
RESTORATION ADVISORY BOARD

FOR

NAS JRB/ARS WILLOW GROVE

Willow Grove, PA, June 7, 2000

Meeting held at the Naval Air Station Joint Reserve Base at 6:00 p.m. on the above date before Kimberly A. Overwise, a Registered Professional Reporter and Notary Public of the Commonwealth of Pennsylvania.

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SPEAKERS:

JIM EDMOND
JIM COLTER
RUSS TURNER
CHARANJIT GILL
SCOTT SHAW
DAN GOODE

PRESENT:

MARY GEMMILL	CDR. GILBERT VIERA
ERIC LINDHULT	LCDR. WILLIAM SCHOEN
JAMES J. VETRINI	APRIL FLIPSE
KEVIN McALISTER	GIL DUNDERDALE
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RAY LEOPOLD	JEFF DALE
ELAINE HUGHES	HAL DUSEN
CARL REITENBACH	STEVEN FRASER
KEVIN KILMARTIN	ROBERT RECH

MR. EDMOND: I'd like to welcome you all back. Thank you for coming. I know it's the time of the year when everybody's busy. Thanks for coming. We appreciate it.

To give you a couple ideas, something I want to tell you, the PAO sent everyone in the RAB tickets for the air show. It's next weekend, not this weekend, the following weekend, Father's Day. They're in the mail today or yesterday. You should be getting them sometime this week. I don't know what day they're for. There's tickets and all that. I hope you all can come out. Change of command here is going to be on the 22nd of July. I think the only thing that's going to be happening on the Air Station besides that before the next RAB meeting is there's going to be a Corvette show in September sometime. Do you know when that is, XO? Sometime in September.

CDR. VIERA: If we're talking in September, we may also have the Country Fair.

MR. EDMOND: Corvette show is around late Labor Day and the Country Fair is right after that. That's the events happening on the Air Station up until the next meeting.

I was going to have Gil talk first but I guess Gil is still on his way back from the tour so we're going to switch things around a little bit and I'll let Jim Colter start it off and Gil will come in second. Jim?

MR. COLTER: Since the last time we got together, many of you hopefully got the addendum work plan.

MR. EDMOND: If anyone doesn't, I have a copy here.

RAB MEMBER: I think my mailman must swipe all my stuff because I get nothing. You have the right address, I know.

MR. EDMOND: I've checked your address two or three times.

MR. COLTER: You should verify the address.

MR. EDMOND: We've done that

two or three times.

MR. COLTER: At the last meeting you might recall I outlined the plan that we were going to shut down the public supply well, Horsham Well 26, and conduct a pump test on it at the EPA's request to determine what, if any, effects of operation that well had on operation at the Air Station. We'll talk about that tonight. Dan Goode will talk a little bit about that. We were successful in shutting the well down for a couple weeks and then restarting it. We got some data on it. Again, at the last meeting we talked about shutting down production wells here in the station, pulling the pumps and gaining access to the open bore holes that we have been trying to do for years at the EPA's request. We were able to work out a schedule with the base to shut those wells down and also give them water in case they had an emergency. We also did that March and April of this year. And we're going to go over some of the results of that tonight.

And the other thing we're going to do in about two weeks is kick off the drilling program out at the fire training area to again address some EPA concerns over data gaps about the extent of the groundwater plume out there. We're going to kick that off in two weeks and our goal is by the end of the fiscal year for the Navy, which is September 30, we'll have the results of those well installations. We're going to take another round of groundwater sampling at Site 5 to see what things look like today and we'll be sending out a feasibility study at the same time outlining different alternatives to address the groundwater contamination out there.

So right now I want to turn it over to Russ Turner from Tetra Tech NUS. He's my environmental consultant. He's going to go over some bits about the work plan.

MR. TURNER: Since the site tour didn't come through, I need to talk a little bit about the Privet Road compound. Everybody's been to Privet Road compound and seen the map. So I'm going to be talking a little bit about the well replacement project which is done in conjunction with some of the investigations underway at Privet Road compound. At least it adds some information to that area. So since you were going to be on a tour, I didn't add a map, but I think everyone knows pretty much where that is.

MR. EDMOND: If anyone doesn't, I have some maps here.

MR. TURNER: We have lots of photos of the actual facilities that have been changed. So if you think of it, it's the north end, basically northeast corner of the facility near Building 78, which is the Public Works building.

Everybody remembers where Privet Road compound is. Over the years doing a lot of studying around Privet Road compound, one of the troubles has been there were two deep Navy production wells that were bore holes with pumps down them and they have some chlorinated solvents in them. We've always wanted to get access to those. We never have been able to because of the problem. But let me back up one step here. Since we didn't have the site tour, there's two things I want to say. We're going to talk about the Navy production well pump replacements and also the work the Navy's going to be doing out at Site 35, which is the fire training area. There's some remedial investigation out there. It's been out for a while. It's under review by EPA. There are a few questions, informal questions from the EPA on that. The Navy is trying to address those. Those are the two topics I want to address.

I mentioned the fact the Navy production wells are used to supply all the water used on the facility so if they were to go out of service, the facility would have to shut down, maybe some of the flight line or some of the important services.

RAB MEMBER: You did say there's solvents in those wells?

MR. TURNER: Yes, that's

true, yes, low levels of chlorinated solvents.

MR. EDMOND: Russ, the entire Montgomery County, Bucks County aquifer area, not just the basin.

MR. TURNER: We're going to talk about the concentrations and the depths that the compounds are entering. So this particular part is actually two steps here. We did the well replacement project, sort of an engineering job. The other project is a water quality project and hydrogeology investigation that USGS is going to talk about. I'm just going to talk about the engineering and just touch on the production wells. The background is the owner is the Navy. The Civil Works department approved the switch. The project manager was North Div engineering command in Lester, Pennsylvania. These are all players that everyone is familiar with, I think. Tetra Tech, we wrote a procurement scope and procured a company, A.C. Shultes, for the well replacement.

This is a photograph. If

you had been on the tour, you would have seen two buildings near the Public Works department. Each one of these buildings contains the well head, contains the motor that drives the pump. Like I mentioned, they were installed in the mid '40s so they've been running for about 50 years. The Navy didn't want us to take them out because they were afraid they wouldn't start again once you take them out. So the deal was put in a new one but have them done by May. We wanted to have the whole process completed by the middle of May this year.

Here's a photograph what the old pump looked like. When I say "pump," this is the inside of that building, the brick building. The well itself is down below here. There are two wells, two buildings, two motors and associated pumps. The pumps are submerged. They were both down about 175 feet, actually 150 feet or so, 10-inch bore holes. These pumps were running very well. They were cool to the touch, smooth. They sounded great.

The operator asked if we were going to give them a 40- or 50-year warranty on the new ones. We had to tell them no.

Here's a shot you can see we had the crew pump rig. We call it a pump rig. It's a crane essentially. Each building has like an opening in the top so you can remove the long flights of riser pipe. You can remove, of course, the motor and remove the riser pipe up. Here's some of the riser pipes here. Like I said, there's 150 feet of pipe shaft to be removed.

Shultes, I give them credit here. They arrived. I think they were punctual. They did a nice job all around.

This is inside the building showing -- of course, you can see the motor has been removed and the base. The well, of course, goes down. Did I mention the depths? Each of the wells is between 350 and 400 feet. I think Well No. 1 is closer to 400 feet. Well No. 2 is about 350.

RAB MEMBER: That's below sea level, isn't it?

MR. TURNER: That's from ground service. Is that below sea level?

RAB MEMBER: The tower is 369 feet; am I correct?

MR. TURNER: I was going to guess around 300 feet. So it would be below sea level quite a bit.

RAB MEMBER: What level did you say the pumps were set?

MR. TURNER: The pumps were set, the old ones, at about ~~350~~ 150 FEET feet.

MR. TURNER: Pumps are set above sea level.

MR. EDMOND: This isn't the fire training area. This is over by Public Works.

RAB MEMBER: 340 is probably surface.

RAB MEMBER: 340 is groundwater.

MR. TURNER: And then surface of the ground is higher than that. So it's in that vicinity. Well, Well No. 1 at 400 feet is probably nominally below sea level if that answers the question.

What we wanted to do, when the contractor removed the pump, the first thing we wanted to do was test at the new proposed pump rate so we ran an eight-hour test with the pump down the well. We just dropped a pump down the well and ran it for eight hours. We had variable drawdowns surprisingly. We had about 80 feet of drawdown in Well No. 20 and only about 20 feet of drawdown in Well No. 1.

When we were finished the pump test -- oh, the reason we did the pump test, of course, is to verify the design. We designed a pump to go in at a certain depth and we wanted to verify that with its design performance there would be enough water to go into the well to not run dry. After we were through the pump test, USGS brought their equipment in and did geophysics and did water quality testing down the hole and Dan is going to talk about that.

Here's the new pump in operation. Each pump is capable of supplying about 288,000 gallons per day.

That's a couple hundred gallons a minute. The typical facility usage is about 110 so we can produce at each well more than double the daily consumption of the facility, entire facility. And even peak daily demand is about 150 so we can still do about double in each of the wells. And that was the design we wanted to do, just about double.

Okay. I'm going to just touch on the quality, just barely, the next slide, we obtained after the geophysics was done. As you can imagine, this bore hole goes down into the ground. It has fractures. Without getting into too much because Dan is going to cover it, we took samples from different levels and found chlorinated solvents were entering at different concentrations from different levels just as we anticipated. That's why we were interested in getting in here to see what was happening. The place where most of the solvent was coming in is down in the vicinity of plus or minus 200 feet, so 250 maybe down to 180. And the same with Well No. 1 although there's very little. That was Well No. 1. I'm sorry. Same with Well No. 2, very little. Total solvents -- I changed the scale here, you notice. I should have mentioned that. This is parts per microgram per liter which would be like parts per billion. Very little is entering Well No. 2. So that's significant to our study, adds some very significant information to our investigation of the Privet Road compound.

