STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF PROPOSED AMENDMENTS
TO 20.6.2 NMAC, THE COPPER MINE RULE

New Mexico Environment Department,
Petitioner.

WQCC 12-01 (R)

FREEPORT-McMoRAN
REBUTTAL EXHIBIT BLANDFORD – 10

Testimony of Thomas Neil Blandford, P.G.
(November 1, 2007) (Excerpts)
STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION

WQCC 03-12(A) and WQCC 03-13(A)

IN THE MATTER OF:
APPEAL OF SUPPLEMENTAL DISCHARGE
PERMIT FOR CLOSURE (DP-1341) FOR
PHELPS DODGE TYRONE, INC.

PHELPS DODGE TYRONE, INC.,

Petitioner.

TRANSCRIPT OF PROCEEDINGS

BE IT REMEMBERED that on the 1st day of
November, 2007, the above-entitled matter came before
the New Mexico Water Quality Control Commission, taken
at the New Mexico State Capitol Building, Room 321, 490
Old Santa Fe Trail, Santa Fe, New Mexico, at the hour of
8:36 AM.

VOLUME 18
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for some of these wells, those constituents are slightly less than halfway down the table.

I guess all that I would point out is that each of those constituents is exceeded for some of these wells even prior to leaching in that area. For example, Well 2-1, Well 2-6, 2-7, 6-4 and 6-5 exceed standards.

I guess the other thing I would point out with regard to preexisting water quality, prior to this data, in earlier reports, such as the Trauger report that we mentioned earlier, there is some -- very little, or in most cases, no groundwater quality data from within the mineralized portion of the ore body that Phelps Dodge is mining.

So while water quality prior to mining off to the west in the Big Burro Mountains may be very good, that doesn't mean that the preleached water quality at the mine was also very good, because it is a mineralized zone and you would expect higher concentrations of various constituents.

This is some of the earliest data that's available, and I think it tends to illustrate that, and we really don't have a lot of very early data for this region.

Q. Thank you, Mr. Blandford.

Have you heard or reviewed testimony from NMED
witnesses, including Ms. Menetrey and I believe Mr. Olson, to the effect that the Environment Department, or probably in some instances its predecessor, the Environmental Improvement Division, relied on representations by Tyrone in discharge plan applications that no groundwater contamination would occur, including groundwater directly below the facilities for which the applications were submitted?

A. Yes, I did hear that testimony.

Q. Are you familiar with Tyrone's initial discharge permit applications for the facilities at the Tyrone Mine?

A. Yes. I've read through the permit files for most or all of them.

Q. Do you agree with testimony on behalf of the Environment Department to the effect that the discharge plans -- the permit applications or the proposed discharge plans represented that there would be no groundwater contamination anywhere, including under the facilities?

A. No, I don't agree with that. In fact, I -- my opinion is exactly the opposite.

I think if you read the early record, as I have, the information clearly indicates that there would be an expectation of not only impacts to groundwater but
exceedance of groundwater standards beneath and adjacent
to these leach facilities.

Q. Mr. Blandford, can you give us some specific
elements that illustrate your view on this topic?
A. Yes.

I'll start with DP-166, which is -- what
exhibit number is this, Mr. Moellenberg?

Q. Yes, Mr. Blandford, I believe you have in
front of you Tyrone Exhibit 921, which is a set of
documents used in the cross-examination of Mary Ann
Menetrey. Is that right?
A. Yes.

Q. Are those the documents you're going to use
for this testimony?
A. Yes, in part.

Q. And if you could, please, refer to the tab
numbers of the specific documents you're referring to as
you go through them.
A. First, I'm going to refer to Tab 12, and
what's provided behind Tab 12 is a copy of the
application to discharge, and the cover letter is dated
March 23rd, 1981.

The second page is labeled "Proposed Discharge
Plan for the Number 2 Copper Leach System."

It's my understanding this is the first
application for a leach system. There was a DP
application prior to this for the Mangas Valley, but
that was for seepage from the tailing.

Let's see. Specifically, in this document, I
would turn back to page five -- well, actually, page
four of the document, and some of the text here is
already highlighted, but at the top of page four, the
statement is made, "The infiltration rate from the
Number 2 Leach dump is estimated to range from
approximately 1,200 to 1,300 gallons per minute."

Just to put that number in perspective, the
groundwater component of what's pumped from the Main Pit
today is about 1,400 gallons a minute.

So here they are -- Phelps Dodge is making a
statement to the Agency that the expected infiltration
rate is really almost that of the total pumping rate of
what we have from the Main Pit today.

Q. Mr. Blandford, can you tell by this
application what is meant by "infiltration rate" as it's
used here?

A. Yes, I believe it means the volume or rate of
infiltration to groundwater.

Q. Thank you.

Please go ahead.

A. The next page, page five, down at the bottom,
there is a section labeled "Flow Characteristics of the
Discharge," and the first paragraph of that reads,
"Pregnant leach solution will infiltrate to the
groundwater directly underlying the dump from the bottom
of the leach dump. Infiltration will occur
predominantly through faults and fractures in the rock
and, to a lesser extent, through interconnected
microfractures in the rock."

