RPM Meeting

NASA/JPL Superfund Site

Thursday, December 6, 2001

9:00 A.M. to 2:30 P.M.

NASA Management Office - Room 180-801

RPM Meeting minutes taken on Thursday, 12/6/2001, 9:00 A.M., at Jet Propulsion Laboratory, 4800 Oak Grove Drive, NASA Management Office, Pasadena, California, before VICKIE BLAIR, C.S.R. No. 8940, RPR-CRR.

ATTENDEES

KEITH A. FIELDS, P.E., Battelle
RICHARD J. ZUROMSKI, Jr., P.E. Navy (NFESC)
PETER ROBLES, NASA Environmental RPM, NASA/JPL
MARK RIPPERDA, U.S. EPA
DAVID YOUNG, Los Angeles Regional Water Quality Control Board
WILLIAM MABEY, Ph.D., Senior Chemist, TechLaw Inc.
RICHARD T. GEBERT, Hazardous Substances Scientist, State of California, California Environmental Protection Agency
RICHARD L. COFFMAN, Ph.D., R.G., Senior Hazardous Substances Engineering Geologist, Department of Toxic Substances Control
MARVIN HILLSTROM, Environmental Engineer, NAVFACENGCOM, Southwest Division
ROBERT KRATZKE, Environmental Engineer, Naval Facilities Engineering Service Center
FRITZ CARLSON, Hydrogeologist, CH2MHill

ATTENDEES (Continued)

HOOSHANG, H. NEZAFATI, Ph.D., P.E., Senior Groundwater Hydrologist/Project Manager, CH2MHill
ERIC ARONSON, Staff Hydrologist, CH2MHill
KEN MARTINS, P.E., Industrial Water Specialist, CH2MHill
ALEX LONG, Navy (NFESC)
CHARLES BURIL, JPL
JUDY NOVELLY, JPL

PASADENA, CALIFORNIA; THURSDAY, DECEMBER 6, 2001
9:00 A.M.
---000---

MR. ZUROMSKI: We have a few new additions today, so we'll go ahead and get started. I wanted to let you know we do have a different court reporter here today, Vickie Blair. So Vickie, since this is her first time trying to get us all correctly on the record, so what I'd like to do, is first of all, go around the room and everybody please introduce yourselves. If your last name is difficult to spell, please go ahead and spell your last name and, also, state where you're from.

Would you like to start, sir?

MR. ROBLES: Peter Robles. I'm the NASA Environmental RPM.

MR. RIPPERDA: I'm Mark Ripperda. That's R-i-p-p-e-r-d-a. I'm from U.S. EPA.

MR. MABEY: Bill Mabey with TechLaw, M-a-b-e-y, consultant to the EPA.

MR. YOUNG: David Young with the L.A. Regional Water Quality Control Board.

MR. GEBERT: I'm Richard Gebert, G-e-b-e-r-t. RPM for DTSC.

MR. COFFMAN: I'm Richard Coffman, C-o-f-f-m-a-n, with DTSC.

MR. BURIL: Chuck Buril, last name B-u-r-i-l, JPL.

MS. LONG: Alex Long. I work with NFESC.

MR. KRATZKE: Robert Kratzke, K-r-a-t-z-k-e. I'm also with the Navy.

MR. ZUROMSKI: Richard Zuromski with the Navy, Z-u-r-o-m-s-k-i.

MR. CARLSON: I'm Fritz Carlson with CH2MHill.

MR. ARONSON: Eric Aronson, A-r-o-n-s-o-n, with CH2MHill.

MR. NEZAFATI: Hooshang Nezafati with CH2MHill, N-e-z-a-f-a-t-i.

MR. MARTINS: Ken Martins, CH2MHill.

MR. HILLSTROM: Marvin Hillstrom, H-i-l-l-s-t-r-o-m, with the Navy.

MR. FIELDS: And Keith Fields with Battelle.

MR. ZUROMSKI: Great.

So if everybody could, again, back to our -- I know we talked about this in the past. Please speak one at a time to make it easy for her to keep track of everybody. And at the same time, if you're speaking, and I think -- if you look at Vickie and she doesn't know who you are, just kind of remind

her who you are.
MR. ROBLES: State your name, please, before you speak. That would be easy.
MR. ZUROMSKI: I think she'll catch on after a while, but maybe in the beginning if you would just -- right -- state your name.
I'd like to get started and get into item number one, which really shouldn't take very long, but I basically want to give a quick project overview. And really you can see from the agenda all the things we are looking at, really the main items on the scheule right now, which are the removal action and the EE/CA and also the OU-2 ROD.
First off, on EE/CA, today we're going to be giving you a preview presentation of the EE/CA and all the background information that was put into the alternatives that we're considering right now. And so the actual EE/CA is probably due out sometime towards the end of this year; I would say in the beginning of January. So you actually won't receive the document today, but basically the meat of the document is what we're going to be presenting to you today.
Secondly, the OU-2 ROD, you have all reviewed the draft record of decision, and I have

received comments from both EPA and DTSC. And I'm presuming that, David, yours are probably sent or are on the way, as well?
MR. YOUNG: Oh, yeah. I have them.
MR. ZUROMSKI: Great. So, basically, now we'll probably do about a two-week turnaround to review the comments and propose some responses to comments. And, actually, I think we have an agenda item today where we've got some previews. Richard, we got yours yesterday, and we got Mark's a little while ago; and so we do have a few things -- we do want to talk about that, as well, today. So then we'll review it probably toward -- until the end of the year. And this will probably -- again, towards the end of the year, beginning of 2002, you will be receiving the draft final ROD. So keep that in mind. You'll have two nice documents to be reviewing when you come back from your New Year's breaks.
Thirdly -- those are really the main scheduled items right now. A couple other things that we'll discuss later on, of course, will be pilot study project and both OU-2 and OU-1, and we'll talk about the schedule for that. But overall, does anybody have any general overview, project overview, or schedule questions at this point? I think I hit

upon the main subjects. Okay.
Well, with that, we're going to go right into the meat of today's discussion, and that's the OU-1, 3 removal action. And you all have a copy of the presentation. This is going to work -- basically I'm going to do a lot of the introductory part of the presentation and kind of talk about background, and then when we get into some detailed technical analysis that CH2MHill has done, we'll also have them also assist in the presentation.
But at any time please feel free to ask any questions you might have. If there's something that you think that maybe we haven't considered or if there's something that you think we need to consider in more detail, this is your chance, really, before the EE/CA comes out. Give us as many comments as you'd like today, and we can take those into account before we put out the draft document. Everybody can see okay with that? Okay. Great.
Well, with that, we're going to do a briefing. We've been working on this EE/CA now, I'd say for -- what? -- about six months, Hooshang? And, of course, with the modeling and everything we've done, we've probably been working on this for almost a year. But the actual EE/CA has been a combination

of efforts between CH2MHill, the Navy, NASA, Cal Tech basically coming together -- we do probably -- what? -- about once a month right now we have been having meetings where CH2MHill will put together their alternatives, a lot of their information, and present to us -- kind of like we're presenting to you today -- what they think are good options for the removal action. Then we would actually sit down and have partnering sessions with them. So there's been a lot of discussion back and forth between NASA, the Navy, Cal Tech, and CH2MHill in putting these options together.
So, you know, if there's something, like I said, that you think is missing, it might be missing from the presentation, but please ask because we might have just not included it in the presentation because there is a lot of information that we've analyzed.
So this is the agenda for today. Basically we're going to talk about -- what we did was we gave CH2MHill what we called a working removal action objective. It was basically something to put them on the course towards what NASA's looking for in this removal action. And so it's a general statement that basically helped them develop their alternatives

from the beginning.

Now, that, of course, could change when the actual document comes out, or there may be additional objectives that may come to light. But this will at least show you what we gave them to work towards.

Then we're going to go through the technical approach. I probably will look to CH2MHill for some of these items because there are some things and detail that either Ken or Fritz or Eric or Hooshang probably know a lot better than I do. But we're going to talk about, really, the approach we took in number one, looking at hydraulic containment. Really, as you'll see in the working RAO, a very important part of this process.

Number two, then, the effectiveness evaluation of the containment options. Again, you'll see in a minute, these are really key to the removal action objective.

And then number three, once we figure this out, what types of treatment technologies have we evaluated that we think will work once we get the first two items on track.

Then we'll go through a description of -- I don't want to say it's the EE/CA

alternatives. It's the EE/CA alternatives that we have definitely pinned down to date. There are a couple others that we'll probably give you a preview of that haven't been completely finalized down to the detail that will probably also be in there, but these are five that will definitely be in the EE/CA.

Then we'll show you our evaluation of these alternatives, basically some pros and cons on either side. This is really a good opportunity; I really would like your comments on the pros and cons. These are what we thought were pros and cons. We'd like to basically get some input on what you think as far as that goes.

And then we'll give you, like I said, examples of other alternatives that we have either considered and probably are going to throw out or we're considering them and we're modifying them and will include them in the EE/CA, and then we'll have questions and comments.

The working RAO, basically to reduce migration of site-related chemicals of interest to unprotected drinking water production wells. This is the statement that we've developed, and it's changed several times; but, again, it's very general because what we want to do and we wanted CH2MHill to focus on

was we want them to come up with as many creative, out-of-the-box ideas, as well as standard, general ideas that would help us keep the site-related chemicals from moving, not only off the facility, but from moving further downgradient off the site. So this was generally what we had them working towards. And, again, this might be refined a little bit more in the EE/CA or based on any comments you might have today.

Going right along with that, we also had some assumptions that we gave them and that we all really discussed when we put together the removal action objective. And these are also assumptions that were used in putting together the alternatives.

First, the chemicals of interest. Most importantly, perchlorate. Perchlorate is the one that is really driving a lot of this removal action. It's moving off-site. It moves a lot quicker than the VOCs, so it can become more of a problem. So that was really the focus. But at the same time, we do have issues with carbon tetrachloride and TCE, so those are also part of the consideration.

Secondly, we wanted them to look at -- we had some rough analysis, basically, on -- I'm not sure what type -- what was the analysis that we did

that showed the -- it wasn't a fate and transport really.

MR. NEZAFATI: No. Just a trend analysis.

MR. ZUROMSKI: Just a trend analysis, right.

MR. NEZAFATI: So you could have the concentrations of chemicals at certain wells.

MR. ZUROMSKI: Exactly. And basically looked at those concentrations over time and over -- since 1997, when perchlorate was found, to see how they've been rising.

And we saw, originally, probably about a year or so ago, you know, that slope was really steep. But it's kind of leveled off based on the current data that we've received from the City of Pasadena. But it still is going up. And so we tried to look at when certain wells were going to be at such an extent having perchlorate that it's going to be hard for them to be able to blend anymore and the need for treatment is going to become more imminent.

But we had them look at that basically to see how quickly do we need to move, and, you know, when -- you know, right here, when is the big question. This was a general trend analysis. We all know that. You got a slug, something could happen, and things could be a lot different. But based on

the general trends, we wanted to get some indication of how quickly we needed to move.

Thirdly, again, this is a removal action, and these are interim actions that we want to take to meet our working RAO. So we wanted them to look at, "Okay, these are things that we need to do now to take care of issues that we're having now." But then, at the same time, number four, how can we make sure that so we don't throw millions of dollars into this program that can't be used and be compatible with the final remedy.

So we really had, you know, two objectives there: Number one, what is something we could do quickly that we can get in place and have it do what it needed to do; but at the same time, how can we make sure that, after we spend that money, put that system in, that when we do our FS and we do all of our further analysis we'll be doing over the next couple of years, how is that going to fit in with this final remedy.

Technical approach. So, based on all that input -- that was a lot of NASA's input, that was a lot of preliminary discussions we had with CH2MHill, the Navy -- we came up with or we had CH2MHill develop alternatives that would meet the RAO

based on all that information. Then we had them assemble alternatives which have changed numbers and have changed forms and, you know, well positions and lots of things have changed, and we'll kind of go through that right now. But we had them assemble alternatives based on all that information and permutations that we did, assemble alternatives that would meet that RAO.

And then, thirdly, we had some evaluation criteria which we'll discuss which kind of is helping us to rank the alternatives, but we're not at that final stage yet. And that will be presented to you in the EE/CA, the actual alternative that we're going to recommend.

So this is the first part. Hydraulic containment. As you saw earlier, the removal action objective is to keep these chemicals from moving further downgradient. So we wanted to focus on containment of the plumee. That's the number one objective. So we looked at hydraulic containment with both on-facility, off-facility wells. We looked at -- you know, once that water was contained and treated, reinjecting it or infiltrating it and/or other public end uses such as consumption.

And so, basically, you can see, and

we'll get into it in just a couple minutes, these up here on the wall -- I'm pointing to the well configurations that were looked at in the EE/CA -- these are different alternatives. So these pumping scenarios were developed based on all these different configurations. So we looked at on-facility extraction and injection, off-facility extraction and on-facility or what we're calling an upgradient injection, which would be the wells that we have in different places but on the facility towards the west. We looked at off-facility extraction and on-facility downgradient injection as an option. Off-facility extraction and probably partial disposal. Basically extracting some and partially putting some through reinjection. And also partially disposing of some through the spreading basins.

And then, also, why not just use the city wells that have been containing this plume for the last, you know, 20, 30, 40 years; just continue to use them as the containment wells.

So these are the different things we looked at.

MR. ROBLES: What were the number of alternatives?

MR. ZUROMSKI: And there it is, to answer your

question. We looked at more than 40 different pumping scenarios, which are all up here on these diagrams. But really, with a total of over a hundred permutations of those. Because what would happen is we looked at things like different water levels when we have wet seasons, we have dry seasons, when the spreading basins in the City of Pasadena are increasing their spreading, when they're decreasing their spreading. So there's really -- I mean, these are where the wells were placed, but the actual permutations of each of the modeling scenarios, there were actually a lot more than that.

We looked at total extraction flow rates, whether it's from NASA/JPL wells or drinking water wells or whatever from two to five thousand gpm. And then we looked at injection rates, if injection was the end use, of 500 to 750 gpm per well. And those, as you can see up on the wall, are all those different permutations.

So kind of to back up a little bit, the model that we used in doing all these permutations was FEFLOW with four layers in the expanded model domain. I think Eric Aronson gave a really good description of this probably about two or three meetings ago when we were initially starting this, so

I won't really get into the model itself. But we've looked at extraction from what we're calling the model layers one, two, and three, which I think -- correct me if I'm wrong -- correspond to the hydraulic layers that we looked at in the past. The upper aquifer layer, what we're calling layers, the middle layer, and a lower layer. What happens if you extract from one and put it into another? Again, those are part of the permutations that were run through.

And then, of course, we looked at one to seven extraction well scenarios. It should be one to seven extraction wells with up to eight injection wells. So it was really just a combination, again, of, you know, if you put a couple wells here and you have to inject here. I mean, there's really a lot of things that went into it, and we'll get into a little more detail in a second.

So I think I'm going to have Fritz give a fill-in right here and a quick effectiveness evaluation part of this discussion because this is really where we're getting into how these scenarios were screened from the modeling standpoint.

Fritz, do you want to give it from here or there because I'll switch for you if you want.

MR. CARLSON: Well, I can just do it from here.

MR. ZUROMSKI: Okay.

MR. CARLSON: The first step in developing the effectiveness of these different alternatives -- I mean, the measure of effectiveness is how well do these configrations of pumping and injection wells capture and contain the known plume.

So the first step is we went through all these scenarios and we screened them with an initial review of particle tracking results; and here's an example, graphically, of what was done. You see the black line, the 18 microgram per liter perchlorate line. That's in layer number two. And this is just an example, which was done for all three of the contamination layers. And you can see the flow lines were started at the edge of that 18 microgram per liter line, and they were allowed to travel downgradient and enter various wells in each alternative. And we screened those just to make sure that the contaminated zone actually went where we sort of wanted it to go where it went into a well, it didn't escape and head off to the southeast.

So that was an additional screening. If we got an alternative that didn't contain things

very well, it didn't make the cut and we didn't worry about it anymore.

So then the next step, a more detailed evaluation of the effectiveness, a quantitative estimate of the effectiveness. And that was done by first defining the total volume of aquifer containing greater than 18 parts per billion perchlorate. And, remember, there's three layers; they all have different-shaped plumes in them. So you can figure the volume using GIS techniques, and you can figure out that basically it's sort of a lumpy sort of plume-shaped, three-dimensional volume of contamination.

And then we defined the eventual fate of water that starts throughout that three-dimension target volume. Is it going to go to well 52, for example, or the Lincoln well or the Arroyo well or new wells or some other place? And then we defined the percent of the total volume of that target area, that plume, that went to each well. It's basically a GIS intersection technique that was done. That's the math. There are different ways of doing it, but we used the GIS technique to accomplish that.

Then the measurement of the effectiveness is the percentage of the volume of the

18 parts per billion perchlorate plume that's captured by the term "protected" wells. I mean, it's the wells that we wanted it to go to, the wells that might have treatment facilities on them, that you could go to some well that's unprotected, if you will. And this is just an example of how this was done. You can see the colors, the nice fall colors, I guess.

MR. ZUROMSKI: We didn't give this to you in your presentation because you can't see it on the black and white slides.

MR. CARLSON: But sort of the yellowish area up there is the part of the area of the aquifer at the top of layer two that would be moving and eventually reach the Arroyo well. Then the -- sort of lighter beige zone are the areas that would eventually reach well 52. And then --

(Discussion held off the record.)

MR. CARLSON: You can see, I mean, this yellow illustrates some of the complications of these flow lines. If you look at that beige area up in the north, you can see that it sort of appears to be isolated, but what is going on is it's actually going underneath; I guess it's probably vertically underneath. It could be over the top, but it is

going underneath towards well 52. So there's a lot of three-dimensional flow in here that's captured in these.

Anyway, this is the approach we used, and that's how all the effectiveness was evaluated.

MR. COFFMAN: Question. Mr. Coffman.

Whenever you're looking at that one area that you said is going under, do you mean it's going down into the lower layer?

MR. CARLSON: Well, this happens to be particles -- you have to be careful with the definitions. These are particles that start at the top of layer two. So you can imagine particles that start at the top of layer two. Now, those particles actually reach well 52.

MR. COFFMAN: In layer two?

MR. CARLSON: Well, anywhere. They would be going -- I believe they would go down into layer three and then back up into layer two.

MR. ZUROMSKI: Right. That's why it's shown disjointed here. These are in layer two, but they're going down into the bottom of 52 because 52 is screened over a very wide interval. It's hard to see.

MR. CARLSON: There are a lot of

three-dimensional flow patterns here that are sort of difficult to capture graphically on a flat screen. This just illustrates it.

MR. ROBLES: Also the problem is we haven't put the topography on there. And so, you know, layer two further north is higher than what well 52 is at. So it could be screened at layer two, but it's going differently. So if we had a three-dimensional, it would be easier to see.

MR. COFFMAN: I was just wondering, when you said it went under, when it went under, did it stay within layer two or actually go into layer three and come into the well that way. But I guess it doesn't matter. It just shows that it's captured by well 52.

MR. CARLSON: It is captured. I mean, there are going to be a lot of details on the three-dimensional flow pattern that, you know, when we get to an alternative, we are going to pursue in a little more detail so we could look at those three-dimensional flow patterns. It's not there. It's not in these graphs. It's just to illustrate the technique.

MR. ZUROMSKI: Would examples of three-dimensional diagrams in the EE/CA assist in --

MR. COFFMAN: I think it would help understand

how you have this isolated area that is connected to that one.

MR. ZUROMSKI: Maybe just a couple examples. I don't know if we want to inundate you with a whole document of all the different permutations that we've done, but maybe for the alternatives that we're looking at maybe give you and show you three-dimensional examples.

MR. ROBLES: That's what we need to do in the EE/CA is to show why when alternatives are finally selected, show the three-dimensional patterns on those so they feel comfortable with them.

MR. ZUROMSKI: Okay.

MR. GEBERT: I have a question on this. Richard Gebert.

What do the percentages indicate for the different wells there? Eighty-five for the Arroyo?

MR. ZUROMSKI: How much of that volume is going to the Arroyo well. So if the whole volume of all the 18 ppb is a hundred percent perchlorate above 18, 85.6 percent of that volume goes to the Arroyo well. And this is almost kind of like a preexisting condition back before Arroyo well was shut off, is

kind of what this diagram is. And it's showing that Arroyo well was effectively capturing the plume before it was shut off, is what it's showing. And so if you theoretically put a well where Arroyo was, go ahead and pump that and treat it, you could be capturing a lot of the plume through that area. So if you have a hundred percent, that's the percentage that's going to Arroyo.

MR. GEBERT: So 85 percent of the plume is being captured by well 52?

MR. ZUROMSKI: No. By the Arroyo well.

MR. GEBERT: I meant Arroyo well.

MR. ZUROMSKI: And then I guess it would be nine percent is going to well 52.

MR. GEBERT: Right.

MR. ZUROMSKI: Are there any other questions on this graph? Okay.

So that's the hydraulic element. So as you can see, and later on today, if you'd like, we can go through and look at, in more detail, any of these different scenarios. But that was the type of analysis that was done for each of those 40 different well configurations and all the different permutations that went into all of them. And,

basically, to look at how effective each of those different alternatives you know, when you place wells in certain areas, how well could they do is what we just showed you.

So hydraulic element aside, then we moved into looking at -- once we were able to capture that water that had the perchlorate in it --

Yes, Mark.

MR. RIPPERDA: I have a quick question. You don't have to go back to that slide, but just to check the math, before Arroyo was shut off, what was the levels in well 52 and in the Lincoln Avenue well?

MR. ZUROMSKI: The levels of perchlorate?

MR. RIPPERDA: Yeah.

MR. ZUROMSKI: They were like five to 10, I think, weren't they, Chuck?

MR. BURIL: No. Actually, what had happened is before Arroyo was shut off, they were able to blend with 52, Windsor, and Ventura wells.

MR. ZUROMSKI: Right.

MR. BURIL: So they were able to continue pumping all the way until it got up into the 80s and 90s, at Arroyo. Then in the total volume sense, the concentration for Arroyo became so great that the

total volume wouldn't meet the 18, so they then had to shut it down. But when they shut it down, actually, it was over a hundred and approaching a hundred and 30 or a hundred and 40, I believe.

MR. NEZAFATI: Hundred and 30.

