

ML - Chester

11/30/77

Caputo v. Chester

Transcript of Trial, vol III, witness:

- Dr. Patrick

- exhibits list

p 55

ML0006928

A-813-78
no Brg

A 150 SEP 1979

SUPERIOR COURT OF NEW JERSEY
LAW DIVISION - MORRIS COUNTY
DOCKET NO. L-42857-74 P. W.

JOSEPH CAPUTO and
ALDO CAPUTO,

STENOGRAPHIC TRANSCRIPT

Plaintiffs,

FILED

OF

vs.

JAN 14 1980

TRIAL

TOWNSHIP OF CHESTER
and PLANNING BOARD
of TOWNSHIP OF CHESTER,

Stephen W. Leonard
CLERK

VOLUME 111

Defendants.

PLACE: MORRIS COUNTY COURTHOUSE
MORRISTOWN, NEW JERSEY

DATE: NOVEMBER 30, 1977

BEFORE: HON. ROBERT MUIR, JR., AJSC

TRANSCRIPT ORDERED BY: PHILIP LIEDMAN, II, ESQ.

REC'D. 10
APPELLATE DIVISION
APR 5 1979

APPEARANCES:

MESRS. AMBROSE & MONICA
BY: PHILIP LIEDMAN, II, ESQ.,
COUNSEL FOR PLAINTIFFS

MESRS. MC CARTER & ENGLISH
BY: ALFRED L. FERGUSON, ESQ., &
NICOLAS CONOVER ENGLISH, ESQ.,
COUNSEL FOR DEFENDANTS

FILED
APPELLATE DIVISION
APR 5 1979

Alfred L. Ferguson
Clerk

abm

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ML000692S

I N D E X

Witness

Direct

Dr. Ruth Patrick

By Mr. English

3

E X H I B I T S

Iden.

Evid.

Description

Page

D-33

Document

4

D-22

Document

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D-23

Document

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D-25

Document

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1 MR. ENGLISH: If the Court please, our
2 witness today is Dr. Ruth Patrick who is a
3 distinguished scientist and limnologist. She
4 has been the Chairman of the Limnology Depart-
5 ment at the Academy of Natural Sciences, and
6 in that capacity has directed a number of
7 studies of the water quality in the upper
8 Raritan Watershed, and also presided over the
9 preparation of the natural resource inventory.

10 I think that she can give the Court
11 an elementary course in limnology, how a
12 stream functions, how its assimilated capacity
13 works, and what is the relationship of water
14 quality to land use in the activities of man.
15 More particularly, I expect that she will
16 express the opinion that insofar as the head-
17 waters area such as Chester bears to the
18 Raritan River, it is necessary to maintain a
19 high standard of water quality for a variety
20 of reasons which she will outline. But one
21 of them is that it is necessary to give the
22 stream further down a fighting chance of
23 maintaining its health.

24 I expect she will express the opinion
25 that the upper Raritan Watershed, as a whole,

1 now contains just about all the population that
2 it can accommodate without degradation of water
3 quality, that a watershed is essentially a unit.
4 If one part of it is overpopulated, that the
5 streams and any part of it are polluted, then
6 some kind of a trade off in composition in
7 another part of the watershed is necessary.

8 I think she will express the opinion
9 that Chester Township because of its natural
10 features and the location in the headwaters
11 area is not a suitable place for relatively
12 dense residential development, nor for sewerage
13 systems, nor for very extensive spray irrigation
14 systems.

15 Shall I call the witness?

16 Dr. Patrick.

17 R U T H P A T R I C K,

sworn.

18 DIRECT EXAMINATION BY MR. ENGLISH:

19 Q Dr. Patrick, what is your occupation, or pro-
20 fession, in a very simple, general way? A My
21 occupation is a scientist, an ecologist primarily concerned
22 with research and experience with water quality of rivers.

23 Q Dr. Patrick, I show you a document which is
24 entitled, "Biographical Data for Dr. Ruth Patrick," and
25 ask you if that is the listing, or description of your

1 education, professional positions, honors, awards, degrees,
2 committees and boards and things of that kind.

3 A Well, most of them. I might say one thing though--

4 Q Let me interrupt you. Do I understand there
5 are a few verbal amendments you would like to make to the
6 document?

A Yes, sir.

7 MR. ENGLISH: The document in Evidence.
8 If the Court please, and if your Honor has a
9 chance to look at it, I think the verbal
10 amendments will make more sense.

11 MR. LINDEMAN: No objection.

12 THE COURT: D-35 in Evidence.

13 (D-35, document, previously marked for
14 Identification was received and marked into
15 Evidence.)

16 Q Now, Dr. Patrick, will you tell us please what
17 changes ought to be made in this document as a result of
18 things that have happened since it was prepared?

19 A Well, I would like to point out that the U.S. Energy
20 Research and Development Administration--

21 Q This is the bottom of Page 37

22 A Commonly known as ERDA, E-R-D-A, is no longer in
23 existence and it is now the Department of Energy and under
24 Mr. Schlesinger. I now serve on two committees, one on
25 solar energy and the other on the potential of CO₂ being

1 a problem in the atmosphere of the biosphere.

2 Q CO₂ for the benefit of the layman is what?

3 A CO₂ is carbon dioxide resulting from the burning of
4 fossil fuels.

5 I am also at present on a special ad hoc group of our
6 President concerned with what should be the water policy in
7 the future and I am to write, as a member of this special
8 committee, on water quality.

9 Q How large a group is the one that you just
10 referred to? A Five people.

11 Q And, the president is President Carter?

12 A Yes, sir. It's directly under Dr. Frank Press the
13 science advisor to the President.

14 Q Are there any other amendments you want to
15 make? A I don't think so. I have received
16 several honors since this, but they are not of great
17 significance.

18 Q On the second page, may I direct your attention,
19 under the list of honors and awards to the recipient of
20 the Annual International John and Alice Tyler, T-Y-L-E-R,
21 Ecology Award, 1975. Can you tell the Court please what
22 that award is? A Well, that award is given to
23 the outstanding ecologist of the world as judged by a
24 committee composed of representatives from Harvard
25 University, from M.I.T., University of California and one

1 other that I can't recall right now. This award is some-
2 times referred to as the Nobel prize of ecology because
3 there is no Nobel prize in ecology.

4 Q Can you describe for us what has been your
5 connection with the Academy of Natural Sciences in
6 Philadelphia?

7 A I went to the Academy of
8 Natural Sciences as a young graduate student. In fact, I
9 had just started graduate work around 1934, as a volunteer.
10 I continued as a volunteer until 1945. I then went on a
11 small salary with the academy. In 1947, I established the
12 Limnology Department of the Academy of Natural Sciences
13 of which I was chairman until the fall of 1973. I have
14 since then been Chairman of the Board of Trustees of the
15 Academy of Natural Sciences, and am presently Honorary
16 Chairman, Senior Curator, that means, senior scientist of
17 the institution. I'm also an adjunct professor of the
18 University of Pennsylvania where I presently teach two
19 courses in limnology.

20 Q Do I understand that in addition to the
21 material listed on Exhibit D-35, you do a certain amount
22 of lecturing at universities and other bodies?

