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NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF:

BOSTON EDISON COMPANY, et al

(Pilgrim Nuclear Generating Station,
Unit No. 2)

POOR ORIGINAL

Place - Plymouth, Massachusetts

Date - 28 August 1979

Pages 11,491 - 11,707

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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 4 In the matter of: :
 :
 5 BOSTON EDISON COMPANY, et al : Docket No. 50-471
 :
 6 (Pilgrim Nuclear Generating Station, :
 Unit No.2) :
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Plymouth Memorial Hall,
Plymouth, Massachusetts

Tuesday, 28 August 1979

The hearing in the above-entitled matter was reconvened, pursuant to adjournment, at 9:00 a.m.

BEFORE:

ANDREW C. GOODHOPE, Esq., Chairman,
Atomic Safety and Licensing Board

DR. RICHARD F. COLE, Member

DR. DIXON CALLIHAN, Member

APPEARANCES:

GERALD H. LEWALD, Esq., Ropes & Gray,
225 Franklin Street, Boston, Massachusetts; and
DALE G. STOODLEY, Esq., Boston Edison Company,
Legal Dept., 800 Boylston Street, Boston,
Massachusetts; on behalf of the Applicant.

MICHAEL B. MEYER, Esq., and FRANCIS WRIGHT, Esq.,
Assistant Attorneys General, State of
Massachusetts; on behalf of the Commonwealth
of Massachusetts, Intervenor.

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APPEARANCES: (Continued)

BARRY SMITH, Esq., Office of the Executive Legal Director, Nuclear Regulatory Commission, Washington, D.C., on behalf of the Nuclear Regulatory Staff.

ALAN R. CLEETON, Pro se.

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C O N T E N T S

<u>WITNESSES:</u>	<u>DIRECT</u>	<u>VOIR</u>	<u>CROSS</u>	<u>REDIRECT</u>	<u>RECROSS</u>	<u>BOARD</u>	<u>CROSS</u>	<u>ON</u>
		<u>DIRE</u>					<u>BOARD</u>	

(Resumed)

Falk Kantor) Leonard Soffer)	--	--	11,502	--	--	--	--	--
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Philip Herr	11,590	11,621	11,631	11,687	--	11,688	11,702	
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EXHIBITS:

IDENTIFICATION

EVIDENCE

Commonwealth No. 112
 (Report from E.G. Case to
 NRC Commissioners dtd
 3/7/78)

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CHAIRMAN GOODHOPE: The hearing will be in order.
 This is a continuation of the hearings of the
 Boston Edison Company, et al., Pilgrim Nuclear Generating
 Unit No. 2, Docket No. 50-471.

Will counsel please state their appearances.

MR. LEWALD: My name is George E. Lewald. My
 address is Ropes & Gray, 225 Franklin Street, Boston,
 Massachusetts.

With me is Dale G. Stoddley, assistant general
 counsel for Boston Edison Company, 500 Boylston Street
 Boston, Massachusetts, representing the applicant.

MR. WRIGHT: My name is Francis Wright. I
 represent the Commonwealth of Massachusetts.

MR. SMITH: My name is Barry E. Smith; I
 represent the NRC staff. My address is Washington, D. C.

MR. CLEETON: Alan R. Cleeton, 22 MacIntosh Road,
 Franklin, Massachusetts, representing myself.

CHAIRMAN GOODHOPE: One matter before we proceed:
 Mr. Lewald has requested the issuance of subpoenas, and the
 board has considered his request. The subpoenas will be
 granted and will be issued immediately upon my return to
 Washington.

MR. WRIGHT: Mr. Chairman?

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CHAIRMAN GOODHOPE: Yes?

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MR. WRIGHT: May I be heard on that, please?

CHAIRMAN GOODHOPE: Are you going to object to presenting the witnesses? This is an ex parte matter, as I understand it.

I'll hear from you, though.

MR. WRIGHT: There is one thing, sir. First of all, we just received this request for subpoena yesterday. We're still considering it. I'd ask that you hold your ruling until we can respond to it. The one thing that immediately comes to mind is it's certainly very much out of the ordinary, and that's the requirement that the witnesses in this case that are being subpoenaed here file written testimony.

I don't think that's usual, at least to my knowledge, for that alone; we'd like an opportunity to respond in detail. As soon as these hearings are concluded, I intend to get back to my office and file a written response.

I'd ask that you withhold any ruling until we've had a chance to respond in writing.

CHAIRMAN GOODHOPE: We'll go ahead and issue the subpoenas as requested. If you have objections to it, then file your objections then.

MR. WRIGHT: Do I understand that would be requiring the witnesses to file written testimony? That's what

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1 the subpoena asks for.

2 CHAIRMAN GOODHOPE: Is that unusual? It's the
3 general custom to file written testimony.

4 MR. WRIGHT: If the party is presenting the
5 witness, yes, it's customary. But if somebody is being
6 subpoenaed, I think it's very unusual to force them in advance
7 of that to sit down and write up testimony to be filed.

8 CHAIRMAN GOODHOPE: Well, I'm assuming that the
9 purposes of this are to permit the witnesses to testify as to
10 what the arrangements were and how they're going to proceed
11 along the lines of the letter of July 25, 1979. to Mr. Abbott
12 and Mr. Moulton, as signed by Alan B. Scheer (phonetic),
13 assistant attorney general.

14 MR. WRIGHT: I think there are many occasions in
15 which witnesses are subpoenaed into these kinds of
16 hearings.

17 But in all cases they are subject to direct
18 examination and then cross examination. I've never heard of a
19 party forced to come in who was not sponsored by a party
20 directly and be forced to write it all out.

21 CHAIRMAN GOODHOPE: If they're unable to present
22 written testimony, and they have a reason to present written
23 testimony, I think that would still be in compliance with
24 the subpoena, if -- even if it does call for it. If they
25 don't have a basis for preparing written testimony, why, they

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1 just say they don't have a basis. They don't know what
2 testimony they want. Therefore, they're unable to present it
3 or file written testimony.

4 MR. WRIGHT: Well, if you --

5 CHAIRMAN GOODHOPE: That's another thing. Do
6 you know that Mr. Parker or whoever he designates is going to
7 object to it?

8 MR. WRIGHT: I have not had a chance to look into
9 this matter at all.

10 CHAIRMAN GOODHOPE: We'll issue the subpoena. If
11 you have objections to the subpoena, file your objections.

12 MR. WRIGHT: Well --

13 CHAIRMAN GOODHOPE: I'm just putting you on notice
14 now that the application will be granted.

15 MR. CLEETON: Mr. Chairman?

16 CHAIRMAN GOODHOPE: Yes?

17 MR. CLEETON: You made a reference to a letter
18 to Mr. Abbott and Mr. Moulton. That's in reference to
19 Pilgrim 1 and not Pilgrim 2. I don't know if this is
20 relevant to this subpoena, but the attachments thereto are
21 a matter regarding Pilgrim 1, not Pilgrim 2.

22 DR. COLE: I think they're related to the
23 emergency planning. It's difficult to separate Pilgrim 1
24 and Pilgrim 2 when you're talking about emergency plans
25 and emergency planning.

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CHAIRMAN GOODHOPE: Thank you, Dr. Cole.

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1 MR. WRIGHT: If I may, Mr. Chairman, may I make a
2 request that you withhold your ruling on the subpoena
3 until we get a chance to respond to it? It'll only be a couple
4 of days and I think it's an unfair position for us. We have
5 a novel question, here, whether or not a witness can be
6 required to submit written testimony in ahead of time. And
7 I just think fairness would call for an opportunity to
8 respond to that particular question. We just received this in
9 yesterday, since we've been down here and simply have not had
10 the time to work this thing through.

11 (Board Conferring)

12 CHAIRMAN GOODHOPE: We'll issue the subpoena. If you
13 have objections, file them. With that we'll proceed with the
14 witnesses.

15 MR. SMITH: Mr. chairman?

16 CHAIRMAN GOODHOPE: Yes, Mr. Smith.

17 MR. SMITH: That was one of the preliminary matters
18 I wanted to report back what I know on the subject we discussed
19 yesterday relating to emergency planning. Unfortunately, I
20 don't know more today than I did yesterday. I think that the
21 best course then, is for me - as soon as I get back, if any
22 thing changes in the nature that I discussed yesterday, to
23 inform the board and parties, and otherwise go ahead as
24 planned. On that matter, I talked to the other parties and
25 at least the parties are in agreement to have testimony filed,

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1 rather than on September 14, which is still within the rules
2 for filing testimony. And also, there's been interrogatories
3 filed by the Commonwealth and we've agreed among ourselves
4 to, of the date of September 10.

5 CHAIRMAN GOODHOPE: All right. But on that, if
6 there are changes, because I certainly want to get a notice
7 out at least two weeks and a press release out at least two
8 weeks in advance of those hearings, so if we're going to do
9 anything, let us know as quickly as you can, so that the board
10 is not going to end up in a bind of getting a notice out
11 under the federal register and a press release out for those
12 October 1 hearings.

13 MR. SMITH: I understand that, sir. We could have
14 a conference call or set up individual call with the parties.

15 DR. COLE: We expect to find out, Mr. Smith. What
16 are you looking for?

17 MR. SMITH: I am looking for whether the commission
18 is going to suspend licensing activities relating to TMI. And
19 emergency planning would be one of those things that they may
20 not want the staff to go forward with.

21 DR. COLE: They did not make a decision yesterday.

22 MR. SMITH: The people I know didn't know if they
23 made a decision. I am going to keep in contact with them--
24 they don't know what the results of the commission's meetings
25 will be today.

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DR. COLE: Okay, thank you.

CHAIRMAN GOODHOPE: I don't think I made myself clear on this yesterday, but I have a little problem on this. They talk in terms of no further licensing but they do not talk in terms of no further hearings on applications for licenses. I don't know if it's a valid distinction; I think it is.

MR. SMITH: I would agree with you, Mr. Chairman, we have the same problem.

CHAIRMAN GOODHOPE: It is a problem.

MR. SMITH: I don't know what the commission's response will be and I hope when they make a response; if they make a response, they'll make clear as to what they see their role as and what they want the staff to do.

CHAIRMAN GOODHOPE: Are there any other preliminary matters? All right. We have two witnesses we had yesterday: Mr. Soffer and Mr. Kantor. They have returned. Mr. Wright, you are cross examining.

tape 1-B

1 Whereupon,

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2 PALK KANTOR

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3 and

4 LEONARD SOFFER

5 were called as witnesses, and having been previously duly
6 sworn, were examined and testified as follows:

7 CROSS EXAMINATION (Resumed)

8 BY MR. WRIGHT:

9 Q If we could, gentlemen, could we turn to staff's
10 exhibit 667 That's the tables that you passed out yesterday.
11 Now if you would look at table 3, just for purposes of
12 identification, this is the table that now represents your
13 latest calculations as to population figures based on the ERT
14 study.

15 A (Witness Kantor) Yes.

16 Q Will you look at column D, please labelled:
17 Tourists. Now, I notice that all of the tourists within
18 30 miles of the Pilgrim 2 site, you have placed in two rings.
19 The two to three mile ring and the four to five mile ring.
20 Could you tell me, does that mean that there are no tourists
21 between zero and two miles, for example?

22 A We do not believe there are any significant
23 concentrations of tourists of two miles, such that when they
24 are weighted, that when they would be a factor in the over
25 all population.

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1 Q But you did have the ERT study with you at the
2 time, that indicates, at least in terms of peak numbers. There
3 are several thousand people in that area. Is that correct?

4 A The ERT study indicates there are tourists within
5 zero to three miles. As I indicated yesterday they are
6 associated with the Pilgrim Shorefront and Overlook.

7 Q That is a restaurant?

8 A No, it's a -- it's a recreation facility. And
9 visitors center associated with the nuclear plant. It's
10 owned and controlled by the applicant.

11 Q And for what reason did you decide that there
12 should -- that the number of tourists there is so negligible
13 that you should call it zero.

14 A The information that we had on the amount of time
15 that the tourists spent there. So we weighted the
16 the average time. The result was not
17 significant, also the fact that the -- the tourists in this
18 area are under the control of the applicant was another
19 factor.

20 Q Now, there's a beach within two miles of the
21 Pilgrim site. Is there not a Priscilla Beach?

22 A Priscilla Beach is within two miles. Yes, it is.

23 Q Presumably, there are people who go to swim and
24 spend the day there?

25 A All right, now Priscilla Beach is a private beach

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1 to my knowledge. And the people who would use the beach would
2 be the permanent residents or the season residents in the
3 Priscilla Beach area, which are accounted for in the odd data.

4 Q What about tourists between five miles and thirty
5 miles? I take it you are not saying there are no tourists in that
6 area?

7 A That's correct.

8 We have found that short term visitors and are
9 significant only within the first several miles of the
10 plant, about five miles.

11 Beyond five miles it takes a tremendous amount of
12 short term visitors to have an effect on the overall population
13 distribution.

14 For example, between 10 and 30 miles to increase
15 the population roughly by 100 per square mile, you need something
16 on the order of 75 million daytime tourists; just a
17 tremendous number as you get further away from the plant and
18 the area increases.

19 DR. COLE: Excuse me. I didn't understand your
20 answer; could you repeat that?

21 I thought you said to increase the population by
22 so many square miles --

23 WITNESS KANTOR: No. To increase the population
24 100 per square mile --

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BY MR. WRIGHT:

Q Mr. Kantor, did you gather figures for the tourists from five to 30 miles?

A No. We don't have the figure on daytime, short term tourists beyond five miles.

I have reviewed some reports on tourism, but I have no report, specifically, on short term visitors into the population data base.

Q And if we go out 30 miles from unit 2, we're including a substantial portion of the Cape, are we not?

A Yes, sir.

Q And Provincetown?

A No, I believe Provincetown is beyond the 30 miles.

Q Would you like to check that?

I believe it's 20, but go ahead.

A You're correct: Provincetown is 25 miles.

Q Thank you.

MR. LEWALD: I suggest Mr. Wright be sworn if he's going to be offering testimony.

CHAIRMAN GOODHOPE: Continue, Mr. Wright.

BY MR. WRIGHT:

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Q Mr. Kantor or Mr. Soffer, for that matter, I compared the original figures that were provided you in the ER between those given you in the ER study, and there are obviously substantial discrepancies between the two

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now that you have attempted to work into your new table.

Do you have any explanation for how this occurred?

Let me ask you a for instance: for zero to one mile, for example, according to the environment 1 report submitted by Boston Edison, there were only 452 seasonal residents there. However, the ERT study that you just received, indicates that there were 1361 people there.

MR. LEWALD: I object to the form of the question.

CHAIRMAN GOODHOPE: We haen't gotten to the question yet.

BY MR. WRIGHT:

Q I'm asking you, sir, what -- or have you investigated why there was such a discrepancy between those two figures.

MR. LEWALD: Still object to the question. It reeks with argument.

CHAIRMAN GOODHOPE: Well, I --

MR. LEWALD: I think the question can be put to the witness without prefatory remarks where the interrogator has examined the results of the investigation.

CHAIRMAN GOODHOPE: I agree: the question can be asked quite a bit more sharply.

Can you explain the difference there?

I don't call it "discrepancy." There is a difference in the numbers; can you explain it, Mr. Kantor? 1137 150

WITNESS KANTOR: I believe the difference results in

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1 the fact that the ERT study today is a much more thorough and
2 systematic review within a short distance of the plant
3 than what was done originally, and came up with a significant
4 number -- additional number of seasonal residents; in turn,
5 they multiplied that by a factor of five, assuming five
6 residents per seasonal resident.

7 And I think the fact is the number five is also
8 larger than the number that was used in the original study;
9 the five people per seasonal resident was meant to be a weekend
10 seasonal peak occupancy number.

11 CHAIRMAN GOODEHOPE: In your study?

12 WITNESS KANTOR: In the ERT study, which I
13 indicated, I believe, was higher than used in the original
14 study.

15 BY MR. WRIGHT:

16 Q Mr. Kantor or Mr. Soffer, did either of you
17 gentlemen work on the calculation that went into establishing
18 the --

19 CHAIRMAN GOODEHOPE: I'm sorry; I couldn't hear
20 the question.

21 MR. WRIGHT: I asked if either of them worked
22 on the calculations that went into the establishing of the
23 low population zone?

24 WITNESS SOFFER: Yes, I did.

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BY MR. WRIGHT:

Q Would these new figures supplied by the ERT study
make a difference in the size of the LPZ?

MR. SMITH: I'm going to object on the grounds
of relevancy.

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CHAIRMAN GOODHOPE: What are you trying to show,

2 Mr. Wright?

3 MR. WRIGHT: Mr. Chairman, as you know, there is an
4 area surrounding the site called the Low Population Zone, and to
5 a certain extent it is based upon the number of people contained
6 therein and the ease with which they can be evacuated in the
7 event of a nuclear emergency.

8 We have just received this information now as to
9 substantially higher numbers of seasonal residents in this
10 area. And it seems to me -- and I only have a couple of
11 questions on this -- that it might be informative for all of
12 us to find out whether or not these figures have now been
13 employed in looking again at the LPZ, because the LPZ originally
14 was based, as I said, to a certain extent on the number of
15 people.

16 CHAIRMAN GOODHOPE: Well your question is, will these
17 new figures change his original figures that he presented in
18 the LPZ?

19 MR. WRIGHT: Yes.

20 CHAIRMAN GOODHOPE: All right. I'll let that question
21 be answered.

22 WITNESS SOFFER: I have not investigated the impact
23 of these new figures on the LPZ.

24 However, based upon just a recollection, and a
25 cursory examination of the numbers, and my understanding of

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1 them today, my judgment is that it would not change our
2 conclusion regarding the LPZ for the following reasons:

3 The calculation that went into the establishment of
4 the LPZ was primarily a calculation that was aimed at
5 determining what the population center distance was. Population
6 center distance is the requirement that is imposed by 10 CFR
7 Part 100.

8 And what we did, and what I did, and what was
9 reported in I believe Supplement No. 3 to the SER, was to make
10 an examination of population concentrations in the area around
11 the plant, and to determine where we believe the nearest
12 population center was.

13 The Staff at that time had reason to believe that
14 the contiguous communities of Plymouth, North Kingston and
15 Plymouth Center would become a population center within the
16 meaning of 10 CFR Part 100. And the question was then to
17 determine where the edge or where the distance to the
18 population center was.

19 This was determined on the basis of several criteria:
20 population density, community institutions such as schools,
21 hospitals, nursing homes and a determination was made that the
22 population center distance was approximately 3.1 miles. That
23 is the distance from the plant to the Plymouth Nursing Home.

24 Therefore, using the requirements in Part 100 that
25 the population center distance must be at least $1 \frac{1}{3}$ times the

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1 LPZ, it was determined could be no larger than 2.3 miles.

2 The Staff requested the Applicant to reduce the
3 LPZ and the Applicant has done so accordingly.

4 The new numbers that have been presented in the ERT
5 study indicate that the population in the low population zone
6 may be somewhat higher than the values that were originally
7 reported by the Staff in the SER supplements of 1974 and 1975.
8 However, this does not change the conclusion as to where the
9 population center distance is.

10 BY MR. WRIGHT:

11 Q I see.

12 A (Witness Soffer) Consequently, my judgment is that
13 no, it does not change the LPZ.

14 Q Mr. Kantor, the ERT study contains tables for ten-
15 year increments. In other words, 1980, 1990 and so forth.
16 And yet your charts, looking at 1985, could you tell me how
17 you got those seasonal figures from the ERT study for 1985?

18 A (Witness Kantor) I interpolated between 1980 and
19 1990.

20 DR. CALLIHAN: What kind of interpolation? Linear?

21 WITNESS KANTOR: Linear.

22 DR. CALLIHAN: Thank you.

23 BY MR. WRIGHT:

24 Q I did some averaging last night myself, and for
25 zero to two miles, based on the new ERT study, I determined

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1 that the peak population -- in other words during the
2 summertime -- was 10,762.

3 Does that sound reasonable to you, Mr. Kantor?

4 MR. SMITH: I object.

5 MR. WRIGHT: Mr. Chairman, I can have him do it.

6 I just want to speed things up a bit.

7 MR. SMITH: I object to that, too.

8 CHAIRMAN GOODHOPE: What is your question?

9 MR. WRIGHT: I want to establish what the peak
10 population is in 1985 between zero and two miles.

11 CHAIRMAN GOODHOPE: Why don't you ask him that
12 question.

13 BY MR. WRIGHT:

14 Q Mr. Kantor, what is the peak population in 1985
15 between zero and two miles, if you could please using the ERT
16 study?

17 A (Witness Kantor) I have to review the numbers here.
18 We are talking about peak daily population, is that correct?

19 Q Yes.

20 MR. SMITH: Mr. Chairman, if the witness could
21 respond to the question, he would have to perform calculations.

22 He doesn't know without doing the calculations is
23 what I understand from his testimony.

24 CHAIRMAN GOODHOPE: Have you done this? Have you
25 made these calculations?

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WITNESS KANTOR: This particular one, no, sir.

CHAIRMAN GOODHOPE: Can you do it rapidly?

MR. WRIGHT: Mr. Chairman, I can tell him the pages that the two --

CHAIRMAN GOODHOPE: We are not going to sit here and you are trying to make this your witness. We are not going to sit here and have him present a statistical study under the guise of cross-examination.

If you want to present the study and point out that yours is much better than what they have done, you have an opportunity to do that.

MR. WRIGHT: Mr. Chairman, I understand that.

And if you would indulge me in this one -- all I need is this one more figure.

CHAIRMAN GOODHOPE: All right. Let's go to this one figure then. But remember, this is the end of it.

Do you understand the question, Mr. Kantor?

WITNESS KANTOR: Yes, sir.

BY MR. WRIGHT:

Q Mr. Kantor, I believe the charts you want are on pages 75 and 76.

A (Witness Kantor) Zero to two miles?

Q Yes.

A In 1980 peak population zero to two miles is 9404. In 1990 the peak is -- peak cumulative population

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1 is 12,121.

2 It appears reasonable that 1985 would be about
3 10,700 peak daily population.

4 Q All right. Let's use that figure then.

5 That would be the number of people that we might
6 expect to find on a, say sunny weekend day in the summertime.

7 Is that correct?

8 CHAIRMAN GOODHOPE: What is that figure?

9 I mean, how do you arrive at it?

10 WITNESS KANTOR: That figure includes permanent
11 residents, peak seasonal residents, and peak seasonal transients,
12 peak motel capacity, peak beach use, peak institutional
13 capacity, hospital and so forth. Everything filled to the
14 maximum.

15 CHAIRMAN GOODHOPE: All right, Mr. Wright, do you
16 have any further questions?

17 BY MR. WRIGHT:

18 Q Could you tell me, Mr. Kantor, and this is of
19 course not much of a problem in this particular aspect in the
20 final supplement --

21 MR. LEWALD: I'm going to object to these questions.

22 CHAIRMAN GOODHOPE: This is what did you say?

23 MR. WRIGHT: I will withdraw what I said.

24 CHAIRMAN GOODHOPE: Ask your question. We will go
25 ahead that way. If you have comments, we will give you plenty

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of time to make them.

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BY MR. WRIGHT:

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Q Why is it more rational to use, or more accurate to use your figure from zero to two miles, your weighted figure which is 3943, than a figure that represents what might be found there on a summer day.

MR. SMITH: I object.

He used the term rational and summer day for foundation. It is argumentative.

MR. WRIGHT: I don't think it is argumentative at all, sir.

CHAIRMAN GOODHOPE: I don't know about "rational. Again, can you explain the discrepancies between the two figures?

I think we have been over this.

Or, is there a discrepancy? Or, what are the differences? Can you explain them?

WITNESS KANTOR: We have responded to this previous comment by the Commonwealth in our responses which are contained in the Final Supplement on page 5-10. In doing an alternative site study we believe it is appropriate to use the annual average population.

However, for emergency planning we would use the peak population.

BY MR. WRIGHT:

Q Well, look at page -- first of all, you said

1 yesterday, I believe, that there were three other sites in
2 the district of Pilgrim that you have seasonal information for.
3 Is that correct?

4 A (Witness Kantor) I want to -- there are three
5 sites among the original alternative sites. Also for Seabrook
6 and Millstone, seasonal residents were also included for
7 those sites, also.

8 Q And what were the three sites?

9 A The coastal sites, sites 18, 19 and 20, plus
10 Seabrook and Millstone.

11 Q If you would look, please, at page 448 of the
12 Final Supplement, that is the population distribution chart
13 for the Montague site.

14 And what is the zero to two mile cumulative
15 population figure, please?

16 MR. SMITH: Mr. Chairman, the figures are in the
17 exhibit.

18 WITNESS KANTOR: For what year?

19 BY MR. WRIGHT:

20 Q For 1985.

21 A (Witness Kantor) 3181.

22 CHAIRMAN GOODHOPE: Zero to three? I thought he
23 said -- did you say zero to three?

24 MR. WRIGHT: Zero to two, sir.

25 MR. LEWALD: Zero to two miles.

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CHAIRMAN GOODHOPE: Kilometers had me mixed up.

BY MR. WRIGHT:

Q So that is roughly comparable to your weighted figure for the Pilgrim site, is it not?

A (Witness Kantor) It is the same distance, same year. The Montague site includes only permanent residents. The judgment was made that the amount of seasonal residents and daily tourists, although there are some in the Montague area, were not significant, so they were not included in these numbers.

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Q The number itself, 3121, is close, is it not, to your weighted figure for the Pilgrim site, which is 3943?

A Yes.

Q And so for that reason you would say there is no appreciable difference between the two?

A We would consider it not to be a significant difference, yes.

Q And yet on one of those peak days at the Pilgrim site there are not 3900 people there, are there? There are 10,000.

MR. SMITH: Object.

BY MR. WRIGHT:

Q Is that correct?

CHAIRMAN GOODHOPE: Overruled.

WITNESS KANTOR: On a peak day in Pilgrim there are, as I indicated, assuming full capacity of all facilities, there are approximately 10,000 people, based on the ERT study.

BY MR. WRIGHT:

Q And yet you would still maintain that your weighting method gives you some kind of handle on the possible risk to the surrounding population of various sites?

MR. SMITH: Object.

CHAIRMAN GOODHOPE: Clearly argumentative, Mr. Wright.

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Don't answer that.

POOR ORIGINAL

BY MR. WRIGHT:

Q Is this problem of peaking one of the reasons why you call population density a crude indicator of risk?

MR. SMITH: Object, in terms of problem of peak. What is problem of peak?

CHAIRMAN GOODHOPE: Do you understand the question, Mr. Kantor?

WITNESS KANTOR: No, sir.

MR. WRIGHT: I can rephrase it.

BY MR. WRIGHT:

Q Is this phenomenon of peak, the fact that down toward Pilgrim you have 10,000 people on a summer day does not appear in your weighted figures. Is that one of the reasons that you say that this weighting method provides a crude indicator of risk?

MR. SMITH: Mr. Chairman, I object again.

CHAIRMAN GOODHOPE: Did he say that?

MR. WRIGHT: Yes. That's the way it's characterized in the Final Supplement, sir.

CHAIRMAN GOODHOPE: Did you say that, Mr. Kantor?

WITNESS KANTOR: I don't believe we said that, no, sir.

CHAIRMAN GOODHOPE: Could you show where he said it?

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POOR ORIGINAL

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MR. WRIGHT: Yes.

WITNESS SOFFER: We may have said that.

I believe we've talked about population density as being a crude indicator of risk. But this entire subject of the weighting of transient population has come up over and over again. And I believe that we have answered it and described our rationale and the reason for the rationale vary completely on page 5-10 of the Final Supplement.

CHAIRMAN GOODHOPE: Well, was this element of peaking that he discussed, was that taken into consideration in your rationale?

WITNESS SOFFER: It's one of the things that was taken into consideration, that's right. There risk is dependent upon many things, of course. It's dependent upon the population distribution; it's dependent upon the meteorology that may exist at the time and what sort of an accident may occur at the time, what sort of warning times. There are a whole host of imponderables that cannot be easily calculated at all.

They all affect the risk of population. The idea of taking an annual average population which involves weighting of transients is primarily to arrive at an overall number by which to evaluate one site as compared to another site.

I believe we have said this a number of times and in a number of places. If you insist on looking at the peak

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1 summertime population, then it would be only fair to say
2 what about the wintertime population as well.

3 CHAIRMAN GOODHOPE: Let's not get into that
4 argument. We understand. I think you've answered the
5 question.

6 WITNESS SOFFER: Okay.

POOR ORIGINAL

7 CHAIRMAN GOODHOPE: Go ahead, Mr. Wright.

8 MR. WRIGHT: Well, if I may ask a question about
9 the wintertime population, sir.

10 BY MR. WRIGHT:

11 Q Mr. Soffer, looking at Table 30, once again, of
12 Staff's Exhibit 66, could you tell me what the wintertime
13 population is zero to two miles?

14 A (Witness Soffer) I think I'll defer to Mr. Kantor
15 on that since he was responsible for preparing the actual
16 numbers on the table.

17 Q Mr. Kantor?

18 A (Witness Kantor) The wintertime population would
19 be as shown in Table A. Permanent residents at two miles, it
20 indicates 2699.

21 Q So that is about 1300 less than your weighted
22 average, is that not correct?

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23 A Yes, sir.

24 Q And your weighted average, on the other hand, is
25 about 6000 less than the peak figure, is that not right?

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1 A Yes.

2 Q All right.

3 Now in the Final Supplement on page 3-4, you say
4 that -- and I'm referring now to the second paragraph from the
5 bottom. You say that Boston Edison Company in gathering the
6 data and making its initial submission to you relied upon the
7 cumulative population values as a guideline, is that not
8 correct?

9 A I believe that was one of the guidelines they
10 used in evaluating the population distribution around the
11 proposed sites.

12 Q And this is a method that is described in a
13 1973 AEC working paper?

14 A That's where I believe they obtained the cumulative
15 numbers.

16 Q And as I understand this particular formula, if
17 the cumulative population surrounding a site exceeds 30,000
18 people at five miles or 500,000 people at 20 miles or two
19 million people at 40 miles, then something else happens, is
20 that correct?

21 A Well, the working paper was an early Staff paper
22 which discussed population guidelines. Some of the guidelines
23 proposed in that paper were the ones you have just mentioned.
24 I think it works out to approximately 400 per square mile.

25 Q 400 people per square mile.

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POOR ORIGINAL

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A Right.

Q Now, of course, you're using 500, is that correct, under Reg Guide 4.7?

A Yes, under Reg Guide 4.7 it's 500 people per square mile.

Q And if these population values contained in this AEC paper were exceeded, then is it not correct that there then must be a showing that the proposed site offers significant advantages from the standpoint of environmental, economic or other factors?

Mr. Soffer, do you remember that?

A (Witness Soffer) That was the proposed Staff paper. I emphasize, of course, that that Staff paper was never approved by the Commission. It never received any official sanction. And it was superseded, in fact, by Regulatory Guide 4.7.

CHAIRMAN GOODHOPE: By what?

WITNESS SOFFER: Regulatory Guide 4.7.

BY MR. WRIGHT:

Q But in any event, in the early days, that was the guideline that was used in preparing the data for the Staff?

A (Witness Soffer) No, that was a proposed guideline.

Q I mean, that was the guideline that Boston Edison used. Isn't that what you're saying here?

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1 A (Witness Kantor) That was one of the guidelines
2 they used as an indication of what AEC-NRC policy was at that
3 time, in the time frame they did the original study.

4 Q Mr. Soffer, isn't it also true that in addition
5 to those numbers I just mentioned, the proposed guideline
6 also stated that if at the time of decommissioning there were
7 60,000 people at five miles projected, or one million people
8 at 20 miles, or four million people at 40 miles -- in other
9 words, double the value -- once again it would trigger this
10 special procedure?

11 MR. SMITH: Mr. Chairman, I object. I think it's
12 been established this is a proposed guideline, and I don't
13 know how it's relevant in this line of cross.

14 MR. WRIGHT: The relevancy, sir, if I may, is
15 that as is obvious from the Commonwealth's comments to the
16 draft supplement, we are very troubled by the, if I may, the
17 fuzziness of the Staff guidelines in this particular area.
18 It is a very critical problem. They have gone through a
19 number of different methods to try to determine which site
20 is better from the standpoint of population, surrounding
21 population.

22 The method that they're now using is contained
23 in Reg Guide 4.7, but that's by no means written in stone.
24 It's not like, for example, something that you'd find in
25 10 CFR Part 100 that we're not allowed to challenge. And I'm

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1 merely trying to show today through cross-examination that
2 there is substantial doubt as to just what the appropriate
3 method to analyze this particular problem is.

4 And I'm not going to take long on this, but I do
5 think I'm entitled to show that under those guidelines, that
6 at one time was considered by the Staff to be relevant and
7 helpful in making this assessment, that the Boston Edison
8 plant is in excess of the guidelines of those figures that
9 I mentioned.

10 (The Board conferring.)

11 CHAIRMAN GOODHOPE: All right. What is your
12 question?

13 MR. WRIGHT: My question, I believe, was to
14 Mr. Soffer, and I was asking him if it was not true that at
15 the time of decommissioning if the plant--the projected popula-
16 tion were to exceed four million at forty miles then it would
17 trigger that special procedure that I read earlier.

18 BY MR. WRIGHT:

19 Q Is that not correct?

20 DR. COLE: Excuse me.

21 What special procedure that you read earlier?
22 Demonstration something?

23 MR. WRIGHT: Yes, these levels are exceeded,
24 Dr. Cole. The Applicant is required to present an analysis
25 of alternative sites including a showing that the proposed

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site offers significant advantages from the standpoint of environmental, economic, or other factors.

MR. COLE: All right.

MR. SMITH: Can the record be clear as to where that statement is coming from?

CHAIRMAN GOODHOPE: Well, it's out of the Staff proposal, is it not, that was never approved?

MR. WRIGHT: Yes.

CHAIRMAN GOODHOPE: The one that Mr. Soffer just described.

MR. SMITH: All right.

CHAIRMAN GOODHOPE: And that's what the Applicant worked with at the time, as I understand it.

MR. WRIGHT: Yes.

WITNESS SOFFER: I'm not very familiar with the Staff working paper of 1973 any longer, primarily because it is no longer -- it no longer represents any official policy. In fact, it never did. It represented merely an internal Staff proposal.

However, I believe you are correct in that regard. I would like to add a few remarks on the nature --

BY MR. WRIGHT:

Q I'm sorry, that answers my question. Thank you, sir.

A (Witness Soffer) I haven't finished yet.

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1 CHAIRMAN GOODHOPE: If you're going into this,
2 we're going all the way, not halfway.

3 MR. WRIGHT: Well, I just think --

4 MR. SMITH: The witness is allowed to qualify.

5 WITNESS SOFFER: I'd like to add a few remarks
6 in regard to what I believe is a misunderstanding in regard to
7 population density criteria.

8 Part 100 does not include any population density
9 criteria, that is true. The Commission has merely said in its
10 statement of considerations that nuclear power reactors should
11 be located away from densely populated centers. For a long
12 time there were no numerical criteria that were used by the
13 Staff, and the Staff judged each site on an ad hoc basis,
14 endeavoring to keep in mind the spirit of Part 100.

15 As a result of the Newboldt Island case, which
16 arose in 1972, the Staff began to propose numerical criteria,
17 and one of the earliest proposals by the Staff was the Staff
18 working paper of 1973 that Mr. Wright has cited from. That
19 was never approved. But the guidelines were rejected, and
20 I'm not sure why.

21 However, the criteria that later appeared in
22 Regulatory Guide 4.7 were promulgated. They have been used
23 by the Staff since they have been promulgated, and they have
24 been used in a consistent fashion in the review of I would
25 imagine about 15 or 20 cases at the present time. The Staff

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1 has done so consistently.

POOR ORIGINAL

2 DR. COLE: Excuse me.

3 Can you tell me what you mean by "promulgated",
4 Mr. Soffer?

5 WITNESS SOFFER: I mean a regulatory guide
6 published by the Staff with the concurrence of the Advisory
7 Committee on Reactor Safeguards.

8 DR. COLE: Okay.

9 WITNESS SOFFER: It is not promulgation in the
10 sense of regulation, that's true.

11 DR. COLE: It's a guideline that's acceptable to
12 the Commission.

13 WITNESS SOFFER: I don't believe that the
14 Commission has formally reviewed it.

15 DR. COLE: So it's just the regulatory Staff.

16 WITNESS SOFFER: It's a regulatory Staff position,
17 yes.

18 DR. COLE: Thank you.

19 BY MR. WRIGHT:

20 Q So it's no different than an NRC working paper?

21 A (Witness Soffer) No, an AEC Staff working paper
22 is an information paper, a proposed paper that was in fact
23 rejected by the Commission.

24 The Staff originally proposed that as a regulatory
25 guide. The Commission rejected it and later released that

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1 paper to the public. That represents a rejected proposal.

2 Q It released the paper, it did not reject it?

3 A Pardon?

4 Q It released the paper and did not reject it?

5 A Yes, sir.

6 Q All right.

7 Mr. Kantor, just two last questions as to this
8 AEC working paper.

9 It's true, is it not, that in 1980 the surround-
10 ing population out to 40 miles from the Pilgrim site is going
11 to be in excess of two million?

12 A (Witness Kantor) Did you say 40 miles?

13 Q Yes, 40 miles.

14 Do you have the PSAR with you, by the way?

15 A I have excerpts from it.

16 CHAIRMAN GOODHOPE: Where are we going now?
17 You've asked the question and you've got something working,
18 and you've pretty thoroughly discredited this working paper,
19 but apparently you want to keep chasing it around.

20 MR. WRIGHT: Yes, I'd like to ask a few more
21 questions about it, Mr. Chairman.

22 BY MR. WRIGHT:

23 Q I asked you about the PSAR only because they do
24 contain the 40 mile figures. If you'd like, I'll show you my
25 copy.

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A (Witness Kantor) I have an excerpt from it.

Q This is Table 2.18.

A Table 2.18 indicates cumulative permanent population at a distance of 40 miles to be in excess of two million.

I might point out that in accordance with the guidelines of Regulatory Guide 4.7 we consider 30 miles to be the region of interest for population purposes.

Q And in the year 2020, Mr. Kantor, it's true, is it not, that out to 40 miles the population exceeds four million?

A The projected population for 2020 at 40 miles exceeds four million as shown in Table 2.1-8.

Q And that table contains only permanent residents in that 40 mile area, is that not correct?