And that's in a nutshell the well replacement project, the well pump replacement project. Any questions?

RAB MEMBER: Do you have any idea what the significance is of those solvents coming in at such a low level so deep down?

MR. TURNER: I think it's something we need to think about. Right now we've collected the data. No. I'm serious. Hydrogeology is very complex.

RAB MEMBER: They are lighter than water so --

MR. TURNER: No; opposite.

Chlorinated solvents are generally heavier. The real significance is it's probably -- not probably. It seems very likely it's not coming from Privet Road. That's the real significance, just a confirmation of our earlier conclusion that we don't believe the source is Privet Road, anywhere around Privet Road.

RAB MEMBER: Off-site maybe?

MR. TURNER: That's a possibility. And there are other possibilities.

MR. GOODE: I'm Dan Goode. I'm with Geological Survey in Malvern, Pennsylvania. We're been working at the base here for several years now initially just doing some geophysics in monitoring wells that were installed and this last year we've been working a little more intensively with Tetra Tech looking at the hydrogeology.

RAB MEMBER: I discussed this but what I'm going to bring up -- and I don't know if this is the appropriate time to talk about it, but Horsham Township has a permit from the Delaware River Basin Commission to draw 83,500 gallons of water I think it is -- no. I'm wrong. 83 million -- what was that figure I had given you? In a 30-day period.

MR. GOODE: Million would be --

RAB MEMBER: During the summer months when more water is being taken out, more water is being used, they've taken out -- they meaning the records of the Horsham Water Authority show 78 I guess it was million gallons in a 30-day period for some of the July, August months. This was two years ago. This was before some of the development, new development came on-line. And we're going to have a geriatric center on Lower State Road which is going to use 1,500,000 gallons in a 30-day period. That's not on-line yet.

MR. GOODE: I think since we have this going, we'll go ahead with this and talk about this and other questions that will come up at the end because I'll show you some regional things, sort of how the base fits into the Horsham water situation.

So the work that we've been doing recently, we're going to lead in with what Russ just talked about looking at production wells and that involved monitoring during the aquifer test that Tetra Tech conducted, geophysical logging of the wells and packer tests. We'll see some results for those. We also back in October did a regional what you call water table map around the base as well as on the base to try to put together the work that Tetra Tech has already done at the individual sites with the bigger picture, water going out to the streams in the area. And then finally we did the shutdown test of Horsham Well No. 26, which Jim mentioned in the beginning. So we'll focus on that at the end.

That leads us right into talking about the new work at Site 5. So the production wells, we have geophysical logging. The only thing I wanted to show right now -- we'll show more geophysical logging in a second -- this is a bore hole television survey that's done of the well. These are just some snapshots from some of the bore hole televisions. So what you see on here, there's a depth counter here, feet, basically feet below land surface. And this is like a fish-eye looking down the well. So there's a light right here that illuminates the area in front of the camera. This is actually a compass so we can tell the orientation. It's really hard to see but north is in this direction. So we can tell the orientation of features that we see in the well. And we can look at things that are going on in the well as well as the surface. What this shows is basically a horizontal fracture zone in the bore hole. You see here this line where it changes from light to dark very abruptly. That's a little, you know, cavern in the bore hole that's out and there's some particles that have collected on the bottom of it.

Why don't we go to the next slide. I don't know what's happening there but this is a picture of a vertical fracture here. There's sort of a line right here and a line over here. And this is a fracture that's, you know, coming through the well like this as opposed to horizontal crossing it that way.

Why don't we go to the next one. This is what a lot of the hole looks like, very smooth rock surface, you know, very nondescript, nothing happening. So quite a lot of the bore hole looks like this and then it's those fractures where we see water coming in and out of the bore hole. And there's essentially no water moving in the rock where it looks like this:

This is a wrench. The other thing the camera can see is maybe some things in the well that aren't there naturally. This is a well that's become encrusted. It's probably been there since 1940. It's a little box wrench.

The next one, this is the

fracture or the fracture zone or the opening in Well No. 1 that produces most of the water. This is about 180 feet below the land surface. And this is where most of the water that you're drinking comes from. It's in through this fracture right here.

Now, the next slide was a little pause for me to show you the video, what this looks like in real-time, but our VCR isn't working. What it looks like in real-time is those little particles -- maybe you can go back to that picture if it's possible. These little particles here suspended in the water, you can actually see those moving in and out of the fractures where you have fractures that either produce or thieve a lot of water depending on what's happened.

So that's one of the ways from the land surface we can get information about what the subsurface looks like in one of these wells.

I'll talk some more about other geophysical logging, more traditional stuff in a little bit when we talk about the packer test. We also did monitoring. Russ mentioned they ran aquifer tests. The driller measures water levels by hand every five minutes or so for eight hours. We also stuck in a pressure transducer. The reason we do that is USGS has a bunch of equipment that we own that we don't care what happens to it. So we end up putting it in the production wells where there was a lot of oil in the wells. We didn't want to put the rented equipment in there.

This is a photograph that doesn't really come out that great here. It's an aerial photograph with a bunch of the monitoring wells in the Privet Road area. This is the operable unit right here. Here's the building that we're in right now, the two production wells, No. 1 here further to the northeast, No. 2, and then there's some of the shallower monitoring well clusters at the Privet Road area. I'll show you some data from the intermediate well at 5 and at 8. You can see that monitoring Well 8 is much closer to 1 and 5 is much closer to Well 2.

These are the results for the aquifer test in production Well No. 1. I've got a lot of information on here so I'll try to explain this quickly. We have this time axis down here so you can see this test. Here's the actual pumping in the production well started over here about 9 o'clock in the morning. We monitored overnight before that occurred. So here's the water level in the production well and this is in the depth essentially below land surface, the depth to water from the land surface. So it's about 33 feet here. In the middle of the night, Well 2 shut off. So all the water level started going up because the other well had quit pumping. Then that well turned back on around a little bit after 5:00 a.m. This is a drawdown in production Well No. 1 that's caused by pumping at Well No. 2. So these two wells obviously influence each other pretty strongly. That data is plotted over on this scale here. So that well turned back on, continues to run during our test.

We with Tetra Tech ran the test in Well 1, have a lot of drawdown here, but you can see you can sort of extrapolate this out. Some of this drawdown is the continued drawdown due to Well 2 continuing to operate during this entire time. What we really look at is the difference between this projected line and what this line ended up doing. As Russ mentioned, this well is quite a bit more productive than the other well. We had about 200 gallons a minute, about 20 feet of drawdown so from around 35 or so down to about 45. You can see this distance here, the drawdown. It gives us a specific capacity. Just divide the pump's rate by the drawdown and this is just a number that can compare wells as to how productive they are. The bigger the number, the higher the yield of the well. So we get about 10 gallons a minute out of this well for every foot of drawdown. If you lower the water level another foot, you're going to get another 10 gallons a minute.

Before we go on, let me just

say I'm also plotting Well 5 and Well 8 here. Those two wells are plotted on a different scale over here because they respond much less than the production well does. So Well 5, which is close to Well 2 actually, you can see Well 5 is close to Well 2 so it has a pretty big response to Well 2 shutting off. Well 8 also responds to Well 2 shutting off but it's much more subdued. What's interesting is that Well 5 actually responds much more to the pumping in Well 1 than Well 8 did. So Well 8 is closer but Well 5 responds much more to the pumping. So you can see here this one is going from about 25 feet maybe down to 27, a couple a feet of drawdown. And Well 8 is less than a foot of drawdown due to the pumping in the closer well. So this stuff is complicated. It's not just depending on how far away you are from the fracture. It's a little bit complicated.

As Russ mentioned, Well 2 is much less productive than Well 1. So the meaning for that in terms of running the wells is you spend more electricity getting water out of Well 2 than out of Well 1. You have to lift it farther for the same pumping rate. So Well 2 is much more expensive to run at the same pumping rate in terms of power consumed. Again, here's our monitoring data, Well 5, we have Well 1. So Well 2 here, this is where we start pumping right here. And what's a little complicating here is that we start running the aquifer test in Well 2 and about 30 minutes later Well 1 turns on. So now we have both wells pumping at the same time. So you have this initial drawdown of Well 2 due to pumping in that well and then when Well 1 turns on, you get more drawdown. So again obviously these two wells are influencing each other pretty significantly. This looks like a change in pumping rate in the well that we were actually testing because you don't see this same blip as much in the monitoring wells. So Well 5 again also responds very much to the pumping in Well 2 because this is close and Well 8 really doesn't respond that much to Well 2 in this picture but you can see its response to Well 1 going on and off.

So by having this monitoring in place keeping the water levels everywhere, we're able to discern what was going on at all these different times whereas if you just measured drawdown in one well, it's really hard to back out how everything was influencing each other. About the same pumping rate, 65 feet of drawdown was the number that I got, a little bit less than what Russ was talking about because of this additional drawdown. He included that. When you just have manual measurements every five minutes, it's a little hard to really put this picture together as easily as with the continuous data. So about 65 feet of drawdown, so much less productive. We only have 3 gallons per minute per foot instead of 10. So that other well is about three times as easy to get the water out of the other well.

Packer testing on the two wells -- why don't we go to the next one -- this is just a schematic of what's involved with packer testing. We have the bore hole here. It's got some casing at the top. And then it's open the rest of its length. And the aquifer test that we just ran was sticking a pump in and pumping water from the entire bore hole. Now what we're going to do with packers is isolate individual sections of the bore hole. These are inflatable packers, which is obviously not the one we used here that I have but this is one used here. Basically it's the same idea. It's a steel body with a rubber bladder around it. We put that in the hole where we want it on the pipe rod and inflate with nitrogen. This expands and seals against the wall of the bore hole. You try to put this in those areas that are fractured and you blow this balloon up against the bore hole. You have two of them and you have your pump in between. And then these tubes are for running water through the packers or monitoring the water levels above and below the packers so we can get water levels in the three zones and isolate a section and take a water quality sample from just that section instead of the entire bore hole. You can pass that around if anybody wants to see what that thing is.

