TRANSCRIPT OF PROCEEDINGS

NASA/JPL CERCLA RPM MEETING

March 4, 2004

Raymond Basin Management Board

4536 Hampton Road

La Cañada Flintridge, CA

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MERRILEE FELLOWS	NASA
KEITH FIELDS	BATTELLE
MARK RIPPERDA	USEPA
ALAN SORSHER	CA DHS
JEFF O'KEEFE	CA DHS
GARY TAKARA	PASADENA WATER & POWER
MICHAEL ISKAROUS	DTSC
CHUCK BURIL	JPL
RUSSELL SIRABIAN	BATTELLE
SAM FRISCH	SHAW ENVIRONMENTAL
KAREN ARTEAGA	GEOSYNTEC CONSULTANTS
WILLIAM GUARINI	SHAW ENVIRONMENTAL
MARK NIELSEN	BATTELLE
JUDY NOVELLY	JPL
JOHN LOPEZ	LOS FLORES
HECTOR COLLINS	CA DHS
MOHAMMED ZAIDI	RWQCB, LOS ANGELES REGION

La Canada, California, Thursday, March 4, 2004

10:08 A.M.

MR. FIELDS: Well, I think we can begin.

Introductions.

MR. SLATEN: Steve SLATEN, NASA RPM for the ground marketing.

MR. BOMAN: Brad Boman, City of Pasadena.

MR. FIELDS: If you could spell your last names for the court reporter.

MR. BOMAN: Boman, without a W. B-o-m-a-n.

MS. FELLOWS: Merrilee Fellows. M-e-r-r-i-l-e-e, F-e-l-l-o-w-s. I'm with NASA.

MR. FIELDS: Keith Fields, F-i-e-l-d-s, with Battelle.

MR. RIPPERDA: Mark Ripperda, R-i-p-p-e-r-d-a.

MR. SORSHER: Alan Sorsher with Department of Health Services, S-o-r-s-h-e-r. And it's A-l-a-n.

MR. O'KEEFE: Jeff O'Keefe, O-K-e-e-f-e. I'm with the California Department of Health Services, also.

MR. TAKARA: Gary Takara, T-a-k-a-r-a. Pasadena Water & Power.

MS. THOMAS: Linda Thomas with Raymond Basin.

MR. ISKAROUS: Michael Iskarous,

I-s-k-a-r-o-u-s, DTSC.

MR. BURIL: Chuck Buril, JPL.

MR. SIRABIAN: Russell Sirabian, S-i-r-a-b-i-a-n, with Battelle.

MR. FRISCH: Sam Frisch with Shaw. And that's F-r-i-s-c-h.

MR. GUARINI: Bill Guarini with Shaw. That's G-u-a-r-i-n-i.

MS. ARTEAGA: Karen Arteaga, A-r-t-e-a-g-a, with Geosyntec for the City of Pasadena.

MR. NIELSEN: Mark Nielsen, N-i-e-l-s-e-n, with Battelle.

MS. NOVELLY: Judy Novelly, N-o-v-e-l-l-y, with JPL.

MR. FIELDS: Okay. The first thing that we had on the agenda was for Merrilee to give us an update on the public involvement outreach.

MS. FELLOWS: There's two items on the agenda for me, one of them is to give you the status of the health meeting. And it's coming up, but I don't have a firm date yet. We're still targeting toward the end of March, but it's very difficult to find high quality in the mix of expertise we want and make sure they're available on the same day the venue is available.

We're looking at the Altadena Community Center

up at Lake and Altadena -- I've forgotten -- Altadena Boulevard, I guess. And it's a room that holds about 100 people.

There are a couple of other nice venues, but I'm not sure how much -- I suspect about 40 myself. In the event there's more, I hate to turn people away and make them upset. The composition of people that we're looking at from Water, from the City of Pasadena, Department of Public Health, and they have offered a doctor to speak. They also not only offered to have him speak, but they've also offered a venue. It was only for 25 people; so we couldn't accept it. They already offered to be a co-host, epidemiology, and somebody local from the county public health and the cancer registry people. So we have a couple of names for each.

And what we're trying to do is -- we have a medical person on our staff, a consultant, to interview people, make sure they can explain things. We just want to make sure it goes smoothly and with the kind of people that can translate to the public. So we're doing that right now.

The people that we're talking to are from the epidemiology program that was suggested by DHS and Dr. Tom Mack from the cancer surveillance program or Dr. Henderson. And Marilyn Underwood who is a

toxicologist for -- what is it? -- Environmental Health Investigations --

UNIDENTIFIED SPEAKER: That's right.

MS. FELLOWS: Not only from Jeff, but it turns out that the medical staff we have helping us know her quite well and say she's really terrific in public.

What we're looking for is the expertise and that friendliness -- I shouldn't say friendliness -- accessibility on it.

If you have any suggestions on a different mix, we don't have to have this cast of stars coming up and talking to people. We want people who can basically translate. Our goal is to get people with health concerns with people who can talk to them about what their next steps are, whether their concerns are considered. You know, valid isn’t the right word.

I still need to be trained on this because I don't know all the language yet. Just to make sure that they can answer the questions and meet the needs of the local population.

MR. O'KEEFE: The time frame is still the same?

MS. FELLOWS: Still towards the end of March, although I'm suspecting it's going to be a little later because it's already the first week in March and we still need to get a mailing out to 13,000 people in the

area from about here in La Canada a little further over all the way to Lake Boulevard on the east and then down to the freeway on the south. A little bit broader spectrum than they had for the public meetings. We need to make sure we try to capture everybody.

I guess that's it on the health meetings.

The other issue I wanted to bring up was the article in the Star News today. I don't know if you guys saw it. I'll summarize it as I pass it around.

This has to do with the San Marino rate hike request, and they're requesting an increase of about 21 percent for the first year. And what they've been doing is pointing to the fact that their -- that some wells are closed and saying the cause for that is the fact that the Pasadena wells (inaudible) to pay higher rates for water. This sort of slops over into the fact that they're suggesting that the wells in San Marino are closed because of JPL chemicals.

And one of the things that we wanted to ask people here -- and actually I'm not sure there's anybody in the room that knows -- is whether San Marino is in the Raymond Basin or not.

MR. BOMAN: They are.

MS. FELLOWS: They are in the Raymond Basin?

We're talking about whether we want to reply to

this, and the answer is probably not except that we may talk to the reporters just in an educational way to make sure we got all the facts consistent.

And I do have some pretty good quotes from Steve. If they hadn't included the quotes from Steve, that's (inaudible) but they did a good job.

If you have any thoughts on it, let us know.

Nobody has had a chance to read it?

MR. RIPPERDA: This (inaudible) to respond to or be upset about. City got contaminated wells. You're the biggest possible source. And they're not really picking on you so much as just complaining about rate hikes.

MS. FELLOWS: They have sent a letter to the PUC that says the wells are closed because JPL has contaminated the wells, and JPL has accepted responsibility for contaminating the wells.

So it's getting blurred. Wells close to us and wells six miles away, I think you're right. Maybe that's just one of the things we shrug. We know that's not likely.

MS. FELLOWS: That's something to talk to -- we've actually called the City of South Pasadena and City of La Canada, Pasadena, and San Marino. South Pasadena isn't --

MS. FELLOWS: Initially we had been told we actually got the water from you, and I guess that's not true.

MR. TAKARA: But it's not our water. They're going directly through an (inaudible). It's not our water that's going into their ground water.

MS. FELLOWS: But they have their own wells, too; right?

MR. BOMAN: Yeah.

MS. FELLOWS: It doesn't matter.

MR. BOMAN: No. They have their own ground water.

Steve or Mary, can you add any information? They are saying that the reason for their losses is tied to the contamination as well as lower water levels -- yeah, lower water levels -- in the ground reservoir.

MS. FELLOWS: He said it was confidential. So I don't know anymore.

MR. SLATEN: So she can talk about it in the paper, but it's a secret.

MS. FELLOWS: And they have said that they've contacted us, but they haven't. So we'll -- I mean it's not really an issue right now, rate hikes of the PUC, not us.

MR. O'KEEFE: Neither I nor Heather know much

detail about this system because unfortunately it's under the jurisdiction of our other supervisor.

MR. BOMAN: And actually they're getting most of their additional water -- a lot of their additional water -- from us through an interconnection. And then we're having to pass on the Metropolitan Water District charges onto them. So that's where a lot of that water is coming from.

MS. FELLOWS: I think -- I mean that's partly what they're saying here. They get (inaudible) because you have reservoir water available because wells are closed. That's probably accurate. But the suggestion that the San Marino wells are closed because of JPL chemicals is the worry --

MR. FIELDS: What is their water rights in the Raymond Basin?

MR. BOMAN: Do you know what their water rights in the Raymond Basin are?

We can get that for you.

MS. FELLOWS: Is there one there?

MS. THOMAS: I'll get it.

MR. SLATEN: So does that do it for the public involvement part?

MS. FELLOWS: Unless anybody has any questions.

MR. SLATEN: We go to OU-1 next; right?

MR. FIELDS: We're just going to say a little bit about OU-2.

MR. SLATEN: So we don't have any slides for that?

MR. FIELDS: We have slides, but it's sort -- we're going to put it off to the end if we have time.

MR. SLATEN: We've got some ta-da about it.

Since we've got so much stuff on the agenda, why don't we save it until after we've heard about Castaic Lake and talk about OU-3, and then we'll go into OU-2 at the end of the agenda. If we keep moving, we'll get to see it all; otherwise -- well, let's --

MR. RIPPERDA: OU-1 -- Mohammed sent a letter. And, you know, a huge part of any OU-1 discussion is going to be talking to the regional board. I talked to him last weekend, and I think he's just going to be late again. So maybe just give him another ten minutes before we talk about -- follow your original --

MS. FELLOWS: Does anybody have his phone number because I'll go outside and call him?

MR. FIELDS: Are you suggesting to hit on OU-2 a little bit, Mark?

MR. RIPPERDA: I would just say stick to your original schedule.

MR. SORSHER: We should be done by 3:00

o'clock, don't you think?

MR. O'KEEFE: Yeah. We'll be leaving if you're not done by 3:00 o'clock.

MR. SLATEN: We have more to talk about.

MR. RIPPERDA: Let's plow on with OU2.

MR. SLATEN: We'll talk a little bit about progress.

Next slide.

Okay. This slide shows all the dots are soil gas monitoring locations. So there's a good spread of those. And the four gas extraction wells inside the centers of the circles -- and I guess the circle is supposed to be their approximate radius of influence of the extraction.

Is that enough on that one, Keith?

MR. FIELDS: Maybe just to clarify that, what has been done so far starting in 1998, they were extracting from VEO-1 under a pilot test scenario. In 2002, they installed VEO-3, 4, and 2, and they've operated for six months; at VEO 3, six months and currently making a transition to moving over to VEO-2 (inaudible) about 500 CFM. And this system is designed to address VOCs.

MR. BURIL: What were the gray areas?

MR. FIELDS: We used water board water. Sort

of an indication of concentrations that may need to be addressed. And the gray there was two chemicals that exceeded the VSTs in certain wells, carbon tetrachloride. And this was after the significant VEO-1 under your jurisdiction.

And so what that is is sort of a combined map of exceedances of the (inaudible) that still need to be addressed.

Here's a little bit of an additional description of connections access to August 2003. There are still two chemicals that exceed the vapor screening levels of carbon tetrachloride, and there is six points within -- or six monitoring well locations -- that would have an exceedance of a VSL. And those are -- as you can see, these levels are very low. Those are about the levels that we were seeing two years ago. The levels of TES are still quite low.

And just to give you a sense, the vapor screening levels is kind of a rough guide as to the concentrations we want to deal with. And, also, to understand, VSLs are calculated to leaching to ground water. There's chemical properties in there. There's soil properties, and then there's the depth or the distance between the water table and where the chemical can be observed within a monitoring point. And so VSLs

vary with depth at this site.

Next to --

MR. RIPPERDA: And these are (inaudible).

MR. FIELDS: Yes, micrograms. And in the rod we said that we would be modeling a safe level and would not only be leaching to ground water, but we'd also consider mixes and travel time and things. So this is a very conservative screening paper.

MR. RIPPERDA: What do the points mean again?

MR. FIELDS: I'm sorry, Mark. That's a good point.

Each monitoring point location has multilevels of soil, gas, and monitoring points. So what I put here was the maximum detected concentration that was depicted in excess of a VSL in those monitoring points. And then to indicate that there was actually two points that exceeded --

MR. RIPPERDA: So monitoring any well, multiple horizons.

MR. FIELDS: That's maybe five to ten points per well -- is that about right? -- depending on the depth.

MR. RIPPERDA: Is there any correlation in the depth, two points to the deepest or the shallowest or anything like that?

MR. FIELDS: There's really no correlation. They vary based on location within the facility and the compound. So TCE may have been with higher concentrations that weren't necessarily exactly coordinated with the carbon tetrachloride.

MR. BURIL: Does it correlate where geology (inaudible) proximity to ground water?

MR. FIELDS: There have been some that are fairly close to ground water. When you're fairly close to ground water, the VSL is quite low.

We have some 3-D maps I didn't focus on, but we can look at those.

This is to give you a sense of what has been accomplished with VOC mass removal. This first phase between April '98 and June of '02 is just vapor extraction. OU-1, that was the one that was installed and pilot tested, and you can see it removed 283 pounds. And then there's been a 26-month test with VEO-3 and VEO-4, as described in the Record of Decision, and each of those, as you can see, are recovering significantly less which -- or much lower mass removal rate. I think those are in the 10-to-12 pound VOCs removed over the duration of six months.

I think what this also shows is that we talked a lot from reaching asymptotic conditions in the ROD, and

we definitely have kind of removed the bulk of the mass. That was definitely removal all during the 2003 time frame. So we're below our mass recovery.

MR. RIPPERDA: Asymptotic, yet --

MR. FIELDS: Or you might want to look at it as sort of mass removal rate, asymptotic meaning you're kind of at a constant, you know, X pounds per month and we can -- I think we need to reevaluate this further with the cost effectiveness we talked about in the rod. Cost effectiveness of this remedy versus dealing with these constituents once they're in the ground water. So that cost analysis will be part of the evaluation as to whether continued operation is cost effective given everything else that we're doing at the site.

We redid our mass estimates based on 3-D modeling of the vapor plume and based on (inaudible). And you can see from June '01, which we presented back in the rod, to August '03 for both carbon tetrachloride and TCE, they were roughly about the same. Of course, our estimate of mass is not accurate within two pounds. So I mean the point would be we're basically at about the same mass estimates between July '01 and August 2003.

MR. RIPPERDA: How does this work when you're getting whatever, 10 to 20 pounds, and you estimate that

there's a total of 35 pounds in place?

MR. FIELDS: You have to look at this -- of course, you know that you can't get a perfect estimate of the mass in place. And we have to look at this -- and just using two sets of data to look at -- how much mass we've removed versus an estimate of how much mass is remaining but realizing that those aren't -- you know, we can't just say with a high degree of accuracy there is exactly 11 pounds. But based on the data that we tested and a mass estimate that was done, it gives us a sense of where we are within the mass removal at the site.

MR. RIPPERDA: I would like (inaudible) mass calculations are totally screwed up. If you're getting 10 to 15 pounds every six months, and that seems to be a constant rate, it means there must be just guessing more, like, you know, 100, 200 pounds in place as opposed, you know, to 11.1 or, you know, 30, 35. And you add the two together --

MR. FIELDS: And realize that this site is, you know, let's say a 100 acres. We have 40 monitoring points with some areas that are plugged. It, I would say, gives us an estimate of kind of two different data points where we are at. And we want to look at that in combination with your mass removal in concentrations

observed in the monitoring points and combine all that data to give us the best decision-making ability possible. This is what we estimate with the data that's available over a very large site.

MR. ZAIDI: These locations, are they located within the hot spots of the USC plume?

MR. FIELDS: We tried to locate the vapor extraction areas within areas that would be within mass -- within concentrations that exceeded VSLs.

You missed the first slide, but it was this. You reviewed this report, but, you know, these wells were placed in (inaudible) to try to best intercept concentrations that exceeded vapor screening.

MR. RIPPERDA: All the green dots in the monitoring points in the --

MR. SLATEN: Did you want to have Mohammed give his name?

MR. ZAIDI: Mohammed Zaidi, Z-a-i-d-i, last name.

MR. FIELDS: And there's a gentlemen that joined us, I believe, from Los Flores.

MR. LOPEZ: John Lopez, Los Flores.

MR. COLLINS: Hector Collins from DHS.

MR. FIELDS: The calculations that I have seen have about between --

MR. ZAIDI: Based on some pilot test; right?

MR. FIELDS: Not only are you collecting chemical concentration data from the vapor monitoring points, you're creating and you use those data to estimate.

MR. ZAIDI: So the farthest what you consider as the radius from the pumping well during the pilot test was 10 or 15; right?

MR. FIELDS: Right. You cut off at a certain vacuum level, let's say.