A That's correct.

Q Now going back to once again page 3-4 of the Final Supplement, you state that the other guideline used by Boston Edison was, in preparing its initial figures, was an envelope population distribution for Indian Point and NewBoldt Island?

A Yes. We have to consider the time frame when this was being done.

MR. SMITH: Mr. Chairman, there's no question. I think the question has been answered.

CHAIRMAN GOODHOPE: I still don't know what the

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question is.

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MR. WRIGHT: I asked Mr. Kantor what the second of the two guidelines was that was used by Boston Edison in preparing its initial population.

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CHAIRMAN GOODHOPE: Answer that question.

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WITNESS KANTOR: This second guideline was an envelope of population distribution around sites that had been involved in the licensing process, and in particular the high population sites, such as Newboldt Island and Indian Point.

BY MR. WRIGHT:

Q And could you explain how that particular guideline works?

A It's simply a -- an envelope of the high cumulative population around sites that have been licensed or involved in the review process.

It's simply a comparison of the population distribution of the proposed site against the envelope of these other sites.

Q So, the Boston Edison submission involved concerning the Pilgrim site and Newboldt Island and Indian Point --

A I believe the criteria were used more in a regional fashion than in a site-specific fashion.

They were attempting to screen out high population areas which would not be suitable for nuclear sites, and they were using information as was best available to them at that time.

Q Do you know where Newboldt Island is located?

A I'm not sure of the exact location.

A (Witness Soffer) Roughly, I know where it is, yes.

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Q Is it located on water, on a river?

A A river.

Q Not on the ocean?

A No, it's on the Delaware River between Philadelphia and Trenton.

Q And the Newboldt Island site, as I understand it, was rejected, turned down?

A That's correct.

Q The Indian Point site is, as I understand -- is located on the Hudson River?

A That's correct.

Q Now, the latest guideline, as you said earlier, is reg guide 4.7. That's the current guideline you're using in assessing population?

A Yes.

Q Could you explain briefly how that particular guideline works?

MR. SMITH: Mr. Chairman, I think the guideline is self-explanatory.

CHAIRMAN GOODHOPE: Well, is your question: how was that guideline used in this case?

MR. WRIGHT: I'm asking how it operates and how it was used in this case.

CHAIRMAN GOODHOPE: All right. Explain how you applied that guideline in this matter.

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WITNESS KANTOR: The reg guide gives population density guidelines for the proposed initial operation of the lifetime of the proposed facility.

The guidelines are meant to be used as indication of high population density sites.

Originally the reg guide indicated that if a site exceeded the population density guideline, then the population density should be examined in the context of an alternative site review.

And the emphasis was on an applicant trying to find the high population density site, when possibly lower population density sites were available. It was not a go-no go criteria.

If a plant site exceeded those guidelines, it did not mean it was unacceptable. It simply meant that population densities should be looked at closely in an alternative site review.

BY MR. WRIGHT:

Q And the guideline says that, as I understand it, if any radial distance out to 30 mile, the population per square mile exceeds 500, then special consideration should be given to alternative sites.

A Yes.

Q Now, would you tell us just what "special consideration" means?

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MR. CHAIRMAN: For accuracy, since the pertinent part of reg guide 4.7 is found in Appendix B to the final supplement, and the phrase, "that special attention should be given to the consideration," not --

MR. WRIGHT: I stand corrected. "Special attention."

BY MR. WRIGHT:

Q Can you tell me what you understand "special attention" to mean?

A I understand it means an applicant would have to demonstrate the economic and environmental and other factors which might weigh for or against an alternative site in comparison with all factors, of which population would be one.

Q You don't understand, in other words, this thing, special attention, the doing of a class 9 analysis.

MR. SMITH: Object to the form of the question. He answered the previous question of what his understanding was.

MR. WRIGHT: I'm asking does it include the doing of a class 9 analysis.

CHAIRMAN GOODHOPE: Overruled.

WITNESS SOFFER: You want an answer to the question?

CHAIRMAN GOODHOPE: Yes.

WITNESS SOFFER: The staff prepared a paper for the Commission. The paper was known as SECY 78-137, where the

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1 staff proposed that in the event an applicant submitted a
2 high population density site -- that is, a site that exceeded
3 500 people per square mile, that is one method of considering
4 alternative sites or is one part of that.

5 The staff proposed to perform examinations of
6 or comparisons of, let us say, other risk from class 9 accidents
7 between that site and the alternative sites.

8 That was a proposal that was made by the staff.
9 There was no action that was formally made by the commission.
10 But I would like to read you a letter that was addressed
11 from the Secretary of the Commission. To Mr. Lee Gossick,
12 the Executive Director for Operations that's dated July 12,
13 1979. The subject is the SECY 78-137 and the text of the
14 commission letter is as follows:

15 The commission notes that they've asked address this
16 subject in a briefing on May 17, 1978. Referring to my
17 memorandum to you dated June 15, 1978, attached. The
18 commission indicated that further action by them should
19 await the completion of the Lewis Report. The commission
20 has now decided to return the paper to the staff without
21 consideration. Pending receipt of the policy task force
22 report, the commission does intend to provide the staff with
23 further direction in this general area in the near future.
24 So at the present time, I would say that the staff has made
25 informal proposals to the commission to look at class 9

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1 accidents. The commission hasn't taken any action.

2 BY MR. WRIGHT:

3 Q In fact, it's been returned to the staff.

4 A Yes. Pending action on the setting policy task
5 force. That's correct.

6 Q And that is a document that Mr. Smith gave us
7 yesterday.

8 A I believe so.

9 Q Now I show you a copy of this. Is that the so-
10 called---

11 MR. SMITH: May counsel see it.

12 BY MR. WRIGHT:

13 Q The so-called SECY 78-137 document?

14 A Yes, it is.

15 (Counsel distributing the documents)

16 MR. WRIGHT: I would like to have this marked
17 as Commonwealth's exhibit 112 for identification.

18 (The above-mentioned document
19 was marked Commonwealth's
20 Exhibit 112 for identification.)

21 And I would like to move it into evidence.

22 CHAIRMAN GOODHOPE: What is it?

23 MR. WRIGHT: This, sir, is the staff document that
24 Mr. Soffer has been testifying about. That recommends to the
25 full commission in the event that those Reg Guide trip levels

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1 are exceeded a class 9 accident analysis should be performed.

2 MR. SMITH: Mr. Chairman, I object.

3 CHAIRMAN GOODHOPE: Well, I want to find out first
4 what it is. This is from Edson G. Case. And who is he?

5 MR. WRIGHT: He's the Acting Director of the
6 Office of Nuclear Reactor Regulation.

7 CHAIRMAN GOODHOPE: All right.

8 And it's through Gossick, the Director for
9 Operations.

10 What is the date on this? I can't see. March 7,
11 1978; is that correct?

12 WITNESS STOPFER: Yes, sir, that's correct.

13 MR. WRIGHT: 1978. It's reflective of staff practice,
14 and I'm going to get into that in just a minute where they've
15 already done class 9 analysis.

16 WITNESS STOPFER: Let me read you the last two
17 sentences from the July 12th memorandum of the Secretary
18 of the Commission.

19 MR. CLEETON: Mr. Chairman, is that the date that
20 it was sent back?

21 CHAIRMAN GOODHOPE: Is the document --

22 MR. CLEETON: The document was sent back on
23 July 12th; is that what this letter is?

24 WITNESS STOPFER: Yes.

25 The letter is dated July 12th, 1979, and the

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last two sentences, which are the most pertinent say:
The Commission has now decided to return the paper to the
staff without further consideration, pending receipt of the
siting policy taskforce report.

The Commission does intend to provide the staff
with further direction in this general area in the near
future.

MR. WRIGHT: But in the meantime, if I may ask
Mr. Stoffer a question --

MR. SMITH: Mr. Chairman, there's an objection
pending.

CHAIRMAN GOODHOPE: That's what I'm trying to
decide. I don't know what value this document is going
to be, but I think under these circumstances, with the
descriptions of it, and what it's situation is now, I
believe the board has to receive it for whatever it's worth at
this time.

(The above-mentioned document,
previously marked Commonwealth's
Exhibit 112, was received into
evidence.)

MR. WRIGHT: Thank you, Mr. Chairman.

MR. LEWALD: It's a document that was sent by the
staff to the Commission and returned -- not that --

MR. WRIGHT: I think it's already in the record.

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1 If that's what it was, Mr. Stoffer has explained it
2 in detail. He said the Commission didn't reject it; they
3 simply returned it to them. They said they're still working
4 on this. So we don't know where it stands, really.

5 But apparently it indicated staff policy 18 months
6 ago, what they thought was useful.

7 MR. LEWALD: The staff proposed the policy.

8 CHAIRMAN GOODHOPE: Well, yes.

9 MR. LEWALD: Which was not policy, but at least as of
10 now has permission or approval or adoption.

11 CHAIRMAN GOODHOPE: That's correct. I think the
12 record is clear on that.

13 So the document will be received.

14 Before you go ahead, while we're still on this,
15 Dr. Callihan has a question he'd like to ask Mr. Soffer.

16 DR. CALLIHAN: Does this document, Commonwealth's
17 112, have any stature within the Commission at this time?

18 WITNESS SOFFER: Not to my knowledge, sir.

19 DR. CALLIHAN: What is used by the staff as a
20 guideline in absence of the content of 112?

21 WITNESS SOFFER: The staff is using -- has used and
22 is using the criteria as given in regulatory guides 4.7; there
23 has been no applicant since this has been proposed to the
24 Commission that has prosed a high density population site.
25 Consequently, I do not know what the staff would do if the

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1 staff were to offer a high population density site at the
2 present time.

3 DR. CALLIHAN: So, it's not clear to me what
4 value this document has at the moment.

5 Do you have any information that would help?

6 WITNESS SOFFER: I would say it represented, as
7 I indicated earlier -- it represented a staff proposal to the
8 Commission that was made as of the date of the paper.

9 DR. CALLIHAN: But it's not being followed by the
10 staff as of today?

11 WITNESS STOPFER: It's not clear whether it would
12 be followed or not.

13 DR. CALLIHAN: How is this document reflected
14 in that which has been presented by the staff in these
15 proceedings thus far?

16 WITNESS STOPFER: The staff has gained some insight
17 into the nature of class 9 accidents in relation to population.
18 This document arose out of the alternative site study that
19 the staff did for the Perry 1 case, which was a high population
20 density case submitted by applicant about two years ago.

21 In that particular case, the staff did an
22 examination of class 9 accidents at the Perry 1 site and for
23 a number of alternative sites.

24 And there were a number of comparisons that were
25 made and are given in this document. The staff has used those

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1 comparisons to gain insight into what the consequences of
2 class 9 accidents would be, and what would be significant
3 with regard to population differences among sites.

4 So, I'd say that the staff has gained some insights
5 from this document.

6 DR. CALLIHAN: Did the staff make use of this
7 information in Commonwealth 112 in its review of the
8 application of the alternative site study in Pilgrim 2?

9 WITNESS STOPPER: Yes, it did, in the sense that
10 the insight that was used in arriving at the differences between
11 the various sites was used at arriving at the test of
12 significance, that is, the factor of two significance given
13 in the final supplement.

14 DR. CALLIHAN: Does the recent action by the
15 Commission in referral or return, as the case might be,
16 to the staff of Commonwealth's 112 negate in any way the
17 analyses presented to this board on alternate sites in May
18 of this year?

19 WITNESS SOFFER: In my opinion, it does not.
20 While it's not clear to me what the staff proposal -- what
21 legality the staff proposal has, I believe that the insights
22 the staff has gained in examining populations at risk and the
23 consequences that might be involved and the comparisons
24 between a high population density site and a lower
25 population density site remain valid.

And I believe that those insights are valid today

david 12 1 as they were a year and a half ago.

2 DR. CALLIHAN: You're saying that the July 1979
3 action by the Commissioners is not cause for any revision
4 or alteration of the staff's position on alternate
5 sites for Pilgrim 2?

6 WITNESS SCUFFER: That would be my judgment, sir.

7 DR. CALLIHAN: Thank you.

8 BY MR. WRIGHT:

9 Q Mr. Soffer, reading from page 1 of this where
10 it says: Purpose -- half way down -- "The staff has
11 concluded that in such instances -- in other words -- where
12 you have relatively high population density, analysis of
13 the relative differences in class 9 accident risks should be
14 included as one element of the site comparisons.

15 Could you tell me how you would go about assessing
16 a class 9 accident risk.

17 MR. SMITH: Objection. Mr. Chairman, this
18 Commission -- excuse me. Strike that.

19 This board cannot consider class 9 accidents, and
20 although the staff may present it to the Commission that
21 it should be considered, it -- in this case the Commission
22 has sent it back and said wait for the siting taskforce
23 study.

24 I just handed this out to the board and parties.
25 That's not in the hands of the Commission.

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2 Now it may be that the Commission will come down
3 and say, yes, we agree with you. And it's no secret that
4 in this again the staff recommends that class 9 consideration
5 should be used in determining siting criteria.

6 Again, we'll have to wait for the Commission. For
7 right now, this time, class 9 considerations cannot be
8 considered.

9 CHAIRMAN GOODHOPE: We don't have a class 9 contention
10 in this proceeding, do we?

11 MR. WRIGHT: What we have in here, Mr. Chairman,
12 is a contention by the Commonwealth that the staff has
13 paid inadequate attention to the differences in population
14 and how they would be impacted in the event of a major
15 nuclear accident.

16 CHAIRMAN GOODHOPE: What are you reading from?

17 MR. WRIGHT: I'm not reading from anything.

18 CHAIRMAN GOODHOPE: Oh, right.

19 MR. WRIGHT: I'm just telling you what our
20 contention is as to population densities. Mr. Soffer has
21 already testified that --

22 CHAIRMAN GOODHOPE: What contention is that?

23 MR. WRIGHT: Contention 12.

24 MR. SMITH: I don't have a copy of that. But I
25 don't recall seeing those words.

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1 MR. WRIGHT: It didn't say all of that. It said
2 that, if I remember correctly, it said that the Staff has
3 done an inadequate analysis of alternative sites with
4 respect to population density.

5 DR. COLE: That is different, sir.

6 MR. WRIGHT: Well it is a difference, sir, but
7 obviously we can't spell out every particular problem that is
8 involved in population densities.

9 But what was a key here was, as we established
10 yesterday, where the population density is used is as a test
11 of the risk that is involved in the event of nuclear accident.

12 CHAIRMAN GOODHOPE: Well, I have the Commonwealth
13 contention No. 12 before me which was accepted by the Board,
14 and it is as follows:

15 "Neither Applicants nor Staff have adequately
16 considered the alternative of locating the proposed
17 plant at a site more suitable from a population
18 density and environmental standpoint."

19 That is your contention.

20 Now you say this requires us to go into examination
21 of Class 9 accidents.

22 MR. WRIGHT: Indeed it does, sir.

23 Mr. Soffer and Mr. Kantor testified yesterday the
24 reason that they looked to population density is it is their
25 one method of determining the relative risks between one site

mm2 1 and another. The risk, that is, to the surrounding population
2 from a nuclear accident.

3 Now, one of those accidents is a Class 9 accident.

4 CHAIRMAN GOODHOPE: The Board continues on in its
5 ruling on that contention. The Board continues on:

6 "As rewritten, the Board does not consider it
7 a challenge to 10 CFR Part 100. The contention as
8 stated enters the proceeding on the basis of NEPA
9 considerations of alternate sites, which, incidentally,
10 is the same basis for the Newboldt Island Siting issue."

11 It is a NEPA consideration, not a health and
12 safety consideration.

13 MR. WRIGHT: Right. And that's what we are talking
14 about.

15 Under NEPA there has to be some consideration
16 given to the risk to the surrounding populations at the
17 various sites that are under consideration. That is one of
18 the NEPA issues, sir.

19 (Board conferring)

20 CHAIRMAN GOODHOPE: Do you have your question at
21 hand, again?

22 MR. WRIGHT: I'm sorry, sir?

23 CHAIRMAN GOODHOPE: Do you have your question that
24 you asked? I was going to have it read back, but I think
25 that you can state it.

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1 MR. LEWALD: I would like to join in an objection to
2 the question.

3 CHAIRMAN GOODHOPE: I want to hear the question
4 first.

5 MR. WRIGHT: What I did, Mr. Chairman, is I read a
6 statement, first of all to Mr. Kantor. The statement comes
7 from SECY 78-137 as Commonwealth's Exhibit 112.

8 CHAIRMAN GOODHOPE: Starting with "The Staff has
9 concluded. . .?"

10 MR. WRIGHT: Yes.

11 "The Staff has concluded that the instances and
12 the instances of relatively high population density,
13 the assessment of relative differences of Class 9
14 accident risks should be included as one element of
15 the site comparisons."

16 That's under NEPA.

17 CHAIRMAN GOODHOPE: What's your question.

18 MR. WRIGHT: My question is, what would be
19 involved in assessing relative differences in Class 9 accident
20 risks?

21 CHAIRMAN GOODHOPE: And your objection is what,
22 that Class 9 is not involved in this proceeding?

23 MR. SMITH: It is not a contention. It cannot be
24 involved in this proceeding.

25 CHAIRMAN GOODHOPE: Why?

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1 MR. SMITH: Okay.

2 First of all, let's start from the beginning of
3 how the Staff used population density.

4 Staff admits that they use it as a crude indicator
5 of residual risk.

6 Now I could not object if the Commonwealth wanted
7 to go and probe behind this factor of two.

8 MR. WRIGHT: We intend to.

9 CHAIRMAN GOODHOPE: Let's let him finish now. I
10 asked Mr. Smith a question. If anybody else has any comments,
11 keep them to himself.

12 MR. SMITH: Going beyond that, the Staff cannot
13 assess the risk of Class 9 accidents at this particular site
14 or any alternatives. It is prohibited by a long string of
15 case law, particularly the most recent, Off Shore Power, where
16 the Staff -- and I believe the cite is 8 NRC 194. In that
17 case, the Staff undertook a Class 9 study of the off shore
18 power systems, arguing the Staff's position was they thought
19 the consequences were greater than that of the land-based
20 plant.

21 The Appeal Board struck down that argument saying
22 it was prohibited of considering Class 9 accidents. And you
23 can't, on your own, without permission of the Commission
24 consider Class 9 accidents.

25 Now in the specifics of that case, the Appeal Board

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1 allowed the Staff to consider Class 9 because they felt
2 floating nuclear power plants were not part of the annex,
3 which sets forth the parameters of the accident analysis
4 for NEPA.

5 In this case we have a land-based plant. The
6 Commission law and the Appeal Board law is we cannot consider
7 Class 9.

8 It is true, the record will show from SECY 137 from
9 the Siting Task Force Study, that the Staff's position is
10 that there should be some consideration, and they are trying
11 to argue that to the Commission. But, until the Commission
12 says all right, you can in this -- whatever, how they describe
13 the parameters, the Staff cannot do it.

14 Now one could argue, I guess, and I wouldn't want
15 to, that maybe even using the population density is against
16 Commission policy. I think that is still within the
17 parameters of alternative site review. But there is no doubt
18 that this number comes from Class 9 consequence analysis.

19 But that is the basis, and I just think we are
20 prohibited by Commission law.

21 It could be that they will come down the line --
22 one more additional point. The Commission does have before
23 it the Off Shore case. We are awaiting a decision. It may be
24 that the Commission will turnaround their policy, or the
25 Siting Task Force Study may be the instrument where they say

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1 in population criteria development, go forth and do Class 9
2 gener... considerations. That may come.

3 But, as of this date we are bound by Commission
4 case law and we cannot consider it.

5 And a further point. The Commonwealth claims that
6 this is -- all along has been part of their contention on
7 population density.

8 I would submit the record shows that the first
9 time this appeared was in their comments to the Final
10 Supplement on Alternative Sites.

11 I don't think this has all along been in their
12 contention.

13 (Board conferring)

14 MR. WRIGHT: Mr. Chairman, may I respond?

15 CHAIRMAN GOODHOPE: Mr. Lewald, do you join in this?

16 MR. LEWALD: I join in that.

17 I did want to say on the record what Mr. Smith has
18 said, giving a history of -- a brief history of the Class 9
19 accident question, referring again to Off Shore Power Systems
20 in 8 NRC 194, which the Commission through the Appeal Board has
21 spoken that Class 9 accidents with respect to land-based
22 plants are not to be considered in environmental reports.

23 I would not object to the basic question that --
24 well, I object to the question that Mr. Wright was presenting
25 to the witness. But we would not object to questions along

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1 these lines to the witnesses, as to what they did in this
2 particular case.

3 But we would submit that any Class 9 analysis for
4 FES purposes is wholly unnecessary and is not qualified
5 Commission regulations.

6 And if the Staff delved into this field for their
7 own particular purposes, I'm not saying that that can't be
8 inquired into. But it actually has no bearing on any
9 determinations that ought to be made in the case.

10 And indeed, as a matter of law, as Mr. Smith has
11 pointed out, this Board would be precluded from entertaining
12 any such evidence that might derive from the Staff examination
13 of Class 9 accidents, which is an area that the Commission
14 has removed from the Staff, if you will --I shouldn't say
15 "removed," the Staff has never had that requirement and
16 it has been considered since its inception that these
17 accidents which are referred to as Class 9 accidents in
18 Appendix B to Part 50, shall not be considered in licensing
19 proceedings.

20 And with respect to the Staff's Final Environmental
21 Statement, there is authority for this again -- the last
22 authority is 8 NRC 194, which is the Off Shore Power Systems
23 Case.

24 In other words, we wouldn't object to an inquiry
25 of what the Staff has done here and reported. But, to conduct

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mm8 1 inquiries as to what policies should or should not be
2 promulgated by either the Staff or the Commission with respect
3 to Class 9, we submit is objectionable, and this was the tenor
4 of Mr. Wright's last question.

5 MR. WRIGHT: Mr. Chairman, may I be heard?

6 CHAIRMAN GOODHOPE: Yes, Mr. Wright.

7 MR. WRIGHT: Yes. Just a couple of quick points.

8 First of all, the so-called Appendix B was never
9 adopted by the Commission. It still has the status of interim
10 guidance, if you will.

11 Based upon the assumption --

12 CHAIRMAN GOODHOPE: What is this, now?

13 MR. WRIGHT: Appendix B is a Commission document
14 that Mr. Lewald referred to as the reason why this Board is
15 prohibited from looking into Class 9 accident analyses.

16 DR. COLE: Mr. Wright, I think there are
17 a significant number of other questions also, which include
18 Shoreham versus NRC several years ago, which indicated, that
19 provided guidance to the Commission that they are not
20 obligated to consider Class 9 accidents in environmental
21 reviews.

22 MR. WRIGHT: That's correct, Dr. Cole.

23 However in this case I am not saying that --
24 all I am trying to discover is what would be involved in a
25 Class 9 accident review, if the Staff chose to do one.

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1 In other words, Shoreham doesn't forbid them from
2 doing one. It only says if they don't want to, they don't have
3 to.

4 DR. COLE: What would that profit us to have in
5 this record, if we cannot consider it under the governmental
6 environmental review? Are we just filling pages of the
7 transcript with that information and can't use it?

8 MR. WRIGHT: I don't think so, sir.

9 The Staff position as I understand it, is where
10 there is relatively high density, this Class 9 analysis should
11 be done.

12 It is our contention this is an area of relatively
13 high density.

14 DR. COLE: But the Staff has no right to -- well,
15 go ahead and finish what you wanted to say.

16 MR. WRIGHT: The other point I would like to make is
17 that the Staff is, of course, taking -- and as Mr. Smith
18 said, the Staff has taken a position before the NRC that it
19 should be allowed to do these kinds of analyses, and in
20 addition has already done some. It did one in the Perryman case,
21 and has done one with the floating nuclear plants.

22 And I think that under the circumstances it is
23 rather disingenuous to say, no, we can't talk about it at
24 this time.

25 Now I am not proposing to spend all afternoon getting

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1 into the ins and outs of the CRAC code. I am just trying to
2 establish briefly what would be involved if a Class 9 accident
3 analysis were to be done.

4 CHAIRMAN GOODHOPE: I don't know if you can -- you
5 said they made one in the Off Shore Power, and they made one
6 in the Perryman?

7 MR. WRIGHT: Yes.

8 CHAIRMAN GOODHOPE: Class 9 accident analysis?

9 MR. WRIGHT: Yes.

10 CHAIRMAN GOODHOPE: Were those made as a part of
11 the environmental review?

12 MR. WRIGHT: Yes.

13 MR. SMITH: Mr. Chairman, could I clarify that?

14 CHAIRMAN GOODHOPE: Yes.

15 MR. SMITH: On the Perryman case it was done as
16 part of the early site review. And one aspect of it was
17 consideration of Class 9 accidents and other external hazards
18 besides Class 9 analysis. That was not part of the contested
19 proceeding, and it was between the Staff and the Applicant,
20 and we rejected siting and it never went to hearing.

21 On the Off Shore we did do a Final Environmental
22 Impact Statement considering Class 9 accidents.

23 The Appeal Board said that but for the fact that
24 this was an Off Shore case and they did not think that such
25 a type facility was included in the annex, we could go forward

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1 with that analysis.

2 But for land-based plants -- and I have the opinion
3 if the Board wants to take a break and read it -- we just
4 can't do it.

5 Maybe, you know the Staff did it, but the Appeal
6 Board has said you shouldn't be doing it.

7 CHAIRMAN GOODHOPE: Right.

8 I'm sorry, Mr. Wright, I interrupted you. Go
9 ahead.

10 Did you have anything more to add?

11 MR. WRIGHT: I don't think so.

12 CHAIRMAN GOODHOPE: Mr. Cleeton?

13 MR. CLEETON: Yes. I'd like to ask a question.

14 CHAIRMAN GOODHOPE: Of whom?

15 MR. CLEETON: Of the Board's ruling on the exclusion
16 of Class 9 accidents for emergency planning zone in the last
17 memorandum of August 9th.

18 CHAIRMAN GOODHOPE: I can't hear you.

19 MR. CLEETON: Apparently the footnote in the last
20 ruling of the Board regarding emergency planning, it also
21 stipulates that Class 9 accidents are not in this case.

22 Now for the last two days we have been hearing
23 about emergency planning in relationship to alternate sites,
24 and we specifically put this population density down to
25 emergency planning because it was stated that they go

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mm12 1 closely together.

2 And what I would like to ask is, are the Class 9
3 accidents also going to be excluded from the emergency planning
4 hearings, because our original contention in terms of evacuation
5 of the Cape, certainly implies Class 9 accidents.

6 CHAIRMAN GOODHOPE: Well, if you implied it, you
7 sure should have stated it very clearly, instead of implying
8 important things like this.

9 I don't buy this implying bit of something important
10 as this. It should have been specifically stated.

11 MR. WRIGHT: There was one further thing that I
12 did want to point out, Mr. Chairman, and that is in the
13 Staff's response to our comments to the draft supplement
14 they go into some detail as to why they shouldn't do a Class 9
15 accident analysis. They don't mention any of the stuff
16 about being forbidden to do so. They just have a number of
17 practical considerations, and that is what I wanted to explore
18 today.

19 If the thing that is holding them up from doing
20 one of these things are the practical considerations, I'd
21 like to suggest what they are.

22 CHAIRMAN GOODHOPE: In this proceeding.

23 MR. WRIGHT: In this proceeding, yes.

24 CHAIRMAN GOODHOPE: That's what you are going to get
25 is a ruling, right after a ten-minute recess.

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MR. SMITH: Does the Board want the Off Shore Case?

CHAIRMAN GOODHOPE: I've read it, but it's been a long time.

You'd better give it to me.

(Mr. Smith handing document to Board)

(Recess.)

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1 CHAIRMAN GOODHOPE: All right, the hearing will be
2 in order.

3 Mr. Wright, as I understand your question it is
4 what would be involved in a Class 9 accident evaluation in an
5 alternate site review.

6 MR. WRIGHT: Yes.

7 CHAIRMAN GOODHOPE: Well, the Board will sustain
8 the objection to that question.

9 MR. WRIGHT: Mr. Chairman, does this mean that
10 the Board is ruling that I am not to be allowed to get into
11 Class 9?

12 I have a number of questions and I just won't
13 bother to ask them and have objections and what have you if
14 that is your ruling.

15 CHAIRMAN GOODHOPE: No, what they did, what they
16 actually physically did in their site review in this proceeding
17 is permissible.

18 MR. WRIGHT: Yes.

19 DR. COLE: I think it's clear, Mr.
20 Wright, that the Commission policy on environmental reviews
21 of the Class 9 accident need not be considered in environmental
22 reviews. I don't think there's any question about that.

23 MR. WRIGHT: Well, let me move on, then, Mr.
24 Kantor.

25 BY MR. WRIGHT:

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1 Q I direct your attention to Appendix B of the
 2 Final Supplement, page B-1. And if I may, I will read from
 3 the last paragraph on that page:

4 "Based on limited studies performed to
 5 date, the Staff concludes that the population
 6 density by itself is a sufficiently crude
 7 indicator that relatively large differences
 8 in the population densities between two
 9 sites would be required to exist before
 10 significant differences of residual risks
 11 at these sites could reasonably be expected.
 12 These studies indicate that population
 13 density differences by a factor of at least
 14 two or more would be required before sig-
 15 nificant differences in residual risk could
 16 reliably be expected."

17 Could you tell me how you derived the so called
 18 factor -- first of all, could you describe for us how that
 19 operates?

20 A (Witness Kantor) We compared the population
 21 density of the alternative site with the proposed site at
 22 radial distance from zero to 30 miles to determine if there
 23 is a significant difference in the densities. And as
 24 indicated here, we're using this factor of two as a guideline
 25 or a benchmark to assist us in determining when there is a

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1 significant difference.

2 Q So in other words, another site would have to have
3 half as many people in it as the proposed site before you
4 would consider it to be more desirable from a demographic
5 point of view?

6 A We would have to see indications that the popula-
7 tion density of an alternative site was lower by a factor of
8 two in comparison to the proposed site, especially within
9 close-in distances within five or ten miles before we would
10 reach a finding that this alternative site was preferable from
11 a population density standpoint.

12 Q And you are concerned with the close-in areas
13 more than the farther-out ones?

14 A Well, I think as indicated on the next page, it
15 gives our position in this regard.

16 Q Page B-2?

17 A Yes.

18 And I could read it if necessary, but it is given
19 on page B-2.

20 Q Now just as a matter of clarification, what's the
21 relationship between this factor of two that you use and the
22 so-called special attention that must be given to alternative
23 sites once the trip levels are exceeded at the proposed site?

24 A Well, this factor of two helps us determine if
25 the population is a significant factor. The population is only

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1 one factor that enters into the alternative site analysis.
2 Special attention I think is directed more toward these other
3 factors, such as other environmental factors, economic factors.

4 Q Well, let me give you an example, then. If the
5 proposed site were to exceed the trip levels contained in
6 Reg Guide 4.7, but its population was not a factor of two
7 greater than any of the alternative sites, what would you do?

8 A Well, again, the fact that it exceeds 500 per
9 square mile, as we indicated earlier, does not mean that the
10 site is not acceptable.

11 Q You would then look to the other sites to see if
12 they have the population that was --

13 A Our main thrust is looking at the difference in
14 population density between the alternative sites and the
15 proposed site.

16 Q But I'm still troubled as to this factor of two
17 and how it would operate if the levels were exceeded.

18 A The fact that the level is exceeded or is not
19 exceeded I don't think has any direct bearing on the factor of
20 two. Once we start comparing the population density we're
21 concerned about the factor of two, no longer with the guide-
22 line density numbers from the reg guide.

23 Q Well, let's, if we could, take Table 66 --
24 excuse me, Staff Exhibit 66, Table 3, which is the 1985
25 updated figures that you provided us. And if we could,

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1 please, compare them with Montague, the figures which are
2 found on page 4-48 of the Final Supplement.

3 Now when you talk about a factor of two, are you
4 talking about comparing population density, or are you talk-
5 ing about comparing the actual numbers of people. Which of
6 these columns, in other words, would you be looking at?

7 A Well, the two columns are related. We look at
8 density, it's just a little bit easier number to handle.
9 But you could look at a factor of two on the total popula-
10 tion.

11 But we look at the density number.

12 Q Well, if you say density is easier, let's do that.

13 I note that for Montague within one mile of the
14 site the population density is 52. Is that not correct, 52
15 people per square mile?

16 A Correct.

17 Q And the population density within one mile of the
18 site at Pilgrim is 250, is that not correct?

19 A Correct.

20 Q That means there is a factor of five difference.

21 A That's correct.

22 Q And this is an in-close area, as you say?

23 A Zero to one mile, yes, close.

24 Q Do we have special concern for it?

25 A Yes. When we say "close" we're talking within

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1 approximately five miles.

2 Q Well, if the Montague site exceeds -- or if the
3 Pilgrim site exceeds Montague by a factor of five, then why
4 does not -- why isn't the Montague site considered more
5 advantageous with respect to demography?

6 A Well, we have to place this in context. Now you
7 look at the next value of zero to two miles. You see the
8 density of the Montague site is 252, and you look at three
9 miles and see it's 339 per square mile. You have to look at
10 this as a whole. You just can't look at the zero to one mile.

11 And if you compare the zero to two, zero to
12 three, zero to four mile density figures at Montague with the
13 density figures shown in Table 3, it's quite clear that the
14 Pilgrim site is not -- the population density at the Pilgrim
15 site is not a factor of two greater than the Montague site.

16 Q Let's look at zero to ten miles, zero to 20
17 miles, and zero to 30 miles at Montague versus Pilgrim.

18 Is it not true that in every one of those cases
19 Pilgrim population exceeds Montague by a factor of two?

20 A Yes. This indicates that as you get further
21 away from the Pilgrim site you start picking up the population
22 around Boston. As you get out 20, 30 miles from the
23 Montague site there are no large urban concentrations. It
24 just simply reflects that.

25 Q And if we could, please, would you look at the

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1 2020 zero to two mile population for Montague and for Pilgrim?
2 That would be Table 4 of Staff Exhibit 66. And once again,
3 is it not true that the Pilgrim site is greater by a factor
4 of two than the Montague site?

5 MR. SMITH: Object.

6 It's not clear as to what number we're looking at,
7 what mileage.

8 CHAIRMAN GOODHOPE: Well, do you understand the
9 question?

10 WITNESS KANTOR: Yes, sir, I believe I do.

11 MR. LEWALD: I'd like to object. I don't think
12 whether the witness understands the question, the question as
13 put and the witness's answer aren't going to match in the
14 record unless the question is --

15 CHAIRMAN GOODHOPE: Well, I'm going to ask him to
16 explain what figures he's talking about.

17 What figures are we talking about, Mr. Wright,
18 please?

19 MR. WRIGHT: Mr. Chairman, for Montague I am
20 looking at Table 9. I'm looking at -- over in the right-hand
21 side it says Population Density. One of the columns is for the
22 year 2020.

23 CHAIRMAN GOODHOPE: All right.

24 MR. WRIGHT: And if we take the zero to two mile
25 range, the figure is 132 persons per square mile.

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For Pilgrim I am looking at Table 4 of Staff Exhibit 66, and I note that in the section entitled Cumulative Population Zero to Two Miles, if you carry that across to the right-hand side, and the persons per square mile listed there is 573.

WITNESS KANTOR: Right.

Mr. Wright, I notice there is a typographical error here in Table 9. If you look at the 2020 population you see that's 3744, and I'll have to check the density. One of these two numbers is not correct.

(Pause.)

Yes, the 2020 number. The density of zero to two miles should be 297 per square mile instead of 132.

BY MR. WRIGHT:

Q 297?

A (Witness Kantor) Yes. Obviously there is an increase in the population between 1985 and 2020. Therefore the densities would also increase.

Q All right.

In any event, Mr. Kantor, in comparing Montague and Pilgrim it's true, is it not, that between zero and one mile and between ten and 30 miles the Montague site is -- or the Pilgrim site is greater than Montague by a factor of two.

MR. SMITH: Mr. Chairman, I object, unless the

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question can be reread. It seems to be unclear.

MR. WRIGHT: I'll gladly restate the question, Mr. Chairman.

CHAIRMAN GOODHOPE: All right. Go ahead.

BY MR. WRIGHT:

Q My question, Mr. Kantor, is:

Comparing Pilgrim with Montagus, is it not true that between zero and one mile and between ten and 30 miles that Pilgrim population figures are greater than Montagus's by at least a factor of two?

MR. SMITH: Mr. Chairman, I'll have to object to the form of the question. There's no form clear as to exactly what we're talking about. There are not a lot of numbers, but it's not clear as to what's being compared.

CHAIRMAN GOODHOPE: How they relate to one another. How do they relate to one another?

MR. WRIGHT: Mr. Chairman, all I'm asking is this factor of two business:

Isn't it true that there are a number of radial rings where Pilgrim is much greater than Montague; and I just listed those rings. That would be zero to one and ten to 30.

CHAIRMAN GOODHOPE: Well, I've got the zero to one. And which one are you reading? Are you still in that 2020 of population density?

MR. WRIGHT: No, I'm looking at 1985. Actually

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1 we can look at 2020 as well.

2 CHAIRMAN GOODHOPE: You're talking about the 52
3 figures.

4 Now what figures are you comparing it with?

5 MR. WRIGHT: 52 compared with 250, Table 3.

6 CHAIRMAN GOODHOPE: 250 on Table 3.

7 And you want to know whether 250 is more than
8 twice as big as 52? That's pretty obvious.

9 MR. WRIGHT: Well, I was asking him about all of
10 those rings in which the factor of two is exceeded.

11 CHAIRMAN GOODHOPE: All right.

12 Now do you understand the question? I think I
13 understand it now. Do you understand the question now, Mr.
14 Kantor?

15 WITNESS KANTOR: Well, as I understood it we were
16 talking about the 2020 figures.

17 BY MR. WRIGHT:

18 Q We're talking about 1985, please.

19 A (Witness Kantor) Well, you could compare the
20 1985 density figures with the density figures shown in
21 Table 3, and it indicates that at certain radial distances
22 the Pilgrim population density is more than a factor of two
23 than at Montague, and I believe the distances cited by
24 Mr. Wright are the distances where the population density is
25 a factor of two greater at Pilgrim.

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1 Also I might point out at other distances the
2 population is less than a factor of two.

3 Q So are you saying, Mr. Kantor, that in order for
4 a site to be considered more desirable from a population
5 standpoint than the proposed site that the population has to
6 differ by a factor of two for all rings and all distances?

