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1 PROCEEDINGS

2 (Curriculum vitae marked Exhibit

3 No. 1 for Identification.)

4 (Report of David Ozonoff, MD

5 marked Exhibit No. 2 for Identification.)

6 DAVID OZONOFF, M.D., a witness

7 called for examination by counsel for the

8 Defendant, Madison-Kipp Corporation, having

9 been satisfactorily identified by the

10 production of her/his driver's license,

11 being first sworn by the Notary Public, was

12 examined and testified as follows:

13 DIRECT EXAMINATION

14 (By Mr. Busch)

15 Q. Please state your name.

16 A. David Ozonoff.

17 Q. Have you been retained as an expert in this

18 matter, the McHugh matter?

19 A. I haven't been retained, but I have been

20 asked to offer an opinion which I have

21 done.

22 Q. When were you asked to render an opinion?

23 A. I think it was probably sometime in mid or

24 late last spring. I don't remember

Page 5

1 exactly.

2 Q. Who approached you?

3 A. Mr. Manzke.

4 Q. Had you ever worked with Mr. Manzke in the

5 past?

6 A. Yes.

7 Q. In what regard?

8 A. Essentially, I was a witness in some cases

9 that he had prior.

10 Q. Do you recall the cases for which you were

11 a witness?

12 A. Well, one of them was called the Lockformer

13 case. I'm not exactly --

14 Q. Can you spell it?

15 A. -- Lisle, Illinois, and then there was one

16 in Indiana. I don't remember the name of

17 the case.

18 Q. Do you recall any other cases?

19 A. I don't, but if there was another case it's

20 probably only one, but I'm not sure if

21 there was or not.

22 Q. Was there a pollutant or a contaminant in

23 the Lisle case upon which you rendered an

24 opinion?

Page 6	<p>1 A. Yes.</p> <p>2 Q. What was that?</p> <p>3 A. That involved chlorinated ethylene like PCE</p> <p>4 and TCE.</p> <p>5 Q. Was there a fate or transport mechanism in</p> <p>6 that case? By that I mean, was it a water</p> <p>7 case, a vapor case, a ground case, or do</p> <p>8 you recall?</p> <p>9 A. I actually don't remember.</p> <p>10 Q. Do you recall when that case was, when you</p> <p>11 were hired?</p> <p>12 A. Five years. Four years. I'm not really</p> <p>13 sure.</p> <p>14 Q. In the Indiana case, was there a defendant</p> <p>15 in the Indiana case?</p> <p>16 A. Yes.</p> <p>17 Q. Who was that, do you recall?</p> <p>18 A. No, I don't.</p> <p>19 Q. Do you recall the contamination or the</p> <p>20 toxic issue?</p> <p>21 A. Yeah, I think everything I've done for</p> <p>22 Mr. Manzke has been chlorinated ethylene.</p> <p>23 Q. Do you recall whether there was any</p> <p>24 particular method of transport of the</p>	Page 8	<p>1 think that's probably -- those are the</p> <p>2 changes. I think there's another</p> <p>3 publication.</p> <p>4 Q. The university of which you speak is Boston</p> <p>5 University?</p> <p>6 A. Yes.</p> <p>7 Q. Let me show you what's been marked as</p> <p>8 Ozonoff Exhibit No. 2. That's been</p> <p>9 proffered to us as your report in this</p> <p>10 matter. If you take a look at it and</p> <p>11 confirm that that's what it is?</p> <p>12 A. Yes, I can confirm that.</p> <p>13 Q. Now, as of the date of this report, did the</p> <p>14 report contain all the, which is</p> <p>15 November 29, 2012. As of the date of this</p> <p>16 report, does the report contain all of the</p> <p>17 opinions that you have in regard to this</p> <p>18 matter?</p> <p>19 A. Yes.</p> <p>20 Q. Since the date of this report, the 29th of</p> <p>21 November 2012, have you formulated any</p> <p>22 other opinions?</p> <p>23 A. No.</p> <p>24 Q. Have you been asked to formulate any other</p>
Page 7	<p>1 chlorinated ethylenes in the Indiana case?</p> <p>2 By that I mean vapor, water, or --</p> <p>3 A. I actually don't remember. You know, I</p> <p>4 think it was -- so improperly managed so it</p> <p>5 wound up on the ground, wound up in the</p> <p>6 ground water. You know, whether the</p> <p>7 pathway to human exposure was through</p> <p>8 ground water or vapor intrusion, I don't</p> <p>9 remember that.</p> <p>10 Q. Let me show you what's been marked as</p> <p>11 Ozonoff Exhibit 1, which was proffered to</p> <p>12 us as your CV, or curriculum vitae. Take a</p> <p>13 moment and look at that, and my question</p> <p>14 is, is that your most recent CV?</p> <p>15 A. I think there is, you know, some minor</p> <p>16 changes from this.</p> <p>17 Q. As you sit here today, do you recall what</p> <p>18 those are?</p> <p>19 A. Well, my term on the EPA Science Advisory</p> <p>20 Board has ended, so I think that's probably</p> <p>21 on here. Yes. I don't know if this says I</p> <p>22 was on the Faculty Senate or not but I am</p> <p>23 on the Faculty Senate again, and I'm on the</p> <p>24 Faculty Council for the University. I</p>	Page 9	<p>1 opinions?</p> <p>2 A. No.</p> <p>3 Q. As you sit here today, do you know how much</p> <p>4 time you spent in the work leading up to</p> <p>5 this report?</p> <p>6 A. You mean work done for this case?</p> <p>7 Q. Yes, I mean this case. I don't mean your</p> <p>8 whole career.</p> <p>9 A. Yes, a lot of work went into this report</p> <p>10 that was not related to this case.</p> <p>11 Q. How much work related to this case?</p> <p>12 A. I probably spent eight to ten hours,</p> <p>13 something like that.</p> <p>14 Q. Can you tell me, specifically during that</p> <p>15 eight to ten hours, what you did relating</p> <p>16 to this case that's contained in this</p> <p>17 report?</p> <p>18 A. Well, a lot of my opinions have been</p> <p>19 previously written down and what I did was</p> <p>20 I looked at the data involving the class</p> <p>21 residences and the site that were provided</p> <p>22 to me by counsel, and I looked at, you</p> <p>23 know, some relative associated material,</p> <p>24 like the website of the Wisconsin DNR, and</p>

Page 10	<p>1 then I used the information to make the</p> <p>2 appropriate changes in what I had already</p> <p>3 prepared, essentially established knowledge</p> <p>4 about this.</p> <p>5 Q. Directing your attention to Page 1 of the</p> <p>6 report.</p> <p>7 A. Okay.</p> <p>8 Q. At the bottom, there's a statement, and</p> <p>9 I'll just read it and then I'm going to ask</p> <p>10 you about it.</p> <p>11 The statement is, "Reports indicate</p> <p>12 that a substantial contamination by</p> <p>13 chlorinated ethylene solvents of soil,</p> <p>14 groundwater and soil vapor occurred at the</p> <p>15 Madison-Kipp Corporation (MKC) facility</p> <p>16 located at 201 Waubesa Street, beginning</p> <p>17 decades ago and continuing until at least</p> <p>18 1989, resulting from improper management</p> <p>19 and disposal of chlorinated ethylene</p> <p>20 solvents."</p> <p>21 The sentence indicates that reports</p> <p>22 indicate, in particular, the fact that</p> <p>23 there was improper management and disposal</p> <p>24 of chlorinated ethylene solvents. Have you</p>	Page 12	<p>1 Q. Do you know how many homes --</p> <p>2 A. Let me just say.</p> <p>3 Q. Go ahead.</p> <p>4 A. I hesitated for a moment because, in fact,</p> <p>5 when these solvents are in the air the</p> <p>6 principal root of exposure is through</p> <p>7 inhalation, but you can actually ingest it,</p> <p>8 so things like PCE are very lipid soluble</p> <p>9 so they can get into things like butter and</p> <p>10 olive oil that are in the house and you can</p> <p>11 ingest it that way. I'd expect that to be</p> <p>12 relatively minor in this case, but I tend</p> <p>13 to think of everything. I think this is</p> <p>14 primarily inhalation.</p> <p>15 Q. Understood. Do you know how many homes of</p> <p>16 the 34 or so homes that are part of the</p> <p>17 Class have actually had reported exposures</p> <p>18 through inhalation of chlorinated ethylene</p> <p>19 solvents?</p> <p>20 A. Well, I've seen the data. I can't give you</p> <p>21 a number right now. I've seen maps, for</p> <p>22 example, which have the homes in which</p> <p>23 there were detects located. I think it was</p> <p>24 probably most of them.</p>
Page 11	<p>1 done any independent work to ascertain the</p> <p>2 type of management and disposal of</p> <p>3 chlorinated ethylene solvents that</p> <p>4 Madison-Kipp engaged in?</p> <p>5 A. No, I haven't, but the fact that, you know,</p> <p>6 the groundwater and soils are contaminated</p> <p>7 with these materials indicates that they</p> <p>8 weren't disposed of properly. Exactly the</p> <p>9 details of the improper disposal, I don't</p> <p>10 know.</p> <p>11 Q. On the next page, Page 2, there's the</p> <p>12 statement that, and I'll just pick up at</p> <p>13 the semicolon on Page 1, "This</p> <p>14 contamination found its way into the</p> <p>15 groundwater, soil, soil vapor and indoor</p> <p>16 air at homes in the vicinity of the MKC</p> <p>17 facility and that this contamination has</p> <p>18 resulted in exposures through inhalation of</p> <p>19 chlorinated ethylene solvents (primarily</p> <p>20 PCE) to residents of these homes."</p> <p>21 Is your opinion limited to the</p> <p>22 inhalation of chlorinated ethylene solvents</p> <p>23 in the MKC area?</p> <p>24 A. Well, yes.</p>	Page 13	<p>1 Q. Are you aware that some of the homes have</p> <p>2 non-detect?</p> <p>3 A. Yes.</p> <p>4 Q. Is it your opinion that the homes that have</p> <p>5 non-detect are not exposed or --</p> <p>6 MR. BUSCH: Strike that.</p> <p>7 Q. The homes that have registered non-detect</p> <p>8 do not have an unacceptable risk of cancer?</p> <p>9 A. So I'm not sure I understand your question.</p> <p>10 Q. Maybe I'll get to it another way. I</p> <p>11 believe it's your opinion, on Page 2, that</p> <p>12 the exposure to PCE in the residential</p> <p>13 environment presents an unacceptable risk</p> <p>14 of cancer; is that correct?</p> <p>15 A. Yes.</p> <p>16 Q. In the homes that have no detection of PCE,</p> <p>17 is it your opinion that they do have an</p> <p>18 acceptable risk of cancer?</p> <p>19 A. If you were in an area where there's</p> <p>20 demonstrable contamination and yet there's</p> <p>21 no detectable level, I'm not ready to</p> <p>22 conclude that there's no exposure.</p> <p>23 Q. Are you -- do you conclude that there is</p> <p>24 exposure?</p>