So there, there is an a clear statement that
there is going to be seepage to groundwater beneath the
dump, and the estimation of the rate of that seepage is
1,200 to 1,300 gallons per minute.

I would note on the next page, page six, that
there was actually some field testing done to assist
Tyrone with estimating that infiltration rate. There
are six test holes that they actually went out and
measured the infiltration rate to assist them in coming
up with this 1,200 to 1,300 gallons per minute value.

Turning over to page seven, again, there is a
statement, "Infiltration rates from the leach dumps,
which depend on the areas being leached, are expected to
range from the 1,200 to 1,300 gallons per minute." And
then they break it out according to a mined-out area and
infiltration from a natural ground area that they are
going to cover.
Turning over to the next page, page eight, is the expected quality of the seepage. So this is what they are expecting to seep to groundwater.

Just to note here, going down the list, the expected concentrations of copper and iron in pregnant leach solution are 1,000. The standard for both of those constituents is one, and so that's solution a thousand times standard.

Sulfate, 25,000 milligrams per liter. The standard is 600. So that's many times the standard, of course.

Total dissolved solids, 37,000. The standard is a thousand. And on down the list, very low pH, 2.4.

So I mean, in my opinion, clearly in this document -- and I don't know how it could be more clearly stated -- that Tyrone is saying they are expecting to leach this pile, the quality of the leach solution is very high total dissolved solids, very high sulfate, high copper, high iron, low pH, a portion of that fluid is going to seep to groundwater directly beneath the leach dump, and Tyrone's estimate of how much of that fluid is going to seep to groundwater is 1,200 to 1,300 gallons a minute.

I don't see how anybody could possibly have thought that there would not -- not only be impacts to
groundwater beneath and adjacent to the facility, but
also that groundwater standards would be exceeded
directly beneath the leach dump.
I don't believe that anybody, either the
Agency or Tyrone, was under that impression that there
would be no groundwater impacts when they applied for
this discharge plan.
Q. Mr. Blandford, are you familiar with the
location of this facility that was covered by DP-166 and
where groundwater flows in that area?
A. Yes, I am.
Q. Could you describe that for us?
A. The area that I'm talking about -- I'm going
to refer to one of my previous exhibits. This is
Exhibit Blandford 4.
The area that's being discussed is essentially
the west side of the mine, the Number 2 Stockpile area
between the Main Pit and Deadman Canyon. This was the
application for the first stockpile that was constructed
in that region.
Q. And what's your interpretation of groundwater
flow direction in this area?
A. Groundwater flow today from this area is from
the southwest to the northeast towards the Main Pit.
Now, the Main Pit cone of depression varied
over time, so the direction of groundwater flow could
have been a little different than this prior to the
formation of the cone of depression at the Main Pit.
Q. Mr. Blandford, are you familiar with the
pollution controls that were proposed in the discharge
plan and required under DP-166?
A. Yes.
The original plan?
Q. Yes.
A. Yes.
Q. Could you describe what those were in the
original plan?
A. Well, essentially, there was a monitoring plan
proposed and a contingency plan, such that if the
monitoring wells in the vicinity of the stockpile showed
increases in contamination, then there was provisions to
invoke a contingency plan.
A little later on, there were exceedances of
standards in some of those monitor wells, and the --
really, the pollution control in that area, if you will,
has been to maintain pumping at the Main Pit, which
serves to capture groundwater from beneath the Number 2
Stockpile area, and, currently, it's extracted and used
as part of the mine process waters, but under closure,
that water would be treated.
Q. Were there any facilities in the discharge plan for capture of these leach solutions or capture of groundwater?

A. Well, yes, certainly, there were different ponds, and some, you know, discussed in the discharge plan for capture of the leach solution.

Q. And do you know where they were located?

A. I do not offhand know where they all were located.

They were generally -- I know there is one on the -- I thought -- my understanding is there were some on the north and east side of the piles.

Q. Were those near the toes of the stockpiles?

A. Yes, they would have been at or near the toes of the stockpiles.

Q. Do you have anything to -- well, let me ask this: Would any of those pollution control facilities or capture facilities that you were just discussing prevent leach solutions from entering groundwater?

A. As of the early construction of this facility?

Q. Yes.

A. No. I believe that those -- there were collection facilities to collect the majority of the pregnant leach solution, the PLS, but the mine's estimate of what would not be captured by those
facilities and what would infiltrate to groundwater was 1,200 or 1,300 gallons per minute.

The rate of application of raffinate at the top of the piles is far greater than 1,200 or 1,300 gallons per minute.

Q.  Thank you.

Mr. Blandford, do you have any other examples that relate to your view of these initial discharge plans?

A.  Yes, I do.

The next example would be DP-286, which is the Number 3 Stockpile area.

Again, referring to Exhibit Blandford 4, the Number 3 Stockpile area is on the northern side of the mine stockpile unit, kind of northwest of the Main Pit.

Q.  Have you reviewed the initial discharge plan application materials with respect to this facility?

A.  Yes, I have.

Q.  And what are your views regarding representations made in this application regarding contact of leach solutions with groundwater?