7 A No, I don't think we're saying that. We're using
8 a factor of two to help us form a judgment on whether a
9 population -- there is a significant difference in population
10 when we look at two sites. We're putting more emphasis on the
11 distance between zero to five miles when we do this. And if
12 the comparison showed that within zero to five miles the
13 population density of the alternative site was more than a
14 factor of two less than the proposed site, then it appears
15 to become a significant difference.

16 We would also have to look at the population
17 beyond that also.

18 Q So there may be some rings in which you have less
19 than a factor of two, but for whatever your reasons you would
20 consider that to be a more desirable site?

21 MR. SMITH: I object.

22 The form of the question is unclear.

23 CHAIRMAN GOODHOPE: Well, go ahead. That's not
24 what he said.

25 Do you want him to repeat his answer again?

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1 That's about all he can do.

2 MR. WRIGHT: I'm still trying to establish
3 whether this factor of two need be applied to every radial
4 ring or not.

5 MR. SMITH: Well, now, that's a good question.

6 CHAIRMAN GOODHOPE: He's answered it once.

7 Do you understand the question? Does this factor
8 of two have to be applied to every radial ring?

9 WITNESS KANTOR: Not necessarily. It helped us
10 form a judgment, and I don't want to get rigid and hung-up
11 on ring-by-ring on a factor of two.

12 BY MR. WRIGHT:

13 Q Now if a factor of two need not be applied to
14 every ring, then how did you go about making the judgment
15 in comparing Pilgrim with Montagus?

16 A (Witness Kantor) Well, we did compare the
17 population densities. We looked in particular at the zero
18 to five miles, the close-in, to see if there was a density
19 difference on the order of a factor of two.

20 We also looked at population beyond five miles to
21 see if there was a density difference of a factor of two.
22 The fact that one ring may or may not meet criteria and the
23 rest of the rings do would be something -- if we came to that
24 situation we would have to consider it in our evaluation.

25 Q And you say that the reason you use this factor

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of two is because density in and of itself is a crude indicator of risk?

MR. SMITH: Mr. Chairman, the question has been answered before, and it's in the Appendix B.

CHAIRMAN GOODHOPE: I agree.

MR. WRIGHT: All right.

BY MR. WRIGHT:

Q Well, assuming that's what you say, then would you please tell me why you have reached that conclusion?

MR. SMITH: I object.

What conclusion are we talking about?

MR. WRIGHT: The conclusion that because population density is a crude indicator of risk that a factor of two is required.

WITNESS SOFFER: May I answer that?

BY MR. WRIGHT:

Q Certainly.

A (Witness Soffer) This was one of the instances where the Staff gained insight from the Class 9 consequences study that was performed for the Perryman alternate site review, and was to some extent reported in SECY 78-137.

It was shown in that paper that there were a number of alternate — strike that.

There were two sites that differed in population density by approximately a factor of five, where the overall

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1 monetized cost of the accident consequences differed by less
2 than a factor of two.

3 This led the Staff to conclude that population
4 density differences would have to be fairly significant
5 before one could ascertain reliably that population density
6 was indeed the difference in risk between two alternative
7 sites.

8 Q And these monetized costs that you speak of,
9 you looked at an area that went out to 150 miles, did you not?

10 A That's correct.

11 Q And over a 150 mile area the monetized cost
12 equaled out, is that correct?

13 A That's correct.

14 Q But you also note, do you not, that in an area
15 much closer to the plant we would anticipate acute fatalities.

16 MR. WRIGHT: If I may, Mr. Chairman, I am now on
17 page 5-8 of the Final Supplement.

18 CHAIRMAN GOODHOPE: 5-8?

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1 MR. WRIGHT: 8, yes. And I'm just saying here --
2 let me read the whole sentence: "The staff expects that a
3 CRAFT code analysis"-- in other words, a class 9 analysis --
4 "for the Pilgrim site would show relatively little difference
5 in long term health effects for any of the sites.

6 "However, staff is aware that severe consequences,
7 such as a few fatalities would be confined to much
8 smaller distances.

9 "The staff, therefore, believes it appropriate
10 in efforts to elucidate the significant differences between
11 the sites to examine the population density over distances
12 of about 30 miles from the site."

13 Now, in the process of evening out, does that mean
14 that you might find out that within the 30 miles there might
15 be differences in fatalities between one site and another?

16 WITNESS TOFFER: Yes, there could be.

17 BY MR. WRIGHT:

18 Q How would you go about determining what would be
19 the factors that you would want to look at in determining
20 the differences as to acute fatalities?

21 A I would expect population density to be a
22 general measure of the differences between acute fatalities
23 that one might expect --

24 Q But you call that, don't you, a crude indicator
25 risk.

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1 So there must be other indicators that perhaps
2 make your analysis a bit more refined?

3 A It would be population density in comparison with
4 the meteorology that might exist at the time of the accident;
5 topographic considerations that might effect how any
6 effluents or radioactivity would be transported; and a
7 whole complexity of factors that enter into the dispersion and
8 transport of radioactivity under accident conditions.

9 Q Also I assume you want to look at road conditions,
10 road capacities?

11 MR. SMITH: Object.

12 CHAIRMAN GOODHOPE: Is that one of the factor --
13 overruled.

14 Is that one of the factors, road capacity?

15 WITNESS STOFFER: You can make accident consequence
16 calculations in one of two ways: you can examine accident
17 consequence calculations, assuming that the population, for
18 example, does nothing whatever to take any kind of protective
19 actions.

20 This is an unrealistic assumption, of course.

21 Or what you can do, you can estimate what the
22 consequences would be, assuming the people tried to take
23 reasonable, effective measures. The consequences would be
24 lower, but it can be done either way.

25 Q To a certain extent it would depend upon road
factors?

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- 1 A In a realistic situation, yes, it would.
- 2 Q And to the extent shelter is required, as opposed
- 3 to evacuation, I assume you'd be concerned with the shield
- 4 matters in buildings and other matters?
- 5 A Those would be among the factors that would be
- 6 considered as protective measures that might be taken, yes.
- 7 Q Thank you.
- 8 MR. WRIGHT: I have no further questions at this
- 9 time, Mr. Chairman.
- 10 CHAIRMAN GOODHOPE: Mr. Cleeton, do you have any
- 11 questions?
- 12 MR. CLEETON: Yes, I have a couple on methodology.
- 13 It won't take very long.
- 14 BY MR. CLEETON:
- 15 Q I believe Mr. Kantor can probably answer them,
- 16 and Mr. Stoffer, if he needs to supplement.
- 17 You've identified yourself as a demographer; is
- 18 that correct? Or having done demographic studies --
- 19 A I believe -- my experience is I've done work in
- 20 demography.
- 21 Q Could you answer for me what the traditional
- 22 definition of a square mile is or a square kilometer.
- 23 A Square mile?
- 24 Q Square mile, square kilometer.
- 25 A A square of one mile on each side.

david4

Q All right. Does the U. S. Geological Survey consider a square mile to be approximately 640 acres?

A I believe that's their version of a square mile, yes.

Q And in approximately one-half -- maybe 40 percent of the United States is gridded out in square mile sections, and then -- of townships and so on.

Most of the western part of the United States is gridded in square miles.

A I'll accept that, yes.

Q All right. Does the USGS, except for measuring the size of bodies of water, include surface -- unenclosed water as a part of their square mileage in estimating size of land areas?

MR. LEWALD: Can we have that question read back?

BY MR. CLEETON:

Q Does the USGS, except for estimating the size of a body of water, include unenclosed bodies of water in their land mass size calculations?

CHAIRMAN GOODHOPE: Are you talking about water like Cape Code Bay?

MR. CLEETON. That's right, sir.

WITNESS KAMROR: I believe they were determining the land area of Cape Cod -- they would not include the adjacent water areas.

CHAIRMAN GOODHOPE: The whole state is what he's

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referring to; you want the square mileage of Massachusetts?

MR. CLEETON: The square miles rather than -- in measuring Massachusetts for purposes of land mass size, they do not include Cape Cod Bay; that's what I was getting at.

He answered that in the affirmative. They do not.

BY MR. CLEETON:

Q Under the circumstances, can you give the square mileage of the town of Plymouth?

MR. SMITH: Mr. Chairman --

MR. LEWALD: I think that's already in the record; it's 100 square miles. We had that.

CHAIRMAN GOODHOPE: We have been over it; do you have it handy, Mr. Kantor?

WITNESS KANTOR: I believe I do have the figures ~~someplace~~.

CHAIRMAN GOODHOPE: I don't know whether this is a preliminary question or not, Mr. Cleeton.

Go ahead.

(Pause.)

WITNESS KANTOR: I'm referring to the document entitled "Massachusetts Population," and in this document for Plymouth, they give the area in square miles as 103.2 square miles.

BY MR. CLEETON:

Q Do you know, sir, whether or not the Chamber of

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Commerce or any official agency or body in the County of Plymouth, the town of Plymouth, or the Commonwealth of Massachusetts identifies the square mileage size of the central population of the town of Plymouth?

CHAIRMAN GOODHOPE: Of the what?

MR. CLEETON: The central population, the so-called downtown or central portion, as contrasted to the geographical boundaries, a lot of which is woods.

WITNESS KANTOR: I don't have any knowledge of that number. I would assume that somebody in the town might have that knowledge. I don't personally.

BY MR. CLEETON:

Q All right. With those in mind, then, in regard to the methodology, including radial or circumferential or concentric rings of population studies, when one calculates from Rocky Point outward in concentric circles, a large body of water is included in the area, which -- they divided the total population to get your density; is that correct?

A Yes, sir, that's correct.

Q In site number one, which is on the Merrimack River, the table regarding that is on page number 414; you show zero to five miles.

Is that a concentric ring, a radial ring. Page 414, taking the top numbers up to five miles.

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A That's the radius, zero to five miles, around site 1.

Q Does it include any significant bodies of water that are unpopulated by people?

A Outside of the Merrimack River, I don't believe there are any significant bodies of water within zero to five miles; perhaps some local lakes.

Q Now, in the method of analysis, as I understand it, in determining low population zone area of exclusion and areas -- regions and so on, you use concentric rings; is that correct?

In other words --

(Indicating).

A We look at radial distances.

Q Radial distances, which when moved on a radius would describe a circle --

MR. LEWALD: Could we have an answer to each of the questions? Exclusion area, low population zone -- I think the question had --

CHAIRMAN GOODHOPE: What is your question?

MR. CLEETON: My question is: in determining area of exclusion, low population zone, and other regions of interests -- I'll pluralize it to take everything out to a point of eight miles -- your area that is used in calculations is a circle.

WITNESS KANTOR: No. When we review an exclusion

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area, we look specifically at the area within that exclusion zone,

BY MR. CLEETON:

Q In other words, the exclusion zone only uses the land mass relative to the Pilgrim site?

You're not counting the water in the exclusion area?

A (Witness Soffer) May I answer?

Q Sure.

A The exclusion area as defined by Part 100 is an area that is defined as -- by the applicant -- where he proposes to have the authority to determine all the activities.

It may or may not be a circle.

Q All right.

A And it may include water area and may not necessarily include water area. So it can be either one. The low population zone is usually circular in shape.

A region of interest that the staff has used for considering alternative sites can be a broadly based geographic region and generally does not include a lot of water areas.

For the purposes of making population density comparisons in accordance with regulatory guide 4.7, the staff does consider the total area within a circle whether that area is land area or water area.

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The intent is to account for the total number of people that will be within a fixed distance of the site and if these people happen to be all on land, then, yes, that's where all the people happen to be.

BY MR. CLEETON:

DAVIDE*lo 1 Q Does the Nuclear Regulatory Commission use any kind of
2 sector analysis to look at population distribution?

3 CHAIRMAN GOODHOPE: Do you know what he means by a
4 sector?

5 MR. CLEETON: Twenty-two and a half degrees. A
6 sector is 22 and a half degrees for purpose of this question.

7 CHAIRMAN GOODHOPE: All right.

8 WITNESS SOFFER: May I answer that?

9 CHAIRMAN GOODHOPE: Yes.

10 WITNESS SOFFER: The commission asked the applicants
11 to submit population data in the form of sectors and
12 concentric areas of analysis. For the purpose of making
13 comparisons, the regulatory guide 4.7, the staff does not
14 use the sector information. However, for examining other
15 considerations in regard to whether an applicant has
16 identified the nearest population center, for example, or
17 whether there are other communities that may potentially
18 become population centers. The staff does indeed examine
19 the sector, the population sector information.

20 BY MR. CLEETON:

21 Q All right, assuming sector analysis for other
22 considerations, like population centers, population in the
23 event of some incident or accident, and for -- in terms of
24 meteorology, in what is commonly described as a plume, are
25 inland sites treated the same a coastal sites?

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1 MR. SMITH: Objection.

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2 CHAIRMAN GOODHOPE: Relevancy.

3 MR. SMITH: Relevancy and question is vague.

4 CHAIRMAN GOODHOPE: What difference does it make?

5 MR. CLEETON: I'm -- Mr. Chairman, I'm simply leading
6 to the fact that in the analysis of site 1 if only concentric
7 circles are used, population densities are simpler to bend for
8 the Pilgrim site; and if you exclude the water at Pilgrim you
9 get densities that are considerably higher than at site one.

10 CHAIRMAN GOODHOPE: I don't think there's dispute
11 about that. But I'll overrule the objection. Do you know, do
12 you use the same methodology inland as you do in a coastal
13 situation such as we have here?

14 WITNESS SOFFER: I'm not sure I understand your question.

15 BY MR. CLEETON:

16 Q Do you use the same methodology in determining
17 population, effective population, namely sector analysis for
18 inland sites as you do in coastal sites?

19 A If -- if you mean, would we use regulatory guide 4.7
20 the same way for an inland site as for an off-shore site.

21 Q Coastal site.

22 A Coastal site. The answer is yes. With the
23 presumption that the meteorology for the two sites is generally
24 similar. In other words, there has to be a general
25 determination by the staff that there is no reason to believe

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1 that the wind pattern would be such at a coastal site that
2 it blows predominantly toward the land.

3 Q All right, then, let me ask this; most of the
4 statements that are made in here refer to wind direction and
5 wind velocity and so on. Are there any that refer to no wind?

6 Stable situation wherein, if an accident occurred,
7 and no wind the plume would not be distributed?

8 MR. SMITH: Mr. Chairman, I have to object. First,
9 we are not sure where he is referring to.

10 CHAIRMAN GOODHOPE: I can't hear you.

11 MR. SMITH: I don't know what he's referring to and
12 also the relevancy to alternative site review.

13 CHAIRMAN GOODHOPE: I think his question is simply,
14 is there any analysis made in the final supplement. Where there
15 is no wind at all blowing. Is that substantively what your
16 question is?

17 MR. CLEETON: Yes.

18 CHAIRMAN GOODHOPE: Or is it assumed that there is
19 a wind of some velocity?

20 WITNESS SOFFER: Our meteorologists have gathered data
21 on the percentage of calm. It's generally less than half a
22 percent at any particular site. On that basis, I think that
23 we do not make any analysis that includes no wind direction.

24 BY MR. CLEETON:

25 Q One final question, if the water were excluded from

davidd 1 your calculations in the matter of the Pilgrim site, would the
david13 2 density be such as to make them considerably higher than the
3 densities at alternative sites?

4 A The answer to that is obviously, yes - of course. If
5 you put the same number of people into a smaller area, then
6 obviously, the population density goes up. However, I must
7 qualify that by saying that this is not the intent of
8 regulatory guide 4.7. Could do it this way and if it had
9 been the intent, I think the guide would have read differently.
10 Population density can be an extremely misleading number in the
11 sense that if you do not define the area that you're talking
12 about very carefully one can arrive at conclusions that
13 population density is an extremely high number. For example, I
14 made an example calculation some time ago in regard to this
15 meeting room, which is approximately 30 feet by 60 feet, I
16 estimated. And it turns out that one person in this meeting
17 room corresponds to a population density of 15,000 persons per
18 square mile. Now it is not clearly the intent of the people
19 framing regulatory guide 4.7 to indicate that isolated
20 concentrations of people, which they obviously knew would lead
21 to higher population densities, should be given undue weight.
22 And that's the reason why regulatory guide 4.7 is to look at all
23 of the people in all of the area under the assumption that the
24 wind pattern is generally uniform.

25 Q May I ask one further question which would be the

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last one. Under the circumstances of the illustration you gave of the density of 15,000 per square mile for this room at the present time being misleading, would not the figures which is water area for the calculation for the population density be similarly misleading when averaged, without that footnote or reference?

A This is the point that I was trying to say. That a population density value without giving a clear indication of what area you are talking about is in and of itself a very misleading number. That by our very nature it's very easy and unambiguous to count people. It becomes ambiguous when we count people per square so and so, if we do not define exactly what we mean by the area. So it would be quite unambiguous for me to say that there are 40 people in this meeting room, however; if I were to say that there is a location in Plymouth where the population density with 40 people per square mile, by the way, the population density is about 600,000 people per square mile.

DR. COLE: You mean 40 in this room?

WITNESS SOFFER: Forty in this room is equivalent to a population density of 600,000 people per square mile. If I were to give you that number without any other qualification it could be very easily an ambiguous type of a number. I believe it's more important to concentrate on the total number of people in a given distance of the plant rather than

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david 15 1 examine population densities in relatively small areas. It's
2 quite obvious, if you looked at a map of Plymouth and the
3 surrounding areas, that you could find areas in central
4 Plymouth where the population density was several thousand
5 people per square mile. And you could just as easily find
6 areas in rather remote sections of town where the population
7 density was conceivably very close to zero. The only thing that
8 gives us an unambiguous answer is the fact that our total
9 number of individuals of people, we are concerned, after all,
10 with the health and safety of people.

11 Q Now, considering people then, rather than density
12 would you consider the Pilgrim site the best site of the
13 several alternatives.

14 MR. SMITH: Object to the term - best.

15 CHAIRMAN GOODHOPE: I can't hear either one of you.

16 MR. SMITH: I object to the term best as a
17 comparison.

18 MR. CLEETON: Mr. Chairman.

19 CHAIRMAN GOODHOPE: What do you mean by best?

20 MR. CLEETON: In the argument that Mr. Smith
21 handed to us the other day, which is a collection of policy
22 statements, so I assume that they are still policy. In that
23 a recommendation section. It states, "Staff practice is
24 neutral concerning facing additional units on previously
25 approved sites." This is page 30 and this is under policy.

1 When an additional site is proposed, the staff evaluates
2 updated site information. Site criteria applied to each additional
3 unit independently. This practice has resulted in different
4 sizes for low population zones, population center distances
5 for different units.

6 Of the same type of the cases Arkansas 2 and Pilgrim 2
7 this was a result of the changes in population. My question
8 goes to the issue of whether or not the Pilgrim site is the
9 better or best site.

10 CHAIRMAN GOODHOPE: I'll let you ask him if this is
11 the preferable site insofar as he participated in the
12 preparation of the final supplement.

13 MR. CLEETON: In terms of population?

14 CHAIRMAN GOODHOPE: Yes.

15 BY MR. CLEETON:

16 Q Is it the preferable site in terms of population,
17 counting people, not concentric or sector analysis?

18 A In terms of population considerations and using
19 the test of significance that Mr. Kantor and Mr. Wright
20 discussed earlier, the factor of two significance, they
21 concluded that there was no site obviously superior.

22 MR. CLEETON: Thank you. No further questions.

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CHAIRMAN GOODHOPE: Mr. Smith.

2 MR. SMITH: No redirect, Your Honor.

3 CHAIRMAN GOODHOPE: Mr. Cleaton.

4 Anybody have any further questions?

5 (No response.)

6 Mr. Kantor and Mr. Soffer, you are excused.

7 (The panel excused.)

8 MR. SMITH: The panel may come back later.

9 CHAIRMAN GOODHOPE: Oh. All right.

10 Well, what's your pleasure? Do you want to
11 adjourn now and come back at 1:15 or go on? What is it?

12 Mr. Herr is next, if he's here.

13 MR. WRIGHT: Yes, he just arrived, sir.

14 I would appreciate adjourning now and starting
15 at 1:15. That's my own personal preference.

16 CHAIRMAN GOODHOPE: Any problems with anyone?

17 MR. LEWALD: We have no objection.

18 CHAIRMAN GOODHOPE: All right. We'll come back
19 at 1:15.

20 (Whereupon, at 11:45 a.m., the hearing in the
21 above-entitled matter was recessed, to reconvene at
22 1:15 p.m., this same day.)
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AFTERNOON SESSION

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1:15 p.m.

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CHAIRMAN GOODHOPE: The hearing will be in order.

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Whereupon,

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PHILIP B. HERR

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was called as a witness on behalf of the Commonwealth of

7

Massachusetts, and having been first duly sworn, was examined

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and testified as follows:

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MR. WRIGHT: Mr. Chairman, for purposes of

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identification, I would like to have Mr. Herr's testimony

11

marked as Commonwealth's Exhibit 113, and I am going to

12

provide the stenographer with the requisite 20 copies so

13

that they may be bound into the record.

14

CHAIRMAN GOODHOPE: Are you going to bind it into

15

the end of today's transcript?

16

Then it doesn't need an exhibit number if

17

it is just to be bound at the end of today's transcript, and

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the reporter is so directed.

19

(Counsel Wright distributing copies to Board

20

and Parties.)

21

MR. WRIGHT: Now, if I may Mr. Chairman, what

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happened is that there were a number of corrections that

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Mr. Herr wanted to make. As a result we notified the parties

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of the changes. And what I am introducing here today is an

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amended version of Mr. Herr's testimony.

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1 Dr. Callihan mentioned yesterday that he would
2 also appreciate knowing just where those changes were made
3 so that he can incorporate them into his old copy. And for
4 that reason I have prepared a document entitled "Corrections
5 of Testimony of Philip B. Herr," for those parties or those
6 Board members who may find that more convenient.

7 (Distributing document to Parties and Board)

8 DIRECT EXAMINATION

9 BY MR. WRIGHT:

10 Q Mr. Herr, will you please identify yourself for
11 the record; your name, address and position?

12 A I am Philip Herr. I am a resident of Newton,
13 Massachusetts.

14 I am an associate professor in the Department of
15 Urban Studies and Planning at MIT, and principal in the planning
16 consulting firm of Herr Associates.

17 Q Thank you.

18 I have just handed you, Mr. Herr, a document that
19 has now been -- it has not been labeled, as a matter of fact,
20 it is entitled "The Testimony of Philip B. Herr on Pilgrim 2
21 Population Density and Other Site Characteristics Submitted
22 by Intervenor Commonwealth of Massachusetts in Support of its
23 Contention No. 12."

24 Can you identify this document?

25 A Yes, that's my testimony.

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mm3 1 Q Is the statement contained therein true to the
2 best of your knowledge, information and belief?

3 A Yes, it is.

4 Q At this time, do you have any further corrections
5 to this particular document?

6 A No, I don't.

7 MR. WRIGHT: Mr. Herr is available for cross-
8 examination, Mr. Chairman.

9 CHAIRMAN GOODHOPE: Do you want to start, Mr. Lewald?
10 Or, have you made another arrangement?

11 MR. LEWALD: I had assumed Mr. Wright at some point
12 was going to offer the testimony.

13 CHAIRMAN GOODHOPE: I assumed that when it was bound
14 into the record it became a part of today's testimony. I
15 took that as an offer.

16 MR. LEWALD: Oh, I see. I must have been sleeping
17 at the switch.

18 CHAIRMAN GOODHOPE: I considered that an offer.
19 I will go back now. Is there any objections?

20 MR. SMITH: Yes.

21 MR. LEWALD: Yes.

22 CHAIRMAN GOODHOPE: Who wants to be first?

23 Mr. Lewald, go ahead.

24 MR. LEWALD: Mr. Chairman, we would object to the
25 end portion of Mr. Herr's testimony beginning with page 20,

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1 on the basis that on the face of the testimony at least, it
2 seems to appear that the testimony offered is offered more
3 in connection with the Emergency Planning Contention of the
4 Commonwealth and the Staff, than pursuant to Commonwealth
5 Contention 12.

6 The testimony from page 20 on deals solely and
7 entirely with evacuation. And from 21, which is a map, through
8 22 and on to the end deals solely with evacuation of Cape Cod.
9 And this would appear to be, perhaps, pertinent to the
10 emergency planning contention. But it doesn't seem to have
11 direct relevancy to Contention 12 as stated.

12 And therefore, we would object to it coming in at
13 this time.

14 MR. SMITH: Staff has the same objection.

15 MR. WRIGHT: Mr. Chairman, the testimony of
16 Professor Herr was prepared with respect to Cape Cod and goes
17 very much to the issue of population distributions around the
18 various sites. It goes to the very heart of our contention,
19 and that is that because of the unique siting characteristics
20 related to the Pilgrim site, and because of the unique
21 population distributions that are involved here, that the
22 Staff has not adequately analyzed the Pilgrim site in light
23 of the other available sites.

24 Now one of the issues that's involved when you
25 talk about population and risk, obviously, in addition to
their distribution and their numbers and other factors

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1 like that, is the ability to protect these people in the
2 event of a nuclear incident. And it is precisely for this
3 reason that Dr. Herr's testimony is included at this time
4 with respect to the Cape Cod population because there is a
5 very real problem here in terms of getting people over that
6 bridge if such should become necessary.

7 It is intimately related to the issue of population
8 for that reason.

9 MR. LEWALD: I would say, Mr. Chairman, that
10 the emergency planning contention says that the acceptable
11 emergency plan cannot be developed to protect persons within
12 and beyond the LPZ at the proposed site. And it seems that
13 whether or not Cape Cod can be evacuated is directly concerned
14 with that, and that is directly concerned with that contention
15 rather than simply the general population densities and
16 accumulations in the vicinity of the site.

17 CHAIRMAN GOODHOPE: And the alternate sites. And
18 what we are considering here is alternate sites.

19 MR. LEWALD: With alternate sites, of course.

20 MR. WRIGHT: I think it is true that certainly
21 portions of Professor Herr's testimony as to the evacuation
22 of Cape Cod will also be relevant when we get into the
23 emergency planning contention.

24 However, I still would maintain that in terms of
25 really closely looking at the surrounding population to

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1 these various sites, this is very pertinent, because you just
2 can't look at people, you have to look at what happens to those
3 people in the event of an accident. That's what our population
4 contention is all about.

5 CHAIRMAN GOODHOPE: Well, we are considering here
6 alternate sites.

7 Is there any information as to whether or how
8 difficult it is to evacuate any of these alternate sites?

9 Are you presenting any evidence on any other sites
10 except this one?

11 MR. WRIGHT: No, we are not presenting any evidence
12 on other sites except this one. We don't have it at our
13 disposal at this time. We are concerned about making a showing
14 that the Pilgrim situation is dangerous enough, or at least
15 gives rise to enough questions as to the surrounding population
16 distributions and the impact of a nuclear accident on them,
17 that the Staff should have done more in its own alternative
18 site analysis.

19 (Board conferring)

20 CHAIRMAN GOODHOPE: Would you object to this
21 being brought in under emergency planning, Mr. Lewald?

22 MR. LEWALD: Well, if it is under the designation
23 of emergency planning, no, I think it is pertinent to emergency
24 planning.

25 MR. SMITH: Staff is of the same opinion, sir.

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1 DR. COLE: How much of a hardship would it create
2 on you, Mr. Wright, if we were to go along with these
3 objections, because it does not really seem to apply to the
4 issue of alternate sites, and then bring it forward at whatever
5 time we proceed with emergency planning?

6 MR. WRIGHT: My only concern would be that in the
7 preparation of our proposed findings of fact for the Board,
8 that we be allowed to refer to this testimony in support of
9 our alternative sites claim.

10 If we are not going to be allowed to do that, then
11 I think it is a definite hardship because I think it is these
12 very matters, the matters of road and sheltering and things
13 like that that make the population analysis done by the Staff
14 deficient.

15 And that's what we attempted to show in this.

16 Now, as I said before, obviously certain portions
17 of this are going to be relevant to emergency planning as
18 well. But it has been our contention all along that you just
19 can't look at numbers of people in comparing one site to
20 another when you are concerned about residual risks. You
21 have to look to other factors as well.

22 And as both Mr. Soffer and Mr. Kantor testified
23 earlier today and yesterday as well, I believe, road capacity
24 is one of those very factors that you would want to look
25 closely at in trying to determine residual risk.

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mm8 1 Now, of course, for them --

2 DR. COLE: But that really seems to be more in an
3 area other than alternate sites, that is emergency planning.

4 MR. WRIGHT: But, if one of the areas in NEPA that
5 you are concerned with is the residual risk in the event of
6 a nuclear accident, then it is our contention at any rate, you
7 have to look not only to population, but to its distribution
8 and to the capacity that the local community has to mitigate
9 the effects of the nuclear accident if it were to occur.

10 And one very clear thing that you can look to here
11 is road capacity and the ability of a community to get its
12 people moved from one point to another. And that's why it is
13 included at this time in our alternative sites contention.

14 Now, of course, the Staff's position is that all
15 we have to do is look at population density per square mile,
16 and that if it reaches a certain -- if it exceeds a certain
17 trip level then we will perform a further analysis.

18 And I would suggest to you, Dr. Cole, that that
19 further analysis that the staff might find itself performing
20 some day in the case where it did consider the population
21 levels were too high, would be to look to road capacity and
22 things like that.

23 The only argument that we have here is whether
24 or not their use of population figures alone, without even
25 looking to sectoral distribution and more refined matters.

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1 like that, satisfies NEPA with respect to demography.

2 We say there is more. We say because of these
3 unique characteristics, one of which is this very matter
4 here of the bottleneck that has occurred, that is occurring
5 on the Cape, because of this unique site characteristic
6 you should have done more, you should have looked much closer
7 at these various sites before assuming that Pilgrim was the
8 preferred site.

9 DR. COLE: You did not look at the other sites
10 with respect to that same category?

11 MR. WRIGHT: Right.

12 And we are saying that the Staff should have looked
13 much more closely at these other sites because of these
14 unique site characteristics here. And one of them -- we are
15 concerned, of course, as you know, about the distribution
16 of population around this site.

17 We are also concerned about road capacity, we
18 are concerned about the ability of the Cape community to
19 get those people off the Cape if that should become necessary.

20 That is a unique site characteristic that we claim
21 should have triggered a far more intensive look at the
22 alternative sites. That is very much like the FNP case, the
23 Floating Nuclear Power Plant case, because there was a
24 unique situation. In that case, of course, it was the fact
25 that one of these things was going to be sited out at sea.

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1 Because there was that unique situation and
2 unique circumstances, the Staff felt obliged to go ahead with
3 this Class 9 analysis.

4 All we are saying here is once again we have a
5 unique set of circumstances; one of which is population
6 distribution; another of which is the problem of the Cape.
7 And because of those unique circumstances, we are asking, or
8 it is our contention th at a far more rigorous analysis of
9 accidents should have been conducted by the staff.

10 MR. LEWALD: Mr. Chairman, what Mr. Wright is now
11 arguing is that because of the unique circumstances here, the
12 Commission's regulations don't apply and some other standard
13 ought to be set forth.

14 If indeed that is his position, he should have
15 raised that earlier because this is in substance an attack on
16 regulations, that you have such a unique set of circumstances
17 with respect to this particular application that the
18 regulations set forth shouldn't be applicable and that some
19 other guidance ought to be given.

20 But there is a regular procedure for bringing
21 this matter before the Board, and indeed before the Commission
22 which hasn't been done in this case.

23 MR. SMITH: Mr. Chairman, may I make a statement?

24 CHAIRMAN GOODHOPE: Yes.

25 MR. SMITH: I think that one thing that should be

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nm11 1 understood and I think is somewhat cloudy by the Commonwealth's
 2 assertions of what the Staff believes: There is a proposed
 3 amendment to Appendix E Part 50 which deals with emergency
 4 planning.

5 Accompanying that amendment is a supplemental --
 6 it is called supplemental information which gives guidance
 7 to the Staff. Again this is not a regulation, it's Commission's
 8 interim guidance. But the Staff is following interim
 9 guidance.

10 That particular interim guidance states that
 11 emergency planning may become a part of an alternative site
 12 review; or, in your alternative site considerations, not
 13 necessarily part of your NEPA review.

14 And we recognize that particular provision. And,
 15 in fact, the Staff has undertaken a review of evacuation at
 16 alternative sites.

17 The important part here is that we feel it is
 18 necessary to separate emergency planning, which is under the
 19 safety side of our review and take in different considerations
 20 than from the NEPA consideration, alternative sites.

21 And that's why we object to this being presented
 22 now. It is a way of keeping, I think, a more orderly record.
 23 We are not objecting to it and would not object to it being
 24 brought in at a later time when emergency planning is
 25 discussed, and we will also, as we indicated in our rebuttal

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1 testimony which was prefiled, we intend to file our
2 examination review of alternative sites as it relates to
3 evacuation.

4 But it is not a NEPA issue, it is a safety issue
5 and triggers a consideration of alternative sites, but
6 not under the NEPA review. And that's why we think it is
7 important to keep this separation.

8 DR. CALLIHAN: Clearly Mr. Smith and Mr. Lewald,
9 this is an exploratory question to attempt to clarify.

10 Mr. Lewald indicated a break point in the
11 testimony and remarked, if I interpret Mr. Lewald, that
12 after page number so and so, it was primarily consideration
13 of evacuation, travel routes, et cetera.

14 Do you imply by that that in advance of your
15 page 20 or whatnot, there is material relevant to today's
16 consideration on alternate site population distribution per
17 say rather than how to get rid of the population?

18 MR. LEWALD: Well, I would not raise objection on
19 those earlier pages.

20 Yes, sir, there is testimony in the first 20 --
21 the first 19 pages that would appear on its face, at least,
22 to be directed to the issue that we are considering today, the
23 alternate site issue raised by Commonwealth Contention 12.

24 DR. CALLIHAN: Mr. Smith, would you object to
25 my question?

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1 MR. SMITH: Yes, I think there are -- as a matter
2 of fact I have some cites as to where there is some small
3 reference to emergency planning at Plymouth, and I would like
4 to correct the record.

5 I made a statement about separating the environmental
6 considerations and the safety. In reviewing the language, we
7 may consider emergency planning advantages or disadvantages of
8 a particular site as part of the NEPA cost-benefit analysis
9 of alternative sites. So I misspoke before when I said
10 keeping it separate.

11 But I still believe that it is important that we
12 do maintain for orderly records, separation of evacuation
13 emergency planning in that part of the hearing and not
14 bringing it to this part of the hearing.

15 DR. CALLIHAN: Referring to another document that
16 we have in hand not yet part of the record, but it is
17 entitled "Staff Rebuttal Testimony."

18 Mr. SMITH: That's right.

19 DR. CALLIHAN: My observation, and I ask for
20 confirmation or consent -- my observation is the material of
21 this document addresses what I will loosely refer to as the
22 forepart of Professor Herr's testimony?

23 MR. SMITH: That's correct.

24 It states in there that we will file at a later
25 time, analysis of evacuation of alternative sites.

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DR. CALLIHAN: Thank you.
(Board conferring)

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1 MR. WRIGHT: Mr. Chairman, may I suggest a way
2 out of this impasse?

3 CHAIRMAN GOODHOPE: Well, I was just going to
4 say the objection has come down. It's just a matter of
5 procedure as to how we're going to proceed, as I see it.

6 You're trying to make more out of it than that.

7 But --

8 MR. WRIGHT: As a matter of procedure, sir, perhaps
9 the testimony could be allowed in to the extent that it
10 applies to the NEPA situation.

11 CHAIRMAN GOODHOPE: Well, there's no doubt,
12 I don't think, as to the first 19 pages.

13 MR. WRIGHT: Yes. I'm talking now about the last
14 part of it.

15 As Mr. Smith has pointed out, in NEPA it can be
16 a consideration. What I would suggest doing -- and I don't
17 know if this would be acceptable to the parties -- is to
18 accept it as part of our alternative sites case, if you will,
19 but allow later cross-examination on this area provided the
20 parties feel that they want to defer cross-examination until
21 the time of emergency planning.

22 But I do think it is very much a part of the NEPA
23 circumstances that we must show in order to make out our case
24 under NEPA. And for that reason I would request that it be
25 accepted into evidence at this time.

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CHAIRMAN GOODHOPE: Well, now, are you suggesting that accept the whole document, have the whole document bound in and limit the cross-examination to the first 19 pages and then have any further cross-examination from 20 on later as a part of the emergency planning? Is that your suggestion?

MR. WRIGHT: Yes, as an accommodation to the parties, yes. But with the clear understanding that these last eight or so pages apply both to emergency planning and to our NEPA contention.

CHAIRMAN GOODHOPE: That's where we get into the problem. As I see, the last part of it does not apply to alternate sites or to NEPA.

Mr. WRIGHT: Well, as I said before, our claim is that as a unique site-related circumstance --

CHAIRMAN GOODHOPE: And now Mr. Smith says that it may be a part of that.

MR. SMITH: As I said, I misspoke. I was reading from the proposed regulation where the Commission says exactly what I read. It's, again, a proposed regulation.

I would have no objection to that procedure as long as it's not ataking us -- Staff stipulation as to how emergency planning should be factored into this particular alternative site analysis.

MR. LEWALD: Well, the special circumstances or

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1 the unique circumstances that Mr. Wright refers to, either
2 these are something beyond the regulations or these are the
3 special attention matters that are referred to in Offshore
4 Systems case, which is 8 NRC 194.

5 These special circumstances, at least as
6 interpreted by the appeals board, are simply introduced to
7 show whether or not the probabilities of risk are greater
8 or lesser than they would be otherwise with respect to the
9 site. And I don't really see how the question of evacuating
10 Cape Cod has any relation to the probabilities of risk at the
11 Pilgrim site.

12 CHAIRMAN GOODHOPE: I think that is our problem
13 too under the present regulations. You want to go beyond
14 the present requirements of the present regulations.

15 MR. WRIGHT: The only regulation we have, sir, as
16 I understand it, is the reg guide 4.7, which is of course not
17 a regulation. We have had an appeals board saying that
18 under special circumstances a Class 9 analysis might be
19 performed. Indeed, that's the Staff's position as well.
20 And the appeals board found that the floating nuclear plant--

21 DR. COLE: Mr. Wright, do you have a reference
22 for that, because that's not my recollection.

23 MR. WRIGHT: My understanding of the Offshore
24 Power Systems case is that they were allowed to go ahead
25 with the Class 9 analysis that was done.

