding paired bedrock wells so that you can
compare those water levels.

So that if question and the so what question
isn't quite answered yet because the if part of it is
not known.

BEN: Okay. Floyd had a comment or a
question so I'm going to put it over here for him.

FLOYD: This is Floyd. I don't know if
this is appropriate at this time. You know that the
models are probably the best tool but if the devil is
in the detail, what you put in the model, because that
impacts what you're going to get out of the model.

And so one of the inputs is the geology and
its impact on the groundwater and surface water. So
one of the questions that was brought up principally by
the County in its review was the question of the karst
terrain and what impacts that might have on the model
and if that was adequately addressed in the model.

And we took a tour of the Kartchner area which
should have similar geology to the mine site. And we
looked at what you could see on the surface and what
you would measure on the surface and if you could
predict groundwater paths somehow from that. And, of
course, we couldn't predict that there was cave systems
underneath that impacted the flow patterns and whatnot.
So you have to do something like electrical geophysics
or other techniques to verify what might be the paths
in limestone terrain.

So, again, you make assumptions based on the
data that's available and if they turn out to be
inadequate, well, you just have to address that if you
can. So we might just be dealing with we need to
reassess the geology and its impacts as one component,
just as a suggestion.
BEN: When you say "reassess", what do you mean by "reassess"?

FLOYD: More data, more technique. And that's one of the things, I don't know how we put up a card and say perhaps we need to add some data level to this assessment before we can move forward.

BEN: I'm going to actually -- if you could write that down as a question, that would be great.

I'm going to hand it to Jim and then it sounded like Roger had something else.

JIM: Yeah, this is Jim Copeland. So just a comment that if you offered me questions that I can't answer -- it's our responsibility through the NEPA to disclose, analyze and disclose, and if we cannot disclose to the public, if we cannot answer those questions and you, as the experts, cannot answer those questions, if you have -- what you have to offer is ifs, ands, or buts, then that means that we cannot fully disclose, which is our responsibility. That's just my comment.

BEN: Will you go back to the incomplete or unavailable information slide?

JIM L: This is Jim Leenhoats, and just a couple of things I wanted to throw in. One of them
was a thing that Stan said and was part of what Deb brought up, and Deb had suggested that some of Stan's work with regard to the question about the direction of flow, right, and the suggestion was that some of Stan's work indicates the direction of flow's irrelevant. But really, that's based on very basic hydrogeological principles. So I want to make sure it's understood that it's not something theoretical that Stan's been working, it's based on basic principles of hydrology. So the change in flow is relevant.

The second point I wanted to bring up that we discussed on both with respect to the models and just briefly with respect to the data collection and the connectiveness, whether or not this meets industry standards, and it may well do that, but I think it's worth asking the question, is it also best available science. And I don't think those are necessarily one and the same thing.

BEN: And so I guess I have a short follow-up question for you. Best available science, do you mean best available science to allow for a hard look NEPA analysis for the Forest supervisor to make an informed decision or best available science to spend ten years studying the question? I'm somewhat exaggerating.
JIM L: The best available science to robustly answer the question what would be the effects in this case on connected surface water features, springs, streams, and whatnot. So is the industry standard going to answer that question robustly or is there some standard that's actually higher than that that we would call best available science?

BEN: And what I'm getting at is for the purposes of informed decision-making in the NEPA process, do you have to have that? Does it really change your answers so much so that the Forest supervisor cannot make an informed decision or is the methods that have been used for the last three plus years, are they -- are they sufficient for the Forest supervisor to make an informed decision in the NEPA process and constitute a hard look?

JIM L: Well, I think, for starters, Stan and Roger have suggested -- and, again, these have been requested of Montgomery and Tetra Tech, that there are some simple tests that can be run that will help answer that question.

BEN: And those are in process, so I think we can let that lie 'cause they're happening. I'm going to go to George 'cause he had his hand up and then back to you, and I'm posing these questions
without answers behind them, but that's the NEPA background.

GEORGE: This is George Annandale here. Surface water. I think one of the things that obviously we're talking about alluvial systems. You need an alluvium system. So one of the issues is whether the mine will change the sediment transport and nature of the geomorphological nature of the system.

I spent a considerable amount of time in the catchment and in the streams itself, and I think if one just looks at basic practical considerations, I don't think that the mine is going to impact the fluvial nature of the Outstanding Waters in Reach 2.

The reason why I say that is that it's evident if you walk through these streams that the whole system is sediment transport limited. What that means is that there's more sediment in the system than what these -- the water that occurs in these channels can transport.

And there are -- you know, if one was to go into the reasons for me saying that, if you just walk through the system itself, firstly, there's an abundance of sediment in the whole reach, all the reaches. The pure nature of the angular nature of the sediment indicates that it's recent, and it comes mainly from all the surrounding catchment, the hills.
If you look at the gradation, it has got the gradation of a sandy material that is not being significantly transported by water or assaulted by water. If you look at many reaches, there's very high evidence that there was very high flow in the reaches and the sediment is still there.

And another piece of evidence, if you look at downstream of structures, we would expect if it was -- if it was a shortage of sediment, you would expect significant skarn, and there's no evidence. It's about six inches at the best if you look at the bridge at the USGS gauge.

So how does this work? The thing is, I think often one would look at a catchment and you think of a rain storm falling over the whole catchment and try and make some estimates, well, how much sediment is now being depleted from the system by the mine and how much water is being taken away by the mine. But that is not really how it works because you have all these different storms occurring in local areas most of the time and that generates a lot of sediment coming from the catchment.

If one would take the estimate that the sediment is going to -- supply is going to be reduced by the mine, which looks like a significant amount if
you look at the location at the USGS's gauge, but it
confuses the whole issue. The thing, if you look at
the whole catchment, the reduction in sediment yield is
probably on the order of 2 or 3 percent, perhaps maxing
on 5 percent. And that is a statistical noise of the
whole sediment of the whole system. So I cannot see
anything changing there.

There are a number of other reasons. There's
a lot of great control throughout the whole reach so
the stream slope, the energy slope, is not going to
change, it's not going to cut down. So I think just
purely from geomorphologic observation, I think one can
safely say that the mine will not impact the sediment
or the fluvial nature of the geomorphological nature of
Reach 2. I think that is clear.

BEN: Okay. Thank you. So it is about
11:40. So we should have already been ten minutes into
session two. But hopefully we'll catch up time later
or --

LARRY: Four-minute lunch.

BEN: -- or have a very fast lunch.

Bev and then Dan and then there's a couple of
things I want to note and see if we can move on a
little bit. Go ahead.

BEV: I just want to kind of affirm what
Floyd was saying about understanding -- having a thorough understanding of the geology of the project area and that as a foundation for the hydrology and hydrogeology. And I would like to better understand -- and maybe this is a one-on-one thing with you and I, Floyd -- what sort of geophysical methodology you have in mind to have a better understanding of the potential for karst features. I don't know if we want to have that occur later.

BEN: Let's have that occur on the side later and we can have that there. And then, Dan, I wanted to check in on something when you're done.

DAN: I just wanted to get back to Dale's point on have we made a determination whether this is a shallow sediment or a groundwater connected system, and the suggestion was made paired wells are a possibility for exploring that. And paired wells, shallow wells sound to me significantly cheaper than debating it for months out.

And so my point is that maybe a recommendation coming out of -- maybe we could reach consensus out of this meeting is to direct the installation of those wells or not, but I think we need to get that point solved because I think it's important if we're going to rely on the model to tell us what's going to happen in
that outstanding water, that we need to know if the
model has anything to say about it at all. So I think,
you know, just I think we need to reach resolution on
that point.

BEN: And so that actually leads pretty
well into what I was going to mention. I asked Chris
to pull this slide up again because a couple of things
have come up where the answer -- the question --
there's a question raised and the answer is, well,
there's ifs, ands, and buts, there's a lot of
consideration. And I just want to revisit this, that
there are ways to deal with that in the NEPA process.

So the question to you is: How much is
additional geological data going to matter? Do we feel
like we've already got good geological data or are
there a lot of feelings in the room that actually we
need to fine tune that a lot because it could make a
huge difference to making an informed decision?

So let's remember that, while we are
scientists here, you are doing science in the context
of a NEPA analysis. And so we're not always going to
get more data. Should we ask: Does it really matter?
Which is the previous slide: Is the information
essential to a reasoned choice? Let's ask that
question. But let's ask that question first. How good
are the data? How much better would our decision be if we had better data?

And this goes for both the determination related to are these springs part of the alluvial aquifer or are they connected to bedrock. How much -- it sounds like that is one where it actually really could make a big difference if we knew the answer to that question definitively.

I don't know how good the geological data that were used in the model is so I can't -- and I haven't heard a strong opinion about that either way in this room about it was awesome and we really don't need to do much to it 'cause we're not going to change the outputs of the model that much by adding fine tuned data.

So what I'm hearing, and then I'll go to Bev and then back to Stan. What I'm hearing is, basically you've already decided that the tool that's being used is the right tool, or at least the tool you have chosen to use, and there are good reasons to use it and your justification is what makes that work out okay in the NEPA context.

It sounds like that's what I heard from you, Mindee, at least is we decided this is what we're using, correct?
MINDEE: Yes. It's the horse that we're riding. But my understanding is we're still evaluating or building the defensibility to just say: It's the tool we're using. We feel pretty good. But we need that last little bit of defensibility and that's where we're going and why, in answer to your comment, why we're riding this horse for three and a half years and still talking about is it the right tool. We believe it can be. We're just trying to shore it up to show that there's more certainty that it is a good predictor of what we're trying to answer with it.

BEN: Okay. And if I'm not mistaken, what Tetra Tech or what Rosemont has been asked to go and do should -- is the first line there, and then it sounds like there's already a way to address what happens if the questions that were done before. So, okay. Bev.

BEV: I think that there are still outstanding questions on the geology; Floyd's brought some of them up. Rosemont is currently doing some further drilling to look at the backbone fault and the potential for flow there. And so I think that question is still out there. And along with that potential for flow, there is a question of there being karst geology there. So I think the question still needs to stay
BEN: Okay. So in terms of this, is this information essential to a reasoned choice among alternatives, the answer is we still can't say yes or no. We've got to do incrementally a little more research to find that out. It sounds like some of that is already happening. Jim or -- sorry, Deb.

MS. WHITHALL: So, in my mind in the moment, I heard a big if regarding the modelling. And this is -- so I just need everybody -- I need to understand this. The if is the modelling is helpful if the bedrock is connected to the spring. If it's not, then it's not helpful. So I just want to make sure I get that.

LARRY: Deb, let me clarify that --

BEN: One second. So, yeah, I think there is a clarification. So I think I can maybe predict what you're about to say, but I'll let you say it, obviously. This is Larry.

LARRY: And just to clarify a little, the model is necessary. It is a tool that has been applied, you know, in a standard way, in a common way. It's a tool that, failing -- that within the NEPA process of definition of whether it's an appropriate tool or not and gives the right answers or not, is the
tool to use. It's a common process and it is the one

to use here, in my opinion.

Now, in terms of the usability of the model, I
forget exactly which word you used, Deb, but the model
solves many questions about many different areas in the
domain in the area of the model itself. Specific to
the if question is determining is the question of if
the model -- if the groundwater is not -- the bedrock
groundwater is not the source of the springs, then the
model does not relate to the conditions of those
springs.

That doesn't render the model unusable because
there are many ways that that model -- many answers
that it answers -- many questions, I'm sorry, that it
answers. It's specific to a very important question of
the Arizona waters.

MS. WHITHALL: Right.

LARRY: That's a key question.

MS. WHITHALL: Right.

LARRY: That's a question that needs to
be answered that if the groundwater system isn't
connected, then it needs to be answered in another way.
That's the clarification I wanted to give.

MS. WHITHALL: Okay.

BEN: Stan and then Cori, 'cause I keep
seeing your hand and I keep ignoring it. And I apologize, I don't mean to do that.

STAN: I kind of tie into this and the need for geologic information in the model. We have two models. Grady's model had a horizontal flow barrier north of the mine area that kind of went across Davidson Canyon that I think the effect of that is to limit the propagation of drawdown northward to the lower Davidson Canyon. And I'm not a geologist, so some of you who are can tell me, is this reasonable or not? It's not in the Montgomery model. So I think in Grady's model you'd see more propagation of effects over to the east, maybe towards Cienega Creek, I don't know. With Montgomery, they might propagate more to the north.

So here's a question. You really have two tools, you know, with different conceptualizations, and is this barrier real? What could you do to try and establish whether that's a legitimate feature in the model or not? That might be something that would help understand, you know, the ultimate effects on these Arizona waters.

BEN: Cori. Sorry.

CORI: I'm going to make this brief because I know we love talking through lunch and we're
all passionate but we probably need to eat.

As a geologist, I'm always amazed that hydrologists can make up predictions based on so few points because, as a mine geologist, we typically have 500 core holes or RC holes in a very small area. Some of the mines in Nevada, for instance, have 10,000 drill holes in a very small area.

Now, I don't know the exact tabulation at Rosemont, but within the mile dimensions and outboard area, probably like, let's say, four square mile area they've probably got five to six hundred drill holes.

Now, Vladimir mentioned 400 wells being within the model area and he was thinking that was a reasonable number. In fact, I think that was a pretty high number for a model to be calibrated against.

VLADIMIR: Yes.

CORI: And that is in a model area of how many square miles? I don't know. Tens of square miles, correct? In the immediate mine area, there are probably five or six hundred holes so I don't know if Rosemont has summarized what they have anticipated -- or what they have intercepted so far in terms of karst topography but that might be a request.

I mean, have you seen bugs? Have you seen any indication of open spaces in the 600 drill holes that
you have now? Which, of course, they didn't drill all those holes. They were drilled by Anamax and Banner and Anaconda and so forth. But there is a geologic record there.

The other observation I wanted to make is that I've seen that geologists like to discriminate to the nth degree numerous, you know, subunits and classifications and the hydrologists come along and it boils down to six units, which is effectively what it is here.

We have four model units so we have -- we have probably 20, 25 rock units out there which got boiled down to a Paleozoic unit, you know, a Gila Conglomerate an arkose, and a basement rock. So all the detailed discrimination in the world gets boiled down to four hydrogeologic units because, from the hydro point of view, there wasn't that much difference between, you know, the Escabrosa and the Horquilla so it got boiled down to four major hydrologic units.

So that was -- I just wanted to say that the mine geologists probably, you know, could answer your question about the karst in the immediate area and geophysical lines of interest but you'd pretty much have to coat -- I mean, you'd have to do lines with such spacing that I'm not sure it would be something
that would be doable.

BEN: Okay. Chris had something else and --

CHRIS: Just two quick clarifications on the last two statements. Regarding Stan's statement about the dike in the model, just to put out there what our mentality was when we set out to do the draft EIS, we viewed that difference between those two models as a great thing; it gives us a range of alternatives. So it does need to be understood. If it's not appropriate, it's not appropriate. However, the fact that we used multiple models was one of our -- we thought it was actually a good thing to look at because it gave a range of alternatives.

As far as the question of whether Rosemont looked for karst topography or any evidence of karst, the question was asked of Rosemont earlier in the process. They produced a memo that's in the file. It was rather short but their short answer was basically: Our geologists found no evidence of karst while they were drilling the core holes.

So we put that in the EIS. We put a lot of caveats on it because of comments we received from state parks and others. But for the record, Rosemont's opinion on that is that they did not see any evidence
of it, for what it's worth.

CORI: Which doesn't mean there's not a
cave or karst system a mile out but who's to know? I
mean, you literally have to drill a hole every ten feet
or quarter mile or whatever, you know, to determine
that.

BEN: Bev.

BEV: One of the reasons we put caveats
in the DEIS on karst is because, in a survey that was
done last year, there were some -- some deposits that
were found, some pieces of deposits that were found
that may have been cave formations. So we do have that
information out there, and it may have just been a
surface spring deposit, but that needs to be
considered.

BEN: Okay. Mindee and then Dan and
then I'd like to pose a question before we go to lunch.

MINDEE: This is Mindee and I keep
wanting to go back to some of the basic tenets about
NEPA. Number one: It's primarily to inform the public
and then information upon which to make a decision.
And it seems like all that we've been talking about,
it's certainly relevant to full disclosure.

As far as this point that's on the screen now,
is the information essential to a reasoned choice among
alternatives, our alternatives -- our alternatives really don't change or the conclusions from groundwater modelling -- I'm having a hard time kind of getting my point out. To say it a different way, is it really relevant to understanding should I choose alternative A, B, or C? Because it is what it is.

And the alternatives right now, we could add different mitigation and maybe we could find some fine tunes that would make some changes, but this is really a disclosure. It's not all that important to the decision provided that, you know, we still have this caveat about if we have a legally compliant alternative, then no action is really not a choice for the Forest supervisor. Very basic foundational point that, you know, we've stood firm on that.

So I'm not sure some of this -- it doesn't seem to be real relevant to understanding what alternative choice you have. It's more a disclosure and how much detail do you need to disclose to the public, how much do you need to study that when you must make a -- you must select an action alternative and there really isn't that much difference regarding groundwater and some of the water effects among the different alternatives.

BEN: And this is -- and I think what
Mindee just said is the reason why I think we're going to be coming back to this kind of throughout the day. So I'm going to -- Dan, you had something else and then I was going to round something out.

