

Exhibit 157

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NORTH CAROLINA

IN RE: : Case No.:
CAMP LEJEUNE WATER LITIGATION : 7:23-CV-00897
This Document Relates To: :
ALL CASES :

VIDEOTAPED DEPOSITION
OF
LAURA M. PLUNKETT, Ph.D., DABT

May 12, 2025

10:00 a.m.

1 APPEARANCES:

2 FOR PLAINTIFFS:

3 LESLIE LaMACCHIA
4 BELL LEGAL GROUP
219 North Ridge Street
Georgetown, SC 29440
5 LLaMacchia@belllegalgroup.com
6

7 FOR DEPARTMENT OF JUSTICE:

8 LACRESHA A. JOHNSON, ESQUIRE
U.S. DEPARTMENT OF JUSTICE
P.O. Box 340
9 Ben Franklin Station
Washington, DC 20044
LaCresha.A.Johnson@usdoj.gov
10 JOSEPH TURNER
U.S. DEPARTMENT OF JUSTICE
11 1100 L STREET NW
12 1ST 3512
WASHINGTON, DC 20005
13 Joseph.B.Turner@usdoj.gov
14

15 REPORTED BY: Sarah B. Townsley, CSR, CRR, RPR
16
17
18
19
20
21
22
23
24
25

STIPULATIONS

IT IS HEREBY STIPULATED BY AND BETWEEN COUNSEL FOR THE PARTIES HEREIN THAT THE VIDEOTAPED DEPOSITION OF LAURA M. PLUNKETT, Ph.D., WAS TAKEN BEFORE SARAH B. TOWNSLEY, CRR, CCR, CSR, RPR, CERTIFIED REALTIME REPORTER IN AND FOR THE STATES OF TEXAS AND LOUISIANA, PURSUANT TO NOTICE AND IN ACCORDANCE WITH THE FEDERAL RULES OF CIVIL PROCEDURE AS PROVIDED BY LAW, ON MAY 12, 2025;

THE PARTIES HEREBY WAIVE ALL FORMALITIES IN CONNECTION WITH THE TAKING OF THE DEPOSITION, WITH THE EXCEPTION OF THE SWEARING OF THE WITNESS AND THE REDUCTION OF THE QUESTIONS AND ANSWERS TO TYPEWRITING;

THE RIGHT OF THE WITNESS TO READ AND SIGN A COMPLETED TRANSCRIPT OF TESTIMONY IS SPECIFICALLY RESERVED;

COUNSEL FOR ALL PARTIES RESERVE ALL OBJECTIONS EXCEPT AS TO THE FORM OF THE QUESTION AND RESPONSIVENESS OF THE ANSWER AT THE TIME OF TAKING OF SAID DEPOSITION, AND THEY ALSO RESERVE THE RIGHT TO MAKE OBJECTIONS AT THE TIME THAT TAKING OF SAID DEPOSITION OF ANY PART THEREOF MAY BE OFFERED INTO EVIDENCE, WITH THE SAME RIGHTS AS IF THE TESTIMONY HAD BEEN GIVEN IN OPEN COURT;

SARAH B. TOWNSLEY, CCR, CSR, RPR, OFFICIATED IN ADMINISTERING THE OATH TO THE WITNESS.

INDEX

EXAMINATION BY	PAGE NO.
Ms. Johnson	5
Ms. LaMacchia	119

EXHIBITS

NO.	DESCRIPTION	PAGE NO.
1	Amended Expert Report of Laura M. Plunkett	14
2	"Evaluation of mortality among Marines..."	40
3	"Mortality study of civilian employees..."	45
4	"ATSDR Assessment of the Evidence for..."	50
5	"Contaminated Water Supplies at Camp Lejeune	52
6	"Evaluation of mortality among Marines..."	60
7	"Cancer Risk and Tetrachloroethylene..."	83
8	"Mortality among aircraft manufacturing..."	84
9	"A Review of the Etiology and Epidemiol..."	86
10	"Occupational trichloroethylene exposur..."	89
11	invoices	120

1 PROCEEDINGS:

2 LAURA M. PLUNKETT, Ph.D., DABT,
3 having been first duly sworn by the court reporter,
4 testified on oath as follows:

5 VIDEOGRAPHER: We're now on the record. My
6 name is Brian Bobbitt. I'm a videographer for Golkow, a
7 Veritext Division.

8 Today's date is May 12, 2025, and the time
9 is 10 o'clock a.m. Central time.

10 This video deposition is being held in
11 Houston, Texas, in the Camp Lejeune Water Litigation,
12 for the United States District Court for the Eastern
13 Division of North Carolina.

14 The deponent is Dr. Laura Plunkett. Counsel
15 will be noted on the stenographic record. Our court
16 reporter is Sarah Townsley, and she will now swear in
17 the witness.

18 (Witness was sworn.)

19 EXAMINATION BY MS. JOHNSON:

20 Q. Good morning, Dr. Plunkett. Thank you for being
21 here.

22 A. Good morning.

23 Q. I just wanted to go over some, just housekeeping
24 and things to go ahead and get us started. All right,
25 I'm going to -- well, I'm sorry, let me go back. I

1 introduced myself before we entered the room, but just
2 to introduce myself again, my name is LaCresha Johnson,
3 representing the United States, and I'll be asking
4 questions of you today, and I'll be asking questions, so
5 please answer them to the best of your ability. If you
6 don't understand a question, please let me know, and I
7 will rephrase the question, and if you do answer the
8 question, I will assume that you've understood it.

9 In normal conversation, it's typical that you
10 may understand what I'm asking before I finish my
11 question, but I would ask, just for the clarity of the
12 record, for the court reporter to capture what we're
13 saying, if you could let me finish my question, and I
14 will, in turn, endeavor to let you finish your answer so
15 that we can, you know, have complete question and
16 answers.

17 When you're asking a question -- excuse me, when
18 you're answering a question, please say your answers so
19 that the court reporter can accurately transcribe them;
20 so "yes" and "no", instead of "uh-huh."

21 Let's see. And you understand that this is a
22 court proceeding, even though we're not in a courtroom
23 and you're under oath?

24 A. I understand that, yes.

25 Q. And do you understand you're obligated to tell

1 the truth?

2 A. I do.

3 Q. All right. And, let's see, I am typically
4 pretty good at talking at a reasonable pace, so like the
5 pace I'm speaking now, so the court reporter can
6 transcribe it, and, similarly, I spoke about
7 interruptions. I will endeavor not to interrupt you
8 while you're speaking; and once the deposition is
9 complete, you'll be given an opportunity to read a
10 transcript of your testimony to make any corrections.
11 You will then be asked to sign it.

12 Also, if there are any ambiguities, like you
13 don't understand a question, please let me know, and
14 I'll try to clarify.

15 During the deposition, you may hear other
16 attorneys say "objection." Unless your attorney
17 instructs you not to answer, please answer the question
18 after the objection has been made.

19 And is there any reason that you are unable to
20 give your most truthful and accurate testimony today?

21 A. No.

22 Q. Is there any reason your memory might be
23 impaired today?

24 A. No.

25 Q. And are you currently taking any medication that

1 might impair you?

2 A. No.

3 Q. Let's see. As far as breaks, typically, of
4 course, if you -- please ask for a break if you need a
5 break, and I would only ask that if a question is
6 pending, that you answer the question before we --
7 before we go to break. Does that sound good?

8 A. That's fine, yes.

9 Q. And one more thing. So before we go any
10 further, I just want to establish a few abbreviations
11 that I use throughout the deposition, because I will get
12 tongue-tied saying the name of some of these chemicals,
13 so I will list them, and if you have any objections, you
14 can let me know.

15 A. Okay.

16 Q. So when I say "TCE", I'm referring to
17 trichloroethylene. When I say "PCE", I'm referring to
18 tetrachloroethylene, or perchloroethylene. When I say
19 "IARC", I'm referring to the International Agency for
20 Research on Cancer. When I say "EPA", I'm referring to
21 the United States Environmental Protection Agency; and
22 when I say "NRC", I'm referring to the National Research
23 Council.

24 A. That's fine. I'm familiar with them. I think I
25 even use those in my report, so --

1 Q. Yes, so I just want to check, because I tend to
2 get tongue-tied around the chemical names, so the
3 abbreviations work much better for me.

4 I see you have -- did you bring any materials
5 with you today?

6 A. Just a copy of my re -- and, actually, I brought
7 the amended report, which is the -- you were served, I
8 think two, three weeks ago, whenever --

9 Q. Oh, last week.

10 A. Okay. Whenever, yeah. Exactly, yeah.

11 Q. All right. And --

12 MS. LaMACCHIA: For the record, the amended
13 report was served on April 22nd.

14 BY MS. JOHNSON:

15 Q. Did you do anything to prepare for today's
16 deposition?

17 A. Yes.

18 Q. What did you do?

19 A. I re-reviewed my report, I looked at some of the
20 references that are cited within my report; not
21 everything, but some of them. For example, there's four
22 or five studies that are --

23 VIDEOGRAPHER: Sorry, we have to go off the
24 record. We're off the record at 10:06.

25 (Off the record.)

1 VIDEOGRAPHER: Time is 10:09 a.m. Back on
2 the record, beginning of file 2.

3 BY MS. JOHNSON:

4 Q. Okay, we're back from our break. Let's see, I
5 believe the last question I asked, which, normally, I
6 would ask the court reporter to read it back, but we
7 were just going over deposition preparation. I'll ask
8 it again so you can give a fuller answer.

9 Did you do anything to prepare for today's
10 deposition?

11 A. Yes.

12 Q. And what did you do?

13 A. So I re-reviewed my report, went through it. I
14 looked at some of the cited references within the
15 report. They're cited in the body, particularly ones
16 that are in groups that you might confuse. So, for
17 example, there's, I think four or five by Dr. Bove, so I
18 looked at those again to make sure I understood which
19 one -- they all have similar topics, but different
20 specifics to them, so I looked at those again. I
21 looked again at the -- some of the guidance documents.
22 EPA's mixtures, guidance from '86. I reviewed the -- I
23 was recently provided the deposition testimony of Dr.
24 Gilbert, and also Dr. Goodman, so I looked at those. I
25 didn't read every word, but I skimmed through those to

1 see what kinds of questions were being asked by both
2 sides. I think your side, the defense -- sorry, the
3 government took the deposition of Dr. Gilbert, and the
4 plaintiffs took the deposition of Dr. Goodman, so I
5 looked at those, and I think you were provided a
6 supplemental list, so you know that those are new
7 things that I have since I filed my report back in
8 April. And, let's see what else do I do? I gathered my
9 bills to make sure that we had -- you had all the bills,
10 because that was something that I know that needed to be
11 provided. I think you were provided those ahead of
12 time; however, yesterday, I had a short meeting, maybe
13 an hour and a half or two hours, with Ms. LaMacchia,
14 and we found that there were two unpaid bills, I
15 believe, that you had not been provided yet, because
16 they'd been submitted but not paid, so those are
17 included in the -- within the package which I brought
18 this morning. I printed those out from my computer for
19 you.

20 Q. Thank you.

21 A. That's about it. I mean, I don't know the --
22 exactly which articles I reviewed, because I started
23 preparing for the deposition about a month ago, because
24 I actually thought it was going to occur earlier,
25 potentially, and I'm going through some changes. I'm

1 moving, and my office is half-packed up, so I've been
2 starting to prepare for things a little earlier than I
3 typically would, which might just be the week before.

4 Q. And how many times did you meet with counsel?

5 A. I had two meetings. One back April -- gosh,
6 right before I filed the amended report, so maybe April
7 12th, 13th, whatever -- if it's -- not a weekday. I'm
8 not sure of the exact date, and then I had a phone call
9 yesterday. It wasn't an in-person meeting; just a phone
10 call yesterday with Ms. LaMacchia.

11 Q. And how long did each meeting last?

12 A. The meeting back in April was probably two or
13 three hours, and the meeting yesterday was two hours, I
14 believe.

15 Q. Okay. And was anyone else present during these
16 meetings?

17 A. Mr. Miceli, an attorney involved in the case,
18 that I have worked with on this case, was also involved
19 in the meeting in April, and yesterday, he joined the
20 call for maybe fifteen, twenty minutes. He wasn't on
21 the entire time, but he was on the call for a period of
22 time yesterday.

23 Q. And did you review any documents with counsel
24 during these meetings?

25 A. During the first meeting, yes. The first

1 meeting, we went through my report because I had noticed
2 that there were some corrections, or typographical
3 errors and things I wanted to make sure you were aware
4 of, so that's one of the things we did. We went through
5 that. We went through a few of the -- of the papers
6 that I cite in my report. I don't remember all the ones
7 we went through from April. Mainly, we were going
8 through the substance of the report, rather than
9 documents.

10 Yesterday, we -- I actually brought up and
11 discussed the EPA 1986 guidance with Ms. LaMacchia,
12 because I thought that was something that I -- I just
13 wanted to make sure they understood why I had used it.
14 I describe it in my report; and we pulled out -- we
15 might have pulled out the Bove studies yesterday, or I
16 might have pulled them out while we were talking, just
17 to go through, again, to make sure that if we're
18 talking -- you know, there's three mortality studies,
19 there's a cancer incident study, you know, to make sure
20 we had those all aligned.

21 Q. And who selected the documents to review?

22 A. Well, yesterday, I did, and initially -- I don't
23 believe they put any documents in front of me in April.
24 I think we just went through the report.

25 Q. And did you take any notes during these

1 meetings?

2 A. The only notes I was took during the meeting
3 back in April. I actually wrote down on a hard copy of
4 my report the changes that I needed to make. I pointed
5 out to them, here's the typo, here's the correction, I'm
6 going to make this, and then I went back to my office,
7 made those, and I have a date of April 17th. That's
8 the actual day I actually made the corrections and
9 submitted the report to Ms. LaMacchia for the submission
10 to you.

11 (Exhibit 1 was marked.)

12 Q. I'm introducing your report as Exhibit 1. If I
13 could have you turn to your CV; forgive me for not
14 saying a page number, but I assumed you knew where it
15 was.

16 A. It's Appendix A, I believe.

17 Q. Thank you. All right, and do you recognize this
18 -- the Appendix A of your amended expert report as your
19 CV?

20 A. Yes.

21 Q. And is this your current CV?

22 A. Yes.

23 Q. And is this a -- is this document a complete
24 representation of your educational and professional
25 background?

1 A. Yes, I believe it is, though it doesn't have
2 details, for example, on many of the projects I've
3 worked on because I'm not allowed to do that with
4 confidential information, but it has a listing of all of
5 my peer-reviewed publications, publicly-available
6 publications or presentations that I've made, as well as
7 it has a description of what I call my training and
8 qualifications and professional experience.

9 Q. Is there any new information in your education
10 and experience, publications, since you drafted this
11 document?

12 A. No, nothing new since then.

13 Q. And you do not currently hold any certifications
14 in the field of epidemiology, correct?

15 A. No, I do not.

16 Q. You have a bachelor of science in zoology,
17 correct?

18 A. I do.

19 Q. From University of Georgia?

20 A. Yes.

21 Q. And you have a Ph.D. in pharmacology, correct?

22 A. Yes.

23 Q. Also from University of Georgia?

24 A. Yes.

25 Q. And you hold yourself out to be a toxicologist,

1 correct?

2 A. Don't hold myself out; I'm board certified in
3 toxicology, as well, and, also, my dissertation project
4 at the University of Georgia was a toxicology endpoint
5 within -- based upon a drug, a drug action, so
6 toxicology's been a part of what I've done since my very
7 early days in my training.

8 Q. You partially answered the question, but I
9 wanted to get -- possibly expounding on what's the basis
10 of your expertise in toxicology.

11 A. Sure, so from the day that I entered the
12 pharmacology department in 1980, the department had both
13 toxicologists and pharmacologists, so people that had
14 same basic training, but they focused on research
15 projects looking at adverse effects or changes within
16 cells and tissues that had to do with either
17 higher-dose exposures or were -- or were indicative of
18 frank toxicity to a cell or a tissue in an animal, and
19 then from there, I actually -- my dissertation project
20 had to do with the cardiotoxicity of digitalis
21 glycosides and understanding the mechanism of action,
22 how the brain triggered arrhythmias, which would have
23 been -- the toxicity was that the heart would actually
24 stop. You would go into ventricular fibrillation, which
25 was the toxicity issue that we were studying.

1 From there, I went to the University of Arkansas
2 for Medical Sciences, and I actually had an appointment
3 both -- separate appointments to the department of
4 toxicology, as well as the department of pharmacology,
5 so I taught undergraduate and graduate -- well,
6 undergraduate -- not really undergraduate students,
7 graduate students and medical students in those areas,
8 so the basic toxicology course for the students, the
9 grad and the -- students. The medical students didn't
10 take basic toxicology, but the grad students did. And
11 then, in addition to that, while I was working both in
12 my -- in my job there at the University of Arkansas and
13 as I had done in my post-doc between 1984 and '86 at the
14 National Institutes of General Medical Sciences, where I
15 was a PRAT fellow, I was interested in looking at
16 mechanisms that were triggered that related to not just
17 what you would like, for example, a drug exposure or a
18 chemical exposure to do, but what would happen if you
19 would get an aberrant cell response -- too much of
20 something occurring -- so that you would get an
21 undesired effect of a drug or a chemical. And that
22 continued through my years in what I call research, both
23 at my post-doc and my academic appointments at the
24 University of Arkansas for Medical Sciences.

25 Then I switched career paths when I moved back to

1 D.C. in 1989, and I worked for a consulting company
2 called ENVIRON, and, there, many of the projects that we
3 worked on had to do with a toxicology focus as they
4 related to risk assessment, looking at the human health
5 effects or the environmental -- adverse environmental
6 effects that may be caused by exposure to a chemical in
7 the everyday environment or through different kind
8 products that people would be exposed to.

9 I sat for the certification exam in toxicology,
10 the DABT certification in 1993, and I've been
11 continually certified since then. I have to re-certify
12 every five years, and so I've continued to keep that
13 certification active.

14 Much of my work that I do relates to toxicology,
15 as well as pharmacology. To me, they're related
16 disciplines in a lot of ways, particularly if you're
17 talking about understanding the entire spectrum of the
18 way that a chemical, a substance, can affect the human
19 body, from the first low-level dose exposure up through
20 the higher-dose exposure.

21 Q. Thank you. You mentioned your publications. Do
22 you have any publications on PCE and bladder cancer
23 experiments?

24 A. No, I do not.

25 Q. Have you published on vinyl chloride?

1 A. No, I have not specifically on vinyl chloride.
2 I've studied both of those chemicals and worked on
3 projects starting back in the early '90s on the toxicity
4 and adverse human health effects, but they were not
5 things that we would publish because we worked on behalf
6 of a client.

7 Q. And you've never published on benzene, correct?

8 A. That's correct; the same answer. I've worked on
9 it since the 1990s, but on projects where they would not
10 lead to publications because of the confidential nature
11 of the work.

12 Q. And the same is true of DCE?

13 A. PCE?

14 Q. Yes. Thank you.

15 A. Yeah, it's true of all four. I haven't
16 published specifically on those, although I have
17 published where the work that I was doing was related
18 to -- somewhat to those chemicals. For example, when I
19 published -- I have a peer-reviewed publication that
20 talks about putting together a strategy for looking at
21 reproductive and developmental toxicity testing, and
22 those chemicals were part of the realm of chemicals that
23 -- in terms of solvents, that we were considering when
24 we were putting together that framework.

25 Q. Thank you. If, in your report, you'll turn to

1 the first page of your report, the first two pages,
2 specifically paragraphs 1 through 8, discussing your
3 training and qualifications.

4 Does any of the experience that you laid out in
5 paragraphs 1 through 8 of your report include experience
6 on bladder cancer?

7 A. So you'll need to be more specific. Can you --
8 I don't want to just answer broadly. I mean, broadly,
9 yes, bladder cancer is something I've researched before
10 as part of my work at ENVIRON, but do you want to maybe
11 ask something more specific about it?

12 Q. Yes. Understanding you can't disclose,
13 obviously, ongoing projects, but have you worked with
14 any outcomes or research regarding bladder cancer when
15 you discuss your training and qualifications,
16 specifically with ENVIRON and your experience through
17 that; so in paragraphs 6, 7, and 8, you talk about
18 working for ENVIRON, and without any, of course,
19 confidentiality of that, if there's any
20 bladder-cancer-related projects.

21 A. So -- yes, bladder cancer was an endpoint.
22 Cancer, generally, was an endpoint, and different types
23 of cancer, including bladder cancer, were ones that
24 were part of the assessments -- general toxicity
25 assessments I've done in the past at ENVIRON, and also

1 more recently in projects that I've worked on when I've
2 been with the companies that I have started
3 post-ENVIRON.

4 Q. So it's fair to say that the research has
5 involved bladder cancer as an endpoint; is that
6 correct?

7 A. Yes. In other words, with all four of these
8 chemicals, over the last thirty years, I have been
9 asked at different times to look at the human health
10 hazards posed by those chemicals, and cancer,
11 generally, including bladder cancer, would have come up
12 in the work that I did over -- over that time period,
13 so, for example, I was very familiar already with the
14 IARC reviews for each of these chemicals and the
15 different types of cancer, and bladder cancer is
16 mentioned for PCE, and there's also studies with TCE on
17 bladder cancer, as well, in the IARC reviews, just to
18 give you an example of information I've reviewed in the
19 past.

20 Q. Were you provided with any documents in
21 connection with this matter, the Camp Lejeune Justice
22 Act litigation?

23 MS. LaMACCHIA: Objection, form.

24 A. Are you asking me at specific points in time, or
25 just generally?

1 Q. Just generally.

2 A. So I was provided, I already told you, with the
3 deposition testimony of Dr. Goodman. It's a rough
4 draft, only. I haven't seen the final draft, and Dr.
5 Gilbert, I think was also a rough draft that I have
6 seen. When I did my literature searches to start work
7 on this case after I agreed to take the case, before I
8 did -- once I did my literature searches and identified
9 articles for retrieval, I did check with attorneys to
10 see if they had some of them already, to try to save
11 some costs for retrieval. They were not free. Not
12 everything was free, so there are some of the
13 epidemiology studies that dealt with bladder cancer, for
14 example, that I know that the -- that the attorneys had
15 collected, so if it was one that needed to be retrieved
16 for cost, I asked first before I retrieved that, so they
17 would have provided me with copies of things that I had
18 identified or wanted to look at.

19 They -- I think, initially, when I first spoke
20 with them, they might have provided me with a copy of
21 the 2017 ATSDR Screening Assessment for the chemicals at
22 Camp Lejeune, although I pulled all of that down on my
23 own, as well, because I went to the ATSDR website and
24 got anything that was there; supporting documents, as
25 well. That's probably all that I can say right now. We

1 had conversations --

2 MS. LaMACCHIA: Please don't reveal
3 anything that we talked about in our conversations.

4 A. Okay. All right, then I'll stop there.

5 Q. Are there any documents that you reviewed, but
6 decided not to rely on?

7 A. So what do you mean "not rely on"? Do you --

8 Q. So let me ask that another way. Out of the
9 documents you were provided, on which documents did you
10 rely in forming your opinions?

11 A. So anything in Appendix C are ones that I
12 reviewed and considered, and they are part of what I
13 call my reliance list. Certainly, within my report, I
14 cite to a smaller subset, and so for the purposes of any
15 one statement in my report, those would be specific
16 reliance materials, but I think you'll notice many times
17 I'll use "e.g." for "for example", to show you there
18 that there's many other ones my list that could be
19 listed there, particularly when you talk about things
20 like the toxicokinetics of the chemicals. There's many
21 review articles, and so there's more in my list in
22 Appendix C, likely, than I cite specifically in any one
23 sentence, but I would point you to Appendix C as the
24 information that I have reviewed and relied upon in
25 terms of my weight of the evidence evaluation.

1 Q. Regarding the methodology section of your
2 report, how did you come up with your search terms?

3 A. Based upon the scope of work, number one, I was
4 asked to look at the human health hazards posed by
5 exposure to the four chemicals -- PCE, TCE, benzene, and
6 vinyl chloride -- and to focus in particular on the
7 endpoint of cancer, and then bladder cancer specifically
8 within the general disease category of cancer, so, as a
9 result of that, based upon -- as I would typically do in
10 any project, I start with the chemical names as a search
11 term. I linked that with "cancer", and then I linked it
12 further with "bladder", and that's the initial searches
13 that I did.

14 In addition to that, I was asked to speak to the
15 underlying mode of action. Under my section of my
16 report about biologic plausibility, I talk about mode of
17 action of chemicals, that -- why it makes sense that
18 these chemicals could cause bladder cancer. That's kind
19 of the question I was trying to answer, and so there,
20 the search terms might not have included, initially, the
21 individual chemical, but would have been "bladder" --
22 "bladder cancer", "urothelial" as the specific subtype,
23 and then looking at either the word "mode of action" or
24 "mechanism", and so that was a separate search that I
25 did because I wanted to understand generally -- and I

1 have a section on that, the coherence of the disease
2 process, the biology behind what we know about bladder
3 cancer, specifically urothelial-cell bladder cancer.

4 So those were the searches I did, and then once I
5 did those searches, I retrieved articles, and then, as I
6 typically will do, those articles will lead to reference
7 lists that I might then look at, and there may be
8 articles that were missed in my search, so I always use
9 the reference list at the back of any article that I
10 found relevant as another source of information for
11 articles that may be informative to include within my
12 weight of the evidence.

13 Then the other part of the process here, because
14 there are so many consensus reviews on each of these
15 chemicals, I also used the reference lists within IARC,
16 EPA documents, ATSDR documents, to cross-reference with
17 the things that I had identified in my search. You
18 know, were there any other epidemiological studies that
19 dealt with bladder cancer and any of these chemicals?
20 Were there any other key papers on bladder
21 carcinogenesis or PCE, or bladder carcinogenesis and TCE
22 that came from those consensus reviews, as well, so I
23 pulled that -- and I thought I had laid it out for you,
24 but I'm just repeating, I think, what's here in my
25 report.

1 Q. And could you point me where in your report you
2 do provide the search terms?

3 A. So I don't give you the specific search terms.
4 I typically do that in deposition. That's why I'm
5 answering the question here today for you. I told you
6 where I went, though. I used three different databases.
7 I used PubMed, TOXLINE and DIALOG.

8 Q. And could another toxicologist replicate your
9 search for literature? Your literature review?

10 A. They should be able to, if you start with the
11 name of the chemical and add "and cancer" and "bladder",
12 to start with and then, from there, you could also
13 replicate the other search I described, which was the
14 one related to bladder cancer and the term either "mode
15 of action" or "mechanism." You could also limit the
16 search if you wanted to, and I think I did do that after
17 -- when I did the name of the chemical, "bladder", "and
18 cancer", I also would have added "human", because I
19 wanted to focus on making sure I had all the epi
20 studies, so I did that, as well. Sort of a subsearch
21 within that.

22 They're really large searches, though, I will
23 tell you. There's a lot known, so I always sort by most
24 recent. I start with what's new, because the consensus
25 reviews will often provide a lot of historical citations

1 for you if you go to there, so if I want to know --
2 well, and I already know this because I've studied them
3 before. If I wanted to know what was known about TCE
4 and cancer in the 1950s, for example, you can get that
5 from the ATSDR tox profile, or you can get that from the
6 IARC review, or you can get that from the EPA
7 comprehensive human health risk assessment documents, so
8 I did an attempt to go pull those articles.

9 Q. And what search engines did you use for your
10 review?

11 A. PubMed, TOXLINE and DIALOG.

12 Q. And did you include any other search engines in
13 your review?

14 A. Those are the three I use. DIALOG is a
15 subscription service that I have, so it's not free.
16 What I find it's useful for is getting to more obscure
17 references, especially older, historical references that
18 may not have made it onto PubMed, which has much more of
19 a medical focus, so if I'm interested in something about
20 chemistry or environmental chemistry, DIALOG is very
21 helpful. That wasn't a focus of the work here, so I
22 used DIALOG only as a check to make sure there wasn't
23 some more obscure discussion of the epidemiology of
24 bladder cancer for each of the chemicals, and I didn't
25 find any additional citations that had not turned up on

1 PubMed or TOXLINE, or were not already cited within one
2 of the consensus reviews.

3 Q. I believe you touched on this, but did you
4 review the entirety of the literature that was the
5 result of your search?

6 MS. LaMACCHIA: Objection, form.

7 A. I looked at the -- the titles, and the abstracts
8 if they were available, in order to choose articles to
9 -- to -- to request. For example, if I didn't already
10 have them. Many of the ones that I found, again, were
11 discussed within consensus review documents or were ones
12 I had already read many years ago, because much of the
13 literature, particularly in the epidemiology of, for
14 example, TCE and PCE are studies that were published in
15 the '80s, '90s, and early 2000s, things that I had read
16 and reviewed before, so I did not ask for every paper
17 and read every paper in their entirety. I focused my
18 review based upon the scope of work that I was asked to
19 address.

20 Q. Did you exclude studies from your review?

21 A. So I don't know what you mean by "exclude." I
22 excluded them if they weren't relevant based on title
23 and abstract. Is that what you mean?

24 Q. Yes. Thank you. Did you consider studies that
25 were inconsistent with your opinions?

1 A. So I could ask you to define "inconsistent", but
2 since I think I understand what you're asking me,
3 because I get asked this question a lot, I looked at
4 evidence that teaches both ways. In other words, I
5 don't just look for studies that show the relationship,
6 for example, between TCE and bladder cancer. I looked
7 at all of the studies that address that, so there's
8 epidemiology studies, for example, that have -- some of
9 which have statistically significant associations, some
10 of which do not, and also some that didn't even bother
11 to report it, so I look across everything that I can
12 find that's relevant to answering a question, and so,
13 yes, if, by "inconsistent", you mean studies that may
14 not have statistically significant results, but I don't
15 -- otherwise, I don't know what you mean by
16 "inconsistent." That's how I would define it.