Here's a case where we have both packers inflated. If the rock is competent and doesn't have a lot of permeability, you will hydraulically isolate these three zones. Quite often we see essentially no change in the water level in the other zones. So if that rock is not fractured, its permeability is extremely low. It's very hard for water to get even just around this 4 foot, 5 foot long packer. Another situation we used at this site was for the deep zones. We would just inflate the upper packer so we would test a very long section of the bore hole at the bottom. Normally this separation here was on the order of 8 or 9 feet between the two packers. We ran one test where it was about 30 feet and I think we had one test where it's on the order of 50 feet of open hole.

So here's some results from

a packer test in Well 2. We're monitoring the water levels in the three zones. That's up at the top here. In this particular well, the upper zone above the top packer and the pumped zone are in good communication. They have essentially the same pressure. So in that upper zone, this is a shallow test, about 70 feet below land surface, at that depth the rock is very weathered and quite fractured, broken up near the land surface. So the packer doesn't really isolate the zones. There's enough permeability in the rock around the balloon to go vertically. Initially we didn't have enough pressure in the packer and right at this time the pump is running, we increase the packer pressure and you can see that the water levels start to change. They start to separate from one another because that zone became isolated. So we realized that had happened. It was getting late in the day. We turned everything off, let it sit overnight. You can see here Well 1 shut down in the middle of the night and you can see how the different elevations in the same bore hole respond very differently to Well No. 1 shutting off. There's much more recovery in the deep part of the well than there is in this very shallow part. It's not as well connected to the pumping zone in that other well. Then Well No. 1 comes back on and then we run our aquifer test here. That's the drawdown in the pump zone. You can see I guess we're getting about 40 feet of drawdown. Initially we reduced the pumping rate and took our sample and quit pumping and deflated the packers and moved on to the next section.

This summarizes the results for the packer test and also shows you some of the other geophysical testing. This is for Well No. 1, which is almost 400 feet deep. So this is a depth on this side from essentially land surface down to about 400 feet. The caliper log is a device that measures essentially the diameter of the bore hole. It has these rollers that stick out and where the bore hole is bigger, it goes out and constricts when it's smaller.

You can see the range here is from 8 to 16 inches. As Russ mentioned, this is a 10-inch well so there's about 10 inches right there. It's only 10 inches down to about 200 something feet and then it's 8, 8-1/2 inches or something below that. Then there's breakout zones where there's enough fractures during the drilling or subsequent to that pieces of rock have come out of the wall and the hole is quite a bit bigger. So this is one thing that kind of indicates zones that might produce water but there's a lot of zones here where, you know, you have increased diameter.

The second log here is temperature. And in lot of production wells like this this tends to work very well for identifying zones. When there's not flow in a bore hole, you generally see smooth temperature profile from top to bottom. The water is just sitting there and it's basically the same temperature as the ground. The earth is a heat source so eventually you start seeing hyper temperatures at depth. But you have the seasonal heating of the land surface that heats and cools the top part of the well. So we're running this in March. We got warmer up at the surface. But what's happening here is that you're having bore hole flow. Water is moving in the well and when it's in the well, it's essentially in a pipe. You saw that the rock is competent. It's like being inside of a pipe. The only place water comes in and out is at these fractures. Right here is a big fracture indicated, big jump in temperature. You have water coming down the well and up the bore hole and going out the well at about 170, 180 feet. There's no pumping in this well at this time but Well No. 2 is running. So the water in this bore hole is flowing vertically in the bore hole from the other zones above and below this and is going out this fracture here and going over to Well No. 2.

As mentioned, the packer isolates these thin blue zones very hard to see here. I'm plotting over here on this side the specific capacity of each zone.

That's a measure not just of the entire well but of each zone's contribution to the overall yield of the well. In this case, the top zone, we were not able to seal the packers so we measured a specific capacity of 15 gallons per minute per foot, which is essentially for the entire well because the packers didn't effectively seal the well. This is higher than the 10 gallons per minute with the aquifer test because we're pumping at a lower rate. We're only pumping at about 20 gallons a minute instead of 200. What normally happens is as you increase the pumping rate, the specific capacity drops off somewhat. It's not a linear change. So it decreases when you increase the pumping rate. That's pretty much in agreement with what the aquifer test got. We didn't seal the bore hole. You can see these zones a lot show up on the temperature log as something might be happening.

We also did flow meeting results. I'm not presenting this here. You can see most of those don't have any yield really. They yield water. We can pump water out and we have samples but they don't really contribute overall to the well. These are two the two horizons that really contribute, this one here at 180 feet and this one, the deep zone, below 350 feet. This is a good point to say Well 2 only goes to 350 feet. The most productive part of this well is below the bottom of the other well. But this is the big player. This one gets about 5 or 6 gallons per minute per foot from that single zone.

Then in between here, these are the results for PCE. Russ showed you some of the other results. This is the contaminants that's detected in the highest concentration in these wells. This is Well No. 1 and we get up to about 40 parts per billion or micrograms per liter. However, it's in a zone that doesn't yield much water. So the zone that yields most of the water has a concentration of between 10 and 20 and I think that's pretty close to what you get when you turn on the pump and, you know, open the spigot and take a sample.

So there are higher concentrations in other zones and this is the information that we can't really get any other way than using these packers to collect samples, a definite increase with depth, relatively low concentrations at the surface. And this supports what Russ was saying that this suggests contaminants are not coming from very close to this well. Otherwise, the shallowest parts of the aquifer would probably be the most contaminated.

RAB MEMBER: Just a real quick question. On the temperature you're insinuating there's an upward gradient below 170 feet?

MR. GOODE: Of temperature? Water is flowing up in the well.

RAB MEMBER: So all the zones below 170 are showing an upward gradient?

MR. GOODE: That's right. When Well No. 2 is on, things change when that well is on. When Well No. 2 is on, water flows into this fracture and goes to Well No. 2 and the water is coming out of these other fractures and flowing up and down in the bore hole to that middle fracture zone.

MR. EDMOND: So when 2's on, it's pulling the water across about the 170 foot mark?

MR. GOODE: Right.

MR. EDMOND: It's like a river.

MR. GOODE: Normally they both run together.

MR. COLTER: So that indicates there's a fracture connecting both bore holes?

MR. GOODE: Absolutely. You'll see it's a little bit different depth than the other well. It's not a flat fracture. Why don't we just go to the next well. Same picture, here's the big zone. It's about 160, 170 in this case. This well is only 350 feet. But the same idea, again, when Well No. 1 is running and Well 2 isn't, you have the same thing. Water is going out over the formation and over to Well No. 1. Normally the system is run as they're both pumping at the same time. The caliper here is a little bit different. You'll see if -- I have the driller's log here from 1940 which Russ gave me on a big piece of paper. That's kind of interesting to look at too. You can do some correlations on there and show just like the white sandstone in Well No. 1 is a little bit shallower in Well No. 2. So this kind of bedding -- this fracture is definitely oriented with the bedding and it's going up from Well 1 to 2 and the lithology does the same thing, white versus red rock. So back in 1940 they basically could have told you all this in 1942.

So, again, 10 inch hole down to 200 feet and 8 inch below that. We have some major hits on the temperature profile here. We went in and isolated and tested. Again the big player is right here. I plotted this on the same scale so you can see this one is less than 3 gallons per minute per foot and there's no productivity at the depth at the bottom but this well ends at 350 feet. The other well you had another productive zone below that department.

MR. EDMOND: I didn't see any TCE results. Did you take TCE?

MR. GOODE: Yes.

MR. EDMOND: Where were they?

MR. GOODE: Much lower, almost zero. Russ has the numbers. In fact, it was on his graph. We kind of flipped through it real quickly. But Well No. 2 the TCE range here has changed from 40 to 10 and you can see the concentrations are much, much lower in Well No. 2. You knew this already from just the bulk samples that you're taking, essentially nothing up near the surface. Now, if you remember our map, Well No. 1 is further to the north and when I showed you the water table map and probably what Russ has already showed you, water is moving to the north. So from Privet Road to Well No. 1 is like a possible flow path but you can't really -- it's harder to see going from Privet Road back uphill to Well No. 2. And this supports that that there's very low concentrations up in the shallow part. We do get a little bit higher concentrations at depth again.

RAB MEMBER: A layman looking at that would say that No. 1 well ought to be put in reserve and draw it off No. 2 with the lower contamination for the health and safety of the people on the site here and maybe even pull that pump up in the 150 foot range.

MR. GOODE: Well, yes. Number one, where the pump is is really irrelevant. What happens in the well is that when you pump the well, this is like a big pipe. It's like a big bathtub. You're just pulling water out of the bathtub. Where the pump sits in that bathtub, it doesn't matter. As long as that pump is below the water level, it draws water from where it draws water. The fact that you were to put your pump right here versus here makes no difference to the well as to where the water is going to come from.

RAB MEMBER: So the PCE test

was done without a pump running?

MR. GOODE: These were done with packers isolating individual zones. So we have a packer, which makes a big difference. But just having the open hole and moving the pump up and down doesn't change anything as far as concentrations. Now, let me just follow on with that a little bit. Number two, there's a treatment system on this water. This water is air stripped and the concentrations coming out the other end of that I believe are essentially nondetectable. So all of that water that's pumped from both wells is thoroughly treated before it's used and that system is in place and running. The third thing is Well No. 1 is much more productive. It's cheaper to get water out of Well No. 1. And really the quality thing isn't going to change that much. You have the treatment system in place so you might say just get rid of this one. And the other thing, the third thing is I just explained how when one well is running and the other one isn't, water goes out this fracture.

MR. TURNER: It goes over anyway.

MR. GOODE: So they're still connected. The fact you're not pumping both of them, you're adding clean water to the system by continuing to pump this well but it's more expensive water. You have to lift it farther.