DAN: Yeah. And it actually ties in to what Mindee just said. It has to do with the karst. Basically, if you walk Sycamore Canyon, walk areas of Helvetia, almost everywhere you find limestone exposed, you'll find karst features. You'll find small solution cavities, you'll find travertine. You find these features there that indicate karst development. However, what you don't see is a -- any type of spring activity, at least I haven't seen it, I don't know if anyone's measured anything. Springs indicate a well-connected karst system. You don't have springs running like a fire hose after a major storm. You don't have any indication of an interconnected karst system there. You do have some caves further south, Agua Caliente Cave, and the Bureau of Mines records they indicate that some caves have been mined out previously have been used as basically convenient routes into the underground but, again, those were on the order of 100 feet, 200 feet long, not on the order of well-connected karst system.

And with the tying back to Rosemont's
information, they reiterated that they did not find any karst in their bore holes, any indications of karst in their bore holes what was it, two weeks ago or a month ago and karst systems, my understanding, are generally shallow groundwater, vadose zone process. So that -- and you may disagree. That's fine.

ROGER: I disagree.

DAN: Okay. Roger disagrees and that's fine. That these are not found particularly deep or unless it indicates a Paleos environment where there was exposure to air. And what I was getting to there was some of the that Rosemont found sulfides they found were not oxidized so it would indicate previous exposure.

BEN: And now I'm a little worried that we may be getting a little too far into the weeds on that stuff so I don't think we should continue the discussion about where you typically would find karst features.

I want to go back to this one thing to wrap up and then just decide where we're going to go after lunch and when we're going to come back from lunch.

I think what Mindee said is correct. That, generally speaking, my impression here is that the question very much still is sort of undecided but there
probably are opinions about if collecting more
geological data or determining if Reach 2 and Escondido
Springs are connected to the groundwater aquifer. Did
I get that right? Those are the two pieces of
information that it sounded like we're saying we could
add.

I'm also kind of hearing that to make a
reasoned choice among alternatives, adding that
information may not be that useful. What may be served
is the public disclosure process. So I think that is
still a question to be pondered and I think that's more
to be pondered by you in the Forest Service is how
essential is that.

I want to say one thing about that, and that
is, remembering just that there are multiple ways to
disclose the information to the public, right? There's
either going to get it and then adding that, and you
would want to do that if you feel like you have to have
it to make an informed decision among alternatives.
You could also disclose this information to the public
by complying with these regulations in NEPA as outlined
in CEQ, a statement that it's incomplete or
unavailable, how relevant is it to evaluating impacts.
That goes back to the reasoned choice among
alternatives to an extent, a summary of what's the
existing evidence and how relevant that is to
evaluating impacts, and then your -- the agency's
evaluation of those impacts based on the methods that
we've been talking about that are generally accepted in
the scientific community.

So remember that we're not just looking at the
first question. I think Mindee hit it right on the
head there that we do have a public disclosure
requirement as well, but you have multiple avenues to
achieve the proper amount of public disclosure.

So, at this point, I kind of feel like this
question, these two questions, should we get this data,
does it serve us, knowing that there are other
activities already in process to address some of the
concerns that were out there, I feel like that's the
question. It's really, if I'm not mistaken, in your
court, Forest Service, as to whether or not you feel
like the data need to be collected or not.

Am I misinterpreting something or do you guys
agree or do you not want to say?

JIM: I'll make a comment.

BEN: Okay. Jim's going to make a
comment and sounds like Bev may have something to add
there, too.

JIM: The decisionmaker -- this is Jim
Copeland. The decisionmaker does not have to be an expert in any of this. What he has to rely on is the conclusions of the experts and what testimony that they provide to make an informed decision and for us to disclose that. And if the information that you're providing, if you cannot draw conclusions that -- and give us a foundation for that, then the decisionmaker is teetering out on a limb out there in his decision, that gives that appearance.

Because I can tell you that there are a lot of opinions out there and when this -- when the final EIS is published, if we don't draw the conclusions, if we don't provide that information, there will be lots of opportunity for the public, whether they're appellants, litigants, or whatever, for them to draw conclusions. And, at the same time, in my experience, when we end up in litigation, we still have to -- they will have those conclusions there and we will have to either contest them or agree with them.

So that's just what my point there is. If you don't have the information to draw conclusions, we can't put the conclusions in the document.

BEN: And I guess I want to add, I want to suggest a follow up to that and tell me if you're okay with this. And that is that the -- your drawing
conclusions. NEPA doesn't say they have to be 100 percent certain conclusions. NEPA's 40 most asked questions say that there -- it's number 18B or something like that -- if there are uncertainties, you need to disclose those uncertainties. And that is acceptable.

So conclusion, but here's some uncertainty and here's our explanation around that uncertainty still provides the decisionmaker with the information that they need to make a decision that then is supportable in a court, for example. So, are you okay with that addition?

JIM: Mm-hmm.

BEN: Bev.

BEV: I just wanted to add, I think there's been some really good discussion about the what if or so what, actually, is what the term was used and Deb made a good point about, well, if it doesn't impact the springs, then why are we -- why are we worried about the modelling?

However, I think that we -- there are things that we're considering that are in addition to the three things that were originally mentioned for areas that are -- of concern for impact. And they have to do, for example, with things like the pit lake
development. That's another issue with groundwater that we're really not touching on today.

So I just want to mention that there are some more so what's that are connected to groundwater and that we're not really seeming to be in the context of the meeting today and the discussion.

MINDEE: And I think that's because some of those are more generally agreed on. They aren't sticking points, there's not a lot of debate or -- yeah, so I understood that these models were really good predictive pit lake models; that's what they're designed to do.

BEV: Okay.

MINDEE: And they're doing a great job at that, but we're using them to predict some other things that are maybe on the fringes.

BEN: And I think what Mindee just said is right on. We're not -- there are certain things we're not addressing in this meeting consciously because there's pretty much already consensus or the points around there that aren't are relatively minor and solvable.

It is -- and I know there are two other hands up. It is 12:10. My request to you or my question to you is: Do you feel like this is something you have to
say right now or can you wait until we start again at 1:00 o'clock?

DALE: Absolutely.

CORI: Absolutely what?

DALE: Wait.

BEN: I just assumed you meant absolutely wait. Maybe that wasn't fair of me to assume absolutely meant wait.

So with -- this shortens our lunch by about five minutes. My proposal is that when we come back, you guys bring up what you need to bring up and that we move to session two.

DALE: It should be quick.

FLOYD: You assume we can remember it, though.

BEN: Yes, dude. You're smart folks. Don't drink too much during lunch.

CHRIS: Different suggestion I'll throw out there. I think session two is going to cover a lot of the same ground as session one. I would like to reverse the order and talk about geochemical impacts after lunch.

BEN: Everybody else good with that?

CORI: We are.

BEN: Anybody opposed to that, I guess
that's easier. So you guys say what you need to say and then we'll move on to the geochemical stuff after lunch. We'll come back at 1:00 o'clock.

(A break was taken.)

BEN: So we are now back on the record. So I hope on the phone Deanne, and Curtis -- Carter, are you there? So we are back --

CARTER: I believe that Elizabeth Goldman is now on the line.

BEN: Elizabeth, are you there?

LIZ: Yeah, I'm here. Hi.

BEN: We've got a lot of people in the room. In a second I'd like you to introduce yourself so everybody kind of knows who you are, is that all right? I'll take that as a yes. Elizabeth, are you there?

ELIZABETH: I'm sorry. This is Elizabeth Goldman. I'm in the wetlands office EPA 9 San Francisco.

BEN: Okay. So let's wrap up session one.

First, Floyd wanted to say something that he decided would be okay after lunch. So we'll start with that and then I've got some wrap-up questions and a couple of things that came out of a conversation with
Deb and Jim and Mindee, who are gone. So I think that those are important individuals, so everybody hold your breath. We'll wait 'cause I think that they should be present for the whole conversation.

(There was a short wait while the remaining participants re-entered the room.)

BEN: Basically what I said is just Floyd, this something he wanted to say. So we'll have that and then we've got some wrap-up of session one and then some things that we discussed at lunch that I think should probably be brought out to the larger group, and then we'll move on to session two where we'll have a similar review of the results and methods, the impact analysis, and discussion, and that will be for geochem.

So we've got everyone now. Floyd, go ahead.

FLOYD: If we recall what we were talking about, if the source -- if what we want to understand is the reaches going into Davidson Canyon, the springs, another way to do that, an additional way, is to look at the geochemistry of the source water surrounding the area. And if we -- we could characterize those either isotopically, you could then back calculate to get the amount of contribution from various sources.
We've done that, at least in one way, in Sonoita Creek. We looked at Sonoita Creek spring, which is another perennial stream in southeastern Arizona. The source waters were so distinct enough that we could isotopically signature them and then look at the spring and calculate back and get an estimate of -- a direct estimate of what we thought were the contributing sources and how much volumetrically they contributed.

So that brings to mind that some of these, the source that we may be looking at may be local and not characterized very well with a large scale regional model, just questions of scale.

BEN: So is that a different or another way of doing -- of determining if -- well, go ahead.

FLOYD: That brought to the point where there's so much literature here that I haven't had a chance to look at --

VLADIMIR: It was addressed by Tetra Tech.

FLOYD: Okay. See, that's what I don't know. But there's a lot of stuff in here so there are other things that we could look at.

The other thing is just to point out -- so it could be here already. We could either just bring it
up or we could remine the data, pardon the pun, to get new information out of it.

The other thing is the fracture analysis of the area is another factor that may be underemphasized, and I don't know how well that was characterized. But we've seen instances where groundwater flow or surface flow -- surface springs are controlled discretely by fracture, unique fracture systems, and they may be close to each other but they could at the same time be very separate. And we've seen different chemistries coming out of different fractures when you start looking at fracture flow. So I don't know if that -- we've got enough data in the report to derive that kind of analysis as well.

GEORGE: Can I just say something? I think I just want to say something as a surface water person and just observing some. And this is the data point that I think this is probably important from an observational point of view is that I was with Dale in the field about a couple of weeks ago, six weeks, on March 21st, and we were in the upper edge of that alluvial source there, the Outstanding Waters, and there was a particular level in the groundwater there. That has dropped probably more than a foot, and one section is completely dry.
So, you know, for me, I would say we have this huge underground system feeding this Outstanding Waters. It's highly unlikely that that whole system will drop by a foot or foot and a half. And for me, just looking at stuff, I think it's my conclusion would be it's probably an alluvial system. We could go into all the science but how do you explain that whole thing, you know? It's impossible for the drop of a foot and a half. I just wanted to drop that piece of information.

LARRY: You saw that spring six weeks ago?

GEORGE: Yeah.

LARRY: And frankly, my opinion, it was even more than a foot from what we saw, the dried upper one now and the lower one that you have a photo of yourself, which is a much larger body of water, suggesting really two or three feet perhaps of drop vertically.

Also, Floyd, there's a -- there is an isotopic analysis in this report by Tetra Tech, and I can just throw it to you.

FLOYD: Okay.

LARRY: I'll get you the figure, which shows that the spring water, Reach 2 Spring water,
lines up on the deuterium/oxygen line as near the meteoric line.

VLADIMIR: Very different from the groundwater.

FLOYD: Okay.

LARRY: There are some other pieces of evidence as you look around, as you stand there at the spring, and if indeed the water were at a certain point, say, at the ground surface in the spring, and then you move 30 feet off laterally to the -- to the rock area outside the alluvium, you see no evidence of vegetation that would suggest the water was only ten feet down. You see no phreatophytic vegetation. You see it very localized.

Very rare to see -- we saw no cottonwoods up there, for instance. There appeared to be, oh, it was an ash, somebody thought that it was an ash tree, Arizona Ash tree. So there was some phreatophytic vegetation but the deep taproot Cottonwood or the deep water Cottonwood that needs continuous saturation, we saw none of those.

So the feeling was, as we stood there with this data, this isotopic data, with the witness borne by these guys six weeks ago, that -- and just the physical look, that we started to question whether this
really is a bedrock tied system.

And it's such a key question that it's probably one that needs to be definitively answered because if we start -- if the whole question ends up arguing on is .4 feet significant in bedrock drop or not, then we're tying ourselves into a whole new set of questions that may be moot because it's simply not connected.

BEN: Okay. So this is good because it goes right into the next thing that I was going to go to to kind of wrap up a little bit.

And the intent here is that everybody basically, based on the discussion that you've heard and your familiarity with the materials you've consumed over the last few years, the idea is to sort of make a call; you know, more or less we're looking at yes or no. And understanding that there's a whole lot of information color coded in that handout that's in the record that demonstrates this. And I may ask some sort of subquestions.

So the three questions that I kind of envisioned as wrap-up, and we can add or delete if you feel like it's necessary, are: Are the tools or the methods being used for the analysis appropriate? I think that there was a conclusion relating to that
already more or less, but I want to double-check.

And that's in the background of that.

Understand that some of the questions that have been raised by Roger and others are in the process of being answered.

The second question is: Are additional geological data and information necessary for an informed decision?

And the third one: Are data related to connectivity of springs and the bedrock aquifer, this question we're asking right now, necessary for an informed decision?

And so I'm looking for essentially yes or no answers, something that's not going to take you more than 15 seconds give or take.

LARRY: Good luck with that.

BEN: I know. So this is -- so to the extent that you can, this is -- we're trying to wrap -- these are the big questions it seemed like that came out, especially these two. And so that's why we're focusing on them as part of the wrap-up before we move on to the next one. So who wants to start?

CORI: Could I make a point with your second bullet?

BEN: Sure.
CORI: Okay. Cori Hoag, SRK. I'm a geologist. This hydrogeology model that has been prepared by Tetra Tech and Montgomery is a geologically based model. For resource estimation purposes, I have seen models performed by companies that had zero geology in it; it was just crunching numbers from the drill holes.

This model is based on drill hole data, subsurface data from probably 500 drill holes, five or six hundred drill holes in the immediate vicinity, and outboard exploration holes and the wells to the best of the compilation of more than 400 wells, I would say, and the surface geology, with geology cut at different elevations. While some specific points may still be of interest in regards to the specific faults, in the end, these specifics were all rolled into hydrogeologic units for the purposes of modelling, and I feel it's sufficient information that's available now to -- for your purposes of making a decision.

BEN: So your answer would be, no, we don't need to get additional data?

CORI: Correct.

BEN: George.

GEORGE: This is George Annandale. I'd like to just make a statement about this industry
standard that has been questioned or the ways are
written down. It's not written down anywhere and I
think that's something that we need to lay to rest.

The reason is that it is innate knowledge in a
community of professionals who practice in a certain
field. Therefore, if you have lawsuits, that's why you
have professionals testifying what is standard of
practice, okay? There is no -- if you have to wait to
write down a standard of practice, by the time it's
written down, it's outdated already.

And secondly, why people won't write it down
is because it will completely shackle the industry to
move forward. Technology is improving all the time and
people are adapting and it's a communal standard.

BEN: So your answer to this one would be yes?

GEORGE: Yes.

LARRY: And by the way, George, isn't that also a metaphor -- another way of saying it is
generally accepted methods?

GEORGE: Yeah.

LARRY: The word "standard" does not imply standards as in a written procedure. It's simply
generally accepted methods.

GEORGE: Yes.
BEN: And to go -- as part of this question, this is CEQ or regulation 1502.24: Insure that professional integrity, including scientific integrity of the discussions and analyses. So I just wanted to point this out again.

And this is part of this reason to have this brief wrap-up is the Forest Service needs to make sure that this was done professionally and with scientific integrity and we're trying to get to that point of, yeah, we feel like it was. We're good. We met -- we're meeting hard look requirements, we're meeting the requirements of the CEQ regulations.

STAN: I could comment on the first one.

BEN: Okay. This is Stan from USGS.

STAN: I would have to say that the methods have not been demonstrated to be appropriate for every question that's being asked of the models. So it's not that necessarily they're inappropriate; the jury's still out. We're asking them to do some additional tests to see are they appropriate for certain analyses.

So I don't know how we can just make a blanket statement that they are or they aren't. They may be appropriate for other analyses, like the pit lake or something like that. It's not been discussed here.
BEN: So pending some of the additional information that's been asked for --

STAN: Yeah, yeah. Reasonable tests should be done that, you know, I would think a modeler should do when they construct a model with artificial boundaries. It probably would be something that I would do if I was constructing a model would be to do those tests to see what the effect of those boundaries are.

BEN: And that's happening, so we recognize that that's the case here, too. Okay.

STAN: Yeah.

BEN: Other wrap-up related thoughts?

GEORGE: This is George Annandale. I think, you know, and I agree with you, that, you know, but I think make the distinction between the methods used and whether the analysis is complete. That is what I'm seeing. So I think we talk about -- my view is we talk about methods. I think methods are appropriate. Whether the model actually can tell you what's going to happen down in Reach 2, that's another question that we need to answer, I'm sure. But that is what I'm thinking.

BEN: I'll go to Deb and then back to Stan, and we need to not take more than five more
minutes with this.

DEB: This is Deb. And I guess I just
would like to add a sort of an amendment to those
questions. And it seemed that the purpose of the
conversation this morning was around the issue related
to the Outstanding Waters in the lower Davidson Canyon.
So as we talk about how you're feeling about these
questions, I come back to that. That's really what the
focus of the conversation was about this morning and
that might change how you think about how you would
answer that.

BEN: Okay.

GEORGE: Could you please just say that
again? I didn't quite follow.

DEB: So these questions for me focus on
the conversation we had this morning, and the topic
that we focused on was the issue around the Outstanding
Arizona Waters in lower Davidson Canyon. So that --
that's the question, the issue at hand.

And so my desire is to have all of you weigh
in on how well, based on the conversation this morning,
that helps us address that issue, so that's just a
little clarification.

