ML — Chester Twp 12/7/77

Caputo v. Chester

Trial Vol V Transcript → Witness:
Whipple
Eby

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

JOSEPH CAPUTO and ALDO CAPUTO,

Plaintiffs,

vs.

TOWNSHIP OF CHESTER and PLANNING BOARD of TOWNSHIP OF CHESTER,

Defendants.

STENOGRAPHIC TRANSCRIPT OF TRIAL

VOLUME V

PLACE: MORRIS COUNTY COURTHOUSE, MORRISTOWN, NEW JERSEY

DATE: DECEMBER 7, 1977

BEFORE: HON. ROBERT MUIR, JR., AJSC

TRANSCRIPT ORDERED BY: PHILIP LINDEMAN, II, ESQ.

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THE COURT: All right.

MR. ENGLISH: If your Honor please, our witness this morning is General William Whipple, Jr., who is currently the Director of Water Resources Research Institute at Rutgers University. He is at the present time one of the consultants to the State of New Jersey in devising a state-wide water plan, and will discuss the situation respecting the water supply in northern New Jersey, the role of the Raritan River, future supply, with reference, among other things, to the confluents reservoir and the significance of protecting the water quality of the Raritan River. He has had experience in what is called Section 208 Planning, which is the requirement of area-wide water quality management planning called for by an act of Congress known as the Federal Water Pollution Control Act Amendments of 1972, sometimes referred to as Public Law 92-500, and I might state parenthetically the kind of planning required by the Federal legislation has been mandated by the New Jersey Legislature in a statute that was signed by Governor Byrne last April.

This planning includes, among other things, consideration of what is called non-point pollution, which is the sort of pollution that does not come out of a pipe from the treatment plant, but covers such things as surface water run-off, ground water seepage, and that kind of thing, and one of the requirements of 208 planning is to consider the effect of land use on the water quality.

General Whipple has done extensive research in the whole area of non-point pollution, and is prepared to testify to the results of that. My understanding is that as a broad generality this shows that the more intensely or densely you use the land, the greater the pollution resulting from non-point sources.

We have for presentation in Evidence a recently completed study of the non-point pollution in a multi-family housing development at a place called Twin Rivers, which is near Hightstown, New Jersey, which quantifies some of the kinds of pollution that result from that sort of land use. We expect that the witness will also discuss the significance of heavy metals in the water and the effect on

water quality in aquatic life; further, that he will talk about the element of hydrocarbons in urban run-off, and the consequences of treating water containing hydrocarbons with fluorine as part of a purofication process, and the chemical result of all that is to produce certain kinds of toxic and carcinogenic materials. I think, in brief outline, that covers what I expect General Whipple to testify about.

THE COURT: All right. Fine. Let's have him sworn in.

GENERAL WILLIAM WHIPPLE, sworn.

DIRECT EXAMINATION BY MR. ENGLISH:

Q General Whipple, what is your present occupation or position? A I'm the director of the Water Resources Research Institute at Rutgers University.

Q How long have you—

THE COURT: General, you'll have to keep your voice up a little bit, if you would, please. Director of what?

THE WITNESS: Water Resources Research Institute at Rutgers University.

Q And, how long have you held that position?

A Over 12 years.

Q I show you a document which appears to be a

curriculum vitae of William Whipple, Jr., and ask you if that is your curriculum vitae? A Yes, that is correct.

MR. LINDEMAN: Is that what you showed me this morning?

MR. ENGLISH: Yes.

If the Court please, I offer the witness' curriculum vitae into Evidence.

THE COURT: D-36. Any objection?

MR. LINDEMAN: I have none, your Honor.

(D-36, curriculum vitae, was received and marked into Evidence.)

Q General Whipple, what has been your formal academic education? A I had one year, Louisiana State University, four years military academy, West Point, and three years of graduate work at Oxford University, which gave me the degrees B.S. from West Point, B. A. and M. A. from Oxford, and then a year of graduate work in civil engineering, Princeton University, giving me the degree of C. E.

Q Were you a Rhodes scholar while you were at Oxford? A Yes.

Q And, subsequent to the completion of your academic education, what, briefly, has been your experience?

A I had 30 years in the Army Corps of Engineers, working

in peacetime very largely on civil works which are the flood control, navigation, hydroelectric power works of the Corps of Engineers, including water supply in the latter period of that time. After this, I retired and worked for several years as a chief engineer for the New York World's Fair Corporation. Then, after a brief period of consulting work in New York, I took my present position with the Rutgers University.

Q What rank did you achieve while you were in the Army Corps of Engineers? A Brigadier General.

Q Can you describe generally for us what kind of work you have done since you became associated with the Water Resources Research Institute at Rutgers?

A This Institute is a Federally supported institute. There's one in each state, and we are supposed to be concentrating our efforts on water problems that are of particular relevance to the State and the region. Soon after I arrived at Rutgers, it was apparent that we were going to be working largely on water pollution problems and questions of environmental impacts of pollution, and I became personally involved in these things within a couple of years, and I've worked very largely in those fields myself, as well as administering the work of the Institute during that time. So that, about 80 to 90 per cent of the work at the Institute has

been in these fields of activity, and so has almost all my personal involvement and research.

Q Do you have any consulting relationship to the State of New Jersey at the present time?

A Yes. I'm one of the two senior advisors on the preparation of the state water supply master plan.

Q Approximately when did you commence that relationship? A That was about a year and a half ago.

Q Have you been involved in any so-called Section 208 studies? A Yes, I have been involved in several of them. The principal one has taken most of my time, the one in Middlesex County, adjacent areas in the Raritan Valley.

Q Perhaps we better back up and explain for the record what a Section 208 study is.

A Under Public Law 92-500, Section 208 requires preparation of area-wide water quality plants.

Q May I interrupt you. Public Law 92-500, otherwise known as the Federal Water Pollution Control Act, Amendments of 1972? A Yes, that is the full title.

Q Thank you. Perhaps you could explain a little bit the scheme and purpose of the Act before you, so we have the setting of the 208 study. A The various

requirements of the Act are, I think, three principal ones. The first and basic one is that which requires all waters in the U. S. to be brought to fishable and swimmable quality by 1983. This is the basic requirement. The priority in administration has been put on another requirement, which is independently stated in the Act, which requires the control of pollution from various treatment plants, treatment plant effluents, and these various requirements set goals for various dates, and these have been implemented by a set of permits which every municipality and every industry is required to obtain, and these permits require them to meet not the water quality standards directly, but a set of effluent standards which control the amount of pollution that these installations are allowed to place in the stream within the given timetable for reducing it.

MR. ENGLISH: May I interrupt you.

Q Are those permits sometimes known as NPDES, or The National Pollution Discharge--

A Elimination System.

MR. ENGLISH: Thank you. May I state for the benefit of your Honor that the system of administering the NPDES permits was assumed by the New Jersey Department of Environmental Protection in legislation signed by the Governor in April, 1977. I'm a little hazy about

the citation, so I won't make mistakes in the record, but if your Honor wants me, by letter, give you the citation of the Federal Act, State legislation--

THE COURT: All right. Go ahead.

MR. ENGLISH: I interrupted you, General. Will you please continue?

A These permits applied to what are known as point sources, and the point sources, generally speaking, are the discharges from treatment plants, either industrial or municipal. I have to make that clear, that the term, "point sources," is not a complete logical definition, but it is usually applied only to treatment plant effluents. The only, I think main, most important definition of the Act is that under Section 208, which requires preparation of area-wide water quality plants, and these area-wide water quality plants are supposed to bring together the requirements for treatment of the point sources with the requirement for achievement of given water quality; the two other main portions of the Act, and the reason why they have to be reconciled, is that there's a great deal of pollution coming into the streams which does not come from the point sources. For example, Mill Run in New Brunswick has no official point sources on it whatsoever, and it's a portion above Livingston Street, but it is, nonetheless, a highly polluted

stream because of the miscellaneous pollution that comes in from the tremendous amounts of streets and urban areas around it, including some industrial and commercial sites. And so, the run-off and various, probably illegal, discharges from these miscellaneous facilities constitute what we call non-point source pollution, and this non-point source pollution is recognized in the Act, Section 208, and the planning under Section 208 is required to consider the non-point source pollution as well as the point source pollution, and to consider remedial measures that would be required to bring the two of them under control so as to achieve the desired water quality.

Q General Whipple, what can you tell the Court about the general adequacy of the water supply in northern New Jersey? A The provisional water supply for northern New Jersey has been a considerable problem, and recognized to be a problem for a number of years passed. During the drought of 1960 to 1966, this was a very serious matter, and at that time the State succeeded in having built two reservoirs in the Raritan Valley.

MR. LINDEMAN: One moment, please, General Whipple. Excuse me. I'm confused a little bit. I wonder if we're finished with qualifications?

MR. ENGLISH: Yes.

THE COURT: I was going to ask that myself.

MR. ENGLISH: I apologize.

MR. LINDEMAN: No questions on qualifications.

THE COURT: Go ahead.

Q You said there was a serious problem. Did that relate to the quality or the quantity of the water supply, or both? A It related at that time, the quality was what gave the greatest concern, and the State succeeded in getting authority to build the two reservoirs, Round Valley and Spruce Run Reservoirs to augment the water supply, and tentative plans were made for construction of a large pipeline that would take this water towards northern New Jersey to meet the shortages that were very, very severe during those years.

Q For the record, where and in relation to what river are these two reservoirs, Round Valley and Spruce Run, located? A They're both on the south branch of the Raritan River. This pipeline was never actually built, probably because the drought ended one year too soon, and the law required a cooperative arrangement between the various municipalities concerned, and with the ending of the drought, the municipalities found it impossible to get together, so the pipeline was never actually built. The need,

however, had been recognized by the planning of the State. Since that time also, the Corps of Engineers has been given authority about six years ago, or eight years ago, at least to prepare a water supply plan for the entire northeastern region of the U. S., and this plan also considered the northern New Jersey area to be an area that was short of water, and explored the possibility of various combinations of water from the Delaware, Hudson River, exploitation of ground water systems which might provide for this water supply. Since this plan was a Federal plan, and a matter which is largely a State responsibility, it came to only one practical conclusion as far as I'm aware, and that is the plan to develop waters of the Hudson River by putting a very large in-take in the Hudson River and piping this water down to reach the area of New York and, originally, New Jersey. This, however, has not been taken up by New Jersey, and as far as I know, New Jersey will have no rights of water from this new Hudson developer. New Jersey was aware of the fact it was only the termination of the drought of 1966 that prevented very serious shortages, that the population continues to increase, that the water requirements continue to increase, and provision of the existing reservoirs, Spruce Run and Round Valley, were inadequate to take care of these future requirements. The State got funds to prepare a water supply master plan designed to carry forward for

the State the planning that had been pushed by the Federal government under this more general authority, and to try to make specific provision for the predicted water requirements of the State at least until the year 2,000, if not further.

This picture was complicated considerably by the fact that for many years the State had planned on using certain water from the Delaware River which would be provided through the Tocks Island Reservoir, which would provide about, as I remember, 300 million gallons a day for the purpose of State water supply, and this water had been considered to be available for the future growth in northern New Jersey. The Tocks Island Reservoir encountered environmental problems, and it was finally decided by the Delaware River Basin Commission that it would not be built at this time, and proceedings were then entered into to de-authorize the reservoir. The State of New Jersey has now taken the somewhat inconsistent stand, previously took the stand they did not want the reservoir built through the Delaware River Basin Commission, the governor has now had to take the stand he does not want to de-authorize because his staff, and I'm sure the governor personally, are well aware of the fact that the water supply situation in New Jersey is in a fairly serious state, and that there is, indeed, a possibility that the Tocks Island water will be so needed that it will have to be built in the future regardless of the environmental

objections because of the fact that there are so few alternatives for increasing the water supply from other sources.

Q Could you tell us what role, if any, the Raritan River plays in the State's thinking about future water supply? A The Raritan River is one of the few sources of good water within the State's major sources, that is considered to be reliably available, and it is currently used by water supply in-takes that, lowest of which is at the junction of the Millstone Bridge with Raritan--

Q Near Bound Brook? A Yes. The water at that point is taken by the Elizabethtown Water Company, and they in preference take the water from the Raritan rather than Millstone, because the Raritan River water is better quality. However, they can take, at times do take from either one. Now, the State, in order to increase the reliable source of water during drought periods, has, of course, already built these two reservoirs at considerable expense.

Q You're referring to Round Valley and Spruce Run? A Yes, and has plans to build a future reservoir at the confluence of the north and south branch of the Raritan River, and this is not, has been a tentative State plan for a number of years, and will presumably, not definitely, but presumably be incorporated into the State

master plan that is now in preparation.

Q Now, in the light of what you have told us, what is the significance of, if any, of the water quality of the water in the Raritan River above the site of the confluents reservoir that might ultimately flow into such a reservoir? A It's currently good quality water, and it is important, of course, also, that it remain good quality water from the purpose of water supply and also as a matter of law. Both Federal and State law require the preservation of the quality of these waters, and, in fact, place heavy obligations on communities, as well as industries, who would in any way reduce this quality.

Q I think, General Whipple, you told us you have done some research in the last few years in the area of non-point pollution? A Yes.

Q Could you tell us in general terms the results of the research insofar as it may involve any relationship between land use and non-point pollution?

A I have been working personally on research projects involving non-point source pollution since 1968. I got into these almost accidentally because there were so many problems involving them, and I've since devised a whole series of projects which have been Federally funded so that I have been continually engaged in research on these matters since that time, over seven, eight different projects, two of which

are still going on today. The thing that came out from the very beginning in our research, and has been found by other researchers in other States, is that the non-point source pollution in the first place is a very significant part of the total pollution in streams,and the second place, it varies very greatly with the land use. When I say, "pollution," we have investigated mainly the organic pollution which is measured in biochemical oxygen demand.

Q Is that sometimes referred to as B.O.D.?

A Yes, it is. All the technical literature is usually abbreviated. And the nutrients which are objectionable in water, partly because, for two reasons; in the first place, if there are nitrates, they become extremely harmful to infants, and there are specific limitations on the nitrates that can be in water supply, and the second place, the nutrients cause the growth of vegetable matter in streams, both plants and microscopic algae, and these vegetable growths, through a process known as eutrophics ultimately can clog up the lakes and, in the short run, can cause them to have disagreeable growths, odors, and even destroy the fish in them during the summertime. This is a process to which almost all the lakes in New Jersey are subject to some extent or another, and the control of the phosphates, particularly, is an objective of water quality planning in order to limit this process.

Q Let me interrupt you with a couple of questions, if I may. Are the phosphates, nitrates which I think you have characterized as nutrients, related in any way to human waste, animal waste? A Yes, they're related to human and animal wastes that contain, in human and animal wastes--. I don't want to give you the impression this is the only source, because they also come from fertilizers that are used extensively in agriculture. So, as contrasted to undeveloped land which has very low nutrients, two main sources of the nutrients in water supply, one is what comes from agricultural land, and the erosion particularly of agricultural land, and the other one from human and animal wastes. Combined sources contribute to the fertilizers.

