UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS
CIVIL ACTION NO. 82-1672-S

ANNE ANDERSON, for herself, and as parent and next friend of CHARLES ANDERSON, and as Administratrix of the Estate of JAMES ANDERSON; CHRISTINE ANDERSON; RICHARD AUFIERO, for himself, and as parent and next friend of ERIC AUFIERO, and as Administrator of the Estate of JARROD AUFIERO; LAUREN AUFIERO; DIANE AUFIERO, for herself, and as parent and next friend of JESSICA AUFIERO; ROBERT AUFIERO; KATHRYN GAMACHE, for herself, and as parent and next friend of AMY GAMACHE; TODD L. GAMACHE; ROLAND GAMACHE; PATRICIA KANE, for herself, and as parent and next friend of MARGARET KANE; KATHLEEN KANE; TIMOTHY KANE; and KEVIN KANE, Jr.; KEVIN KANE; DONNA L. ROBBINS, for herself and as parent and next friend of KEVIN ROBBINS, and as Administratrix of the Estate of CARL L. ROBBINS, III, MARY J. TOOMEY, for herself and as next friend of MARY EILEEN TOOMEY, and as Administratrix of the Estate of PATRICK TOOMEY; RICHARD J. TOOMEY; JOAN ZONA, for herself, and as Administratrix of the Estate of MICHAEL ZONA; RONALD ZONA; ANN ZONA; JOHN ZONA; and PAT ZONA,
Plaintiffs,

-v-

CRYOVAC, Division of W. R. GRACE & CO.; W. R. GRACE & CO.; JOHN J. RILEY COMPANY, Division of BEATRICE FOODS CO.; BEATRICE FOODS CO.; and XYZ Company(ies),
Defendants.

SILVER & RENZI REPORTING SERVICE
824 W. State Street, Trenton, NJ 08618
(609) 989-9191
(TOLL FREE IN N.J.) 800-792-8880

Continued testimony of GEORGE F. PINDER, Ph.D taken stenographically in the above-entitled matter before ELIZABETH M. ELDER, a Certified Shorthand Reporter and Notary Public of the State of New Jersey, at the Hyatt Regency Hotel, Princeton, New Jersey, on Friday, February 14, 1986 commencing at 10:10 a.m.

A P P E A R A N C E S:

MESSRS. SCHLICHTMANN, CONWAY & CROWLEY
171 Milk Street
Boston, Massachusetts 02109
BY: STANLEY W. ELLER, ESQ.,
Attorneys for the Plaintiffs.

MESSRS. LOWENSTEIN, SANDLER, BROCHIN, KOHL, FISHER, BOYLAN & MEANOR
65 Livingston Avenue
Roseland, New Jersey 07068
BY: MICHAEL L. RODBURG, ESQ.,
Attorneys for the Defendant,
Beatrice Company, Inc.

MESSRS. FOLEY, HOAG & ELIOT
One Post Office Square
Boston, Massachusetts 02109
BY: AMY WOODWARD, ESQ.,
Attorneys for Defendant,
W. R. Grace & Company.

I N D E X

E X H I B I T S

A That's correct.

Q That professional judgment is carried out to three decimal places of accuracy?

A No, that's not what it says.

Q You told me you used 2.300, did you mean to say the second and third zeros in part of that number?

A Mr. Rodburg, we are talking about hydraulic conductivity?

Q Yes.

A The number was 2300 not 2.300.

Q Then I wrote it wrong or heard it wrong or you said it wrong.

A Or all the above.

Q The number that we are now talking about, so the record is clear, that you first testified to - and if I misstated it as 2.3, I certainly meant only to repeat what you told me - for the hydraulic conductivity which you used was 2300 feet per day?

A That is my recollection.

Q In your judgment, that contains two significant numbers?

A That's correct.

Q That number is your best professional judgment of the average permeability at the Riley

site?

A That constituted my opinion at the time that I prepared the calculations.

Q Is it still your opinion today?

A I think perhaps if I were to do another calculation, that I might use a slightly reduced value for hydraulic conductivity.

Q When you said do another calculation, that means you did a first calculation to reach 2300?

A I'm sorry, Mr. Rodburg, I have no idea what you are saying.