BEN: And that's good clarification, and
I kind of considered it embedded, but I think it's
better to voice.

The other thing to recognize as part of that clarification is obviously this third question is kind of central to that, it seems to me, from what I've understood, from what people have said. So the answer -- if the answer to this is you've got to get the data and the data show that they're not connected, then the groundwater-related tools are no longer relevant to the analysis of drawdown-related impacts in those springs. So recognizing there's an interconnection between these two.

So, George, you had something else.

GEORGE: I just want to say one more thing. I think, you know, me not being a groundwater specialist or anything like that, I'm sitting on the side making observations also. What I read into this is there are, I think succinctly, three things, I think.

Firstly, it seems to me just purely from an engineering common sense point of view that there's -- probably this model is not going to tell us at Reach 2 what the impact of the mine is going to be because it's so far away and the time scales are so long.

Secondly, I think the -- that answer, what I gathered from Larry this morning, may be answered by
saying putting in these piezometers in the alluvial system and drill the hole down into the bedrock and see where the water is and make a conclusion of the connection right on-site.

And, thirdly, I think if the conclusion would be that it is an alluvial system then, as far as I'm concerned, with as much certainty as I can say from a surface pool point of view, there's no impact from the mine because the alluvium is still there. That is for my view.

BEN: Okay. Other -- so it would be great to hear from everybody, recognizing that we have notes from the previous part of the meeting, too, but, go ahead.

BEV: I just have a quick question about Reach 2 Spring. Larry, you were saying that it's recharged meteorically. So is that -- would that be from the stream that it's adjacent to where it would come from further upstream or --

LARRY: It looks --

BEN: Sorry. Spacing out.

LARRY: Bev, the evidence -- I see nothing definitive, but the evidence suggests, both from the data collected previously and isotopic analysis and geomorphology and the shape of the
drainage there, the way that the spring looks, the
springs actually are in the alluvium. And when I say
"spring", the Reach 2 Spring.

There's an upper area that's now dry that six
weeks ago was wet. And a lower spring some hundred
feet downstream and perhaps two to three feet lower
that is now just a very small pool that was
substantially larger six weeks ago. Those are within
and inside of the alluvium themselves. They are not
tributary to the drainage. They are embedded just as
the first emission of the Cienega Escondido Spring is
down on the main spring of the Cienega Creek that
simply expresses right out of the alluvium; it's a nick
point, a low spot in the alluvium that it comes out of.
That's what we see apparently at Reach 2. So it's a
part and parcel piece of the alluvium, part of the
alluvium.

BEV: So it could be recharging from
quite a ways upstream?

LARRY: Did you ask me for recharge,
meteoric charge of the field, did I get?

BEV: I was asking if it was recharged
in the immediate area or if it was collecting water
from a large area.

LARRY: Okay. I got on a roll. It
seems that the saturation, the alluvium is meteorically and locally recharged. That you have long periods of no precipitation followed by intense thunderstorms or some winter general rains of low intensity that probably form event-driven recharges to the alluvium. So it's all meteoric, it's local.

BEV: I understand that. I'm just wondering how big an area of recharge that spring is being recharged by.

LARRY: It's everything -- in terms of collection to the alluvium, it's everything upstream --

BEV: Okay.

LARRY: -- within the alluvium and what runoff comes into the spring during an intense storm and then locally it's simply that area right there where it shows up.

BEV: Okay.

BEN: Okay. Now, do we have to -- I'm going back to, let's stay out of the weeds. Are we ready for somebody, maybe just one other person or, again, it would be great to hear from everybody on these, that's the intent, it's not to have it just be a few people. So can we have that input quickly from others?

BEV: I would like to know if Roger has
any comments.

BEN: So Bev just asked if Roger has any comments and now Roger has the pizza.

ROGER: Well, back to this laid to rest item of the standard of industry practices. I was willing to give in on that and I did make a request that I be shown model situations where this kind of model had been produced and I never saw any adequate comparisons.

And I've never been able to find a similar model for especially a desert condition where there have been -- other than the Death Valley regional flow simulation model, which is a USGS model, and also that USGS does have standards that can be relied upon.

BEN: Do you have any opinions on the other stuff, too?

ROGER: Additional? Actually, yes. When we first started this project, I was concerned about having an adequate monitoring network, but apparently producing an adequate monitoring network would have required more NEPA documentation and we were not able to produce what I would have considered to be an adequate groundwater monitoring network.

In fact, the major deep wells were within the footprint of the ultimate pit and will end up being
mined out and unless we come up with some mechanism for
being able to put in a reliable and good monitoring
network, we won't have anything at that point. So that
kind of information is important and --

MINDEE: That task is assigned to Salek
right now.

BEN: Okay.

MINDEE: To be identifying where are we
going to monitor groundwater.

BEN: After implementation, not as part
of making your NEPA decision.

MINDEE: Yes, yes.

ROGER: Hopefully that will become
integral to the whole process rather than after it
starts.

BEN: But it should be very clear that
it sounds like that groundwater monitoring network is
something that you're considering to be needed so that,
as part of your monitoring during construction and
operations and post, you've got adequate data to be
able to respond when you need to from a management
perspective. Like we're not -- my understanding was
we're not trying to get that before you make a
decision.

MINDEE: That's my understanding.
BEV: And that was my understanding from the beginning, was we would have a certain number of monitoring wells that the company was drilling initially and that we would add additional wells with the -- with the permitting that would come with the mine.

BEN: Okay.

ROGER: Yeah, we had to rely upon basically private land at that point.

BEN: Right.

ROGER: And so there are large areas of geography that were kind of off limits.

BEN: Right. I understand that. But I just want to make sure that that distinction was clear between wells -- monitoring wells you would drill for monitoring versus that which you would drill to help you with your NEPA analysis, which are different things.

Anything else?

ROGER: Not at this point.

BEN: Okay. Chris.

CHRIS: Yeah, I'll put a bow on a couple of process questions that just popped up.

BEN: Okay. And then I'm going to move on to another item leading into session two.
CHRIS: Just to reiterate what Mindee said, constructing the monitoring networking forward, not for the NEPA analysis but going forward. In process right now the plan is to involve many parties in doing that. Salek currently has the assignment to do part of that. I know Rosemont had ideas that they might bring to the table. It'll all come together into a specific monitoring plan but the monitoring plan in the DEIS is not specific. The eventual one will be specific. So that's one item.

Other item regarding the analog models using the same techniques, the question was asked in a written form of SRK very recently, Forest produced some questions that we wanted to have answered, that was one of them. They did submit that in draft form, so you should have a couple of analogs at least that they came up with. I don't know if you've seen it yet but, for the record, it's out there.

ROGER: Didn't I ask about that about two years ago?

CARTER: Who was that speaking just then?

CHRIS: This is Chris Garrett.

BEN: Did you have a question, Carter, or was that the only one?
CARTER: No, I was trying to see who
that was that he was -- I'm trying to keep track of it.

BEN: Gotcha. Chris, and then Roger.

Now, I want to just stop for a moment because, as the
facilitator, I want to refer to this respect each other
and be polite. I'm going to be perfectly honest that,
as an outsider, the "didn't I ask for that two years
ago" felt not respectful or polite. Understanding that
there have been some long time frames between some
requests and responses, you know, NEPA is a long
process, and certain things take longer than others.
So I just want to point to that, again, real quick,
'cause that felt like it didn't comply with that ground
rule.

LARRY: And to finish that up, by the
way, you asked for those, we gave you two. Those are
two models at San Manuel, and you asked for those
recently and we gave them to you recently.

ROGER: Yes, I remember the two models.
And I just want to make two comments on those was that
one was the Albuquerque Basin model, which I could not
find the similarity.

LARRY: No, it was San Manuel.

BEN: I'm going to stop this right now,
actually, and you guys -- we can discuss it outside of
this meeting. There is no reason to continue with this conversation here.

BEV: I think we have an issue that we need to tie up before we go on and that is, what is our resolution on the boundary issue? Did we figure out a resolution on that? Or is somebody still -- are there still questions about that? And that's been something that's come up a few times and I think we should get out on the table today and figure out where we're going with that.

BEN: I'm going to try to summarize that just briefly 'cause I think I know what the resolution was. If I was wrong, you can correct me.

My understanding was that questions related to the boundary have been sent up to Rosemont to address the comments from Roger and others. They are going to bring back something to this group that will be evaluated, and that there will be a specific approach related to how to deal with if certain conditions are met, then you might have a change, and if it turns out that it doesn't really change the model outputs, then you don't have a change.

But there are -- so there are certain things where the next steps really need to be -- and I think it was Vladimir proposed some next steps which are
going to be in the notes, but the intent was we know that's -- we're working on resolution. We'll get to the next steps if we need to change direction or whatever with the way the model's being used later. Is that accurate? Did I miss anything important?

BEV: I'd just like to ask Roger if that satisfies his concerns right now.

ROGER: Well, I think that letter we just sent out, Salt Lake sent by my desk two days ago, that's meant to address that.

BEV: Okay.

BEN: And that is apparently in process from everything I've heard.

JIM: Jim. I'd just like you to close the loop and simplify it for me on those three questions.

BEN: Okay.

JIM: Yes, no, maybe, yes.

BEN: So we didn't hear from everybody, which is kind of not what I was hoping for, but I think we're at a point where we do just need to move on. I heard yes with caveats. In other words, we need to do some of the tests proposed by Roger and others.
MELISSA: Can you repeat the question for the people on the phone?

BEN: Yes. I'm pointing to a question here which you're supposed to know just 'cause.

The first question was: Are the tools and methods being used for the analysis appropriate? I heard yes with caveats, pending the tests.

JIM: What tests?

BEN: The tests that Roger suggested in the recent memo, the boundary condition tests.

CORI: Simulations.

BEN: Simulations.

CORI: Different simulations.

BEN: Cori was just saying "different simulations". So hopefully I'm getting close enough that everybody's on the same page here.

The second one was: Are additional geological data and information necessary for an informed decision? I heard Cori say no, we've got what we need. There's a lot of information out there that is available to us and it's sufficient for the purposes of the NEPA decision that needs to be made. I don't recall, maybe I missed something, a second opinion on that that was contrary to what Cori suggested.

MINDEE: But Floyd had mentioned earlier
some concerns about was there adequate study to really -- I don't know the lingo -- but to interpret the geology relative to water movement.

BEN: Right. Floyd had brought that up and it is addressed in the Tetra Tech report was my understanding. This was, for example, related to looking for isotope signatures and things of that nature, Floyd, right? But what we talked about geophysical techniques --

CARTER: The next question of whether additional geological data to make an informed decision, does that include in it the data that would come from the installation of wells to determine whether the connectivity between the bedrock aquifer or the shallow alluvial aquifer, is that what you're referring to, whether or not that is really necessary?

BEN: No. Different question.

Go ahead, Floyd. I mean, you might get some data out of that, I presume, but that would not be the intent of the piezometers specifically.

Go ahead.

FLOYD: Apparently there was some resulting drill information that indicates there was not karst geology.

FLOYD: But still there's a possibility to input geophysical studies that might detail that a little clearer than random drill holes.

BEN: Okay.

FLOYD: You know, with drill holes, you usually get a driller's report. Unless a geologist is standing at the drill hole, you get a driller's report, and they do things like move granites and brown granites and things like that, and you don't know what they really mean. So --

BEN: So --

FLOYD: There's a possibility there's more information that could be used.

BEN: Okay. So this is sort of a no with, yeah, there's still the possibility that it might be needed for an informed decision. So I'm hearing a lot of wavering and we should probably at some point here talk about where's the dividing line between when do we just stop wavering and make decisions, which is really more up to you guys at the Forest Service.

Cori.

CORI: I would disagree with my esteemed friend, Floyd. The characterization of material properties here are sufficient to -- you know, in conjunction with the known geology across Southern
Arizona, of the properties of Paleozoic sequence, or basement rocks, the andesite material, the arkose, and, you know, the basin fill, in conjunction with the hydrological characterization that was done, is sufficient to characterize, for the purposes of preparing a numerical flow model, the hydrogeological properties.

So the aquifer tests that were done on these formations and the calculations that were done are sufficient so that putting in, you know, more subsurface information is not going to materially change the K values, I mean, the permeability, the material properties that were used in the numerical flow models, so that's all I wanted to say. I don't think it would materially change the outcome of the model.

BEN: Okay. And I'm going to move on to the third question now 'cause we do need to move on to other things, too.

The third question was: Are data related to connectivity of springs and bedrock aquifer necessary for informed decision? This is the one where I think it is the most important to link back to the whole idea that what we're primarily concerned about here are -- is drawdown in the Outstanding Arizona Water in
Davidson Canyon. Are we going to be impacting the values that make it an Outstanding Water?

My understanding from the discussion is that answering this question actually could make a difference to proposed mitigation if it were needed and the level of impact that you can reasonably expect based on the tools we're using.

Am I incorrect in that? In anybody's estimation?

BEV: I have to back up a little bit.

BEN: Okay.

BEV: I want to weigh in again on the possibility of geophysical work along the backbone fault, and I have to say that, based on my knowledge of Southeastern Arizona geology and the project area, I would tend to -- I would tend to think that some geophysical work would answer some of the questions that we have from our comments on the DEIS, and it would give us some resolution. I'm sorry to back up. But I had to -- I had to make that statement.

BEN: Okay. Again, at this point, I'm going to let that statement lie as the last statement about that.

BEV: Okay.

BEN: That's it.
All right. Did I misstate the interpretation that I had of the conversation earlier about determining whether the springs are solely in the alluvial system there or whether they're connected to bedrock and how important it is to answer that question?

Chris. And, by the way, I'm not suggesting that it necessarily be by the piezometer method because there are multiple ways to make those conclusions.

CHRIS: Which is exactly what I was going to say. I don't think you mischaracterized it. That is a very important question that has to be answered.

Coming from the perspective as an author of the EIS, having to write this analysis, some of you have heard me use this phrase before, "belt and suspenders". You never rely on one thing, you rely on as many things as you can get your fingers on, and then it's kind of the preponderance of the evidence. And the uncertainty is part of that. You kind of weigh it all and then you leave the uncertainty on the table and it falls where it falls.

In this case, I just want to say that there are a lot of lines of evidence already on the table, and I'm not going to say where they fall, I think some
other people have already weighed in on that, but we are not standing here without information.

BEN: Can I suggest -- so I would like to suggest that we start to compile some action items, because it strikes me that one action item as a result of this conversation is write it up in a way -- maybe it's already in the draft EIS and maybe I haven't read that section or whatever. But let's write it up, the lines of evidence there are that demonstrate one way or the other, before we decide about the need for piezometers.

So is that -- is that a reasonable action item to come out of this that can help to resolve this? And I'm not going to say who does it but it does seem like there's a white paper, a memo, a something related to what we already know.

LARRY: It's not only reasonable but I think it's necessary to frame the degree and amount of any piezometric work that might need to be done. So you have to start at square one with a summary of lines of evidence and knowledge to date and then go from there.

FLOYD: I second the idea. I think there's a lot of information and it's not all pointing to one place, it's not pointing to that answer. So we
can't always -- a lot of data to go through, so it's not always easy to put all this together for that answer.

    LARRY: And that's why we're talking about it now because it's in pieces, it's disseminated a bit. It needs to be brought together, summarized, and then let's see where we are.

    FLOYD: Okay.

    BEN: Okay.

    MINDEE: So I would propose that the Forest looks at that task and decides the who, who's involved, who reviews, what are the time frames, that the Forest kind of frame up the task, make the assignment, and then get that information in front of the decisionmaker to decide, are we going to go for more, and what is that more if we need it.

    BEN: Okay. That sounds like a great idea. I think that that's exactly -- that, I think, is the cleanest way to go forward and the best way to be sure that you get what you need.

    I would suggest that we do a similar item, a similar report for this other question related to geology. I think this is probably the more -- the question that must be answered. It really does matter to a reasoned decision here. This one could be -- the
jury is -- there's not consensus on this where there is on this one. So I -- it seems like a report on that would be needed, too.

This is -- sorry, for those on the phone -- the question about gathering additional geological data to inform the modelling analysis.

Do others feel that that would also be used for -- do others feel like -- Bev?

BEV: I just want to point out, I heard what Deb said earlier about what we're actually focusing on today. And I think that we have gotten off the subject a little bit in talking about karst and all that kind of stuff, but we have the resources here to discuss it and so, yeah, I think we are in agreement on doing that. I don't think it necessarily has anything to do with the springs that we're talking about, and lower Davidson, but we're all here, we have the good minds to discuss this, and it's an opportunity we need to seize. So, yeah, I think we need to do that.

BEN: So we're creating more work for ourselves here. All right. So there's at least one person saying, yeah, let's do a memo of this, too, and figure out what do we get by what we think we might add. And my suggestion on both of these once they're written up is that then they're framed to some extent
of this idea of informed decision-making and also
looking back at what the CEQ regulations ask you to do
relating to incomplete or unavailable information. So
I think if those are addressed, then those -- it's a
dual purpose of informed decision-making and public
disclosure.

Is there any disagreement on adding that?
Okay. Hearing none -- or maybe everybody's just ready
to move on.

Okay. I think there's one thing that is going
to help to inform the upcoming analysis that I think
two minutes on would be worthwhile. So, at the end of
the day, the Forest Service is going to need a --
basically a defensible analysis that meets hard look
requirements, right? We've already talked about those;
conclusions supported by evidence and rationale.