Q And, you made a reference to the effect nitrates have on infants. Can you be a little more specific about that? A The nitrates in drinking water, excessive nitrates in drinking water, cause a syndrome referred to as "blue babies." I don't remember the technical medical name. The limitation is ten milligrams per liter in order to prevent this happening.

Q You have told us that your studies indicate that some of the sources of non-point pollution come from agriculture, agriculutral land use, and from human waste. Have your studies gone into the relationship between different

kinds of land use, and the density of land use, and non-point pollution? A Yes. They have. I should also mention a third pollutant, type of pollutant which we have measured in these various cases, and that is the heavy metals. The heavy metals. These are lead, zinc, cadmium, copper, and chromium, and they, of course, are in varying degrees objectionable in water, and they, in all of our recent studies, we have measured the heavy metals in urban run-off and non-point source pollution in addition to the nitrates and phosphates. To answer your earlier question about land use in general, the more intensively the land is developed, the higher the polluted growth. Undeveloped land has very little in the way of pollutants, except what erodes from the natural rocks and soils and some from the vegetation, but it is low in organic pollution, in nutrients, and in heavy metals. The general tendency is that the greatest pollution comes from urban lands, from heavily developed residential lands, from industrial lands, commercial lands. That is, what constitutes a city is, various portions of a city all have relatively high loads as contrasted to totally undeveloped land, and the single-family residential land and ordinary road-crop agriculture have relatively less than the developed land, but more than the total undeveloped.

Now, as regards nutrients, you have somewhat more nutrients from agricultural land, and so residential land

and agricultural land as regards nutrients are probably about tied depending on the type of agriculture and the type of residential development, but in general the highest nutrients also come from urban areas in terms of the loading of nutrients per square mile.

THE COURT: Would you please read back the answer?

(REPORTER COMPLIES.)

THE COURT: All right.

Q Have your research projects indicated anything as to the relationship of population growth within the watershed and non-point pollution? A Yes. We did have one much earlier study in which we made a specific evaluation of pollution over a period of time concentrated with population, and found that the pollution was increasing as the population grew.

Q Now, I show you, General Whipple, a document entitled, "Run-off Pollution from Multiple-Family Housing," dated November, 1977, and ask you, first, if you are involved in the preparation of that document?

A Yes. That's correct.

Q And, can you tell the Court briefly what this document represents? A This is the findings of a research project designed specifically to determine the pollution from multiple-family housing.

Q And, were you, what was your personal relationship to that research project? A I was the one of three principal investigators on it, and I was the originator of the project, and the author of the final report, principal author of the final report.

MR. ENGLISH: If the Court please, I offer the report in Evidence, and I'll have further questions about it for the record.

MR. LINDEMAN: If your Honor please, I respectfully object to the entire report, any evidence whatever to be adduced from it. I have read the report, and I have read the transcript of General Whipple's depositions fairly extensively. While the report to which counsel and the witness now refer is extremely technical, and I confess very difficult to understand in some of its mathematical calculations, even without regard to that I submit that the document has no relationship whatever to anything which could be deemed to be relevant or admissible evidence in this case. That, of course, the Court can only know after it hears something about it, but I just think, I think it's fair in this kind of a long, complex case to say that when the

document is first offered. I think it's also correct to say that the report is a detailed study of the pollution tests or the tests for pollution in the Twin Rivers area, Hightstown New Jersey. That's really all that it is. I dare say it's accurate. I'm sure that it's complete and authoritative, but has no relationship to this case. There's nothing in the report that relates or compares the Twin Rivers area to the area in question in this case, and if the, if counsel and the witness should attempt to do so, I would object to that because there has been no effort to relate them before, and I should not be surprised to hear that now. So that, I state this preliminarily, your Honor.

THE COURT: Not having seen it, I'm a little bit at a loss. Mark it D-37 for Identification, and then since you have the man that participated in it, let him testify with respect to it. If later at some point it is appropriate to mark it into Evidence, I don't know what the report is about, so you're going to have to go into it, I guess.

MR. ENGLISH: Well, I thought it might

be helpful to the Court to have the document in front of your Honor while the witness was testifying. That's why I offered it at this time.

THE COURT: He can go ahead and testify without doing that.

(D-37, report, was received and marked for Identification.)

Q General Whipple, with reference to the research project, results of which are embodied in Exhibit D-37 for Identification, can you tell us, first, what was the point or issue that you were investigating in this research project? A The reason we went into this research was the fact that we had previously had a research project participated in by five universities in five different states, in order to evaluate the pollution from urban run-off of different kinds, and the project was successful. We found we had roughly similar conditions in the various states. We were able to come to certain conclusions which were published in national journals, and our own reports of the five universities, but when we had completed it, we found that we did not have specific information on multiple-family housing, and this was important because of the number of developments of this type of housing that were taking place in New Jersey. The reason that we did not

have this information was that we had contrasted urban areas to suburban areas in which we had, of course, single-family housing, but the urban areas we had chosen all had multiple-family housing, if they had it, mixed up with single-family housing and commercial development, so we were unable to determine how much of the rather high pollution was due to the housing, and how much to the commercial and minor industrial facilities that were scattered among them, and so we found that this was a considerable matter of interest. We got, we had an existing research authority with which some consideration and some kindness in Washington could be stretched to cover such a thing. We did not have sufficient funds, and we found,however, that one of the planning agencies, Delaware Valley Regional Planning Commission, and one of the townships of New Jersey were interested in the outcome sufficiently to contribute funds, and so were these contributed funds, plus the Federal money we had available, we located, we looked around to find a multiple-family housing site that would be just multiple-family housing without any commercial, industrial facilities, or anything that might cloud the picture, so we could say definitely that in such and such area the pollution that originated there came solely frommultiple-family housing, and the open spaces around it, and not from extraneous and perhaps irrelevant, confusing, other sources. We found the

site that we wanted in Twin Rivers, a large development east of Hightstown, and chose two areas in this where the drainage from a considerable portion of this housing came down, and could be measured in a large storm sewer, and we then proceeded to apply the techniques that we had used and developed in this previous research to evaluate the pollution coming from this area.

Briefly, in order to do this, and it is a difficult thing, we had to get our students out there in advance of the start of the storm, before the rain started, and take samples every ten minutes during the storm until it was over. The reason being that pollution varies so much during the run-off that unless you take it at very frequent intervals, the results are completely meaningless. These samples are then used to get a complete record of loading, when I say, "loading," I mean the total mass of the various pollutants that came through this particular storm, and then we have the problem of relating that storm to total annual run-off. So, we could get a total annual amount that was produced. This is similar to the techniques we used for other types of areas and in order to make this record complete, we extended it to get, so we would have storms in summer, fall, spring, even got samples of, two samples of snow melting, which turned out to be highly polluted in organic pollution. These were all combined in order to get

the most complete picture possible of the pollution coming from this area, and this is the way we finally got our estimates, and then reduce this to the usual terms of average pollution in pounds per day, per square mile, averaged over a year of record.

Q You mentioned a township as having supported this research project. Was that Chester Township?

A No, it was not. It was Bernards Township.

Q And, is the technique which you used and which you have described, one that is recognized by scientists as standard or appropriate? A Yes. This is one of the appropriate techniques. The other alternative is to apply continuous recording meters and this is an alternative method which is satisfactory if you have the time and the money to make permanent installation. It has its disadvantages, but this is certainly an accepted method. It's the way we worked out with these other universities, and had applied in previous research, and it is an accepted method of doing this.

Q Can you describe for the Court what the Twin Rivers project consists of, something about its size and the relationship of the density of the townhouses on the tract?

A The Twin Rivers development is a recently constructed and, I think, good quality development of row houses commonly referred to as townhouses or garden apartments, single-family

dwellings abutted one to the other, and these are grouped together, and then with considerable open, they have parking areas, roads serving them, and then considerable open spaces between them. So that in the area that we have, if I may refer to the table in this Exhibit, the, of the two storm sewers, one had a total drainage area of 36.4 acres and 246 townhouse units, and the other one had 23.8 acres and 163 townhouse units. The residential areas, that is, occupied by the townhouse units themselves, and the roads and parking connected with them, 63.1, 61.7 per cent for the first, and 47 per cent for the second, so that there were considerable open spaces, acres. This, of course, is customary in building this type of development.

Q That area which you said in one case was 61.7 per cent occupied by the houses and roads, and the other case was 47 per cent included the lawns in the immediate vicinity of the buildings? A Yes.

Q General, I'm not very good at mathematics, but approximately how many dwelling units per gross acre in the entire site do we have at Twin Rivers?

A Well, let me see, the first one is about 11 units per acre, and in the second it is about 15, 14 or 15 per acre.

Q Now, is that the per acre of the residential area, or per acre of the entire tract?

A Per acre of the residential area only. In terms of the entire tract, it is about seven for one and, my mathematics is getting a little slow too. Looks as though it's about seven or eight for each one.

Q I guess you're referring, of course, to Table One, page 2 of Exhibit D-37 for Identification?

A Yes.

Q And, I guess what I referred to as the total area as described here, total tract as described here is the total drainage area; is that correct?

A Yes.

Q Now, may I direct your attention to Table Two on page 3 of D-37 for Identification, and ask you if you can break down the acreage which was previously considered as the total residential area into the housing on the one hand and the associated roads and parking lots on the other?

A In the first case the housing itself occupied 9.5 acres, and the associated roads and parking lots were 13.

Q And, that was out of a total area of 36.4 acres? A No. That was out of the residential area of 22.5 acres.

Q Right, but the total drainage area with respect to the figures you're talking about was 36.4 acres?

A Yes, yes.

Q And, in the case of the other drainage area,

what was the acreage for houses and for associated roads and parking lots-- A 6.5 acres for houses and 4.7 acres for roads and parking lots.

Q And, the total drainage area was how much?

A 23.8.

Q Now, I think you have already referred to the field and laboratory procedures. Is there anything further that you want to say on those subjects?

A No, I think the field and laboratory procedures were standard. They were the best we have been able to develop and most people who try to do the same thing, I might say that the agencies that are now trying to do water quality observations of this type under the Section 208 authorities, are finding it very difficult to do, and they would be very happy if they would be able to get as complete results as we have been able to do with the students, because this is a more thorough result that they usually have to rely on in their planning.

Q One matter I would like you to clarify for me, please, in Tables 1 and 2 which you have already referred to. Apparently, as I think you told us, you took your water samples from a couple of manholes and storm sewers? A Yes.

Q For the first area, 36.4 acres you described, apparently there was a second reading of another manhole

downstream which you called "1-B", as contrasted with "1-A"; is that right? A Yes.

Q And, in your earlier answers as to the acreage, and you referred to the data pertaining to, I guess it's the upstream manhole called "1-A"-- A Yes.

Q --in view of all that, what's the point of significance of the figures for manhole "1-B"?

A Well, I should apologize for that complication, in an already complicated report. Since I'm under oath, I will tell what I did not tell in the report, and that is that "1-B" was the fact that the student made a mistake, and he was supposed to sample what we have as "1-A" and "2", and by accident he sampled "1-A" and "1-B", got the wrong manhole, and so we later had to relate the data to the manhole that he sampled although it had not originally been our intention to do this.

Q Now, General Whipple, may I direct your attention to Table 4 on page 7 of Exhibit D-37 for Identification, and ask you, first, the general question, if that Table records the results of your analyses of the run-off samples which you took? A Yes, it does.

Q And, again still in general terms, what kind of information is given in Table 4?

A This is the summary of the analysis of the data reduced to terms of pounds per square mile per day for an

average year for an area such as those that we're studying, multiple-family housing of this type. I might clarify it to say that when it says pounds per square mile, the square mile refers to the total area, and not the restricted residential area which, would be higher.

Q Total area, drainage area?

A That's right.

Q Now, what conclusions did you reach from your, from this research project, without getting at the moment into the details, detailed figures shown on the Tables.

MR. LINDEMAN: I object, your Honor. I object to any testimony of any kind on this subject. I submit that the background that General Whipple has now shown to the Court demonstrates that what he has done is to prepare a complicated report of the impact of the development of Twin Rivers upon the environment. The difference, perhaps, with the report of General Whipple and that which Norman Smith would have testified to is that the Smith-Jaman report would have been anticipatory, and would have been based upon the expertise of the, of those preparing the report, whereas General Whipple has actual empirical data, data which he actually used and found in the project.

If the Court had heard Mr. Smith's testimony, would have heard the density of the housing, project in question would have been about 3.18 per acre, whereas in General Whipple's report overall seven units per acre, and so far as the actual residential area itself is concerned, between 11 to 14 units per acre. In addition to that, there's no testimony as to the topography, geology, and all the other factors that conceivably and presumably affect hydrology and the impact that any construction might have on an environment. Similarly, we know nothing about the nature and construction of the drainage system. We know nothing about the water bodies that may have been, that may have existed in the Twin Rivers area. I'm not sure that's necessarily material, because all that General and his staff were doing was measuring the effect of construction upon the, upon the environment. But, be that as it may, there, nevertheless, is no, there's no evidence whatever in the report of the fact of whether or not the Twin Rivers area was a watershed area or what. So that somewhat in the nature of a proceeding to determine the

value of real estate, we are really in a test here of comparables and in order for whatever evidence that may be contained in this report to have any benefit to the Court, we've got to know whether or not the situation in Twin Rivers was comparable, and we have to have a whole long string of very complicated items of evidence to determine what was contained in Twin Rivers in order to determine comparability. All of that, I say, is not withstanding the fact that the environmental impact statement of Jaman Engineering was disallowed for, perhaps, proper reasons even though we objected to it at the time, but having been disallowed, there's no evidence before the Court as to whether they're going to be townhouses, X, Y, or Z construction, how close together they're going to be, what percentage of the land they're going to cover, what the parking area is going to be, how the drainage would be constructed, what the nature of the soil was through which whatever surface waters would drain, nothing.

And, for that reason, this report, while perhaps excellent, has no place in this case, and I object to it.

THE COURT: What's the relevancy of it, Mr. English?

MR. ENGLISH: If the Court please, this report is not designed to answer the, something not in Evidence, but the issues in this case as I understand them have two, at least two facets. One is that the entire zoning ordinance of Chester Township is invalid because it does not provide an adequate amount of multi-family housing to meet the rule of Mount Laurel and Oakwood at Madison. Secondly, the zoning of the area in which plaintiff's property is located is unreasonable because the density is too low. If I could telescope those two propositions, I think an issue before your Honor is whether low-density land use in Chester Township is reasonable. Having in mind that in both the Mount Laurel case and more particularly in the Oakwood at Madison case, the Supreme Court recognized that environmental considerations should be taken into account, and might have a bearing upon the appropriateness of multi-family housing in any particular location.

