The Technical Review Committee meeting was held on 20 February 1992 at Building #1, Marine Corps Base, Camp Lejeune, North Carolina. The meeting commenced at 1307 with the following persons present:

George Radford, EMD, Camp Lejeune
Laurie Boucher, LANTDIV
Jack Butler, NCDEHNR
Tom Dickey, NCDEM
Ray Wattras, Baker Env.
Michelle Glenn, EPA Reg IV
Glenn Adams, EPA Reg IV
Tom Augspurger, U.S. Fish & Wildlife
Jerry Bittner, City of Jacksonville
Byron Brant, LANTDIV
Nina Johnson, LANTDIV
Debra Pickett, EMD, Camp Lejeune
Lynn Srinivasan, Baker Env.
Major D. Mercier, EACO, Camp Lejeune

RADFORD: I am George Radford with the Environmental Management Department here at Camp Lejeune. I started here, came down from Cherry Point about mid-January and have just picked up the IR Manager's job, and I think I've talked to everybody on the phone and we've had some meetings with EPA and the state to iron out some situations and some changes in personnel--that type thing--prior to the TRC meeting. Probably I think we would be best served by going around the room and introducing--each person introduce themselves so that we know who everyone is. I'd just like to say that I welcome you all here to the TRC, and I think we'll probably pass it to Ray Wattras here on the end with Baker Environmental. He's going to do the presentations for some of the sites. Hopefully for some of you that are somewhat unfamiliar with Camp Lejeune, it will help you get up to speed on the sites and help you know what we've done and what we plan to do in the future. Okay.

(Each person present introduced himself.)

WATTRAS: Let me begin with an overview. Obviously this is the Marine Corps Base, Camp Lejeune area. It's roughly 170 square miles in total area.

(Throughout Mr. Wattras' presentation, he referred to a series of diagrams or maps which were placed on an easel.)

WATTRAS: We're going to talk about four areas today. The first area we're going to talk about is the Hadnot Point Industrial

area. It's located right here on the map. And just to get an idea of where we're at, we're located in this building right in this area. So the Hadnot Point Industrial area is just a short distance away.

Another site, Site #6, is located along Holcomb Boulevard here. There's actually two areas of Site #6. Lot 201 is located in this white area and Lot 203 is this area where you can see it's whited out. Another site that we're going to talk about today is Site #48. It's located at I guess what's referred to as the "Air Station". It's located right--pretty much right here. There's a small cove of water, and it's a former photography lab building up in here. We'll get into that a little bit later. That's the location of Site #48. Site #69 is known as the "Rifle Range Chemical Dump" and it is located down in this area.

The reason I wanted to just show everybody the locations is to have an idea that these four sites are really not close to each other. They have nothing in common. They were studied primarily because of what was thought to be their highest priory sites. Is that pretty much correct, Laurie?

BOUCHER: Yes.

WATTRAS: Okay. This drawing here is the Hadnot Point Industrial area. That's the one that's located right along Holcomb Boulevard. The area--for purposes of defining it--is located between Holcomb Boulevard, Lewis Road--which runs in this direction, the Main Service Road--which is just right out of the picture here, and Sneads Ferry Road along the northern boundary of the area.

Hadnot Point Industrial area consists of around 75 buildings. Some of these buildings are offices, some are warehouses, storage facilities, commissaries, maintenance shops for heavy vehicles, and as you can see here, everything from racket ball courts to--I believe even a Burger King in that area down there is located within Hadnot Point.

Years ago, another engineering firm known as "Environmental Science and Engineering"--or I'll refer to them as "ES&E"--conducted a record search of the facility, and through the record search, they identified a number of areas of concern. One area is located--and we refer to it throughout the study as the 900 area--it is basically a combination of buildings used for vehicle maintenance where they--through the record search, they identified an underground tank that was used to store TCE. The tank size was roughly 440 gallons. They did degreasing operations allegedly in this area.

Another area of concern was down here and it's referred to as the "1200 area". Again, it's another area involved with vehicle maintenance. Reported areas of drum storage areas and again, some unknown alleged underground storage tanks in this area. The third area is referred to as the "1600 area" and just to clarify, the way we came about these area numbers, these buildings begin with 901, 902, and 903, and so forth. These building numbers are in the 1200--actually some of them are 1300. And down here, these buildings--the identification of the buildings is the 1600 numerical system. Again, this is another area that had documented use of solvent from vehicle maintenance through degreasing operations.

Now, there are two areas that are identified as "sites". Site #21 is a transformer storage yard. It has not been studied to date. It will be studied in the future. Site #22 is the former fuel farm area. It has been studied. In fact, right now they are on the verge of implementing or operating a pump and treat system because of floating product on the ground water where it's floating jet fuel on the ground water.

Now, what I want to talk about though--we'll exclude a lot of discussion between these two sites because they are being handled separately, and maybe now is a good time, Laurie, to briefly explain--or I could and you can maybe jump in when I say something incorrect or whatever. Site #21 will be studied in the near future. We're going to consider it as part of the Hadnot Point Industrial area. It makes sense--it is within the boundaries of the area.

Site #22, we're looking at turning that over to the RCRA side because it's an underground storage tank facility.

BOUCHER: This is Laurie Boucher. We'll be turning that over to the USTA which is handled by the state of North Carolina.

WATTRAS: That's correct--the Underground Storage Tank and--

RADFORD: George Radford--it will be North Carolina Division of Environmental Management predominately out of Wilmington, and they're already in--I think Mr. Dickey is already aware--we've got a pump and treat system built and are working the bugs out in getting it operational right now.

WATTRAS: Okay. Let me go on by saying, some of the studies that have been performed by ES&E included following the RCRA search when they identified the areas of concern. They then conducted what is referred to as a "soil gas investigation", and the soil gas investigation, you perform one to help identify soil and/or

ground water contamination. Specifically, when you talk about solvent use, you think of some chemicals that are known as trichloroethylene which is commonly referred to as "TCE". The soil gas study, when they performed it, they punched--for lack of better words--shallow bore holes throughout these areas. They extract air from that bore hole, they run it through a field chromatograph--gas chromatograph unit, and it reads out a result, and it's an estimated concentration of the total volatiles within that air column of sample. They identified very high readings of TCE in those samples around the 900 area and around the 1200 area and the 1600 area. So the soil gas study confirmed the records search that because of the former use of solvents in this area, there was a possibility that it had gotten into the soil and/or ground water.

Following the soil gas study, they installed some monitoring wells and they augered some test borings. The test borings--I believe there were roughly ten borings in each area, and they located the borings in those areas that exhibited the highest soil gas readings, and they were primarily around Building 901 and 902. In fact, right here is the one TCE underground storage tank that I mentioned previously. So we have ten soil borings in each area, and again, they were in the areas which exhibited the highest soil gas readings.

They also installed throughout the years in different stages a total of 30 shallow monitoring--27 shallow monitoring wells, seven intermediate wells, and eight deep wells. And let me discuss a little bit about the geology and hydrogeology of the area. Hadnot Point is underlaid by two flow systems. One flow system is a shallow aquifer. It's estimated to go down to a depth of around 25 to 30 feet. The other aquifer is known as the "Castle Hayne Aquifer". It is the aquifer which roughly would cover the distance 30 feet to as deep as 300 feet. Below 300 feet, the water has reported to be brackish and unusable. So fresh water does exist for the top 300 feet, for the top two flow systems, the shallow and the Castle Hayne.

These shallow wells are identified as these wells in red, and unfortunately I don't have--maybe I should leave this drawing out so you can see and correlate the location of wells with the areas of concern. The shallow wells are in red. The green wells--the way they coded them, the designation--when you see a "dash 2", that stood for--those wells were what they called intermediate depth wells. They monitor the ground water at a depth of around 75 feet. The red colored wells monitor the ground water at approximately 25 feet. So those wells--the data that they obtained from the red wells represent the shallow flow system. The intermediate wells would represent the upper portion

of the Castle Hayne. Wells where you see a "dash 3" next to it are deep wells. Those wells are approximately at 150 feel below the ground surface. And also, there are a number of former potable water supply wells, all of which have been closed down because contamination was detected, primarily low levels of TCE and benzene. The benzene--I kind of jumped over that issue before when I talked to you about solvent use in the area. But this former fuel farm right here has the floating layer of product, and the constituents that are associated with jet fuel in a lot of cases are what are known as "BTEX" or benzene, toluene, ethylbenzene, and xylene. So these potable water supply wells are closed.