23 A Oh! Yes, sir, I do.

24 Q Can you describe briefly your activities in
25 that area where you lecture?

A Well, I have
lectured in the School of International Studies at

1 Salzburg, Austria where I organized a course in water
2 pollution. I have taught at Yale University a course in
3 ecology. I have taught at Harvard University in their
4 land planning program. I have given a great variety of
5 lectures all over the Country and in Europe.

6 MR. ENGLISH: If the Court please, I
7 tender Dr. Patrick as an expert.

8 THE COURT: Mr. Lindeman, any questions?

9 MR. LINDEMAN: I have no questions, your
10 Honor.

11 THE COURT: All right. Proceed then.

12 Q Dr. Patrick, in what general fields of research
13 have you engaged during your professional career?

14 A I have, of course, concentrated most of my efforts
15 since 1947 in the study of rivers. I have myself personally
16 entered and studied in detail some eight-hundred sections,
17 over eight-hundred sections of rivers in the U.S., in
18 Europe, in Canada, in Mexico and in South America and in
19 Thailand. I have spent most of my time studying,
20 published over one-hundred scientific papers on aquatic
21 systems, and this includes their chemistry, physics and,
22 of course, emphasis on their biology. My particular
23 studies have dealt with the algae, diatoms, but I have
24 also spent considerable time working with all groups of
25 organisms.

1 Q For the record, how do we spell diatoms?

2 A D-I-A-T-O-M-S. I have also been a concerned
3 scientist in the sense that I have participated actively
4 in various government committees and, as the record will
5 show, am now actively on the Executive Advisory Committee
6 of the Environmental Protective Agency. I'm on our
7 Governor's Science Advisory Committee. I'm on the Board
8 of Nature Conservancy and a number of other such boards
9 which I take an active interest in.

10 Q Dr. Patrick, I show you what appears to be a
11 Xerox copy of an article written by you entitled, "Some
12 Thoughts Concerning Correct Management of Water Quality,"
13 which appears in a volume entitled, "Urbanization and
14 Water Quality Control," headed by William Whipple, Jr.,
15 and ask you if that is a copy of one of your publications.

16 A Yes, sir.

17 MR. ENGLISH: I offer a copy of the
18 article in Evidence.

19 MR. LINDEMAN: I object, your Honor.
20 I do not know if this article was presented to
21 us previously. I think not. But in any
22 event, under the ruling, at least under Ruth
23 vs. Fenchel which was referred to us yesterday,
24 this is not the kind of thing that properly
25 can be done even if the article is written by

1 the witness herself because what it would do
2 presumably would be to buttress testimony which
3 she would otherwise give, and her testimony
4 is really the thing that this Court is con-
5 cerned about, not general articles on a field
6 which may, or may not have anything to do with
7 the subject at hand. So that, really, my
8 objection is twofold. First, that I have not
9 seen this article before and, secondly, that
10 it is not proper to be received.

11 MR. ENGLISH: I think Mr. Lindeman may
12 be correct. He has not seen this. My only
13 purpose in making the offer is that here is
14 a statement in readable form on the general
15 subject of water quality and the management of
16 it which I think is of importance in this case.
17 I thought it might be helpful to the Court to
18 have this in the record.

19 THE COURT: For the terminology?

20 MR. ENGLISH: It does not define termi-
21 nology, but expounds the general concepts of
22 the subject.

23 MR. LINDEMAN: I don't know that, your
24 Honor.

25 THE COURT: I don't either.

1 MR. LINDEMAN: For that reason I would;
2 naturally, I'm fearful of it. I don't know
3 what is says.

4 THE COURT: All right. I think you're
5 correct. I long for help like that, Mr.
6 Lindeman, but I think you're technically
7 correct. So I'll sustain your objection.

8 MR. LINDEMAN: If your Honor please--

9 THE COURT: I have gone through that
10 problem before. Medical information is very
11 difficult. I'm a layman and--

12 MR. LINDEMAN: So am I, of the worse kind.

13 THE COURT: When we start throwing terms
14 around it's very difficult to grasp them.
15 You're correct.

16 MR. LINDEMAN: This may be of aid. I'll
17 read it and if I think there's no--

18 THE COURT: All right. But, I'd
19 like you to look at it now if you would take a
20 glance at it because if it's terms she's going
21 to be talking about it would be helpful.

22 MR. ENGLISH: If the Court please, I do
23 not anticipate that, having this article in
24 front of you would be any particular help
25 during the examination of the witness.

1 THE COURT: What I'm saying, I would
2 like to take a look at it, get an idea of the
3 terms that she's going to be discussing. I
4 have had one other case on streams and the
5 algae, and the flora, and the fauna in the
6 stream and on some of the terms I had a great
7 deal of difficulty with someone from the
8 Academy of Natural Sciences. Not Dr. Patrick
9 but someone else, and it was an area that I
10 can't honestly say I can recall all the terms.
11 But I remember having a great deal of difficulty
12 with some of the terms, and I have to write an
13 opinion, or give an opinion so I'd like to go
14 through the terminology if there are any
15 technical terms I will be running into.

16 MR. LINDEMAN: There are a few things
17 already that I see that give me trouble.

18 THE COURT: All right. Okay. Doctor,
19 when you go into technical terms, I wish you
20 would go a little slowly, at least, at the
21 outset.

22 THE WITNESS: And explain the meaning?

23 THE COURT: Yes. Thank you.

24 Okay, Mr. English.

25 Q Now, Dr. Patrick, in the course of your work

1 have you conducted and directed any research programs
2 dealing with the water quality of the upper Raritan Water-
3 shed? A Yes, sir.

4 Q I show you a document entitled, "Water Quality
5 Survey Upper Raritan Watershed, August and November, 1967"
6 which has been marked Exhibit D-22 for Identification in
7 this proceeding, and ask you if you can tell the Court what
8 that document represents. A This document

9 represents a study which I helped to conduct in 1967,
10 during the months of August and November. I actually
11 visited these areas, at least, most of them and helped with
12 checking of the invertebrates though I was technically in
13 charge. Well, as it states here the fieldwork was done
14 by Dr. Patrick and Mr. Robert R. Grant, Jr. So it shows
15 I participated in that.

16 Q Does this report, Exhibit D-22 for Identifica-
17 tion, express the results of the studies which you made?

18 A At that time, yes, sir.

19 MR. ENGLISH: I offer it in Evidence.

20 Q Dr. Patrick, was there any particular purpose
21 that was imposed upon the society for the preparation of
22 this document, D-22? A Do you mean by--

23 Q Was the society asked merely to report on the
24 health of whatever streams existed in the watershed solely
25 for the purpose of determining what that was or did it go

1 beyond that, that is to say, was it also to determine what
2 affect, if any, development in the area had, or was having
3 upon the health of the streams? A As I recall,
4 sir, the purpose is just as stated on Page 3. The purpose
5 of these surveys was to determine whether or not there was
6 a reasonably well balanced flora and fauna, and if the
7 flora and fauna was not well balanced how it was altered.

8 Q Yes. In that respect is it that the determina-
9 tion was to be the extent in the streams themselves that
10 the flora and fauna may have been altered or was it also
11 the cause, if any, of any such effect? A We
12 looked at, our first charge was to look at the stream.
13 If we found it had been altered, to then try to estimate
14 what was the cause.