MR. COLTER: Is there anything you can explain about the big fracture at the bottom but the low --

MR. GOODE: Yeah. This is why we don't just do caliper plugs. Here's a huge breakout. The thing basically maxed out. We don't know how big that cavern is. That possibly could have been during drilling they hit a hard spot and just hanging on it and cobbling up the formation as the rock spins around there. This is very exaggerated as things that look very thin here are not thin. This could be several feet and we've compressed this whole scale down very small.

MR. COLTER: It doesn't

yield any water?

MR. GOODE: It does yield water. We pump several gallons a minute out of it. But in terms of the overall productivity of the well, it's not a significant player.

MR. COLTER: Do you suppose maybe that fracture ends at some point, that it's not a continuous fracture?

MR. GOODE: It either might not be a fracture or it's just a fracture that's open for a certain distance and then it's not connected to other fractures that produce water. In fact, you might just do a quick slug test on this and it might seem to yield more water but as you run a pump test, you see it really doesn't have much productivity on it. So we don't just use the caliper. We really try to go in there and try to directly measure the yield of each of these zones independently. So these are the two Navy production wells. There's an Air Force production well sitting there too which some of this information could be possibly have gotten from taking these same techniques over there and looking at the situation in that well.

RAB MEMBER: Excuse me. If I understand you correctly, you're saying it makes no difference how far down you drop the pump?

MR. GOODE: That's right.

RAB MEMBER: I appreciate that. However, supposing you're down, just picking a number here, 300 feet but there's more pollutants or toxins or whatever at that area than there is at 150 feet? That wouldn't change the quality of the water?

MR. GOODE: No. It's almost like the -- all the fractures see --

RAB MEMBER: You mentioned it's heavier than water so it would go to the bottom.

MR. GOODE: That whole density thing is not a major player in what's happening here.

RAB MEMBER: Okay.

MR. GOODE: If you have a blob of TCE in a swimming pool, it's going to sink. If you've got a blob at the surface that's bleeding off a little bit of TCE and going through rock that's high permeability, low permeability fractures, where the water is going is carrying the TCE with it, that's what's happening here. The density part of it is a third or second or third order effect. Now, this is hard to understand so this is not -- these are good questions. It definitely comes up a lot. As far as the fractures know, all they see about the well is what the pressure is in the well. The fracture doesn't see where the pump is. All it knows is I'm being pulled toward that well by a pressure gradient. And that's all that matters. It doesn't see that the pump is at 300 feet or 100 feet. It just knows there's a lot of water moving out there. The water level in the well is 60 feet below land surface. I have to go over there. That's all it sees. It doesn't matter where the pump is. Each of those fractures is doing that. If you wanted to, you could say multiply these concentrations by this little yield bar and you'd get a qualitative measure of how much each zone is contributing to the overall mass of TCE coming into the well. So even though this one yields a lot, it's got a very low concentration. So where we got this big hit doesn't yield much water. So the concentration in this well is very likely to be close to this number, close to zero, not this one here. We just got that number because we put the beaker there and that's the only water we looked at it. We didn't mix it with the other water. All those zones are contributing at different -- these are the proportion of how much they contribute and they contribute at this concentration and it all mixes together. Where the pump sits, the only factor there is you want the pump to be below the water surface. Other than that, it doesn't matter, 300 feet, 150 feet.

Okay. The next thing I want to talk about is the water table mapping we did. We did two basic activities at that time. One was monitoring indicator levels. We put some continuous monitoring in some wells and regionally we took a synoptic sample. We went out and measured the water levels during one week and tried to take a snapshot of what the water levels in the area looked like.

This is driven by the work that Tetra Tech has been doing and continues to do. I apologize for this graphic. I grabbed this off some E-mail that Russ sent me. Here's contours for the Site 5 area. Here's the border of the facility. And this is Horsham Road. And here's Site 5 area. And Tetra Tech has this groundwater divide so that means that the topographic -- the water level surfaces drop off going to the north and they drop off going to the south. So this is like water north of this line is driven in the northward direction and south of this line is driven in the southward direction. The water is essentially driven by gravity. Okay? And these are contours on the topographic surface, if you will, of the water. So it's highest up here and water moves downhill. It goes away from the high water level towards the low water level. And what the low water level is are streams and wells, pumping wells.

RAB MEMBER: What's the arrow showing?

MR. GOODE: The arrow is the dip of the beds. So the geologic formations dip off to the north and so maybe the next slide is a good one. Well, that was shallow water levels. I contoured up -- from the data that Tetra Tech had, I contoured up the deeper -- the intermediate wells. You can see I've got .2 foot contours here. It's very shallow, really hard to figure out which direction things are going in. That's one reason we wanted to step back and get a bigger picture. But you can see these levels at the intermediate wells. We have it high over here, 6i. It looks like it's going down toward the west. One anomaly down here is 11i, which is the last well towards Horsham Road. The water surface is about 10 feet lower than it is up here, so a big dropoff in the intermediate zones down to this well. That was something that was plaguing us what's going on there. This is the I guess source areas here.

Why don't we go on to the next one. Here's a cross-section. I hope you can see these light blue beds here. These are the correlating beds from well to well. This again Tetra Tech put all this together. I just modified it a little bit. So -- I'm sorry. The blue lines are the contours of the pressure, the water level and these brown are the dipping beds. Is that right, Kevin?

MR. KILMARTIN: Yes.

MR. GOODE: So you have the beds dipping off towards the north. This whole idea about the dense contaminants and the extent that fractures are oriented with these beds, we have this interplay between the gradients and the dipping beds. These are both contributing to how the water is moving. We're continuing trying to figure this out. This is some further work to try to look at that in more detail. I just put some contours on here. I think when Tetra Tech did this, we just drew these contours and I extended this over this direction based on the data. There may be some other hydrogeological reasons for not having this contour here. It shows you the dilemma. Does the stuff go this way sort of downgradient, which is what the hydrologic person would say, just going to go downhill down the water contours, or is there this kind of effect of the dipping beds which might have high permeability kind of going off to the north? It's really easy to move to the north in the beds.

MR. TURNER: Is that Well 3 to the left?

MR. GOODE: Yes, this is 3. So the intermediate zone picked up very low, up to 10 parts per billion, real low. So here are these contours. You can see the water is going down. The base is a recharge area. And I added contours to go down to this well. So you can see there's a big dropoff in pressure so something is definitely happening over here that we wanted to look at a little bit more, well cluster 11.

So first I wanted to show you some monitoring data. This really follows along with what Tetra Tech did where they just monitored water levels in Well 11 and other wells to try to see if the well cycle in the Horsham Township wells had an effect on the base. So we wanted to basically look at that again. Go ahead, Jim.

So we were monitoring Wells 11, cluster 11 and 6, the intermediate zone in Well 6, which is sort of one of the northernmost wells at Site 5. I don't show you that data here. I have the data here for Site 11. We have monitoring wells at different depths. This blue line here is the deepest well. It's 11i. That water level is plotted over here, this scale over here. It's 25 feet over here whereas the two shallow wells we only have 10 feet of difference. The two shallow wells basically have the same water level. They plot right on top of each other. The black bars are precipitation. This is Hurricane Floyd. Between these two days we had about 8 inches of rain measured here at the base. You can see, of course, the wells respond dramatically to that recharge event. This one right here is the one that flooded my basement when we lost power for 12 hours and the sump pump died. It wasn't nearly as much rain, though. But one thing you'll see here even before Floyd happened we were in a drought. Of course, you all remember this was the end of the drought. So water levels were very low at that time. But you can see here that the deep well is coming up. You can see this. The deep well is coming up while the shallow wells are still going down. So when we have recharge due to this huge rainfall event, we see the shallow wells respond first and then the deeper wells respond right after that. But here something else is happening. The water level in the deep zone is coming up. I thought this was because of pumping. This is because of pumping in Horsham and the reduced pumping because of the drought. So we're reducing our water use. We're seeing some recovery in the deeper part of the system before the shallow part of the system starts to recover. You see it goes up quite a bit. Then we get the big hit with Floyd. I wanted to point out our water table mapping event was around the first or second week of October, so right in here after Hurricane Floyd. So actually it's good because it's more representative of sort of average conditions and not drought conditions, extreme drought which we had before that.

This is a long term monitoring well from the USGS drought monitoring database with the State of Pennsylvania and you can see here this is in Chester County. I use this well because it's pretty close by but not affected by pumping. We have a well in Montgomery County and Bucks County but they're both heavily affected by pumping. So we use this well just to show here in October here's the big recharge in October due to

Floyd. This is the drought. You're starting to get a water level near the lowest ever measured in the well. Then we recover. This light blue line is you can see actually a little bit better than the median when we did our water table mapping in October. This is long term data back to '66. So now I'll just show you the summary for the regional. This is a little hard to see. This is basically a photograph I took because this map is in draft right now. We don't have it on the computer. But this green line is the highest contour I show on the map. Here's the diabase dike that comes through the very southern part of the base. Here's the green line. These are the highest levels in here. Site 5 is right in here. And so there's a groundwater divide somewhere, you know, in this area, either right at Site 5 or a little north, right in agreement with what Tetra Tech had at the small scale. Now we're looking at a much bigger area. So to the south water levels drove off towards the Pennypack stream and to the north water levels drop off. This is 320 feet, 280, 240 down to the Neshaminy.

Additionally, there's some pumping wells on here and you can see a little contour drawn around Well 26. The water level in that well when it's pumping is much lower than the surrounding areas so it's got its own little cone of depression. Here's another Horsham well up here. So basically this is the answer.

The other thing to see here is that when you cross one of these major streams, when you go from the Neshaminy to the other side, the water levels go back up. So there's no water coming into this basin from outside the basin. The water that's used in Horsham comes from Horsham, comes from rainfall in Horsham, locally derived. The drinking water in these wells is from recharge and it's from recharge upgradient, uphill.