MR. RIPPERDA: Because if well 52 is getting 9.6 percent, assume 10 percent, of the 18 parts per billion, and the background, because of Colorado River water injection or something, is whatever, two, three --

MR. ZUROMSKI: Six or seven.

MR. NEZAFATI: Six to seven.

MR. RIPPERDA: Okay. Let's say it's six. And 10 percent is at 18, you're still essentially left with like 6.3 or 6.4. So if you're saying that the well number 52 was at much higher levels, then it seems like your particle capture thing right there, the numbers there, are either -- I'm not understanding something or maybe it's an artifact of it all being at the top of layer two, but there's other layers that are higher up.

MR. NEZAFATI: I think one point is that this was when the Arroyo well was pumping.

MR. RIPPERDA: Right. That's why my question was: What were the levels in well 52 when Arroyo

well was pumping?

MR. BURIL: That was only in the low 10s.

MR. RIPPERDA: Okay. I just wanted to do a quick math balance check on your particle tracking.

MR. CARLSON: One thing about the fall color charts is that that is weighted by the area of that 18 parts per billion plume. It's not weighted by the concentrations.

MR. ZUROMSKI: And it's all based on contouring and how well that contour is defined, as well.

MR. CARLSON: Right, exactly. And that's water that would be captured eventually; it's not necessarily water that's all being captured at the same time. So you can't really go through and do 10 percent times 18.

MR. RIPPERDA: Yeah, I know. But you've answered my question.

MR. BURIL: Coincidentally, it happens to work out.

MR. RIPPERDA: It has to be at least in the ballpark.

MR. BURIL: Yeah. And it is.

MR. ZUROMSKI: I think Hooshang actually has the numbers right there if you wanted to --

MR. ROBLES: Perchlorate wasn't actually being measured until right before the Arroyo was shut down.

MR. ZUROMSKI: Yeah.

MR. NEZAFATI: June of 1997, this is well 52, 7, 10, 11. And then look at the Arroyo well; in August it got to about 200. And then, basically, it's been really averaging about 20 or 25. And we are not clear on this date, so --

MR. RIPPERDA: That's good. That checks. I just always want to check physical reality against your particle tracking.

MR. ZUROMSKI: Definitely.

MR. ROBLES: Reality check.

MR. ZUROMSKI: Right.

MR. CARLSON: The other thing to remember is the percent of water that is drawn by well 52, it's not like 18 percent of the water or five percent of the water from well 52 is drawn from this plume. It's that five percent of the plume goes through well 52, and that's the difference.

MR. RIPPERDA: Right.

MR. ZUROMSKI: Okay. So that was basically how we determined what type of well configurations to use in the different alternatives.

Then, of course, like I was saying,

once we get this water above ground, what do you do with it? So we had Ken evaluate some treatment technologies. And so we looked at evaluation of treatment technologies for, of course, number one, VOCs, which have been present for a a long time and have been known for a while. So we wanted to consider that.

But, of course, number two, being the most important, perchlorate treatment technologies. And we'll go through those technologies in just a second. One thing I do want to note, when we did get into little more detailed evaluation, we looked at these different scenarios. We looked at where the water was coming from. This basin has a lot of other things in it, and this includes TDS, chloride, sulfate, TSS, chromium to a small extent, and nitrate, which ended up being a very significant factor, as you'll see in a couple minutes.

And so basically what happens is when we were doing different well configurations, we would see that, well, if we start pumping from a certain area and start drawing, you know, the perchlorate plume towards our capture wells, all of a sudden, the other wells from the city start drawing -- not necessarily perchlorate or VOCs that we're capturing,

but chloride and nitrate, which we have some high nitrate levels down to the south of this site, that if they get too high and can no longer blend, we've created another problem. So these are kind of the things that we had to deal with when we were dealing with the whole technology evaluation. So kind of part of the analysis.

So VOC treatment -- and I'm going to have Ken go through the actual technologies, but we can just go through this real quickly.

The primary VOC targets, as we saw, were carbon tetrachloride and trichloroethylene. And treatment technologies, pretty standard technologies. Again, VOCs, for the most part here, are fairly low. We're not really worried about high levels of VOCs to treat. So we looked at pretty standard technologies like granular activated carbon, air stripping, advanced oxidation processes, and biological treatment.

And so I think Ken is going to talk really quick about how these technologies were evaluated in detail.

MR. MARTINS: Well, Richard was great at the earlier presentation. I thought that if I'd come up front, you could see me a little better.

I'm going to give you some information on these four technologies, and ranked them, based on engineering opinion, as this: To screen them down to something that will actually be more detailed to look at.

So for liquid phase carbon, LGAC, we believed the cost to be moderate, the effectiveness good, that it can work and accomplish the goals of meeting below MCL's treatment. And the implementation being very good, that it's, you know, one of the two most comment treatment technologies.

Stripping ranked virtually the same.

Advanced oxidation, however, though, the cost is higher. The equipment is more expensive. Significant power costs, particularly here in California now, and then extra chemical costs. The effectiveness is only fair, and that's because carbon tetrachloride is very difficult to oxidize. But the implementation is pretty good, and it's well done, and there are some systems out there. But not quite as many and as well implemented as the carbon stripping.

And then finally biological, and that would be an ex-situ process. We're not talking about in-situ at this point, just simply ex-situ. And the

cost would be moderate, so likely comparable to the carbon stripping. However, the effectiveness is poor. Once again, carbon tetrachloride is the deal killer there. It can be degraded but, if it is degraded down, methylene perchloride and vinyl chloride, which are both as problematic, or even more so, that carbon tetrachloride. And then also the implementation is only fair because these contaminants are much more difficult to actually handle biologically.

So we can screen out the lower two.

So then we looked at the cost for these. We did a reasonably detailed cap and O and M cost estimate and net present value costs. These net present values, by the way, are for a 30-year net present value, okay. We present costs later on for five-year and 30-year windows. But we figure whatever we put in, even though this EE/CA is an interim action, whatever we put in is likely going to be used as part of the final remedy over at least a 30-year period. So we looked at those numbers there.

So looking at the carbon stripping, you can see they're relatively comparable. There is a difference there, but within the realm. And the accuracy of these estimates, at least you can

consider these relatively comparable numbers.
So with that in mind, we ended up selecting carbon treatment even though it was a little more costly than stripping because overall the costs really are similar, again, within the accuracy of the estimates. But it's also much simpler implementation. It's simpler operation. It's a passive filter, as opposed to the more dynamic process that stripping is. And we feel it's better public acceptance because it has the least emissions or no emissions, really, lowest visual impact, and it's just more easily understood.
Now we're going to take a look at perchlorate. Perchlorate is a different cat. Much, much more complicated process here because it's just a newer contaminant and things haven't been quite as lined out with that.
We looked at ion exchange using bifunctional resins. This is the process developed by the Lawrence Livermore Lab Group.
Ion exchange using the ISEP system is a Calgon process that some of you are probably aware of.
Reverse osmosis.
Liquid phase carbon. Once again,

there's some work out there showing it could work.
Electrolytic reduction.
Ex-situ anoxic biological reduction, which is a fluidized bed reactor like the Envirex U.S. Filter process.
A subterranean bioreactor.
Enzyme-based chemical reduction.
And iron-based reduction processes.
MR. ZUROMSKI: And, again, these are ex-situ.
MR. MARTINS: All this is intended to be ex-situ. The only caveat is the subterranean bioreactor listed an alternative of looking at a reactor below ground but not part of the aquifer, where we treat it in bioreactor, and then it would go up in the air through a filtration base and into the groundwater.
So for perchlorate treatment using the first subset of five technologies here, we rank them, once again, based on engineering opinion, what we believe the scope would be, what we believe the cost would be, the effectiveness, and implementation.
Bifunctional resin process. We believe the cost would be moderate compared to other technologies that could be used for perchlorate. The effectiveness would be very good. There's some very

good literature out there and some pilot work that's been done that shows it's highly effective for perchlorate removal. It's highly selective. And the implementation is good. Not very good, but good, and there is a good swath of data showing that it does work. But there is some development of it to be done, so it hasn't been done full-scale.
The next process, ISEP process, the Calgon process. Once again, we ranked the cost as moderate. But the effectiveness, very good. Not only are there excellent pilot-scale data from JPL site itself and other bench data, but as well there's a full-functional system in La Puente that you may be aware of. Implementation is very good. It's been done full scale.
Reverse osmosis. Cost, high. Equipment cost is relatively high, but the O and M cost is going to drive it very high beyond that. It really is just overtreating the water because you're removing all salts. The effectiveness, fair to good. Because in this instance we have to remove a significant portions of the contamination percentage-wise. And so while reverse osmosis can do it, it might take a two-stage process. Once again, there has been some test work along those lines

showing that we really took a two-step process to do that. Implementation is very good. That is, the equipment is common and could easily be implemented.
Carbon treatment. Costs, low to moderate. Particularly low since we might already have carbon on line for the VOCs. However, the effectiveness is fair to poor. There is some literature showing you can move perchlorate with carbon, but it's just not an appropriate technology. There are some ion exchange properties to carbon, but it's going to have a relatively short life to it. Not as predictable. It's going to depend possibly more on the contaminants within the carbon and how it was activated versus ion exchange resin is a much more predictable technology. The implementation, though, is very good. They're common systems.
Electrolytic reduction. This is a process where we use like a metal electrolysis kind of system where we have anodes and cathodes that can electrolytically reduce the perchlorate. In this case here, the cost is moderate, but the effectiveness only fair because it hasn't been developed. There is a patent that discusses the usages on perchlorate, but it hasn't been developed at a scale that we can seriously consider for the

EE/CA. And the implementation in that case would also be only fair to poor.

So we eliminate the lower three and keep the top two.

Ex-situ biological. This is the process that U.S. Filter has in their newest systems. And once again, we believe the cost to be moderate. The effectiveness, very good. Excellent lab data, pilot data from JPL, as well as full-scale data from Rancho Cordova and Longhorn and Army emissions plants. Implementation is very good, but none full scale.

Subterranean bioreactor. It really is the same biological process as the U.S. Filter process, but it's a fixed media, a rock media; and the biomass has to grow on the surface of the rock. We would feed it with methanol and nutrients and run it in an anoxic atmosphere. So the cost would be moderate. The effectiveness we believe would be very good, but the implementation is only good to fair because it hasn't been done on full scale, and there's some complicated issues here with regard to just sheer area we would need to do it.

MR. ROBLES: What was the area?

MR. MARTINS: Fifteen acres, roughly.

MR. ZUROMSKI: We could, of course, remove all those buildings.

MR. ROBLES: Yeah. Why not relocate?

MR. MARTINS: Or do it and build on property on top of it. It's possible, but it's a pretty big project. And there's other issues that come into play, too.

And then there's enzyme reduction. A French tarragon enzyme has been found that catalytically can reduce perchlorate. And the cost would likely be low to moderate; and in the future, this could be a very, very promising technology. However, the effectiveness really is uncertain. There's just some preliminary lab data; and, therefore, we also have to state the implementation is poor.

Iron-based reduction. It's a sort of electrolytic process. We're going to use iron, ferrocene, to help provide a reox reaction to reduce perchlorate. Again, there's lab data showing that it works. It has been done, but not at full scale, so the implementation is poor.

So with that in mind, we retain only ex-situ biological from this list.

So the next slide.

So out of all the technologies we looked at, we're down to this: Ion Exchange using bifunctional resins, the Lawrence Livermore process, they came up with.

Ion exchange using the ISEP process from Calgon.

And then an ex-situ anoxic biological reactor using the fluidized bed reactor like the U.S. Filter Envirex process.

Other treatment issues. Ion exchange and biological treatment for nitrate reduction. Richard mentioned earlier about how we have a nitrate plume itself at our site. So if we're extracting water for perchlorate and VOCs in the north, which was the low nitrate section, you can no longer blend and meet nitrate levels with the city. So that means we may have to treat at the wellhead for the other wells, the Ventura wells, for nitrate reduction. So we need to look at that here.

In the case of the bioprocess, we'll have like filtration for TSS reduction, so when we reinject, it cannot foul the wells up.

pH adjustment.

Treatment for chromium. The treatments we have for perchlorate should treat for chromium,

but we need to just keep that in mind.

And then ion exchange, reverse osmosis, for chloride reduction. That could come into play with the ISEP process, and we'll talk about that shortly.

But these are all really ancillary to the main process requirements. We didn't focus on the other stuff, we kept this in mind. We've included costs for some of these things for our processes.

MR. ZUROMSKI: Actually, if you look at your agenda now, this is really the background information. This is all the background information on the hydraulic approach and the technologies evaluated before we actually get into the current alternatives that were evaluated in the EE/CA.

And so I wanted to see at this point, number one, I did have it, of course. We had it as kind of a breakpoint in the agenda. But at the same time I wanted to see, based on all this background, and before we really look in detail at the alternatives, do you guys have any general comments, questions, or concerns with any of these things that we've presented so far before we actually kind of meld it and, you know, put it all together?

MR. ROBLES: Do you think that we missed something?
MR. ZUROMSKI: Is there something we haven't evaluated?
MR. ROBLES: In your experience, do you think that we've missed something, because we think we covered everything?
MR. COFFMAN: Have you looked at a possibility of bioplowing or problems like that since you're also having to deal with outside problems with the water just beyond the VOCs that you identified like chlorine and nitrates and things like that? So have you evaluated that in these treatment technologies that you're looking at?
MR. MARTINS: Are you talking about bioplowing from the extracted water or only when we try and reinject? I'm not sure --
MR. COFFMAN: Either/or.
MR. MARTINS: Okay.
MR. COFFMAN: It's a problem in a lot of treatment systems where you can address one type of contaminant, but it causes a problem with another one. So you're trying to treat several different kinds of contaminants.
MR. MARTINS: Right. We have a relatively low

TOC in the water outside of what sort the DMCs are.
MR. ZUROMSKI: But the answer is yes, that we have.
MR. MARTINS: Thank you.
MR. COFFMAN: That's Richard.
MR. MARTINS: We have added filtration on the ion exhange to cover Richard's issue. And then on the bioprocess, then it's all part of that process that would be uptake in that process, and then that is filtered downstream before it's reinjected.
MR. GEBERT: In the EE/CA, you'll list, you know, what you've considered. You don't have a problem with sulfate?
MR. ZUROMSKI: We do have sulfate above the basin plan levels here, and that was one of those kind of ancillary issues that would probably get treated through biological system and the ion exchange system, but maybe not to the level to the basin plan, which is kind of one thing that we're kind of talking about.
MR. MARTINS: Again, these would be consistent with the extracted water, so things are not going to change much in the process. But the chloride is an issue with the ISEP process, which we'll talk about later on, that increases significantly.

MR. GEBERT: Sulfate, you would probably go to anaerobic treatments?
MR. MARTINS: If we had to do that.
MR. ZUROMSKI: Right.
MR. MARTINS: We don't anticipate that as being a problem.
MR. ZUROMSKI: The fluidized bed reactor, the way it was set up, if you look at the pilot test results, it treats all the nitrate. And then they stop it when it treats the perchlorate so it doesn't get to the sulfate treatment, so you don't have hydrogen sulfide produced.
MR. MARTINS: It really isn't an anaerobic; it's anoxic.
MR. ZUROMSKI: But that, of course, leads to the problem of the ancillary system because the part coming in and the part coming out are the same, but they're already background above basin plan levels, so that brings us into problems for reinjection.
MR. MARTINS: Although we think that's negotiable there. But the perchlorate issue is a more significant issue. Actually, it's a natural increase.
Did you want to break?
MR. ZUROMSKI: I was going to leave it up to

you. Do you want to break? We're going to get into a lot of more detail now and throughout the discussion.
MR. BURIL: Let's take a break.
MR. ZUROMSKI: Let's take just about five, 10 minutes here, come back, and then we'll go into the details. Please, while you're at it, take a quick look at what is on the wall kind of just so you'll know what you're staring at from back there. I know that's a little hard to see. Then we'll come back in about -- how about in eight minutes, 20 past.
(Recess taken.)
MR. ZUROMSKI: So we've seen so far all the background information that went into the selection of the alternatives, and so now what we're going to get into are the alternatives that are going to be in the EE/CA that we know of so far, and then some other things we're considering that need a little bit more analysis before we decide whether they're going to be in the EE/CA, if they're feasible or not. So description of the alternatives, alternative 1A, 1B, and 1C. What I'm going to say right now is that alternatives 1A, 1B, and 1C, the hydraulic element, extraction wells with a total capacity of 3,000 gpm -- yes.

MR. ROBLES: Just one concern. How many alternative numbers did we have when we started this?
MR. NEZAFATI: You mean in terms like 1A, B? Maybe 12, 15.
MR. ROBLES: Just to let you know, we've looked at many, many alternatives.
MR. ZUROMSKI: And these are combinations of both the hydraulic element, technologies, seeing which ones are going to affect how the plume changes and also where the new areas of other chemicals that we have concerns with are going to come from.
So based on all that, alternatives 1A, 1B, and 1C have the same hydraulic element. So the only differentiation you're going to see in there is the treatment option.
So the collection option for all three of those are extraction wells with a total of 3,000 gpm placed as one on-facility well 600gpm, and two off-facility, 1,200 gpm wells. And there they are. I was going to say it's all up there, but here they are.
So, as you can see, the extraction areas are in area one, as we saw earlier, right next to the Arroyo well. I think Eric and I met with the City of Pasadena about two months ago, and we talked

with them about the condition of their Arroyo well and the feasibility of using it. I think we're definitely going to test the well. We're going to actually try to take some samples fairly soon. But what they saw when they shut it down, and the last time they took samples, is there is a lot of rust, and they're thinking the well is starting to degrade because it's very old. So one thing we asked them to consider in the cost is the replacement. However, in the same area screened over similar intervals because, as we saw, it was very effective for pulling the chemicals from the site.
And then also about not quite halfway in between well 52 and the extraction well at the Arroyo well site, another extraction well. Those are two 1,200 gpm wells. And then one extraction well three at 600 gpm right in the source of the perchlorate plume where it originates. This is around monitoring wells seven and 16, which have historically been the highest levels of perchlorate. I think it's right around in these areas right here. But that, again, would be a source reduction well to help decrease the mass of chemicals that are moving to the off-site wells, which are more for containment. At the same time, we

found that if you also were going for injecting as an option with this, we were going to be injecting this 3,000 gpm upgradient.
And what happens is that we increased the flow to such a level with that 3,000 gpm injection that it actually pushes the plume in a funny shape south if we don't extract on-site. So we need to extract on-site, not only to remove mass, but also to help us contain what we're reinjecting so it doesn't shift the plume.
Does that make sense? That makes sense to you guys? Good. So that's the hydraulic element for options 1A, 1B, and 1C.
Secondly, then you have the treatment technologies that Ken just discussed a couple of minutes ago. Alternative 1A is the same hydraulic element using the bifunctional resin ion exchange.
Alternative 1B is the same hydraulic element, again, with the fluidized bed reactor. And we can switch those, as well.
And alternative 1C is, same again, same hydraulic element, with the ISEP system.
So, basically, once you do contain the plume through that hydraulic element, how do you treat it? And really that comes down to several

issues which have to do with both reinjection and also with the other chemicals, depending on which technology you're using, comes down to issues like chloride or biological issues for injection.
Is that --
MR. MARTINS: That's basically right.
MR. ZUROMSKI: Okay. Because what happens is, okay, I'm not so sure with the ancillary chemicals for the bifunctional resin. I don't think there was that much concern with that.
MR. MARTINS: No. It's very selective resin.
MR. ZUROMSKI: Very selective. So you're not having a very high increase in the chloride concentration in the reinjection water. So you're basically going to stay about the background level. Whatever you're extracting, you're going to be putting in probably the same level.
Same thing with the biologically-treated water. You're going to have all different types of background things of chloride or sulfate or TDS. They're all going to be about the same. They don't really change in the reaction. Though, of course, these treat perchlorate and nitrate very well, the one issue, of course, with the biological treatment is reinjection of

biologically-treated water. And we'll kind of get into those pros and cons in a minute.

And then, thirdly, of course, you have the ISEP system. And, again, it removes all the perchlorate and nitrate, but you're going to have issues with sulfate. And, actually, you have to remove the sulfate.

MR. MARTINS: Sulfate is coming out. That's one of the problems.

MR. ZUROMSKI: Right. And that's one of the things that does raise the cost.

But the issue with the alternative 1C is that it significantly increases the chloride level above background because you are exchanging not only perchlorate and nitrate, but also bicarbonate for chloride, and so you're going to start increasing your chloride concentration well above the background level, therefore, having problems with the basin plan requirements

MR. BURIL: Did Calgon indicate to you --

MR. ZUROMSKI: Yeah. And, actually, I will get into that; and we haven't done a full analysis of that, as well. Calgon has given us some options that we haven't really looked at in detail. And depending on which -- it's not going to swing too much of which

option is taken, but it is good to note that Calgon has some preliminary results, not from any full-scale application, but from some work they've done in their lab, that shows that they can reduce the chloride. And I think they have a low, medium, high option. And they can get it down -- still above the basin plan level, but into the 40s to 50s for excess chloride rather than 150.

So there are ways to bring it down, but you're still going to be having issues with the chloride no matter which configuration you use. But it will bring it down if that's an issue we have to deal with.

MR. BURIL: You said chloride is already a problem?

MR. ZUROMSKI: Chloride is already above the background levels for the basin plan, which is 15. And we see on our site anywhere from 20 to 150 chloride depending on the wells you're looking at.

MR. BURIL: And it's interesting to note, too, that the water company just upgradient of us injects water which is well above the basin water.

MR. ZUROMSKI: Right. Right. And, actually, I was kind of pointing that out to, I think, Bill and

Richard and David earlier is what happens is that when you look at our annual monitoring reports, which do a full chemical analysis of, also, just the regular anions and cations in the groundwater, you can see -- here's the Valley injection wells upgradient. You see in the upper layers, in MW-14 and down here in MW-10, higher levels of chloride and lower levels in the lower screens. But then, basically, as you can see as it moves along, you see higher levels down here and lower levels in the upper screens. So you can see that there's some chloride being injected that does move across the site. So that's something that we're having to contend with, as well.