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1 MR. SMITH: If I may comment, that is correct,
2 but not on the grounds given by Mr. Wright, but on the grounds
3 that the appeal boards found that the Commission had never
4 considered floating nuclear power plants when they adopted
5 the annex to Appendix D. Therefore they allowed it to be
6 considered in that particular case.

7 But it's true, the Staff argued the special
8 circumstances for that particular item. It was rejected by
9 the appeal board.

10 MR. WRIGHT: The Staff is also arguing now before
11 the NRC that there are special circumstances when a Class 9
12 analysis should be done. And not only is it true for floating
13 nuclear plants, but it's true for a land-based plant as well.

14 There was a statement -- I can quote from their
15 brief which I have here. The point remains, Mr. Chairman,
16 that what I propose I don't think is all that out of the
17 ordinary, that if the parties feel that they're not prepared
18 at this time to go forward with the cross-examination on
19 evacuation as it relates to emergency planning, then by all
20 means let them again cross-examine Dr. Herr at a later time
21 as to this particular portion of his testimony.

22 He will be appearing again as our witness in the
23 emergency planning phase of these proceedings, so that's not
24 a problem.

25 All I would ask this Board to do is to allow us

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1 to introduce this as part of our alternative sites
2 contention because I do think it constitutes that kind of
3 unique circumstance.

4 Now mind you, this whole area, as we found out
5 today, is a tremendously evolving one. No one knows from one
6 day to the next quite what is going on. We have matters
7 before the NRC at this point. We also have a number of
8 task forces looking at various matters that are coming out
9 of Three Mile Island.

10 We have the Staff itself urging that in certain
11 circumstances the Class 9 analysis should be performed. We
12 have the Staff taking a position before the NRC that it should
13 be allowed to do Class 9 analyses.

14 And just for all of those reasons I think that
15 it's the better part of wisdom to at least accept this in
16 and proceed. I just don't see what the problem is.

17 MR. CLEETON: Mr. Chairman.

18 DR. CALLIHAN: Can you, Mr. Wright, define a
19 fairly clean break point of Prof. Harr's testimony where
20 you would separate, if you can, the site demography and that
21 sort of thing from evacuation?

22 Mr. Lewald named a page.

23 MR. WRIGHT: Well, the problem is that to a large
24 extent I guess Mr. Lewald is talking about the pages beginning
25 at page 20. And quite a bit of that testimony relates to

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1 for example if we look at page 26, the nearby population
2 south-southeast. There are pages that talk only about the
3 actual population to be found there.

4 We're not talking at that point about evacuation,
5 but only about the populations to be found within certain
6 sectors. And then in addition he also discusses road
7 capacity. And then he compares road capacity, at least for
8 the Cape, anyway, road capacity with these population figures.

9 DR. CALLIHAN: Well, my impression was that the
10 methodology and the like are considered more -- to a greater
11 degree in the earlier section than in the later. And I was
12 seeing if you could separate the pages between the two
13 subjects.

14 MR. CLEETON: Mr. Chairman.

15 CHAIRMAN GOODHOPE: Yes.

16 MR. CLEETON: Might I offer in addition that
17 since the second piece of the Final Supplement, with the
18 exception of the Merrimack, Millstone, Mont and Seabrook
19 sites, 18-A, -B, -C, E, 19 and 20 are all affected by the
20 Cape, if you take a look at the map, that this is relevant
21 to alternative sites, all of the sites that are offered as
22 the centerpiece for this Final Supplement to preferable sites.

23 And the evacuation of the Cape is relevant to all
24 of those that I cite.

25 CHAIRMAN GOODHOPE: Well, I don't remember in

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1 detail right now, and I don't think I agree with it. But I
2 can't say that I remember that in that context. I don't
3 believe it was presented for that purpose.

4 But don't hold me to that because I don't
5 remember in detail.

6 (The Board conferring.)

7 CHAIRMAN GOODHOPE: Well, we're going to let the
8 document be bound in, the entire document be bound in. I think
9 it's a procedural matter.

10 And let's try to limit the cross-examination, to
11 the best we can, to the first 19 pages concerning the
12 alternate site problem. I think that that is what is
13 important. And the remainder of it, into the evacuation,
14 emergency plans.

15 You're going to make the argument that as a
16 part of alternate sites they should have considered
17 evacuation plans at all of the alternate sites, not just
18 Cape Cod, and that since they didn't do this then your
19 argument is going to be -- you made such a showing as to
20 how impossible it is or difficult it is to evacuate around
21 Pilgrim 2, that the Staff was deficient in not considering
22 this and looking for a better and easier evacuation plan
23 around the other possible sites.

24 You can make the argument. I don't think that the
25 regulations permit us to even address it other than to reject

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1 it at this time.

2 MR. WRIGHT: If I may, Mr. Chairman, there's a
3 little bit more to it than that, and that's the part that
4 troubles me. It's not only that; it's our contention that
5 the Staff should have looked more closely to such matters as
6 evacuability when they reviewed these various alternative
7 sites. But it's also that the unique problems associated
8 with the Pilgrim site should have triggered that more
9 intensive analysis.

10 CHAIRMAN GOODHOPE: As we perceive the regula-
11 tions, the triggering point was not reached, I don't believe,
12 in Pilgrim 2.

13 So that the exhibit will be bound into the record
14 and we'll go ahead and proceed with the cross-examination as
15 far as it pertains to alternate sites. And the rest of it,
16 then, from 20 on, will be for Mr. Herr when he comes back for
17 cross-examination as a part of the emergency planning.

18 MR. WRIGHT: Then, Mr. Chairman, under the
19 circumstances, if I take your ruling to mean that you are
20 going to treat the evacuation section of Mr. Herr's testimony
21 as irrelevant, then I'd like to make an offer of proof.

22 CHAIRMAN GOODHOPE: You've made the offer.
23 You've stated that the whole document is relevant to the
24 subject.

25 MR. WRIGHT: I've stated that there are unique

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1 circumstances associated with the Rocky Point site, one of
2 which is the problem of evacuation. And that in itself
3 should have triggered a far more rigorous analysis of the
4 other sites.

5 CHAIRMAN GOODHOPE: All right.

6 That's not an offer of proof, it's an argument
7 which you want to make based on this exhibit. All right.
8 That's it.

9 The entire document will be bound into today's
10 testimony, as I stated previously.

11 (The document referred to follows:)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
Boston Edison Company, et al.)	
(Pilgrim Nuclear Generating Station,)	Docket No.
Unit 2))	50-471

TESTIMONY OF PHILIP B. HERR ON PILGRIM 2
POPULATION DENSITY AND OTHER SITE
CHARACTERISTICS, SUBMITTED BY INTERVENOR
COMMONWEALTH OF MASSACHUSETTS
IN SUPPORT OF ITS CONTENTION NO. 12

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Commonwealth Contention 12:
Neither Applicants Nor Staff Have
Adequately Considered the Alternative
of Locating the Proposed Plant at a
Site More Suitable from a Population
Density and Environmental Standpoint.

My name is Philip B. Herr, and I am an Associate Professor of City Planning at the Department of Urban Studies and Planning, Massachusetts Institute of Technology. A copy of my resume is attached.

I. NRC SITING POLICY

It has been long-standing NRC policy to require the siting of nuclear power reactors away from densely populated areas. In the event of a serious radiological accident, emergency off-site measures will obviously be far more effective in sparsely populated areas,^{1/} and this judgment is now quantified in Reg. Guide 4.7: if projected population density within a thirty-mile radius of a potential site exceeds 500 persons per square mile at the time of initial operation or 1,000 persons per square mile at its retirement, then "special attention should be given to the consideration of alternative sites with lower population densities."

It is apparent that the trip levels contained in Reg. Guide 4.7 serve a very significant function with respect to reactor safety; because some residual risk will remain even after all reasonably attainable safety measures are built into

^{1/}See Statement of Considerations, 10 CFR Part 100, 27 FR 3509 (April 12, 1962); Regulatory Guide 4.7 (November, 1975); "Commission Action Paper", SECY 78-137 (March 7, 1978).

the design of a proposed nuclear reactor, careful evaluation of the size and distribution of the population surrounding that reactor appears to have emerged as the NRC's primary means of ensuring that the consequences of any accident more severe than design-basis events are mitigated as much as possible, including the siting of the proposed reactor in a less populous area. Population density, therefore, functions as a threshold indicator of residual risk and the potential consequences of the so-called Class 9 accidents, i.e. those beyond the design basis of the reactor. If the trip levels of Reg. Guide 4.7 are exceeded, then "special consideration" should be given to alternative sites, including (one would assume) a close look at just how each of the candidate sites would fare in the event of a Class 9 accident.

II. POPULATION DENSITIES SURROUNDING THE PILGRIM UNIT 2 SITE

The methodology used by the Staff and the Applicant in determining the Pilgrim 2 population distributions is discussed in detail below, especially those techniques that tend to understate the final figures and obscure risk potential in the area surrounding the Rocky Point site. As a preliminary matter, however, the results that were reported for 1985 are shown in Figure 1, a chart prepared by the Staff for the 1975 Safety Evaluation Report (SER) which I updated by using data from Table 1 of the 1978 Draft Supplement to the Final Environmental Statement (Draft Supplement). For 40 and 50 miles, the figures were exponentially interpolated from the Preliminary Safety Analysis Report (PSAR), Table 2.1-8.

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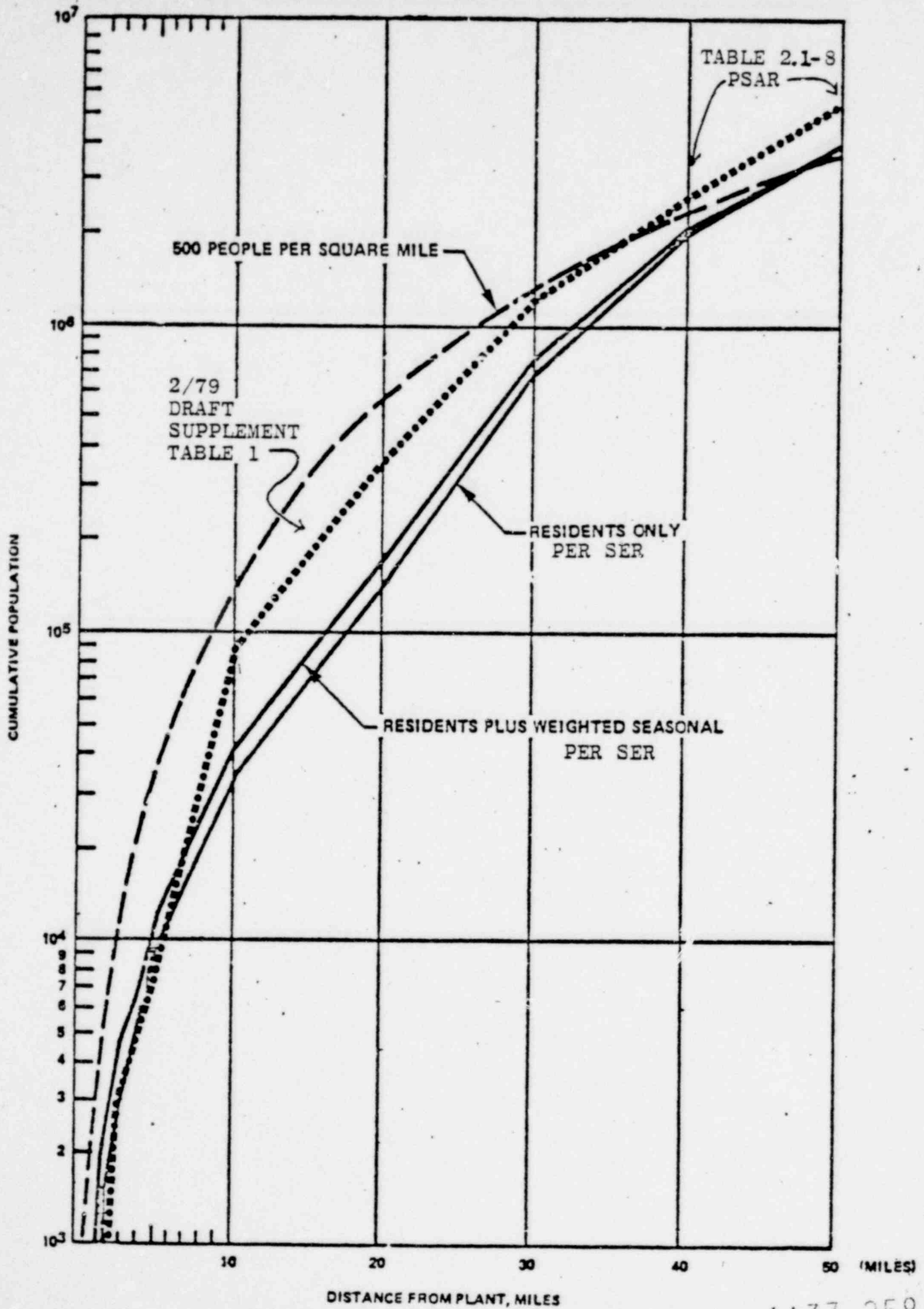


Figure 2.3 - CUMULATIVE POPULATION DISTRIBUTION

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It is noteworthy that beyond ten miles the difference is much smaller between the 500 persons per square mile threshold line and the line plotting the most recent figures than between the recent figures line and the line plotting the earlier SER figures. It is also noteworthy that the 500 person per square mile threshold is reached only a modest distance beyond the 30 mile radius. Furthermore, should the initial year of commercial operation be deferred beyond 1985, the gap between projected population and the Reg. Guide threshold figure would be rapidly narrowed, given the UE&C estimated growth rate of nearly 2% per year.^{2/}

Turning to the methodology employed in the Draft Supplement, if population density is to be used as an indicator of risk and as virtually the exclusive device for determining whether a Class 9 analysis is warranted as part of the NEPA review, then the work done by the Staff and the Applicant for Pilgrim 2 contains certain assumptions and omissions that can not help but compromise the reliability of this factor.

A. Daily Recreational Visitors

First, neither the Applicant's 1978 update nor the Staff's Draft Supplement considers daily recreational visitors and tourists in determining population density, and the lines

^{2/}A 2% growth rate is in fact quite rapid: most recent year 2000 projections of Massachusetts population by the U.S. Bureau Census indicate between 0.6% and 0.8% per year statewide growth between 1975-2000 (see U.S. Bureau of the Census, "Population Estimates and Projections", Series P-25, no. 796, March 1974.

plotted on the chart at Figure 1 are understated to this extent. Of particular concern are daytrippers to tourist attractions in Plymouth itself; according to Table 2.1-4 of the PSAR, Mayflower II and the waterfront homes attract 400,000 tourists per year, and are only 4.5 miles west of the Rocky Point site, while Plimouth Plantation attracts 250,000 tourists per year and is only 2.5 miles west of the site. Six miles to the southwest, Myles Standish State Forest attracts 300,000 campers and picnickers per year, and while some double counting clearly is present in the above figures, they all tend to corroborate a Plymouth Chamber of Commerce estimate that nearly one million persons per year currently visit the town.

One million person-days is equivalent to another 2,700 persons year-round on a time-weighted basis, most of those persons being located fewer than five miles from the Rocky Point site. This represents perhaps another 10% increase in the time-weighted population within five miles of the site, with smaller but significant percentage increases at greater distances. Of greater concern, however, is the fact that these people are not evenly distributed throughout the year, but for the most part visit Plymouth during the summer months, with a peak figure of 2,689 persons per day being reported by the Pilgrim Village and 3,400 per day (peak season) being reported by Mayflower II.^{3/}

^{3/}From May 14, 1979 conversation with David Case, Director of Plimouth Plantation, Inc.

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The weighting methods employed by the Staff in measuring transients will be discussed in more detail below. For purposes of the Plymouth daytrippers, it suffices to note that exceptionally large numbers of people can be expected in close proximity to the site during at least two months of the year, people who already put a severe strain on Plymouth's traffic flow problems and people who will have had no prior instruction in emergency measures and no homes in which to shelter themselves.

B. Time Weighted Population Densities

In arriving at average population densities for the area surrounding the Rocky Point site, the Staff employed weighting factors of 1.0 for permanent residents and 0.25 for seasonal residents. As noted above, daily visitors were not considered at all, because the Staff concluded that when weighted these figures would be negligible (Draft Supplement, Section 3.3.3, pg. 20-21). Perhaps such weighting assumptions would hold true for an area experiencing moderate seasonal fluctuations in population, but when an area is as profoundly effected by tourists and summer residents, as is that surrounding the Rocky Point site, the use of weighted population density as an exclusive threshold indicator of residual risk is highly questionable. To the extent that the licensing process is concerned with the consequences of serious reactor accidents, it is illusory to obscure the crowded conditions that occur every summer in the Plymouth area by averaging the total transient inflow over the course of an entire year. A more realistic approach is suggested below in Section III.

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C. Inclusion of the Water Area in Calculating Average Population Densities

The 53 municipalities which are at or less than 30 miles from the Rocky Point site have a projected 1985 population of 981,000 persons winter, 1,393,000 summer and a land area of 1,256 square miles, using the same sources and formulas as used by UC&E. This means a winter density of 780 persons per square mile of land area, a summer density (with summer-only population "discounted" at 100/365) of 870 persons per square mile, and an actual summertime population (seasonal plus year-round) of 1110 persons per square mile. These figures, which were derived by focusing exclusively on land area surrounding the site, are far more revealing than the Staff's in reflecting the actual living density of the area in question and local road capacity for evacuation, shelter or treatment.^{4/} As with time weighted population densities, the Staff's methodology amounts to a gamble that certain variables (in this case, wind direction) will minimize consequences of a serious radiological accident. To the extent that population density is used as the NRC's exclusive indicator of people at risk, then such an approach appears questionable.

4/

Indeed, even the sectoral analyses proposed below understate real density through inclusion of water areas. The south-southeast sector below Rocky Point has a five-mile density of under 2,000 persons per square mile, but the Priscille Beach-White Horse Beach neighborhood which directly abuts the proposed station has a summer-time density of about 20,000 persons per square mile, based on map measurement and PSAR data. That is the density for which shelter, evacuation and other emergency services must be adequate, not the sectoral density of 1,800 persons per square mile, or the time-averaged 30-mile density of about 400 persons per square mile.

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III. MAXIMUM RISK TO POPULATION

When in the site selection process a decision-maker is assessing the comparative risk resulting from a hypothetical major accident, a question of critical concern is what the worst consequences might be at each alternative site. In order to rationally evaluate alternative sites, a decision-maker must be able to assess the most severe consequences which are reasonably likely following an accident at each site, measured by the maximum, not average, number of people who might be exposed to risk. A determination of "average" risk to "average" population, as measured by Regulatory Guide 4.7, fails to capture the variations in population seasonality, density and distribution of unique site characteristics relevant to the inquiry of maximum risk.

At locations having unusual spatial and temporal distributions of population, as is true for the Rocky Point site, cumulative annular average density alone is an inadequate measure of accident consequence, and therefore an inadequate measure of risk. There is no explicit discussion in the Staff's Draft Supplement dealing with comparison between sites regarding the maximum number of persons potentially at risk in the event of a major accident.

A realistic and useful analytic method for evaluating comparative accident risk, in addition to an average density analysis, is to assess the maximum consequences measured by the population at risk. Such a method permits examination of unique site and population characteristics, which are necessary and relevant for an intelligent assessment of accident consequences.

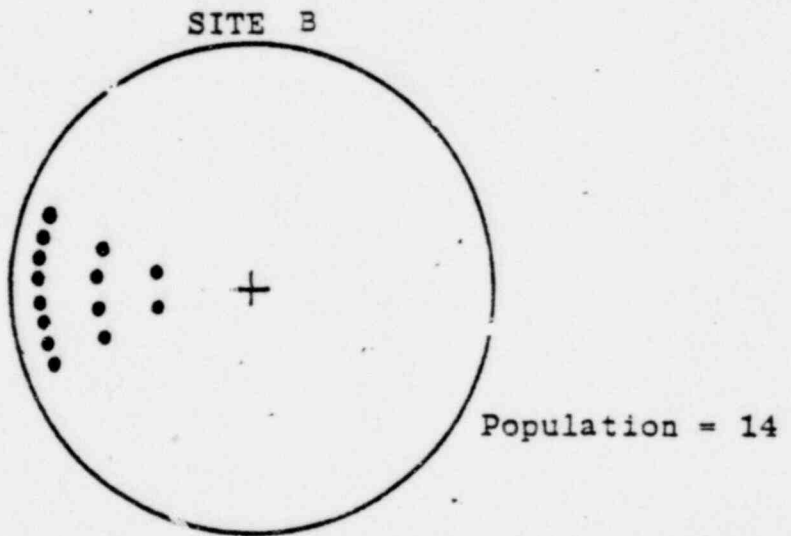
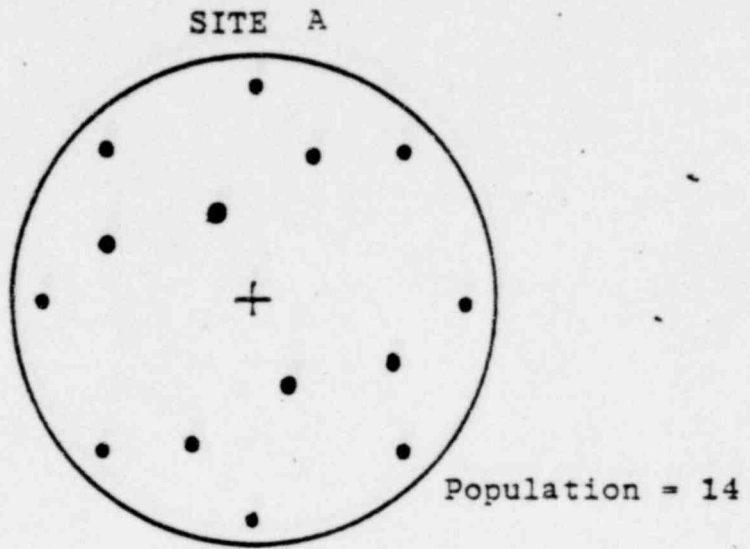
The difference between the "expected value" analysis, which was

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done by the Staff, and the maximum risk analysis, which was not, can be illustrated by two hypothetical sites having equal numbers of nearby residents but different spatial configurations, as shown on Figure 2. The "expected value" of population risk is identical in the two cases: the expected value of risk is the product of the number of persons within a prescribed radius and a probability function, both of which are the same for each site. However, in the event of a major accident resulting in a westward plume, the affected population requiring evacuation, shelter, or other protective actions is perhaps seven times higher at Site B than at Site A. Site B can be said to have an unacceptably high number of persons potentially at risk. Only on an "expected value" basis are the two sites equivalent. If the objective of the decision-maker were to minimize maximum potential population at risk, or to avoid exceeding an acceptable threshold of population at risk, Site A is a far superior selection.

The demographic analysis done to date for the Pilgrim II site selection has measured and compared the time-weighted population summed over all directions, thus analyzing the expected value of population risk. However, study to date omits any explicit comparative analysis of sites regarding maximum risk in the event of a major accident. Because of that omission, studies to date fail to reflect the special site characteristics of the Rocky Point site: in some directions at some times, relative to its average

FIGURE 2. RISK: EXPECTED VERSUS MAXIMUM



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density, this site exposes a high number of persons to risk. In this regard Rocky Point is more like hypothetical Site B than Site A.

There are two variations from the uniform distribution, assumed in the expected value model, which deserve analysis: temporal and sectoral.

A. Temporal Analysis

Both the PSAR and the Applicant's 1978 Update to the UE&C Siting Study focus on "weighted" seasonal population, appropriate for expected value analysis, but obscuring other critical concerns. For example, the PSAR "discounts" the 1975 peak seasonal population of 25,277 persons within five miles to 4,el8 on a time-weighted basis. However, if an accident were to necessitate a five-mile evacuation in the summertime, there in fact would be 25,300 visitors requiring information, guidance, traffic capacity and shelter, not 4,300.*/ The 1978 Update indicates a "weighted" 1985 population within five miles of Rocky Point at 19,800 persons. Similarly, this estimate grossly understates the magnitude of the evacuation task should one be necessitated in the summertime. Decision-makers are provided with no information to allow comparison of these maximum populations with those at other sites.

At ten miles, the issue of temporal variation is similarly obscured. The 1978 Update reports a "weighted" 1985 population of 58,000 within ten miles of Rocky Point. Our analysis of recent projections by the Old Colony Planning Council, Metropolitan Area Planning Council, and Cape Cod Planning and Economic Development

*/ Analysis based upon the 'Pilgrim Station Environmental Report' (ER) as amended through May 20, 1974, suggests that in fact peak 1990 population within five miles may be nearly 63,000 persons.

Commission largely support that figure on a weighted basis (we estimated 61,200 weighted population), but our analysis indicates a summer peak population of 76,800 persons, and this is exclusive of daytrippers. A population of 76,800 within ten miles is more indicative of the true number of persons potentially exposed to risk and the necessity of immediate relocation in the event of a major accident in the summertime.*/ On fair weather days, an additional 10,000 persons can be expected to be within this zone of concern because of tourist attractions in the Plymouth area: beaches, historic sites, boating, sightseeing.^{5/} The consequence of a summer accident, in fact, would involve half again as many persons as the weighted average suggests.

B. Sectoral Analysis

A sectoral analysis of population around a site permits examination of true population distribution, which is otherwise obscured by calculations of average densities. An assessment of persons and site characteristics located within a radial sector is a highly relevant consideration to a site evaluation of maximum risk of a major accident.

Population distribution surrounding the Rocky Point Site is extraordinarily uneven by radial sector. This extreme variation in distribution is shown on Table A, which provides cumulative permanent population (excluding seasonal residents and daytrippers) by 22.5° sectors (see PSAR, Table 2.1-8). The table demonstrates clearly that some sectors have as much as four times the average (mean) sectoral population. This dramatic variation in population

*/ Analysis of the Environmental Report indicates a 1990 total of nearly 180,000 persons at peak summer periods.

^{5/} See, PSAR, Table 2.1-4.

TABLE A

1990 PERMANENT POPULATION BY SECTOR, 0-30 MILES*

N	0
NNE	0
NE	0
ENE	1,830
E	4,740
ESE	24,050
SE	61,080
SSE	39,615
S	46,387
SSW	33,739
SW	131,131
WSW	96,085
W	142,324
WNW	290,996
NW	328,327
NNW	70,946

Mean 79,453

Total 1,271,250

Standard deviation: 97,591

* PSAR, Table 2.1 - 8

distribution is not narrowly confined to one or two sectors, as indicate. by the sectoral standard deviation of 97,591. Figure 3 illustrates geographically where the sectors of cumulative permanent population occur around the Rocky Point Site.

The following provides an examination of two sectoral regions of special concern to the assessment of maximum risk of a major accident at the Rocky Point Site.

1. The Northwest

The population density of the region northwest of the Rocky Point site is dramatically high. Nearly one half of the cumulative permanent population within 30 miles of the site is concentrated in the two northwesterly sectors (See Table A and Figures 3 and 4).^{6/}

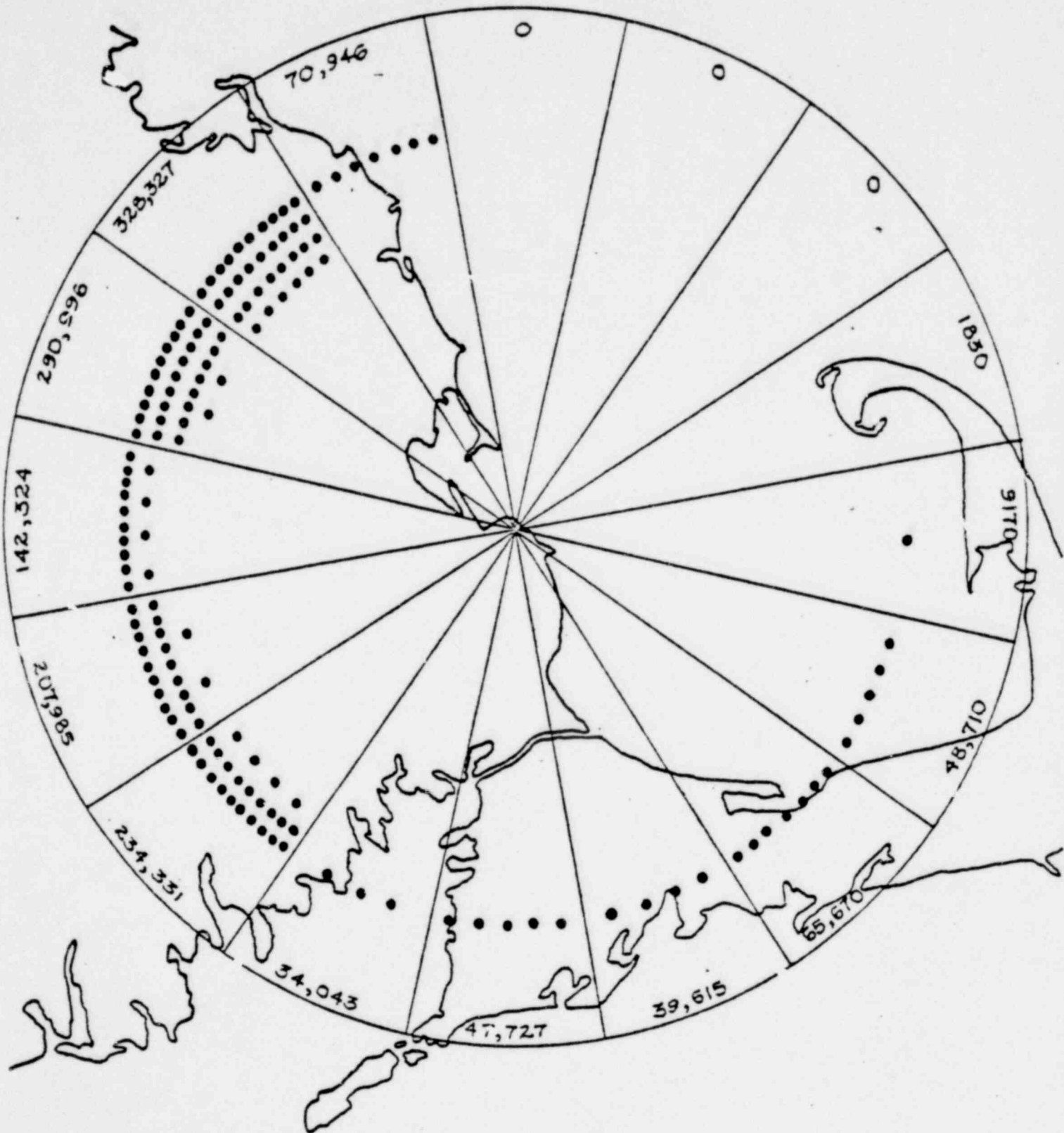
The northwest sector alone is projected to have a 1990 population of almost 330,000, and a density (excluding seasonal population and net in-commuting) of 1,858 persons per square mile.^{7/} This average density is nearly quadruple the guideline density of 500 persons per square mile calculated for the date of plant

^{6/}The total cumulative permanent population (excluding seasonal residents and daily transients) for the northwest (NW) and west-northwest (WNW) sectors in 1990, at a radial distance of 30 miles, is estimated to be 619,323. The Applicant has estimated the total cumulative permanent population for all 22.5° sectors at 30 miles to be 1,267,220 in 1990. (See, PSAR, Table 2.1-8). Our independent calculation of these sectors, based on PSAR Table 2.1-8, indicates that the total permanent population is 1,271,250 (See Table A).

^{7/}PSAR, Table 2.1-8; density calculated by author.

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FIGURE 3:
PERMANENT POPULATION BY SECTOR, 1990



• = 10,000 population

1990 Permanent Population,
30 Miles
Source: PSAR table 2.1-8

FIGURE 4

30 MI.

POOR ORIGINAL

20 MI.

10 MI.

NORTHWEST SECTOR

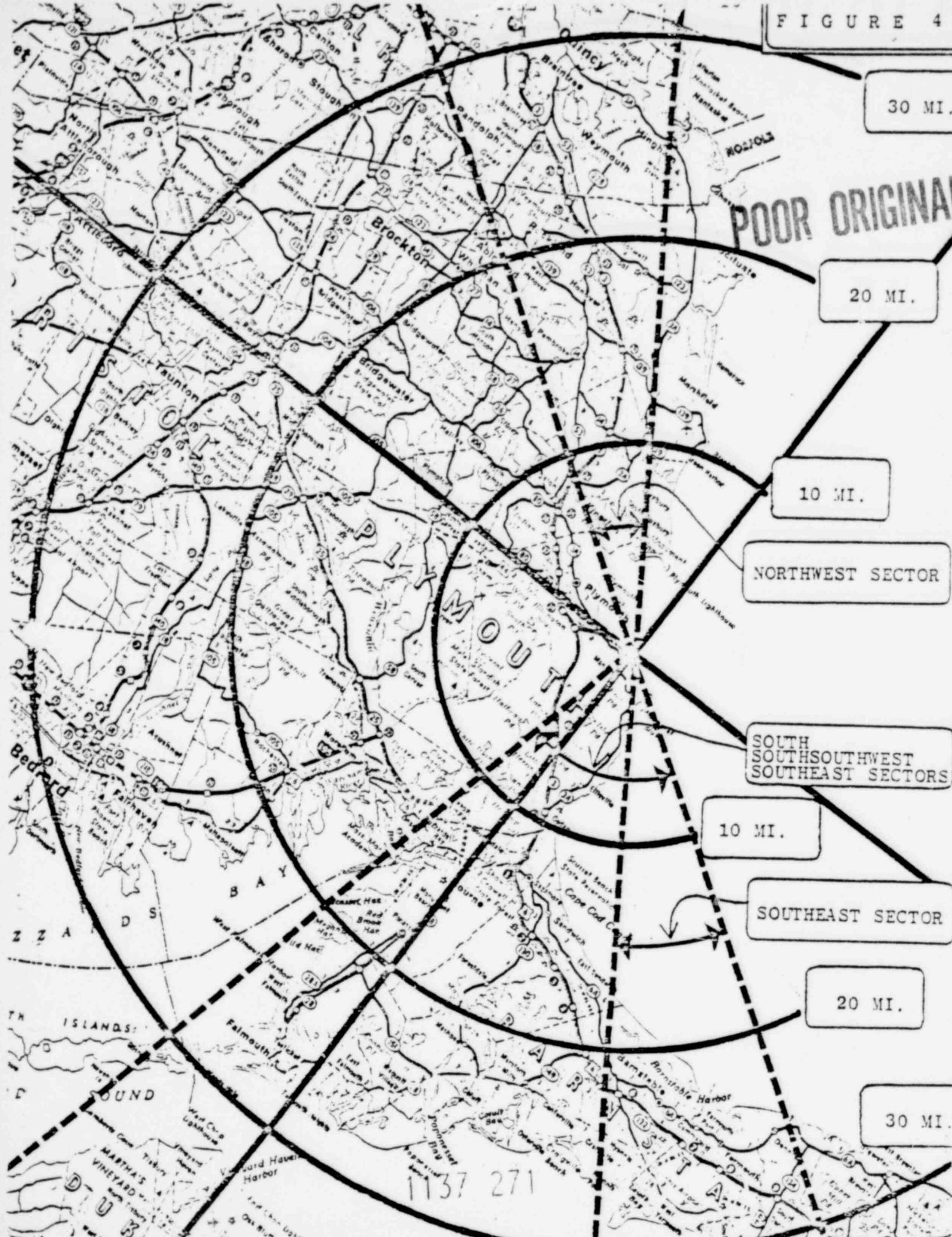
SOUTH
SOUTHWEST
SOUTHEAST SECTORS

10 MI.

SOUTHEAST SECTOR

20 MI.

30 MI.



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operation.^{8/} In the year 2020, the northwest sectoral density, as projected in the PSAR, increases to 3,737 persons per square mile, or once again almost quadruple the guideline density of 1000 persons per square mile at the assumed end of plant life.

The Staff's application of the annular population density formula does not reveal the true numbers of persons at risk in this sector in the event of a major accident. Employing the staff's calculations, one would have to assume that for each alternative site each sector contains 1/16 of the total population. For Rocky Point, this would seemingly indicate approximately 77,000 persons will be located in the northwest sector in 1985, and approximately 160,000 persons in the sector in 2020.^{9/} In reality, as noted above, the numbers of persons potentially exposed to the risk of a major accident in this narrow 22.5° northwest section is far greater than the staff's analysis would suggest. The PSAR indicates that almost 330,000 permanent residents will in fact live in this sector in 1990, increasing to nearly 700,000 persons in 2020. In other words, a major radioactive release under wind

^{8/}NRC Staff Regulatory Guide 4.7, pp. 4.7-16. A 1990 date is used here for two reasons. First, the Applicant's PSAR population data (the only available source for sectoral analysis) is presented in ten year increments. Second, the NRC staff has indicated most recently that Pilgrim Unit 2 may not be needed until 1989/90. Accordingly, the year 1990 appears to be a reasonable operational date for purposes of demographic analysis.

^{9/}See Draft Supplement, Table 1; persons per sector at 30 miles calculated by author.

conditions blowing to the northwest would affect a population as great as that affected at an alternative site having a uniformly distributed population averaging four times as high as that estimated for the Rocky Point site.

The potential exposure of 700,000 persons to hazard in the event of a major accident is clearly a relevant consideration in assessing the comparative risk to population at the Rocky Point site and its alternatives.

2. The Southeast

Another region of particular concern is that to the southeast of the Rocky Point site. This sectoral area is unique not only because of its population density and high seasonal fluctuations, but also because of its unusual land/water and transportation characteristics. It is within this region, which has the highest summer population, that the major transportation routes south from Rocky Point and from Cape Cod to the mainland converge. This convergence is significant in terms of both assessing total population at risk and the site specific problems associated with evacuation and emergency planning.

At thirty miles, the PSAR indicates a cumulative permanent 1990 population of 61,000 in the 22.5° southeast sector. A majority of this population is concentrated in the mid portion of Cape Cod, which is heavily impacted by population seasonality. The Pilgrim Area Conservation and Development Project data indicates seasonal population more than doubles seasonally in this area.^{10/} These figures translate into a 1990 sectoral density of 850 persons per square mile, or a 2020 sectoral density of 2,000 persons per square mile during the summer season. The consequence of a major summertime accident with a southeasterly wind at Rocky Point, could be to expose to risk a population equal to that which would be affected at a site having a uniformly distributed population density double the guideline densities of 500 and 1,000 persons per square mile.