Q I thought you already clarified 2300 feet per day is a professional judgment?

A Yeah.

Q Now, you told me if you did another calculation, you might reach a different result?

A Clearly, we are not communicating. What I am talking about is a transport calculation. What I am not talking about is a calculation of hydraulic conductivity.

Q I asked you whether your opinion as to the hydraulic conductivity on the Riley site of 2300 feet per day is still your opinion?

A My current opinion is that the permeability

on the Riley site is probably somewhat less tha
on the average over the site.

Q How much less?

A I would say based on the information have available, since these calculations were m that the permeability is probably between -- I say between 800 and 2500.

Q That's your best professional judgmen you now see it, on all the information you have today?

A That's my feeling at this particular And I think you realize that information is com almost daily on this site and it's a moving tar but I am trying to be forthright with you, and that's what I currently feel is the situation.

Q I really appreciate that, doctor, bec have been struggling with the same moving targe

Now, then, the Darcy velocity which y computed relied upon the permeability which you now testified for me about and the gradient?

A That's correct.

Q What gradient did you use?

A .001.

Q Where did you get that number?

A Are you deliberately going back over the testimony or is this an accident?

Q We haven't asked you about gradient, have we?

A You certainly have. Do you want to go back and look? You are saying that you didn't ask about gradient?

Q Where did you get .001?

A You don't remember asking me that? I said I carried the number in my head.

Q Are you talking about yesterday's testimony?

A Mr. Rodburg, I will answer all of those questions again, but believe me, you have asked them all before.

The value that I used in the calculation was .001.

Q Where did you get that?

A It was transmitted to me by Weston.

Q Who, at Weston?

A The same individual that I told you about before whose name I also don't remember right now.

Q Did the unknown person at Weston give you just water level elevations and distance and you computed the gradient or did he give you the gradient?

A First of all, he gave me the gradient, then I wanted to be very careful that there were no mistakes, so he quoted over the telephone to me the numbers that he used and the calculations that he did.

Q Did you write those down?

A I wrote those down.

Q Where are they?

A I discarded them.

Q The only evidence we have is your recollection today that it was .001?

A That's correct.

Q Over what distance?

A That was over the distance indicated by this plot.

Q What is the feet indicated in the plot?

A That would be between the Riley site and well G, which constitutes approximately 525 feet, and, of course, the estimate that we are talking about is the most conservative estimate, since as you are getting near wells G and H, those gradients increase hydraulically.

Q Is it your testimony that the average gradient between well G and some point on the Riley property 525 feet from well G is .001?

gradient or what?

Q A flat gradient.

A A flat gradient by its definition is zero.

Q And relatively flat?

A In these materials, I would say that perhaps .00001 would be considered quite a low gradient.

Q Four zeros?

A Yes.

Q Have you done any calculations of the gradient of the Riley property when wells G and H are not pumping?

A I didn't do a calculation in the sense that we have described here, however, the exhibits that I have provided you yesterday have such gradients calculated on them.

Q All the exhibits that you provided yesterday were marked?

A As I said before, I did not pay attention to what was marked and what wasn't marked.

Q The next variable in Exhibit 17, there is a capital letter designation D immediately beneath V sub D.

Since you have my only copy, read for the record what it says there?

A It says 115.

Q No units?

A No units. Are you asking me if there are units or whether they are designated?

Q We know they aren't designate.

A That's what I am answering.

Q My next question is, are there units?

A Yes.

Q What are those units?

A That would be in terms of feet and days.

Q Feet per day?

A Feet square per day.

Q What does D represent?

A D is the dispersion coefficient that goes into the transport equation.

Q I can't help but note that the dispersion coefficient is exactly twice what it is in Exhibit 16, is that coincidence?

A Completely.

Q Where did you get the dispersion coefficient of 115 square feet per day?

A The dispersion coefficient is computed as the product of the dispersivity and the magnitude of the velocity. I think I am correct in saying I think

I used the same dispersivity, which is the field measured parameter, in both of those calculations.

Q Let's start with dispersivity, why is it field measured?

A It wasn't field measured.

Q I misheard you. Let's start with, what is dispersivity?

A Dispersivity is a physical coefficient descriptive of a particular hydraulic environment.