Now the results of the investigations--let me start with the soil. It was somewhat of a surprise due to the high soil gas readings that were detected that not much soil contamination existed. They found low levels of volatiles in the 900 area and naturally in a limited number of bore holes. Maybe one or two bore holes exhibited the contamination and the rest were really clean. The same down at the 1600 area, down in this area. A couple of the bore holes did exhibit low levels of volatiles such as TCE, but it was limited--again one or two bore holes.

The 1200 area--which is right here--right in this area, they took some samples and they were--as high as the soil gas readings showed, they really didn't find anything with respect to volatile contamination in the soil. Now, the ground water though however has correlated very well the soil gas, and what we have found to date are three source areas. We definitely see a pattern of ground water contamination up in the 900 area. There are very high levels of TCE and other solvents in the shallow aquifer. The intermediate wells also showed solvents but to a much lesser degree. For example, the shallow aquifer, where it may be as high as a thousand parts per billion of volatiles, the intermediate was much less than that--maybe a total of around 100 parts per billion. The deep wells were even less than that--trace levels at best in some of these deep wells.

The same thing with the area down here. We found very high levels of volatiles in the shallow, lower levels in the intermediate, and the deep showed even lower levels. This tells you--let me just summarize that right now. What you have is a downward migration. These aquifers are not confined. That means that contaminants in the shallow can make their way down into the deeper portions of the aquifer. And as I mentioned before, these potable water supply wells which are shown with the block around them, at one time back in the mid-80's when they sampled them, had levels of TCE and benzene that were above what's referred to as drinking water standards. When they were recently sampled

back in 91, they showed much less contamination and we think one reason might be because once they were shut down and pumping was discontinued, the migration of contamination from the shallow to the deeper portion of the aquifer was slowed down. The pumping influence of these potable water supply wells, therefore, could have--we'll say--made matters worse, because of the fact that you're drawing contaminants down through these different flow systems.

This area of the fuel farm, we have two plumes, the TCE plume moving in this direction, and ground water flow--if I could just back up--ground water flow in the northern part of Hadnot Point is pretty much west/southwest, so it's sort of in this direction right here. Ground water flow in the southern part of Hadnot Point is more to the southwest direction. So we have two TCE plumes or two solvent plumes, and we do have a plume around this fuel farm that's associated with the BTEX. Maybe what I could do--unfortunately, I don't have a figure that shows what these plumes look like, but maybe you could pass around this report here. I'm not sure if some of you have this report, but there are a number of figures--in fact, it might be easy just to take these right out and pass them around for everybody, and you can take a look at what's defined as the plume area.

I guess right now, and we can save a lot of questions for the end, but does anybody have any questions on something that wasn't clear or anything like that? We can get into more questions later on.

I should talk about the lead that we also found in this shallow aquifer. If you can just start passing these around, it discusses the different plumes. (Referring to some documents he had removed from a set of documents.)

Lead, of course, was found in high levels beneath this fuel farm area in the shallow aquifer. We found lead pretty much associated with each area of concern, both the 900 area and the 1600 area, and right now we're not sure whether these are random hits of lead or whether they are due to additional sources, but we found a hit of lead up in this area and I believe down here in Well 14. Neither area that we know of right now--we're not quite sure why these wells had elevated levels of lead, and when I say "elevated levels", for purposes of clarifying that, I'll refer to that as levels above the drinking water standard which is 50 parts per billion. So there is also a lead problem in the shallow aquifer.

The way we're doing this project right now, we are going to--we're looking at ways of cleaning up the shallow aquifer and we

are performing what is known as an interim remedial action on the shallow aquifer. It's something that we want to start cleaning up. We know we have a problem in the shallow aquifer. It may not be the final solution, but we feel we have enough information that we could start cleaning up this shallow aquifer. There are really five alternatives involved that we looked at. One alternative involves no action, and as some of you are aware, you always have to evaluate the "no action" alternative as a base line against the other alternatives. The second alternative would be to construct--or install extraction wells in each of these two plumes, the one around the 900 area and the one around the 1600 area. We would start out with four extraction wells in each area. Two wells would be placed near the "hot spots" and the other two wells would be placed near what we know as the boundary of this plume. We would like to try to contain any further migration from the source area. The same thing down here--a four well configuration where we would have two wells near the hot spot, which appears to be down in this area, and two wells just down-gradient to help contain any further migration because the plume is going in this direction. The wells would be phased in over years. Initially, we would have four wells in each area pumping at a rate of five gallons per minute per well. So 20 gallons per minute down in this area; 20 gallons per minute up in this area.

Over the years what we would do, after year one, we will take samples as this alternative is being implemented, and we would also monitor other wells in the area. But we may make the decision that we need more than four wells. The decision may be based on the fact that four wells just isn't containing--the influence of the four wells is not sufficient to halt that migration. So we would go in as part of this alternative and install four other wells. Locations, we don't know right now. They're going to be based on more field data as we learn more about how this aquifer acts. We could then make better judgments on well placement. We may not put any more wells in. Four wells could be sufficient in containing the plume and reducing the levels. So that's one thing about ground water cleanup. There are a lot of unknowns. It's not an exact science like building a bridge or anything like that where you have sound mathematical formulas that you use. There are a lot of unknowns in groundwater remediation, and we feel going in with a phased approach versus putting in 16 wells in each area would be more sensible and cost effective.

Finally, if eight wells aren't enough, we will consider going back one more time and installing possibly four more wells in each area. My point is and what I'd like to stress is our approach is phased because of the unknown factor. Four wells may

be sufficient, and this is a learning process over the years that we implement this alternative.

Now once we pump the extracted ground water, we looked at four alternatives. One alternative would be to treat this water with a carbon absorption unit. Let me back up one second. Before we even treat the water through a treatment system, we would need to pre-treat it because of the high iron and other metals found in the aquifer, and we would also run it through an oil/water gravity separator in case we did run into any type of product. That would definitely cause a problem with your system if you started the pump and you got some sort of floating--or sinking layer in this case. So the alternatives that I've discussed, all of them include chemical reduction to get rid of any metals, and it also includes running the ground water through an oil/water separator.

We looked at four alternatives. The first one is carbon absorption. Carbon absorption, we feel is a proven technology for remediating solvents. Once we would--we would actually have two units, one in each area, and the units would discharge to the surface water after treatment. So one carbon unit would be up in this area. I believe for purposes of this investigation, we focused around this area which was a clear area, and down here, here's where most of the pumping would go I think. But nevertheless, there are two units that would be involved. Another alternative involves air stripping. Again, two units would be installed: one in this area where we're going to remediate this plume, and another one up above. A third alternative involves the pre-treatment that I've discussed, the chemical reduction and the gravity oil/water separator, and we would discharge it into a sanitary sewer line which would then take it down to the Hadnot Point Sewage Treatment Plant which is located off of this figure, adjacent to the New River down here. The Hadnot Point Sewage Plant consists of an aeration lagoon, equalization basins or primary sedimentation basins, and a biological trickling filter. It would then be discharged to the New River.

BITTNER: Why is waste after air stripping?

WATTRAS: Pardon me?

BITTNER: Why is waste after air stripping? I'm aware of some success with air stripping where water was able to be reused for potable purposes.

WATTRAS: We would have no place to--we can't reinject the water. We wouldn't want to use it for potable water. We could send it

in a--it could either be sent right to the stream or after the air stripping--which isn't discussed as an alternative--the only other place to send it would be to the Sewage Treatment Plant. But our thought was, "Why clean water to mix it with sewage again?"

BITTNER: That's my question.

GLENN: This is Michelle Glenn. On this particular--right now what you're hearing is kind of proposed, and it's being evaluated in that report. I don't think that those type comments can really be addressed here. There will be a public comment period when you can make that same comment, and we will sit down and actually consider it as opposed to just giving you an answer right now. It takes a little more consideration, I think, if you're proposing an alternative to what's being presented, and to just look at it just briefly--

BITTNER: I'm not proposing an alternative--I'm raising a question.