A.  The expected or anticipated seepage of leach solutions at this facility is significantly less than was put forth for the Number 2 Stockpile, but they are
still significant; and the information provided by
Phelps Dodge to the Agency would clearly indicate
exceedance of standards both beneath and adjacent to the
stockpile.

Q. Do you have a copy of that initial discharge
plan application with you here today?
A. Yes, I do.

I believe that's been labeled as Tyrone
Exhibit 928 in the new numbering system.

Q. I believe that's correct.

Could you, using that exhibit, give us some --
well, first of all, are the documents contained in
Exhibit 928 in the administrative record in this matter?
A. Yes, they are.

Q. And could you, using those exhibits, tell us
what in these exhibits supports your view that you just
gave?
A. Okay. I'm going to look at Exhibit 928, and
I'm not going to go through the whole exhibit.

There is a lot of analysis that can be read,
for anyone interested, about how the seepage to
groundwater was estimated.

But on page 18, approximately halfway down the
page, there is a section titled, "Groundwater Most
 Likely to Be Affected By the Seepage Discharge."
MR. DE SAILLAN: Excuse me. What page are you on?

MR. BLANDFORD: Page 18 of Exhibit 928.

MR. DE SAILLAN: Thank you, Mr. Blandford.

MR. BLANDFORD: Yes.

I would just read the first sentence there.

"Some pregnant leach solution will infiltrate through the bottom of the leach dump into the groundwater directly underlying the dump bottom area."

And there is many -- a lot of other information in this document that makes it clear that seepage was expected, but I just selected that one sentence to read.

The other item I would point out, before we leave this particular document, is on page 27 of the same document, the first full paragraph there reads, "Actions to protect subsequent users in the Mangas Valley from harm will be made on the basis of the analyses of samples obtained from Wells 10 and 11."

I wanted to read this statement, because it's very similar to other statements provided in the early record for all the DPs, that when Phelps Dodge or Tyrone provided correspondence regarding impacts to groundwater and how groundwater was going to be protected, they consistently either directly state or imply that they
are considering groundwater at a place where another user would be using it. They are not talking about groundwater directly beneath the facilities.

So if there is a statement -- and there has been a number of them pulled out -- for example, in Ms. Menetrey's direct testimony, where there is a statement that Phelps Dodge says, "Impacts to groundwater will be limited," or "Impacts to groundwater are not expected to be significant," whatever the statement is, they are not talking about groundwater directly beneath the facility. They are talking about groundwater at a place where another user would be using that groundwater.

That, in my view, is the only consistent reading of the administrative record.

So, for example, with regard to DP-286, in particular, if you go on back a few pages, there is actually two -- there is a second document behind that first one that I was talking about, and both documents together are labeled as Exhibit 928.

This second document is a letter from Woodward-Clyde Consultants. It's document A-17 in the DP-286 administrative record.

This is a letter, basically, responding to a series of EID comments. So the application for the
discharge plan was submitted to the Agency, the Agency had questions about certain things, and Woodward-Clyde, who was a consultant for the mine at that time, is answering those particular questions in this letter.

Again, the letter is rather lengthy, but I would like to turn back to page six of that letter.

Yes, sir.

MR. SWAZO: Is that the letter that's dated March 6th, 1984?

MR. BLANDFORD: Yes, it is.

Page six of that letter is labeled at the top "Dilution of Seepage."

There is a comment from EID that the mine, through Woodward-Clyde, is responding to, and the EID comment is reproduced here, and it says, "The second paragraph of your August 19th, 1983, letter states that you do not feel that a groundwater model is warranted since processes such as dilution and sorption in the aquifer will reduce concentrations of contaminants. If these processes are to be invoked then they should be described and quantified."

So Woodward-Clyde is presenting their response to that comment.

And there is, let's see, one, two, three -- there is four pages that respond to that comment, and
after the four pages, there is a -- there is a map
that's labeled, if you can see it, Figure 1. So this is
from the -- this is from the response letter.

So what Woodward-Clyde did, to respond to that
particular comment from the Agency, is they made some
computations of groundwater flow and mixing of the
seepage beneath the stockpile with that groundwater
flow.

The way they did it -- on that figure, you'll
see kind of two polygons in the center of the figure.
The center closed polygonal shape represents the
approximate extent of the Number 3 Leach Stockpile as
proposed, and the outer polygon is an area where
Woodward-Clyde made some computations of groundwater
flow and water quality.

So what they did is, first, they did a
dilution calculation, they took the seepage and said
what if that seepage was mixed with all groundwater
beneath the facility, and they come up with a dilution
factor of 1,700. But they really -- I think they
realized that's not really an appropriate scenario and
they move on to some more complex computations.

The second one is what I want to focus on.
What they did is they took a line of vertical slices
through the entire thickness of the aquifer downgradient
of the Number 3 Stockpile, and they used the hydraulic
gradient, hydraulic conductivity, aquifer thickness,
other information that they had available to them at
that time, and they computed the rate of groundwater
flow across that vertical slice, and they compute that
volume to be about 540 gallons per minute.