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<p>1 A. I think it's likely that there is exposure. 2 Q. What's the basis of that? 3 A. Or at least potential for exposure. 4 Q. On Page 2, the next sentence reads, "Data 5 provided to me indicate that the 6 concentrations of the chlorinated ethylene 7 organic solvents in the indoor air to which 8 residents have been, are currently, and in 9 the future could be exposed present an 10 imminent and substantial long term health 11 danger." Is that your opinion? 12 A. Yes. 13 Q. Is there any -- it references the fact that 14 the concentrations of the chlorinated 15 ethylene organic found in the homes of the 16 residents. What concentrations of 17 chlorinated ethylene organic do you believe 18 must be reached before an imminent and 19 substantial long term health danger is 20 presented? 21 A. It's my opinion that once you're able to 22 measure it then it's already an 23 unacceptable risk. The reason for that is 24 that, in terms of the biological potential</p>	<p>1 the box, I wouldn't have had to have 2 written anything else, so I'm not sure how 3 to answer that. 4 Q. Once again, the first sentence reads, "It 5 is my opinion, within a reasonable degree 6 of medical certainty, that exposures to PCE 7 in the residential environment present a 8 public health risk to the Class Area 9 residents." 10 If I were to interpret what you said 11 previously, that's because it's your 12 opinion that once it's detectable, it's 13 already unacceptable? 14 A. Well, because, for this particular 15 chemical, detectable amounts actually 16 represent a substantial biological 17 potential. 18 Q. And that's PCE? 19 A. Yes. It's not my opinion that once 20 anything is detectable. 21 Q. It's PCE? 22 A. Right. I'm talking about PCE. 23 Q. The next sentence says, "This risk is 24 related to exposures to PCE and its</p>
<p>Page 15</p> <p>1 that you have, it's plausibly reasonable, 2 and it's certainly unacceptable, because 3 there's no benefit to it; it only carries 4 risk with it. 5 MS. ROSS: I'm sorry, I didn't 6 hear the last of that sentence. 7 THE WITNESS: It only carries risk 8 with it. 9 Q. Going to the box in the opinion on Page 2. 10 Is there any significance in your reportage 11 as to the bolding and the placement of this 12 language in a box? 13 A. Not beyond the obvious one, which is it was 14 meant to set it off so that it would be 15 easy to see. 16 Q. Okay. This really is at the core -- the 17 boxed in areas tend to be the core of your 18 opinions; is that fair to say? 19 A. Well, I don't know what you mean by core of 20 my opinions. I'm a scientist so I have 21 lots of opinions on things. I think what's 22 in the box was what I thought was pertinent 23 about my opinions for this case, to some 24 extent. If all I needed was what was in</p>	<p>Page 17</p> <p>1 degradation products via inhalation through 2 indoor air and ambient air." 3 Can you list for me the degradation 4 products that you reference there? 5 A. Well, what happens with PCE, if you think 6 of the chemical structure of PCE, it's two 7 carbons connected with these double bonds, 8 and then, like, four ears hanging off are 9 these four chlorines. That's the 10 tetrachloroethylene that's in its name. 11 What happens in the environment is 12 that in anaerobic conditions, that is 13 conditions without oxygen, microbes in the 14 environment start stripping off those 15 chlorines one by one. When you remove the 16 first one, you're left with 17 trichloroethylene. When you remove the 18 second one, you're left with one of the 19 isomers of dichloroethylene. And when you 20 remove three of them, you only have one of 21 the chlorines left, all the others have 22 been replaced by hydrogen, and you have 23 vinyl chloride. And then if you remove 24 that one, you've gone all the way down to</p>

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<p>1 ethylene, which is a hydrocarbon. So the 2 degradation products are the anaerobic 3 dechlorinated compounds that are produced 4 from stripping off those chlorines. 5 Q. Are there initials to describe 6 trichloroethylene? 7 A. Yeah, TCE. 8 Q. Are there initials to describe vinyl 9 chloride? 10 A. A lot of people call it VC. And 11 dichloroethylene is often abbreviated VDC 12 or DCE. VDC because it's vinylidene 13 chloride is sort of a generic name for it, 14 but it's chemical name is dichloroethylene 15 and you have to say which of the isomers. 16 Q. What do the initials VOC, if anything, 17 describe? 18 A. Volatile organic chemical. 19 Q. Are these that we just spoke VOCs? 20 A. They are. 21 Q. In the box it also indicates that it's your 22 opinion "within a reasonable degree of 23 medical certainty that the 24 weight-of-the-evidence favors the</p>	<p>1 it, then the arithmetic really has worked 2 against you because there's quite a lot of 3 it around once it's detected. Even though 4 the units of detection are sometimes 5 expressed in a way that make it sound 6 small, like a part per billion, in 7 biological terms, actually, that's a very 8 large exposure because in terms of the 9 number of molecules, which are the number 10 of potential interactions with a cell that 11 could produce a cancer is very, very large 12 at that point. 13 Q. Is your report limited to risk of cancer or 14 is it broader than risks of cancer? 15 A. Well, my -- I think this report is largely 16 related to cancer. There are risks that 17 are non-cancer risks, some of which are 18 produced by literature that I've 19 contributed to. 20 Q. This opinion is primarily about cancer? 21 A. Yeah, this is primarily about cancer, but 22 if you want to know what my opinion is, 23 actually, since this was written I'm much 24 more concerned, not much more concerned,</p>
Page 19	Page 21
<p>1 proposition that exposure to PCE in the 2 residential environment of Class Area 3 members presents an increased and 4 unacceptable risk of cancer to those 5 exposed under the usual circumstances of 6 living and working in a contaminated 7 environment such as in Madison, Wisconsin." 8 And the unacceptable risk once again here 9 is the anytime PCE is detected, correct? 10 A. Well, if there's enough PCE to detect it 11 with the usual analytic methods then the 12 biological potential to produce harm and no 13 benefit at all makes it unacceptable. 14 Q. So PCE at any level once detected presents 15 an unacceptable risk of cancer in your 16 opinion? 17 A. Well, that's not what I said. I said once 18 detected then it's present at a level which 19 presents unacceptable harm. You had those 20 two things reversed. I'm not saying at any 21 level whatsoever. 22 Q. Once detected it presents an unacceptable 23 risk? 24 A. Yeah. But if your instruments can detect</p>	<p>1 but I am concerned about non-cancer risks, 2 and I think that when I gave my opinions it 3 was sort of implicit there that there are 4 public health risks in general not 5 completely restricted to cancer. 6 Q. Have you done any analysis of non-cancer 7 risk since your report? 8 A. Well, we published about several papers and 9 I can't remember when the last one came out 10 because it takes awhile for these things to 11 go through the publication. 12 Q. Have you done any work in this case in 13 regard to assessing non-cancer risks since 14 the promulgation of your report? 15 A. No. 16 Q. At Page 3, you reference two 17 government-sponsored studies which you are 18 currently the principal investigator or 19 co-principal investigator. Can you name 20 what those are for me, please? 21 A. Let me see which ones those are when I 22 wrote this. I don't remember which ones 23 they were but I'll tell you the two that 24 exist now.</p>