RAB MEMBER: These numbers are what again?

MR. GOODE: These are the altitudes of the water level. That's 320 feet and the contour on the base here -- I'm not sure what the elevations are there but higher than 320 feet.

RAB MEMBER: So these are all above sea level?

MR. GOODE: Yes.

RAB MEMBER: As opposed to the numbers we were looking at before was depth below ground level?

MR. GOODE: That's right. So this is like a topographical map of the water, of the groundwater in the area of the basin and around. So this was a major snapshot for us and I think hopefully will confirm, you know, the ideas that were already going around that basically water goes downhill and you're not going to change that. Even with dipping bed geology, water still has to go downhill. It goes from the high areas to the low areas which are the streams and pumping wells.

This was just to show you that again there's a groundwater divide on the base so you have water flowing north and south. Why don't we go back a second, Jim. I'm sorry.

The other thing to notice about this map maybe is that things are sort of aligned in this direction. We kind of see how the contours go out like this. Here's 280. This is the geology. This is the strike of the geology in this area. The rocks strike this way and they dip off to the north, slightly northwest. So this has a major impact on where the streams are. They erode the soft beds. They don't erode the hard beds. So they line up with a soft bed here like the Neshaminy and then that controls how the groundwater flow system works. Not only are the streams oriented this way, but this system behaves in an anisotropic way so we get -- what you see with anisotropy is these elongated contours along the strike direction and we see that even in the regional water table map, not just a drawdown plot.

Any questions on that before we move ahead?

Okay. Finally, we get into

shutdown. You'll have to tab through these. We have a public supply well, a system that runs on the tank level. When the system in the tank gets low, all the systems turn on and then it turns off and cycles on and off based on demand. Horsham Water Authority and the Philly Suburban Water Company were very gracious and agreed to shut the well down. We shut it down for six days, monitored for a lot longer than six days at the time. So it's very hard for them to run a straight aquifer test because they didn't have a place to send the water. But it was pretty easy for them to turn off the well and they had enough production from their other wells.

So just the maximum recovery after six days the pumping well recovered about 40 feet. And an intermediate well at the landfill area on No. 1i recovered about 28 feet. This well is often dry. When you go out to measure the water level or take a sample, there's no water in it. When we turned off Horsham Well No. 26, the water level came up 28 feet. The next well that came up the next most was here, 11i. I was hoping for 28 feet at 11 but I didn't get that. So the shallow well at -- this well is at the same location at 1i but it's open to a very shallow part of the formation. That had the next most recovery and then, finally, Well 4i at the landfill area. All the other wells we measured, the water level dropped from the time we turned the pump off until it was turned back on. So I think although these numbers are small, they're real. Those wells really are responding to that pumping well because all the other wells are going up -- excuse me. The water level is dropping instead of coming up.

This is looking at some of the continuous data. It's plotted on the same scale here. The kind of orangish-yellow is the production well. We had a transducer system in that well which only measured the water level down to about 52 feet. So we got a manual measurement here and we were planning to turn the well off here. This was right at the end of

January. I don't know if any of you remember that time period. It was extremely cold. We had snow every time I was out there pretty much. It was really difficult just the logistics. I know Tetra Tech's personnel suffered through this well, bitter cold while we were out there. So there's a manual measurement. The level in the pump when it's normally running is about 70 feet below land surface. You can see that probably dropped off a little bit before it was shut down. The gray is the shutdown period. Then we picked up its recovery when it came above 50 feet and it got up to about 30 something feet. One thing right off is at the end of six days, it was still coming up. So this thing had not equilibrated at six days. It takes a very long time for this system to re-equilibrate to changes in these large production wells. Then the well is turned back on.

Now, normally the way we monitor what's going on with the water authority is they have a chart on the tank that shows when the water level is going up and down in the tank. So that's when the pumps are on. However, the actual well pump is going on much more frequently than that chart shows. That's because the production well pumps into another reservoir for the treatment system. There's a second pump in the treatment system that's responding to the tank. The actual well pump does not respond. So those fluctuations, this is one of the reasons I think it was hard for us to figure out what was happening with the data before was the fluctuations here are actually much more rapid than shows up on the chart that they give us because that well is turning on and off depending on the demand in the well, not in the tank. It cycles on and off every few hours and you can see the water level gradually dropping off and continuing to drop off for the entire time we were monitoring. So it takes quite a while to re-equilibrate with the situation.

This is the data for Well 1i

on the same scale so you can see this just dramatic recovery in that well of the water level, an extremely high permeable connection between the production well and Well 1i.

MR. TURNER: The horizontal distance is somewhere around half a mile?

MR. GOODE: I'll show you a map in a second where these are. Here's the blue line. This is my favorite. This is Well 11i at the fire training area. Even on this scale you can kind of see it is coming up over that period. And when the well turns back on, it quits coming up and starts to drop off very gradually. Another thing on this graph to notice, you can see here this is really just the reflection of the cycle of what's happening in the production well. The water level in 1i is highest in the early morning right before people wake up. So there's very low water demand overnight. The pumps aren't running. They turn off at 2:00 in the morning or something and at 5:00 a.m. or so they come back on and you see that drawdown. Every day you get that peak in the morning. This is not an earth tide effect because it doesn't change. Earth tides are a 24-hour cycle. This is really just the pumping. Very smooth here, no pumping, then it gets back into the cycle where the peak occurs every morning. I'm going to show you that again at another well.

Now, I'm really just going to harp on 11i until it kills me. Here I've plotted the drawdown in the production well on this side and I've just expanded the scale for 11i at the fire training area. So this is a little confusing because here's the well turning off right here, this line, but this well actually starts to recover about six hours before that. Unless we had our clocks off by six hours, which I kind of doubt, there's something else going on here. But overall there is definitely recovery from the beginning to the end of the test. The highest level here in 11i is right when this well is turned back on.

The other thing to notice here is this is what Tetra Tech was looking at before. We have seen this before without the shutdown. There's always a peak right in the early morning. These are very small water level differences but we can still see that well turning off. There is always a peak right in the morning. When that well is off, we don't see the peak in the morning. Even though this is up and down here, we don't see that peak every morning. When you turn that well back on, again we get a peak in water level every morning because the township wells are off overnight, much, much lower permeability connection but it is connected. And we saw the system hasn't equilibrated after six days. If we ran this down for a month, we would probably see the number of wells that would respond expand further. But much lower connections, only one dramatic connection, and that's that Well 1i at the landfill area.

RAB MEMBER: How deep

totally is 11i?

MR. GOODE: 80 something.

MR. TURNER: It's intermediate. It should be 170. We don't remember. We can check on that. It should be around 150 to 170.

MR. GOODE: It's probably in the order of 100 to 170 feet. I don't think I have the reports here. The production well is 300 some feet. I'm not sure, much deeper. The production well is much deeper than these monitoring wells like the Navy's well.

RAB MEMBER: You said it was intermediate. I was just trying to figure out.

MR. GOODE: That depth range is up to 170 feet or so but each well is slightly different. I think they're 5- or 10-foot screens.

MR. KILMARTIN: 10.

MR. GOODE: So it's only open to a 10-foot section of the rock. Okay. Why don't we go to the map which I hope is next. This really looks bad but here's Well 26, Horsham Road again, the base, Well 26 right here. These colors in the background are the geology, geologic map. So you have different members of the Stockton formation. You can see there southwest to northeast strike. They're dipping off to the northwest. And if you look along strike from Well 26, it takes you right over to Well 1. This is just the classic feature of groundwater flow in these basins is that there's high permeability connections along strike. So there's the well that responded 28 feet, 40 feet of response here, .3 here and here's 11i at the fire training area which responds .5. So even though it's a farther down dip, it's still getting a better connection than 4i right here. So things are complicated, you know, in figuring out the plumbing of the ground. Here's a homeowner well that we monitored, very shallow that we had a continuous recorder on, did not show any effect to the well. You can see it's about essentially the same distance as this well.

MR. COLTER: What depth was that homeowner well, do you know?

MR. GOODE: No, I don't. I didn't measure it. But I would guess it's probably 150 feet. Also, here's Well 6. So this well also along strike was continuing to pump, of course, during this whole time. Here's another Horsham well up here, No. 17. So these wells were continuing to go on and off. We shut this one down here and you can see much more response here. The shallow well only responded .3 at the same map distance but shallower responded much, much less.

RAB MEMBER: Where's the groundwater divide?

MR. GOODE: Up in here. So this well is pumping and water is going to come from uphill, upgradient to that well.

MR. EDMOND: If they shut off 6 and 26 at the same time, would it have been greater?

MR. GOODE: Probably, I would guess, but maybe not significantly. Very high permeability connection from here to here but no indication that it goes from here to there. So it may be of limited size oriented kind of this way but of limited extent. So when this well is pumping, there's very large drawdown right here. So if you want to think of this, one way to think of this is there's kind of a plate, like a dish in the ground where the water levels dropped over that entire dish and water is going to flow into that dish everywhere to try to get to that well. Water is not just coming uphill from here, it's also coming uphill from this area because basically that's a part of this well. It's got such a good connection. It's going to go down, hit that formation where 1i is screened and then just shoot over to the well.

MR. COLTER: Would that indicate a fracture between the two or not necessarily?

MR. GOODE: A fracture or set of fractures or fracture zone, whatever, extremely high permeability to go from this well to that well. Now, if we had done packer testing here and here, we maybe could nail that down even more as to what fracture in this well that is, that kind of thing, but we don't have that detail.

MR. EDMOND: Dan, why then doesn't the contaminants at 5, Site 5 -- it seems to be after an initial going down they're being pulled to the north.

MR. GOODE: That's right. That's what I showed you. Also, 11i doesn't show anything.

MR. EDMOND: But I mean if 11i is affected by 26, then you would think that the fire training area would be affected by 26 but it's just the opposite.