17 Q. That is a perfect definition. Thank you.

18 You mentioned the scope of your work, so I want
19 to turn to your amended report, paragraph 9, and in
20 here, you describe the scope of your report as being
21 asked to evaluate the human health effects associated
22 with exposure to the four chemicals PCE, TCE, benzene,
23 and vinyl chloride, that were detected at varying levels
24 over the years in the water supply at Camp Lejeune, and
25 to provide opinions as to whether the chemicals that

1 contaminated the water posed a hazard to human health.
2 You state that as the scope, but then you go on to talk
3 about the focus. Could you define why the focus is
4 included in your scope of work?

5 A. So, because if I was to write a report that
6 describes in detail all of the human health hazards
7 posed by those four chemicals, we would have textbooks,
8 and so, as a result, the particular question that I was
9 asked to address, by the attorneys, was to focus on the
10 issues related to the human health hazard of bladder
11 cancer and whether or not -- what my opinions were as
12 it related to the relationship, and whether or not
13 bladder cancer was a human health hazard that is linked
14 with, associated with, or, in my view, more like -- at
15 least as likely or not something that you would -- would
16 describe for this particular exposures, based upon how I
17 know the exposure happened. So, in other words, looking
18 at the water exposure at Camp Lejeune as sort of the
19 kind of overarching umbrella, and then putting that
20 within how people are exposed, (unintelligible) telling
21 me, and then using that to look at the literature and
22 focus on the relationship between that exposure and
23 bladder cancer.

24 Q. And in analyzing the epidemiological and
25 toxicology literature on association, would you agree

1 that a literature search is a key step?

2 A. Yes, well, unless you are someone who has a
3 didactic memory, and has done this before, and you're
4 just repeating something, but yes, absolutely, and I
5 would argue, even if you've done it before, you need to
6 update, and so that's why I always focus my searches to
7 look at what was most recent, since, for example, the
8 last time I visited the issue of cancer with each of
9 these chemicals.

10 Q. And a search should be crafted to produce
11 positive and negative as a results; is that accurate?

12 MS. LaMACCHIA: Objection, form.

13 A. I don't think you can craft that way. I mean,
14 as a scientist, you're putting in search terms that are
15 ambivalent to positive and negative. They're just
16 search terms related to that topic, then when you
17 review the literature, you, as a scientist, must weigh
18 all of the evidence you can find that is relevant to
19 the question you're asking, both positive and negative.
20 If by "positive and negative", you're focusing, for
21 example, as I -- I talked earlier about statistical
22 significance, or -- I will say this: For these four
23 chemicals, I would find it hard to believe you would not
24 find a consensus opinion among all the scientists that I
25 have ever met that these chemicals pose a hazard to

1 human health in the drinking water. That's a basic
2 understanding, so you start from there.

3 Q. And turn to paragraph 13 in your amended expert
4 report. You've written -- I'll let you get there.

5 You've written, "In my literature and document
6 review, I employ another tool and generally accepted
7 methodology known as weight-of-the-evidence assessment",
8 correct?

9 A. Yes, that's correct, the last sentence to the
10 paragraph, yes.

11 Q. Thank you. And is this different from a
12 more-likely-than-not opinion?

13 A. Well, that's two different things. Weight of
14 the evidence is a methodology. More likely than not is
15 an -- could be an opinion that you developed after you
16 used weight of the evidence going through scientific
17 information, so it's two different things.

18 Q. And a as-likely-as-not opinion would result
19 from your weight-of-the-evidence assessment; is that
20 correct?

21 MS. LaMACCHIA: Objection, form.

22 A. So using my weight-of-the-evidence assessment in
23 my conclusions, I have formed the opinion that it's at
24 least as likely as not that, and -- I have my bullets
25 that go through each of the chemicals, and I link those

1 to bladder cancer and/or cancer, so, yes, the result of
2 my weight-of-the-evidence assessment took me to that.

3 Q. And is there a standard method for your
4 approach to your Bradford Hill analysis that you could
5 reference?

6 A. So what do you mean by "standard approach"?

7 Q. So do you reference the original publication by
8 Sir Bradford Hill in conducting your analysis, or do you
9 refer to a more modern interpretation of Bradford Hill
10 applications?

11 A. So I do both. So the -- Bradford Hill paper in
12 1965 sets forth, for the first time, this organized
13 idea of how to look at the association of an exposure
14 with a disease, and he has a set of considerations that
15 he goes through nine of them and he talks about them in
16 detail in terms of what he meant each of those to be --
17 "he" being Sir Bradford Hill; however, if you go forward
18 in time, I cite to the Rothman text from 1998 in
19 paragraph 15. Dr. Rothman's a well-known,
20 well-published epidemiologist who's written many
21 textbooks, and in this particular textbook, he, indeed,
22 talks about use of Bradford Hill cites to the paper, and
23 talks about those considerations in the exact same way
24 generally; however, he uses different language,
25 obviously, because he's writing a textbook, and he gives

1 a lot more detail, but, overall, what you read in the
2 Rothman textbook, if you ask me about updated, I guess
3 that's an update of a use, but, to me, there's nothing
4 inconsistent in the Rothman textbook from what you see
5 in Bradford Hill. The difference is the Rothman
6 textbook focuses much more on the fact that, by 1998, we
7 had a much more robust published literature in the area
8 of epidemiology than we had in 1965. Epidemiology
9 existed in '65, but there wasn't as much of a focused
10 research effort in that area as there was 30-some years
11 later.

12 Q. Did you look at strength of association in your
13 report?

14 A. So in the context of what?

15 Q. As a -- as one of the nine Bradford Hills, you
16 addressed coherence, and biological plausibility... am I
17 missing one? Experiment, and analogy. So I guess my
18 question is: There's only four addresses in your --
19 four Bradford Hill addresses in your report, versus
20 nine?

21 A. So others in the litigation, it's my
22 understanding, are doing a full Bradford Hill analysis,
23 general cause assessment going through each of those
24 nine considerations. The scope of the work that I was
25 engaged to do and agreed to do was to use my expertise

1 in toxicology and risk assessment to address parts of
2 the Bradford Hill considerations that were relevant to
3 my specific training, expertise, and things that I do on
4 an everyday basis. I address strength of association
5 every time I look at a study. Anytime I look at a
6 study, I look at whether the results were statistically
7 significant or not, whether or not the studies were
8 properly designed to enable you to come up with a
9 statistically significant finding or not. It's like a
10 power. How well was the study designed? Did it have
11 enough people, enough animals in it to be able to come
12 to a conclusion that you believe you could rule out
13 chance alone? So I certainly always have that in my
14 mind as I'm reviewing literature, but I was not asked --
15 that was beyond the scope of what I was asked to do. I
16 was not asked to do a full Bradford Hill assessment, so
17 that's why I addressed four of them, but not all nine.

18 Q. Could you point to where in your report where
19 you say that it's beyond the scope of what you were
20 asked to opine on -- or discuss the nine Bradford Hill
21 versus the four which you did discuss that you say is
22 the scope within your expertise in toxicology and --

23 A. So, I don't have that exact language as you just
24 quoted to me, but I would say if you look -- 15 and 16,
25 in paragraph 15, at the very end, I say, "As a

1 toxicologist in this case, I have been asked to address
2 some of the Bradford Hill considerations that might
3 apply to the work I have undertaken." So "some" is not
4 "the whole", and then in the next paragraph, I define
5 for you what four I am going to address, and I say, as
6 part of my work related to understanding biological
7 mechanisms that may underlie carcinogenesis, I evaluated
8 the literature, and these four particular Hill
9 considerations are highly relevant to the data and
10 information that I reviewed, relied upon, analyzed, and
11 formed bases for my opinions.

12 MS. JOHNSON: Can we take a five-minute
13 break? We've been going about an hour.

14 VIDEOGRAPHER: Off the record. 10:52.
15 This concludes file 2.

16 (Short recess was taken.)

17 VIDEOGRAPHER: Back on the record, 11:05
18 a.m., beginning of file 3.

19 BY MS. JOHNSON:

20 Q. All right, for my next question, we're going to
21 turn to paragraph 25 of your report. Let's see, so you
22 -- in paragraph 25 of your report, you write that PCE
23 has been classified as a probable human carcinogen by
24 IARC, correct?

25 A. Yes.

1 Q. And this is different from a more certain
2 designation of human cancer risk, such as IARC's known
3 human carcinogen, correct?

4 A. It certainly is a different classification, yes,
5 and it's typically chosen based upon IARC's description
6 of both the animal and the human data.

7 Q. And also referring back to paragraph 25, you
8 write that PCE has been classified as likely to be
9 carcinogenic in humans by all routes of exposure, by EPA
10 2012, correct?

11 A. Yes.

12 Q. And this is different from more certain
13 designations of human cancer risks, such as EPA's
14 carcinogenic in humans, correct?

15 A. It's a different designation, that's correct.
16 All of these classifications have different levels, and,
17 over time, chemicals can move from one to the other
18 based on new data and information.

19 Q. And also in paragraph 25 of your report, you
20 write that PCE has been classified as reasonably
21 anticipated to be a human carcinogen by the National
22 Toxicology Program, correct?

23 A. Yes. I abbreviate it "NTP", but you have it
24 correct. That's the name of the group.

25 Q. I had to look it up online, so... and this is

1 different from more certain designations of human cancer
2 risks such as NTP's human carcinogens, correct?

3 A. It's a different designation, yes. All of these
4 bodies have different levels of evidence and different
5 assessments, and a chemical can go from one to the other
6 based upon information that is available at the time of
7 the review.

8 Q. Thank you. All right, so we're going to turn to
9 paragraph 35 of your report. In paragraph 35 of your
10 report, you also note that IARC classified TCE as being
11 carcinogenic to humans, correct?

12 A. Yes, that's correct.

13 Q. And IARC classified TCE as carcinogenic to
14 humans based on sufficient epidemiological evidence for
15 cancer of the kidney with strong mechanistic support
16 from studies in experimental animals and exposed humans,
17 correct?

18 A. I don't remember the wording, but that sounds --
19 I would refer -- we could pull the document out to know
20 the specific wording, but yes, I am aware that they
21 called it generally carcinogenic to humans, and then
22 they focused on some parts of the data that they
23 reviewed; and they do discuss kidney, yes.

24 Q. And do you recall -- the classification of TCE
25 as carcinogenic to humans was not based on a finding of

1 sufficient epidemiological evidence for bladder cancer,
2 correct?

3 MS. LaMACCHIA: Objection, form.

4 A. So I don't think I would state it quite that
5 way. You want me to explain why? I would -- so,
6 certainly, within the IARC review, they acknowledge and
7 they discuss in detail the fact that there has been
8 findings of bladder cancer in humans, but in terms of
9 their overall conclusions, they focus down on the kidney
10 cancer and the human data as being the strongest signal
11 for human cancer.

12 Q. And you further state in paragraph 35 of your
13 report that TCE is likely to be -- TCE to be likely
14 carcinogenic in humans by all routes of exposure,
15 correct? That is the last sentence --

16 A. Well, it's not likely. It's actually as
17 carcinogenic. This is -- all three of those bodies
18 found TCE to be a human carcinogen, and they just state
19 it in different ways.

20 Q. In the same paragraph 35 for this information,
21 you cite to the US EPA 2011 report; is that correct?

22 A. Yes, that's correct.

23 Q. Is that report the Integrated Risk Information
24 System Chemical Assessment Summary, TCE?

25 A. I have to look. I have a number of EPA

1 publications. Hold on just a second. No, it's the EPA
2 2011 toxicological review of trichloroethylene in
3 support of the summary information, so the title was
4 "Toxicological Review."

5 Q. Do you recall if the 2020 EPA risk evaluation
6 for TCE was included in your reliance files?

7 A. It should be. I have it at home on my computer.
8 Yes. It's on -- it's in Appendix C here.

9 Q. Thank you. I see your reference. It's -- third
10 page. We are done with your report for just a moment,
11 so if you want to put that aside, we're going to move
12 on.

13 (Exhibit 2 was marked.)

14 Q. I am introducing Exhibit -- I'm one behind. I'm
15 introducing Exhibit 2, which is the 2014 --

16 A. Probably don't want to mark -- oh, there we go.

17 Q. As you mentioned previously, you reviewed the
18 2014 Mortality Study for Marines in Training, correct?

19 A. Yes, that's correct.

20 Q. And are you aware that Dr. Bove testified that
21 this study suffered from exposure misclassification
22 issues?

23 MS. LaMACCHIA: Objection, form. Lack of
24 foundation.

25 A. Are you asking me about something he stated in

1 his paper, or are you asking me about something he may
2 have said in some other venue?

3 Q. This was stated during his deposition, and I was
4 wondering if you were aware of any misclassification
5 issues regarding this study.

6 A. I didn't -- I'm not aware of that testimony that
7 you're asking me about. I believe he discusses
8 limitations, however, and let me look to see whether he
9 talks about that here. Yes, he talks about it here, so
10 it's also discussed in his paper on page 12 of 14.

11 Q. And was one of the exposure misclassifications
12 discussed on page 12 of his -- of his study that it was
13 very little information on where Marines were
14 barracked?

15 A. Yes, but I think it's important to point out
16 that, in his discussion of this, the misclassification
17 is not something that's going to result in
18 overestimation of risk, but, actually, underestimation,
19 and that's an important consideration when you look at
20 this study and the limitations.

21 Q. And one of the study's conclusions states that
22 the precision of many hazard ratio estimates was low,
23 as indicated by wide confidence intervals; is that
24 correct? And, of course, take your time --

25 A. There is a sentence that reads as you have just

1 quoted, yes.

2 Q. And if I could ask you to turn to Table 4 in the
3 study, which is on page 7 of 14; and you see on Table 4,
4 the third line down, where it says "All cancers", and
5 there is a standard mortality ratio of .85, with a
6 confidence interval of .80 to .90.

7 A. I see that, yes.

8 Q. And do you see one -- well, one skipped line
9 down for kidney cancer, the standardized mortality ratio
10 is 1.16 with .84, 1.57 confidence interval?

11 A. Yes, I see that line.

12 Q. And do you see one below that for bladder
13 cancer, the far right column says .84 for standardized
14 mortality ratio, and .42 to 1.51 confidence interval?

15 A. I see that number, yes.

16 Q. And if you go about four lines down, still on
17 the far right column, for non-Hodgkin's lymphoma,
18 abbreviated as "NHL"?

19 A. Yes, I see "NHL".

20 Q. Okay, the standardized mortality ratio is .68,
21 and the confidence interval of .52 and .88; you see
22 that?

23 A. I see those numbers, yes.

24 Q. And one more about two lines down, also on the
25 right column, you see .78, and confidence interval of

1 .60 to .99 for confidence interval?

2 A. If you're referring to the line that is listed
3 for leukemias, yes, I see those numbers, yes.

4 Q. Yes. If I could ask you to turn to Table 5,
5 which is on -- which is on page 8, the next page, and I
6 will bring you to Table 5, which is for Camp Lejeune
7 versus Camp Pendleton hazard ratios and 95 percent
8 confidence intervals.

9 A. I see that, yes. I'm sorry, I didn't know it
10 was a question.

11 Q. I should have put "correct" at the end. And if
12 I could -- I'm going -- I'm looking at the second bold
13 line, "Disease of primary interest", "Kidney cancer",
14 hazard ratio of 1.35 with the lower -- the LCL of .84
15 and upper as 2.16. I may not have read that correctly.

16 A. No, you did. That's correct. Those are the
17 correct numbers on the line for kidney cancer.

18 Q. And if you'll go one line down for bladder
19 cancer, you see the hazard ratio is .76 with the
20 confidence interval as .34, 1.71?

21 A. You've read those numbers correctly, as they're
22 there.

23 Q. And about four lines down, abbreviated as "NHL"
24 for non-Hodgkin's lymphoma, .81 hazard ratio, with a .56
25 confidence interval to 1.18. Did I read that

1 correctly?

2 A. You read that correctly. Yes, you did.

3 Q. And skip one, one more line down -- excuse me --
4 yes, I believe I just read NHL. I lost my place. The
5 writing's very small. Okay, now we're looking two lines
6 down. And if you go down to "Leukemias", about two
7 lines down, we have 1.11 for hazard ratio, with
8 confidence interval of .75, 1.62; correct?

9 A. You read that correctly, yes.

10 Q. Now if we can turn to Table 7, which is on page
11 10; and it's the bottom table.

12 A. Yes, I'm there.

13 Q. And for bladder cancer, we see no results
14 reported in this table; is that correct?

15 A. They are not reporting on bladder cancer here.
16 They're focusing on four other disease endpoints.

17 Q. And there are no results reported for
18 non-Hodgkin's lymphoma, correct?

19 A. For NHL, they are not reporting. This table is
20 focusing on a different issue than an overall hazard
21 ratio. It's looking at what I call dose response.

22 Q. And there's no dose response for benzene for
23 leukemia, correct?

24 A. Well, I don't think you can say that based on
25 this data alone. I would -- I haven't focused on that

1 part of how many people were in each group. Dose
2 response and the results, and the hazard ratios that you
3 would calculate would be highly influenced by the number
4 of people in each group. If you had many more in the
5 low exposure group, versus not as many in the high
6 exposure group, it may be that your hazard ratio that
7 you calculate is affected by the power of the study to
8 detect what the relationship really is, so I don't think
9 you can say that. I think he reports it as he reports
10 it, and I don't disagree with that. You'll notice he
11 has a statistically significantly increased hazard in
12 the benzene low exposure group, however.

13 Q. We are done with this, if you'd like to put it
14 aside, and I'm going to be handing you... this will be
15 marked as Exhibit 3.

16 (Exhibit 3 was marked.)

17 BY MS. JOHNSON:

18 Q. All right, what I've handed you is -- just for
19 the record, what I've handed you is the 2014 Civilian
20 Mortality Study, and you reviewed Dr. Bove's 2014
21 Mortality Study of Civilians, correct?

22 A. Yes. It's one of the ones I cite and discuss in
23 my report.

24 Q. And are you aware that Dr. Bove testified that
25 this study suffered from serious limitations and

1 misclassification bias?

2 MS. LaMACCHIA: Objection, form.

3 A. I'm not aware of his testimony, but I think you
4 can find that discussion in his limitations section, as
5 well. Let me look and see. Yes, he has it -- actually,
6 it's the section under "Discussion." He discusses it on
7 page 11 of 13.

8 Q. And are you aware that one of the limitations
9 was a lack of data on worker water use, and that some
10 did not use the water?

11 A. Yes, it's discussed, and, just as he says in the
12 other paper, however, he believes that these issues with
13 exposure would bias towards underestimating, rather than
14 overestimating, risk.

15 Q. And if I could ask you to turn to Table 3 in the
16 exhibit. For the Standardized Mortality Ratios
17 Underlying Cause of Death for Bladder Cancer, the
18 standardized mortality ratio for Camp Lejeune is .53 for
19 bladder cancer, and was .69 for Camp Pendleton; did I
20 read that correctly?

21 A. You read those numbers correctly, yes.

22 Q. And if I could ask you to turn to Table 4, and
23 for the Hazard Ratios for Camp Lejeune vs Camp
24 Pendleton, and if I can draw your attention to the third
25 line down for bladder cancer, we have .65 hazard ratio,

1 .12 to 3.65 for a confidence interval. I believe I
2 stated that correctly; is that correct?

3 A. I think it's -- yes, you did.

4 Q. And we're still going to use this, but I want to
5 have you set this a little bit to the side for just a
6 moment, and we're going to go back to your report,
7 paragraph 62, please.

8 Regarding the 2014 Bove study, much of the
9 discussion in paragraph 62 of your report cover studies
10 about male breast cancer; is that correct?

11 MS. LaMACCHIA: Objection, form.

12 A. So no. I discuss -- I go through, here, the
13 different Bove studies. I start with the Marines study
14 in the top of the paragraph, then I describe what the
15 civilian study was, and then later on, yes, I do go into
16 the Ruckart study. Ruckart study was different from the
17 other two Bove studies because it focuses on one
18 specific type of cancer only, and it was a
19 hypothesis-driven evaluation that they were being asked
20 to address, and so that's why they focused that out --
21 at least my understanding of reading the paper, that's
22 what Ruckart describes.

23 Q. And why is the Ruckart study important for
24 bladder cancer?

25 A. It's not. I'm giving -- well, it's important

1 for cancer hazard generally, but I'm certainly not
2 relying on it as having a signal for bladder cancer,
3 because I didn't focus on that. The reason I'm
4 describing it here is I'm trying to lay out for you what
5 did we know. The topic here in this section is hazards
6 posed by exposure in the water to the mixture of
7 chemicals, and so I'm giving you what we know. We have
8 five different studies to go through, and so I just give
9 them to you so you understand that I have reviewed all
10 of these studies and gone through them and considered
11 them as part of my assessment.

12 And I would point you to -- I'm sorry, you don't
13 have a question pending, but this is what I'm telling
14 you at the end of paragraph 62. I say that all three of
15 these studies, that's Ruckart included, corroborate
16 cancer-specific chemical hazard assessments, so I'm not
17 citing it specifically just to bladder. I'm talking
18 about what those three studies do.

19 Q. In your last sentence of paragraph 62, you make
20 a reference to bladder cancer latency, but without the
21 -- but not the results of the Bove studies as regards to
22 bladder cancer; is that correct?

23 A. So in this sentence, my focus is -- I'm trying
24 to explain what latency is and how important that is to
25 bladder cancer, the epidemiology of bladder cancer. It

1 is a disease that can take many decades to develop. The
2 literature on smoking corroborates this, where that's
3 one of the most common relationships where it has been
4 described, but, generally, for chemical exposure and
5 bladder cancer, people talk about the latency as being
6 many decades; and that's important in the context of
7 Bove because he himself, if you look at his
8 description, this is a ten-year follow-up. It's not a
9 fifty-year follow-up. There's somewhere else in my
10 report I give you some citations to latency and
11 peer-reviewed papers, and it talks about it being as
12 much as fifty years.

13 Q. And, previously, we looked at Table 4, the study
14 of Marines and the standard mortality ratio for bladder
15 cancer is -- at CL is .84. Do you recall that?

16 A. We can look real quick. The Marine study, yes.

17 Q. Yes. Table 4.

18 A. Actually, it's Table 5. For bladder cancer, no.
19 It's .76. Is this what you were referring to --

20 Q. Standard mortality ratio --

21 A. Oh, no, I was looking at the hazard ratio.
22 Sorry.

23 Q. That's okay. There's lots of tables floating
24 around.

25 A. Let's see. .84 was the SMR for Camp Lejeune,

1 yes; not Camp Pendleton. Yes.

2 Q. And then Table 5 of the hazard ratio for Camp
3 Lejeune versus Camp Pendleton is .76, correct?

4 A. That's correct.

5 Q. All right. I believe you can set these aside.
6 I'm going to give you what will be Exhibit 4, which is
7 the 2017 ATSDR Assessment of Evidence.

8 (Exhibit 4 was marked.)

9 MS. LaMACCHIA: Thank you. I needed
10 another copy of this.

11 MS. JOHNSON: Yes. I loved bringing these
12 on the plane. They were so light.

13 BY MS. JOHNSON:

14 Q. And you have reviewed the ATSDR's 2017
15 assessment of the evidence, correct?

16 A. Yes, and this is listed, and I think even
17 mentioned in my report.

18 Q. Are you aware, generally, of how long it takes
19 for an epidemiological study to plan and perform -- how
20 long it takes to plan and perform an epidemiological
21 study?

22 MS. LaMACCHIA: Objection, form.

23 A. So I don't perform them, but I am generally
24 aware, based on my review of the literature, if that's
25 what you're asking me, but it's highly dependent on the

1 type of epidemiological study that you're planning to
2 perform.

3 Q. Dr. Bove performed ATSDR systematic review of
4 four chemicals and 16 health outcomes at Camp Lejeune in
5 just six weeks. Are you aware of that?

6 A. So show me where you're pointing to. I don't
7 recall the time period described. What page are you
8 on?

9 Q. I'm not on a page, I'm sorry. As many pages
10 that are here, it is not on a page. Dr. Bove exposed
11 this during a deposition, and if you're not aware of
12 that, would that -- would a time estimate of six weeks
13 to review four chemicals and 16 health outcomes surprise
14 you?

15 MS. LaMACCHIA: Objection, form.

16 A. I don't know. I'd have to see the context of
17 what he describes having actually done, so I can't
18 answer that yes or no.

19 Q. I believe this actually is in the report, that
20 Dr. Bove was -- he did the ATSDR Assessment of Evidence
21 by himself.

22 A. So where are you?

23 Q. I am... take the clip off. Well, forgive me, I
24 am mistaken. That was in his deposition.

25 Would it surprise you to learn that the ATSDR

1 assessment of evidence was performed by Dr. Bove alone?

2 MS. LaMACCHIA: Objection, form.

3 A. Same answer. I don't know. It would depend on
4 the context of what he described as having performed.
5 If this was all information that he already had in his
6 files, that's a different answer, versus information
7 that he had to go and start from scratch with. I don't
8 know what he did.

9 Q. Okay. We're going to put that one aside for
10 just a moment -- we are going to come back it, so you
11 don't want to have that go too far. I'm marking what
12 will be Exhibit 5.

13 (Exhibit 5 was marked.)

14 BY MS. JOHNSON:

15 Q. It's the National Research Council report.

16 MS. LaMACCHIA: Thank you.

17 BY MS. JOHNSON:

18 Q. And are you aware of the -- referring to the
19 report I just handed you, are you aware of the National
20 Research Council, who they are?

21 A. Yes.

22 Q. Have you ever worked with the National Research
23 Council, which I will abbreviate as "NRC"?

24 A. So not myself personally, but I have supported
25 scientists within the company at ENVIRON who were

1 serving on panels. The NRC often puts together
2 different panels to address different issues, and Dr.
3 Rodricks, Dr. Joseph Rodricks at my company, was on
4 several of these kinds of assessments, putting together
5 these kinds of documents over the years.

6 Q. So you are aware that the National Research
7 Council is a branch of the National Academy of
8 Sciences?

9 A. That's correct.

10 Q. And have you relied on studies by the NRC?

11 A. I sometimes have cited to them in reports,
12 depending upon what I'm doing, yes, that's correct. For
13 example, I often rely upon their documents where they've
14 developed RDAs, recommended dietary allowances as part
15 of the work that the NRC does through the Institute of
16 Medicine and specific panels about food.

17 Q. And did you review the NRC 2009 report on
18 drinking water at Camp Lejeune?

19 A. Yes, is this -- I was going to ask you is this
20 the '09 report. This looks like the -- you don't have
21 the date and I'm pretty sure that's what this is, yes,
22 so I have seen this, yes, and I have reviewed it. I
23 hope it's listed. It should be in my Appendix C.

24 Q. And are you aware that the NRC committee on Camp
25 Lejeune had 13 members, and -- well, excuse me. Are you

1 aware that the NRC committee on Camp Lejeune had 13
2 members?

3 A. I'd have to go and look at the description of
4 the work, so no, I -- I mean, I will tell you that it's
5 in common that they'll have eight to fifteen members,
6 based on the work that I did with Dr. Rodricks. They
7 pick people within different scientific disciplines to
8 cover different aspects of whatever it is that they're
9 reviewing so they may have a -- like in a case like
10 this, they may have a modeling person, they may have a
11 toxicologist, they may have a physician, they may have
12 an engineer, all different people to contribute to the
13 questions that the -- that the committee is looking
14 into.

15 Q. And if you'll turn to page 237 -- yeah, you'll
16 have to take the clip off where the page numbers are.

17 A. Yeah, it's crazy.

18 Q. There, they list the biographical information of
19 the Committee on Contaminated Drinking Water at Camp
20 Lejeune, and the first -- the chair is listed as David
21 Savitz.

22 A. Yes, I see that, and you're right, there are 13
23 here, if I count them.

24 Q. And you are not aware of how many authors -- how
25 many authors there were for the ATSDR 2017 Assessment;

1 is that correct?

2 A. I don't think that it's listed there, no, and
3 very different -- I would say to you there's a reason
4 why you list it here, but you wouldn't necessarily --
5 the ATSDR assessment is a work product of the agency.
6 This is a work product of the committee, and so they're
7 going to list you individual people so you can look at
8 whether or not there's anyone here that you would
9 consider in terms of bias or a -- an investment in
10 terms of what the outcome of the -- so this is a
11 transparency issue. You always put the people on the
12 committee and with their qualifications, and if you
13 look at them, you'll see that there's different types of
14 people.

15 Q. We're going to go back to the ATSDR assessment
16 of evidence for a moment. On page 13 of the 2017
17 assessment, there is the summary of evidence, and are
18 you aware or do you know where the ATSDR got the term
19 "equipoise and above" from?

20 MS. LaMACCHIA: Objection, form.

21 A. I don't think they tell you in this report,
22 necessarily. I am familiar with them using the term,
23 though, in this report.

24 Q. I'm actually going to take you back to Exhibit
25 5, the NRC report, and if I could bring you to page 6,

1 there'll be a large gray box on the opposite page.
2 Excuse me, the bottom -- at the bottom of page 5 --
3 towards the bottom, there is a categorization discussed,
4 and the sentence states, "The IOM categorized evidence
5 according to an established scheme accepted by the
6 Department of Veterans Affairs in evaluating risk to
7 veterans of the Vietnam War and Gulf War." Did I read
8 that correctly?

9 A. I'm sorry, I was at the wrong --

10 Q. One back. At the bottom of page 5.

11 A. Oh, here it is, yes. I see that, yes.

12 Q. And on the next box, it describes categories of
13 evidence of association. Did I reference that
14 correctly?

15 MS. LaMACCHIA: Objection, form.

16 A. Yes. This is the one that the IOM used to
17 classify, yes.

18 Q. I think we're done flipping back and forth for
19 the moment. We're starting back on the 2017 assessment
20 of evidence. Okay, now, going back to the overall
21 summary of evidence for the 2017 assessment.