Page 22	Page 24
<p>1 Q. Okay.</p> <p>2 A. One of them is an EPA grant for which I'm a</p> <p>3 co-investigator, not a principal</p> <p>4 investigator. It's in the EPA STAR</p> <p>5 program. STAR is an acronym that stands</p> <p>6 for science to achieve results, and it's a</p> <p>7 program that EPA -- it's a grant program</p> <p>8 that EPA established, at least the part</p> <p>9 that we're involved in, to deal with issues</p> <p>10 of cumulative risk, and so the principal</p> <p>11 investigator of that, Professor Madeleine</p> <p>12 Scammell, was my last graduate student, and</p> <p>13 I'm actually very pleased to say that she's</p> <p>14 my boss now on this grant, since I'm a</p> <p>15 co-investigator on her grant, and it makes</p> <p>16 me very proud to say that.</p> <p>17 But I also have another grant which</p> <p>18 she is on, so I'm her boss on that one, and</p> <p>19 the other grant is an NIH grant, and it's</p> <p>20 something that I've had for 17 years. It's</p> <p>21 at the Superfund Research Center, and it's</p> <p>22 a multi-project grant funded currently at</p> <p>23 the level of about 2.1 million dollars a</p> <p>24 year. I'm the program director of it.</p>	<p>1 on Page 6 in the Footnote 3?</p> <p>2 A. I'm not sure if this has all of them.</p> <p>3 Q. At least some of them are?</p> <p>4 A. Yeah, probably most of them. There may be</p> <p>5 one that's not on there because it came out</p> <p>6 after this. I'm not sure.</p> <p>7 Q. In regard to the NIH grant, is there any</p> <p>8 specific study that's being done with</p> <p>9 regard to PCE in which you were involved?</p> <p>10 A. This is the NIH grant.</p> <p>11 Q. How about the STAR?</p> <p>12 A. The STAR grant is a methodology grant.</p> <p>13 It's more theoretical and it has</p> <p>14 applications to PCE but it's about</p> <p>15 cumulative risk to all sorts of things in</p> <p>16 the environment.</p> <p>17 Q. In this matter, have you been asked to</p> <p>18 render any opinions in regard to PAHs?</p> <p>19 A. No.</p> <p>20 Q. Have you been asked to render any opinions</p> <p>21 in regard to PCBs?</p> <p>22 A. No. I know that there are PAHs and PCBs</p> <p>23 there and I have opinions about them.</p> <p>24 Q. You didn't report them in your report, did</p>
Page 23	Page 25
<p>1 There are maybe six or seven project</p> <p>2 leaders of which at least five of them are</p> <p>3 senior faculty members leading their own</p> <p>4 projects with me as the overall program</p> <p>5 director. There are five projects, one of</p> <p>6 which is a PCE project, and three -- five</p> <p>7 core facilities.</p> <p>8 Q. Those two studies, two programs that you're</p> <p>9 involved in, the NIH and the STAR program,</p> <p>10 what, if any --</p> <p>11 MR. BUSCH: Strike that.</p> <p>12 Q. Of the two programs in which you are</p> <p>13 involved, the NIH grant and the STAR</p> <p>14 program, do any of them relate to PCE or</p> <p>15 its degradation products?</p> <p>16 A. Yes.</p> <p>17 Q. Which ones and how?</p> <p>18 A. Well, the Superfund Research Center has an</p> <p>19 entire project devoted to PCE, and that's</p> <p>20 been going on since probably the late</p> <p>21 1980s, and it's an environmental exposure</p> <p>22 to PCE and almost only through drinking</p> <p>23 water, and we publish many papers for them.</p> <p>24 Q. Are some of those the ones that are listed</p>	<p>1 you?</p> <p>2 A. No -- well, I wasn't aware of any exposure</p> <p>3 pathway to the residents here so I didn't</p> <p>4 actually address that.</p> <p>5 Q. You have not been asked to render any</p> <p>6 opinions with regard to PAH or PCB,</p> <p>7 correct?</p> <p>8 A. No, I haven't, but of course whether I will</p> <p>9 give opinions about it, I'm not completely</p> <p>10 in control of because you may ask me for my</p> <p>11 opinion.</p> <p>12 Q. You haven't been asked by plaintiffs in</p> <p>13 this case to render opinions on PAH or</p> <p>14 PCBs?</p> <p>15 A. No. I could possibly be asked by you, I</p> <p>16 suppose.</p> <p>17 Q. Directing your attention --</p> <p>18 A. While we're stopped for a second. I like</p> <p>19 to stop once an hour because I have bone</p> <p>20 spurs in my neck.</p> <p>21 Q. You control whatever you want.</p> <p>22 A. I know. We're a long way from that.</p> <p>23 Q. You control the whole thing, sir.</p> <p>24 A. Okay, then let's go home.</p>

Page 26	Page 28
<p>1 Q. Which I'm sure is a rarity in your life. 2 On Page 7, you have a discussion that 3 continues about the weight-of-the-evidence 4 methodology; do you see that? 5 A. Yes. 6 Q. Did you employ weight-of-the-evidence 7 methodology in arriving at your opinions in 8 this case? 9 A. Yes. 10 Q. Did you use any other methodology? 11 A. Well, you know, weight-of-the-evidence 12 methodology is sort of a term of art for a 13 lot of different things, which includes 14 making judgments about the evidence and 15 which pieces to weigh, how much importance 16 you give them in your decisions, and I'm 17 not speaking quantitatively there, but 18 qualitatively, so I used lots of other 19 methodologies in pursuing the 20 weight-of-the-evidence. 21 Q. Those are the ones that you discuss at some 22 length in this report? 23 A. Well, I discuss quite a bit the nature of 24 scientific method and scientific judgments</p>	<p>1 (Previous question is read back by 2 the Court Reporter.) 3 Q. I'll restate it. Did you use the 4 weight-of-the-evidence methodology in 5 arriving at an opinion other than "Can 6 chlorinated ethylene solvents cause cancer 7 in human beings?" 8 A. Well, I do use weight-of-the-evidence 9 methodology for arriving at my scientific 10 opinion. To the extent that I have given 11 scientific opinions in this report, that's 12 what I did. 13 Q. Okay. 14 (Discussion off the record.) 15 Q. At Page 21, you make the statement that 16 "Toxicology is an experimental science, 17 while epidemiology is an observational 18 science." Does that observation play any 19 role in your opinion? 20 A. Just for the record, there's also a 21 footnote there that suggests that there are 22 possible exceptions with respect to 23 epidemiology. 24 Q. Okay.</p>
Page 27	Page 29
<p>1 and then I employ them. 2 Q. Directing your attention to Page 17. One 3 of the issues that this report addresses is 4 the question "Can chlorinated ethylene 5 solvents cause cancer in human beings?" Do 6 you see that? 7 A. Yes. 8 Q. In opining on that, did you use the 9 weight-of-the-evidence methodology? 10 A. Well, that's not -- yes, I think the short 11 answer to that is yes. Its got a more 12 complicated long answer. 13 Q. Did you use the weight-of-the-evidence 14 methodology in arriving at any opinion 15 other than the one that "Can chlorinated 16 ethylene solvents cause cancer in human 17 beings?" 18 A. In this report you mean? 19 Q. Yes, I'm sorry, in this report. 20 A. Well, I think the answer here is -- I was 21 going to say the answer is yes but now I 22 don't remember what the question was. 23 MR. BUSCH: Can you read back that 24 question?</p>	<p>1 A. Does this play a role? I'm not sure what 2 you mean by "play a role." 3 Q. Well, do you view your opinion -- you view 4 your opinion in this matter as an 5 epidemiological opinion as opposed to a 6 toxicological or both or neither? 7 A. It's a scientific opinion. I am an 8 epidemiologist but I do use toxicology -- 9 there is a branch of epidemiology that 10 could be called experimental, so that's 11 part of my professional expertise, but most 12 of the evidence that we're talking about is 13 not in epidemiology, it's from the 14 observational portion of epidemiology, and 15 I am primarily an observational 16 epidemiologist. 17 Q. The methodology that you use in 18 observational epidemiology is described, at 19 least in part, in your report, correct? 20 A. Yes, in part. 21 Q. Is there any part of observation or of 22 epidemiology that's important for your 23 report that's not contained in your report? 24 A. No, I don't think that's important for my</p>

Page 30	Page 32
<p>1 report. There's quite a lot that's not 2 here. I'm writing a book now on the 3 subject. But I don't think it affects any 4 of the opinions here. 5 Q. At Page 41 -- excuse me, Page 40 of your 6 report, you reference at Paragraph D, 7 "Relationship with time," and in 8 Paragraph E, "Dose-response relationship". 9 Do either of those, "Relationship with 10 time" and "Dose-response relationship" bear 11 on your opinion in this case and if so how? 12 A. Well, my opinion here is not a specific 13 causation opinion, it's a general 14 causation, and it's not -- it's about the 15 ability of these chemicals to do certain 16 kinds of health effects, so these bear upon 17 the interpretation of epidemiological 18 studies, as described here, and I don't 19 know what to say beyond that. 20 Q. It certainly comes into play but your 21 opinion is not reliant upon any particular 22 dose-response or relationship with time; is 23 that fair to say? 24 A. Yes, except in so far as those things are</p>	<p>1 Q. In your opinion, is there a difference 2 between the use of the word "probable" and 3 "likely"? 4 A. No. At least that's not my understanding 5 there's a difference in EPA's language, and 6 I think in ordinary parlance there isn't 7 either. 8 Q. Much of your work at Boston University and 9 through grants has been relating to 10 exposure to PCE in drinking water, correct? 11 A. Didn't you just say how much. 12 Q. No, I just made a statement. Is it correct 13 that much of your work over the past 14 several years at Boston University and 15 otherwise has been in regard to exposure to 16 PCE in drinking water? 17 A. Yes, probably the last 25 years. 18 Q. Is the primary means of ingestion in those 19 studies the actual consumption of water 20 that has PCE in it, as opposed to vapor 21 that may come from the water? 22 A. It's hard to say. Of course a lot of 23 estimates are that when you have all of the 24 organics in drinking water that about half</p>
Page 31	Page 33
<p>1 related to the interpretation of the 2 studies that are considered in this report. 3 Q. Okay. Directing your attention to Page 48. 4 There's a statement, "It is my opinion, 5 within a reasonable degree of medical 6 certainty, that exposure to PCE in the 7 residential environment presents a public 8 health risk to the Class Area. This risk 9 is related to exposures to PCE and its 10 degradation products." 11 How, if at all, does that opinion 12 differ from the opinion set forth on 13 Page 2? 14 A. I think it's saying it's the same general 15 idea in different language. 16 Q. At Page 68, in the box, there's a statement 17 that "At the very least, it is clear there 18 is independent, informed, scientific 19 opinion that accepts the proposition that 20 TCE and PCE are probable human 21 carcinogens." 22 You italicized the word "probable"; 23 do you see that? 24 A. Yes.</p>	<p>1 of the exposure may be through inhalation, 2 but that varies from setting to setting. 3 Q. Have you done any -- 4 A. And there's dermal exposure, too. 5 Q. Have you done any studies isolated on PCE 6 and its degradation bi-products -- that's a 7 bad term. 8 MR. BUSCH: I'll strike it. 9 Q. Have you done any studies on PCE, DCE or 10 TCE limited solely to vapor being the means 11 of ingestion, inhalation? 12 A. No. 13 Q. At Page 137, in the last paragraph, you 14 reference some testimony from Michael 15 Schmoller and some information from John 16 Hausbeck referencing mitigation systems. 17 Do you see that? 18 A. Yes. 19 Q. Are you aware of the types of mitigation 20 systems that are being offered to certain 21 residents in the Class Area? 22 A. From what I recall from descriptions that 23 this is -- I can't remember exactly what 24 the exact term is, sub-slab ventilation or</p>

