UNITED STATES DISTRICT COURT

DISTRICT OF MASSACHUSETTS

Civil Action
No. 82-1672-S

SKINNER, D. J.
and a Jury

ANNE ANDERSON, ET AL

V.

W. R. GRACE & CO., ET AL

Sixty-Sixth Day of Trial

APPEARANCES:

Schlichtmann, Conway & Crowley (by Jan Richard Schlichtmann, Esq., Kevin P. Conway, Esq., and William J. Crowley, III, Esq.) on behalf of the Plaintiffs.

Charles R. Nesson, Esquire, on behalf of the Plaintiffs.

Herlihy & O'Brien (by Thomas M. Kiley, Esq.) on behalf of the Plaintiffs.

Hale & Dorr (by Jerome P. Facher, Esq., Neil Jacobs, Esq., Donald R. Frederico, Esq., and Deborah P. Fawcett, Esq.) on behalf of Beatrice Foods.

Foley, Hoag & Eliot (by Michael B. Keating, Esq., Sandra Lynch, Esq., William Cheeseman, Esq., and Marc K. Temin, Esq.) on behalf of W. R. Grace & Co.

Courtroom No. 6
Federal Building
Boston, MA 02109
9:00 a.m., Monday
June 23, 1986

Marie L. Cloonan
Court Reporter
1690 U.S.P.O. & Courthouse
Boston, MA 02109

THE COURT: All right. We start with a new witness this morning.

MR. KEATING: Yes. Dr. John Guswa, your Honor, will be the next witness.

JOHN GUSWA, Sworn

Direct Examination by Mr. Keating

Q Will you state your name, sir?

A My name is John S. Guswa.

Q And what is your business address, Dr. Guswa?

A 1740 Massachusetts Avenue, Boxborough, Massachusetts.

Q And by whom are you employed?

A I'm employed by Geo-Trans, Incorporated.

Q What is your position with Geo-Trans, Incorporated?

A I'm a principal hydrogeologist and vice president of Geo-Trans.

Q Can you tell us what the business of Geo-Trans, Incorporated is, Dr. Guswa?

A Yes. Geo-Trans is a consulting company that specializes in groundwater hydrology. And we provide services which range from site investigations to detail quantitative analysis using groundwater models.

Q How many people are employed at Geo-Trans?

A Approximately 50 people are employed by Geo-Trans.

Q And are they all located in Boxborough?

A No.

Q Where are your other offices?

A We have three offices. The main office, our corporate office, is in Herndon, Virginia. Herndon is located near Reston, near Dulles Airport. We have about 30 of our employees in Herndon. We have an office in Boulder, Colorado and I think about 10 to 12 employees there, and we have an office in Boxboro and four employees in our office in Boxborough.

Q What are your duties as the principal hydrogeologist with Geo-Trans?

A Principal hydrogeologist is a title we give to our senior level employees, and we are responsible for the technical performance of all the projects. We are senior people assigned to the project to provide technical direction, to review the technical analyses that are done and basically approve a report before it's released.

Q Could you tell the jury what your educational background is, sir?

A Yes. I have a bachelor of arts degree in geology from Franklin and Marshall College, and that degree was awarded in 1967.

Q And after that --

A Yes. After that, I have a master's degree in science

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from Penn State University, from the Geology Department, with a specialization in geomorphology and that degree was awarded in 1969. And I also have a PhD from Penn State University from the Geology Department, with a specialization in hydrogeology, and that degree was awarded in 1976.

End A

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Q You said your Master's degree had a specialization in geomorphology?

A Yes.

Q Can you tell us what geomorphology is?

A Yes. There are several subdisciplines within geology. One is geomorphology, which in the strict technical sense is described as the study of the earth's surface; and people who study geomorphology would tend to study the effects of oceans, the effects of streams. My particular interest was the effects of glaciers.

Q What has been your employment background, Dr. Guswa? And I would ask you to focus on activities involving either geology or hydrogeology.

A My first employment as a geologist would have been the years I spent in Wyoming working as a geomorphologist and mapping glacial deposits in northwestern Wyoming. I was working on a research project related to the evolution of a mountain range in northwestern Wyoming and particularly how the glaciers affected the shape of that mountain and the types of deposits made by the glaciers that existed in those mountains.

Q After your activity in Wyoming, what was the next job that you had that related to either geology or hydrogeology?

A The next job is, I worked for the United States Geological Survey, Geological Division, in Boston,

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Massachusetts. I worked mapping the surficial geology and determining the glacial history of an area referred to as the Pepperill Quadrangle.

Q What do you mean by the surficial geology?

A Surficial geology describes the geological materials -- is a term that is applied to the geologic materials that exist at the earth's surface.