And within that they will also need to
understand and disclose uncertainty related to the
conclusions that have been drawn. My question is: For
everything that we're talking about today, do we have
the capability to, in general -- and so I'm going to
basically go straight into the conclusions, presuming
that we have defensible analysis, which is a lot of our
discussion, right? Do we have the capability to come
to some conclusions that are supported by evidence and
rationale? Could you take what was already written, for example, and write up: The modelled results are this. This is what I -- these are the lines of evidence that suggest the way it was done was appropriate and that the conclusions are reasonable.

And then there's obviously uncertainty associated with this. So could you then also say: This is the level of uncertainty and this is where that uncertainty comes from? Could this group do that with the questions that we're dealing with today? In general.

LARRY: Yes, with caveats. The caveats are the two memoranda. The caveats are the two summary reports that tie together what either we know at this point -- what we know at this point and what additional needs to be known to determine whether we need to do additional work.

BEN: Okay.

LARRY: So I think the answer is yes with a caveat with those two memoranda.

BEN: Yes, pending work that we know is going to come to us soon or get initiated following this meeting.

LARRY: And the work that's ongoing right now in the first question about the demonstrating
the viability of the western boundary.

BEN: Right. So -- and, Mindee and Deb and Jim, if I mischaracterize kind of our conversation, because for everybody else's knowledge, when we were sitting at lunch, this is some of what we were talking about at lunch. If I mischaracterize, let me know.

But I'm trying to get at what is going to matter in the NEPA context. What is going to matter in the NEPA context is: Did you do the analysis in a defensible, supportable fashion? What are your conclusions? And can you support them with evidence and rationale? And then what's the uncertainty and explain that, too.

NEPA is a lot about explaining yourself. The courts typically side with plaintiffs when the agency does not provide adequate justification. So that's what I'm seeking. Yes, with caveats, is a fine answer. I want to have that in the background because that's part of what needs to come out of this.

You're responding to comments on a draft EIS. Some of those comments are suggesting you don't have an appropriate justification, I presume, or that your methods are faulty on some level, which requires justification, maybe some tweaking of things, et cetera. So I'm putting a lot of emphasis on this for a
reason.

Any other opinions that are contrary to, yes, with caveats?

Okay. Hearing none or just people being tired, let's take a short break. It is 2:10. I think let's go five minutes. Okay. Five minutes works. Five minutes. 2:10, we'll come back at 2:15. And we're going to focus on the geochemical impacts.

(A break was taken.)

BEN: So I think we're on the record now. Same method. We're switching from Cienega Creek, we're skipping over that, and going to geochemical impacts because the discussion here is actually very similar to the discussion we already had, correct?

CHRIS: If we have time, we can come back to it because there's probably nuances, but --

BEN: Okay. But, in general, we've covered a lot of what we would have covered there already. So we're switching to geochemical impacts. Same idea. Chris will talk about the summary of impacts, summary of methods, then there's the opportunity to ask questions and have discussion, and we'll try to do a similar wrap-up to what we did on the last one.

CHRIS: And I'm going to take the
liberty to, once I go through the summary of impacts, summary of methods, to throw out some of the issues that we've heard that might start -- generate the conversation, so just bullet points. I won't even bring questions.

Okay. And I think I have three slides here because there's a lot of different components of the geochemistry. So those three slides are infiltration and seepage, that's the first slide; second one is seepage water quality; and the third slide is pit lake water quality. So those are the three things I'm going to cover real quick, what our results were, what methods were used to get there.

All right. Infiltration and seepage. There are three facilities of interest at the mine site. There is the dry stack tailings facility, there is the heap leach facility, and there's the waste rock facility.

Infiltration modelling was conducted on all of those independently. Same people, AMEC or Tetra Tech, but they weren't all one model; they handled each facility differently. For all of them, the models used show that when precipitation falls on these facilities, the model shows that it did not infiltrate and it does not cause seepage. So -- however, there is still
seepage coming out of these facilities.

For the heap leach, it's the draindown left over from the process. That's at closure of the heap leach. Now, the heap leach will be closed about six or seven years into the mine and then it will be encapsulated in waste rock. There's only a small amount of oxide ore that gets heap leached.

At the point that it's closed, seepage is about ten gallons per minute. And then what the model shows, that decreases to about one gallon per minute after 45 years. By about 115 years, there's no more draindown coming out of that heap.

The tailings facility. Now, this is dry stack tailings, which means that it's been filtered to filter the water out. It's much like a wet sand, not the same, maybe the same grain size, but it's like a wet sand that they lay down mechanically rather than slurry dump like most facilities. Once you build up that tailings pile, water will squeeze out of that. It's not free water when it's stacked, but there will be -- there will be seepage when it comes out of that tailings facility even though it's dry stack.

What they've modelled is 8.4 -- to be specific, 8.4 gallons per minute at closure. Now, this would be 20, 22 years after the mine opened is when
they plan to close it. That seepage out of the tailings is modelled to continue for about 500 years, eventually reaching zero.

The waste rock now, because -- the waste rock has no water associated with it, there's no processing. It's just run the mine, dumped -- the waste rock dumped. So because there's no -- the models show that no precipitation will infiltrate, theoretically, what the models show is that the waste rock won't have any seepage coming out of the bottom. However, in the EIS we did allow for the possibility of that. So we didn't just ignore it, we allowed that it could happen if there's a big precipitation event if you do get infiltration, and so we did go ahead and look at the water quality. We didn't just, you know, say that it doesn't matter.

The way these were modelled, it was a finite element method and I can say no more about that because I don't understand it but these guys do. An important point is that it used average climate conditions, precipitation and evaporation. And I'll come back to this when I talk real quick about what we've heard during the public comment period. They modelled a couple of different types of storm events, 100-year, 24-hour storm, and then a multi-day storm event. So
that's the infiltration, the water coming out, how much.

The next question is: What does it look like, what's the water quality. So, again, each of these facilities was modelled differently.

The heap leach. Now, I think there's a lot of misconception about what the heap leach actually is. It is a lined facility. What comes out of that is collected and it is put into the -- during operation into a pond for processing. That said, what's left -- one detail we don't know is how they will deal with that draindown after closure. That heap leach is going to be encapsulated in waste rock. We do not have those details; they've been requested. So while the draindown is collected, and it's never discharged to the environment, there are some outstanding questions about exactly how they accomplish that after you've covered it with waste rock. We will get those answers.

In any case, this is a heap leach. The whole point is to get metals out of it, so the untreated draindown, it does exceed standards. And when I say "standards", in all of these cases we're talking about Aquifer Water Quality Standards, Arizona Aquifer Water Quality Standards. Cadmium, fluoride, nickel, selenium, the draindown does exceed those standards for
those metals.

Treatment is required of this. If this were to be discharged in the future, treatment would be required as modelled. Now, they did model a couple of ways you could treat it, but the actual treatment method has not been described; it's not been determined yet.

Okay. Tailings. Now, seepage from the tailings is not collected, there is no liner. This infiltrates to the aquifer or whatever substrate the tailings pile is sitting on. As modelled, it does meet standards. The draindown, the seepage coming out of the tailings meets all the numeric Aquifer Water Quality Standards.

The waste rock, if seepage occurs, similar, there is no liner, it infiltrates to the aquifer or whatever substrate's down there, and it also meets standards.

So how were these modelled? It was a geochemical mixing model, and the important point of that is each facility used a different starting solution and the details here are more important to maybe the specialists, but the take-home point is that they were based on the leaching -- leaching test, the SPLP and MWMP leaching test. Those are acronyms and I
don't think we need to define those because that's a larger discussion. They were based on multiple tests, not just a single test. They were kind of multiple rock types, multiple leaching tests, and then they used that to generate a starting solution.

Okay. So that's the infiltration. What does the water look like when it's coming out of the bottom? The other question is what does the pit lake look like.

So, to lay the groundwork, a pit lake does develop after closure. While they're mining, of course, they're keeping that pit dewatered, but when they stop doing that, water very slowly comes in. And when I say "slowly", I mean slowly. It takes about 700 years for the pit lake to fully develop. What it looks like once it's done or in the process of being done, the pH of that pit lake ranges. They say it's about 8.0, 8.1. The Aquifer Water Quality Standards are not exceeded. However, the Surface Water Quality Standards for some uses are exceeded.

Now, what are those uses that we're worried about? Wildlife. Wildlife, particularly avian species that might fly down in there and use that inviting pit lake in the middle of the desert. It does exceed some standards.

Now, we won't go into this in detail but it is
important to note that Aquifer Water Quality Standards and Surface Water Quality Standards, by regulation, neither one is necessarily applicable to a pit lake. So it's a very gray area in the regulations what standard you actually use. So we'll let that sit; that's a different question.

The important part here about methodology, they used four different modelling scenarios. They -- because there's, you know, they wanted to take a range of possible modelling rock types to influence the modelling, they used low, average, high geochemical loading, and then they chose a fourth scenario where they took the Bolsa Quartzite, which is one of the most acid-generating rock types, and they used that and then -- well, maybe that's the only thing that affects the pit lake. Not the only thing, it's one of the major things that affects the pit lake. I'll leave the details to the specialists. The point is, multiple scenarios were used.

The only other point that comes out is that the pit, as modelled by the flow models, it is a terminal sink. So when this pit lake develops, it will continually evaporate water from this aquifer and it will create a cone of depression around the pit lake that encompasses the mine site and particularly the
tailings, waste rock, and heap leach facilities. If something infiltrates after this pit lake has developed and this cone of depression develops, it's a terminal sink, it ends up in the pit lake.

So that's your quick overview of what the summary of impacts and the summary of methods.

Now, let me just throw out some quick bullet points of what we heard during public comments and maybe that's places to go. Number one: The whole idea that precipitation won't infiltrate in these facilities was raised, a big question. Number two: There's a perception that the pit lake will be acidic or it will be, you know, highly toxic. So the water quality in the pit lake, certainly the perception is out there that it might be worse than is indicated by the models. Same with the seepage coming out of the tailings or the waste rock. There's the perception that the models perhaps don't estimate it properly and it will be much worse.

And, of course, the heap leach, I already kind of mentioned the problem there. A lot of people pointed out the fact that we don't know how we're going to collect this after it's been covered in waste rock and closed. That question's on the table; it is being answered. So that was a concern that was raised, but
maybe not necessarily one we need to particularly worry about in this conversation.

BEN: Go back to your -- the first one that you stated, sorry, the public concerns.

CHRIS: Infiltration, precipitation not infiltrating and causing seepage.

BEN: Okay. So I guess, based on the summary and the public concerns that came up, what are the questions that this group has about these potentially environmental impacts? Mindee.

MINDEE: I'd like to hear from the experts if these questions have been asked and answered, as a starting point. I mean, where are we right now in our answer to these questions or the significance of how serious it is, how unknown it is? I mean, what's the risk around the question?

BEN: Okay. I'm assuming you're the one that's going to address that. Go ahead.

STEPHEN: This is going to be quite a long answer, I think.

BEN: This is Steve Day, by the way.

STEPHEN: Sorry, Steve Day from SRK. So my first reaction when I got involved in the review of this project was this is a porphyry. I was told it was a porphyry, and porphyry mines do have
a bit of reputation, some of them do, for having severe water quality issues. And there's one famous one called the Berkeley Pit which is at the very extreme end of porphrys.

But I was a little disappointed when I got involved in this because I actually collect porphyry -- information for porphrys and I found out that it actually doesn't have the features that we expect of porphyry deposits. There are some classic things that we see in them, there are reasons why we have poor quality drainage, which are -- particularly the hot fluids that produce the deposit react with the rock and they deposit the minerals that create acid inside of them.

Well, this deposit, it was formed by hot waters, but it doesn't have the same -- those features that we see in porphyry deposits. And one of the classic ones is a -- it's kind of what we call a pyrite halo iron sulfide kind of zoning around the deposit and this is where all of the problems with porphrys come from, that zone.

That zone does not exist for this deposit. The pyrite content in this deposit is remarkably low. It's -- a lot of it's less than a percent sulfur. And there's also a lot of carbonate, too, that comes in
from the host rocks, and carbonate is an acid-neutralizing mineral.

So, on balance, just looking at the geological setting, it was very clear from the outset to me, just looking at it from that angle, that it didn't look like all of the porphrys that I'm familiar with that have severe water quality issues.

Now, that, on its own, is not enough to kind of answer that question. I mean, there are other features to think about, but also as part of the work that was done by Tetra Tech to characterize the geochemistry of the rock, they did this procedure called acid base accounting which is, you know, a very ordinary industry standard procedure that is a proxy for looking at the balance between minerals that generate acid and minerals that consume acid.

And when they did that procedure, they discovered that the, you know, it kind of made sense from what we knew about the geology and the geological setting that the balance was strongly in favor of the minerals that consume acid, the carbonate minerals.

That's not to say that there aren't some units in this deposit that are possibly acid-generating and we've also heard about the quartzite and there's an andesite unit in there that does have acid-generating minerals.
but that's not the abundance of the rock there.

So to answer the question that the public has raised, this is not like sort of the way we think of porphyry deposits that maybe that's where the concern is coming from, where you have an excess of acid-generating minerals. We actually have an excess on balance of the acid-consuming minerals.

So we don't expect this to have Berkeley Pit style pit lake, an acidic pit lake. There's seepage coming out of the rock; you wouldn't expect it to be a toxic, you know, acidic water. And that's not to say we shouldn't think about the things that are immobilized regardless of acidic conditions. I mean, there are things to think about like selenium and arsenic and molybdenum elements that don't need acidic conditions to mobilize. We need to think about those and consider them. But I don't think this is a severe mine site that can have a severe acidic water.

I just should add a caveat on that that you have to manage a mine when you're mining. I've discovered over the years through experience that if a mine -- if a mine has any acid potential in it anywhere, miners can sometimes find a way to make it do what it shouldn't do. So it means that the -- there have to be management plans in place when they're
mining to make sure that they don't accidentally take this sort of small fraction of rock that could be a problem and put it somewhere where it could be a problem. So, anyway, hopefully, that kind of provides a little bit of background. Yes

    BEN: So I think Dan, right?

    DAN: Yeah, Dan. On the leaching tests -- and I'm familiar with the insides of that test -- does it account for contact time for we were talking about 500 years to drain the tailings pile and 115 for the leach pad, does that test account for that full contact time where water has more time to be in contact with acid-bearing rock?

    STEPHEN: Yeah, okay.

    BEN: Does the test account for contact time?

    STEPHEN: If we're going to do this -- well, I actually need to clarify. This is Steve Day here again. You're referring to the leach tests that they did?

    DAN: Yeah, right.

    STEPHEN: In fact, that was a concern that I raised with these procedures because -- in fact, the big concern to me was their high dilution procedures. So this SPLP -- that stands for Synthetic
Precipitation Leach Procedure -- and it's performed at a ratio of 20 parts water to one part solid, all right, which is -- that was a concern to me because -- and I think it relates to what you're asking is that it's a very -- it's a very high sort of water contact ratio, which is not something that you'd see in a very dry site like this. So I raised that as a concern.

The other, Meteoric Water Mobility Procedure, that's MWMP, that procedure is done on one-to-one ratio, the one part water to one part solid. That's still very dilute compared to what you would expect to see at the site.

And I -- so I raised that concern with Tetra Tech when we were reviewing this because I thought, well, you take it down the line, well, okay, so you're much drier conditions, so you have much less water contact at a ratio level, and you've also got the kind of long-term, like you've got a drop of water that starts somewhere inside the pile and, you know, it's not going to take days or minutes to get through the pile, it's going to take years or decades or maybe something even longer.

And so I asked them to look at that because I was concerned about this -- the limitations of the procedures. I expected when they went from SPLP to
MWMP with a 20-to-1 ratio change, that you'd see a
20-to-1 increase in the concentration, like you'd see
the concentrations in the MWMP being 20 times higher.

They'd also done some site tests as well where
they put samples inside some large kind of leaching
columns, I guess columns is right, yeah, columns
on-site, you know. And, again, that sort of takes you
sort of nearer to what the site conditions were. And
it was --

So what they discovered was when they looked
at that was that the concentrations were very similar
at all three scales. They were not seeing a
concentration effect. And so that -- that gave me some
confidence that even though they were using these
procedures which are of concern to me because they were
very dilute, that they were actually giving sort of an
indication of how leachable these rocks would be just
because we could see similar effects at different
scales.

And that's one of the questions that we
struggled with is how do you take these lab tests and
bring they up to site conditions. So I feel like that
there's -- there's still limitations in what they did.
I mean, these, again, are industry standard methods
that everybody does, and they're really the best we
have to represent the word chemistry, to represent what
a drop of water would do when it gets in this waste and
what it might look like over the long-term as well.

DAN: Okay. And the second question --

BEN: So, Cori, and then back to

follow-up question.

CORI: Yes. Dan, I just wanted to

comment. There's another test, the humidity cell test,
which you're probably familiar with that have longer
kinetics, longer duration kinetics, and those tests
were performed as well, but it was -- they were
performed on materials that had been identified with
the preliminary screening with ABA, the acid-based
accounting, SPLP, and MWMP to have -- well, ABA first,
to have the potential to generate acid. So they did do
humidity cell tests on major -- the rock types that
were shown to have some potential for to generate acid
or certain potential to generate acid. It wasn't clear
so they did do those.

So on some of the source terms, humidity cell
data, which represents a longer time frame were used
for the source terms. But it was primarily a mix of
SPLP and MWMP for those.

CARTER: If I'm not mistaken, it seems

that this is -- the EIS put more reliance and more
weight on the SPLP tests than on the kinetic or meteoric water mobility testing procedures. Am I mistaken? I can't remember.

BEN: So -- sorry. One second. Did you get that?