15 Q Do you know if there were any conclusions in
16 the document that identify any causes of changes?

17 A Well, in our studies it is, in this particular
18 study, and many of the academy's, it has been the purpose
19 not to name names but to rather point out conditions such
20 as enrichment due to nutrients such as sanitary wastes
21 entering a stream or due to increased sedimentation, but
22 not to, unless we were specifically asked to, name a given
23 company, or a given town as the cause.

24 Q Well, rather than just name an entity
25 which may have been a malefactor, was it the purpose and

1 the actual operation of this report to identify what may
2 have happened, what the cause may have been? For example,
3 if it were, if there were a plant being constructed by
4 U.S. Steel and the society did not want to mention the name
5 of U.S. Steel, did it at least say that construction, or
6 excavation of the soil in any area was a cause of a
7 particular alteration which had been found?

8 A Now, for instance, on Page 12 under Station 10 it
9 was, this lack of fauna indicates the condition of the
10 water at this station was polluted during both surveys.
11 The condition of the flora indicated that this pollution
12 was not as toxic to plants. The upstream land use
13 contained both residential and industrial areas. This
14 area would be classified as, this area of the stream would
15 be classified as polluted. Now, in that it refers to the
16 general cause, probably being, but does not, residential
17 and industrial areas. Then over here on the next page--

18 MR. LINDEMAN: Just one moment please,

19 Dr. Patrick. You're referring to Station 10?

20 THE WITNESS: Yes. Then on--

21 BY MR. LINDEMAN:

22 Q I just want to ask you something on that one.
23 Does that last paragraph refer to a change so far as you
24 can see or recall, or was it just the reporting of a
25 condition? A Well, it was comparing, as it says,

1 this fauna with other stations. For example, other stations
2 that we were examining at the same time. That is what it
3 was trying to do.

4 Q Okay. Will you go to the next--

5 A On page 13 it says, "This station appears to be semi
6 healthy, near polluted due to organic enrichment." This
7 station is below the Bernardsville sewerage treatment plant;
8 the upstream land use so we did pay attention to land use,
9 was moderately residential. A dozen or so new homes were
10 noted on the hill just above the station. So I think that
11 answers your question as to how we considered the land use.

12 Q But, you did not necessarily attribute land
13 use to the fact of either pollution or the absence of land
14 use to the fact that water was clear; is that a fact, or
15 was it not correct? Were you not just simply identifying
16 a condition rather than to make an evaluation?

17 A No. We were trying to relate it in general to the
18 land use in the area. Of course, at the time this was
19 being done Mr. Lloyd, then an employee of the Academy of
20 Natural Sciences, was making these maps which you have
21 seen.

22 MR. ENGLISH: Referring to the natural
23 resource inventory?

24 THE WITNESS: Yes, natural resource
25 inventory.

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THE COURT: Mr. Lindeman, are you cross examining her on her testimony as it's reflected or--

MR. LINDEMAN: No. The purpose is I wanted to, there's no question, of course, of the witness's qualifications and the fact that the document, report was prepared under her direction, but so far as the data which is contained in it I'm just curious to find out if conclusions may have been drawn from it or in it that are based upon information which, perhaps, so far as this Court is concerned, may not be properly receivable. We had a lot of testimony yesterday--

THE COURT: On what basis?

MR. LINDEMAN: On the fact that--

THE COURT: Let me just tell you this so you don't get caught in any unexpected traps. I have done some further research and there's a strong suggestion by at least Judge Conford that I am mistaken in my rulings yesterday. Mr. McCormack also suggested, having read both of them last evening, Mr. McCormack suggests the foundation that Mr. English laid yesterday with respect to the

1 utilization of technological information can
2 be the basis for a report. Judge Conford is
3 even more specific in a case called Shamoan In-
4 dustries vs. the Department of Health in New
5 Jersey 93 N.J. Super--

6 MR. LINDEMAN: What's the page, your
7 Honor?

8 THE COURT: Well, I have to get you the
9 page. First page is 272. The portion that
10 is significant is at 283 and I'll read it to
11 you because it's very important. "Appellant
12 argues that in effect Wortreich's testimony
13 was hearsay to the extent that he relied upon
14 his guide which in turn was based on technical
15 literature not in Evidence. This is not a
16 sound objection. The guide was not relied
17 upon or cited testimonally as proof of the
18 truth of its contents, but merely is evidence
19 of what Wortreich considered in arriving at
20 his expert conclusions of violations of the
21 code by the appellant."

22 What they were dealing with was air
23 pollution violations. "So for that purpose,"
24 and he goes on and he says, "For this purpose
25 it was unexceptionable. Most experts rely on

1 what they regard as authoritative literature
2 in their fields. That Wortreich did so in
3 this case does not undermine the competence
4 of his testimony, but adds rather to probative
5 weight."

6 MR. LINDEMAN: That changes the rule--

7 THE COURT: It seems to me it would
8 change it with respect to all except that one
9 map where there seems to be some subjective,
10 some very subjective utilization. Weight
11 might be one thing. Admissibility is another
12 which Mr. English was arguing the point and it
13 would seem to me that what Judge Conford is
14 saying here is, "All right it's admissible.
15 An expert has the right to rely upon it and
16 the precise truth of it is not that significant.
17 The expert has that right to rely on it if
18 it's an authoritative source." And, I would
19 gather that the Soil Conservation Service
20 reports for the U.S. Department of Agriculture
21 are authoritative sources by Mr. Lloyd's
22 testimony. So he did the same thing, almost
23 the same thing, in part, that this Mr.
24 Wortreich did here in the Shamon case.
25 He took technical data from other sources and

1 put it together in his own compilation and
2 then use it to ascertain whether or not there
3 was compliance with the requirements of the
4 Department of Environmental Protection on the
5 particles being emitted from a couple on a
6 Shamoon Industry plant, and as I told you
7 yesterday I do not like to be overly
8 technical. I have a great deal of concern for
9 that one map and I think with respect to that
10 one I'll hold my line. I'm going to make
11 them come in and tell me how you got the K
12 factor and the slope factor to come together
13 and mark up that map. With respect to the
14 others it just seems to me to be a compilation
15 they rely on and even that map can be, could
16 be admissible. The weight that I would give
17 it without understanding how it's arrived at
18 is questionable. But, it would seem they are
19 admissible. Note what I read to you, though.

20 MR. LINDEMAN: I very strongly disagree,
21 your Honor. I don't think necessarily I
22 should argue the point now.

23 THE COURT: Mr. McCormack in his book
24 on evidence, as I indicated to you, suggests
25 rather strongly that this should be admissible

1 because if this is what the experts in the
2 field relied upon, and even your expert
3 admitted that he used, Mr. Ferguson was care-
4 ful to point out to me, as I found in my notes,
5 admitted that he used and found it quite
6 accurate with one exception, particularity
7 to this parcel of land that we're involved in.
8 He relied on the Soil Conservation Service
9 data.

10 MR. LINDEMAN: I agree.

11 THE COURT: If that's the case then
12 what Judge Conford I think is saying is,
13 "Judge, let it in, let it be admissible."
14 The weight that is up to me. The truth of it
15 is something else, again but let the expert
16 use it to rely upon factors for his testimony.

17 MR. LINDEMAN: I think, however, the
18 problem has to be, as the Court pointed out
19 yesterday, whether or not that which is
20 offered is data, and is based on data or is
21 based upon opinion or is heavily opinion,
22 data mixed with opinion in some of those
23 documents, and that's the part that I was
24 very substantially objecting to.