Now, if the Court please, this evidence

is of a general nature to be sure, but we submit that it is relevant on the issue of how large a population Chester Township can sustain, what the environmental effects of denser land development than is now permitted by the zoning ordinance would be. We further submit that these concerns as to the density of land use in Chester Township have an important bearing upon the general welfare because of the importance of the Raritan River to the public water supply because of the prospect, plans of the State to develop the confluents' reservoir, and your Honor will recall Dr. Patrick testified about that last week, and the necessity of which both Dr. Patrick and General Whipple have testified about of maintaining high quality waters in the upper reaches of the Raritan River where Chester is located. It seems to me this is relevant evidence for your Honor to determine the validity of the zoning--

THE COURT: I'll allow it. I think some of the, many of the questions raised by Mr. Lindeman can be clarified on cross-examination. The Jaman report that you referred back to, I think the similarities are not there. The

purpose for which it was offered is not there. As you correctly pointed out, it was anticipatory at that time, and it was something else. I ruled on it, and this, I read, to have a different facet in the case. So, I'll allow it.

MR. FERGUSON: For the information of the Court, your Honor, we had General Whipple prepare during the discovery of this case a specific report in which he estimated the pollutant loading resulting from the proposed site plan for 856 units. We're not, of course, going to go into that report on this case. That would be in the nature of a rebuttal to the Smith environmental impact statement.

THE COURT: All right. Go ahead. The question is what conclusions did you reach from your research project?

A We reached the conclusion that the multiple-family housing produced much more pollution per unit than single-family housing. Now,--

MR. ENGLISH: May I interrupt you, General Whipple. If the Court please, I would like to renew the offer into Evidence of the report D-37 for Identification.

THE COURT: Mr. Lindeman?

MR. LINDEMAN: It might be of help to the Court based upon your Honor's ruling just now.

THE COURT: I'll accept it. I don't want, what I don't want to be bound by, though, is trying to understand the technicalities that are in some of these reports. I would appreciate being allowed to see it for the assistance of understanding some of the tables, but what I'm only going to relate to is what's been testified to. I'm not going to relate to any other portion of it unless it's brought to my attention.

MR. LINDEMAN: I appreciate that, too, your Honor. I do say also I object to the report for the reasons I stated before, so I don't mean by my saying I think it would be appropriate for the Court to look at it, that it takes away from my objection. I do object. But, I think for the purpose of the speed of the case that the Court seeing the document now would probably be of help to it.

THE COURT: All right. Let me look at it then. Let's leave, I'm going to leave that

out of Evidence for the present. I don't know if it's necessary for it to get into Evidence.

(COURT OBSERVES.)

THE COURT: These conclusions are on page what?

MR. ENGLISH: Beginning of page 9.

THE COURT: All right.

BY MR. ENGLISH:

Q General Whipple, I understood you to say in your last answer that you found that the pollution per dwelling unit was higher in the case of a sort of multi-family housing that existed in Twin Rivers than you had found in other research projects with respect to single-family housing. Did I understand that correctly?

A Yes. We can establish that fairly well for B.O.D., that is for organic pollution, and for nutrients, particularly phosphates. We think the same thing is probably true for other pollutants, but we have no clear-cut data because we did not have clear-cut data about heavy metals loading from single-family units, so we had to compare the heavy metals loading at Twin Rivers with residential areas that had some commercially industrial areas mixed in them, so it wasn't a pure case. So, we do not have its clear comparison there. We do have quantities in this loading, pounds per

square mile per day for Twin Rivers, and at least B.O.D. and phosphates the indication is quite clear that the, both B.O.D. and the phosphates we obtained there are more than twice as great as we had obtained for single-family housing in other places.

MR. ENGLISH: Let me interrupt.

Q Do I understand that you have made similar investigations of the non-point pollution from watersheds which were entirely single-family dwelling units?

A Yes. Well, what we were really surprised with, the extent of the difference. I had predicted a difference in the analysis that I made before the fact. In order to be, I didn't know how much it would be. I was sure there would be more pollution per unit in the multi-family housing for the reason that whatever pollution comes from the housing unit in single-family housing, it is drained, ordinarily drained across the lawns and gardens before it gets into any stream, and in multiple-family housing, you ordinarily have a drainage system that takes this drainage very quickly, and, therefore, it does not have time to be absorbed by the soils and the grass before it reaches the storm sewers. But I frankly had not anticipated it would be as great as twice as much, but that's what the data show, and we have no other data to compare this with. We have no record or indication of any research findings regarding the pollution

from multiple-family housing that's been published anywhere else in the U. S. We know there's some people in Virginia that have done some work of this type, people that we worked with before, but we do not have their results because they haven't been published, and we haven't been able to get ahold of it. So, we concluded that insofar as we could tell from this, the probability that multiple-family housing originates perhaps twice as much pollution per housing unit than single-family housing. We had to say perhaps, because after all these matters vary from area to area, and when we make a general statement on the basis of two watersheds, one type of housing,we don't want to be quantitative about it but it is very definite there's more pollution per unit from the multi-family housing, materially more.

Q Are you saying in effect that if 500 dwelling units were to be built in a given area, there would be a greater quantity of non-point pollution if they were built as townhouses as opposed to being built as single-family houses? A I would have to give, say very definitely yes, and I would have to say that it's my professional opinion based on the data that I have so far, I would say I would estimate it as twice as much.

Q General Whipple, may I direct your attention to Table 4 on page 7 of Exhibit D-37 in Evidence. Do I understand in that table the left-hand--. Well, will you

tell me what the left-hand column entitled, "Pollutant," shows? A Those are the various, usual symbols of the various pollutants. B.O.D.$_5$ is the measure of organic pollution. B.O.D.$_5$ is the usual way it's measured. NH_3 is ammonia, ammonia nitrogen, measured as ammonia nitrogen. NO_3 is nitrates. The COD is chemical oxygen demand. Total P means total phosphorus in the form of different forms of which it exists. SS is total suspended solids, mostly silt and sand. Pb is lead; Zn is zinc; Cu is copper; Ni is nickel; Cr is chromium; and Fi is iron. What this means in significance, if you take the lead, the interpretation of the table is that if you had a square mile of area that included multiple-family housing of the type you had at Twin Rivers drainage area of one square mile, the average amount of lead that would be produced by storm run-off would be 1.8 pounds per day.

Q Now, as, from the point of view of the water quality standards required by the Federal Water Pollution Control Act, Amendments of 1972, otherwise known as Law 92-500, how would you characterize the loadings which are set forth in Table 4 on page 7 of Exhibit D-37 for Identification? A You can't relate those loadings directly to the standards of the water quality act because they have to be combined with other considerations, the amount of water in the stream and so on, because the environmental

dangers, environmental disadvantages of the pollution is measured ordinarily by the concentrations in the stream, and Table 4 doesn't give the concentrations, gives total amounts, and so you have to go to considerations of concentration before you can get, these, of course, result in concentrations in the stream in which they flow.

Q Would the concentration be influenced by the size of the stream? A Oh! Yes.

Q I notice on page 9 of your report, which is D-37 for Identification, reference to concentrations of ammonia, lead, and phosphorus, which are given, I take it, as milligrams per liter-- A Yes.

Q Whereas, in Table 4 on page 7, you quantify the loadings in terms of pounds per square mile per day. Is there any way that those two different kinds of readings, namely pounds per square mile per day can be related to milligrams per liter? A Well, it can be, and actually we had the concentration data. We had to go through that in order to make the computation. But the, for comparison with other areas the loadings are more significant. I did refer on page 9 to the concentrations, and, for example, lead concentration two-tenths of a milligram per liter, that is four times the allowable State standard for lead in streams of good quality, so that the average concentration of lead in the run-off is in accordance

with State law in streams. Of course, if the stream is large enough, it can be absorbed, but depending on other sources of pollution, this, of course, is a detrimental factor to have urban run-off from a development of any size. This run-off in this case goes into the, goes into the Millstone River, which is also a good drinking water stream, and it is detrimental to have run-off with two-tenths of a milligram per liter of lead.

Q What about the concentrations you found for phosphorus at Twin Rivers? A Phosphorus, two milligrams per liter, is many times the amount of phosphorus required to support nutrification, so again this run-off is run-off that will cause nutrification, unless it's many times diluted by streams.

Q Is there any standard in New Jersey for the concentration of phosphorus which is acceptable?

A It's incredibly low. I think it's, it depends whether there's a lake involved. If it's going into a lake or reservoir, then the standard, as I recall, is five one-hundredths per milligram per liter, only a fraction of a milligram per liter. This is way above it. Three-tenths of a milligram per liter. I put it in the report.

Q It's three-tenths of, not five-tenths of a milligram per liter for phosphorus entering the lake?

A Yes.

Q Now, General Whipple, you have shown us in Table 4 on page 7 of D-37 for Identification, loadings for the heavy metals which you described. Can you tell the Court in general terms what is the significance of heavy metals in stream water? A Two significance--one is for human consumption, of course. Lead is particularly, particularly bad because it's a cumulative poison. The other heavy metals have various degrees of toxicity. Copper and chromium are quite toxic. Iron, on the other hand, is not appreciatively toxic unless it's in very high concentrations so that generally speaking the, it has been found that the heavy metals are serious pollutants in areas with urban run-off, and while the studies are only beginning to be seriously done, we believe that heavy metals are probably responsible for the extremely low quality of streams around urban areas to a considerable extent. There are, of course, other pollutants involved, but we believe that heavy metals are certainly a part of it. They act very largely through accumulation of sediments in the tissues of some of the small creatures that live on the bottom, in addition to what accumulates in the water itself.

Q Are these figures on Table 4 showing the mean loadings of various heavy metals limited to what you found dissolved in the water, or do they also include the heavy metals that were in the sediments in the streams?

A Included sediments in the streams, and most of the heavy metals are actually incorporated in the sedimentary materials carried in the water. You can see they're a very high portion of particulate matter is over two thousand pounds per square mile a day suspended sediments, which is many times as much as these pollutants, and the pollutants in most cases. We didn't measure them. I don't have the figures for this particular one, but in other places we found that something like 60 per cent and over 80 per cent of the other heavy metals were included in the particulate matter rather than dissolved in the water itself. These, of course, are compounds of heavy metals. They don't exist in most cases in a pure state. It's not metallic lead. Various compounds, chlorides, phosphates, so on, which lead is combined in, including some organic elements that include the metallic constituents.

Q Well, if people drink the water and not the sediment on the bottom of the stream, what difference does it make if heavy metals are found in the sediment sitting on the bottom of the stream? A The difference it makes is that these things are toxic to the creatures, small creatures that live in the stream to, can be toxic to the fish directly, or to things like insect larvae that the fish feed upon, and this is the reason why they're included in the water quality limitations, because of their

effect on the environment as well as their effect on humans. These two considerations are balanced in setting up the water quality standards.

Q General Whipple, have your studies indicated the presence of hydrocarbons in urban run-off?

A Yes, they have. Not in this particular case, but in other cases.

Q And, what are hydrocarbons, where would they come from? A Hydrocarbons are extremely large, complex form of chemical substances and we have found them in all of the urban run-off that we have tested for this, for hydrocarbons. The tests are extremely complex, so they're not ordinarily done, but under a large grant from the National Science Foundation we were able to test hydrocarbons in the Trenton and Philadelphia areas in urban run-off, and we found that generally there were two to four milligrams per liter of hydrocarbons in this ordinary urban run-off. This comes presumably from automobile drippings and other lubricating oil that gets out into the streets and onto the ground, and eventually washes in there with the run-off. The significance of it is that hydrocarbons in themselves, many of them are poisonous to either humans or to marine species, and that when the water containing hydrocarbons is chlorinated, this may cause certain more complex compounds known as chlorinated or halogenated compounds,

and these in many cases are much more toxic, and some of them are known to be carcinogenic, so a number of the chemicals in water that the Environmental Protection Agency is most concerned with, and are beginning to require protection against under the water quality safe-drinking water act are compounds that are either hydrocarbons or derivatives of hydrocarbons that are formed by various processes including the chlorination of water. This has gone to such an extent that the entire question as to whether water should be chlorinated has become a very serious one. E.P.A. removed the previous requirement that all water be chlorinated and this in effect is now the word, and alternatives to chlorination are being sought in order to prevent the creation of compounds that may be more harmful than the bacteria that the chlorination is designed to remove.

Q Do you know whether the water taken from the Raritan River by the Elizabethtown Water Company is chlorinated before being distributed to its customers?

A Yes, it is.

Q Well, is there any relationship to the number of automobiles and the amount they're driven on the one hand, and the amount of hydrocarbons one could expect in run-off into streams on the other?

A We feel that there is. We have no, we haven't got sufficient data to make a statistical proof of it. We have

only found that in urban run-off there is hydrocarbons, and in urban areas there are a large number of automobiles, and the hydrocarbons tested have chemical similarities to used crankcase oil, so that we have, if I may be permitted a phrase, legal phrase, we have circumstantial evidence.

MR. ENGLISH: Would this be a good time for the morning break?

THE COURT: I have a couple of things I would like to take care of. Let's recess until eleven o'clock.

(RECESS OBSERVED.)

THE COURT: All right, Mr. English.

BY MR. ENGLISH:

Q General Whipple, to what extent, in your opinion, can one generalize from your findings about non-point pollution at Twin Rivers to the question of non-point pollution in other multi-family housing developments?

A We certainly can't say that all housing developments, multi-family housing developments are going to be similar. We try to choose in Twin Rivers one that's more or less typical of what's going on in New Jersey, and, of course, there will be differences. The principal differences would result in two aspects. One would be things that would increase the gross amount of pollution generated by one household, and that would be if they had more children, therefore more

meals served, more garbage, more pets, more automobiles. These would all be things that would increase the total amount of pollution that would be produced, and the other aspect is how close the pollution is to drains. In multiple-family housing, we have more impervious surfaces, so habitually they're accompanied by developed storm drainage systems, and the pollution that falls, there's more pollution that falls on paved surfaces or else adjacent to paved surfaces, drains so that it gets into the drainage more quickly and anything that affects that, of course, would affect the pollution. If you would have multiple-family housing that would be developed without an ordinary drainage system, and drain the storm water run-off across the countryside, of course you get something quite different. We have to use, I mentioned before, this is the only data we have on multiple-family housing, and, therefore, we have to use it for lack of something until we get more experience which may make more precision, but for the time being, this is the best way we have to apply this, the only way we have to apply this would be to consider factors that might change either the gross amount of pollution generated per household, or vary the rapidity to which it would enter the drainage system.

MR. ENGLISH: If the Court please, this concludes my direct examination, and I would renew the offer into Evidence of General

Whipple's report, which is D-37 for Identification.

MR. LINDEMAN: Your Honor, I have no particular confidence that the brilliance of the cross-examination will change the Court's view. I wonder if it might not be better to await at least the completion of it before a ruling is made on that.