So that's what they are saying is moving
through the aquifer downgradient of the Number 3 Leach
Stockpile prior to leaching. That 540 gallons a minute
is provided on page eight of the letter.

And then they take their -- what they assume
to be their worst-case seepage rate from beneath the
stockpile of ten gallons a minute, and they assume --
they say, "Well, all right, if that entire volume of
seepage gets entirely mixed with this 540 gallons per
minute of groundwater flow beneath the facility, what
would the -- what would the dilution factor be? What's
the effect of that mixing?"

And they come up with a dilution factor of 54,
which basically means that the PLS that's seeping to
groundwater would be diluted by a factor of 54, if it's
completely mixed throughout the entire aquifer thickness
downgradient of the Number 3 Stockpile. That's the
computation that they did.

Now, to look at that in terms of computations,
I've prepared another exhibit.

Q. Mr. Blandford, have you done some computations of your estimates of groundwater quality using the dilution factors you've just discussed?

A. Yes, I have. That's provided in Exhibit 929. It's a one-page exhibit. It's a table, and the table is labeled, "Predicted Impacts to Groundwater at the Number 3 Stockpile (DP-286) Based on Information Provided During the Application Process."

What I've provided in this table, I've had some selected constituents of PLS, this is what's going to be seeping to groundwater, I have the standard listed for the various constituents. The third column is the expected quality of stockpile seepage. This comes from a table in the application itself.

So, again, this is what the applicant is telling the Agency the quality of the seepage is going to be. TDS, 37,000, it's similar to many of the other applications.

Then the next column -- there are two columns, they are labeled "Predicted Concentration in Groundwater Approximately 500 Feet Downgradient of the Stockpile Toe."

So this vertical slice that they selected to do their analysis is about 500 feet north or
downgradient to the stockpile toe. So this is where the computation is being made.

There is a dilution factor of 54. So the way that that factor gets used is you take the expected concentration of the seepage and divide it by 54 to get the expected concentration of groundwater if that seepage was entirely mixed throughout the full vertical extent of the aquifer at that vertical plane they are looking at.

So they are looking over -- they are not looking at the top 20 or 30 feet, which our monitor wells typically monitor, they are looking at several hundred feet of saturated thickness, and the resulting values there of dividing by 54 are provided.

The first one for TDS, for example, is 685. Now, 685 is below the standard, but I have a footnote there that if you included background water quality that was measured and provided in the application, you would exceed standards.

And sulfate, again, is below standard, but if you consider background, the standards would be exceeded -- you exceed 600.

Going on down from there, fluoride, aluminum, copper, iron, manganese, zinc, you would exceed standards, and in many cases, by quite a bit, doing that
dilution calculation.

So this fourth column over is the computation that was provided to the Agency to look at this effect of dilution.

If you simply take what -- the analysis that Woodward-Clyde did and provided to the Agency, you would come to the logical conclusion that 500 feet downgradient of the leach stockpile, standards are going to be exceeded for all these constituents.

That's all information that's in the record and was provided as part of the application process.

If you didn't want to have -- I added another column to the right there, which is a computation that I made if you assume -- you want to look at half the aquifer thickness instead of the full aquifer thickness, and you can see the effect, it's essentially double.

So through reviewing this information, I just -- I really can't see how, again, anyone would have been under the impression that water quality standards were not going to be exceeded directly beneath and adjacent to the stockpile.

Again, I'll go back to comments when -- and, actually, let's go ahead and turn to one.

On the next page, page nine, and I'm going back to Exhibit 928, that very last paragraph, there is
some discussion about groundwater quality. This was -- actually, a portion of this paragraph was quoted by Ms. Menetrey in her direct exhibit, and I'm going to read from NMED Exhibit Number 11, which is Ms. Menetrey's direct exhibit. I'm going to read a quote from page 15. This is a portion of Ms. Menetrey's discussion of this particular DP.

And it says here -- Ms. Menetrey's words were, "Tyrone stated further that, and then the quotation, 'With a leachate flow of 10 gallons per minute, the mixed water' -- and then she's added in parentheses, '(groundwater and leachate) could show an increase in contaminants of approximately one to two percent and pH may be slightly affected. If complete mixing is accomplished the contaminant increases would not be detectable.'"

So this is an example -- the Agency has provided these comments, and they are saying that the context for these comments relates to groundwater directly beneath the leach facility, and I disagree with that.

These comments that Phelps Dodge made, or their consultants early on, are not referring to groundwater beneath the facility, they are referring to groundwater far away, typically at someplace where
another user would be using the groundwater. In this particular case, it's down the Mangas Valley.

So to compare that quote, if we go back to the full paragraph, which is provided on this page nine of Exhibit 928 in the letter I've been discussing, the full quote is, "As the plume migrates, the dilution ratio would likely increase until the plume totally mixes with groundwater. The effect of the leachate on pH of the groundwater would depend on the buffering capacity of the soil and groundwater that the leachate passes through. With a leachate flow of 10 gallons per minute, the mixed water could show an increase in contaminants of approximately one to two percent," and so on for the remainder of the quote.