22 MS. LaMACCHIA: On page 13?

23 BY MS. JOHNSON:

24 Q. Yes, on page 13. What is your understanding of
25 the term "equipoise" in clinical research?

1 A. So "equipoise" is a term I have seen used in
2 English before in other contexts. I've seen it used in
3 this document. In reading this document, I would define
4 it as meaning that there's -- if you're weighing the
5 evidence like I do in my methodology, and you -- the
6 scale tips one way or the other, equipoise is where
7 there's a fifty-fifty relationship, where it's not
8 tipping one way or the other, but it does meet the "at
9 least as likely as not" standard within this report, and
10 also within my report where I'm describing my
11 conclusions as at least as likely as not.

12 Q. So you do equate "equipoise and above" as --
13 with "at least as likely as not"?

14 A. I would, as a scientist, based on my reading of
15 these documents and -- and my understanding of what the
16 "at least as likely as not" standard means within the
17 Camp Lejeune Act.

18 Q. Are you aware of the term "equipoise" denoting a
19 lack of scientific consensus?

20 MS. LaMACCHIA: Objection, form.

21 A. So you'd have to show me what it is you're
22 referring to, to agree or disagree that there's such a
23 definition. I will tell you that, again, "equipoise"
24 meaning that the scales are here, essentially in that
25 range of fifty-fifty, at least as likely as not.

1 Obviously, that's not reflecting "the scales tipping",
2 where everyone agrees it's this or everyone disagrees
3 with this, so it depends how you define "consensus",
4 too. I refer to consensus documents in my report, and
5 reviews. What I mean by "consensus reviews" are a panel
6 of experts getting together, laying out their evidence
7 for and against why they chose to make certain
8 assessments or certain -- draw certain conclusions, so
9 consensus isn't always having to do with weighting. It
10 can be just essentially what evidence are people looking
11 at, and what can we agree to that we're going to put on
12 paper, so IARC comes to consensus when they draft their
13 reviews. That doesn't mean that everyone on the
14 committee agreed or everyone disagreed. It is what
15 they all agreed to put into the document; "they" being
16 the panel.

17 Q. So is there any public -- published guidance on
18 how to apply an equipoise standard?

19 A. I don't know. I haven't ever looked for it. I
20 can't answer that. I will certainly tell you there's
21 lots of guidance on weight of the evidence and how to,
22 as a scientist, to go through and consider strength in
23 limitations, what -- what evidence you do and don't
24 have, whether or not if you're -- if you're asking a
25 question like I was, looking at water exposure to these

1 four chemicals, you know, do I have data on oral
2 exposure from animals -- which would be the relevant
3 route. Do I have data in humans that may have been
4 exposed orally? Does it make a difference whether
5 people are only exposed orally? And then other things
6 to consider in a case like this is, do I have evidence
7 -- and I do -- where someone has actually looked at a
8 population of people and looked at whether or not they
9 were reports of cancer or other types of diseases in
10 that population? That would be the overall group of
11 studies, Bove and Ruckart, so those five studies that I
12 cite to.

13 Q. So can the equipoise standard that you described
14 be -- excuse me. That was a bad question. Let me
15 rephrase that. Can the equipoise standard be used to
16 describe positive associations?

17 A. I don't know --

18 MS. LaMACCHIA: Objection, form.

19 A. I don't know what you mean by "equipoise
20 standard." If you're asking me can the word
21 "equipoise" refer to positive associations? Certainly,
22 those are part of what is within the evidence that's
23 getting you to the point of equipoise. You know,
24 obviously, if you're at that point of equipoise, around
25 that fifty-fifty range, in this case of epidemiology,

1 you obviously have positive studies. You must also have
 2 either negative studies or a lack of statistical
 3 significance, potentially. Depends on the
 4 epidemiologist. That's not what I did in this case. I
 5 did not attempt to go through all of the epidemiological
 6 evidence and do a general causation overall assessment.
 7 Instead, I used the epidemiological evidence as part of
 8 my human health hazard assessment in forming my opinions
 9 about whether or not it was at least as likely or not
 10 that there was a cancer hazard posed by the chemicals,
 11 or the -- or the overall exposure situation in the
 12 water.

13 MS. JOHNSON: Take a five-minute break?

14 VIDEOGRAPHER: Off the record. Time is
 15 11:53.

16 (Short recess was taken.)

17 VIDEOGRAPHER: Back on the record. Time is
 18 12:14 p.m., beginning of file 4.

19 BY MS. JOHNSON:

20 Q. I'm going to start by handing you what is --

21 A. 6.

22 Q. Thank you. Exhibit 6.

23 (Exhibit 6 was marked.)

24 BY MS. JOHNSON:

25 Q. I think you should recognize this. It's the

1 Evaluation of Mortality in Marines, 2024. You reviewed
2 Dr. Bove's 2024 mortality study, correct?

3 A. Yes. I cite this in my report.

4 Q. Are you aware of whether or not this mortality
5 study conducted an individualized exposure assessment?

6 A. I believe that none of these studies do that
7 he's done, so I'd have to look to see what it says, but
8 I don't recall that being what he would have done. Let
9 me look. No, he doesn't do it on an individual basis.

10 Q. I'm going to ask if you could turn to page 7 --
11 excuse me, page 6, and, unfortunately, the
12 page-numbering is where the staple is, so I apologize
13 for that. Table 2 is when you open on the left side.

14 Table 2 is the Standardized Mortality Ratios for
15 Marines and Navy personnel at Camp Lejeune; is that
16 correct?

17 A. That's correct.

18 Q. And if you'll -- if I could point your attention
19 to the second line, where it has, "All cancer
20 malignancies for Camp Lejeune at .92, confidence
21 interval .89, .95. Did I read that correctly?

22 A. Well, that's the observed SMR; is that what
23 you're asking me? Yes, with the confidence intervals
24 around that.

25 Q. Okay. And if I could take your attention to few

1 lines down to "Urinary/bladder"; and just let me know
2 when you're there.

3 A. Yeah. I'm there.

4 Q. Okay. And for Camp Lejeune, the standard
5 mortality ratio of .9 -- excuse me, I have .97 with a
6 confidence interval of .74 to 1.24. Did I read that
7 correctly?

8 A. Yes, you did.

9 Q. So the standard mortality ratio for
10 urinary/bladder cancer is equal to .97 at Camp Lejeune;
11 is that correct?

12 A. Yes, that's correct. This is a terribly-done
13 table, but yes, I agree that's what this is. I think
14 he's missing his "N" column, here. There's numbers
15 before. I think that's the number of observations, but
16 --

17 Q. That's what I deducted from that --

18 A. Yeah, this is -- unfortunately, the table looks
19 like it's missing a column, but that's fine, yes, I
20 agree that that is the SMR.

21 Q. And if I could take your attention to Table 4 --
22 excuse me, I'm sorry, Table 3 -- I misread -- on the
23 next page; and this is the standard mortality ratio for
24 civilians at Camp Lejeune; is that correct?

25 A. Yes. Unlike the other papers where he split

1 them, he put them both into one paper on the two
2 different populations.

3 Q. And if we look at the second line for all
4 cancers, you have the standard mortality ratio of .93,
5 confidence interval of .87, .99; did I read that
6 correctly?

7 A. Yes, you read it correctly.

8 Q. And if you go about, oh, maybe, a dozen lines
9 down, for urinary/bladder, we have the standard
10 mortality ratio of .85 and the confidence interval of
11 .50 to 1.34, correct?

12 A. You read that correctly, yeah.

13 Q. So for civilians at Camp Lejeune, the standard
14 mortality ratio is equal to .85, with a confidence
15 interval of .50 to 1.34; is that correct?

16 A. That's what he's reporting in Table 3, yes.

17 Q. Thank you.

18 A. I shouldn't say "he." That's what the author
19 is, because there's more than one author reporting.

20 Q. And if I could point you to Table 4, which is on
21 page 8, for the second line down on Table 4, "All cancer
22 malignancies", adjusted and unadjusted, 1.06 with a
23 confidence interval 1.02 to 1.11, correct?

24 A. Yes, which would be, by the way, statistically
25 significant in this table.

1 Q. And if I could take you down about, oh, roughly
2 fifteen rows to "bladder cancer."

3 A. Yes.

4 Q. At 1.02, the confidence interval is .7 to 1.45?

5 A. You read that correctly, yes.

6 Q. Thank you. And the hazard ratio comparing Camp
7 Lejeune Marines with Camp Pendleton is 1.02, correct?

8 A. This isn't Marines. This is -- oh, yes, it is.
9 This is Marines. Yes, that is correct.

10 Q. We'll put the tiny numbers away for a moment.

11 I'm going to return to the 2017 public health
12 assessment.

13 Now, concerning the risk values that are present in the
14 ATSDR assessment of evidence, are you aware that the
15 policies and procedures used to develop regulatory risk
16 values are conservative and health-protective, and
17 embody an unquantified margin of safety?

18 MS. LaMACCHIA: Objection, form.

19 A. So if you're reading a definition, I don't
20 recall that specific language in here, but I would agree
21 that, often, they're health-protective.

22 Q. Are you aware that the ATSDR has advised the
23 MRLs are set below levels that might cause adverse
24 health effects in most people, including sensitive
25 populations?

1 MS. LaMACCHIA: Objection, form.

2 A. I don't know what they state here, but I would
3 agree, based on my experience and training, that an MRL
4 is set to be protective of majority of the people in the
5 population, so that is how they do it. It is a level
6 that is chosen based on scientific evidence to be one
7 where they would not expect to see an adverse health
8 effect. That doesn't mean it couldn't still occur, but
9 that's what they're hoping to do, is to protect against
10 that.

11 Q. Are you aware that the EPA has advised that
12 reference values are not predictive values, that they
13 provide no information about risks at higher exposure
14 levels?

15 MS. LaMACCHIA: Objection, form.

16 A. I think it depends on what kind of risk value
17 you're talking. Some of them are set to be -- for
18 example, they are risk values set under the program
19 called "ABLES" that are meant to be -- some of them are
20 reflective of higher levels of exposure and some lower
21 levels of exposure based upon the time of exposure, but
22 if you're asking me as a general concept, that's
23 possible, depending on the type of reference value
24 you're talking about.

25 Q. Are you aware that the public health -- 2017

1 public health assessment was limited by a lack of water
2 sampling prior to 1982?

3 MS. LaMACCHIA: Objection, form.

4 A. So I don't know exactly what the language is,
5 but I would agree that they had water samples that were
6 taken starting in 1982, and then they used water
7 modeling to describe, based upon what kinds of
8 activities had happened on the camp, how to construct
9 what levels would have been back in time, which is not
10 an unusual exercise to do when you lack the data, based
11 upon the fact that you just discovered the problem.

12 Q. Are you also aware that the public health
13 assessment was limited by uncertainty about when the
14 contamination first occurred in the water supplies? I
15 believe you referenced this in your previous answer.

16 MS. LaMACCHIA: Objection, form.

17 A. It would be the same answer. I don't know if I
18 can point to the specific language, but, certainly,
19 they talk about exposure starting in around 1957, so
20 they have evidence to believe that that was when things
21 would have -- the dumping and different things would
22 have had occurred on base. So they had information;
23 they just didn't have quantified drinking water levels
24 at the water treatment plants that they discovered in
25 1982 when they started doing that sampling. I would --

1 I would refer you to other experts in the litigation
2 that can discuss this much more fully than I can, but I
3 will tell you this: It's important to understand that
4 that reconstruction of what the contamination would have
5 been back at time is not without a scientific basis,
6 based upon my experience in looking at what they've
7 described. I've seen some documents that described how
8 they went about their modeling.

9 Q. Are you aware that the public -- the 2017 ATSDR
10 public health assessment was relying on testing of
11 finished water for leaving the treatment plant, rather
12 than the point of exposure, like a faucet or shower, for
13 estimating exposure?

14 MS. LaMACCHIA: Objection, form.

15 A. I am aware that it was at the treatment plants,
16 yes, which would be the point of origin. I will tell
17 you, however, that it is possible -- although it is
18 possible, since these are volatile chemicals, that you
19 could lose some. The fact that you have it at the point
20 of origin is a common method to use if you're going to
21 do an exposure risk assessment for what someone would
22 get out of their tap, because of the fact that the pipes
23 are -- unless you have a really weird, leaky, pipe
24 system, the pipes are feeding from the point of origin
25 to the home, and then you turn the tap on and it comes

1 out.

2 Q. And are you aware that the Public Health
3 Assessment was also limited by a limited amount of
4 information about site-specific exposure parameters?

5 MS. LaMACCHIA: Objection, form.

6 A. I don't know what you mean, generally. That's a
7 really are broad term by saying "specific exposure
8 parameters." You want to give me an example that you
9 want me to consider?

10 Q. Sure. Possibly -- a possible scenario to
11 consider would be a location on base during a specific
12 year, lack of limited information based on where someone
13 lived on base, for what duration of time.

14 A. So, on the first example, I would agree that
15 they did not necessarily have -- because I already told
16 you I agree that what they did was point of origin, so
17 the issue would be -- would be that is where the data
18 comes from.

19 On the second, however, that's the type of
20 information -- I didn't do this, but I would imagine,
21 for individuals involved in the litigation, you could
22 ask questions and get information about where they
23 lived, what they did, those kinds of things, but I did
24 not do that. That's the beyond the scope of what I did.
25 I did not do individual exposure assessments for

1 plaintiffs in the litigation.

2 Q. And you can put the ATSDR assessment aside for a
3 moment, and we are going to go back to your report.
4 Let's see. We're going to go to paragraph 15; and in
5 paragraph 15 of your report you write, "As a
6 toxicologist in this case I've been asked to address
7 some of the Hill considerations that might apply to the
8 work I am undertaking", correct?

9 A. Yes, I stated that, yes.

10 Q. And if you turn to paragraph 27 of your report,
11 you write, "I also reviewed the body of data and
12 information related to PCE exposure and bladder cancer
13 in humans, since the relationship was a focus of my
14 hazard assessment", correct?

15 A. Yes, that is correct.

16 Q. And you reviewed that information, the
17 information that you indicate in paragraph 27?

18 A. I list for you the information that I have
19 reviewed and relied upon, yes, as part of my weight of
20 the evidence evaluation and the hazard assessment
21 approach.

22 Q. So based on paragraph 15 and 27, did you perform
23 a Bradford Hill analysis of the PCE information?

24 A. So I performed an -- a weight of the evidence
25 analysis as part of hazard assessment of the PC --

1 epidemiological literature. As I state for you later on
2 in this paragraph 27, I say at the bottom of page 16,
3 "Although I assume that others will be addressing these
4 studies as part of a full causation analysis, I reviewed
5 each of these as part of my overall weight of the
6 evidence for bladder cancer as a human health hazard
7 linked to exposure to perchloroethylene." So that's a
8 different analysis than you would do if you were -- as
9 others in this litigation will do, I assume -- I believe
10 that's true. I haven't seen any of the expert reports
11 of the other experts for plaintiffs, but, I assume
12 that's what they're doing.

13 Q. Did you do a -- did you do a Bradford Hill
14 analysis for the human studies for any of the chemicals
15 for the CL's -- Camp Lejeune's studies?

16 A. So I can't answer that yes or no. Would you
17 like me to explain why?

18 Q. Please.

19 A. I'm assuming that you're -- by the way you're
20 asking that question that you're asking me use of
21 Bradford Hill to do a full causation analysis, and that
22 is not what I did; however, I did use the Bradford Hill
23 considerations as part of my review of any of the
24 information that I looked at, and I think I told you
25 that earlier. So, for example, for each of these

1 studies I list in paragraph 27, I looked at things such
2 as strength of association that was reported, I looked
3 at whether or not the studies describe strengths and
4 weaknesses to give me an idea of whether or not the
5 information would be considered reliable by most
6 scientists that are reviewing these kinds of studies, as
7 I've done in the past. I looked at whether or not the
8 information contained within the studies met the
9 criteria -- I'm sorry, the consideration of coherence.
10 Did they make sense based on what we know how bladder
11 cancer develops as a disease, right? So I looked at
12 that in terms of the epidemiological information and
13 the Bradford Hill considerations, so I did apply the
14 types of things that Bradford Hill lays out in his 1965
15 paper in terms of how you would go through and look at
16 epidemiological evidence, but, again, I'm not doing a
17 full causation analysis. I, instead, was addressing
18 certain parts of the Bradford Hill considerations that
19 are within my purview as a toxicologist, human health
20 risk assessor, and someone who is forming opinions about
21 the human health hazards and whether or not they met the
22 standard of at least as likely as not.

23 Q. Okay, so it's -- is it fair to say you conducted
24 a consideration of Bradford Hill, versus an analysis of
25 Bradford Hill?

1 A. No. I would say, instead, what I did was, I
2 used the Bradford Hill considerations to guide my
3 analysis of studies that would be relevant to what
4 Bradford Hill describes. So, certainly, Bradford Hill
5 in his paper, and also Rothman in his textbook talks
6 about epidemiology as being part of the information --
7 human studies as being part of the information that
8 would support the kinds of things that he's describing
9 to understand the relationship between exposure and
10 disease, and so that's what I did. I apply the
11 considerations while I'm doing my analysis, but I'm
12 applying the considerations in terms of a weight of the
13 evidence evaluation for hazard, not answering the
14 question about causation that other experts in this
15 litigation are handling.

16 Q. Okay. So let's turn to paragraph 88 of your
17 report.

18 A. Okay.

19 Q. And about middle of the way through, about
20 midway down -- I'm just going to start reading from
21 there because it is one of those I don't want to cut off
22 where you're saying that there's -- the portion I'm
23 going to read is, "more likely than not involves the
24 steps of formation of reactive metabolites in the liver
25 and in kidneys, excretion of reactive metabolites into

1 urine where they come into contact with cells that line
2 the urinary system -- urothelial cells; 4, interaction
3 of the reactive and genotoxic metabolites in urothelial
4 cells; and 5, initiation of genotoxic events that can
5 lead to carcinogenicity in the bladder." Did I read
6 that correctly?

7 MS. LaMACCHIA: Objection, form.

8 A. You have read -- where you started from, you
9 read correctly, that's correct.

10 Q. Okay. The process that I -- I just read from,
11 do these events take place in mice and rats? The --
12 the five items that I read from your report in paragraph
13 88.

14 A. So, in order to answer that question, you have
15 to have an understanding of the differences between
16 human mice and rats in terms of their physiology of
17 their bladder and the way they store urine. Do you want
18 me to explain?

19 Q. Yes, please.

20 A. So, certainly, within mice and rats, we have --
21 we have evidence from the scientific literature that
22 there are genotoxic metabolites formed in mice, rats, as
23 well as humans, so there are metabolic studies or
24 toxicokinetic studies that have been shown that the --
25 there are species similarities in terms of the reactive

1 metabolites formed, but what is different about rats and
2 mice to humans is this concept of how long the contact
3 within the urothelial system -- the cells of the
4 urothelial lining of the bladder can occur, and that's
5 because, unlike humans, rats and mice can void at will,
6 so they urinate every five to fifteen minutes, so
7 there's no long-term storage of -- even when they're
8 sleeping, they're urinating, unlike humans, where we
9 have habits, due to cleanliness and just development of
10 physiology over time, where we store urine during the
11 nighttime, so -- and, in fact, we also store urine
12 during the day. We have patterns. Unless you have a
13 disease of your bladder where you have an urgency where
14 you can't hold urine, most humans will hold urine for
15 hours at a time in between -- in between going to the
16 bathroom. That doesn't hold for everyone. Again, there
17 are pregnant women, women who have different diseases of
18 their urinary system where their valves are not working
19 properly, but, generally, that's true, and, overnight,
20 most of us hold urine for at least four to five hours.
21 Even if we get up in the middle of the night, most of us
22 are holding urine, and that's what's important to
23 understand. It's the idea that you're giving, in
24 humans, a long, prolonged duration of exposure of the
25 urothelial cells, and this is not something you would be

1 able to see in animals. So if your question was, can I
2 find, in rats and mice, evidence for the exact same
3 types of changes in urothelial cells that you might see
4 in humans that are developing bladder cancer, you're
5 unlikely to do that because of the mechanism here, which
6 requires the reactive metabolites to be excreted into
7 the urine, and then held for a period of time in order
8 for that biological response to be seen. This is
9 consistent, by the way, with the scientific literature
10 that just talks about smoking. It's -- what I'm coming
11 up with here, by the way, is not novel. It's not Dr.
12 Plunkett's mechanism or mode of action. It is
13 something described within the literature for other
14 types of chemicals that, indeed, result in accumulation
15 of toxicants in the urine of humans.

16 Q. So the -- I may misstate this, so bear with me.
17 So the metabolites would not accumulate in mice and rats
18 to cause evidence of bladder tumors. Am I stating that
19 scientifically correct?

20 A. They wouldn't sit there as long, that's exactly
21 right, accumulate to the same level, that's exactly
22 right. That's, to me, the important difference in terms
23 of understanding what the literature on rats and mice
24 say. For example, the literature on rat and mice
25 toxicity shows that, just like humans, that these

1 chemicals are indeed -- these reactive metabolites are
2 formed in the kidney -- we know that -- of all the
3 species, and we know that we have kidney toxicity, so we
4 know when they get to the kidney, those things can,
5 indeed, be toxic, but what we don't have and what we
6 can't cross-extrapolate to is the importance of the
7 accumulation of those toxic metabolites in the
8 urothelial system, and that's -- as far as the bladder,
9 because that's what's different. The physiology's going
10 to diverge, and so if you look at a long-term study in
11 humans, if you have enough latency to look at bladder --
12 whether or not a certain exposure is linked to bladder
13 cancer, and you follow people for a long enough period
14 of time to account for latency of the disease, you may
15 not get concordant results in rats and mice, so rats and
16 mice may not show bladder tumors, but, indeed, they show
17 similar toxicokinetics, and they show similar injury due
18 to those reactive metabolites in the urinary system
19 where the kidney has been the organ that's been looked
20 at.

21 Q. So does it make it biologically plausible for
22 TCE, PCE, benzene, and vinyl chloride causing bladder
23 cancer in humans, and exposed animals don't get bladder
24 tumors?

25 MS. LaMACCHIA: Form.

1 A. I wouldn't say it that way. What I'd say was I
2 would not expect the animal bioassays to necessarily
3 show bladder tumors, even though we have evidence for
4 tumors of the bladder in humans exposed to these
5 chemicals; so, in other words, the concordance, or the
6 read-across, or the extrapolation is not necessarily
7 dispositive. Just because you don't see them in rats
8 and mice doesn't mean you can't see them in humans, and
9 that's what I'm saying for you. It's a
10 generally-accepted principle of animal cancer bioassays
11 that the -- what is important is whether or not cancer
12 can be caused and whether or not the cancer is being
13 caused systemically or not, depending on how you're
14 exposing the animals, so, in other words, if you give it
15 orally, do you get tumors? If you give it inhalation,
16 do you get tumors? If you give it dermally, do you get
17 tumors? Do you see cancer? And then in terms of --
18 the other important thing is look at target organs.
19 What are the target organs in animals? And then when
20 you look at human studies, you look at those target
21 organs, but it doesn't mean that you'll have an exact
22 one-to-one read-across. In fact, that is something
23 that the toxicology community sets out in textbooks.
24 The value of the animal studies is not to be able to
25 predict exactly what organs you'll see cancer in, but

1 to be able to be predictive of cancer itself, and
2 that's what happens. There are some exceptions to that
3 rule. There are certain types of cancers that, indeed,
4 go from animals to humans, but not all, and just because
5 -- again, just because it doesn't happen doesn't mean it
6 can't happen in humans, and that's what the
7 generally-accepted principle has been. You need to look
8 at the human studies by themselves and then look at the
9 biology and see if you understand why, and that's what
10 I'm attempting to do here in this paragraph. I'm
11 attempting to explain the biology and why it makes
12 sense to me that this particular -- this is my per --
13 actually, I'm talking to all four here, because they all
14 four share -- or all three share this property.
15 Benzene, TCE, and PCE share the property of forming
16 reactive metabolites on the livers and kidney, being
17 excreted into the urine, being able to interact with
18 urothelial cells by the factor in the urine, and there
19 is human evidence of bladder cancer with those three
20 chemicals, as I lay out in earlier sections of the
21 report.

22 Q. Will you turn to page 55, paragraph 99? In the
23 first sentence of paragraph 99, you state, "To fulfill
24 the Hill consideration of coherence, I compared what is
25 known about the toxic effects of PCE, TCE, and benzene

1 generally, and the information discussed in the
2 scientific literature about how bladder cancer develops
3 and what risk factors are known, as well as the basic
4 biology of the human urinary system." Correct?

5 A. Yes, that's correct. You read that correctly.

6 Q. And we've, of course, talked about how you
7 considered Bradford Hill, but here, the -- the
8 consistency factor isn't addressed; is that correct?

9 A. Well, consistency within the Bradford Hill
10 considerations would be a different -- a different
11 consideration that I'm not addressing. I'm addressing
12 coherence. I'm talking about the relationship between
13 the basic biology of the disease and what we know these
14 chemicals can do, and whether or not that basic biology
15 of the disease fits within the pattern that I'm
16 describing. So, for example, latency is an example of
17 basic biology of the disease, which would fit here,
18 right? The basic biology of the disease being related
19 to the production of toxicants that can get into the
20 urine, that's another issue of basic biology of the
21 disease, as well.

22 Q. So the basic biology would fit in with your
23 criteria, which is separate from consistency as a
24 Bradford Hill -- in Bradford Hill factor?

25 A. So, consistency is a separate consideration, as

1 I list in my report, and I'm addressing four of these
2 considerations, and that is not one I'm addressing.
3 Again, it's my understanding that others are doing an
4 entire analysis through each of those nine
5 considerations.

6 Q. Okay, and the factors that you do address in
7 your -- in your -- the four factors that you do address
8 in your report, your literature search covered things
9 that would be consistent with those four, but not
10 necessarily the other five that were not a part of your
11 report. Do I have that correct?

12 MS. LaMACCHIA: Objection, form.

13 A. No, not -- no, I didn't do a search on Bradford
14 Hill, other than I did do a search looking at mode of
15 action, which would be part of biologic plausibility,
16 but also fits with experiment, and also fits with
17 analogy, and also fits with coherence, so these four
18 definitely are things that relate to some of the
19 literature that I brought up in that separate search I
20 did on mode of action for bladder cancer with each of
21 the chemicals; however, other Hill considerations would
22 be -- could be gleaned from the literature that I
23 gathered in my literature search. Again, I didn't do a
24 literature search to only try to fulfill those
25 considerations. I did a general literature search based

1 upon what I was being asked to do, which was a hazard
2 assessment for bladder cancer, and then determining
3 whether or not, based on that assessment, I could form
4 an opinion about that relationship and whether or not --
5 and what I concluded, and I give you that at the end of
6 my report.

7 Q. Okay, going one paragraph up to paragraph 98,
8 you describe cigarette smoking as a risk factor for
9 bladder cancer, correct -- or one of several that you
10 list, but a risk factor for bladder cancer, correct?

11 A. Yes, that's correct.

12 Q. And do you know how much of a risk factor
13 cigarettes are for bladder cancer? As in what is the
14 overall -- that is a bad question. Strike that. How
15 significant of a risk factor for bladder cancer smoking
16 would be.

17 MS. LaMACCHIA: Objection, form.

18 A. So I don't know if I can answer that I know the
19 results of metaanalyses in terms of the hazard ratios.
20 I don't know that I could give you that, but what I can
21 tell you is that, certainly, bladder cancer and
22 cigarette smoking is a relationship that's been
23 discussed for decades in the literature, and, as a
24 result of that, if you'll look at the epidemiological
25 studies that are -- I relied upon, most of those

1 consider that as a confounder for discussing on whether
2 or not they correct it, adjust it, or were not able to,
3 so I do believe it is an important risk factor, so if
4 someone is doing a differential diagnosis for a patient
5 or an individual plaintiff in the litigation,
6 certainly, cigarette smoking is something they would
7 gather information on, but that doesn't when you're
8 talking about a standard of at least as likely as. It
9 doesn't matter whether one has a higher risk ratio or
10 not. The point is are both of them understood risk
11 factors or not, or are three or four of them understood
12 risk factors as not, because "at least as likely" does
13 not take into account whether or -- or worry about
14 whether or not one has a risk ratio that's twofold
15 higher than other. They're both possible risk factors
16 that you need to consider when you're doing a specific
17 causation assessment. That's my opinion.

18 MS. JOHNSON: Actually, right now would be
19 a good time to break for lunch, if everyone's okay with
20 that.

21 VIDEOGRAPHER: Off the record, 12:55 p.m.
22 This concludes file 4.

23 (Lunch recess was taken.)

24 VIDEOGRAPHER: Time is 1:45 p.m. Back on
25 the record, beginning of file five.

1 BY MS. JOHNSON:

2 Q. I am marking what is going to be Exhibit 7.

3 (Exhibit 7 was marked.)

4 BY MS. JOHNSON:

5 Q. Dr. Plunkett, I've given you a paper -- I may be
6 mispronouncing it. Aschengrau?

7 A. Aschengrau, yeah.

8 Q. As the cancer -- Cancer Risk and TCE in Drinking
9 Water in Massachusetts, and have you seen this paper
10 before?

11 A. Yes, I have. I thought this was on my list, but
12 if it's not, I've seen it before.

13 Q. This is a case control study, correct?

14 A. Yes, that's correct.

15 Q. And the study has no measured dose data,
16 correct?

17 A. No. They estimate the dose based upon some
18 modeling/statistical analyses, but they did not have
19 individual data; that is correct.

20 Q. And the study gives results with and without
21 considering latency, correct?

22 A. They did, yes.

23 Q. The latency chosen for bladder cancer was
24 fifteen years, correct?

25 A. I don't remember the number. Let me --

1 Q. If you refer to page 287, that should assist
2 you.

3 A. Yes, that's what they state, yes.

4 Q. And if you --

5 A. It's the same latency, by the way, for kidney
6 cancer, as well.

7 Q. And there's no increased risk for bladder
8 cancer, unless latency was ignored; is that correct?

9 A. So if you're asking about the abstract, that is
10 a statement they make, yeah. That's correct.

11 Q. We're done with that one. I'm marking Exhibit
12 8.

13 (Exhibit 8 was marked.)