CORI: Yes, you're correct in that the fate and transport models for the heap leach facility, waste rock dump, and the tailings were all done using SPLP -- a mix of MWMP and SPLP chemistries that were mixed together in proportion to the rock types that are in those facilities. So those were used for those three facilities.

For the pit lake, humidity cells data were used where available. So it was a mix but -- so you're correct in that dominantly it used the short-term leach -- the leaching data.

BEN: Do you have a follow-up question, Carter, on that?

CARTER: You're asking if I had a follow-up?

BEN: Yes. Well, why don't we do this, Steve is going to add something and then if you have a follow-up question, we can do that and then we'll go back to you.

STEPHEN: Yeah, Carter. I mean, that
was one of my concerns when I first started reviewing this, was that overemphasis on this procedure. And I only have gotten more comfortable with it because they do have these other tests, the MWMP and the humidity cell, and in some respects I wish they'd kind of gone back and used other procedures but they -- I feel like it's not grossly incorrect what they did. I mean, they've used the data and it does -- it does give the same kind of answers as the other procedures do.

CARTER: Right. Okay. -- or could it be modified to reflect the data sources as greater confidence in the --

BEN: Carter, I'm going to restate what you said and just confirm that I got it more or less right, okay?

CARTER: Sure.

BEN: If I understood you right, you said it seems to you that the EIS should be revised to better reflect the different tests that were done to understand that there were multiple tests and how those are similar or different at the end of the day; is that correct?

CARTER: Right. And I'm -- to the point that was made regarding the additional tests lending confidence to the results provided by the SPLP test.
SPLP, we had similar concerns, to -- I'm sorry I missed the name of the speaker -- we had similar concerns and we were aware of the other procedures performed but they weren't really used in the EIS as much it seemed.

BEN: Okay.

CORI: Can I just answer that quickly? This is Cori with SRK. It might be helpful for you to review, one of the Tetra Tech memos addresses the scaling of SPLP and it has a comparison -- comparison charts that show the range that you would -- that they were getting with MWMP, the SPLP, and the humidity cells and these columns that -- these field columns that they did, you know, for I think it was 18 or 16 field columns.

So that memo would be probably helpful for you to read so that you'd get that assurance because that was what Steve Day asked for this comparison and that's what helped us to gain confidence that, in some cases, the use of SPLP was actually very conservative because the numbers were higher concentrations than the humidity cells. So, you know, in many cases there was absolutely no difference between the various methods. So that memo would be helpful for you to read, I think.

BEN: And I guess to note, and if somebody could help me out to write this down, that
would be great. A key suggestion that I'm hearing from Carter is just write it up in the EIS, the different things that were done and how they relate to each other. So -- thank you, Steve. That would be great.

ELIZABETH: This is Elizabeth. I think that it's important to note that Carter wasn't saying just write it up. I mean, we identified a number of key issues in our response to the draft EIS regarding the modelling that was done. And so I wouldn't want to summarize the discussion by saying, you know, just write up what you did, put it in the draft EIS, as necessarily resolving our concerns.

BEN: No, I didn't in any way intend that it would resolve your concerns but it did strike me as a good suggestion. So I just wanted to add that, so -- but we understand that there is more to discuss. Chris had something to add here, too.

CHRIS: Yeah, Elizabeth and Carter. This is Chris Garrett. Just to let you know where we are in the process right now, the Forest took the EPA letter very seriously and your detailed comments. The Forest actually wrote a scope of work for SRK to address directly the comments that you raised. That's in draft form right now, the Forest hasn't seen it yet, but those specific issues are at the forefront being
documented.

CARTER: Okay. Thank you.

BEN: Dan, did you have a follow-up?

DAN: Yeah, just a --

BEN: Okay.

DAN: So I think your description of the humidity cells and so forth is probably the answer to this, but you said you did the acid-based balancing. Does that account for difference in kinetics and weathering between the acid-producing minerals and the base-producing minerals, for example, pyrite weathering speeds versus carbonate weathering speed? So is that carbonate available to neutralize acid?

BEN: Running around again. Okay, so Steve.

STEPHEN: Yeah, Steve Day again. The humidity cells are intended to measure that difference and they ran it for 35 weeks.

CORI: 35 weeks.

STEPHEN: And they definitely show that the carbonate minerals are available. I mean, 35 weeks is not -- obviously not forever, but they showed that they were reactive over that period, yeah.

DAN: Okay. Thank you.

BEN: Dale.
DALE: Dale Ortman here. I'm hearing what appears to be a slight disconnect in how to interpret some of these various tests, each of which has its own acronym. You know, some tests want to try to replicate a time frame and a closer to real world reaction and others, specifically the acid base accounting, that is a screening test, and I'm going to step back and just say one thing.

That essentially assumes all the available acid stuff produces acid and all the available neutralizing stuff neutralizes and it just says how much more of each is there. And because what I'm hearing is a slight confusion around which tests deal with time, which tests deal with just gross chemistry, and assume everything has reacted. And if you want to say anything more, Steve, go.

STEPHEN: No, I think that's good. I mean, we're really talking about three different types of tests here. The acid base accounting, as you said, gives the balance between the acid-consuming minerals and the acid-generating minerals, and that's a potential test. I think it says if they all reacted completely.

The humidity cell test is designed to measure the actual rates of reaction of those minerals. So it
tells us, you know, if you generate acid at this rate, can it be neutralized? So it's going to more the actual rates that things happen.

The SPLP and the MWMP are looking at solubility of the reaction products. So that's not a rate test either, it's a measure of solubility.

BEN: And on our no acronyms, I'm just sort of letting those go to sort of say all this as far as those particular acronyms are concerned. Floyd.

FLOYD: Just a question. You know, we're not -- I'm not an engineer, I'm a geologist. So one of the questions, when we mix acid and bases and acid and carbonates, we're going to neutralize. So what are we analyzing? We're analyzing the product of the neutralization? 'Cause often that's -- or are we analyzing the water from the reaction?

What tends to happen is that if you just analyze the water, you will create an aluminum-based hydroxyl product that has most of the metals in it. The water will be fairly devoid of the metals. So you'll come out with a neutral, fairly clean, looking to standards water. But, in fact, the precipitate, which can be transported by the water, will move the metals as particulates in columns.

So one of the questions in the configuration,
if we are going to discharge into the aquifer, are we accounting for the precipitate that's -- that would be of particulate matter that might be transported by the water? And then what happens after that precipitate enters the aquifer? The lower parts, it could be remobilized and under other conditions.

BEN: Okay. I'm going to pass this back to Cori.

CORI: We need a two-prong approach on that one. What Rosemont has done so far is to model the leachates or through test work give us an indication through hundreds of tests what the range of chemistry would be on the leachate generated, you know, through meteoric water hitting these materials.

And what has not been done yet and which is going to be done at some point is to model the leachate volume and quality in conjunction with the groundwater characteristics, to model that at the point of compliance, what would the groundwater composition be.

So that has not yet been done because Rosemont is currently -- they've installed the point of compliance wells and they're monitoring them on a monthly or a quarterly basis or whatever for, you know, a period of time. So the water quality at the points of compliance have not been modelled.
We have an indication of what the leachate quality will be and they've done aquifer load calculation on the volume, the volume and quality with respect to the ambient groundwater based on the pit monitoring wells.

STEPHEN: Floyd, I'll have another -- I think I kind of picked up something that sort of goes back to how I ended my preamble, which is that what you kind of described is almost that they're allowing portions of the rock to go acid and then it's getting internally neutralized, but then you're getting the precipitates and then the precipitates can be in trade.

I think they should be able to design a management plan like actually how they place the rock so that you actually don't ever get pockets going acid. So that you make sure that your acid-generating parts of the rock go out and they get mixed well enough with the rocks, you know, with the acid-consuming part of it so that you don't ever get the sort of large scale acid rock drainage forming inside and having to neutralize it.

So the precipitates end up being like formed almost at the point they're generated rather than having kind of acidic water that comes down and mixes and then you've got the yellow boy or the white...
precipitates or whatever it is. That, you know, you want to avoid that because if you allow that to happen, then the things that don't precipitate in, like zinc and cadmium, would end up getting into the groundwater. So you really want to avoid that process from happening, and I think at the scale of this -- that the acid, you know, ARD acid rock drain potential, they should be able to design the waste rock so you wouldn't have that problem.

FLOYD: Was it clear that they're going to do that?

BEN: Was it clear that they were going to do that was what Floyd asked.

CORI: Floyd, they have -- Tetra Tech has prepared and it was submitted to ADQ as part of the aquifer protection permit application, they have submitted a waste rock segregation plan.

FLOYD: Okay.

CORI: So that in terms of the waste rock dump, the materials that are identified by our control technicians out in the field on a day-to-day basis, that those are, you know, the Bolsa Quartzite and the andesite or the acid-generating materials would be placed in such a manner that they would not be in an outboard face embankment.
And then on the tailings condition --

STEPHEN: Can I just --

CORI: Oh, sure.

STEPHEN: Just on the waste rock, that should be carefully reviewed. I mean, we've raised that as a concern that there needs to be detail in how they're allowed to do that.

CORI: It's a conceptual.

STEPHEN: It was a conceptual version I saw.

FLOYD: Okay.

BEN: And there was something else.

CORI: On the tailings, you could also expect to get acid-generating material. And in an operational point of view, typically you have a shovel, more than one shovel, out there in the pit mining from different faces. The material is loaded onto large haul trucks, taken up to a primary crusher, where it's basically blended on a truck-by-truck basis. So you may have a shovel that's over there mining the quartzite at any one day, but there's another shovel over here mining, you know, Horquilla limestone or there would be another one mining waste rock, you know, the arkose.

So those materials would be -- whatever, you
know, they would typically be blended in operations because they're all going to be milled together in big ball mills and SAG mills and then processed simultaneously and deposited out there.

So there's going to be enough blending that if a thin layer of materials that's dominantly Bolsa quartzite which, by the way, is only about 4 to 5 percent of the material that's going to be mined or less, 1 percent, it would be blended in the bulk of the material, which is carbonate. Their ore is primarily in Paleozoic limestone units.

BEN: Are there any questions from EPA on the line that's come up?

CARTER: Not on that specifically but actually I do have a question. Unfortunately, I'm going to have to drop off this call very shortly and it might be, since SRK is preparing specific responses to our comments regarding geochemistry, it could be that maybe I should just wait until I get that and then we can have a discussion outside of this. And if that's the case, go ahead and tell me so.

But I would be interested in discussing the infiltration seepage modelling and the conclusion that the site or the waste rock, the tailings, I guess everything other than the heap leach, pretty much
decided that it -- the conclusion that it won't cause seepage, and that conclusion is not one that EPA is comfortable with. And so, as I said, we can wait 'til I get that report or we can discuss that briefly before I have to get off the line.

BEN: I think we should discuss it briefly before we get off the line. And I'm not sure who to pass the pizza off to to start it off.

JIM L: I have a comment about that.

BEN: All right. We'll start off with a comment from Jim about that. So I'll pass it off to him and then that will get us going.

JIM L: I've kind of been waiting for the conversation to go this way to throw this in there, but it's generally reasonably well demonstrated that infiltration and recharge doesn't happen much or very quickly in open desert environments in natural soils, right? It could be thousands to tens of thousands of years before you get much infiltration past a meter or two, and that's because we have effective vegetation that scavenges water.

But we know that recharge and infiltration does happen in the desert, right? And it happens for two reasons. One is we get concentrations of water of wet periods that happen in fairly small periods. If
you use average precipitation over longer periods of time, you often will not predict recharge that actually will occur.

The other reason is you get water concentrated not just on an open flat floor, but you get it running into depressions, low points, ephemeral channels.

So I think it's worth asking the question, and I don't know what assumptions were made in the modelling, but if the assumptions were made that it was an even, flat surface and whatever water was applied to the surface was homogenized over that surface, I think it's reasonable to ask whether that's a good assumption or not that over time you'd start to get, unless you have a perfectly maintained surface, you would get ponding of water in locations, and you would get development of rivulets and channels in which you would concentrate water. And you tend to get infiltration happening in those locations, although perhaps not in the intervening locations.

BEN: Who do I get the pizza to?

CARTER: And, actually, on that point, as we pointed out in our comment letter, according to the draft EIS, mostly designed for this project would include actual infiltration basins on top of mine features which would serve to collect that water, as
you were mentioning, not just over time through erosion, but actually by design, which was very concerning to us.

BEN: Okay. There's two things. One, Chris Garrett and then Mike Sieber is going to talk.

CHRIS: Right. This is Chris. I'm not going to talk to any of the technical details because that's for Mike sitting right next to me, but there's, I think, three process points I need to throw out here.

In addition to this memo or this scope of work that was given to SRK very specifically on this infiltration question and the modelling and the question raised by EPA about using actual climate precipitation data instead of averaging it, basically, the infiltration questions that EPA raised, when that comment letter was read by the Forest, we actually felt that was an important enough issue that a request went to Rosemont to remodel with different scenarios.

So in addition to the work that SRK is doing to just add, you know, kind of a professional opinion on some of these, there is additional work going on that was requested of Rosemont not in hand yet; we do not know the status of that work. But I did want to point out that the infiltration was perceived as being an important thing to remodel or potentially remodel.
That was one point. And there was another one. Go to Mike.

BEN: And he'll think about it while we go to Mike.

CARTER: For that first part, thank you. I wasn't aware of that yet. Thanks for that.

MIKE: This is Mike with SRK. As far as Jim's comment, they used -- all of them were 2D models, okay? So, I mean, as far as modelling depressions and all of that --

CORI: It wasn't done.

MIKE: 2D models for infiltration and seepage are pretty typical. Tetra Tech used vadose W, the geoslope program, and AMEC used SV flux, which are both, you know, standard seepage.

JIM L: Really, it's a boundary condition question. In other words, you could do the 2D modelling but assume different boundary conditions.

BEN: Oh, I'm sorry. I neglected my responsibilities here related to the mike to make sure everybody on the phone hears you.

JIM L: Well, in fairness, I kind of interrupted there, so --

But you could treat it as a boundary condition problem.
MIKE: Right.

JIM L: You have a 2D model but you are assuming different rates of infiltration or even heads if you have a pond of water under a series of conditions for different models based on where you think -- or assume ponding issues.

BEN: Okay. It looks like we've got Chris and then probably Mike after that.

CHRIS: I remember what point I needed to make and I think it will clarify a question for Mike.

The other point I was going to make was this -- the question you raised about ponding of water on top of the tailings facilities. So that is another one of those issues that is -- has been raised and was perceived to be fairly important. Right now the Forest, in conjunction with Rosemont, is trying to redesign storm water management on the site. The Forest has come up with some conceptual goals they would like to see happen and Rosemont is trying to meet those goals. Not completed yet, we're very close on that. But there's a lot of progress has been made, and one of the goals that looks like it's been accomplished is post-closure, no ponding or storage of water on those facilities, intentional ponding, or, you know,
infiltration or holding back of water on those facilities.

However, and this is the question I think for Mike, during operation, storm water regulations require that the storm water from the tailings facility be segregated. And I believe it will have to be captured and held and it may very well be on top of the tailings facility. So I think the question maybe that goes to Mike is: Will that water infiltrate into the tailings pile? What's the state of the art on that?

MIKE: This is Mike with SRK again. They did a, I guess, sensitivity they have to dike, to pond, I don't know for how long, and there's -- I guess it's BATCT regulations as far as 15 days or five days, I'm not sure, is the minimum for the ponding. And it increased the seepage a little bit. It wasn't -- I mean, they didn't put the pond up there for a long time, it was a few days, and it increased the seepage a little bit. But and that 8.4 gallons per minute is the max and, I mean, that, if you assume an 870-acre tailings zone --

CORI: 0074.

MIKE: Yeah, or 0079, I mean, it might be bigger. So it would be a smaller tailings gallons per minute per acre. I mean, it's not like a hose
coming down in one spot the 8.4 a minute and then it's going to taper off.

BEN: Okay. Cori's going to add something and then Dale.

CORI: Mike used the term "BADCT", which is not bad kitty cat, but B-A-D-C-T -- yeah, C-T. And it's a requirement of Arizona Department of Environmental Quality that engineered facilities such as tailings and pondments and heap leach facilities have control mechanisms in place to minimize degradation to the waters and, in such case, such seepage, for instance.

I would think that a seasonal event where there's ponding, if this becomes apparent that there is seepage greater than what was predicted, they will quickly implement either a seepage pond or a pump-back system or a sump or some kind of control mechanism to recover the seepage because, as Chris or Ben mentioned, I don't remember, they don't have -- I mean, you wouldn't be able to discharge that storm water and the seepage water, it can't be discharged. So it's going -- it will be controlled. That's required by the -- their aquifer protection permit.

So, I mean, there's always a potential that they've underestimated the seepage, but as the scenario
that Mike's put in there, they did put a pond on the top and maybe it was okay. I mean, we don't typically have water sitting around on the ground for more than, you know, five days or a week or two weeks.

JIM L: I presume that control would have to --

BEN: Sorry, one second. Go ahead, Carter. Could you start over?

CARTER: Sure. In regards to the project potential to produce seepage again, we know that there was a technical memorandum published by or provided by SRK Consulting that called out concern with the use of a data set for the infiltration modelling that used a tiny, tiny fraction of an inch of water every day for I think it was 260 days of the year as opposed to what would be expected in this region of Arizona, which is very large storm events with many inches of water falling over the course of a couple of days, and just a couple of times during the year having those monsoon events.

And we didn't -- I haven't seen a response provided by Tetra Tech to that concern. I think SRK's concern was well put and it didn't appear to be responded to. Has that been responded to?