So, clearly, at the start of the paragraph, they are saying "as the plume migrates." They are talking about there is a plume that exists at the leach facility and it's moving downgradient, and if you let it go far enough to a point where it would fully mix with groundwater, this is the context of the quote they are providing. They are not providing that analysis with regard to groundwater directly beneath the leach facility.

Q. Thank you, Mr. Blandford.

Do you have any other specific examples of
your point that the Tyrone discharge plan applications
did not represent that there would be no impacts to
groundwater underneath the permitted facilities?
A. I have one more, and this is from DP-435,
which is, again, the Number 2 Leach Stockpile Complex.
This is the Number 2A Leach System, which is north of
the Number 2 Stockpile.

So, again, referring to Exhibit Blandford 4,
the Number 2A Stockpile is this stockpile here, kind of
due west of the Main Pit, again between the Main Pit and
Deadman Canyon.

Q. Mr. Blandford, do you have some documents that
you intend to use for your testimony on this discharge
permit?
A. Yes. This is, I think, the last document in
the packet which is labeled Tyrone 930 now, under our
updated numbering system.

Q. Could you describe that exhibit for us?
A. Yes.

There is a cover letter here dated May 14th, 1986; and the second page is labeled "Phelps Dodge Corporation, Tyrone Branch, Tyrone, New Mexico, Discharge Plan Number 2A Leach Dump," dated May, 1986.
Again, this is the original permit application
for this Number 2A Stockpile.
Turning over to the fourth page of the exhibit, it's kind of the opening page of the document, labeled "Discharge Plan Number 2A Leach Dump," and halfway down the page, there is "Seepage Quantity," and just to read the first paragraph, "We have estimated that a maximum of 96 gallons per minute of pregnant leach solution will be lost through the dump base and pregnant leach solution ponds during leaching." And then they explain how they obtained the 96 gallons per minute number.

Again, this is just another example -- I mean, I already went through the example of the Number 3 Stockpile, where the estimated seepage rate was 10 gallons a minute, and so here is an estimate of, you know, a seepage rate of almost ten times that, and clearly this seepage would impact groundwater as well.

So this, to me, is a clear theme, looking through the early permits, that the information that was provided clearly indicates that there will not only be impacts to groundwater, but that groundwater would exceed standards directly beneath and adjacent to these leach facilities.

MR. HUTCHINSON: Excuse me, Madam Hearing Officer.

MS. PADILLA: Commissioner Hutchinson.
MR. HUTCHINSON: This eventually became discharge permit what number?

MR. BLANDFORD: 435.

MR. HUTCHINSON: 435.

MS. PADILLA: Thanks.

Missed that number, too.

Q. (BY MR. MOELLENBERG) Thank you, Mr. Blandford.

I'd like you to assume that the Water Quality Act and the Water Quality Control Commission Regulations governing discharge plans and discharge permits would not allow the Department to approve a discharge plan unless the applicant demonstrates that no groundwater underneath or downgradient of the proposed facilities would exceed WQCC groundwater quality standards.

A. Okay.

Q. Do you understand that assumption?

A. Yes.

Q. Based on your review of the application materials for DP-166, under the standard I've asked you to assume, in your view, could the discharge plan for DP-166 have been approved?

A. No, clearly not.

Q. Using the same assumption, in your view, could the discharge plan application for DP-286 have been
approved?

A. No.

Q. And, again, using the same assumption as to the approval standard, could the application for DP-435 have been approved?

A. No.

Q. Mr. Blandford, have you heard or reviewed testimony from Ms. Menetrey on behalf of the Environment Department that if the Commission accepted Tyrone's proposal to use the MMD permit boundary to define the place of withdrawal of water for present or reasonably foreseeable future use for the Tyrone Mine, that would undermine requirements for abatement of groundwater across the Tyrone Mine site?

A. Yes, I had heard that testimony.

Q. Do you agree with that testimony?

A. I do not.

I think the Department has put forth, through several witnesses, that if Tyrone's proposal is accepted, that essentially that's going to lead to abatement measures being removed, a large zone of impacted water that, you know, we're just going to pollute and not do anything about it; and the reality is that that -- well, number one, Tyrone doesn't want to do that; and, number two, it's not even feasible.
If we're going to meet standards at the permit boundary, we have to have abatement measures inside the permit boundary. You can't wait until highly contaminated water gets to the permit boundary and then just deal with it then. It doesn't make sense economically or physically.

Really, if you look at many places, the location of the permit boundary relative to the stockpiles is very close.

For example, referring back to Blandford 4, the MMD permit boundary follows very close the toe of the Number 1 Stockpile, all the way down by the Number 1A, 1B, 1C Stockpiles, around the south side, around the west side.

The permit boundary is not very far from the stockpile toes, so if we're going to meet standards at the permit boundary, we're going to need to maintain our capture systems for impacted water at the stockpile toes. It's not like we could move out 2,000 or 3,000 feet and do something there. That would make no sense, and it's not even physically plausible at most locations.