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^{10/}See "Applicants Answers to the Commonwealth of Massachusetts' Interrogatories Set No. 4." (September 7, 1978).

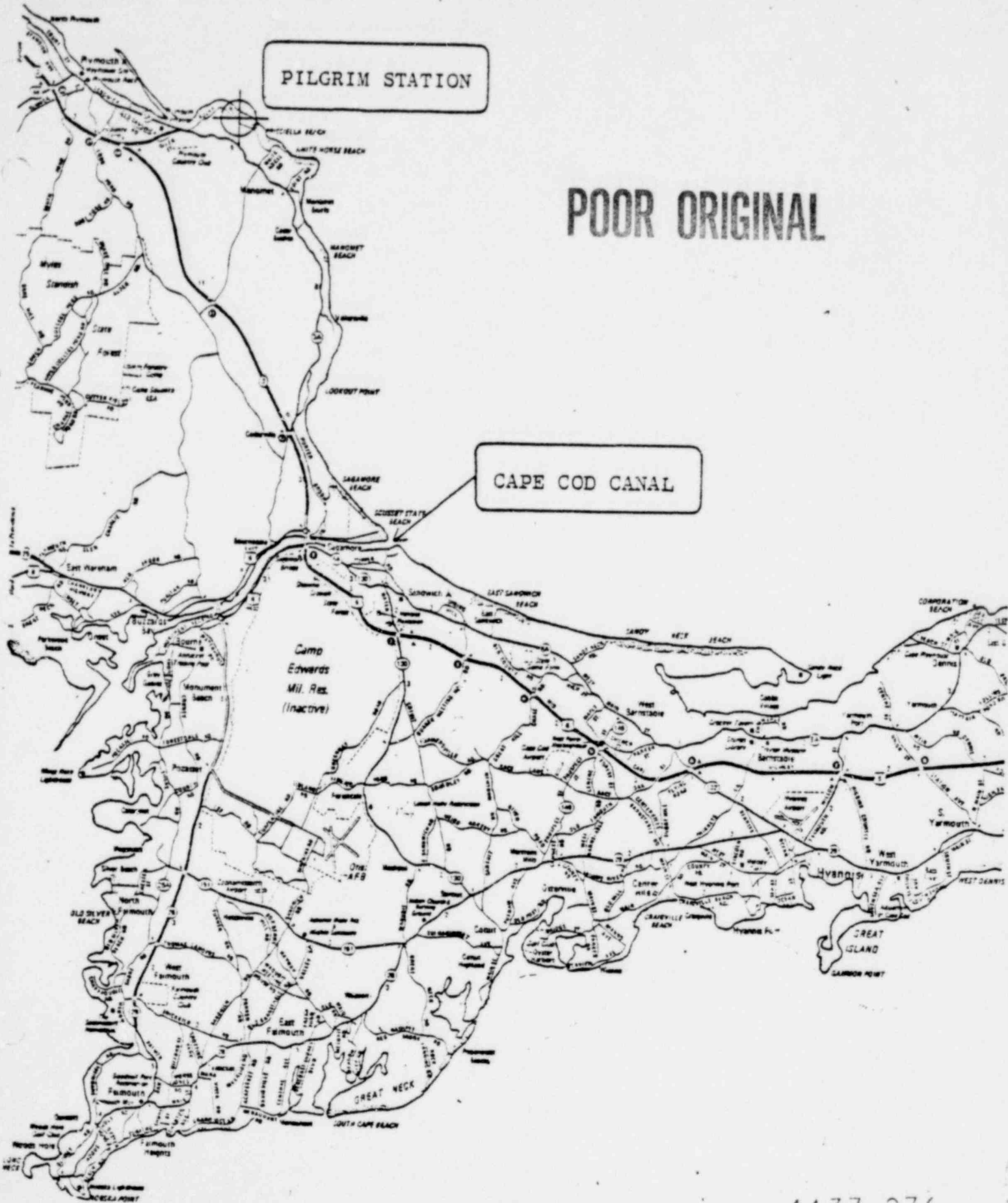
a. Unique Population and Site/Transportation Problems.

Egress configurations and limitations makes the southeast situation in the event of a major accident even more serious than population density suggests. As Figures 4 and 5 illustrate, there are special site circumstances regarding evacuation routes from the vicinity of Rocky Point, especially for population south or southwest of that site. Because of the presence of the Myles Standish State Forest and a vast largely undeveloped area, movement southwesterly through that area is possible only over a rudimentary maze of narrow, winding two-lane roads, many unpaved and discontinuous, all of them poorly marked.

As a consequence, the natural evacuation route for almost the entire population to the southeast, south, or southwest of Rocky Point is Route 3 southward to North Sagamore, then west along Route 6 on the northern border of the Cape Cod Canal (the "Scenic Highway") to Routes 25 and 6 leading west and northwest. A few persons may find and use Herring Pond Road, but that route leads almost unavoidably to the Scenic Highway as well. A few natives may thread their way to Glen Charlie Road in Wareham, Head of the Bay Road in Bourne, or other by-passing routes, but their numbers cannot be large.

Evacuation from Cape Cod, whether voluntary or mandatory, would be via a road system notorious for its present deficiencies. Again, see Figure 5. For a variety of jurisdictional and policy reasons, those deficiencies are likely to only slowly be removed. Most obvious is the limitation that all egressing traffic must use the two Canal bridges of four narrow lanes each.

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In the event of either voluntary or mandated evacuation, most Cape evacuees must move closer to the danger source in order to escape. The northern of the two Cape bridges, the Sagamore Bridge, is just over 10 miles from Rocky Point, and for much more than half of the potentially evacuating population from the Cape that is the easier bridge to reach. To avoid that bridge because of either congestion or hazard, only minor roads and a circuitous route are available for most of the affected population.

To estimate emergency road capacities, we have used lane capacities in common planning usage. Under ideal conditions, one lane of limited-access expressway can carry 2,000 vehicles per hour. Narrow unseparated lanes such as those on the Cape Cod Canal bridges or a road shoulder pressed into emergency use can theoretically carry up to 1,500 vehicles per hour. One lane on an ordinary country road is unlikely to carry more than 1,000 vehicles per hour. Three persons per vehicle is double the normally assumed vehicle occupancy, but is close to average household size.

In the event of a 1990 evacuation to 10 miles south of Rocky Point, we estimate a population of over 36,000 persons to be evacuated from the southeast through southwest quadrants.^{11/} Based on an assumption of three persons per vehicle, this means

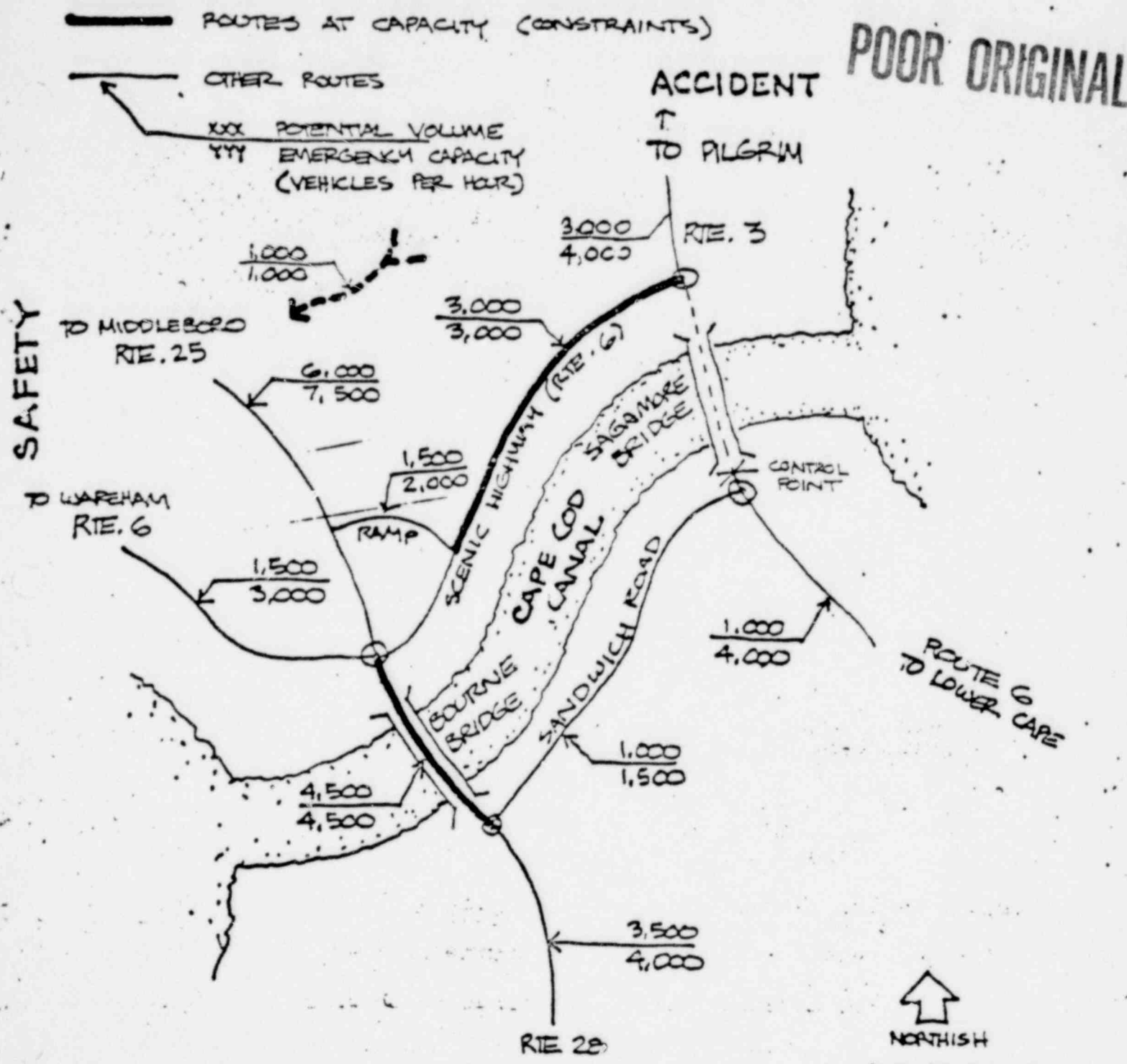
^{11/}The estimate of 36,000 for these three sectors is based on PSAR Table 2.1-8 (permanent population), with the percentage increase of seasonal population based on the same percentages shown in Table C. See, PSAR, Table 2.1-2a. Daytrippers are not included. Analysis of the Environmental Report indicates a 1990 peak seasonal total in excess of 50,000 persons.

evacuating 12,000 vehicles over the Scenic Highway plus the back road maze. If two lanes of the Scenic Highway (which varies from 2 to 4 lanes) were reserved for westbound traffic and the Sagamore Bridge were closed to traffic leaving the Cape (in order to reserve Scenic Highway capacity for evacuees), the Scenic Highway would provide capacity for 3,000 vehicles per hour from the ten-mile zone. Another 1,000 vehicles per hour might use back roads. That means a three-hour minimum evacuation time, assuming no breakdowns, expert guidance, and good weather. This evacuation scenario is illustrated by Figure 6.

Meanwhile, there may well be Cape Cod population simultaneously seeking to leave the Cape. This would be the case if a twenty or thirty mile evacuation were suggested or ordered. Even without official notice, it is reasonable to assume that the Cape transient population would probably need nothing more than the remote threat of trouble to start heading for the bridges, since even rain produces that effect. In other words, it is not unreasonable to assume that persons will seek access to the mainland from the Cape in the event of a major accident at Rocky Point.

However, giving priority to 10-mile evacuees on the vital Scenic Highway link would limit Cape Cod evacuation to about 100,000 persons with six hours as shown in Table B. Six hours is the maximum time during which access to the bridges and the Scenic Highway can be assured. This evacuation time is based on the assumption that a radioactive plume traveling in a south or southwesterly direction could reach this critical transportation

Figure 6 SAGAMORE BRIDGE CLOSED: EMERGENCY VOLUMES & CAPACITIES



5/7/79 FBH & A

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TABLE B

CAPE COD EVACUATION CAPACITY

Hour*	Hourly capacity	Cumulative total
1	13,500 persons	13,500 persons
2	13,500	27,000
3	13,500	40,500
4	22,500	63,000
5	22,500	85,500
6 Assume Sagamore closed	13,500	99,000
7 Assume Bourne closed	0	99,000
		99,000

*Hour 0-3: Sagamore Bridge assumed to be closed to Cape population to allow evacuation of 0-10 mile area around Rocky Point (sectors SE, SSE, S, SSSW, SW only). Cape evacuation during this time is assumed only via Bourne Bridge.

*Hours 4-5: Both bridges accessible to Cape population.

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network within six hours, most likely causing thereafter the closure of the Scenic Highway and either or both of the Cape Cod Canal bridges.^{12/} See Figure 7.

The 1990 summer-only population of Cape Cod is projected to be about 360,000 persons, in addition to 180,000 year round residents.^{13/} That means that within 6 hours, only a quarter to a third of the tourists could get off the Cape, assuming all the natives stay home or in other shelters.

By similar analysis, it would take eight hours to accomplish a 10-mile evacuation of the 2020 population over that same road network, allowing only 80,000 to escape the Cape within six hours. By 2020, we estimate there will be approximately 680,000 persons within 30 miles of Rocky Point on the Cape in the summer (doubling the relevant PSAR table 2.1-8 sectoral permanent population figures). That means that one person in eight on the Cape could leave the peninsula in the assured time available, given optimal notice. It is easy to imagine that far more than one in eight persons on the Cape will seek immediate access to the mainland even if directed to stay home and seek shelter.

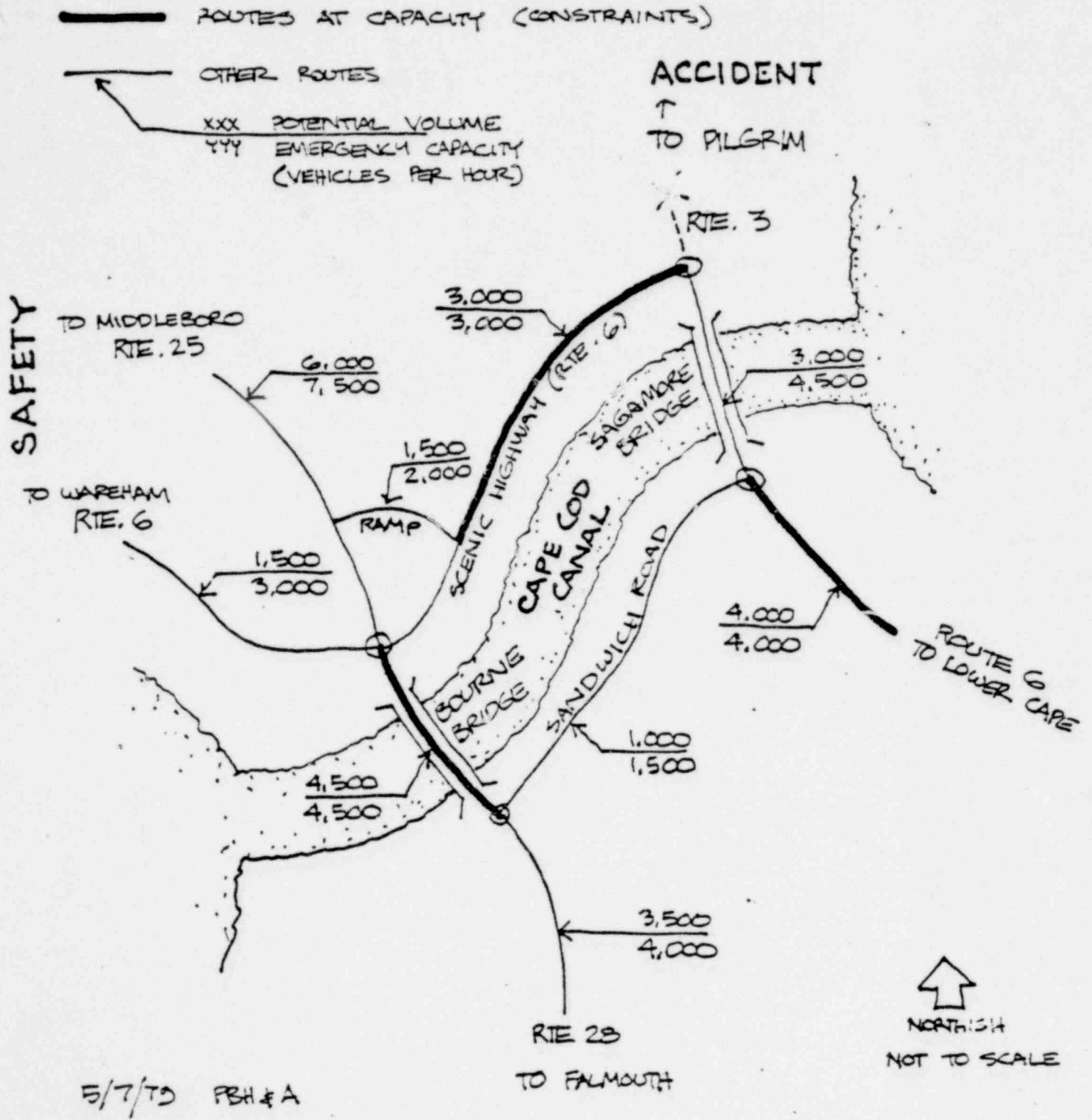
b. Nearby Population-South/Southeast

Maximum risk is of concern not only at the 10 to 30 distances impacting Cape Cod. At much closer range, the maximum risk in the event of accident is also far greater than suggested by average density figures, or by any of the data directly presented in the documentation prepared for or by the Staff.

^{12/}At a rate of travel based upon AEC Staff, "Population Distribution Around Nuclear Power Plant Sites", April 1973, pg. 2.
^{13/}Herr Associates, Development Projections for Cape Cod, for the CCPEDC, April, 1976. 1137 281

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Figure 7 ROUTE 3 NORTH CLOSED
EMERGENCY VOLUMES & CAPACITIES



The peculiar configuration of the Rocky Point site is such that a south-southeast plume trajectory would carry an accidental release along a coastal corridor densely populated in the summertime. PSAR Table 2.1-2a indicates "current" peak seasonal population by sector and out to 5 miles,^{14/} and when added to PSAR Table 2.1-8 permanent resident data for 1972 gives a fair reflection of early 1970's peak seasonal conditions (see Table C). On that basis, the south-southeast sector alone contained nearly 9,000 persons within 5 miles of the Rocky Point site during early 1970's summers, a density of 1800 persons per square mile, more than triple the 500 persons per square mile guideline of Regulatory Guide 4.7. The fact that this high density is "balanced" by lower densities at other seasons and in other sectors does nothing to diminish the magnitude of the problem of exposure if a major accident occurs at an unfavorable season under unfavorable wind conditions.

As with Cape Cod, the configuration of land, water and roads limit emergency evacuation measures. Based on PSAR data, Priscilla Beach, White Horse Beach and Manomet Heights have a summer resident population of some 7,000 persons; all are within a narrow arc and less than two miles from the Rocky Point site (see Figure 8). Only two narrow two-lane roads provide that population

^{14/}We understand those figures to reflect early 1970's conditions and to be exclusive of year-round residents (Note that in some sectors 1972 "permanent" population from PSAR Table 2.1-8 exceeds "peak seasonal" population from Table 2.1-2a).

TABLE C

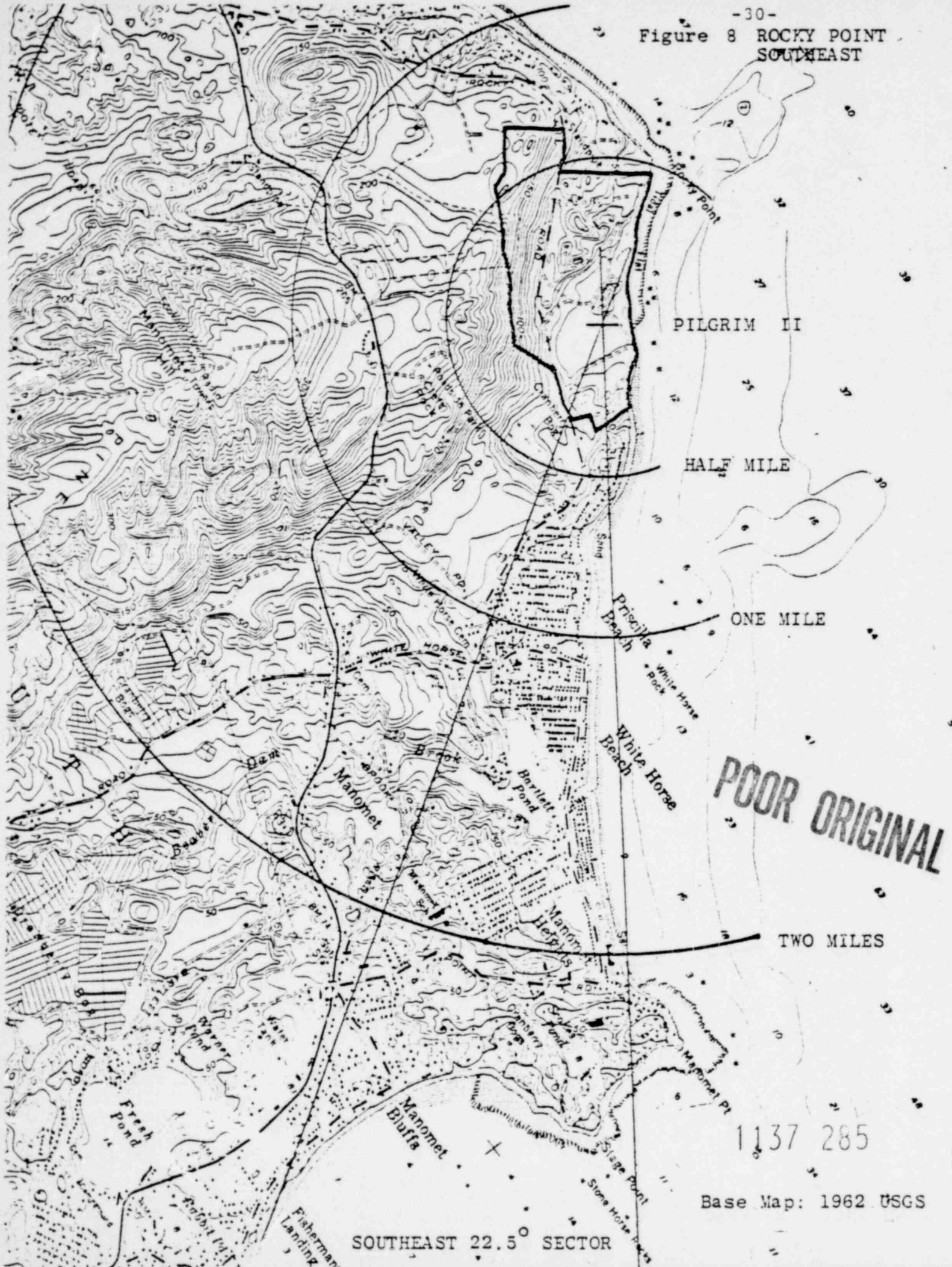
EARLY 1970's SEASONAL POPULATION BY SECTOR, 0-5 MILES

	<u>Permanent</u>	<u>Peak Seasonal</u>	<u>Total</u>
N	0	0	0
NNE	0	0	0
NE	0	0	0
ENE	0	0	0
E	0	0	0
ESE	0	0	0
SE	1,170	5,728	6,898
SSE	1,593	7,136	8,729
S	190	145	335
SSW	24	155	179
SW	285	96	381
WSW	532	215	747
W	3,894	3,491	7,385
WNW	1,575	6,712	8,287
NW	18	994	1,012
NNW	0	605	605
<hr/>			
Total	9,281	25,277	34,558

Source: PSAR Tables 2.1-2a and 2.1-8

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Figure 8 ROCKY POINT SOUTHEAST



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Base Map: 1962 USGS

SOUTHEAST 22.5° SECTOR

with egress to Route 3A. Any accident, breakdown or construction obstruction would seriously impair the ability of the network to accommodate emergency demand.

As with the larger area of concern, therefore, the special circumstances of ocean, density patterns and transportation networks within five miles of the site combine in perverse ways. At times, the Rocky Point site could expose far more people to risk than would a site of comparable average density but uniform sectoral and temporal distribution. Further, this problem is compounded by the fact that the areas of highest density proximate to the site have limited evacuation potential.

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EDUCATION

Massachusetts Institute of Technology, Masters in City Planning,
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Rensselaer Polytechnic Institute, Bachelor of Architecture,
Tau Beta Pi, Sigma Xi honoraries, Thesis Prize.

CURRENTLY

Associate Professor of City Planning, M.I.T., Department of Urban
Studies and Planning. Courses and research in growth and
land use planning, participation, coastal zone management,
design, impact analysis.

Principal, Philip B. Herr and Associates, consultants in land use
planning, development regulation, impact analysis, partici-
patory design.

Member, Revere Beach Design Review Board (appointed by Secretary of
Environmental Affairs).

Member, American Society of Planning Officials, Urban Land Institute.

Registered Architect, Commonwealth of Massachusetts.

RESEARCH PARTICIPATION

Development Impact Assessment, funded by Massachusetts Department
of Community Affairs, through Herr Associates, 1975-1976, and
Rockefeller Foundation, through M.I.T. Design of methods for
local analyses of development consequences. Publication:
Evaluating Development Impact, M.I.T. Laboratory for Archi-
tecture and Planning, August, 1978.

Environmental Impact Assessment, funded by Rockefeller Foundation
and others through M.I.T. Laboratory for Architecture and
Planning, 1976-1978 (with Lawrence Susskind and others).
Studies of institutional considerations in assessing compre-
hensive consequences of infrastructure systems design, case
study of coastal zone management.

Maine Development Strategy, funded by Rockefeller Brothers Founda-
tion and Maine Bureau of Public Lands, through M.I.T. Depart-
ment of Urban Studies and Planning, 1974 (with Lloyd Rodwin
and others). Design of an approach to utilization of state-
owned lands through new organizational approaches. Publica-
tion: Economic Development and Resource Conservation: A
Strategy for Maine.

RESEARCH PARTICIPATION (continued)

Cambridgeport/Ecologue, funded by U.S. Office of Education, Office of Environmental Education, and others, through M.I.T. Department of Urban Studies and Planning, 1969-1972 (with Stephen Carr and others). Development of innovative methods for enabling community residents to develop neighborhood plans. Publication: article in Progressive Architecture, December, 1976.

Mobility for the Poor, funded by U.S. Department of HUD, through the M.I.T.-Harvard Joint Center for Urban Studies, 1968-1970 (with Aaron Fleisher). Analysis of travel patterns and disabilities of the poor, and of possible remedies, based on survey data from Boston, Memphis, St. Louis, Milwaukee and Baltimore.

CONSULTING

Participatory planning and design. Program design and technical assistance for a variety of New England towns and regional planning agencies, including Bourne, Edgartown, Franklin, Gloucester, Oak Bluffs, Rowe, Sharon, Sherborn, Sunderland, and Tisbury, Massachusetts; Hanover, New Hampshire; Cape Cod Planning and Economic Development Commission.

Innovative development control. Techniques designed have included growth timing (Bourne, Falmouth, Franklin, Greenfield, Sandwich); performance zoning (Clinton, Franklin County, Gay Head, Sandwich); transfer of development rights (TDR) (Sunderland); critical resource zoning (Sherborn, Sunderland); regional land use control (Franklin County, Martha's Vineyard Commission).

Other development control. Over twenty zoning bylaws and ordinances have been rewritten and adopted, numerous other controls designed and adopted in more incremental fashion.

Impact analyses. Cape Cod National Seashore (for National Park Service), open space acquisition (for Association for Preservation of Cape Cod), dog track (for Blackstone), PUD (for Natick), resort development (for Franklin County), nuclear power plant (for Franklin County).

Central area studies. Amherst, Andover, Gloucester, Lexington, Northampton, Salem, among others, in each case utilizing alternatives to conventional federal-aided urban renewal.

Regional efforts have included "208" Water Quality Management planning for Cape Cod, creation of a regional housing authority and regional building inspection system for Franklin County, model cluster zoning legislation for Cape Cod.

JOURNAL PUBLICATIONS

American Institute of Planners, Planners Notebook, October, 1973, "Performance Zoning: The Small Town of Gay Head, Massachusetts, Tries It", with Kevin Lynch.

Eno Foundation, Traffic Quarterly, April, 1962, "Timing of Highway Impact".

Urban Land Institute, Urban Land, February, 1960, "Regional Impact of Highways".

Extensive descriptions of Herr's community work have appeared in Progressive Architecture, November and December, 1976; Journal of the American Institute of Planners, January, 1975; The Land Use Controversy in Massachusetts (L. Susskind, Ed., 1975); Performance Standards: A Technique for Controlling Land Use, Oregon State University Extension Service.

PREVIOUS EXPERIENCE

Chairman, Planning Subcommittee, Governor's Task Force on Coastal Resources.

Member, Steering Committee, Coastal Zone Management Program.

Director of Planning (subsequently, President), Economic Development Associates, Inc.

Research Associate, Greater Boston Economic Study Committee.

Consulting Associate, Adams, Howard and Greeley.

Planner, City of Berkeley, California.

Instructor, Boston University, Wentworth Institute, Boston Architectural Center.

Architectural draftsman/designer, George W.W. Brewster, Warren C. Obes.

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MR. WRIGHT: The other point, if I may, sir, is that Prof. Herr will have additional testimony as to evacuation --

CHAIRMAN GOODHOPE: Yes, you said that.

MR. WRIGHT: -- that will be filed whenever the date is. There will be considerably more testimony.

CHAIRMAN GOODHOPE: All right.

(The Board conferring.)

CHAIRMAN GOODHOPE: Go ahead. Are you through with Mr. Herr?

MR. WRIGHT: Well, there is one more matter, Mr. Chairman. I hate to take up any more of your time, but if we are going to strip out, as it were, that portion of Mr. Herr's testimony that reflects on evacuableity, I would point out that Mr. Lewald's characterization of from 20 on is not quite accurate.

If you will look at, let's see, page 20, 21, 22, 23, 24, 25 and most of 26, they involve to a large extent a discussion of the Cape Cod and evacuation problems. However when we get to the bottom of page 26 there is a section entitled Nearby Population South-Southeast. And -- well, of course, 27 is a figure which relates to the earlier testimony so that doesn't count. We're talking about the bottom of page 26 and then from 28 on is all testimony going to population densities in that particular sector, that south-southeast

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1 sector.

2 CHAIRMAN GOODHOPE: To the end?

3 MR. WRIGHT: To the end.

4 CHAIRMAN GOODHOPE: All right. That will be
5 received, then, also, as you just described it, as a part of
6 your alternate site presentation.

7 MR. WRIGHT: Thank you, Mr. Chairman.

8 MR. SMITH: Mr. Chairman.

9 CHAIRMAN GOODHOPE: Yes.

10 MR. SMITH: Just for clarification, if I read
11 read those pages -- we're starting on page 28. Mr. Wright
12 said?13 MR. WRIGHT: Yes -- no, starting at page 26,
14 the bottom of page 26, Nearby Population Centers.

15 MR. SMITH: Right.

16 As I read the testimony that precedes the last
17 sentence and paragraph on page 31, it really does continue to
18 relate to evacuation.19 MR. WRIGHT: The last -- would you repeat that,
20 please?21 MR. SMITH: The last full sentence on page 31,
22 beginning with "Any accident..." and then the last paragraph.23 My reading of that is that the preceding
24 testimony was to demonstrate the problems with evacuation
25 planning. I don't want to belabor the point, but....

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CHAIRMAN GOODHOPE: You're talking about that first full paragraph on page 31?

MR. SMITH: The first full sentence, beginning with "Any accident..."

MR. WRIGHT: In other words, Mr. Chairman, all of this section B relates to population figures within the south-southeast sector except for this one sentence:

"Any accident, breakdown or construction obstruction would seriously impair the ability of the network to accomodate emergency demand."

And then this last paragraph I think is more a summation.

CHAIRMAN GOODHOPE: Yes.

I'm not going to go through this thing -- we're not going through this thing sentence by sentence. I think the ruling is clear.

We will proceed on the basis of that.

BY MR. WRIGHT:

Q Mr. Herr, would you please summarize your testimony as it is contained in this statement with the exception of the material related to evacuation of the Cape?

A First we reviewed the demographic projections which had been submitted by the Staff and we found that while they are not above the trip densities of Regulatory Guide 4.7, that they are in fact not that far from them when one looks at

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the entire range of annular distances from zero to 30 miles.
 But that there were, as has just been discussed, special
 circumstances at this site which raised concerns regarding
 what those density numbers really meant in drawing conclusions
 about this site vis-a-vis other sites regarding the proximity
 of the population and the consequence of that for population
 at risk.

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1 At this site, the population at risk, as I
2 understand the term to be defined -- that is persons for
3 whom protective actions would, in the event of an incident,
4 be taken -- that population of risk is highly sensitive to wind
5 and highly sensitive to season.

6 If the wind direction were fortunate, the population
7 at risk would be very, very small, conceivably zero, in light
8 of the coastal location of the site.

9 If the wind direction is unfortunate, the population
10 at risk would be much higher than that which would be at
11 risk at a population of the same average density, but with
12 that density uniformly distributed throughout the site.

13 The degree to which this factor varies from sector
14 to sector in the numbers of persons is unusual in relation
15 to other sites.

16 That is compounded with another variation; in
17 this case, not a variation, but a variation over time, and
18 the population potentially at risk is a function of whether
19 an incident should occur in the summer season or winter
20 season.

21 What that means is that at this site, because of
22 those peculiarities of sectoral distribution and temporal
23 distribution, that the consequence of an accident could be
24 of larger magnitude than the consequence might be at another
25 site with a more even distributed population.

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1 For an asymmetric site, for example, the
2 magnitude of effort which is potentially required in an
3 emergency action is larger because there's a larger number of
4 persons to be provided with prophylaxis, provided with
5 sheltering than would be the case, given a more uniform
6 distribution.

7 That represents not only a cost in the event of
8 an accident, it represents a cost even without an accident,
9 since it represents a cost in terms of an unnecessary level
10 of population -- more than that, it raises questions such
11 as, for example, the relationship between the absolute limit
12 on the scale of insurance coverage, and the absolute
13 population which might be placed at risk, and therefore
14 potentially drawing on that insurance coverage.

15 For a site of more -- that number, that
16 relationship would be far different than the relationship
17 with this highly asymmetric site where the population
18 potentially at risk is very large as compared to the total
19 population within 30 miles.

20 More than that --

21 MR. LENALD: I'm going to object to this. I
22 thought the witness was summarizing what his written
23 testimony was. He's arguing a point here which only sees
24 smatterings of anything in his written testimony.

25 I don't see anything in his testimony about

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insurance, for instance.

I'd like to object to this and have the witness instructed as to what the procedure is.

CHAIRMAN GOODHOPE: Just state briefly what your testimony is.

THE WITNESS: I guess the final point here to the truncated portion is simply that in the case of a highly asymmetric site what we are discussing is the possibility of an absolute level of loss which is relatively high. I make the distinction between the expected value type of probabilistic analysis which was made and the consideration what that maximum population at risk might be and what that might translate into in terms of death and injury. And make the point that two small accidents are not the same as one larger accident. I make the point that, in fact, there is evidence in our society and there is evidence, in fact, in statements before this commission that there is a societal aversion to large-scale accidents, even when -- and in terms of expected value they are of comparable expected value. On that basis, we argue that in fact, one of the pieces of information that should be available to a decision maker is that degree to which a maximum level of population and risk might differ between sites. We don't have that information regarding alternative sites here. We didn't have available to us the information necessary in order to do that.

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CHAIRMAN GOODHOPE: Are you talking about
evacuation, now?

THE WITNESS: No, sir, just talking bout numbers of
persons potentially at risk between sites.

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CHAIRMAN GOODHOPE: And it might go on because of the diffused characteristics of the situation, that the risk of increase is higher because of the inability to evacuate.

THE WITNESS: Yes, sir, that's what we were to discuss.

CHAIRMAN GOODHOPE: That's from page 20 on?

THE WITNESS: That's correct.

CHAIRMAN GOODHOPE: All right.

MR. SMITH: Mr. Chairman, I have some voir dire.

MR. LEWALD: I will defer to Mr. Smith's voir dire.

CHAIRMAN GOODHOPE: Have you finished direct?

MR. WRIGHT: Yes.

VOIR DIRE EXAMINATION

BY MR. SMITH:

Q Professor Herr, tell me what academic coursework you've taken at the undergraduate or graduate level in the design of commercial nuclear power plants?

A I've taken no coursework with respect to commercial nuclear power plants.

Q You've never had any academic coursework in determining biological effects of radiation?

A No, sir.

Q Have you had any academic coursework in

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1 diffusion or meteorology?

2 Have you had any experience in that?

3 A No, sir.

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5 Q Have you studied any scientific treatises
6 with regard to commercial nuclear power plants?

7 A That's hard -- I reviewed a great deal of
8 material with respect to nuclear power plants in recent months,
9 but I've certainly not -- the gist of your question -- it's
10 not my area of expertise.

11 Q What is your area of expertise?

12 A My training, my practice, and my teaching are in the
13 area of urban planning, including, among other things, the
14 demography, including among other things, the transportation,
15 and including among other things, decision analysis.

16 Q Have you performed any dose calculations to
17 determine the amount of radioactive materials a person would
18 have to be exposed to during a release to the environment
19 from a nuclear power plant?

20 MR. WRIGHT: Objection. My grounds for objection,
21 Mr. Chairman, the doctor's testimony does not go to anything
22 other than the demography of the situation down on the Cape
23 and the immediate area and the analysis that must be done of those
24 population figures in order to make the determination
25 as to that.

MR. SMITH: Mr. Chairman, I would state that --

MR. WRIGHT: There is nothing in his testimony that

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c 1 refers to dose levels or anything of that nature.

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2 He does not attempt to quantify what dose
3 someone is going to receive in the event of an accident; -
4 he's concerned only with population distribution and how
5 those figures should be treated.

6 MR. SMITH: I restate -- and I was going to, after
7 my voir dire, make a motion to strike because I believe
8 that Professor Herr constantly refers to consequences of
9 an accident.