GLENN: Well, it's a good question though and it should be raised officially on the record. I think that that is something that we need to look at and make sure that we're clear in our decision making as to why that wasn't considered or, if we should have considered it, how do we want to evaluate it>

JOHNSON: Would you repeat the question?

BITTNER: Why discharge the--from the air stripping process, why discharge it to waste, to a sewer treatment plant, when it's clean water? I'm aware of some results through air stripping where it's been reused in the potable water supply.

WATTRAS: Okay. Well, originally I misunderstood your question. I thought you were asking why are we discharging it to a surface water as opposed to reusing it?

GLENN: I think the question has to do with "Why are you discharging it--

WATTRAS: To the surface water.

GLENN: Exactly, as opposed to using that water since you've already used the resources to clean it.

WATTRAS: Okay.

GLENN: And that's certainly something we should consider when we're evaluating comments on what we propose.

WATTRAS: Okay. The final alternative involved sending it again to the Sewage Treatment Plant for a period of approximately three years. There may be a possibility that the Sewage Treatment Plant at Hadnot Point could exceed their capacity because of other sewage treatment plants at the base closing down, and that these other sewage treatment plants would then have to send their water to the Hadnot Point Sewage Treatment Plant. So what we came up with was another alternative that for the first three years, we would--while the Sewage Treatment Plant had the capacity, we would send it there. And they are building a new sewage--they are looking at alternatives--Camp Lejeune is looking at alternatives right now of either building--constructing a new sewage treatment plant or modifying the existing sewage treatment plant. Is that correct, George?

RADFORD: George Radford. There are several things going on. We are looking at kind of a two-phased approach right now to modify the Hadnot Point plant, to accept some flow from other parts of the Base as we shut down other plants, and some treated flow that would go out after the plant to a common out-fall to the river. You're probably familiar with what we're looking at. We are presently negotiating an SOC, Special Order by Consent, with the state as to how we would go about and what the schedules would be and when we would start construction. But there will actually be two phases of construction. There will be a phase to bring some of the flow to Hadnot Point, and then I believe the date is '99--by 1999, we're proposing that we bring all the flows to Hadnot, either treated or untreated, and they would all go out a common outfall from both the north and southern ends of the base.

And, Mr. Bittner, to get back to your question, I think one other concern as far as what we could do with that water after it comes out of an air-stripper--and, yes, you're correct, it could be below all detection limits and be, in effect, clean water. We would have to be concerned with North Carolina DEM and the ground water standards and what they would allow us to do with that water after it comes out of the system. That would be another concern that we would have to look into.

DICKEY: Tom Dickey with North Carolina DEM. That water can be--I don't want to say "reinjected" because injection wells are illegal, but it can be infiltrated back into the ground through an infiltration gallery.

WATTRAS: We have talked about that aspect. We're not sure whether this--because of poor drainage--that would work very well, but we haven't ruled--you know--it could be considered.

Okay, that last alternative--like I said--the first three years we would send it to the Sewage Treatment Plant. At that period where it could not accept the flows, we would provide portable or temporary carbon units to treat that ground water until either the new sewage treatment plant was on line or the existing one was renovated where it could accept our flow. So the last alternative is an off-shoot of the previous one, and it was added because of that possibility that the Sewage Treatment Plant could exceed its capacity down the road.

Now, the capacity--like I said-- it's not because of our flows. We're talking about flow rate anywhere from 40 gallons per minute in the initial year to worst case--we'll say 160 gallons per minute. Our alternative isn't--we'll say--the straw that breaks the camel's back. It's really the other sewage treatment plants. We're talking there--you know--hundreds of thousands of gallons per day as opposed to our flow. So, I just wanted to clarify that. It's not this alternative that's really--we'll say--impacting the capacity of the Sewage Treatment Plant. It's the fact that other sewage treatment plants would be shut down, and that's the real problem with the capacity at the Hadnot Point Sewage Treatment Plant.

So that is what is going on at present at Hadnot Point. There is work going on right now by O'Brien and Gere at the fuel farm, and they are doing a recovery system of the product, and we're looking at doing something for the shallow aquifer. We want to continue studying the deep aquifer because of the fact that--you know--we had potable wells shut down, and we would look at cleanup alternatives of the deep aquifer down the road. And the same things with soils. The soil problem has not been--it's still being studied. It is not over yet.

Right now might be a good time to take any questions on Hadnot Point because after this discussion, we're going to talk about three completely different sites. We can open up the questions right now.

RADFORD: Does anybody else have anything they can think of?

JOHNSON: Nina Johnson. Did you say that in the absence of pumping the deep wells, the natural flow is downward and not upward from the deep aquifer?

WATTRAS: Previous hydraulic tests by ES&E did say that there was definitely a connection between the aquifers. I don't think there is enough information to say that--or I don't recall seeing the report coming out and saying that there is a downward, natural migration. I believe the migration was more of the influence of the pumping wells.

JOHNSON: I think you said that. I think you said that there is a downward migration, even without the pumping.

WATTRAS: I don't think there is enough information to know for sure at this point.

BOUCHER: This is Laurie Boucher. There is indication that the ground water flow is from the shallow to the deep aquifer, that it's a vertical, downward gradient under down conditions.

WATTRAS: Under natural conditions--okay.

BOUCHER: I'd like to clarify with Mr. Bittner. Your question, was that in reference to the discussion in general, or was it with respect to the feasibility study report or the proposed plan?

BITTNER: Just general discussion.

WATTRAS: Any other questions?

(Negative response.)

WATTRAS: All right. We're going to talk about Site #6 right now. I mentioned before that Site #6--I showed you two areas, and both areas are referred to as Site #6. It's located along Holcomb Boulevard. This is Lot 201 and this is Lot 203. We are studying each lot separately. Although both lots are called "Site #6", there is not a whole lot in common between them, and we felt it was best to look at each one separately as opposed to as a whole.

Lot #201--and this is not to scale--is roughly 25 acres in size. It's fenced-in right now. It's used as an active storage lot for things like lumber, compressed gas. When I did the walk-through, there were non-PCB transformers stored there. Vehicles were stored in the area. But historical information--this goes back to I guess 1983 when air and water research did what's called an initial assessment study. They identified that there were three areas that they stored pesticides and PCB's. The pesticide storage areas are identified here with the "A" designation. The PCB storage is this area "B".

A previous contractor on this entire area installed eight borings. He took one sample from each boring. We assume that the samples were taken in these three areas, but we have no documentation, unfortunately, where the actual locations were taken. They did find low levels of pesticides. It's kind of hard to qualify what "low levels" mean. They were approximately .1 to .2 parts per million. Generally speaking, I would consider that low on my judgment, but nevertheless, that's what we had known about the soil--that there was some soil contamination at Lot 201 and it was the pesticides.

They also installed five monitoring wells. The wells were placed pretty much--most of them were placed up at the western edge of the low. One well was placed down in this area. They sampled the wells, they analyzed the samples for volatile organics and PCB's and pesticides. They may have analyzed the samples for volatiles with the unknown certainties of what may have been stored here. It really isn't quite clear why they looked for volatiles when the area was primarily known as a pesticide and PCB storage. But nevertheless, the results of the ground water showed that there were no volatiles detected in the monitoring wells, nor were there PCB's and pesticides. Let me just state, here was one volatile--I shouldn't say "no volatiles". There was chloro--if someone can help me--there was a volatile. It was very low levels and I have it in my "cheat sheets" here. It will just take a minute to find that. Carbon disulfide was detected in that well, 6GW6 at 10 PPB. Inorganics exceeded federal or state water quality criteria, and some of the inorganics included iron, chromium, lead, manganese, and barium. That includes all wells, what are to be considered up-gradient wells and down-gradient. Now, unfortunately, I mentioned a lot of the wells were installed up in this area. The ground water flow is primarily in this area, going towards Bear Head Creek. So what you have here is really one down-gradient well from both of these two areas, and if you don't really known anything about the down-gradient quality, down in this area coming from say this storage area "A".