BEN: I'm going to give this to Chris --
give it to Chris to address that.

    CHRIS: And anybody correct me if you
know better, but I think the answer is, no, Tetra Tech
did not respond to that. That is the request that
went --

    MIKE: They did.

    CHRIS: They did? Okay. Mike says they
did a little bit and he can explain that. But that --
changing that precipitation input into that model was
one of the things that Rosemont was requested to do
recently.

    BEN: So we can at this point reasonably
expect that, I suppose.

    CHRIS: Yes.

    BEN: Go ahead, Mike.

    MIKE: Tetra Tech used a -- came up with
ten years of precipitation data but it was from U of A
in Tucson, which I don't know how -- and they did
nothing to say how applicable it was to Rosemont. So,
I mean, that's significantly a distance away and higher
elevation. So I don't know. They did that ten-year
thing, and it was, you know, I don't know how valid it
was 'cause they didn't describe the precipitation but
it didn't give any infiltration in the waste rock
either.
BEN: So there's that understanding that they've been requested to use better, more realistic precipitation inputs to the model. Dale, you had something that I think you were going to say.

DALE: Yeah, I'm hearing a discussion, a rather theoretical discussion of tailing seepage. Being the one in the room who is the mining geotechnical engineer, I've designed them, I've built them, I've closed them, I've run them. And when we're dealing with a whole tail, which is the dry stack, we're not having any size segregation in material from the flotation cells to when it's laid out, so there's no sand beach there. The grinds are such that once you place it in an unsaturated condition and you have any thickness at all, you can, in a periodic sense, place water on that and, yes, you will get some of that water moving down into it.

But the system is so air locked from really having deep infiltration, it simply can't move the air out of the very tiny pore spaces between the whole tail fast enough to offset the evaporation for the ponded water, and these finer whole tails then have a very deep capillary zone. So it can, once the water's evapped off the top, it evaps that right up out. So practically, from observing many tailings
ponds, you will not generate deep infiltration from periodic ponding on a whole tail certainly, which is a dry stack tail.

BEN: I'm going to send it back to Jim -- or not. He's decided that he doesn't need to have the microphone. Okay.

So what's -- I guess, what's left unspoken? I'm hearing good discussion. I'm not hearing -- I'm hearing that certain action items are in process. I'm not hearing anything that's coming out that's making me think that more action items that this group needs to address is coming out. Mindee raised her hand now.

MINDEE: I think EPA had another question, and maybe it's better answered when SRK responds to EPA's comments and whatnot, but I have this question. I believe EPA had some concerns, too, about what they called preferential water pathways developing through some of these waste and other products. Is that possible? Are we addressing that? Is it a valid concern?

BEN: Who should I give the microphone to? Okay. We'll start with Dale.

DALE: Give it to me again. Being the guy who's designed, built, watched waste dumps happen, preferential pathways can certainly occur, they can.
They can occur from settlement cracking something, they can occur from the very fact that when you dump a truckload of material down a slope, you have a segregation in size. They certainly can occur. To try to quantify them is not a practical thing, but to address qualitatively these things, yeah, they can happen.

The next step to me is you take a look at, okay, if you have, say, a preferential pathway, is the quality of the water that might go through that such that it is actually a concern for the overall either groundwater quality beneath it or, in much wetter climates, a toe seepage occurring? Now, this isn't one of those much wetter climates where continual toe seeps, you know, they just don't happen here.

So I think as far as the EIS goes, a recognition that preferential flow pathways are certainly possible, they aren't quantifiable, and then you do a qualitative look at, is it really important to the water chemistry offsite in the environment? And I think we have the data from the geochemistry looks to generally say -- to say that we really do not expect any groundwater or surface water chemistry issue occurring should we find we have preferential flow paths.
The other thing is if you ever actually observed such a phenomenon, you would do something about it. So keep in mind this is all still being done under an aquifer protection permit with all the groundwater monitoring, alert levels, everything else associated with the APP -- aquifer protection permit.

BEN: And I guess I have one -- I have one question in that. You said if that did happen, you would do something about it. And I think that's part of what it would be needed -- we would need in the EIS is what would you do about it? And what's the -- and it doesn't have to be a single thing, it could be a suite of things.

DALE: It was very much almost a standard operating procedure comment. Just like Cori said, if you see something happening that you don't want to have continue happening, you look at it as a specific, unique situation and you try to solve it.

There are numerous tools in the box, but trying to give some sort of blanket description, it's, you know, standard; dirt work, you disrupt the inflow, you, you know, you collect the outflow. You know, really trying to predict too far ahead is a fairly fruitless exercise.

BEN: And I'm not asking you to predict
what in the future you can do, but I think many
instances in the EIS, it's important to note the suite
of options.

DALE: BMP, best management process.

ELIZABETH: I only wish that the BMPs
could halt the potential for significant degradation
once it occurs. And that's why it's so important to
eliminate any uncertainty. Unfortunately, once
contamination, once downstream waters are polluted,
some of those impacts are permanent, and that's why our
concerns are so significant, so serious.

BEN: That was Elizabeth, yes. And I
want to editorialize a little bit. The one BMP, I
think the intent of the Forest Service is not to boil
it down to the BMP, it's probably more -- and correct
me if I'm wrong, Forest Service folks -- to
characterize what those are, how effective they would
be so that we have a better understanding of the
variety of options available, not the one necessarily,
but I don't think it would probably in the EIS boil
down to "We would use BMP to address the problem."
There would be more detail to that to the extent that
it's realistic.

STEPHEN: Can I just add something?
Just a pitch here for, it seems like monitoring to a
lot of people just means water. But you've got to
monitor the rock that's going out there, too. Like
order those procedures. If you're having to
selectively place and place them, order them, have
management systems in place to monitor all that, and be
diligent. Exactly right. You don't want it to happen,
you want to be checking your procedures are working
properly in the first place.

BEN: Cori, did you have something else
to add?

CORI: There's always a potential to
underestimate concentrations and volumes in these
models. But currently the waste rock is not estimated
to have an aquifer water quality exceedence problem.
The main facility that has the problem is the heap
draindown which is, you know, will -- cannot be
discharged without water treatment that would be
applicable for whatever reason you're going to use it.

So -- so right now the waste rock dump, at
least it would be worth recalibrating once they
actually have waste materials and check it with the
real materials out there. But the materials that were
used to model this do not show aquifer water quality
exceedence.

BEN: Jim had another question. One
thing that it seems like we're sort of starting to
slide into a little bit in the discussion has to do
with uncertainty, too, which we probably should come
back to in a second, right? Jim.

JIM L: Bingo. Really only a comment
following up on Steve's comment, but the uncertainties
that are inherent under -- really underscore and argue,
I think strongly, for the importance of robust
monitoring network, robust and independently developed
monitoring network.

BEN: And that's -- and I guess could
somebody explain the monitoring, sort of the monitoring
plan, if you will? So if -- Cori raised her hand, so
I'll give it to her. I think that that is something
that should certainly be addressed.

CORI: Under the conditions of their
aquifer --

CARTER: I'm sorry to interject really
briefly. While I do agree with the point with
monitoring, I'm afraid that I have to drop off the
call; I have a very important meeting to attend to. So
thank you very much for your time and I will, if
possible, I'd love to see the meeting minutes for the
rest of this that I'm missing out on.

BEN: Okay. We'll -- I think that the
intent is to probably distribute the minutes fairly widely. My guess is the Forest Service will take care of that. Thanks for joining us while you could be here. Elizabeth, are you staying on?

ELIZABETH: I can stay on until 4:15.

BEN: Okay. That should be fine. Okay.

Go ahead, Cori.

(Mr. Jessop terminated his connection.)

CORI: Jim, I'll speak to your question about monitoring 'cause there's a couple of different aspects of that, but under the aquifer permit that they were issued on April 10th, I believe, this specifies a number of steps that the operators would take on a daily, weekly, monthly, quarterly, annual, and biannual basis.

And this includes, from a operator point of view, daily inspections of pond levels, you know, daily inspections of and weekly inspections -- site inspections, I call them, of channels, whether there's anything blocking a channel, are pumps in good operating order, the diversion structures, are they free and clear of any debris that could block them and dam them up, are the pond freeboard levels maintained or if the liners that are used, is there an indication that there's gashes or, you know, if there's a repair
issue, it has to be noted and fixed right away typically. Then the liner systems have a leak collection and recovery system so that has to be demonstrated that that's in good operating order and so forth.

So those are kind of visual monitoring that are done on a daily basis by the employees as a whole but also rovers that go around and definitely check these things.

The monitoring also has groundwater quality analysis metrics that are put in place that have alert levels and aquifer quality limits. So at least in the groundwater, if there's an indication that they can see from plotting the results, if they're getting a trend, an upward trend, then they would need to address that with ADQ and explain what the system is. And if there's really a problem that's occurring, then mitigation steps will have to be taken into account.

BEN: And Chris and then Floyd.

CHRIS: And I just wanted to add a couple of things that I mentioned before, that Salek actually has the task right now to put together more of this monitoring. So it begs the question, with all of the questions in the APP, what's Salek doing? And that comes to the robust monitoring program. The Forest, I
think, recognizes that the APP is just one component
and their point of compliance wells are very important,
but they're geared towards water quality and to an
extent to impacts, water level drawdown from, you know,
what the model shows, compare it to you can rerun it,
but it doesn't speak to the resources that the Forest
necessarily is concerned about that are beyond kind of
the extent of the mine, the immediate mine location.

So I think the robust monitoring program that
will come out of the work going on right now will
include all of the stuff that's in the APP, the
operational monitoring, the point of compliance wells,
all of that, as well as perhaps other wells that are
farther distance away that are meant to be -- to look
at water levels rather than quality. It may be surface
water monitoring; certainly that's proposed right now,
gauging station. It may include -- it certainly will
include storm water monitoring as part of the storm
water permit. And it very well could include some
spring monitoring, and we don't know, maybe it hasn't
been discussed, but stuff like riparian vegetation
monitoring. I mean, there's a lot of stuff in that
that could go into a robust monitoring program. So APP
is geared towards this little discussion but there's a
lot more.
JIM L: Right, thank you.

BEN: Floyd's next.

FLOYD: This is Floyd. He partially answered what I was going to ask.

BEN: Okay.

FLOYD: But the other part of my question was, if there's a leak or a problem, are there steps -- what are the steps of notification? Are there steps of notification for outside monitors or the ADQ or the Forest Service? Is there a way to channel that information to concerned agencies?

BEN: Good question. I assume that there is. I would think that built into their permits, et cetera, that there are certain notification, reporting procedures, et cetera. Cori seemed like she had something to say.

CORI: Yeah. Each permit would have its own contingency to-do loop. You know, if you have a problem, then you have to do this and this and this and report back.

But in -- and Chris is so right that each one of these permits will have their own contingency mechanisms. So contingency plan will be framed: If you have this, then you do this.

So for the aquifer protection permit, for
instance, there is a reporting mechanism specified in
the permit. It's typically within five business days
unless it's something catastrophic. But if it's
like -- for instance, they recognize it's going to take
you a little while to get your assays back from the lab
and you may have to compile them or whatever. So there
is some mechanism for that.

But typically, I mean, repair issues are
typically taken care of within, you know, 24 hours or a
couple of days because that's an obvious problem that
just needs to be fixed.

FLOYD: Okay.

BEN: Okay. Mindee.

MINDEE: In the broader context of
monitoring, the Forest has asked the formal cooperating
agencies that have a memorandum with the Forest Service
as cooperators to meet later in May and start talking
about the details of all monitoring, what is required
by permit, what is desired because it, you know, it
relates to a mitigation measure that's applied, what is
nice to have, what is a must have, who would do it,
what's the frequency, just -- and Jonathan and I have a
lot of work to do to get that framed up and have a
point to launch off from.

So it's a big body of work and we know it
needs to be done. We're launching off into it. And
that's about all -- that's where I am with it right
now. And, of course, all things that we're talking
about specific to water are very key components to
that. Those are probably some of the ones that are
more easily defined.

FLOYD: Okay. Thank you.

BEN: Okay. Not everybody has spoken.

I think we had a little bit more broad-ranging
discussion before. Fewer people are speaking this
round, I suspect that's because geochemistry is just
not your specialty.

FLOYD: Or they're tired.

BEN: Or they're tired, or both. So

being mindful of time, it is 3:30 and so what I'm still
hearing primarily is a lot of these questions, the
answer is, yes, we're working on this study or, yes,
those questions have already been passed on, and
there's been a directive from the Forest Service to get
that information; yes, we've got a meeting planned with
the cooperators to understand the requirements of
permits, et cetera.

It sounds to me like there's not necessarily a
lot that needs to be resolved by this group that isn't
already in the process of being resolved and that
perhaps, after those things are in, we may have, you
know, more things to visit on, but -- so is that -- are
other people hearing the same thing as I am? Or does
anybody think, no, you're totally hearing it wrong?
May be a better way to ask it.

Okay. Bev had her hand up so I'll turn it
over to her now.

BEV: I had my hand up a little while
back and then we got off on another tangent.

BEN: Sorry, my fault.

BEV: I just have a real quick question
of SRK and that is: Do you feel like we have
sufficient information to go from the conceptual waste
placement plan that we currently have to a finalized
plan that will facilitate our calculating the
reclamation bond?

BEN: I presume I should hand it over to
you guys. "You guys" being Cori and Steve.

BEV: Or do we need additional
information?

CORI: Bev, are you talking about the
acreage and the surface area and the footprint of
the --

BEV: Well, I'm talking about
specifically where different portions of the waste rock
would go. Do we have sufficient information on
geochemistry and mineralogy and all that kind of
information to know where waste rock is going to be
placed or is there additional information that is
needed?

STEPHEN: Is the bond -- sorry. This is
kind of a -- I just don't know how it works here. But
the bond you're talking about, is that for just for
reclamation purposes or is it for --

BEV: Yeah. And that's really not the
key part of it. The key part --

BEN: I'm going to hand this back to

BEV: The key part of my question is:
Do you feel we have sufficient information for a final
waste rock placement plan or is there any additional
information that needs to be gathered for that? You
said that you've reviewed the APP plan and it's
conceptual. Do we need additional information to go to
final?

CORI: No, Bev, I don't think we need,
you know, we're going to need additional information
right now to make a decision. I don't think having any
more information would help the decisionmaker in this
case. So it's one of those things that all of the test
work that's been done has been done on materials that aren't actually the waste materials piled up on the ground. So, at some point, you know, for closure planning, Rosemont will need to do, and ADQ will require them to update their models based on the actual mined materials, the tailings, the leached materials, and the waste rock dump.

So we can't get any more information than we already have because we don't actually have any mined materials out there to do mineralogy and whatever based on the actual rocks that are piled on the ground. But I think they have been sufficiently characterized as the range that we'd be expecting in the leachate quality that would come out, a range that you'd expect in the ABA analyses. So I don't feel that there's need to do any further work at this point.

And, as I understand it, the waste rock dump, waste rock storage facility is located fairly close to the pit rim and, you know, if it has different load from what I see on the outline, I don't think it -- I mean, it's going to be approximately in the same area, and it's a matter of acreage and you can do your bond calculations on the information you have now.

BEV: Okay.

CORI: And, in my experience with the
other operations such as Carlotta, they revisit their bond calculations like every five years or every ten years or something on a routine basis to see if those estimates need to be updated.

BEV: Okay. I think the bond part of it is less important than the last part that I asked.

CORI: Yeah, yeah.

BEV: So, thank you.

BEN: Okay. Anything else related to -- before we wrap up this session related to the geochemical impacts? I'm not sure we touched on every one of the different areas. I think we did to an extent but, you know, if there aren't any other questions, in the absence of the ongoing information that's being gathered, that need to be posed today, then obviously we can move on.

I'm just going to wait a second to make sure that there's not something brewing. Okay. Then, I'll write up the wrap-up as we go into, I think, probably another short break is required because when you get to this time of day, you're losing brain cells rapidly at this point, I suspect. So let's take maybe another, I think it was five minutes that we had before. It's probably actually more -- well, it's 3:36. Let's go to 3:45, nine minutes.
(A break was taken.)

BEN: So I just want to quickly wrap up the discussion concerning geochemical impacts and then we should move into at least some discussion of Cienega Creek impacts before we finish at 4:30 today.

So what I wrote down, just so that we're all clear, is data and information gathering is in process for all the key questions relating to all the substantive comments or sort of the big things that need to be addressed. There are things being done, Chris was going to reiterate exactly what those were in a second, and I'll write those down so everybody knows.

The only thing -- and there were no additional action items that were brought up during discussion except Mindee brought up a parking lot item which is not urgent but should be addressed at some point and that is when we were having the discussion about preferential pathways through the waste, tailings or heap, how would those be dealt with. And my impression is that the -- a more generic description, so to speak, the different ways or and some discussion of the suite of options that would be available that should at least be compiled with the admin record, if not included in the EIS. That is not urgent.

The other things that Chris is mentioning I
think are more important. Did I miss anything? Or misinterpret anything?

ELIZABETH: This is Elizabeth. The issue about preferential pathways was brought up in our EIS letter so we would hope that the Forest Service would address that in the EIS document.

BEN: Yes, and my understanding is that it is -- I think that's happening, that's happening. I was just referring not so much to the preferential pathways as the question of what do you do if that happens, that there does need to be a little bit more detail added to the EIS in addition to addressing the question that you brought up. Does that make sense?

Okay. Now, Chris is just going to give us a quick list, I think it's just a couple of items, of things that are happening as part of this first bullet.