For example, if you were flying over an area in an airplane and looking out the window and down at the ground, it describes those materials you would see as you were looking out the window.

Q You mentioned the Pepperill Quadrangle.

A Yes.

Q Is that Pepperill, Massachusetts?

A Yes.

Q When you say "Quadrangle," can you tell us what you mean by the expression "Quadrangle"?

A Yes.

The United States Geological Survey is involved in many different activities, one of which is providing mapping services for the United States. In order to do that, they have subdivided the United States into small rectangles on the basis of latitude and longitude. Quadrangle is the name applied to one of these small rectangles.

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Q Were you retained by the law firm of Foley, Hoag & Eliot to perform a study concerning the W. R. Grace facility in Woburn, Massachusetts?

A Yes, I was.

Q And when were you retained?

A In June of 1985.

Q And what were you asked to do?

A I was asked to make an evaluation of whether contaminated groundwater beneath the Cryovac plant could have reached Wells G and H by May of 1979.

Q And can you tell us briefly, now, Dr. Guswa, what you did in order to be in a position to answer that question?

A Yes. I reviewed the available geologic, hydrologic information for that area in order to develop an understanding of the physical conditions or the hydrogeologic conditions that affect groundwater flow and chemical transport in the Aberjona River Valley.

Q Have you, sir, formed an opinion whether chemical contamination of the groundwater at the Cryovac site could have reached Wells G and H before May of 1979?

A Yes, I have.

Q And what is your opinion?

A My opinion is that chemicals or contaminated groundwater from beneath the Cryovac plant could not have reached Wells G and H by May of 1979.

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Q And what is the basis for that opinion, Dr. Guswa?

A The basis of that opinion is my review of the available geologic and hydrogeologic information, which allowed me to develop an understanding of the hydrogeologic conditions that affect the groundwater flow and chemical transport in the Aberjona River Valley.

On the basis of that understanding, I have developed a three-dimensional groundwater flow and chemical transport model. And I've used that model or those models to analyze travel time, time of travel for chemicals to move from the Cryovac plant down toward the Aberjona River.

And it is my conclusion or opinion that even if chemicals were released to the groundwater system in 1960, the day the plant opened, they could not have reached Wells G and H by May of 1979.

Q What types of information did you use to develop the understanding that you referred to a moment ago of the groundwater system in the Aberjona River Valley?

A There are two general categories of information: That information which describes the physical framework of the earth, the geologic materials themselves, and the second category is the hydrologic information that describes the water and its movement through those materials.

Q And can you tell uc what the sources of information were that provided you with the data that was related either

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you put the cross-section.

Did this area define at least part of the area where you obtained your water-level information?

A Yes.

The first review of water-level information was the published reports by the field investigation team. They covered a larger area, but those water level maps were much more general. These are the data points from which water levels were collected from, say, probably early to mid-November through the middle of January. These water levels were collected fairly regularly from these wells during that time period.

Q Did you cause to be measured -- maybe you can tell us, how were these water levels measured at these particular wells?

A The water-level measurements are made in several ways. The information that is used to prepare a water-table map follows fairly standard procedures.

We drill a well. It penetrates into the ground to some depth. The water will rise up into that well and is an indirect measurement of the energy in the groundwater system at the point the well is opened, where the screened interval of the well is.

The water-level measurement is actually a measurement of the potential energy of the groundwater

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system. I will try to use the term "water level" to avoid being confusing. It is not an easy topic to talk about.

Now, wells are installed. And one of the first steps is that the well casing itself, its elevation, is determined by a land surveyor. In fact, four land surveys were done within this area, one focusing on the Cryovac facility.

The EPA hired a separate land surveyor, but there was a little overlap between wells in the Cryovac plant and west of Washington Street. Woodward-Clyde as well as plaintiffs' people -- Weston Geophysical also hired land surveyors to survey specific wells within this area.

Once the elevation is determined, that is, a fixed elevation, assuming there are no mistakes or discrepancies, we now know the elevation of our measuring point on our well.

Then we have several different techniques for measuring water levels in the well. They are principally based on measuring the depth to water below the measuring point in the well. The simplest, the easiest and most reliable but generally most expensive in terms of man time is actually making a measurement with a steel tape or a tape measurement.

You take a tape, put a weight on the end of it, either paint it or chalk it or mark it in some way so

feet apart and we measure water levels in those two wells, we have an indication of the gradient, hydraulic gradient, between those two wells. We also have vertical hydraulic gradients in the groundwater flow system.

The purpose of wells at different depths in the same place is to get information about the vertical hydraulic gradient. If we combine the vertical well clusters with the lateral wells, that gives us a three-dimensional representation of the groundwater flow system.