14 BY MS. JOHNSON:

15 Q. I apologize. I covered it up with the
16 government exhibit sticker, but it's the Mortality Among
17 Aircraft Manufacturing Workers.

18 And, referring to Exhibit 8, this was a cohort
19 mortality study, correct?

20 A. Yes, that's what it was. A retrospective cohort
21 mortality study.

22 Q. And this study concluded that, among the workers
23 most heavily exposed to TCE in our series, there was no
24 significant excess deaths ascribed to, among other
25 cancers, bladder.

1 A. So are you reading something --

2 MS. LaMACCHIA: Wait, let -- I'm sorry.
3 Let her finish her question.

4 A. I thought you said "correct." Maybe I'm wrong.

5 Q. I will refer you to page 594 for that
6 information; and that is towards the bottom.

7 A. So could you repeat the quote?

8 Q. Sure. The quote was, "Among workers most
9 heavily exposed to TCE in our series, there was no
10 significant excess deaths ascribed to", and among the
11 cancers listed is bladder cancer; is that correct?

12 MS. LaMACCHIA: Objection, form.

13 A. You are correct that, in that sentence, bladder
14 is one of the cancers where they state that, yeah.

15 Q. Okay. And on the same page, the study also
16 found no significant excess cancers of the bladder in
17 connection with PCE exposure, correct?

18 A. State your question again.

19 Q. Sure. The study found no significant excess
20 cancer of the bladder in connection with PCE exposure?

21 A. Okay, so I don't see that quote. They do
22 discuss it in the first paragraph under "PCE." Is that
23 where you are? I assume you're reading --

24 Q. I'm reading under the PCE section.

25 A. Right, I'm in this first paragraph, and they're

1 talking about bladder cancer here, but where are you
2 reading from?

3 Q. I am reading from the last paragraph, which is
4 -- goes towards the top of the second column on page
5 494. It's a little block --

6 A. Yeah, okay. All right, so, based on that, what
7 I see is they have a sentence that says, "As noted, we
8 found no significant excess of leukemia or cancers of
9 the rectum, lung and bladder." That's what you're
10 referring to?

11 Q. Yes.

12 A. Yes, that is stated there. I agree they state
13 that.

14 MS. JOHNSON: This is going to be Exhibit
15 9, which is the... Halaseh study. I may be
16 mispronouncing this.

17 (Exhibit 9 was marked.)

18 A. This is the paper that we read -- that I cited
19 to earlier, yes. Halasseh, or Halaseh, I'm not sure. I
20 haven't met the individual, so I don't know.

21 Q. I think I'll try and go with "Halaseh" for
22 consistency, and I will ask you, this is a non-systemic
23 literature review; is that correct?

24 A. Are you trying to say "systematic", not
25 "systemic"?

1 Q. I mean "systematic."

2 A. So I don't know if he used systematic review.
3 He doesn't state in that in his methodology, so I can't
4 answer that one way or the other. It's a review paper,
5 and I cite to it because it describes some of the things
6 I was talking about in terms of the most common type of
7 bladder cancer being urothelial cells, and also the
8 issues about chemicals contacting the urothelial cells,
9 and that posing a risk of cancer.

10 Q. And we previously discussed where you mentioned
11 risk factors in your report. Do you recall?

12 A. I mention some of them, yes, that's correct.

13 Q. Okay. Did you consider -- and previously, you
14 stated that -- and please correct me if I'm misstating
15 this, that you considered risk factors of cigarette
16 smoking and tobacco in your report?

17 A. I list it as a risk factor, and it's something I
18 looked for in some of the literature when I reviewed
19 looking at whether or not in the epi studies, they had
20 talked about risk factors, and whether or not they did
21 any adjustments of their hazard ratios -- for example,
22 as a relative risk based on that -- and a common one I
23 think I stated for you earlier is smoking, which would
24 be exposure to tobacco ingredients, and they don't
25 really know exactly what ingredient or complex of

1 ingredients is responsible, but they believe it's
2 related to the PAHs.

3 Q. Okay. I'm going to take you to page 6. It's
4 the -- pretty much the last page before the references,
5 and direct you to the first paragraph, the conclusions,
6 where the paper concludes that tobacco is the primary
7 recognized cause of bladder cancer, accounting for 30 to
8 40 percent of all cases of urothelial carcinoma, and up
9 to two-thirds of all bladder cancer. Do you agree with
10 that statement on page 6?

11 A. I haven't formed an opinion that I agree or
12 disagree, but I would state for you I have seen similar
13 suggestions, and that's why most of the papers on
14 epidemiology will look at it in terms of confounders.

15 Q. And did you consider other risk factors related
16 to occupational exposures, such as aromatic amines?

17 A. Well, I'm not doing specific causation, so I
18 can't answer that for any individual plaintiff, but,
19 certainly, I discuss the fact that other chemical
20 exposures are also potentially linked; however, in the
21 -- in the water at Camp Lejeune, we have a definition of
22 what they believe has been found and where it came from,
23 so that's why I would not have focused on aromatic
24 means, other than to recognize that, obviously -- you
25 know, PAHs are an aromatic amine, that's in cigarette

1 smoke, but if somebody worked in an industry, certainly,
2 in a differential diagnosis, I would expect a physician
3 to ask some questions about occupation.

4 Q. And if I can direct you to page 4, and under the
5 header of "Occupational and environmental exposure",
6 Haleseh states that this type occupational exposure is
7 responsible for five to ten percent of all bladder
8 cancer. Did I read that accurately?

9 A. You --

10 Q. It is, I apologize, the fourth sentence down in
11 the Occupational and Environmental Exposure paragraph.

12 A. So I disagree that he said that it's just
13 aromatic amines. He's focusing on three specific ones,
14 and I believe that those are -- I think I recognize that
15 list. Yes, I've actually seen the Cumberbatch paper
16 before in the past, so I'm aware that there is a hazard
17 ratio calculated there where they talk about those three
18 specific aromatic amines.

19 (Exhibit 10 was marked.)

20 BY MS. JOHNSON:

21 Q. I'm marking, for Exhibit 10... Dr. Plunkett,
22 I've handed you the Moore paper on occupational TCH
23 exposure and carcinoma risk, and this was a case control
24 study, correct?

25 A. I'll have to look. This is not one I cite to.

1 I am familiar, however, with this general topic, but I
2 don't think I have cited to this paper, so let me look.

3 Q. Absolutely.

4 A. It's a hospital-based case control study, yes.

5 Q. So, as a hospital-based control study, it would
6 acknowledge that -- it would be acknowledged that it may
7 not represent the general population in each study for
8 region selection bias?

9 A. I think -- I can't answer that without looking
10 at the paper. I don't know. I mean, just because it's
11 hospital-based depends upon who the people are and where
12 they came from, and if this is -- it looks like this may
13 have been people that were in the hospital because of
14 having renal carcinoma, and so the issue would be
15 whether or not they were representative. I can't answer
16 that; I don't know.

17 Q. And did this study consider latency when it gave
18 results?

19 A. I don't know. I've never seen it, so I can't
20 answer that. You want me to look at it a minute, or you
21 want me to go ahead and look for that? I -- up to you.

22 Q. Why don't you take a couple minutes and look
23 that over, and then I'll check back with you.

24 A. Can you ask your question again? I don't think
25 I see anything about latency in here, but go ahead and

1 ask your question again.

2 Q. Did the study give results without considering
3 latency?

4 MS. LaMACCHIA: Objection, form.

5 A. The results that are provided do not discuss
6 latency; however, I can't tell you without knowing more
7 about the study whether -- looking at the records, maybe
8 they did. I don't know. They don't discuss it in the
9 published paper. What they do discuss, however, by the
10 way -- this is a part of my discussion about my
11 individual susceptibility factors for why certain people
12 may be more at risk of bladder cancer, and this is a
13 specific issue about gene variants that have to do with
14 metabolism.

15 Q. And before we go any further, let me just
16 confirm that we have the right study. If we can go back
17 to your expert report for a moment, and if you could
18 just peruse your materials considered and I just want to
19 double-check that the Moore study is among the
20 materials.

21 A. So, I don't see it on my list here. This is
22 alphabetical. That's where I looked, but let me look
23 and see if I cited it back here and then didn't put it
24 the Cs. Yes, I'm sorry, it is in my list, and I may be
25 citing this in my section about genetic susceptibility,

1 so let me look.

2 Q. I just wanted to double-check and make sure.

3 A. I apologize.

4 Q. No, that's fine.

5 A. No, I didn't remember this one.

6 Q. And if you'd like to take a couple minutes to
7 refresh on the study, that's fine --

8 A. No, no, I looked through it and I didn't recall
9 the study, but the topic, I do recall because I talk
10 about this in my report about gene variants, so --
11 anyway, so go ahead.

12 Q. Did this study assess environmental exposure to
13 solvents in drinking water or air pollution?

14 A. No. This was based upon job -- mainly upon job
15 descriptions of exposure -- occupational exposure to --
16 to more than TCE, but TCE was a focus.

17 Q. We're done with that. You can put that one
18 aside. I believe you have your report still in front of
19 you --

20 A. Uh-huh.

21 Q. Just wanted to double-check. Okay. In the
22 Section C of your report on benzene, do you opine that
23 benzene can cause bladder cancer? And I'm specifically
24 -- I'm specifically looking at paragraph 53.

25 A. 53?

1 Q. Yes. It's at the end of the benzene section.

2 A. So I opine very specifically in my first
3 sentence where I believe it is least as likely than not
4 that benzene can -- the human health hazard of bladder
5 cancer is associated with benzene exposure, so I talk
6 about the fact that the human health hazard could
7 include development of bladder cancer when you talk
8 about exposure to benzene in the water at Camp Lejeune,
9 and I think that's consistent, also, with the conclusion
10 that I have at the end of the report, as well; so it's
11 not quite what you said.

12 Q. I understand. Let's see. So is it your opinion
13 that benzene in Camp Lejeune water was sufficient by
14 itself to cause bladder cancer?

15 MS. LaMACCHIA: Objection, form.

16 A. I don't think I formed that opinion, no. That's
17 beyond the scope of what I did for benzene by itself,
18 but I certainly think that the scientific literature
19 would support my opinion that water contaminated with
20 benzene, whether at Camp Lejeune or anywhere, would be
21 hazardous to human health, and it could include the
22 specific human health hazard of bladder cancer.

23 Q. As a toxicologist, do you agree with the
24 principle that the dose makes the poison?

25 MS. LaMACCHIA: Objection, form.

1 A. So I agree, generally, with that concept, but
2 it's highly dependent upon, not just dose, but also
3 other characteristics of the chemical, as well, but,
4 certainly, that's the general principle that most of us
5 -- it's a starting point for toxicologists when they
6 consider exposure.

7 Q. So, in general, the risk of developing a disease
8 from a chemical exposure increases with the dose? Have
9 I stated that correctly?

10 MS. LaMACCHIA: Form.

11 A. Well, it does for non-cancer human health
12 effects, but for cancer human health effects, it's not
13 quite so clear, and that's because of the fact that, in
14 order to examine cancer risk, we have -- the data that
15 we have doesn't define the threshold for most cancers
16 for most chemicals, so as a result of that, there is a
17 -- for risk assessment purposes, there's linear low-dose
18 extrapolation which is performed, where you assume that
19 there are -- very low levels of exposure can, indeed,
20 cause cancer outside the realm of observed --
21 observations in animal studies, for example, or human
22 studies. We haven't defined it, and if you haven't
23 defined it in risk assessment, then what you do is, you
24 assume that -- that you go from the dose that you know
25 about down to zero in a straight line. Do I believe

1 there is some dose that could be at risk without cancer?
2 I believe there probably exist, but we have not defined
3 it for these four chemicals, so, for purposes of human
4 health risk assessment, we operate on using the linear
5 low-dose extrapolation method.

6 Q. You may have already answered this in your last
7 question, but I want to pose -- what is -- what is the
8 level of exposure to benzene that would be necessary to
9 cause bladder cancer?

10 MS. LaMACCHIA: Objection, form.

11 A. So no one has determined that, in an animal
12 study or a human study, to date. Instead, what we know
13 is that, across doses from low exposures for longer
14 periods of time, or higher doses for shorter periods of
15 time, cancer generally is an outcome that you'd see.
16 The most common cancer would be leukemia, but you also
17 have studies that have shown risks of other cancers, as
18 well.

19 The latency for blood cancers is shorter than
20 bladder cancer, and so that may be a confounding factor
21 for why we haven't been able to find any information on
22 what levels of exposure are more likely or less likely
23 to be associated with an increased risk.

24 Q. Is it your opinion that exposure to any amount
25 of benzene is sufficient to cause bladder cancer?

1 MS. LaMACCHIA: Objection, form.

2 A. I don't think I formed that opinion, no. That's
3 beyond the scope of what I attempted to do, but I do
4 believe that in the literature that I have reviewed and
5 relied upon, that I can draw the conclusion that
6 exposure to the levels of benzene that are reported in
7 the water at Camp Lejeune, and that's why I did that
8 risk assessment for you later on where I tried to
9 quantify what would be the probability that someone
10 exposed to levels of those four chemicals in the
11 water -- and I have levels of benzene that I input into
12 that model -- what that probability may be.

13 Q. So based on your model, how much Camp Lejeune
14 water exposure is required to reach a level of benzene
15 exposure that can cause bladder cancer?

16 MS. LaMACCHIA: Objection, form.

17 A. That's beyond the scope of what I did. The
18 model that I use, it -- you have to put -- input some
19 dose, so it's what was the exposure level based on that.
20 You can use the model or the equations to predict what
21 the likelihood of observing cancer would be; and this is
22 cancer generally. It's not any one particular form of
23 cancer, because it's based upon the calculated cancer
24 potency factors that have been based upon different data
25 sets for chemicals.

1 Q. Okay, so -- so no specific cancer would be the
2 output of the model; it would be cancer, generally?

3 A. The model that I'm using, which is the EPA
4 method for -- based upon EPA's equations for modeling or
5 predicting what a risk could be in a population, so not
6 talking any one individual. I'm talking about a
7 population of people exposed to benzene and the other
8 chemicals in the water, but in my table, you could pull
9 out benzene alone, because there's a number for that.
10 Based upon the data that is observed, I'm predicting
11 what would we maybe see? Would we expect to see there
12 be an increased risk above that de minimis risk of one
13 in a million and that's what the model does. The model
14 is not predicting with any certainty that there will
15 definitely be ten people or a hundred people or a
16 thousand people. It's just saying that, based upon the
17 situation and the conditions that you're putting into
18 that "cancer model equation" that is being used, this is
19 what you would look for. Would you see an increased
20 risk? Yes. That's what my calculations say. They say
21 that there should be an increased risk, and so I would
22 expect to see some cases of cancer in the. Population,
23 including cases of bladder cancer, based on my
24 assessment of the relationship between exposure to these
25 chemicals and the human health hazard of bladder cancer.

1 That's probably more than you asked for. I apologize,
2 but I --

3 Q. No, no, it's -- trying to parse this out. I
4 appreciate the more fulsome explanation you've
5 provided.

6 And you provided a -- I can repeat the same
7 question for TCE and bladder cancer; however, you have
8 opined similarly on TCE. I can go through -- if you
9 want to go through the questions similarly as I did for
10 benzene to make it a little bit easier to digest --

11 A. It would have the -- if you're -- if you're
12 going to ask the questions the exact same way, I would
13 address them the same way, whether it was benzene, vinyl
14 chloride, TCE, or PCE. I haven't formed an opinion one
15 way or the other that there is any specific dose that is
16 the threshold at which you get bladder cancer. The data
17 would not allow us to do that. What I have done in my
18 assessment is form the opinion that it's at least as
19 likely as not that bladder cancer's a hazard associated
20 with exposure to the water at Camp Lejeune containing --
21 and tracing it to TCE, or tracing it to PCE, or tracing
22 it to benzene and then when you talk about increased
23 risk of cancer, then I'm throwing vinyl chloride back in
24 because I'm not talking about a specific form of cancer.
25 I'm talking about cancer generally and whether I would

1 expect to see cancer in the population of people exposed
2 to the water at levels that were being detected at Camp
3 Lejeune.

4 Q. Thank you. I was going through the exact same
5 questions for each individual chemical, so that has been
6 the rest, vinyl chloride. With one follow-up for
7 chloride -- you mentioned vinyl chloride comes back into
8 play because we are not talking about specific bladder
9 cancer. We're talking about cancer generally. Do I
10 understand that correctly?

11 A. Yes. My opinion about vinyl chloride is it
12 poses a cancer hazard, and the reason I discuss it in
13 this report, even though I'm focussing on bladder
14 cancer, is because of the issue -- the fact that vinyl
15 chloride is something that's actually formed from TCE --
16 PCE due to metabolism. PCE is metabolized to vinyl
17 chloride and TCE, so, as a result, when you're talking
18 about the exposure to TEC, it's very likely that people
19 in the environment that were exposed to just one were
20 exposed to all three, and then, in addition to that, we
21 have good evidence that vinyl chloride produces toxic
22 metabolites that are reactive that are also formed
23 similarly by liver metabolism, kidney metabolism, by the
24 enzymes that are present, but the data on vinyl chloride
25 are not there for me to be able to form the opinion that

1 it's least as likely as not that the human health hazard
2 of bladder cancer is associated with vinyl chloride, but
3 cancer is.

4 Q. And, just to clarify, you have not addressed DCE
5 anywhere in your report. Were you asked to discuss or
6 opine on DCE or just PCE, TCE, vinyl chloride, and
7 benzene?

8 A. So the four chemicals that I was asked to opine
9 on are the ones you've just listed and if by "DCE", you
10 mean dichloroethylene or ethane?

11 Q. Ethylene --

12 A. Yes. No, I was not asked to opine on that. It
13 has its own human health hazard profile, though. I was
14 not asked to do that.

15 Q. Okay, thank you. And thank you for helping me
16 with the word, because I understand there are two
17 endings to the "E" in DCE. And before we move on to
18 another area, I'll ask for a short break.

19 VIDEOGRAPHER: Off the record, 2:23. This
20 concludes file five.

21 (Short recess was taken.)

22 VIDEOGRAPHER: Back on the record, 2:39
23 p.m., beginning of file six.

24 BY MS. JOHNSON:

25 Q. Referring back to your report, we're going to

1 transition to the mixture section of your report, and no
2 specific paragraph; just that section generally as a
3 reference.

4 A. Okay. Yeah, it's after the vinyl chloride.
5 Okay.

6 Q. Page 56, it starts.

7 A. Uh-huh.

8 Q. At least I have 56?

9 A. Page 56? Oh, you're further than me. I was
10 looking at the hazards posed by the mixture on page 34.
11 Okay, yeah.

12 Q. You evaluated -- previous to this section, you
13 evaluated the chemicals -- the four chemicals
14 individually; is that correct?

15 A. Yes, that's correct.

16 Q. When you were retained, were you initially only
17 evaluating individual chemicals?

18 A. No. I was always asked to look at the human
19 health hazards exposed to chemicals in the water, and
20 so, to me as a toxicologist, you start with looking at
21 the individual profiles to know whether or not there's
22 any reason to consider there to be potential for
23 additive effects among mixtures. Does that answer your
24 question?

25 Q. Yes. Did anyone ever suggest you frame your

1 opinion based on a mixture, rather than the individual
2 chemicals?

3 A. No, no one suggested how to frame my opinions.
4 I just agreed to a scope of work.

5 Q. In your chemical mixtures section of your report
6 -- or throughout your report generally, do you reach the
7 opinion that there's a causal relationship between Camp
8 Lejeune water and bladder cancer?

9 A. That was beyond the scope of what I did. I
10 would consider that as a full -- I'm sorry, a general
11 causation assessment. I do believe, however, you find
12 causal statements similar -- you'll find some reference
13 to statements that could be used if I was going to do a
14 full causation assessment. Do you understand what I'm
15 saying? In other words, some of what I have in here,
16 someone else could take and build upon, and, if asked,
17 you could do a full causation assessment. That was
18 beyond the scope of what I did. I have the building
19 blocks for some parts of that.

20 Q. I understand that. Thank you. And in going
21 through, in case you'd like to refer, I'm looking at
22 your conclusions for the wording of your first several
23 conclusions generally and the phrase "Camp Lejeune
24 water." For one of the individual -- I'll read one off.
25 "It's at least as likely as not that the exposure to

1 Camp Lejeune water with PCE specifically is hazardous to
2 human health, and that the human health hazard would
3 include the development of bladder cancer." When you
4 say "Camp Lejeune water", how are you defining that?

5 A. I'm defining it as the -- as the substance that
6 is described within the ATSDR assessment of what the
7 water was coming from the water treatment plants, and
8 then the fact that there was water detected with certain
9 levels of perchloroethylene over time for this
10 conclusion, so I'm referring to the fact that I'm aware
11 of the fact that Camp Lejeune water treatment plants had
12 water in it that was contaminated with
13 perchloroethylene.

14 Q. Did you define -- in the chemicals mixture
15 Section 7 of your report, did you define "Camp Lejeune
16 water" differently as in your individual chemical
17 conclusions?

18 A. No. I don't think so. Are you referring to
19 paragraph 100?

20 Q. Yes.

21 A. So Camp Lejeune water, the data that I have
22 indicates that there were four different chemicals
23 found in the water, and in samples, they would be found
24 at the same time, so they were a mixture. And then --
25 so I think that's the same as what I'm telling you in

1 my conclusions, but I'm focusing on a particular
2 chemical. I'm saying that, in that water that contained
3 perchloroethylene, it may have also had TCE and benzene
4 and vinyl chloride. We know it had perchloroethylene,
5 and my assessment indicates that the perchloroethylene
6 or the PCE within the Camp Lejeune water that people
7 drank was an exposure that would pose a human health
8 hazard of bladder cancer to anyone who drank the water.

9 Q. Okay, so the -- so the combination of
10 contaminants would be PCE, TCE, vinyl chloride, and
11 benzene? Did I state that correctly?

12 A. Well, the water had all four, but for any one
13 individual, for example, on any one given day, it may be
14 that they -- we don't know what -- whether or not they
15 had more PCE or more TCE. We don't have those
16 measurements, so, instead, you take those measurements
17 you have and you look at whether or not they were
18 exposed to -- they were exposed to water where the
19 information supports what mixture was there, okay, and I
20 know that, for example, within the data for Hadnot Point
21 and Tarawa --

22 Q. We're calling it "Tarawa", but we could be --

23 A. Tarawa. Tarawa and Hadnot Point, that there
24 might have been a different mixture in terms of what
25 predominated versus the other, but in both cases, they

1 detected all of those in the water at different points
2 in time. Sometimes a non-detect for vinyl chloride on a
3 given sample, but there are data indicating that all
4 four were there.

5 Q. And did you account for the differences in
6 mixture levels in -- by area? I'll make that a
7 two-part question. Did you account for differences in
8 mixture levels by area, say, Tarawa Terrace or Hadnot
9 Point?

10 MS. LaMACCHIA: Objection, form.

11 A. That was beyond the scope of what I did. It's
12 my understanding there are others who are looking at
13 these issues of differences in exposure, but that was
14 beyond my scope.

15 Q. And did you account for differences in mixture
16 levels over the years of the -- the years at issue in
17 this case, which would be the 1950s or '60s through
18 1980s?

19 MS. LaMACCHIA: Objection, form.

20 A. I think that was beyond the scope of what I did,
21 as well, although I am aware of the fact that there are
22 data in some tables and certain documents that the
23 ATSDR has that there are differences at different points
24 in time in different years, which is why I am focusing
25 on the issue of hazard, which is the potential. If

1 they're there, they have the potential.

2 Q. Are you aware of a cumulative dose that a
3 mixture become -- that the mixture particularly at Camp
4 Lejeune become carcinogenic?

5 A. I don't think I have tried to determine the
6 entire realm of values, but I do give you -- in my
7 calculation, I give you -- I took the median levels, I
8 believe, and -- not mean. I think I took the median.
9 Maybe I took the mean levels, and I gave you that
10 calculation, so that is a calculation where I gave you
11 individual numbers, and then I gave you an additive
12 number, and that should be Appendix D. It's also a
13 table in my report, as well, but Appendix D, you can get
14 that, as well, so you can see each chemical -- this is
15 on -- I don't think I give it a table number, but in
16 Appendix D, I have a spreadsheet table for you, and I
17 give you each chemical based upon each of the two
18 separate systems, or taking mean values across the
19 system, okay, so I'm looking at different levels and
20 different -- and different reports of data, and I'm
21 giving you a trichloroethylene, for example, estimated
22 oral cancer risk at a certain exposure level, and I'm
23 doing the same thing for perchloroethylene, vinyl
24 chloride, and benzene, and then I'm estimating a cancer
25 risk assuming that, based upon the data, that all four

1 of them are there, based upon the mean levels that I'm
2 reporting, and I'm doing it based on two different
3 exposure levels, either four liters a day or eight
4 liters a day, and I talk about in my report why I chose
5 these values.

6 So I think this is an answer to your question. I
7 did do it here, but I'm not saying that there's not
8 other values you could calculate, depending on different
9 exposure scenarios you wanted to use.

10 Q. Do you know of any scientific literature that
11 has specifically studied the carcinogenic effects of
12 this mixture?

13 A. Yes, it would be the Bove studies, the Ruckart
14 study; if it's literature. And then, of course, for
15 government documents, it would be the ATSDR assessment.
16 Oh, Rosenfeld. That's the other one. I forgot that
17 one. That's also cited in my report, as well.

18 Q. And are you aware of any dose response
19 assessments specific to this mixture, rather than the
20 individual chemicals?

21 A. Are you asking me if anybody has done a study
22 where they've taken water and -- with certain levels of
23 those four chemicals, and then manipulated the water to
24 make the levels higher and lower and given them to an
25 animal? Is that what you're asking me? Because that's

1 the only way you would be able to do that.

2 Q. That would be a yes.

3 A. So if that's what you're asking me, yes, I mean,
4 somebody could attempt to do an animal bioassay. I
5 would tell you that it would be a waste of animals,
6 however, because the answer you would get from an
7 ethical review committee for reducing animal use, they
8 would say we know something about each of those
9 individually, and there would be no need for us to
10 repeat that and look at that based on the epi data we
11 have, and then also the individual data we have. It
12 would be -- it really, truly would be a waste of poor
13 animals at this point, but, hypothetically, could you do
14 it? Yes, you could try to do that.

15 Q. Did you conduct any dose response modeling for
16 this mixture?

17 A. I did not. It's described a bit -- I believe in
18 the Bove studies, they talk a little bit about exposure
19 response, but I did not attempt to do that. That was
20 beyond the scope of what I did.

21 Q. If you were provided with a dose response
22 modeling for this mixture, would it have given your
23 opinion more certainty?

24 MS. LaMACCHIA: Objection, form.

25 A. So there, you'll need to describe what you mean

1 by being provided dose response modeling. Are you
2 talking about toxicokinetic modeling to look at rate of
3 formation of reactive metabolites? Are you talking
4 about an animal study? What are you talking about?
5 Because there's different ways you can do that.

6 Q. I'll be referring to an animal study.

7 A. No, I don't believe it would have given me
8 anymore certainty at this point based upon the human
9 data that we have for not only the individual chemicals,
10 but even the studies that have been done by Dr. Bove and
11 his group looking at cancer in the population. The only
12 way to get to more certainty at this point in time would
13 be to continue to monitor those Marines another ten
14 years, another ten years, another ten years, and see,
15 once all of them have died, what the actual estimates of
16 cancer risk were in the population, and that's a study
17 that just is probably not possible to do, based upon how
18 expensive it would be to -- and how much -- how hard it
19 would be to get people to agree to be followed for that
20 long a period of time. That would almost be a clinical
21 study at that point.

22 Q. Did you examine whether any of the chemicals
23 compete with each other for the same metabolic pathways?

24 A. I did, and that's why I discussed in my report
25 the importance of the fact that, actually, these were

1 low-dose exposures, compared to what we know about the
2 saturation levels for the enzymes, where you would
3 start, and that's when competition would become
4 extremely important. If you've got enough of the two
5 chemicals, let's say PCE and TCE, in the blood such that
6 they saturated the enzymes and they are no longer being
7 produced at the same rate, that would be a problem, but
8 the indication from the literature that is available
9 would indicate that that's not something that would be a
10 significant driver, based upon the levels of exposure
11 we're talking about.

12 Q. So that means it would not be a problem in this
13 particular scenario with these four chemicals in Camp
14 Lejeune water?

15 MS. LaMACCHIA: Objection, form.

16 A. I don't think -- I don't know the answer to it.
17 It's not something I can answer based on the available
18 evidence I have, but what I would say to you is that's
19 how you would attempt to do it, is you'd have to almost
20 do studies to figure that out, but, because, as I point
21 out in my report, that we have low-dose exposures and we
22 know the enzymes saturate at higher -- at levels that
23 are considered "high", how do we define that? I haven't
24 attempted to do that, but that's a discussion in the
25 literature, so I don't believe, in the data that we have

1 on the levels in the water, it's not like I have parts
2 per million of PCE and parts per billion of TCE where
3 I'd worry about the PCE interfering with the TCE
4 metabolism. All of those things that are available are
5 in the same magnitude of exposure in the part per
6 billion range, I believe, from the data I've seen.

7 Q. The exact relationship between the interactions
8 of TCE, PCE, benzene, and vinyl chloride is not known;
9 is that correct?

10 A. You'll need to be more specific. Relationships
11 to what? To producing -- producing certain levels of
12 reactive metabolites, to producing genotoxic events, to
13 producing a cancer response? All of those could have
14 different answers.