THE COURT: All right.

CROSS-EXAMINATION BY MR. LINDEMAN:

Q General Whipple, you are familiar with a fair number of multi-family dwelling projects in the State of New Jersey, are you not? A I wouldn't say I'm familiar with them.

Q Do you know about the existence? Have you made an inquiry as to their existence, where they may be, and what is involved in order to determine which multi-family project you would want to study?

A Oh! Yes. I considered what I, the availability of different housing units, yes.

Q You stated, I believe, that under Public Law 92-500 that there is a requirement that by 1983 all streams and rivers be cleaned up at least to a certain extent; is that not correct? A Yes.

Q You are familiar, are you not, with a very large

multi-family project which is being constructed by the Hartz Mountain people, I think, Hackensack River, Meadowlands? A Sorry, I'm not familiar with that.

Q You do not know the townhouse project unit that is being constructed, still being constructed at this time?

A No.

Q So far as watersheds are concerned, it is true, is it not, General, that at least that it is your view that it is difficult to keep clean, if that's the proper word, any and all watershed areas where residential or other construction may be done; isn't that so?

A That's correct.

Q And, so there is nothing very peculiar necessarily about the Upper Raritan watershed area so far as the fact that it may be difficult or there may be certain restrictions that would be required to keep whatever water areas are, there may be, to keep them clean?

A It's a typical, I think of watersheds that are used for water supply, and, of course, the other condition that's relevant is that it will have a reservoir at its lower end so that there are, those conditions, many other watersheds that have those similar conditions, but there's nothing special about the Raritan other than that it falls in that particular category.

Q So far as that, construction of that reservoir is concerned, there has been no enabling legislation passed to date so far as you know, has there, toward its construction? A I'm under the impression they started getting land. There's been no enabling legislation to build a reservoir, no.

Q Right. Now, is it not a fact, General, that a function of the nature of pollution that may result from any run-off is the character of the area, whether it be from the point of view of, character of the soil, number of automobiles that exist in a particular area, number of farm animals, all of those factors? A Yes.

Q Is it not also a fact that in measuring both the heavy metals, nitrates and phosphates, that the nature and character of the soil through which any of the surface waters run has a bearing? A It has some bearing, but most of them come from man's activities in developed areas.

Q By that you mean the creation of waste materials? A Yes.

Q Now, is that so, true of the heavy metals concentration that you referred to?

A Yes.

Q They come from man's activities?

A Yes.

Q What do you mean by that? Do you mean waste materials that, heavy metals come from waste materials?

A Not entirely waste materials. For example, if you consider where zinc comes from around the house, there is zinc that comes out, we believe, that comes from probably from galvanizing materials that are used that erode off, not erode, but dissolve off to some extent in the rainfall, so they're products of corrosion as well as waste materials that are deposited on the ground.

Q So, therefore, the nature of construction can be, can be controlled and if it is controlled at least that might affect the extent of the zinc that would appear in the run-off; is that correct? A Yes, if we, if you build a house without any galvanized materials around it on the fences, in the house, would eliminate that source of the zinc, yes.

Q Do you know, by the way, if it's possible to do that? A It's possible, yes. It's possible, of course.

Q What about some of the other heavy metals, cadmium, for example, what is-- A I can't tell where cadmium comes from in urban areas.

Q How about nickel? A I can't say where nickel comes from, no.

Q Lead? A Lead comes very materi-

ally from automobiles. The tetraethyl lead in gasoline; there's some lead used in, of course, in batteries; and around houses to a limited extent. But, the lead,we think,is probably associated mostly with automobiles.

Q Now, the contribution of automobiles to pollution in the run-off, is that because there is spillage from the automobiles, or is it the exhaust or what? I'm really curious to know how that happens. A The exhaust, drippings from the under carriage, dust forms on automobiles and accumulates oil and grease from the lubrication of it, and from leakage around gaskets, falls off onto the streets.

Q How about chromium? What's the source of pollution in chromium? A Well, chromium on automobiles, I suppose, may contribute some, but I don't know where the chromium comes from. We haven't been able to get down to checking in detail the origins of any of these things, and I'm giving you mainly the impressions that I formed in considering where this might be from studies I've made, but we have not actually traced it.

Q Have you measured the differences in similar housing or other developed areas, differences in the run-off pollution based upon the nature and character of the soils through which any of the material runs?

A Yes, we attempted to do that one in one of our earlier studies. We took, we considered there would probably

be major differences between the land in the alluvial plains or outwash, sometimes called outwash plains that are generally east of Highway 1 in New Jersey, which are old coastal plains, and the land back of this which is the erosion of the rock formations, and we made a special analysis by taking areas,undeveloped areas, agricultural areas, and housing areas in those two quite different types of topography and soils in order to determine what we expected to be considerable differences. We were unable to find the differences. I don't say they don't exist, because they unquestionably do, but they were not sufficiently obvious that they could be determined.

Q Are you saying that you couldn't detect the extent of the difference, or the reasons for the differences?

A We couldn't detect, there are many variations from place to place, but we do not detect, from the data we had we couldn't detect there was a difference. There was unquestionably some difference, but not sufficiently great that we were able to detect it. The main differences came and the differences in the development, the undeveloped lands, two different soils and topography were different. Similar agricultural lands are similar, housing lands similar, but as between one topography and soil type and the other, the differences are not sufficiently great that we were able to detect them.

Q General, can you tell us, please, what regulations, if any, existed as of 1969, respecting the character and construction of drainage systems for the purpose of cleaning or filtering surface waters?

THE WITNESS: I'm sorry. I don't understand the question.

Q Do you know if there were any regulations by either the Department of Environmental Protection or even the Environmental Protection Agency regarding the kinds of drainage, pipes that would be built or that could be built, and whatever filtering operations those pipes might have in them?

THE WITNESS: Do you mean, when you're talking about pipes, are you talking about drainage, storm drains?

MR. LINDEMAN: Yes, sir.

A No, I'm not familiar with the regulations, storm drains, in 1969.

Q Do you know if there were any?

A I think it varies from municipality to municipality. I'm quite sure there were no Federal regulations at that time.

Q How about the Department of Environmental Protection? Did it have any? A I'm not sure.

Q It is possible, is it not, that storm drains can contain some kind of filtering device or process in them so that surface waters can be treated before they are ultimately discharged? A This is, theoretically, possible. I'm not aware of any case in which it's been done in New Jersey.

Q Are you aware of any system by which surface waters are treated, though, whether it's in the draining pipe, drain pipes or otherwise? A Oh! Yes.

Q How is that done? A It's not done very widely at all, but there are cases in which they are. The City of Chicago is about to enter into, I think, a system. It would cost about a billion dollars, system called TARP, T-A-R-P, which is for the purpose of accumulating their, their drainage from their combined sewers, which, of course, is very largely storm run-off, and treating it before it's released. This will be done by systems of aeration and sedimentation, passing it through some form of primary, what's essentially, what's called primary treatment before it's released to the rivers. This is in its very early stages. The treatment part has not yet been built. Some of the tunnels have been built, but this is a definite plan, and will be accomplished because of the special conditions in the Chicago area.

Q It would have been possible, would it not, for

the developer of Twin Rivers, and perhaps even Saddle River, was it, another development you referred to in your report, or in your testimony, did you not refer to Saddle River? A I don't remember referring to Saddle River.

Q As far as Twin Rivers is concerned, it would have been possible for some treatment to have been accorded to the surface water run-off? A Oh! Yes.

Q And, do you know if it was done?

A What they did, they put in, have no treatment, no. They have a detention basin, they have no treatment.

Q Are there not various treatment measures that could have affected the extent of the pollution that you discovered? A Oh! Yes. Urban run-off could be, of any kind, could be treated. The National Commission on Water Quality made some estimates what it would cost to treat urban run-off nation-wide, very rough estimates, and they estimated that it would cost $199,000,000 to give primary treatment to all the cities of the U. S., to the urban run-off from all the cities in the U. S.

Q You don't have any idea what the cost would have been in the initial stage of construction for allowance for treatment of the surface waters in the Twin Rivers project, do you? A No.

Q But, it is possible that such treatment could

have taken place, and that the extent of the pollution that you observed would have been less or could have been less, could it not? A It's entirely possible.

Q Would you not say, General Whipple, that the construction of 300 multi-family dwellings in the Township of Chester, and in the Upper Raritan watershed, would undoubtedly be detrimental to the environment?

A To some extent, yes.

Q They would be more detrimental, perhaps, than if they were all single-family houses, would they not?

A That's correct.

Q Is the fact, what is your view about the construction of 150 multiple dwellings on one 250-acre tract in this watershed, as opposed to just single-family dwellings on such a tract? A I would say that it would cause, approximately, twice as much pollution to put in the same number of dwellings in multiple-family housing as it would to put them in single-family housing.

Q Now, it is possible, is it not, in the construction of a multi-family project to control the extent of pollution, both from surface waters and any other source, and perhaps easier than in a whole collection of single-family dwellings; isn't that so? A Yes, but the ease is--. It's a difficult and expensive process.

Q It can be done, and, in fact, the opportunity

for control in a multi-family project is really greater than it is where there are scattered individual units over the landscape; is that not so? A I have to say theoretically, yes. But, I don't regard that as a practical likelihood that will ever happen.

Q Is there any control for the, whatever seepage may occur from septic tanks, individual house septic tanks into the environment, so far as you know?

A You're talking generalities now, not any specific--

Q Yes, perhaps I ought to preface the question by asking whether or not there is seepage that occurs from septic tanks for individual homes?

A Oh! Yes. Of course there is. There is seepage. That's part of the process. You expect that seepage.

Q Is it not likely, if not possible, that that seepage has some adverse effect in the pollution of the watershed area? A I think that depends very largely on the type of septic tank and the very, and the type of soil in which it's constructed.

Q The Department of Environmental Protection is at least one agency in the State of New Jersey that has something to say about the construction, and the placement, and the size of a septic tank for an individual house, does it not? A That's correct.

Q And, similarly, such a department would have

something to say about the construction and the controls that would be incorporated into a multi-family dwelling that would be constructed in a watershed area; is that not so? A They have something to say about, it would depend what the multiple-family dwellings were going to do. The primary controls, as I understand it, are municipal, and I'm not aware of the details of what the Department of Environmental Protection would require, unless there was some flagrant insult to the environment.

Q Whatever it would be, though, it is your understanding now, in a field that you have so much expertise and clearly do, that there are governmental agencies which exist today that oversee the plans and the construction of developments including multiple-family dwellings, are there not? A Yes, but not the urban--. There are no regulations that require the, that I know, specifically regulating the treatment of urban run-off from these multiple family dwellings.

Q And, yet, these agencies, whether they be State or municipal, do have something to say about drainage systems per se, and are you aware, by the way, that the Township of Chester, for one, requires that an environmental impact statement be submitted in connection with the construction of a project of multi-family dwellings?

A No, but I'm sure that's correct.

Q Well, I think you can take it that it is correct. I don't mean to be quizzing you on that necessarily. Assuming that there is one, that the, one of the purposes undoubtedly would be that the municipality would know, or the State would know what it is you're going to do, and what effect, if any, your project is going to have in, on the environment; is that correct? A Yes, sir.

Q And, the purpose for that is to, first, to tell what you're going to do; secondly, what's going to happen, and then whatever agency would be involved, to tell you what you really ought to do, whether you already planned to protect the environment, among other things; isn't that so?

A In general, yes.

Q Is it not a fact, General, that there is a difference in the nature of pollutant run-off that you might observe where there is a housing project of seven units per acre, as opposed to half that, let's say, for overall density? A Well, the number of units per acre, if you have more units per acre, you have more pollution. I'm not sure it would make any difference in the amount of pollution per unit.

Q Is that measurable? Are you able to actually measure the pollutant per unit where you--

A Oh! Yes.

Q Where you got, let's say, if you had seven

hundred per acre as opposed to three per acre, could you really measure the extent that each one produces pollutant?

A You don't measure them separately, but you know the amount of acreage and the number of units, simple matter of division, find out what the pollution per unit is in either case.

Q What I'm trying to find out is this: Isn't it really very different to measure the pollutant per unit where you have a great many units in a given area as opposed to a few? I'm just wondering if the rise of creation of pollution isn't geometric as opposed to arithmetic. I don't know this. It just seems to me that would be likely.

A I wouldn't say it's exactly geometric, but it certainly does depend on the, certainly does increase with the, with the multiple-family as contrasted to the single-family. Wouldn't say it's geometric to any particular ratio, but is certainly increased.

Q Similarly, the number of multi-family dwellings in a fixed areaaffects the extent of pollution per unit; is that not so? I mean that you have more geometrically, or at least some extent, geometrically than arithmetically?

A I don't think that's the case. The reason is that the, the reason for the increased, the increased pollution per unit is related to the proximity of the units to the drainage system, and the lack of intervening lawns. Now,

multiple-family housing usually has the houses clumped one house right next to the next one. This is the nature of it. Now, that is, because of the parking and the roads, this is inevitably connected to a drainage system immediately. Now, if these clumps of houses are served by drainage systems, are spaced more widely across the landscape, I wouldn't think that would have any effect at all or any appreciable effect that you could measure on the pollution per unit because of the nature of the, of the effect. It is the proximity to the drainage and the fact that these households are close, one to the other, and not the total number of units per acre that governs the run-off, pollution per unit.

Q Is the pollution greater if the drainage pipes are closer to the immediate source of the run-off than farther away from it? A Yes, that's right.

Q So that if the, if the surface water, rain or whatever, has a chance to seep through the soil, there is some effect upon the extent of pollution by virtue of that--

A This is correct, and that's the reason why the single-family housing characteristically has less pollution than the multiple-family housing.

Q Did you make any study in Twin Rivers of the distances of the drain pipes, immediate source of the run-off? A Well, there's no way you could measure the distance. Naturally, the sources of pollution, naturally

the garbage cans near the back door, drainage is not far off, parking areas in front of the house, they are all served fairly closely by drainage systems. In order to avoid the accumulation of the run-off from all of these impervious surfaces, they have to be. I don't think there's anything, I think that's sufficient.

MR. LINDEMAN: Just bear with me one moment, if your Honor please.

Q General Whipple, did you testify on direct examination you get somewhat more nutrients from agricultural land than you do from residentially developed land?

A No. I testified they are, depending on the type of agriculture, type of development, that they both have a considerable range which overlapped, so I can't say definitely residential land has more nutrients than agricultural land.

MR. LINDEMAN: I have no further questions.

REDIRECT EXAMINATION BY MR. ENGLISH:

Q General Whipple, I understood you to say on cross-examination that you do not consider it practical to have extensive controls of the run-off from multi-family housing projects. Am I correct in my impression of what you said? A I said that it wasn't practical to have treatment.

Q Treatment. All right. And, what is the, why is, what is the reason for that view?