MR. ZAIDI: What is your cutoff?

MR. FIELDS: Battelle is not operating the system; so I don't know that data. Whatever the approved approach for determining radius of influence is, part of the previous testing.

MR. ZAIDI: These dark edges are the hot spots. These are the plumes; right?

MR. FIELDS: Right. And I think, you know, there are areas that exceed vapor screening levels but realize that the levels that we have in gas are fairly low to start with. So there's not a hot spot in the true sense of how the term is usually used. There's just some areas that vapor screen --

MR. SORSHER: I think -- to keep reminding myself -- and I think we all need to keep in mind

because there's been so much construction, buildings, foundations, utility lines, trenches all over the place, that, you know, that's going to affect, number one, the way the contaminants moved originally and how your vacuum is going to move through these various soils.

Are most of the extraction zones and your monitoring zones, are they below the level things were disturbed?

MR. FIELDS: Yeah. These start at 30 or 50 feet below ground surface. So you're out of the area that would be disturbed by these activities. But I think your point of there's a lot of buildings, a lot of things, putting wells in is a very expensive endeavor. So, you know, we have the monitoring points and wells that we -- we are put in a position that not only made sense technically, but also had to work within the facility boundaries.

MR. SORSHER: It certainly complicates things.

MR. FIELDS: You know, again we're looking at all that data together to try to determine what kind of success that we're having with these systems.

MR. SORSHER: Is there any monitoring of the real shallow area? Has that been done during the screening portion of this?

MR. RIPPERDA: Yeah. They're with soil vapor

probes all over the land to check those.

MR. BURIL: To a depth of up to 20 some feet. And typically those showed nothing.

MR. SORSHER: Way back there was actually soil excavations of hot spots.

MR. BURIL: There was only 12 locations, one at a storm drain.

MR. SLATEN: Generally the model here is the sea birch dug up to 30 feet deep. Put in a lot of water and a little bit of solvents and tried to flush stuff down. They went pretty much straight down.

MR. SORSHER: So they worked down. You can imagine out in that alluvium sewer and water and wash water and everything went into the seepage pits, and they were glad to see it go away.

MR. RIPPERDA: I guess I'd like to see the actual operator of this system. It's fine for, you know, a monitoring report of a remedial action report that after the new system -- well, after the system gets moved to its fourth location and it's operated for a month or so, it can monitor drawdowns in the surrounding monitoring. If they can give the date you're showing and give an overall report of the drawdown's influence, mass reductions in monitoring points, we can talk about what needs to go into that report. But today I'd rather

move on -- I think this is fine; this is good about as much as you know. So it's time for the actual operator to write a report.

Let's move onto OU-1 now unless you have a real nugget to give us.

MR. FIELDS: And I just didn't think of it when you said it before -- when you made reference to the VOC mass removed because it indicated that we're not getting a good rating.

I realize that VOC mass removed is a total VOC concentration which includes other things like the Freon and other constituents. And here carbon and carbon tetrachloride was primarily located in that VEO-1. And since they've moved to the other vapor wells, that is an explanation that we're just looking at two volatiles versus all the volatiles as we were thinking and should have made that clear. Sorry.

MR. SORSHER: These are on the web.

MR. FIELDS: We have added through August '03 soil vapor monitoring points or vapor monitoring reports to the website very recently within the past month.

MR. ZAIDI: One little comment on putting it together, the report and the progress report for the SVE, if you made a graph from start -- from the start -- and then how did it come down and how did it get to the

same sympathetic level? I think that would be for each one.

MR. FIELDS: For each monitoring point?

MR. ZAIDI: For each one.

MR. FIELDS: That would have to be other than the operational report that is asked in the soil monitoring where they would be tracking concentration with time.

Yeah. We can check to see if that's in there. And if it's not, we can make that report.

MR. ZAIDI: That belongs -- if you left it alone, and you had a rebound period, what was the rebound? How much of that got up before you restarted the system? So that we know the D1 would be a good indication of what is the residual concentration here of the USC.

MR. FIELDS: Agreed. Okay.

MR. SLATEN: All right. OU-1 study.

MR. RIPPERDA: I have a quick question. You know, with the noise of this and with a lot of us facing --

MR. FIELDS: Can everybody hear? Everybody is talking Okay.

MR. SLATEN: We got this actual field work going on on OU-1. What's the first slide?

MR. FIELDS: Kind of a reminder where we're dealing with within --

MR. SLATEN: We gave something like this actually to the press last week, but a little simpler than this, a little less stuff on it. I didn't see them using it, but tried to do a real simple thing for them. We took out some of the -- of the arrows and so forth. This is a real simple monitor of the OU-1.

MR. FIELDS: There was a question at the last meeting of whether we would be going through that fault. I thought it was useful here to see what I was trying to explain at the last meeting, that the fault traces typically this edge point, what we see on a map. But this fault heads back --

MR. SLATEN: We went through, got into the granite, drilled through that and then fell out the bottom -- came out of the bottom of the granite. So, yeah. It was kind of an interesting little geology lesson.

This gives you the -- the right block is the one that we're working on now, which is the first phase of it. We've drilled that top-right well by -- above MW-7. Drilled that and then knocked down. And on the bottom-right blue one, we've drilled one well there. That's actually the location of two extraction wells

that are at different vertical levels. Then the left block is the second phase of it, which will happen next year.

Just a simple cartoon of the layout of the system. It's going to fit into an area 126 feet by 160 feet, and that's some of it. Without going into the details, that's some of the bigger parts on it.

MR. FIELDS: A couple of the items are highlighted just to indicate there is a couple new design elements that have been added, the clarifier, the backwash garage and the primary ones.

MR. SLATEN: Most of that was to minimize the amount of waste water -- to press out more water, to return more water and not waste as much. And that's the backwash system, a cartoon of it really.

What this was about was to try to reduce the discharge, try to reduce what we were reinjecting back in the Raymond Basin. Pretty pictures of the first well we were drilling. It was just this last week.

MR. FIELDS: Yeah, a pause. It's raining.

MR. SLATEN: The drilling went well. I think everything went really smoothly. I think it's a professional crew, good equipment and good people.

MR. SORSHER: Who is the driller?

MR. FIELDS: Water Development Corp.

MR. SORSHER: Are they using that percussion method?

MR. SLATEN: Mud rotor. And the deer keep grazing right on the hills when the drills are chugging away. It's kind of loud, but the deer don't mind.

MR. RIPPERDA: How much do these cost? Do you know?

MR. FIELDS: The drilling costs within the four -- the four well locations were in the 400,000 range.

MR. RIPPERDA: So 100,000 each for drilling or 400,000 each for drilling?

MR. FIELDS: 100,000 each for drilling. In real life they're only going down about 300 feet each.

MR. RIPPERDA: You can do this with mud rotary because it's going to be production and extraction for monitoring points.

Can you use this same method -- would you have to use the same sonic?

MR. FIELDS: Sonic would be preferable. The reason we needed this for the flow ratewise, we're going to pump and we couldn't using sonic drilling. Sonic may even have been preferable. If it could have given us a large enough four-hole diameter, sonic would be used. It can be used for monitoring point locations. You also

get a much better geologic rendering of what the surface --

MR. ZAIDI: Formations (inaudible). So pressure cake.

MR. SLATEN: Yes.

MR. ZAIDI: Then how would (inaudible).

MR. SLATEN: Normal well development, flushing.

MR. ZAIDI: Be able to remove it? So that would affect a lot.

MR. SLATEN: Developing later this week the first two wells -- or today, I guess, that maybe they will start.

So, yeah. They've got a drilling with mud. You've got to clean that up afterwards.

MR. ZAIDI: The oil industry, they have to do a lot of (inaudible) make sure that each is optimum.

MR. SLATEN: Got to get that mud back out of the way. So, yeah, flushing.

Next picture.

This one is looking down from kind of up to where the rig was, the location of that tank was. A lot of old equipment around. But that's the location of where the first actual plant is going to be that we showed you the layout before, you know. 161 feet by 26 feet. That's that. It's going to be sitting there

where that -- to help define for people where it's going to be and where they can't park and get them used to seeing something there.

Next. We are still working on the sanitary sewage discharge, part of the reinjection. We're still working with Raymond Basin. I did get back a letter from them, like, last week asking for a little bit more and then air discharge. I still have an exemption request letter that I've got to send to them.

MR. ZAIDI: Letter? You got a letter?

MR. SLATEN: Yeah. Yeah. Yesterday or the day before. I haven't had a chance to really get into it.

MR. ZAIDI: Filling these wells, and I think we have suggested a few things that (inaudible). I've done the tube and a sounding tube because these pretty large diameter (inaudible).

What's the diameter?

MR. SLATEN: We're drilling at 12 right now.

MR. FIELDS: Yes, but the well itself will be six.

MR. ZAIDI: Because that will help. These wells, they will be working for a long time. So -- and you also suggested that the similar part of the cases previously in your plan, but designed to be of PVC, I think. But we suggested that --

MR. SLATEN: These wells are steel.

MR. ZAIDI: Stainless steel?

MR. SLATEN: Stainless steel screen and steel casing.

MR. FIELDS: That were refined as we were moving forward in some of the design details such as that.

MR. SLATEN: I'll get your comments and get a copy and make him read them on the airplane.

MR. ZAIDI: I will as well. So those things are also complied with.

MR. FIELDS: I realize that we've drilled over half the wells. And so a design change of a sounding tube is something we can definitely incorporate on Phase 2. But I mean they're drilling and have completed wells already for Phase 1.

MR. ZAIDI: The thing is that when you are submitting a work plan, that means that you don't start the work before its approval. If you already built a well, and in four months after drilling a well (inaudible) still not, then it means you will not be able to incorporate all the requirements. And these wells are big wells. These will be dealing with hundreds of thousands of gallons. When you are measuring an injection well, you will not be able to

cause injecting a lot of water. At the same time you want to also keep track of what the mounting is doing there and for keeping track of how much ground level.

Now, during injection you have to have some place where you can put your sounding tube and get a non-turbulent level (inaudible). And if you don't include that -- that sounding tube -- then you will never get that data which is very important.

And there are other things, also, like pressure gauge, (inaudible). So, you know, the volume, how much is going. So these are very important.

MR. FIELDS: All those items that are requested (inaudible) the cone of depression, monitoring flows and pressures, all that data will be collected, and it's part of it. The question of whether a sounding tube has to be installed in order to get the water level data is something we need to -- you know, based on our design -- initial design and discussions -- we did not feel we needed one.

MR. ZAIDI: You should have told us (inaudible) that we are not including, and you never tell us. I think that needs to be told because when the agencies requires something that (inaudible) and that has to be complied with. If you are disagreement with that, yes, discuss with us. If you convince us, we'll take it out

or modify it upon agreement. But just agreeing whatever you think is correct and without informing us, that's not very good.

MR. SLATEN: When did this work plan go out for comment?

MR. FIELDS: The first version went out in April '03.

MR. SLATEN: When did we feel like we had approval to proceed or whatever?

When did we feel like -- I kind of inherited most of this.

MR. ZAIDI: We never approved it.

MR. RIPPERDA: There's problems on all sides here -- me, you, NASA. You know, we've been beating NASA up, but the most important thing is to, you know, treat the problem. And we've all been pushing NASA for two years now. "You have to get out in the field. You have to do something about it."

They issued a work plan almost a year ago. And, according to the rules that regulate us and NASA is supposed to play by, we have 30 or 60 days to comment on it. At the end of that period, if they don't have any comments from us, they can just go final with it.

So NASA has waited, like, seven or eight months, and they're going forward. And so your comments

are important. But, in the meantime, they had to be getting work done.

So I guess I would, you know, say NASA's job is go out there and treat the problem.

And now that you've submitted comments -- I think your comments are good -- wells haven't yet been installed. They should sit down with you and discuss their technical reasons why they think they can get mounting levels and quality water level measurements without them, and you can see whether you believe it or not. But certainly for the wells that are already in, I would say those wells are in, and I want to see treatment start.

MR. ZAIDI: I'd (inaudible) but they submitted expanded study work plan in which there were a few (inaudible) like (inaudible). But then we had meeting with David, and he said (inaudible) adequate requirement. And we had given a comment on that previously. Then we had this work plan again. Again, quite a few things which already addressed in the previous comment, but they were not complied with and again being (inaudible).

So I think we got it. We addressed it. It was this should be discussed, and nobody else has so far addressed (inaudible). People are still giving comments

on EE/CA. So I thought that expandability work plan was the most important part because they can go ahead and install the valves and designing the system right now (inaudible).

So that's why we gave these. And this was delayed because of the meeting and the change of the plans, also.

Previously there was no plan for reinjecting (inaudible). There was only one in the core of the plume. So, yes, there has been delays, but there has already been reasons for those delays and not (inaudible).

MR. RIPPERDA: We've all done things wrong here. So not meaning to beat up the original board, but you're looking at what our objective is: To clean up the hot spot in the aquifer. And obviously they have to pump where they're pumping. The places they're injecting are close to the best possible places that they can physically get.

So there's -- I don't have a problem with where they're pumping or where they're injecting the things. What we want to make sure what doesn't happen is the plume gets spread or somehow adversely impacted by this operation. And I feel like the -- you know, if you put a well map up -- which you may or may not have -- but

there's plenty of (inaudible) monitoring wells, which I kind of wanted to talk about with you and Steve and Keith. And it sounds like Keith hasn't yet seen your letter, and Steve hasn't had time to digest it.

Later maybe we can have a conference call in a week or so. But the actual construction of the wells, you know, sounding tubes, you know, those are nice. But if the purpose is to see whether the plume is being adversely impacted, you know, there's monitoring wells in the vicinity that give you some of that information, and you can turn -- if the water is too turbulent, there are designs (inaudible) you can turn the wells off for a day, take your measurements.

So there's certainly ways to work around all of that to get to what we really want to clean up, which is the aquifer, and make sure we're not adversely impacting it.

MR. ZAIDI: (Inaudible). But on the future wells, which have not been tried yet, this would be, I think, a greater idea because, you're right. If there are enough monitoring wells around, then, yeah, we can get some idea when we're injecting around that.

Nearest monitoring well, say, 300 or 500 feet there, we will not have an idea of how much mounting is here and where it's going. But if you have an idea how

much did it mount here and how much is this here, but here, that much, we'll not have good idea. We cannot protect it. That's why the mounting -- the measurement of the monitor by length flows to the injection well. That's why it was, I think (inaudible).

MR. RIPPERDA: I read your comments, and I thought, yeah, these are good technical comments, and I'd like to see how Keith's well design -- people plan to do it without that. Maybe they actually know what they're doing, and their design is going to be fine. And maybe we (inaudible) absolutely in the wells that you haven't completed yet required the sounding tubes and the other couple things you mentioned. But for those that are already done, I certainly think that the information that we need to get on how the water is moving, we can get. You know, this 90 gallons a minute out of that first production well and, you know, injecting 45 gallons a minute into the two split injection wells.

Whatever mounting there is it's going to be so localized. It's not going to affect (inaudible) outside of that immediate area. It's not going to drive the plume somewhere where it's not already.

I do think it's important in the future NASA closely tracks when documents go out. I share some of

the blame because, you know, with changing RPM, Davidson sent work plans. We changed our mind. We haven't really tracked a release date, a comment due date, response to comment date. That's something Steve and I have talked about ad nauseam.

MR. ZAIDI: Also, very important when we're injecting, we should know how much we're injecting.

MR. FIELDS: Yeah.

MR. ZAIDI: Because getting that injects sending the water down, down so that you are -- if there's a graph of how much you are putting in at what time, what days, you construct a history of that, also.

MR. FIELDS: And it's very important to the Raymond Basin Management Board that we know how much we're at exactly. There are pressure sensors that are going to be -- if there's a high water, you know, backup excessive amount (inaudible) well, automatic sensors that will shut the system off until we get that fixed. There's a significant level of process control within.

Once we see your comments, we'll be glad to respond to whatever level detail that you would like to see with regard to those, but I think in general, from what I've heard with the exception of a sounding tube, we already have it. Those items are definitely included in the sounding tube. We'll just have to look into it.

Quite possibly that's a better design.

Also, pressure -- a pressure sensor appropriately placed within the well and situated -- you know, tied into our POC and systems controls will be adequate as well. We just want -- we want to see your comments and then respond to them individually.

MR. RIPPERDA: Certainly your point that NASA, EPA, nobody can just blankly go forward with what NASA thinks is best.

MR. ZAIDI: Why are you (inaudible) giving it for your benefit? We want to control something. If you are free to do all by yourself, then (inaudible).

MR. FIELDS: I won't make anymore comments. I think since January it was made very clear we planned to start operations or start drilling in February. That was a clear message in the public meetings. We have other stakeholders that have been set up that we are going to start in February.

MR. SLATEN: We would have started a lot earlier. Actually we held off for the public meetings, things like that.

MR. FIELDS: So I mean with -- we just have to take into consideration all the issues that we're doing in the length of time of reviews. And we'll do our best to respond to your comments.