Q. To further illustrate that point, are you familiar with reclamation and abatement measures already underway by Tyrone inside the MMD permit boundary?
A. I'm familiar with many of them, yes.

Q. Could you describe the ones that you're familiar with?

A. Well --

Q. At least some of them.

A. Yes.

There are a variety of groundwater capture systems, some both for regional water and perched water, which I discussed in my direct testimony, but there is also a large amount of ongoing reclamation work right now.

All of the tailing impoundments in the Mangas Valley either have been reclaimed or are in the process of being reclaimed. The Number 1 Stockpile is in the process of being reclaimed. That's on the east side.

There has been a large amount of regrading and covering which has already been conducted on the south side of the mine, and there is plans for other reclamation activities around the mine.

So there is a lot of measures that have already been implemented or are ongoing right now related to -- you know, that will assist with meeting abatement requirements at the MMD permit boundary.

Q. Have you heard or reviewed testimony by Mr. Marshall raising concerns regarding past excursions
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(intentionally omitted)
MS. PADILLA: Great. Thank you.
Mr. Jensen, thank you very much.
MR. JENSEN: Thank you.
MS. PADILLA: Okay. I think we can return now to questions of Mr. Blandford by the Commission.

I think we were on Commissioner Johnson.
Would you like to continue?
MS. JOHNSON: Thank you, Madam Chair.
Well, I'm glad I had that chocolate mousse.
MR. BLANDFORD: I'm jealous.
MS. PADILLA: Me, too.

NEIL BLANDFORD

after having been previously duly sworn under oath, was questioned and testified further as follows:

CROSS EXAMINATION (CONTINUED)

BY THE COMMISSION:

MS. JOHNSON: Mr. Blandford, can we go to Exhibit 928, and during your testimony on this exhibit, you directed us to several places within it.

I'm looking right now at page nine of the March 6th, 1984, attachment, I think it is, and I made some notations during your discussion of this part, and it's the last paragraph on that page.

Are we looking at the same place now?
MR. BLANDFORD: Yes, I believe so.
MS. JOHNSON: And you were explaining that
this language illustrated that the parties at that time
were looking at -- I think the quote was applying the
standards, quote, somewhere far away.

Do you remember that testimony?

MR. BLANDFORD: Yes, but I believe my
testimony was that this was a quote selected by the
Department, and my understanding of the application of
that quote is that it's being implied that it was
intended by Phelps Dodge, or their consultants, to apply
to groundwater beneath the facility; and my point is
that the consultants for Phelps Dodge at that time, in
making this quote, certainly was not referencing effects
to groundwater immediately beneath the facility.

MS. JOHNSON: Right.

And you used the comments that they were
applying this concept to some point of withdrawal
somewhere far away.

Is that -- but pursuing that, what -- can you
just give me a little bit more detail in what you're
conceptualizing here?

What do you mean by "somewhere far away," and
what was -- what do you think was proposed in this
language specifically, or in this discharge plan?

MR. BLANDFORD: Well, in this letter, which is
part of this DP record, my opinion is what they mean by this paragraph -- they don't say exactly how far away, but they say, "As the plume migrates, the dilution ratio would likely increase until the plume totally mixes."

And they don't say they think that's going to happen in one mile, two miles, ten miles. There is no reference there.

They are just saying that, clearly, your source of contaminants to groundwater is near surface, from the leach stockpile at the source, and as that contamination moves farther away from the source, there will be a greater amount of mixing with the groundwater; and that process of mixing, as the plume moves away from the source, is what this paragraph specifically refers to.

I don't know that when they wrote this paragraph they even had a specific distance in mind. I think they are describing a process, as the plume moves, it will mix, and if it's gone far enough to totally mix with the aquifer, this is what they expect.

MS. JOHNSON: Okay. So -- and this document reflects -- well, it's 1984.

This is in a letter that is developed sometime after the original proposed discharge plan, and presumably there were more negotiations after that.
Do you know where the -- if there -- or if there was a specific location at which they thought the plume would be totally mixed and you could meet standards agreed upon as a part of DP -- whatever number this discharge is --

MR. BLANDFORD: 286. DP-286.

MS. JOHNSON: -- 286.

MR. BLANDFORD: I don't recall reading a reference to where Phelps Dodge or their consultants proposed -- or thought that the plume would be entirely mixed.

Now, this is -- in this DP correspondence, there is some discussion about the trigger wells, which I mentioned, three miles downgradient, and this is the DP that there was some correspondence back and forth, back and forth, about where would groundwater standards have to be met, and I believe that some of those documents are provided in Exhibit 921.

MS. JOHNSON: So are you saying that, when the final discharge plan was approved, that there was no specific place agreed upon in that plan as a so-called point of compliance?

MR. BLANDFORD: I believe that's correct.

What I'm saying is that I believe the mine's view of what they were doing was protecting groundwater for use
by subsequent users. They don't call out the specific
nearest well, but you can discern that it's somewhere
down the Mangas Valley.

As the Environment Department has already
testified, they don't specifically state in these
permits where the place of present or reasonably
foreseeable future use is, so we have this -- this
unknown about, "Well, where was it anticipated standards
would be met?"

