will be back Monday---

THE COURT: He will be back Monday.

THE FOREMAN: We will pose them then.

THE COURT: You would rather hold to the second round?

THE FOREMAN: Yes.

THE COURT: Okay. Mr. Keating?

REDIRECT EXAMINATION, By Mr. Keating

Q Dr. Guswa, let me ask you a couple of questions about the bedrock, the issue that came up today concerning the existence of the bedrock and the fact that part of the water in the aquifer, in your opinion, I take it, moves through the bedrock?

A Yes.

Q Does your model or did your model take into account the bedrock, and if it did, in what respect it took in bedrock?

A It was one of the layers in the model. And it was an approximation of the bedrock in the sense that it allowed water to move through it under a low, under the permeability of gradient that would exist in the bedrock. it was not an exact representation of the fractures that existed there because there is no form to describe exactly what those fractures are. So in the sense of the way we approach things, it was just a general material through which groundwater could move.

Q Now, in your opinion, in your model rather, did the model conclude that the movement of contaminants in the saturated or the area -- I guess you call it unconsolidated area -- was the area of fastest movement of the chemicals?

A Yes.

Q And can you tell the jury why that was the conclusion, or why that is the logical result of the utilization of the model?

A Within the unconsolidated material, in the center of the valley probably, I don't know the exact percentage, but a larger percentage is in the unconsolidated material. In the Cryovact Plant or anywhere along the edge of the valley, the proportion of what is in unconsolidated versus what is in bedrock is not as dramatically different as in the center of the valley. Groundwater flow, however, on the sides of the valley is very small volume. The only source of recharge is the precipitation. So the net effect is a very small amount of water moving through the bedrock.

Q Now, are you able to tell either from the model or from your own experience -- You had mentioned some work in New York with bedrock. But based on the model or your own general experience, are you able to determine where the movement of water in the bedrock actually occurs? I mean, taking, for instance, the aquifer in East Woburn?

A No, I am not.

Q And is that one of the -- Is there movement, in your opinion, from the bedrock to the saturated zone when there is water within the bedrock?

A Yes.

Q And is that the reason why your model contemplates the fastest movement of water would be within the saturated zone?

MR. SCHLICHTMANN: Objection as to form.

THE COURT: May I have the question, please?

(Question read.)

THE COURT: Objection sustained to form.

Q Fine.

Where, then, sir, was the, did the model contemplate the fastest movement of water?

A In the middle layer, the unconsolidated.

Q That is because of what?

A That is because of the hydraulic conductivity and the permeability of that material or, which is the permeability.

Q Now, yesterday Mr. Schlichtmann showed you a cross section of an E&E FIT report. I don't recall which one it was. It had a cross section and it had a cross section somewhere around the Cummings property and the Grace site as you went up to the northeast?

A Yes.

Q And you, when you looked at the diagram and it had certain definitions of subsurface material within the cross section, you stated that the cross section was a diagram which showed, and I think your words were, grain size?

A Yes.

Q Would you tell the jury what you meant when you said that was a diagram which was showing grain size?

MR. SCHLICHTMANN: Objection, is it not stricken? That testimony, I thought, my Brother struck it.

MR. KEATING: I didn't hear you.

MR. SCHLICHTMANN: I thought that part of the testimony was struck.

THE COURT: Not that part.

MR. SCHLICHTMANN: The diagram was shown to the jury of the cross section.

THE COURT: I don't think so.

MR. KEATING: I thought you got back to it. The testimony was struck but I think the diagram was later used again I thought, your Honor.

THE COURT: I didn't think it was. I don't, I will check the transcript.

MR. SCHLICHTMANN: I will agree to let it go back in. I don't want him to refer to struck testimony.

THE COURT: Well, you want to inquire along

these lines?

MR. KEATING: It is not a major point. I want to bring out what he meant by---

THE COURT: You can inquire along those lines and you show me where it is in the transcript, and we will resurrect it.

MR. SCHLICHTMANN: Unstrike it.

THE COURT: Sure.

Q Whad did you mean, Dr. Guswa, when you said it was a diagram which displayed grain size?

A I meant the diagram was based on drillers' logs. There were eight wells used to construct that geologic section. The material that is typically contained in the drillers' log is a description of the grain size and the material encountered and the variation in the grain size; that is what that diagram purported to show.

Q
MC/jm

Q Now, what did that diagram or that particular cross section show you, at least what did it tell you as a hydrogeologist about relative permeabilities or other factors concerning subsurface materials that are important to you in determining the movement of water?

A The diagram itself had no reference to permeability.

Q Why not? What did it not say to you that you would have to know in order to use that as a reliable grid for determination of permeabilities?

A The diagram would have to have information about compactness and the degree of sorting of the material.

Q All right.

And was that contained there?

A No.

Q Was there other information contained in the diagram which would be information that you would look for or, in fact, in this particular case you did look at in determining relative permeability in the cross sections which you prepared, such as the details of boring logs?