MR. SLATEN: I'll get a system in place to put a little more transparency to what the turn-around dates are and when we have to have comments back and when we're going to move forward, things like that.

MR. RIPPERDA: Can we have a conference call in a week with DTSC Regional Board, you guys, to talk about your response to Mohammed's comments and, also, talk about a tracking system and a schedule for upcoming documents?

MR. SLATEN: I think it will be important for OU-3, that we do have the schedule and everybody knows what it is. And then we try to contact someone and keep OU-3 moving forward.

Did we get through all of your slides?

MR. FIELDS: I'm pretty sure. We're still coordinating.

We had a good design meeting yesterday with Caltech facilities, and obviously there is a lot of coordination that has to happen on that. And critical operations are happening at the facility, all the utilities. So we're moving forward with that.

And then this was a slightly revised schedule you'll --

MR. SLATEN: I'm trying to find it, but this summer we'll be turning on the pumps.

I think on the agenda we had OU-3. Next there's some of the stuff we're going to talk about affected by the FBR and the Castaic Lake discussion.

So I would recommend that we go ahead and run through the Castaic Lake presentation now and then talk about OU-3 while we're eating our lunch or something. Part of what we're thinking about with OU-3 now has to do with acceptability of the FBR. People here know whether it really works or not.

So I'm going to turn it over. Okay.

MR. GUARINI: Bill Guarini, G-u-a-r-i-n-i, and I'm with Shaw Environmental.

And my phone number is wrong. It should be 433-7183. I didn't check it.

MR. SLATEN: What about lunch?

MR. FIELDS: We were going to pick up sandwiches at noon if that's okay. That's why we had Subway --

MR. SLATEN: Sorry to interrupt.

So everybody gets to hold their hunger until noon.

MR. GUARINI: First of all, I'd like to thank you for the opportunity to stand up here and explain to you what happened at Castaic Lake. It's not often I get a chance to stand in front of a group in public and

admit where I've done something personally and my company has done something that probably shouldn't have been done. Certainly, there are some things that we would have done differently if we could go back in time but, nevertheless, I will tell you the story.

MR. FIELDS: Go to the next one.

MR. GUARINI: What I decided to do -- I really get upset when people make excuses for what they do. That's not right, and it's never been something that I felt comfortable doing. However, to answer your questions and get into discussion on what happened at Castaic Lake, I'm going to have to point out some things that went wrong. Most of them were things that we could have changed, although some of them were Murphy hanging around the pilot program. But I thought the best way to help you understand why we made some of those business decisions -- whether you agree with them or not -- and, also, the best way for you to understand the FBR technology would be to go back to where the technology is and how it fits in relation to the Castaic Lake project.

So what I'm going to talk about today is the full-scale system. Some of you have seen the system up at Aerojet, and we have a couple others running.

I'm going to talk to Gary Takara and

Dave Amidei to get the conditional approval. We'll talk about the Castaic Lake project with Sam Frisch who is the process engineer in our Lawrenceville group who designed many of these systems. He also happened back in 1992 to have designed and had constructed the pilot unit that we used at Castaic Lake. And that's a long story that I'll tell you about.

And today, Webster -- who is not here yet -- he's in our San Diego office. He's a Ph.D. environmental engineer from USC that actually was involved on a more regular basis with Castaic Lake, although clearly not as involved with that program as we typically are with our pilot programs.

Then what I'd like to do is remind you that we tested the FBR technology using more appropriate for the (inaudible) reactor peak of the valve that's today -- Webster is walking in here now.

But, anyway, I'd like to remind you that we did a pilot test using JPL over (inaudible), and you'll see the results of that testing.

And then I'd like to open up for comments. So if you have any questions, please feel free at any time during this to ask questions, otherwise I start to get a little wet under the collar.

These are pictures of three full-scale items,

and I'll go through each one of them. It's a very, very minor detail I'm not going to spend a lot of time on. I think a lot of you have heard this presentation before. Some of you know a lot about this, even more than I do. I thought it would be a good idea to give you an overview on it.

Out at Aerojet they have continuous flow JAB. Right now they feed on an automated process flow controls that allow you to know when they need more electronic donor when the concentration has changed, and all this is done without a resident operator. So when Brad and Gary and David Amidei and I and Sam went out to visit the unit, we actually had to make arrangements to get in the control room and wipe a few cob webs off of the control panel.

These things run themselves in the full-scale system that you don't see in the pilot system for a lot of reasons, but a pilot unit takes a lot more attention than a full-scale unit. They also wanted to test -- I mean acknowledge as a substrate at Aerojet -- which is the electron donor. The ground water is such they don't have to add any neutrons. So we have no (inaudible) to the Aerojet system. And because there is a small recycle, they do have some flexibility to air flows.

If you read Dr. Zaidi's letter, this technology

is appropriate. If you're going to be somewhat content to the resector (inaudible) at least some sort of re-calculation in the front in the seal so that the nitrate concentrations fluctuated significantly during the course of the operations. And I'll get into that in more detail.

Next slide, please.

As I mentioned, there were four 14 diameter fluid bed units each of which has fluidization (inaudible) fluidize the bed or expand the bed. That rate stays the same. What changes is the amount of recycle and the amount of net feed to the reactor. Right now those reactors have been tested. Each one of them can treat 1500 gallons a minute of forward flow from the ground. They are currently feeding about 1325 gallons per minute. So they're treating over 7 million gallons a day with ground water anywhere from low levels of perchlorate -- I think we've reached each thousand parts per billon. The original design of these units, by the way, was 900 gallons per minute for reach reactor. So the units are operating well above the design capacities. It's --

MR. ZAIDI: Can you go back to the slide? I didn't catch the fluid indication rate. It's the rate that injecting at the bottom?

MR. GUARINI: Right. What's happening is you have a line rights, and that's circulating 1850 to 2000 gallons a minute. But that 1850 comprise 1500 of water from the ground and 350 gallons per minute of recycle from the top of the reactor.

MR. ZAIDI: Okay.

MR. GUARINI: So you're sending 1500 gallons out or, in that case now, 1325 gallons per reactor is being surface discharged up at Aerojet, and they're making up the difference with recycle.

MR. SORSHER: What's the lowest concentration that you're dealing with there?

MR. GUARINI: Well, the lowest is zero, but right now they're running about 1700 PPB. They added some additional flow capacity, and some of that has very little perchlorate. And I don't have a detail of everything they're doing at Aerojet.

MR. SORSHER: Just general.

MR. GUARINI: Next side.

This is the first 32 weeks of operation. I actually have not with me today -- it's back in Lawrenceville -- a disc from the EPA that apparently is public information that will show you what the inlet and outlet concentration of those reactors are that they reported. It's public information. But I could tell

you, from talking to the Aerojet personnel recently, they've been operating five years now and consistently have about four (inaudible). So the regulators and Aerojet, and by definition Shaw, is very happy with the operation of those systems. And I welcome any one of you who hasn't seen those to come up and take a look at those reactors, and I think it will address a lot of your questions on the long term (inaudible) of the unit.

MR. ZAIDI: How much (inaudible) solution of water that comes in?

MR. GUARINI: About 12 minutes.

MR. TAKARA: What was the insufficient ethanol dose?

MR. GUARINI: This is during the startup period. So at the beginning, as the biomass was growing, you had an acclimation period. One of the costs of operating this system is electron donor addition or how much ethanol or acetic acid -- we typically run 5 to 20 percent. Aerojet was testing to see how little electron donor they could add while still staying in compliance with their permits. If I were to bring this out five years, it would be a flat line.

Next, please.

This is a system out at the Longhorn Army Ammunition Plant. It's a five-foot diameter reactor

(inaudible) stainless as are the reactors at Aerojet, and this is a pump skid. I think I had mentioned that at my last presentation back on November 6th. They actually have three metering pumps which feed -- they use acetic acid. They do need some nitrogen and phosphorus at Longhorn. And the third one is for pH adjustment, but they don't need to adjust the pH because it's pretty close to seven. This unit has been operating since February '01, and has been operating very well. The original design capacity was 15,000 parts per billon of perchlorate. Once they got the system up and running, they realized they could turn on this well that they had shut off previously and were running actually 20- and 30,000 parts per billion in the feed here.

This is an interesting story that I think I told you, also, last time I was here where on September 11th of 2001, the tragedy struck our country. The operator was asked to leave the site. He went out to the electron donor tank, which is a hundred gallon total that lasts about a month. And they have a five-gallon pail of nutrients that feeds the reactor. He made sure they were both full. He left the site, came back nine days later, and the reactor was removing 18,000 parts per billon to below four parts per

billon.

Clearly these things can run themselves once they're up and running. You'll see later on it's a silver bullet. I don't think there is a technology that's going to work everywhere, but when it's placed right --

MR. O'KEEFE: Is that system used for drinking water or discharge?

MR. GUARINI: In the case of the Longhorn, they actually discharge into a drinking water lake. It's Cato Lake where they get their drinking water supply, but it is not directly into the pipe.

MR. BOMAN: What's the low rate?

MR. GUARINI: Fifty gallons a minute, although, the load is pretty high. The way these things are designed, based on the load to the reactor per cubic foot of reactor, and load consists of oxygen nitrite and perchlorate that is being fed to the system. You also have to (inaudible) for the nitrite because the microbes will consume electron donor and (inaudible).

This is a picture of a reactor that's actually at a facility in McGregor Weapons Industrial Reserve Plant which is pretty close to Waco, Texas. The main reason I show it, aside from the fact that this has about two years of operating data, it's consistently

below four parts per billion.

If you go to visit this reactor, you have to get out of your car, I guess, six times. There were three fences, and inside the third fence there are cattle and horse roaming the field. And this reactor is, like, right in the middle of it. It's all controlled remotely. Every once in a while somebody goes out to fill up the electron donor tank (inaudible) GPM for 400 gallons a minute depending on the concentration. And the concentration ranges from 0 to 20 parts per million or 20,000 parts per billon.

And the reason, also, is they have an in-situ trench there. When the rainfall is heavy, the in-situ trench biologically isn't sufficient to remove all of the perchlorate. So to contain the plume, they pull the water out and run it through our reactor. And once again that's been running for about two years.

So, anyway, the picture there is that this technology, although I'm not happy with the results you're going to see from Castaic, is based on some pretty large systems up and operating anywhere from two to 35 years. So it's not like Sam and I have been involved in fluid bed reactors for other chemicals like chloride solvents and checking for the 12 or 13 years that we've been working for Shaw Environmental.

And they've actually been in industry probably for over 20 years.

I put this slide up to show you that we have done a significant number of field studies. Obviously Aerojet, Longhorn, and McGregor have resulted in full scale. (Inaudible) that are supplied from U. S. Filter, the subcontractor, Shaw for the FBI, is to treat their ground water. That's all I can really say about that one.

We also did a pilot study at JPL that I'll present a little bit of data in a minute.

We also did a pilot test on site south of the Massachusetts Military Reservation where we treated anywhere from three parts per billon to 200 parts per billion. Nitrate was very low. It was only in the one to two parts per million ranges, and there were two antiseptic compounds used in munitions.

We also have done pilot tests at Redstone, American PF, and obviously Castaic Lake, which is why I'm here.

Aerojet decided that they wanted to take one of their reactors -- one of those four, 14-foot diameter bed reactors -- and generate data that hopefully would result in at least conditional approval, which it did, to promote drinking water. And, in addition, customers

they involved, DHS very early in that process and in discussions with DMS and the EPA and an expert panel that they put together, they established that they needed to confirm these parameters which included the operating parameters for the reactor. They wanted to be sure that water that they produced they would drink, as the public would, and basically collect data to support the design of a full-scale system.

What they actually tested there for nitrate and perchlorate was the granular activated carbon-based (inaudible) also have multimedia filters that we'll be putting in at the OU-1 area. They also have OV and chemical UV. Those were in (inaudible) and VOCs. They also had a liquid phase as a built-in suspender for the VOCs and then before anything would go into your drinking-water supplies. That's something that they also tested just to give you an idea of the scale.

And, once again, this is important when you compare it to the Castaic Lake project, at least in my simple mind. Their pilot treated anywhere from 900 to 1500 gallons per minute, and they ran this from about March 2000 to somewhere into 2001. They finally submitted a report to DHS of results in April of '02 in a letter of conditional approval. They tested the 350-gallon-per minute multimedia filter. The USO system

was 100 gallons a minute, anything liquid as carbon. And then they did a small disinfection unit, and they did some clarifier work to concentrate the biosolids.

In discussions with DHS and EPA and their expert panel, at least for the GAC fluid bed reactor, they knew that they had to look at these parameters. I'm not going to go through every one of them. But one that is important and one of the conditions -- and it was while we're flying to OU-1 area -- is the effluent from any (inaudible) from surface water. Their plant would be very similar to the back end of our plant.

We also took a look at control parameters that would give you extreme confidence that what was going into the pipeline did not contain something you didn't want it to contain.

Aerojet wanted to see if they could use reduction potential to help control the system. DHS wanted to go one step further. So when you read their conditional letter of approval, it requires online nitrate and with feedback and feed forward control to the units. And all of our full-scale systems will do that.

MR. ZAIDI: The effluent that you have measured and that you have analyzed in all these systems that you have installed, how often do you monitor that, and have

you simply found that you monitor any time and you get four micrograms per liter?

MR. GUARINI: Each one of the units is monitored on different time scales. It's all set by the regulatory agencies. Until we got into a steady state and met our process guarantees and the state's requirements -- because these are all state-driven systems -- they were sampled on a daily basis. Right now it's probably -- it depends on the system -- but I think Longhorn, which the only one I really know, it's monthly. They check it obviously for making drinking water. DHS is not happy with that. That is why we have the continuous online monitoring.

MR. ZAIDI: So you can do online monitoring by --

MR. GUARINI: Yes. It's a new system. It's not (inaudible) system. It's Dianek. It's based on the EPH method 314.

MR. ZAIDI: How about the second bioreactor effluent? Do they contain proprietary microbes as part of the multimedia filter?

MR. GUARINI: No. These are actually naturally occurring micro organisms. In the case of the first system, the Aerojet system, we actually used sludge from a food manufacturing plant. There were food-grade micro

organisms.

You'll see one of the big differences that the Castaic Lake has compared to our other systems is we didn't inoculate at all. We were asked to just let the microbes in the ground water help (inaudible).

So obviously pathogens are a concern, particularly for drinking. And Perry McCardy was actually on our expert panel at the time, and he determined in the expert panel report that there were no pathogens there. We didn't see them, and they never entered the reactor during the course of the one-year pilot study.

Just to give you an idea -- I'm not going to go through samples of ground water. There's a number of different levels of the FBR, the aeration trench which is used to remove any residual ethanol or acetic acid that you have into the filter and out of it along the GAC.

I mean we basically did quite a few sampling points. And then the next slide that we'll show you we sampled for quite a few different things, and I'm not going to go through all of these. But clearly this was a very rigorous test to show without a shadow of a doubt to Dr. Jacizee (phonetic spelling) And Dr. Yamamoto there is something they could sign their names to in

terms of producing drinking water.

And back in April of '02, we ended up -- well, actually Aerojet ended up getting a letter from Dr. Jacizee that in the opinion of the Department of Health Services of California, this biological process is a stable means of reducing below the protection limit and producing water that is drinkable. And about that time I got involved with this in terms of trying to find the place where we could next take it, which is to take it from a permitable system (inaudible) producing drinking water.

Next there are a couple of key conditions, and there are actually 11 conditions in there. We show, I think, four of them here. Basically anything that you put into drinking water has to be NSF approved so that you can drink it. You want to be sure that the microbes, even though the microbes never see the top, you still want to be sure there's never anything bad for you in that water. And that is something that we've been able to do.

As I mentioned earlier, it's very important to control the system, and we will put an online of nitrate and perchlorate on the site. Finally, it is to be followed by a surface treatment plant under Title 22.

All right. Now, we get to Castaic Lake. And

this is a test -- I'll give you a little bit of the history because I find it interesting. But my mind doesn't work like normal people's.

Anyway, when we were trying to get to the point where we were going to steam to produce drinking water, we looked at something for somebody to basically be a responder to the program. And I had been given some people's names at Castaic Lake. And, lo and behold, they are very understanding of the restraints and the weaknesses of biological processes, and they were very interested in testing the fluid bed reactor for their site. That had happened about two weeks prior to today.

And I go into their facility. They had awarded a contract to Corolla Engineers to do a pilot test of a number of different technologies, including a few ionic change resins. Corolla affixed a bioreactor and, of course, Shaw's fluid at the time. They asked us for all the pilot units we had available and what we call our Model 30 unit which is sized to treat 30 gallons per minute. It's a 20-inch diameter unit. It's the same unit that we used at Aerojet, same unit at McGregor, at least design of the unit that we used at JPL. And we proceeded to get a contract to have them release one of our 20-inch diameter units which was made (inaudible) in this pilot test for Castaic Lake.