MR. GOODE: I guess I'm not drawing that conclusion. See, the hydraulics tell me -- here's the source area. I'm not sure we know precisely where that was. There's something happening very shallow with the soil. But once you get into the rock, there's some contaminants entering the rock at the top. Now, if they're north of that groundwater divide, I think we're going to continue to go north. And that groundwater divide is really right in this area.

MR. EDMOND: So the groundwater divide is affecting the whole --

MR. GOODE: Very flat here. If it's to the south of there, it's eventually going to go to the south but the rate is maybe very low. The other thing that this -- the fact that this well responds and the shallow well doesn't respond, the other thing that that tells us is there's low permeability vertically. So to go from that intermediate zone to the shallow zone is very difficult. That's why we have the large difference in water levels. The water is going that way but there's a lot of resistance to flow in the formation. And then when things are moving slowly, there's a lot of time for other things to happen, diffusion into the rock matrix, absorption, maybe even degradation happening. I don't know what the geochemistry is there but it could be these things are actually being degraded if they have enough time before they get to this. But the hydraulics I think are clear that if you were to put something in 11i, it's probably going to go towards Well 26. Now, when it gets there is very uncertain.

RAB MEMBER: Did you test the quality of 26?

MR. GOODE: No. But quarterly they do their own water monitoring program and I think they once had a detection of a solvent. But generally their water is very good. And they have a treatment system right on that well already for other reasons.

MR. TURNER: For carbonate But they have had chlorinated solvent in that well in the past.

MR. GOODE: This is a cartoon of the classic model of the system. We have a shallow and deep well. This purple zone, strike is coming out the board at you is the strike direction. So here's Well 11i and the pumping well is back in the back of the room but it's also open to this purple zone. So when it pumps, there's a very good connection along the purple zone. Here's the shallow zone at 1i, very low permeability to get across the beds, much lower permeability across the beds than along these bed-oriented features. Where there are fractures or fracture zones, it doesn't really matter, but it's some high permeability features oriented with the dipping beds. That's kind of the classic model for these Triassic systems. Then up at the top, which is where the contaminants come from, is sort of this soft, highly weathered soil to rock to weathered rock finally to unweathered rock as you go deeper.

Finally, I just wanted to show you some very preliminary -- give you an idea of what we can do with models. And we're going to try to extend this with the shutdown test. So the idea here is to use a model of the system to match the measurements that we have. Basically we run two situations with the model. One is before we change anything, we have sort of a quasi-steady situation and try to match the water levels that we measure for our water table map and then we can also look at the response of the system to this dramatic change of the shutdown and try to make the water levels in the model agree with the real world. So this gives us a tool for looking at the real world system. One thing we hope to eventually do, which I don't have here today, once we have a model like this, this sort of matches the real world, then we can project back where that well gets its water from, what the contributing area of recharge is that flows into that well.

So again the model is very rough at this point. I just put this together just to kind of give you a flavor of what we could get out of that, hopefully we will get out of it and what goes into it. Water goes downhill so one of the main things is topography. That's what the colors are here. This is a DEM, digital elevation model, for the area. The reds are the high elevations right in the middle of the base locally. Right on the road is the high. And the blue are the lowest elevations in the stream drainage networks. So here topography has a huge control. The geology modifies it but it really can't overcome topography in most cases. The squares are some of the wells in the Horsham water supply system. Here's 6. This is 26, 17. These are the older wells over here which actually yield a lot less water along this side of the base. The other thing, recharge is coming into the model. The black line is the domain of the model. And the discharge is going to streams, which we actually put in the model the streams and the pumping wells. Those are the two main discharges for the water balance. I don't have the base wells in these simulations yet.

Again, don't write home about this yet. This is just kind of an illustration of what we can do with the model. These are the levels in what I'm calling the i layer in the model corresponding to the i wells at the site.

This is kind of a steady model before things are changing. This is what's normally the situation. You can see I put anisotropy into the model. So the contours are oriented with the strike and dip. We have a groundwater divide in here about where the water table map said the groundwater divide would be and then water flows to the north to the Neshaminy and to the south to the Pennypack. And you can see we also have some closed contours around some of the production wells so Well 6 happens to show up with contours, Well 26 doesn't quite show up with these contour levels. Here's another well. Here's one over here and so on. And then we can take the model and turn off Well 26 and just look at the difference, how much the water level comes up when Well 26 is turned off for six days. That's the recovery in the i level. So it's oriented in strike and I added a very high permeability zone that connects it to where 1i is right over here at the landfill area. So we have a lot of recovery in the i layer in the model after six days. We go to the next one and look at the shallow layer of the model. So by adjusting the properties of the model, basically the permeability or the hydraulic conductivity, we can try to make these levels that the model simulates match what we actually measure. That helps us figure out what the pumping is in the system. So here in the very shallow layer you see we have very little recovery but it also extends over towards the landfill area because of this high permeability zone at depth.

And so eventually we can take a model like this and look at the contributing areas. I just wanted to go over what we see as our products. We're going to develop a hydrologic atlas. This is a one-sheet report which will have the water table on it and some logs and correlation of the dipping beds. And a lot of that is just pulling together regional scale stuff from what Tetra Tech has already done on the base. Then we'll write up a report about the production well testing which will have the aquifer test geophysics and packer test in it and a separate report for the analysis of the shutdown test where we're planning eventually to use this model to figure out the plumbing down in that area and extend that a little bit.

Our near term plans are to, as Russ mentioned -- actually, he's going to talk some more about the plans for the future. We're going to put in some more monitoring bore holes and also we're going to try to take shallow cores at the fire training area and see if there's VOC's that are not in the fractures in the rock but actually in the rock matrix that might be feeding the fractures. So even the soil has been removed, the very shallow source has been removed, we might have a little bit deeper weathered rock that's going to continue to be a source of VOC's in the future. We're going to try to grab some of that rock and measure the VOC's in the rock matrix, in the water that's in the rock matrix. And Russ is going to talk some more about those plans.

MR. EDMOND: Anybody have any questions for Dan?

RAB MEMBER: When you made all these bore holes, did you ever run into a situation where an artesian effect occurred?

MR. GOODE: Yes. Actually, Kevin can tell you more about that over at the Ninth Street landfill, I guess.

MR. TURNER: Further north and west of Site 5. We have I think three artesian wells at another site that we haven't talked of.

MR. EDMOND: You should have brought in your article in the North Div newsletter showing how to stop these artesian effects.

MR. TURNER: We had a little fun with that. If you put in a monitoring well and it turns out to be artesian, constantly flowing, air monitoring for some reason, possibly chlorinated solvents but the other thing is if it's flowing in the wintertime, it freezes up, goes across the road and it's a mess. So we did a little research project and we published it and it was a little bit of fun.

MR. EDMOND: More or less like a packer test but permanent.

MR. TURNER: Yeah, permanent packer test.

MR. GOODE: There's a well just off base at the golf course that flows. They used to have a water fountain there for the golfers.

RAB MEMBER: There used to be one up Heath Valley Road.

MR. GOODE: That one is flowing today. Well, I don't know about that one but the one at the golf course is. They actually put a discharge pipe below the land surface that goes out to a creek so it doesn't freeze. The other thing with freezing you didn't mention, I thought the main thing with freezing is it breaks the well. It's made out of PVC.

MR. COLTER: Did you want to continue with plans for Site 5?

MR. EDMOND: It's up to the

RAB members. Do you want to take a short break? That was a lot of information.

MR. GOODE: I have a couple of other handouts. Here's a couple more copies. I also brought our latest newsletter, USGS in Pennsylvania.

MR. EDMOND: We'll take a short break, let the Air Force do their presentation, and close up.

(Short recess.)

MR. TURNER: As much as we know about Site 5 and Dan covering this -- this is Site 5 where Dan was talking about the water levels quite a bit. Like I was saying, as much as we know about that site, there are a few questions remaining. Remedial investigation was performed and we drew some conclusions about conditions there. And EPA has made some and the State and others have made some informal comments so the Navy wants to keep things moving so we're going to address those comments. Just a real quick review.

Plan view of Site 5 and our wells, this is what we would postulate would be the center of the contamination. That's Well No. 1. This is an oblique angle looking from the southwest of the wells. You can see they're in different depths below ground surface and surrounding what we were trying to define the plume that exists in groundwater. This is just the side view of the same wells. This would be basically from the south but through this A-A cross section. So we've modeled -- this is done about a year ago. We modeled the plume. This is looking from the oblique angle a little bit from the southwest. And what we found, this slide shows two things, shows what we think is our best guess of what the plume looks like. You can see it's kind of limited to the vicinity of the fire training area. You know, it's basically centered around the high concentrations.

The other thing here -- two other things I want to show here. This well here, this well actually is the Well 3 that Dan showed furthest to the north that had between 10 and 50 -- historically it's got 50 parts per billion. I think lately it's showing 10 or 20 or 30, depending on what day you sample it, but let's say around 30. We show that as nondetect because our professional judgment at that time was, as it says in the remedial investigation, that this concentration we don't believe is related to this source here. However, meanwhile, EPA says, well, suppose the liquids which are denser than water were to go down and travel along dip of the bedrock. So groundwater is flowing towards me in this. Dip is in the opposite direction to the north. Does everybody remember that from Dan? The other thing we want to do is confirm the plume remediation to the north and northwest, basically the west and southwest, actually I should say, west and southwest.

So here are the remaining concerns: Potential impact on township Well 26. Dan is doing a whole study and he has three reports that will touch on that. Delineation of the solvent plume. EPA said you haven't really shown us where exactly this plume is. You probably have a good guess. We don't agree with one of the points. And then we want to look at the effect of the geologic structure. We don't have an answer for it so we're going to install a well to answer the question is there a possibility that historically dense liquid flows to the north down dip on the surface of that geological area?

So what we propose to do then would be to install three new monitoring wells. This is the center of Site 5. I guess this is the apron of the runway. Site 5, center of the area. So to the west, a little bit to the southwest are two data gaps we want to fill at the depth of about 175 feet so we can follow that plume more accurately. In addition to that, we want to put a well in here very carefully to the proper depth to check on the possibility that the dense concentrated compounds would have been traveling to the north contrary to groundwater flow direction to the south.