A The illustration that was shown was based on eight test wells that were drilled along that section, three of those wells were drilled as part of the E and E project, the other five were logs that were available through the literature through the USGS data files. Therefore, it was a representation of the grain size. The text that

actually accompanied it described it as glacial till sitting on the sides of the valley and coarse grain outwash in the center of the valley.

Q Now, yesterday you were asked whether the chemicals which are now found to be in S21, which perhaps you could tell us where S21 is in relation to the Grace site?

A S21 is a little bit to the west of the Grace site and a little bit to the south.

Q Across the street?

A Across the street, yes.

Q Now, you were asked whether the chemicals present now in S21 came from the Grace site, and you said that part of the chemicals presently found at S21 you believe came from the Grace site?

A Yes.

Q The Court then asked you if in your opinion the chemicals that are now found there and you believe are from the Grace site, whether those chemicals would have been there from the Grace site by May of 1979?

A Yes.

Q And I think you answered that you had not analyzed the problem in that way?

A Yes.

Q Now, after we recessed last night, did I ask you -- or yesterday afternoon, to look at the exhibits and see

whether the chemicals that you assumed came from the Grace site would have gotten to Well 21 by May of 1979 if you assume they were deposited at the Grace site in 1960?

A Yes.

Q And what did you determine that your exhibit showed?

A That it showed that they would have.

Q And did you note that when you had been showing one of your zonation sections to the jury a couple of days ago?

A No. The zonation section showed the 25-year fronts of three different chemicals, but if I take this concentration profile for the 19 years and put it on that other illustration, it would indicate the front would have reached Well S21 by 1979.

Q So if you assumed the materials were deposited at the Grace site in 1960 and you used your 19-year time frame, which is one of the three time frames you used, where would the chemicals have been in around 1979, around May of '79, how far beyond Well 21 would they have gone; if you know?

A Well, they would have been approximately 800 feet from the end of the building. I can look it up for you.

Q Sure.

Do you want a map?

A Yes, I think there is one right there.

Q I am showing you G-967. Why don't you point out the Grace site.

A Grace plant is right here (indicating).

Q Where is S21?

A S21 is approximately here (indicating).

Q All right.

It would be your opinion that by May of '79 that the part of the contaminants in S21 that came from Grace would have been there by May of '79?

A Yes. The concentration profile says about 750 feet. The source area was here, the 147, 150 putting it just about at Well S21 (indicating).

Q That would have assumed a 1960 disposition of those materials at the Grace site?

A That's correct.

Q How far would that area be from where Wells G and H are, Dr. Guswa?

A That would be approximately 1600 feet.

Q Sixteen --

A Sixteen hundred from Well H.

Q So in your opinion by May of 1979, whatever contamination came from the Grace site that was in Well 21 would still be 1600 feet from the nearest well?

A Yes.

Q Okay.

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And I take it even under your 25-year scenario, as you testified originally, that material would not be near Wells G and H?

A That's correct.

Q Assuming, once again, a 1960 deposit date?

A Yes.

Q All right.

Now, Mr. Schlichtmann showed you yesterday, I believe, a map, once again, from one of the FIT Reports, which showed certain contamination found in monitoring wells between Olympia Avenue and Salem Street. Do you remember that?

A Yes.

Q And that report, incidentally, does not identify what the source of those contaminations between Olympia Avenue and Salem Street are?

A No, it does not.

Q All right.

Do you have an opinion as to what the source of the contamination, which was shown on that exhibit at various wells between Olympia Avenue and Salem Street are and, if you do, would you like to explain your opinion with reference to specific findings and specific wells?

A Yes..

Q All right.

I am going to use P-AL. And drawing your attention specifically to the area between Olympia Avenue and Salem Street, which is the same area depicted in the FIT Report that Mr. Schlichtmann showed you with reference to contamination found in particular wells, Dr. Guswa, could you tell the jury what is your opinion as to the likely source or a probable source that the contamination in those particular wells, I think that was an '82 FIT Report?

MR. FACHER: Can we get the dates, please?

MR. SCHLICHTMANN: Which report, March or June?

MR. KEATING: June.

MR. FACHER: I would like to get the dates he is talking about, if you don't mind, the date of the findings of the contamination.

A Just a minute, please.

The information that we have, as everyone is probably aware, of the chemistry or chemicals in this area is after 1979. It has been my effort to try and understand where these chemicals could have come from. And if we look at Well S97, which is located approximately 200 feet east of Well H --

Q What is that downgradient from, if you know?

A Well, S97 is downgradient or close proximity to the

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rifle range. The rifle range has been in existence for over a hundred years. The rifle range has a septic system. The rifle range, they clean weapons, they use solvents. Any chemicals that they would dispose of for any of the operations on the rifle range would go into the ground through their septic system. That is a probable source in the sense that it is contributing to the contamination, pervasive levels of contamination that are found in the Aberjona River Valley.

:nd Q
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R
VW/jm

Q Can you point out any other wells that were contaminated that were shown in that FIT Report and what you believe likely sources might be for those?

A S81 and S82 are contaminated with tetrachloroethylene.