Page 34	Page 36
<p>1 exhaustion or something like that.</p> <p>2 Q. Have you had any or have you studied at any</p> <p>3 point in time the efficacy of such sub-slab</p> <p>4 mitigation systems?</p> <p>5 A. No. I say that our Superfund Center, not</p> <p>6 me personally, but the center and the</p> <p>7 program I direct, does do vapor intrusion</p> <p>8 work.</p> <p>9 Q. Your opinion in -- you have not been asked</p> <p>10 to render nor are you rendering on opinion</p> <p>11 on the efficacy of sub-slab mitigation</p> <p>12 systems as a means of addressing vapor</p> <p>13 intrusion, are you?</p> <p>14 A. No.</p> <p>15 Q. Directing your attention to Page 138.</p> <p>16 There's a -- the first phrase in the first</p> <p>17 sentence says that "current uncertainties</p> <p>18 do not allow precise estimation of cancer</p> <p>19 risk from exposure to PCE and potentially</p> <p>20 TCE and VC in the residential environment</p> <p>21 at levels seen in the Class Area." Do you</p> <p>22 see that?</p> <p>23 A. Yes.</p> <p>24 Q. Can you list for me the current</p>	<p>1 Area?</p> <p>2 A. Eliminate exposure.</p> <p>3 Q. The exposure which we talk about are the</p> <p>4 detected exposures, correct?</p> <p>5 A. Well, I'm saying eliminating exposure.</p> <p>6 Q. At any level?</p> <p>7 A. Yes. That would eliminate the</p> <p>8 uncertainties, if that's the question.</p> <p>9 Q. Yes. The last sentence indicates that the,</p> <p>10 or states that it's reasonable and</p> <p>11 supportable "for residents of the Class</p> <p>12 Area to believe that the measured levels of</p> <p>13 PCE, TCE and VC contamination of their</p> <p>14 groundwater, soil, soil vapor and indoor</p> <p>15 air presents them with an excess risk of</p> <p>16 cancer not balanced by any benefit and</p> <p>17 could be considered unacceptable by a</p> <p>18 reasonable person."</p> <p>19 In the context of this report, what</p> <p>20 do you mean by "excess risk of cancer"?</p> <p>21 A. Cancer that's attributed to the exposure to</p> <p>22 PCE.</p> <p>23 Q. At any level above that which would be</p> <p>24 there in its absence?</p>
Page 35	Page 37
<p>1 uncertainties of which you refer?</p> <p>2 A. Just about everything that goes into making</p> <p>3 these kinds of estimates. The biological</p> <p>4 mechanistic bases of the models, the</p> <p>5 parameters used in the models. The</p> <p>6 uncertainty in the inputs into the models</p> <p>7 and the fact that the models produce</p> <p>8 expected values and many of them don't</p> <p>9 produce distributions of possible risks.</p> <p>10 Q. Excuse my ignorance, but can you be more --</p> <p>11 can you elaborate a little bit more on what</p> <p>12 you mean by "failure to produce</p> <p>13 distributions"?</p> <p>14 A. So they tend to produce expected values or</p> <p>15 average values, in layman's terms. So if</p> <p>16 you have two people, one who is five feet</p> <p>17 tall and one person who is six feet tall,</p> <p>18 their average is five-foot six, but nobody</p> <p>19 in that sample is five-foot six feet tall,</p> <p>20 so the distribution is five feet and six</p> <p>21 feet. The average is five-foot six.</p> <p>22 Q. What, if anything, do you believe could be</p> <p>23 done to eliminate the uncertainties that</p> <p>24 you believe to be current in that Class</p>	<p>1 A. No, not necessarily.</p> <p>2 Q. What makes it excess?</p> <p>3 A. Well, first of all, if you can measure it,</p> <p>4 then there's plenty of it around, because</p> <p>5 our instruments are not that sensitive that</p> <p>6 we can get down to levels that don't have,</p> <p>7 I would say, biological potential of public</p> <p>8 health significance.</p> <p>9 Q. So once again, the fact that it's measured</p> <p>10 makes it in excess?</p> <p>11 A. No, the fact that the level at which it's</p> <p>12 measured makes it an excess. If we had</p> <p>13 instruments that were maybe a thousand</p> <p>14 times more sensitive, you might be able to</p> <p>15 get down to a level at which people would</p> <p>16 say -- I don't know.</p> <p>17 Q. But based upon the fact that with the</p> <p>18 current level of instrumentation that it</p> <p>19 can be detected, that in and of itself</p> <p>20 represents an excess risk?</p> <p>21 A. Yes, I think that's primarily a question of</p> <p>22 arithmetic, and I think in this report, I</p> <p>23 went through that arithmetic, and</p> <p>24 essentially it's because molecules are very</p>

Page 38	Page 40
<p>1 small and a microgram of PCE has got an 2 awful lot of molecules. Each of those 3 molecules has got some biological potential 4 to cause some harm, but if there were a 5 handful of them, maybe a million of them or 6 ten million or a hundred million, but we're 7 talking about one with fifteen zeros after 8 it. We're talking about very, very, very 9 large numbers of potential and biological 10 interactions, and that's purely a function 11 of the fact that what chemists refer to as 12 Avogadro's number. It's the number of 13 molecules in one gram molecular weight of a 14 chemical, and it's a huge number. It's 15 6.023 times ten to the 23rd. That's one 16 with 23 zeros after it. 17 So if you have even a fraction of 18 this, say one billionth of a mole gram 19 molecular weight, then you still have one 20 with 15 zeros after it or 14 zeros after 21 it. It's an incredibly large number. The 22 fact that a part per billion doesn't sound 23 very big, that's just a function of the 24 unit that's being used, and if you use</p>	<p>1 actions. 2 Q. Do you agree that exposures below regional 3 screening levels can be considered not to 4 present toxicological concerns? 5 A. Well, since regional screening levels 6 differ from region to region, that can 7 hardly be true. 8 Q. Assuming that all regions agree as to an 9 appropriate screening level, do you agree 10 with the proposition that exposures below 11 screening levels can be considered to not 12 present a toxicological concern? 13 A. No. EPA doesn't believe that and neither 14 do I. 15 Q. Did you consider at all in your opinion the 16 site specific dose and duration of 17 exposure? 18 A. I'm not sure what you mean by that. 19 Q. Did you consider site specific information 20 in that part of your opinion that addresses 21 dose-response? 22 A. I actually don't understand the question. 23 Q. In your opinion, you do take into 24 consideration dose, correct?</p>
Page 39	Page 41
<p>1 units of molecules, then that number 2 suddenly is a very, very large exposure. 3 MR. BUSCH: This would be a good 4 time to break. We're an hour into it. 5 THE WITNESS: Sure. That's 6 perfect actually. 7 MR. BUSCH: Okay. 8 (Recess.) 9 Q. Doctor, do you know what regional screening 10 levels are from the EPA? 11 A. You mean what the levels are? 12 Q. No, just generally the concept of regional 13 screening levels? 14 A. Yeah. 15 Q. What do you understand a regional screening 16 level to be? 17 A. They are -- my understanding is that 18 they're sort of -- well, it depends a 19 little bit on what the relationship of EPA 20 to the state is as to whether the state has 21 prelaw or not, but they're some kind of 22 guidance or direction to people who are 23 trying to deal with environmental problems 24 as to when they should take certain</p>	<p>1 A. You mean specific doses? 2 Q. Yes. Or do you not? 3 A. I take -- well, first of all, there is no 4 risk if you're not exposed. 5 Q. Okay. 6 A. And what I -- I took dose into account to 7 the extent that we've already discussed, 8 which is that if you can see it, then we're 9 talking about a biological potential here 10 that concerns me as a public health 11 scientist, so to that extent the answer is 12 yes, I took it into account in that sense. 13 Q. Did you take into consideration or into 14 account the frequency and duration of 15 exposure? 16 A. Yes, I think so. 17 Q. How? 18 A. That when you're living in a house, the 19 frequency is daily and the duration is the 20 amount of time that you spend in that 21 environment, so when I talk about risk to 22 people living under ordinary circumstances, 23 or whatever the exact language was, I was 24 referring to frequency and duration.</p>

Page 42	<p>1 Q. By the way, of the eight to ten hours that</p> <p>2 you spent in compiling the report, how much</p> <p>3 of it did you spend in reviewing the site</p> <p>4 specific data, do you know?</p> <p>5 A. Well, you know, for example, not for</p> <p>6 example, but I review that because I wanted</p> <p>7 to take what I had written about PCE and</p> <p>8 make it appropriate to the setting, so I</p> <p>9 needed to see what the setting was.</p> <p>10 Q. But if the total amount of time spent was</p> <p>11 eight to ten hours, how much of it was in</p> <p>12 reviewing the data?</p> <p>13 A. Probably at least half of it. I can't give</p> <p>14 you an exact. I wasn't doing one thing all</p> <p>15 at once. I would go back and forth.</p> <p>16 Q. Would you agree with the definition, the</p> <p>17 following definition, that risk assessment</p> <p>18 is the characterization of the potential</p> <p>19 adverse health effects of human exposures</p> <p>20 to environmental hazards?</p> <p>21 A. Well, I don't think I object to it. I</p> <p>22 think one could probably come up with</p> <p>23 different definitions of risk assessment.</p> <p>24 I think that probably describes a lot of</p>	Page 44	<p>1 assessment, that is to say a point or</p> <p>2 interval estimate of average risk.</p> <p>3 Just to add to that. I did perform</p> <p>4 an assessment of risk. I assessed the</p> <p>5 risk, but if you want to put -- if you want</p> <p>6 to put the word assessment after risk then</p> <p>7 you're referring to a particular kind of</p> <p>8 operation, but I think my report is really</p> <p>9 an assessment of risk.</p> <p>10 Q. On a qualitative as opposed to quantitative</p> <p>11 basis?</p> <p>12 A. It's not purely qualitative. When you talk</p> <p>13 about quantitative basis, in the context of</p> <p>14 risk assessment, you're talking about a</p> <p>15 point or interval assessment of a</p> <p>16 probability.</p> <p>17 Q. You did not do that in this case?</p> <p>18 A. I did not do that, no, but I did other</p> <p>19 quantitative things. For example, there's</p> <p>20 a fairly complete review of quantitative</p> <p>21 aspects of the literature up through 2003</p> <p>22 or so.</p> <p>23 Q. Did you use at all in your opinion or</p> <p>24 reference at all or take into consideration</p>
Page 43	<p>1 what's done.</p> <p>2 Q. Did you engage in risk assessment in</p> <p>3 formulating your opinions as set forth in</p> <p>4 the report?</p> <p>5 A. So when you -- you're saying risk</p> <p>6 assessment now, you're specifically</p> <p>7 referring to this definition?</p> <p>8 Q. Let's go back. Do you use the term "risk</p> <p>9 assessment" in your practice?</p> <p>10 A. Yes.</p> <p>11 Q. Would you define "risk assessment" for me</p> <p>12 as you use it.</p> <p>13 A. Well, when I've done risk assessments and</p> <p>14 when I hear other people talking about it,</p> <p>15 they usually are talking about some kind of</p> <p>16 point or interval estimate using one or</p> <p>17 another kind of a model, so quantitative</p> <p>18 estimate, and a risk is a probability.</p> <p>19 Q. Did you engage or did you undergo --</p> <p>20 MR. BUSCH: Strike that.</p> <p>21 Q. Did you perform a risk assessment in</p> <p>22 rendering your opinion as set forth in</p> <p>23 Exhibit 2?</p> <p>24 A. No, I didn't perform a quantitative risk</p>	Page 45	<p>1 at all the EPA's screening level of 9.4</p> <p>2 micrograms per cubic meter for PCE?</p> <p>3 A. That refers to what?</p> <p>4 Q. The EPA screening level.</p> <p>5 A. For what?</p> <p>6 Q. PCE.</p> <p>7 A. Well, are you talking about soil, soil gas,</p> <p>8 sub-slab, indoor air?</p> <p>9 Q. Excuse me, vapor. Indoor air.</p> <p>10 A. Indoor air?</p> <p>11 Q. Yes.</p> <p>12 A. Screening level of what? Say it again.</p> <p>13 Q. 9.4 micrograms per cubic meter.</p> <p>14 A. Well, the Massachusetts screening level is</p> <p>15 .21 parts per billion, so a part per</p> <p>16 billion is about seven micrograms per cubic</p> <p>17 meter so talking about 1.4.</p> <p>18 Q. 9.4?</p> <p>19 A. 1.4 parts per billion screening level, I</p> <p>20 believe, is what it is in Massachusetts,</p> <p>21 micrograms.</p> <p>22 Q. Whatever the screening level is that the</p> <p>23 EPA adopts, it was not specifically used in</p> <p>24 your report or referenced in your report</p>