15 Q. Okay. My specific question is regarding any
16 synergistic effect.

17 A. So there's been no studies on the -- and you'll
18 notice I don't opine that they're synergistic. I
19 mention that the mixtures guidance document at EPA says
20 assume they're at least additive, maybe synergistic, but
21 I haven't opined that they are synergistic, which is
22 why, in my mixtures risk assessment, I didn't attempt
23 to add them together at anything greater than simple
24 additivity when I did that calculation for probability
25 of -- or how -- what would my prediction be for the

1 likelihood of cancer risk based upon the numbers that I
2 input, and, again, it's -- it is a projection based on
3 the numbers I put in, and I haven't done any type of --
4 and I wouldn't suggest you do any type of
5 plaintiff-specific risk assessments that way. I told
6 you that in my report. I think the best way to look at
7 individual risks is to really look at differential
8 diagnosis through a specific causation assessment,
9 because each person can be so different than the next
10 person, and you would need to consider that in a medical
11 context, not just based on exposure alone.

12 Q. So you did -- you did opine on an additive
13 effect interaction between the four chemicals at issue
14 that you discuss in your report; is that correct?

15 A. Yes, because I said that the available guidance
16 from EPA would indicate that that's what you would do if
17 you wanted to do a prediction of risk based upon EPA
18 methods. You would assume additivity, because all four
19 have cancer as an endpoint. Three of them are even more
20 similar -- benzene, PCE, and TCE -- because they have
21 bladder cancer, I believe, as a hazard, so you could
22 take my table and take away the vinyl chloride if you
23 wanted to and just look at those three. You could also
24 look at the potential additivity of just PCE and TCE, or
25 you'd look at all of them individually, but the EPA

1 guidance indicates that you would, if cancer is the
2 common endpoint that you believe they're operating by a
3 mode of action that could be similar, and I say they
4 are, because they're all producing reactive metabolites
5 that can be genotoxic. That's sort of the basis for my
6 "additivity assumption", that I'm not saying -- I
7 haven't opined beyond that based upon the use of the EPA
8 guidance.

9 Q. So would you agree that synergy requires
10 empirical scientific evidence, and not just theoretical
11 plausibility?

12 MS. LaMACCHIA: Objection, form.

13 A. I haven't formed that opinion one way or the
14 other. What I would say is that I typically would not
15 assume synergy without some scientific evidence upon
16 which to base it on, and that scientific evidence could
17 be due to -- as simple as a -- one study showing that
18 the two chemicals, when they're put into the body,
19 separately or combined, produce a lower threshold for
20 toxicity. There's a lot of animal studies that in the
21 past have tried to do that. They'll take two chemicals
22 that are similar -- chemically similar, in a class, and
23 if they wanted to determine whether or not they're
24 synergistic or additive, you dose an animal with a
25 hundred milligrams and a hundred milligrams and look at

1 some endpoint of toxicity, and then you put them
2 together and see whether that endpoint of toxicity is
3 lowered by a lot or not, or does it appear to be more
4 like an additive effect. And you'd have to pick an
5 endpoint -- I mean, some people do it based on a very
6 crude measure of calculation of a lethal dose. That's
7 really, really, crude, but you could also do it based on
8 more objective measures and blood -- blood chemistry, or
9 something else, as well.

10 Q. Have you performed any of this type of research
11 or experiments that would test that hypothesis?

12 A. For these chemicals, I have not, but there are
13 -- there are a number of people who have explored this
14 issue when they've developed relative potency schemes
15 for things such as dioxins, and I think even PAH
16 compounds, where they've looked at the individual
17 toxicity response, and then looked at what happens when
18 you add them together. I have not done that work, and I
19 certainly have not done that work in this case with
20 these chemicals, and I did not find that work in the
21 published literature, or else I would have presented it
22 to you. If I had found someone that had done that work,
23 I would have presented it to you to show you what is
24 said about synergy versus additivity.

25 Q. You have responded to my next three questions.

1 A. I'm not really trying to do that. I'm sorry.

2 Q. No, it's -- I mean, these are logical questions,
3 so they kind of naturally flow, so thank you for your
4 response. Let's see. Are there any Camp Lejeune or
5 other contaminated water studies that show exposures to
6 benzene, PCE, and TCE together cause higher cancer rates
7 than exposure to each separately?

8 A. I'm not aware of that. Again, that would have
9 been something relevant to cite, too, if I identified it
10 in the literature.

11 Q. Has IARC found the combination of benzene, TCE,
12 and PCE in drinking water synergistic or additive?

13 A. I don't believe they've opined on that, but I
14 haven't looked, to answer that question for you. They
15 typically evaluate individual chemical solvents, rather
16 than mixtures of solvents, but I can't answer that
17 without looking. I don't know.

18 Q. Are you aware of any other organizations or
19 agencies that may have found a combination of benzene,
20 TCE, and PCE in drinking water synergistic or additive?

21 A. Don't know if it's possible. For example -- to
22 answer that question, maybe go look at some of the risk
23 assessments that were done at Superfund sites in the
24 past by EPA scientists or consultants to EPA. Again,
25 that was beyond the scope of what I did, and I did not

1 attempt to see if others had done that. Let me add,
2 it's not in the peer-reviewed literature, so if I was
3 looking, I would be looking for things that you can find
4 through FOIA, through government documents, things like
5 that.

6 Q. Turning back to your conclusions, in case you
7 want to get it in front of you.

8 A. Okay.

9 Q. Going back to some of the language found in your
10 conclusions, specifically the at least as likely as not,
11 were you -- were you instructed to opine on the At Least
12 as Likely as Not standard as found in the Camp Lejeune
13 Justice Act?

14 MS. LaMACCHIA: Object to form.

15 A. I wasn't asked to opine on that standard, but
16 what I was -- as I always do when I began to work in
17 litigation cases, I need to understand the context of
18 the standard, the legal standard that I'm looking at.
19 So, for example, if you were in criminal court versus
20 civil court, you have a different legal standard, right?
21 Well, in this case, we have a different standard than
22 may be applied in some other civil actions, for example,
23 so I was aware of it, and so I asked that question, and
24 when I -- when I found out the answer to that question,
25 that does inform, as a scientist, how I go about looking

1 at the literature. I will tell you that, in the case of
2 all of these four chemicals, you can -- you can -- on
3 the issue of cancer, it's more likely than not. It's
4 not just as least as likely. All four of these
5 chemicals pose a hazard -- a human health hazard of
6 cancer in drinking water, and I think there's consensus
7 documents that tell you that, but when I talk about this
8 case and the particular issue of Camp Lejeune
9 contaminated water, I have used the standard that
10 scientific assessment method that I thought made most
11 sense to do, which would be to look at what is required,
12 I have to be at least as likely as not, so I have used
13 that language here. Other reports that I do for other
14 cases might use a different -- different language, but I
15 do, indeed -- I would argue that that's not an
16 unscientific standard. It's that weighing of the
17 evidence. It's the idea that when you weigh the
18 evidence as a scientist, you're going to find that the
19 -- where do they fall? Are they about the same, are
20 they weighted one way, or are they weighted the other,
21 so this is not a standard that's that far removed, to
22 me, from science, it's just a matter of how I express it
23 in terms to be consistent with what I was asked to do
24 and the scope of my work.

25 Q. And did you review the complete language of the

1 statute in drafting your conclusions -- or your
2 conclusions? And I'll save the next question as a
3 follow-up so I don't ask a compound question.

4 A. So I did not read the entire statute, if that's
5 what you're asking, but we did have a discussion and I
6 asked about the standard, and this was the discussion,
7 and this is where I came down based on that discussion.

8 Q. Okay. Have you ever interpreted a statute's
9 legal causation or a standard before?

10 A. I don't think I understand your question, so I
11 probably have not.

12 Q. In your previous non-legal professional work,
13 have you interpreted a statute's legal causation
14 standard before?

15 A. Well, there's two different kinds of work I do,
16 so I don't think I cross over, so -- I use the same
17 methods, regardless of what I'm doing. I use weight of
18 the evidence, I use scientific review methods based on
19 my experience and training, general -- kind of general
20 considerations from Bradford Hill, general reliability
21 standards when reviewing scientific studies. That's all
22 the same, regardless of whether it's litigation or
23 non-litigation, but in a litigation context, I
24 definitely would ask questions of the attorney that I'm
25 working with about -- if there's something particular

1 about this case in order to explain to the judge what it
2 is that I'm finding and translating my science into
3 something that makes sense for someone who's not a
4 scientist to understand, and so that, to me, is what the
5 at least as likely as not language is about, is taking
6 this, you know, weighing of the evidence and putting it
7 into language that tells you we're about here and if
8 it's more likely than not, then I've got greater than
9 fifty percent, right, and lower than fifty percent on
10 one side, so that's sort of how I've actually talked
11 about it with juries before; talked about what is more
12 likely than not meaning. This is the first civil case
13 I've worked on with the at least as likely as not
14 standard. I will say that.

15 Q. Thank you, Dr. Plunkett. I have no further
16 questions.

17 MS. LaMACCHIA: I do have a couple
18 questions, can we just take a Cummins?

19 MS. JOHNSON: Sure.

20 VIDEOGRAPHER: Off the record, this
21 concludes file 6.

22 (Short recess was taken.)

23 VIDEOGRAPHER: Time is 3:16 p.m. Back on
24 the record, beginning of file 7.

25 EXAMINATION BY MS. LaMACCHIA:

1 Q. Dr. Plunkett, before we started the deposition,
2 I had handed the United States copies of your invoices,
3 and I want to make sure they get admitted as Exhibit 11
4 today.

5 (Exhibit 11 was marked.)

6 Q. Prior to the deposition, plaintiff's counsel did
7 produce some invoices. There were a couple that were
8 inadvertently produced, and I'd like to just state for
9 the record that CL_EXPERT_PLUNKETT_000000005 to 6 was
10 inadvertently produced, as well as 03 to 04 were
11 inadvertently produced, so I would like to admit as
12 Exhibit 11 a copy of the six pages of invoices that you
13 were provided before the deposition.

14 MS. JOHNSON: Need a --

15 MS. LaMACCHIA: Yes, please, and I will do
16 another formal production of these invoices.

17 BY MS. LaMACCHIA:

18 Q. In the very beginning -- probably in the first
19 hour of the deposition, I think you were questioned
20 about things you reviewed in preparation for your
21 deposition, and you had used the term "rough drafts" of
22 Gilbert and Goodman. Did you mean rough draft
23 transcripts of depositions or rough draft expert
24 reports?

25 A. Just transcripts, and, by the way, I did -- I

1 should correct today. I did not mention I have seen
2 three expert reports from defense, and they should have
3 been in a list that were provided to you. I've seen
4 Goodman, McCabe, and Lipscomb, but not drafts, just
5 final submitted reports.

6 Q. So you've never seen any rough draft expert
7 reports, correct?

8 A. No, I have not.

9 Q. Okay. Towards the end of Ms. Johnson's
10 questioning of you, she was asking questions about dose
11 response assessments for mixtures versus individuals,
12 right?

13 A. Yes.

14 Q. Okay. And you had referred her to Appendix D in
15 your report, which also correlates to page 60 paragraph
16 108 in your report, right?

17 A. Yes, and there's also a table in the report that
18 may be the next paragraph down on the next page that
19 also corresponds to -- where I lifted some of the
20 summary statistics out of Appendix D.

21 Q. Okay. Would you agree that the four compounds
22 at issue -- benzene, PCE, TCE, and vinyl chloride, share
23 a similar mode of action?

24 A. Yes. That's what I state, and that's why I did
25 the additivity assumption.

1 Q. Okay, and you've explained this in your report,
2 right?

3 A. Yes, I did.

4 Q. Okay. But, independently, in your opinion, to a
5 reasonable degree of scientific certainty, a causal
6 relationship exists between PCE and bladder cancer,
7 right?

8 A. There's a -- there is a relationship that is
9 causal as it relates to the hazard of bladder cancer
10 generally, yes, and that's the same for -- I thought I
11 corrected, when I answered the question, where I said
12 that each of them individually carries that specific
13 hazard of cancer. Three of them carry the specific
14 hazard of bladder cancer. The only one that doesn't, in
15 my opinion, based on the information I reviewed, is
16 vinyl chloride, and that's because I lack the
17 epidemiological evidence that I have for the other three
18 -- the other three compounds.

19 Q. Okay. And that was going to be my same question
20 for each of the compounds. So it would be your same
21 answer; is that right?

22 A. Yes, that's correct.

23 Q. I don't have any further questions.

24 MS. JOHNSON: No redirect.

25 VIDEOGRAPHER: Off the record, 3:20.

1 COURT REPORTER: Do you have a standing
2 order --

3 MS. LaMACCHIA: We do have a standing order
4 with -- Kristie Martello, I believe, is her name.

5 COURT REPORTER: Okay.

6 MS. LaMACCHIA: And the standing order is,
7 you know, unless we need a rough copy -- like it's a
8 requested --

9 MS. JOHNSON: I'll take a rough.

10 COURT REPORTER: Okay.

11 (Deposition was concluded 3:22 p.m.)
12
13
14
15
16
17
18
19
20
21
22
23
24
25

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NORTH CAROLINA

IN RE: : Case No.:
CAMP LEJEUNE WATER LITIGATION : 7:23-CV-00897
This Document Relates To: :
ALL CASES :

REPORTER CERTIFICATION

VIDEO DEPOSITION of LAURA M. PLUNKETT, Ph.D.,
taken on April 8, 2025;

I, Sarah B. Townsley, CCR, RPR, CSR, hereby
certify to the following:

That the witness, LAURA M. PLUNKETT, Ph.D., was
duly sworn by me, and that the transcript of the
deposition is a true record of the testimony given by
the witness;

That examination and signature of the witness to
the deposition transcript was reserved by the witness at
the time of the deposition;

I further certify that I am neither counsel for,
related to, nor employed by any of the parties in the
action in which this proceeding was taken, and, further,
that I am not financially or otherwise interested in the
outcome of this action.

Certified by me on this 22nd day of May, 2025.



Sarah B. Townsley CRR CCR CSR RPR

Certified Realtime Reporter

TX CSR #5746; LA CCR #92016; RPR 814558

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

ERRATA SHEET

WITNESS: Laura M. Plunkett DEPOSITION DATE: 5/12/25

REPORTED BY: Sarah B. Townsley CRR, CSR, RPR, CCR

Page No. _____ Line No. _____ Change to: _____

Reason for Change: _____

Page No. _____ Line No. _____ Change to: _____

Reason for Change: _____

Page No. _____ Line No. _____ Change to: _____

Reason for Change: _____

Page No. _____ Line No. _____ Change to: _____

Reason for Change: _____

Page No. _____ Line No. _____ Change to: _____

Reason for Change: _____

Page No. _____ Line No. _____ Change to: _____

Reason for Change: _____

Page No. _____ Line No. _____ Change to: _____

Reason for Change: _____

0	10:52 36:14	1986 13:11	219 2:4
000000005	11 4:18 46:7	1989 18:1	22nd 9:13
120:9	120:3,5,12	1990s 19:9	125:1
00897 1:4	1100 2:12	1993 18:10	237 54:15
124:5	119 4:4	1998 33:18	25 36:21,22
03 120:10	11:53 60:15	34:6	37:7,19
04 120:10	12 1:12 3:8 5:8	1:45 82:24	27 69:10,17,22
09 53:20	41:10,12 47:1	1st 2:12	70:2 71:1
1	120 4:18	2	287 84:1
1 4:8 14:11,12	12:14 60:18	2 4:9 10:2	29440 2:4
20:2,5	12:55 82:21	36:15 40:13,15	2:23 100:19
1.02 63:23 64:4	12th 12:7	61:13,14	3
64:7	13 32:3 46:7	2.16. 43:15	3 4:10 36:18
1.06 63:22	53:25 54:1,22	20005 2:13	45:15,16 46:15
1.11 44:7 63:23	55:16 56:22,24	2000s 28:15	62:22 63:16
1.16 42:10	13th 12:7	20044 2:9	3.65 47:1
1.18. 43:25	14 4:8 41:10	2009 53:17	30 34:10 88:7
1.24. 62:6	42:3	2011 39:21	31886 125:2
1.34 63:11,15	15 33:19 35:24	40:2	34 43:20
1.35 43:14	35:25 69:4,5	2012 37:10	101:10
1.45 64:4	69:22	2014 40:15,18	340 2:8
1.51 42:14	16 35:24 51:4	45:19,20 47:8	35 38:9,9 39:12
1.57 42:10	51:13 70:2	2017 22:21	39:20
1.62 44:8	17th 14:7	50:7,14 54:25	3512 2:12
1.71 43:20	1950s 27:4	55:16 56:19,21	3:16 119:23
10 4:17 5:9	105:17	64:11 65:25	3:20 122:25
44:11 89:19,21	1957 66:19	67:9	3:22 123:11
100 103:19	1965 33:12	2020 40:5	4
108 121:16	34:8 71:14	2024 61:1,2	4 4:11 42:2,3
10:00 1:12	1980 16:12	2025 1:12 3:9	46:22 49:13,17
10:06 9:24	1980s 105:18	5:8 124:11	50:6,8 60:18
10:09 10:1	1982 66:2,6,25	125:1	62:21 63:20,21
	1984 17:13		73:2 82:22

89:4 40 4:9 88:8 42 42:14 45 4:10 494 86:5	65 34:9 46:25 68 42:20 69 46:19	87 63:5 88 42:21 72:16 73:13 89 4:17 61:21	ables 65:19 above 55:19 57:12 97:12 absolutely 31:4 90:3 abstract 28:23 84:9 abstracts 28:7 academic 17:23 academy 53:7 accepted 32:6 56:5 77:10 78:7 accordance 3:7 account 76:14 82:13 105:5,7 105:15 accounting 88:7 accumulate 75:17,21 accumulation 75:14 76:7 accurate 7:20 31:11 accurately 6:19 89:8 acknowledge 39:6 90:6 acknowledged 90:6 act 21:22 57:17 116:13
5	7 4:14 20:17 42:3 44:10 61:10 64:4 83:2,3 103:15 119:24 74 62:6 75 44:8 76 43:19 49:19 50:3 78 42:25 7:23 1:4 124:5	9 9 4:16 29:19 62:5 86:15,17 90 42:6 90s 19:3 28:15 92 61:20 92016 125:6 93 63:4 95 43:7 61:21 97 62:5,10 98 81:7 99 43:1 63:5 78:22,23	
5 4:3,12 43:4,6 49:18 50:2 52:12,13 55:25 56:2,10 73:4 5/12/25 126:2 50 4:11 63:11 63:15 52 4:12 42:21 53 46:18 92:24 92:25 55 78:22 56 43:24 101:6 101:8,9 5746 125:6 594 85:5	8 8 4:15 20:2,5 20:17 43:5 63:21 84:12,13 84:18 124:11 80 42:6 80s 28:15 81 43:24 814558 125:6 83 4:14 84 4:15 42:10 42:13 43:14 49:15,25 85 42:5 63:10 63:14 86 4:16 10:22 17:13	a a.m. 1:12 5:9 10:1 36:18 abbreviate 37:23 52:23 abbreviated 42:18 43:23 abbreviations 8:10 9:3 aberrant 17:19 ability 6:5 able 26:10 35:11 75:1 77:24 78:1,17 82:2 95:21 99:25 108:1	
6			
6 4:13 20:17 55:25 60:21,22 60:23 61:11 88:3,10 119:21 120:9 60 4:13 43:1 121:15 60s 105:17 62 47:7,9 48:14 48:19			

action 16:5,21 24:15,17,23 26:15 75:12 80:15,20 113:3 121:23 124:23 124:25 actions 116:22 active 18:13 activities 66:8 actual 14:8 109:15 actually 9:6 11:24 13:10 14:3,8 16:19 16:23 17:2 39:16 41:18 46:5 49:18 51:17,19 55:24 59:7 78:13 82:18 89:15 99:15 109:25 119:10 add 26:11 111:23 114:18 116:1 added 26:18 addition 17:11 24:14 99:20 additional 27:25 additive 101:23 106:11 111:20 112:12 113:24 114:4 115:12	115:20 additivity 111:24 112:18 112:24 113:6 114:24 121:25 address 28:19 29:7 30:9 35:1 35:4 36:1,5 47:20 53:2 69:6 80:6,7 98:13 addressed 34:16 35:17 79:8 100:4 addresses 34:18,19 addressing 70:3 71:17 79:11,11 80:1 80:2 adjust 82:2 adjusted 63:22 adjustments 87:21 administering 3:24 admit 120:11 admitted 120:3 adverse 16:15 18:5 19:4 64:23 65:7 advised 64:22 65:11	affairs 56:6 affect 18:18 affected 45:7 agencies 115:19 agency 8:19,21 55:5 ago 9:8 11:23 28:12 agree 30:25 57:22 58:11 62:13,20 64:20 65:3 66:5 68:14,16 86:12 88:9,11 93:23 94:1 109:19 113:9 121:21 agreed 22:7 34:25 58:14,15 102:4 agrees 58:2 ahead 5:24 11:11 90:21,25 92:11 air 92:13 aircraft 4:15 84:17 aligned 13:20 allow 98:17 allowances 53:14 allowed 15:3 alphabetical 91:22	ambiguities 7:12 ambivalent 31:15 amended 4:8 9:7,12 12:6 14:18 29:19 32:3 amine 88:25 amines 88:16 89:13,18 amount 68:3 95:24 analogy 34:17 80:17 analyses 83:18 analysis 33:4,8 34:22 69:23,25 70:4,8,14,21 71:17,24 72:3 72:11 80:4 analyzed 36:10 analyzing 30:24 animal 16:18 37:6 77:2,10 77:24 94:21 95:11 107:25 108:4,7 109:4 109:6 113:20 113:24 animals 35:11 38:16 59:2 75:1 76:23
--	---	--	--

77:14,19 78:4 108:5,13 answer 3:18 6:5,7,14 7:17 7:17 8:6 10:8 19:8 20:8 24:19 51:18 52:3,6 58:20 66:15,17 70:16 73:14 81:18 87:4 88:18 90:9,15,20 101:23 107:6 108:6 110:16 110:17 115:14 115:16,22 116:24 122:21 answered 16:8 95:6 122:11 answering 6:18 26:5 29:12 72:13 answers 3:13 6:16,18 111:14 anticipated 37:21 anybody 107:21 anymore 109:8 anytime 35:5 anyway 92:11 apologize 61:12 84:15 89:10 92:3 98:1	appear 114:3 appearances 2:1 appendix 14:16 14:18 23:11,22 23:23 40:8 53:23 106:12 106:13,16 121:14,20 applications 33:10 applied 116:22 apply 36:3 58:18 69:7 71:13 72:10 applying 72:12 appointment 17:2 appointments 17:3,23 appreciate 98:4 approach 33:4 33:6 69:21 april 9:13 11:8 12:5,6,12,19 13:7,23 14:3,7 124:11 area 34:7,10 100:18 105:6,8 areas 17:7 argue 31:5 117:15 arkansas 17:1 17:12,24	aromatic 88:16 88:23,25 89:13 89:18 arrhythmias 16:22 article 25:9 articles 11:22 22:9 23:21 25:5,6,8,11 27:8 28:8 aschengrau 83:6,7 ascribed 84:24 85:10 aside 40:11 45:14 50:5 52:9 69:2 92:18 asked 7:11 10:5 11:1 21:9 22:16 24:4,14 28:18 29:3,21 30:9 35:14,15 35:16,20 36:1 47:19 69:6 81:1 98:1 100:5,8,12,14 101:18 102:16 116:15,23 117:23 118:6 asking 6:3,4,10 6:17 21:24 29:2 31:19 40:25 41:1,7	50:25 58:24 59:20 61:23 65:22 70:20,20 84:9 107:21,25 108:3 118:5 121:10 aspects 54:8 assess 92:12 assessment 4:11 18:4 22:21 27:7 32:7,19,22 33:2 34:23 35:1,16 39:24 48:11 50:7,15 51:20 52:1 54:25 55:5,15 55:17 56:19,21 60:6,8 61:5 64:12,14 66:1 66:13 67:10,21 68:3 69:2,14 69:20,25 81:2 81:3 82:17 94:17,23 95:4 96:8 97:24 98:18 102:11 102:14,17 103:6 104:5 107:15 111:22 112:8 117:10 assessments 20:24,25 38:5 48:16 53:4
--	--	---	--

58:8 68:25 107:19 112:5 115:23 121:11 assessor 71:20 assist 84:1 associated 29:21 30:14 93:5 95:23 98:19 100:2 association 30:25 33:13 34:12 35:4 56:13 71:2 associations 29:9 59:16,21 assume 6:8 70:3,9,11 85:23 94:18,24 111:20 112:18 113:15 assumed 14:14 assuming 70:19 106:25 assumption 113:6 121:25 atsdr 4:11 22:21,23 25:16 27:5 50:7 51:3 51:20,25 54:25 55:5,15,18 64:14,22 67:9 69:2 103:6 105:23 107:15	atsdr's 50:14 attempt 27:8 60:5 108:4,19 110:19 111:22 116:1 attempted 96:3 110:24 attempting 78:10,11 attention 46:24 61:18,25 62:21 attorney 7:16 12:17 118:24 attorneys 7:16 22:9,14 30:9 author 63:18 63:19 authors 54:24 54:25 available 15:5 28:8 38:6 110:8,17 111:4 112:15 aware 13:3 38:20 40:20 41:4,6 45:24 46:3,8 50:18 50:24 51:5,11 52:18,19 53:6 53:24 54:1,24 55:18 57:18 61:4 64:14,22 65:11,25 66:12 67:9,15 68:2	89:16 103:10 105:21 106:2 107:18 115:8 115:18 116:23 b b 2:15 3:4,23 124:12 125:4 126:3 bachelor 15:16 back 5:25 10:1 10:4,6 11:7 12:5,12 14:3,6 17:25 19:3 25:9 36:17 37:7 47:6 52:10 55:15,24 56:10,18,19,20 60:17 66:9 67:5 69:3 82:24 90:23 91:16,23 98:23 99:7 100:22,25 116:6,9 119:23 background 14:25 bad 59:14 81:14 barracked 41:14 base 66:22 68:11,13 113:16	based 16:5 24:3 24:9 28:18,22 30:16 37:5,18 38:6,14,25 44:24 50:24 54:6 57:14 65:3,6,21 66:7 66:10 67:6 68:12 69:22 71:10 80:25 81:3 83:17 86:6 87:22 90:4,5,11 92:14 96:13,19 96:23,24 97:4 97:10,16,23 102:1 106:17 106:25 107:1,2 108:10 109:8 109:17 110:10 110:17 112:1,2 112:11,17 113:7 114:5,7 118:7,18 122:15 bases 36:11 basic 16:14 17:8,10 32:1 79:3,13,14,17 79:18,20,22 basis 16:9 35:4 61:9 67:5 113:5
--	---	---	---

bathroom 74:16	44:22 45:12 76:22 78:15,25	biological 34:16 36:6	76:22,23 77:3
bear 75:16	92:22,23 93:1	75:8	77:4 78:19
began 116:16	93:4,5,8,13,17	biologically	79:2 80:20
beginning 10:2	93:20 95:8,25	76:21	81:2,9,10,13,15
36:18 60:18	96:6,11,14	biology 25:2	81:21 83:23
82:25 100:23	97:7,9 98:10	78:9,11 79:4	84:7,25 85:11
119:24 120:18	98:13,22 100:7	79:13,14,17,18	85:13,16,20
behalf 19:5	104:3,11	79:20,22	86:1,9 87:7
believe 10:5	106:24 111:8	bit 47:5 98:10	88:7,9 89:7
11:15 12:14	112:20 115:6	108:17,18	91:12 92:23
13:23 14:16	115:11,19	bladder 18:22	93:4,7,14,22
15:1 28:3	121:22	20:6,9,14,20,21	95:9,20,25
31:23 35:12	best 6:5 112:6	20:23 21:5,11	96:15 97:23,25
41:7 44:4 47:1	better 9:3	21:15,17 22:13	98:7,16,19
50:5 51:19	beyond 35:15	24:7,12,18,21	99:8,13 100:2
61:6 66:15,20	35:19 68:24	24:22 25:2,3	102:8 103:3
70:9 82:3 88:1	93:17 96:3,17	25:19,20,21	104:8 112:21
88:22 89:14	102:9,18	26:11,14,17	122:6,9,14
92:18 93:3	105:11,14,20	27:24 29:6	block 86:5
94:25 95:2	108:20 113:7	30:10,13,23	blocks 102:19
96:4 102:11	115:25	33:1 39:1,8	blood 95:19
106:8 108:17	bias 46:1,13	42:12 43:18	110:5 114:8,8
109:7 110:25	55:9 90:8	44:13,15 46:17	board 16:2
111:6 112:21	billion 111:2,6	46:19,25 47:24	bobbitt 5:6
113:2 115:13	bills 11:9,9,14	48:2,17,20,22	bodies 38:4
123:4	bioassay 108:4	48:25,25 49:5	39:17
believes 46:12	bioassays 77:2	49:14,18 62:1	body 10:15
bell 2:3	77:10	62:10 63:9	18:19 69:11
belllegalgrou...	biographical	64:2 69:12	113:18
2:5	54:18	70:6 71:10	bold 43:12
ben 2:9	biologic 24:16	73:5,17 74:4	bother 29:10
benzene 19:7	80:15	74:13 75:4,18	bottom 44:11
24:5 29:22		76:8,11,12,16	56:2,2,3,10
			70:2 85:6

bove 10:17 13:15 40:20 45:24 47:8,13 47:17 48:21 49:7 51:3,10 51:20 52:1 59:11 107:13 108:18 109:10 bove's 45:20 61:2 box 2:8 56:1,12 bradford 33:4 33:8,9,11,17,22 34:5,15,19,22 35:2,16,20 36:2 69:23 70:13,21,22 71:13,14,18,24 71:25 72:2,4,4 79:7,9,24,24 80:13 118:20 brain 16:22 branch 53:7 break 8:4,5,7 10:4 36:13 60:13 82:19 100:18 breaks 8:3 breast 47:10 brian 5:6 bring 9:4 43:6 55:25 bringing 50:11	broad 68:7 broadly 20:8,8 brought 9:6 11:17 13:10 80:19 build 102:16 building 102:18 bullets 32:24 c c 23:11,22,23 40:8 53:23 92:22 calculate 45:3,7 107:8 calculated 89:17 96:23 calculation 106:7,10,10 111:24 114:6 calculations 97:20 call 12:8,10,20 12:21 15:7 17:22 23:13 44:21 called 18:2 38:21 65:19 calling 104:22 camp 1:4 4:12 5:11 21:21 22:22 29:24 30:18 43:6,7	46:18,19,23,23 49:25 50:1,2,3 51:4 53:18,24 54:1,19 57:17 61:15,20 62:4 62:10,24 63:13 64:6,7 66:8 70:15 88:21 93:8,13,20 96:7,13 98:20 99:2 102:7,23 103:1,4,11,15 103:21 104:6 106:3 110:13 115:4 116:12 117:8 124:5 cancer 4:14 8:20 13:19 18:22 20:6,9 20:14,20,21,22 20:23,23 21:5 21:10,11,15,15 21:17 22:13 24:7,7,8,11,18 24:22 25:3,3 25:19 26:11,14 26:18 27:4,24 29:6 30:11,13 30:23 31:8 33:1,1 37:2,13 38:1,15 39:1,8 39:10,11 42:9 42:13 43:13,17 43:19 44:13,15	46:17,19,25 47:10,18,24 48:1,2,16,20,22 48:25,25 49:5 49:15,18 59:9 60:10 61:19 62:10 63:21 64:2 69:12 70:6 71:11 75:4 76:13,23 77:10,11,12,17 77:25 78:1,19 79:2 80:20 81:2,9,10,13,15 81:21 83:8,8 83:23 84:6,8 85:11,20 86:1 87:7,9 88:7,9 89:8 91:12 92:23 93:5,7 93:14,22 94:11 94:12,14,20 95:1,9,15,16,20 95:25 96:15,21 96:22,23,23 97:1,2,18,22,23 97:25 98:7,16 98:23,24,25 99:1,9,9,12,14 100:2,3 102:8 103:3 104:8 106:22,24 109:11,16 111:13 112:1
---	---	--	--