Samples were taken--surface water and sediment samples were taken along Bear Head Creek. They found pesticides in Bear head Creek. Now, they only had two sampling locations. One, I believe, was on this side of Holcomb Boulevard, and the other sampling location was on this side of Piney Green Road. What made things confusing was that both sediment samples showed pesticides in them, and the up-gradient sample showed higher levels than the down-gradient sample. So that's a concern of ours. We're not quite sure whether the contamination in Bear Head Creek is due to Lot 201. Surface drainage--and when we walked the site, it appears that surface drainage would drain

down to this area. When we also walked the site this past September, we identified what we refer to as an "intermittent drainage area" which pretty much looked like a man-made ditch. There was a culvert right here and I don't believe we identified where that culvert lets out. It could let out in Bear Head Creek but we don't know right now. So most samples were taken from this intermittent drainage ditch to date. There is even a possibility that there is really no migration pathway due to this intermittent draining ditch from the site to Bear Head Creek, that this ditch would intercept it. In fact, the topography is even--I believe it's a little bit higher out in this area, which would prevent any overland migration of soil coming from this lot, and again impact in Bear Head Creek.

So in summary, historically what we know about this are that, yes, there are low levels of pesticides within--somewhere within these storage areas. Again, the location--we do not have any information on where they took the samples. Ground water quality is impacted by inorganics. It appears to be free of volatiles and of pesticides but, again, we could use another--a little bit more information on the ground water. And we do know that Bear Head Creek is impacted by pesticides. We're not so certain the source of the pesticides is really from Lot 201 because of the fact that up-gradient sampling locations showed higher levels of pesticides than the location which is adjacent to the site.

What we're proposing to do, we are going to do more sampling out here because there's really--from a perspective of trying to determine what's the problem and determining how to clean up the problem, there's a lack of information to date. Let me show you what we're proposing. Initially what we're going to do is we're going to take more samples in both areas "A" and "B". We're pretty much going to put a 50 by 50 foot grid in this area. We're going to obtain soil samples from the surface, which would be considered the top six inches of soil, and at a depth right above the water table, which would be between four to six feet below ground surface. So in this area, we would be collecting 32 samples and we would be analyzing those samples for pesticides. Down in this area, we would analyze them for both pesticides--same thing--we're going to put a grid in, 16 samples--or 16 locations, 32 samples. We would analyze these samples below here for pesticides and PCB's. The reason we included pesticides was for the possibility that you could have run-off coming down into this area.

Back up into this area "A", again, 16 shallow borings with a total of 32 samples collected, analyzing them for pesticides. We also need to take some background samples because--especially

when you look at inorganics. What might appear to--if you have levels of lead or iron in your soil, without comparing it against something that--what we consider not impacted by past activities--and you can note that this area is wooded up here, so we have to assume nothing took place back there over the years. We did do a walk-through. Nothing appeared to be disturbed, so we felt that this could be representative of background conditions. So we are going to take some soil background samples. We're also going to take some samples where these yellow markers are, up soil to assess whether there's anything from surface run-off leaving this disposal area. So we're going to take samples on both sides of this intermittent drainage ditch.

Now, once we look at these results, we may have to go back in. For example, we take some samples from this area and we find that two or three of the bore holes exhibited high levels of pesticides. We would most likely have to go back in to take more samples to quantify what is--how much soil was really impacted. That would be done in all three areas after we looked at what we call the Phase One data. The same thing would happen out in these areas where if we identified something--if something came up in Phase One, we would probably have to go back in to take additional samples to quantify the total extent of contamination.

With respect to sediments and surface waters, we planned on taking surface water and sediment samples from this intermittent drainage area. Nothing has been sampled there to date, so we have no idea whether this ditch is impacted at all. For right now, we chose three locations. This one is pretty much the most up-gradient location obviously adjacent to the site and below the site area. If, for example, we found contamination in all three areas, that would probably require us to go through, quantify the total amount of sediments that would require remediation.

Bear Head Creek--I mentioned before--we only have two samples taken before, one down in this area and one up in this area. We feel this creek needs to be looked at much in more detail. We propose a total of six sample locations along--again up-gradient in the site area and down-gradient up Holcomb Boulevard. We would take samples from both banks and from the center of the stream. These samples again would be analyzed for pesticides, PCB's, and I believe I did not mention inorganics when I was discussing the soil. It goes the same for the sediments. We do want to look at inorganics in these soils because of the pesticides and some of the things that might be arsenic and so forth.

With respect to ground water, we propose to take another round of ground water samples. We wanted to add one well in the

area and that well would be representative of the down-gradient location from this area "A". The ground water samples would be analyzed for pesticides, PCB's.

Just let me look on my cheat sheet and see if I covered everything about his investigation. (Referred to some documents.)

GLENN: This is Michelle Glenn. Where you have the sediment samples shown on Bear Head Creek, can I assume that if there is water present that you'll take the surface water also.

WATTRAS: You're right. I did not mention that, but, yes, surface water samples would be taken. Again, if there is water in the intermittent drainage area, we will take water samples, and Bear Head Creek obviously has water in it all year round, and we would take water samples from those locations.

One reason we want to take it from each bank again goes back to, we're not sure why we're finding pesticides in Bear Head Creek to begin with, so we'd like to at every one of these stations, it pretty much involves taking a sample from both the bank--this side of the bank, that side of the stream, and from the center of the stream.

Just recently, we just--there could even be some influence from a trailer park up in this area. So we have to consider that. It may require adding another sample location even up-gradient of that trailer park. Pretty much, Bear Head Creek, there's not much more to it. It goes off the map here, but if we added one more sample location, we may have that creek characterized from its source to down below the site.

Okay, one important thing that I didn't talk about yet regarding this site, we plan on doing an aquatic study of Bear Head Creek. We know we have pesticides in the sediments. We planned on doing a benthic study at three sampling locations where we would assess any stress to the benthic community. We would have one sampling station up-gradient of Piney Green Road, one sampling station adjacent to the site area, and one down below Holcomb Boulevard. In addition to the benthic study, we do plan on doing fish population studies to assess any stress to the aquatic community, and also to collect fish samples for tissue analysis, and obviously we're looking for pesticides, PCB's and inorganics when we do those analyses. So we did consider the environmental impacts associated with what we feel is the most important environmental area, and that would be Bear Head Creek. Any questions?

BITTNER: What were the level of pesticides?

WATTRAS: The level of pesticides that they found to date--I believe I said they were about .1 or .2 part per million. Let me just check, because I think I wrote that down. Okay, .14 to .17 PPM, so I was a little bit low when I said .1 or .2. So it was in general less than one PPM for pesticides that were detected. No PCB's were ever analyzed for at this site to date.

AUGSPURGER: Are those levels also from Bear Head Creek or are they from the site itself?

WATTRAS: No, those were from soil samples. Let me just see if I have anything on the sediments here. Okay, the sediment concentrations were .07 part per million or approximately 70 parts per billion pesticides. And in a previous study, it did say that they were detected in both samples and the upstream exhibited the higher levels.

AUGSPURGER: This is Tom Augspurger with the Fish and Wildlife Service. I have a question about the sediment sampling, and it applies to all the sites. Are the sites chosen in any way other than special distribution? Like, is there going to be a targeting of depositional areas? In some of the documents it said that they have seen some scouring effect there, and if you just space out the samples along that transect there, it may be that you're sampling a sediment that's real tightly packed sand or clay, and you're not going to get anything there.

WATTRAS: That's a good point. We will take that into consideration and you may--I don't believe we exactly--we may not have said that in our plans, but you're absolutely right about areas that would fall into that category. But, no, as of today, we have not discussed that aspect. We were pretty much identifying general areas to correlate it with site impacts.

AUGSPURGER: I think it would be important during a site recon--get out and walk the site to look where these depositional areas have been or a place where it might broaden out, because you might not find anything in that straight stretch, and .07 is not a lot to start out with.

WATTRAS: No, it's not.

AUGSPURGER: I mean you could probably find that anyplace in the coastal zone because of historic use of DDT for mosquito control.

WATTRAS: Exactly.

AUGSPURGER: And also, I don't think it was in any of the document, but it might be, is there going to be testing of the physical parameters of the sediment, like TOC and grain size, so that you know whether or not you're comparing apples and oranges, like a sand or a silt?

WATTRAS: We received that comment from EPA; we'll definitely consider that. But, to date, we did not, and my risk assessment person is shaking her head--she believes that's an important parameter, so most likely we will be doing that.

AUGSPURGER: Okay, we would advocate that also.