25 THE COURT: But if he relies upon it

1 that way, it seems to me that the admissi-
2 bility factor becomes predominating and the
3 proof of it is, proof of its contents is not
4 the key. It's the admissibility, who has the
5 burden of proving the truth of its contents
6 is still open. But it would seem to be
7 admissible.

8 MR. LINDEMAN: In any event, your Honor,
9 it is not really just based upon the soil
10 business of yesterday but rather to ascertain
11 whether the report is merely to define what the
12 condition of the streams was without regard
13 necessarily to the cause and effect as to
14 which an opinion might have been made. I
15 wanted to find out if there were opinions in
16 this D-22 regarding the reasons for either
17 degradation or health of the streams. I can't
18 really tell.

19 THE COURT: The reason I asked my
20 question is, wouldn't it be more appropriate
21 to cross examine her with respect to the
22 report unless you're saying it has no
23 relevancy at all.

24 MR. LINDEMAN: No, I'm not saying that.

25 THE COURT: Okay. So isn't it more a

1 question of cross examining her to find out
2 the thrust of that report on your client's
3 position rather than question her now on the
4 admissibilities of the document? It seems
5 to me it would be admissible if it has
6 relevance. The weight, again, is something
7 else that I will determine after I heard all
8 the questions and answers propounded with
9 respect to it.

10 MR. LINDEMAN: I guess it can be in both
11 areas. I see the Court's point.

12 THE COURT: All right. Let's let it be
13 marked in Evidence. That will be D-22 then.

14 (D-22, document, previously marked for
15 Identification was received and marked into
16 Evidence.)

17 DIRECT EXAMINATION BY MR. ENGLISH CONTINUED:

18 Q Dr. Patrick, I show you a document which has
19 been marked Exhibit D-23 for Identification in this
20 proceeding which is entitled, "Water Quality Studies of
21 the Upper Raritan Watershed for the Upper Raritan Watershed
22 Association May, 1968, October, 1969," and ask you if you
23 can tell the Court what that document represents and your
24 connection, if any, with it. A This was a study
25 made by the Limnology Department of the Academy of Natural

1 Sciences and it was done under my direction and it is the,
2 I actually participated in part of the study.

3 Q And, what is the general scope and nature of
4 the study reflected in D-23 for Identification?

5 A Well, this is a repeat study on the upper Raritan
6 Watershed looking at the same stations which we had
7 previously. I might say that when we do these studies we
8 certainly do examine the land use at the time that we make
9 the studies but, of course, the main emphasis is placed on
10 the condition or health of the stream.

11 Q In your professional opinion is the health of
12 the stream, the quality of the water in the stream related
13 to the land use in the watershed? A Very much
14 so.

15 MR. ENGLISH: I offer Exhibit D-23 for
16 Identification into Evidence.

17 MR. LINDEMAN: No objection.

18 THE COURT: In Evidence.

19 (D-23, document, previously marked for
20 Identification was received and marked into
21 Evidence.

22 Q Now, Dr. Patrick, I show you a document which
23 has been marked D-25 for Identification in this proceeding
24 which is entitled, "Upper Raritan Watershed, Water Quality
25 Survey, 1972, for the Upper Raritan Watershed Association,"

1 and ask you if you can tell the Court what that document
2 is all about and what, if anything, has been your connection
3 with it. A This was the study in which we
4 paid particular attention to land use and the assimilated
5 capacity of streams in areas of low usage versus those of
6 high density usage. I actually participated in this one
7 too.

8 Q Was it prepared under your general supervision
9 and direction? A Yes, sir.

10 Q When was the fieldwork done for the study?

11 A It was done in 1972, as I recall. Yes, sir. That's
12 right.

13 MR. ENGLISH: I offer Exhibit D-25 for
14 Identification into Evidence.

15 MR. LINDEMAN: No objection.

16 THE COURT: All right. In Evidence.

17 (D-25, document, previously marked for
18 Identification was received and marked into
19 Evidence.)

20 Q Dr. Patrick, I now show you Exhibit D-24 in
21 Evidence which is the natural resource of the Upper Raritan
22 Watershed Association which Mr. Thomas Lloyd has testified
23 about, and I would ask you if you had anything to do with
24 the preparation of the natural resource inventory.

25 A This natural resource inventory was prepared by

1 Mr. Lloyd under my supervision. He was then a member of
2 the Department of Limnology of the Academy of Natural
3 Sciences and I worked rather closely with him in the
4 preparation of this report.

5 Q And, in a general way are you familiar not only
6 with the text which is D-24 in Evidence, but also the
7 series of maps which have been identified as a part of the
8 natural resource inventory? A Yes, sir. I
9 would say that I'm generally familiar with them. I have
10 not in detail gone over them recently.

11 Q As a scientist, Dr. Patrick, what use, if any,
12 do you make of the reports and data produced by the Soil
13 Conservation Service of the U.S. Department of Agriculture?

14 A Well, I think that most ecologists rely upon the
15 data of the Soil Conservation Service and the U.S. Geo-
16 logical Survey for data to use in judging soil profiles,
17 soil conditions and general topography, stream gradients.
18 In other words, it is considered the base line data, the
19 best that there is.

20 Q In utilizing the material put out by the Soil
21 Conservation Service do you use not only the descriptions
22 of the characteristics of the soil but also the classi-
23 fication of certain soils as having severe, moderate or
24 slight limitations for certain uses?

25 A Yes, sir, we do. We depend on these sorts of things

1 because; of course, I suppose that if you were a soil
2 scientist you would go out and do some of the work yourself
3 but when you are an ecologist you can't be a specialist in
4 everything, and so you do rely very heavily on this kind
5 of data.

6 Q Now, in addition to the work you did in connec-
7 tion with the three reports on water quality in the upper
8 Raritan Watershed which we have just discussed and I think
9 they were D-22, D-23 and D-25, respectively, have you made
10 other field trips or investigations of conditions in the
11 upper Raritan Watershed?

12 A I have visited
13 the upper Raritan Watershed many times. I teach, as you
14 know, at the University of Pennsylvania. I teach two
15 graduate courses in limnology and I bring my class up here
16 to study some of the streams at various times. My last
17 visit was I think in November of this year.

18 Q By, "up here" you mean the upper Raritan Water-
19 shed?

20 A The upper Raritan Watershed.

21 Q Now, as a result of your studies and famili-
22 arity with conditions in the upper Raritan Watershed how
23 would you describe the quality of the water within the
24 watershed?

25 MR. LINDEMAN: May we have a time on that;
as of now?

MR. ENGLISH: Yes, now, and if necessary,

1 over the past decade

2 THE WITNESS: The quality of the water as
3 to its ability to support aquatic life and its
4 general chemical and physical characteristics
5 is quite variable, in some areas it is in what
6 we consider healthy or good condition. In other
7 areas it has been affected by pollution of
8 various types. This pollution being from non
9 point sources as well as point sources. By
10 non point sources I mean such things as
11 cattle septic tanks, a variety of different
12 kinds of things.

13 Q May I interrupt you? Non point sources would
14 that also be characterized as coming from surface water run-
15 off, ground water seepage and that sort of thing?