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<p>1 that I saw; is that correct?</p> <p>2 A. No, it wasn't.</p> <p>3 Q. Do you agree that indoor air typically</p> <p>4 contains volatile organic chemicals,</p> <p>5 including PCE, from consumer products,</p> <p>6 building materials, and outdoor air?</p> <p>7 A. Yes, it often does.</p> <p>8 Q. Is indoor air concentration resulting from</p> <p>9 these sources commonly called background?</p> <p>10 A. Yes, I think commonly but probably</p> <p>11 inappropriately called background.</p> <p>12 Q. Do you know, for example, some of the</p> <p>13 sources from which background PCE may</p> <p>14 emanate?</p> <p>15 A. Yes.</p> <p>16 Q. Give me some examples, if you would.</p> <p>17 A. Well, PCE is used in dry cleaning. It's</p> <p>18 found in some kind of products like drain</p> <p>19 cleaners, you know, other household things.</p> <p>20 I don't know what they all might be. Most</p> <p>21 of the dry cleaning exposure is gone by the</p> <p>22 time you get the clothes home but it</p> <p>23 contributes to urban background.</p> <p>24 Q. That is the more concentrated the</p>	<p>1 world so.</p> <p>2 Q. Do you know if the use of PCE is banned in</p> <p>3 various cleaners and cleaning substances?</p> <p>4 A. Not that I'm aware of.</p> <p>5 Q. Is it banned at all in any application to</p> <p>6 your knowledge?</p> <p>7 A. Well, I think we just talked about dry</p> <p>8 cleaning.</p> <p>9 Q. In Los Angeles but how about nationwide?</p> <p>10 A. Not yet.</p> <p>11 Q. Are you aware that a study was done by the</p> <p>12 United States Environmental Protection</p> <p>13 Agency in regard to background indoor air</p> <p>14 concentrations of volatile organic</p> <p>15 compounds?</p> <p>16 A. Yes.</p> <p>17 Q. It was promulgated sometime in 2011?</p> <p>18 A. Well, there have been numerous studies.</p> <p>19 Q. Are you aware of one that was promulgated</p> <p>20 in 2011?</p> <p>21 A. I don't know what you mean by</p> <p>22 "promulgated".</p> <p>23 Q. Published.</p> <p>24 A. No.</p>
Page 47	Page 49
<p>1 population the more background PCE, as a</p> <p>2 general proposition?</p> <p>3 A. May or may not be. It depends upon local</p> <p>4 conditions. So many dry cleaners are now</p> <p>5 moving away from PCE because of its</p> <p>6 toxicity so my dry cleaner no longer uses</p> <p>7 PCE.</p> <p>8 Q. Is PCE a banned substance from any use in</p> <p>9 the United States?</p> <p>10 A. Well, it will be -- in California I think</p> <p>11 it's going to be banned for dry cleaning</p> <p>12 use. If not already, in a year or two, but</p> <p>13 it's not yet banned but likely will be in</p> <p>14 the not too distant future.</p> <p>15 Q. Do you know if it's banned in Wisconsin for</p> <p>16 use in dry cleaning?</p> <p>17 A. I don't know.</p> <p>18 Q. Is it banned in Massachusetts for use in</p> <p>19 dry cleaning?</p> <p>20 A. Not yet. Actually, I think Los Angeles</p> <p>21 county is the only place where such a ban</p> <p>22 has actually been put into effect or about</p> <p>23 to be put into effect, but Los Angeles</p> <p>24 county is bigger than most countries in the</p>	<p>1 Q. To your knowledge, is there an estimated</p> <p>2 level of PCE nationwide that's deemed to be</p> <p>3 background?</p> <p>4 A. You mean an ambient outdoor air or indoor</p> <p>5 air?</p> <p>6 Q. Indoor air.</p> <p>7 A. Well, I think my general impression that</p> <p>8 the 50th percentile in a distribution for</p> <p>9 indoor air concentration is somewhere</p> <p>10 around half a part per million billion</p> <p>11 volume.</p> <p>12 Q. What is the significance, from your</p> <p>13 perspective of being in the 50th</p> <p>14 percentile?</p> <p>15 A. It has no particular significance other</p> <p>16 than it's one of the places in the</p> <p>17 distribution that's frequently used as a</p> <p>18 marker. It's the median.</p> <p>19 Q. Does -- when it is -- when it's expressed</p> <p>20 in terms of the 50th percentile, what is</p> <p>21 meant by that from a lay perspective?</p> <p>22 A. It's the median.</p> <p>23 Q. So the median of indoor air background of</p> <p>24 PCE is what again?</p>

Page 50	<p>1 A. I haven't looked at this for a bit, but my 2 recollection is somewhere around a half 3 part per billion as a volume measurement, 4 so that means that 50 percent of households 5 will have that or less. 6 Q. Is a half part per billion a measurable 7 level of PCE? 8 A. Yes. 9 Q. Another way to put it is, that's a 10 detectable level of PCE? 11 A. Yes. 12 Q. Does that mean that, on average, I know you 13 don't like to -- I won't say that. That 14 the level -- does that mean that 50 percent 15 of the houses have one half part per 16 billion or that all houses have, on 17 average, a half a part per billion? 18 A. It's not an average, it's a median, and 19 that's an extremely important difference. 20 Q. In the context of this, the median is the 21 mid-point number, correct? It means that 22 half of the detections -- excuse me, that 23 the highest, the mid-point between the 24 highest and the lowest detection, is that</p>	Page 52	<p>1 lognormal distribution to it. That's a 2 bell-shaped curve which has been 3 transformed logarithmically, so it's now 4 skewed, and they fit that and assume that a 5 lot of the non-detects are -- there's stuff 6 there, but it goes according to the 7 lognormal distribution. That's not a bad 8 way to do it but it can produce certain 9 kinds of bias when you do it, and you don't 10 really know what the measurements are below 11 your level of detection, so that's kind of 12 a long-winded way of saying we don't know. 13 Q. I appreciate that. I believe you said that 14 one of the more prevalent uses of PCE, at 15 least here to for, has been in the dry 16 cleaning industry? 17 A. Yes, that and degreasing are probably the 18 two principal uses. 19 Q. Assume for the moment that my laundry, the 20 laundry that I use to do my shirts, for 21 example, uses PCE, and assume that I wear 22 five laundered shirts a week and every 23 two weeks I take them to the laundry and I 24 pick them up and put them in my car and I</p>
Page 51	<p>1 the median in this context? 2 A. Well, no, it includes all the non-detects, 3 so supposing that you had 100 measurements 4 and 49 of them were non-detects and the 5 50th was a half part per billion, then that 6 would be the median. In other words, you 7 take all the measurements and you line them 8 up in order and you go halfway down the 9 line, so it doesn't take into account the 10 distribution at all. 11 Q. Are you aware of any studies that take into 12 account the distribution of PCE? 13 A. Yeah, the problem -- there's a different 14 kind of problem there because the 15 non-detects are not zero. Some of them may 16 be zero but a lot of them aren't, so in 17 order to figure out what the non-detects 18 are, you have to make an assumption about 19 what the underlying distribution of the 20 data that it might be. 21 So there's different ways to do it. 22 One of them is you can take all the 23 non-detects and call them zero. I think 24 what EPA frequently does is they fit a</p>	Page 53	<p>1 drive ten shirts that are laundered in PCE 2 or have some PCE component in them from the 3 dry cleaning. Am I, as you understand it, 4 am I exposed during my car ride to a 5 detectable level of PCE? 6 A. The data that I've seen, and I haven't 7 looked at it for awhile -- well, first of 8 all, my advice to you would be to find 9 another dry cleaner because a lot of them 10 are moving away from PCE not because so 11 much the risk to consumers, although 12 consumers don't like it when they find out, 13 but the risk to the workers. 14 So the answer to your question is 15 that the data that I've seen in the past, 16 when people weren't quite as careful with 17 PCE, was that if you had dry cleaning, 18 let's, say not your shirt but your jacket, 19 your suit jacket, and you took it home on a 20 very hot day wrapped up in plastic from the 21 dry cleaners, that in a certain percentage 22 of them there might be some measurable PCE 23 in your car from that, but mainly not. 24 That's not -- my impression, that's not a</p>