WATTRAS: The thing about Bear Head Creek, it's kind of funny--I'm from the Pennsylvania area and our creeks are a lot--they look a lot different than your creeks. Our creeks are fast-running with a lot of cobbles and so forth along the bottom. The creeks--at least Bear Head Creek and Wallace Creek, which we'll talk about later, are more slow-moving, almost would appear to be standing water. So maybe getting back to your comment about areas that would be better suitable to sample, we may not be able to visually determine that, because of the fact that the stream is kind of pretty much the same the whole way. It's just very slow, almost standing water.

GLENN: This is Michele Glenn. There were some areas that you could identify where we should definitely target to sample. It's not that straight and I think that's a good point, to make sure that those depositional areas and some of the other--I guess the inside of the curves--those kinds of places get sampled.

WATTRAS: Okay.

AUGSPURGER: It may be that you have to go pretty far down-gradient from the site toward the New River itself before you get one of those good high organic depositional areas, but a sample there would be better placed than four or five of them next to the site if they weren't--didn't have the organic content, and it could bind up those contaminants. They're not going to stick around.

WATTRAS: Any other questions on this site. There is a staff gauge located on here. We want to put one in there when we take our static water levels to help better define the hydrology of the site.

Now, as I mentioned before, Lot 201 and Lot 203--
RADFORD: Ray, could we take a break?

WATTRAS: That's fine.

RADFORD: And why don't we reconvene about 2:15?

(The meeting recessed from 2:04 to 2:20 P.M.)

RADFORD: Why don't we reconvene, and Ray will pick up at Lot 203. We talked about Lot 201 prior to the break.

WATTRAS: Okay, as I mentioned before, the two lots--they're both referred to as Site 6, but there are a lot of differences between the two of them. This lot is an inactive storage area. It is no longer used. Vehicles aren't coming in and out of it. There's a lot of debris throughout this lot. I'm not going to go down through this list, but initially, on the background information, we knew about one area up here which allegedly pesticides and PCP's were disposed of in this area. We did a walk-through in September of '91 and we identified a number of significant things that played a big role in planning this investigation. I'm just going to go through a few of them.

We learned that there were storage bins throughout this fence line. That's what these--where you see them numbered "1" through "13". They're empty right now, but at one time they were used to store something or another. We've located drums on site. There are several areas where there are either full drums or empty drums. Just real quick, there are drums down in this area. Areas 6 and 7 contain metal drums. I believe these are empty, but you don't know what's underneath or in the ground. This Area 5 also contains drums and these are the ones that Camp Lejeune is--they are actually going to remove these in the near future.

RADFORD: George Radford. That Area 5 contains some drums that were remediated previously in some soil from a previous action at this site. They are mainly DDT contamination. We have just done a sample and got the results back by FAX. We haven't got the official results back, but the FAX'd results show some DDT contamination. The drums are segregated and they're overpacked in the 85 gallon drums. And what we'll be doing with those is turning them into our DRMO, the people that get rid of the hazardous waste here on base--Defense Reutilization and Marketing Office. But as soon as we get the official results back and get the appropriate documentation and turn it in as a hazardous waste--we'll be turning that in and get those drums out of here.

WATTRAS: Basically, just to make a point, there are a lot of areas of concern on Lot 203. I'm not going to go down this list here that indexed to the figure. I'll leave it up on the side here and you can look at it yourself. There is everything from

some above ground storage tanks labeled "diesel fuel" to mine field clearing training kits to M-16 shells to--as I mentioned before--the reported possible DDT and PCB disposal area, so on and so forth.

One thing that we did note during the walk-through was this--what we referred to as the ravine. It's a very steep ravine. It eventually enters Wallace Creek. Wallace Creek does border Lot 203 to the north. This creek is used for recreational fishing. The lot is--Site 201 is down south of this lot. There are woods between Lot 201 and Lot 203. The northern border of this site includes Piney Green Road, and there's a firing range along that side of Piney Green Road, and then down here is Holcomb Boulevard to the east. Previous investigations--again, this is a 46 acre lot--there were eight samples taken. We assume the samples were taken from this area that was identified as the possible DDT/PCB disposal area, and what they found--actually there were 10 composite samples. The samples were taken zero to three feet below ground surface, and they did detect low levels of DDD, DDE and DDT. The levels are .05 PPM. So that's relatively low. Again, we're not exactly sure where the bore holes were augered.

They also installed four wells. Well #1 and 2 located north of Piney Green--or on this side of Piney Green Road, well #3 was installed just inside the fence line and near the ravine, well #4 is located on this--between lot 203 and 201 out in this area. They sampled the wells, they analyzed the wells for volatiles and pesticides. This well right here, ground water #1, consistently showed elevated levels of TCE and benzene. The source of it--we're really not sure, you know, of the source of that ground water contamination. The other shallow well--let me just go back--these wells are shallow monitoring wells--the other wells, 2, 3, and 4, were not found to be contaminated.

There is a supply well on this side of Piney Green road. This supply well, Well #651, is a deep supply well. It contains water at a depth of around 150 feet. It was found to be contaminated with volatiles.

There is another supply well on this side of Wallace Creek at a good distance away from the site that was also found to be contaminated with volatiles. Whether there is a connection between the volatile contamination in these two potable water supply wells and this site is unknown right now. The fact that you have contamination in this shallow aquifer but none in these wells doesn't give us enough evidence to provide any linkage between that deep ground water contamination.

BOUCHER: This is Laurie Boucher. I'd like to clarify for those that haven't been aware of it, we have done a site inspection of what is possibly a new site up in the northern area of Wallace Creek, because the first time we sampled on this site in Wallace Creek, we found the up-gradient samples in Wallace Creek higher than those down-gradient, and we were not convinced that they were from this particular site. So there are separate efforts to define what that source might be, and that is called Site 82, Piney Green Road. And in the future we'll have reports to you of the results of that field inspection.

AUGSPURGER: How far up the stream is it?

BOUCHER: I would say it would probably span 100 feet of the stream--I can't say exactly--but it was a pretty good length.

WATTRAS: I did want to mention--I did say that the ground water contained TCE--it also contained vinylchloride in the shallow well. Now, the surface water was sampled--surface water and sediments were sampled by ES&E, and they found in the surface water itself levels of vinylchloride and TCE in the water samples, which was a little bit surprising. It tells me that there is some problem out in this area. Again, the up-gradient sample in the surface water showed the volatiles as did the down-gradient sample in the creek. The sediments, they analyzed the sediments for pesticides, PCB's, and I believe also volatiles, and they didn't find anything in the sediments except below this ravine, they did find some polynuclear-aromatic-hydrocarbons or PAH's at this location. We're going to be studying both Wallace Creek and we have a lot of investigations proposed for this entire site, mainly because of the number of things that were identified on this site and the fact that we have a limited amount of soil data to date. Like I said, eight samples in one area, and the entire area is a 46 acre site.

Let me discuss then what we plan on doing out here. One of the first things that we're going to do--allegedly, this lot was used as one time as a burrow pit. It is now filled in. There was some information on drilling log notes in ES&E's report where a passerby came by and made a comment to the driller that a lot of things were buried at this site. So one of the first things that we want to do is perform a geophysical investigation of the entire lot to possibly identify whether there are buried drums underneath this what is now fill, or--the geophysics will tell us the metallic objects underneath. It will also help us define if it was a burrow, what is the boundary of that burrow pit. It will give us more information on what might be a former disposal area.

Another investigation that we're going to do is what is known as the soil gas study where again we would take samples throughout the site area to help identify if it was a drum disposal area--you know, if we have no idea where it is, it might help identify where these potential source areas might be. Based on the results of both the soil gas survey and the geophysical investigation, where those areas are identified as "hot spots" we would propose soil samplings with bore holes--augering of bore holes--in those areas to define what the problem is. Those samples would be analyzed for the full scan of organics and inorganics. There is also a possibility, based on the geophysical investigation, if there is a high probability that there is something buried there, we would conduct test pitting, and we would like to visually inspect what is in that fill material. So a lot of things depend on the soil gas and the geophysical investigation. It's going to dictate pretty much the rest of our subsurface investigation.

Regardless of those two investigations though, we do want to do some soil sampling, and they're identified in purple here. We do want to put in some bore holes right now in areas that--for instance, Area #5 mentioned previously, there are drums in that area right now. Some of these other areas where we want to install bore holes involve some of the above ground storage tank areas where they were labeled as a storage tank with diesel fuel. So we would do some soil sampling at areas of concern.