112:19,21 113:1 115:6 117:3,6 122:6 122:9,13,14 cancer's 98:19 cancers 42:4 63:4 78:3 84:25 85:11,14 85:16 86:8 94:15 95:17,19 capture 6:12 carcinogen 36:23 37:3,21 39:18 carcinogenesis 25:21,21 36:7 carcinogenic 37:9,14 38:11 38:13,21,25 39:14,17 106:4 107:11 carcinogenicity 73:5 carcinogens 38:2 carcinoma 88:8 89:23 90:14 cardiotoxicity 16:20 career 17:25 carolina 1:1 5:13 124:2 carries 122:12	carry 122:13 case 1:3 12:17 12:18 22:7,7 36:1 54:9 59:6 59:25 60:4 69:6 83:13 89:23 90:4 102:21 105:17 114:19 116:6 116:21 117:1,8 119:1,12 124:4 cases 1:6 88:8 97:22,23 104:25 116:17 117:14 124:7 categories 56:12 categorization 56:3 categorized 56:4 category 24:8 causal 102:7,12 122:5,9 causation 60:6 70:4,21 71:17 72:14 82:17 88:17 102:11 102:14,17 112:8 118:9,13 cause 24:18 34:23 46:17 64:23 75:18 88:7 92:23	93:14 94:20 95:9,25 96:15 115:6 caused 18:6 77:12,13 causing 76:22 ccr 3:5,23 124:12 125:4,6 126:3 cell 16:18 17:19 25:3 cells 16:16 73:1 73:2,4 74:3,25 75:3 78:18 87:7,8 central 5:9 certain 37:1,12 38:1 58:7,8,8 71:18 76:12 78:3 91:11 103:8 105:22 106:22 107:22 111:11 certainly 23:13 35:13 37:4 39:6 48:1 58:20 59:21 66:18 72:4 73:20 81:21 82:6 88:19 89:1 93:18 94:4 114:19 certainty 97:14 108:23 109:8	109:12 122:5 certification 18:9,10,13 124:9 certifications 15:13 certified 3:5 16:2 18:11 125:1,5 certify 18:11 124:13,21 chair 54:20 chance 35:13 change 126:4,6 126:7,9,10,12 126:13,15,16 126:18,19,21 126:22,24 changes 11:25 14:4 16:15 75:3 characteristics 94:3 check 9:1 22:9 27:22 90:23 91:19 92:2,21 chemical 9:2 17:18,21 18:6 18:18 24:10,21 26:11,17 38:5 39:24 48:16 49:4 88:19 94:3,8 99:5 102:5 103:16
---	---	--	---

104:2 106:14 106:17 115:15 chemically 113:22 chemicals 8:12 19:2,18,22,22 21:8,10,14 22:21 23:20 24:5,17,18 25:15,19 27:24 29:22,25 30:7 31:9,23,25 32:25 37:17 48:7 51:4,13 59:1 60:10 67:18 70:14 75:14 76:1 77:5 78:20 79:14 80:21 87:8 94:16 95:3 96:10,25 97:8,25 100:8 101:13,13,17 101:19 102:2 103:14,22 107:20,23 109:9,22 110:5 110:13 112:13 113:18,21 114:12,20 117:2,5 chemistry 27:20,20 114:8	chloride 18:25 19:1 24:6 29:23 76:22 98:14,23 99:6 99:7,7,11,15,17 99:21,24 100:2 100:6 101:4 104:4,10 105:2 106:24 111:8 112:22 121:22 122:16 choose 28:8 chose 58:7 107:4 chosen 37:5 65:6 83:23 cigarette 81:8 81:22 82:6 87:15 88:25 cigarettes 81:13 citations 26:25 27:25 49:10 cite 13:6 23:14 23:22 33:18 39:21 45:22 59:12 61:3 87:5 89:25 115:9 cited 9:20 10:14,15 28:1 53:11 86:18 90:2 91:23 107:17	cites 33:22 citing 48:17 91:25 civil 3:8 116:20 116:22 119:12 civilian 4:10 45:19 47:15 civilians 45:21 62:24 63:13 cl 49:15 120:9 cl's 70:15 clarify 7:14 100:4 clarity 6:11 class 113:22 classification 37:4 38:24 classifications 37:16 classified 36:23 37:8,20 38:10 38:13 classify 56:17 cleanliness 74:9 clear 94:13 client 19:6 clinical 56:25 109:20 clip 51:23 54:16 coherence 25:1 34:16 71:9 78:24 79:12	80:17 cohort 84:18,20 collected 22:15 column 42:13 42:17,25 62:14 62:19 86:4 combination 104:9 115:11 115:19 combined 113:19 come 21:11 24:2 35:8,11 52:10 73:1 comes 58:12 67:25 68:18 99:7 coming 75:10 103:7 committee 53:24 54:1,13 54:19 55:6,12 58:14 108:7 common 49:3 54:5 67:20 87:6,22 95:16 113:2 community 77:23 companies 21:2 company 18:1 52:25 53:3 compared 78:24 110:1
---	--	---	---

comparing 64:6	41:21 57:11 58:8 88:5	confounding 95:20	87:15 91:18 110:23
compete 109:23	102:22,23	confuse 10:16	considering 19:23 83:21
competition 110:3	103:17 104:1 116:6,10 118:1	connection 3:11 21:21	91:2
complete 6:15 7:9 14:23 117:25	118:2	85:17,20	consistency 79:8,9,23,25 86:22
completed 3:14	concordance 77:5	consensus 25:14,22 26:24	consistent 75:9 80:9 93:9 117:23
complex 87:25	concordant 76:15	28:2,11 31:24 57:19 58:3,4,5 58:9,12 117:6	construct 66:8
compound 118:3	conditions 97:17	conservative 64:16	consultants 115:24
compounds 114:16 121:21 122:18,20	conduct 108:15	consider 28:24 55:9 58:22 59:6 68:9,11 82:1,16 87:13 88:15 90:17 94:6 101:22 102:10 112:10	consulting 18:1
comprehensive 27:7	conducted 61:5 71:23	consideration 41:19 71:9,24 78:24 79:11,25	contact 73:1 74:2
computer 11:18 40:7	conducting 33:8	considerations 33:14,23 34:24 35:2 36:2,9 69:7 70:23 71:13,18 72:2 72:11,12 79:10 80:2,5,21,25 118:20	contacting 87:8
concept 65:22 74:2 94:1	confidence 41:23 42:6,10 42:14,21,25 43:1,8,20,25 44:8 47:1 61:20,23 62:6 63:5,10,14,23 64:4	considered 23:12 48:10 71:5 79:7	contained 71:8 104:2
concerning 64:13	confidential 15:4 19:10		containing 98:20
concluded 81:5 84:22 123:11	confidentiality 20:19		contaminants 104:10
concludes 36:15 82:22 88:6 100:20 119:21	confirm 91:16		contaminated 4:12 30:1 54:19 93:19 103:12 115:5 117:9
conclusion 35:12 93:9 96:5 103:10	confounder 82:1		contamination 66:14 67:4
conclusions 32:23 39:9	confounders 88:14		context 34:14 49:6 51:16 52:4 112:11

116:17 118:23 contexts 57:2 continually 18:11 continue 109:13 continued 17:22 18:12 contribute 54:12 control 83:13 89:23 90:4,5 conversation 6:9 conversations 23:1,3 copies 22:17 120:2 copy 9:6 14:3 22:20 50:10 120:12 123:7 correct 15:14 15:17,21 16:1 19:7,8 21:6 32:8,9,20 36:24 37:3,10 37:14,15,22,24 38:2,11,12,17 39:2,15,21,22 40:18,19 41:24 43:11,16,17 44:8,14,18,23 45:21 47:2,10 48:22 50:3,4	50:15 53:9,12 55:1 61:2,16 61:17 62:11,12 62:24 63:11,15 63:23 64:7,9 69:8,14,15 73:9 75:19 79:4,5,8 80:11 81:9,10,11 82:2 83:13,14 83:16,19,21,24 84:8,10,19 85:4,11,13,17 86:23 87:12,14 89:24 101:14 101:15 111:9 112:14 121:1,7 122:22 corrected 122:11 correction 14:5 corrections 7:10 13:2 14:8 correctly 43:15 43:21 44:1,2,9 46:20,21 47:2 56:8,14 61:21 62:7 63:6,7,12 64:5 73:6,9 79:5 94:9 99:10 104:11 correlates 121:15	corresponds 121:19 corroborate 48:15 corroborates 49:2 cost 22:16 costs 22:11 council 8:23 52:15,20,23 53:7 counsel 3:2,16 5:14 12:4,23 120:6 124:21 count 54:23 couple 90:22 92:6 119:17 120:7 course 8:4 17:8 20:18 41:24 79:6 107:14 court 1:1 3:22 5:3,12,15 6:12 6:19,22 7:5 10:6 116:19,20 123:1,5,10 124:1 courtroom 6:22 cover 47:9 54:8 covered 80:8 84:15 craft 31:13 crafted 31:10	crazy 54:17 criminal 116:19 criteria 71:9 79:23 cross 25:16 76:6 118:16 crr 2:15 3:5 125:4 126:3 crude 114:6,7 cs 91:24 csr 2:15 3:5,23 124:12 125:4,6 126:3 cumberbatch 89:15 cummins 119:18 cumulative 106:2 current 14:21 currently 7:25 15:13 cut 72:21 cv 1:4 14:13,19 14:21 124:5
d			
d 106:12,13,16 121:14,20 d.c. 18:1 dabt 1:10 5:2 18:10			

data 36:9 37:6 37:18 38:22 39:10 44:25 46:9 59:1,3 66:10 68:17 69:11 83:15,19 94:14 96:24 97:10 98:16 99:24 103:21 104:20 105:3 105:22 106:20 106:25 108:10 108:11 109:9 110:25 111:6 databases 26:6 date 5:8 12:8 14:7 53:21 95:12 126:2 david 54:20 day 14:8 16:11 74:12 104:13 107:3,4 125:1 days 16:7 dc 2:9,13 dce 19:12 100:4 100:6,9,17 de 97:12 dealt 22:13 25:19 death 46:17 deaths 84:24 85:10 decades 49:1,6 81:23	decided 23:6 deducted 62:17 defense 11:2 121:2 define 29:1,16 30:3 36:4 57:3 58:3 94:15 103:14,15 110:23 defined 94:22 94:23 95:2 defining 103:4 103:5 definitely 80:18 97:15 118:24 definition 29:17 57:23 64:19 88:21 degree 122:5 denoting 57:18 department 2:6 2:8,11 16:12 16:12 17:3,4 56:6 depend 52:3 dependent 50:25 94:2 depending 53:12 65:23 77:13 107:8 depends 58:3 60:3 65:16 90:11	deponent 5:14 deposition 1:8 3:3,11,18,20 5:10 7:8,15 8:11 9:16 10:7 10:10,23 11:3 11:4,23 22:3 26:4 41:3 51:11,24 120:1 120:6,13,19,21 123:11 124:10 124:16,19,20 126:2 depositions 120:23 dermally 77:16 describe 13:14 29:20 30:16 47:14 59:16 66:7 71:3 81:8 108:25 described 26:13 49:4 51:7 52:4 59:13 67:7,7 75:13 103:6 108:17 describes 30:6 47:22 51:17 56:12 72:4 87:5 describing 48:4 57:10 72:8 79:16	description 4:7 15:7 37:5 49:8 54:3 descriptions 92:15 designation 37:2,15 38:3 designations 37:13 38:1 designed 35:8 35:10 detail 30:6 33:16 34:1 39:7 details 15:2 detect 45:8 105:2 detected 29:23 99:2 103:8 105:1 determine 106:5 113:23 determined 95:11 determining 81:2 develop 49:1 64:15 developed 32:15 53:14 114:14 developing 75:4 94:7
---	---	---	---

development 74:9 93:7 103:3 developmental 19:21 develops 71:11 79:2 diagnosis 82:4 89:2 112:8 dialog 26:7 27:11,14,20,22 dichloroethyl... 100:10 didactic 31:3 died 109:15 dietary 53:14 difference 34:5 59:4 75:22 differences 73:15 105:5,7 105:13,15,23 different 10:19 18:7 20:22 21:9,15 26:6 32:11,13,17 33:24 37:1,4 37:12,15,16 38:1,3,4,4 39:19 44:20 47:13,16 48:8 52:6 53:2,2 54:7,8,12 55:3 55:13 63:2 66:21 70:8	74:1,17 76:9 79:10,10 96:24 103:22 104:24 105:1,23,24 106:19,20,20 107:2,8 109:5 111:14 112:9 116:20,21 117:14,14 118:15 differential 82:4 89:2 112:7 differently 103:16 digest 98:10 digitalis 16:20 dioxins 114:15 direct 88:5 89:4 disagree 45:10 57:22 88:12 89:12 disagreed 58:14 disagrees 58:2 disciplines 18:16 54:7 disclose 20:12 discovered 66:11,24 discuss 20:15 35:20,21 38:23 39:7 45:22 47:12 67:2	85:22 88:19 91:5,8,9 99:12 100:5 112:14 discussed 13:11 28:11 41:10,12 46:11 56:3 79:1 81:23 87:10 109:24 discusses 41:7 46:6 discussing 20:2 82:1 discussion 27:23 41:16 46:4,6 47:9 91:10 110:24 118:5,6,7 disease 24:8 25:1 33:14 43:13 44:16 49:1 71:11 72:10 74:13 76:14 79:13,15 79:17,18,21 94:7 diseases 59:9 74:17 dispositive 77:7 dissertation 16:3,19 district 1:1,1 5:12 124:1,2 diverge 76:10	division 5:7,13 doc 17:13,23 document 1:5 14:23 15:11 32:5 38:19 57:3,3 58:15 111:19 124:6 documents 10:21 12:23 13:9,21,23 21:20 22:24 23:5,9,9 25:16 25:16 27:7 28:11 53:5,13 57:15 58:4 67:7 105:22 107:15 116:4 117:7 doing 19:17 34:22 53:12 66:25 70:12 71:16 72:11 80:3 82:4,16 88:17 106:23 107:2 118:17 dose 16:17 18:19,20 44:21 44:22 45:1 83:15,17 93:24 94:2,8,17,24 95:1,5 96:19 98:15 106:2 107:18 108:15 108:21 109:1
--	--	---	--

110:1,21 113:24 114:6 121:10 doses 95:13,14 double 91:19 92:2,21 dozen 63:8 dr 5:14,20 10:17,23,24 11:3,4 22:3,4 33:19 40:20 45:20,24 51:3 51:10,20 52:1 53:2,3 54:6 61:2 75:11 83:5 89:21 109:10 119:15 120:1 draft 22:4,4,5 58:12 120:22 120:23 121:6 drafted 15:10 drafting 118:1 drafts 120:21 121:4 drank 104:7,8 draw 46:24 58:8 96:5 drinking 32:1 53:18 54:19 66:23 83:8 92:13 115:12 115:20 117:6	driven 47:19 driver 110:10 drug 16:5,5 17:17,21 due 74:9 76:17 99:16 113:17 duly 5:3 124:15 dumping 66:21 duration 68:13 74:24	effort 34:10 eight 54:5 107:3 either 16:16 24:23 26:14 60:2 107:3 embody 64:17 empirical 113:10 employ 32:6 employed 124:22 employees 4:10 enable 35:8 endeavor 6:14 7:7 endings 100:17 endpoint 16:4 20:21,22 21:5 24:7 112:19 113:2 114:1,2 114:5 endpoints 44:16 engaged 34:25 engineer 54:12 engines 27:9,12 english 57:2 entered 6:1 16:11 entire 12:21 18:17 80:4 106:6 118:4	entirety 28:4 28:17 environ 18:2 20:10,16,18,25 21:3 52:25 environment 18:7 99:19 environmental 8:21 18:5,5 27:20 89:5,11 92:12 enzymes 99:24 110:2,6,22 epa 8:20 13:11 25:16 27:6 37:9 39:21,25 40:1,5 65:11 97:3 111:19 112:16,17,25 113:7 115:24 115:24 epa's 10:22 37:13 97:4 epi 26:19 87:19 108:10 epidemiol 4:16 epidemiologi... 25:18 30:24 38:14 39:1 50:19,20 51:1 60:5,7 70:1 71:12,16 81:24 122:17
	e e 100:17 e.g. 23:17 earlier 11:24 12:2 31:21 70:25 78:20 86:19 87:23 early 16:7 19:3 28:15 easier 98:10 eastern 1:1 5:12 124:2 education 15:9 educational 14:24 effect 17:21 65:8 111:16 112:13 114:4 effects 16:15 18:5,6 19:4 29:21 64:24 78:25 94:12,12 101:23 107:11		

epidemiologist 33:20 60:4	estimates 41:22 109:15	55:16,17 56:4 56:13,20,21	21:13,18 22:14 23:17 27:4
epidemiology 15:14 22:13 27:23 28:13 29:8 34:8,8 48:25 59:25 72:6 88:14	estimating 67:13 106:24 ethane 100:10 ethical 108:7 ethylene 100:11 etiology 4:16 evaluate 29:21 115:15 evaluated 36:7 101:12,13 evaluating 56:6 101:17 evaluation 4:9 4:13 23:25 40:5 47:19 61:1 69:20 72:13 events 73:4,11 111:12 everyday 18:7 35:4 everyone's 82:19 evidence 3:21 4:11 23:25 25:12 29:4 31:18 32:7,14 32:16,19,22 33:2 38:4,14 39:1 50:7,15 51:20 52:1	57:5 58:6,10 58:21,23 59:6 59:22 60:6,7 64:14 65:6 66:20 69:20,24 70:6 71:16 72:13 73:21 75:2,18 77:3 78:19 99:21 110:18 113:10 113:15,16 117:17,18 118:18 119:6 122:17 exact 12:8 33:23 35:23 75:2 77:21 98:12 99:4 111:7 exactly 9:10 11:22 66:4 75:20,21 77:25 87:25 exam 18:9 examination 4:2 5:19 119:25 124:18 examine 94:14 109:22 example 9:21 10:17 15:2 17:17 19:18	28:9,14 29:6,8 31:7,21 53:13 65:18 68:8,14 70:25 75:24 79:16,16 87:21 94:21 104:13 104:20 106:21 115:21 116:19 116:22 except 3:16 exception 3:12 exceptions 78:2 excess 84:24 85:10,16,19 86:8 exclude 28:20 28:21 excluded 28:22 excreted 75:6 78:17 excretion 72:25 excuse 6:17 44:3 53:25 56:2 59:14 61:11 62:5,22 exercise 66:10 exhibit 14:11 14:12 40:13,14 40:15 45:15,16 46:16 50:6,8 52:12,13 55:24 60:22,23 83:2

83:3 84:11,13 84:16,18 86:14 86:17 89:19,21 120:3,5,12 exhibits 4:6 exist 95:2 existed 34:9 exists 122:6 expect 65:7 77:2 89:2 97:11,22 99:1 expensive 109:18 experience 15:8 15:10 20:4,5 20:16 65:3 67:6 118:19 experiment 34:17 80:16 experimental 38:16 experiments 18:23 114:11 expert 4:8 14:18 32:3 70:10 91:17 120:9,23 121:2 121:6 expertise 16:10 34:25 35:3,22 experts 58:6 67:1 70:11 72:14	explain 39:5 48:24 70:17 73:18 78:11 119:1 explained 122:1 explanation 98:4 explored 114:13 exposed 18:8 30:20 38:16 51:10 59:4,5 76:23 77:4 84:23 85:9 96:10 97:7 99:1,19,20 101:19 104:18 104:18 exposing 77:14 exposur 4:17 exposure 17:17 17:18 18:6,19 18:20 24:5 29:22 30:17,18 30:22 33:13 37:9 39:14 40:21 41:11 45:5,6,12 46:13 48:6 49:4 58:25 59:2 60:11 61:5 65:13,20 65:21,21 66:19	67:12,13,21 68:4,7,25 69:12 70:7 72:9 74:24 76:12 85:17,20 87:24 89:5,6 89:11,23 92:12 92:15,15 93:5 93:8 94:6,8,19 95:8,22,24 96:6,14,15,19 97:24 98:20 99:18 102:25 104:7 105:13 106:22 107:3,9 108:18 110:10 111:5 112:11 115:7 exposures 16:17 30:16 88:16,20 95:13 110:1,21 115:5 expounding 16:9 express 117:22 extrapolate 76:6 extrapolation 77:6 94:18 95:5 extremely 110:4	f fact 34:6 39:7 66:11 67:19,22 74:11 77:22 88:19 93:6 94:13 99:14 103:8,10,11 105:21 109:25 factor 78:18 79:8,24 81:8 81:10,12,15 82:3 87:17 95:20 factors 79:3 80:6,7 82:11 82:12,15 87:11 87:15,20 88:15 91:11 96:24 fair 21:4 71:23 fall 117:19 familiar 8:24 21:13 55:22 90:1 far 8:3 42:13 42:17 52:11 76:8 117:21 faucet 67:12 federal 3:7 feeding 67:24 fellow 17:15 fibrillation 16:24
--	---	---	---

field 15:14	finished 67:11	focuses 34:6	94:10 95:10
fifteen 12:20	first 5:3 12:25	47:17	96:1,16,22
54:5 64:2 74:6	12:25 18:19	focusing 31:20	98:18,24 99:25
83:24	20:1,1 22:16	44:16,20 89:13	105:10,19
fifty 49:9,12	22:19 33:12	104:1 105:24	108:24 110:15
57:7,7,25,25	54:20 66:14	focussing 99:13	113:12 116:14
59:25,25 119:9	68:14 78:23	foia 116:4	formal 120:16
119:9	85:22,25 88:5	follow 49:8,9	formalities
figure 110:20	93:2 102:22	76:13 99:6	3:10
file 10:2 36:15	119:12 120:18	118:3	formation
36:18 60:18	fit 79:17,22	followed	72:24 109:3
82:22,25	fits 79:15 80:16	109:19	formed 32:23
100:20,23	80:16,17	following	36:11 73:22
119:21,24	five 9:22 10:17	124:13	74:1 76:2
filed 11:7 12:6	18:12 36:12	follows 5:4	88:11 93:16
files 40:6 52:6	48:8 59:11	food 53:16	96:2 98:14
final 22:4 121:5	60:13 73:12	forgive 14:13	99:15,22
financially	74:6,20 80:10	51:23	113:13
124:24	82:25 89:7	forgot 107:16	forming 23:10
find 27:16,25	100:20	form 3:17	60:8 71:20
29:12 31:18,23	flipping 56:18	21:23 28:6	78:15
31:24 46:4	floating 49:23	31:12 32:21	forth 33:12
75:2 95:21	flow 115:3	39:3 40:23	56:18
102:11,12	focus 18:3 24:6	46:2 47:11	forward 33:17
114:20 116:3	26:19 27:19,21	50:22 51:15	found 11:14
117:18	30:3,3,9,22	52:2 55:20	25:10 28:10
finding 35:9	31:6 39:9 48:3	56:15 57:20	39:18 85:16,19
38:25 119:2	48:23 69:13	59:18 64:18	86:8 88:22
findings 39:8	92:16	65:1,15 66:3	103:23,23
fine 8:8,24	focused 16:14	66:16 67:14	114:22 115:11
62:19 92:4,7	28:17 34:9	68:5 73:7	115:19 116:9
finish 6:10,13	38:22 44:25	76:25 80:12	116:12,24
6:14 85:3	47:20 88:23	81:3,17 85:12	foundation
		91:4 93:15,25	40:24

four 9:21 10:17 19:15 21:7 24:5 29:22 30:7 31:22 34:18,19 35:17 35:21 36:5,8 42:16 43:23 44:16 51:4,13 59:1 74:20 78:13,14 80:1 80:7,9,17 82:11 95:3 96:10 100:8 101:13 103:22 104:12 105:4 106:25 107:3 107:23 110:13 112:13,18 117:2,4 121:21 fourth 89:10 frame 101:25 102:3 framework 19:24 frank 16:18 franklin 2:9 free 22:11,12 27:15 front 13:23 92:18 116:7 fulfill 78:23 80:24 full 34:22 35:16 70:4,21 71:17	102:10,14,17 fuller 10:8 fully 67:2 fulsome 98:4 further 8:10 24:12 39:12 91:15 101:9 119:15 122:23 124:21,23 g gather 82:7 gathered 11:8 80:23 gene 91:13 92:10 general 17:14 20:24 24:8 34:23 60:6 65:22 80:25 90:1,7 94:4,7 102:10 118:19 118:19,20 generally 20:22 21:11,25 22:1 24:25 32:6 33:24 38:21 48:1 49:4 50:18,23 68:6 74:19 77:10 78:7 79:1 94:1 95:15 96:22 97:2 98:25 99:9 101:2	102:6,23 122:10 genetic 91:25 genotoxic 73:3 73:4,22 111:12 113:5 georgetown 2:4 georgia 15:19 15:23 16:4 getting 27:16 58:6 59:23 gilbert 10:24 11:3 22:5 120:22 give 7:20 10:8 21:18 26:3 48:8 49:10 50:6 68:8 71:4 77:14,15,16 81:5,20 91:2 106:6,7,15,17 given 3:22 7:9 83:5 104:13 105:3 107:24 108:22 109:7 124:16 gives 33:25 83:20 giving 47:25 48:7 74:23 106:21 gleaned 80:22 glycosides 16:21	go 5:23,24,25 8:7,9 9:23 13:17 16:24 27:1,8 30:2 32:25 33:17 38:5 40:16 42:16 43:18 44:6 47:6,12 47:15 48:8 52:7,11 54:3 55:15 58:22 60:5 63:8 69:3 69:4 71:15 78:4 86:21 90:21,25 91:15 91:16 92:11 94:24 98:8,9 115:22 116:25 goes 33:15 86:4 going 5:25 10:7 11:24,25 13:7 14:6 32:16 34:23 36:5,13 36:20 38:8 40:11 41:17 43:12 45:14 47:4,6 50:6 52:9,10 53:19 55:7,15,24 56:20 58:11 60:20 61:10 64:11 67:20 69:3,4 72:20 72:23 74:15
--	--	---	---