So those are the first three options really distinguished by not only what's being reinjected, but, again, also by cost. And if you look at costs, I want you, if you can, to try to ignore the 30-year net present value for right now. We're looking at a removal action, and so we're looking at what is really going to happen over the next -- I'd say two to five years. And so really look at the five-year net present values when you look at these numbers. And you can see that for alternatives 1A and B, you have, if you consider it with or without the nitrate treatment, that the

biological treatment is definitely the cheapest, but, you know, not that much. Four million, five million, between the two ion exchanges in this one. So you have some benefits there.

Yes, Hooshang.

MR. NEZAFATI: I suggest that we have a couple of slides that --

MR. ZUROMSKI: On the pros and cons.

MR. NEZAFATI: -- basically gives some assumptions on costs which helps you to explain that. We can get to the costs later.

MR. ZUROMSKI: We'll get to those in just a second. But those really have to do with pros and cons, which we'll get into in a moment.

So now I'm going to go and quickly introduce alternatives 2A and 2B, both of which are wellhead treatment systems.

Alternative 2A basically involves using the current well 52 and a new Arroyo well, as we discussed earlier, to collect about 3,200 gpm of water containing perchlorate coming off the site. And what we found through the modeling is that, based on what you saw earlier in the diagram that showed where the different water is being captured, those two wells are capturing almost 98 percent of the

perchlorate plume that's coming from the site, or at least while they were operating.

So we found that by doing this type of system, you can collect and prevent the migration of most of the perchlorate plume from moving off-site.

So, basically, the idea is to, first, start out with well 52, build a system, put it on well 52. Go through the 97-005 process to get -- which is a DHS process that requires you to do a background analysis and search for different chemicals before you start operating a system in what they call a contaminated area, and basically get those two wells on line to perform the collection for this containment option.

Yes.

MR. BURIL: Is it your thought that you would put a perchlorate treatment system on line with 52 prior to completing 97-005?

MR. ZUROMSKI: Yes. On well 52.

MR. BURIL: Can't do that. 97-005 says that if you alter a well as a result of contamination, you fall subject to the process immediately.

MR. ZUROMSKI: Okay. Well, we actually have done, I know -- and Peter Torrey is not here -- we did look at the regulation in detail, and that putting

the ISEP system or any type of system on 52 right now does not trigger 97-005; however, when we bring Arroyo well on line, it will trigger 97-005.

MR. BURIL: That I would suggest very strongly that you verify this with the DHS because with Gary Yamamoto, the chief engineer for this region of DHS, and Vera Melack-Vecchio, sat in this room two years ago -- three years ago now. They told us, "If you alter a well's discharge to deal with contamination, you fall subject to that requirement."

Now, whether they've since interpreted differently, I don't know. That may very well be.

MR. ZUROMSKI: This is really based on our current conversations. We've talked directly with both Sacramento and the local DHS, and the current picture looks like we can put this treatment on well 52 before we are subject to 97-005

MR. BURIL: Okay.

MR. ZUROMSKI: Hooshang.

MR. NEZAFATI: We are not altering the flow rate.

MR. BURIL: It's not the flow rate.

MR. ZUROMSKI: It's altering the treatment.

MR. BURIL: If you add treatment -- the way it was previously -- but, again, it sounds like it's

changed. But the way it was done previously, if you have to treat a well in order to keep it working for you, which is the way I think that they would view this, then you are subject to the 97-005 requirements.

MR. NEZAFATI: Well, like Richard said, he has talked to the same people that you just mentioned.

MR. BURIL: Okay. Well, then, they've apparently backed off of it.

MR. NEZAFATI: They may have some different interpretations.

MR. ZUROMSKI: I think it really depends on the interpretation and things, but that is one thing that we have researched. But it will definitely be triggered by adding a new well on line, which would be the new well in the Arroyo well location.

MR. YOUNG: Hey, Richard.

MR. ZUROMSKI: Yes, David.

MR. YOUNG: Historically when well 52 and the Arroyo well were capturing 98 percent of the plume, were they pumping at the same gpm capacity as that?

MR. ZUROMSKI: Roughly, yeah. I think that well 52 pumps around 1,200 gpm and Arroyo is around 2000 gpm

MR. BURIL: Correct.

MR. YOUNG: All right.

MR. ZUROMSKI: And that's why you could see earlier that, you kow, Arroyo well was capturing a lot of the plume, number one, at a higher flow rate, and, number two, it's obviously screened in such a way that it was just a lot more effective at capturing the plume.

So that's the collection option, again, for both options 2A and 2B, again, based on the effectiveness evaluation, effectiveness evaluation that Fritz talked about earlier.

And the treatment options that would go with that are actually the same, as well. Both of them are treatment at the wellhead basically modifying the VOC plant that's out there already, so you don't have to consider new VOC treatment, and adding on the ISEP plus system for treatment to drinking water standards. And, of course, the end use, then, of course, would be to the purveyor for public consumption on both 2A and 2B.

The difference comes -- and you can see here in yellow, it shows treated for the full capacity of 3,200 gpm. We did some analysis based on how much right now the city -- how much water they're

pumping and how much they can blend. As they were doing back four years ago when they were pulling the water from the Arroyo well, it was at a much higher level -- it was like 80 or 90 -- before they couldn't blend anymore. And it's really because of the total volume of water they were pumping. So what we saw is that when you get this new well on line, the new well in the Arroyo well area, and you have that pumping, you can actually operate this 3,200 gpm system at around 1,800 gpm to still be able to treat significant amounts of perchlorate really only on the Arroyo well where the highest levels probably will be, and treat the one well, and they will still be able to easily get below the action levels.

Now, you're going to say there's going to be issues with that, and, you know, the operations. And so we did consider a contingency for having available the full 3,200 gpm as necessary. And so really this comes down to a operational standpoint and what is really acceptable to both the regulators and the purveyors. But it's really to show how much cost savings you can get between the operational modification. And you can see, when you look at 2A and 2B, the costs really aren't that much different if you look at the five-year net present

values. So it shows you that, you know, if you're going to do this, you might as well go full steam and move forward. And that's on alternative 2A.

So again, those are options 1A, 1B, 1C, 2A, and 2B, and those are ones that at least right now we're retaining for further evaluation into the end; they will be in the EE/CA.

Now, I think we're going to get into a little bit later some other options we've looked at, but right now let's just focus on these five in detail, pros and cons, and I think -- Ken, are you going to help me go through some of these?

MR. MARTINS: Whatever you want me to do.

MR. ZUROMSKI: Whatever you'd like to do, Ken, that's fine.

MR. RIPPERDA: Can I just ask a few questions first?

MR. ZUROMSKI: Yes, definitely.

MR. RIPPERDA: First, does NASA agree that 300,000 a year is incidental? Just a joke.

MR. ROBLES: What I will tell you is that we had a hard time. The CH2MHill folks understood NASA's concern with certain treatments. They really came to us and said you really have to look at well treatment. It's very effective. So we did.

MR. RIPPERDA: Oh, so you listen to CH2MHill, but you don't listen to Chuck or me.

MR. ZUROMSKI: Well, you know, one of the other things is -- good point. But, you know, on top of that, Mark, that's true. But, also, you have to also look at what we're thinking of. Again, this is a removal action. This is for, you know, two to five years. We've also looked at how these can fit in the final remedy, and you'll see in the pros and cons how you can take that wellhead treatment option and turn it into a final remedy which may help actually contain the plume and help start removing mass, as well. So it gives us options is one of the reasons why it was retained because there are lots of other things that were involved that may make it more attractive. But, again, we're looking at it from the short term. So the short term to meet our goals, what would do that, and then fit into the final remedy.

MR. ROBLES: Plus the fate and transport particle tracking show very clearly that this really meets the RAO criteria.

MR. ZUROMSKI: Very effective.

MR. RIPPERDA: You don't have to -- like I've

been telling you for the whole time I've been here that you just treat the Arroyo well --

MR. ROBLES: Now we have technical backing to support your recommendations.

MR. RIPPERDA: So next question: The costs over here on any of the -- you know, extraction and injection, do they include the cost of the replacement wells? Yes.

MR. ZUROMSKI: Yes. And that's what I was just going to go through. These costs are -- I think -- what's the capital cost for the Calgon system? Like $9 million or something like that.

MR. MARTINS: I think it was only five.

MR. ZUROMSKI: Five million dollars?

MR. MARTINS: Yeah. 5.5 or something.

MR. ZUROMSKI: So on all of these, you've got these capital costs over here, capital costs of $23 million. But the ISEP is only five million. And you say, "Well, how's that?"

Well, because you have all the well costs, you have treatment, extraction, disposal, if disposal, of course, includes, especially on these downgradient options, six more wells to inject. Very costly.

It also includes, and this is clear

across the board, I think five additional monitoring wells. So at -- what? -- about 300,000 each or something like that? That includes a pretty significant amount of cost.

You also have replacement wells. Like we were talking about, what if -- okay, for example, if you do alternative 2A, you don't need replacement wells because you're going to be delivering water to the public. But what if we take over those wells and we start pumping and reduce their capacity? You might have to consider how that's going to affect their ability to pump, and then you might have to include replacement wells. Those are included in the costs.

97-005 requirements. That's a costly and lengthy process to go through.

Possibility for the nitrate treatment.

And then, also, continued operation of the VOC treatment. Again, look at the cost savings. Here you have additional VOC treatment; there it already exists.

So those are definitely factors that went into the cost. I don't know. I don't think there's any --

MR. MARTINS: Well, one more big cost that hasn't been so explicit is the pipeline. If you look

at the drawings, you can see, you know, how much pipeline.

MR. ZUROMSKI: Pipelines, right.

MR. BURIL: Like a million dollars in piping alone.

MR. ZUROMSKI: Right.

MR. RIPPERDA: Well, I'm actually surprised that all of the new extraction/injection costs, as far as the O and M, is about the same. I would think that the extra pumping requirements, just the, you know, the pumps and the energy, go through that. And when you replace the City of Pasadena well at some more remote site and have to build new pipeline for that.

MR. ZUROMSKI: I think we might have considered that as a flat cost. Is that correct, Ken? The O and M and everything for the replacement wells and pumps and everything, the pipeline.

MR. MARTINS: Well, the replacement wells, we didn't add anything for labor for those because you guys swap out the labor they would have had, anyway. The same thing for this inspection. We did take into account the difference in potential pumping head you had to face there versus what they used to have. But that was actually pretty small differential.

MR. BURIL: So 1A, B, and C do include the capital costs of the replacement wells themselves?

MR. MARTINS: Yes, that's right.

MR. ZUROMSKI: So, again, lots of factors affecting cost other than just your normal O and M and capital costs.

MR. RIPPERDA: But luckily you're almost done with the 97-005 process because the regulators all asked you to start those a couple years ago.

MR. ZUROMSKI: Right. And we should be done tomorrow, right, so it shouldn't be a problem.

So when you look at the alternatives, and here's basically just laying out what you see up here on the board straight out in front of you, here's your comparison for the costs. And you can see, you do get a lot of cost savings of not having to pipe in the additional measuring treatment and things down here. But then when we get into the pros and cons, you see -- there are still pros and cons on both sides. So you can't look at cost alone. But cost is a factor over five years.

So here's evaluations of the alternatives. Ken, I'd like you to come up here and we're going to talk some more because these really have to do with a

lot of the effectiveness of the technologies. And, Hooshang, please feel free to jump in.

This is kind of where we sat down, Chuck, Peter, myself, some other folks in the Navy, Marvin, all the CH2MHill folks, and Alex and Kimberly at one time, and we really went back and forth --

MR. ROBLES: And Judy was at the meeting.

MR. ZUROMSKI: I did mention Chuck and Judy. And we sat down and really talked about, okay, cost is one thing, but what are all the other pros and cons?

And these are things that we have thought, on our side, you know, what are the things that make these more attractive than not. And so what I want to do is this is the time where, if you guys have any comments, if you think something we think is a pro is a con or a con is a pro, please let us know because these are definitely things that go into the evaluation of these alternatives.

And we actually, I think, at one of our last couple meetings, we came up with a whole list which really ended up being the CERCLA criteria, but a list of factors that helped us do this evaluation. So this has been done pretty much in detail, but here's a summary of the pros and cons.

Again, going back to alternatives 1A through 1C, the hydraulics are all the same, so we just considered the pros and cons of the hydraulics separately.

First, as we were talking about earlier, moderately effective in meeting the RAO. When you looked at, again, the analysis that Fritz did, and you look at adding those three different wells, plus the injection, how much is actually captured, you get not a hundred percent capture because it's not a full containment alternative, but you get pretty good capture of the chemicals such that they're not going to migrate downgradient.

Secondly, this also, this alternative, provides pretty good protection not only for the city wells, but, also, if you look shortly downgradient, you have the Lincoln Avenue wells, which are in the low -- what? -- 10s, right now for perchlorate. But if things aren't moved along, those will eventually increase, as well, as well as downgradient.

MR. MARTINS: Yes.

MR. ROBLES: That was one of the things that we saw in the particle tracking was that the Lincoln Avenue well number three had a very minute trace of downgradient chemicals going to it. And it was a

concern that we wanted to make sure that we included it as part of the alternative that we have to really look at because we didn't want problems with Lincoln Avenue.

MR. ZUROMSKI: Right. Because though the chemicals are low right now, the perchlorate is low, over time, of course, as things move downgradient and with the absence of the Arroyo well -- the Arroyo well, of course, effectively capturing a lot of this plume for very many, many years, you know -- the flow has increased toward Lincoln Avenue now. So that was definitely something of concern. So definitely a pro to this option is that it contains some of the plume from moving toward the Lincoln Avenue wells.

No risk from serving water to the public. Always, you know, a concern. Is the public going to accept treated water? What if there are upsets in the system? Definitely something to think about that; if you're going to deliver the water to the public and you're going to treat it, it has to be very seriously considered. But since you're injecting, you don't really have that concern here.

Effective plume migration control. As we talked about, it also provides containment of the high concentration areas, which pump and treat we can

see is not the only final remedy for the site. I mean, really it's for containment. But it just has the incidental effect of putting a well in the high concentration areas to not only remove that mass but to help contain the plume from the injection. So it does provide some benefit that the other option might not provide.

And, then, finally, it's probably very likely to be consistent with the final remedy. If you do this type of containment, once you've got the plume contained to a certain area, then we can do things like in-situ degradation. Other ways to reduce the mass on-site. And if the plume's contained, it gives us more time to do that. So definitely pros to the hydraulics of 1A through 1C.

However, there definitely are cons, and these are to the hydraulics again. You have typical issues with reinjection, as Richard Coffman brought up earlier. You not only have your issues with fouling, but you also have issues on this site, which we found -- thank you, Chuck, we really appreciate it -- piping routes. As you can see, look at where this piping route goes. It goes all the way up and around the spreading basin and all the way down along the fence line. And that's because we were informed

that we were going to try to just bring it straight through here. Well, two problems with that:

Number one, endangered species issues with having to bring it across the Arroyo, which is now a critical habitat for the Arroyo toad.

Number two, utilities, utilities, utilities. That was really the main reason why this pipeline was chosen to go along this way.

And so, again, I mean, that's definitely going to be something that has to be considered. It has a lot of costs, and we're still going to have to figure out where, you know, where are you going to put this going along the fence line? It's definitely going to be -- whether it's above ground or below ground, it's something to consider.

Definitely another con was nitrate treatment. This wasn't really clear from that little picture that we showed earlier where it showed where the wells were going because that's really where the 18 ppb water was going because that was only perchlorate. But what is not shown is when you looked at all the different particle tracking scenarios, what happens is: Say you have your two extraction wells up here at Arroyo and somewhere

between well 52 this is going to pull a lot of the water from the site and up here into those extraction wells, which that's what we want it to do. What happens, however, is it shifts the pumping from these two city wells down here to this area up here which is upgradient in La Canada where they have a lot of unsewered areas that have high nitrate. And so all of a sudden you have this new nitrate being drawn into these wells, and that requires nitrate treatment. So that's definitely a con to that type of scenario. Of course, you can easily add nitrate treatment, but that does add to cost.

How they're handling -- just to let you know, how they're handling that now, of course, is through blending because they are still getting a lot of that water going through here. But they wouldn't have the capacity to blend that down anymore.

And then another thing, of course, is the added cost of the replacement well; but not only that, trying to find a place where that replacement well could be located to avoid any impacts of having to put additional treatment for not only VOCs but more perchlorate treatment. Why go ahead and spend millions and millions of dollars here when we are going to have to put another well for perchlorate

treatment right downgradient? It kind of seems to defeat the purpose. So definitely cons to that alternative.

More cons? Boy.

These are kind of some of the things that kind of came up at our last meeting, actually, was a portion of this injected water in about five years, once we are injecting up here, is going to eventually reach these wells down here, the city wells. And really the concern with that was --

MR. NEZAFATI: Basically that, you know, a portion of that, not a hundred percent of the water is being captured by the extraction wells, so a portion of the extracted water, even though it's treated, but it's going to be captured by the city wells. So the same issues with creating the plumes, or public health and whatnot, that could be also to some lesser degree applicable to this scenario.

MR. ZUROMSKI: Right. That really goes along with the next bullet of small risks in creating new plumes. You know, the "Aerojet" scenario where at one time they were treating water, didn't really know that there was perchlorate in it, and were injecting it downgradient. All of a sudden now you have a plume twice as long as it originally

was because you were injecting things you didn't know were there.

So a smaller risk with this one. As you'll see in the later one, some other options that we have, maybe a bigger risk, but a small risk of creating a smaller perchlorate plume which could move across the site here, as well, if it wasn't treated effectively. So those are other things to consider.

Also, you have your injection well capacities. These are right along -- I don't know -- for most of you, you have been around long enough to know that there's a fault that runs -- what, Chuck? -- right straight through around -- right around here, right around the top?

MR. BURIL: Basically right across the top of there.

MR. ZUROMSKI: And so if we're injecting water right against the fault, that might pose some problems with injection. Definitely things that we need to consider.

Of course, placement of injection wells was a very big issue so this was probably the most, you know, beneficial place to put it because it didn't push the plume very far. But, you know, if

you put it in different places, different effects. And, again, that went into the many scenarios that we looked at; and still, even with that issue, it's probably the best place to do injection.

And then finally a con is that you have continued operation of the VOC treatment plant because now you have VOC treatment here, but you also still have it out there, which you can't avoid with some of the other options we've talked about here today.

Now we're going to get into treatment.

So we did the pros and cons because since, again, hydraulic elements are the same.

Bifunctional ion exchange. And, Ken, you want to go ahead and run through these? And this really gets into what are the true pros and cons of each of these treatment technologies, and this is really pertinent to everything we're talking about here today, these pros and cons because you are going to have these type of issues.

MR. MARTINS: Okay. You recall earlier for the perchlorate we narrowed it down to three different alternatives: Bifunctional ion exchange resin, the anoxic biological process, and the ISEP process.

So with the bifunctional resin, pros and cons on the same chart here. It's easily argumented, as a pro, because it's individual vessels, and if you currently have four vessels on line, you could add a fifth or a sixth vessel again after capacity. And the regeneration systems could easily be adapted to the additional fifth and sixth vessels, for example. So that's a real positive because in the future we figure we may need to build onto the system for the final remedy, and we want this system to be able to be used for that.

Then there's also minimal impact on TDS and chloride concentrations because the resin's very highly selected for perchlorate, based on some nitrate, too, but a much smaller -- you know, focuses mostly on perchlorate as opposed to the other resin process; for example, it takes out virtually any andiron. And, so, therefore, it has less impact on TDS and chloride.

On the alternative for cons, the technology is not proven at full scale. Some pilot work has been done. Some very good bench-scale work, supported by the nation's -- one of the nation's best labs, but it's not done on full scale. And the reality is, is there will be lessons to learn at full

scale that we don't even know about yet.

And then the cost is on the higher side. It's not the least cost alternative by any means.

Turning to alternative 1B, the anoxic biological reactor is the fluidized bed reactor like the U.S. Filter and Envirex. The pros look pretty good. It's technology proven at full scale. There were some upsets we had recently about, you know, how well it's run at the Rancho Cordova site. I talked to the engineers and the people that built the system from many years ago, and they are very happy with the system overall. They've had some issues, but it's issues they caused themselves. They've done a number of tests trying different concentrations of menthanol and substrate concentrations, different flux rates and flow rates, and they've gotten themselves into some trouble doing that. But whenever they've just operated the system for the purpose of just letting it run, they have been very pleased with performance. They meet the non-impact limits. And they have influence that are 2,200 ppb, as opposed to our numbers which might be 350. So they're much higher concentrations, but they still meet the lower number. But they have less nitrate, I should mention.

The minimal impact on TDS and chloride concentrations, because here we're not going ion exchange process; we're not exchanging one anine for a different type of anine. There is some impact on pH and such with the biological process, but it's small compared to the other technologies.

And it's the least cost technology of the ones we looked at. Something on the order of $10 million less than the other technologies for the equal systems, 1A, B, and C compared.

And then the treatment is also easily augmented. We probably would design this as being four reactors, but if we increase capacity in the future because we're going to go towards a final remedy, we need extra capacity, we can add a fifth reactor. And, in fact, it turns that Rancho Cordova, things worked so well for them in their testing, that their original system they put in for 3,600 gpm, they now run at 6,000 gpm. So it's pretty robust.

But there is some downside, and that is one con we can think of -- and it's real -- is public acceptance of biologically-treated water. There are some uncertainties there about how they would react. Now, it's not our intention that this would be a direct public use. It's going to be a reinjection;

however, we can still foresee some concerns that the public may have.

The last technolgy is the ISEP plus. The pros, it's definitely proven at full scale. There is a full functional system in La Puente, and it runs well. It's been relatively problem-free for them.

And it's likely to have good public acceptance. We can talk about it in terms of being like their Calgon water softeners, same kind of process. I think that we all accept that.

MR. ZUROMSKI: And it's actually already being delivered to the public in La Puente.

MR. MARTINS: In La Puente, yeah. It's a full functional system in La Puente. It's been operating, I think, at least a couple years. I've seen it about six months ago.

MR. BURIL: And it is the only licensed or accepted technology for the State of California.

MR. ZUROMSKI: For drinking water treatment.

MR. MARTINS: Right. That's right.

MR. ZUROMSKI: Again, we're looking at 1A, B, and C, though, on injection. So that is the one differentiation between one and two.

MR. MARTINS: Right. Absolutely key.

On the downside, though, is it's not easy to augment the higher flows. The way it works is this carosel of ion exchange units, and you buy for a certain size, you know, 3,000 gpm. You say, "Well, gee, I need to go 4,000 now." You can't do it. You'd have to have a separate second system.