Another area of concern, just to give you some examples, 2930--one was an acid container storage area. So these are typical areas that we have reason to believe it's worthwhile at this point because of what allegedly may have been there or is presently there right now, we want to take a look at the soil. So those areas are identified here in purple.

With respect to ground water, we're proposing to add six wells, both a shallow and a deep well. Most likely it would be--when I say "deep well", it would actually be an intermediate well. The aquifer--again we're talking 25 feet for shallow wells and approximately 75 feet for the deeper well. This will help us--since we know we have ground water contamination in this well right here, we don't have anything down in this area to tell us whether there is any ground water contamination coming from this site. So we did propose three locations right now.

More monitoring wells could be installed based on the results of that soil gas investigation that I mentioned earlier. Again, the locations, we can't really determine them until we get those results back, because the soil gas will help us strategically place those wells.

We're planning--this ravine is a big concern of EPA and the Navy because there were a lot of things--there was a pool of batteries down in this area--we plan on taking surface water and sediment samples throughout the length of this ravine, so there are five stations there where we plan on collecting surface water sediment samples. Everything--because of the unknown nature of this site, pretty much everything is being analyzed for full organics and full inorganics. Unlike the previous site where we knew we had a focus problem of pesticides and PCB's, we cut back our sampling or our analytical parameters to just focus on that type problem. Here we have too many unknowns and we need a lot more information to characterize this site.

Wallace Creek would be sampled. Again, we'd like to take samples on both banks and from the middle of the stream at a number of six locations along Wallace Creek, and we'll take into consideration that comment you mentioned earlier about areas where sediments may be deposited over time. Again, surface water samples would be taken at those same locations.

We plan on conducting--because of the levels of volatiles in Wallace Creek, we plan on doing, again, benthic studies and fish population and tissue sampling of the fish in Wallace Creek. And again, three stations, one up-gradient, one adjacent, and one down-gradient of the site, and it would help us assess whether the volatiles in surface water are impacting the aquatic life.

Right now are there any questions on this site?

AUGSPURGER: This is Tom Augspurger again. The benthic sampling and fish sampling, those are all phase two studies, right, depending on what you find out?

WATTRAS: No, we propose those as--correct me if I'm wrong, Laurie--I believe phase one. Because of the fact that we have volatiles in surface water right now, there was justification that something should be assessed. In cases where--if we didn't know anything about the surface water or sediments, that would most likely be the scenario. Well, we would like to find out first whether there is a problem at all before we would spend the time and money to do something like that. The surface water has some pretty high levels of vinylchloride and TCE in it right now. One problem might be an inorganic study, when we talk about an up-gradient location, the fact that previous studies have identified surface water contaminant up-gradient, we have to take a second look at how far up we need to go to get that background location.

AUGSPURGER: What is the distance between those sites, roughly--between up-gradient and down-gradient at the site where they're planning now?

BOUCHER: This is Laurie Boucher. Are you asking what is the distance between Lot 203 and Site 82?

AUGSPURGER: No, between the proposed sampling sites within Wallace Creek.

BOUCHER: Ray can tell you that based on the distance of this map. It does span right across Piney Green Road and right around the center of the site and then down by Holcomb Boulevard.

WATTRAS: This is probably about a quarter mile apart between say adjacent to the site and the other side of--I'd say a third of a mile at most.

AUGSPURGER: Okay.

RADFORD: And, Ray, I think you've said it--George Radford--that's 46 acres, right?

WATTRAS: Yes.

RADFORD: I just wanted to make sure everybody picked that up to give you an idea of the size.

WATTRAS: That's one reason for a phased approach at this site is the size and the number of different areas of concern. It's really not homogeneous with respect to one type of contamination that we could run into. It could have isolated problems here and there.

Site 48 is the site located at the Air Station. This site is roughly six acres in size. It was a former photo lab building, and it was reported that mercury from radar lines was collected in beakers and simply dumped outside of this area. No one knows for sure the exact location of the dump, but if you visit this site, the grass is mowed--you can't see anything on the surface. There is a tree line that is located along the bank of the New River here and there is a drainage ditch--but there is a tree line where one report said that allegedly the mercury was disposed of in the wooded area--I believe is how it's phrased--and another report said that it was simply disposed of behind the building. So no one knows for sure where the mercury was disposed. That's one thing we're going to try to find out, and we'll get into that a little bit later. The quantity of mercury is also unknown. One report did mention that best guess could be

a thousand pounds over the ten year period that they collected mercury from those radar lines. Again, that number could be off by some margin because of the fact that no one really had any records on it.

To date here is what they've done out there. They've taken--I'm going to have to use my cheat sheets again here--too many sites to talk about in one day here. Four borings were installed and samples were taken above the water table. The location of those four boring--nobody is really sure where they were collected. We have to assume--and the report that it was reported in did discuss this as the "assumed disposal area", so we also have to assume that those four locations were within this boundary right here. All four samples had levels of mercury and the maximum concentration were .03 parts per million in the soil. So we do have some documentation that the samples that were collected did exhibit mercury.

Back in 1984, ES&E collected four sediment samples, and the way the reports describes it is that the sediment samples were taken from the marsh area, which we believe to be this little bat cove right here. Again, the locations--I'm not quite sure--two may have been on this side and two may have been on the other side of this marsh, but mercury was detected again in all four sediment samples, and the levels ranged from .02 to .04 parts per million.

Now in 1991, ES&E took additional samples from the marsh area. This time they collected ten samples and they analyzed the samples for inorganics, and in this case, none of the samples detected mercury. So you have back in 1984 the sediment samples showed up with levels of mercury, and in 1991, not one sample indicated the presence of mercury. No ground water sample has been conducted, and back in 1991, they attempted to collect shellfish from this area. They attempted to do so in January and they were not successful in locating any shellfish.

BOUCHER: This is Laurie Boucher. I'd like to clarify, the reason for collecting shellfish in January was because we were under a compliance deadline to provide reports of this site investigation to EPA and the state by a certain date, and in order to meet that date, that was the time we needed to be out in the field, and we recognize that it's not a good time to locate fish. So we hope this time that we can schedule it so that we can obtain fish at a time of the year when we can expect them to be there and still meet our compliance schedules. So we're working under some constraints here.

WATTRAS: Based on what we know about this site, there's a lot of unknowns. Basically the source area is unknown. No one can confirm exactly where the mercury was spilled or disposed of. One other thing is that only mercury has been analyzed for in the soil, so nobody knows whether there is other--you know, when we brought up the subject of mercury in radar lines, others felt we should look at other inorganics, for example, silver. So this time when we go back out there, we're going to look at a full scan of inorganics in the soil and in the sediments.

Obviously another major issue or thing to be concerned with is the ground water quality. Because no wells were installed, we have no idea what impact, if any, there is on the ground water. the presence of absence of mercury in the sediments is a question. You know, in '84 there was mercury in the sediment, and in '91 no mercury was present. And finally, we don't know what impact, if any, there is to any aquatic life in this area. So we have a proposed scope of work that deals with these concerns, and we'll discuss that next.

What we planned on doing, first of all, was--throughout this assumed disposal area, we were going to perform a geophysics study which may help identify areas that have high metallic readings. We're going to do the geophysics study, we're going to run a very tight grid or a transect, ten feet spacings throughout the back of this building. Areas that exhibit high metallic readings through the geophysics, we would conduct soil sampling in that area. It's not shown on this figure but, for example, there is a hit--and I'm going to use this light pole for sake of discussing it--what we would do is, for every hit or area of concern identified through geophysics, we would put in five borings. One would be at the center of that hit, and the other four would be along the edge--or if you can imagine an imaginary square right here or box. So it would be a two phase approach--phase one being the geophysics to identify any areas that may have high metallic readings, and a phase two to go in and sample those areas and analyze them for the inorganics.

There are going to be some soil samples taken that aren't related to the geophysics investigation. We have reason to think that maybe if someone was to dispose of mercury, that the best place to dispose of it would not be in a mowed lawn but into--this is very--there's a lot of saplings and brush back in this area. So we do plan on taking some soil borings, and they're shallow--I mean the water table is probably three or four feet--and analyze this soil for inorganics to see if we could locate, "Well, maybe all the dumping occurred over here or over here." Nobody knows, so that's why we have to pretty much put these apart or around. I think these are about 50 or 75 foot spacings.