Q Where did you get the dispersivity number which you used in calculating D?

A That was based on my observation of the material that occurs on the Riley site, the well logs that I had available to me, my geologic interpretation of my equation and by a professional judgment.

Q What number did you reach for dispersivity based on your professional judgment and all the other things you just said?

A It's my recollection that it was 50.

Q 5-0?

A That's my recollection.

Q Does that have units attached to it?

A Oh, yes, it has units of feet.

Q Why did you choose 50, what factors leaped

out at you to choose 50 as opposed to 1,000 or 1?

A I thought it was a very conservative value for the materials that I had observed, and I wanted to make as conservative a calculation as I thought was appropriate.

Q What do you mean by conservative in your answer?

A Well, what I mean is that the field value available would almost certainly be larger.

Q Do you have any field values available?

A Not for this site.

Q Do you know if anybody has any field values available?

A I have no knowledge.

Q How would one go about getting field values?

A You would have to conduct a test that was designed to determine dispersivity.

Q How are those tests conducted?

A The normal way that one goes about this is to do a two well tracer test.

Q With a dye?

A With a dye.

Q That was not done in this case?

A I don't know. Do you think we could break

THE WITNESS: That sounds familiar.

Q Next on Exhibit 17, there is a designation for capital R?

A Yes.

Q No units?

A Yes.

Q What is R?

A R is the retardation coefficient.

Q The number as it appears on Exhibit 17 is what?

A .302.

Q Does it have units?

A I don't recall it having units. I would have to work it out or see a definition of it explicitly in order to tell you for sure. I do not believe it has units.

Q How did you derive the value of .302 as used in Exhibit 17?

A That's based on the carbon content of the soil and the KD parameter, which is a chemically related parameter that is associated with the ability of a chemical compound to adsorb to a porous media, I guess it should be medium. Media is the plural.

Q Other than the exhibit which I now tell you

I don't have with me, and I regret, because I thought I did, but there was an exhibit you recall previously marked as to the carbon content of the soil that you had?

A I don't know if it was marked, Mr. Rodburg, but I do remember, I believe it was a two-page document where this information was tabulated.

Q Other than that document, do you have any other data on carbon content?

A I have no data specifically on the site that I am aware of.

Q The KD parameter, where did you get that?

A That is tabulated in the literature.

Q The literature that you referred to was also provided to us?

A The literature that I referred to is, basically, documents that have either been provided to you or are reports of U.S. Government agencies.

Q Specifically, with respect to Exhibit 17, did you consult a report of a U.S. Government agency?

A Such a report was consulted.

Q Do you remember the name of it?

A No, I don't remember the name of it.

Q Do you know who published it?

A The EPA published it.

Q Do you remember when they published it?

A I don't know when they published it.

Q Do you know what the subject matter of the report was?

A It, basically, contained information on the chemical properties of specifically the retardation properties of a vast number of compounds.

Q For what purpose did you consult this EPA publication?

A To obtain information on the properties of the compound 1, 2, trans.

Q I took this away from you, not to be impolite, I'm sorry.

The second page of Exhibit 17 contains a retardation coefficient for trichloroethylene?

A That's correct.

Q What is it for that?

A .88.

Q In Exhibit 16, the retardation coefficient for TCE as used there was also .88?

A Yes.

Q Do you have any knowledge as to whether there are any differences in soils between what is at

the Grace property and what is at the Riley property?

A I think that they are similar, but somewhat different.

Q You haven't discerned a difference insofar as your choice in the retardation coefficient?

A No.

Q You did see a difference in terms of the Darcy velocity, though?

A Two different values were used, yes.

Q Two different values were used for dispersivity?

A No. I think the same value was used for dispersivity.

Q You are right, my question was dispersivity. Two different values were used for the dispersion coefficient?

A Yes.

Q Was it the same dispersivity value for each?

A That's my recollection.

Q The difference in the two numbers shown was accounted for solely by the differences between the magnitude of the velocities?

A I believe so.

Q What is the retardation coefficient used for

in this calculation, what physical phenomenon are you trying to account for?

A It accounts for the tendency of molecules in solution to become attached to granular media, particularly those media that contain carbon.