Another one is it has a significant impact on chloride concentration that Richard had alluded to earlier. I have, also. And it's likely to exceed basin plan limits. And we'll talk about that in more detail on the next slide.

And it's a higher cost technolgy as compared to the biological process.

ISEP process. It does cause changes in water quality. On chloride, the basin plan is a hundred. Now, Richard --

MR. ZUROMSKI: Downgradient.

MR. MARTINS: Downgradient. And Richard has some new information. There's really two steps we need to look at.

MR. ZUROMSKI: Right. It has both -- in conversations with David and looking at the basin plan, there's a definition in the basin plan that says for Monk Hill sub-basin, 100 ppm of chloride below the spreading basins and 15 ppm above

the spreading basins. The definition that David gave me was that upgradient of the spreading basins was above; therefore, if most of our site is upgradient from the spreading basins, we would have to meet the lower requirement of 15 ppm versus a 100.

MR. MARTINS: And we need to mention that the existing groundwater that we would be extracting, this the the well that we would be drawing from for alternative 1A through C, that blended together is going to be 25 to 30 already. So we already got an issue with the upper part of the basin plan.

MR. ZUROMSKI: David, were you going to say something?

MR. YOUNG: That's correct. I'm going to have to clarify, though. If those requirements pertain to surface water discharge only, like MPEDS, because when it comes to reinjection, there may be different standards, different parameters that need to be, you know, looked at.

MR. BURIL: The question I would have is how does Valley Water Service inject blends of Colorado River water, then, because they can easily exceed a hundred?

MR. YOUNG: I actually asked the very same question about the background levels. You know, if

you try and reinject at background levels, you're exceeding the basin plan above spreading ground limit. And then also specifically with the reinjection. So we'll find out about that and get some clarification.

MR. MARTINS: That sounds really helpful.

MR. BURIL: That's a major issue that I'd like to make sure people recognize is that none of the treatment processes that we're talking about, then, meet the basin plan. If we're talking about 15 ppm, none of them meet it.

MR. ZUROMSKI: They would meet the 100, the biological would meet the 100 because you're at background.

MR. BURIL: Correct.

MR. ZUROMSKI: But anything really above at the 15 --

MR. BURIL: Yeah. And if we are viewed as above in our location here at JPL -- and we are, okay, good. So we have that answered. That's a bit of a conundrum.

MR. MARTINS: May I ask, do you know, is the whole JPL facility considered above or is the southern boundary maybe considered below?

MR. YOUNG: Well, based on the flow regions

that we've seen in the modeling, anything that's upgradient of the spreading grounds would be defined as above; so, you know --

MR. MARTINS: Okay. I think the gradient is going that way, okay.

MR. YOUNG: It's considered above.

MR. MARTINS: All right.

Well, let me just quickly show you what the impacts, at least in this discussion, and it's even more significant, and Chuck is right, all technologies at this point will not meet the upper basin plan.

MR. BURIL: Right.

MR. MARTINS: Okay. But with the ISEP treated water, the low could deviate as high as 150, 250. Now, remember, it started out at 25 to 30. It could go as high as this with the current standardized ISEP process, whereas the biological process would maintain chlorides almost, you know, with no change. And the bifunctional resins would likely change the chlorides a little bit, five ppm of change.

So significant impact we need to consider, but there's some real pluses of ISEP, too, because of the public acceptance and it's viable and it's been done.

It's been retained, and because we think it's contingent on negotiations regarding the basin plan and further understanding how that might apply to JPL

MR. MABEY: Is the chloride from the ISEP, is that driven by your perchlorate, your nitrate, or do you know what drives it?

MR. MARTINS: And everything else. Here's the deal. The ISEP process, the current ISEP process, is really not a selective resin at all. It removes all anines. So not only perchlorate and nitrate, which you want it to get out, but also sulfate and -- here's the killer -- bicarbonate.

MR. ZUROMSKI: That's kind of what we were talking about a little bit with Calgon, is that they have some process modifications that they're looking at right now where they can slow down the treatment of the influence stream and change, basically, the regeneration and treatment options such that they can get it down. But it's still going to be high, but it won't be --

MR. MARTINS: Make it more selective.

MR. ZUROMSKI: Right. It will make it more selective.

MR. BURIL: What you're really doing, also --

I worked a great deal with the ISEP system. The biggest concern that I believe that they face is the efficiency of the rinse after regeneration because you're faced with going with a 15 percent sodium chloride solution through the bed in order to regenerate it, to strip the perchlorate and the nitrate and whatever else is in there off. And then you have to rinse that material out of the beds so that it's usable again. Well, you can rinse a great deal, have very high level of cleanliness, but you generate a tremendous amount of waste. So there's that tradeoff that you need to try to evaluate.

And then the tests that we did, the tradeoff was to get it down to the point where it's usable to make sure that you meet drinking water quality standard, which is where we went to.

MR. MARTINS: Which is 250, yes.

MR. ZUROMSKI: Because it can definitely meet drinking water. That's no problem whatsoever.

MR. BURIL: And if you modify the process, as Richard is talking about, by slowing the carousel, what you're doing is you're increasing the efficiency of the regeneration rinse process, but you're also increasing the waste.

MR. ZUROMSKI: Right.

MR. COFFMAN: Has the waste disposal been accounted for in the estimated costs?

MR. MARTINS: Yes. We actually -- you notice we used the ISEP plus process on a prior slide which indicating the technology's here. And that has a destruction model for the chloride, nitrate. It's a high-temperture, catalytic process. And ultimately what waste is remaining is the concentrated sulfate solution, actually is trucked off-site. A lot of the brine can be reused.

MR. COFFMAN: Do you also need to worry about air permits --

MR. BURIL: No.

MR. COFFMAN: -- if you're doing thermal destruction?

MR. BURIL: It's all enclosed.

MR. MARTINS: Yeah. That's right. Enclosed vessels.

MR. ZUROMSKI: And it actually uses a very expensive metal to make sure that -- because it's a very, very high-temperature, high-pressure process. That's what really kind of makes some of the costs in the ISEP plus go up.

MR. MARTINS: Because the full cost here would be very high otherwise, you know, the underwriting

for that. So it actually pays for a lot of extra capital equipment to take care of that.

That may be it.

MR. ZUROMSKI: I think -- okay.

So that's really the detail on the technology, and we'll probably get back to this technolgy in just a second, but that's what we have for the first three alternatives.

The second alternatives, the well head treatment alternatives that have been retained so far, do have a lot of pros; and as both Mark and Chuck had talked about earlier, it's definitely effective in meeting the removal action objective.

MR. ROBLES: They have very good crystal ball.

MR. ZUROMSKI: Definitely, definitely.

MR. RIPPERDA: Can't we just ask Peter?

MR. ZUROMSKI: Because it's very effective in meeting the RAO because as we saw earlier, it contains, I think, based on our analysis, about 98 percent of the 18 ppb perchlorate plume coming from the site. So it's going to provide immediate protection for well 52 because you're going to put it on 52. Right away then, once you get Arroyo on line, which is about a year or so later, you're going to have complete containment and, at the same time, good

perchlorate treatment.

Then it's also going to, once it's gone through and both wells are on line, it provides very effective treatment and protection for Lincoln Avenue wells because, again, this is containing 98 percent of the water that has 18 parts per billion perchlorate from moving off the site. So it's very effective for protecting all of the downgradient drinking water wells.

Low cost. If you look at the cost, it's pretty obvious. I think over five years it's about $10 million, $13 millions less, depending on which technology you use, than alternative one technologies. So that's definitely something to be considered, especially since this, again, is a removal action. So that's why I asked you earlier, look at the five-year costs.

Next, there's really no issue with managing the treated groundwater. We've talked about the chloride issues, the reinjection issues. If you are delivering this to the public -- and we'll get to the cons in a moment -- you really don't have anything to worry about with managing the treated groundwater.

And then you have, again, really

consequent to that, is you don't have any risk of creating new plumes from injecting this water. So there are definitely some pros to this approach.

There's a few more. It might be easily accepted by the public and other stakeholders. That could be a con, as well. You could talk about it either way because now they're getting treated water. But they're getting treated water because it's been treated for VOCs for 10 years. So that could definitely be a pro, but it also could be a con.

Does not require two VOC treatment facilities. As we talked about earlier, we've got a nice facility that's already operating out there that could definitely save some money.

Nitrate issue. You're not changing the flow of what's going on. Actually, you're probably going to be in better shape once you get Arroyo on line because you can more easily blend the water that's coming through the system.

And then at the same time you don't have any issues with replacement wells. Again, limiting that, of course, to the removal action. Long-term remedy might add additional costs if you look at different permutations, but for the time being, no replacement wells needed.

However, there are some cons, and we'll discuss whether you do definitely need to have a much more highly reliable system when you are delivering this water to the public. It needs to consistently meet the drinking water levels. So you need to make sure that the system is really going to operate at the most effective level that it can so if you do have issues with the systems having upsets or whatever it may be, you kind of want to take that into consideration when choosing a technology.

May not be easily accepted by the public. As we talked about on the pro side, how is the public going to feel about all of a sudden having this water treated for perchlorate?

Need to comply with 97-005. And, again, this may take up to two years based on current analysis. That's why we want to, for the removal action and immediately, get well 52 on line and treating for perchlorate, and then, basically add on the Arroyo well once we get through the 97-005 process.

And then, finally, the final exit strategy may not be clear. There are a lot of different things we can discuss regarding final exit strategies. We've done a lot of analysis so far, but

we're not to the point of a final remedy. But, again, going back to our initial assumptions that we wanted CH2MHill to consider, how we're going to clean up the site, how we're going to make this into a system that contains the plume. And then we also -- how does it help us remove, reduce, the source of the chemicals on-site. Those are things that need to be considered. So how this would fit in with that might not be clear. So it might not require us to look at a new treatment system just for on-site. It might require us to take the system and use this system as the containment system, and, then, of course, have to buy new wells, anyway. I mean, there are lots of different things, but, again, something to consider.

And now these alternatives really are -- these pros and cons are for both A and B. If you look at the B by itself, you have the additional con of treating 1,800 gpm versus 3,200 gpm, and what's the likely acceptance of that, and what's really your added cost benefit of doing that.

Before I even get into this, I just want to -- these are the technologies that we're definitely considering at this point with probably a couple more. And I want to know, as far as what

we've done so far, have we given you enough information as far as these technologies go? Is there anything else that you think that we need to look at? And we'll get to some other things that we've looked at in a moment, but anything else that you think that we've missed or we need to consider in the technologies we've presented so far, pros and cons wise?

MR. COFFMAN: Well, it sounds like you've considered this issue, this source removal in 1A through C, but you don't address it at all in 2A and B. And so you're going to have a shortened treatment or mediation process in 1A through C because you're not addressing it. Have you thought about combining it and maybe adding extraction/injection system just on-site and couple it with the 2A/2B process of wellhead treatment?

MR. ZUROMSKI: And actually delivering that water to the public from the source well on-site?

MR. COFFMAN: No. You're not going to be able to do that, so probably you would have to set up an injection/extraction system, almost like a closed system on-site.

MR. ZUROMSKI: Definitely.

MR. COFFMAN: And then go ahead with the

wellhead treatment off-site.

MR. ZUROMSKI: I think that -- again, going back to our removal action objective of containing the plume, all of these options, again, that was the number one consideration. But, definitely, things such as source removal and future of the system and how it fits into -- that's really an exit strategy issue for us. How does that work in the final remedial action. You know, source removal is going to have to be a definite component of the final remedial action.

Do we need to do it now? Based on our current analysis, it's not really necessary. The only reason really it's really being done here is to supplement the extraction for this injected water, and it just has the kind of incidental benefit of really being more consistent with the final remedy because it's doing source removal. So, yes, we did consider that. And we considered having either our own seperate little treatment system up here in this area, but that's a final solution. What we really need to concentrate on is the immediate goal of doing protection.

But another thing is, you know, you can also look at these systems as you can augment them to

do that in the future, as well. I mean, those are things that we're definitely considering is, you know, how is it going to fit into that remedy.

Anybody, before we move into some other --

MR. MABEY: I had a similar question because you're looking at a 600-gallon pumping rate, and, you know, whereas that may -- sooner than later might be a better way, especially if that perchlorate -- and perchlorate could be around for a long time, if your OU-2 remediation, you know, works, then you still have perchlorate.

MR. ZUROMSKI: Right.

MR. MABEY: And so in a sense I agree that, you know, think about sooner than later.

MR. ZUROMSKI: Right. I mean, I think that's definitely being considered. I think the reason that it's maybe not in the removal action, that would be more of a remedial action, is only because from what we've seen with the fate and transport of perchlorate, that it's really not an immediate concern for public health issues and those kind of issues because of the -- basically you've had this perchlorate plume or this high concentration of perchlorate on-site for 60 years, and you're still

only seeing 30 ppb downgradient. It's not moving as fast as we thought it should move. If it was moving a lot faster, we'd think that would be more -- you know, it would definitely be imminent. So I think the reason that's not in the removal action is we're still considering things like doing a pilot test for in-situ source reduction, which would be a lot more cost effective than putting a 600 gpm system there. I think it's really going to depend on those types of tests, and that's why it's not in the removal action. But definitely will be considered in the short-term and the long-term. So, great comment.

Mark? David? Richard?

Okay. I'll just keep moving this along, then. So, you know, just to show you kind of the breadth of things that we're looking at, you know, these are very detailed and expensive technologies. But we also have to look at things that are kind of worst case because we needed to look at things like what if we needed to make sure that not one drop of perchlorate moved off the site at all, so we looked at a full containment alternative that really captured from our flow model 100 percent of the 18 ppb perchlorate plume. Then we also looked at something not quite a hundred percent but

something that was pretty close that utilizes well 52 as a containment well rather than, as we were talking about earlier, a well for public distribution. So these are the kind of things that we're looking at.

There's another one that we're looking at might be in the EE/CA, as well. What if we can't reach any agreements with the city or Raymond Basin or -- well, actually, we would have to reach agreements with Raymond Basin. But what if we couldn't use city wells or we couldn't use city property, how would we, as NASA, handle this plume just with our our property and within our own site. It's a lot more difficult than we thought just because of the flow regimes of being able to extract water and then having to reinject it, you basically have a problem that every time you increase the extraction rate, you increase the injection rate, and it's kind of a Catch-22.

So those are the kinds of things we're looking at right now which will probably be in the EE/CA if they're feasible at all, but they're turning out to be very difficult. So that's one of the reasons why you see a lot of these options using the existing wells that are out there right now.

So just to kind of go through these

options. Here's your full containment alternative. This alternative from the flow model shows that it captures a hundred percent of the 18 part per billion perchlorate plume. 3,800 gpm. A lot of water and it would use both the liquid phase granular activated carbon and the FBR system for treatment because the end use would be reinjection and just basically based on costs.

So here's your collection regime. Again, you have to use 52 and Arroyo to get efficient extraction and collection and containment of the perchlorate plume. But you'd also need a small on-facility well and another smaller off-facility well.

Hooshang, did you have a --

MR. NEZAFATI: I just wanted to make sure that the figure is there if you want it.

MR. ZUROMSKI: Right. The figure is here. It kind of shows you -- you have what we're calling the new Arroyo well, which is at the Arroyo well location. You have a well between 52 and Arroyo and the existing well 52. And then you also have this small well down here to capture anything that's coming from up here, the perchlorate that's coming maybe from upgradient types of sources. So you have

four wells. A lot of extraction.

Now, one of the main reasons why we disregarded this alternative or we threw this out at this point was the only way to effectively capture that much water and contain it is you can't reinject it upgradient for the problems we talked about earlier. If you inject 3,900 gpm of water, you have to capture it again somewhere. And basically it creates this do-loop that you can never get through. So we had to do downgradient injection in order to make this work. As we'll talk about in the pros and cons in a minute, that creates other problems that we might not want to deal with. But that's our full containment alternative.

And I think the cost, based on five years, is actually pretty close to your other alternatives 1A, 1B, and 1C. So based on costs, it's really not that significant. And may still be a potential thing to evaluate in the EE/CA.

The other alternative that we're looking at was containment using well 52. Again, this is a 3,000 gpm system that would use just Arroyo and 52.

Now, if you think about it, this kind of sounds like this would be something that you would

reinject the water, again, and then whereever you did that, upgradient or downgradient, would depend on, you know, how the flow model worked. But this really is alternative 2A, but just using the water differently. So this kind of shows -- the reason this was in here for evaluation was this really kind of shows maybe what alternative 2A could be turned into someday to help us actually clean the site and contain the water in a different option. But, again, it was something that we wanted to consider, and, again, as the removal action. But if you look at, you know, costs, actually, it's a lot cheaper; but it's going to have some problems I'm going to talk about in the cons that kind of made us think that, well, maybe for removal action this isn't the best way to go.

MR. BURIL: I have a different version of the same song.

MR. ZUROMSKI: Sure.

MR. BURIL: If you did an on-site extraction, would that help your capture by your 2A/2B? If you don't have the -- you said that there's a southern component that you're worried about and that's why you're going to put in the extraction well on-site.

MR. ZUROMSKI: And if we didn't have that,

what would happen?
MR. BURIL: If you did that on-site extraction well, would that provide better capture with your Arroyo and your 52 well?
MR. ZUROMSKI: Eric.
MR. ARONSON: I think he's talking about 2A and 2B, if you added an on-site well there. It would not increase the amount of volume of the area you're capturing because it's already contained in that area.
MR. ZUROMSKI: Yeah. It really showed -- I think all of the analysis they did showed that 52 and Arroyo, by themselves, without having added injection issue, really captures almost a hundred percent of the water.
MR. RIPPERDA: The reason it was necessary for capture in 1A/1B is an artifact where the injection is.
MR. ZUROMSKI: Exactly. So if you inject downgradient, you don't have that issue. But then you have other issues which we'll get into in the cons in just a moment.
So on those two alternatives, which may or may not still be in the EE/CA. I mean, really, if you guys want those in the EE/CA or some permutation

of it, I think we're definitely going to consider including those.
Pros. It's highly effective in meeting the RAO. It definitely contains all of the 18 ppb perchlorate plume. Keeps it from migrating. Very likely to fit into a final remedy because this is going to really help us contain the plume and also help us hopefully contain it and treat the source. And there's no risk from serving the water to the public.
Some other cons. The extracted water is injected downgradient. And, again, this goes back to our Aerojet scenario. It's not captured by the extraction wells, so though we're containing and treating to acceptable levels, all of the perchlorate from the site, in the future, what if the discharge limit goes down? What if there's some other chemical, like Aerojet found out, perchlorate? What if something happens? Now all of a sudden you've been injecting, you know, three to four thousand gpm downgradient that's going to go downgradient fairly quickly. And there's other production wells downgradient we need to worry about. So that was probably one of the main issues with downgradient injection.

And then also we have this issue in Altadena. We have issues related to environmental justice and locating all of this equipment and injection in this community that's downgradient from us.
So those are probably the main reasons why these alternatives were thrown out. It's really not because of the effectiveness of the capture. The capture is great. It's really what do you do with the water afterwards? That's the issue.
A few other ones. High cost. I can't really say they're that much higher cost. They're all high cost. But they're pretty comparable over five years.
Very complex, though. A lot bigger. A lot more piping. If you look at the piping routes for this full-containment option, you've got piping going all the way up, down, you know, for all these wells to the treatment system. Then you have to pipe it all the way back to the injection wells. A lot of piping. A lot of complex systems. So it's definitely an issue. They still require replacement wells and all the incidentals that go with that. And it's really more of a remedial action than a removal action. This could be very much a final solution

with the addition of some source control. And so if you look at what we're really trying to do in the short term, which is protect downgradient protection wells, it's maybe really overkill for doing that. So those are some cons.
And that's it. I left about a half hour. I don't know how much discussion, questions, comments. You've got everybody in the room here today that's really for the most part been involved in all of this analysis, and I really want to, you know, take advantage of that if we can.
Although you don't have the actual document in front of you, we have pretty much all the data that went into -- that's going into that document with us here today, whether it's in our minds or -- Hooshang brought all the different containment options and everything with him. That won't necessarily be in the EE/CA, but were used in all this analysis.
So I leave it open to you right now.
Do you have any questions or anything or any additions that we might want to consider in the removal action? Any changes? Is the removal action objective what you had thought we were shooting towards? Please.

Mark, yes.
MR. RIPPERDA: I know you did a lot of runs that aren't included in this. I just want to -- couple of things I want to make sure you did runs on -- because I never liked the original proposal of injection because my intuition told me that it would cause problems. And I asked you to run the downgradient even though I didn't think I would like it. I just wanted to open your minds. But there's probably some location of production and injection that would allow you to pump lower quantities but still get enough capture of producing around the old Arroyo well and injecting somewhere around well 52 a little bit south of well 52, where instead of having to do 3,000 gallons a minute, you know, because that southern injection location would keep the on-site contamination more north, you know, you might be able to pump at slightly lower, like maybe 2,000 gallons a minute, production injection would actually work. So did you evaluate some slightly southerly injection?
MR. ZUROMSKI: This one right here, right, Eric? We have 66 and 67 and --
MR. NEZAFATI: This is still on-the-facility injection?