Another thing, one other

thing came up not even by the EPA but in discussions we had with USGS and the Navy and others. The possibility came up that bedrock in the vicinity of what we call the source area, possibility that chlorinated solvents could be existing in the bedrock itself, in the matrix of the bedrock. And, therefore, we're going to be pooling a rock core down in this location, using a new technology, little bit of developing technology USGS is familiar with and going to try to determine if there is a significant amount of TCE stored in this bedrock near below the surface of the regional spill areas. The fire training area is here. So across this area is the area of the original source we were concerned with.

And that's it. Any questions? I know it was pretty quick but we already talked a lot about Site 5.

RAB MEMBER: I guess my question is, what are you going to do with the information?

MR. TURNER: We're going to

take a series of samples, crush the bedrock and measure. So if we find it, we're going to find how much there is. There has been some work done on this in the West Coast in California. We're going to have to see what it means.

MR. GOODE: I think one of the main issues is trying to predict what's going to happen in the future. If excavating the soil removes all of the source and the system is simply we're going to have to wait for water to be flushed out of the fractures, we would expect the concentrations to drop off relatively quickly. But if after the source is removed there's a lot of TCE or other contaminants sitting in the rock matrix where it doesn't flow, that's going to continue to bleed out very slowly over time and so the concentrations will not drop off nearly as rapidly if that's the case. So this is really important for trying to predict the long-term quality of water that flows out of that area.

MR. COLTER: It also will

affect I guess the remedy we select for doing a pump and treat. And where you have this continual source that we can't address, then we're really just going to be spending a lot of money and not getting a lot of cleanup. So it will at least address that area that we could relatively expect if the rock core is free of contaminants that a pump and treat system should work toward cleaning up that section of the aquifer.

RAB MEMBER: And it does have contaminants, you would move towards the natural attenuation remedy solution?

MR. COLTER: I'm not sure what we would have to do at that point. Russ?

MR. TURNER: There is precedent for removing some bedrock. We've done it elsewhere, Army bases and things. You can get the equipment in there and rip it up. When it becomes impractical, you don't continue if it were to get to that point.

MR. EDMOND: Any other

questions for Dan, Jim or Russ? Okay.

MR. COLTER: By the way, we're kicking this off the week of June 19, going to kick the Site 5 work off.

MR. EDMOND: Then I need to talk with Russ to set up a decon area.

Then we'll turn it over to Gil for the Air Force.

MR. GILL: We're going to make it a shorter one and discuss remediation of the POL site. Since we have access after two years we have done sampling, so we're going to discuss that and discuss the future of the off-base site. I'm going to ask Mr. Scott Shaw from HSI Geotrans...

MR. SHAW: I promise to keep this really short. As Gill said, the major development in the POL area has been access to off-site properties. When I say off-site, if you guys are taking your trip over to the ponding basin and looked at the ponding basin and turned your shoulder, you would have seen the POL area right behind you. The off-site area I'm speaking of is immediately adjacent to the base fence. It's specifically a piece of property that goes this way and then out over that way. This piece of property belongs to the National Land Trust. What this has allowed us to do is to once again as Gill said after two or three years gain access to a series of monitoring wells we've previously had unlimited access to.

This was a map of the contaminant plume in 1992. We have a similar map from 1996, which is the next slide, showing a reduction in the -- first of all, in the amount of residual fuel. I believe if I was able to plot these up here right now, you would also see a reduction in dissolved contaminants. We talked a lot about chlorinated solvents like TCE and PCE. The contaminants we're talking about is BTEX or benzene, toluene, ethyl benzene and xylene, typical contaminants from a gasoline spill. The spill here was JP4 stored in the POL area. The study we're already doing, as most of you already know, is ORC to provide oxygen to the subsurface. With access to the downgradient properties, we did a second injection.

I think if you go two more slides, the first injection took place along what we call two fence lines, basically a series of very narrow -- when I'm saying "narrow," an inch boring into the ground usually about 10 to 16 feet into which we injected the ORC. Once we got the ability to go off-site, we decided that we would only inject in this downgradient fence line and in a series of monitoring wells with exceedences of regulatory concentrations of those compounds I talked about earlier. So we have a series of wells on the base and off the base into which we've actually placed ORC. That was done in DM5, I believe DM4, and I know DM11 off base. Prior to doing that, we collected a series of groundwater samples in January on the base and down in the National Land Trust property.

We got access to this intermediate piece of property in April and we immediately collected a round of samples. We had our first round of samples there by the end of April, the results of which are -- this is the January sampling. And when I say off-site, this is the National Land Trust property. It's very encouraging. You can see there are nondetects for all of the BTEX compounds, the first four, and you're also seeing some enrichment or relative enrichment of dissolved oxygen. Benzene, these compounds degrade much faster when there is oxygen present. The presence of oxygen here means that that process -- because we've had detections in these wells before, that process has already taken place and you're returning to near, for lack of a better word, clean conditions. These are the downgradient wells on the base. You can see they're still affected by those compounds. And the next slide are from those wells off the property, immediately adjacent off the property, the highest concentration being at DM11, a well into which we installed ORC directly.

We have since in the last two weeks collected another round of samples but because it's only two weeks we don't have sample results back. I hope to see a reduction in those concentrations. What this access will let us do working with Gill and his office, we've decided to start to look at how the degradation has taken place over time and what sort of mass removal rates we're seeing. This is from the series of samples that were taken in 1996. Prior to the initiation of the current investigation in late 1998, it was the last time a full round of samples were collected on the base. At that time we did have access to that piece of property. This once again is DM11. It's the highest concentration of BTEX on the site. This is DM5 that we talked about before. And where you see little red X's, nothing was detected there. The yellow concentration -- yellow piece of the pie is benzene contribution to the total concentration. The diameter of the square is proportional to the concentration. So because DM11 is the largest, the highest concentration, combined concentrations of those four compounds are there.

The next slide shows the results of the samples collected at the end of April in those wells immediately downgradient. DM11 still has the highest level of concentration but there's a substantial decrease in that level.

Now, what our next step is to do is gather all of this information, the stuff from 1992, the information from 1996, and the information that we've collected during our current investigation, and determine what the mass removal rate for BTEX has been at the site under near what we call natural attenuation, how the site is basically cleaning itself. Once we have those concentrations, we can use a process we call Tinmass to calculate the actual mass or as nearly calculate the actual mass of those contaminants within the system. It's not shown here but because you divide the area up into a series of triangles, you can calculate a mass in that given triangle based on the concentration and the known porosity, take that information from 1992 -- hopefully it's a higher number. I'm quite sure it is -- compare it to 1996 and continue to generate data as we move through the current project to see what kind of degradation we're having.

This is a slide that I've actually used in this presentation before that shows as you move away from the source area up here what that degradation rate appears to be. Half life of in this case a parameter called total petroleum hydrocarbons is half of the material is gone in about six years. You continue to have concentrations of petroleum hydrocarbons in the ground because you still have that undissolved free phase liquid present.

In summary, in light of the historical data and with being able to gain access to the off-site property, we're encouraged that, one, natural attenuation is going on, it's an active and significant process in the POL area. What we want to do is take all this information that we have and generate the figures that you've seen using technology called GIS, geographic information system, and continually replicate and calculate those changes in mass and try and attempt to do that on a quarterly basis.

Are there any questions?

MR. GOODE: I'm not sure I understand the rationale for putting the ORC into the monitoring wells. Could you explain that?

MR. SHAW: Well, one of the issues that we've always dealt with is actual delivery into the groundwater and determining what the most efficient way of doing that is. We've used direct injection with the small probes below groundwater at that point. It's much harder to tell how efficient that is as opposed to putting it into a 6-inch or 8-inch bore hole. It's a pilot study and we need to determine if that's a more efficient delivery method than the injection.

MR. GOODE: So it seems to me you're going to create a microenvironment right at that monitoring well?

MR. SHAW: Right.

MR. GOODE: Are you then going to use data from that well in that Tinmass procedure?

MR. SHAW: One of the things we can do with Tinmass is eliminate data points and work on different schemes to try to get what we feel is the most accurate picture of what's going on. Obviously, because we went from 1992 where we had one set of wells to 1996 where we had another set of wells to two years where we had a very small subset, it's going to be difficult to get a complete picture the whole way along. So with the GIS and being able to basically turn wells on and off and extrapolate with professional judgment --

MR. GOODE: You see where I'm headed, that by implementing a remediation technology in those monitoring wells, they really are not suitable for monitoring anymore.

MR. SHAW: We have a considerable amount of data. That remedy was only one vehicle. We had a considerable amount of data prior to that.

MR. GOODE: But as far as I know, there's no real data showing that the ORC is directly doing anything yet so I thought we'd have still a critical need. And it seems to me you've removed -- you've lost those monitoring points because you've created little microenvironments right at the monitoring point which causes the data from that well to be not representative of the ground.

MR. SHAW: We have been very careful in the wells we've selected to do that. We have not put ORC in each one of those big pies. We have ORC in I think three of the wells, three or four of the wells. So that is something we've taken into account.

MR. GOODE: Have I missed it? Has there been real conclusive data about the ORC so far?

MR. SHAW: The pilot study is due to end in the calendar year.

MR. GOODE: But one more question. Are you monitoring water levels in these wells?

MR. SHAW: We've been sampling on a quarterly basis. We held off on the pilot study for nearly six months because the monitoring levels were too low. We have what we feel is very, very good --

MR. GOODE: But there's no like continuous monitoring right now?

MR. SHAW: No.

MR. GOODE: Thanks.

MR. EDMOND: Anybody else?

RAB MEMBER: What effect on the contaminants did this massive influx of water of the hurricane -- how much effect did that have on the contaminants? Did it flush a lot out or didn't nobody monitor it?