Q The higher the carbon content, the higher the retardation coefficient?

A That's the assumption that's made.

Q The next number on Exhibit 17 is a small letter n equals .20?

A That's correct.

Q n stands for porosity?

A That's correct.

Q Is that a field measured number?

A That is not a field measured number.

Q How did you --

A -- in this case.

Q How did you get .20?

A I observed the documents of the Grace consultant, wherein he estimated a value of .15, because that seemed relatively low for the materials that I was observing, and because the velocity increases as the porosity decreases, I felt that it would be more conservative and prudent to use a value

slightly larger than the one that he quoted in his report.

Q You used the .20 value as well for the Riley calculation in Exhibit 17?

A That's correct.

Q Why did you use it for the Riley calculation?

A Well, based on my experience with materials such as I encountered on the Riley site, it seemed like an appropriate choice.

Q What geologic materials did you encounter at the Riley site?

A Well, there are a number of materials that, basically, could be classified in the terminology that was used yesterday as glacially fluvial material. It's normally sand, gravels.

Q What is the characteristic range of porosity for glacially fluvial material?

A It's relatively narrow. It probably would not exceed .25 and would not be less than .15.

Q Is there published literature with respect to such glacially fluvial materials?

A I am sure there are such literature. I can't recall any specific reference at this point.

Q Did you consult any literature in determining .20?

A Probably.

Q Do you know what literature you consulted?

A No.

Q Is glacially fluvial material different than glacial till?

A Yes.

Q Would you expect to find higher values for glacial till?

A No.

Q Lower values?

A Yes.

Q Does glacial till have a larger range?

A Well, that depends on the till. The till is a very generic term and incorporates a tremendous number of distinctly different materials.

Q With respect to the value for porosity, is it fair to say that the values for glacially fluvial material is generally higher than for glacial till?

A It's difficult to answer your question, and that's why I am hesitating. It's probably true that on the average, glacial till would have a smaller porosity than glacially fluvial material.

Q Did you make an independent judgment of the materials at the Riley site or did you rely on the assessment of others?

A I'm sorry, I don't understand your question.

Q In characterizing the material as glacially fluvial, is it your independent assessment or the assessment of someone else?

A Oh, that's my own assessment.

Q For certified geologists, it's customary to make such classifications based on visual observations?

A Yes.

Q Have you seen the classifications of others in this case?

A I don't recall any particular one.

Q You don't recall whether anyone else has a different view as to what the materials are?

A No. I can only believe that if they are capable geologists, they would hold similar opinions.

Q Only incapable geologists hold dissimilar opinions?

A Perhaps less capable would be appropriate.

Q What about sand and gravel, what is the porosity range for sand and gravel?

A It's, basically, what I said. It's somewhere between typically .15 and .25.

Q How about for sand?

A The range is about the same. The way it works, Mr. Rodburg, is that irrespective of the size of the material, given the same environments, you will have the same porosity.

Q It doesn't ever go higher than .25?

A Theoretically, it can go higher if you carefully assemble spheres, but in natural occurring material, it is more probable than not, you will be within that range.

Q You would regard three to five as an improbable range in this case?

A I think that would be excessively high.

Q What about three?

A I think that would be excessively high also.

Q You would not regard three as a reasonable porosity value?

A I think it's more probable than not that it would be less than that.

Q Is porosity capable of being field measured?

A That is difficult, not impossible, but difficult.

Q Could it be laboratory measured?

A Normally, values that are used are determined in the laboratory.

Q Do you use any laboratory measured values in concluding that .2 was the porosity?

A I don't remember.

Q The next value number on Exhibit 17 is the L. There is some confusion about the last testimony. The number shown on Exhibit 17 is 525 feet?

A Yes.

Q Can you tell me what that represents?

A That was the approximate distance from the Riley site to well G.

Q Earlier today, you testified as to a specific line of wells commencing on the west side with S80. Somewhere in that line of S80 to G was where you thought you used 525 feet?

A I think that's reasonable to assume.

Q Is that the location of the Riley site to which you refer on Exhibit 17, 525 feet?

A I think to determine that, we would really have to have a map with a scale on it and a ruler. I don't recall explicitly what my reference point was.

Q How would a map of the scale help you to