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<p>1 significant exposure. I don't think 2 there's probably anything to speak of from 3 shirts. 4 Q. But it's mostly those items that are truly 5 dry cleaned, like suits and woven fabrics? 6 A. Yeah, and of those, only under special 7 circumstances would there be a brief 8 exposure under not well-defined 9 circumstances, like really hot days and 10 only from some dry cleaners. Dry cleaners 11 differ. So you might bring it home from 12 one place and there might be no exposure 13 from another place, and now that they're 14 using the transfer method, there's not as 15 much exposure that way. 16 Q. Have you taken any position at all publicly 17 in regard to the desirability of banning 18 PCE from all use in the United States? 19 A. It's my opinion it should be banned from 20 all use. Have I ever taken a public 21 position on it? I can't remember. If 22 anybody asked me about it, that's what I 23 would say. I think I and a lot of people 24 consider it an unreasonably dangerous</p>	<p>1 opinions, have you? 2 A. No. Well, to be honest with you, from what 3 I quickly saw from what she said, she seems 4 to agree with me, but I can't say that from 5 a detailed reading of it. I expect that, 6 you know, what she was asked to do is 7 criticize me, and I was not surprised to 8 see, but her bottom line seems to be the 9 same as my bottom line; this is a likely 10 cause of cancer in human beings, or it's 11 likely to cause cancer in human beings. 12 Q. You have not been asking to rebut any of 13 her specific opinions? 14 A. No. 15 MR. BUSCH: I want to take 16 five minutes. I may be able to eliminate 17 some of this stuff. 18 (Recess.) 19 Q. Doctor, in your opinion, are there any 20 members of the Class who are not exposed to 21 an unacceptable risk of cancer? 22 A. Well, just looking at the environmental 23 setting here, the environment that's 24 substantially contaminated and the</p>
Page 55	Page 57
<p>1 product in the sense that you don't need 2 it. 3 Q. Are you familiar with the U.S. EPA's vapor 4 intrusion screening level calculator that 5 was published in March of 2012? 6 A. Well, I mean, I have looked into what EPA 7 is doing on vapor intrusion a little bit, 8 so I don't know that they have actually 9 publicly put anything out there. There was 10 a leaked graph vapor intrusion that inside 11 EPA had, but I don't think that's up on 12 their website. I think it has either been 13 withdrawn or -- so the answer is, I know 14 that there is something, but I don't think 15 it's really out there. 16 Q. Whether it's out there or not, you did not 17 use an EPA vapor intrusion screening level 18 calculator in coming up with your opinions, 19 correct? 20 A. I did not. 21 Q. Did you read the expert report of Barbara 22 Beck? 23 A. I only took a briefest glance through it. 24 Q. You've not been asked to rebut any of her</p>	<p>1 groundwater and the soil and in the air, 2 and I think you have to be worried about -- 3 it's reasonable to consider that there's a 4 risk of harm to anybody who lives bordering 5 on this facility. This is pretty close 6 quarters. 7 Q. Have you been to the site? 8 A. No, I haven't. 9 Q. Have you interviewed any of the homeowners? 10 A. No. 11 Q. Other than discussions with your 12 attorney -- excuse me, with the attorney 13 for the Class and with your review of the 14 information provided to you, have you 15 talked with anyone else? 16 A. No. You mean specifically about this case? 17 Q. About this case. 18 A. I have colleagues. I ask them about stuff. 19 Q. Not about this case? 20 A. No. 21 MR. BUSCH: I'll pass the baton to 22 the others. 23 CROSS-EXAMINATION 24 (By Mr. Jacques Condon)</p>

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1 Q. Doctor Ozonoff, my name is Jacques Condon.
 2 I just have a few follow-up questions. Can
 3 you pull out Exhibit No. 1, which is your
 4 CV. I noticed in here -- you described
 5 yourself as an epidemiologist, correct?
 6 A. Yes.
 7 Q. For awhile you were in the staff at the
 8 Department of Neurology at the Boston VA
 9 Medical Center?
 10 A. Yes.
 11 Q. What's the difference between neurology and
 12 epidemiology?
 13 A. They're completely different disciplines.
 14 Q. What are they? Can you explain the
 15 difference?
 16 A. Neurology is the clinical discipline about
 17 diseases of the nervous system, and
 18 epidemiology is a methodology for
 19 understanding determinants of distribution
 20 of a disease in a population.
 21 Q. When you were at Cornell, was your emphasis
 22 in neurology, epidemiology?
 23 A. Are you asking me why I was in the
 24 Department of Neurology?

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1 Q. Yes.
 2 A. There's a very simple answer to that
 3 question, which is that I was the
 4 co-director, along with a colleague who was
 5 a neuropsychologist, of the Boston
 6 Environmental Hazard Center, which was the
 7 principle Gulf War research center for the
 8 Department of Veterans' Affairs. So we
 9 were located at the Veterans' Hospital and
 10 I was given an appointment on the staff of
 11 the hospital, which meant that I could see
 12 patients if I was so inclined, which I
 13 wasn't, because I'm not a diagnosing or
 14 treating physician at this point, although
 15 I'm licensed to do that. It was
 16 essentially just an administrative slot for
 17 me as the director of this center in a
 18 clinical facility, and the reason it was in
 19 the Department of Neurology was because my
 20 colleague is a neuropsychologist. She
 21 actually succeeded me in the department at
 22 Boston University.
 23 Q. So it was more a circumstance of being part
 24 of the VA that you're listed under the

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1 Department of Neurology?
 2 A. Yes.
 3 Q. The report that has been marked as
 4 Exhibit 2, you said in your earlier
 5 testimony that came from either prior
 6 versions or it came from other sources; is
 7 that right?
 8 A. It is in part, which is this is a report
 9 that I sort of developed over a period of
 10 time because this is what I do is
 11 chlorinated ethylenes, and I wanted a way
 12 to explain this, not only to explain
 13 chlorinated ethylenes, but to explain the
 14 whole process of how we understand these
 15 things. A lot of people have read this, so
 16 it's not like you're the only one to have
 17 read it, but it's also useful in
 18 circumstances like this and so each of the
 19 circumstances like this that I've used it
 20 with have had specific parameters to them,
 21 and so I make the changes that are
 22 appropriate to that.
 23 Q. There's a lot of background material in
 24 terms of methodology,

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1 weight-of-the-evidence, other things in
 2 this report, right?
 3 A. Yes. Actually, one reason is because it
 4 has become important when offering opinions
 5 these days to explain exactly how you
 6 arrived at your opinion, and I think that I
 7 took a lot of care to explain that and
 8 that's applicable to lots of different
 9 cases, not just this one.
 10 Q. The opinions in some of the background
 11 material that's in your report, have you
 12 published that separately?
 13 A. No. Well, I'm an academic, so I write
 14 papers and I'm sure that these ideas appear
 15 in other forms in different ways or they
 16 were first part of papers and appear here.
 17 I'm writing a book now on mathematical
 18 foundations of epidemiology and obviously,
 19 this is part of that.
 20 Q. When you sat down to prepare this report,
 21 were you taking it from one or two sources,
 22 did it come from different papers; how did
 23 you come up with what we have as a 140
 24 page --

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<p>1 A. You mean the origin of this?</p> <p>2 Q. Right.</p> <p>3 A. My head.</p> <p>4 Q. Over time.</p> <p>5 A. Yeah. It's original with me. I wrote it</p> <p>6 myself. I didn't -- it's not copied or</p> <p>7 taken from another source, except where</p> <p>8 cited. I cited everything.</p> <p>9 Q. In the eight to ten hours you spent looking</p> <p>10 at things in this case, did you write</p> <p>11 140-page report in that time?</p> <p>12 A. No, I think, as I described, I essentially</p> <p>13 spent the time in this case finding those</p> <p>14 things which were necessary in order to</p> <p>15 make this relevant.</p> <p>16 Q. You took what you thought was necessary to</p> <p>17 make it relevant, you inserted those into</p> <p>18 this report; is that right?</p> <p>19 A. I adapted this report so that it addressed</p> <p>20 things that are relevant to this case.</p> <p>21 Q. What source did you adapt it from?</p> <p>22 A. You know, as I described, the data on</p> <p>23 residents and site specific --</p> <p>24 Q. No, I mean -- sorry. We're not</p>	<p>1 exactly.</p> <p>2 Q. I believe those cases were five or</p> <p>3 six years ago, or what was the timeframe of</p> <p>4 those?</p> <p>5 A. Something like that. There's more</p> <p>6 up-to-date citations in this one, but it's</p> <p>7 not systematic. I do, obviously, keep</p> <p>8 track of the literature because this is</p> <p>9 what I do for a living, PCE epidemiology,</p> <p>10 and there are lots of citations in papers</p> <p>11 that I've co-authored on that have come out</p> <p>12 in this period. I don't know if they're</p> <p>13 all cited in here or not.</p> <p>14 Q. If you go back to Exhibit No. 1 and look at</p> <p>15 Page 8. Look at the very top. There's</p> <p>16 something you published in the New England</p> <p>17 Journal of Medicine. This goes back</p> <p>18 awhile, 32 years ago. "Artificial</p> <p>19 Sweeteners and Bladder Cancer." Did you</p> <p>20 come to a conclusion in that article?</p> <p>21 A. Yeah. This was actually a response to an</p> <p>22 article written by Morrison in New England</p> <p>23 Journal of Medicine, a case control study.</p> <p>24 The artificial sweetener involved was</p>
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<p>1 communicating very well. You say you</p> <p>2 adapted it. Does that mean you took</p> <p>3 down -- you had a report already, you took</p> <p>4 things out --</p> <p>5 A. Yes, I had a report already that had lots</p> <p>6 of stuff in it, and, in fact, there are</p> <p>7 things that I've written in the past that</p> <p>8 talk about autoimmune disorders and birth</p> <p>9 defects, which could very well have been in</p> <p>10 this one.</p> <p>11 Q. The report that you had already, what case</p> <p>12 was that?</p> <p>13 A. Its been used in a number of cases.</p> <p>14 There's a case out in Burbank. I can't</p> <p>15 remember what the caption was.</p> <p>16 Q. You talked about the Indiana case and</p> <p>17 another case. Were those reports, would</p> <p>18 they look similar to what I see in</p> <p>19 Exhibit 2?</p> <p>20 A. Yes, they would.</p> <p>21 Q. Same information with the exception of</p> <p>22 information that would be case specific,</p> <p>23 right?</p> <p>24 A. Probably pretty much so. I can't remember</p>	<p>1 saccharin, which was actually banned under</p> <p>2 the Delaney Clause. It was a comment on</p> <p>3 Morrison's study, and he and I ran into</p> <p>4 each other, unfortunately he passed away a</p> <p>5 number of years ago, but he and I ran into</p> <p>6 each other and I said, "I wrote that</p> <p>7 because what you said was going to be</p> <p>8 misunderstood." He said, "It's not my job</p> <p>9 to teach people."</p> <p>10 Q. What was your conclusion?</p> <p>11 A. Well --</p> <p>12 Q. Thirty-two years ago, what was your</p> <p>13 conclusion?</p> <p>14 A. I'm guessing that you've read it more</p> <p>15 recently than I have since I read it 32</p> <p>16 years ago when I wrote it. I can't</p> <p>17 remember exactly what the issue was</p> <p>18 anymore, to be perfectly honest.</p> <p>19 Q. Do you recall whether you were -- either</p> <p>20 the article you were commenting on or your</p> <p>21 comment was negative towards saccharin?</p> <p>22 A. Yeah, I thought that the saccharin ban</p> <p>23 under the Delaney Clause was reasonable.</p> <p>24 Q. If you go to Page 11. Let me know when</p>