They were also going to test in parallel one of their own units that I think was three or four inches in diameter, and we were going to treat somewhere between 215 and 315 gallons a minute. Plus -- I don't understand them that well. So we decided we were going to go ahead with this.

We actually will to do some modifications to the unit after it came out of JPL, and we were getting ready to ship the units when we got a call telling us that they no longer could get us the amount of water that we needed to one -- that 20-inch diameter -- and was there any way possible we could supply them with a smaller unit.

So it just so happened at North Island treating chlorinated solvents using an anaerobic system to anaerobically dechlorinate and then (inaudible) an aerobic system to remove the chlorinated solvents and actually starting up that full-scale system which is a little aside. This is when Sam was a lot younger. This was about 12 years ago.

This is a 12-inch diameter, stainless steel (inaudible) that is made for aerobic treatment of chemicals. At the time we knew that there would have to be some modifications, but we didn't really understand the significance of putting in an aerobic system. So we

sent this reactor from North Island to Corolla without making any adjustments to it with the understanding we may not get started right away.

Meanwhile, running for about a day or two already and already acclimated (inaudible) as I mentioned, neither reactor. So they were already up and running. So this was the closest opportunity to get a drinking-water system in. So we were kind of excited to try and be cooperative. These are just a number of things that they tested for.

All right. Now, why is it important that this system was in an aerobic system? The microbes like to take the easy way out if they can. Well, it turns out it's a lot easier for them to breathe in oxygen than it is for them to breathe in (inaudible). Any time there's oxygen in the stream, (inaudible) preferentially remove the oxygen and then worry about nitrate to survival. It's also important to get rid of the oxygen before you can get to the nitrate and the perchlorate. And then sequentially it goes up for (inaudible).

Well, it turns out that this reactor is -- we really didn't find (inaudible). You could see here the first 50 to 60 days of operation the results were all over the board, even for oxygen what turns out in our designs but, in particular, our full-scale units, the

recycle line which goes back down into the bottom of the reactor there is no venting. So oxygen never gets into that line. So you have a relatively steady state of concentration of oxygen. And the aerobic system, it all drops from the top. It goes through some type of pipes. Everything is vented because we want oxygen. We want to reoxygenate so everything is vented. It goes into a solids removal tank, and then it goes back to the reactor. So unbeknown to us, we were re-adding oxygen into the system when we didn't think we were.

During those first 60 days of Operation Murphy, everything happened. We had power outages. Our acetic pump went down. I mean I'm not making excuses. A lot of things happened that I wish didn't happen. We were pulling all of our resources into North Island with all the other work that we had done in perchlorate, all those other sites that I showed you earlier. We thought we were going to throw our reactor after two months, walk out and have a nondetect, although Todd was losing sleep on a regular basis. (Inaudible.) saying don't worry about it. Just we didn't inoculate the reactor the way we did the other ones. Don't worry about it. As it turns out, that wasn't the case.

Another thing that happened -- and I have kind of a key-event slide later on -- another thing that

happened was they actually were not giving us water with perchlorate in it. They were pulling from a well. I don't know whether it was on site or off site. They spiked it with perchlorate. We weren't running the system. It was being run by somebody else. We would get data for two or three days, usually somewhere around seven or ten days after the date it was taken. The nitrate levels were 15, 15, 15. Then all of a sudden it was 12, but we forgot it was 15 the week before. And the next thing we know, the nitrate during the course of the test was significantly decreasing.

Well, shame on us. That should never have happened, but it did. At points where the nitrate was coming down, we were still feeding the same amount of acetic acid. So we were significantly overdosing. In the past we never had problems with breakthrough. When we fed a little acetic acid, we didn't realize the impact that it had.

Once again, I'm not making excuses. We screwed up, you know, but I'm just trying to give you the reasoning so you understand it. Then later on the nitrate concentration went back up. And even though we had this, we still didn't pay as much attention here as we should have. Nevertheless, we consistently did remove all the nitrates all below the detection limit --

well, most of them are below the detection unit now -- and that's the perchlorate.

As I mentioned earlier, if you're putting in oxygen that you didn't know you had, if you're putting in too much or too little nitrate and you're not paying attention to it, which you don't do with a full-scale system because that is what Dr. Jacizee and Rich Raverman is going to (inaudible) we were getting, you know, weeks at a time of good data. And right at the -- in here -- we had a couple blips of 4.3, 4.5 PPB, but we had PPB off nondetect.

The next slide we weren't getting the perchlorate (inaudible) measure that low. But this is all less than four PPB. What you see is a situation where you're controlling the feed to the reactor and monitoring the acetic acid. And Murphy wasn't hanging around. We could get to the grade, the perchlorate there.

One of the things I should say: Early on, after about 60 or 70 days when we realized the oxygen was a problem, we installed a nitrogen blanket to try and get around the problem that we had with adding oxygen back to the reactor. And it was day 17 where you start to see a spike again of perchlorate. Something happened to the nitrogen blanket and, once

again, we didn't find out until about seven days into the test.

So, anyway, the good news is -- and fortunately I spoke to Dr. Jacizee today -- and he agrees this just shows the world that the conditions that DHS put in their letter of approval are significant and need to be addressed. And they will be. And they are in our full-scale systems. But I'm sure what's going to happen from Castaic Lake -- I did get a speck for the full-scale system. I have no idea what that means. But I actually spoke to the guy yesterday.

So next slide.

MR. O'KEEFE: Was that at the very end?

Was that the last day of operation?

MR. GUARINI: No. It went a few more days. We had two more flips, and those were associated with the acetic acid pump was starting to give, and we weren't getting a consistent feed.

MR. O'KEEFE: So that was basically your longest period of stability?

UNIDENTIFIED SPEAKER: That system was designed back in '92. And I guess for a number of reasons either reliability with the pump or loosing prime where the pump was, it elevated above the feed time. They did lose prime on a number of indications. Nowadays we

would detect that, but this system did not have the capability.

MR. GUARINI: Next side.

All right. I hate to admit it, but, yeah, the reactor wasn't the right reactor. But we have great engineers, and we have some smart people. We should have noticed that sooner. Once again, not making excuses for the people like me who aren't smart enough (inaudible) paying attention to this pilot program. The other people were being distracted by the North Islands, the McGregor, the fact that Shaw had just acquired us and we're all trying to be assimilated and integrated into a new company. Lots of reasons. As it turned out we didn't pay proper attention to it. We were arrogant we thought it was just going to just hit, and it didn't. I don't know what else to say beyond that.

Next slide.

Once again, I'm not going to go through a whole list of everything. This is about bullet things that happened during the pilot test that affected the performance. Despite all of these problems, we consistently got back to nondetect for some period of time which once again gives credibility to the fact that these biological systems are much more resilient than a lot of people give them credit for.

The good news -- I already hit the first point -- we know we can treat that water at Castaic Lake. And if they did decide they wanted to use a fluid bed reactor with its ancillary equipment, even with all those flips, we feel comfortable enough that we can control the performance, that we would guarantee the performance of that reactor.

The next slide is just reminding people this was actually -- most of this work was done by U. S. Filter in conjunction with Envirogen and the former company. This is the unit that is way out at JPL. It's 20 inches in diameter by 15 feet high. The recycle is submerged and goes back down to the reactor. We ran this for quite a few months.

The next slide shows a nitrate data. What we did -- I guess we ran about a month at some relatively high nitrate. To be honest with you, I'm not sure why it shut down here other than the fact that it will show for a substantial period of time you can run the reactor in recycle to not feed an electron donor and (inaudible) electronic and start up when you do have nitrate and perchlorate and get nondetect so these microbes stay happy and working.

We then reduced the ethanol. No. 11 gives you a more comfortable feeling that you're really getting

biological degradation. So always good to allow the reactor to go to breakthrough, and we did that here.

The other thing once again, ethanol or acetic acid consumption is one of the main consumables, one of the main operating costs. So it's always good to know how little you can add to still get to where you want to go. You can see they had a significant amount of time getting rid of all the nitrate. Here they actually started spiking up perchlorate and still maintained a great performance all below four parts per billon in the effluent.

And the last slide is what I've been saying all along: A lot of people believe, including me, that the FBPBR system can produce safe drinking water. It's not a silver bullet. You're going to find sites where technically doesn't work. You're going to find (inaudible) cost effective. If that's a concern, as in many places it is, but if you apply it properly, as I believe this application is, it will work. And we have a report that U. S. Filter published. So though that --

MR. O'KEEFE: I'd like a copy of that report.

MR. GUARINI: Sure.

MR. ZAIDI: Can I have a copy, too?

MR. GUARINI: I don't know if you can answer them, but you can answer --

Oh, of the report. I thought you were going to ask questions.

MR. ZAIDI: Of the report.

MR. SORSHER: When you're feeding in excess ethanol or acetic acid, is there any condition -- I suppose some control -- so you don't form sulfides. Or how much sulfide is typically formed at all, if any?

MR. GUARINI: Very little. We typically run somewhere around 5 to 20 percent excess of electron donor. And on a bad day you can go up on top of one of the reactors and know that you're getting a little bit of sulfate reduction, but most times you don't get to that point. And a lot of it has to do with how much electron donor you have.

MR. SORSHER: If you have other organics in the water, you form any -- what's the word -- the organic sulfides or complexes or anything like that?

MR. GUARINI: No. We haven't seen that. And if you look at some of the things Aerojet did, they did have to test for a lot of that stuff. There is TCE up at Aerojet. It doesn't get affected by the bioreaction, but it also doesn't inhibit the bioreaction in perchlorate and nitrate. It depends on the design. It can be open, and many reactors are, but out at the other sites we have covers on them with a vent

basically. And we do -- we can supply -- if that's a concern, we can supply a system that captures the vent and treats H2S or whatever is being formed.

MR. SORSHER: The other questions I have is regarding the ethanol. What concentration do you use?

MR. GUARINI: Well, it takes three drink -- no. We use -- I'm not sure.

Is it 50, Sam?

MR. FISCH: At Aerojet they use ethanol because of the large volume of water and the relatively fair amount of ethanol in the storage tank, and they use a high concentration. It's 90 some-odd proof.

MR. GUARINI: Probably glacial. Probably like 95, I would assume.

MR. SORSHER: You know -- you know, is there issues with flammability?

Also, is there a security tax?

MR. GUARINI: One of the reasons why we've gone to acetic acid approval for NSF for drinking water is we thought ethanol is more problematic but it's less expense (inaudible) probably better off spending the extra money for drinking water systems, we will use acetic acid.

MR. SORSHER: I see.

MR. O'KEEFE: So that's the intention?

MR. GUARINI: That was the intention.

MR. O'KEEFE: Was there mention about a corn-syrup solution?

What was that about?

MR. SLATEN: I don't know. What was the --

MR. GUARINI: I think what it was was the in-situ demonstration.

MR. FIELDS: I think there was some confusion where they took the corn syrup and thought that was going to be done.

MR. GUARINI: We actually looked at that. As an aside, we looked at AMMR because we wanted to once again save money on feed costs, and we fed molasses. We had reactors in parallel. And what we found is you're better off with a lower carbon molecule. You have less by-products formed. You have more specificity -- whatever that word is if I could say it -- specificity on producing what you want to produce and getting the results you want when you use acetic acid or ethanol.

MR. RIPPERDA: acetic acid at both the OU-1 and OU-3?

MR. GUARINI: And Longhorn is using McGregor, also. There are at least three operations of (inaudible) that works as well as ethanol. All the constructed sites now, with the exception of the OU-1

area, are using ethanol.

MR. SORSHER: Getting back to the sulfate again, JPL has a pretty high sulfate level in their water, I think. Were there odors noticed during the pilot test?

MR. GUARINI: Alan, I don't remember. Spent most of the time out there at the site when we were running that. So I'll get back. May even be addressed in the report I forgot.

MR. FIELDS: I thought you had it in one of the slides.

MR. GUARINI: Ethanol we found -- and I would like to acknowledge if you could just get back to the last slide.

We found in many laboratory experiments and the field tests both were pretty much interchangeable, acetic acid and ethanol.

I always feel a little bit embarrassed about being the guy in front of the room when I am with people who think I'm smarter than I am. I like to acknowledge the people that really did the work, and these are the people that have been involved -- I think most of you -- Perry Russel Trodes, Robert Clark, Mike McGuire, Rick, and Gary Yamamoto. They were all involved with the DAS testing and approval. A lot of the work that we

have was paid for by the Army and the Army Corps of Engineers and the Navy. Of course, Castaic Lake has been great, and Corolla Engineers has been a pleasure to work with, and I would like to acknowledge their efforts in getting me up here and hopefully answering your questions

MR. TAKARA: The Castaic Lake, was it determined that the microbes were not a contributing factor to some of the problems you're experiencing?

MR. GUARINI: It wasn't a biological problem; it was mechanical.

MR. O'KEEFE: Because the other system, the fixed-bed system, was using the indigenous?

MR. GUARINI: To be honest with you, people will say jokes, you know, the packed-bed reactor worked well and yours had problems and everything (inaudible). And if they weren't there, we would have just walked away and say we can't work at this site. It just doesn't work. Or we would have said you can't go draw false conclusions.

MR. O'KEEFE: I have a general comment for the group, not Shaw specifically. But the operating parameters are site specific. So DHS wants to get very much involved in the start-up testing demonstration of the full-scale system to make sure -- and this is during

the period where reinjection will be occurring to make sure it's being looked at carefully for our concerns and for the ultimate permit for the drinking water usage.

MR. SLATEN: Makes sense.

MR. BOMAN: Would DHS be looking at OU-1 as kind of a pilot for OU-3?

MR. O'KEEFE: Not really. We probably just --

MR. BOMAN: The question is do you need to be involved? Do you want to be involved in OU-1 so that would help you with OU-2?

MR. O'KEEFE: It's a different scale.

MR. SORSHER: A different concentration.

MR. O'KEEFE: Different concentration, but the previous pilot the concentration didn't seem to be a factor on performance.

MR. GUARINI: No.

MR. FIELDS: The OU-1 system will be fairly close in design with the Trident filter and part of the conditional acceptance.

MR. BOMAN: I'm wondering if the nitrates may be a little different.

MR. FIELDS: But at least will be a good next step after the small-scale pilot to this one and then --

MR. TAKARA: What nitrates are you having over at JPL? What level of nitrates?

MR. FIELDS: I don't recall.

MR. RIPPERDA: It was low PPM.

MR. GUARINI: But not variable. Castaic was 20 down to 5. But once again they were bringing, I think, 3500 gallons of water every Monday to the site, and I assume it all came from the same well. But if the well had been shut off -- I'm a chemical engineer so I don't understand subsurface wells at all -- obviously variability that you wouldn't expect in a full-scale (inaudible).

MR. O'KEEFE: In that area the nitrate areas are seasonably variable.

MR. SLATEN: For my purposes, you know, I have people like the reporter asking me how many other places in the state do they have these and how long have they been running and things like that.

Could I could get someone to get me a page sheet of things I don't know. Certainly I don't want to make stuff up.

MR. GUARINI: I'm in the process of doing that for two other projects. So I will make sure you get a copy of that.

MR. SLATEN: Where and how high the levels are. Like a one-pager. If they ask me, you know, where else in California, where else in the country are these

running, how many of them are up and running and how long, if any, have been used for drinking-water supply. Those are the main questions I'd like to be able to answer.

MR. RIPPERDA: You want that for biological?

MR. SLATEN: Yeah.

MR. RIPPERDA: If you could supply -- it's not your job to know about the ion exchange, but you must kind of know what's all there.

MR. GUARINI: (Inaudible) that was the way my charter was. Our strength was we were a small business. We didn't have time to focus on everything. At Shaw we want to be sure that -- not that we didn't want to be sure, but they really want to be sure what they supply with the right technology for the problem definition that we're treating. And they have actually supplied, I think, three or four ion exchange systems, not on drinking water (inaudible) to DOD facilities to remove perchlorate and nitrate.

So if I do have some information, I'll share it. But I'll let you know how comfortable I feel with the data.

MR. RIPPERDA: Just none of ion exchange treatment systems that actually exist for drinking water.

MR. GUARINI: There is a finite number of them. So it shouldn't be too hard.

MR. RIPPERDA: The number of biological systems of drinking water?

MR. GUARINI: Right now very finite.

MR. RIPPERDA: Zero; right?

MR. O'KEEFE: Gary Yamamoto has a list of ion exchange treatment plans that are permanent in California for perchlorate removal.

I have a question: Does your technology have any other applications, such as, nitrate removal, or are you just specifically marketing for perchlorate?

MR. GUARINI: This type of reactor design removes nitrate also. There's a system installed near Modesto for nitrate removal. This is a farming area; so nitrate levels are in the 40 to 60 PPM range.

The other thing that we use this for, as I mentioned earlier, is chlorinated solvents, and we're in the process of starting up a system with two 14-footers to treat chlorinated solvents down in North Island in the San Diego area.

MR. O'KEEFE: Back to my question I keep asking: Is there any of your systems used directly for drinking-water purposes?