MR. ZUROMSKI: Well, I have this one here, too.
MR. RIPPERDA: Right. Just as a thought, I also didn't like things like it has to be on the facility because I didn't think on-facility would ultimately end up working. So as long as you're in the evaluation stage, you better evaluate what works best physically and find what works best physically, and then do whatever negotiation or thing you have to do or -- find out if it just flat-out won't work because you don't have access.
So as long as you're doing just computer models, I'd want you to run it for the best physical locations for capture.
MR. ZUROMSKI: I think we did do that. I think the answer is yes, we did do that. Not those specific locations, but looking at the most feasible locations, regardless of whether or not they're on the facility or off the facility.
MR. ROBLES: Because we're not just protecting well 52. We're also looking at Lincoln Avenue wells downgradient. And then locating it here, when we start impacting those wells, you have to pump more to protect the Lincoln Avenue wells downgradient, and you get the same loop now because you're funnelling the plume a little further north of that protected

well 52. But, in essence, I think that we wouldn't get the saving on that.
MR. ZUROMSKI: We can run, if you want, a specific scenario run. We've got the model. Eric would love to stay up another late night, as he's been doing for us, and run another one. I think at this point it wouldn't be a problem at all.
MR. RIPPERDA: Eric has done all of these so he knows what's gone into them and what's come out. So his intuition should be better than mine at this point because I'm just guessing.
You've certainly done a lot more than what you've just shown. But I guess I would want to just -- to scale the money, since right now wellhead treatment is coming out drastically cheaper than anything else, if NASA is going to make their decision with money as a huge component of it -- I mean, I don't know what NASA's decision is going to rest on for their recommendation, but I would want to maybe go for the cheapest extraction/injection scenario you can come up with. Which, my guess is, it would be pumping out of the Arroyo well or maybe two wells like you've got over here with the wellhead treatment option. You've got an Arroyo well and

something really close to the Arroyo well, and then injecting somewhere south of well 52 and maybe a little bit west.
MR. ZUROMSKI: Like in the middle of the Arroyo.
MR. RIPPERDA: So that way everything heading toward the Lincoln Avenue wells from your contaminant source is passing through the Arroyo well location, not swinging south because you've got injection right in your scenario one. You had problems with things trying to escape south. But if your injection well is really where it's trying to escape through, then you're pushing it more toward your extraction wells than you are the Arroyo well.
MR. ZUROMSKI: One thing we did have them consider, though, that did constrain them in off-facility injection or extraction was we did have them consider the Hahamongha watershed park program, and where the spreading basins would expand to based on the City of Pasadena's predictions. And we did have that as a constraint because we didn't want to put wells in places where maybe in the next -- maybe in the next five years would all of a sudden be a spreading basin. So that was definitely one of the restrictions that we did give them for -- you know,

because we did ask them to kind of do really what you're saying.

So maybe where you're saying, would that possibly be in where that Hahamongha plan would show in your spreading basin? Was that one of the issues? Because I thought we looked at that, as well.

MR. ARONSON: There's probably still land essentially east of that or wherever it was to avoid that.

I just want to note one thing. Richard did mention that it was pushing things south; it was actually pushing things east. And that's the well up in the source zone is actually designed to stop it from being pushed out to the east, not to the south. It doesn't necessarily affect what you were saying. I think it's still an option that -- I think we'll find that the pumping rates will be quite high because we had to come up with the Lincoln wells and we had to change things, but it's definitely something we can do a couple permutations on it.

MR. RIPPERDA: If your RAO is to keep the Lincoln well from going above 18, you don't have to pump, I wouldn't think at the full 3,000 gpm. There are lower pumping rates that capture enough of that

18 ppb plume to keep it from driving Lincoln higher when you include all the other dilution that happens from Lincoln. It's not just pulling from that one zone.

So anyway, like, to humor me maybe, because a lot of these other scenarios I saw had a host of production and injection wells. You kind of came close to what I was thinking, but -- you know, I always hate to say like, "Oh, you've done 20, but do one more." But --

MR. NEZAFATI: We have the model.

MR. ZUROMSKI: Okay.

MR. CARLSON: The other consideration, of course, is when you start using drilling treatment and not delivering the full 1,300 gallons per minute when you're in the replacement well.

MR. RIPPERDA: Right. No. That absolutely would include the replacement well and everything. I just want to try to take the lowest cost injection alternative to have as a comparison. I'm not saying that I want it, because I'm still a huge proponent of wellhead treatment.

MR. ZUROMSKI: Yeah. Let me just say part of that really was back to Fritz's effectiveness evaluation is that when we did look at all of these,

we looked at back -- you know, in fact, if you look at those percentage issues, we kind of looked at -- when you look at a specific scenario, and you pump a certain amount at a protected well, where does the other water go; and that's going to be an issue that we'll probably have to deal with that. Because, you're right, we can still maybe protect 50 to 75 percent and treat that much of that plume. And you're right. Maybe that other 25 percent isn't really going to matter because it's either going to degrade or dilute or disperse or it might get picked up but at low level enough that it won't be an issue.

But those are kind of the factors that we did evaluate for technologies. What percentage -- I mean, you can't guess that it needs to be 85 percent to do that. You can't really. That's kind of impossible to do. But trying to see where the water is going is the big issue. And I think that doing that analysis, and then using what your scenario is calling for, we can definitely do that.

MR. NEZAFATI: One other question between Eric and Mark, if we did that, would the injected water still be captured by the extraction wells or would we get into the same cons that you just described about creating a plume or whatnot?

MR. RIPPERDA: It absolutely falls into the same con as all the other injection systems.

MR. NEZAFATI: I just want to make sure that it is the case. But we have the model, and it's just a matter of really running --

MR. RIPPERDA: How far north or south you place that injection well so that some percentage of it gets captured, I'm not sure where the best place to minimize the pumping rates would have to be.

MR. ROBLES: But the main goal is to get the costs as far down as possible.

MR. NEZAFATI: Right. For the extraction.

MR. RIPPERDA: Like a single extraction well, and, you know, two or maybe three injection wells, just the lowest cost alternative.

MR. ZUROMSKI: No problem.

MR. CARLSON: So one quick follow-up.

In your thinking, if we did your scenario, if it worked out -- I don't know yet -- but it was going to be the west and just north of 52, you were saying?

MR. RIPPERDA: No. And this is just my guess. I want Eric to do what works the best. But my guess is it would be south and west of well 52.

MR. CARLSON: South and west, okay. Do you

think that that would be in an area where it would be the lower basin plan, as opposed to upper? We talked earlier about, you know, the direction of travel, and it's kind of still above the basin, but it's pretty far south, so --

MR. YOUNG: Again, you'd have to base it on, you know, water and groundwork modeling and see how the flow regimes are for that southern area. If the contours, you know, intercept the spreading grounds, then that would still be considered above.

MR. CARLSON: I see.

MR. RIPPERDA: Could we get copies? You could send a copy of the basin plan to Richard and one to me. I've got portions of it, but I don't have all of it.

MR. YOUNG: Of course.

MR. ZUROMSKI: That would be very helpful, actually, to all of us.

MR. YOUNG: Okay.

MR. RIPPERDA: And then we certainly need to think about the basin plan, and it would be great if you could comply with it right off the bat. But since, obviously, none of your injection scenarios are going to off-the-shelf comply with it, you can definitely work towards waivers or other -- I mean,

the staff level or first-level management says, "Comply." There are many other SuperFund sites and many other basins and boards where the CERCLA remedial action needs a waiver to an existing basin plan or anti-deck policy or whatever. And you can get those, and you need to be like raising those issues or finding out how to apply for those waivers, you know, sooner rather than later.

MR. BURIL: And, again, I would point out the example of our Valley Water Service injection wells. We already have a precedent for injeciion upgradient of JPL.

MR. RIPPERDA: So I would hate to just sit around and say, "Oh, that violates the basin plan. We can't do it. What are we going to do?" Because there's already somebody in your basin.

MR. ZUROMSKI: Maybe that would actually be some more information, David, if you could get it for us. Do they have some kind of waiver or permit or what?

MR. YOUNG: I'll find out.

MR. BURIL: What is the regulatory scheme that allows it to do what they're doing.

MR. YOUNG: And, again, we discussed that these sites are discussed on a site-by-site basis.

So as Mark was saying, you know, just because the parameters of the basin plan require certain values to be met doesn't necessarily mean that every site, you know, adheres to those exact concentrations.

MR. BURIL: Is it a basic premise of the basin plan concept that -- to protect the valuable uses of the resource?

MR. YOUNG: Yes

MR. BURIL: So given my understanding of the basin plan, if we were able to protect the basin plan's valuable uses, and in this particular instance, I believe it would be drinking water supply, then there would be some leniency toward increasing the concentration of chloride that would be allowed? Because I would think that that would be the premise of what is going on with Valley Water.

MR. YOUNG: Right. And, again, I'll have to find out what is happening there.

MR. RIPPERDA: The basic idea behind all basin plans is they're geared towards NPDS-type discharges and industrial processes. So, you know, the CERCLA stuff of pump the groundwater, do something with it, inject it back wasn't anywhere in the thinking of the original basin plan writing. It's geared to "You have some industrial process. We want your water to

be cleaner than the water that's there because we don't want anything added to the mass load that already exists." Which is why the boards are willing to consider site-by-site waivers or CERCLA-type cleanups or Regional Board order cleanups.

Then 97-005, what's going on? Are you guys working towards that?

MR. ZUROMSKI: It's really going to depend on which scenario we pick because if we pick one of our well injection scenarios, it's going to have to do with what are we going to do with the replacement well, and where that well is going go in and everything pertinent to that. But if we do one of these, we are going to definitely do it. It just depends on which one.

So we are definitely willing to go through that process with the city. It just really depends on when we do it. It depends on which scenario we pick.

MR. RIPPERDA: So just like every meeting that we've ever had, I'll once again reiterate my desire for you guys to be working on the application, be talking to DHS, and have it all ready to go, whichever one you're going to pick.

I'm still -- every time I'm more

disappointed than I was at a previous meeting that you haven't gone farther with your 97-005 process. You should basically have everything ready to go so at the moment you pick wellhead treatment, if you were to pick it, you're ready to go. DHS has fully been briefed. They've got information from you already. You're almost ready to go out and hold a public meeting, you know.

Of course, that's unrealistic because they need time to review and everything, but they should know everything you're doing. They should have the impact and source evaluation already because the cost of that is pretty minimal if you decide to go with some injection alternative. Whatever money you spend on that is a drop in the bucket compared to, you know, 30 million in capital cost.

MR. ZUROMSKI: We might not even need to do a lot of the analysis based on how they interpret the law.

MR. MARTINS: Richard --

MR. RIPPERDA: Every contractor is given 97-005.

MR. ZUROMSKI: David, just a second.

I think that for the most part -- I mean, we didn't bring, unfortunately, the guy who has

been looking at the ARARs and 97-005 with us, Peter Torrey. But I know that Peter has been in direct contact with all of the DHS individuals to help us decide how 97-005 will impact us. But I am not sure, and I'm not sure if you are, either, how far they have gone or Peter has gone, in that process. But he has definitely been in contact with them. They know what we're doing on a conceptual level, but maybe not on the detailed level.

MR. RIPPERDA: Right. I want you to go farther than finding out how it impacts you and actually do the paperwork. Thanks.

MR. YOUNG: I was just going to say, since I'm a fairly new project manager on this site, I wasn't around when the 97-005 issue was addressed. But it sounds like it's ongoing. I thought JPL met with DHS previously and discussed this. Right?

MR. BURIL: We did.

MR. ROBLES: Sure

MR. BURIL: We did. That was some three years ago now. And, at the time, what they told us was any wellhead treatment scenario would absolutely trigger the 97-005 requirements. There have been overtures by DHS in venues outside of this room that have stated that any work that's done within the Raymond

basin, particularly Monk Hill, would be viewed as something that would trigger 97-005 if the end use of water was to be public consumption. So whether those policies and thoughts have changed over the course of time as a result of new interpretation, I don't know. I would have to defer to CH2MHill and their folks.

MR. ROBLES: The federal government does does not get a 97-005 permit. As to PWD, we're going to support them on that. To do that, we have to do some negotiations with them. And so that's where the replacement model issue, if we're going to comply with 97-005. We've got to sit down with them, help them get the permit. We can support all the documentation for our portion only.

So it's not, I know the frustration, Mark, that you have, but NASA's position is we won't get the permit. We will help someone get the permit. We will work with someone who is going to get the permit.

MR. RIPPERDA: Right. When I hear -- like a downside is it might be up to two years. We've been working on this for three years, and you don't write the permit, the City of Pasadena doesn't write the

permit. DHS writes the permit. City of Pasadena turns in the permit application, and you can write the permit application, hand it over to Pasadena, and the City of Pasadena turns it in the next day. And so what I'm asking you is to actually start writing the permit application.

MR. ZUROMSKI: David, did you have something to add?

MR. YOUNG: That's all right.

MR. ZUROMSKI: Besides 97-005, any other questions with what we've done?

MR. COFFMAN: Yeah, I have a question. Since I'm new on this, I don't know all the background. I'm trying to catch up on it.

Is the 3,000 gallon permitted extraction rate, is that just based on what the existing wells were pumping at and was any evaluation done at lower pumping rates to see, or is that sort of the optimum pumping rate to capture the most significant portions of the plume?

MR. ARONSON: Yeah, higher and lower extraction rates were looked at. That's the rate that provides the most effective capture.

MR. ZUROMSKI: That's not a hundred percent, either; right? That's effective capture. That was

like 75 percent.
MR. ARONSON: Three-quarters.
MR. ZUROMSKI: Yeah. Like three-quarters. So that isn't the lowest, but it isn't the highest. It is kind of the most effective for meeting the requirements.
MR. BURIL: What was the 75 percent?
MR. ZUROMSKI: 1A, B, and C.
MR. RIPPERDA: And this is all based on particle capture; it's not a true fate and transport.
MR. ARONSON: It would be vector transport.
MR. BURIL: Just to be sure I'm clear, the 2A/B scenarios were 98?
MR. ZUROMSKI: Ninety-eight, yes. Again, as we were talking about earlier, when you need 98, 75 percent really isn't -- it's not a hundred percent provable at this point, but probably isn't a hundred percent necessary based on what we've seen in the past.
MR. BURIL: For comparison purposes.
MR. ZUROMSKI: For comparison purposes, correct.
Any other questions or anything else you'd like to see? And, Mark, back to your scenario. Would you like that to be an alternative in the

EE/CA, or would you just like us to look at it and if it's feasible and fits with what we're looking at, then include it in the EE/CA?
MR. RIPPERDA: I only want it evaluated for scaling purposes.
MR. ZUROMSKI: Okay.
MR. RIPPERDA: If it's nowhere close to being as effective or it's not much cheaper, then don't bother. If it's almost as effective as other stuff but significantly cheaper because there's less piping, less transport, then include it as like one of the outliers of the scale. But I'm not asking that it has to be in the EE/CA. It's just if it --
MR. ROBLES: Our intention is to go with the 2A/B alternative as the preferred alternative for the EE/CA, and have the 1A to 1C as the backup if we can't get agreements with Pasadena because that's going to be the biggest obstacle. The political issue is really what is driving the program.
MR. ZUROMSKI: A lot of the work is going to have to do with how we negotiate with the City of Pasadena.
MR. ROBLES: If we can't negotiate with City of Pasadena, the fallback is alternative 1 if we have impasses.

MR. ZUROMSKI: But the issue is not only when you look at that alternative 2A, it provides -- you know, I'm not saying that that is the actual recommended alternative as it is, but I would say that it provides a lot of benefits that it meets the RAO now. But for things like augmenting it to fit to the final remedial solution, it also provides benefits in that because if it's already capturing most of the chemicals coming from the site, especially perchlorate, now that you know your plume is captured, then you can start agumenting it to work on source reduction on site because you don't have to worry as much about things moving to production wells.
So, you know, whether you keep it as well head treatment or you turn it into some kind of containment system and then go ahead and kind of add in that additional source reduction well, something like that, I mean, it leaves a lot of options open. And that's why it's very attractive from that standpoint.
MR. RIPPERDA: Under alternative two, you didn't do any biological -- because I know there's the perceived perception that the public won't like biological?

MR. ZUROMSKI: Right.
MR. RIPPERDA: What's the difference in cost between biological and ISEP under alternative two?
MR. ZUROMSKI: Just the capital?
MR. RIPPERDA: Or whatever.
MR. CARLSON: Net present value, 30-year value is about $10 million. Very significant.
MR. RIPPERDA: So I would include that. There's no sense in assuming the public won't let you do something.
MR. BURIL: It's DHS. Biologically-treated water is prohibited for public consumption by DHS. And Aerojet has gone through gyration after gyration trying to deal with that issue. And DHS, be it through whatever, has basically turned a deaf ear to it.
MR. CARLSON: It hasn't been done.
MR. RIPPERDA: Since I think DHS is being shortsighted in this, I would include that in your EE/CA. And then it can be -- you know, at some point under the detailed analysis it can be dropped out because of lack of regulatory acceptance or something. But because it's one of those good ideas that I wish that in general the public and regulators would come to accept, include it in your EE/CA.

MR. BURIL: Backing it up against the nine criterion in compliance with ARARs, it would automatically fall out because it's not a permitted system for the end use that's identified in alternative two.

MR. RIPPERDA: Right. So it will fall out in the detailed analysis, but at least it's there. I mean, you're always --

MR. ZUROMSKI: And, of course, every system has to be permitted individually, too, so --

MR. RIPPERDA: Right.

MR. ZUROMSKI: What about the 2B alternative? Do you think maybe we should eliminate that and just make 2B the biological treatment? Because if you look at all the differentials, I mean, I'm not sure -- do you think that really needs to go through the detailed analysis, or should we turn 2B into basically replacing the treatment with biological? Because, I mean, really, how you operate the system could be something you could kind of explain in 2A, and call 2B -- instead of having it as a separate option have 2B. I mean, I just want to know what your thoughts were on that. I didn't know what everybody thought about how we could change the operations to reduce cost.

MR. BURIL: Just a personal observation and opinion on 2B and the reduced flow rate. If I were the City of Pasadena, I certainly would not want to go to my constituencies and say, "I'm going to only partially treat the water you're going to drink."

So from that perspective I would think we would have almost zero public and other stakeholder acceptance of that.

MR. ZUROMSKI: I agree. I think that will probably end up just changing 2B to the biologically-treated drinking water, and let it go through the --

MR. RIPPERDA: At the full volume since the difference between 2A and 2B at five years is only --

MR. ZUROMSKI: It's about five million at five years for treating biologically.

MR. RIPPERDA: Okay. Right. So that's a real difference in cost.

MR. ZUROMSKI: Yeah.

MR. RIPPERDA: The difference between the existing 2A and 2B at five years only is 700,000.

MR. BURIL: Yeah. It's not worth it.

MR. RIPPERDA: Which isn't really worth --

MR. ZUROMSKI: And let them operate it as they need to. And if they can operate it at lower

chlorides, well, hey, all the better for them because we all save money in the end. Okay.

We still have a few minutes here. We have a lot of others things we're going to talk about after lunch. Is there anything --

MR. ROBLES: We wanted to show you so that when you do get the documents, you see all of the thought process behind it.

MR. ZUROMSKI: When you look at it and say, "Did you look at this?" I want to be able to answer your question today, that answer is, "Yes, we have looked at it." And/or, "We haven't, but we will."

MR. YOUNG: One more.

MR. ZUROMSKI: Please, David.

MR. YOUNG: My suggestion is just do one more model.

MR. ZUROMSKI: And we will definitely consider that.

MR. COFFMAN: 2A and 2B, ISEP treatment, treatment is the existing treatment as the plant is performing?

MR. ZUROMSKI: It would use the existing VOC treatment at the plant, and we would add on to the ion exchange system to it and/or the biological system on 2A and 2B. Because right now, I don't

know. Back to, you know, historical things we've been talking. Since about 1990, we've had an air stripping unit on the Pasadena wells treating for VOCs. So basically we wouldn't even have to add additional VOC treatment in 2A and 2B because we would just augment that with perchlorate treatment.

MR. COFFMAN: And your ISEP, are you talking would be the Calgon or the resin?

MR. ZUROMSKI: That's the Calgon system.

MR. MARTINS: That's the Calgon system.

MR. COFFMAN: Calgon. Resin would be like --

MR. MARTINS: That's ion exchange resin, also.

MR. ZUROMSKI: It's just the reliability issues that we talked about earlier. It's the fact that it's already being used for drinking water in La Puente. And the cost, to some extent, is just -- probably makes it that much better for drinking water applications.

MR. BURIL: Just a little history for you, Richard. There are actually two systems in place on public supply systems right now. One is the Pasadena system that has just been described; the second is Lincoln Avenue. They have both of their production wells tied to a GAC system. And those are both

designed, obviously, for VOCs.
MR. ZUROMSKI: But, of course, as we talked about earlier, and we'll probably get into this a little later when we get to pilot study stuff, it's probably even taking out some of the perchlorate to a limited extent. It's just that what we have seen from our pilot studies is there's a certain point where the carbon is just not effective in the long term for perchlorate treatment. So that's one of the reasons why we're concerned with the Lincoln Avenue wells, as well, because it's low right now but has the potential for increase.
Well, does anybody have any other questions or anything like that? If you do have some after lunch, we can, you know, discuss them a little more. We do have a host of other things. It probably won't take more than hour or so after lunch. But I would like to break for lunch right now. We can run down to the cafeteria. It shouldn't take us more than an hour. Come back up, reconvene. We'll talk about the ROD. We'll talk about pilot studies. We'll talk about the really good stuff, and I might have to extend about 15 minutes that I allowed for the adminstration record some really good stuff I learned yesterday that we'll talk about after

lunch.
So with that, we'll take a break and come back at one.
(At 11:55 A.M., the deposition was adjourned for lunch.)
/// (Please see next page.) ///

PASADENA, CALIFORNIA; THURSDAY, DECEMBER 6, 2001
(At 12:51 P.M., the meeting was reconvened.)
MR. ZUROMSKI: What we're going to do, first, CH2M, while they're still here, do you have any more questions on EE/CA? What we're going to evaluate? Basically anything you've seen today, plus what Mark is talking about, other little permutations that we're talking about right now will be presented in the EE/CA to you. And, hopefully, with the background that you receive today, that should be adequate to go forward and move forward and move towards the recommendations.
So are there any other questions on the EE/CA?
Yes, Mark, please.
MR. RIPPERDA: You had exit strategy as maybe a con, or you had some somewhere, I think, for wellhead treatment. And I didn't see it anywhere else. And I just want to point out that essentially the exit strategy is going to be the same for any of these. It's not a pro or a con for any one of them. Ultimately the final remedial action will have to achieve ARARs throughout the process for both on- and off-site.

MR. ZUROMSKI: Absolutely.
MR. RIPPERDA: The site is actually defined in the NCP, so I can use that word.
MR. ZUROMSKI: True.
MR. NEZAFATI: Good point.
MR. ZUROMSKI: Okay. That's fair.
Anything else that we should clear up?
What I want to do, then, also while we have CH2MHill -- we're borrowing their equipment here today, the projector. So what I'm going to do is kind of switch around and do the administrative record presentation before the ROD because I want to use their projector before they leave. So I just want to let you know basically what's going on with the administrative record.
All the information in the repositories, as you know, has been updated on a regular basis. They're all paper repositories right now; but, as we've talked about, we've scanned in the entire administrative record. I think almost all the supporting documentation, as necessary. I think we're almost there. We're not quite there yet. And we're just about completed with our database and electronic copies of the administrative record.
So we went around yesterday, Keith,

myself, Marvin, and Alex, to the libraries. And I had done this once before a while ago with some different ideas, but we went around and talked with the libraries about our new idea.