And my point here is that if you simply take
the information provided to the Agency, you can clearly
come to the conclusion that it wasn't the intent to meet
standards immediately beneath the pile, because the
information provided illustrates that standards would
not be met beneath the pile, even if you assumed the
mixing throughout the entire thickness of aquifer
especially right at the pile.

So I could see no way that the interpretation
by the Agency or Phelps Dodge at that time could have
been that standards would be met right beneath the pile.

So it doesn't say exactly where standards
should be met, it's somewhere downgradient, but what it
clearly implies is that it's not right beneath the pile,
or even adjacent to the pile, I would say.

MS. JOHNSON: So is it your understanding,
then, that there was never any further effort to apply
any kind of hydrogeologic analysis or contaminant
transport analysis to determine where groundwater
standards could be met? None of that was ever done?

You just went on your merry ways, with the
Department having one view and Phelps Dodge having
apparently another?

I mean, I don't -- I don't want this to be a
loaded question, but there has clearly been a lot of
confusion, and we've had questions and testimony about
what went on to -- in between administering the site
with individual discharge plans and seeming to go
forward with apparently a meeting of minds, maybe not,
and then transferring to DP-1341, where there is no --
clearly no meeting of minds between the parties.

I'm still trying to figure out what went on
and what the parties were thinking along the way, and if
you can add anything to that discussion, it would be --
I'd like to hear your views.

MR. BLANDFORD: Well, all I can say,
Commissioner Johnson, is from Tyrone's side and their
consultants, they are the ones that discussed protecting
subsequent users, and there is documents where they talk
-- in this area, they talk about down the Mangas Valley,
but they don't provide a specific location or a specific
property owner or well location, but it's clear that, in
Tyrone's eyes, they were -- in terms of where they would
need to meet standards and make sure the standards were
met, it was somewhere down the Mangas Valley, such that
subsequent users were not affected.

I have not seen, other than some of the
back-and-forth documentation regarding contingency
plans, that direct -- you know, you don't see the Agency
put out, "This is where we think standards need to be
met," you know, "Right here is the point."

My point, in going back through this whole --
this documentation, this early documentation, is that,
well, the Agency has put forth the position that, you
know, "We mean right below the pile, that's what we've
always meant, there is really no question about that."

But if you just go back and look at the
submittal and do the computations of what would this
seepage mean for groundwater computations immediately
beneath the pile, clearly nobody could have thought that
standards were going to be met beneath the pile.

So I don't know what the Agency was really
thinking of at that point, but I don't believe that they
were thinking of meeting standards immediately beneath
the facilities, which is the position that they are
putting forth in this case.
MS. JOHNSON: I assume that the way -- that the activities at the discharge site, in terms of the use -- installation and use of pump-back wells and interceptor wells and trenches, and that kind of engineering, has evolved a lot since, say, 1984 when this language was being exchanged. Is that correct?

Or were those, you know, part of the engineered system right from the beginning?

MR. BLANDFORD: No, those would have been evolved. There were capture systems for PLS installed when the -- you know, when the piles -- prior to leaching, but there were not systems installed prior to leaching to intercept impacted groundwater that bypassed those primary capture systems for PLS.

Those were installed as groundwater quality was affected at monitor wells adjacent to facilities and concentrations were rising, and that's when the pump-back systems or trenches and things of that nature were installed.

MS. JOHNSON: So it seems like, if I'm understanding this whole process, both -- and I'm trying -- I think we're all trying to get our hands around what's happened technically, as well as in a regulatory sense, and the time line.

It seems like this was kind of a -- again, I
don't want to be facetious, but it seems like kind of a
grand experiment; that nobody truly understood, when
these systems were installed, the magnitude of the
potential for impact to groundwater.

Is that a reasonable statement? I mean, we
couldn't look out 10 or 20 years and envision that we're
going to be where we are now?

MR. BLANDFORD: Groundwater directly beneath
the facility, for example?

MS. JOHNSON: No, because I -- what you --
your previous statement, what I keyed in on is that the
pump-back wells were always part of the engineered
system.

Obviously, you put leachate -- you know, you
capture the leachate at the bottom of the pile and you
pump it back and that's part of the engineered
infrastructure.

But later on, as contamination started
escaping and there were contingency plans implemented,
that you would have to maybe put in a capture trench or
some more capture zone wells outside of that in order to
protect groundwater.

So, I mean, obviously, that -- well, maybe not
so obviously, but what that seems to me to say is that,
when these facilities were installed and engineered,
that you didn't envision that there was going to be any escape, but then there was, so you put in some more protection and you implemented contingencies, and, you know, it's an evolving process in terms of your understanding of how these systems interacted with this hydrogeologic setting, and that -- was that a part of why there was this lack of understanding from the start on where you were -- what water was protected, because the engineered system started expanding, it went from just -- not just the pump-back -- not just the leach site and the seepage and then the pump-back wells and then the capture zones beyond that, and then so on, trying to get a handle on the system and the groundwater contamination. So it evolved over time, is that what I'm hearing?