CHRIS: Yeah, so I keep saying it's in the works, it's in the works, it's with the works. So let me reiterate the things that are in the works. I think I have four things:

Storm water redesign, how storm water is managed on the site. One of the goals of that is reducing ponding and capture of the water, getting as much downstream as possible in Davidson Canyon, but also preventing ponding on top of the facilities, at
least post-closure;

Number two: When we got EPA's comment letter, we requested that SRK weigh in on many of the geochemistry comments and infiltration comments, so that's in the works. It is not released yet as a draft. The Forest hasn't seen it, but that will be coming out;

Number three -- number three: Before that even happened, the Forest had developed some internal questions about geochemistry, some lingering questions that kind of had been going on. SRK also was asked to weigh in on those and those results are coming. They are not released yet draft. The Forest hasn't seen them but we'll have them soon.

BEN: And you said those were questions from the Forest Service?

CHRIS: Those are questions from the Forest Service.

BEN: Okay.

CHRIS: And the final thing: When we receive EPA's comment letter, the infiltration stuff jumped out as being reasonable to ask Rosemont to redo that modelling, so we did. We do not know the status of that, when they might get that back to us, but Rosemont has been requested to remodel the infiltration
specifically using an actual climate record, not this averaged out precipitation data.

I think that captures everything that we're working on on these topics.

BEN: Okay. So it is a couple of minutes before four. We are scheduled to leave at 4:30. I think if we can have about 20 minutes on the upper Cienega Creek impacts discussion, that's about what we'll be able to fit in to make sure we have a little bit of time to wrap up and make sure everybody is aware of action items and next steps, which I think are important to clarify before we go too far.

So we'll start now and then wherever we are at about 4:20, we will stop and wrap up.

CHRIS: Okay. So upper Cienega Creek. So the concern here, there's no surface disturbance with this watershed, so the concern here is groundwater drawdown. And we are -- all the modelers assume that Cienega Creek is connected in some way to the regional aquifer. They do not assume there's no -- there's no question about where the springs arise, it's just assumed that Cienega Creek does arise in some way from the regional aquifer.

In this case, we have three models that we were able to use because Myers, this was included
within his modelled domain. All right, the results, Montgomery thousand years in the future, extremely, extremely small drawdown, 0.01 feet. I normally wouldn't mention that because that's well within the error of even, you know, rounding. However, there's a reason and I'll get to that in a little bit down this bullet point list. Tetra Tech, similar problem with before; it's such a small drawdown on the scale that they provided that it's impossible to say but it's less than a foot. Myers' 0.2 feet. So three models largely show these small drawdowns.

Now, Montgomery and Tetra Tech and Myers all took an additional step, and because they're assuming that Cienega Creek is connected to the aquifer, they're able to model what's going to happen to the stream flow, there's packages to model that. So they did that.

Montgomery came up with change of 0.02 CFS -- that's cubic feet per second. That's 1 percent of average annual base flow. And that has been a concern so I'm just using that as a marker. Average annual base flow is not necessarily what we're analyzing in the EIS. That would reduce the length of perennial flow by point -- or 0.16 miles. So the perennial length of the stream would shrink by that amount.
Tetra Tech showed a slightly higher impact. Theirs came up to 3 percent of average annual base flow. Myers' showed a very similar to the Montgomery model of 1 percent of base flow.

So question of average annual base flow, that's just one measurement. We understand that minimal flows are the real concern and that you'd be looking at seasonality, you'd be looking at drought conditions. So I don't want that to be a stumbling block because that's really not how we analyzed it in the EIS.

Okay. Important points. There were three models. The results all show something very similar. Again, these were MODFLOW models. The three models incorporate a wide variety of boundary conditions, of assumptions. And it's important to note particularly in the -- I think it was the Tetra Tech model that they used a highly conductive stream aquifer connection. So I think they wanted to make sure -- I'm not going to put words in their mouth, but I think they wanted to make sure in the limiting factor in the stream flow wasn't the stream flow. They wanted to make sure that if there was an impact propagating toward Cienega Creek, it would show up in the creek, I think, and the modelers can correct me, maybe Tetra Tech can correct
me and Montgomery, but I think there was a very highly
conductive connection between the stream and the
aquifer.

VLADIMIR: It was in Montgomery model. They did not limit this connection, they put perfect
connection.

CHRIS: Right. So that connection was
specifically in the Montgomery model.

ROGER: The vertical hydraulic
conductivity was 100 feet per day.

BEN: Roger just said vertical hydraulic
conductivity was 100 feet per day, for those on the
phone.

So was there anything similar to what you did
from geochem from public comments that could get us
started off?

CHRIS: I think there's two things I
could point out and one is just the generic sense that
came out of the public comments, and this is from the
public as a whole, as well as cooperators, and that is,
that this mine will have a major impact on Cienega
Creek and on the Cienega Basin in general.

So the other thing that came out of cooperator
comments, specifically BLM, is that there are very
sensitive resources out there, and it's not just
Cienega Creek, it's Empire Gulch, there's other wetland areas, La Cienega Natural Conservation Area. There are a lot of sensitive natural resources out there. And I think the concern was that those weren't addressed properly. So those are kind of the two generic.

BEN: To go back to your first generic, you said that there was the generic feeling from the public that there would be a lot of impact to Cienega Creek.

CHRIS: Right.

BEN: How? Like impact what?

CHRIS: Well, it takes a lot of forms. Some people read what's in the EIS, what you see on the screen, and they take that to be a very substantial impact. So it's a perception issue. Where we might say 0.01 feet is so small that it's ridiculous. However, that does affect the stream flow and so the public -- some of the comments perceived that any change is huge.

On the other end of the spectrum, people have put forth alternative hydrologic analyses and particularly the Sonoran Institute came out with several that have hit the news lately that take a more -- I don't know how to put this, but maybe a more generic approach to show that there could be much...
larger impacts throughout the Cienega Basin.

So it's a wide variety from just a concern over what's been presented to a different presentation and a different analysis.

BEN: George.

GEORGE: I would just like to know, the concept of having -- protecting something a thousand years out, for me it's inconceivable. What is the intent of that?

BEN: So I think there's -- do you mind if I add to the question? So what's the intent behind modelling a thousand years out? And maybe this is the same question, but it may not be: Why did you go to a thousand years instead of 500 or a hundred or some other number? Are you the person to answer that?

VLADIMIR: I can answer. This is Vladimir. Intent was to show close to the steady state condition for any -- for some reason, both Tetra Tech and Montgomery struggling with numerical solution to steady state post mining condition.

The approach was taken just to simulate this time in big enough to approach to this steady state condition. This is how thousand-year prediction was chosen.

ROGER: This is Roger Congdon. The only
drawback is that it's not quite the steady state condition. I think it can be done without too much difficulty.

BEN: Can you say more about that?

ROGER: Actually, I think I did it. That's all.

BEN: Oh, you mean from previously?

ROGER: Yeah, it's somewhat different.

BEN: Okay.

ROGER: It's not vastly different but it's somewhat different.

BEN: Okay. Is that -- so when you -- are you -- I'm sorry. I'm stumbling over your reaction. Are you saying that you already said more about that in our previous discussion earlier today or --

ROGER: I think I did. But, actually, I would prefer the steady state solution but if they can't do it, a thousand years is probably close enough.

BEN: Okay. And I'm assuming there's something, like I guess the way that you're proposing it would be done, you just referenced something about, here's how I would -- is that written down somewhere or has it --

ROGER: No. Actually, that would
probably be 95 percent or more of the steady state
condition.

BEN: Okay.

ROGER: And, as such, is probably
adequate.

BEN: Okay. So I'm going to go to Jim
real quick. Since you're right there, you can just
pass it to him. And then --

JIM L: This is Jim and I'm conveniently
close. So it makes it easy. So I would say that, you
know, we could pretty much ditto the discussion from
this morning in many ways and Stan's comments with
respect to artificial boundaries stand here as well.

I would say that, you know, speaking toward --
apart to the steady state question, that it would be
very useful to have alongside these numbers of change
what changes are predicted through artificial
boundaries, in other words, what production in outflow
occurs across artificial boundaries or other boundaries
and are those reasonable?

BEN: And if I'm not mistaken, the --
one of the outcomes from some of the questions that
have been brought up in the past that we already
addressed this morning also relate to this question, so
the whole western boundary is -- that's going to
address this, too.

JIM L: Yeah, it plays in. We don't need to repeat that whole discussion.

BEN: No, definitely not.

CHRIS: However, one thing I heard earlier is that it's not necessarily just the western boundary. When we're talking about Cienega Creek, I think you guys, I think I heard you say earlier all the other boundaries may be of concern, too. I want to make it clear. I'm not quite sure what's been requested of Rosemont will cover those other boundaries or not. It depends on how they interpret that question, so --

BEN: So, with that in mind, then, can -- when did that request go to Rosemont? Can that request be amended to make sure that they address all of the boundaries and not just the western boundary?

And then I saw Dan's hand went up and then I'll go from Dan back to Roger.

DAN: Yeah, a couple of things. One on the boundary conditions, yeah, for Cienega, the eastern boundary may actually prove more important for the -- if the boundary conditions are, in fact, contribute more water or less water, you know, under stress or not. That's something we need to find out.
Basically the stream flows in Cienega are so low that any changes at the boundary conditions could mask any changes in stream flow. Basically, it's just a matter that that creek has so little water in it now that looking into the future and minor changes in boundary conditions and water supply coming from a boundary could mask impacts, and that's one of the reasons. So we want to take a look at that on the eastern boundary to see what is going on, see if there are any, you know, we've thrown around this infinite supply of water. Obviously, infinite supply is not happening. But the question is, are the changes and what are the magnitude of the changes, if there are any, at the boundary relative to what we're seeing in the creek. Okay, that's one thing.

The other thing is, on the question about thousand-year steady state -- a true steady state would be very nice to have. One thing, it simplifies the models; storage tends to drop out as a concern. But one thing we're looking at for the decisionmaker side of things is that you want to take the model out to say, what are the impacts? You're disclosing the impacts. If those impacts occur 20 years out or a thousand years out, the response time or the remedy time you have to work with at this mine is really about
20 years, 30 years. If you -- once you have a pit in place, you don't have -- there's not much you can do about it.

So the decisionmaker needs to know that, yes, we are -- we expect to have some impact 500 years out, a thousand years out that we're not going to be able to do much about, but we have to know that when you make that decision, that you're making it for that time out there. So that's why I think taking this model out and considering those impacts down that far out is important.

Again, if you're looking at a steady state, if you could do an actual steady state model, that would tell you, you know, way out, this is what the final configuration would look like barring, you know, all the changes that are going to happen in the next 500 years. So those are the two comments.

BEN: Roger and then Deb.

ROGER: Yeah, I just wanted to say that I believe that the request we made was more the boundary conditions in general and not just in a specific location in the model.

BEN: It does -- that may be true. It strikes me that it's probably worth clarifying so that time is not wasted. So I'm not sure who makes that
clarification with Rosemont that they understand it, but it seems like it's worthwhile to be sure. Deb.

DEB: Vladimir's been trying to make a comment for quite some while, so I just wanted to point that out and hand it back to him.

BEN: Okay, that works. I'm actively ignoring you is what it is.

VLADIMIR: Thank you, Deb.

I would like to mention, yes, boundary condition should be addressed but I will be honest with you, with my experience, I am not expecting to increasing significantly better predictability of the model. It's 0.01 feet of drawdown or 0.5 feet of the drawdown or 0.8 feet of the drawdown. It's been somehow this uncertainty in my opinion still would be exist.

BEN: I'm going to go back to Deb and then to Chris.

DEB: I don't know if this is helpful or not but I know that in my work as a social scientist, when I'm doing a social economic analysis in an EIS, something that helps the decisionmaker and the public get these really complex figures and these tiny numbers is context. So putting the number in context with something else the people can relate to, it just helps
give them a sense of how big or small are we talking about. And that can be quite powerful. So for whatever it's worth.

BEN: And that's really good comment on a number of levels. So I don't remember in the EIS but for pretty much all of the impacts, you should be providing the context of impact and not just the pure number but how much is it of the whole. Hence, the addition of 1 percent of average annual base flow. That sort of thing is the context that I think is helpful for the decisionmaker. That's what you're getting at, correct? But you should be doing that everywhere anyway. So, hopefully, that's happened in this case, too.

CHRIS: So -- I'm sorry, George. I'm going to cut you off.

GEORGE: Oh, no, please go ahead.

CHRIS: So I want to ask a question because I've now heard George say something and I've heard Vladimir say the same thing. For impacts to upper Cienega Creek, is this tool, does this tool answer the question? Or can this tool --

ELIZABETH: This is Elizabeth. And I'm sorry if I'm interrupting as you're passing the phone along but, as was previously mentioned, you're really
looking at average annual base flow and, as we
discussed, there are ripple pool complexes, special
aquatic sites along Davidson and at the Cienega, and
groundwater drawdown will reduce stream flow and the
surface extent persistence duration of pools and
ripples and so, when that happens, and the extent and
persistence of these pools mock the changes, you
typically get like, you know, adverse water quality
impacts, increases the temperature, increases the
dissolved solid concentrations, increases the dissolved
oxygen and that, in turn, affects -- can result in
increased algoblooms and then all these changes are
going to adversely affect aquatic organisms dependent
on the habitat, including indigenous species.

And so when you even show the average annual,
you're not really, as previously mentioned, saying that
you will get those extreme periods, any change, slight
change would -- could have dire consequences to aquatic
organisms that live in those ripple pool sequences. So
I'm not sure that that really translates to the
environmental impact as a result of changes in
groundwater from groundwater drawdowns.

BEN: Okay. And I guess so when it
comes to those changes, what should happen in a
disciplinary process in an EIS is the outputs from the
water analyses should be provided to the biologists and others dealing with those questions to then have those discussed in that section, and I guess I want to just note that to bookmark and then that's something to follow up on as responses to comments are completed.

ELIZABETH: Yeah. I mean, if you look at changes in surface water quality from the product and then you have groundwater drawdowns and that that translates into impacts, including surface water quality, yeah.

BEN: Yeah. I'm going to turn it back over to, I guess, Vladimir at this point to address the question that Chris raised. Do you need it restated or are you good?

VLADIMIR: No, I remember the question.

BEN: Okay.

VLADIMIR: I would like to confirm that both Montgomery and Tetra Tech groundwater models were developed as pit lake in-filling models. And those models has limitation in prediction of the propagation of the drawdown at the limit one feet, half of the feet, or 0.1 feet per day.

It's -- in my opinion, if this -- if this model show that it would not be any changes in the water level or groundwater flow, this model can be
used. But to determine what kind of the percent of the impact, those models, they are not sensitive, they're not designed, they're not -- they're not trained and educated by existing data to predict this.

GEORGE: I think I'd just like to comment on the issue that you've raised on variability, and I agree with you, in this part of the world, that is probably much more -- well, not is probably, is much more important than the mean flow changes.

But for me it is I think one needs to at least get some idea of what is realistic to worry about and what not. If you talk about a .01 foot change in a water surface elevation or a flow, that is not even measurable in a practical sense if you would really go out in the field and measure it. You know, so there must be some cut-off so we say, well, now, this now starts to become an important issue so, no.

For me, anything in hydrology, specifically my opinion, is anything within 25 percent you're doing pretty good, particularly surface water hydrology. So I just don't -- these small numbers for me doesn't mean squat. It says there's nothing happening.

ELIZABETH: And I think -- this is Elizabeth. And I think the problem is you're seeing it maybe hydrologically and not biologically because ever
so slight changes can change an ecosystem and the viability of that habitat for plants and animals to thrive in, many plants and animals, so it is really important. And then you combine that with other impacts as, you know, as a result in combination with changes to surface water hydrology, and you see that that impact is real and significant.

BEN: I think that, yeah, George is going to address that.

GEORGE: What I would like to ask you is this: What -- what studies have been done to determine how sensitive these species are to these slight changes and where is the cut-off? Or is this just conjecture?

ELIZABETH: I believe that -- I'm getting some feedback but there are -- there is information, studies available on the habitat, the distribution of native -- there is information out there we can work on, the wildlife service, BLM, and, yeah, there's studies that have been done regarding the effect of changes, hydrologic changes, to the viability of, you know, of these aquatic organisms that thrive in the system.

So, I mean, I'm not sure -- are you saying that nobody knows? It's never been done? I think it's pretty common knowledge that, you know, you modify the
hydrology, you affect the aquatic organisms that live and thrive in that system. But --

BEN: I'm concerned that we might be heading down a road that is not going to be fruitful for our last five minutes. I think we've got what you've provided, Elizabeth, in the notes. It seems like this is -- what we intended to cover here are the water -- specifically, water resource related impacts, not necessarily the places where those impacts should also be translated to other impact analyses in the EIS.

So -- and we just don't have the right people in the room to address the question that you've raised. So I think that this is a parking lot item that probably needs to be tracked and followed up on. So could somebody write down Elizabeth's concern as it's been expressed, hopefully, and make sure we're tracking it?

CHRIS: I want to clarify one thing.

BEN: Okay. I'm handing it over to Chris for a second.

CHRIS: Elizabeth, I want to make sure that you don't have the impression that we're dismissing your concerns.

ELIZABETH: No.

CHRIS: We're not.
ELIZABETH: I think maybe George or
Vladimir were.

CHRIS: Well, I think they were
answering a different question. And I don't want to
put words in their mouth but the question I think I
asked them wasn't, you know, will there be impacts to
the biological resources if there is a change, the
question is: Is the tool we're using capable of
measuring a change or predicting a change? So I just
want -- I think there was a little cross-disconnect
there.