10 And if he has not the expertise to tell us what
11 those consequences should be, I think that should be
12 stricken.

13 CHAIRMAN GOODHOPE: Objection overruled. What's
14 the answer?

15 THE WITNESS: No, sir -- I've forgotten the question.

16 BY MR. SMITH:

17 Q Have you had any coursework or experience in
18 radiation protection?

19 A No, sir.

20 Q Have you had any experience -- strike that.

21 In your resume attached to your testimony -- and I'm
22 trying to find the exact reference -- you -- let's see if
23 it's still in here.

24 I believe you mention somewhere you've done work on
25 nuclear power plant -- yes -- impact analysis on nuclear

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1 power plants for Franklin County.

2 Is that what you have done under impact analysis?

3 A Yes, sir, that's correct.

4 Q Could you elaborate what that involved?

5 A That involved studies made for the Franklin
6 County Planning Department regarding the demographic
7 and economic and other social consequences of a potential
8 nuclear station.

9 Q Did you do any accident analysis?

10 A No, sir.

11 MR. SMITH: Mr. Chairman, I'd like to move to strike
12 certain portions of this testimony based on the fact that
13 Professor Herr doesn't have the qualifications to address
14 consequences of nuclear accidents.

15 I take specifically from page 8, the second
16 full paragraph, first sentence I move to be stricken.

17 CHAIRMAN GOODHOPE: Hold on a second.

18 MR. SMITH: Let me check the --

19 MR. CLEETON: That's not in the new document.

20 CHAIRMAN GOODHOPE: Starting out at location --

21 MR. SMITH: Yes, I'm sorry: I'll have to look at the
22 new. That would be the second paragraph, the first sentence
23 there. In fact, I would strike the whole paragraph or move
24 to strike it.

25 CHAIRMAN GOODHOPE: Anything else?

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MR. SMITH: Yes, sir: page 12 -- I'll have to cross-check now.

Page 12, the last sentence before section B.

MR. WRIGHT: What is the sentence?

MR. SMITH: "The consequence of a summer accident, in fact" --

Page 17, the last sentence, beginning with "In other words," and going over to page 18, and all the testimony on page 18.

CHAIRMAN GOODHOPE: Just that first sentence starting at the bottom of page 17?

MR. SMITH: Right, and going over to 18 and all of the testimony on 18.

It appears to me to be talking about consequences of accidents.

And page 28 ---

MR. WRIGHT: What?

MR. SMITH: 28.

CHAIRMAN GOODHOPE: 20?

MR. SMITH: 28. Near the -- I believe it's the last sentence in the first paragraph, beginning with "The fact that this high density," and to the end of that sentence. I move to strike that based on the fact that, again -- on the expertise on accident analysis and also under meteorological conditions.

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f 1 I think that in doing this, I've -- I hope I've
2 found most places where Professor Herr talks about accident
david10 3 consequences.

4 If I haven't, I would just like a ruling on whether
5 this witness is qualified to address accident consequences.

6 MR. WRIGHT: If I may be heard, Mr. Chairman.

7 CHAIRMAN GOODHOPE: Yes.

8 MR. WRIGHT: As Mr. Smith read off these various
9 statements and sentences, I looked at them briefly; I
10 haven't had a chance to look at all of them closely, but
11 my impression is that in every one of these instances, all
12 Professor Herr does is say, "Assuming that we have an accident,
13 this will happen to the population."

14 In other words, his focus is only on the population
15 and the problems that are associated with a particular sector.
16 He's not concerned with radiological consequences or anything
17 like that.

18 He's only talking about an event, that once you
19 assume it, it's going to have certain consequences for those
20 people, based not on the dosage they received or anything
21 like that, but the sheer numbers alone, or road capacity.

22 As I say, I didn't get a chance to look at these
23 closely as we went through, but in any event, I don't think
24 Dr. Harr at any point attempts to -- attempts to actually
25 assess the amount of dosage that an individual is going to

POOR ORIGINAL

9 1 receive.

David 2 He's only been asked to assume that a reactor
3 accident occurs, and asked --

4 CHAIRMAN GOODHOPE: And there is exposure involved.

5 MR. WRIGHT: And there is some form of exposure
6 involved.

7 And he's only been asked to discuss the
8 population that is found in a particular sector. I think
9 that is the case with every one of these items, and I
10 think it's really -- well, for example, let's look at page 12,
11 the sentence that Mr. Smith wants to take out: "The
12 consequences of a summer accident would, in fact, involve
13 half as many people as the weighted average suggests."

14 All he's talking about here, obviously, is a
15 comparison of a peak figure for the weighted average that
16 has been defended today and yesterday by Mr. Kantor and
17 Mr. Soffer.

18 That's the crux of his discussion here.
19 We're not talking about anything other than how he handled
20 people; how do you -- do you weight them or are you more
21 concerned with the absolute peak numbers that are present on
22 any given day?

23 And the mere fact that the word "consequence" is
24 in there seems to me is really straining this.

25 MR. SMITH: Mr. Chairman, I would think the other

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1 areas I've asked -- moved to strike, I think would go beyond
2 the recitation of the words "accident consequence," and also,
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3 again, on page 28 I forgot to move to strike the first
4 sentence -- on page 28, which deals with plume trajectory
5 and carrying an accidental release.

6 I think this demonstrates that Professor Herr is
7 talking about consequences, and I don't know how Mr. Wright
8 can make the statement that the consequences don't matter in
9 his evaluation.

10 I think it's part of his evaluation.

11 CHAIRMAN GOODHOPE: I don't think he said quite
12 that.

13 DR. COLE: You're talking about the first sentence
14 on page 28?

15 MR. SMITH: Yes.

16 DR. COLE: All he says is that the trajectory would
17 carry an accidental release along the coastal corridor.
18 That doesn't talk about consequences, does it?

19 MR. SMITH: No, it talks about -- I assume he's
20 talking about meteorology there. I don't think he has --

21 DR. COLE: He just identifies the plume as a
22 south-southeast plume, which is just direction.

23 MR. SMITH: Well --

24 DR. COLE: I think the same applies to all the
25 others; pages 8, 12, 17 and 18. He is not really talking

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about the consequences of it.

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1 MR. SMITH: We are not talking about --
2 DR. COLE: We are not really talking about the
3 consequences of it. He is talking about people that would be
4 affected by whatever this happened, without saying what the
5 "whatever" is.
6 MR. SMITH: Well if that's the view, would the
7 Board agree that he doesn't have the expertise to talk about
8 it, the consequences?
9 DR. COLE: The "whatever."
10 MR. SMITH: Yes.
11 MR. WRIGHT: I don't think that's it.
12 Are you asking for a ruling? He hasn't said
13 anything to that effect yet.
14 MR. SMITH: He has it in his testimony.
15 CHAIRMAN GOODHOPE: Well, it gets down to the
16 question of what weight are we going to give these statements.
17 (Board conferring)
18 CHAIRMAN GOODHOPE: I have to agree, he is not
19 qualified in a number of these fields to assess these risks.
20 As we read his testimony he is assuming that there
21 is some type of exposure in these areas. And assuming that he
22 is talking about the number of people who will be involved in
23 that exposure.
24 Is that an accurate statement, Mr. Wright?
25 MR. WRIGHT: Yes, Mr. Chairman.

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CHAIRMAN GOODHOPE: With that understanding, I'll overrule the objection.

MR. CLEETON: Mr. Chairman, Mr. Smith said "and other unspecified portions of his testimony for which he has no expertise."

Is that also overruled?

CHAIRMAN GOODHOPE: I don't know what --

MR. CLEETON: He said, "and other unspecified portions of his testimony."

CHAIRMAN GOODHOPE: We overruled the objection.

MR. CLEETON: Okay.

DR. COLE: Mr. Smith will have to be a little more specific than that.

CHAIRMAN GOODHOPE: We overruled the whole objection.

MR. CLEETON: Thank you.

CHAIRMAN GOODHOPE: Are you going to proceed with cross, Mr. Smith?

MR. SMITH: I believe it is the Applicant's --

CHAIRMAN GOODHOPE: Are you finished with your voir dire?

MR. SMITH: Yes, I am, sir.

CPCSS-EXAMINATION

BY MR. LEWALD:

Q Professor Herr, would you adopt what the Chairman has said as a fair statement of your testimony, that the

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1 population here in the vicinity of the Pilgrim plant, in the
 2 event of an incident, will have some type of exposure, or
 3 be affected by some type of exposure that you don't know the
 4 severity of which, or you don't know the severity of which or
 5 suggest the means to either avoid or protect the individuals
 6 from such exposure?

7 A Yes, I think that's fair.

8 Q Then you would have no idea, would you sir, whether
 9 or not a segment of the population ought to be sheltered or
 10 evacuated from the scene.

11 Is that true?

12 A Yes, I think it is fair to say that I'm not an
 13 expert on choice of emergency strategy.

14 Q You are not an expert as to any of the methods
 15 that might be employed, if any, in the light of a nuclear
 16 incident either?

17 A Yes, I think that's fair. That's correct. That's
 18 not my expertise.

19 Q And to the extent that your testimony might indicate
 20 that you are recommending or suggesting some responses to a
 21 hypothesized nuclear incident, we should disregard that
 22 testimony?

23 A I think it would be too bad to disregard it, if
 24 other pieces of the discussion before this Board either now or
 25 later were to suggest that they became germane.

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1 I clearly am not an expert at whether evacuation
 2 should or should not take place at some distance from the
 3 site. But I think that hardly suggests that the demographic
 4 analysis which we have done ought to be disregarded because
 5 I can't make the case for why we should evacuate at 10 miles
 6 or 20 miles or whatever that distance might be.

7 Q Well, if I heard your prior statements correctly,
 8 you are not pretending to be an expert as to say whether
 9 evacuation should take place at any place.

10 Isn't that correct?

11 A That's correct.

12 Q Irrespective of whether it is one or thirty miles
 13 from the site?

14 A That's correct.

15 Q And the same thing would apply to shelter, would
 16 it not?

17 A That's correct.

18 Q And the same would apply to any prophylactic that
 19 might be used as against radiation protection, or for radiation
 20 protection?

21 A (Nodding affirmatively)

22 CHAIRMAN GODHOPE: Did you answer the question?

23 THE WITNESS: I said yes that's correct.

24 BY MR. LEWALD:

25 Q Can we sum this up, Doctor, and say that you have

mm5 1 no expertise as to what the population at risk is in relation
2 to Pilgrim Nuclear Unit No. 2?

3 A Not as I understand the term "population at risk"
4 to be defined.

5 My understanding of population at risk is that
6 population for which some protective measures might, in the
7 event of an incident, be called for. And I would not say that
8 I know nothing about that.

9 Q Have you ever done any work in connection with a
10 nuclear facility?

11 I mean any work of any nature except what you are
12 presently doing with regard to this facility in developing
13 your testimony?

14 A Yes, sir.

15 As I testified earlier, I did do consulting for
16 the Franklin County Planning Department regarding the
17 proposed Montague station.

18 Q And was this in the area of exposure of population?

19 A It has been a while since that work was done. I
20 don't recall any work on that with respect to exposure of
21 population.

22 Q Did you present -- I didn't mean to cut you off.
23 Were you through?

24 A (Nodding)

25 Q Did you present any testimony with respect to the

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1 Montague plant either in this State or before any federal
2 agency or regulatory body?

3 A No, sir.

4 Q Now, in reference to your present testimony which
5 you have filed here, was this testimony prepared entirely by
6 you?

7 A The testimony was prepared entirely under
8 my supervision.

9 Other individuals assisted with both the analysis
10 and the language drafting.

11 Q And were these individuals under your supervision
12 within your firm, Herr Associates?

13 A Some individuals were within my firm, Herr Associates.
14 Yes.

15 Q And I take it from your answer that some were not?

16 A Yes, sir.

17 Q Can you identify the people that were not?

18 A Certainly.

19 This was developed -- how can I say -- in
20 consultation with the Massachusetts Attorney General's Office.

21 Q Do you have the names of the people that you
22 consulted with in the Attorney General's Office?

23 A I presume it is appropriate. The three people that
24 are here, Frank Wright, Laurie Burt and Michael Bernstein are
25 the three individuals who have had the most contact with.

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1 Q And this represents the entirety, at least, does
2 it of the outside people -- and by outside I mean people outside
3 of your business associates -- that contributed to this
4 testimony?

5 A I have discussed this topic since the time that
6 we began our work on it with quite a large array of people,
7 many of whom have in fact contributed to my understanding
8 of the issues involved, some of whom are neither in my employ
9 or work for the Commonwealth of Massachusetts, but are simply
10 colleagues at MIT. I would say chiefly -- I guess that's the
11 only other set I can think of, some of my colleagues at MIT.

12 Q Well you are not in the habit, are you sir, of
13 going around testifying as to what Nuclear Regulatory
14 Commission regulations mean, and how they should be
15 interpreted, are you?

16 A Once again, this is the only time that I've
17 testified in a proceeding of this sort.

18 Q And do you feel yourself qualified, sir, to
19 interpret the regulations of the Nuclear Regulatory Commission
20 and certain of the guidelines of its Regulatory Staff?

21 A No, I don't feel myself qualified to interpret
22 their regulations.

23 Q But you did so anyway?

24 A I wasn't aware that I had done so. I may have
25 inadvertently done so.

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Q You don't consider that the testimony you have
 2 filed here in this proceeding in any way interprets Commission
 3 regulations and guidelines of the Regulatory Staff?

4 A My understanding was that what we were doing, what
 5 I was doing, was being done under my supervision, was the
 6 preparation of testimony under under those regulations and
 7 regulatory guides as I understood them.

8 Now I had to interpret them, I guess, in order
 9 to understand what testimony was or was not appropriate. But
 10 it certainly was -- the only interpretation which I had to
 11 do was such interpretation as is necessary in order to prepare
 12 my testimony.

13 Q So I take it you were supervising Ms. Burt and
 14 Mr. Wright and the other gentleman in preparing this aspect
 15 of your testimony that dealt with Commission regulations?

16 A I'm sorry, sir. Could you be more specific as to
 17 where it is that my testimony bears on Commission regulations?

18 Q Do you have difficulty with the question I put to
 19 you, sir?

20 MR. WRIGHT: I object, sir.

21 BY MR. LE WALD:

22 Q If you don't understand it, I'll endeavor to restate
 23 it. But if you do understand it, I'll ask that you answer
 24 the question.

25 A Yes, I have difficulty understanding the question.

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1 Q Is it your testimony that you supervised the work
2 of Mr. Wright, Ms. Burt and the other gentleman from the U.S.
3 Attorney's office in conjunction with the policy and regulation
4 and guidelines of the Commission and their interpretation?

5 MR. WRIGHT: I object to that, Mr. Chairman.
6 He never testified to that effect.

7 CHAIRMAN GOODHOPE: All he has to do is say no, then.
8 He is being asked right now.

9 THE WITNESS: Then I'll say no.

10 All of the testimony presented was prepared under
11 my supervision. I consider it all my own testimony. I don't
12 consider it interpretation of regulations though. That may be
13 where my understanding of what it is that I have done is
14 deficient.

15 BY MR. LEWALD:

16 Q Can we turn to the first page of your testimony
17 and, the first sentence after your name and address, under the
18 caption, NRC Siting Policy.

19 You do make the statement, do you not, that it
20 has been longstanding NRC policy to require the siting of
21 nuclear power reactors away from densely populated areas?

22 A That's correct.

23 Q And do you consider this an interpretation of NRC
24 policy, or do you not?

25 A It is an observation on practice.

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mm10

1 Q And was this something that you supervised the
2 introduction into your testimony?

3 A It's an observation which I made based on reading,
4 among other things, a document prepared by Mr. Bunch examining
5 the -- I don't recall its title, Demography Surrounding Nuclear
6 Stations, which in a very concise way recapitulates the history
7 of NRC actions with respect to siting.

8 This was an understanding which I came to from reading
9 that as well as other materials.

10 Q Now, could you tell us what the mechanics were of
11 putting your testimony together?

12 Was it drafted initially by you then reviewed by
13 other people? Or, did you review drafts of other people?

14 Could you tell us just how that was put together?

15 A Testimony went through a number of drafts. It
16 was initially drafted, I believe, in its entirety by me with
17 possible exception of one piece which may have been done by a
18 person in my office; it escapes my memory at this point.

19 Those drafts were then reviewed by the people who
20 I previously mentioned in the Massachusetts Attorney General's
21 office.

22 And subsequent to their review, critical comments,
23 they were then rewritten.

24 Q Were you sought out by someone to give testimony in
25 this proceeding, or did you volunteer?

mm11

A No, sir, I was sought out.

2 Q And were the parameters of your testimony outlined
3 in any way during this discussion during which you were sought
4 out?

5 A The only discussion which I recall had to do with
6 the qualifications which I had for assessing the demography and
7 other characteristics, transportation characteristics of the
8 environs. And there was nothing discussed beyond that.

9 Q The Pilgrim facility wasn't discussed, Southeastern
10 Massachusetts wasn't discussed?

11 A Certainly we discussed the purpose for which I was
12 doing the analysis, which was the Pilgrim facility. But the
13 desirability on it was not discussed, my position on it was
14 not discussed.

15 Q Did someone give you an outline of what your
16 testimony was expected to be?

17 A No, sir.

18 MR. WRIGHT: Mr. Chairman, I object to this line
19 of questioning. I held off for a number of these questions.
20 I think at this point that Mr. Lewald is getting far too far
21 afield, and I object also to the tenor of the questions as
22 well.

23 CHAIRMAN GOODHOPE: It is still appropriate cross-
24 examination.

25 Overruled.

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1 MR. LEWALD: May I have the question read back,
2 please?

3 (Whereupon the reporter read from the record as
4 requested)

5 BY MR. LEWALD:

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6 Q Was there any discussion by anyone what your
7 testimony was expected to be?

8 A I'm sorry, I think the answer is the same. Yes, sir.

9 Q No --

10 A What was discussed were the topical areas which I
11 was to address.

12 Q And what were the topical areas which you were
13 suggested to address.

14 A The topical areas which I was to address were
15 the demography and special site circumstances in that location.

16 Q I'm having trouble hearing you, sir.

17 The second one was what?

18 A Special site circumstances at that location.

19 Q Was there any discussion about radiation exposure?

20 A There may have been some discussion about radiation
21 exposure in the course of conversation, but not central to what
22 I was doing.

23 Q Were you asked to address -- strike that.

24 Were you asked to address nuclear regulatory
25 regulations and Staff guidelines in your testimony?

mm13

1 A No, sir.

2 Q You just did this on your own?

3 A I guess it is fair to say yes, in order to provide
4 a context for the demographic analysis which I was presenting.
5 It seemed appropriate to try to put together a document
6 which stood alone.

7 Q Even though you admit that the context that you
8 are providing is an area that you know nothing about?

9 A Once again I think what I suggested earlier was
10 not that I know nothing about it, but that I'm not an expert
11 at issues of dose levels, expert at meteorology, or for that
12 matter, an attorney expert at law.

13 I don't think I had to be any of these things in
14 order to observe that NRC policy has been, for example, to
15 require siting away from densely populated areas, or the
16 other contextual comments which are included.

17 Q Have you read Staff's Regulatory Guides 4.2, 4.7?

18 A I have read them in germane part. 4.2, I don't think
19 I have read in its entirety. 4.7, I believe I have.

20 Q Do you know what 4.2 is about?

21 A As I recall, 4.2 deals with emergency planning.

22 Q Have you ever read regulation or Part 100 of 10 CFR?
23 That's the Code of Federal Regulations, Title 10.

24 A Once again I read it in germane parts.

25 I may, in fact, have read all of that, being

mm'4

1 relatively short. I have read at it. I may well have read
2 all of it. I certainly would those parts which bore, as I
3 understood it, on the testimony I was preparing.

4 Q Is it your view that you have a working knowledge
5 of these, of part 100 and also the regulatory guides that I
6 referred to earlier?

7 A Sufficient to prepare the testimony which I prepared,
8 yes.

9 Q Could you describe the differences between Division
10 1 Regulatory Guides, and Division 4 Regulatory Guides?

11 A I'm sorry, between --

12 Q Division 1 Regulatory Guides and Division 4?

13 A No, sir, I could not.

14 Q You couldn't?

15 A No.

16 Q Is it your position, Doctor, that the Pilgrim
17 facility, Pilgrim 2, doesn't satisfy the Commission's regulations
18 and Staff's regulatory guides, or that the regulatory guides
19 and regulations aren't sufficient?

20 A I have made no judgment about that.

21 I was never asked to make an assessment of Pilgrim 2.

22 Q In that respect?

23 A Yes, in that respect.

24 Q Do you have an opinion?

25 A No, sir.

POOR ORIGINAL

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mm15 1 Q Do you have an opinion on whether or not Pilgrim 2
2 has satisfied Commission regulations with respect to alternate
3 sites, and also the Staff's guidelines with respect to alternate
4 sites?

POOR ORIGINAL

5 A The Pilgrim 2 analysis, whether the studies of
6 Pilgrim 2 sites --

7 Q If I have made that too cryptic, yes. Pilgrim 2
8 analysis both by the Applicant and the Staff.

9 A I have not formed a judgment regarding -- I think I
10 am not competent to form a judgment regarding the letter of the
11 regulation and the law.

12 What I do testify is that the substance of what has
13 been done is in my view inadequate to allow an assessment of
14 all the important considerations in assessing one site versus
15 others because of the omissions which we have commented upon.

16 Q And do these omissions or failures stem from the
17 regulatory guides, or from the action of the Applicant and the
18 Staff?

19 A In my layman's reading of the regulations and the
20 regulatory guides, I see nothing in them which would prevent
21 the Staff from doing an analysis which would fully satisfy the
22 information requirements to make a responsible choice among
23 sites.

24 So that there is no block in the nature of the
25 regulatory guides and regulations as I understand them, which

mm16 1 would prevent that full analysis.

2 But again, I'm not an attorney and that's my lay
3 understanding of those materials.

4 Q Your position is that there is no inhibition in
5 the regulatory guides that would prevent either the Applicant
6 or the Staff from going ahead and doing other things?

7 A That's correct.

8 Q Would you tell us whether there is any requirement
9 in the regulatory guides to do these things that either the
10 Staff or the Applicant has not pursued?

11 A Again I think that's a legal judgment, that probably
12 I shouldn't try to make.

13 The intent, the narrative description of the intent
14 of those regulations at its most simple level read by me as
15 a relative newcomer to this area of planning for commercial
16 nuclear stations appears to me not to be fully met by the
17 analysis which we have to this point.

18 But once again the technical question of whether
19 there is technical compliance, whether there is technical
20 obligation clearly I am not a technician on the law.

21 Q Have you reviewed the supplement to the FES and
22 related documents? The FES itself?

23 A I have reviewed the FES, I have reviewed the
24 supplement, both the draft supplement and final supplement.

25 I have briefly reviewed this morning what I guess

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1 is the supplement to the supplement which updated certain
2 of the population figures.

3 Q And have you made a judgment as to what
4 environmental considerations have been inadequately considered
5 by these documents in the context of applicable regulations
6 and regulatory guides?

POOR ORIGINAL

7 A Yes, sir.

8 I think that's what the bulk of my testimony
9 concerns.

10 Q Your testimony only relates to the population
11 issue?

12 A It deals with the population issues and the
13 topology of the locus, the fact of intervening water bodies,
14 the fact of transportation routes which, for certain
15 populations require movement closer to the station prior to
16 being able to move further from the station.

17 They don't -- but the testimony certainly does
18 not concern itself with things such as effects on marine life
19 or many other areas that are of concern.

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1 Q I may be repeating something. If so, please bear
2 with me. But it's my understanding that it is your testimony
3 that you do not believe that you have the background or the
4 experiance to perform risk analysis for nuclear power stations.
5 Is that correct?

6 A Sir, the term "risk analysis" carries many
7 different meanings to different people, so I want to be
8 careful not to dismiss all of my expertise. I think I am
9 in fact expert at risk analysis in the decision theoretic
10 mode. But I don't have expertise with respect to the meteor-
11 ology, with respect to dose levels, with respect to those
12 things which are particular to nuclear stations or nuclear
13 energy or nuclear accidents.

14 Q Well, if I said radiation exposure risk analysis,
15 then this would be the area that you do not have expertise --

16 A That's correct.

17 Q On page 1 of your testimony, what do you mean by
18 the term "reactor safety"?

19 A What do I mean by the term "reactor safety"?

20 Q Yes.

21 A I guess I mean with respect to the hazard to
22 population which would follow from an incident.

23 Q What particular hazards to the population?

24 A I had no particular ones in mind; whatever ones
25 they might be.

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1 Q You have no particular hazards in mind in your
2 answers to any of the hazards that might be present?

3 A That's correct.

4 Q And you have no suggestion or no views on what
5 those hazards might be composed of?

6 A I'm not sure where you're trying to carry me.
7 There are hazards associated with radiological effects, if
8 that's what it is you wish me to say. But beyond that I
9 have no particular notions, whether it's effects on the
10 thyroid or whether it's whole body doses or man-rams or
11 whatever any of those several measures are, no, sir, I don't.

12 Again, I don't think it's necessary to the mean-
13 ing of the sentence.

14 Q Well, going back to reactor safety, could you
15 tell us what you mean by "reactor safety"?

16 MR. WRIGHT: I'll object to that, Mr. Chairman.
17 That's already been asked and answered just two questions ago.

18 MR. LEWALD: If you'll tell me what the answer
19 was then I wouldn't ask the question again. I didn't think
20 I got an answer to that question, Mr. Wright.

21 CHAIRMAN GOODHOPE: Well, the objection is
22 overruled.

23 What do you mean by "reactor safety"?

24 THE WITNESS: It means the safety of the population
25 surrounding the reactor.

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BY MR. LEWALD:

Q And I take it from that that this doesn't have anything to do with the operation of the reactor itself?

A No, sir.

Q Do you have any knowledge, or have you done any reading with regard to engineering implementations that are directed to safety of the operation of nuclear reactors?

A Well, the only reading in that area that I recall having done is that which is intended to understand, the meaning for the LP2, for example. But the specific plant engineering is certainly not an area that I've done any reading on at all.

Q Do you consider that the subject of engineered safety features is relevant to the subjects of accident analysis and emergency planning?

A Yes, sir, I do think it's relevant.

Q Now on page 2 you refer to design base events, do you not?

A I may, yes, sir.

Q And what are these that you're referring to on page 2?

A My understanding is that there are a series of postulated types of events which might occur and for which the plant has been designed with protective devices so as to contain the consequence of that event at a level which in

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1 the light of the configuration of the LPI fits the design
2 parameters of that station.

3 Q Am I correct in assuming that you do not have a
4 familiarity with all regulations and regulatory guides which
5 deal with this question of reactor safety?

6 A I'm sure I do not, yes, sir.

7 Q And would it be fair to say that you would not
8 have the knowledge and background to assess what might be
9 considered the primary means of assuring that accident
10 consequences would be minimized?

11 A Are you referring now to design basis accidents
12 or are you referring now to more than design basis accidents?

13 Q Could we have the question read back, please?

14 CHAIRMAN GOODHOPE: Read the question.

15 (Whereupon, the Reporter read from the record
16 as requested.)

17 THE WITNESS: Are you waiting for a response
18 from me, sir?

19 MR. LEWALD: Yes.

20 CHAIRMAN GOODHOPE: Yes.

21 THE WITNESS: I'm sorry.

22 With respect to design basis -- I'm sorry, with
23 respect to more than design basis accidents my understanding
24 of what is the primary means of mitigating consequences comes
25 again from my reading of material such as Bunch reports, such

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1 as -- I'm sorry I don't have it here -- a recent subcommittee
2 report, Congressional subcommittee report that -- I can't
3 cite it. I can provide a cite to you subsequently. But my
4 understanding that's stated at the top of page 2 comes from
5 that reading and I do feel that I'm competent to reach that
6 conclusion, yes, on the basis of that reading.

7 BY MR. LEWALD:

8 Q And what are the primary means, sir?

9 A Once again, it's stated. I think I would say
10 nothing different than is stated at the top of page 2.
11 The size and distribution of the population surrounding that
12 reactor appears to have emerged as the NRC's primary means
13 of assuring that the consequences of any accidents are
14 more severe than design basis accidents are mitigated as
15 much as possible.

16 Q And on what do you base this view, sir?

17 A Once again, it's based on my understanding from
18 reading the literature in the field. The particular case that
19 I would cite here is D. F. Bunch, Metropolitan Siting, A
20 Historical Perspective, NUREG-0478.

21 Q And would this, is it fair to say, sum up your
22 reading?

23 A I think that was the salient reading on that
24 issue.

25 Q Now on page 3 of your testimony, which is the

mpb6 1 chart, the top of that figure refers to population versus
2 guidelines, does it not, 1985? **POOR ORIGINAL**

3 A Yes, sir.

4 Q And do I understand from this chart that this is
5 to represent cumulative population as against the distance
6 from the plant in miles for 1985?

7 A Yes, sir.

8 Q Pardon?

9 A Yes, sir.

10 Q Can you tell me where the line Residents Only
11 Per SER is?

12 A It's a copy -- this chart is a copy of a page in
13 the Safety Evaluation Report, with the exception that the
14 small dotted line was added by my staff.

15 Q In dropping down to the other legend, the other
16 side of the line Residents Plus Weighted Seasonal per SER --

17 A Yes, sir.

18 Q -- this again comes from the Staff's Safety
19 Evaluation Report 1975?

20 A Yes, sir.

21 Q Do you have that with you, by any chance?

22 A Yes, sir, I do.

23 Q Would you look at that chart?

24 A Yes, sir.

25 Q And can you look at the page before the chart in

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1 the SER and tell me whether or not it is indeed true that
2 this reflects 1985 projections?

3 A I'm sorry, the two -- I have to go to the page
4 prior to that. The answer to the question is not on the
5 preceding page but it is two pages preceding. And two pages
6 preceding says:

7 "Figure 2.3 shows the 1972 cumulative
8 total weighted population in the vicinity of
9 the proposed site."

10 So that the two lines, Residents Only, Residents
11 Plus Weighted Seasonal Per SER are in fact 1972 data, and the
12 dotted line is 1985 data.

13 CHAIRMAN GOODHOPE: The dotted line, the one that
14 you inserted?

15 THE WITNESS: That's correct.

16 BY MR. LEWALD:

17 Q But you were representing this chart, were you
18 not, as indicating a reflection of 1985 data, sir?

19 A I was certainly representing it that the
20 500 people per square mile guideline was intended for the
21 initial -- is a guideline for the initial year of plant
22 operation. In the instant case that's 1985. And our dotted
23 line was a plotting of 1985 data, so that also was 1985.

24 The two solid lines are in fact 1972, and it
25 clearly should have been so labeled on the chart. There was

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1 no intention to be deceptive.

2 Q Well, in fact, until a moment ago you believed
3 they to be 1985, did you not, Doctor?

4 A I'm refreshing my memory by reading the testimony.

5 Q Can you answer the question?

6 (The witness reading.)

7 A No, sir, no, sir, the labeling of the chart is
8 inadequate. But the intent of our portrayal was to show the
9 way in which --

10 CHAIRMAN GOODHOPE: That's not the question.
11 The question is until Mr. Lewald brought this to your
12 attention did you believe that the two solid lines were
13 1985 information?

14 THE WITNESS: The answer is no.

15 CHAIRMAN GOODHOPE: All right.

16 Next question, Mr. Lewald.

17 MR. LEWALD: The question was did he believe
18 they were 1985 until a minute ago.

19 CHAIRMAN GOODHOPE: Yes. And he said no.

20 BY MR. LEWALD:

21 Q Prior to looking at the PSAR as I directed you to,
22 Doctor, is it your testimony that you did not believe that
23 the representation on your exhibit for Residents Only Per SER
24 and Residents Plus Weighted Seasonal Per SER referred to
25 1985 projections?

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1 A First, you referred me to the SER, not the PSAR.
2 And the answer continues to be no, I did not think until
3 having looked at the SER that those represented 1985. I in
4 fact thought that they represented, without refreshing my
5 memory I couldn't tell what year, but that they represented
6 some year prior to the preparation of the SER.

7 CHAIRMAN GOODHOPE: Is this a good breaking point,
8 Mr. Lewald?

9 MR. LEWALD: Yes, this would be fine.

10 CHAIRMAN GOODHOPE: Thank you.

11 We'll take a ten minute recess.

12 (Recess.)

13 CHAIRMAN GOODHOPE: The hearing will be in order.

14 Mr. Lewald.

15 BY MR. LEWALD:

16 Q Prof. Herr, on page 8 of your testimony in the
17 second full paragraph on that page you state that cumulative
18 annual average density alone is an inadequate measure of
19 accident consequence.

20 What leads you to that belief, sir?

21 A Essentially the reason is because simply looking
22 at annular density doesn't take into consideration the
23 variation in sectoral density or variations in population
24 by sector, which may well be the population at risk in the
25 event of any given incident, that at least with respect to

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1 some effects it is not the entire population in 160 degrees
2 surrounding the site at all distances which is germane or
3 which is at risk in the sense of appropriately having
4 protective measures prepared for it, but rather it is the
5 population in some sector, as suggested in the Rasmussen
6 Report and as suggested in a variety of later documents.

7 Q Are you equating site specific license review
8 with alternate site analysis?

9 A In this testimony what I'm raising is that sites
10 may well not be equivalent with respect to population at risk,
11 even though they are equivalent with respect to average
12 density. And that lacking information with respect to
13 potential population at risk an informed selection among
14 sites is not possible. And in my view that's an analysis
15 between sites.

16 Q Now you mentioned protective action measures, did
17 you not?

18 A I may have, yes.

19 Q What are protective action measures?

20 A My understanding is there are a variety of
21 possible ones, one of which is evacuation, another of which
22 is sheltering, another of which is prophylaxis. There may
23 be more. Those are the three that I'm familiar with.

24 Q Now are you suggesting in connection with the NRC
25 review that these matters aren't addressed at all in

mpb11 1 licensing?

2 A I'm not suggesting that at all, sir. What I'm
3 suggesting is that in considering alternative sites it is
4 germane to know the number of persons for whom such actions
5 may be called for, and that that information at this stage
6 has not been provided for selecting among these sites.

7 Q Your testimony is that a worst case analysis ought
8 to be applied in each instance?

9 A A worst case analysis is not the term I'd use.
10 I think a worst case analysis would be one in which, for
11 example, one might imagine a plume trajectory which would
12 wiggle and waggle so as to include the largest possible -- or
13 to pass over the largest possible population, and one would
14 make further assumptions regarding, for example, it occurring
15 on let's say one of the infamous Saturdays, of which we have
16 three during the summertime, when traffic conditions are the
17 worst. We'll assume breakdowns and so on. It's far from a
18 worst case analysis.

19 What I am suggesting is that an understanding of
20 a reasonably likely maximum population at risk should be
21 included in order to make a well informed choice among sites.

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5david 1 Q A reasonably likely population?

david 1 2 A That's correct.

take 13 3 Q And you're distinguishing this as something

fls mpb 4 less than a worst case analysis?

5 A Yes, sir.

6 Q And it's your view you can arrive at this by a

7 determination of the cumulative annual population surrounding

8 a site?

9 A There simply is no way to make an estimate of

10 the potential population at risk, given only cumulative

11 annual data.

12 Q So that your position lies somewhere in between

13 assessing cumulative annual population data and a worst

14 case analysis?

15 A I think that some people --

16 Q Is that true?

17 A Yes. Yes.

18 Q And would this vary from site to site?

19 A Would what vary?

20 Q The in between case, would this vary from site to

21 site?

22 A In the necessity of examining the reasonable maximum

23 population density at risk; the -- would the necessity

24 of that vary from site to site?

25 Q Yes.

A I think the importance of doing it would vary from

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david2 1 site to site.

2 I'm not well informed what the full cost of that
3 analysis would be in terms of either financial cost or delay
4 in any given instance, so I don't know what the tradeoff
5 is.

6 Probably it's information that would be useful
7 in all cases, but in any case we have reason to believe
8 that the site in question differs from the norm by a substantial
9 amount, as indeed in this case we're confident it does.

10 Then the importance of doing that analysis is
11 heightened.

12 Q On page 9 you refer to "unacceptably high number
13 of persons potentially at risk," do you not, sir?

14 A Yes, sir.

15 Q And can you tell me what an acceptable high number
16 of persons at risk is?

17 A No, sir. I don't think that's appropriate to
18 my role. It's clear I'm not an expert on that. All that I'm
19 arguing is that the information on which a decision maker
20 could make a judgment to whether the numbers potentially
21 exposed r at risk is or is not acceptable should be available
22 to them. And it is not.

23 Q You feel qualified to testify what an
24 unacceptable number is, but not an acceptable number, I take it?

25 A No, sir. I don't believe there's any testimony in

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david3 1 here regarding what is an acceptable or unacceptable
2 number; only what is an acceptable analysis.

3 My testimony is only that the number
4 potentially at risk should be available to the decision maker
5 for him to make a judgment as to what is or is not
6 acceptable in light of all the other considerations.

7 I don't suggest that is an exclusive
8 consideration. I suggest that as one that would be balanced
9 against other demographic considerations. I think that
10 the cumulative annular density, the time weighted and seasonal
11 population is an appropriate measure; it's a useful one.
12 I think decision makers should have that. I think they should
13 also have peak seasonal, peak sectoral information in order
14 to be able to make this additional assessment.

15 How you weigh one against the other is clearly
16 not something which I've attempted to give in testimony. How
17 to decide what is or is not an acceptable threshold is
18 not something I've given testimony on; only the --

19 Q You're not suggesting the regulatory staff does not
20 require this information as peak density and area-specific
21 density in connection with emergency planning, are you, sir?

22 A Emergency planning is a whole -- it seems to have
23 been adequately discussed. That's an additional
24 consideration.

25 All that I'm saying is that in the basic choice

david4 1 of site at which point one is essentially choosing among
2 a population array and a topological array, that this
3 information in a readily accessible form should be made
4 available.

5 Q Is it your position, sir, that tourists and
6 transients, and what you may call daily or seasonal visitors
7 ought not to be weighted in some fashion in arriving at a
8 cumulative population of a particular region or area around
9 the site?

10 A My position is that it's entirely appropriate to
11 weight seasonal population and day trippers for one
12 kind of analysis, and that one kind of analysis should be
13 available and is available; and that there's another kind
14 of evaluation, in which weighting seasonal population and
15 day trippers is inappropriate.