76:9 81:7 83:2 86:14 88:3 98:12 99:4 100:25 102:13 102:20 116:9 117:18 122:19 golkow 5:6 good 5:20,22 7:4 8:7 82:19 99:21 goodman 10:24 11:4 22:3 120:22 121:4 gosh 12:5 government 11:3 84:16 107:15 116:4 grad 17:9,10 graduate 17:5 17:7 gray 56:1 greater 111:23 119:8 group 2:3 37:24 45:1,4,5 45:6,12 59:10 109:11 groups 10:16 guess 34:2,17 guidance 10:21 10:22 13:11 58:17,21 111:19 112:15 113:1,8	guide 72:2 gulf 56:7 h habits 74:9 hadnot 104:20 104:23 105:8 halaseh 86:15 86:19,21 halasseh 86:19 haleseh 89:6 half 11:13 12:1 handed 45:18 45:19 52:19 89:22 120:2 handing 45:14 60:20 handling 72:15 happen 17:18 78:5,6 happened 30:17 66:8 happens 78:2 114:17 hard 14:3 31:23 109:18 hazard 30:1,10 30:13 31:25 41:22 43:7,14 43:19,24 44:7 44:20 45:2,6 45:11 46:23,25 48:1,16 49:21 50:2 60:8,10	64:6 69:14,20 69:25 70:6 72:13 81:1,19 87:21 89:16 93:4,6,22 97:25 98:19 99:12 100:1,13 103:2 104:8 105:25 112:21 117:5,5 122:9 122:13,14 hazardous 93:21 103:1 hazards 21:10 24:4 30:6 48:5 71:21 101:10 101:19 header 89:5 health 18:4 19:4 21:9 24:4 27:7 29:21 30:1,6,10,13 32:1 51:4,13 60:8 64:11,16 64:21,24 65:7 65:25 66:1,12 67:10 68:2 70:6 71:19,21 93:4,6,21,22 94:11,12 95:4 97:25 100:1,13 101:19 103:2,2 104:7 117:5	hear 7:15 heart 16:23 heavily 84:23 85:9 held 5:10 75:7 helpful 27:21 helping 100:15 high 45:5 110:23 higher 16:17 18:20 65:13,20 82:9,15 95:14 107:24 110:22 115:6 highly 36:9 45:3 50:25 94:2 hill 33:4,8,9,11 33:17,22 34:5 34:19,22 35:2 35:16,20 36:2 36:8 69:7,23 70:13,21,22 71:13,14,18,24 71:25 72:2,4,4 78:24 79:7,9 79:24,24 80:14 80:21 118:20 hills 34:15 historical 26:25 27:17 hodgkin's 42:17 43:24 44:18
---	--	--	---

hold 15:13,25 16:2 40:1 74:14,14,16,20 holding 74:22 home 40:7 67:25 hope 53:23 hoping 65:9 hospital 90:4,5 90:11,13 hour 11:13 36:13 120:19 hours 11:13 12:13,13 74:15 74:20 housekeeping 5:23 houston 5:11 huh 6:20 92:20 101:7 human 18:4,18 19:4 21:9 24:4 26:18 27:7 29:21 30:1,6 30:10,13 32:1 36:23 37:2,3,6 37:13,21 38:1 38:2 39:10,11 39:18 60:8 70:6,14 71:19 71:21 72:7 73:16 77:20 78:8,19 79:4 93:4,6,21,22	94:11,12,21 95:3,12 97:25 100:1,13 101:18 103:2,2 104:7 109:8 117:5 humans 37:9 37:14 38:11,14 38:16,21,25 39:8,14 59:3 69:13 73:23 74:2,5,8,14,24 75:4,15,25 76:11,23 77:4 77:8 78:4,6 hundred 97:15 113:25,25 hypothesis 47:19 114:11 hypothetically 108:13	ignored 84:8 imagine 68:20 impair 8:1 impaired 7:23 importance 76:6 109:25 important 41:15,19 47:23 47:25 48:24 49:6 67:3 74:22 75:22 77:11,18 82:3 110:4 inadvertently 120:8,10,11 incident 13:19 include 20:5 25:11 27:12 93:7,21 103:3 included 11:17 24:20 30:4 40:6 48:15 including 20:23 21:11 64:24 97:23 inconsistent 28:25 29:1,13 29:16 34:4 increased 45:11 84:7 95:23 97:12,19 97:21 98:22 increases 94:8	independently 122:4 index 4:1 indicate 69:17 110:9 112:16 indicated 41:23 indicates 103:22 104:5 113:1 indicating 105:3 indication 110:8 indicative 16:17 individual 24:21 55:7 61:9 68:25 82:5 83:19 86:20 88:18 91:11 97:6 99:5 101:17,21 102:1,24 103:16 104:13 106:11 107:20 108:11 109:9 112:7 114:16 115:15 individualized 61:5 individually 101:14 108:9 112:25 122:12
	i		
	iarc 8:19 21:14 21:17 25:15 27:6 36:24 38:10,13 39:6 58:12 115:11 iarc's 37:2,5 idea 33:13 71:4 74:23 117:17 identified 22:8 22:18 25:17 115:9		

individuals 68:21 121:11 industry 89:1 influenced 45:3 inform 116:25 information 15:4,9 21:18 23:24 25:10 32:17 36:10 37:18 38:6 39:20,23 40:3 41:13 52:5,6 54:18 65:13 66:22 68:4,12 68:20,22 69:12 69:16,17,18,23 70:24 71:5,8 71:12 72:6,7 79:1 82:7 85:6 95:21 104:19 122:15 informative 25:11 ingredient 87:25 ingredients 87:24 88:1 inhalation 77:15 initial 24:12 initially 13:22 22:19 24:20 101:16	initiation 73:4 injury 76:17 input 96:11,18 112:2 institute 53:15 institutes 17:14 instructed 116:11 instructs 7:17 integrated 39:23 interact 78:17 interaction 73:2 112:13 interactions 111:7 interest 43:13 interested 17:15 27:19 124:24 interfering 111:3 international 8:19 interpretation 33:9 interpreted 118:8,13 interrupt 7:7 interruptions 7:7 interval 42:6 42:10,14,21,25 43:1,20,25	44:8 47:1 61:21 62:6 63:5,10,15,23 64:4 intervals 41:23 43:8 61:23 introduce 6:2 introduced 6:1 introducing 14:12 40:14,15 investment 55:9 invoices 4:18 120:2,7,12,16 involved 12:17 12:18 21:5 68:21 involves 72:23 iom 56:4,16 issue 16:25 31:8 44:20 55:11 68:17 79:20 90:14 91:13 99:14 105:16,25 112:13 114:14 117:3,8 121:22 issues 30:10 40:22 41:5 46:12 53:2 87:8 105:13 items 73:12	j job 17:12 92:14 92:14 johnson 2:7 4:3 5:19 6:2 9:14 10:3 36:12,19 45:17 50:11,13 52:14,17 56:23 60:13,19,24 82:18 83:1,4 84:14 86:14 89:20 100:24 119:19 120:14 122:24 123:9 johnson's 121:9 joined 12:19 joseph 2:11 53:3 joseph.b.turner 2:13 judge 119:1 juries 119:11 justice 2:6,8,11 21:21 116:13 k keep 18:12 key 25:20 31:1 kidney 38:15 38:23 39:9 42:9 43:13,17 76:2,3,4,19 78:16 84:5
---	--	---	--

99:23 kidneys 72:25 kind 18:7 24:18 30:19 65:16 115:3 118:19 kinds 11:1 53:4 53:5 66:7 68:23 71:6 72:8 118:15 knew 14:14 know 6:6,15 7:13 8:14 11:6 11:10,21 13:18 13:19 22:14 25:2,18 27:1,2 27:3 28:21 29:15 30:17 38:19 43:9 48:5,7 51:16 52:3,8 55:18 58:19 59:1,17 59:19,23 62:1 65:2 66:4,17 68:6 71:10 76:2,3,4 79:13 81:12,18,18,20 86:20 87:2,25 88:25 90:10,16 90:19 91:8 94:24 95:12 101:21 104:4 104:14,20 107:10 108:8 110:1,16,22	115:17,21 119:6 123:7 knowing 91:6 known 26:23 27:3 32:7 33:19 37:2 78:25 79:3 111:8 kristie 123:4 I I 2:12 la 125:6 lack 40:23 46:9 57:19 60:2 66:1,10 68:12 122:16 lacrosha 2:7 6:2 lacrosha.a.jo... 2:10 laid 20:4 25:23 lamacchia 2:3 4:4 9:12 11:13 12:10 13:11 14:9 21:23 23:2 28:6 31:12 32:21 39:3 40:23 46:2 47:11 50:9,22 51:15 52:2,16 55:20 56:15,22 57:20 59:18 64:18	65:1,15 66:3 66:16 67:14 68:5 73:7 76:25 80:12 81:17 85:2,12 91:4 93:15,25 94:10 95:10 96:1,16 105:10 105:19 108:24 110:15 113:12 116:14 119:17 119:25 120:15 120:17 123:3,6 language 33:24 35:23 64:20 66:4,18 116:9 117:13,14,25 119:5,7 large 26:22 56:1 latency 48:20 48:24 49:5,10 76:11,14 79:16 83:21,23 84:5 84:8 90:17,25 91:3,6 95:19 laura 1:10 3:4 4:8 5:2,14 124:10,14 126:2 law 3:8 lay 48:4 78:20 laying 58:6	lays 71:14 lcl 43:14 lead 19:10 25:6 73:5 leaky 67:23 learn 51:25 leaving 67:11 left 61:13 legal 2:3 116:18,20 118:9,12,13 lejeune 1:4 4:12 5:11 21:21 22:22 29:24 30:18 43:6 46:18,23 49:25 50:3 51:4 53:18,25 54:1,20 57:17 61:15,20 62:4 62:10,24 63:13 64:7 88:21 93:8,13,20 96:7,13 98:20 99:3 102:8,23 103:1,4,11,15 103:21 104:6 106:4 110:14 115:4 116:12 117:8 124:5 lejeune's 70:15 leslie 2:3 lethal 114:6
---	---	---	---

leukemia 44:23 86:8 95:16 leukemias 43:3 44:6 level 18:19 65:5 75:21 95:8 96:14,19 106:22 levels 29:23 37:16 38:4 64:23 65:14,20 65:21 66:9,23 94:19 95:22 96:6,10,11 99:2 103:9 105:6,8,16 106:7,9,19 107:1,3,22,24 110:2,10,22 111:1,11 lifted 121:19 light 50:12 likelihood 96:21 112:1 likely 23:22 30:15 32:12,14 32:18,24 37:8 39:13,13,16 57:9,11,13,16 57:25 60:9 71:22 72:23 82:8,12 93:3 95:22,22 98:19 99:18 100:1	102:25 116:10 116:12 117:3,4 117:12 119:5,8 119:12,13 limit 26:15 limitations 41:8,20 45:25 46:4,8 58:23 limited 66:1,13 68:3,3,12 line 42:4,8,11 43:2,13,17,18 44:3 46:25 61:19 63:3,21 73:1 94:25 126:4,7,10,13 126:16,19,22 linear 94:17 95:4 lines 42:16,24 43:23 44:5,7 62:1 63:8 lining 74:4 link 32:25 linked 24:11,11 30:13 70:7 76:12 88:20 lipscomb 121:4 list 8:13 11:6 23:13,18,21 25:9 54:18 55:4,7 69:18 71:1 80:1 81:10 83:11	87:17 89:15 91:21,24 121:3 listed 23:19 43:2 50:16 53:23 54:20 55:2 85:11 100:9 listing 15:4 lists 25:7,15 literature 22:6 22:8 26:9,9 28:4,13 30:21 30:25 31:1,17 32:5 34:7 35:14 36:8 49:2 50:24 70:1 73:21 75:9,13,23,24 79:2 80:8,19 80:22,23,24,25 81:23 86:23 87:18 93:18 96:4 107:10,14 110:8,25 114:21 115:10 116:2 117:1 liters 107:3,4 litigation 1:4 5:11 21:22 34:21 67:1 68:21 69:1 70:9 72:15 82:5 116:17 118:22,23,23	124:5 little 12:2 41:13 47:5 86:5 98:10 108:18 lived 68:13,23 liver 72:24 99:23 livers 78:16 llamacchia 2:5 location 68:11 logical 115:2 long 12:11 50:18,20 74:2 74:7,24 75:20 76:10,13 109:20 longer 95:13 110:6 look 21:9 22:18 24:4 25:7 29:5 29:11 30:21 31:7 33:13 34:12 35:5,5,6 35:24 37:25 39:25 41:8,19 46:5 49:7,16 54:3 55:7,13 61:7,9 63:3 71:15 76:10,11 77:18,20,20 78:7,8 81:24 88:14 89:25 90:2,20,21,22 91:22 92:1
--	--	---	---

<p>97:19 101:18 104:17 108:10 109:2 112:6,7 112:23,24,25 113:25 115:22 117:11 looked 9:19 10:14,18,20,21 10:24 11:5 28:7 29:3,6 49:13 58:19 59:7,8 70:24 71:1,2,7,11 76:19 87:18 91:22 92:8 114:16,17 115:14 looking 16:15 17:15 18:4 19:20 24:23 30:17 43:12 44:5,21 49:21 54:13 58:10,25 67:6 80:14 87:19 90:9 91:7 92:24 101:10,20 102:21 105:12 106:19 109:11 115:17 116:3,3 116:18,25 looks 53:20 62:18 90:12</p>	<p>lose 67:19 lost 44:4 lot 18:16 26:23 26:25 29:3 34:1 113:20 114:3 lots 49:23 58:21 louisiana 3:6 loved 50:11 low 18:19 41:22 45:5,12 94:17,19 95:5 95:13 110:1,21 lower 43:14 65:20 107:24 113:19 119:9 lowered 114:3 lunch 82:19,23 lung 86:9 lymphoma 42:17 43:24 44:18</p>	<p>majority 65:4 make 3:19 7:10 10:18 11:9 13:3,13,17,19 14:4,6 27:22 48:19 58:7 59:4 71:10 76:21 84:10 92:2 98:10 105:6 107:24 120:3 makes 24:17 78:11 93:24 119:3 making 26:19 male 47:10 malignancies 61:20 63:22 manipulated 107:23 manufacturing 4:15 84:17 margin 64:17 marine 49:16 marines 4:9,13 40:18 41:13 47:13 49:14 61:1,15 64:7,8 64:9 109:13 mark 40:16 marked 14:11 40:13 45:15,16 50:8 52:13 60:23 83:3</p>	<p>84:13 86:17 89:19 120:5 marking 52:11 83:2 84:11 89:21 martello 123:4 massachusetts 83:9 materials 9:4 23:16 91:18,20 matter 21:21 82:9 117:22 mccabe 121:4 mean 11:21 20:8 23:7 28:21,23 29:13 29:15 31:13 33:6 54:4 58:5 58:13 59:19 65:8 68:6 77:8 77:21 78:5 87:1 90:10 100:10 106:8,9 106:18 107:1 108:3,25 114:5 115:2 120:22 meaning 57:4 57:24 119:12 means 57:16 88:24 110:12 meant 33:16 65:19 measure 114:6</p>
	<p>m</p>		
	<p>m 1:10 3:4 4:8 5:2 124:10,14 126:2 made 7:18 14:7 14:8 15:6 27:18 117:10 magnitude 111:5</p>		

measured 83:15	29:18 40:17 50:17 87:10	76:16 77:8	104:19,24
measurements 104:16,16	99:7	miceli 12:17	105:6,8,15
measures 114:8	met 31:25 71:8	middle 72:19	106:3,3 107:12
mechanism 16:21 24:24	71:21 86:20	74:21	107:19 108:16
26:15 75:5,12	metaanalyses 81:19	midway 72:20	108:22
mechanisms 17:16 36:7	metabolic 73:23 109:23	milligrams 113:25,25	mixtures 10:22
mechanistic 38:15	metabolism 91:14 99:16,23	million 97:13	101:23 102:5
median 106:7,8	99:23 111:4	111:2	111:19,22
medical 17:2,7	metabolites 72:24,25 73:3	mind 35:14	115:16 121:11
17:9,14,24	73:22 74:1	minimis 97:12	mode 24:15,16
27:19 112:10	75:6,17 76:1,7	minute 36:12	24:23 26:14
medication 7:25	76:18 78:16	60:13 90:20	75:12 80:14,20
medicine 53:16	99:22 109:3	minutes 12:20	113:3 121:23
meet 12:4 57:8	111:12 113:4	74:6 90:22	model 96:12,13
meeting 11:12	metabolized 99:16	92:6	96:18,20 97:2
12:9,11,12,13	method 33:3	misclassificat... 40:21 41:4,16	97:3,13,13,18
12:19,25 13:1	67:20 95:5	46:1	modeling 54:10
14:2	97:4 117:10	misclassificat... 41:11	66:7 67:8
meetings 12:5	methodology 24:1 32:7,14	mispronounc... 83:6 86:16	83:18 97:4
12:16,24 14:1	57:5 87:3	misread 62:22	108:15,22
members 53:25	methods 112:18 118:17	missed 25:8	109:1,2
54:2,5	118:18	missing 34:17	modern 33:9
memory 7:22	mice 73:11,16	62:14,19	moment 40:10
31:3	73:20,22 74:2	misstate 75:16	47:6 52:10
mention 87:12	74:5 75:2,17	misstating 87:14	55:16 56:19
111:19 121:1	75:23,24 76:15	mistaken 51:24	64:10 69:3
mentioned 18:21 21:16		mixture 48:6	91:17
		101:1,10 102:1	monitor 109:13
		103:14,24	month 11:23
			moore 89:22
			91:19
			morning 5:20
			5:22 11:18

mortality 4:9 4:10,13,15 13:18 40:18 42:5,9,14,20 45:20,21 46:16 46:18 49:14,20 61:1,2,4,14 62:5,9,23 63:4 63:10,14 84:16 84:19,21 move 37:17 40:11 100:17 moved 17:25 moving 12:1 mrl 65:3 mrls 64:23	necessary 95:8 need 8:4 20:7 31:5 78:7 82:16 108:9,25 111:10 112:10 116:17 120:14 123:7 needed 11:10 14:4 22:15 50:9 negative 31:11 31:15,19,20 60:2 neither 124:21 never 19:7 90:19 121:6 new 11:6 15:9 15:12 26:24 37:18 nhl 42:18,19 43:23 44:4,19 night 74:21 nighttime 74:11 nine 33:15 34:15,20,24 35:17,20 80:4 non 42:17 43:24 44:18 86:22 94:11 105:2 118:12 118:23 normal 6:9	normally 10:5 north 1:1 2:4 5:13 124:2 note 38:10 noted 5:15 86:7 notes 13:25 14:2 notice 3:7 23:16 45:10 111:18 noticed 13:1 novel 75:11 nrc 8:22 52:23 53:1,10,15,17 53:24 54:1 55:25 ntp 37:23 ntp's 38:2 number 14:14 24:3 39:25 42:15 45:3 62:15 83:25 97:9 106:12,15 114:13 numbering 61:12 numbers 42:23 43:3,17,21 46:21 54:16 62:14 64:10 106:11 112:1,3 nw 2:12	o o'clock 5:9 oath 3:24 5:4 6:23 object 116:14 objection 7:16 7:18 21:23 28:6 31:12 32:21 39:3 40:23 46:2 47:11 50:22 51:15 52:2 55:20 56:15 57:20 59:18 64:18 65:1,15 66:3,16 67:14 68:5 73:7 80:12 81:17 85:12 91:4 93:15,25 95:10 96:1,16 105:10 105:19 108:24 110:15 113:12 objections 3:16 3:19 8:13 objective 114:8 obligated 6:25 obscure 27:16 27:23 observations 62:15 94:21 observed 61:22 94:20 97:10
n			
n 62:14 name 5:6 6:2 8:12 26:11,17 37:24 123:4 names 9:2 24:10 national 8:22 17:14 37:21 52:15,19,22 53:6,7 naturally 115:3 nature 19:10 navy 61:15 necessarily 55:4,22 68:15 77:2,6 80:10			

observing 96:21 obviously 20:13 33:25 58:1 59:24 60:1 88:24 occupation 89:3 occupational 4:17 88:16 89:5,6,11,22 92:15 occur 11:24 65:8 74:4 occurred 66:14 66:22 occurring 17:20 offered 3:21 office 12:1 14:6 officiated 3:23 oh 9:9 40:16 49:21 56:11 63:8 64:1,8 101:9 107:16 okay 8:15 9:10 10:4 12:15 23:4 42:20 44:5 49:23 52:9 56:20 61:25 62:4 71:23 72:16,18 73:10 80:6 81:7 82:19	85:15,21 86:6 87:13 88:3 92:21 97:1 100:15 101:4,5 101:11 104:9 104:19 106:19 111:15 116:8 118:8 121:9,14 121:21 122:1,4 122:19 123:5 123:10 older 27:17 once 7:8 22:8 25:4 109:15 ones 10:15 13:6 20:23 23:11,18 28:10,11 45:22 89:13 100:9 ongoing 20:13 online 37:25 open 3:22 61:13 operate 95:4 operating 113:2 opine 35:20 92:22 93:2 100:6,8,12 111:18 112:12 116:11,15 opined 98:8 111:21 113:7 115:13	opinion 31:24 32:12,15,18,23 81:4 82:17 88:11 93:12,16 93:19 95:24 96:2 98:14,18 99:11,25 102:1 102:7 108:23 113:13 122:4 122:15 opinions 23:10 28:25 29:25 30:11 36:11 60:8 71:20 102:3 opportunity 7:9 opposite 56:1 oral 59:1 106:22 orally 59:4,5 77:15 order 28:8 73:14 75:7 94:14 119:1 123:2,3,6 organ 76:19 organizations 115:18 organized 33:12 organs 77:18 77:19,21,25	origin 67:16,20 67:24 68:16 original 33:7 outcome 55:10 95:15 124:25 outcomes 20:14 51:4,13 output 97:2 outside 94:20 overall 34:1 39:9 44:20 56:20 59:10 60:6,11 70:5 81:14 overarching 30:19 overestimating 46:14 overestimation 41:18 overnight 74:19 own 22:23 100:13
p			
p.m. 60:18 82:21,24 100:23 119:23 123:11 p.o. 2:8 pace 7:4,5 package 11:17			

packed 12:1	86:18 87:4	59:22 60:7	24:5 25:21
page 4:2,7	88:6 89:15,22	69:19,25 70:4	28:14 29:22
14:14 20:1	90:2,10 91:9	70:5,23 72:6,7	36:22 37:8,20
40:10 41:10,12	papers 13:5	80:10,15 91:10	69:12,23 76:22
42:3 43:5,5	25:20 49:11	105:7 111:5	78:15,25 85:17
44:10 46:7	62:25 88:13	partially 16:8	85:20,22,24
51:7,9,10	paragraph	particular 24:6	98:14,21 99:16
54:15,16 55:16	29:19 32:3,10	30:8,16 33:21	99:16 100:6
55:25 56:1,2	33:19 35:25	36:8 78:12	103:1 104:6,10
56:10,22,24	36:4,21,22	96:22 104:1	104:15 110:5
61:10,11,12	37:7,19 38:9,9	110:13 117:8	111:2,3,8
62:23 63:21	39:12,20 47:7	118:25	112:20,24
70:2 78:22	47:9,14 48:14	particularly	115:6,12,20
84:1 85:5,15	48:19 69:4,5	10:15 18:16	121:22 122:6
86:4 88:3,4,10	69:10,17,22	23:19 28:13	peer 15:5 19:19
89:4 101:6,9	70:2 71:1	106:3	49:11 116:2
101:10 121:15	72:16 73:12	parties 3:3,10	pending 8:6
121:18 126:4,7	78:10,22,23	3:16 124:22	48:13
126:10,13,16	81:7,7 85:22	parts 35:1	pendleton 43:7
126:19,22	85:25 86:3	38:22 71:18	46:19,24 50:1
pages 20:1 51:9	88:5 89:11	102:19 111:1,2	50:3 64:7
120:12	92:24 101:2	past 20:25	people 16:13
pah 114:15	103:19 121:15	21:19 71:7	18:8 30:20
pahs 88:2,25	121:18	89:16 113:21	35:11 45:1,4
paid 11:16	paragraphs	115:24	49:5 54:7,12
panel 58:5,16	20:2,5,17	paths 17:25	55:7,11,14
panels 53:1,2	parameters	pathways	58:10 59:5,8
53:16	68:4,8	109:23	64:24 65:4
paper 28:16,17	parse 98:3	patient 82:4	76:13 90:11,13
33:11,22 41:1	part 3:20 16:6	pattern 79:15	91:11 97:7,15
41:10 46:12	19:22 20:10,24	patterns 74:12	97:15,16 99:1
47:21 58:12	23:12 25:13	pc 69:25	99:18 104:6
63:1 71:15	36:6 45:1	pce 8:17 18:22	109:19 114:5
72:5 83:5,9	48:11 53:14	19:13 21:16	114:13

percent 43:7 88:8 89:7 119:9,9 perchloroeth... 8:18 70:7 103:9,13 104:3 104:4,5 106:23 perfect 29:17 perform 50:19 50:20,23 51:2 69:22 performed 51:3 52:1,4 69:24 94:18 114:10 period 12:21 21:12 51:7 75:7 76:13 109:20 periods 95:14 95:14 person 12:9 54:10 112:9,10 personally 52:24 personnel 61:15 peruse 91:18 ph.d. 1:10 3:4 5:2 15:21 124:10,14 pharmacolog... 16:13 pharmacology 15:21 16:12	17:4 18:15 phone 12:8,9 phrase 102:23 physician 54:11 89:2 physiology 73:16 74:10 physiology's 76:9 pick 54:7 114:4 pipe 67:23 pipes 67:22,24 place 44:4 73:11 plaintiff 82:5 88:18 112:5 plaintiff's 120:6 plaintiffs 2:2 11:4 69:1 70:11 plan 50:19,20 plane 50:12 planning 51:1 plant 67:11 plants 66:24 67:15 103:7,11 plausibility 24:16 34:16 80:15 113:11 plausible 76:21 play 99:8 please 6:5,6,18 7:13,17 8:4	23:2 47:7 70:18 73:19 87:14 120:15 plunkett 1:10 3:4 4:8 5:2,14 5:20 83:5 89:21 119:15 120:1,9 124:10 124:14 126:2 plunkett's 75:12 point 23:23 26:1 35:18 41:15 48:12 59:23,24 61:18 63:20 66:18 67:12,16,19,24 68:16 82:10 94:5 104:20,23 105:9 108:13 109:8,12,21 110:20 pointed 14:4 pointing 51:6 points 21:24 105:1,23 poison 93:24 policies 64:15 pollution 92:13 poor 108:12 population 59:8,10 65:5 90:7 97:5,7,22 99:1 109:11,16	populations 63:2 64:25 portion 72:22 pose 31:25 95:7 104:7 117:5 posed 21:10 24:4 30:1,7 48:6 60:10 101:10 poses 99:12 posing 87:9 positive 31:11 31:15,19,20 59:16,21 60:1 possible 65:23 67:17,18 68:10 82:15 109:17 115:21 possibly 16:9 68:10 post 17:13,23 21:3 potency 96:24 114:14 potential 101:22 105:25 106:1 112:24 potentially 11:25 60:3 88:20 power 35:10 45:7 prat 17:15
--	--	--	--

precision 41:22	principle 77:10	product 55:5,6	11:11,15 21:20
predict 77:25	78:7 93:24	production	22:2,17,20
96:20	94:4	79:19 120:16	23:9 91:5 98:5
predicting 97:5	printed 11:18	products 18:8	98:6 108:21
97:10,14	prior 66:2	professional	109:1 120:13
prediction	120:6	14:24 15:8	121:3
111:25 112:17	probability	118:12	public 58:17
predictive	96:9,12 111:24	profile 27:5	64:11 65:25
65:12 78:1	probable 36:23	100:13	66:1,12 67:9
predominated	probably 12:12	profiles 101:21	67:10 68:2
104:25	22:25 40:16	program 37:22	publication
pregnant 74:17	95:2 98:1	65:18	19:19 33:7
preparation	109:17 118:11	project 16:3,19	publications
10:7 120:20	120:18	24:10	15:5,6,10
prepare 9:15	problem 66:11	projection	18:21,22 19:10
10:9 12:2	110:7,12	112:2	40:1
preparing	procedure 3:8	projects 15:2	publicly 15:5
11:23	procedures	16:15 18:2	publish 19:5
present 12:15	64:15	19:3,9 20:13	published
64:13 99:24	proceeding	20:20 21:1	18:25 19:7,16
presentations	6:22 124:23	prolonged	19:17,19 28:14
15:6	proceedings	74:24	33:20 34:7
presented	5:1	properly 35:8	58:17 91:9
114:21,23	process 25:2,13	74:19	114:21
pretty 7:4	73:10	property 78:14	pubmed 26:7
53:21 88:4	produce 31:10	78:15	27:11,18 28:1
previous 66:15	113:19 120:7	protect 65:9	pull 27:8 38:19
101:12 118:12	produced	protection 8:21	97:8
previously	110:7 120:8,10	protective	pulled 13:14,15
40:17 49:13	120:11	64:16,21 65:4	13:16 22:22
87:10,13	produces 99:21	provide 26:2,25	25:23
primary 43:13	producing	29:25 65:13	purposes 23:14
88:6	111:11,11,12	provided 3:8	94:17 95:3
	111:13 113:4	10:23 11:5,11	

<p>pursuant 3:7</p> <p>purview 71:19</p> <p>put 13:23 40:11 43:11 45:13 52:9 55:11 58:11,15 63:1 64:10 69:2 91:23 92:17 96:18 112:3 113:18 114:1</p> <p>puts 53:1</p> <p>putting 19:20 19:24 30:19 31:14 53:4 97:17 119:6</p>	<p>72:14 73:14 75:1 81:14 85:3,18 90:24 91:1 95:7 98:7 101:24 105:7 107:6 111:15 115:14,22 116:23,24 118:2,3,10 122:11,19</p> <p>questioned 120:19</p> <p>questioning 121:10</p> <p>questions 3:13 6:4,4 11:1 54:13 68:22 89:3 98:9,12 99:5 114:25 115:2 118:24 119:16,18 121:10 122:23</p> <p>quick 49:16</p> <p>quite 39:4 93:11 94:13</p> <p>quote 85:7,8,21</p> <p>quoted 35:24 42:1</p>	<p>rate 109:2 110:7</p> <p>rates 115:6</p> <p>rather 13:8 46:13 67:11 102:1 107:19 115:15</p> <p>ratio 41:22 42:5,9,14,20 43:14,19,24 44:7,21 45:6 46:18,25 49:14 49:20,21 50:2 62:5,9,23 63:4 63:10,14 64:6 82:9,14 89:17</p> <p>ratios 43:7 45:2 46:16,23 61:14 81:19 87:21</p> <p>rats 73:11,16 73:20,22 74:1 74:5 75:2,17 75:23 76:15,15 77:7</p> <p>rdas 53:14</p> <p>reach 96:14 102:6</p> <p>reactive 72:24 72:25 73:3,25 75:6 76:1,18 78:16 99:22 109:3 111:12 113:4</p>	<p>read 3:14 7:9 10:6,25 28:12 28:15,17 34:1 43:15,21,25 44:2,4,9 46:20 46:21 56:7 61:21 62:6 63:5,7,12 64:5 72:23 73:5,8,9 73:10,12 77:6 77:22 79:5 86:18 89:8 102:24 118:4</p> <p>reading 47:21 57:3,14 64:19 72:20 85:1,23 85:24 86:2,3</p> <p>reads 41:25</p> <p>real 49:16</p> <p>really 17:6 26:22 45:8 67:23 68:7 87:25 108:12 112:7 114:7,7 115:1</p> <p>realm 19:22 94:20 106:6</p> <p>realtime 3:5 125:5</p> <p>reason 7:19,22 48:3 55:3 99:12 101:22 126:6,9,12,15 126:18,21,24</p>
q			
<p>qualifications 15:8 20:3,15 55:12</p> <p>quantified 66:23</p> <p>quantify 96:9</p> <p>question 3:17 6:6,7,8,11,13 6:15,17,18 7:13,17 8:5,6 10:5 16:8 24:19 26:5 29:3,12 30:8 31:19 34:18 36:20 43:10 48:13 58:25 59:14 70:20</p>	<p>r</p> <p>range 57:25 59:25 111:6</p> <p>rat 75:24</p>		

reasonable 7:4 122:5 reasonably 37:20 recall 38:24 40:5 49:15 51:7 61:8 64:20 87:11 92:8,9 recent 26:24 31:7 recently 10:23 21:1 recess 36:16 60:16 82:23 100:21 119:22 recognize 14:17 60:25 88:24 89:14 recognized 88:7 recommended 53:14 reconstruction 67:4 record 5:5,15 6:12 9:12,24 9:24,25 10:2 36:14,17 45:19 60:14,17 82:21 82:25 100:19 100:22 119:20 119:24 120:9 122:25 124:16	records 91:7 rectum 86:9 redirect 122:24 reducing 108:7 reduction 3:13 refer 33:9 38:19 58:4 59:21 67:1 84:1 85:5 102:21 reference 25:6 25:9,15,16 33:5,7 40:9 48:20 56:13 65:12,23 101:3 102:12 referenced 66:15 references 9:20 10:14 27:17,17 88:4 referred 121:14 referring 8:16 8:17,19,20,22 37:7 43:2 49:19 52:18 57:22 84:18 86:10 100:25 103:10,18 109:6 reflecting 58:1 reflective 65:20 refresh 92:7	regarding 20:14 24:1 41:5 47:8 111:15 regardless 118:17,22 regards 48:21 region 90:8 regulatory 64:15 relate 80:18 related 17:16 18:4,15 19:17 20:20 26:14 30:10,12 31:16 36:6 69:12 79:18 88:2,15 124:22 relates 1:5 18:14 122:9 124:6 relationship 29:5 30:12,22 45:8 57:7 69:13 72:9 79:12 81:4,22 97:24 102:7 111:7 122:6,8 relationships 49:3 111:10 relative 87:22 114:14 relevant 25:10 28:22 29:12	31:18 35:2 36:9 59:2 72:3 115:9 reliability 118:20 reliable 71:5 reliance 23:13 23:16 40:6 relied 23:24 36:10 53:10 69:19 81:25 96:5 rely 23:6,7,10 53:13 relying 48:2 67:10 remember 13:6 38:18 83:25 92:5 removed 117:21 renal 90:14 repeat 85:7 98:6 108:10 repeating 25:24 31:4 rephrase 6:7 59:15 replicate 26:8 26:13 report 4:8 8:25 9:7,13,19,20 10:13,15 11:7 12:6 13:1,6,8
---	---	---	---