16 A Yes, sir. Surface runoff is one of the largest
17 sources, particularly from roads, parking lots, and from
18 houses, lawns. It's amazing how much water runoff is
19 increased. As Dr. Leopold has pointed out in his book on
20 urbanization that when you have over fifty percent of the
21 watershed with house roofs, with roads, with parking lots,
22 with driveways the sediment load increases eight times
23 entering the stream, thus fifty percent coverage and that
24 any flood is two point seven times as high and the flood
25 of any given area will occur two point seven times as often.

1 Q Well, I'm afraid I interrupted you for some of
2 the definitions. You were telling us that--

3 A It is very variable. The water quality in most of
4 the watershed, and this is really what preturbs me from my
5 recent look at this upper Raritan Watershed is that you see,
6 probably due to increased habitation, increased usage that
7 the streams in many cases are not as good as they were in
8 1967, and that there is, these are small streams. They are
9 what are classified by the hydrologist as, first order,
10 second order, third order streams. Perhaps, fourth order.
11 By that we mean, first order stream is a stream that has no
12 tributaries, usually a mile in length. A second order
13 stream is a stream that may have a first order stream as a
14 tributary and so on. These small streams are very limited
15 in their flow and they're very limited in the amount of
16 non point sources, point sources runoff that they can
17 assimilate, although they have assimilated capacity if the
18 use is low enough. Our problem, and I won't get into a
19 lecture on limnology, but our great problem in this Country
20 is that we're trying to put too many people on too small
21 bits of land and we're trying to put too many head of cattle
22 in the west on too small, even in the east on too small
23 bits of land, and this is one of our great problems because
24 these small streams just can't take it.

25 Q I think in your testimony earlier you used a

1 phrase, "A healthy stream." Can you define what you mean
2 by a healthy stream? A A healthy stream, and
3 this term is now pretty generally adopted, is a stream that
4 has a great variety of aquatic life in it. That is to say,
5 it has many different kinds of fish, of insects, of lower
6 invertebrates, of algae present in it and furthermore, that
7 in a healthy stream we find a mixture of what we call
8 species sensitive to pollution, with those that are fairly
9 tolerant of pollution and one of the first effects of
10 pollution which happens in an enriched stream is that the
11 population of these species that are more tolerant become
12 much larger, whereas in the, a semi-healthy stream the
13 sensitive species tend to have either very low populations
14 or to be reduced in number, whereas in polluted streams you
15 typically find very few sensitive species and a great
16 proliferation of the more tolerant species. Now, not only
17 are you concerned with numbers of species in a healthy
18 stream but you are concerned with its ability to assimilate
19 nutrients that get into it either naturally or man-made.
20 Under--

21 Q Can you tell us what nutrients are, Dr. Patrick?

22 A Nutrients are particulate matter such as, under
23 natural conditions, you would have insects falling into
24 the stream, you would have bird droppings coming into the
25 stream, you would have runoff from the forest floor and

1 these are nutrients and ammonia, nitrates, not very much of
2 those, phosphates and a number of others I can go into,
3 very usually about twenty of these, that we analyze. When
4 we analyze for stream conditions we're concerned with the
5 oxygen, concerned with the pH, concerned with many things.

6 Q pH is what? A pH is the logarithm
7 of the free hydrogen in the water.

8 Q What's the significance of that?

9 A The pH is a factor for the growth rate of organisms
10 in what we call a bicarbonate buffer system. This is the
11 ability of bicarbonate, salt of carbonic acid to alter the
12 effects of any acid or alkali that enter a stream and this
13 range is usually from about six, five, to about nine in a
14 healthy stream.

15 To go on with what I was saying, the assimilated
16 capacity of a stream is very important and all over the
17 world people are paying more and more attention to this
18 because it's a way of accomplishing, you might say, the
19 digestion of nutritive material without man-made processes
20 and this is accomplished by the bacteria, some of the lower
21 invertebrates, the fungi that are in the waters and under
22 natural conditions, a healthy condition that which enters
23 is assimilated so the stream appears, when you look at it
24 to be clean. When you find very large massive growths of
25 anything in the stream, then you realize larger populations

1 are very evident and I, because of my long experience just
2 like a doctor that has had a lot of experience, can diag-
3 nose the degree of pollution by looking at these aquatic
4 life, by looking at the assimilated capacity and, of course,
5 by the chemical characteristics.

6 Q Is there any relationship in your judgment
7 between the--let me strike that. Is there any relationship
8 between land usage and the preservation of the assimilative
9 capacity of a stream?

10 A There is a very great
11 relationship between land usage. In other words, by
12 various, we now know that in the Delaware Basin, for
13 example, that about fifty percent of the organic matter
14 comes from non point sources and these non point
15 sources are from runoff, surface runoff, from towns, from
16 streets, from leaky septic tanks in some areas, but a
17 great problem also is from cattle, that a great deal of it
18 comes from, it comes from all segments of society surface
19 runoff.

20 Q What happens if the assimilative capacity of
21 the stream is overloaded, or destroyed or however you would
22 describe it?

23 A Well, when the natural
24 assimilative capacity of a healthy stream is overloaded
25 then one gets the development of these so called nuisance
growths, large growths of algae such as cladophora,
C-L-A-D-O-P-H-O-R-A, such as stigeoclonium,

1 S-T-I-G-E-O-C-L-O-N-I-U-M, and some of the blue-green algae.
2 This happens when severe changes, definite changes have
3 taken place. Less pollution will cause just an overgrowth
4 of certain diatoms, diatoms being food of most aquatic
5 life. So that the, when a stream is overloaded the bacterial
6 populations go way up, the oxygen content goes down, the
7 BOD goes up and--

8 Q What's the BOD? A The BOD is the
9 biochemical oxygen demand which is the demand for oxygen
10 created by the bacteria in trying to digest the excess
11 organic matter that enters the stream. Likewise from--

12 Q May I interrupt you, again? Does a high BOD
13 have the effect of withdrawing oxygen from the stream
14 water? A Yes, it does. That's exactly what
15 it does. Of course, with treated sewerage like secondary
16 treatment, often the main affect is excessive nutrients
17 such as the various forms of nitrogen and phosphorus and
18 also sewerage is chlorinated with the imbalance of the
19 trace metals and we're finding that this is a very important
20 aspect of, you might say, the effluent that goes into the
21 streams because if they have been heavily chlorinated they
22 often alter greatly the algael population and, furthermore,
23 Dr. Larson of our laboratory has shown, as have others,
24 that this residual, chlorine, or chlorine products,
25 chloramines, many of them are carcinogenic.

1 Q What is the affect on the potability of water
2 of the growth of these blue-green algae and other forms of
3 life which you say result from the excessive nutrients?

4 A There are many affects. One affect, of course, is
5 the blue-green algae as shown by the work of Dr. Gorham,
6 G-O-R-H-A-M, contain toxic noxious substances and if human
7 beings drink water that had a lot of blue-green algae in
8 it they may become somewhat ill. There are documented
9 cases where cattle have become very ill by drinking water
10 heavily infected with blue-green algae. Less severe than
11 that, of course, is the effect of these algae in producing
12 taste and odor problems. Dr. Palmer, P-A-L-M-E-R, of the
13 EPA, now retired, published a book, small book on the
14 kinds of algae that produce taste and odor problems and
15 these varied all the way to some of the diatoms. Many of
16 the greens do this, many of the what we call yellow-green
17 algae do this and the blue-green--

18 Q Does the presence of large amounts of the kinds
19 of algae, other forms of stream life you have referred to,
20 have any affect on the dissolved oxygen in the stream?