16 And that's the analysis which is missing. I would
17 not argue from my position, for example for -- in doing what
18 I refer to as the expected value analysis, including
19 total land area, and including seasonal population at full
20 value.

21 That is, in my view, mixing apples and bananas.
22 It's difficult to ascribe a logical meaning to the outcome
23 of that analysis.

24 But in order to understand the maximum reasonably
25 expected population at risk, I simply can't get that

david5

understanding if I count some people as quarter people because if it should occur that the incident were to take place during a peak season, they would not be quarter people; they would be whole people.

So in a sense with the same logic as obliges whole people to be considered, seasonal people to be considered as whole people for the evacuation analysis; the same logic applies to doing a maximum population at risk analysis.

Q You used the phrase, "maximum reasonable population at risk."

A That's correct.

Q Is it your position that the staff has adopted a rule of a minimum reasonable population at risk?

A The analysis which has been done and which has been accepted by the staff, it's neither maximum nor minimum, but rather looks at what is the expected value of the population at risk or what is in a sense what is the average expected population at risk.

It's not a minimum population at risk at all.

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1 Q How does one go about determining a maximum
2 reasonable population risk?

3 A My view is this can be done by considering the
4 season when the population is highest, and considering the
5 variations among sectors with respect to the proportion of
6 whole of the population which is how with each of those sectors.

7 Q And can you tell us whether or not this view is any
8 where espoused by regulation or guideline?

9 A Go back to my earlier answer and say that in my
10 layman's reading of part 100 it seems to me reasonable to
11 expect that analysis to be done in my layman's reading of the
12 word - explicit regulatory guidelines. It appears to me that
13 there is no, in those regulatory guidelines, obligation upon
14 the applicant or the staff to meet that analysis, but neither
15 do I find anything in those regulations which includes it.

16 Q Well, your answer is that such an analysis is
17 provided for in part 100. Is it your position that such
18 analysis has not been done in this case?

19 A It's clear that it has not been made available to
20 me.

21 Q Where have you -- for alternative sites. Where have
22 you looked, sir?

23 A Well, I've look in the Environmental Report, I've
24 looked at the PSAR, I've looked in the SER, I've looked in the
25 Draft Environmental Statement, the Draft Supplement to the

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Environmental Statement, the final Supplement to the Environmental Statement, the most recently handed to me the piece of paper this morning and I found in none of those sectoral analyses of the alternative sites -- I may have missed it.

Q Can I sum up your position that you feel that a Part 100 analysis should be done for each of the alternative sites that are under consideration in an alternate site analysis?

A That a part 100 analysis should be done for each of the alternative sites?

Q Yes.

A That aren't considered?

Q Yes.

A In the way that I've considered it? Yes, sure. If I understand the question correctly.

(Pause.)

Q What would -- or what does a Part 100 analysis tell one?

A I'm sorry. I don't understand the meaning of Part 100 analysis.

Q Didn't you use the term "Part 100 analysis"?

A No, I don't believe so. I may have, but -- but this is the first I heard it. I heard you use it. I was confused by it. - I may have inadvertently used the term

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which caused me to bring it back to me, but --

Q Do you know what Part 100 requires of an applicant by way of licensing a nuclear plant, sir?

A Generally, yes, sir.

I have it in front of me if you want to refer to a particular section.

Q And can you just tell us very briefly what that requires?

A It requires a great range of things; it's hard for me to briefly characterize all of them.

Q Does it require some calculations with respect to dosages at certain intervals or areas, distances from the plant?

A Yes, sir. It's a part of determining low population zones, population center distances, and so on. If I somehow conveyed the sense that I believe that type of analysis should be done for all alternative sites, I was mistaken.

I don't mean that.

Q You did not mean that.

A I do not mean that. The records which I made.

Q I don't have a question before, if you don't mean that --

MR. WRIGHT: Mr. Chairman, I think that the witness should be allowed to complete his answer.

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MR. LEWALD: He's answered it.

CHAIRMAN GOODHOPE: I thought he did complete it.

MR. WRIGHT: He started to say something more.

MR. LEWALD: He said a lot of things more.

CHAIRMAN GOODHOPE: I don't think it was an answer to the question.

MR. WRIGHT: I think he was explaining, Mr. Chairman, if I may--

CHAIRMAN GOODHOPE: Some reference, well, what was it? Go ahead. What is the reference you had.

THE WITNESS: No, I'm sorry. I'm content to withdraw the comment.

MR. WRIGHT: I withdraw my objection.

MR. LEWALD: Excuse me, jus: a minute.

THE WITNESS: Mr. Chairman, if it would help clarify the record, I'd be glad to cite specifically what I meant by the reference to Part 100.

CHAIRMAN GOODHOPE: Why don't you let Mr. Lewald ask you a question.

MR. LEWALD: If you want to say what you mean, t go right ahead. Doctor, I'm not trying to --

THE WITNESS: Part 100.10, it's factors to be considered when evaluating sites. And item B under that states that population density -- and these characteristics of the site environments, including the exclusion area or

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low population zone center distance; and it says words which I referred to as in my view in order to fully consider the population density and use characteristics of the site environment, that it's necessary to go beyond simple, cumulative, annular population.

And I certainly by that comment -- didn't mean to invoke all the other parts of Part 100 as appropriately being done for alternative sites.

It's just that one narrow piece of the -- of site evaluation factors.

BY MR. LEWALD:

Q Doctor, on page 20 of your testimony you have a second paragraph --

MR. WRIGHT: Mr. Chairman, perhaps I'm mistaken, but I thought this was part of what we had stricken.

MR. LEWALD: I didn't think it was.

CHAIRMAN GOODHOPE: We didn't strike anything.

MR. WRIGHT: I mean that was going to be deferred until the time of the evacuation discussion.

CHAIRMAN GOODHOPE: That's what the intention was.

MR. LEWALD: May I just ask a point of clarification, I guess.

CHAIRMAN GOODHOPE: Wasn't that your objection? It's in the record. Does it have to do with what we're discussing now?

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MR. LEWALD: It has to do with his testimony.

CHAIRMAN GOODHOPE: Prior testimony? The first 19 pages?

MR. LEWALD: Well, I'm referring to page 20; if I can't ask any questions on page 20, then I'll --

CHAIRMAN GOODHOPE: You're the one that wanted it kept off until we got to emergency planning, and --

MR. LEWALD: We did, but the ruling of the chair was to put it in anyway. So the upshot of the whole thing is it's in evidence, but we can't examine on it, so I'm not sure whether we --

CHAIRMAN GOODHOPE: At this time are we going into emergency planning?

This is where I'm confused, as to what's --

MR. LEWALD: I can do this by interrogatories, I guess. I don't need to go into it now. And in that case, I have no further questions.

CHAIRMAN GOODHOPE: Do you object to him examining at this time on this?

MR. WRIGHT: Well, I object to Mr. Lewald having it both ways: wanting to put it off and at the same time wanting to cross examine here today.

I would have preferred doing all this today as part of our alternative site analysis, but now the board has ruled against us in this respect, so it's my understanding that the information will be subject to cross

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examination at the time of the emergency planning hearings.

CHAIRMAN GOODHOPE: Yes.

Yes, that's the way the record stands right now. Do you want to go into this? I can change our previous ruling.

MR. LEWALD: I won't press it now. I'll stop my examination at this point, reserving the right to continue on the next subject.

CHAIRMAN GOODHOPE: All right.

MR. SMITH: Does that complete your --

MR. LEWALD: It does complete it.

BY MR. SMITH:

Q Mr. Herr, could you give me your definition of risk as used in your testimony?

A It's going to be hard because I'm afraid at the time I wrote this I was ignorant of special meanings that that word evidently has in this kind of proceeding in this topical area.

And my guess is I have not used "risk" with any more particular meaning than "chance." That probably has broader or narrower meanings at different points in the testimony, which I can conceive of -- those that are familiar with that particular use of "risk" terminology. The chance --

CHAIRMAN GOODHOPE: Chance of an automobile

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accident going home, something like that?

THE WITNESS: Yes, that would certainly be chance; chance of the wind blowing from the northeast instead of the southwest. It is there is some consequence attendant on that risk, the risk that the wind might blow in an unfavorable direction.

BY MR. SMITH:

Q Let me understand, doctor -- is it doctor?

A Professor.

Q Professor. When I see the word "risk" here, I should just use the term "chance."

A Can you give me a location.

Q Start from the beginning.

A Chance with negative consequence.

Q I'm trying to find out if you used the term, professor; let's start at page 6 -- let's start at page 1 where you refer to reg guide 4.7, last paragraph, "because of some residual risk."

How are you using the term there?

A Because some residual -- in that case it substitutes risk for chance for danger to the population.

Q When you are saying "chance," you're just using it in terms of probability or just the random chance that something may happen with no significant mathematical probability.

A That's correct.

1137 348

david14

Q That's correct?

A That's correct. I had no particular measure in mind in using the word "risk" at that location.

Q Well, in cross examination, I believe you used the term "maximum reasonable risk."

Is that --

A Population at risk.

POOR ORIGINAL

Q Okay.

A The use of the term "population at risk," I was using it again in that case, I would think, in exactly the way in which I understand it: it is -- it is used in this field -- and that is -- and I took that from regulation guide 1.101 where it describes population of risk or describes it in terms of persons for whom protective actions are being or would be taken. When I used that term, "population at risk," I meant it as exactly that, in that special way.

Q If I recall, reg guide 1.101 is used for emergency planning?

A That's my recollection as well, yes, sir.

Q Do you see a difference between the staff's assessment of emergency planning and alternative site review? Do you know if there is a difference?

A I'm confident there is a difference.

Q Do you know if the staff, when doing evaluations for emergency planning does take into consideration peak populations?

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A It's my understanding that they do.

Q And if you use the term "maximum possible risk" as used in reg guide 1.101 --

A "Population at risk."

Q That's what you said; you said you got that from reg guide 1.101, and that gives emergency planning, and you agree that the staff uses peak population when doing emergency planning.

Where, then, do you and the staff -- where do you disagree with the staff's analysis?

A I would disagree with the staff's analysis as the analysis of the population at risk for alternative sites; it's not before us and that in choosing among the sites, it's germane to know what the maximum population at risk would be.

There was a distinction, as I understand it, between this proceeding under NEPA and the later proceeding under other aspects of the license procedure.

It's not -- I frankly don't understand it, so that I can't meet the argument as to the moment at which that should be there.

My argument is that in order to make a reasonable choice between sites you need this information; the information has evidently not been made available at this time.

Q What I understand you to say is: for each alternative

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site you should do an emergency planning evaluation. Is that what you're saying?

A I think that the ability to do emergency planning for each of the alternative sites clearly is germane to the choice among those sites in the event that some of those sites would prove much easier to do emergency planning for or emergency planning would prove more effective for them than other of those sites; if that's what you intend, yes.

Q It's not what I intend; it's what you intend.

A Yes.

Q Let's turn to page 9; when you use the term "maximum risk analysis," how are you using risk there?

A In order to more clearly express the thought there, what I meant by "maximum risk analysis," was analysis of the maximum population at risk.

Q Does risk to you mean probability times consequence?

A I think that's -- I think that's one perfectly acceptable meaning of risk.

Q But that's not how you use it in the testimony.

A I'm trying to think -- I think certainly not, at least not consistent.

Q Now, staying with page 9, when you talk about -- let me make sure I'm looking -- you say that "site B can be said to have an unacceptable number of persons potentially

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at risk."

And if I look at site B you have a fairly large number of people in one area.

Is that a correct characterization?

A Yes.

Q Now, why are they at a higher risk now, as you used the term?

A Each of those individuals is no more at risk than each of those individuals in the site A, but the maximum potential population which might be at risk is higher at site B than it is at site A.

Q Because of chance?

A Because of the chance of wind direction.

Q Now, isn't it true that if these people altogether -- if there's a nuclear incident and if somebody could tell -- warn these people with one warning, and at site A there would have to be a number of warnings, since the people are scattered around, that these people would have a better chance of getting out of the way of the plume, as you described it in your testimony?

A Once again, I am not changing the meaning that I understand because I think it's a very good one of population at risk.

But the population for which some form of protective action would have to be taken -- and what you're saying is that protective action might, in the case of a

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dispersed population, be either more difficult or less effective than in the case of a concentrated population.

That's getting into another set -- set -- that's getting into another set of considerations, and I don't think at this point it's proper to discuss those; we may be discussing them in a month or so.

All we're saying is we've got more files potentially involved with the incident in the case of site B than with site A.

Q If I give you the hypothetical that you have a site which has a high population in various sectors for two months of the year but a very low population for 10 months of the year, would one say that the people with -- the people there at 10 months of the year have a greater risk overall?

A The risk of the people is different than the maximum numbers of people who might be at risk; that's a different measure; a measure of the expected value of the number of people at risk simply is conceptually different, distinct from the maximum number that might be at risk.

And I would say that in the case of a site where there's a whole lot of people there for two months out of the year and only a few there for 10 months out of the year, the individuals that are there for the 10 months out of the 12 months out of the year -- if there is some time related risk with being there, sure.

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They individually have greater risk than those people who are there only for a short time.

But in terms of measuring the maximum possible or likely risk, that maximum number has nothing to do with whether they are there only two months or whether they are there for all 12 months.

end 13

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1 Q But if I understand you correctly, you used the
 2 term risk as just chance, just chance, just that's how we should
 3 look at it. Just a chance that somebody is going to be there
 4 and not taking anything else into account. That's how you
 5 would use the term.

6 A We are not saying you should take nothing else into
 7 account.

8 As I testified earlier today, I think we said in
 9 the testimony, I don't object to the average density analysis
 10 as one of the pieces of information that should be available.
 11 I think this other should be available as well.

12 And what we should not be doing is in a sense
 13 relying on the chance that an incident will not occur at a time
 14 where it will be particularly damaging, or take the chance
 15 that the wind will blow in a favorable direction.

16 When you ignore those things you are saying that you
 17 are risk neutral in decision analytical terms. That is where
 18 some of our confusion of terms unfortunately comes in. You are
 19 saying I'm risk neutral with respect to the risks attendant on
 20 wind direction or the risks attendant on the time of the year
 21 when an incident might occur, saying I don't care about that
 22 risk, I am going to put that out of my calculus and I'm only
 23 going to deal with time-weighted and direction-weighted
 24 occurrences.

25 And what we tried to establish in my testimony is

mm2] 1 that society is not risk neutral with respect to matters of
2 that sort, and we don't think that decisionmaker should be
3 asked to make decisions absent the information which they can
4 then use and which they themselves are risk neutral with
5 respect to that.

6 That's for them to decide.

7 But they should have the information with which
8 they can make a balanced judgment of, there's some threshold
9 of possible numbers of persons who might be at risk that's
10 unacceptable and then that -- the judgment as to whether that
11 threshold exists or whether something they're weighing is their
12 choice.

13 But they should be informed so that they can make
14 that choice.

15 Q You are not saying that the Staff is ignoring the
16 peak populations in their analysis of a site? They do
17 consider them in the emergency plan?

18 A What I'm saying is that the Staff has not provided
19 information at this point regarding the risks attendant on
20 seasonality and wind direction for the alternative sites.
21 Of what happens at some later stage is speculative. But my
22 understanding is that peak population will be analyzed for the
23 selected site at the emergency planning stage, and I under-
24 stand from the prefiled testimony that the relative evacuation
25 I'm sorry, the emergency planning consequences of site

mm3

1 selection will subsequently be presented, I'm afraid that's
2 an attorney's argument whether that material belongs now or
3 later.

4 My argument is that that material belongs,
5 regardless of when it appears.

6 Q In your consulting work have you ever done
7 environmental impact analyses?

8 A Yes.

9 Q And in doing those analyses, can you describe
10 what type of impact analyses you have done?

11 A Well, we have in part done impact analysis on the
12 impacts of Montague Nuclear Station, done impact analyses of
13 individual developments, impact analyses of policy plans, I
14 have done work at the state level, municipal level, private
15 developments, a great range of things.

16 Q Were these impact analyses specifically for a
17 requirement under the National Environmental Policy Act?
18 That's what I'm referring to, if you have done any of those?

19 A The work which we did for Franklin County was in
20 anticipation of NEPA requirements. But that matter, to my
21 knowledge, hasn't proceeded to that point.

22 None of the others that I have done that I can think
23 of were done under the Environmental Policy Act.

24 Oh, I'm sorry. We have done an impact analysis
25 quite recently regarding a subway line extension which is in

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1 litigation under provisions of NEPA.

2 We did another impact analysis regarding highway
3 in Connecticut for NEPA proceedings.

4 So, I guess the answer is yes, we have, now that
5 I recall them.

6 Q Was that work done for a government agency, or for
7 a person applying for a government permit or license?

8 A In both those cases it was done for private
9 organizations.

10 Q That needed a federal license of some kind?

11 A No, which were challenging the issuance of some --
12 which are challenging the correctness of some public action.
13 IN one case actions of the Secretary of Transportation in
14 approving a subway extension; in another case challenging
15 the correctness of the actions of the Secretary of
16 Transportation, I guess, regarding an expressway.

17 Q In those evaluations, did you consider -- were you
18 in your role as a consultant, considering the reasonableness
19 of the action being taken?

20 A The usefulness?

21 Q The reasonableness.

22 A Oh, reasonableness.

23 I would have said that that's what we were doing in
24 each of those two cases.

25 One case we found in our professional judgment, that

mm5 1 it was reasonable, and the other case we found in our
2 professional judgment that it was not.

3 Q Have you ever done any other risk analysis of any
4 type?

5 A As I understand that term, risk analysis, I would
6 say in the sense of risk-free construction and so on,
7 academically yes but as a consultant no.

8 Q Just one final question, I think.

9 Could you tell me when I read your testimony, how I
10 am to define again the term "risk" as you use it?

11 A And I guess once again without having been
12 sensitized to the particular weight attached to that word and
13 its meaning, it is hard for me to know all the places I have
14 used it, and therefore hard for me to characterize how I've
15 used it in each of those cases.

16 When I have used it in the phrase population at
17 risk I think we have been reasonably clear regarding what that
18 means.

19 I think it is only that way in specific context that
20 I can do it.

21 Q How is this Board to analyze your testimony if they
22 don't have it, have knowledge of how you used the term?

23 A Once again, as we went through -- I would be glad to
24 try to clarify the meaning which we were ascribing to that
25 term in any location where it gives trouble. I would even be

mm6 1 glad to, in fact, go back through this -- not today while we
2 are sitting here -- and try either to get rid of the word
3 and substitute other words for it, or use it in some narrower
4 way.

5 I don't think that is what is standing in the way
6 of understanding between us.

7 CHAIRMAN GOODHOPE: You don't think what?

8 THE WITNESS: I don't think that's what is standing
9 in the way of an understanding between us. For example, the
10 prefiled testimony it appeared to me that the Staff understood
11 very well precisely the point that we were making, despite
12 differences with respect to --

13 CHAIRMAN GOODHOPE: What prefiled testimony?

14 THE WITNESS: My understanding is that there is
15 Staff rebuttal testimony to my testimony.

16 Is that not the case?

17 CHAIRMAN GOODHOPE: Some has been filed. Yes.

18 Is that what you are referring to?

19 THE WITNESS: Yes.

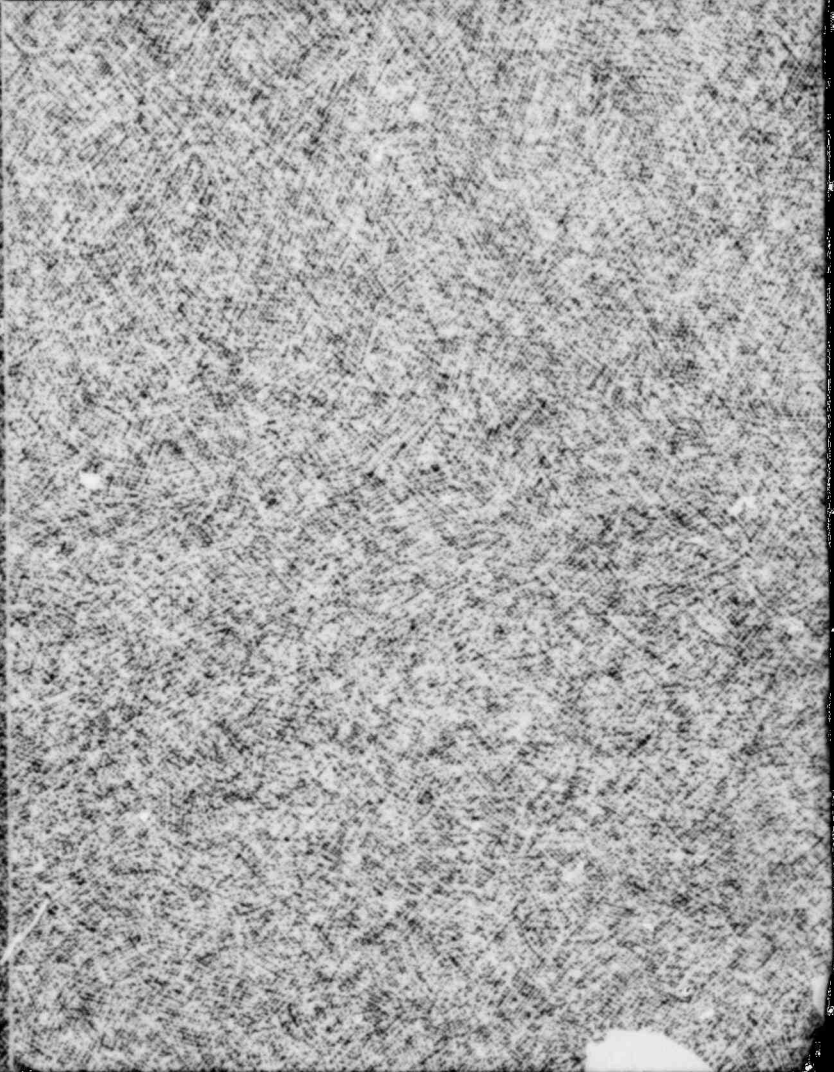
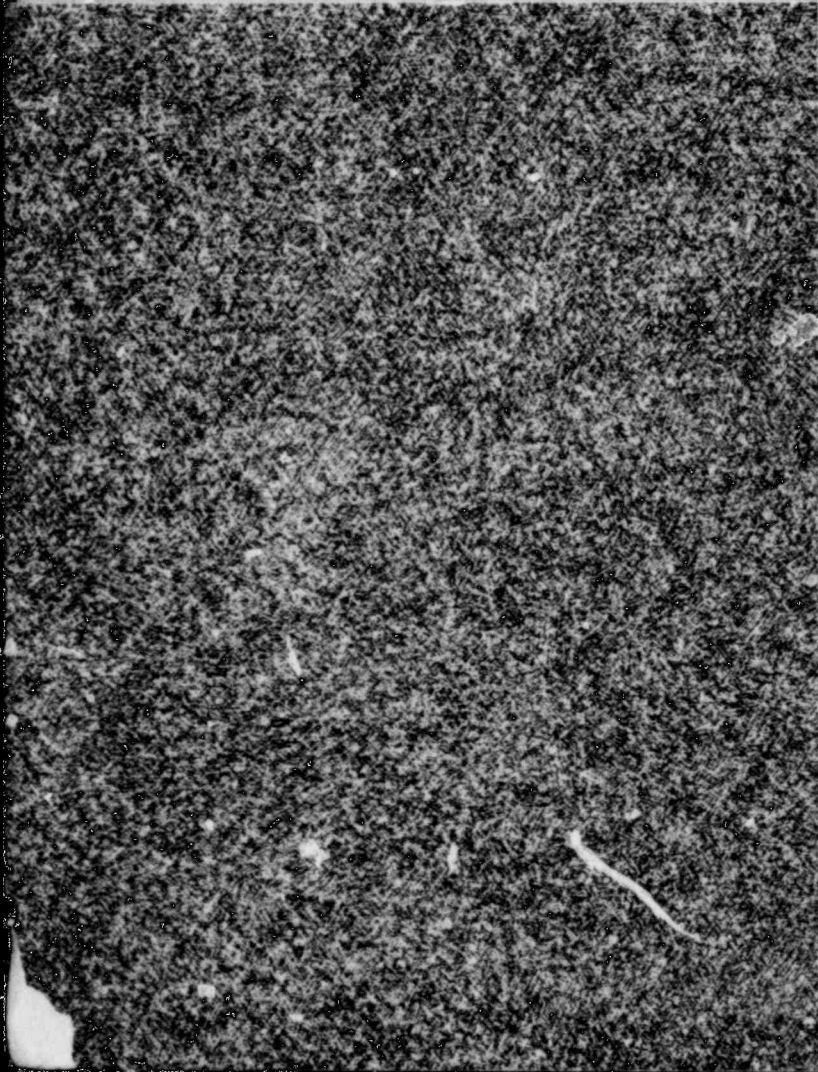
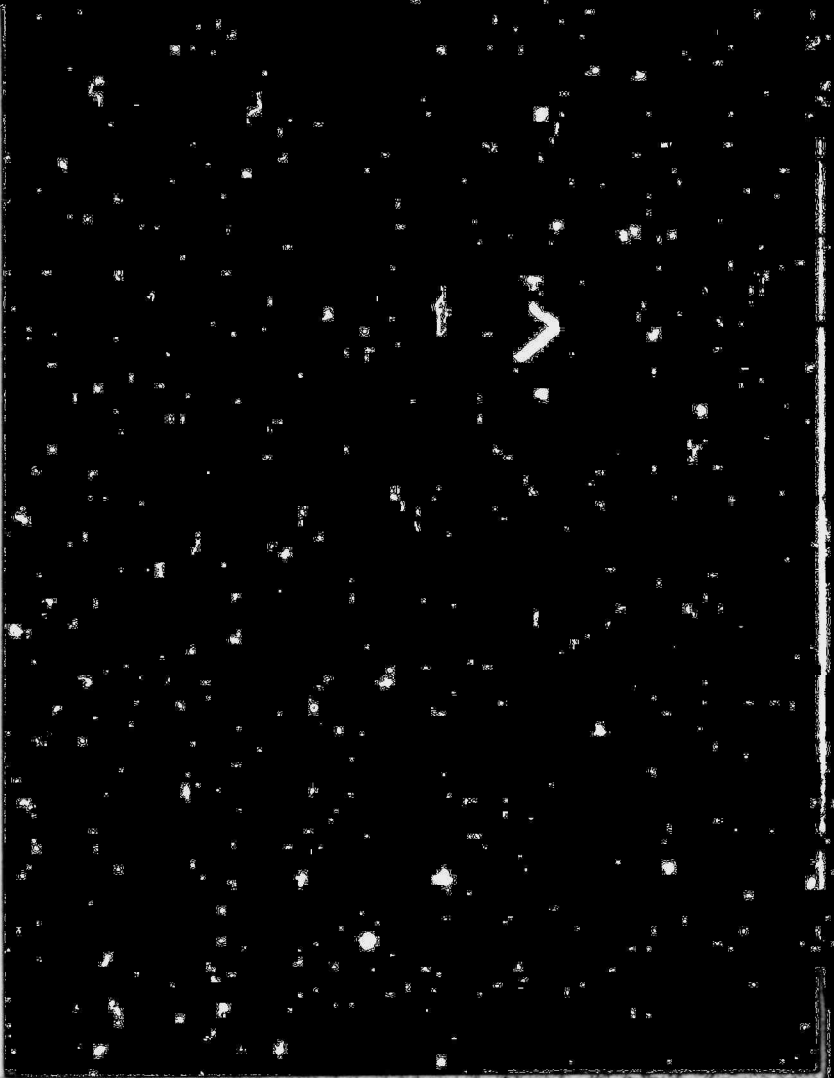
20 BY MR. SMITH:

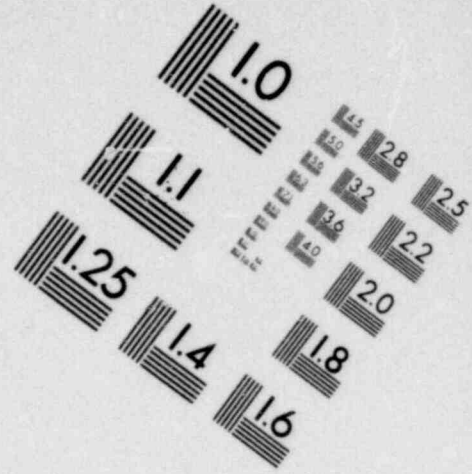
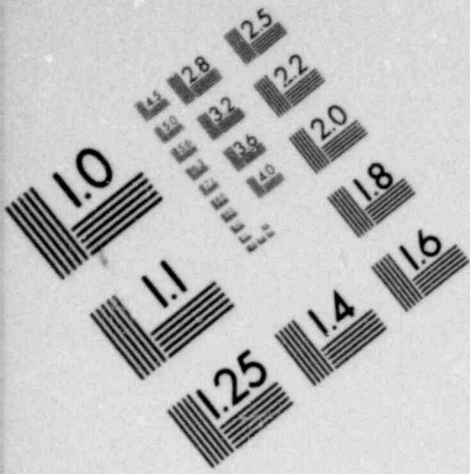
21 Q And you are saying that your understanding of
22 risk and the Staff's are the same?

23 A No, sir.

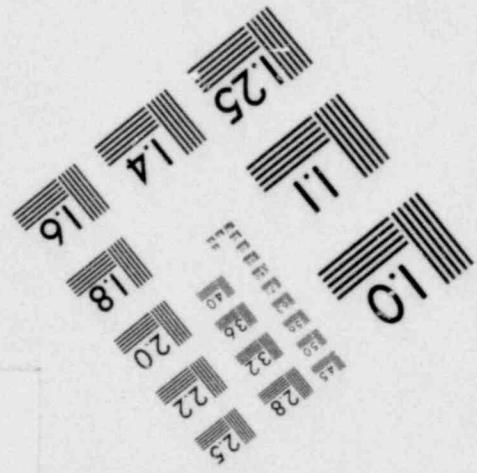
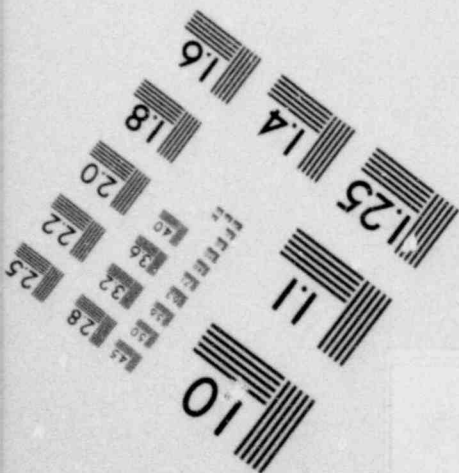
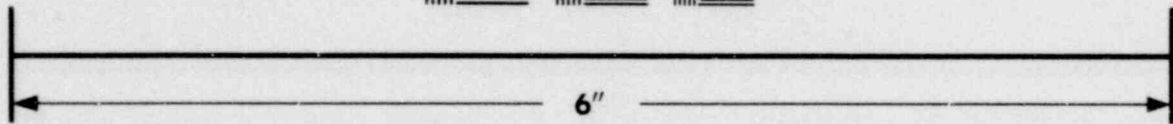
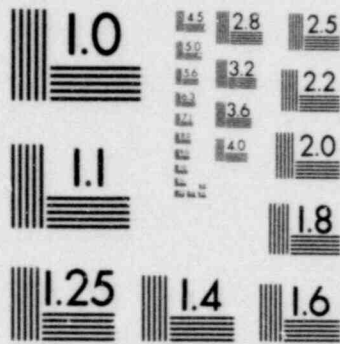
24 What I am saying is --

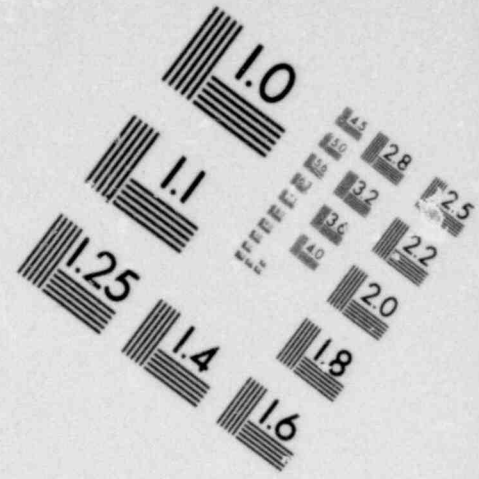
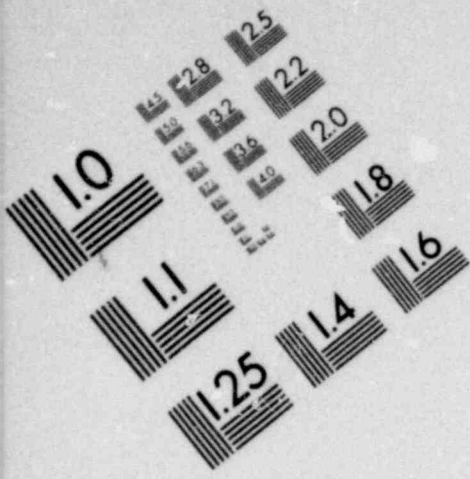
25 Q That's all I asked you.



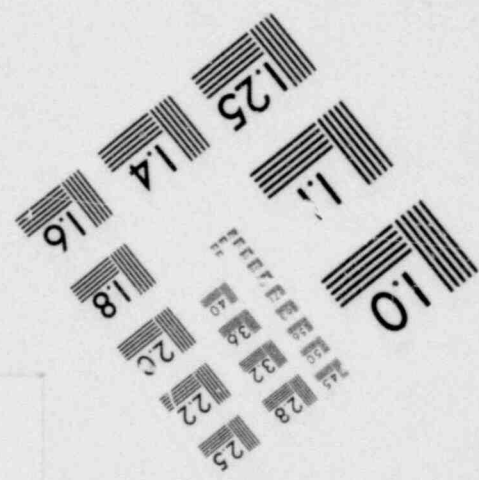
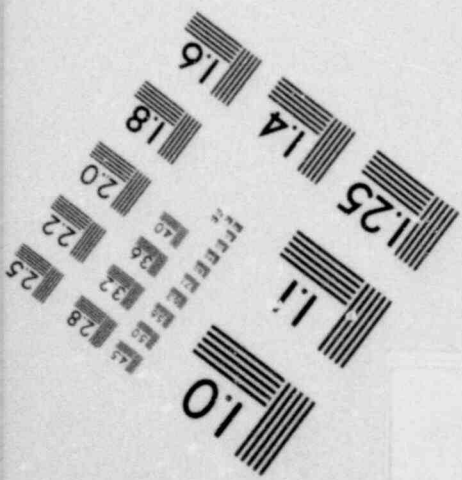
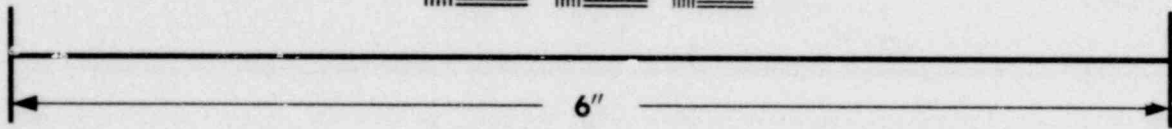
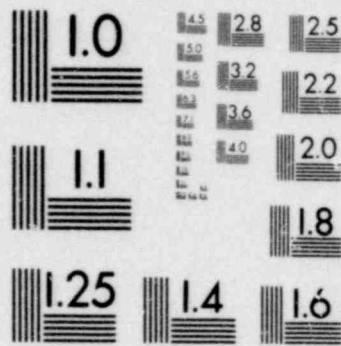


**IMAGE EVALUATION
TEST TARGET (MT-3)**





**IMAGE EVALUATION
TEST TARGET (MT-3)**



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1 MR. SMITH: That finishes my cross-examination.

2 CHAIRMAN GOODHOPE: Mr. Cleeton?

3 MR. CLEETON: I have two questions. One is on
4 page 7, having to do with -- the title is Inclusion of the
5 Water Area in Calculating Average Population Densities.

6 I will start with that one.

7 BY MR. CLEETON:

8 Q Would you explain how it is by including the water
9 area in calculating average population densities, that this
10 analysis results in a more realistic assessment of the true
11 population density in and near the Pilgrim site?

12 A You say you want me to explain how it is that by
13 including water --

14 Q No.

15 Well, that's part of -- in other words, the way this
16 is headed, it says inclusion of the water, and your analysis
17 is a critique of that.

18 And I use the word excluding. In other words, by
19 excluding the water in the calculations, is it a more
20 realistic assessment of the true population density in
21 and near the Pilgrim site?

22 A I clearly would have the same difficulty which the
23 Staff earlier had, saying what is the true density of the
24 population divided by the surface area is a true density.

25 Population divided by land area is also a true

1138 001

mm8

1 density, but it is a different density. It shows a different
2 thing.

3 The population divided by surface area is a
4 perfectly appropriate way of describing how many people are how
5 close to the site. And I actually don't object to that, only
6 argue that there is an additional description which is
7 population on the land.

8 And once again this comes to such issues as the
9 numbers of persons in close proximity, for example, who might
10 be within earshot of the warning system and therefore might
11 more easily be alerted by virtue of their being at higher
12 density, than their being at the theoretic density that you
13 arrive at by taking population and dividing by surface.

14 I think it is an issue that cuts two ways. It has
15 been suggested that for example evacuation speed is an inverse
16 function of density. To the degree that that's true my guess
17 is that that is true with respect to density on the land
18 rather than surface density.

19 It simply describes a different measure of what is
20 the place like, and it is useful to have that additional
21 measure of what is the place like. And it may argue that this
22 is a better site than what otherwise had been the case, or
23 it may argue that it is a worse site.

24 But it simply is a part of the description of
25 the site.

1138 002

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1 Q All right.

2 Now just one other question.

3 I think you have already explained -- and my
4 question is, on sector analyses, does this give a more
5 realistic or complete assessment of the true population
6 distribution in and near the Pilgrim site as related to
7 alternative sites?

8 A Adding a sectoral analysis clearly enables you to
9 better understand once again what is the peculiar nature of
10 this versus other sites.

11 For example, the report which I mentioned
12 earlier had been very useful to me in coming to understand
13 this field, prepared by Dr. Bunch, tabulated populations around
14 sites which had been nominated for approval; metropolitan
15 sites and densely populated sites.