And so what we'd like to do, and this is kind of -- sorry. What we'd like to do, and Keith is going to show you in just a minute, basically Battelle is going to maintain the adminstrative record, the electronic copy of the administrative record, at their office, their facility. Paper copy, of course, will be maintained here on-site. And what we're going to try to do is, through Battelle, constantly keep the electronic administrative record updated, and then have it linked through IP addresses to all the computers at the respository libraries. So, basically, any computer in the repository libraries can read electronically all the documents in the administrative record through this database function. And it would also be available via password to all of you, as well.

And, basically, we'd like to do that and remove the paper copies from the repositories and just maintain electronic copies at the respositories, the paper copy and the electronic copy here on-site.

MR. BURIL: What form would the electronic

copy here on-site take that would be accessible?

MR. ZUROMSKI: It would be the same that's available at the --

MR. BURIL: I mean, are you going to have it on a CD/ROM?

MR. ZUROMSKI: No. It's going to be all through database. Keith is going to show you how it works. It's actually very, very interesting.

MR. BURIL: Because the big thing I would be very concerned about is the fact an IP address, once somebody knows, it unless you've got one hell of a series of firewalls, is subject to a lot of security concerns. And things can get kind of mishmashed, if you will, by any number of people. So I don't know if you've thought of that or not, but. . . . .

MR. ROBLES: We may have to back it up.

MR. BURIL: So I'm thinking you may have to have more security -- I don't know. If you've got security in this thing already, that's fine.

But I'm thinking, just even in my own office, I've got two firewalls and a couple of security measures that most departments don't normally have just because I don't want someone from the outside hacking into our system and playing with data.

MR. ZUROMSKI: Right. That's a good point, and I think it's definitely something we're considering is protecting the documents, but countering that with the fact that we are trying to make this generally available to the public but at the respositories in some manner.

MR. BURIL: That's fine. And there's nothing wrong with that approach.

MR. ZUROMSKI: That's something that we're going to be working on is how to make it secure enough that that goal is met, and we're just basically working out the details right now.

MR. BURIL: My biggest concern would be to have something show up in an administrative record, in a meeting such as this meeting that says, "The EPA says killing babies is fine." You know, I don't think you'd want that.

MR. FIELDS: This is being recorded; right?

MR. ZUROMSKI: So basically what I want to do now is that's our idea if you look -- and Keith and Battelle looked at the requirements for administrative records, and the requirements say paper copy or mic- --

MR. FIELDS: When the regs were written, I mean, the intent was what was the other option

besides paper copy, and it does give some provision for microfiche, but maybe the intent of the law is that there's options outside of paper, which would be the electronic form, maybe. We did call the CERCLA hotline and ask them, and they didn't really have a precedent set to let us know whether or not this is --

MR. ZUROMSKI: But the whole purpose of doing it this way is, number one, instead of having only one copy at each of these libraries, every computer has access to all the documents. They can print any page they want at the libraries. Whatever they want copies of, that's fine.

And one of the problems we ran into at the OU-2 public meeting is people were stealing documents or removing documents. That's happened throughout the years. You can't steal the documents from the database if it's secure. So it gives a little bit more public access.

Of course, you do have the concerns with the people who may not be computer friendly, but we've thought about that. We've thought about providing a very simple instruction sheet, and then you see how easy the searches and stuff are on the page itself, anybody who takes the initiative to, you

know, look at the instruction sheet and go into the documents shouldn't have a problem reviewing pretty much anything they want to.

So what I want to do is kind of go through it. This is kind of the draft page that Keith has been working on, so not everything is final yet. So if you have any comments, again, please let us know. And, you know, basically it's kind of -- just shows the basic shell for how all this would work and how it would appear to both the public and to you. And if you have any comments or questions as we go along, you know, please feel free to let us know.

So, Keith, do you want to go ahead?

MR. FIELDS: Sure. And, basically, this is a web application, and it's used through a browser. Microsoft Internet Explorer, NetScape. And all the libraries do have open public access for these, and we could increase security.

Our intent, Chuck, was to increase security. Not only we could use passwords, but we could also use IP addresses where a website could only -- this website could only be accessed from a particular IP address, meaning only from these library computers or IP addresses of, you know, if

you wanted to give us yours, we could give you access to it.

MR. ZUROMSKI: We were trying to think of ways to make it not difficult, but the things that we found for the library, and all the librarians we talked with yesterday liked about it is that it requires them to do nothing except for maintain their computers and have our little instruction sheets available. So that's a benefit for them, as well.

MR. FIELDS: Another large benefit looking -- when we went and visited each of these information repositories yesterday, it's just a cabinet or a shelf where these documents are located. For a member of the community to come in and just dig right in, it's not particularly useful; whereas on a webpage, we can give some sort of -- make it a little bit more user friendly, a little bit more community friendly. Maybe a tool to promote community relations, as well.

MR. MABEY: You're trying to take the paper away?

MR. ZUROMSKI: Yes. We would take the paper copies out, and retain a paper copy at the site, which is definitely a requirement. There's no getting around that. But it's the fact that we don't

have to continuously update and worry about paper copies missing. Maybe a page is missing. What if we go through an audit, like we do on a regular basis, and somebody took out a paper. Unless you look through every document and every page, you'd never know that.

This is a lot more reliable, and it's a lot, you know, more effective, we think, for public relations. And also kind of going along with what Keith was saying, when you do these searches, if you were trying to search through all the paper copies, you would have to know what you're looking for; whereas with this you can just type in "perchlorate," and all the documents related to perchlorate come up, and look at what you want. And you know, hey, of course, there's going to be a lot of documents, but hey.

MR. MABEY: Sorry I asked.

MR. ZUROMSKI: So definitely.

MR. FIELDS: We basically divided this website up into three main aspects. One part we called the main. In the main is sort of -- that could be the community-relations-type aspect where we give some project background and go through some of the options we had there. And this is -- like Richard said, we

presented this to Richard yesterday as the draft, so -- Peter hasn't seen it yet, either.

And then we have the administrative record search portion where the entire administrative record database is maintained, and you can do searches on that to find documents and then view documents.

And then also we put in a feature called a discussion room. The discussion room is sort of like a website E-mail where a user could go in -- let's say they had a comment or a question, they could go into the user room, submit their question, and then NASA or a contractor, whoever the appropriate person is, could respond to that question via the discussion. And it has features in it such that if they submitted their question, and once NASA responded to that question, they would get an E-mail notification to their home E-mail that says, "Response is available at the discussion room to your question."

MR. BURIL: Would that response then be part of the record?

MR. FIELDS: It would be part of this website and part of the database; so, I guess, yes.

MR. ZUROMSKI: I guess if it met the

requirements for inclusion, sure.
MR. BURIL: How do you plan on coordinating release of information, say, through this discussion room with the requirements that are in the FFA that state that all the agencies have to have reviewed and approved anything released for public review?
MR. ZUROMSKI: They would not be on here unless that was so.
MR. FIELDS: We could set up a protocol such that nothing is posted unless everybody's in agreement.
MR. ZUROMSKI: And we kind of do that right now. We don't release them to the public. But, I mean, I think a lot of you guys -- the ROD, we have gotten available to you on line. The intent would be to still have that seperate webpage for documents that are under review. These are for things that have been approved, that are part of the administrative record that the public should have access to. That's all that would be on here.
MR. FIELDS: In all reality, this discussion room, how often -- if -- we would have to see how often it's really used. If you look at the logs of people who had actually visited the information repositories, it wasn't a long list.

MR. BURIL: The public response to your ROD, you had, you know, a number of questions. That's the other end of it.
MR. ZUROMSKI: Right. And, actually, when we were doing our meetings, you know, this would be very effective for -- you know, we had all those comment cards and everything that we responded to. This is another way to solicit, and it's another way -- you know, if we have this available, if it was an approved document, we could, like Keith was talking about, we could just put this -- for example, if the public -- if the proposed plan was out for review right now, instead of burying it in the administrative record, why not just put it right on this home page so people could look at it right away. Because then -- you know, this is the review period right now. During that review period, you could have it available for everybody to look at because that's the intent.
And, then, of course, you would also still send out the paper copies to our mailing list and all that, as well. This is just like another tool. That's all it would be used for, for the public involvement.
MR. BURIL: Quick question. And this is

purely example. It doesn't really have any factual information on it right now, does it?
MS. LONG: Only if you searched it to pull up the title of something, maybe.
MR. FIELDS: I mean it does have information in it, yes.
MR. BURIL: The thing that caught my eye was the February 7th, 8th, and 9th public meeting.
MR. FIELDS: This is a secured site.
MR. ZUROMSKI: We couldn't even get into it yesterday through the NASA firewalls, so. . . . .
MR. FIELDS: Well, we have security on this site, too. And, currently, it's just an internal version.
MR. BURIL: That's what I was wondering. That's fine.
MR. ZUROMSKI: Nobody knows we're having a public meeting today.
MR. BURIL: Least of all us.
MR. FIELDS: And this is information -- I understand your question now, Chuck. The information here is not hard and fast. This is just preliminary dates, some ideas, just to show functionality more than anything else.
This home page is where we could do

some of the most important events, brief introduction to the site. Program contacts is just a list of the folks here that the community might be interested in contacting, and if you click on --
MR. ZUROMSKI: We could put pictures up there, too.
MR. FIELDS: Yeah.
So you can click on one, it takes you to the person, their E-mail address. You can see some information there about each person who's available. I put links to the website, to their particular website, so they could look and get some more information from EPA region nine or whatever that may be.
We have a schedule, and this is where we could put the most -- you know, some of the upcoming activities and dates that we want the community to be aware of. And in that respect, we can use this as part of some of the other tools we use to inform the community what's going on at the site.
Some thought we had here is maybe we could put recent files, or maybe some of the most important files currently so that they wouldn't have to go into the admin record database search. You

know, maybe currently we did the OEE-2 responsiveness summary, the proposed plan. Here's from our public meeting. We had some presentation slides, the answers to frequently asked questions. A sheet we handed out at public meetings. And then we're working on a revised community relations plan. Maybe we want to put that in there.

But just an idea for maybe some of the documents we feel would be the most -- would have the most interest, we could put them on a separate location that's maybe a little bit easier to find.

We have website contacts with just, you know, more contact information for various folks.

Thought we might be able to focus on some of the remediation activities currently going on at the site and update the community that way. Here's maybe some information on what SVE is, a schematic diagram. This is basically from some information that was presented at the public meeting.

We may have some pilot test results which could tell the community what's happened, you know, how many pounds of VOCs have been removed, or, once the EE/CA is going, what kind of performance data we would have there. And some of these figures

are things we've seen in the past like this cumulative mass removal curve or something like that.

And then another idea is maybe for different remediation systems, particularly after they've been installed, is to have a photo gallery so that folks could see what SVE, what the actual system looks like. I didn't have any pictures at this time, but it could be in this format where they could go through and look at photos from the site and get a better understanding, a better feel for what the carbon system looks like.

MR. ROBLES: So if we put in there, "This is a regulator," we have Mark Ripperda's face there.

MR. FIELDS: Yeah.

MR. ROBLES: Standard regulator.

MR. BURIL: That's not what you said before, Peter.

MR. FIELDS: And then also another idea is we put in an overview of the CERCLA process, and a link to the EPA's information on the SuperFund process, as well.

So this is just to give you a sense of some of the functionality that we could put on here, I mean, certainly this could expand quite a bit and

give us quite a few tools for the community to look at.

The next aspect is the administrative record portion, and we talked yesterday about how we want to do this. At this point, there's just one search, but we talked about having -- which is typical for websites to have -- maybe a quick search and then an advanced search. You know, maybe some folks -- typically, people just like to type in a word or two and hit search, and we could put in that for ease of functionality. But then there may be users that would like to have maybe some more options on refining their search.

Basically the way the search works right now is you can identify either subject key words, record number, or author. You can identify what type of record it is, whether it's a fax or a meeting minutes or a plan. We can say "All Types" for this. And then let's say we want to search for a fact sheet. So all you do is type in your key word, hit search, and it returns the results.

Right now, the database isn't complete. We didn't load up all the CDs, and there are also some files that are still missing. So you can see some of the files aren't there. But,

eventually, it would have the information and then a link to the document itself. Okay. That one is not there because it's not -- we didn't load it onto the database. That one isn't, either. One of these will be.

MR. RIPPERDA: It works like a normal website.

MR. BURIL: I might point out, a NASA website.

MR. FIELDS: I should have checked this beforehand. Ah, there we go. Some information has been scanned in. I think we only loaded the first disc just while we're testing; that's why some of the links aren't connected up.

MR. ROBLES: So they could make a copy of this?

MR. FIELDS: Yep. They could save it if they had a disc.

MR. ROBLES: It's only read only and copy only; no modification?

MR. FIELDS: Right. In fact, I think the way they did it here was scanned in everything up to this point, so in that respect, it's an image. It can't be modified.

MR. ZUROMSKI: And they could also take electronic copies if they wanted to, right, if they brought a floppy?

MR. FIELDS: Yeah. They could save this to -- they have a save button here.
MR. CARLSON: It's a PDF file.
MR. FIELDS: Yeah.
MR. ZUROMSKI: But there is no way to change it, unless you go, obviously, to see a modification because it is an image. All of these documents were hard copies that were scanned in an image, so there's no real way unless it's obvious to modify it.
MR. FIELDS: And for future documents, a lot of the documents we do now, we go straight from, let's say, Microsoft Word to PDF. And then if you don't put on the right security, you can modify those documents within PDF. So we would just have to modify those slightly; or, you know, you could put in passwords and such that you can't modify them.
But that's the general way this would work. If, for instance -- this question was asked yesterday. If we went in and wanted to search for a particular thing and it wasn't there, it would indicate that no records are there at this point.
MR. ZUROMSKI: Whereas before we got a blank screen, and we didn't know what was happening. Now it tells you the reason that nothing is happening is because that document is not there.

MR. ROBLES: That's why.
MS. NOVELLY: How are the records sorted? It doesn't seem to be in order by date or anything.
MR. FIELDS: It was probably sorted, my guess is, is by record number. Let's see if that's true. It doesn't provide -- yeah, here it is, the record number on the far left. It looks like descending order by record number.
MR. CARLSON: Newest to oldest.
MR. FIELDS: Are you sure?
MR. ZUROMSKI: It looks like descending order.
MR. FIELDS: It is descending, the far left, so the highest number came up first and descending order down.
MR. BURIL: So as far as the record numbers and some other key field, it doesn't look like there's any specific way that you put them in. It's just whatever record came up at the time that you inputted. This Sony 2289 is 1993, and then I think there was -- this five others or something was 1999.

MR. FIELDS: And that's an artifact of however they were scanned in by -- is it --
MR. CARLSON: You could change the date if you wanted to.

MR. FIELDS: We could organize them by date. Date actually makes more sense to do the newest first.
Are there any more questions on the --
MR. RIPPERDA: What's on the administrative record home page?
MR. ZUROMSKI: That was the one that we started with.
MR. RIPPERDA: I just want to see it again really quick.
MR. FIELDS: This one?
MR. RIPPERDA: No, the admin record.
MR. FIELDS: Oh, the home page.
MR. RIPPERDA: Just go to admin record.
So is there a way to -- instead of having to do searches on key words, author, title, can you have an index of the entire record that would show up so that somebody who doesn't know what they're looking for can see a listing of all titles.
MR. ZUROMSKI: Yeah. Basically, that already exists and we would just have to provide it as another link.
MR. FIELDS: We'd have to think through that, if there's 5,000 or 6,000 records, how easy it is.
MR. BURIL: There's a lot more than that.

MR. FIELDS: Yeah, exactly. Maybe there's more.
MR. CARLSON: If they ask for that, it takes forever for a list to come up.
MR. FIELDS: But, you know, if we're talking how do we -- maybe we could organize those by type, if it's a fax or meeting minutes or something like that. We can think about how we could organize that. That's a good idea.
The last feature is the discussion room, and we had talked a little bit about its purpose. It would ask a user to register, otherwise it wouldn't know how to inform a user that something was available or response was available. But they can register anonymously and view the discussion room. But it's basically just very similar to an E-mail system. You can type a new subject, or, if you have selected a certain subject, you can reply to that.
MR. COFFMAN: Would this show all the inquiries and responses?
MR. FIELDS: Yeah.
MR. COFFMAN: For everything.
MR. FIELDS: So if they started --
MR. COFFMAN: So they could go through and

just see what other people asked and the answers they've gotten?
MR. FIELDS: Very similar to like a news group, if anybody uses news groups.
MR. BURIL: That was a question I had.
Do individuals who use this have the ability to answer the question that's posed by somebody else that is not, say, of NASA, Navy, whatever?
MR. FIELDS: They could reply, but it would indicate who the author was. And they can only reply if they put their name in. Now, I guess we need --
MR. BURIL: I could see Mickey Mouse giving a lot of responses.
MR. FIELDS: That's true. Somebody could log in as a fake name and/or say that they're NASA and put it in, and the author would show up there. So there are some things we probably need to think about through this with some security issues.
MR. ZUROMSKI: There were some other reasons that were brought up. Maybe if we weren't going to necessarily use it for the public discussion room, we could also use this for discussion room for documents, for discussing with you guys when you have comments or questions on documents doing, like, net

meetings and discussion of comments on documents just informally over this. And so that everybody can see, like when Mark called me and said, "What do you think about this idea for SVE" or something like that. Then you could just post it up there and Richard and David would also know that we talked, and there were things going on.
MR. LONG: But then that part you wouldn't be -- you would make it so it wouldn't be accessible.
MR. ZUROMSKI: No. That would be just for internal. These are just other ways to possibly use this discussion room, is probably definitely the most -- something we haven't kind of firmed up yet
MR. CARLSON: I would use Battelle's website for that discussion off-line where no one else could get into it.
MR. FIELDS: And the same website that you guys downloaded the ROD from has this same type discussion room, and that's where we borrowed the idea from.
But, actually, thinking through this, it would be acceptable or understandable to have folks submit comments, but I don't think the response -- and then maybe some sort of HTML hard-coded response at some point. More of like a --

they could -- comments could be submitted and comments could be evaluated before they're posted here. You know, as soon as they post, something is put on there. So we probably need to think through this quite a bit more.
MR. RIPPERDA: Having the stuff done as a moderated message board is what it's usually called.
MR. FIELDS: Right, exactly.
MR. RIPPERDA: Where stuff is submitted, you evaluate it, and you decide what actually gets posted for everybody to see.
MR. FIELDS: Exactly.
MR. RIPPERDA: I love the rest of it. The admin record, the main page with all the general information on it.
MR. ZUROMSKI: What do you think about using it for a substitute for paper repository?
MR. RIPPERDA: Yeah. I'm fine with that.
MR. ZUROMSKI: Because, to tell you the truth, the libraries were very open to this. NASA wants to do this. As long as we can do it, we plan to get this in before we do the public meetings for the removal action so that we can advertise it, have people use it, test it out, really, during that time because there's not going to be any documents

actually coming out for a while. So this would be the best time to test it.
MR. CARLSON: So somebody could go to the library terminal there to access it?
MR. ZUROMSKI: Yeah, right. The City of Pasadena has like 24, 14 downstairs and 10 upstairs. Altadena had about at least a dozen, and La Canada had about five or six. So there's definitely -- that's the one good thing, if somebody is looking at the ROD, that's the ROD. They have to wait. Whereas this, anybody can look at it at any time. And then also you don't have to worry about things being missing. I mean, those are really the key points.
MR. CARLSON: Very positive.
MS. LONG: And even though you can have them printed, the libraries charge you. The printing cost is less than the copying cost, so if they were going to copy it with a piece of paper, it's still going to cost them less to print it so --
MR. ZUROMSKI: Then they can always just save it on a disc and they can do whatever they want with it after that.
MR. BURIL: One aspect I would like to be sure everyone is thinking about with this discussion room part of this is that the moderation of that, the

timeliness of it, and the kinds of things that, if you don't moderate it, that get on there, could be very difficult to deal with. I've seen enough news rooms -- I follow basketball quite carefully, and I go into some of these on occasion. And you'd be amazed at the number of times you find links to porno sites. And that is one of the things that I think we have to be very careful of. We don't want to have our image tarnished by some thoughtless person putting something like that in there.

MR. ZUROMSKI: That's probably the least desirable part of this, of what we've done so far, is -- really, the key features are the main page and the admin record.

MR. FIELDS: I like the idea of being able to submit a comment, not that it shows up anywhere immediately, but it's a vehicle for them to submit the way Mark had indicated.

MR. ZUROMSKI: Where it sends an E-mail to --

MR. FIELDS: Yeah.

MR. BURIL: But a chat room format, I think would be a possible mistake.

MR. ZUROMSKI: I think you may be right.

MR. FIELDS: Another thought that we had that came up yesterday is the ability to add your name to

the mailing list and to review the mailing list to see if your name is on it.

MR. ZUROMSKI: Or update your address.

MR. FIELDS: Or update your address. So that's something that we may -- that we're going to consider when we get to back to the office, putting in that feature, as well.

MR. RIPPERDA: The standard webpage stuff -- I think you should just go with this without the discussion room. But a standard webpage format has a "Contact Us" button where you have a discussion room or you've got JPL -- and on the "Contact Us," that would bring up a page that either E-mail at blah, blah, blah where they click on that and E-mail gets sent, or add your name to the mailing list and a little form for the address gets filled out.

MR. FIELDS: And we have these web contacts; that's where you can click these folks and go directly to E-mail.

MS. NOVELLY: You have the ability to review the mailing lists. I would hope that would be just to check and see if my name is on it and not be able to look at anyone else's.

MR. RIPPERDA: Right. No. it would be add my name to the E-mail address, not everybody else.

MS. NOVELLY: Yeah. You wouldn't be able to see other people's names.

MR. FIELDS: You know, maybe the idea would be "Add my name to it," we would get it and say, "Okay, they're already on it. We don't have to add them." That's probably a better way to do it.

MR. ZUROMSKI: Basically to make it so they can do that because that was something that we noticed from when we sent out the proposed plan was that we were receiving a lot of things back from people's addresses that have changed or whatever, so this would make us -- at least give us the opportunity to make sure it was updated.