MR. GUARINI: No. No.

MR. O'KEEFE: And the Longhorn one, the drinking-water reservoir, was that a raw or treated or finished water reservoir?

MR. GUARINI: Raw-water reservoir.

MR. O'KEEFE: So it goes through a full surface water treatment --

MR. GUARINI: I assume it does. I never looked into it.

MR. RIPPERDA: When you have highly variable nitrate, do you just adjust the electron donor, or do you adjust, maybe, adding a little oxygen?

MR. GUARINI: No. We do it through electron donor; right. We usually try -- and whatever oxygen is coming out of the ground is what we feed the reactor. There's none in the recycle. In the case of Aerojet, now they're treating 1325 gallons of water from the ground. So they only have, like, 500 gallons of recycle.

In the case of Longhorn, the fluidization rate at the bottom of that reactor is 200 gallons a minute, and the net feed is 30 gallons to 250 gallons. So the recycle is 150 to 170 gallons a minute. So you have more recycle coming in, but the oxygen in the recycle is as close to zero as it could get. But it does come in from the ground water.

MR. SLATEN: So you're going to be around today if people need to catch you?

MR. GUARINI: If anybody needs a business card, they can pay me by how many of these I give out.

So happy to share them with you.

Sorry, Mohammed. Oh, you want one?

MR. O'KEEFE: I'd like to give you one pilot study report.

MR. GUARINI: Sure.

Thank you very much for your time. I appreciate it.

MR. BOMAN: We've been sitting for a couple of hours. I think people are ready for a break. We'll be getting sandwiches delivered after a little bit. So we'll take a break and start back. And the sandwiches will just show up whenever they show up.

(A brief recess was taken.)

MR. SLATEN: I guess, if we're ready, we can talk about OU-3 work. Just last week Mark came down --

That was last week; right?

MR. RIPPERDA: Right.

MR. SLATEN: After being out in the Pacific for something; right?

MR. RIPPERDA: In Guam.

MR. SLATEN: Mark came back and asked for a

meeting with the City of Pasadena and with DHS and with NASA to talk about where we are on OU-3. So you'll need to just go on from here and talk about what went on last week; okay?

You know, we went down to Pasadena's offices talking about ways that we can move things along faster and just kind of did some brainstorming, had some ideas about how we could do that, and one of the things that we talked about was a lot of the time -- the next six or eight months on OU-3 -- was going to be tied up in the contracting process. That best value award that was going through the Navy, you know, goes out for proposals and there's evaluations we were working on to get one of the Pasadena's -- somebody that could kind of work for Pasadena -- and report to them, get them on the source evaluation board.

We worked through that issue, but the idea came up: Is there a way that we wouldn't have to spend so much time going through the contract process? The response is, yeah, if we use the exact electric (inaudible) which is doing OU-1. And just expanded, we could cut half a year or more probably off of getting the system up and running. So we talked a little bit about that.

I've been talking about that now internally

with the Navy and NASA and had a conference call yesterday with NASA's contracts people, and it sounds like that could work. The contract is appropriate. It's big enough. It's appropriate. It's already in place. There could be economies of scale of using that, economies of scale of maybe using the same contractor and probably using the same contractor to put in both systems if that's the way the contracting works now. What would be a six-week or eight-week or maybe more process of going through the contracting, the way it was proposed might be cut down to a couple of weeks of kind of an accelerated proposal that would be contracted out through Battelle that we haven't had much to do with. We would just tell them build it this way or give us a performance that's this or something.

And so what that would have to mean, though, is we go ahead and decide on the technology now. This would also be a little bit of a catch-22 where we have about putting the action memo -- the EE/CA action memo. It would save some time in this kind of an order of things as in the critical path of what comes first, EE/CA action first or contracting.

The Navy had a little bit of trouble going the other way before we had the technology chosen. The Navy was a little reluctant to release any kind of contract

bid proposal stuff. So there was -- going this way has several kinds of advantages. What it adds up to is it might shave a year off -- it could shave a year or maybe even 18 months -- depending how we work through things of getting the system up and running, OU-3.

What would it mean? The big advantage is the timing discharge. And we talked about Pasadena, that they wouldn't be intimately involved in this, that whole contracting process that we were talking about. So that's one disadvantage.

For NASA it's taking a little bit more risk on (inaudible) thinking that we will make it work. But basically the risk is on us to get a system that does work. What it does with the 97005 stuff, I guess you run is concurrently but separately. It's not as much of a front anymore. The advantage to that disadvantage, I guess, is we go ahead and choose a technology, and later we're going to have to defend it in effect. The advantage is the earlier we start it makes it easier to put in some of those 97005 documents. So we got real information on some pumps, etcetera. Later, we have real information about its actual performance, I mean historical data before we go final on the permit.

So we talked all that through last week. And at least among those that were there, we agreed it

sounded like a good idea. And I got a letter from Phyllis Curie yesterday from the City of Pasadena that says, "Good. Go forward. Take this approach. We approve it."

I have copies of the letter if people would like to see it. It seems pretty straight forward to me.

Who all wants a copy? Probably got about 15. That's it. Two pages.

I have some that don't say "Copy" that are clean.

Here's what I think could happen here. My NASA kind of described this back -- what was going on to my NASA management -- back in Washington, and they said, "You do not have permission to do this yet. You do not have upper management permission to do this. You need to gauge the response from Pasadena," which we started to do, "and from the other stakeholders," us basically, and whether we think that this is an acceptable idea. Then I have to report back to them what the response is, and then I can get permission. That can happen fairly quickly, but I'm not authorized to do this on my own. So I wouldn't take unilateral -- even if I did have authorization, I wouldn't take unilateral action on this without weighing in with everybody. But I think this is a good way to go.

I guess what I'd like to talk about today and what people want to hear about are the pros and cons and kind of anything more about the concept and talk about whether people would support this as an idea for acceleration. Gary people may be reading the letter. I think Gary probably didn't draft the letter.

Didn't you get it from Phyllis?

MR. TAKARA: Yes.

MR. SLATEN: Do you have anything?

MR. TAKARA: Actually Sean is the one that spoke to Phyllis on this. The approach -- again the letter states that we're open to (inaudible) ion exchange or biological. We have no preference. All we request, however, is that the water treated from the system meets the department health standards and that come to some kind of agreement memorialized as quickly as possible so we can put this behind us and move forward with the actual treatment.

Our main concern is just continuing quickly, and then we'll prevent some of this contamination from shifting over from our east-side wells. And hopefully, as Steve said, this could speed up the whole process by a year.

What is NASA's proposal of getting the speed back? Is it just from the agencies? From the public?

What does headquarters --

MR. SLATEN: Mostly this here in this room. We're not going to be able to go out and take a vote or anything. It has been biological in the news for the last couple of months. We talked about it at a public meeting, and it's been in several articles. And we've had some good questions about it, but no resolution to the idea. Now, that's not a mandate. That's not a clear mandate that everybody is going to love it, but, you know, we got to gauge whether that's enough of a public feedback that we're willing to proceed ahead at some risk.

MR. RIPPERDA: At what point will NASA management be happy?

MR. SLATEN: I don't know. Depending on kind of what I hear here, I'll go back and tomorrow I will tell them and I will see if they're happy, if that makes them happy.

MS. FELLOWS: We have published the action memo for comments.

MR. RIPPERDA: For moving forward, you know, the things you have to do, the action memo -- obviously a whole new action memo to the action memo we have now.

MR. SLATEN: It would stay something entirely different.

MR. RIPPERDA: I take it that you will reissue it, and that you can do -- whether or not (inaudible) public comment period. And I would think at the end of that period NASA would say, yes, this is what we want to do or not.

MR. SLATEN: That's the official one. But the -- turn me on right now.

MR. RIPPERDA: For NASA headquarters, for you to (inaudible) regional board, City of Pasadena, this sounds like a good way to go.

MR. SLATEN: We should realize the risk of it, though, is that we sort of stopped pursuing the other route. To put it another way, stopped going down the -- letting the contract for the other, the slower route, start pursuing this route which means start getting some design stuff drawn up. And I will be spending money on the design that's not guaranteed yet that I will get to use. And EE/CA, hoping that it goes that way, the public would accept it. If they don't, I have wasted a couple of months -- a couple of months further behind sort of than I was already.

So there is some risk here that if this all goes to hell in a hand basket when we publish the EE/CA, then I got to start over on the old approach.

MR. RIPPERDA: But the EE/CA was general enough

that you don't have --

MR. SLATEN: Don't have to change it. I think the EE/CA should be the same, but the action memo would reflect the new thought.

MR. BURIL: Just a question in terms of -- isn't this tantamount to going to (inaudible)?

MR. RIPPERDA: We've had this discussion before about action memos versus rods, and the action memo is a decision document. This is being done as a removal action. So whether we're speeding it up by just saying, yeah, the biological system is what we're going to select in the action memo, or we're going to do the way they're going to do that's not any different under the way Steve had been talking about today.

You know, the bigger picture of this is doing a cleanup. This big okay to do under removal action authority --

MR. BURIL: Okay.

MR. RIPPERDA: It's a borderline, but there's not a hard-and-fast rule that says you can't. And, you know, we (inaudible) NASA. And it's come up at these meetings where I've said, "I'm okay with doing this under removal action authority." And nobody else has complained.

And so, yeah, EMS, as a general rule, doesn't

like to see this big a project happen under removal action authority, but we're not going to say no.

MR. BURIL: Is there a general opinion regarding the amount of public relations work we've done already as being adequate to take this step?

MR. RIPPERDA: Certainly the one round of public meetings we just held is pretty minimal. I've been talking with Merrilee and Steve, and I want to see another public meeting that happens, you know, within the action memo public meeting comment period. There's not a regulatory requirement for a public meeting to be held for action memo, but I would certainly like to see a little more effort than the bare minimum. So we've talked about having a public meeting in that period. Whether it be kind of done together with Merrilee's health meetings -- and she's shaking her head violently no --

MR. SLATEN: My guess is we go ahead and do this first one for the accelerated action and push back the health a little bit.

MS. FELLOWS: I want to give the people that have health concerns very specialized attention and make sure it's focused on that.

MR. RIPPERDA: So in which case, yeah, Merrilee and I have talked about the downside of having two

meetings with different focuses really close together and people being slightly confused and in kind of an information overload. They might go to the wrong one or go to both and be bored or whatever because we're kind of cramming through, I don't know, a $20 million or, you know, something-like-that system that ultimately is hopefully going to be used for public water consumption.

I do want to have an action memo meeting, but then there's the whole DHS permit (inaudible). Before it gets -- DHS is like the last bastion of (inaudible) to the public. So the reason to have an action memo public meeting is exactly the kind of -- you know, protects NASA, protects all of us that before we commit to spending this much money, we've gotten the public input even though the public has another chance at the permit meeting.

MR. BURIL: Is there a precedent for this within EPA?

MR. RIPPERDA: I don't know. I'm sure there is, but I haven't, like, looked into it. There is a dollar amount maximum allowable when EPA is a lead agency and we're spending the trust fund, the soup fund money. And this is certainly bigger than that, but this rule doesn't apply to a federal facility PRP.

MR. SLATEN: Their questions were valid last

week when we were going the slow route. The only thing that has changed now is just me trying to find a way to get it in farther.

MR. BURIL: My only concern would be whether or not a third party outside this room would consider this as a mechanism to circumvent the process.

MS. FELLOWS: That's why we feel so strongly trying to have an action memo meeting, even though it's difficult to pull off. I think it's important.

MR. ZAIDI: Action memo meeting is a very good idea. We finalize -- all the agencies sit down with NASA and finalize our comments, and we decide on the system. And then in that meeting, also, we can invite Chuck to present that system -- Shaw system -- technically proficient people who are asking performance (inaudible) public meetings. But they are satisfied right there. And then we can circulate some kind of question among the audience as to whether the public was satisfied or not. And that will push us forward as far as action memo goes.

MS. FELLOWS: I didn't quite understand the timing.

MR. RIPPERDA: Just to finish up your --

MR. BURIL: Yeah. My management shares with our attorneys. And my management, whether or not

they're entirely happy, they'd rather go forward with this than wait for the whole feasibility study ROD process which would take another year on top of everything that is happening.

So EPA feels strongly enough that (inaudible). We'll kind of do things a little differently than we would normally do, like, to save that year's worth of time to do that year's feasibility (inaudible). For now -- for timing -- Steve's got an issue in action memos. Got to give the regulators 30 days to review it. At that time there's a 30-day public comment period. So if you assume it's going to take Steve a month to write it, a month for us to comment, let's say two weeks for them to respond to comments, that's 60 -- that's, you know, 85. That's about three months out for a public meeting on the action memo.

MR. O'KEEFE: But if Merrilee was going to proceed with the end of March, beginning of April with a health meeting, why doesn't she just continue along that route?

MS. FELLOWS: Now that's impossible. It's got to slip -- we're just not ready to go at the end of March.

MR. O'KEEFE: It sounds like you'll have at least six weeks.

MR. RIPPERDA: To me the end of March, middle of April.

MS. FELLOWS: End of March and middle of April depends on how sure I am. We know we can't do it tax week. Then we start scootching up on this. We really are offering a meeting while there is still time for the public to come I work with. We will do that.

MR. RIPPERDA: But it's got to be within the official comment period, and that's going to be some time probably mid May to mid June. And so the action memo public meeting, you know, if everything happens quickly, like best possible way, you'd be holding it in early June.

What's the --

MS. FELLOWS: That's five weeks from the other one. We do get them put up against each other. We want to make sure people keep coming. You know, you're wearing us out. So we're blowing it off. But I just haven't looked at the calendar.

MR. RIPPERDA: Personally I would refer to that (inaudible) and get complaints addressed. And I want that out of the way before we try to talk about, you know, engineering solutions. And if it happens within a month to six weeks, you know, I'd say okay because the people who really have concerns and complaints are going

to have their chance to come and, like, you know -- well, so they're within a month of each other.

MS. FELLOWS: And I have talked about this, in fact, a month a part. That wears people out. Now that I thought about it some -- well, I'd rather do that than put the whole process off a couple months. I agree with that.

Let's get back to Steve's comment: The whole idea of this is to hurry. Is it really going to take as long --

MR. SLATEN: Let's go back to the calendar one more time.

One thing I would like to do is ride hard at least on the things that we have control over to see how quickly I can get them done.

That said, I'd like to -- to do this I think makes sense to get it started. There is economies of scale while certain contractors are out doing different things, well drilling, different things going on. If we wait (inaudible) what and when those are.

We got one contractor out building something coming up to this summer. And so there's probably economies of scale getting started on some other parts -- OU-3 parts -- of it as well.

All that said, I guess one thing that I would

ask, since people have already seen the EE/CA, they haven't seen the action memo yet, I'm wondering if a full 30-day RPM review would be necessary for the new action memo that describes the new accelerated process.

MR. ZAIDI: The thing is we are working -- I'm working another 55 sites. This is not my only project; it's just one of my projects. So we can, of course, maybe prioritize this such an urgent matter. But I think 30 days is reasonable time to be given.

MS. FELLOWS: So you're saying it doesn't take you 30 days to respond, but you need some flexibility?

MR. ZAIDI: My management wants me to focus on other projects that they think are more -- well, you don't have CEOs I got.

MR. SLATEN: Okay. I mean whatever, 30 days according to the agreement, 30 days for, I think, a document like this. It says 30 days or less if agreed by the parties or something.

MR. ZAIDI: I do it sooner, but I think it's better go 30 days.

MR. RIPPERDA: Shaving two weeks out of the process can't be a make-or-break thing.

MR. SLATEN: I'm going to be looking to shave a day or a week off whenever I have control of it. I'm just looking for if there's any other possibilities.

MS. FELLOWS: So do you think -- assuming NASA approves this -- is it going to really take you a month to do a revised action memo?

MR. SLATEN: That's what Keith told me this morning.

MR. FIELDS: That's one of those --

MS. FELLOWS: He was doing a Mohammed on you.

MR. SLATEN: That's where I'm going to be pressuring Keith.

MR. FIELDS: Always try to start at a good point.

MR. SLATEN: That's my first place. Keith will be hearing from me.

MS. FELLOWS: Frankly, for Mohammed's request, you know, earlier at some point before he gets it, we're going to have to figure out the time line because we are to start advertising and setting up meetings so you'll know how long you'll have. You're not to be under the gun. Won't help me to be. A public meeting to get it done faster.

MR. ZAIDI: I will do my best. Put down 30 days if you're holding somebody responsible for that.

MS. FELLOWS: Yeah. What I'm saying, once we say to you you have 30 days, I'm going to plan from the 30 days. You know, I can't have a moving target.

Whenever we have all the responses, it's going to be from the 30-day thing.