21 A Yes, the algae--this is a complex question. Part of
22 it is easy to answer, part of it is very complex. Algae,
23 by the process of photosynthesis generate oxygen and often
24 in the middle of the day in a stream with a lot of algae
25 in it the oxygen will grow, rise very rapidly to super-

1 saturation in the stream. Now, usually in these streams
2 where you get excessive algae growth you also get excessive
3 bacteria growth. Bacteria have much higher demands for
4 life, we call that respiration, than algae do so that at
5 night in many streams that produce high algae growths there
6 will be very low oxygen. This low oxygen has been wrongly
7 interpreted by many people as being solely due to algae.
8 It is due to bacteria which are present, primarily but also
9 to the algae to some extent.

10 Q Is there any relationship between the level of
11 dissolved oxygen in water and its potability?

12 A Yes. Water that did not have, I'm trying to think
13 right now whether the Environmental Protective Agency in
14 its drinking water requirements what the level of oxygen
15 requires, but I know for wildlife five parts per million
16 is required. Certainly it would be very bad to supply a
17 community with water that was very low in oxygen because
18 the water goes through pipes and is reduced. When you
19 lower the oxygen content, you lower what we call the redox
20 potential, that is to say, we make everything in the water
21 reduced and under such conditions copper pipes will yield
22 a lot of copper. Zinc will yield, if there's any zinc
23 fittings that water goes through, heavy metals become much
24 more prevalent so that it would certainly not be desirable
25 to have a water supply that had very low oxygen in it.

1 Q Can you tell us please what is meant by
2 biological magnifics? A Biological, I suppose
3 you are meaning that in relation to heavy metals or just
4 in general. Biological magnifics in general, a definition
5 might be that most, many aquatic organisms, particularly
6 the algae but also fish and various invertebrates have the
7 ability to concentrate many fold, many orders of magnitude,
8 the concentration of substances induced into water. For
9 example, I have just finished a large series of experiments
10 with heavy metals and from those we know that if you had
11 say a microgram of say vanadium, V-A-N-A-D-I-U-M, or
12 chromium, C-H-R-O-M-I-U-M, in the water that algae diatoms,
13 which are good food for organisms or other algae, but I
14 know most about diatoms, will concentrate maybe fifty-
15 thousand times the amount that is in the ambient and the
16 more diluted they are, the more they concentrate because
17 they concentrate up to a given threshold and then, of
18 course, that may become fatal to the algae. So they are
19 now being used extensively in many places to monitor small
20 amounts of trace metals that may get into a system and so
21 biomagnetics, also, insecticides are known to be concen-
22 trated by some organisms. It is known to concentrate in
23 insecticides and various organics. I discussed that many
24 nights in Michigan.

25 Q Why does it make any difference that algae

1 and diatoms and, whatnot, have this excessive concentration
2 of heavy metals? A Well, it's particularly
3 serious in regard to diatoms because they are the main
4 food for most aquatic life.

5 Q What are diatoms? A Diatoms are
6 unicellular algae that have a cell wall of silicic and
7 these diatoms are the main food in the aquatic world, lakes,
8 reservoirs, streams of aquatic life and they, therefore,
9 if they have concentrated these heavy metals this concen-
10 trate is transferred to fish, to oysters, to clams, to
11 organisms that eat them, and so we may get, depending on
12 the amount that the organism eats of these algae, rela-
13 tively high concentrations in fish. This, of course, is
14 one of the great concerns of EPA right now and not only
15 heavy metals but with the matter of kepone which you heard
16 about, K-E-P-O-N-E, in the St. James River and such. It's
17 a fact that these very, very small amounts that are emitted
18 become concentrated and then become a hazard.

19 Q Dr. Patrick, what is the significance of the
20 fact that in Chester Township being located in the head-
21 waters of streams flowing into the Raritan River, what is
22 the significance in terms of the effect of water quality
23 as it may exist in Chester Township on the health of the
24 Raritan River as a whole or if you prefer to limit it to
25 the upper Raritan Watershed as a whole, you may do so.

1 A I don't know as I would know all of the effects. I
2 have heard that you are, or some people are thinking about
3 a dam or reservoir down near the base of the upper Raritan
4 Watershed.

5 Q You're referring to the confluent reservoir
6 at the junction of the north branch and south branch of the
7 Raritan River?

8 A If the upper Raritan River,
9 rivering system receives much more in the way of nitrogen
10 and phosphorus, if such a reservoir is built and the
11 sediments collect in the reservoir, certainly the sediments
12 will increase as urbanization increases. Then the
13 nutrients accumulate in the reservoir and the nutrients in
14 a reservoir are recycled and built up over time and so that
15 algal growths, from looking at the phosphorus concentrations
16 in some of the streams that flow into that reservoir right
17 now, you would have algal growths developing that might
18 hinder recreation, but certainly would tend to produce
19 taste and odor problems for any drinking water taken from
20 that reservoir. The effect of a reservoir on, I don't
21 know as you want me to go into that but that could have
22 various effects.

23 Q Do go into it, please.

24 A The building of a dam or reservoir in this system
25 could have quite serious implications downstream. When
it could be beneficial in the sense it could help the flow

1 augmentation--

2 Q Excuse me. What is the location of a possible
3 dam you're talking about now? A I was thinking
4 about--well, I was talking in general. I was referring to
5 this reservoir downstream that we, that at least they
6 were talking about. I might discuss the effects in general
7 of a dam or would you rather have me--What do you want me
8 to do?

9 THE COURT: He's asking the questions.

10 MR. ENGLISH: Yes.

11 Q There is in Evidence, Dr. Patrick, as Exhibit
12 P-1, what I understand to be a site plan of a development
13 proposed by the plaintiffs in this proceeding which
14 appears to call for a dam of some kind on Peapack Brook.
15 May I inquire if the size of the dam has been indicated
16 in the record?

17 MR. LINDEMAN: It hasn't.

18 MR. ENGLISH: It is not?

19 THE COURT: Not with any specificity,
20 no.

21 Q Are you generally familiar with Peapack Brook,
22 Dr. Patrick? A Yes, sir.

23 Q Do you have any idea where the location of
24 the plaintiffs' property is on Peapack Brook?

25 A I have seen--

1 Q Counsel will correct me if I'm wrong, but it
2 is in the vicinity of Fox Chase Road?

3 THE COURT: Why don't we give her the
4 map of Morris County that we have. That would
5 probably help her. That lake has been described
6 in various, the last proposal, it's a six acre
7 lake, I believe.

8 MR. LINDEMAN: To forestall a lot of
9 preliminary efforts in putting things up I'm,
10 of course, going to object to any testimony of
11 this witness on the quality, condition or
12 effect, if any, of the lake and dam, anything
13 that may have to do with any of the develop-
14 ment of our property to the point of view of
15 its affects upon the environment because that
16 was precisely what we were prevented from
17 doing and that, of course, goes to, in a sense,
18 should any such question be asked it would be
19 in the nature of an environmental impact--

20 THE COURT: If you want to object you
21 can.

22 MR. LINDEMAN: I do object to it. I
23 wonder if now, before we hang up a lot of things,
24 perhaps a ruling on it might be in order.