MR. SHAW: One of the differences between the contaminants we talked about before, the chlorinated solvents, and the contaminants we're talking about now are they're lighter than water, they float on the water surface. As the water level rises and falls, you get changes in concentrations because you are basically re-introducing that water to residual contamination that's stuck on the soil. So you do see the changes in water level. You see some fluctuation in those concentrations. Now, because of our inability to get off-site access, we held off for about six or seven months in taking groundwater samples and it was largely because we knew that this information -- we knew that we were going to get access. We were in active negotiation with the property owner. We couldn't tell when we were going to get it. So am I able to look at one piece of data and say this was taken one month and water rose a foot and a half and here's what the concentrations did? No, I can't do that directly. But there's a reason why we couldn't. We didn't have access when we wanted to. We feel that with that bigger picture, we will be able to do more efficient work at the site. Does that answer your question?

RAB MEMBER: Well, not really because, in other words, I think it would be a very good thing to measure what dissolves with the influx of a lot of water.

MR. SHAW: What the concentrations are with an influx of a lot of water?

RAB MEMBER: In other words, that water would flush it out.

RAB MEMBER: Actually, you have to picture the water table. It's not when it rains the water is rushing down. It more or less rises. As it rises, the material on the top, some will attach to the soil particles and --

RAB MEMBER: Even when it's up high, it's going somewhere. It's not going to stay there.

RAB MEMBER: It's moving up and going along a higher plane. But it will leave some contamination up here but also --

RAB MEMBER: I imagine a lot of water going through there should have some effect on the contaminants.

MR. EDMOND: In one respect you're right, but in one respect it's spreading some of the contaminants. There's an old EPA solution, quote, when it comes to hazardous waste, dilution isn't a solution. And that's what you're doing to the ground when it rains, you're diluting it, which is making the concentration less somewhat but you're also spreading it because as it's moving along, as Eric was saying, particles are adhering to soil, getting into cracks and crevices within the infrastructure of the geology and staying there after the water resides to normal level.

RAB MEMBER: Well, my question is, how much of that flushes out? Nobody knows. Nobody monitors.

MR. EDMOND: Nobody knows.

MR. SHAW: That's why you can't look at one event as opposed to another. You have to look at the system over time.

MR. GOODE: The rainfall from Floyd is probably still in the ground. It doesn't flush out in the way that pond does, let's say. That water takes years probably to reach the streams in the groundwater system. So any one single event will not flush out the groundwater system.

RAB MEMBER: You're not really changing the speed of the water but the volume of the water changes is what you're saying.

MR. GOODE: You're adding water.

MR. SHAW: It's always rising.

RAB MEMBER: You're not forcing something out, you're just getting more off of it.

MR. GOODE: You can think the overall driving force between here and the Neshaminy is 65, 70 feet of change in water levels. So the fact it goes up 3 feet here doesn't really change that large scale driving force. And the residence time is years to move out, not weeks or something.

MR. EDMOND: Any other questions for Scott? Thanks, Scott. Thanks, Gill.

MR. EDMOND: A couple closing items I guess before we call it quits. I'd like to ask for any community comments, any comments from the community, positive things, negative things. Any things you guys want to get off your chest, so to speak, I'm opening the floor.

RAB MEMBER: One thing, Jim. In the minutes there was some conversation about getting more people involved. I think the time of day is a problem. Traffic if you haven't noticed is a problem in this area and I don't think there's another meeting that's held at 6 o'clock at night. People cannot get here from any distance at all. Two turnpike exits away they cannot get here for that. It would not help me personally. I miss a lot of meetings because I teach at night but if you made it 7:30, which is when most local meetings are -- 6 o'clock is very convenient for people who spend their day here at the site but if you want community involved, I think that's something you have to take a look at. Originally this thing started midafternoon somewhere but it might be reasonable to change it. It would screw up the tours that you take almost as bad as having transportation because you'd only have a couple times when you'd have enough light to do it that late.

The other thing is looking in this book here that they spent $5 million thus far on remediation and they're projecting in addition roughly $34 million to be spent, my concern is how much of that is going to be paper and studies and how much of it is really going to be really getting the contaminants out of the ground, out of the water and cleaning it up? Does anybody want to answer that?

MR. COLTER: Yeah. I generated that. Our process is an investigation program, design, construction of a remedy, construction of any interim remedies, and finally and probably the biggest piece of that 33 million is long-term operations of all remedies that we plan on putting on the site here. That was generated probably three years ago. We have a program that does a real rough cost estimate based on certain inputs. In fact, three years ago we hardly knew much about -- we knew we had groundwater contamination at a couple sites. A couple landfill sites we assumed we had groundwater contamination. So that's the worst case scenario shown in there that if all six IR sites we're dealing with have contamination and you put a pump and treat system at all six sites based on some acreage and overall assumption that you run those systems for 30 years and operate and take samples on a quarterly basis, you can see that that last piece of the pie for 30 years of operation generates that $30 million that you see there.

RAB MEMBER: This only goes out some 14 years.

MR. COLTER: Well, we go out to 2015 but our 2015 number is the difference from the -- say if you took 2000 as the baseline, 2030 minus operations for 15 years so that's a 30-year number. Most of that 33 million is operations of like six pump and treat systems. What we know today is that's not going to happen. And every year we get another decision from the EPA to close out a site or to get a remedy in place. We have better costs, actual costs than that rough program. So as each of those books are generated, you should see a decrease in that long-term number.

RAB MEMBER: The numbers from Warminster are almost done and they're much, much more lower because they're much more accurate.

RAB MEMBER: $25 million.

MR. EDMOND: But see how it's a straight line? They know what the problem is. The remedies are in place. Now it's just operating those remedies until the groundwater is clean.

MR. COLTER: We do that

because we have to show Congress what we may need in the future as far as appropriation and cleanup dollars. You see, that book is for all Navy sites. That's what they use when they go to Capitol Hill.

MR. EDMOND: They use worst case scenarios.

MR. COLTER: Yes. Our worst case scenario is we'll be putting a pump and treat system in six sites. We already know now that's not going to happen. So as we go down the road, as April said, in a more realistic scenario you have more realistic costs that are more accurate.

RAB MEMBER: This is February 2000, only a couple months old, and your data may be a couple months prior to that.

RAB MEMBER: Couple years prior to that.

MR. COLTER: Cost estimates used in that were developed in 1997. And we haven't gotten to a point where regulators have agreed we don't need a pump and treat system. So we're still running on the worst case scenario at a couple sites that we're fairly sure won't do any good, do another remedy like maybe monitor natural attenuation, maybe an ORC that's a lot less expensive to install and a lot less expensive to operate than the worst case pump and treat system.

RAB MEMBER: Thank you.

MR. EDMOND: As Jim was saying, as this moves along, we're pretty much held -- I won't say held up but for loss of a better word by EPA. They have to make the decisions. When EPA allows us to say, okay, that site can be cleaned in this way, then Jim will make a realistic cost of the cleanup and long-term cleanup. As he was saying, these are worst case scenarios because no decisions have been made by EPA on any of our sites. We're working on worst case scenarios until EPA makes final decisions and we as the Navy and EPA sign off on it and say, okay, this is what we're going to do. Until then, he has to abstract those costs. And it's -- being in the military, it's better to abstract your costs high and say, hey, here's the money back than to come in low and say I need 15 million more dollars.

MR. COLTER: Part of that 33 million, small part of that is money for next year, money for 2002, money for 2003. If I were to assume a decision that we think we don't need to do work at the site and I ran that, that money would go to another site where somebody says I need it. If the regulators are going to come in and say we disagree, we think you need to do this and we negotiate, then I've lost that money and that remedy goes to the back of the line for lack of a better term. So until decisions are made we keep -- at least I do. I keep the money assumed worst case and pretty high so next year if the regulators say we want you to do something, there's money there to do it.

RAB MEMBER: In other words, everything's inflated.

MR. COLTER: Yes.

MR. EDMOND: For loss of a

better word.

MR. COLTER: But it's based on the program. That's the flaw of the program. It's a very rough cost estimating program. You only input a couple questions and it generates cost, acreage, things like that. It's not very accurate but it's a budgeting tool for Congress to say what's the prognosis for the Navy's cleanup program, not so much what's the exact prognosis but what's it looks like.

RAB MEMBER: You have a Congressman sitting down there saying we need some of that money.

MR. COLTER: Right, hopefully.

MR. EDMOND: That's why you go high so he can't get his hands on that money.

And about the 7:30, what I'd like to do is have the community members think about it. The next meeting we'll come back and discuss if 7:30's not a good time, if 6 o'clock is not a good time, what would be a good time for the community.

RAB MEMBER: 6:30.

MR. EDMOND: As long as you get a good cup of coffee, John, I know you're coming. Any other community input? Okay. I'd like to apologize again for the poor tour or lack thereof a tour. I'll get to the bottom of this tomorrow.

Air show tickets, like I said earlier at the beginning, are in the mail. Check's in the mail. No. But if anyone doesn't receive tickets or you need a couple extra tickets, please feel free to give me a call and I'll try and work something out, but call me as soon as possible. The air show is next week and these things will go fast.

Finally, anyone who has a community group, civic group, children, boy scouts, want to use our nature trail, today we got the signs that identify plant species, animal species. Please call Sheri Jones, PPO, and she can arrange that. The nature trail is over a mile long, a couple ponds, bridges, very nicely done.

Lastly, I set the date for

the next meeting. 13 September was a date that I chose because it was after Labor Day. It's on a Wednesday night as normal. Anyone have any complaints with that? Or we'll etch that in stone. Then etched in stone the 13th of September after Labor Day. I wish you all a happy summer. And I hope to see you at the air show.

I hereby certify that the foregoing is a complete and accurate transcript of the proceedings and evidence as reported stenographically by me and transcribed under my supervision.

Kimberly A. Overwise

Kimberly A. Overwise
Registered Professional Reporter