A The reason is that run-off from these projects comes in very great peaks. You have a heavy rain, you have a tremendous amount of run-off that occurs only for a short period of time, but it has to be handled, and so it is generally not economically feasible to provide for treatment of it.

Q In other words, you have to provide a large capacity of your treatment plant for only occasional use?

A Yes, and it would be an expensive business, and it's only in situations such as Chicago and tentatively in San Francisco where they're very large cities, and have particular situations that they have really seriously found it desirable to go into the treatment of urban run-off.

MR. ENGLISH: If the Court please, I again renew my offer into Evidence of General Whipple's report which is D-37 for Identification.

MR. LINDEMAN: One other question before getting to that, your Honor.

RECROSS-EXAMINATION BY MR. LINDEMAN:

Q Regardless, though, of the extent of any particular rainfall, General, it is possible that surface waters can be detained in some kind of a detention pond or pool, treated at that point, isn't that so, and that, therefore, would make the cost of treatment of surface waters

lower? A Yes, and that, of course, is what's being done in Chicago. They're actually taking the surface waters in deep tunnels and reservoirs so that it can be treated over a period of time.

MR. LINDEMAN: Your Honor, on the offer, I renew my objection to it for the same reasons that I stated before, and also for the reason that I think the Court can even tell from the testimony of the General that not everything in the report was the subject of his testimony. In fact, I would say it just seems to me it's about half of it, and I think that's for a good reason. They didn't want to put all of that testimony in it.

THE COURT: I think from the standpoint of what I have heard from the General's testimony, I don't feel that the report is necessarily that much more relevant that it should be marked into Evidence. I'm satisfied that his testimony is sufficient here; the remainder of it, complexities of it, without total explanation, would not be helpful to the Court. I'll sustain the objection. I have a non-relevant question that I would like to ask off the record.

(DISCUSSION OFF THE RECORD.)

THE COURT: Thank you very much, General. You may step down.

MR. FERGUSON: Our next witness is Mr. Carl Eby from the Soil Conservation Service. We subpoenaed him to be here at 1:30. I expect him here around 1:00, 1:15.

THE COURT: We'll break until 1:30 then. Thank you.

(LUNCHEON RECESS IS OBSERVED.)

MR. FERGUSON: Mr. Eby, will you take the stand?

C A R L E B Y, sworn.

DIRECT EXAMINATION BY MR. FERGUSON:

Q Mr. Eby, by whom are you employed?

A The U. S. Soil Conservation Service.

Q Is that an agency of the U. S. government?

A Yes.

Q What department? A Department of Agriculture.

Q Are you here today pursuant to my subpoena issued to you in your capacity as an employee of the U. S. government to testify in this litigation?

A Yes.

Q Mr. Eby, would you state for the record and

the Court your educational qualifications?

A I graduated from Rutgers with a Bachelor of Science degree, three years of graduate work at Michigan State University, and then I came back to Rutgers and did another year of graduate work.

Q What year did you graduate from Rutgers?

A 1954.

Q Would you tell us your employment after graduation from Rutgers or your last year of graduate education, whichever first occurred? A I worked in the State of Michigan for the university as a soil scientist doing soil mapping in the field.

Q What year was that? A That was '50--, after graduation from Rutgers in '54, until July of '56, and then I went in the Army for two years,and I went back and worked another year in Michigan, and then I came here to New Jersey to work for the Soil Conservation Service about, Spring of '58 or '59.

MR. FERGUSON: Let me interrupt you.

Q What field was your degree from Rutgers in?

A Research and Agriculture.

Q And, what work did you, what field did you do graduate work in? A Soils, soil genesis and classification.

Q Now, when you came back to work for the Soil

Conservation Service in 1958, in New Jersey, would you tell us what position you held, for whom you worked, what agency, and briefly what you did in each one of them?

A I worked for the Soil Conservation Service, U. S. Department of Agriculture, as a field soil scientist in Somerset County.

Q Will you tell us what a field soils scientist does? A He prepares soil survey maps, checks on soil conditions, assists the conservationist with determining soil properties in the field. Then after I finished in Somerset County, I came to work in Morris County about 1961 or '62, I don't know, right in there somewhere, and I was the party chief in directing the survey in Morris County until its completion. Then, I wrote up the soil survey report.

Q Will you just interrupt yourself briefly there and tell us what a party chief for the Soil Conservation Service doing a soil survey in Morris County in 1961, would do, and what was the purpose of your work?

A I directed the soil survey. I had, for part of the time, two field soil scientists working with me, and part of the time, three. I had a few other part-time workers who did drafting work in connection with the survey. I supervised them. It was my responsibility to supervise the survey and see that it got done.

Q So that we know what we're talking about, is this document marked, "Soil Survey of Morris County, New Jersey," is that what you're talking about that you did the soil survey work for? A Yes.

Q Please go on. I think you indicated you were the party chief in Morris County around 1962.

A Once the field work was finished, I prepared the soil survey report, and got the maps ready. Then, I was finished in Morris County. I was transferred to the State Office, and given the position there of the Soil Correlator for the State of New Jersey.

Q Now, would you tell us approximately when you were finished with your work in Morris County?

A I'm bad on dates.--

MR. FERGUSON: I'll give you--

A 1961 the work was finished up.

Q All right. I show you a document marked D-1 for Identification in this trial, entitled, "Soil Survey of Morris County, New Jersey, U. S. Department of Agriculture Soil Conservation Service, Publication Date--"; will you tell us if that's the document you're talking about, and when the publication date was? A Yes. This is the document, and it was finally published in 1976, but the work was completed and the descriptions approved in 1971.

Q Now, between the time when you started on this

project and the publication date of 1971, would you tell us what, if any, information was available in your office with respect to the soil classification work you had done, how it was available, and whether it was available to interested planners, developers, scientists, whoever might come and ask for it?

MR. LINDEMAN: One moment. I certainly have no questions addressed to the witness' qualifications, but I do have this observation which is somewhat of the form of an objection to make to the testimony. I believe that Mr. Eby's name was furnished to us in a letter, I think it was fairly recently, I'm not sure. I'm not, I don't really acknowledge that the furnishing of the name as an expert fully complies with the rules where we propounded interrogatories early in the game and asked who the witnesses would be and the nature of their testimony. But, notwithstanding that, we're as interested in the truth as the Court is, and insofar as Mr. Eby's testimony, I think, is sought today to enlighten the Court on some documents that were referred to by Mr. Lloyd, I would have no objection because I think that we should know rather than not know, but if

he's going to go into extensive testimony on the soil of Chester and a number of other things which we did not have an opportunity to examine on, I think that would be improper. I'm not really sure what Mr. Ferguson intends to do, though.

MR. FERGUSON: I did not intend to call Mr. Eby until Mr. Lindeman objected to the N.R.I. going in on the basis that according to Mr. Lloyd's testimony he conferred with Mr. Eby about some of the inputs to his maps, and is the source of his information. However, and so the principal purpose of his testimony is to offer that foundation, and to explain for the Court what a lot of this base information is, and how it was generated. I do intend to ask Mr. Eby a few questions from his perspective as a soil scientist about the general nature of the soils in the Peapack watershed, which is the particular region in which the subject site is located. I do not intend to go into extensive testimony about all the soils in Chester Township.

MR. LINDEMAN: If your Honor please, that being the case, I'll reserve whatever

objections I have to the particular questions.

THE COURT: Fine.

MR. FERGUSON: Insofar as this witness is an expert, and insofar as any of his expertise is called for, I have offered his qualifications--

MR. LINDEMAN: I'm satisfied.

MR. FERGUSON: He's a fact witness as to what he did and why.

THE COURT: Fine. Go ahead.

MR. FERGUSON: I think I was in the middle of asking you a question. I forgot what it was.

THE COURT: What, if any, information in your office exists on soil, existing on soil classification was made available to planners and experts.

A Well, as the work was completed in sections of the township, we prepared interim sheets containing the information on the soils for those particular areas, and made copies of our soil survey field sheets available to them.

Q Do you recall Mr. Thomas Lloyd?

A Yes.

Q Would you tell us what you recall him doing, whether he came to see you, and if so, when and what happened?

A He came into our office with a group of students, and I believe he was a student himself at the time, at the University of Pennsylvania, seeking soils information on the north branch of the Raritan watershed. He was doing a study of the quality, water quality in the north branch and making a study of environmental factors that would have an impact on that.

Q Did he request the soil sheets and data which your office had generated? A Yes.

Q Did you give it to him? A Yes.

Q Did he, do you know what he did with it?

MR. LINDEMAN: For one thing, one of the preceeding questions was leading. I'm not concerned with that. Did he know what he did with them, that's too vague, I think.

MR. FERGUSON: I'll rephrase it.

Q Did Mr. Lloyd return to you and show you the results of his work? A Yes.

Q What did he show you? A He showed us a series of interpretive maps that he had made using the information and the criteria that we gave him. He raised some questions about erodibility, the fact that the K factor by itself, which is a statement of the erodibility, was not a particularly useful item to prepare a map for, and wondered if he might in some way combine the

K factor with other soil factors, and after some discussion we arrived at a point where he could combine degree of slope with K factor, and produce a map that would present a picture of relative erosion hazard. We saw all his interpretive maps showing degrees of limitations for houses, septic systems, I don't remember the others.

Q Did you do any particular degree of review of Mr. Lloyd's work at that time, or how extensively did you get into his interpretive map, maps, and how they were prepared? A Only to the extent that we discussed with him the criteria that we were using and showed him how to apply those criteria to the maps, and showed him the method to use to prepare the maps, and then to look at some of the maps and see, just check to see that he had applied the criteria as far as we could see.

Q And, what was your conclusion when you asked that question? A He had used our information the way that we would like to see it used.

Q Now, before we get into looking at the individual maps, I'd ask you to take Exhibit D-1 for Identification and would you, in your own words, tell the Court what this soil survey document is in terms of the kinds of information it presents-- A Well, it's a, it's an inventory of the soil resources of Morris County.

Q Could I interrupt you and ask you if there is

a nationwide or regional program of preparing these soil surveys by the Soil Conservation Service?

A There is a nationwide program. It's carried out by the Soil Conservation Service in cooperation with the Land Grant College, experiment stations.

Q When did this program start, do you know?

A Oh, this particular phase of it about 1935.

Q Has it been ongoing ever since?

A Yes.

Q Do you know how extensively across the country it's been going on? A Well, it's going on all over the country. It's in every state. Some states here in the east are nearly finished. Most states have a program to complete the soil survey in their state.

Q Do you know, by the way, how many employees the Soil Conservation Service has doing the soil survey work across the country? A No, I don't know. Many.

Q Do you know how many there are in New Jersey?

A Right now involved in the soil survey, we have seven soil scientists employed by the Soil Conservation Service, and three employed by the State of New Jersey working under our supervision.

Q Now, I believe I interrupted you when you were telling us what the types of information contained in the soil survey are, and the purpose which they were gathered for?

A Okay. It's an inventory of the soil resources. It has a map showing the locations of the different kinds of soils and a description of each kind of soil along with various interpretive tables showing how the soils might be used and how they react in different management.

Q Now, the interpretive tables,would you tell us a bit more, in some more detail what the interpretive tables are, and their purpose? A The interpretive tables are based on properties of the soils, evaluated for different criteria as to how these properties affect use and--

Q Would you give us an example?

A Well, there's a community development table--

Q Is that on page 88? A Yes. It's entitled, "Town and Country Planning." That table--

MR. FERGUSON: Excuse me, Mr. Eby. With Mr. Lindeman's permission, I would ask that a copy of this document be shown to the Court so that the Court can follow the witness. I do intend to move the document into Evidence as a foundation document, and specifically some of the tables, and the methodology used and the purposes for the report itself.

MR. LINDEMAN: The document is going to get into Evidence. I don't have any objection.

Might as well be marked now than later.

THE COURT: It will be marked in Evidence, then.

(D-1, book, was received and marked into Evidence.)

Q I believe, Mr. Eby, you were about to refer to approximately page 88--

MR. FERGUSON: Excuse me. Let's give the judge the one that was marked in Evidence, and you can refer to your copy.

(COURT OBSERVES.)

Q I call your attention to the section on page 88 entitled, "Town and Country Planning," and ask you if, I'll ask you what the purpose of that section is?

A That is an introductory statement as to the concepts that were used in making the table for, "Town and Country Planning." It covers the ratings, "slight, moderate and severe," and tells what is meant by those, and then it goes on to list the uses that were evaluated in the table.

Q Now, going back to the first sentence, I'll just read it for the record, "This section is mainly for land planners, municipal officials, developers, owners or users of land, and others who are responsible for the preparation or evaluation of land use plans or for community development." I would ask you to comment upon that sentence,

and tell us if you can, as an employee of the Soil Conservation Service, why it is there--

MR. LINDEMAN: I object, your Honor. I don't think it's, interpretation is necessary of that sentence.

THE COURT: Isn't it self-explanatory?

MR. FERGUSON: I want to emphasize, if I can, the purpose of the collection of this data, and the presentation of the data in the report.

Q Is there anything other in that sentence the Court ought to know in evaluating the use of the Soil Conservation Service data for, "Town and Country Planning?"

A I think the real key here is that soils information should be used, if it is to be used at all, should be used in the planning process, the soil survey, these maps, these interpretations are to be used in the planning process rather than for specific on-site interpretations as to what is at a point on the landscape. Because of the nature of soils, in the mapping process you have to make inclusions of a great variety of soils that occur in the landscape in the mapping unit. But to know what soil is at a point in order to design where you're going to put, say a house, in order to design a foundation, you must go to that point and study the soil and make your measurements to design a foun-

dation,so that it's very important that you dont try to substitute soil survey information for on-site investigations.

Q Is it correct--

MR. LINDEMAN: Excuse me. May I ask the court reporter to mark that answer, please?

Q Another way of stating it is that this document is not specific enough to enable any particular concrete decision to be made with any, with respect to one point of ground? A Yes.

Q You mentioned the ratings of slight, moderate and severe. Would you explain what those ratings are for the benefit of the Court? First, I'd ask you if that was the first classification, nomenclature, that the Soil Conservation Service used? A No. That wasn't the first. We started out speaking in terms of suitability and unsuitability, but we found that places that were said to be unsuitable because of other considerations,maybe the economic considerations or the fact if we rated it as unsuitable because you couldn't satisfactorily dispose of sewerage effluent on the site, a person could build a sewerage treatment system, central sewers, and then the limitation was removed, so that, or an engineer would come up with a design that would satisfactorily remove the limitation, so instead of speaking in terms of suitability, we now speak in terms of degrees of limitation, and that's what the slight,

moderate and severe limitations are. They're largely based on economic considerations.

Q Would you tell us, then, the definitions of slight, moderate and severe as used in D-1 in Evidence?