13:14,24 14:4 14:9,12,18 19:25 20:1,5 23:13,15 24:2 24:16 25:25 26:1 29:11,19 29:20 30:5 32:4 34:13,19 35:18 36:21,22 37:19 38:9,10 39:13,21,23 40:10 45:23 47:6,9 49:10 50:17 51:19 52:15,19 53:17 53:20 55:21,23 55:25 57:9,10 58:4 61:3 69:3 69:5,10 72:17 73:12 78:21 80:1,8,11 81:6 87:11,16 91:17 92:10,18,22 93:10 99:13 100:5,25 101:1 102:5,6 103:15 106:13 107:4 107:17 109:24 110:21 112:6 112:14 121:15 121:16,17 122:1 reported 2:15 44:14,17 71:2	96:6 126:3 reporter 3:6 5:3,16 6:12,19 7:5 10:6 123:1 123:5,10 124:9 125:5 reporting 44:15,19 63:16 63:19 107:2 reports 45:9,9 53:11 59:9 70:10 106:20 117:13 120:24 121:2,5,7 represent 90:7 representation 14:24 representative 90:15 representing 6:3 reproductive 19:21 request 28:9 requested 123:8 required 96:14 117:11 requires 75:6 113:9 research 8:20 8:22 16:14 17:22 20:14 21:4 34:10	52:15,20,22 53:6 56:25 114:10 researched 20:9 reserve 3:16,19 reserved 3:15 124:19 responded 114:25 response 17:19 44:21,22 45:2 75:8 107:18 108:15,19,21 109:1 111:13 114:17 115:4 121:11 responsible 88:1 89:7 responsiveness 3:17 rest 99:6 result 24:9 28:5 30:8 32:18 33:1 41:17 75:14 81:24 94:16 99:17 results 29:14 31:11 35:6 44:13,17 45:2 48:21 76:15 81:19 83:20 90:18 91:2,5	retained 101:16 retrieval 22:9 22:11 retrieved 22:15 22:16 25:5 retrospective 84:20 return 64:11 reveal 23:2 review 4:16 12:23 13:21 23:21 26:9 27:6,10,13 28:4,11,18,20 31:17 32:6 38:7 39:6 40:2 40:4 50:24 51:3,13 53:17 70:23 86:23 87:2,4 108:7 117:25 118:18 reviewed 9:19 10:13,22 11:22 15:5 19:19 21:18 23:5,12 23:24 28:16 36:10 38:23 40:17 45:20 48:9 49:11 50:14 53:22 61:1 69:11,16 69:19 70:4 87:18 96:4
---	--	---	--

116:2 120:20 122:15 reviewing 35:14 54:9 71:6 118:21 reviews 21:14 21:17 25:14,22 26:25 28:2 58:5,5,13 ridge 2:4 right 3:14,19 5:24 7:3 9:11 12:6 14:17 22:25 23:4 36:20 38:8 42:13,17,25 45:18 50:5 54:22 71:11 75:21,22 79:18 82:18 85:25 86:6 91:16 116:20 119:9 121:12,16 122:2,7,21 rights 3:21 risk 4:14 18:4 27:7 35:1 37:2 39:23 40:5 41:18 46:14 56:6 64:13,15 65:16,18 67:21 71:20 79:3 81:8,10,12,15 82:3,9,10,12,14	82:15 83:8 84:7 87:9,11 87:15,17,20,22 88:15 89:23 91:12 94:7,14 94:17,23 95:1 95:4,23 96:8 97:5,12,12,20 97:21 98:23 106:22,25 109:16 111:22 112:1,5,17 115:22 risks 37:13 38:2 65:13 95:17 112:7 robust 34:7 rodricks 53:3,3 54:6 room 6:1 rosenfeld 107:16 rothman 33:18 34:2,4,5 72:5 rothman's 33:19 rough 22:3,5 120:21,22,23 121:6 123:7,9 roughly 64:1 route 59:3 routes 37:9 39:14	rows 64:2 rpr 2:15 3:5,23 124:12 125:4,6 126:3 ruckart 47:16 47:16,22,23 48:15 59:11 107:13 rule 35:12 78:3 rules 3:8 s safety 64:17 sample 105:3 samples 66:5 103:23 sampling 66:2 66:25 sarah 2:15 3:4 3:23 5:16 124:12 125:4 126:3 sat 18:9 saturate 110:22 saturated 110:6 saturation 110:2 save 22:10 118:2 savitz 54:21 saying 6:13 8:12 14:14 68:7 72:22	77:9 97:16 102:15 104:2 107:7 113:6 says 42:4,13 46:11 61:7 86:7 111:19 sc 2:4 scale 57:6 scales 57:24 58:1 scenario 68:10 110:13 scenarios 107:9 scheme 56:5 schemes 114:14 science 15:16 117:22 119:2 sciences 17:2 17:14,24 53:8 scientific 32:16 54:7 57:19 65:6 67:5 73:21 75:9 79:2 93:18 107:10 113:10 113:15,16 117:10 118:18 118:21 122:5 scientifically 75:19 scientist 31:14 31:17 57:14 58:22 116:25 117:18 119:4
--	--	---	---

scientists 31:24 52:25 71:6 115:24 scope 24:3 28:18 29:18,20 30:2,4 34:24 35:15,19,22 68:24 93:17 96:3,17 102:4 102:9,18 105:11,14,20 108:20 115:25 117:24 scratch 52:7 screening 22:21 search 24:2,10 24:20,24 25:8 25:17 26:2,3,9 26:13,16 27:9 27:12 28:5 31:1,10,14,16 80:8,13,14,19 80:23,24,25 searches 22:6,8 24:12 25:4,5 26:22 31:6 second 40:1 43:12 61:19 63:3,21 68:19 86:4 section 24:1,15 25:1 46:4,6 48:5 85:24	91:25 92:22 93:1 101:1,2 101:12 102:5 103:15 sections 78:20 see 6:21 7:3 8:3 9:4 10:4 11:1,8 22:10 34:4 36:21 40:9 41:8 42:3,7,8 42:11,12,15,19 42:21,23,25 43:3,9,19 44:13 46:5 49:25 51:16 54:22 55:13 56:11 61:7 65:7 69:4 75:1 75:3 77:7,8,17 77:25 78:9 85:21 86:7 90:25 91:21,23 93:12 95:15 97:11,11,19,22 99:1 106:14 109:14 114:2 115:4 116:1 seen 22:4,6 53:22 57:1,2 67:7 70:10 75:8 83:9,12 88:12 89:15 90:19 111:6 121:1,3,6	selected 13:21 selection 90:8 sense 24:17 71:10 78:12 117:11 119:3 sensitive 64:24 sentence 23:23 32:9 39:15 41:25 48:19,23 56:4 78:23 85:13 86:7 89:10 93:3 separate 17:3 24:24 79:23,25 80:19 106:18 separately 113:19 115:7 series 84:23 85:9 serious 45:25 served 9:7,13 service 27:15 serving 53:1 set 33:14 47:5 50:5 64:23 65:4,17,18 sets 33:12 77:23 96:25 several 53:4 81:9 102:22 share 78:14,14 78:15 121:22 sheet 126:1	short 11:12 36:16 60:16 100:18,21 119:22 shorter 95:14 95:19 show 23:17 29:5 51:6 57:21 76:16,16 76:17 77:3 114:23 115:5 shower 67:12 showing 113:17 shown 73:24 95:17 shows 75:25 side 11:2 47:5 61:13 119:10 sides 11:2 sign 3:14 7:11 signal 39:10 48:2 signature 124:18 125:2 significance 31:22 60:3 significant 29:9 29:14 35:7,9 63:25 81:15 84:24 85:10,16 85:19 86:8 110:10 significantly 45:11
---	---	---	--

similar 10:19 76:17,17 88:12 102:12 112:20 113:3,22,22 121:23	115:16 somebody 89:1 108:4 somewhat 19:18	107:19 111:10 111:15 112:5,8 122:12,13	standing 123:1 123:3,6
similarities 73:25	sorry 5:25 9:23 11:2 43:9	specifically 3:15 19:1,16 20:2,16 23:22 24:7 25:3	staple 61:12
similarly 7:6 98:8,9 99:23	48:12 49:22 51:9 56:9	48:17 92:23,24 93:2 103:1	start 22:6 24:10 26:10,12 26:24 32:2 47:13 52:7 60:20 72:20 101:20 110:3
simple 111:23 113:17	62:22 71:9 85:2 91:24	107:11 116:10	started 5:24 11:22 21:2 66:25 73:8 120:1
sir 33:8,17	102:10 115:1	specifics 10:20	starting 12:2 19:3 56:19 66:6,19 94:5
sit 75:20	sort 26:20,23 30:18 113:5 119:10	spectrum 18:17	starts 101:6
site 68:4	sound 8:7	split 62:25	state 30:2 39:4 39:12,18 65:2 70:1 78:23 84:3 85:14,18 86:12 87:3 88:12 104:11 120:8 121:24
sites 115:23	sounds 38:18	spoke 7:6 22:19	stated 40:25 41:3 47:2 69:9 86:12 87:14,23 94:9
situation 60:11 97:17	source 25:10	spreadsheet 106:16	statement 23:15 84:10 88:10
six 51:5,12 100:23 120:12	speak 24:14	standard 33:3 33:6 42:5 49:14,20 57:9 57:16 58:18 59:13,15,20 62:4,9,23 63:4 63:9,13 71:22 82:8 116:12,15 116:18,18,20 116:21 117:9 117:16,21 118:6,9,14 119:14	statements 102:12,13
skimmed 10:25	speaking 7:5,8	standards 118:21	
skip 44:3	species 73:25 76:3		
skipped 42:8	specific 20:7,11 21:24 23:15 24:22 26:3 35:3 38:20 47:18 48:16 53:16 64:20 66:18 68:4,7 68:11 82:16 88:17 89:13,18 91:13 93:22 97:1 98:15,24 99:8 101:2		
sleeping 74:8			
small 44:5			
smaller 23:14			
smoke 89:1			
smoking 49:2 75:10 81:8,15 81:22 82:6 87:16,23			
smr 49:25 61:22 62:20			
solvents 19:23 92:13 115:15			

states 1:1 3:6 5:12 6:3 8:21 41:21 56:4 89:6 120:2 124:1 stating 75:18 station 2:9 statistical 31:21 60:2 83:18 statistically 29:9,14 35:6,9 45:11 63:24 statistics 121:20 statute 118:1,4 statute's 118:8 118:13 stenographic 5:15 step 31:1 steps 72:24 sticker 84:16 stipulated 3:2 stipulations 3:1 stop 16:24 23:4 storage 74:7 store 73:17 74:10,11 straight 94:25 strategy 19:20 street 2:4,12 strength 34:12 35:4 58:22	71:2 strengths 71:3 strike 81:14 strong 38:15 strongest 39:10 students 17:6,7 17:7,8,9,9,10 studied 19:2 27:2 107:11 studies 9:22 13:15,18 21:16 22:13 25:18 26:20 28:14,20 28:24 29:5,7,8 29:13 35:7 38:16 47:9,13 47:17 48:8,10 48:15,18,21 53:10 59:11,11 60:1,2 61:6 70:4,14,15 71:1,3,6,8 72:3 72:7 73:23,24 77:20,24 78:8 81:25 87:19 94:21,22 95:17 107:13 108:18 109:10 110:20 111:17 113:20 115:5 118:21 study 4:10 13:19 35:5,6 35:10 40:18,21 41:5,12,20	42:3 45:7,20 45:21,25 47:8 47:13,15,16,16 47:23 49:13,16 50:19,21 51:1 61:2,5 76:10 83:13,15,20 84:19,21,22 85:15,19 86:15 89:24 90:4,5,7 90:17 91:2,7 91:16,19 92:7 92:9,12 95:12 95:12 107:14 107:21 109:4,6 109:16,21 113:17 study's 41:21 studying 16:25 submission 14:9 submitted 11:16 14:9 121:5 subscription 27:15 subsearch 26:20 subset 23:14 substance 13:8 18:18 103:5 subtype 24:22 suffered 40:21 45:25	sufficient 38:14 39:1 93:13 95:25 suggest 101:25 112:4 suggested 102:3 suggestions 88:13 summary 39:24 40:3 55:17 56:21 121:20 superfund 115:23 supplemental 11:6 supplies 4:12 66:14 supply 29:24 support 38:15 40:3 72:8 93:19 supported 52:24 supporting 22:24 supports 104:19 sure 10:18 11:9 12:8 13:3,13 13:17,19 16:11 26:19 27:22 53:21 68:10 85:8,19 86:19
---	--	--	--

92:2 119:19 120:3 surprise 51:13 51:25 susceptibility 91:11,25 swear 5:16 swearing 3:12 switched 17:25 sworn 5:3,18 124:15 synergistic 111:16,18,20 111:21 113:24 115:12,20 synergy 113:9 113:15 114:24 system 39:24 67:24 73:2 74:3,18 76:8 76:18 79:4 106:19 systematic 51:3 86:24 87:1,2 systemic 86:22 86:25 systemically 77:13 systems 106:18	46:15,22 49:13 49:17,18 50:2 61:13,14 62:13 62:18,21,22 63:16,20,21,25 97:8 106:13,15 106:16 112:22 121:17 tables 49:23 105:22 take 13:25 17:10 22:7 36:12 41:24 49:1 51:23 54:16 55:24 60:13 61:25 62:21 64:1 73:11 82:13 88:3 90:22 92:6 102:16 104:16 112:22 112:22 113:21 119:18 123:9 taken 3:4 36:16 60:16 66:6 82:23 100:21 107:22 119:22 124:11,23 takes 50:18,20 talk 20:17 23:19 24:16 30:2 49:5 66:19 89:17 92:9 93:5,7	98:22 107:4 108:18 117:7 talked 23:3 31:21 79:6 87:20 119:10 119:11 talking 7:4 13:16,18 18:17 48:17 65:17,24 78:13 79:12 82:8 86:1 87:6 97:6,6 98:24 98:25 99:8,9 99:17 109:2,3 109:4 110:11 talks 19:20 33:15,22,23 41:9,9 49:11 72:5 75:10 tap 67:22,25 tarawa 104:21 104:22,23,23 105:8 target 77:18,19 77:20 taught 17:5 tce 8:16 21:16 24:5 25:21 27:3 28:14 29:6,22 38:10 38:13,24 39:13 39:13,18,24 40:6 76:22 78:15,25 83:8	84:23 85:9 92:16,16 98:7 98:8,14,21 99:15,17 100:6 104:3,10,15 110:5 111:2,3 111:8 112:20 112:24 115:6 115:11,20 121:22 tch 89:22 teaches 29:4 tec 99:18 tell 6:25 26:23 54:4 55:21 57:23 58:20 67:3,16 81:21 91:6 108:5 117:1,7 telling 30:20 48:13 103:25 tells 119:7 ten 49:8 89:7 97:15 109:13 109:14,14 tend 9:1 term 24:11 26:14 55:18,22 56:25 57:1,18 68:7 74:7 76:10 120:21 terms 19:23 23:25 24:2,20 26:2,3 31:14
t			
table 42:2,3 43:4,6 44:10 44:11,14,19			

31:16 33:16 39:8 55:9,10 71:12,15 72:12 73:16,25 75:22 77:17 81:19 87:6 88:14 104:24 117:23 terrace 105:8 terribly 62:12 test 114:11 testified 5:4 40:20 45:24 testimony 3:15 3:22 7:10,20 10:23 22:3 41:6 46:3 124:16 testing 19:21 67:10 tetrachloroet... 4:14 8:18 texas 3:6 5:11 text 33:18 textbook 33:21 33:25 34:2,4,6 72:5 textbooks 30:7 33:21 77:23 thank 5:20 11:20 14:17 18:21 19:14,25 28:24 29:17 32:11 38:8 40:9 50:9	52:16 60:22 63:17 64:6 99:4 100:15,15 102:20 115:3 119:15 theoretical 113:10 thereof 3:20 thing 8:9 77:18 106:23 things 5:24 11:7 12:2 13:3 13:4 19:5 22:17 23:19 25:17 28:15 32:13,17 35:3 59:5 66:20,21 68:23 71:1,14 72:8 76:4 80:8 80:18 87:5 111:4 114:15 116:3,4 120:20 think 8:24 9:8 10:17 11:2,5 11:11 13:24 22:5,19 23:16 25:24 26:16 29:2 31:13 39:4 41:15 44:24 45:8,9 46:3 47:3 50:16 55:2,21 56:18 60:25 62:13,15 65:16	70:24 86:21 87:23 89:14 90:2,9,24 93:9 93:16,18 96:2 103:18,25 105:20 106:5,8 106:15 107:6 110:16 112:6 114:15 117:6 118:10,16 120:19 third 40:9 42:4 46:24 thirds 88:9 thirty 21:8 thought 11:24 13:12 25:23 83:11 85:4 117:10 122:10 thousand 97:16 three 9:8 12:13 13:18 26:6 27:14 39:17 48:14,18 78:14 78:19 82:11 89:13,17 99:20 112:19,23 114:25 121:2 122:13,17,18 threshold 94:15 98:16 113:19 throwing 98:23	tied 8:12 9:2 time 3:18,20 5:8,9 10:1 11:12 12:21,22 21:12,24 31:8 33:12,18 35:5 37:17 38:6 41:24 51:7,12 60:14,17 65:21 66:9 67:5 68:13 74:10,15 75:7 76:14 82:19,24 95:14 95:15 103:9,24 105:2,24 109:12,20 119:23 124:20 times 12:4 21:9 23:16 tiny 64:10 tipping 57:8 58:1 tips 57:6 tissue 16:18 tissues 16:16 title 28:22 40:3 titles 28:7 tobacco 87:16 87:24 88:6 today 6:4 7:20 7:23 9:5 26:5 120:4 121:1 today's 5:8 9:15 10:9
---	---	--	--

together 19:20 19:24 53:1,4 58:6 111:23 114:2,18 115:6	114:17	transcript 3:15 7:10 124:15,19	77:4,15,16,17
told 22:2 26:5 68:15 70:24 112:5	toxicokinetic 73:24 109:2	transcripts 120:23,25	turn 6:14 14:13 19:25 29:19 32:3 36:21 38:8 42:2 43:4 44:10 46:15,22 54:15 61:10 67:25 69:10 72:16 78:22
tongue 8:12 9:2	toxicokinetics 23:20 76:17	transition 101:1	turned 27:25
took 11:3,4 14:2 33:2 106:7,8,9	toxicological 40:2,4	translating 119:2	turner 2:11
tool 32:6	toxicologist 15:25 26:8 36:1 54:11 69:6 71:19 93:23 101:20	transparency 55:11	turning 116:6
top 47:14 86:4	toxicologists 16:13 94:5	treatment 66:24 67:11,15 103:7,11	twenty 12:20
topic 31:16 48:5 90:1 92:9	toxicology 16:3 16:4,10 17:4,8 17:10 18:3,9 18:14 30:25 35:1,22 37:22 77:23	trichloroethyl... 4:17 8:17 40:2 106:21	two 9:8 11:13 11:14 12:5,12 12:13 20:1 32:13,17 42:24 44:5,6 47:17 63:1 88:9 100:16 105:7 106:17 107:2 110:4 113:18 113:21 118:15
topics 10:19	toxicology's 16:6	tried 96:8 106:5 113:21	twofold 82:14
touched 28:3	toxline 26:7 27:11 28:1	triggered 16:22 17:16	tx 125:6
towards 46:13 56:3 85:6 86:4 121:9	tracing 98:21 98:21,21	true 19:12,15 70:10 74:19 124:16	type 47:18 51:1 65:23 68:19 87:6 89:6 112:3,4 114:10
townsley 2:15 3:5,23 5:16 124:12 125:4 126:3	training 15:7 16:7,14 20:3 20:15 35:3 40:18 65:3 118:19	truly 108:12	types 20:22 21:15 55:13 59:9 71:14 75:3,14 78:3
tox 27:5	transcribe 6:19 7:6	truth 7:1	
toxic 76:5,7 78:25 99:21		truthful 7:20	
toxics 75:15 79:19		try 7:14 22:10 80:24 86:21 108:14	
toxicity 16:18 16:23,25 19:3 19:21 20:24 75:25 76:3 113:20 114:1,2		trying 24:19 48:4,23 86:24 98:3 115:1	
		tumors 75:18 76:16,24 77:3	

typewriting 3:13 typical 6:9 typically 7:3 8:3 12:3 24:9 25:6 26:4 37:5 113:14 115:15 typo 14:5 typographical 13:2	understand 6:6 6:10,21,24,25 7:13 24:25 29:2 48:9 67:3 72:9 74:23 78:9 93:12 99:10 100:16 102:14,20 116:17 118:10 119:4	university 15:19,23 16:4 17:1,12,24 unpaid 11:14 unquantified 64:17 unscientific 117:16 unusual 66:10 update 31:6 34:3 updated 34:2 upper 43:15 urgency 74:13 urinary 62:1,10 63:9 73:2 74:18 76:18 79:4 urinate 74:6 urinating 74:8 urine 73:1,17 74:10,11,14,14 74:20,22 75:7 75:15 78:17,18 79:20 urothelial 24:22 25:3 73:2,3 74:3,4 74:25 75:3 76:8 78:18 87:7,8 88:8 usdoj.gov 2:10 2:13	use 8:11,25 23:17 25:8 27:9,14 33:22 34:3,25 46:9 46:10 47:4 67:20 70:20,22 96:18,20 107:9 108:7 113:7 117:14 118:16 118:17,18 used 13:13 25:15 26:6,7 27:22 32:16 56:16 57:1,2 59:15 60:7 64:15 66:6 72:2 87:2 97:18 102:13 117:9,12 120:21 useful 27:16 uses 33:24 using 30:21 32:22 55:22 95:4 97:3
u	understanding 16:21 18:17 20:12 32:2 34:22 36:6 47:21 56:24 57:15 73:15 75:23 80:3 105:12		
u.s. 2:8,11 uh 6:20 92:20 101:7 umbrella 30:19 unable 7:19 unadjusted 63:22 uncertainty 66:13 under 6:23 24:15 46:6 65:18 85:22,24 89:4 underestimates 46:13 underestimates 41:18 undergraduate 17:5,6,6 underlie 36:7 underlying 24:15 46:17	understood 6:8 10:18 13:13 82:10,11 undertaken 36:3 undertaking 69:8 undesired 17:21 unfortunately 61:11 62:18 unintelligible 30:20 united 1:1 5:12 6:3 8:21 120:2 124:1		
			v
			value 65:16,23 77:24 values 64:13,16 65:12,12,18 106:6,18 107:5 107:8

valves 74:18 variants 91:13 92:10 varying 29:23 ventricular 16:24 venue 41:2 veritext 5:7 versus 34:19 35:21 43:7 45:5 50:3 52:6 71:24 104:25 114:24 116:19 121:11 veterans 56:6,7 video 5:10 124:10 videographer 5:5,6 9:23 10:1 36:14,17 60:14 60:17 82:21,24 100:19,22 119:20,23 122:25 videotaped 1:8 3:3 vietnam 56:7 view 30:14 vinyl 18:25 19:1 24:6 29:23 76:22 98:13,23 99:6 99:7,11,14,16 99:21,24 100:2	100:6 101:4 104:4,10 105:2 106:23 111:8 112:22 121:22 122:16 visited 31:8 void 74:5 volatile 67:18 vs 46:23	water 1:4 4:12 5:11 29:24 30:1,18 32:1 46:9,10 48:6 53:18 54:19 58:25 60:12 66:1,5,6,14,23 66:24 67:11 83:9 88:21 92:13 93:8,13 93:19 96:7,11 96:14 97:8 98:20 99:2 101:19 102:8 102:24 103:1,4 103:7,7,8,11,12 103:16,21,23 104:2,6,8,12,18 105:1 107:22 107:23 110:14 111:1 115:5,12 115:20 117:6,9 124:5 way 18:18 23:8 31:13 33:23 39:5 57:6,8 63:24 70:19 72:19 73:17 75:9,11 77:1 84:5 87:4 91:10 98:12,13 98:15 108:1 109:12 112:5,6 113:13 117:20	120:25 ways 18:16 29:4 39:19 109:5 we've 36:13 79:6 weaknesses 71:4 website 22:23 week 9:9 12:3 weekday 12:7 weeks 9:8 51:5 51:12 weigh 31:17 117:17 weighing 57:4 117:16 119:6 weight 23:25 25:12 32:7,13 32:16,19,22 33:2 58:21 69:19,24 70:5 72:12 118:17 weighted 117:20,20 weighting 58:9 weird 67:23 went 10:13 13:1,4,5,7,24 14:6 17:1 22:23 26:6 67:8 wide 41:23
---	---	--	---

witness 3:12,14 3:24 5:17,18 124:14,17,18 124:19 126:2 women 74:17 74:17 wondering 41:4 word 10:25 24:23 59:20 100:16 wording 38:18 38:20 102:22 words 21:7 29:4 30:17 77:5,14 102:15 work 9:3 18:14 19:11,17 20:10 21:12 22:6 24:3 27:21 28:18 29:18 30:4 34:24 36:3,6 53:15 54:4,6 55:5,6 69:8 102:4 114:18,19,20 114:22 116:16 117:24 118:12 118:15 worked 12:18 15:3 18:1,3 19:2,5,8 20:13 21:1 52:22 89:1 119:13	worker 46:9 workers 84:17 84:22 85:8 working 17:11 20:18 74:18 118:25 worry 82:13 111:3 write 30:5 36:22 37:8,20 69:5,11 writing 33:25 writing's 44:5 written 32:4,5 33:20 wrong 56:9 85:4 wrote 14:3	109:14,14,14 yesterday 11:12 12:9,10 12:13,19,22 13:10,15,22
	y	z
	yeah 9:10,10 19:15 54:15,17 62:3,18 63:12 83:7 84:10 85:14 86:6 101:4,11 year 49:8,9 68:12 years 17:22 18:12 21:8 28:12 29:24 34:10 49:12 53:5 83:24 105:16,16,24	zero 94:25 zoology 15:16

Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

DISCLAIMER: THE FOREGOING FEDERAL PROCEDURE RULES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

THE ABOVE RULES ARE CURRENT AS OF APRIL 1, 2019. PLEASE REFER TO THE APPLICABLE FEDERAL RULES OF CIVIL PROCEDURE FOR UP-TO-DATE INFORMATION.

VERITEXT LEGAL SOLUTIONS

COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

Veritext Legal Solutions is committed to maintaining the confidentiality of client and witness information, in accordance with the regulations promulgated under the Health Insurance Portability and Accountability Act (HIPAA), as amended with respect to protected health information and the Gramm-Leach-Bliley Act, as amended, with respect to Personally Identifiable Information (PII). Physical transcripts and exhibits are managed under strict facility and personnel access controls. Electronic files of documents are stored in encrypted form and are transmitted in an encrypted

fashion to authenticated parties who are permitted to access the material. Our data is hosted in a Tier 4 SSAE 16 certified facility.

Veritext Legal Solutions complies with all federal and State regulations with respect to the provision of court reporting services, and maintains its neutrality and independence regardless of relationship or the financial outcome of any litigation. Veritext requires adherence to the foregoing professional and ethical standards from all of its subcontractors in their independent contractor agreements.

Inquiries about Veritext Legal Solutions' confidentiality and security policies and practices should be directed to Veritext's Client Services Associates indicated on the cover of this document or at www.veritext.com.