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<p>1 you're there. 2 A. Yeah. 3 Q. You're there? 4 A. Uh-huh. 5 Q. Look at No. 64. It talks about "Cancer in 6 the Vicinity of a Department of Defense 7 Superfund site in Massachusetts," and this 8 was something that was apparently published 9 in a Toxicology and Industrial Health 10 publication. Do you see that? 11 A. Yeah. 12 Q. Do you recall if you reached a conclusion 13 in what this particular article or whatever 14 this was? 15 A. Well, reach a conclusion. We reported an 16 association. 17 Q. Association of what? 18 A. A statistically significant association 19 between breast cancer and, I think it might 20 have been lung, and these mortar training 21 positions on Otis Air Force Base on Cape 22 Cod. 23 Q. You said there was a statistically 24 significant correlation?</p>	<p>1 Massachusetts." Do you see that? 2 A. Yes. 3 Q. Are you familiar with this cancer risk in 4 residential proximity to cranberry bog in 5 Massachusetts? 6 A. Yes, I'm co-author of it. 7 Q. What was going on? 8 A. Cape Cod, which is where we've done a lot 9 of work, and this was either funded by 10 Massachusetts or NIH. I think it was -- 11 Q. You said NAH? 12 A. NIH. I think it was the Commonwealth of 13 Massachusetts at this point. There are two 14 states, maybe three, actually, Wisconsin 15 may be one of them, that produce 16 cranberries so a cranberry bog is like a 17 giant pool full of cranberries, and in 18 order to grow them, they put pesticides on 19 them, and often that's done through the 20 water. It's call chemigation. At one 21 point it was done by airplanes, aerial 22 spraying of cranberry bogs. 23 Now people live right along there, 24 their houses border on the cranberry bogs,</p>
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<p>1 A. Association, yes. 2 Q. Is that based on studies that you reviewed 3 or what was that? 4 A. It was based on studies we did. 5 Q. When you say "we," was it you, part of a 6 grant, what was it, if you can recall? 7 A. It was part of a grant and, you know, those 8 are my co-authors listed with me. 9 Q. Was it a grant from governmental -- 10 A. Yeah, it was either the Commonwealth of 11 Massachusetts or NIH and I, on that date, I 12 don't remember exactly who the funder was. 13 Q. Okay. 14 A. Just to explain -- do you want me to 15 explain what it was about or you don't 16 care? 17 Q. Let's move on. If you can go to your 18 report, which is Exhibit 2, and in 19 particular I want you to look at Page 6. 20 A. Okay. 21 Q. In the large footnote number three, if you 22 go eight lines down, there's a reference to 23 "Cancer risk and residential proximity to 24 cranberry bog cultivation in</p>	<p>1 and so we used a drift model for that have 2 been used by the pesticide people about how 3 pesticides drift away when you're spraying 4 them. 5 Q. Just so I'm clear, when you say "drift 6 model," is this an actual physical model or 7 more a model from a scientific -- 8 A. I'm not sure what you mean by a physical 9 model. 10 Q. When you say "drift model," what is a drift 11 model? 12 A. It's a, in this case it was an equation 13 predicting how pesticides drifted when you 14 spray things, although we did something, 15 now that I'm telling you, we used 16 information on drift models, but we 17 actually used a buffer around the cranberry 18 bogs. I think it was 2500 meters, 19 something like that, so we compared the 20 cases of brain cancer within that buffer 21 and outside that buffer zone, and that's 22 where this association came from. 23 Q. Was that also a grant? 24 A. Yeah.</p>

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<p>1 Q. When you're part of this grant proposal and 2 you're doing your research and you create a 3 buffer around the zone, are you there 4 literally taking samples or how does that 5 work? 6 A. Okay. It was not a grant proposal, it was 7 a grant. A proposal is how you get the 8 grant. 9 Q. Thank you. 10 A. We were funded to do research by the 11 Commonwealth of Massachusetts on cancer on 12 Cape Cod, different kinds of cancer. I 13 think there were seven different kinds of 14 cancer. One of them was brain cancer. And 15 one of the things we decided to look at was 16 whether living near cranberry bogs, because 17 they're sprayed aerially, was related to 18 brain cancer, and there was actually a 19 pretty strong association with brain cancer 20 living close to the bog and the vicinity of 21 the bog, so this was a study that we did 22 using the state's cancer registry and 23 interviewing people. 24 Q. What was your ultimate conclusion on the</p>	<p>1 outside of that 2500 meters by part of the 2 study group, which were the members who 3 lived on Cape Cod? 4 Q. In that particular study, you came up with 5 the relative risk numbers? 6 A. Yeah, it was estimated with something else 7 called an odds ratio. 8 Q. Odds ration, I saw that in your report. 9 You refer to it as OR. 10 A. Yes. 11 Q. There is some odds ratios related to births 12 and other things in some reports? 13 A. Yeah, so often you can't measure a relative 14 risk directly because of the way your 15 observations are collected, and if you use 16 a study design called a case control 17 design, you don't actually get the relative 18 risk, you get something called an odds 19 ratio, which is the odds of having the 20 disease if you're exposed compared to the 21 odds of having the disease if you're not 22 exposed, but it turns out when the risk of 23 getting the disease is relatively low, less 24 than ten percent or less than one percent,</p>
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<p>1 spraying? 2 A. There was a relative risk, something like 3 four, four and a half, living close to the 4 cranberry bog. 5 Q. What do you mean by "relative risk"? 6 A. In other words, the risk living close to 7 the bog compared to living farther away 8 from the bog. 9 Q. When you say "relative risk," that's a 10 percentage? 11 A. I presume too much, I'm sorry. So if I 12 were to ask what the relative risk of, say, 13 being in this room versus not being in this 14 room. I would take the risk, a measured 15 risk of being in this room and compare it 16 to the measured risk outside the room and 17 take their ratio. That's the relative 18 risk. So a relative risk of ten would mean 19 that it was ten times riskier to be in this 20 room than outside this room. 21 A relative risk of four for cranberry 22 bogs means that it was four, four and a 23 half times riskier to live within 2500 24 meters of the cranberry bogs than to live</p>	<p>1 then the odds ratio and the risk ratio are 2 basically the same thing. 3 Q. There are other references, and you just 4 mentioned in the Cape Cod that it sounds 5 like it was an extensive study in Cape Cod? 6 A. We have been studying them probably for 7 20 years, maybe longer, and it's not the 8 same datus. We keep collecting new data. 9 Q. It's an ongoing study? 10 A. Yes, its been ongoing and now it has been 11 extended into Rhode Island. 12 Q. Is it because of how the geography of Cape 13 Cod or what's -- 14 A. That's a good question. The original 15 impetus for the study was that when people 16 looked at the state's cancer registry they 17 saw that the risk of cancer was about 18 25 percent higher if you lived on Cape Cod 19 compared to the rest of the state by a 20 particular kind of measure, and then the 21 question was why. So we were asked by the 22 state and funded by the state to try to 23 come up with an answer to that question. 24 So we looked at a number of things.</p>