A They're contained here on page 88, rating of slight means that the soil properties are generally such that the soil is satisfactory for the intended use without any major changes in design. The rating of moderate indicates that there are limitations in the soils which would require specific design of whatever function you're doing to overcome those limitations, would cost a little bit more money to do so, and then the rating of severe means that the soil properties are so unfavorable that it requires major changes in design or structures to overcome those limitations.

Q I call your attention to page 90, and ask, Table #7, and ask you to tell us what that table is, and what its utility might be for the heading of "Town and Country Planning?" A Well, that table lists the soils throughout the county, and then the series of potential use of the soils across the top, and gives the degree of limitation and the reasons, major reasons for the limitations in each of the columns. The way in which this information ought to be used is in the planning process to select those areas which are most suited for a use, and which, if used for that, would have the least impact on the environ-

ment. Areas with severe limitations, if used for a particular purpose, would be the most expensive to design, to overcome those limitations, and have potentially the greatest impact on the environment.

Q Could you give us an example of something which would be more expensive to overcome and would have more of an impact on the environment? A Well, the classic is the flood plains. We would rate a flood plain as having a severe limitation for a housing site. A person could overcome that limitation as far as flood hazard by putting fill in there to raise the structure above the level of the flooding. The flood limitation is removed, the impact on the environment is that we've removed that particular portion of the flood plain from its natural function in the landscape; that is, to allow the excess water to spread over it and to remain there for a period of time, and then flow away briefly after the storm is passed, and probably to move the flood problem somewhere else.

Q What about steep slopes? Can you give us an example of how that can be overcome, and relative cost factor?

A You could go in and regrade the whole area. In hard-rock country, which this area is, this would prove, if you are going to cut down into the soil to any depth, say 10 feet or something like that, you're going to be encountering rock and stones, would be uncovered, which would then have

to be disposed of in some way. You just have to tear up the whole landscape to get rid of a steep slope.

Q Mr. Eby, I would ask you whether the classifications of slight, moderate and severe as you have testified to are used in the body of this document for the specific soil descriptions themselves, and I'm referring really to pages 10 through, I guess, 58?

A The degrees of limitation are not used in those descriptions. The reason was that if we give degrees of limitation in the tables, and we give degrees of limitations in the text, maybe in two or three tables the process of editing to see that we were consistent throughout was just too much of a job, so we used the degrees of limitation in the tables only. In the narrative descriptions of the soils, we list simply the kinds of limitations that that soil has rather than the degree. Slight, moderate and severe are not used in the narrative descriptions of the soils.

Q So, then, to determine the kinds and extent of the limitations, you used both Table 7, which has the degree of limitation, and the English-language description as it were, of the soil to give you the qualitative nature of the limitation? A Yes.

Q Mr. Eby, I call your attention to this map, which is Exhibit D-24j, I believe that's just for Identification, and ask you if that is one of, that caption,

"Soil Limitations for Septic Tanks," is one of the limitations described in Table 7 of your report?

A Yes.

Q And, I want you to assume that this data was taken from the, the information in your office, and prepared by Mr. Lloyd around 1969, 1970, would you tell the Court what utility this kind of information would have in regards to determining the appropriate use of the land which it describes? A Well, it would be useful in showing those areas with slight, moderate or severe limitations for on-site septic effluent disposal from a septic tank. The particular way in which it should be used, I think, would be to, in the planning process, to first indicate those areas where you would be most likely to find a suitable place for disposal, on-site disposal systems, and those areas where you would be most likely to have severe limitations for on-site disposal.

Q I show you map number 13, Exhibit D-24i, and once again I want you to assume Mr. Lloyd prepared this from the data in your office, from your sheets, same classification of slight, moderate and severe according to the color code on it, and I would ask you the same question, i. e. how is this information useful to a land planner, and I'd like you to explain what the limitations for light buildings with cellars refer to? A Well, it

would be used pretty much in the same way as the previous map. That is, it shows those areas with slight, moderate or severe limitations for buildings with cellars, and to be used in the planning process to select the sites that are, have the least limitation, and also to point out the sites with the more severe limitations. He could also use both of these maps in planning for his needed on-site investigations, point out the areas where he should probably spend considerable time investigating the nature of the limitation in order to plan for procedures to overcome those limitations, and the criteria that are used for on-site or for the foundations are contained in the, in our guide for interpreting engineering use of soils.

THE WITNESS: Could I refer to that?

MR. FERGUSON: Yes, please. You're referring to another document.

THE WITNESS: Yes.

Q Would you tell us what document you're referring to?

A It's the "Guide for Interpreting Engineering Use of Soils", prepared by the U. S. Department of Agriculture Soil Conservation Service.

Q And, what's the purpose of that document?

A It lists the criteria that we are to use in evaluating soils for various uses.

Q In conjunction with the soils survey?

A Yes.

MR. FERGUSON: Please go ahead.

THE WITNESS: All right.

A The criteria that are listed for limitations for dwellings in that are the soil drainage, depth, seasonal high-water table, flood hazard, degree of slope, spring swell potential, unified soil groups, potential potation, stoniness, rockiness, depth to bedrock.

Q And, are those all the parameters of the soil which are incorporated in the limitations map for limitations for light buildings with cellars?

A Yes.

Q I call your attention to Exhibit D-24k for Identification, and represent to you that this is the map on which Mr. Lloyd has combined the information from the two previous maps, and ask you to comment on that map, and add anything about it which, that you had not added from the previous two maps. The title is, "Combined Soil Limitations," "Slight Buildings," on one, and "Septic Tank," on the other.

A Well, assuming that he has, has done just that, it's a convenient way of putting into one map the two reasons for, or the two uses and limitations light buildings such as dwellings and the septic disposal.

Q Is the combined information on one map with a color key grading from the lightest with slight, slight

limitation, and the darkest with severe, severe limitations, in your opinion as a soil scientist, helpful to a land planner in terms of locating appropriate locations for various land use? A Yes, I think it would be very helpful.

Q I call your attention, Mr. Eby, to map number D-24g, labeled "K Factor," and ask you to tell us, first, what K factor is. A K factor is the relative erodibility of a soil.

Q Now, will you tell us how K factor was established and by whom? A The Soil Conservation Service, in cooperation with the Agricultural Research Service, and various agricultural experiment stations throughout the country conducted tests on standard plots to determine the erodibility of those soils. They had very specific dimensions of the plots and degree of slope, and then they measured the amount of erosion that occurred from those soils that they used as key soils, and then we were able to relate soils that were not studied to the key soils based on their similarity to those soils so that we have, K factors are determined for many, many soils throughout the country. That's about all I can say about K factor, I think.

Q Have K factors been determined for the soils in D-1 in Evidence, "Morris County Soil Survey?"

A There was a period when we published them, a period

when we didn't. I'm not sure they're published in the report. I don't believe they're published in the report.

Q Are the K factor sheets or data available in your office? A Yes.

Q Do you know if Mr. Lloyd got that data from your office? A Yes.

Q Do you know whether he did, did he get them from your office? A Yes, yes, he did.

Q Will you look at the color key on the bottom of the map, low is less than .24; medium is .24 to .37, and high is .37 and above. Would you tell us whether, in your opinion, those are reasonable classifications of K factor groups? A Yeah. Yeah, they're reasonable.

Q I assume from your answer that there could be others, but this is the one that was selected and is not, or it is reasonable in your opinion? A It's reasonable. It's also a good set, good limits to use for those soils in Morris County because it grouped the soils very well so that those soils that are, have a low erosion hazard have that, fall in that low category, and those in the moderate fall into medium, and those with the high fall in the high.

Q Can you recall discussing this classification with Mr. Lloyd? A I don't recall the details, but I recall that we did discuss it, yes.

Q Is the opinion you just gave about whether it's reasonable based upon your looking at it and your knowledge at the present time, rather than your recollection?

A I'd say on both.

Q I call your attention, Mr. Eby, to map D-24h, I believe, number 11, entitled, "Erodibility of Soils," sub-title, "K Factor Modified by Slopes," and ask you if you would, if you need to, come down and look at it-- I showed it to you before taking the stand--and tell us with special reference to the color-code key and legend on the bottom, your opinion as to the reasonableness or unreasonableness, however you want to describe them, of the classification by K factor and slope as to the category of slight, moderate and severe. Before you start, first, did you discuss this with Mr. Lloyd? A Yes.

Q Can you recall what you discussed with him, and what you told him? A Well, the basic thing that we discussed was that the K factor by itself did not provide him with a very useful map because there were other factors that affected erosion hazard, and ought to be reflected in a map of the relative erosion hazard, so we discussed that he might combine degree of slope with K factor, and after some discussion we came up with some groupings, and I don't recall whether these were the groupings we used, but these are reasonable groupings.

Q That's on the basis of your looking at them now and judging them by your present knowledge and expertise?
A Yes. And, what these groups show is relative erosion hazard. The lightest color has the least hazard of erosion, would be the areas least likely to erode and least likely to produce sediment. The darker areas in those areas most likely to erode, most likely to produce sediment.
Q Would you, for the benefit of the Court, tell us other factors that may be or should be considered in the question of erodibility of soils, and then why they, then your opinion as to whether the two factors here, slope and K factor, are a useful grouping? A Well, in calculating erosion, anticipated erosion that you might expect from an area, we use the soil loose equation, which has, among the factors, K factor, the degree of slope, length of slope, cover, period of year when the soil is exposed, and the kind of practices that are applied and each of these factors modifies the erodibility so that you can calculate, we can calculate the anticipated erosion under a set of conditions. These two, K factor and degree of slope, are factors that we can learn from the soil survey map, from the maps, kinds of soils that are mapped, slopes that are mapped. We can learn these from the map, and that's why these were chosen as two that we might show on this map.

Q Would it be correct to say that you can't show the other factors on a map because you can't readily obtain the data? A Well, we can't obtain them from the soil map which is what was being used as a base, yes.

Q So, they're not available on the soil map, and to get them you have to go to some other source or field investigation? A Right.

Q In your opinion, is this map combining slope and K factor a useful tool of analysis when you judge what use should be made of what kinds of soils and in general of the locations? A It would be the kind of a map that a planner might use when he is weighing this information along with other information to make a judgment as to the use it would be made of an area.

MR. FERGUSON: Your Honor, with respect to all the maps that we have had Mr. Eby testify about, we intend to move their introduction into Evidence during Mr. Lloyd's testimony tomorrow, but largely on the basis of Mr. Eby's testimony, I would ask Mr. Lindeman when he cross-examines to bear that in mind, although it's appropriate to move the maps at a later time. Indeed, I'll make the offer now, if Mr. Lindeman has no objection.

THE COURT: Mr. Lindeman?

MR. LINDEMAN: I do object. I think it's more appropriate with Mr. Lloyd.

THE COURT: All right.

MR. FERGUSON: During cross-examination I would hope that Mr. Lindeman would ask any questions of this witness as to the foundation for the admissibility of those maps.

MR. LINDEMAN: I will, your Honor.

THE COURT: You can put him on warning.

MR. LINDEMAN: I don't intend to call Mr. Eby back for the rebuttal.

THE COURT: All right.

Q A point of clarification, Mr. Eby. Is slope one of the parameters of a soil as described in D-1, the soils survey? A Degree of slope is, yes.

Q So that slope is a factor in categorizing and making judgments about the soil, different soil types which, in fact, are listed in D-1? A Yes.

Q Mr. Eby, a short time ago, you mentioned the element of cost in connection with the classification of slight, moderate and severe as used in D-1. In your opinion as a soil scientist, are the classifications used in D-1 of slight, moderate and severe useful in determining those areas in general which will or can be used for development at least cost to the developer? A If you do not

consider the price of the real estate, availability of other service that might be located nearby, and so on, yes.

Q Excluding the other factors which might generate cost, such as remote location, whatever?

A Yes.

Q Your answer would be yes?

A (Witness nods.)

Q Will you tell us why? A Well, the areas of slight limitation, the soils have very few limitations, and those that they have are very easily overcome by the standard design construction practices, things that a developer would have to do regardless of anything else, and so these are just,the costs are minimal. As you go into the areas of moderate limitation, the degrees of limitation become more severe, the measures which the developer must take to overcome these limitations or to design for them are more, require more input, perhaps different designs so that the cost would go up and then, finally, when you get into severe areas of severe limitations, the areas have so many limitations or such critical limitations that major changes in design and structures are indicated so that the cost just goes up just as a matter of definition of those terms.

Q I call your attention to page 10 of D-1 in Evidence--. Sorry, withdraw that. We'll hold that. Are

you familiar with the lands in Chester Township from your perspective as the soils scientist who prepared D-1? By the way, I don't know if I asked you that, who was the principal person in charge of preparing D-1 in Evidence?

A I did.

Q From your point of view as the preparer of D-1, are you familiar in general with the soils of Chester Township?

A Yes.

Q I ask you if you're familiar with the sub-region of Chester Township known as the Peapack watershed?

A Yes.

Q I would call your attention to that area just south of the Chester Borough line, down to the Morris County-Somerset County line in Chester Township, and ask you if you have any way today of looking at the data which would categorize or classify the soils in that area, and call your attention to sheet 32 of D-1 in Evidence?

A Well, we have the soil map in here which shows the locations of the soils and the kinds of soils that are mapped there, and then the narrative descriptions of the soils that tell what the properties are, and the interpretive tables which indicate the kinds of limitations and degrees of limitations, so to find out what the soils are in a particular area, I would just outline the area on the map, and then look at the map and read it.

Q Would you do that with respect to the area that I just mentioned; that is, Peapack watershed between the borough line and the county line?

THE WITNESS: Sheet 32?

MR. FERGUSON: I believe it's 32. You check me and make sure I'm right.

THE WITNESS: Well, it doesn't extend all the way down to the certain end of the borough line. It does pick up from the Chester Borough and extend down south of Fox Chase Road. I have to go to another map to go all the way to the county line.

MR. FERGUSON: What other map would you go to, and--

THE WITNESS: Sheet 36.

Q By using sheets 32 and 36, categorize as briefly as you can, by still giving us the guts of it as it were, the types of soil in that area, soil series, whatever classifications are appropriate. A Well, the major soils are Parker and there are a couple of different mapping units of Parker, one being the extremely stony, the other being g r a v e l l y, and different slopes of Parker soils. Adjacent to the Peapack Brook, there's mostly the steeper slopes, and as you get further removed from the brook, the slopes are a little more gentle. Another soil there is

Califon, I think it is. Yes, Califon loam. That's a, not as nearly as extensive as the other soils, looks like Parker and Edneyville are the most extensive. Cokesbury is there. Now, in order to determine the properties of those units, I'd go to the narrative description of Parker-Edneyville. That begins on page 36, and the unit that was fairly extensive in, on the map was the P.E.D. and P.E.C., and that's Parker-Edneyville, extremely stony, sandy loams, 15 to 25 per cent slopes, and the P.E.C. is Parker-Edneyville, extremely stony, sandy loams, 3 to 15 per cent slopes.