25 THE COURT: We got into the area. You

1 weren't here, Mr. English. We got into the
2 area of site plan approval and I ruled that a
3 report by J.E.M. Associates could not be
4 admitted into Evidence, could not be testified
5 to because it was not on the issue of site
6 plan approval. I think he's correct in his
7 objection. I would have liked to have heard
8 it and have him open the door to the other way
9 but that's part of procedure. I think he's
10 correct.

11 Q Dr. Patrick, you have already referred to the
12 proposed dam. You may certainly refer to that if you care
13 to, and any comments you want to make about the general
14 effect of a dam on a stream would be in order, but please
15 do not try to comment specifically on a dam that might be
16 located on Peapack Brook.

17 THE COURT: Let me warn you that if you
18 want to open this door that you may be opening
19 the door to Mr. Lindeman on rebuttal. I want
20 that clear. That's what I said, I'd like to
21 hear it. If you start getting into the
22 question of dams there's an implication that
23 may open the door to his environmental impact
24 study. I just want it to be made clear so at
25 some later date, I don't want it argued that

1 was not the intent. You started talking about,
2 specifically, of the effect of dams. There's
3 clearly an implication here it can only be
4 directed at the proposed site plan because I
5 heard nothing in the--

6 MR. ENGLISH: If the Court please, I do
7 not want to open that door. Let me make a
8 fresh start on my question.

9 Q Dr. Patrick, do you have an opinion as to the
10 relationship of the proposed confluent reservoir at the
11 junction of the south and north branches of the Raritan
12 and water quality of the streams flowing into that

13 reservoir? A Well, I think, sir, that I have
14 previously testified to the fact that it is a general rule
15 accepted by many people, certainly in other places than here
16 in New Jersey that water entering a reservoir or lake should
17 not have phosphorus, pH greater than .01 milligrams per
18 liter, whereas, and this is in the general EPA guidelines,
19 whereas .05 milligrams per liter is allowable in a free
20 flowing stream that does not enter a lake. These are
21 estimates that have been obtained by studying eutrophics.

22 Q What does eutrophics mean, Dr. Patrick?

23 A Eutrophics means producing conditions that are con-
24 ductive to excessive growth.

25 Q Growth of what? A Well, all sorts

1 of aquatic things, organisms.

2 Q Would such excessive growth be related in any
3 way to the health of the stream? A I think
4 that I have answered that in the sense that when a stream
5 receives excessive nutrients these large growths of
6 species develop do not have very much predator pressure;
7 that is, many things don't eat. We have just finished a
8 study under my, which I'm actively participating in at the
9 academy which shows the growths of cladophora, for example,
10 that commonly comes up in streams under increased nutrients,
11 greatly reduces the fecundity of snails, and these little
12 tiny snails, physa, are very important in the food chain
13 of streams and the fecundity drops spectacularly from
14 high fecundate to practically nothing. In other words,
15 they cease to lay eggs. This also happens with the
16 spirogyra, another algae that comes up under outrophics,
17 a green algae.

18 Q Can you tell us what the food chain is and
19 how that relates to water quality? A Well, the
20 food chain is the transfer of food or nutrients from one
21 group of organisms to another and this food chain usually
22 goes from algae at the base or to nitrates at the base
23 into various invertebrates such as snails, insects, worms
24 and then these organisms are eaten by other organisms
25 such as fish, clams, oysters, if you're in the sea, and so

1 we have a cycling of nutrients. Now, the great importance
2 of this is with increased energy cost, man is going to
3 have to turn more and more to fish, either through
4 agriculture or natural fish for their animal protein and
5 it is evermore important, we in Washington believe, that
6 our streams remain of high quality for the supporting of
7 fish life. That is what 92500 is all about.

8 Q 92500 being the Water Pollution Control
9 Amendment of 1972? A That's correct.

10 Q Now, a few moments ago you stated the
11 appropriate quantities of nitrates and phosphates--

12 A Phosphates.

13 Q Nitrates-- A Just phosphates.

14 Q --of streams entering a reservoir. Do your
15 studies on the Upper Raritan Watershed Association which
16 I think were D-22, D-23 and D-25 in Evidence, contain any
17 data as to the level of phosphates which the academy
18 found during its studies over the last decade?

19 A Yes, sir. They contain a great deal of information
20 on this. You have only to look at the tables, and the
21 report which is the one for the 1972 studies.

22 MR. ENGLISH: I think that's D-25.

23 THE WITNESS: You can see the phosphates
24 PO_4 in many of the areas is already in excess.
25 It's all right for free flowing streams in

1 some cases but in other cases it's not.
2 It's already overused. Certainly damming
3 those, if one were to alter the rate of flow
4 in those areas can get into considerable
5 trouble.

6 Q Would an increase in population in those areas
7 have any predictable affect on the phosphate level?

8 A I think it is pretty well documented in the liter-
9 ature by, well, in simply cutting down the trees. Dr's
10 Borman, B-O-R-M-A-N, and Likens, Borman is at Yale, Likens,
11 L-I-K-E-N-S, is in Cornell, just published a book on the
12 watershed of which they have been studying called Hubert
13 Brook which shows how just cutting down the trees greatly
14 influences the nutrients entering the watershed and an
15 area I recently visited in Virginia it was very evident
16 that the golf course, nutrients coming off the golf course
17 was greatly influencing the nutrients in the stream. So,
18 yes there's a good deal of evidence scattered. I did not
19 think I would be asked that question so I don't have de-
20 tailed information. But there's a great deal of evidence
21 in the literature that urbanization does this.

22 Q Do your studies indicate anything as to the
23 carrying capacity in terms of total population of the
24 upper Raritan Watershed? A We didn't make
25 any detailed studies of this but it is certainly evident

1 that the condition of the streams due to present populations
2 in many of the areas are presently receiving as much
3 nutrients as they can tolerate and in some cases they're
4 showing signs of enrichment, semi-healthy conditions.

5 Q Do you have then an opinion as to whether or
6 not an increase in the population within the upper Raritan
7 Watershed would have a discernible affect in the water
8 quality in the watershed?

9 MR. LINDEMAN: I object, your Honor.
10 It's a question tantamount to "When did you
11 stop beating your wife?" I think the witness
12 already answered that one. Any population
13 apparently has an effect.

14 THE COURT: Read the question back
15 please.

16 (REPORTER COMPLIES.)

17 THE COURT: I'll let her answer it just
18 in case--

19 THE WITNESS: I would say that in a
20 little different context, that we do know in
21 this 1972 study it clearly shows the
22 importance of open land or open space in the
23 assimilation of nutrients as seen in the
24 study of the Black River between Stations 14
25 and 17, and that this open space is very

1 necessary if one is going to maintain water
2 quality overall. Now, naturally, not all areas
3 can be maintained as open space but there must
4 be open space maintained in these headwater
5 streams if one wishes to maintain water quality.

6 Q For the record, are Stations 14 and 17 located
7 in or near Chester Township? A I'm not sure of
8 the limits of Chester Township but if you refer to this
9 map, 14 and 17 are this area in through here and I believe
10 Chester Township does come over here.

11 MR. ENGLISH: The witness is referring to
12 the map on the back of Exhibit D-22.

13 THE WITNESS: Here's 14, 15--

14 MR. ENGLISH: Just for the stenographic
15 record, Station 14 is on the Black River, north-
16 east of the Borough of Chester and downstream
17 from Ironia, Station 15 is a little upstream
18 from Pottersville and Station 17 is on Lamington
19 River southeast.