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<p>1 One of them was cranberry bogs and one of</p> <p>2 them was one of the original suspicions,</p> <p>3 which was Otis Air Force Base might be the</p> <p>4 source of contamination. Relevant to this</p> <p>5 case, it turned out that there was another</p> <p>6 source of contamination on the Cape that</p> <p>7 people sort of knew about but didn't know</p> <p>8 what the extent of it was.</p> <p>9 Q. What was that?</p> <p>10 A. PCE contamination of the water. Now, the</p> <p>11 really interesting part about this is where</p> <p>12 that PCE contamination came from. It</p> <p>13 turned out that it came from the lining of</p> <p>14 the water mains, which made this an</p> <p>15 extremely unique situation because it</p> <p>16 became like a gigantic natural experiment.</p> <p>17 Q. How long did it take to realize it's the</p> <p>18 lining of the water mains --</p> <p>19 A. It was going on for a full ten years before</p> <p>20 anybody realized it, and they discovered it</p> <p>21 by accident in Rhode Island when they did</p> <p>22 some routine water testing and they found</p> <p>23 PCE in the water and they couldn't figure</p> <p>24 out where it was coming from because this</p>	<p>1 areas, we'll give you a new kind of water</p> <p>2 pipe. We'll coat the inside of it with a</p> <p>3 plastic," and a plastic is something called</p> <p>4 Piccotex. It's a resin.</p> <p>5 Q. Piccotex?</p> <p>6 A. Yes, P-i-c-c-o-t-e-x. It's on the outside</p> <p>7 of milk cartons. So its been tested to be</p> <p>8 safe for contact with water and stuff like</p> <p>9 that. So the question is how do you get</p> <p>10 this on the inside of the pipe. Well, what</p> <p>11 they decided to do is dissolve it in PCE</p> <p>12 and then paint the inside of the pipe with</p> <p>13 it and under the assumption that the PCE</p> <p>14 would evaporate and they would have a lined</p> <p>15 plastic pipe, but there wasn't a big enough</p> <p>16 market for this pipe so they made the pipe</p> <p>17 to order, and what that meant was that if</p> <p>18 you lived in Falmouth on Cape Cod and you</p> <p>19 were in the water department and you needed</p> <p>20 to replace the water mains on Oak Street,</p> <p>21 you ordered 100 feet of water main for Oak</p> <p>22 Street and within 48 hours of the order</p> <p>23 they would paint the inside of some</p> <p>24 asbestos cement pipe and ship it off to</p>
Page 75	Page 77
<p>1 case is typical of where PCE comes from,</p> <p>2 water and the air, which is someone throws</p> <p>3 it on the ground and it gets into the</p> <p>4 groundwater, but they couldn't find any</p> <p>5 source of PCE here, and it took many months</p> <p>6 for the EPA to figure this out, and here's</p> <p>7 what the story turned out to be.</p> <p>8 Q. Were you part of the team that figured it</p> <p>9 out or was it EPA acting alone?</p> <p>10 A. EPA and Commonwealth of Massachusetts and</p> <p>11 Rhode Island.</p> <p>12 Q. Okay. Keep going.</p> <p>13 A. Sure. So here's what happened. That there</p> <p>14 is very soft sort of corrosive water in the</p> <p>15 northeast and the water mains had been</p> <p>16 coated with sort of tar, asphalt type</p> <p>17 substance to protect the water mains from</p> <p>18 corroding and so on, but with this soft</p> <p>19 corrosive water it was creating color and</p> <p>20 taste and odor problems. So in the late</p> <p>21 1960's, two companies, Johns Manville</p> <p>22 Corporation and, I think, CertainTeed, who</p> <p>23 are makers of asbestos cement pipe said</p> <p>24 "Well, you know, if you're in one of these</p>	<p>1 you, so you got freshly painted. They put</p> <p>2 it in the ground and the assumption was</p> <p>3 that it would go away. It would dry up and</p> <p>4 by the time they put it in the ground, it</p> <p>5 would all be gone. Well, that turned out</p> <p>6 to be really wrong.</p> <p>7 Q. Has it since been remediated?</p> <p>8 A. So they started putting the pipe in in 1969</p> <p>9 and by 1979 they figured this out. The</p> <p>10 amounts in the water were pretty</p> <p>11 substantial.</p> <p>12 Q. Sorry, the mouths in the water?</p> <p>13 A. The amounts in the water were pretty</p> <p>14 substantial and they had about 700 miles of</p> <p>15 this pipe and it was scattered all over the</p> <p>16 place. Oak Street might have some and then</p> <p>17 Main Street a mile away might have some for</p> <p>18 a block or two.</p> <p>19 Q. When you talked about substantial amounts,</p> <p>20 they were doing tests and coming up with</p> <p>21 whatever the ratios were?</p> <p>22 A. Yes. It was way over what EPA at that</p> <p>23 point allowed it, and the suggested no</p> <p>24 adverse response level for PCE in water was</p>

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<p>1 40 parts per billion. It's now five parts 2 per billion, and it was way over 40 parts 3 per billion and some of the time it was 4 thousands of parts per billion. 5 So the way they remediated it was to 6 a systematic program of flushing and 7 bleeding, so they put a tap on Oak Street 8 where this pipe was and they just kept 9 running fresh water through it all the time 10 so it diluted it, basically, until they got 11 it under the five-part per billion level, 12 and they've been doing that ever since. 13 It's still there. 14 Q. Still being flushed? 15 A. It's still being flushed, and the pipe is 16 still there but a lot of the PCE now is 17 leached out of the lining of the pipe. 18 So what does this have to do with us? 19 So I was on an advisory committee for the 20 Department of Environmental Quality 21 Engineering and this issue came before us, 22 what are they going to do about the pipe 23 and about the health threat from it. So I 24 actually, and that's where this flushing</p>	<p>1 I think we published our first cancer paper 2 on PCE and bladder cancer in 1993 and one 3 of the things that you'll find, if you look 4 at the iris assessment, is that paper is 5 cited as one of the half a dozen with the 6 highest quality exposure assessments. 7 Q. I think you said, correct me if I'm wrong, 8 that you're part of the study that helped 9 devise the flushing technique? 10 A. I was part of the advisory committee. It 11 all emerged from the advisory committee and 12 the department. 13 Q. Can't they just use different type of pipe? 14 A. Well, they would have to dig up 700 miles 15 of pipe. That would have been the ideal 16 solution, replace the pipe, but that was 17 not possible. 18 Q. The other solution you came up with was a 19 flushing technique? 20 A. Yeah. Not ideal, obviously, but it did get 21 the levels way down. 22 Q. Below the EPA level? 23 A. Yeah, substantially below, actually. 24 I should explain something.</p>
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<p>1 and bleeding was devised, and so I knew 2 about this and I decided this would be a 3 really good subject for epidemiologic 4 investigation, and we were funded to -- you 5 know, along with all these other possible 6 sources of cancer, this is one that was a 7 lot of interest to me, because one of the 8 things you'd like to do with an 9 epidemiological study is when you make a 10 comparison, you like to compare like with 11 like, and we have this natural experiment 12 here, so we located where all the pipe was 13 from records of the water companies and 14 then we did a big study by comparing cancer 15 of people who had cancer with the pipe in 16 front of their house and people who didn't 17 have the pipe. 18 Now, I've simplified a little bit 19 because we used a mathematical model 20 actually to estimate the amount of PCE that 21 was leaching out of the pipe, given the 22 diameter of the pipe, the age of the pipe, 23 and when the person moved into their house, 24 so it's quite an elaborate methodology, and</p>	<p>1 Massachusetts is not like Wisconsin or 2 Illinois. In fact, it's not like almost 3 any other state in the union. 4 Q. Well, nothing compares to Wisconsin. 5 A. Well, I'm from Wisconsin so I appreciate 6 that, but in this important respect, which 7 is that every square inch of Massachusetts 8 is in a city or town. There's no such 9 thing as an unincorporated area. Counties, 10 basically, exist only on paper. So there's 11 351 cities and towns and almost as many 12 water companies, so when you have all these 13 cities and towns on Cape Cod, it's not like 14 you can do one thing to everybody at once. 15 You've got all these small jurisdictions. 16 Q. Small jurisdictions, municipalities? 17 A. Cities and towns, and that's all there is. 18 On Cape Cod it turns out there is a county 19 health department but that's unusual. 20 Probably more than you wanted to know 21 about this. 22 Q. Thank you. As part of the Cape Cod 23 research, you're also looking at the 24 drinking water aspect and the potential</p>

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<p>1 cancer causing effect of the drinking 2 water? 3 A. That's the study I just described to you. 4 Q. It's the same one? 5 A. Yeah, because the PCE is in the drinking 6 water, and it's in the drinking water if 7 you've got that pipe and it's not in the 8 drinking water if you don't, so that's why 9 this is a giant natural experiment because 10 you might have PCE in your water and your 11 neighborhood in back of you doesn't 12 because, and they didn't have that pipe 13 replaced in front of their house. 14 So all of these studies about PCE 15 that you see here cited on Page 6, those 16 are all almost, I think every one of them 17 is a study this situation of the PCE coming 18 out of the lining of the pipe. 19 Q. As an epidemiologist, you're looking at a 20 natural setting and trying to determine if 21 that natural setting relates to the actual 22 event for which you're researching? 23 A. Well, ideally, we like to do an experiment, 24 which is randomly assign people to PCE</p>	<p>1 A. No. 2 Q. Were there any opinions that you formed 3 that you were asked not to provide? 4 A. No. 5 Q. Are there any plaintiffs in the Class that 6 you believe have not been exposed to PCE 7 through inhalation? 8 A. Well, I described the information that I 9 was given. On the basis of that 10 information, I can't make a determination 11 about individuals, but it's my opinion as a 12 scientist that they all have substantial 13 potential for exposure, if not actual 14 exposure. 15 Q. That's true of the non-detects, as well? 16 A. Yes. 17 Q. Thank you. That's all I have. 18 CROSS-EXAMINATION 19 (By Mr. Condon) 20 Q. Did you ever provide the plaintiffs' 21 counsel with an itemization of your time 22 that you spent? 23 A. No, I don't. 24 Q. Did you bill them?</p>
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<p>1 contaminated water and not. You can't do 2 that. So you look around in the world for 3 something that's almost like a natural 4 experiment, and this is almost unique in 5 PCE studies. In fact, it is unique in PCE 6 studies because you have almost a natural 7 experiment going on here that you can 8 observe. 9 You should never ask an academic 10 about his research. You'll never get out 11 of here. I'll just keep talking. 12 Q. On that note, I have no further questions 13 at this time. Thank you. 14 MS. KREIL: I have no questions. 15 MS. ROSS: I just have a couple of 16 questions. 17 CROSS-EXAMINATION 18 (By Ms. Ross) 19 Q. I'm Becky Ross. I represent Continental 20 Casualty Company and Columbia Casualty 21 Company. 22 Were there any opinions that you were 23 asked to provide that you chose not to 24 provide?</p>	<p>1 A. I haven't billed them yet. I just have to 2 remember to do that. I'm a horrible 3 business person and I don't do very much 4 litigation anymore. I'll bill him, I'm 5 sure. 6 Q. So you haven't billed him yet. When you 7 provide him with a bill, do you have an 8 itemized bill, this amount doing this? 9 A. It says one and a half days of whatever. 10 Q. That's how you normally do it? 11 A. Yeah. 12 Q. Okay. Thank you. 13 MR. MANZKE: Why don't we reserve 14 and we can take a look at the transcript. 15 (Discussion off the record.) 16 MR. CONDON: Condensed and e-tran. 17 MS. KREIL: Same, condensed and 18 e-tran. 19 MS. ROSS: We'll take a condensed 20 and e-mailed. 21 MR. MANZKE: Condensed and e-tran. 22 (Whereupon the Deposition was 23 concluded at 12:16 p.m.) 24</p>