BEN: And that's part of the reason why
I wanted to say let's stop this conversation 'cause we
are talking about different things. But let's put it
in the parking lot, the biological question related to
changes in the hydrology, to make sure that we don't
lose sight of it.

Floyd also had something to say and then I
think we're at the point where actually we need to
start to wrap up, though I have a question for Vladimir
as a follow-up to your response to Chris' question. Go
ahead.

FLOYD: This is probably just a parking
lot comment but I agree with George in the sense that
the amount of change that's predicted here seems
minuscule, so maybe the model isn't practical. If we look at -- look at the USGS gauge information from the '90s to the present, the natural drought conditions that we've entered have caused a greater change than what's predicted in a thousand years, I think. So I'm not sure how these models are working, you know?

BEN: So that's -- that brings me to my question for Vladimir, and that is, or maybe for everybody here, really, and that is: Given the limitations of the model to predict these fine scale, potential fine scale changes in the hydrologic condition of Cienega Creek, okay, we understand that there are limitations, is there something else that's better?

DAN: How much money you got?

BEN: So I'm going to return back to our CEQ guidances, then, in a second.

DAN: Basically, to get at -- I'm sorry. I forgot your name. Lisa?

BEN: Elizabeth.

DAN: Elizabeth's point is that you can go from minor drop downs in water levels, minor decreases in flow and you can get to a loss of habitat. It's expensive, though, 'cause you have to map in detail the entire river system. You have to map the
width of the current flow, the depth of the current
flow. You have to basically make it a detailed
elevation map of the whole river. Basically, what
you're doing is then you start subtracting water out
and redesign -- and recalibrating how much flow is left
and then, from that, you can look from depths, from
widths, what perimeters, you can look at temperature
effects. You can estimate those based on how deep your
water is, how fast it's flowing. And from the
temperatures you can go to fish oxygen levels, you can
go to algae blues, you can go to fish survivability and
those kinds of things. But it is not cheap and it is
not quick.

BEV: What kind of time frame are you
talking about, what kind of study?

DAN: I think it took us over a year on
the San Pedro. So it's not a quick thing, it's not a
cheap thing, but it can be done. And then the question
comes back down to, again, from what -- that kind of
goes back to that whole bonding issue, the bigger
picture we're talking about here with the groundwater
models. Is the creek being accurately modelled in the
models to the point that we should go out on this kind
of adventure or is it basically kind of like, it's in
the noise so that the model itself, as Vladimir's kind
of been indicating, you can't pick up on that kind of level, even plug into a river model that shows all of these things I just discussed, because you don't have that decrease in flow to plug in there to say what happens. So that comes back to that question.

BEN: And on that note, I just want to point out something, there are two -- there's still two different things going on. One is, is there a better tool than the model we used to predict these downstream impacts? The separate one that Dan just raised is related to habitat-related impacts and what studies you would do to determine what those might be in a drawdown scenario. So that is one thing that I understand you could do. It's expensive, it's long. That assumes that the model -- or that we've got good data so that you can actually do the one study and have it inform the other, right?

So just -- it seems to me, and maybe I misinterpreted something, that they're separate things. So I still want to bookmark parking lot item that biological question and return to the question of, is there something better. I'm talking -- not talking about biological impacts. I'm talking about just drawdown impacts. Is there something better?

And I did see a hand or two go up and I want
to get to those people and I want to wrap up. I'm hearing no response on "is there something better", so either you're just so zapped that you don't want to say it because you're worried it's going to tip off a conversation or there's not, or there is and you just don't want to say it right now because of I don't know why. So Vladimir has a hand up and then I did see other hands, so I don't want to ignore those.

VLADIMIR: I will express my opinion. I do not know better tool than numerical groundwater model. Unfortunately, at this stage, model is not properly calibrated to answer this question. Unfortunately, you could answer this question only based on initial data collected during initial stage of the mine excavation when largest stress would be in place into the system.

BEN: Given that we can't do that before a NEPA decision is made, sorry, is -- okay. Given that we can't do that before a decision is made in the NEPA process, so that's not an option. And that we're at the -- I want to find out what is the action item that's coming out of this? Quick discussion that needs to be addressed. Maybe this is another short report related to, you know, some of our options, maybe it already exists, and I'm just not fully aware of the
different memos, reports, et cetera, that have been produced as part of this analysis. But can we finish on a "let's do this task" to start to hone in on the question around how to do this analysis or feel like we've got the best hard look possible?

Okay. So we'll go to -- we'll go to this side since I'm on this side and we'll start with Jim and then Dan and Mindee, and I heard some motioning to somebody and I'm not sure, maybe it would be Dale or Steve or somebody else. Go ahead.

JIM L: And I'm in complete agreement with Vladimir, right? So to create a model that allows you to assimilate change, you have to observe change to calibrate it, right? And without that data -- we will be able to get that data when you have the stresses to the system. But something you can do, not having that information, is to attempt to bound the possible reasonable answers with various conceptual models.

All right. So you can set up a series of conceptual models, and numerical models then are built on those and try to bound your solution, so you're not trying to actually predict what's going to happen, you're trying to bound the range of things that might happen, recognizing that probably the real answer is somewhere in between.
BEN: And hold on to that for one moment and so bookmark it. Sorry, just so I'm a little bit more efficient. Dan, go ahead.

DAN: Okay. Chris, earlier you mentioned that you weren't going to use annual flow reductions, you were going to get to something more specific. Can you tell us where that is and where that's headed or is underway or --

BEN: Okay. I'm going to -- probably should have gone back to you, Vladimir. So I'm going to go back to you to respond to Jim and then to you to answer Dan's question and then we'll go to you, Mindee.

VLADIMIR: Both Montgomery and Tetra Tech used similar approach. They play with different sensitivity analysis. They play what if scenario. They really do not know exact reality of the parameter. They increase, they decrease, they see what would happen. Unfortunately, a result of the sensitivity analysis indicate two possibilities: no impact and impact. It's on the boundary at the edge of this sensitivity analysis.

CHRIS: So the question I'm answering is: If we're not using average annual base flow as our comparison to predict model impacts, what are we using?

So we did present it in the EIS, we did
present the average annual base flow because that was kind of what came out of the modelling reports. But then we took it a step further and we used minimum monthly flows from the USGS gauge Cienega Creek at Sonoita and we plotted those by month, averaged over the period of record, we looked at them -- not average but the minimum monthly flows, and what showed, understanding that you're superimposing an annual average model onto a seasonal fluctuation, it shows that potentially I think June, July could be significant issues.

BEN: Mindee.

MINDEE: Again, from a layperson's standpoint in all of this, what I understand in part is something that we would monitor in the future would be groundwater effects. To be able to put that information, those stressors back into the model to run the model again and kind of validate is the rate, the trajectory, you know, just validate how well did the model predict what we're expecting, and we're planning to do that.

And I thought, Jim, that I heard you say something to that effect, but then a different comment made me wonder if I misunderstood. But we -- I think we have a plan to measure what's happening against what
was predicted and if there are different changes, you know, drastic changes, we may be able to plug that information back into the model and then see, with that information, the real information, kind of calibrate as we go.

And, I don't know. I think that can help. And I don't know how you calibrate before without a lot more information. So our plan is to monitor and calibrate as we go.

JIM L: No, I think that's absolutely correct, that as you stress the system, you start to develop the information you need to really better understand how the system's going to respond.

BEN: And you're referring to once in the future mining scenario there will be this monitoring that allows for sort of constant check, you're referring to after a decision, correct?

MINDEE: Yes.

BEN: Okay. And Jim, and then I think we need to wrap up. It sounds like we might -- okay, go ahead.

JIM: Jim Copeland. And just a comment. Is that Christine on the phone?

BEN: Elizabeth.

JIM: Elizabeth. It might be worth your
while to follow up with her because I think what I heard her saying was that this may be in the hydrologic world considered insignificant and discountable but if you're using these results right here to draw conclusions to the biological resources, that they aren't insignificant and discountable to the biological resources. I think I heard that you may be -- it may be considered that you're coming to the wrong conclusions and that consultation with the Fish and Wildlife Service should also be part of this discussion here to make sure that you're not bypassing that, even though this is a hydrologic discussion.

If you're using this -- because it's not reasonable for, say, a fisheries biologist to be doing their own modelling and all of these kinds of things; they would be relying on input from these things that you're doing, and so that's part of the so what.

BEN: Absolutely. I think I heard that. What you just said is what I heard, too. I think that needs a harder look or we need to confirm that we are taking the hard look, I guess. Go ahead.

GEORGE: This is George Annandale. I think to answer the question of what can one use to look at how variability changes, I've got a significant interest in looking at water supply reliability in arid
regions and there are two parameters that determine water supply magnitude and reliability.

One obviously is the mean, 'cause that tells you how much water can potentially at most be available. But the other one is the coefficient of variation. And what that is is the standard deviation of the flow divided by the mean. And if you have those two parameters, you can -- I think what one can do perhaps to prove the results of the study, is to look at the reliability of a certain amount of flow that you deem desirable for habitat survival and compare the pre and post conditions for that. That, I think, gives you a guideline of where you can go because, in the end, it's the reliability of flow, I would think, is probably a dominant feature. I'm not a fisheries or ecologist or anything like that, but I would suspect that that is something that you'd like to look at. And once you have those two parameters, it's very easy to really make an assessment of how it affects reliability of flow.

BEN: Okay. We're slightly past 4:30, which is a big no-no on my part. So I apologize for that. My sense is we should end unless there's a burning desire to stay until five by most people, but I'm feeling like anything having to do with the Cienega
Creek discussion really we either need, it sounds like to me, an action item that somebody's got out of this -- I'm feeling like there's really not a clear one -- or a way to proceed with addressing Cienega Creek impacts after this meeting. So that's the one or both of those two things is what I kind of want to get out real quick and then I'll sum up. Chris.

CHRIS: I would propose an action item.

BEN: Okay.

CHRIS: And it's -- I don't know what it looks like yet but it would be a tech memo of some kind, and I don't know who would write it yet, but I think it would be probably people in this room.

There's two questions there and they're the same questions that we've asked. Is the model or the tool that we have right now adequate to answer the question, not the habitat biology question that comes later, but just how much drawdown could there be at Cienega Creek? I think we've got some answers today from that but we ought to put it in writing and really flush it out so that we've got something solid that we can really sink our teeth into.

The second question is the same one that's been asked, and I think there probably is an answer out there that we just need to brainstorm and that is: So
what else could we do? What other tool? I think it's worth looking into that.

I have a couple of ideas that I didn't want to prolong the discussion, but there might be ways we could do it or at least supplement what we've got with the models. So I would say an action item would be to write a memo that addresses those two issues.

BEN: Would you, Forest Service, mind approaching these -- this action item in the same way that you proposed to approach this one, that would you decide how and who and all that kind of stuff gets that done?

MINDEE: Mm-hmm.

BEN: So you guys are good with that? So I'll add that note in the second, that you guys will figure out how that gets approached. But that seems like the most logical, the best way to end on these questions is to, you know, somebody go out and we need to search it out a little bit more.

We have had a -- I think it's been a pretty good day actually, a long day, but we started off with some introductions. I think everybody is pretty clear that the folks in this room have a lot of experience to bring to bear and there were some really good discussions. Hopefully, everybody really knows what
happened to date and where we are, what's happening next, right? If there's any confusion about that, talk to Chris or Melissa, I think.

We had a short summary of kind of the overview of the NEPA backdrop to the discussion which did come up a few times later on, mostly related to what the Forest Service needs to do to demonstrate they met hard look requirements under NEPA and what you do if you have incomplete or unavailable information. I think it's worthwhile to be sort of looking back at those periodically and making sure that we're sort of accounting for that as we move forward.

We started with session one. This was our longest discussion, and the main things that came out of it that I just wanted to note were -- I think the biggies, these two action items, we've got a couple of short reports that Forest Service is going to work out who, how, when that will help to frame the path forward related to the Davidson Canyon Outstanding Arizona Waters question. That's where we certainly spent most of our time.

After lunch we came back and we did the geochemistry discussion, and the basic answer at this point to that is we've got a bunch of things that are in process, no other really big outstanding questions
came out that aren't in the process of being addressed.

We did have the one parking lot item that came up related to looking at what happens. We need to have somewhat more of a well-developed plan about what happens next in the -- sorry, the preferential pathway question.

And then the last thing, which was the least amount of time, was Cienega Creek impacts. And it sounds like we had covered some of that discussion previously related to the Davidson Canyon. So some things are in process.

Other than that, we still have the questions that Chris proposed that should be answered in some sort of a tech memo or short report that the Forest Service also needs to decide who, what, where, when, how is that done.

Am I missing anything? That's actually quite a lot of ground to cover. I'm not sure -- I do think we very much achieved this first meeting purpose of providing an opportunity for direct face-to-face communication between agency, staff, and specialists, and the consultants that have been pretty deeply involved in producing memos and reports.

Unfortunately, we did not have the EPA folks here in the room. Hopefully, that can happen at some future
time but hopefully they got what they needed.

I think we got partway to answering or to making sure that the Forest Service has taken a hard look at the environmental consequences, or at least what we achieved, it seemed to me, was a way to determine that, yes, we're doing what we need to do to make sure we're meeting our requirements under NEPA. That's the impression that I got.

Any other thoughts on that? Okay. With that, we're done. Ten minutes late. I apologize. But any closing remarks from anybody? Mindee

MINDEE: Things still have a little bit of an unsettled feeling to me. So is there another step that continues this or, I mean, I don't want to just say: Nice to meet you. See you in heaven or something. It feels like we've got some synergy and we've got the right people. Is there more discussion that needs to be planned for with this group?

BEN: Good question. That is something I neglected 'cause I did mention before when we wrapped up we needed to talk about next steps.

So next steps are clearly the things that you guys have to do in terms of those reports that came out that we need to produce. What else? I mean, I do think that this has been a productive dialogue. It
seems like it's been on a number of levels really useful.

What would the Forest Service like to see? Do you have a concept of what happens after those reports are produced, for example? Do we reconvene this group in a similar type meeting? Do we have a longer workshop, a two- to three-day sort of a thing that does go into the weeds a little bit more? What is -- what is -- what are you guys feeling is needed?

MINDEE: I don't think on my feet that fast. I really need to talk about it or hear from others or --

BEN: Bev had her hand up and then I'll hand it to you, Deb.

BEV: I could see some usefulness in reconvening once we have more information addressing some of the issues that we've come up with and some that have come up today in some of our action items.

DEB: This is Deb. The answer for me is it depends, and it depends on what comes from the assignments that we have to go back and think about and what comes from those assignments. So that's -- that's kind of how it's feeling to me in the moment.

I do want to say that this has been incredibly helpful today. And I really appreciate everybody
taking time to be here and to be very honest and
forthright in sharing information and your perspective.
So, yeah, I guess we're just going to need -- I guess
I'm in the same boat with Mindee, that we're going to
need a little bit of time to digest and think through
what we heard today and just, again, want to thank
everybody for being here.

BEN: And I think we can -- if that's
the decision, that let's leave it vague, let's see the
products, if everybody can be okay with that, I think
it sounds like that's the best approach for everybody.
Let's see what happens. Let's see not only the
products that have been requested here, but the other
products that we know are in process once you know
there's a lot of stuff happening right now.
And, you know, there's -- it would be
difficult, it does seem like, to set up a meeting in
two months and say: This is what we're going to do.
Melissa, you had something to add?

MELISSA: Yeah. Well, I guess my
proposal to move forward would simply be that we get
these technical reports all combined, reviewed,
everybody has enough time to kind of sit with the
information, and then perhaps instead of having, you
know, this many people all in one room, there could be
some smaller kind of like subgroups that, you know, that kind of work together in a more collaborative way that doesn't require like the coordination of, you know, 20 different schedules to find a time, like a process something a little more like that.

BEN: And you've got lots of options, right? I mean, it does seem like there's either nothing is needed, we have the information that we need, in all the products that are provided. Another meeting is needed, perhaps longer, with smaller break-out groups that would actually cover both, it does still cover the coordination group, but you would get the small group dialogue as well as the larger group dialogue or perhaps it's just reconvening this whole group in another single day. So there are lots of options. I think you guys will have to take the information and decide what you think will be the most productive for the requirements you meet. Bev.

BEV: One thing I wanted to mention, if we are -- if we do need to reconvene for a partial day to gather and then break-out groups, we need to give a lot of consideration to the time it took to organize this meeting.

BEN: Okay. If everybody else is feeling good, are we -- is there -- is the unsettled
feeling more settled, understanding that it's still vague? Okay. Well, I appreciate everybody. I think we did a good job of working together on the ground rules and thanks for working with me and helping me out, too. That was great. Bev.

   BEV: I think Elizabeth had something to say.

   BEN: Elizabeth, were you saying something?

   ELIZABETH: No, I wasn't. Thank you very much for the opportunity to participate.

   BEN: Thank you. All right. Well, we're wrapped up. Thanks everybody. Appreciate it.

   (Concluded at 4:46 p.m., the same day.)
CERTIFICATE

BE IT KNOWN that I, Cindy J. Shearman, RMR, took the foregoing proceedings at the time and place stated in the caption hereto; that I was then and there a Certified Reporter in and for the State of Arizona; that the proceedings were reduced to writing under my direction; and that the foregoing pages contain a full, true, and accurate transcript of my notes of said proceedings.

Dated this 14th day of May, 2012.

Cindy J. Shearman, RMR
Certified Court Reporter #50718
State of Arizona