UniFirst, the dry cleaning company, had a spill of tetrachloroethylene. I think it is probably that tetrachloroethylene that was used at that facility, which was responsible for the tetrachloroethylene found in S82, S81.

Q Do you know how long UniFirst was in the dry cleaning business at this location on the north side of Olympia Street?

A I believe since 1966.

Q And are you aware of the size of the tank of tetrachloroethylene that they kept at the UniFirst facility during the time that it was used for dry cleaning?

A I believe 5,000 gallons.

Q Do you know, sir, how many wells were placed by UniFirst or by the EPA or by Weston on the UniFirst property?

A There are two on the UniFirst property and one off to the side.

Q And is it your opinion that some of the contamination that you see in the wells, I think you said they were S81 or S82, which are downgradient from UniFirst, may have come from the UniFirst property?

A Correct.

Q Are there any other wells within that area that you think you have an opinion as to the probable source of contamination?

A S64 and S63 are located south of the Cummings Industrial Park. This used to be the Johnson Brothers Nursery, which was in operation from 1948 to 1977, when it was sold and turned to the industrial park.

The concentration of TCE, in the hundreds parts per billion -- this is a residential area, Dewey Avenue and Olympia Avenue.

Q Now, this map does not depict what actually existed between Dewey Avenue and Olympia Avenue. Can you describe to, and I am not sure there was any testimony on it, can you describe to the jury what structures and what activities go on between Dewey Avenue and Olympia Avenue?

A Yes. This is a residential area.

Q Do you know how long it has been a residential area?

A To the best of my knowledge, the first house, the first residence was in 1922. There have been houses added through the 1950's or the early 1960's, when it probably reached its full size at the present.

This area originally was served by septic systems on the properties. The sewer went thrcugh in 1966. They were given the opportunity to hook up to the

sewer system. In discussions with the town engineer, that indicated there was only a record of one resident hooking up to the sewer system. The other chose to stay on the septic system.

Q This map does not show how many houses are located between Dewey and Olympia Avenues. Dr. Guswa, without looking it up now and having a chance to do that over the weekend, do you know how many residential houses there are?

A Twenty to thirty.

Q Of those 20 to 30, you said one had hooked up to the sewer?

A Definite information that one had in 1973, I believe. The rest, I believe, are still to be on the septic system.

Q What inferences or opinions do you draw as a hydrogeologist from the existence of the 20 to 30 residential houses upgradient from the two wells that you just described, as having contamination in terms of a source of contamination for those particular wells, these houses being on the septic system?

A The septic system in a ground moraine of clay deposits The septic system is the method of disposal of your household waste. If you have paint, cleaning, if you take materials that you dump down the drain, they are going in the septic system. They get into the ground. Similarly, if your septic system backs up, which it is likely to do in a clay

material like this, one of the common things in the 1960's was to go to Sears or some store and get the old septic tank cleaner which contained TCE and dump it in the ground to clean it out.

Q Having dumped TCE in the tank, what happens to the TCE that were put in the septic system?

A It becomes part of the groundwater system.

Q Are there other particular wells, Dr. Guswa, before we recess in that area, that you want to point out to the jury and indicate to them what you believe the probable source of contamination at those wells?

A I look at the pattern of contamination in S21, G-01 and the Cryovac plant. We have high levels of chemical concentrations at the Cryovac plant. We come to downgradient, S22, and see concentrations of 20 parts per billion today. We get to go to G-01 and see concentrations of 10 and 20 parts per billion. We have S21 sitting over here (indicating) with a concentration in 1981 as much as 600, and 1985 as little as 200. And these are the kind of questions that I am forced to deal with many times because the 1981 to 1985 samples represent a decrease in the level of contamination.

Does it represent an increase in the precision and accuracy of the analytical techniques? This is not -- this pattern of coming off the Cryovac plant low value, high value, low value is not consistent within the time frame we

are looking at for the Cryovac plantbeing a source of all these chemicals in here. I would think that, given the history of what has gone on at this place, that just, as the FIT Report concluded, more details site specific studies are needed to identify the sources of contamination to G and H. I think that these areas need to be evaluated at the same level of detail that the Grace site has been evaluated, because the history of operation, the normal day-to-day things that occurred can explain the levels of contamination you see in the groundwater system, even the center of the Aberjona River Valley.

Q Can you explain, Dr. Guswa, without attributing any of the contamination that is found in this particular area here, at least south of S21, to W.R. Grace Company?

A Correct.

MR. KEATING: I would like to recess now. I have a few more questions for Dr. Guswa on Monday.

THE COURT: All right.

The discussion of the cross section, the cross section JJ from the FIT Report appears in yesterday's transcript, Page 69-92 up through 69-100. I don't see any of it was stricken. I am trying to find what part it was.

MR. KEATING: I think it was earlier than that.

THE COURT: I was looking for that. I was

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looking for at least that part. It was not stricken. I don't have it.

MR. KEATING: We can re-unstrike it.

Thank you, your Honor.

End R
VW/jm