Q Are you referring to the two language descriptions of the, these soil types on page 37?

A Yes. You want me to read the descriptions or just--

Q No. Just state for--. If there's anything significant about their soil characterization from your point of view as a soil scientiest which would relate to an intelligent land-use plan of the area, please tell us what it is. A Well, the dominant characteristic of both the units is the extremely stony, fact that it has stones up to boulder sizes, and the depth, probable depth to bedrock, four to six feet in the P.E.D. unit, and six to ten feet or more in the P.E.C. unit.

Q I call your--. Just for the record, P.E.D. unit is what? That's Parker-Edneyville, extremely stony, sandy loams? A 15 to 25 per cent slope.

Q And, the P.E.C. is Parker-Edneyville, extremely stony, sandy loams, 3 to 15 per cent?

A Yes. Then, the other soil mapping unit in that area, within that watershed that's fairly extensive is the Edneyville. There's an E.D.B. and E.D.C.

Q Are they described on page 24?

A Beginning on page 24 and extending over to page 25.

Q And, I'd ask you the same question about the Edneyville series from your point of view as a soils scientist, what characteristics are significant if you're going to design an intelligent land-use plan for that kind of soil? A Well, the Edneyville is the less stony soil. It's a deeper soil. That's about the major two differences.

Q I call your attention to page 8, excuse me, page 10, and paragraph number 13, paragraph entitled, "Parker-Edneyville Association." Would you tell us in your own words what these numbered paragraphs refer to, and then I'll ask you a question about that particular paragraph.

A These numbered paragraphs in this section of the report refer to the mapping units on the general soils map which is the colored map in the back of the book.

Q Would you--. A This is the more generalized map to give you a broad picture of the soils in the county.

Q Are the two soil classifications which you just told us about as being in the Peapack Brook watershed, are they classified as Parker-Edneyville Association?

A They are the major soils in that association.

Q There's a sentence in there which I would like you to comment on, quote, down towards the bottom, second to last paragraph, "This association is unsuitable for farming and is severely limited for extensive community development." Does that sentence have reference to the characterizations of severe, slight, and moderate, which you testified about earlier? A Yes.

Q The next sentence is, quote, "It is suited to open space activities and to protection of watershed.", and ask you if you can tell us any more information about the watershed protection capability of that kind of soil, or if I'm not describing it correctly, why, you tell us.

A Well, the primary reason that it becomes, or that it's considered as suited for open space and protection of watersheds is that the limitations affecting its use for any intensive purpose are such that it's, you would have less of an impact on the environment if you did not go in and develop it. Really, what I'm trying to say, I guess, is it's suited for this by default because it's not, it has such severe limitations for any other use.

Q I have a book which you very kindly gave me

yesterday when I interviewed you in your office. Would you just tell us briefly what this book is, who put it out, and what it's for? A That's--

Q Would you give us the title first?

A "Soil Surveys and Land Use Planning." It's a book that was put together by people in the Soil Conservation Service, and it's primarily intended to introduce the use of soils survey information to people who are not knowledgeable or particularly knowledgeable about soils.

Q Such as? A Well, most of the land use planners, municipal officials.

MR. LINDEMAN: Lawyers.

(Laughter.)

MR. FERGUSON: No further questions.

MR. LINDEMAN: May I have a few minutes?

THE COURT: Let's take a break.

(RECESS IS OBSERVED.)

MR. FERGUSON: I have three questions I forgot on direct, your Honor. Mr. Lindeman doesn't object.

THE COURT: Go ahead.

BY MR. FERGUSON:

Q During the recess, you were mentioning to me why the Parker-Edneyville soils are grouped in association, or why they're described that way in your report, D-1.

Would you repeat that for the benefit of the Court and explain it to us as best you can? A That mapping unit, Parker-Edneyville, extremely stony, because of the stones that are in the soil, we're not able to investigate with sufficient frequency to separate the Parker soils from the Edneyville soils. The stones stop our augering. We routinely map with a hand auger so in the process of boring into those soils, we're able to identify both Parker and Edneyville soils as being present, but we couldn't separate the two of them because we couldn't bore to sufficient depth often enough, so we mapped them in a complex.

Q The reason your auger or bit couldn't go down the full distance was what? A The stones.

Q Stones would prevent it?

A Yeah.

Q For the benefit of the record and the Court, would you describe for the Court what one of your survey parties which you were in charge of in 1968 to '71 would do when doing the map work for the soils survey?

A We worked generally as individuals. We go out alone. We carry a map and soil auger, which is 60 inches long, and we walk over the landscape, observing soil properties that we can see at the surface, and boring holes into the soil to a depth of 60 inches. Then we prepare, put maps, lines on the map delineating the different kinds of soils. Each

soil has a whole series of properties that are unique for that soil.

Q Do you measure those properties as best you can when you're out there? A We measure them in the field by field techniques. We observe soil colors which are an indication of drainage. Gray colors in the soil indicate areas where the soil is saturated for periods. Feel the soil, texture of the plasticity to determine the amount of sand, silt and clay. Observe the stones, depth to rock, slope, all of those properties. And, we select sites that are representative of the soil that we're looking at or representative for that area to go back to later and get permission from the landowner, usually, to take a back hoe in and dig a deep pit and take samples for laboratory analysis.

Q Thank you. Now, do you have a definition of bedrock which you as a soil scientist use and is used in that report, D-1? A Yes.

Q Will you tell us what that definition of bedrock is, and if it's printed-- A It should be in the glossary, I hope. Okay. It is not in the glossary in this report. All right. In our work, we use bedrock to refer to the relatively unweathered residual hard rock underlying an area.

Q Well, assume we're talking about Chester Town-

ship, and I understand it's Precambrian Gneiss, the underlying rock? A That's the dominant one, yes.

Q Can you give us the benefit of how that definition would be applied to the rock, either as bedrock or fractured bedrock? In other words, what would the parameters of that definition be on Precambrian Gneiss?

A I'm not sure that I can understand what you're driving at.

Q Well, would it vary from place to place as to what kind of bedrock you would measure would be absolutely hard bedrock, or what about fractured bedrock, broken up into large pieces? A Well, the surface of the bedrock in some areas is marked by a transition zone from soil to rock, weathered, more weathered, some saprolite. It's partially weathered rock, chemically altered, but essentially in place. The rock in places is highly fractured, and the bedrock, there's not a sharp boundary from soil to rock. In other places, it's a very abrupt boundary.

Q Is saprolite considered bedrock for the purposes of D-1? A No.

Q Is highy fractured Gneiss considered bedrock for the purposes of D-1? A If the rock fragments are more abundant than the soil material mixed with them, yes.

Q My final question is, I forgot to ask you or

bring out during your qualifications what your present job is. Will you tell us and explain it for the Court?

A My title is the Soil Correlater for the State of New Jersey, and my job is to supervise the technical aspects of the soil surveys throughout the state to see that we're mapping the same soils with the same names wherever we're doing work, and to correlate this into the national system.

MR. FERGUSON: Thank you. No further questions.

CROSS-EXAMINATION BY MR. LINDEMAN:

Q Mr. Eby, do you have any personal knowledge now, or do you have recollection as to whether or not at the time of the, let's say about 1972 through 1974, if you were ever consulted by either the firm of Candueb & Fleissig or Mr. Tore Hultgren of that firm with regard to work that he was doing for Chester Township?

A The second name that you gave me doesn't ring a bell at all. The firm of planners, say it again.

Q Candueb, C-a-n-d-e-u-b, and Fleissig.

A I don't recall.

Q Do you remember whether a Mr. Borman ever consulted with you? A I think so. Borman and Duran.

Q I think it was Borum--

MR. FERGUSON: Borman and Duran.

A Yes, that firm consulted with us.

Q Did they consult with you in or about 1975, '76, to your knowledge? A About Chester Township?

Q Yes. A I don't think so.

Q Have you consulted with anyone about Chester Township recently about the planning of Chester Township, that is to say, within the last year, year, 1977?

A No.

Q Now, would you know if anybody in your, in your department, Soils Conservation Service, would have consulted with any of those people for the purpose of assisting them in planning? A I stopped into the Morristown office this morning on the way here and was told that they had been out to an area, to this particular area in Chester Township, assisting with some on-site investigations; Sylvester Fletcher was the soil scientist who attended that, and the other fellow who went along was an employee of the Morris district. I don't recall his name.

Q Was that just within the last few months, would you say? A No, not within a few months. Fletcher is resigned from the service some time ago, I guess six months or so, at least, so it's been that long ago.

Q About six months ago?

A At least.

Q Approximately. Now, would you know whether or not any such person had consulted with this Morristown office at any time in 1976? A About Chester Township?

Q Right. A No, I don't know.

Q Would you have any way of knowing, is that information likely to have come to you if that office were, in fact, consulted? A If they had any questions to raise specifically about soils, if the Morristown employees had questions to raise about soils that they couldn't answer, yes, I probably would have heard; but if they felt that they could adequately handle it with the soils survey report, no, there's no reason they would have consulted our office.

Q What is the expertise of the people who man the Morristown office? A There's the, there's a conservationist, who's the supervisor of the office, and then there are engineering technicians, an engineer, primarily a hydrologist. They now have a soil scientist person who is trained as a soil scientist, but has taken the job as a conservationist, soil conservationist, in the office.

Q How long has he been there, or she?

A He. I would guess about six months.

Q Mr. Eby, would you look, please at map number 32 in D-1 in Evidence? Now, that map 32 is a general de-

lineation or shows a general delineation of the character of various kinds of soils in Chester Township, does it not?

A A portion of--

Q Pardon me? A Of a portion of the township, yes.

Q Look to the index of map sheets at the very back of the Exhibit, number 32 shows that it is in Chester, doesn't it? A Yes, Chester and Mendham, Chester Borough.

Q 26 shows some of Chester Borough, Chester Township, also; is that correct? A Yes.

Q Now as to map number 32, soils which are designated or sections which are designated E.D.B., Edneyville gravelly loam, slight, looking through the township there are a number of sections of fairly extensive acreage, are there not? A Yes.

Q And, some of that property, just by the way, some of that E.D.B. is in the plaintiff's property. Do you know where that is on parcel, on map 32? A Well, I know generally where this property is that we're talking about. I don't know the boundaries of it.

Q Can you tell whether E.D.B. is in any of the plaintiff's property? A If you show me the boundaries, yes.

MR. LINDEMAN: My showing you is just

my telling you now, but, and it can't be accepted as Evidence, but--

MR. FERGUSON: Well, now, maybe we can all get in the act here. Why doesn't Mr. Lindeman draw the boundaries in green pencil, and then the witness can say what's inside.

MR. LINDEMAN: I can't do that.

MR. FERGUSON: Mr. Salzman?

MR. SALZMAN: Not exactly.

THE COURT: Mr. Lindeman has withdrawn it, Mr. Ferguson. Leave it alone.

Q Now, can you tell us, can you tell us, Mr. Eby, approximately what the acreage of the E.D.B. areas would be?

THE COURT: You mean of the entire township?

MR. LINDEMAN: Well, as we look at it on map 32.

THE COURT: I think you may be getting the reaction I'm getting. He's asking a very difficult question. Aren't you? Look at an aerial photograph, which is clearly what this is, and make an estimate of spots of soil, and come up with--

MR. LINDEMAN: Well, if your Honor please--

THE COURT: What I'm going to say to you is it's an unfair question to ask any expert;unless he has had an opportunity to really study it, and make some measurements, it would really be off the top of his head.

Q Let me show you one little section, a number of sections. I'm pointing to an area right now of E.D.B. in Chester Township. Here is another one, and here is a third. Now, just looking at those three for the moment, is there any way that you can estimate approximately what the acreage is just on those three? A The scale is 1 to 20,000.

Q Just roughly. A I would guess 300 acres.

Q Overall? A Yeah, maybe 400.

Q There are other areas of E.D.B., of course, here, to which I have not referred?

A Yes.

Q Now, also, P.A.C. There are some P.A.C. areas on this map number 32, are there not?

A Yes.

Q I'm going to point out just a few P.A.C. areas. Here's one, two,-- A This is different.

Q Well, in the few, they're scattered generally throughout, are they not? A Yeah.

Q Could you make any estimates of the acreage at least that you looked at on D-1?

A About three areas you pointed out?

Q Approximately. A Well, I'd say that we looked, pointed out about 200 something, less acreage of that unit than of the other one.

Q Right. Now, going to table 7, the table designated, "Limitations of the Soils for Town and Country Planning," and Edneyville, the definition of the character of the soil, or the criteria for E.D.B.for foundations with basement is slight; without basement it's slight; moderate for lawns, landscaping, et cetera; slight for septic tank, and so forth. Generally, therefore, the use of the E.D.B. sections would be,at least according to this classification without regard to other criteria, would be satisfactory generally for the construction of buildings, would they not, or would it not? A Well, it would be slight, yes. Have slight limitations.

Q Right. Now, as to the P.A.C. which is at page 96, generally the, except for athletic fields and sanitary land fill, the criteria or the characteristics, or the various uses of the P.A.C. is moderate; is that not correct?

A Yes.

Q Do you know if there are any other areas, any designations of areas in this, at least on map number 32,

where the classifications show, have criteria that are satisfactory in the sense that the limitations are either moderate or slight for the construction of buildings?

A Any other mapping units that would come out that way?

Q Yes. A There's an area of A.N.B. which is Annandale, and A.N.C. there, slight or moderate.

Q Can you tell us from what you're looking at there approximately the acreage that you can see?

A On those two? Just in the areas that I'm looking at?

Q Yes, on map 32 of D-1. A Well, I wouldn't want, I see perhaps 100 acres up here in this one corner, but there may be other areas. Here's another area of the Annandale soil, so there's not, it's not a very extensive soil on this sheet.

Q Take a look at map number 26, which was also significantly of Chester Township, please Mr. Eby, and tell us what you find just in looking at it as to the acreage of Edneyville E.D.B. sites, and I think I'm sure I can, well I can point some out. You can find them easier than I.

THE COURT: Pleasant Hill Road?

Is that the area you're pointing to? There's a road running along there. There's an E.D.B. area. See the road?

THE WITNESS: Yes.

MR. LINDEMAN: Is this the road, your Honor?

THE COURT: Here.

A Yes. There's extensive areas of Edneyville and Annandale.

Q And, the P.A.C.? A P.A.C., there's a few spots of it at least, haven't seen any extensive areas of it yet.

MR. FERGUSON: I'm somewhat mystified. I don't know if I should object or not. I don't think it's necessarily improper. I don't know, frankly, what, how we tie this into anything or--

THE COURT: I'm smiling because I'm guessing where Mr. Lindeman is going.

MR. LINDEMAN: Well, this case is not being tried on the basis of Mr. Caputo's property. We would show what our own characteristics may be, but there's certain obstacles to that.

THE COURT: I'm just talking about the township and ordinance--

MR. FERGUSON: I have, well, I'm slightly mystified.