MR. SLATEN: Back through the calendar. So if we worked on it right now, and Keith stuck to his 30 days but I get him to shave off a week because we're already almost a week into this month, that would mean by April 1, if I could send it out to RPM, review the revised action memo, plus what I would throw in, answers and comments on the existing EE/CA because we got comments from everybody. If that takes 30 days, that takes us through to the 1st of May. If I were able to get it public noticed almost -- no. I got to incorporate comments. Gets us into May, just mid May, I guess, before I could publish. If I pushed it right --

MR. RIPPERDA: And there's another step there, and that is draft, draft, final, final. So 30 days for regulated for us to review, too. Two weeks for you to respond to comments. And then, you know, technically under the FAA, there's another 30 days for us to review your response to comments which is called the draft final stage. And then after that it goes final.

So, you know, at that point we might all be able to shave two weeks off to just look at your response to comments.

UNIDENTIFIED SPEAKER: Is this document

considered a secondary document?

MR. RIPPERDA: Yeah.

MS. FELLOWS: So then after you guys review and if you have any major changes to his comments, then he incorporates them again. Then it goes to public comment.

UNIDENTIFIED SPEAKER: WMA in the Pasadena – I mean if you're going to want to speed things up.

MR. RIPPERDA: We're going to include Pasadena and DHS in the regulator period.

MS. FELLOWS: Okay. All right. So it does look like they'd be far enough apart.

MR. RIPPERDA: If you want to save time. I don't know at what point you lose the ability to use the existing OU-1 contract. I guess you can use the contract --

MR. SLATEN: Mobilization of contractors and such.

MR. RIPPERDA: But your contractor is going to be finished. Now it's a matter of how fast you do this accelerated OU-3. Your drilling contractor is going to be done.

MR. FIELDS: There's some things we could start even electrical piping. But, you know, kind of starting to consider all those together.

MR. SLATEN: I guess I'll be proceeding at risk having plans and papers drawn up and all that to get ready to go this way. I'm going to go ahead and run that concurrently with the administrative process of approval. But at what point I do -- is there any point where I've gone too far? Can I break ground before we've -- before we have final approval knowing I'm proceeding at risk breaking ground but spending millions of dollars on plans and everything anyway?

MR. BOMAN: Go for it.

MR. SLATEN: At what point? If there is some point that I've gone too far before I have approval, you know, a physical construction --

MR. RIPPERDA: I'll have to talk about this with my lawyer and management who would probably be more nervous about it than I would be. I would like to say drill your wells and everything, but we're going to make you move them or we're going to (inaudible).

I'll check with my lawyer and my boss. I would think drilling wells would be going too far. I would think doing electrical and surface pipes and building pads, things like that, would be okay. But actually buying the treatment system or drilling wells would be too much. That's my guess.

MR. BURIL: Are you saying that anything that

could be used, any technology that's applied to this situation, would be okay?

MR. RIPPERDA: Yeah. That's my guess. And certainly it's not just the action memo that you need to get out for comment and agreement. You need to have a work plan. You know, it's kind of the same problem we just hit with the OU-1 stuff, and you got comments.

MR. ZAIDI: Different (inaudible). Oh, it's too late. You got the wells in. That's not going to be acceptable for this one. So you're kind of proceeding at your risk to pay your contractor money to produce a work plan including locations of monitoring wells, the installation, design of the extraction and injection wells, location of extraction and injection wells. Monitoring all of that, you should be issuing that about the same time as the action memo so that the regulators have a chance to review that because you can't move forward with any well installation until you get approval from the regional board on all that stuff.

MR. SLATEN: We do have some more to talk about -- about the next step in the monitoring well installation stuff -- after we get through this.

MR. RIPPERDA: That is probably the Sunset well, and that's important.

MR. SLATEN: Access agreement.

MR. RIPPERDA: And your EE/CA had in it monitoring wells near the new injection wells. So that's going to be in a work plan before you can go out and start drilling your wells. So you got to have Battelle issue you a working plan for purely the OU-3 stuff around the same time as the action memo. That's another whole big thing for Battelle to be doing.

MS. FELLOWS: And we still have to deal with JPL facilities, too.

MR. ZAIDI: I'm willing to have meetings and personal meetings with Steve, Mark, Pete so we can quickly decide. You know, I'm not too far from here. So I can come over and discuss this. And whatever our mutual agreement is, we can finalize it.

MR. SLATEN: I come to realize, even with working with Pasadena, us writing back and forth, just doesn't work. It's not fast enough. We're going to be meeting just more face to face. But in real time you can work so much more out.

MR. ZAIDI: This first and work plan later. We never allow it to (inaudible).

MR. RIPPERDA: So back to your first question: It sounds like all the regulators are in agreement with your approach, and you can go to NASA headquarters and say you got concept buy-in, and then you need to write a

new action memo, and you need to write a work plan and get both of those out to the regulators.

MR. SLATEN: All right. It seems to me like the water companies would probably -- this would probably be okay with them because it's accelerating, pulling back on the plume and starting to get in their best interests.

Is there any issue with the water companies that I'm not aware of that would affect trying to accelerate what we were going to do already?

MR. TAKARA: Is this plan to be brought up with the Raymond Basin at any time?

MR. SLATEN: People, you all have a better feel for how things work here than I do.

Who else do I need to inform and get some feedback from?

MS. FELLOWS: Probably looking at me.

MR. TAKARA: Have you spoken to Lincoln?

MR. SLATEN: Not specifically about that, although I get the feeling from him anything we do to accelerate --

MS. FELLOWS: He's pressing us to accelerate every single day.

MR. RIPPERDA: I don't think trying to educate everybody about your own internal (inaudible) trying to

speed things up and how you need to send a letter to Raymond Basin and to any individual water companies saying we want to get, you know, the off-site treatment system up and running by whatever the time line is.

MR. SLATEN: What is means is choosing the technology now.

MR. RIPPERDA: We're proposing to (inaudible) biological the treatment system, or we proposed to produce air into the Arroyo -- inject it with a little map here on our site -- and you have to formally ask the Raymond Basin for permission. And you may have to use Pasadena's water rights, however that works.

MR. SLATEN: That is no different than -- they don't care about my internal contracting difference if we go ahead and propose FBR and go ahead and shave off --

MR. RIPPERDA: So you send that letter to Bob at his water company and also send it to the Raymond Basin Executive Committee, and that's it.

MR. BOMAN: To Rubio, Los Flores. Pasadena has already sent you a letter.

Anybody else, Linda?

And then just the Raymond Basin.

MR. O'KEEFE: I just want to point out, since everything is moving pretty fast with our 97-005 policy

writers for the OU-3 project, although OU-1 is probably exempt from EE/CA, now might be a good time to get that started.

MR. SLATEN: At what point does it need to be done?

MR. O'KEEFE: For the permit. But you usually would do it in the design phases of a project.

MR. RIPPERDA: You can tell all of us, Keith.

MR. FIELDS: The first step? EE/CA's initial study, we've already done a draft -- internal draft, initial study -- that has been sent to NASA.

MR. RIPPERDA: They can do the OU-3 part with injection without EE/CA because that's a circle action, but they haven't started anyway.

MR. FELLOWS: That's agreed.

MR. O'KEEFE: All the 97-005, that's a significant process that we don't want to lose steam on either. So we're trying to make sure we're pursuing those separately and concurrently.

MR. SLATEN: Okay.

UNIDENTIFIED SPEAKER: One question for the health meetings. We're a small outfit and customer. About these meetings earlier (inaudible) lead time as possible because we need to send notice without billing. Otherwise we have to spend $1500 or so on another

special mailing.

MS. FELLOWS: We will either get it in your billing or pay for your separate mail.

UNIDENTIFIED SPEAKER: They read meters around the 22nd or 23rd, and we get them out usually by the first of the month. If we can get something out, notice (inaudible) really helpful for us.

MS. FELLOWS: So we have it in the first week in April.

MR. RIPPERDA: The 22nd. Then it goes out around the 1st.

MS. FELLOWS: It's tricky, but I'll pay attention to it.

UNIDENTIFIED SPEAKER: But it's sure helpful. People will call me, "How come you didn't tell me about the meeting?"

MS. FELLOWS: That's our objective.

UNIDENTIFIED SPEAKER: I can put notices or flyers in the post office. That's a shotgun approach.

MS. FELLOWS: But we'll help you do all that. I'll just call you up, and we can talk about the different --

MR. SLATEN: Is it preferable to put it in the bill or -- if we paid it, would you just as soon (inaudible).

MS. FELLOWS: Where your --

UNIDENTIFIED SPEAKER: (Inaudible).

MS. FELLOWS: Separate mailer, which we're planning to do, are they going to see it? Do you really need one in your bill? They will know it's coming from you?

I know I throw my bill stuffers away.

UNIDENTIFIED SPEAKER: We do that (inaudible) that it's important to them and will actually --

MS. FELLOWS: Tied it to the bill or something separate?

UNIDENTIFIED SPEAKER: Separately you'll get their attention. Some people, those that bother, will. So either way will be fine.

Logistically we just go down to Kinko's and make a quick 1500 copies and send them out. There's some postage involved, but it isn't big, big bucks. It's the stuffing part. We may need them to stuff it, too, and just get them out. If we have to do a separate billing --

MS. FELLOWS: I'll call you next week.

MR. SLATEN: Well, if we're ready to move on, you have to turn your thing back on because we've got some stuff to talk about on the kind of the waterway we know about, water quality and leading up to kind of

what's the next step in the monitoring well network installation.

Maybe I will save this one for last. Everybody is kind of tired. So we won't spend three hours, but I think there will be some good discussion here.

So go ahead and flip away. You see JPL, and you see this perchlorate levels; right?

MR. FIELDS: Yeah. I added this one.

MR. SLATEN: Because I hadn't seen this one before.

MR. FIELDS: I added it this morning. This is April, May, 2003.

MR. SLATEN: I can see my house. It's right there.

MR. FIELDS: There was a request -- there was a request by Mark -- to provide some maps and some concentrations of perchlorate, understanding the first thought was to go through what we know about perchlorate in the basin.

We kind of have two points of reference. The one is the NASA monitoring well network, and the other is the production wells within the basin. So this sort of represent NASA's monitoring network and it indicates what we all kind of know is there's relatively high concentrations around MW-16, 7 and 24, which is the

expanded treatment (inaudible) as MW-20 is the furthest downgradient well. But then NASA's network --

MR. BURIL: What screen is that in?

MR. FIELDS: That is in screen four layer three.

MR. ZAIDI: Concentration --

MR. SLATEN: Let's keep going. We got a lot more that shows stuff like that.

MR. ZAIDI: There's a lower concentration of 5.8 and 4.1 before we get to the Arroyo; right? Then it raises up again?

Is it part of the same JPL or coming from somewhere else?

MR. FIELDS: I hesitate because it's fairly complicated. Just there's multilevel monitoring wells, too, and also single-level monitoring wells that are mixed in here. Like MW-7 -- I showed the result from MW-7. On the others I pulled up the maximum. So some of these -- and it's not completely clear exactly where the plume is going -- but we have tried to model it on sort of a surface-plan view and then also three dimensionally. I think maybe the point from this one -- in fact, there are -- we've had detections in 17 and 2 within the monitoring well network. 124 was the highest.

MR. SLATEN: We'll get some more of the forensic to tell you why we think that's our perchlorate.

MR. FIELDS: The next thought on that --

MR. BURIL: Your head is in the way.

MR. FIELDS: April 2003, to reinforce that concept. This is a 3-D picture of what we're looking at. This is more of what it looks like when we map that data with a C-23 conceptualization. You can see this is MW-20. This is 19. This is 21. This is 17, and this is 18. So here is 17, 18, 19, 20, 21.

MR. SLATEN: We took out the other slides for perchlorate at other points in time; right?

MR. FIELDS: I kind of wanted to show -- one is April and August. August -- interestingly in August it was not detected in MW-20 for perchlorate.

MR. SLATEN: Perchlorate is not behaving well in its carbon tet. When you do it over time, it's a credible, believable thing. There is so much jumping around of perchlorate in either some laboratory --

MR. BURIL: I was just going to ask how do you feel about your QA.

MR. SLATEN: There's enough jumping around of it to make you wonder what is real and what's not. How much is real and so forth. So that needs more work.

There is nothing really we can do today to say about it except it is kind of fishy the way perchlorate comes and goes (inaudible) the next month and things like that.

MR. FIELDS: As you know, the pumping, I think, of these within the basin may have something. Although, first cut, if there wasn't a good correlation with pumping, and it changes almost too rapidly for that. I mean the EPA method 314, there is a lot of discussion around that right now and interference with high ionic strength water. So that's something that's going to be kind of flushed out as we move forward.

But the reason why we're jumping around is not completely there --

MR. BURIL: How many times have you seen that?

MR. FIELDS: Three over the -- since October 2002. So, like, 50 nondetect, 80 nondetect, 124. So it's, like, bounded by nondetects.

I have a graph in here that we could look at later.

MR. BURIL: Sample techniques.

MR. SLATEN: What can you be sure of?

MR. FIELDS: We're not sure, yeah. There's a lot of things that need to be looked into that I think kind of need to be rolled into this OU-3 intersection.

MR. SLATEN: Let's move on.

MR. FIELDS: Then this, the jewel 3-D type plume.

The point that I just wanted to show on this just for conceptualizing when we talk about multilevels -- you probably can't see this -- MW-20 has five points that are represented here. And so when we're comparing, what we're looking at previously is where these multilevel wells get discreet. And now what we're going to be looking at with a production well (inaudible), for example, Arroyo was screened for several hundred feet. So when we're looking at results from a production well, we don't know where within that stratograph -- the unit we're getting the concentrations. And, you know, it's sort of a blended sample of wherever the pump is located and how permeable the aquifer is right there.

Just to conceptualize, there's a difference in the data that we're looking at when we go to the production wells.

I don't intend for anybody to read these graphs, but I was trying to introduce there's five areas -- six areas -- you're looking at here. This is JPL facility. This is valley wells that are sort of upgrading the JPL facility. There's Arroyo well 52, Ventura, the Monk Hill, City of Pasadena wells, Rubio Canyon, Los Flores wells, Sunset reservoir wells and

other City of Pasadena wells. The data that we will be looking (inaudible) pulled it off there in February of '04. So it's fairly up to date based on what the purveyors have submitted to DHS.

So I thought that we could look -- I highlighted this photograph. And then you can see the next slide is that graph in a larger view.

MR. BURIL: Can you back up to that graph location, the furthest east location? I can't read it from here.

MR. FIELDS: There's a (inaudible) and I believe Chapman are the ones that are reported in the DHS data base and have had low level.

MR. O'KEEFE: Just looking at the website of our data base, just like range of values of key text throughout California. If you really wanted to get to the source data, I can get you that.

MR. FIELDS: And we may unless the source data varies much more widely than these. We have data from '97 to 2004, which gives us a good kind of -- the individual results.

MR. O'KEEFE: It just gives you ranges; correct?

MR. FIELDS: It gives dates and results.

MR. SORSHER: Did you get the CD or actual --

MR. FIELDS: Yeah. You can download from the website.

MR. SLATEN: On 12/6/99 a specific couple of specific samples.

MR. SORSHER: Instead of them burning CDs, people ask for them. People can just download it now, I guess.

MR. O'KEEFE: Not that I'm aware of.

MR. FIELDS: I'm telling you I went to the DHS website. We downloaded. It was updated through February '04.

MR. O'KEEFE: That was on for perchlorate data. The orange vertical, is that Highway 39 there?

MS. FELLOWS: Rosemead.

MR. SLATEN: And down that way is where the San Marino wells apparently are.

MR. FIELDS: And to put it into context, this blue line is the Raymond Basin. This light blue line maybe -- I'm color blind -- is the Monk Hill sub-basin. And just, I mean, we're looking basin scale with this data.

I'm going to quit doing that. I drove people crazy yesterday.

MR. SLATEN: I'm used to it now.

MR. FIELDS: These are valley water wells in

the four to ten range as reported by DHS. There's perchlorate throughout the basin.

Next is the Rubio Canyon/Los Flores. Again four to ten range on these.

I tried the scale on the left. The concentration scale I kept the same so that we could -- as you're looking at it, it makes a little more sense.

Here is Arroyo, the Monk Hill, City of Pasadena wells. There is only a few data points from Arroyo well which was enacted in 1987 when we first started monitoring. One hit was actually off the chart a little bit maybe. But since I was just trying to keep consistent with that scale, there was a couple of deductions. By that time, the well had been inactive for a long time. Those rules I wouldn't consider valid as when it was pumping consistently.

So you can see Arroyo well, well 52, the two wells that are part of the removal action have concentrations in the 15 to 50 range. And Ventura and Windsor are less than 15. Typically in the four-to-ten range.

Now, looking at Sunset wells, which Sunset reservoir wells -- hopefully I'm referring to those right -- what we're seeing here there's five wells in that area, and they're ranging from the 4 to 15

typically. There's been a couple points that exceed that 4-to-15 range, but over the past three to four years were in that range.

And, lastly, the further east wells, City of Pasadena wells, even out there in the, you know, sub-fours to almost ten range. So --

MR. BOMAN: Tens must be a lab error.

Can you erase that one? I don't think we need that.