16 He includes in that table not only the annular
17 population, but the population in the worst sector. And I
18 found that column showing the population in the worst sector
19 in fact to be very revealing. It adds a dimension to my
20 understanding of the site.

21 I can look at this and there are fourteen densely
22 populated sites which are tabulated by Dr. Bunch, and only one
23 of those fourteen densely populated sites has a
24 larger population in the worst sector than has Pilgrim.

25 That gives me a new understanding of what is this

mm10

1 Pilgrim site like?

2 If I take the Pilgrim site and I compare it based
3 on average density, it falls fairly low in that set.

4 Now how it is that as a decisionmaker I would balance
5 one sector which is clearly making possible a population
6 consequence or again, I should be careful, which is raising a
7 potential of population at risk in a sector which is very
8 large together with an overall density which is not unusually
9 large measured against other densely populated sites, I think
10 is a very complex question.

11 But the inclusion of that information allows a
12 more complete evaluation.

13 Just a very simple number. I can take one additional
14 step which took ten minutes with a pocket calculator, to see
15 what percentage of the total population is in that worst
16 sector. And I found that sites range from having -- if you
17 had a uniform site, theoretical site, and you had 6 percent,
18 6 1/2 or so in that one-sixteenth of the compass, none of the
19 sites are anywhere near that, they all start -- they start at
20 15 percent, the average is about 22 percent in the worst sector.
21 Pilgrim has about 35 percent in the worst sector.

22 That helps me understand what is the nature of
23 this thing and I can translate from that into a very real
24 consideration. And that is that the maximum size of population
25 for which I am going to have to provide emergency actions is

mm11 1 at Pilgrim quite large in relation to its overall density.

2 And that is useful for me to know in evaluating all
3 the other pieces. That information simply should be
4 available. Not just against these other fourteen sites, all of
5 which are history, but against whatever number of candidate
6 sites or alternative sites can realistically be considered in
7 this instance.

8 MR. CLEETON: Thank you.

POOR ORIGINAL

9 CHAIRMAN GOODHOPE: Mr. Wright?

10 Do you have any redirect?

11 MR. WRIGHT: Just a couple of minutes, Mr. Chairman.

12 REDIRECT EXAMINATION

13 BY MR. WRIGHT:

14 Q The last question Mr. Smith asked you, Professor
15 Herr, asked you whether you would say your understanding of
16 risk and that of the Staff's are the same.

17 You said no, and then were cut off.

18 Would you like to complete that statement?

19 A I can't remember the train of thought.

20 Q If you don't, it's all right. I just didn't
21 want to leave you cut off.

22 A Of course I will remember it as soon as I step out
23 the door.

24 MR. WRIGHT: I have no further questions,
25 Mr. Chairman.

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CHAIRMAN GOODHOPE: Dr. Callihan?

2

DR. CALLIHAN: Yes.

3

EXAMINATION BY THE BOARD

POOR ORIGINAL

4

BY DR. CALLIHAN:

5

Q I would like to turn, please, to your figure 1,

6

which is on page 3 of the testimony, and continue the

7

discussion of it, which has been rather extensive, I realize.

8

And ask what is the meaning of the caption at the bottom of

9

the page, Figure 2.3.

10

Figure 2.3 of what?

11

A That's figure 2.3 from the Safety Evaluation

12

Report.

13

Q Which of the editions, do you know?

14

A Which of the editions?

15

Q Which revision, which supplements and so forth?

16

A It will take me a moment.

17

Q This is Staff Safety Evaluation?

18

A Yes, sir, that's correct.

19

MR. SMITH: Mr. Chairman, it appears to be June '75,

20

this one.

21

MR. CLEETON: It is in his testimony.

22

CHAIRMAN GOODHOPE: It appears where?

23

THE WITNESS: June '75.

24

DR. CALLIHAN: June '75. Thank you.

25

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BY DR. CALLIHAN:

Q Your caption is Population Versus Guideline at the top of the page, and does the 1985 go with -- is that the date at which this -- is this the representation of the population in 1985?

A No, sir, the drawing is deficient, and I apologize for that. The intent of the drawing was to show the way in which, the rapidity with which the population density was approaching that of regulation guidelines and was meant to display the temporal -- the way in which the line shifted over time.

The two solid black lines, Residents Only Per SER and Residents Plus Weighted Seasonal Per SER, as noted on the previous page, are from the '75 report and reflect '72 population. That shows how we were in 1972.

And the dotted line with the arrow pointing approximately through it saying 2/79 Draft Supplement Table 1 is a reflection of 1985 population, and the dashed line labeled 500 People Per Square Mile is the Reg Guide 4.7 guideline for the first year of operation. And in this case that would be 1985.

Q There are three instances where a descriptive term is given, followed by an arrow. In each case the arrows don't terminate on the lines. Is that correct?

To be specific, near the left-hand margin

mpb2

1 two-thirds of the way from the bottom is the statement
2 "2/79 Draft Supplement Table 1".

3 Now explain what is indicated by that notation,
4 please?

5 A That arrow is supposed to point to the line which
6 is alternate circles and squares. It doesn't quite point to
7 it because the --

8 Q So that is a spacial distribution of the popula-
9 tion as taken from -- Taken from what?

10 A The draft supplement to the Final Environmental
11 Statement.

12 Q All right.

13 And similarly, in the upper right-hand corner
14 there are a couple of arrows that indicate points at the
15 moment.

16 A That's intended to bracket the two data points
17 on that same line, the one at 40 miles and the other at 50
18 miles. The draft supplement only provided data to 30 miles,
19 so we went to the next most current source which we had,
20 which was the PSAR, and we inserted those points at 40 and
21 50 miles from the PSAR.

22 The PAPSAR used 1980 and 1990, as I recall, as
23 their data. So we did an interpolation between those two
24 dates using the same exponential interpolation technique
25 which the Applicant has used. But the attempt was simply

1138 008

mpb3

1 in the last two data points. The only real data points are
2 the even ten miles; the ones past ten came from a second
3 source.

4 Q Thank you.

POOR ORIGINAL

5 On page 5, if I read correctly, you have a
6 weighting factor in the beginning of the only full paragraph
7 on that page. You have a weighting factor of -- to put it
8 in yesterday's terminology, .27 percent, correct? The
9 weighting factor for the tourists, if I read correctly.

10 A That's correct.

11 Q And the Staff has .33 percent, with which I'm
12 not quarreling. I'm just being sure of the identity.

13 A I believe that simply comes from the reciprocal
14 of 365, if memory serves me right.

15 Q Okay.

16 This assumes a one day visitation.

17 A That's right.

18 Q Thank you very much.

19 CHAIRMAN GOODHOPE: Dr. Cole?

20 DR. COLE: Just a couple of questions, Prof. Herr.

21 BY DR. COLE:

22 Q On page 4, the second paragraph, could you
23 explain to me your -- the basis for I guess it's a one-
24 sentence paragraph.

25 Could you explain to me the basis for that

1138 009

mpb4

1 statement, sir? Particularly with respect to the population
2 density being the exclusive device for determining whether
3 the Class 9 analysis is warranted.

4 A I think it's been made abundantly clear that
5 I'm not an expert on either the regulations or the regulatory
6 guides. My understanding of the regulatory guide calls for
7 consideration of special circumstances when population density
8 per square mile exceeds 500 persons per square mile. And
9 it's not in that guide, but if I understand correctly the
10 practice of this has on occasion -- and this was discussed
11 earlier today -- on limited occasions entailed as a part of
12 that special analysis a Class 9 accident analysis.

13 If that's the basis of that statement, that's
14 my understanding of the way in which those analyses have or
15 have not been called for was that it was the trip level of
16 500 persons per square mile which triggered the possibility
17 of that being called for based on the precedent of previous
18 cases.

19 Q All right, sir.

20 One of the points you made today, and one of the
21 principal points of your paper, which I thought you made
22 rather well, was that the Staff should do something more
23 with respect to alternate sites than just the annular popula-
24 tion data.

25 A Yes.

1138 010

mpb5

1 Q And specifically you mentioned they should
2 provide radial sector data.

3 Would you go, then, further and say that that
4 would have to be coupled with meteorological data in order
5 to make it even more reasonable?

6 A No -- yes and no. The meteorological data is
7 not germane to an analysis of the maximum population which
8 might be at risk. That maximum might be at risk regardless
9 of whether that's a wind direction which is common or not
10 common. Where the meteorological data would seem to me to be
11 more useful in fact is as an adjunct to the -- what I've been
12 referring to as expected value analysis, where you could
13 refine that expected value analysis by weighting sectors
14 by the frequency of occurrence of wind in those sectors.

15 But as far as analyzing maximum population at
16 risk, I don't -- and again, more information is always
17 useful, but it doesn't seem to me that it's salient to have
18 that and it doesn't seem to me that the cost and difficulty
19 of collecting site specific meteorological data should
20 prevent one from doing the easy thing, relatively easy
21 thing, which is simply collecting numbers of people by radial
22 sector.

23 Q All right, sir. I understand your point on that.

24 You talked about special site characteristics of
25 the Pilgrim 2 site and identified the seasonal variations and

mpb6

1 the spatial allocation, spatial differences.

2 Did you look at or get an opportunity and did in
3 fact look at any of the other alternate sites that were
4 proposed for Pilgrim Unit 2 with the thought in mind of
5 identifying any special site characteristics?

6 A Not in a systematic way. I'm familiar with, I
7 guess, at least generally, all of those sites and very familiar
8 with several of them. So I'm aware of some of their particular
9 site characteristics, peculiar site characteristics. But I
10 didn't do anything systematic with respect to them because
11 it seemed beyond the scope of what Commonwealth was called
12 out to do at this point.

13 Q So you did not make any study to determine whether
14 they might in fact have some of the same deficiencies that
15 Pilgrim Unit 2 might have?

16 A That's correct.

17 Q All right, sir.

18 On page 7, just a small point here, sir. On line
19 7 you have the end of a sentence where there are the words
20 "...used by UC&E." Is that United Engineers and
21 Constructors, UE&C?

22 ? You're on page 7?

23 Q Yes.

24 A Is that the old draft or the new draft?

25 Q I think it's the same way on both drafts, UC&E.

POOR ORIGINAL

POOR ORIGINAL

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mpb7

1 A Yes. Those are the people to whom I refer --
2 oh, I see it. There it is.

3 Yes, it should be UE&C.

4 Q All right, sir.

5 Then you are referring to United Engineers and
6 Constructors? Or to what does that refer?

7 A It refers to the Applicant's consultant, and I
8 don't recall his name. If it is in fact United Engineers
9 and Contractors, then those should be reversed.

10 It was intended as a reference to the Applicant's
11 consultant.

12 Q All right, sir. Thank you.

13 On the bottom of page 7 you refer to Priscille
14 Beach and White Horse Beach, and in the footnote you indi-
15 cate a summertime density of 20,000 persons per square mile.

16 Do you recall what the total number of persons
17 involved in that calculation were, sir? What is the popula-
18 tion of Priscille Beach and White Horse Beach?

19 A I don't recall it. I would have to go back through
20 notes to replicate it. I'm sorry, I can't do it extemporaneous-
21 ly.

22 Q Offhand you don't know how many square miles were
23 involved in the calculation?

24 A I'm sorry, no, sir.

25 Q All right.

1138 013

mpb3

1 At the bottom of page 9 you talk about the
2 special site characteristics of the Rocky Point site. Am
3 I correct that the special site characteristics that you
4 are referring to are the temporal and spatial characteristics,
5 and if that's not so, what special site characteristics?

6 A In that context on page 9 these are indeed the
7 only special site characteristics to which we were referring.

8 Once again, it's my view that there are other
9 special site characteristics which bore consideration in
10 choosing among alternative sites having to do with topology
11 and the fact that some folks have to come closer to the site
12 in order to move away from it, and having to do with the
13 nature of the road network in relation to this station.

14 But in this context I wasn't referring to those
15 latter two things.

16 Q All right.

17 You used the term "risk neutral" --

18 A Yes.

19 Q -- on wind direction and temporal considerations.

20 A Yes.

21 Q I think I know what you mean by that. Could you
22 explain that, sir?

23 A It's the jargon of my field, I'm afraid.

24 Q We have it quite a bit in ours too, sir.

25 A Okay.

mpb9

1 A person who is risk neutral would not, given a
2 choice between two situations, one in which he has a 50-50
3 chance of winning \$100 versus a 50-50 chance of -- I can't
4 make the numbers come out right--- losing \$400, he'd say a
5 50-50 chance of winning -- I'm sorry, \$1000 is worth \$500 to
6 me as a probable benefit of that, of the 50-50 chance of
7 losing \$400 is a cost of 200. I subtract the 200 from the
8 500 and I get \$300. Therefore it's worth paying \$300 to
9 get the opportunity to play that game.

10 That person who would do that would be risk
11 neutral. Some people like myself are cowards and afraid of
12 things like that, and we might say 'I can't afford to lose
13 \$400. If I win 1000 I'll probably just waste it. So being
14 risk averse, I won't take that, I won't pay \$300 for a 50-50
15 chance of winning 1000 and a 50-50 chance of losing 400.'

16 And in terms of utility theory, what people are
17 arguing is that that's true for virtually everyone with the
18 exception of a few people who make the gambling business work,
19 and that for most of us in fact winning an extra dollar is
20 not worth as much as losing a dollar.

21 Now there is evidence in work by Farrar and
22 Slessen that the operations research center at MIT for
23 example that indicates if you examine accident experience
24 that our society is risk averse. It is not risk neutral.
25 If you just think about the chance occurrence of disasters,

mpbl0 1 whether they're natural disasters or transportation disasters
2 or building disasters or other disasters involving man-made
3 facilities, that if you write an equation to express the
4 probability of those things occurring that what you would
5 expect is an equation which has a square function in it.

6 When you look at natural disasters they in fact
7 substantially occur with that kind of a frequency, that is
8 the larger ones are infrequent, the smaller ones are more
9 frequent. And when you pin a line to it it's some square
10 function.

11 When you look at the disasters which involve
12 airplanes and trains and mines and buildings, what you find
13 is that in fact it's a cubic relationship with great consistency
14 and great consistency among those classes of accidents. And
15 what they point out is that what's true is that our society
16 doesn't behave as if it were risk neutral; it behaves as if
17 it were risk averse.

18 The DC-10 accident which caused our society
19 great grieving has caused now probably the DC-10 to be
20 emerging as one of the safest means of travel. It once
21 again illustrates how badly we feel about big accidents.

22 The same weekend the DC-10 accident occurred an
23 approximately commensurate number of people were killed in
24 automobile accidents, in which we're doing something, but
25 nothing very large. We demand more safety for the 747 than

mpb11

1 we do of the 707. We demand more safety in a bus than we do
2 in an automobile. We demand more safety for a large building
3 than a small building.

4 The expected value of an accident claiming a
5 life given the way in which our society behaves is lower in
6 elements involving large numbers than it is in elements
7 involving smaller ones.

8 There's a certain amount of -- not a large
9 amount -- a certain amount of a theory around why our
10 society is risk averse, but I'm aware of no one who's arguing
11 that it is not. And in fact in the Rasmussen Report it was
12 pointed out that one of the considerations of the nuclear
13 industry is that our society is -- there's a quote I could
14 pull out in which the authors point out that our society
15 clearly is more averse to large accidents at low probability
16 than it is to small accidents with a high probability.

17 1000 persons killed is not equivalent to ten
18 accidents each killing 100 or 1000 accidents each killing
19 ten. They are not equivalent.

20 And therefore two sites, one of which has a whole
21 lot of people in one sector and the other which distributes
22 them uniformly are, from the point of view of risk, not
23 equivalent because we are risk averse.

24 Q I understand your point, sir. Thank you.

25 DR. COLE: I have no further questions.

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DR. CALLIHAN: I have one, if I may return with
apology.

BY DR. CALLIHAN:

Q In your testimony, particularly on page 4,
you make reference to United Engineers and Constructors'
growth rate, estimated growth rate two percent per year. And
in a footnote you make a statement that two percent growth
rate per year is a sizeable thing, really.

A Yes.

Q And do you indicate by that that the study made
of this area is an overestimate?

david flws

POOR ORIGINAL

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take 16

A Yes, sir; I wouldn't argue that. I think once again that was a gratuitous, contextual addition; when people look at an annual rate like 2 percent and say that is very, very small -- that's a very conservative assumption -- in reality that's very high. It isn't an assumption. It's an analysis.

We did review it; we used independent sources. We're not quarreling with the basic growth rate they projected. I'm not arguing it's too high.

Just by way of context it is not too high, but it is a very substantial growth rate. Southeastern Massachusetts is a very rapidly growing region.

DR. CALLIHAN: Thank you.

MR. LEWALD: I have one more question, if I may.

CROSS ON BOARD EXAMINATION

BY MR. LEWALD:

Q Could I put this hypothetical to you, doctor?
Assuming the site and the site environment has five permanent residents throughout the year and 20,000 visitors which all come on one day; that's site A.

And then take site B, which has 20,000 permanent residents and five visitors during the year and they all come on one day.

Are these sites equal insofar as the maximum risk to the population? Is that the way you look at this?

1138 019

david2

A If I remember your numbers correctly --

MR. WRIGHT: Mr. Chairman, it's my understanding of the rules of this proceeding that questions can occur after the board has asked questions only based on the board's questions.

I don't think Mr. Lewald's question qualifies for that.

MR. LEWALD: I think this did arise from questions asked by the board.

CHAIRMAN GOODHOPE: If you object to it, it's overruled.

Go ahead: do you understand the question?

THE WITNESS: In one case we have five year around residents and 20,000 day visitors and in the other --

CHAIRMAN GOODHOPE: All in one day.

THE WITNESS: All on one day. And in the other instance, we have 20,000 people who are living there year around and five people who come and visit on one day.

And do those both expose the same maximum population at risk?

MR. LEWALD: Yes.

THE WITNESS: The answer to that would be yes.

MR. LEWALD: Thank you.

CHAIRMAN GOODHOPE: Anything further?

MR. SMITH: I have one.

1138 020

POOR ORIGINAL

david3

BY MR. SMITH:

Q Professor Herr, in response to a board question, my understanding is what you would want for alternative sites is the sectoral analysis for the proposed sites and all alternatives; is that correct?

A Sectoral analysis and unweighted population.

Q Okay.

And that's all you want? And --

A That's the thrust of what we're saying today, Yes, sir.

Q It's my understanding you look at that and based on that decision alone, it's one input?

A Yes, yes.

Q You don't want to see meteorology?

A We'd love to see meteorology, but I don't think that prerequisite to the other being useful.

Q What is the use, then, of seeing the large numbers, just the fact that they are large numbers? That in and of itself is important?

A Sure it is, because that's useful for assessing the magnitude of effort which may be involved in making emergency preparations and in assessing adequacy of insurance arrangements and in assessing how big a chance am I taking, how much -- once again, to use the gambling analog, am I going to bet the house.

MR. SMITH: One moment, please.

1138 021

david4

(Pause.)

BY MR. SMITH:

Q In this sectoral analysis, do you also want to know where the population is located with regard to distance from the site?

A Can I give a layman's answer --

Q No, you --

A The answer would be yes. I would very much like to see that, although I don't understand it all. I surely believe that folks who are close to the site are in a different circumstance relative to hazard rather than people who are further away. So, like yourselves, I would one way or the other give greater consideration to people who are close in. So, yes, what for demographic analysis would be useful would be the kind of format that is now developed in the PSAR; it's reflected in the SER; it's reflected in the ER, which is the population growth and the population growth by distance.

It's been incredibly vexing; in order to get the population within a range, I'd have to subtract the outer ring from -- you know -- the other to get the difference, and be utterly unable to disentangle seasonal from year around once they've been weighted and summed.

So, you know, if I was able to write the specs for what would ideally be provided, it would be each of those pieces separately.

1138 022

david5

MR. SMITH: Excuse me a moment.

That's all the questions I have.

CHAIRMAN GOODHOPE: Thank you for being here,
Professor Herr. You're excused.

(Witness excused.)

What have we for tomorrow? Because we're going
to adjourn now.

Is there anything for tomorrow morning?

MR. SMITH: We would like to put in our rebuttal
testimony.

CHAIRMAN GOODHOPE: Well, we only have -- it's
4:30 and the manager has been patient here.

MR. SMITH: I'm wondering if there's cross
examination --

CHAIRMAN GOODHOPE: Of whom?

MR. WRIGHT: There'll be some, that's the problem.

CHAIRMAN GOODHOPE: Oh.

MR. SMITH: We'll wait until tomorrow, because
there will be cross.

CHAIRMAN GOODHOPE: All right.

MR. WRIGHT: Mr. Chairman, apparently this is the
only thing that is left here. This rebuttal testimony and --
it's a shame to bring everybody back here just for what I
intend to be some very brief cross examination.

Under the circumstances, I will waive the cross
examination.

david6

CHAIRMAN GOODHOPE: All right.

MR. SMITH: I would like to stipulate it into the record and have it bound and I'll give the requisite copies to the reporter.

CHAIRMAN GOODHOPE: All right, the staff's rebuttal testimony to Phillip Herr will be bound to the end of today's transcript.

Mr. Lewald, do you have any comment on it? Did you have any cross?

POOR ORIGINAL

MR. LEWALD: We had no cross on the staff's rebuttal testimony. No further cross of the witness.

CHAIRMAN GOODHOPE: All right. It'll be bound in at the end of today's transcript as testimony.

MR. SMITH: All right, I'm just trying to think of all the procedures. That's fine.

CHAIRMAN GOODHOPE: Is that what you want?

MR. SMITH: The witnesses are under oath, there's no problem with this. I was just thinking in my mind whether there is any evidentiary problems. I don't think there are. The witnesses are under oath, it's been accepted. Fine.

CHAIRMAN GOODHOPE: Well, they're here to testify and will be here in the morning. That's the record. Well, that's it.

MR. SMITH: If we're binding it in, we don't have to come here tomorrow.

david7

CHAIRMAN GOODHOPE: That's what I understand. We're all through at this point. Now is there anything else, besides the testimony? The rebuttal testimony, that anybody has that will be presented tomorrow?

(No response)

CHAIRMAN GOODHOPE: Nobody has any then, so.

MR. LEWALD: The only thing we would like to present that we can do by way of writing is the briefing schedule. If the board would entertain such, but we can do that in writing rather than --

CHAIRMAN GOODHOPE: You're talking of presentation of proposed findings?

MR. LEWALD: Yes, sir.

(Board conferring)

CHAIRMAN GOODHOPE: Let's discuss that after we get off the record. The hearing will be adjourned subject to notice of the board.

(Whereupon, at 4:52 p.m., the hearing was adjourned subject to the call of the chair.)

1138 025

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

BOSTON EDISON COMPANY, et al.

(Pilgrim Nuclear Generating Station,
Unit 2)

}
}
}
}
Docket No. 50-471

REBUTTAL TESTIMONY TO PHILIP B. HERR,
ASSOCIATE PROFESSOR OF CITY PLANNING, MIT

By
Falk Kantor and Leonard Soffer
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

1138 026

1 Q. Have you read the Testimony of Philip B. Herr on Pilgrim 2 population
2 density and other site characteristics?

3 A. Yes, we have.

4 Q. Do you have any general comments to make regarding Professor Herr's
5 testimony?

6 A. (Mr. Kantor and Mr. Soffer)* Yes. We believe that Professor Herr's
7 testimony is very similar to the comments upon the Draft Supplement made
8 by the Commonwealth of Massachusetts (See pages A-16 through A-30 of the
9 Final Supplement to the FES). We therefore believe that the Staff responses
10 to these comments which appear on pages 5-6 through 5-11, inclusive, of
11 the Final Supplement apply to much of Professor Herr's testimony as well.

12 Q. Professor Herr has given his interpretation of NRC siting policy on
13 pages 1 and 2 of his testimony. Do you have any comments to make in this
14 regard?

15 A. Professor Herr's interpretation of NRC siting policy is not totally
16 accurate or complete. The NRC relies primarily on a defense-in-depth
17 approach to protect the public health and safety. Siting is one element
18 in this approach. Nuclear power plants are required to be sited, designed,
19 constructed, and operated on the basis of conservative application of
20 sound and accepted engineering principles, on requirements of multiple
21 and redundant safety systems, and on a set of regulatory requirements that
22 are updated to reflect operating experience. The designers, builders, and
23 operators of these plants are required to have effective quality assurance
24 programs and their work is subjected to a continuing licensing and

* The responses to these questions are joint responses of Mr. Kantor and
- Mr. Soffer unless otherwise indicated.

1 inspection process by the NRC. However, even though the probability of
2 large accidents is very small, there remains some residual risk and the
3 residual risk to a surrounding population is higher when the proposed site
4 is in an area of relatively high population. Therefore the Commission
5 has had a consistent and long-standing policy of encouraging the siting
6 of reactors away from densely populated centers. As a further protective
7 measure, the Commission requires that emergency plans be developed which
8 provide reasonable assurance that appropriate measures can and will be
9 taken to reduce individual and population exposures in the event of an
10 accidental release of radioactive material.

11 Professor Herr has alleged that "emergency off-site measures will obviously
12 be far more effective in sparsely populated areas." This statement is in-
13 correct in two ways. First, Part 100.3(b) points out that "whether a specific
14 number of people can, for example, be evacuated from a specific area, or in-
15 structed to take shelter, on a timely basis will depend on many factors such
16 as location, number and size of highways, scope and extent of advance planning,
17 and actual distribution of residents within the area." Second, it does not
18 conform to historical experience. The results of Ref. 1 have indicated that
19 evacuation has usually been accomplished more quickly in a relatively
20 densely populated area.

21 Professor Herr also states that "careful evaluation of the size and dis-
22 tribution of the population surrounding the reactor appears to have emerged
23 as the NRC's primary means of ensuring that the consequences of any acci-
24 dent more severe than design-basis events are mitigated as much as possible."

Ref. 1. "Evacuation Risks - An Evaluation," EPA-520/6-74-002.

1 This is not entirely correct. Requiring that nuclear power plants be
2 located away from densely populated centers as well as requiring that
3 emergency plans be developed both function as means of keeping the con-
4 sequences of accidents beyond the design basis low.

5 Q. In section II of his testimony, from page 2 to page 8, Professor
6 Herr makes the general statement that the methodology used by the Staff
7 and the Applicant has relied upon "techniques that tend to understate
8 the final figures and obscure risk potential in the area surrounding the
9 Rocky Point site." What comments do you have to make in response to
10 this?

11 A. In this section, Professor Herr appears to fault the Staff methodology
12 in three areas: treatment of daily recreational visitors, time weighting
13 of transients, and inclusion of the water area in calculating the average
14 population density. We will respond to each of these.

15 First, as discussed in Appendix B of the Final Supplement to the FES, the
16 guidance given in Regulatory Guide 4.7 was followed in determining the
17 cumulative population densities for the area surrounding the proposed Rocky
18 Point site and each of the alternative sites. This guide indicates how
19 transients and water area around a site should be treated. However, as Re-
20 gulatory Guide 4.7 is silent on the matter of comparing the population dis-
21 tribution of an alternative site to that of the proposed site, we developed
22 additional guidance for use in alternative site evaluations which is also
23 discussed in Appendix B of the Final Supplement to the FES.

24

1 Second, daily recreational visitors as well as seasonal residents weighted
2 to reflect their occupancy on an annual basis were included in the popu-
3 lation total for the Rocky Point site. This is indicated in Section 4.1,
4 page 4-2, of the Final Supplement (Section 4.1, page 30, of the Draft
5 Supplement) and discussed in more detail in pages 5-8 and 5-9 of the Final
6 Supplement in our response to the comments of the Commonwealth of Massa-
7 chusetts. As stated in our response, the number of visitors to the Ply-
8 mouth historical sites and environs was projected to be 942,000 in 1985
9 and 1,598,000 in 2020. These population values were weighted by a factor
10 of 0.0033 (approximately one day per year occupancy) and included in the
11 total population estimate.

12 Third, the comments made by Professor Herr in regard to weighting of tran-
13 sients are similar to comments made by the Commonwealth of Massachusetts to
14 which we responded in the Final Supplement. As discussed in our response
15 in Section 5.23 of the Final Supplement, transient populations; i.e.,
16 seasonal residents and daily visitors, are weighted according to the fraction
17 of time, on an annual basis, they are expected to be present. This is in
18 accordance with the guidance of Regulatory Guide 4.7 and, in effect, provides
19 an annual average of the population surrounding the site. The weighting of
20 transients is in keeping with the objective of an environmental review of
21 reaching a decision based on a realistic assessment of all factors rather
22 than on a worst-case analysis. An evaluation of the annual average popu-
23 lation distributions in an alternative site review provides the basis for
24 the staff's judgment as to whether an alternative site is preferable,

1 from a population standpoint, to a proposed site. However, it is impor-
2 tant to distinguish between an alternative site study and emergency planning.
3 For emergency planning purposes, the actual time-dependent population
4 patterns including the peak transient populations are considered in the
5 development of the plans along with other site specific information such
6 as the availability and character of local evacuation routes. Pro-
7 fessor Herr has failed to make the distinction between an alternative
8 site study and emergency planning.

9 Professor Herr's comment with respect to inclusion of the water area in
10 obtaining the average population density is similar to comments made by
11 the Commonwealth of Massachusetts. In our response to Section 5.23 of
12 the Final Supplement, we indicated that the staff's consideration of
13 land and water areas in determining the population density at a radial
14 distance from a coastal site is consistent with the staff's concept of a
15 risk analysis as employed in evaluating alternative sites. A basic assump-
16 tion in this approach is that typical coastal meteorology exists and that
17 roughly half the time the wind is blowing offshore. An examination of 2
18 onsite meteorological data for the Rocky Point site indicates that this
19 is the case. To use only the land area in determining the population
20 density in an alternative site review, as Professor Herr would have us
21 do, would weigh against coastal sites in comparison with inland sites and
22 discount a distinct advantage of coastal sites in that no people are at
23 risk on one side of the site. (See responses below for further discussion
24 of staff methodology.) Again, it must be emphasized that for emergency

1 | planning purposes the actual distribution of population is considered
2 | rather than the average populations used in alternative site comparison

3 | Q. Do you have any other comments in regard to this section?

4 | A. Yes, there is a plotting error in Professor Herr's representation
5 | of the 1985 cumulative population for the Pilgrim site in Figure 1 of his
6 | testimony. The 1985 cumulative population between 0 and 5 miles is higher than
7 | depicted by Professor Herr. However, the 1985 cumulative population is still
8 | below the 500 people per square mile curve as indicated by Professor Herr.

9 | Q. Professor Herr has commented on page 8 that "there is no explicit
10 | discussion in the staff's Draft Supplement dealing with comparison between
11 | sites regarding the maximum number of persons potentially at risk in the
12 | even of a major accident." What is your response to this?

13 | A. The staff has observed (see page 5-10 of the Final Supplement to
14 | the FES) that an annual average population is appropriate in order to
15 | make a realistic overall assessment of the environmental risk associated
16 | with a site. The staff also noted that for emergency planning considera-
17 | tions plans must be shown to be compatible with the maximum number of
18 | persons that might be in the vicinity.

19 | The Commission has proposed amending its regulations regarding Emergency
20 | Planning (Appendix E to 10 C.F.R. Part 50). In the notice that accom-
21 | panied the proposed Amendment and which appeared in the Federal Register
22 | (FR, page 37473, August 23, 1978), the Commission noted in the Supple-
23 | mentary Information that:

24 | The principal aspects of the NRC staff review for

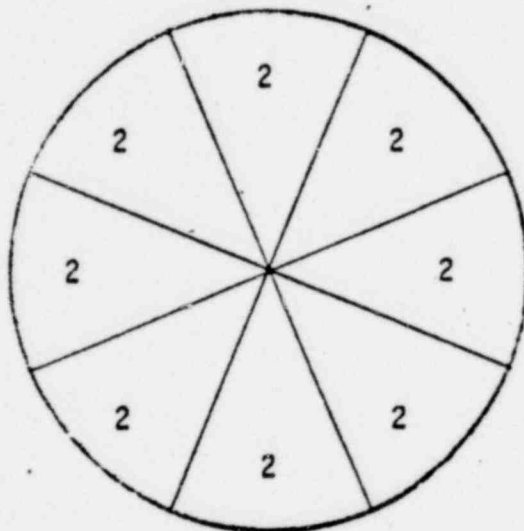
1 emergency planning includes the protections of persons
2 within the exclusion area, the onsite emergency response
3 organization, the protection of the public beyond the
4 exclusion area and the connection between the facilities
5 plan and that of the offsite emergency response organi-
6 zation consisting of local, State and Federal agencies.
7 These reviews are part of the safety review of each
8 application. These matters may also be considered in
9 identifying any potential emergency planning advan-
10 tages or disadvantages of particular sites as part of
11 the NEPA cost/benefit analysis of alternate sites.

12 The staff has therefore prepared an analysis with the objective of iden-
13 tifying "any potential emergency planning advantages or disadvantages
14 of particular sites." This analysis will be presented as a separate piece
15 of supplemental testimony at a later time in this proceeding, and will
16 consider the maximum number of persons in the vicinity of each of the
17 sites.

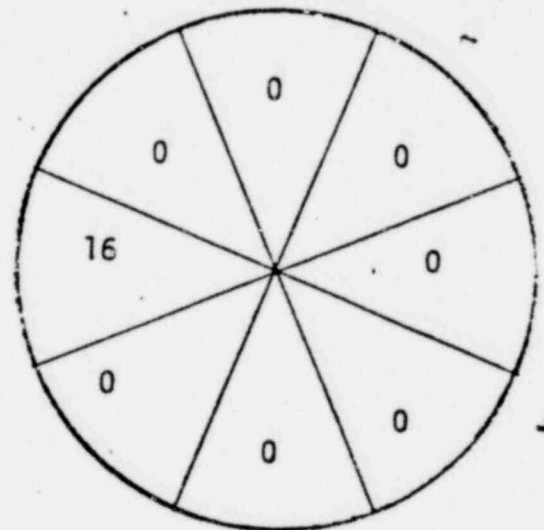
18 Q. In order to illustrate the difference between the staff's "expected
19 value" analysis and his "maximum risk" analysis, Professor Herr has pre-
20 sented an example in Figure 2 of his testimony of two hypothetical sites
21 having equal numbers of population but different spatial configuration.
22 Do you have any comments on this illustration?

23 A. Professor Herr has shown two hypothetical sites, one with the popu-
24 lation uniformly distributed (Site A) and one with all of the population

1 concentrated in one western section (Site B). Professor Herr states that
2 the population risk would be identical in both cases using the staff's
3 method but in actuality the "maximum risk" is much greater for Site B in
4 the event of a major accident coupled with a westward wind.
5 We believe Professor Herr has confused risk with worst case consequences
6 and that his example can be used to illustrate the difference between risk
7 as defined by the staff (probability times consequences) and risk as en-
8 visioned by Professor Herr. For reference, the two hypothetical sites
9 are show below.



SITE A
POPULATION = 16



SITE B
POPULATION = 16

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22 In Site A we have placed two units of population in each of eight sectors;
23 i.e., distributed the population uniformly. In Site B we have placed
24 all 16 units of population in one western sector. (We have changed the

1 population values slightly from Professor Herr's example for ease of com-
2 putation but basically our example is identical to Professor Herr's.)
3 Now let us assume that (1) the probability of an accident occurring is
4 the same at both sites, (2) the population is all located at the same dis-
5 tance from the reactor, (3) the wind is uniformly distributed at both sites,
6 and (4) all other factors are equal. In our evaluation we would say that
7 the risk of exposure to the population is equivalent at both sites. This
8 can be shown mathematically as follows:

9
10 Risk = Probability x Consequences

11 where probability is represented by the annual frequency the wind blows
12 toward a given sector (1/8 or .125) and consequences are represented by
13 the number of people in a given sector. For Site A, summing over all
14 eight sectors:

15 Risk A = (.125)(2) + (.125)(2) + (.125)(2) + (.125)(2) + (.125)(2) +
16 (.125)(2) + (.125)(2) + (.125)(2)

17 Risk A = 2

18
19 For Site B, summing over all eight sectors:

20 Risk B = (.125)(16) + (.125)(0) + (.125)(0) + (.125)(0) + (.125)(0) +
21 (.125)(0) + (.125)(0) + (.125)(0)

22 Risk B = 2

23 Therefore, the risk to the population of a serious accident at the two
24 sites, as defined by the staff, is equal.

1 Professor Herr would say that the "maximum risk" of an accident, assuming
2 a westward wind, is much greater at Site B ($.125 \times 16 = 2$) than it is
3 at Site A ($.125 \times 2 = .250$). We submit that what Professor Herr has illus-
4 trated is that the consequences at Site B would be much worse than at
5 Site A if the accident occurred with a westward wind. In this regard,
6 we agree with Professor Herr. However, the risk, as we have demonstrated,
7 is the same at both Sites A and B. The risk at Site B would only be
8 much greater than at Site A if the wind blew toward the population con-
9 centration sector with a much greater frequency of occurrence than toward
10 the other seven sectors.

11 Q. Professor Herr states that the population distribution around the
12 Rocky Point site is extraordinarily uneven by radial sector and that in
13 some sectors (e.g., the northwest and southeast sectors) the population
14 density is nearly four times higher than the population density guideline
15 values given in Regulatory Guide 4.7. Is this a proper application of the
16 population density guidelines?

17 A. No. The population density guideline values given in Regulatory Guide ³
18 4.7 are intended to be used in conjunction with cumulative population density,
19 that is, average population density. They are not to be used to draw
20 conclusions regarding individual high population density sectors. The
21 staff was aware in the development of the population guidelines that there
22 would be sectors or concentrations of population within the radius of
23 interest that would have much higher densities than the average. If the
24 objective was to examine the populations in these high density pockets,

1 different guideline criteria would have been developed.

2 Professor Herr also states that the consequences of a major accident in
3 the summertime with a wind toward the southeast would be to place at
4 risk a population more than double the population indicated by the guide-
5 line values of Regulatory Guide 4.7. We would like to reiterate that the
6 population density guideline values of the guide are not intended to be used
7 for emergency planning purposes and that in developing emergency response
8 procedures the actual population distribution is used.

9 Q. Professor Herr has discussed traffic problems associated with a
10 possible evacuation of the area around the plant together with a possible
11 evacuation of Cape Cod. Do you have any comments?

12 A. Yes, but they will be set forth in the Staff's testimony relating
13 to emergency planning.

14 Q. Does this complete your testimony?

15 A. Yes.

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