In addition to the soil, since we know nothing about the ground water, we want to put one well in initially. We would install the well, we'd take a sample for a quick turn-around laboratory analysis of 24 to 48 hours, the sample would be analyzed for inorganics. Based on the result of that sample, if the ground water is clean, we would do nothing else. If we find mercury in the ground water, we propose to put in three additional wells. This would--because the river is flowing in this direction, this well would act as a down-gradient well. There may be some tidal effect involved, so we'd put a well somewhat back from this initial well location, and we'd put a well back in this location to sort of assess ground water conditions in light of the fact that you might have some tidal influence where the ground water is going back and forth like that.

Surface water sediment is probably--obviously, the soil is a big concern, but the surface water sediment is another big concern. The fact that they did detect it at one time and it wasn't detected at another needs to be further investigated. What we're going to do for the sediments is a two-phased approach. Phase one is going to involve taking samples where--let's see, a total of one, two, three, four, five, six, seven, eight, nine, ten, eleven--twelve samples along this bank of the New River. Now, we noticed that previously no down-gradient sediment samples were taken. It seemed like most of the samples were taken back in this marsh area, so these samples--pretty much from say here down would represent down-gradient locations, and we'll have to see what we find there. We're also taking surface water samples--and the surface water samples are identified by this brown square right here--to assess surface water quality.

Now, we look at that data and we find that we have a problem in the sediments--we want to go back out there and install additional--or collect additional sediment samples. We would want to go off-shore this time because we'd want to quantify what impact, you know, if we know we have sediments that are contaminated along the shoreline, we want to go off-shore and collect some sediment samples. So the phase two locations are identified by this purpose triangle.

With regard to any aquatic studies, we first want to evaluate sediment conditions, and this is what we talked about just before, Tom, where if nothing shows up in phase one in the sediments or surface water, we most likely will not propose to perform any aquatic studies. On the other hand, if we find mercury in these sediments, we would to again a benthic study where we would collect samples at an off-site. We may have to go up in this area in this case. We would collect some benthic

samples adjacent to this site and again at some location down stream from this site. In addition to the benthic study, again we would collect shellfish for tissue sampling of heavy metals.

Any questions on this site?

AUGSPURGER: This is Tom Augspurger. I realize it might be moot since there's a phase two study, but the SOP for the tissue analysis for the benthic invertor doesn't specify that you won't composite between species, and at the next site that you're going to discuss that was done before where you had some clams and some oysters, and they were mixed in as one sample--in the sampling analysis plan for this site, it says that if you needed to do that during a phase two study, you would collect oysters and clams. It doesn't say that they would be compositive, but I just wanted to recommend that those be kept separate. There's a much bigger data base to compare your samples to if you analyze only oysters and a separate sample of only clams or something like that. It just makes it harder to interpret.

WATTRAS: The last site, Site 69, is the Rifle Range Chemical Dump. Again, the drawing here is not to scale. I would define this area as approximately six acres in size. It's located pretty much at a high spot at the elevation. It's pretty much at the top of a hill, and what they've noted previously was that you have different ground water flow directions. Because of that it appears that the ground water is flowing in all directions, which makes some sense when you're at a high point.

Let me give you a little background of this site. It was allegedly used as a chemical waste dump between 1950 and 1976. Waste materials were reportedly disposed of in trenches at this site, and when we did our walk-through in September, you can definitely tell areas that have been disturbed where things were buried. Waste materials that were allegedly disposed of here include PCB, pentachlorophenol, pesticides, gas possibly containing cyanide, chemical agent test kits, and fired and unfired cartridges. We believe that there is a high probability that chemical agents may be present, based on discussions with the U.S. Army Technical Escort Unit. There has been documentation that Camp Lejeune used chemical agent training kits back in the 70's. There has been some documentation that they were shipped out of Camp Lejeune. Back in 1970, there was a report that an explosion took place on this site when drums were being emptied off the back end of a truck. So the history of this site is rather interesting.

When we did our walk-through, we did--like I mentioned before, there are a lot of areas that you can tell things were

buried there. There is an area here which we call the "open area". Areas around it contain a lot of trees, and in this area, there's just brush and some saplings. There's an area where we found test kits on the surface. There is a long trench here about five to six feet wide and about 75 or so feet long that they may have disposed of whatever in that area. We've had--there were stains coming up from the ground, large stained areas, and then a smaller one down in this area. To date, no soil samples are--

BOUCHER: I'm Laurie Boucher. I'd like to make two comments. One is that there is a fence around this area, a very high fence, and warning signs not to go on the site. The other comment is with respect to these chemical agent test kits. They have the actual chemical agents. They're not just simulants. We've talked extensively with the Army on this--they're considered the experts in chemical surety material such as this, and they have explained to us, based on what records they have and what information we have of the site, that we had the real stuff here, although in small quantities. It was not simulants and therefore, we need to be concerned about how to approach this site, because if there is any indication at all that we have chemical surety agents, in their experience it's just the tip of the iceberg. Therefore, we are convinced that we need to approach this site with great caution.

WATTRAS: As I mentioned before, no soil samples have been taken within the site area. ES&E installed a total of eight wells. All the wells were put outside--within the fenced area but outside of this alleged disposal area. I believe they weren't interested in going through that material, but the eight wells were sampled and they did detect some volatile contamination. Specifically in wells 2, 3, 4, and 5, they detected low levels of vinylchloride, TCE and benzene.

They also collected surface water and sediment samples. These locations are identified here in purple where they collected surface water and sediment samples. Some of the areas were simply water depressions on the site--you know--rain water or whatever. They're not really associated with say an intermittent stream, and it might be helpful to show you this other--while I'm talking about surface water and sediment samples--pull off this other figure here. Again these are the previous surface water and sediment sample locations. You can see, some of them were on site, some of the surface water sediment samples were in some intermittent drainage streams from the site. Down here is the New River. It's not--unfortunately this is not to scale. It is not as close as it appears on this

figure here. The New River may be--I'm going to guess--at least a thousand feet away from this site.

RADFORD: George Radford. I don't think you've--could you give us an idea of how big the site is itself?

WATTRAS: The site is roughly I believe six acres.

RADFORD: Okay, you may have said that.

WATTRAS: It is heavily treed. There are some areas where you can tell where there is a lot of ground disturbance, but it's very forested in this area. It is not open--this entire area is heavily forested, very thick vegetation.

Well, I mentioned before, they took samples of the surface water and of sediments, and the on site surface water samples--and these are the ones I'm referring to--when I say "on site", they were pretty much taken off blotter depressions. They did exhibit vinylchloride and TCE, and they were above the water quality criteria. The sediment samples obtained from these two intermittent streams showed again low levels of pesticides, .11 part per million. Whether there's any correlation between disposal practices and what they detected in these two intermittent streams, I don't know if there's enough information to close that loop on that.

In summary for this site, we know nothing about the soil and about any subsurface contamination within the boundary of this site. We do know that there is ground water contamination with volatiles. We do know that surface depressions on site show the volatiles in them, and we do know that at least these intermittent streams have shown to be contaminated with low levels of pesticides.

Again, for this site we're not proposing to take any soil samples because of the possibility of running into chemical agents. We're looking at it from a standpoint of ground water only at this point.

BOUCHER: I'd like to clarify that. When we were scoping out this investigation, we had originally intended to go in there and do some subsurface investigation--trenching, taking samples, finding out exactly what we have down there--but as we got deeply into it and talked to the Army experts on this, we discovered that in order for us to do that, we were expected to involve them because they are the experts, and at this point in time, there is a question in the Army's mind whether this chemical surety material is considered a hazardous material--a hazardous waste.