MR. BLANDFORD: Maybe partially correct, but I think what -- first of all, the primary capture systems at the toes of these stockpiles are not pumping wells, it's -- there is -- and in this case, 286, for example, there is weirs constructed at the surface and the stockpile was emplaced on top of a preexisting drainage network, and so as the PLS comes down, it drains towards the channels that would have been there naturally prior to emplacement of the stockpile. Those drain to a certain point, and then there is a concrete weir
constructed to capture that surface and very near
surface flow. So there is not wells involved there in
the primary capture system, it was just those weirs.

Yes.

MS. JOHNSON: Can I stop and ask just a
question?

Then so I hearing you to say that you
understood the existence and nature of the natural
drainage channels underneath the site and that they were
intended to be part of the engineered system, that you
were taking advantage of those features to help focus
the flow of leachate from underneath the piles? Is that
what you're saying?

MR. BLANDFORD: Yes, absolutely.

By "you," I assume you mean Tyrone as opposed
to me personally?


MR. BLANDFORD: Yes, that's correct.

And then there was seepage that, over time,
bypassed underneath those systems; see the impacts in
monitor wells, which are not that far downgradient of
the systems; and that's the point that corrective
investigations and measures were basically kicked in.
That's where pumping wells would come on line, perhaps
additional trenches, things of that nature.
MS. JOHNSON: See, and this is the concept to
me that -- it is important to me, because that's a big
change right there from engineering a system that
incorporates the natural hydrogeologic features, and
then all of a sudden, "Oh, it's not working quite like
we thought it would, and we're getting deeper
infiltration, and it's escaping, so now it's going out
here, and we have to put -- you know, expand --
implement a contingency plan and expand the engineering
in order to mitigate the groundwater contamination."

Was that what happened in that phase that you
just described?

MR. BLANDFORD: Well, that capture would
happen, but I don't -- it was never -- that seepage was
never intended to be captured by the primary system.

In its discharge plan submittals, when there
is discussion of seepage to groundwater, that's not part
of the -- that's not intended to be captured as part of
the plan that was put forward.

The primary PLS collection systems near
surface may have been designed -- they are designed to
capture most -- the vast majority of PLS applied -- or
raffinate applied and turns into PLS. That's the
solution that's processed to get copper. So the mine
wants to capture as much of that as possible.
But what they are saying in the application is -- when you talk about seepage to groundwater, they are saying, you know, that we're going to apply this much PLS, but we're not going to be able to capture all of it, we're going to lose part of it, and this is how much we think we're going to lose.

At DP-286, it was 10 gallons per minute, you know, per 20-acre leach area, was their estimate of high infiltration. At 166, it was 1,200 to 1,300 gallons a minute.

So when I talk about seepage and PLS and what the mine was putting forward, that was never intended to be captured as part of the active mining process.

That's what they were telling the Agency that they expected not to capture, because it was going to seep into the ground and eventually go to groundwater.

MS. JOHNSON: So it was intended -- in your view, it was intended from the very beginning to use the aquifer -- at least this -- correct me if I'm getting this perspective wrong, but what I am hearing is that it was Tyrone's intent from the beginning to use all of the aquifer to dilute the impacts of the PLS that escaped your capture zone?

MR. BLANDFORD: That's correct.

It was their -- their intent and understanding
that they could impact groundwater beneath the
facilities, that's what the seepage calculations show,
and they acknowledged that they need to protect
groundwater, but their understanding of the regulations
and the law is that they protect groundwater at a place
of -- a subsequent user, not right beneath the facility
itself.

If they -- if their understanding was that
they could not exceed groundwater standards beneath the
facility itself, none of this would have ever gotten
through.

I mean, how could it with these numbers? That
just doesn't make sense.

MS. JOHNSON: Well -- yeah.

I mean, I guess I see a difference between
impacting the groundwater immediately beneath the pile
within what I would view as the engineered system and
impacting the entire thickness of the Gila conglomerate.
I mean, those two things are pretty far apart, and
somewhere in there, there is -- something, it seems to
me, went wrong, but that's just my view.

I think I've beat -- I think I've done enough
with those, and I think I have a much better
understanding of how all that worked and what the views
were, so I really appreciate that discussion.
I'd like to just back up to another line of questioning and clarify a few things about testimony that you gave regarding the regional flow system and Mr. Johnson's testimony on his groundwater model that he did with the State Engineer's Office.

Actually, one other sort of clarification question before that.

Do you know whether there has been any study done that quantifies what the background concentration is of the various key parameters that you're looking at as being representative of mine activity, water quality, things like TDS, sulfate, manganese, those kinds of things?

Has there been any study to quantify what natural background is for those parameters in the various geologic units?

MR. BLANDFORD: I believe that some of our early groundwater reports -- by "early" for Daniel B. Stephens, I mean the mid-'90s -- speaks a little bit to some of those issues, but there is not, to my knowledge, a comprehensive water quality study, and that has been proposed as part of the stage one abatement plan, which is Condition 34 of DP-1341. We've proposed that such a study be conducted.

MS. JOHNSON: That would be a good thing.
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(intentionally omitted)