20 THE WITNESS: We also have a station at
21 Route 24--

22 MR. LINDEMAN: Your Honor, I can not--
23 (COUNSEL SPOKE AT THE SAME TIME.)

24 MR. LINDEMAN: I object to the reference
25 by counsel, "Simply because I don't know it."

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Obviously the witness is not, has no data to support whether or not any of these stations are in or outside of it. They may be.

THE COURT: It's something I'll have to figure out.

MR. LINDEMAN: Any question then as to whether or not they are or not in the Township I think, with the witness not knowing, would be improper. I do object to any--

THE COURT: I think in the report, I think I can draw my own conclusion in the report using my own geographical information.

MR. ENGLISH: We can all trace it. I can too but it seems a little bit--

THE COURT: All right. Do you have anything else?

MR. ENGLISH: Yes, your Honor.

THE COURT: Are there many more questions of her? My Court Reporter--let's take ten minutes.

(RECESS OBSERVED.)

DIRECT EXAMINATION BY MR. ENGLISH CONTINUED:

Q Dr. Patrick, what do you mean by on site waste disposal?
A On site waste disposal is usually referred to as the disposal of waste on site by the use

1 of septic tanks or French drains, something of that sort.

2 Q And, is there some kind of distinction between
3 on site disposal and off site disposal?

4 A Well, yes. You usually only use on site disposal,
5 septic tanks where you have relatively low density housing
6 such as I think in many sections of the eastern part of the
7 U.S. it's very variable depending upon the terrain, the
8 soil's porosity, and a whole lot of other things, but I
9 think about an acre to three acres, depending upon what is
10 the characteristics of the slope, soils and aquifers and
11 so on is usually about the amount of land referred to for
12 on site. If you do not have on site then you go to off
13 site disposal and off site disposal is usually done by a
14 sewerage collecting system which results in sewerage treat-
15 ment which may be primary, secondary or tertiary. The
16 U.S. Government now requires municipalities to have at
17 least secondary treatment and tertiary in some areas. In
18 the case of tertiary treatment it's obtained by either
19 land, spray, spray irrigation methods or by chemical
20 treatments of various types. Some cases have used resin-
21 like exchange beds but not very often, but there are a
22 number of ways.

23 Q Now, based on your familiarity with the terrain
24 and natural conditions in Chester Township do you have an
25 opinion as to the suitability of off site waste disposal

1 treatment in Chester Township?

2 MR. LINDEMAN: If your Honor please, I
3 object. I don't know what, there has been no
4 evidence as to the witness's detailed knowledge
5 of the conditions in--

6 THE COURT: I'll sustain the objection
7 unless a better foundation is laid.

8 Q Dr. Patrick, can you tell us the degree of your
9 familiarity with the terrain and natural conditions in

10 Chester Township? A Well, this has gone on over
11 a period of time since 1967. I have driven over a good
12 deal of it by the roads. I have actually walked in the
13 areas of the creek, of the land around the streams. I can
14 not say I have been over all of it. I have certainly
15 studied the maps quite thoroughly with Mr. Lloyd, particu-
16 larly at the time he was preparing them, to make sure they
17 were accurate in testing them because I was ultimately
18 responsible.

19 Q You're referring to the maps contained in the
20 natural resource--

A That's right. I would
21 say that is my, I certainly have studied the maps, the
22 U.S.G.S. maps, soil conservation maps.

23 Q Based on your familiarity with Chester Town-
24 ship do you have an opinion as to the suitability of off
25 site waste treatment in Chester Township?

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MR. LINDEMAN: If your Honor please, I object again. I would like a certain amount of voir dire on this question before it be answered.

THE COURT: Voir dire on what?

MR. LINDEMAN: I would like to find out what the witness's opinion would be as to the, as to some more precise knowledge as to the quality and condition of the soil conditions and--

THE COURT: I think that's properly something on cross examination. I'll allow it Mr. Lindeman. You can show it on cross examination.

MR. LINDEMAN: All right. Then I just merely state then that I object to the question on the ground that for the purpose of answering this question it's not sufficient to be aware of the terrain from the point of view of the surface along with a detailed study of the maps.

Q Do you remember the question, Dr. Patrick, or would you like it read back? A Would you read it back to me.

(JUDGE READS IT BACK.)

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THE COURT: That's the synopsis of it.
Essentially, that's the question.

THE WITNESS: Well, of course, Chester
County varies greatly.

Q Just the Township? A The Town-

ship, the terrain varies considerably, the geology varies
considerably and the depth of the soil varies considerably.
I feel that the streams by and large are not, well, I know
the streams in Chester Township are not large enough to
receive secondary effluent from a sewerage treatment plant.
If one were to go to a spray irrigation which is very good in
some areas they should go to a flat or fairly flat area.
They should make sure, grass has been shown over and over
again to be preferable, spray irrigation, so they should
go to grass. They should explore the field because no one
yet has been able to devise a system that correctly dissolves
a spray irrigation so that there's no excessive runoff --

MR. LINDEMAN: Forgive me for the ruden-
ness of this, Dr. Patrick. I want to inter-
rupt and object. The witness is clearly
answering a question which is part of a report
of which Mr. English and I are fully familiar
with, but I think it's not really responsive
to the question. The question is simply

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whether or not the Township is suitable and what Dr. Patrick is doing now is really going to the next step which is to define.

THE COURT: Did you say, "Discuss the suitability or--"

MR. ENGLISH: I asked for her opinion as to the suitability. To be technical, I think it's the prerogative of the propounder of the question to object to whether it's responsive or not rather than opposing counsel.

MR. LINDEMAN: Well, I object. I think not. I think I am, have that right to object as to whether or not the witness is on the question and I do object.

THE COURT: He has the right. The question being, did she have an opinion on the suitability. Technically I guess she should answer that yes or no. I take it you do have an opinion on the suitability of Chester Township for off site sewerage disposal?

THE WITNESS: I was trying to speak as a scientist in general terms.

THE COURT: All it is, Doctor, is if you do have one and the next question is what is it, so you do have an opinion?

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THE WITNESS: Yes, sir, I do.

THE COURT: Okay. Now then what is it?
Now, go ahead with your answer.

THE WITNESS: My answer is that I think that the Chester Township is variable in its suitability, that the, if you're going to have spray irrigation one should have a fairly flat area, that the use of grass has been shown over and over again by the Campbell Soup Company, by various people to be more suitable than forest. Whatever method is used there should be tile under it because no one so far as my data, and I researched this a fair amount, have shown anyone has been able at all seasons of the year at all times to have spray irrigation so that it is just sufficient for the plants to utilize all of the nutrients that are applied, but rather than their need to be drained under it in a retention pond, can be monitored and the effluent re-sprayed if necessary in order for a suitable quality for percolation to be reached.

MR. ENGLISH: You may cross examine.

MR. LINDEMAN: I have no questions,
your Honor.

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THE COURT: Step down, Dr. Patrick.

Thank you very much.

THE WITNESS: Thank you, sir.

THE COURT: All right, gentlemen.

MR. FERGUSON: We don't have anybody here
to follow Dr. Patrick today.

MR. LINDEMAN: Off the record.

(DISCUSSION OFF THE RECORD.)

(WHEREUPON PROCEEDING WAS ADJOURNED.)