But I think you're right that this should only be "Submit your name if you don't think it's on the list," and we can do the verification ourselves.

MR. BURIL: I'd like to suggest that you take that one step further; that the only individual names that show on this are official agency contact names because those are the folks who are identified as public interface for those agencies. Virtually any other name should not be on there.

MR. ZUROMSKI: So that's what we want to present and let you know it sounds like -- you know,

if sounds good to you guys.

MR. CARLSON: One more little comment.

MR. ZUROMSKI: Sure.

MR. CARLSON: I know some of those PDF files can get pretty big because the document can be large. Can they be broken up so somebody could save it on a 1.4 meg disc? How many pages can they hold on that? Is there a way to do that, to save one page at a time?

MR. ZUROMSKI: You could give them the WinZip format or something like that.

MR. FIELDS: Unfortunately, in a zip, when you zip an image, you don't gain that much. We haven't reviewed it enough, and we didn't do the scanning on the documents, and we're still receiving that data, so we'll have to look into it. If you get documents that are extremely large, that could definitely be an issue.

MR. COFFMAN: Things like maps and pictures and things take up a lot of space. A PDF file of a map could be eight or 10 megabytes in size.

MR. FIELDS: Although the way they did this, if they're just scanning in the documents, there's no difference between a map or a text because they're all images.

MR. CARLSON: It's still 50K per page or something like that. We had them fax it -- we get faxes that actually show up as E-mail for our system, and I think it's like 50K per page, roughly. So a 1.4 meg disc holds 20 pages. It ain't nothing.
MR. FIELDS: We'll look into that.
MR. BURIL: That's a good point because if someone wanted to call up the RI, for example, you know, that's some 600 pages. With all the various things that support it, that would be heaven knows how many megabytes -- gigabytes.
MR. FIELDS: Do we know if they divided that?
(Discussion held off the record.)
MR. RIPPERDA: I think it's okay because it's the CERCLA program, and they are the lead agency. NASA is the CERCLA lead agency.
MR. MABEY: I was asking the question whether or not -- you're using the term "CERCLA." Does that give people the impression this is an EPA-run program?
MR. ZUROMSKI: Does Superfund actually give the connation that it was an EPA-run program? CERCLA would give it that opposite impression?
MR. MABEY: I'm just offering an

interpretation it could be outside the --
MR. BURIL: No. Well, it's possible, but with NASA's logo there and it says, "Welcome to the NASA/JPL CERCLA website," you know, that's pretty concrete that this is a NASA site, I think. It's dealing with a CERCLA program that NASA deals with.
MR. ZUROMSKI: What we'll probably do is once Keith and I kind of go through to make sure it has all the features, we'll probably send it out to you guys to take a look at. And if you have any comments or language changes or whatever you might want, we'll probably just, you know, make any changes that you might deem necessary.
MR. BURIL: Could I make a request? And that is that before this be released to the public, we give JPL's public affairs folks a chance to look at it. Because we want to be sure that there's consistency regarding JPL, the facility, between all of the various webpages, because we have literally dozens of them here at JPL. And I want to make sure that the information provided here is consistent with those.
MR. ZUROMSKI: I think we'll provide it to everybody, including you, and we'll rely on you to coordinate with the JPL folks.

MR. BURIL: That would be fine.
MR. CARLSON: By format and color -- consistent by like format and color of motifs, you mean?
MR. BURIL: There are formats that are imposed on JPL by NASA that may impact us. I don't know that it's going to go to that level of detail. But just to be sure that, you know, information is consistent throughout that's provided that's about the facility itself.
MR. CARLSON: All right. I see.
MR. ZUROMSKI: Well, that's all we want to do is give you a quick overview, show you how this works, get your comments in. Like I said, once we get it all kind of finalized up, we'll send you a link to it with a password so you can get into it and take a look at it a little bit more, tell us what you think. And, hopefully, by early next year, we'll have this up and running with the link and we'll be ready to go by the time of the public meetings.
With that, we'll go ahead and shut this down because I know CH2MHill needs to leave, and they want to take their little projector with them. We were going to take it from them, but they decided not to. Do you want to take a quick like two-minute

break while we let them shuffle around, and then we'll come back.
MR. BURIL: Sure. That's fine.
(Recess taken.)
(Hearing resumes without the presence of Fritz Carlson, Ken Martins, Hooshang H. Nezafati, and Eric Aronson.)
MR. ZUROMSKI: Shall we get started again already? Okay.
Operable unit two record of decision. You guys have all received the draft, and we've got all your comments. And, David, if you want, you can talk about your comments. But what I want to do is we did receive your comments and we've taken a look at them, but I want to know your feelings on the draft ROD and how you feel it was presented. And in general, you know, your comments aside, how do things look on the draft ROD as far as going forward to the draft final at this point? And I'd like if each of you, if you could share your thoughts, that would be great, and then we'll talk a little bit more about your comments.
MR. RIPPERDA: Do you want to start on one end and work your way around?
MR. ZUROMSKI: Sure, Mark. Why don't you go

ahead.
MR. GEBERT: I want to start. I probably have even less to say than Mark does.
I thought it was very well written. You have my comments. They were more suggestive than they are -- you know, there are ways a few things could be said better; but, you know, by and large you did a great job.
MR. ZUROMSKI: Great.
MR. ROBLES: I liked your clarifications because they were very helpful
MR. GEBERT: In some ways it's a little easier to understand. But other than that, you did a good job.
MR. ZUROMSKI: Is there anything significant, do you think, aside from your comments that we are going to need to address before we go to draft final or addressing your comments should be sufficient?
MR. GEBERT: That should be sufficient.
MR. ZUROMSKI: David.
MR. YOUNG: Well, I told you on the phone when we talked that one day that I haven't had much experience as far as RODs, you know, and reviewing them in the past. And so I was trying to review the document, you know, being as objective as possible,

maybe, from a regulation standpoint and, you know, from a consultant and also maybe someone reading it in the public. And so I thought it was well written. And, you know, all the information was there that was discussed previously in the meetings that we've had, so I thought that was good.
Now, as far as my specific comments, I guess I could talk about.
MR. ZUROMSKI: That would be great. Sure.
MR. YOUNG: We had a couple of people from the board review the document. And some of this we've discussed before in our meetings, but they just wanted to sort of emphasize this out of the document. And let's see. One would be that you proposed additional extraction wells for the full-scale system; but I'm not sure, and I don't remember it being in the document, that you didn't propose additional vapor monitoring points, too. And that may be necessary to evaluate, you know, the extent of contamination vertically and laterally.
MR. ZUROMSKI: That is actually something in an internal tech memo that we have already discussed that we are planning to put in.
MR. YOUNG: Okay.
MR. ZUROMSKI: But if you'd like us to include

that as part of the ROD, we can do that
MR. YOUNG: Yeah.
Let's see. Secondly, it was indicated in the ROD that the system will be operated until the performance objectives are achieved. And it was based on the performance -- or the readings concentrations at the soil vapor points, but the concentrations also need to be reduced to baseline levels at the extraction wells themselves, too, so --
MR. ROBLES: That's a good point.
MR. YOUNG: I mean, I guess that's not evident, but I guess it just needs to be clarified.
MR. ROBLES: Clarified, and to be more specific with that, okay.
MR. YOUNG: Right.
And then lastly -- I'll just read this off here. As indicated in the regional board's letter dated February 11th, 2000, to NASA/JPL, concerning the draft feasibility study report for operable unit two, the VOC rebound concentrations measured from vapor monitoring probes shall be compared with the calculated soil screening concentrations based on the regional board's interim site assessment and cleanup guide book. And you're well aware of that.

However, if the rebound concentrations, upon successive sampling, exceeds 50 percent of the soil screening concentration, the SVE system must be reinitiated.
I can't remember exactly how we discussed shutdown of the system; but, basically, the interim site assessment and cleanup guide book says that, you know, if the rebound concentration does not exceed 50 percent of the soil screening concentration measured, let's say, quarterly over a period of one year, then the system can be shut down.
So I think, then, in the ROD, if I remember correctly, that it stated that you would monitor for some, you know, period of time, and then if you didn't see the rebound above, you know, asyntotic levels, then you would shut down the system. Whereas I think the guide book specifies you need to have a certain length of time that the system is shut down, continued monitoring, and then over -- say after a year, if the levels haven't rebounded, you know, significantly, then you can shut it down.
MR. ZUROMSKI: So it's a little more specific.
MR. YOUNG: More specific, that's all.
MR. FIELDS: We've looked at it quite a bit. We can talk about it more. But, yeah, the 50 percent

of the screening level -- I mean -- so that's saying if it rebounds to 50 percent of the screening level, you have to reinitiate the system?

MR. YOUNG: Yes.

MR. FIELDS: I mean, your screening level, if you hit your screening level, that means you've cleaned up the site; right? Is it that you're saying now you have to shut it down, and then you come back up to only 50 percent of that, we have to reinitiate. There's some language in there that seems, if not impossible to achieve -- maybe I'm reading it wrong -- but it's very -- extremely stringent beyond maybe what's capable of the system.

MR. YOUNG: I wish I would have --

MR. FIELDS: We'll look into it closer and then in our response get back to you. But we have looked at that closely, and we've had discussions. But we'll look at it more and give you a good response.

MR. YOUNG: You have that document; right?

MR. FIELDS: Yeah. We did look through that. There are portions where we've used that extensively, and we did consider all of those in our development.

MR. BURIL: David, this is the one that was done in like '96 by the --

MR. FIELDS: Yeah.

MR. BURIL: -- by Taneka and others?

MR. YOUNG: I think that's right.

MR. BURIL: Okay.

MR. YOUNG: Well, let's talk about it further, okay.

MR. RIPPERDA: When you send a copy of the basin plan to Richard, can I get a copy of that? Instead of you copying and sending one to me and one to him, since he's used to sending things out, send a copy of the basin plan to him. And then if you guys have the regional board guidance document on SVE, could you also send a copy of that?

MR. FIELDS: Do you want me to send it to you?

MR. ZUROMSKI: Send it to both of us.

MR. RIPPERDA: Along with the basin plan.

MR. YOUNG: Sure.

And then I guess we should talk about that and just clarify a few issues. And that's it.

MR. ZUROMSKI: Okay.

MR. ROBLES: That's a good point. We need to be more clear on that because that's going to be a question from the public: when do you shut the thing off and when do you turn it back on?

MR. ZUROMSKI: What we'll do is we'll look at

that over the new few weeks and then we'll provide a response, and if we need clarification, we can also have an extra teleconference to discuss that.

MR. YOUNG: I'm going to forward this document to you.

MR. ZUROMSKI: Okay. Great.

MR. BURIL: Isn't the shutdown criteria established within the ROD?

MR. RIPPERDA: Not concretely. Right now, the ROD has a little bit of a mishmash of shutdown criteria. It's got that rebound logarithmic and the log of the --

MR. BURIL: Yeah. That's what I remember.

MR. RIPPERDA: Which isn't any regulatory criteria; it's, you know, some author, some professors or whatever, some consultant, you know, wrote it. It looks pretty good, but it's not a regional board, you know, regulatory criteria.

So the ROD had that in there, and it also had something about when economically you're not getting enough out to justify running it compared to groundwater treatment.

So right now the ROD doesn't have what I would call an exact shutoff criteria, which I kind of like.

MR. FIELDS: You like exact or you like it --

MR. RIPPERDA: No. I like it a little.

MR. FIELDS: I think it's kind of passe to really pin down exact because you don't know what is going to happen. I mean, basically, it seems to me you want to establish some general thought process on how we're going to acheive an exit strategy. And it is, no matter what, it's a negotiation process once we get to a certain point.

MR. BURIL: That's kind of where I'm heading on this question, and that is with your knowledge of the criteria that the regional board has, I don't know if you've studied it thoroughly, but from my experience with the criteria, because I saw it back in '96, and I've been watching it ever since, there appears to be quite a distance between what's being said here in the ROD and what you're saying. And the impact to that -- or impact of that on the longevity of the operation of this system, and, ultimately, the cost of this remediation is significant. It is not immaterial by any means. And I think that that needs to be brought out in some form and discussed and reached with some kind of conclusion because I could see this becoming a sticking point at some juncture.

MR. ZUROMSKI: Because you couldn't get out of

that do-loop is what would happen.
MR. BURIL: These criteria are extremely stringent.
MR. FIELDS: Absolutely. Absolutely.
MR. YOUNG: Well, then, let's get this in the pipeline.
MR. FIELDS: Yeah. I think this would be a good point to address it. You've brought it up, and we can go through and come to some resolution of that.
MR. ZUROMSKI: So just forward your comments, and we'll look into it right away.
MR. YOUNG: Hopefully within a couple weeks we can resolve that.
MR. ZUROMSKI: Definitely. Definitely.
Anything else in general besides those specific comments, David?
MR. YOUNG: No. That about covers it.
MR. ZUROMSKI: Great. Thank you.
MR. RIPPERDA: Well, actually, I'll let Bill talk for himself. He's asked questions or made comments to me, so anything that you feel strongly about, Bill.
MR. MABEY: Well, I mean, there was an issue about the shutdown criteria, and there were several

criteria. The rebound factor is based on a total pressure. It wasn't chemical specific. And so if you're sucking Freon and get the Freon out, that's great. But that's not really going to solve your groundwater problem. So different wells looks like they may have different chemical mixtures, okay.
So the question is: Are you going to use that rebound factor the same for all wells, or are you going to take into account the consideration of what the chemical composition is in that well?
MR. FIELDS: Well, it would be chemical specific. I mean we can clarify that. When I saw your comment, that's what we thought. I mean, we were intending to look at each compound individually in each well, and that's how they're recorded, and then look at their rebound.
So there's some compounds like Freon that are already -- there's not a concentration at the site that exceeds a screening concentration prescribed by the guidance document, so -- but then there are, you know --
MR. MABEY: So what you're saying, you were actually going to provide specific rebound factors for TCE, carbon tet, each one, and try and dump by that criteria?

MR. FIELDS: Right. Exactly. It would be -- compound specific was the intention, not a total VOC reading. Because we probably -- our screening criteria or cleanup goals or whatever would not be based on a total VOC; it would be based on individual compounds. That's how it's specified.
MR. MABEY: Okay.
MR. BURIL: That is consistent with the criteria of the regional board, isn't it?
MR. FIELDS: Exactly. They require that per compound. So we'll make sure that that's clear.
MR. MABEY: Okay. There are just some clarifications, and then there was also some -- our engineering went through and made some comments with regard to the cost estimates.
MR. ZUROMSKI: Actually, we wanted to address that today, in general.
Go ahead, Keith.
MR. FIELDS: Oh, basically with the cost estimates, I think it's agreed that at this point we could come up with a much refined cost estimate that incorporates what our current knowledge is with our pilot test system, with how many wells we really think we're going to install, with the idea of having a mobile unit that rotates through systems rather

than having five separate systems like the cost estimate's based on.
MR. ZUROMSKI: We've got a contractor who has given us the cost for the wells, to drill the wells, the operating data.
MR. FIELDS: Right. Actual costs.
So I guess the point is: Do we want to use what was in the FS because it was in the FS and just carry that forward through the ROD? Do we want to refine the cost estimate to what we think is more accurate at this point and deal with the discrepancy within that to the FS, but have a more accurate estimate?
Because, really, once we get down to it, we can't defend these numbers with our current information. And I understand what you're saying, you know, like you had a question on, you know, the cost is significantly above RS means for drilling. And I assume that that's because they're using the sonic drilling technique, and that's what it was based on, which is significantly more expensive.
So, yeah, I guess the question that would be is just do we want to maintain this cost estimate that was in the FS because it was in the FS and for consistency through the ROD, or do we want to

refine it at this point and have maybe what would be more accurate with our current understanding of the site and conditions?

MR. MABEY: This was in more of a -- I hate the acronym, but a conceptual remediation action plan, in some ways, am I correct? Because you're saying you may put in five wells?

MR. ZUROMSKI: In the FS, right, it was conceptual. And it's actually --

MR. MABEY: And it still is conceptual.

MR. ZUROMSKI: Right. It's based on the procedure, and going to a site and drilling the wells, seeing what the concentrations are, and then moving forward from there.

And then even -- Mark and I were talking on the phone -- even though you go and drill that new extraction well, you do one of those new techniques like the PneuLog technique to see if that extraction well, when it gets drilled, is even going to be worth extracting from for any significant amount of time, if any.

So those are the kinds of things that aren't really built into that cost estimate. That cost estimate is very conservative, and it's basically straight out of the FS.

So what Keith is saying is basically, yes, we could go back and we could give you -- based on what we're planning, we could give you a much better defendable number, but is that necessary since this has been drawn through the FS, through the proposed plan given to the public, what is the necessity of doing that? Because we would have no problem doing it if it's necessary. So I think that was pretty much our response to that.

But we wanted to know because that's going to kind of determine how we're going to respond to you, as well. Because if you want us to do that, we're happy to do that.

MR. RIPPERDA: I don't think I want you to -- I don't want you to redo because there's so many variables. I included all of his engineer's details just so, if you wanted to, you could be double-checking with your engineer. Making sure that he or she isn't screwing up.

And then Richard and I both had, I think, very similar comments of even though it appears that the ROD guidance from the EPA asks for a lot of these net present value tables and everything, just go ahead and take them out and include the summaries. Don't give them quite so much detail.

MR. ZUROMSKI: Okay.

MR. MABEY: There was an issue --

MR. FIELDS: So do not redo cost estimate?

MR. RIPPERDA: Right.

MR. MABEY: Just be aware of what was flagged going through.

MR. ZUROMSKI: Definitely.

MR. MABEY: And one of the things that was not flagged we also noticed was it didn't appear that you figured some modeling to evaluate loading residual chemicals to groundwater. The modeling costs were not including that cost estimate. Sometimes that can get appreciable. And it doesn't say whether any modeling has been done or who will do it or when it will be done.

MR. FIELDS: At this point, and because this is still obviously not tied down either, but the modeling that's being done is just what's in the guidance, which is very simple modeling.

So when the FS was written, it was several years ago, not by us, it's not do we need to -- do we go back and include a cost element for modeling. I don't know.

MR. MABEY: I just think you need to reference the FS, this was done, and will be revised at a later

time. Just so you know where it's coming from.

MR. FIELDS: Should we list out a list of maybe assumptions that we have -- that have changed since the FS? Is that what you're asking?

MR. ROBLES: No, no. Because that's just too much. Just keep it for your reference.

MR. FIELDS: Okay. This is just for our reference; no change in the ROD. Okay. That's understandable.

MR. MABEY: We have an issue, that, again, the first objective, asyntotic, you know, we've been through this. It was asyntotic submission for shutting it off; but, again, you're going to put in more criteria for shutting the system down.

And do you want to discuss this issue of acceptable risk?

MR. RIPPERDA: Why don't you put it in your words since you're the -- you were talking quite eloquently about that this morning.

MR. MABEY: I don't know if it was quite eloquently.

This issue of acceptable risk, but it's -- EPA's generally acceptable risk is the following, okay, which is a general statement, okay. Going through the list, you can read this to say that

10 minus four cancer risk is acceptable to the site. That's just if you read it. I'm saying the public may react to that.

MR. BURIL: Violently.

MR. MABEY: Yes. And what it really means, as I understand it, is that's really a manageable risk range, and, you know, just capture that, the essence of that.

MR. FIELDS: Absolutely.

MR. MABEY: On other projects I'm going through right now have the same problem, acceptable risk. And so that's sort of the topic of the month or the year, I guess, whichever it is at this point.

Some language issues, some clarification of the terms which are obvious.

Perchlorate was not mentioned. Now, are you saying perchlorate is mainly up in that sector NW-7 and 16? And are you saying there is no perchlorate on-site in the OU-2 that's going to be SVE'd, if that's a word?

MR. FIELDS: We're not saying anything about the perchlorate, but I'd like Mark's or yours suggestion to put a paragraph in to acknowledge that it exists and that data will be collected during the remedial action or at some point down the road, so

that we're not ignoring it. But there's no data to report on it at this point, and that there was no data collected during the RI. But I like the idea of acknowledging that and then moving on.

MR. RIPPERDA: I forgot how I worded it.

MR. FIELDS: I though that was good, yeah.

MR. RIPPERDA: But something where perchlorate came up after the remedial investigation, and we will be taking --

MR. BURIL: My suggestion would be to the use the same language that's in the FS.

MR. RIPPERDA: I forget what's in the FS.

MR. BURIL: Probably very similar. I haven't seen your comments, but it was basically language that you had suggested that's in the FS.

MR. RIPPERDA: So as long as you guys agree. That's something we feel strongly about. We want mention of perchlorate in here. And we absolutely want some deep soil samples for perchlorate when you're drilling a new well.

MR. MABEY: And one thought, you know, I just discussed with Mark. When you go to do the analysis for perchlorate, you may want to think about rather than a soil sample analysis, maybe a soil extract analysis because that might be an even bigger sample,

and it might be an easier analysis, and it may be cheaper. I don't know.

MR. ZUROMSKI: We talked about other things when operating the SVE system is getting soil moisture, too, you know, because sometimes during the rainy season you might hit a pocket while operating SVE and your knock-out pot might fill up with water.

Why not, you know, just for guessing sake, take a look at that just to see -- that might give you some indication. I mean, the problem is, of course, you know, there's no real, real solid way, of course, right now to know what's in the soil, the perchlorate. And there's no way probably to get it out. But at least to give us some indication, that could be another way. That's a great idea, as well.

MR. FIELDS: Have you guys worked any with -- or are they using like an SPLP extraction in California to measure perchlorate? Have you guys had that at any of your sites?

MR. RIPPERDA: I don't know. A guy at EPA, one of our chemists who works in the analytical services side, Joe Heidelberg, he would be a good guy to talk to because I know he's doing work on perchlorate.

MR. MABEY: What you need to do, though, when

you do an extraction test, SPLP or whatever you want to use, the concentration you get in water does not mean anything, okay. You need to take that mass and transfer it back into a mass of perchlorate per mass of soil, okay. Because what happens when you do the SPLP when you do the extraction, you move down the sample.

MR. FIELDS: Twenty time.

MR. MABEY: Plus the pour volume of the soil, which brings it down even more, okay. So you need to express that in some way in terms of a mass of perchlorate per mass of extracted soil to make it a more meaningful quantity.