MR. O'KEEFE: Our data show less than detection limit for the low values, or did it show a true value?

MR. FIELDS: Interestingly, yeah, they show, as you can see from this graph here, we're sub-fours on this.

MR. SLATEN: Twos and threes it looks like.

MR. FIELDS: It doesn't provide that level with detail in the data base, but they're estimated values.

MR. O'KEEFE: Well, it's a matter of whatever the lab submits.

MR. BOMAN: Yeah. See, that's our own lab. And so when the level went down to more (inaudible).

MR. SLATEN: When was that?

MR. BOMAN: January 2002, when we went to four parts per billon as opposed to 18. From there on out we went nondetect. But before that we were actually giving

the real number that we were guessing at or, you know, estimated number what we with getting there.

MR. FIELDS: Yeah. You know, whatever that data was just pulled off the website just to give us a sense, I think, of the levels throughout the basin.

MR. BURIL: Could you back up to the map one more time?

Could you help orient me here with street names just a little bit, that vertical line with the arrow?

MR. FIELDS: This one? I'm going to guess Lake.

MR. BURIL: And the next one over is Hill?

MS. FELLOWS: First the Craig site. Is that at Craig Street?

MR. BOMAN: That is Alan or Hill. Probably Alan.

MS. FELLOWS: That's my thought, too.

And then you got Eaton and Conway under that.

MR. BURIL: Eaton Canyon is right under where the Arroyo is.

MS. FELLOWS: Right.

MR. SLATEN: On the big void shot under Eaton Canyon, I guess nobody --

MR. BURIL: That was going to be the next question of mine. Does (inaudible) have a well out

there? Does anybody know?

MR. BOMAN: (Inaudible) has one off of New York.

MR. BURIL: New York and what?

MR. BOMAN: If this is Eaton Canyon --

MS. FELLOWS: To the west of --

MR. BOMAN: So right there would be a well. Then they have another well down here on New York.

MR. FIELDS: There's a recent report by Geo Science submitted to the Raymond Basin Management Board, and they're looking at a report for conjunctive use. They do identify this area -- sort of an area -- they don't have data on.

MR. BURIL: Has anyone looked at the (inaudible) data?

MR. FIELDS: It could be in the data base, and I missed it if they haven't detected perchlorate.

MR. O'KEEFE: I suspect it hasn't been detected there, but certainly if anybody asks we can provide that information.

MR. FIELDS: The next step may be --

MR. BURIL: That area that we're talking about is all I'm asking.

MR. FIELDS: Ground water flow, just so we -- you can correct me if you think I'm incorrect on this

area -- but it flows -- you know, kind of flows west to east, south near the JPL facility. And then it turns south, pretty much dead south towards these Sunset reservoir wells. Sort of an easterly component heading out to the east.

MR. O'KEEFE: It follows the 210.

MR. FIELDS: Yeah. It follows the 210.

UNIDENTIFIED SPEAKER: For the past year all the purveyors in the Raymond Basin have been sending their well data to Stetson Engineering for their water quality study which contracted to do for the Raymond Basin. So we submit -- I submit mine every month. A lot of them do it quarterly. But we started around last March or April. I believe we have a little more protected data there which may help you.

MR. FIELDS: Actually we have been in close coordination with the Raymond Basin and Geo Science, and they've shared data bases back and forth. I chose to give you this data base because it was from a DHS web site, and I just thought it was a good, valid set of data.

MS. FELLOWS: So (inaudible) must be submitting data on that, too, then.

UNIDENTIFIED SPEAKER: I assume, yes.

MR. FIELDS: We can look at that because we

have that entire data base.

MR. SORSHER: Where are those two monitoring wells that have the fluctuating levels --

MR. FIELDS: To put it in perspective, MW-20 is maybe a thousand feet to the west of Rubio Canyon/Los Flores. And then MW-17 is up here closer to Arroyo. So the data set we have before -- yeah, that's a good point. I should have put something like that in there sort of like in this area.

MR. ZAIDI: You have 20. What you have in MW-7? They're same or different level?

MR. FIELDS: I apologize. Can you ask your question again?

MR. ZAIDI: The screen seven --

MR. FIELDS: Seven on site.

MR. ZAIDI: Probably in the shallowest.

MR. FIELDS: Fifty to 100 feet.

MR. ZAIDI: This MW-20, is this the same?

MR. FIELDS: Goes down 800 to 1000 feet.

MR. BURIL: But it's separated by several hundred feet.

MR. FIELDS: But there's five screened intervals that go down as deep as 800 or 1,000 feet.

MR. O'KEEFE: The other one that was --

MR. ZAIDI: Seven.

MR. FIELDS: Seven.

MR. ZAIDI: MW-20 you said intervals. And so this reading of 139 or 136, that was for accumulative sample?

MR. BURIL: No.

MR. FIELDS: I just took the max, and it was nondetect in all except screen four which is in a deeper portion and then nondetect in five.

MR. ZAIDI: How did the screen concentration get to the source? Do you have any (inaudible)?

MR. FIELDS: In the source?

In general, the plume is shallower in the source and moves out and down as it goes -- probably moving down because of pumping and things in the path. Or maybe -- you know, but there's the hydrostatic units. They're not separated by a confining layer. There is obviously flow which is going vertical. Kind of starts shallow and goes deeper.

MR. ZAIDI: So basically with (inaudible) or 26 or not. That's what I'm trying to establish.

MR. SLATEN: Next we'll talk about water types; right?

Is it time to go do that?

MR. FIELDS: We can try to head back.

So then what we're talking about is moving

forward with some initial investigation. So we're looking at what tools we currently have available to us to evaluate the source of perchlorate.

He know that there's low levels pretty much throughout the basin. That's pretty much determining to what point are those levels associated with releases from the JPL facility. So there's a couple of tools that we have to do that.

One that kind of helps us understand this is water type. We've all talked about water types to a certain degree, I think one or two. There are sources that water originates locally. One is sort of mountain recharge off the San Gabriel mountains. One is sort of an older water deeper in the aquifer. These water types are found beneath the JPL facility (inaudible) levels. And a good job was done in the OU-3 correlating type three with injection with MDW water and the valley wells. So we see, you know, Colorado River water has high chloride. It's different from the lower surface chloride water that originates locally.

So that's just one tool that we would use in evaluating NASA's responsibility for perchlorate.

MR. SLATEN: What about La Canada's septic tanks?

MR. FIELDS: Co-location with other chemicals,

La Canada's unsewered areas, there's been related to us that that's associated within perchlorate concentrations with La Canada. Maybe nitrate, particularly with the co-location with VOCs. To a certain extent carbon tetrachloride is not detected with the basin based on the data we have outside of a plume that's associated with JPL. In one sense, carbon tetrachloride is sort of a tracer with perchlorate. We all know that perchlorate travels more readily in water than carbon tetrachloride. So a perchlorate plume could travel ahead. But if you see them both together, that's a good indication that it may be associated with a source originating from NASA. And what we're seeing is the Arroyo well, Well 52, and the Lincoln Avenue wells. We don't see carbon tetrachloride outside of those points to a significant degree.

Then the other side is the PCE. Historically JPL has very low levels of PCE. However, upgrading and (inaudible) unsewered areas in La Canada, PCE is higher concentrations in those.

So the occurrence of a PCE chlorate, but no carbon tetrachloride draws into question NASA's responsibility because the PCE in carbon tetrachloride would move at the same rate because the retardation, the rate at which they move and are held back within the

aquifer, based on carbon, a natural organic matter, is about the same. All these tools have to be used in connection with each other.

And the third tool we have is ground water modeling and (inaudible). But that's what we're talking about, is getting what additional field data do we want to correlate with all these items. But the ground water, NASA has several models. We developed a model for OU-1 to help us simulate our extraction. There is a Monk Hill model that was (inaudible) by the C. H. Toom Hill that helps us in the Monk Hill area. And then we expanded a basin scale model. All these are now models to help us understand flow outside the Monk Hill Basin.

I put up the Raymond Basin that Geo Science is developing. We're working very closing with them sharing data. We're trying to get the information we can. We want to make sure that the assumptions that go into both of those models are similar so when we do some similar work, we're going to get similar results.

The next thing I want to do is kind of take these current tools that we have and apply them to some data that we do have from Geo Science to data base on a couple of the well areas. And the first one would be Rubio Canyon/Los Flores. And what we see here is Rubio Canyon 4. Rubio 7 does not have any detections of

perchlorate, but Rubio 4 does. And the maximum PCE has been nondetect (inaudible) and the water type is a one, two. The modeling that we've done so far which indicates particles originate at JPL and could reach that well, as well as particles originating from the valley company area based on (inaudible). So somewhat inclusive on ground water modeling. So that is sort of the data we have on that one.

Los Flores, 17.2 PCE, no detections of carbon tetrachloride at one, three water-type close proximity. And this is just -- a I put an MW-20 here just for comparison. The highest hit we've seen on any of the screens is .30. The water type tends to vary with depth. Historically the upper portion of that well and the lower portions are one/two type water. So from that well, which is the closest well to these wells, they see a lower rate. Upper portions, we have perchlorate detections associated with the type one/two. So there have been some questions that come up on these wells, what portion of that water are they pulling from. The perchlorate detections were observed. South of Lincoln Avenue has detections. Also, carbon tetrachloride modeling shows it comes from JPL.

Those pieces of data apply to Lincoln Avenue. Three provide fairly strong indication that those are

from JPL. Same thing for Sunset wells I selected. Same here. All these wells have had detections of perchlorate. They have detections of PCE. None of them have had detections of (inaudible) and the water type has been varying from three, one, three, two, three. So there are some higher chloride, higher sulfate concentrations in this water. That's from the Sunset reservoir area which causes some -- indicates we need to collect more data to more fully understand that.

And then the ground water modeling data indicates that a particle could in fact travel -- the minimum travel time between JPL and these wells was calculated at 41 years. The average travel time was calculated at 70 some years. And just because a particle can travel that far in 40 years at a minimum doesn't mean enough particles travel that far because there's a lot of production wells in between the Arroyo and Well 52 in particular. Historically they have done a good job.

So the modeling certainly causes some uncertainty, too. While the travel time, we want to continue to work that with Geo Science to make sure that particle travel and the travel times are consistent between the two models. And if they're not, figure out why.

MR. ZAIDI: (Inaudible).

MR. O'KEEFE: The aquifer?

MR. ZAIDI: Yeah. So -- and the (inaudible) pretty good, too; right?

MR. FIELDS: This is a productive aquifer. That's accounted for in these models certainly.

Now, there's some interesting data here that I'm going to show next, and it's a couple of these Sunset reservoir wells. And we went back to some DWP reports back to the '20s, looked at water quality, particularly sulfate, and we found that there has been a shift with time. Not that we know the reason for this shift, but the sulfate concentrations have increased since the '60s. Arroyo Well put this on here, too. Looks like there's some increase, but maybe not as much as these wells. We plotted this up here, too. If, in fact, there's Colorado River source which has been related in this is kind of where the Colorado River is with regard to sulfate.

A similar trend with chloride. You see (inaudible) wells beginning in the '60s and then TDS. The data wasn't available, but beginning about '60, those are increasing as well within that.

So sulfate up here.

I apologize. That should be TDS. That's

correct. That's not.

So within the Sunset reservoir wells, which is a particular interest to additional investigation, there is some data that indicates there's been somewhat of a shift from the '20s, '40s, '50s in water quality, and we don't know the cause of that shift, but we think that's part of this additional investigation, too, is understanding that and understanding water quality versus depth and perchlorate concentrations versus water quality and (inaudible).

MR. BURIL: Have you been given any research when Colorado River water was being brought to Southern California and was put into residential use?

MR. FIELDS: The connection to the Sunset reservoir of MWD (inaudible) was made in 1941.

Then, lastly, is the Riley wells. And they have typically -- they have fairly high levels of PCE that associated with La Canada sources -- dry cleaner sites and some unsewered areas.

Nondetects typically -- there was one sample of, like, .06, which is just above the detection limit of four and consistently water type three. And the modeling that we did -- and I know Richard Atwater isn't here and he -- if he can provide the data that he references to this would be great, but we could not

simulate a flow reversal of significant time frame for a particle to originate at JPL facility and get to the valley water company wells. It was a three-year-plus travel time assuming a very significant gradiants of flow reversal. That's never been seen.

MR. BURIL: Just to augment, we did some actual ground water level testing some years ago before (inaudible) took over the program and measured water levels static. They were left a day, and a day and a half to (inaudible) even with the valley service water wells running. And those wells to the west of us off that, the grading was still to the east.

MR. FIELDS: Right. And if you look in between those wells and JPL facilities, it's sort of flat because that's flowing sort of southeast, and JPL is sort of flowing south. And the bulk of the water from valley wells is going to the south of the JPL facility.

So the pieces of clay that we have for the valley wells indicate that those three items that we talked about that indicate valley wells are not the responsibility of JPL.

And so -- I mean just I want to use all this data for us to determine where to put production or additional monitoring wells. And so, you know, trying to take what data we do know and then identify our data

gaps and uncertainties and try to supplement that with additional monitoring wells.

MR. ZAIDI: East of Arroyo which might have got the basin into four segments as we go eastward.

MR. FIELDS: I'm sorry. I don't understand.

MR. ZAIDI: Faults.

MR. FIELDS: There is a fault. I believe this line here is a basin scale. That's maybe greenish. It's our basin scale model, and we cut it off right here.

And I believe that is a fault; is that correct? Isn't there a fault in this area?

MR. ZAIDI: Smaller close to --

MR. FIELDS: There's the JPL fault that is sort of up in this area.

MR. BURIL: That green area approximately?

MR. FIELDS: That actually is pretty doggone close.

MR. ZAIDI: Faults which are, like, east?

MR. FIELDS: This is a north-south fault

There are some (inaudible) off of this east-west fault, but they have not been mapped any further than a very small area up here.

MR. ZAIDI: Different fault blocks or sub-basins would (inaudible) and that might also

increase in that monitoring.

I'm just throwing it out. I don't know if sudden increase after you're getting from 5,000 to 8,000 and then sudden increase of the monitoring wells from 136. It could be some kind of barrier. Or if it's continuous to the source than the same horizon, we have much higher concentration there than --

MR. FIELDS: There has been efforts to try to identify fault locations going back to, I think, the '40's and '50's. But the data that we have does not indicate faults other than the JPL and some of these over here. I think that's a good idea of why some of these concentrations may not make sense, but the data that he have right now we can't move in that direction.

MR. ZAIDI: I understand.

MR. FIELDS: So we put this map together to kind -- there's two areas that are based on our initial evaluations that we wanted to talk about today where we think additional wells -- monitoring wells -- might be appropriate, multilevel monitoring wells so we can coordinate for perchlorate with depth, and that will give us a better understanding of where NASA's responsibility is.

So these green areas are the two areas that we're thinking about a well or wells. There's been

discussions with the City of Pasadena on a well near Sunset reservoir. And since we do have detections of perchlorate in one, two water deep within the aquifer in MD-20, the leading edge, this is sort of the idea of some leading edge delineation work. And the idea here is maybe they start them here and then work together. If, depending on the results of this and the results of this, maybe this next phase is wells in here.

But the first thought was to kind of start at these two points, particularly with the Sunset reservoir wells and try to get an idea of, you know, a multilevel well there and maybe one up closer to Rubio Canyon/Los Flores and 20.

MR. TAKARA: The Atlanta well could be an ideal site for an additional monitoring well.

MR. FIELDS: Where is the Atlanta well.

MR. TAKARA: Off the Woodbury.

MR. FIELDS: In fact, just as a little bit of background, putting in multilevel monitoring wells is expensive because you have to go 1,000 feet deep or so. And the first thought we had was maybe we can use production wells that are screened at multiple levels. To get discreet, we did try that at the Arroyo well 351. We had to pull the pump. Pulling the pumps out and everything is a serious operation anyway, and it renders

the well inoperable until that is put back.

So we looked at those two wells. We also looked at the Atlanta well. Then there was a well we'll call the Casitas well. I believe, we weren't able to get into Atlanta. We met obstruction right about where the screen is, and the data we got back from Arroyo well and 152 was not valid or good data. We showed that there is -- actually, the screens were basically plugged up, and there was just a very small trickle of water coming in at one location.

So the data wasn't valid. We had kind of thought that it was sort of a long shot whether that would work, but we thought it was worth while to try to take the less costly approach before we looked into a more extensive well monitoring (inaudible) samples from production wells trying to identify the best location for multilevel --

MR. RIPPERDA: Are you thinking about putting two wells initially, and then one well -

MR. SLATEN: I guess the way we're going to do it we're going to take all of this and put it to an RI addendum and write it up as a proposal for this whole next phase, which I guess then would set the stage for other wells to come as more of a quicker proposal.

MR. RIPPERDA: So you're going to provide all

this information with narrative scripts and RI addendum and recommend your first set of locations?

So you're going to go out and install a well and then issue an RI addendum?