Q If you put three wells within a small area and you put them down at three different depths, why don't they all come up with the same water-level elevation if they are within a reasonably close proximity of each other when the three are placed in the ground?

A The reason for that is the fact that the water is flowing and losing energy as it flows from one point to the next.

If we were to take a beaker of water which is not flowing, a tall beaker, and had wells open at different depths in that beaker, they would in fact all measure the same water level.

When we get to the real-world system and we have water moving through the ground, as it moves through the ground it loses energy because it is overcoming the frictional forces as it is going past the different

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sand grains and moving through the different materials. It is losing energy. That energy loss is reflected in a lower water level.

Under an idealistic condition, if we know there is an energy loss, we can calculate the difference in water levels. Since we do not know exactly what is happening under the ground, we actually do it the opposite way; that is, we measure the water levels as an indirect indicator of which way groundwater is flowing, because the difference in water levels, assuming there are no measurement errors, is a reflection of the energy loss in the groundwater system. It tells us which part has lower energy than the other. That tells us a preferred direction or -- the best you can determine gradients from two points, it gives us a component of a hydraulic gradient between those two wells.

Q So it is the case when you put a well cluster in and you have wells at different depths all located within a close proximity of each other that-you often get different water-level measurements from those three wells even though they are located quite close together?

A That is correct. The only condition in which you would not get different water-level measurements is if there was no vertical-flow component.

Q That is the hypothetical beaker of water?

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A Yes.

Because there is a vertical-flow component, we also get vertical head differences, different water levels.

Q Do you also measure the same well at different points in time?

A Yes.

Q Can you tell the jury why it is important to measure the same well at different points in time?

A Yes, because water levels measured at wells -- the groundwater-flow system changes in response to in this case and most importantly variations in precipitation or other hydraulic stresses.

A A water table map is a representation of the elevation of the water level surface as measured by wells which penetrate to the water table.

Q Have you prepared water table maps for use in this particular matter?

A Yes, we prepared water level maps.

Q Excuse me. Water level maps?

A A water table map is actually a very precise term that refers to just the top of the zone of saturation. But because we have these vertical variabilities for wells that are not located exactly at the boundary between the zone of saturation and the unsaturated zone, the term "water level map" is the more appropriate term to use.

Q And you've prepared those for this case?

A Yes, I have.

MR. KEATING: Your Honor, I have a series of these maps that Dr. Guswa has prepared but I think it's going to take me a while to walk through each of them and they're sort of in a package.

THE COURT: Let's do it tomorrow morning.

MR. KEATING: Fine.

THE COURT: Suspend now until 9 o'clock tomorrow morning.

(Whereupon the jury left the courtroom.)

(CONFERENCE AT THE BENCH AS FOLLOWS:

MR. SCHLICHTMANN: I was just wondering how long Mr. Keating plans for his direct examination so we can plan --

MR. KEATING: Yes, a fair question. I would like to finish it tomorrow on direct. I'm not sure I'm going to be able to. I'm certainly not intending to go too much beyond tomorrow. I mean I would like to finish it tomorrow, to tell you the truth, but it could well go into Wednesday.

THE COURT: But not very much.

MR. KEATING: I hope not, your Honor, yes.

MR. SCHLICHTMANN: And there will be witnesses after this witness?

MS. LYNCH: Yes.

MR. SCHLICHTMANN: Can we be provided copies of those witnesses?

MR. KEATING: We'll either call you after lunch or send you a letter.

MR. SCHLICHTMANN: I wonder if we could actually look at those water level maps he's showing tomorrow.

THE COURT: Are they here now?

MR. KEATING: They're right back here. You're welcome to look at them.

THE COURT: Okay. How many more witnesses after this one?

MS. LYNCH: About half a dozen, I think.

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MR. KEATING: Probably about half a dozen, not all of whom are long witnesses, though. I think we have a decent chance of winding this up before the break on the fourth.

THE COURT: And then we can come back and deal with questions, instructions?

MR. KEATING: Yes. That is my -- That is my objective. I could get --

MS. LYNCH: He's known as an optomist in our office.

MR. SCHLICHTMANN: It seems to be moving.

THE COURT: I've made jest. My colleagues have asked me: How is the case moving? And I've said: At glacial speed. And I didn't realize it was going to be literal this morning.

END OF CONFERENCE AT THE BENCH.)

(Whereupon the 66th day of trial was concluded.)

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I N D E X

Witness	Direct	Cross
JOHN GUSWA, Sworn		
(By Mr. Keating)	66-2	

EXHIBITS

No.		For Id.	In Evid.
G-920	Report		66-36
G-921	Document entitled "Hydrology and Water Resources of the Coastal Drainage Basins of Northern Massachusetts from Castle Neck River, Ipswich to Mystic River, Boston"		66-71

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