MR. ZUROMSKI: I think when we do get to that point, we will definitely be in contact with you guys on that.

MR. BURIL: Bill, is that presumed a hundred percent of perchlorate and a hundred percent extraction is achieved?

MR. MABEY: Yeah. And, I mean -- and for perchlorate, you know, that's not --

MR. BURIL: It's not entirely unreasonable.

MR. FIELDS: If you're going to do that -- I mean, if you're relating it back to soil, I don't think SPLP is the method used. You'd want to use

some extraction method or some extraction -- something that would remove all of it, or you would have a better idea that all of it was removed, rather than trying to dilute it down and calculate it back. You just want to try to extract it.

MR. MABEY: For what the number means and what that soil volume, you know, represents, I think if you get within 80 or 90 percent of what's there, okay, the flag up -- the flag goes down, okay. So it's not a real number that you were going to put much faith in. Yeah, we got some stuff there. We gotta start thinking about it now in terms of do we have high concentrations in soil? That's the objective of the data is a flag, not for decision-making process, as to do we proceed to clean up the site, okay.

MR. ZUROMSKI: Exactly.

MR. MABEY: It's a data quality objective issue.

I think that was -- I mean, in terms of the risk assessment, when you say there's, you know, basically acceptable risk, and, you know, I think the guidance suggests you need to put some numbers in there, some specific chemicals. You discussed dioxin in the nine criterions that went into the RI.

All you have is you have the active chlorodibenzodioxin, pretty much. You don't have any of the other. And so I think a little bit more information like that might be a little more useful in the ROD, as a public document, to make people feel really a little more knowledgeable as to what is there.

Saying there's no risk is -- because there is an acceptable risk, may trigger some people to ask what's there and they may start digging. Giving them the information upfront, and they may not start asking you questions, you know.

The other issue was the issue of the residential, or do you want to just think about that in terms of risk?

MR. RIPPERDA: You can go ahead and say what you were saying this morning and talk about it.

MR. MABEY: One of the things in discussing this issue of risk, okay, what you're really saying out there, the site is going to be an industrial site for all intents and purposes, okay. So using that residential risk evaluation is meaningless, okay. And just if you leave the term "residential risk" out, say, "This is an industrial site," then you may get better public acceptance as opposed to suggesting

this could be residential site.

MR. BURIL: One question, though. Isn't the criteria in the evaluation for residential risk the most conservative?

MR. MABEY: Yes, it is.

MR. BURIL: So from the standpoint of distinguishing between residential and industrial, from a public perspective, if you place the most stringent criteria for risk on the site as residential and explain it in that fashion, you're not trying to qualify it. You're saying, "We did the very hardest test we could."

I, personally, would find that to be more of a comfort than to make the distinction of residential to industrial.

MR. MABEY: But if your risk is five times 10 to the minus five, okay, and you call it acceptable risk in a residential setting, okay, then I think the public may react to that and say, "Whoa," okay.

You need to decide how much information you want to present, okay, and put it in the right context. But I'm just saying putting it in there in a residential context, I mean, when it never will be used as a residential area, okay, may trigger some concern on the part of the public.

MR. BURIL: That's true.

MR. ZUROMSKI: That's a good point.

MR. MABEY: And so why raise issues which really aren't necessarily important to be raised?

MR. RIPPERDA: There was some stuff Bill and I were talking about this morning. So it's not really in there. I wrote something where I suggested a rewrite just of your language, residential use versus industrial use, which was just a pure language edit.

I do think it's good to, on any site, run both residential and industrial and give numbers.

MR. BURIL: I think one thing that I'd like to just be sure, and I'm not remembering the numbers right now, so help me if you guys remember them.

Do we have a situation where the industrial risk is acceptable but the residential risk is not?

MR. MABEY: I couldn't find the information, and, in fact, the risk assessment section is missing from the RI I have for some reason.

MR. ZUROMSKI: That was the specific copy we gave you.

MR. MABEY: Okay.

MR. ZUROMSKI: But available to the public is the --

MR. BURIL: You're no help, Richard.
MR. MABEY: Originally, I was thinking about this thing with Mark is going back over previous comments from my predecessors; they felt there was inadequate data in the surface soils to do a risk assessment, okay. And by this -- you know, avoiding this issue of residential risk, then it becomes a moot issue in terms of how many soil samples because if, indeed, down the road, JPL goes out of business, and they do a property transfer, okay, there's going to be due diligence to go out and collect more soil samples regardless of what you've done.
So I'm just saying, you know, think about how you want to present the risks and make this an industrial site and get on with it.
MR. ZUROMSKI: What comment number is that offhand just to note the comment number?
MR. RIPPERDA: That was a discussion number.
MR. ZUROMSKI: I know it was a discussion number, discussion you had, but your comment, Mark, related to that. Because what we'll do, is Keith and I will kind of try to address that in your comment, even though it's not specifically related to, you know --
MR. MABEY: Well, I can write that up.

MR. ZUROMSKI: Yeah. If you want to do it as a separate comment --
MR. RIPPERDA: It should be a separate comment because it's a little more philosophical.
MR. ZUROMSKI: So just go ahead and send it to us in a letter, and we'll just address that, as well. But if you could E-mail us a copy ahead of time while we're developing our response to these commments, that would be helpful, as well.
MR. BURIL: I would like to suggest that consideration be given to the idea that we have residences literally abutting the property line. And so from a public perspective consideration, the fact that, you know, it's good while it's industrial but somehow perceived as not good while residential, simply by crossing a fence line, you have made that distinction, is going to be something you're going to have to word very carefully.
MR. MABEY: Well, the whole risk assessment section was pretty devoid of any clarity in terms of, you know, "Most risks were acceptable," is what it said. And so you may want to go back and address that specifically.
MR. ZUROMSKI: Okay.
MR. MABEY: I really think the same deficiency

existed in the FS for reasons that I don't know.
MR. RIPPERDA: Let's talk about that a little bit. So we do have three specific comments that address risk assessment; two of them were from me and one was from Bill. And they kind of beat around the bush a little bit with what we were talking about.
They all boil down to the fact that in the RI your soil samples were all geared at potential sources. So you're taking samples from around the seepage pits, from around the discharge to the Arroyo. You weren't doing anything like what you do when you're closing a military base where you're trying to evaluate reuse of an area. So you don't really have a data set to say, "You could put a daycare center in, and the soils there are fine for it." Because you didn't try to do any kind of grid sampling, you really didn't try to do a surface soil sampling analysis and risk assessment. But you're in a kind of bit of a bind because a typical soils ROD, you want to say that, the soils don't pose an unacceptable risk. So you kind of use some of that standard language that goes along with soils risk assessment in your conclusions, but you don't really have a data set that leads you to those conclusions.
So that's where Bill's talking about,

kind of just change the way you think about how you present it would help. If you say that this ROD addresses the vadose zone soils and the source of contamination, the source of chemicals to the groundwater, and pose your risk analysis in terms of that. And then you can also -- whatever soil samples you do have, which were biased towards, hopefully, the most contaminated areas, and if those meet PRG's or if those meet a risk assessment, assuming that those are the worst on-site, and that they still allow for residential or industrial reuse, you know, state it in that way.
You know, "The soil data set that we do have which were taken from the suspected highest areas of contamination, you know, still allow for unrestricted use" and give whatever chemicals are there, what their values are, and say, you know, it comes out to a five times minus five risk. Something like that.
MR. ZUROMSKI: Okay. Keith is writing feverishly. We do have all of this on the record, too, in case you do need to get it later.
But does that make sense to you as far as --
MR. FIELDS: Yeah.

MR. ZUROMSKI: Because we're going to be typing up those responses.
MR. FIELDS: Sure. That sounds like a real good idea.
MR. ZUROMSKI: Okay.
MR. FIELDS: We'll do it.
MR. ZUROMSKI: Did you have any other, you know, even --
MR. RIPPERDA: Everything else is just written down. It's hopefully pretty -- you don't really have a site conceptual model. The flow chart that's in there, I think, of a site conceptual model as being physical, a source, transport, and a pathway. And the site conceptual model is -- you have -- I don't know what to call it.
MR. FIELDS: It's one type of site conceptual model, but not necessarily the most useful type. I think it was the type that was in the FS and carried forward. If we'd like to make another one, we can.
MR. RIPPERDA: This is written in here, so I guess I don't really need to talk about it. But it was actually on your webpage, just the physical drawing of the plume and all of that.
MR. FIELDS: Yeah. You asked to draw that.
MR. RIPPERDA: I like that.

MR. MABEY: As a public document, it's good to have that because the record of decision may actually get more attention than the feasibility study in terms of your local population.
MR. RIPPERDA: Otherwise I think stuff in here is pretty self-evident. Bill also was saying to me this morning that he thought it was pretty brief, didn't provide much detail or background, and --
MR. ZUROMSKI: We intended to reference documents a lot, and, you know, that's the style that we decided to use. Originally, actually, the internal -- first internal draft was considerbly thicker, it was considerbly larger, and had -- and it was just a, you know, tradeoff. So if you'd like to see more information on there.
MR. RIPPERDA: I'm just trying to just throw more things out. I don't want everything to just be me. I want Bill to talk from his perspective, as well. So I explained to him that I was happy with it the way it is because basically it's a presumptive remedy. You know, a lot of the information, both the geology and the contaminant information along with the ARARs analysis and the nine criteria analysis, you just don't need as much because the whole point is you're trying to protect groundwater, and the

presumptive remedy says, "This is the appropriate thing to do." Whether you have a lot of stuff in soil or a little bit of stuff in the soil, in the vadose zone, you know, it almost doesn't matter.
MR. ZUROMSKI: And that actually just -- I think we addressed the questions that we were going to address to them, anyway.
So does anybody else have any other comments, then, on the ROD that we can discuss before we respond to your comments?
MR. RIPPERDA: Yeah. Just to try to keep making it easier or tougher for you, so, you know, everything that -- it sounds like all three of the regulators have submitted are pretty much specific comments. The only two real rewrites, kind of conceptual rewrites, are the risk assessment, you know. We can write that a little bit out, a couple paragraphs, and maybe the shutoff criteria. And it sounds like most of the regulators kind of are of the opinion that we don't want an absolute formula or asyntotic value or something in the ROD.
I personally much prefer to have language such -- you know, "It will be shut off when it's in compliance with State of California Regional Quality Control Board criteria, U.S. EPA criteria,

and regulatory acceptance or acceptance of the regulators." That's my happy zone.
Some responsible parties much prefer to have an exit strategy in place before they start. They want to know when we either extract this many pounds or when our rebound is this percent, we can shut it off. They don't want to leave it open-ended in case they get a tough-to-deal-with regulator. But there's too many variables for me to want to pick an equation, a priority.
MR. ZUROMSKI: I mean, I think that these are things that we're going to have to discuss, you know, internally. NASA, see what they have to say. I can see your point. You're looking for something a little more general. We had kind of balanced it a little bit, but maybe we can achieve some kind of medium there. But we'll respond, you know, as we need to. And then, you know, we can discuss it in the next round of --
MR. MABEY: By way of review with respect to, you know, when you put down the criteria, you put down like the .2 as specific rebound factor A, and then the data weren't there to support the fact that, really, there was no work on the site to support that, okay. So if you put in, like Mark says, this

is how we will achieve closure when it's in compliance with all the various guidance, you know, and with approval of RPM agencies, you know, something like that will make us feel better.

MR. ZUROMSKI: So it's, you know, we'll do this if you concur in what we're doing, rather than this is when it's going to be shut off, is what you're saying?

MR. RIPPERDA: Yeah.

MR. ZUROMSKI: But maybe still allowing us to do what we feel comfortable in having something that we think that we could shoot for as an exit strategy, but with the concurrence of the RPMs or something like that, to some effect. I mean, that's something that we can overcome, work on. That's fine.

MR. MABEY: Sometimes, as you point out, we go into these things with these RODs, and some RODs, at the beginning, you find out other things about the site that isn't covered by the ROD. And then you have a mess. And, so, you know, it's good to have flexibility, but you have to realize that the good part for now and the bad part later on is for flexibility.

MR. ZUROMSKI: Okay. Then with that, are there any more questions on the ROD for now? Like I

said, probably, you know, within the next two weeks, we'll be working on your response to the comments and we'll send you that via E-mail, and then we will discuss those probably on a conference call. I will try to set up a conference call. I know it's going to be getting close to probably Christmastime, but -- I know, Richard, you're going to be gone and you're coming back when again?

MR. GEBERT: January 8th.

MR. ZUROMSKI: Okay. And so maybe we can, if we don't get them in while you're around, we can either get Richard on the phone and/or we can just wait until you're back. We'll see how long it takes us to address the comments first.

With that, let's go into the last bullet, I guess, which is really number seven, the pilot study progress.

The first thing I want to address is the SVE. I sent each of you a memo with a little technical backup probably about two, three weeks ago, and gave you like 30 days to take a look at it. I'm asking you now if you need the next two weeks or if we should go ahead and get started.

MR. RIPPERDA: Yeah, you can -- yeah.

MR. ZUROMSKI: Because we found that now would

be a good time to get started rather than wait until January, if possible. So unless you have any problems with us --

I don't know if Bill or Richard saw the memo put together. Basically the memo says that we have our SVE pilot that we've been operating for the last couple years out there. And, basically, we want to restart it and try to use the criteria that we're proposing in the ROD to apply it to the pilot study just to see how it would work in order to maybe help bolster our arguments in using those types of criteria. But at the same time doing another pilot study just to continue the pilot study because, you know, there is still some -- you know, it would be beneficial to continue to run the pilot study right now.

So if nobody has any problems with that, and if you do, that's fine. Just give me another couple weeks or something like that. But if not, we're going to go ahead and get started as soon as possible.

MR. BURIL: I was just going to suggest that you have two related but distinct items from each other. One is what you do with the data; the other is do you start the plant? The key question I think

at this juncture is do you start the plant? I personally think that the answer should be an unequivocal yes.

Beyond that, as far as what you do with data generated from it, that's still open for discussion as something you can do in the future.

MR. ZUROMSKI: And I think what we want to do is we're going to go and we're going to do a baseline soil vapor round first. Go in. Operate the study based on, you know, the operating criteria. Once we're done, stop, take another reading, and probably by then we'll have been through most of the ROD, anyway, and then we can kind of include those in the remedial design, as well, those results. So, yeah, it would be more kind of pushing that toward the remedial design, but helping us in that effort, as well.

MR. RIPPERDA: If you need written, I can send you an E-mail. I actually meant to send you one right away, and if I didn't, I just thought I did and forgot. So, yeah, you can start it up, according to me, and just take enough data so that you can -- if you're going to try to use it as a rebound test, then compare it to what you might ultimately end up with, just take enough data so that it can be used as

such.
MR. GEBERT: Go ahead and start.
MR. ZUROMSKI: All right. That's the first bullet.
Second bullet was Foster Wheeler packed bed reactor. We are kind of in a holding pattern right now, and I think that very soon -- I don't know if we're going to maybe start up; but, basically, the system is ready to be started up right now, subject to other issues that we're dealing with.
But basically to tell you how it's setting up right now is it's been modified such that there's -- we repacked the reactors. We took out the celite that was in there, which was a very small particle of diotamaceous earth that we were using as packing material, and we were using two different types of plastic packing material that have been used in packed bed reactors that have been very successful for other chemicals. So we were going to try to use them for perchlorate.
Peter has examples of it on his desk. So what we've done is, basically since we have those problems with clogging when we did the first one, we decided to use these different packing materials. And it looks like it's going to be pretty promising,

but we're going through some things internally, as well, plus still conditioned, of course, on possibly getting concurrence from the regional board on discharge to the Arroyo versus trucking off the pilot study water.
Basically whatever way we go, we're going to operate this thing for about 30 days, and going to push out about 200,000 gallons of water. And basically what do we do, how do we operate it, and what is the end disposal option for that water are going to be the two things we're trying to decide right now.
MR. ROBLES: Those are the two.
MR. ZUROMSKI: Those are examples. That's actually -- yes, it is a scrubby sponge.
MR. MABEY: If it doesn't work, you can always sell it to Good Housekeeping or something like that.
MR. ZUROMSKI: It's a scrubby sponge, actually, but inside of it are larger celite pellets because they provide a lot of surface area. And the reason we went with that device, going with just the celite pellets is, again, because of the clogging issue. And, so, again -- I mean, the packed bed reactor for perchlorate treatment is different -- from the fluidized bed reactor that we used here, is this bed

does fluidize a little bit because of the water pressure; but for the most part, it's very stable. And so the big issue is clogging and how do we keep it from clogging.
MR. ROBLES: What about the black one?
MR. BURIL: I had this with marinara sauce a few nights ago.
MR. ZUROMSKI: Yeah. We call that the pasta, the rotini. And that was actually used in a packed bed reactor for the nitrate treatment, and was very effective. So we're trying it for perchlorate, which has very similar properties, plus we are treating nitrate at the same time.
So we're kind of going through a couple things right now, and really the two issues we're trying to resolve are, number one, are we going to get this thing going and running soon; and, number two, what do we do with the water afterwards? And those are discussions we're having internally and probably within -- we'll probably make the decision fairly soon, I would say, whether or not we're going to just finish that up.

MR. MABEY: This is for perchlorate?

MR. ZUROMSKI: For perchlorate, yes.
MR. MABEY: And is it a biological treatment?
MR. ZUROMSKI: Biological, yes.
MR. MABEY: Based on what?
MR. ZUROMSKI: Well, it's based on -- well, it's based on reactor designs for nitrate. Basically, it's a packed bed reactor that is fed and operates very, very similar to the U.S. Filter fluidized bed reactor that operates in an anoxic condition. Almost exactly the same. The only difference is operating costs for not having fluidized beds which leads to problems with, you know, back flushing and that. But could be significant in cost savings. You saw up there -- I mean, $5 million over whatever number of years for fluidized bed versus the ion exchange. You might be able to save, you know, even more from fluidized beds by operating this if it's feasible.
MR. MABEY: Is this an in-house system?
MR. ZUROMSKI: "In-house" being?
MR. MABEY: It's your own system, JPL system?
MR. ZUROMSKI: No. It is by Foster Wheeler. It's research we're doing through Foster Wheeler.
So, like I said, we will handle that, but I wanted to give you an update.

And, finally, in-situ study update. We are definitely moving forward with that now. We were kind of waiting for a while because we were looking for data from the ESTCP program, the research program, to see if we could have tapped into some research funds and kind of piggyback on a Navy research project. And that's not going to happen. And I've got the official answer. And, according to NASA, they want to proceed. So now I'm working with Evan Nyer from Arcadis who has been working with us, working a lot on both this packed bed reactor and also on our tiger team back in March 2000, working with his company to start to initiate discussions on getting this in-situ study going.

So this is definitely something we're going to pursue, at least on a small scale, probably in the same area near MW-7 to really shoot at the source of the perchlorate and try to reduce that source significantly to, of course, over time, reduce the larger operation of the containment system.

And that's pretty much all I have.

Does anybody else have anything else, questions, other items, things that we haven't discussed today that you'd like to discuss, feel

free?

MR. RIPPERDA: An administrative request, could you include Bill Mabey on any E-mails to me on any E-mails you send to me and any documents that you send.

MR. ZUROMSKI: Sure. What's your E-mail address, Bill? Just give me a card and take care of that. I used to have you connected up with Phoebe, and then Phoebe left. I'll just do the same for Bill.

MR. RIPPERDA: Yes.

MR. FIELDS: Bill, may I have a card, as well.

MR. ZUROMSKI: That's my office.

MR. MABEY: After the comments we made, then he's going to --

MR. ZUROMSKI: Great. Thank you.

Anything else at all?

What I want to do now is then schedule our next meetings. I guess first of all, Robert is so kind to have -- I don't have a January calendar.

MR. KRATZKE: I don't either. I have a real little teeny one.

MR. ZUROMSKI: Thank you. I appreciate that. So it looks like probably we're going to be having the EE/CA, draft EE/CA, come out, you know, around

the end of this year, beginning of January. So if we had maybe -- and I would propose that we don't have our regular conference call on the 3rd, which we normally do. We would move it to a week back on the 10th of January. Because Richard will be back, and most likely you'll have the EE/CA in your hands so that we can maybe have some discussions, rather than try to push it to the 3rd right now.

Does anybody have any objections to that?

So we'll go for January 10th for the first conference call. And then Robert has it circled here, "Don't do it on the 7th."

MR. KRATZKE: That's right. I'm busy then.

MR. ZUROMSKI: But does anybody else have any problems, then, with doing it on the 14th? I think last year we did our teleconference on Valentine's Day, as well. I think I remember doing that. So would we like to have a Sweetheart's RPM meeting?

MR. BURIL: On when?

MR. ZUROMSKI: On the 14th of February.

MR. BURIL: I worry about you, Richard.

MR. ZUROMSKI: Yeah, me too.

MR. MABEY: You need a lot more hugs and kisses, is that what you want?

MR. ZUROMSKI: I need a lot of support.

MR. MABEY: Are you going to send us all candy, too?

MR. ZUROMSKI: If you approve the EE/CA.

And then back in, you know, March having our regular face to face, we could do it on either the 7th or the 14th, whatever preference, if anybody has a preference. Again, unless you have a big "No" right now, should we go for the earlier or later date? Earlier date? Is that okay, so we can get it back on track. So we'll go for March 7th.

(Discussion held off the record.)

MR. ZUROMSKI: So that's pretty much it, then.

That would be for the next three months with our meetings: 10th, teleconference; 14th, teleconference; and face-to-face back here again on March 7th.

Anybody else have any other final comments, questions?

Thank you very much, everybody, and we are adjourned. And I think I have two minutes, according to my adjournment schedule. Are you sure there's no more issues?

I'd like to thank Vickie for doing our

court reporting today. Thank you, Vickie. Hopefully things went fairly well for you today, and you could follow everybody. And so I guess this meeting is adjourned.

(Whereupon, at 2:27 P.M., the meeting was adjourned.)

---000---

STATE OF CALIFORNIA)
) ss
COUNTY OF LOS ANGELES)

I, Vickie Blair, Certified Shorthand Reporter, number 8940, RPR-CRR, for the State of California, do hereby certify;

That the foregoing transcript is a true record of the meeting.

I hereby certify that I am not interested in the event of the action.

IN WITNESS WHEREOF, I have subscribed my name this 12th day of December, 2001.

Certified Shorthand Reporter for
the State of California