MR. FIELDS: We're saying RI addendum. A work plan will kind of give us all the information we have about our current conceptual site model trying to take all the information we have shown here. And there's also obviously more information than that and try to build an understanding of what we know, identify what we don't know (inaudible). Then also have some of the other items. Maybe do a revised sampling analysis plan rather than referring back to the original one as new chemicals -- maybe we want to add things like that.

MR. RIPPERDA: Unfortunately, after years of meetings, this is the first time I have to leave early because I have an appointment back in San Francisco at 5:00 o'clock. For the first time we actually have something really exciting at the end of the meeting.

Thank you very much, Keith. This was good information.

And you guys can just set the next meeting and let me know.

MR. BOMAN: I guess we're not -- we're thinking the proposal of three wells and probably two

and one is where we're leaning right now, but we don't know exactly until we kind of write it all up and put it down on paper and propose it.

MR. BURIL: Have you thought at all about fertilizer use in that whole white area there? I guess that's the golf course and so forth.

MR. BOMAN: I think about it every day.

MR. FIELDS: What fertilizer was used there, what water was used to irrigate all that for how long, that is something we have thought about. And I do not have data on it, but it's sort of the next point of question.

And, also, there's some work done by Geo Science that shows some significant increases in water levels around the Sunset reservoir area. And I think that's sort of a data point we need to try to look into further, too, to understand why if other areas are kind of receding in ground water levels, why this area --

MR. SLATEN: Let's put one right there. It's all these things that we have to think about now. Is it important that we want to make sure that we try to catch the golf course influence, or is it more important -- so all that stuff we're going to have to be thinking about now. I wonder about the golf course. Of course, every golf course I've every known about was impacted by

chemicals, lots of different chemicals.

MS. FELLOWS: You're not used to golf courses in deserts.

MR. O'KEEFE: There was a recent news article about lower level for perchlorates being found in the Fontana/Riverside area some of which are not directly associated with any military contract or aerospace facilities, and it points towards citrus groves and that historical agricultural uses of those areas.

MR. FIELDS: There was a Chilean fertilizer that evidently was used in that area.

MR. ZAIDI: From the early data, we have some (inaudible) probably get background of concentration of both JPL and, also, in this area.

MR. FIELDS: Yeah. The day that -- that I was showing going back pretty much to whether the method that came back before then, the detection was 400 or something.

MR. SLATEN: I do think -- I mean I didn't mention it -- the data on TDV and other things -- that goes back to the teens is interesting in some of these areas because it's climbing. There is some impact there from some --

MR. FIELDS: Not native course, a background of nitrate or other related fertilizers and then before

putting in these wells and water purveyors so you're not really putting wells where you're not responsible.

It's a background. Naturally there was some source JPL responsibility.

MR. SLATEN: Kind of two reasons to put in a well. One reason, to get down and try to define the leading edge of your plume. And we can understand that that's a valid reason.

Another reason for me to go down by Sunset is find out whether or not we're going to have to add that to what we're going to pay somebody for impacting their resource.

It's kind of two different philosophies for putting in a well, and I'm not sure which one is the best driver. I mean it's important to rule in or out our impact to the Sunset reservoir. It's also important to completely define the leading edge of our chemicals so we know how to respect it, how to design our final remedy and things like that.

MR. ZAIDI: Because I had questions about Sunset reservoir.

Why do you think the plume is coming that way and how much of the responsibility of JPL and all that stuff?

MR. FIELDS: All important questions.

MR. SLATEN: To which we don't know the answer to, and we don't want to spend a half million dollars to put in a well that's not going to answer any questions or raise more questions.

MR. ZAIDI: Exactly.

MR. BURIL: I would suggest that you get consideration for the idea of maybe identifying some other sources irrespective of the fact that you got a minimum travel time from JPL to the Sunset area. That's pretty high concentration down there.

MR. FIELDS: That's another important thing is not only saying this is our -- you sort of have to say this is the extent of the plume that we know, and there are concentrations over here. There has to be. What else would cause that?

MR. SLATEN: It's like it's a puzzle that we might have to prove ourselves innocent by proving somebody else guilty. It's not a good position to be in.

Do I go into a golf course and drill a two-foot-deep hole and find perchlorate? Okay. That must be where Sunset comes from and that a clear enough cause and effect --

MR. FIELDS: There has been some injection (inaudible) down in the reservoir area. Whether or not

that injection has been enough injection to cause those concentrations is not known.

MR. O'KEEFE: Usually when you get in this discussion, the Raymond Basin Board starts to get very upset with that assumption that MWD may have impact.

Is anyone here representing the board?

MR. BOMAN: Linda.

MR. O'KEEFE: It usually seems to be a very sensitive topic.

MS. FELLOWS: They are sensitive issues, but we need to talk about what to do next.

MR. BOMAN: We've got a sensitive issue, too, and we've got to figure out what's ours and what's not ours and we pay for ours.

I don't want to step on anybody else's toes, but facts are facts. And there's a lot of Colorado River water that's come into this area.

MR. ZAIDI: Also from JPL. I think gradient must be just based on topographic data. It should be pretty steep -- right? -- the hydraulic?

MR. FIELDS: Between JPL and Sunset reservoir?

MR. SLATEN: Yes.

MR. FIELDS: Yeah. It's pretty steep. You know, there's water-level data. It's just that there's a lot of water-level data, historical data. And

definitely on the models that the City of Pasadena has developed and, also, the Battelle and (inaudible) tells, you know, if you release a particle here, it goes here. I mean that is the flow path.

MR. ZAIDI: Say it again. Source area?

MR. FIELDS: If you release something around this Arroyo, a particle within the model, it heads this direction. So I mean there is the flow pattern, but --

MR. BOMAN: Why argue? Let's move on now.

MS. FELLOWS: Because it takes 71 years to do it.

MR. ZAIDI: That's more southward.

MR. FIELDS: The gradient kind of flows this way and then turns south here. And it's pretty much due south in this area.

MR. ZAIDI: I would say there must be a big change there. The gradient don't change ordinarily like that. There must be some kind of barrier.

MR. BOMAN: There is -- that's why the two sub areas -- the Monk Hill -- there is outcroppings of bedrock which makes that --

MR. SLATEN: If you go back a billon years, that was the river flow. If you look at the bedrock, there is kind of like -- almost like a river, a valley -- that takes that direction.

MR. FIELDS: We don't have it on a graph, but all the models you'll see, particularly the one at Monk Hill was developed -- you can see the Monk Hill protrudes up --

MR. ZAIDI: So the formations are kind of rigid kind of?

MR. BOMAN: Yeah.

MR. FIELDS: I think the bedrock actually comes up above the ground water.

MR. ZAIDI: So maybe this is a hydraulic barrier then all coming -- everything coming from JPL should be stopping there.

MR. FIELDS: It's -- it sort of splits. It's a hill that comes up going out both sides.

MR. ZAIDI: If this is the hill, that's JPL. This is one basin. And because of this hydraulic barrier, yes, anything up here will --

MR. FIELDS: It's more like -- I wish I could -- if this is the Raymond Basin like this, this is Monk Hill. Let's say it's like that. So water comes down and flows to this side, and water flows to this side and it flows across here or whatever it -- it's sort of a hill that protrudes up. It's not a barrier like you're thinking. It's an island. That's a good analogy.

MR. SLATEN: Point to Monk Hill on there, please.

MR. FIELDS: Where that Monk Hill would be, I believe, it's in this area.

Is this right?

MS. FELLOWS: Uh-huh.

MR. FIELDS: This is sort of the boundary of Monk Hill.

MR. SLATEN: Is the Monk Hill very well defined so where we would need to put further monitoring wells would be --

Your previous slide had one that showed where the Monk Hill barrier was, the light blue.

MR. FIELDS: I think this is the Monk Hill boundary of the sub basin. The actual Monk Hill is, I think, in here.

MR. BOMAN: Somewhere in there, yeah.

MS. FELLOWS: Further north.

MR. FIELDS: I like the idea of looking at this. That compound would be a nice location for one of the hills.

MR. SLATEN: So you're saying the Monk Hill is here?

MR. FIELDS: Yeah. I think the Atlanta well would be to the west of the Monk Hill.

So the next step would be that we're going to put together a work plan and distribute that. And then start moving forward concurrently hopefully with the city on identifying locations if the city has good locations like the Sunset reservoir area and then Atlanta well, and then looking for other locations as well. If there's none --

MR. BURIL: Keith, you found the Sunset reservoir (inaudible) high-water level?

MR. FIELDS: Uh-huh.

MR. BURIL: Have you done any correlation in the golf course area?

MR. FIELDS: This is data that we got within the past several weeks. So we have not done the correlation yet.

MR. BOMAN: You got to realize we haven't pumped any on the west side, or very little. We pushed on the west side. Plus, that water that comes from Monk Hill, we haven't been pumping that water either. So it's almost like that's where the river is going, and it's building up down there when it gets down closer to the fault.

Where there's -- on the east side there's -- we've seen a drop quite a bit where we've been pumping.

MR. FIELDS: Another interesting thing that I

had talked about -- probably Steve and I haven't talked about this yet -- but looking and trying to determine a retardation factor for perchlorate. We know that, you know, there's in the literature the rate at which it's slowed down by natural organic matter (inaudible) that makes a value -- makes it significant how perchlorate travels.

So that's another test we may want to consider. We brought it up in the past talking with NASA. But if we just looked at literature values, it could change value types to an average of 71 if it took the high end of the end of the literature, you're (inaudible).

MR. BURIL: Is there any well in the golf course area of any kind?

MR. BOMAN: Not that I know of.

MR. FIELDS: Are they irrigating with potable water, or do they have their own production wells or do they use an MWD connection?

MR. BOMAN: Yeah. It's potable water, and it's a little more clay in that area, too. I don't know if that has any effect.

MR. FIELDS: It's impeding downward migration definitely.

MR. TAKARA: Monitor Well 19, how many sample points are there?

MR. FIELDS: Five.

MR. TAKARA: Are you picking up any perchlorate in the first sample?

MR. FIELDS: The highest levels?

MR. TAKARA: The highest levels.

MR. FIELDS: In the highest level of 21, there has been perchlorate if you go back in the '97, '98 timeframe with a water quality three type. So there is with time. Some of those concentrations are changes and, also, the water type that is associated with that perchlorate is changing. So there's some interesting -- and for some reason that stops in 90. Then there starts to be a pickup of perchlorate in the lower levels. They're 1 in 98. Then they started -- then we didn't see anything for a long time. Then there was a hit in 2002.

MR. BURIL: What was that one there?

MR. FIELDS: I'm sorry?

MR. BURIL: I didn't see that one multiline draft that was there.

MR. FIELDS: We actually had decided --

MR. SLATEN: I didn't want you to see it. At any time something that has to do with interference of perchlorate in the laboratory detection method, you know what your TDS is.

MR. FIELDS: It has to do with ionic strength. If you have chloride, there's the way those come out on that. 314 method is interference.

MR. SLATEN: But this is really new stuff that people are just starting to look in to, and it's not worth us getting wrapped around.

MR. FIELDS: But it is an issue that is kind of gaining some interest.

MR. SLATEN: You'll probably be hearing about these types of things in the literature next year.

MR. TAKARA: Monitoring Well 20, how that data, the perchlorate levels in the screens from the '97/'98 period transition, just to give you from '94 we shut off (inaudible) 1994 -- summer of 1994 -- and we shifted a large focus of our energies of using that surface water to recharge ground water recharge.

So around 1998 we started to receive large amounts of ground water credit. So I'm not sure if this plays any part of it out of the Monk Hill. If I recall, we did a lot more pumping from those wells than we did in the earlier '92, '93, '94 periods. So I'm not sure if that's drawing a lot more -- I know the deep ones, and they're pulling -- I'm not sure what deposit levels they're pulling from. I know we're pumping a lot more water.

MR. FIELDS: One thing we have are water master reports back to '85 to understand further back and understand the pumping rates within these wells for ground water modeling and just for an understanding of how much was extracted and when beyond that.

So that's something we need to work on getting, and the water master reports would certainly reflect that.

MR. ZAIDI: Department of Oil Conservation, maybe some sized lines that run across Sunset reservoir area that you can look them up. Maybe there are some segments. That surface may be flat and may not be such outcrops but in the subsurface.

MR. FIELDS: I'll talk to our modelers and see what they come across in the past. This basin has been modeled several times, and my guess is that a lot of those documents -- historical documents -- have been evaluated, but I will check.

This was the MW-21. See screen one back until 2000 sometime had, like, in the 87th perchlorate dropped down more recently. And here are those hits that I was telling you about, Chuck.

Fifty and 60 manage and 124, but each time it goes back to nondetect it doesn't make a lot of sense, and that's in screen four. And then there was that blip

in '98.

MR. BURIL: Is there any water-type analysis associated with those blips and those valleys?

MR. FIELDS: They're all one, two water types.

MS. FELLOWS: All screens?

MR. FIELDS: The deeper screens are one, two, yeah. We actually -- these will be in that work plan, but we have a lot of these -- sorry about that -- a lot of these cross sections that have perchlorate, carbon tetrachloride and then PC data. And then this red is a type one. The blue is a type two. And then a white is type three. And if it's split, it's fourth. We have tried to look at depths with quality and within several cross sections.

MR. ZAIDI: Might be useful in defining the pathway.

MR. FIELDS: We are talking about 40-year travel times or 100-year travel times for certain types of these things. I don't know. Maybe you could let me know what you're thinking at some point on the tracer tests on how we would use that in a near term.

MR. ZAIDI: Well, in the immediate JPL area, Arroyo area, if we can monitor by injecting a source area and finding out -- give us flow direction and follow it (inaudible) actual other than estimated from

or whatever, you know, because to date I don't think we have probably most accurate estimation of velocity. And depending on the hyperability, these very permeable. And the fact that we can produce these oil wells it means it's very (inaudible) and maybe if we can test maybe give us some actual numbers of velocity.

MR. FIELDS: We can look into that. What I'm recalling is that it's still -- if we release something near MW-7, it would be 20 years before it got to the Arroyo well, Well 52.

MR. BURIL: Ten years based on pumping at the time.

MR. FIELDS: Okay. So I mean it's -- I don't know enough about tracer tests to know that it's even applicable in that time frame.

MR. ZAIDI: I'm saying --

MR. FIELDS: It's something to look in to.

MR. BURIL: Just to share a little bit with you, we looked at the same kind of thing back in the mid '90s. That's about the time perchlorate showed up. At the time it was the consensus of the people perchlorate was one of the best tracers we had.

MR. FIELDS: That's a good point, although now it's sort of everywhere.

MR. BURIL: In the (inaudible) it's not

retarded to any great degree. It's conservative and easily detected.

MR. FIELDS: There's also some studies that we've done in our lab that perchlorate is retarded to a certain degree with the presence of chlorinated VOCs. So there's a lot of things to consider with that.

MR. BOMAN: Yeah, it has been. It's -- it's sort of used at chlorinated sites. Perchlorate was identified as a pretty good tracer for that because it's going to move ahead more quickly than the TCE and carbon tetrachloride.

MR. SLATEN: How close are we to being done?

MR. FIELDS: That's all we have.

MR. SLATEN: I guess we're done.

The 97-005 stuff, the status of that is we sent back out some stuff -- I sent back out some stuff last week.

MR. O'KEEFE: We haven't really begun yet.

MR. BOMAN: So we'll just keep working on that. We'll talk about it next month, I guess. I didn't ask for a certain turnaround.

MR. O'KEEFE: We're going to need at least 30 more days.

MR. TAKARA: And it's on the website. So we can download it.

MR. SLATEN: Is there anything else?

MR. O'KEEFE: Are we setting another meeting date?

MR. FIELDS: The standard protocol is a quarterly.

MR. SLATEN: But next month is by phone, the first Thursday, at 10:00.

MR. TAKARA: Your agenda set April 8th for 9:00 A.M.

MR. SLATEN: Let's go April 8th at 9:00 A.M. That's a Thursday.

MR. TAKARA: I think that's a Thursday.

MR. SLATEN: Telephone. Quarterly we're back here. So I'm sorry --

MS. FELLOWS: We'll send an e-mail to get everybody on it this time.

MR. SLATEN: We'll send out an e-mail about a week ahead.

Thanks.

(At 2:17 P.M. the proceedings were concluded.)

STATE OF CALIFORNIA)
) ss
COUNTY OF LOS ANGELES)

I, REBECCA M. BREITENBACH, C.S.R. No. 6157, do hereby certify:

That said Transcript of Proceedings was taken before me at the time and place therein set forth and was taken down by me in shorthand and thereafter transcribed into typewriting under my direction and supervision, and I hereby certify the foregoing transcript is a full, true and correct transcript of my shorthand notes so taken to the best of my ability.

I further certify that I am neither counsel for nor related to any party to said action, nor in any way interested in the outcome there.

IN WITNESS WHEREOF, I have hereunto subscribed my name this 12th day of March, 2004.

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REBECCA M. BREITENBACH