MR. LINDEMAN: So far as--

THE COURT: Off the record.

(DISCUSSION OFF THE RECORD.)

Q Now, so far as individual townships or even individual sites are concerned, it is your, would be your recommendation that any information that is contained in D-1 is not intended to eliminate on-site investigations for specific structures; isn't that so?

A That's correct.

Q That rather, D-1 just serves as a guide for the screening of sites and for planning for detailed investigations at minimum costs, right? A I think I would go a little further, serves as a basis of soils information on which you can do your general planning, your planning can be based on it, but when it comes to making a decision about a point, then I think you must go and make your investigation at that point.

Q And, even from a planner's point of view, D-1 is a starting point, is it not, so that if a whole inventory, if you will, of a township such as Chester is to be made, that more specific and detailed investigations on site have to be made over the town to more correctly, to fix those places that are useful for certain kinds of development; not useful, but suitable?

MR. FERGUSON: Object, if it calls for any other perspective, other than a soil

scientist.

MR. LINDEMAN: No question about that just from the soils point of view. None of the other criteria can come into play with this witness.

A Well, I think as a basis for planning at a municipal level, township level, the detailed soils survey, those maps in the back of the book are sufficiently detailed for that purpose.

Q Sufficiently detailed to determine which properties would be suitable for what kind of a--

A Areas in which general areas of the township a particular zone might be established, yes.

Q Mr. Eby, on the maps that you referred to that counsel, Mr. English and I think Mr. Ferguson, too, pointed out to you, you stated, I think, that as to the erodibility, K-factor maps that you saw those maps. Now, did you see them in their final state, that is as they appear in Court now when Mr. Lloyd was going over them with you?

A I think not. I think he brought his work up at an early stage in it as he was doing the work for verification that this was the approach to take before he got the whole thing done; if he had done something wrong, he didn't want to start over, so my recollection is that he brought it to us as he was working on it as he got into it to verify that

he was taking the correct approach.

Q Would you have any way of knowing that the particular pieces of paper, big pieces of paper, but the particular maps that were shown to you today are the ones that he started to work on, or did he have drafts, preliminary drafts that he was-- A I would have no way of knowing that these are the pieces of paper that he brought in.

Q Were they big maps that he had, big as the ones that, such as D-24j, i, and k, ones that you looked at before, they were just as big? A Well, I-- yes.

Q Were they colored? A Yes, to some degree. Some of them were colored. That is what he was doing, coloring the maps, and we were looking at them to see that this was the way to do it.

Q Did they have the same colors then as now so far as you recall? A I don't recall.

Q Now, when you had, when you looked at the map on the combination of K-factor and slopes to determine erodibility, you, in fact, did see that map, did you? I think that was D-24k. You saw that particular map that Mr. Lloyd was working on? A I don't know. I think we discussed the principles that he was using, and I recommended certain class limits that he could use that were

pertinent.

Q Would you say, then, that rather than actually seeing the product, either in its early or completed stage, that you discussed the concept with him as to how it was being done, and you talked about the criteria and the way it should be done, and how things should be marked; is that what you did? A We did both. We discussed the principles and how it should be approached, and I reviewed some of his work in its early stages to see that he and I were talking about the same thing, that he understood what I was saying. So, I saw some of his maps.

Q However, in no event can you say with any certainty that that which you looked at today is the same thing that you saw when he was checking it with you?

A No, I couldn't say.

Q Can you say that it's doubtful that they are the same? A I don't know.

Q Now, so far as the word parameters is used a lot in this case, criteria, measurements, whatever may be involved, what were they? What were they, for example, for the K-factor map? What documents or what data was made available to Mr. Lloyd from which he drew all that red business? A Well, we have lists of the soils indicating the K-factors for their soils, and we have what we call single-sheet interpretations that we give out for the

interim information, and on those single-sheet interpretations the K-factors are listed.

Q What do you mean by the"single-sheet?"

A It's a sheet that we have written up on a piece of paper that lists properties for the soil and interpretations for that soil.

Q Is there any map, then, that shows what the boundaries are of the various places where certain interpretations apply? You see-- A Same criteria are applied.

Q My point is this: I'm not sure that I'm making myself clear. We have a map here that shows red and yellow, some brown on various of these maps, and they show locations on the map. I'm curious to know from what source Mr. Lloyd worked in order to know that where he was putting the red was right, was correct, and where the yellow should go, and where the white should go. What was it that he had? What was it that you showed to him to determine that those places were right? A We gave him our interpretation information for each soil so that he would look on the soils map which is the base for all of his maps, identify the soil that was there, then go to the interpretations for that soil and see whether it is considered slight, moderate or severe, and then he would go back and color it accordingly, so it's a coloring by the numbers.

Q Right. Now, insofar as the interpretations are concerned, rather the classifications, are you talking about what appears in D-1, those various maps that show where the Edneyville is and where the Parker-Edneyville, and the Califon, and all the others, are those the maps where that-- A No, he was working from the field sheets, copies of the field sheets. That was the preliminary information that we compiled, and put together these maps that are published in D-1.

Q What do the field sheets show?

A Same information using field symbols. It was, field sheets were the sheets that we worked on in the field.

Q Field sheets, maps?

A Yes, aerialgraphs, same as these.

Q Did you bring any of that data with you from which we could, we can tell what it was that he worked with? A No. It's this information.

Q All right. Now, when you, when you looked at his maps, whatever work he had, tell us, please what it was that you did to verify the correctness or absence thereof?

A I would look at the area that was colored a particular way, look at the soils symbol that was in that area, see what that symbol was, then refer to the interpretive tables, and see how that particular soil should have been colored. It was colored the correct color, it was right. All I did

was to look at the soils and look at the interpretive tables and see how they were colored, and that was it.

Q Did you check in any way that the extent of the yellow or the white was correct? Did you make any measurements, or was it just a visual-- A It was the same areas. The base information, the area, the soils are delineated on his base, those lines that are in the background on that area, the soil boundary lines.

Q But, he drew them, didn't he, you didn't draw them or nobody at Soils Conservation drew it? That is to say, he copied them from some other maps? A They were, just what his procedure for assembling the map was, I don't know. I don't think they're free hand.

Q But, you don't know? A No, I think--. He can testify how he made his maps.

Q You made no calculations, though, to determine that what he did was accurate or otherwise? Is that correct?

THE COURT: Calculate?

MR. LINDEMAN: I don't know what kind of a calculation can be made of measurements.

THE COURT: If you don't know the word you're using in the question, how can the witness understand?

MR. LINDEMAN: By calculations, I mean measurements. I don't know what the measure-

ments, what the method might have been. I'm curious to know if there was any method that was utilized to determine that those drawings, those maps that we've looked at are accurate.

THE COURT: Well, I don't think the question is a proper question. If you don't know the meaning of the word you're asking in a question--. I want to know what you mean by "calculations," and if you can't--, question and answer will have no meaning to me.

MR. LINDEMAN: I mean measurements. I want to know if he took a ruler or any other kind of draftsman's instrument to determine if what was shown on those maps were correct to verify the particular soil type in any particular location.

THE COURT: Okay. Now, do you understand the question?

A The maps that he was working on, the base information that was on the map was the soil map. It was on the map, so that it wasn't necessary for me to make any measurements to see if it was located properly. It was on the map. All I had to do was to look at it, and see what kind of soil he had in the area.

THE COURT: Are you saying it was just

a blow-up, then, of the S.C.S. map?

THE WITNESS: Reproduction of the map.

THE COURT: Okay.

Q Did he tell you there was a blow-up of the S.C.S. map? A My recollection is that's what it was, not necessarily an enlargement, just a reproduction of the base information.

Q And, you know that because he told you that, you didn't, you didn't make any, take any--

A If it differed in a great way from the field sheets that he reproduced or copies from, I would have seen it. That's my job, working with maps, and little changes in maps I can see.

MR. LINDEMAN: I wonder if we might have that combination map, please.

MR. FERGUSON: Erodibility of soils?

MR. LINDEMAN: I think it's D-24k, combined map.

THE COURT: D-24k is a combination of the light building and septic map.

Q Now, on D-24k, severe appears in various places. Do you know if that severe--. Well, let me withdraw that, and ask a preliminary question.

What really does "combined soil limitation" mean? Can

you tell me? A Well, my interpretation of what I see there is that he took the map for showing the degrees of limitation for light buildings and the map showing degrees of limitations for on-site septic effluent disposal, and then combined them into a single map. Those areas that were shown as having slight limitation for both light buildings and septic effluent disposal are shown in that lighter color. Those areas that had a slight limitation for buildings and a moderate limitation for on-site septic effluent disposal are shown in yellow and so on down. By some procedure of overlaying one on the other, he showed the dual limitation for each.

Q Did you verify any of the colorings on that map or whatever he showed you at the time? That is to say, verify the extent of, let's say the slight area, did you measure it and determine whether or not it was correct?

A I didn't do the whole map. I didn't check over his whole map. I gave him a procedure to follow, discussed it with him. He went and did some of the work and brought his product, partial product, back. We reviewed it and I was satisfied that he was following the procedure that we had discussed, that he understood what we were talking about. Now, I did not discuss with him, or at least I do not recall discussing with him, putting together into a single map the combined soil limitations for buildings and septics.

Q So, you didn't see D-24k at any time then, either in its formative or completed stage?

A I don't recall having seen it.

Q He just-- A I think the details of how he did his maps, you'll have to ask him.

MR. LINDEMAN: I agree. That's right. I agree. I share that.

Q But, I'm just asking you, Mr. Eby, if you know of your own knowledge as to how he did it?

A I know what I told him, what we discussed, and I know that I looked at some of his work in the early stages, and was satisfied that he understood what I said to him.

Q Now, some general questions, Mr. Eby. Do you know whether, can you tell us whether erosion is increased if, in the construction of any buildings,you don't disturb the surface of the ground? A If you don't disturb the surface of the ground, would erosion be increased?

Q Is erosion affected adversely?

A Assuming you don't disturb the surface of the ground, I guess erosion would not be increased greatly. Probably somewhat, because of the concentration of water from the roof drain or something like that, but if you don't disturb the surface of the ground, I would say it would not appreciably increase erosion.

Q Now, if you are going to disturb the ground in the construction of any buildings, are there not equations to tell you how much soil may be eroded? Well, answer that one first. A Yes, there's an equation that we use, probably others for calculating the amount of erosion that you get from the site.

Q Are there not standard precautions that can be taken to lower any erosion to acceptable limits, even when you have construction on property which is generally characterized as erodible soil? A There are measures for reducing erosion or attempting to control erosion, yes. You stuck a weasel in there, "acceptable," and I'm not ready to say what's "acceptable."

MR. LINDEMAN: I will accept your comment to the question and let me withdraw the word "acceptable."

Q Just say that there are measures that can be taken to reduce, let's say the effect of erosion?

A Yes.

Q In construction of buildings. All right. Now, are there not generally governmental boards and bodies that oversee or have to do with the plans and specifications of any builder which are particularly interested in the controlling and noting the extent of light erosion?

A Yes.

Q Generally, they exist in municipalities and certain state bodies, do they not? A Yes, the Soil Conservation district is charged with that responsibility.

Q Now, so far as the appropriateness or suitability of any land for septic tanks, is it proper to rely upon a map such as those that have been shown to you today, the various D-24 maps, in terms of the construction of any dwellings or buildings that are likely to have septic tanks, or is it not better to do some on-site investigation to determine whether septic tanks are appropriate or suitable?

A To determine suitability of a lot, a spot?

Q Yes. A On-site investigation.

Q Can you tell us whether or not a K-factor of 0.17 of Parker-type soil is high? Is that considered to be high? A No.

Q Is it low? A 0.17 is low.

Q What about .28? A It's about--

THE COURT: What about it? Is it high or low?

MR. LINDEMAN: Right. High or low. Beg your pardon.

A It's near the upper end of what we generally consider as medium.

Q By that, you mean acceptable, within acceptable ranges? A No. That's not a proper interpretation of K-factor. That's just relative erodibility of a soil.

Q Is that word, "medium," or "median?"

A Medium.

Q .24, 0.24, what's that? A That's the low end, what I would consider medium.

Q Edneyville has a characteristic of .24, does it not, or would you want to check that? I guess that would be in the volume, would it not? Is that contained in D-1? A No. K-factors are not in here.

Q All right. Would it be normal that Parker-Edneyville type soil would, or that a test pit in Parker-Edneyville type soil of ten feet would show that there was no bedrock hit to that depth? A It's erodible, sure, entirely probable.

MR. FERGUSON: What was that answer? I didn't hear.

THE WITNESS: It would be very probable that you could go out and dig a test pit in a Parker-Edneyville mapping unit to a depth of ten feet without hitting bedrock.

Q Is that true for P.E.D. as well? Would your answer be the same for P.E.D.-type soil?

A P.E.D. --

Q Will you check that?

A That is a Parker-Edneyville on the steeper slope. It is entirely possible that you would go into an area of P.E.D. and dig a hole to a depth of ten feet without hitting bedrock.

Q The survey, however, D-1, page 37, Parker-Edneyville, 15 to 25 per cent slopes, says that bedrock is generally at a depth of four to six feet?

A Yes. That's why you have to make on-site investigations.

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

REDIRECT EXAMINATION BY MR. FERGUSON:

Q Mr. Eby, what is a soil conservation district?

A A soil conservation district is a division of state government, and it is charged with the, among other things, what I referred to then was the enforcement of the sediment and erosion control.

THE COURT: It's in the statutes.

MR. FERGUSON: I wanted to establish that was a non-municipal body, state body.

Q Is that on the-- A It's under the State Committe of Agriculture, I believe. I think it's under Agriculture.

MR. FERGUSON: That's all the questions I have.

THE COURT: Step down. Thank you. All right. That's it for today. See you tomorrow morning at nine o'clock.

MR. FERGUSON: Yes, sir. We have Mr. Lloyd coming back. We can have Mr. Kasler available tomorrow afternoon to continue. I don't know what Mr. Lindeman anticipates would be his cross-examination.

(DISCUSSION OFF THE RECORD.)

(WHEREUPON PROCEEDING WAS ADJOURNED.)

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

JOSEPH CAPUTO and ALDO CAPUTO,

Plaintiffs,

vs.

TOWNSHIP OF CHESTER and PLANNING BOARD of TOWNSHIP OF CHESTER,

Defendants.

CERTIFICATE

I, ELLEN DI BENEDETTO, a Certified Stenographic Reporter of the State of New Jersey, do hereby certify that the foregoing is a true and accurate transcript of the proceedings in the above-entitled matter as taken by me at the time and place aforementioned.

CERTIFIED SHORTHAND REPORTER

ELLEN Di BENEDETTO
NOTARY PUBLIC OF NEW JERSEY
MY COMM. EXPIRES FEB. 17, 1983

DATED: March 31, 1979