Since this question has come up with the Army and they're not sure to term it a hazardous waste or not, they are unable to remove it from the ground and safely secure it. They have locations that will store chemical surety material, but now that it may be termed hazardous waste, they cannot bring it to these locations and store it. So we're in a Catch 22 where if we go to the site and start digging and we find something, they are required and we are required to secure it, and there are definitions of what that means. One definition, we could build some kind of a building on site and have guards for 24 hours. Well, that's not really practical for us to do. The other requirement would be--or the other alternative is to take it off site. Well, as I said, we don't have a place to take it off site--the Army doesn't presently. So at this point, although we'd like to go in there and find out what's there so that we could move towards removing or remediating it, we can't do this at this point, and we're looking for ways through this process. And what Ray is going to describe is a non-intrusive investigative approach to find out as much as we can about the site, from around the site and on top and through the ground water, without digging through. And when we found this out, we were incredulous. So we were as surprised about how we have to approach this site as you might be in hearing it, and any input or ideas that you might have, we'd love to hear.

WATTRAS: Also, maybe we could add that the Army pretty much said, "If there's a suspicion that you have agents there," they won't--they're not even proposing to help. They had rather just say, "Leave that site go. It's only when you accidently run into chemical agents, we'll let Army technical escort units come to assist you." They had rather not even address sites where there's a high suspicion, and based on the background information of this site, they said something to the effect that, "You have a lot more information than most other sites have, and therefore, there is a very high possibility that you could have chemical agents at this site." So based on their expertise, we feel pretty confident that there could be agents within this landfill.

What we propose to do--before I get into the ground water, let me tell you a little bit more. We do want to define these disposal areas a little bit better. We want to perform again geophysics investigations which are non-intrusive that we could do walk-overs, identify the boundaries of these disposal areas, and in combination with the geophysical investigation, we would like to do a soil gas investigation because we do have a ground water problem. The soil gas might be able to locate a specific area within the disposal area that's acting as the source, or it could help us define the extent of that plume.

We plan on sampling these wells. We're not putting in any new wells at this point, but when we sample these wells, we're going to look for volatiles, but we're also going to look for what's known as "chemical degradation products", and we contacted a laboratory called "Midwest Research". They are the experts in analyzing for chemical agents, and they gave us a list of probably ten or twelve parameters which are associated with the breakdown of chemical agents, specifically, mustard gas and other types of agents. So if we find them in the ground water, we're probably going to have to go into a second phase to further delineate that plume of we'll say degradation products. That would obviously be a phase two task.

So for phase one, to just summarize what we're doing out here, again, non-intrusive work to locate or better define these disposal areas, ground water sampling and looking for degradation products to see if any of these products are either on site or migrating off the site, and we're also going to do more sediment and surface water sampling. There was what we consider a limited amount of surface water and sediment sampling--and I'll put this figure back up--as you can see the symbols in purpose here represent previous sampling locations. We want to add a few more. None of these drainage areas to the north of this site have been studied, and all of these drainage areas do go down to the New River--drain into the New River. Again, we would take samples at the head--say the head waters of these drainage basins. The samples again would be analyzed for full target compounds as organics, inorganics, and degradation products.

We plan on taking samples along the New River also, obviously one sample which would be up-gradient of this unnamed creek and adjacent samples to the site. And again, we want to resample these two areas. Specifically, we're looking this time in addition for the organics, inorganics, and chemical degradation products.

Are there any questions? I did not mention aquatic surveys. Again, that's a phase two activity dependant on what we find in these different streams whether we think we would need to go one step further to assess any environmental impact. Right now, we're not so sure what's the real problem, if anything, in these different drainage basins.

BOUCHER: We've gone through different investigations back with ES&E, through two separate investigations--I believe it was 1987 and 1991--we have sampled the ground water at this site, and the level of contaminants that we find--which are mainly volatiles--have been consistent. We have not yet seen a trend where these

levels are increasing or decreasing. They are pretty much the same in those sampling efforts.

WATTRAS: I should also mention, ES&E did some sampling--they sampled some shellfish from the New River. I don't have a number of how many samples they actually analyzed. They found chloromethane and acetone in these samples. Now acetone is a laboratory contaminant. We really don't know whether that's associated with contamination from this site, some other source in the New River, or whether it's a laboratory contaminant. Again, with the chloromethane we can't really correlate that to the site right now. There's really just not enough evidence to say that the chloromethane found in shellfish is due to this site because of the fact that there are more things going on in the New River than just this site. So there could be other influences which resulted in the presence of that contaminant in the shellfish. I wanted to mention that--that there has been some shellfish sampling done.

AUGSPURGER: I think there were four done. Those were the ones I had mentioned earlier that were the composites of oysters and some kind of clam.

WATTRAS: Okay.

RADFORD: Do we have any other questions on any of the sites or any of the discussion we've had this afternoon? I'd like to add that if anyone has any comments that come up after you leave or if you think of it on the way home or whatever, we are more than agreeable to have any of your comments because it helps us generate a better report or a better work plan to further study the sites. We would ask that, in the interest of our schedules with EPA and the fact that we've got that as a driver to move forward, that you get your comments to us as soon as you can, if you're going to have any. I'll be sending out meeting minutes from this meeting to each person that attended, as well as the people that were invited--some of the local people that were invited and didn't come. They will all get meeting minutes. If you see anything on the meeting minutes that you don't agree with or raises other controversy or questions, let us know.

BOUCHER: Laurie Boucher. I'd like to add that in order to incorporate your comments into the next version, the draft final of these reports, we need to receive them within about ten days, and if you needed a little bit more time than that and you did intend to send us comments, please call either George or myself and tell us that they're on their way so that we can see how we can fit those into incorporating them into our next version of the documents.

RADFORD: We appreciate everybody attending, and I think it's beneficial for us--beneficial to have you here and beneficial for the people who are relatively new to looking at Camp Lejeune.

AUGSPURGER: I wanted to mention a couple of issues that might not pertain to the work plan as it stands now and I'm unsure as to when you would add things in, in relation to whether you need a late phase 2 or a phase 3, and that's wetland _____ (inaudible) delineations on those sites, particularly Site 48 where, if it becomes apparent that there is site activity, you're going to require remediation in those areas. We would want to know where the wetland line was and that there was a recognition in one of the documents that the wetland area would be complied with. You might want to start thinking about it now. You would have to write it into a contract to get that done--the type of surveying work that's being done to make particular maps of those facilities. You may get a company that will do your wetland delineation line on those sites without a lot of extra work. A significant portion of mapping that is simply survey techniques. The hydrology, you might have that established by some of the bore hold investigations that are going on. The only thing that would be lacking would be somebody that was experienced in wetland vegetation to tell you what you have there.

RADFORD: George Radford. I would like to add--we've got a pretty substantial natural resources side here. I don't know if you've worked with any of the foresters or the fish and wildlife people here on base, but they've got a pretty good catalog of wetland areas, and I don't know about specifically some of these dump sites, but as far as vegetation and where some of these species might exist, we've got a pretty good handle on some of that. I can't say it's site specific but I would go to them first and ask them what they've got to see how much extra we might need to do.

AUGSPURGER: Absolutely, I agree. And another thing was, if you get to the stage where you're going to be doing some of that IBI work, it might be good to coordinate with the state because they do so much of that here. North Carolina is really far advanced in their benthic sampling and fish assemblage sampling. I don't whether the SOP in here for that type of work mirrors the state program. If it doesn't, it probably should because then you can draw on an entire data base for Southeastern streams, and it would eliminate some of the concerns that you might get of "is this an appropriate reference site?" They would be able to tell you right off the bat because of their network whether something was ordinary or out of the ordinary. But that would be real dependent on what techniques you used to collect those samples.

WATTRAS: This is Ray Wattras from Baker. Can we contact you to get a contact from that agency, that division?

AUGSPURGER: Sure.

WATTRAS: Would you know specifically the person to speak with?

RADFORD: Is it Doctor Rudo by chance?

AUGSPURGER: I'd have to think about it, to tell you the truth. I'd have to ask somebody back at the office. I know who you could talk to who could refer you to the person who does that work, and that would be Vince Snyder. They're the people who do the shocking. He's Chief of Technical Services. But whether or not he's the one to speak to about their methodologies, there might be someone in a more technical role below him. You can call and I'll track that down.

WATTRAS: Okay, thank you.

RADFORD: Anything else?

(Negative response.)

RADFORD: We appreciate your being here, and we hope it's been of benefit to be up to speed on some of these sites. We hope to see you here at future meetings as we discuss some of these other sites.

(The meeting adjourned at 3:14 P.M. on 20 February 1992.)