NUCLEAR REGULATORY COMMISSION

ORIGINAL

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	:	
	:	
PHILADELPHIA ELECTRIC COMPANY	:	
	:	DOCKET NO. 50-352 OL
(Limerick Generating Station	:	50-353 OL
Units 1 and 2)	:	

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AT: Bethesda, Maryland

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UNITED STATES OF AMERICA

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Fifth Floor Conference Room

4350 East-West Highway

Bethesda, Maryland

Wednesday, October 20, 1982

The hearing in the above-entitled matter convened, pursuant to notice, at 8:30 a.m.

BEFORE:

LAWRENCE BRENNER, Chairman
Administrative Judge

RICHARD F. COLE, Member
Administrative Judge

PETER A. MORRIS, Member
Administrative Judge

APPEARANCES:

On behalf of Applicant,
Philadelphia Electric Company:
TROY B. CONNER, JR., Esq.
MARK JAMES WETTERHAHN, Esq.
Conner & Wetterhahn
1747 Pennsylvania Ave., N.W.
Washington, D.C. 20026

On behalf of the Regulatory Staff:
ANN P. HODGDON, Esq.
JOSEPH RUTBERG, Esq.
Washington, D.C.

On behalf of Intervenor,
Del-Aware Unlimited, Inc.:
ROBERT SUGARMAN, Esq.
Sugarman & Denworth
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Suite 570
121 South Broad Street
Philadelphia, Pa. 19107

CONTENTS

EXHIBITS

RECESSES:

Morning - 2577
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P R O C E E D I N G S

JUDGE BRENNER: We are ready to begin.

Mr. Sugarman, yesterday we marked for identification Del-Aware Exhibits 15 and 16. Since they are each just a few pages, I would like to bind them in for convenience today, in addition to the three copies for the official file. So the reporter will need a total of four copies and at least one copy before his pickup person picks up his stuff. So if somebody has one copy of each, I would like to get it to the reporter right now.

(The documents referred to, previously marked Del-Aware Exhibits 15 and 16 for identification, follow:)

MECHANICAL ENGINEERING DIVISION
N2-1 - 2301 Market Street

5-14-82

INSERT #1

MEMORANDUM

Subject: Point Pleasant Project
Limerick Generating Station

A meeting was held May 12, 1982, in the Neshaminy Water Resources Authority offices to discuss the status of the Point Pleasant project. Attending was: R. A. Flowers-NWRA, E. H. Bourquard and J. J. Powers-EHB and W. E. Dickinson-PECo.

The meeting was called by Mr. Flowers, who is most anxious to have final design of facilities completed and specifications issued for bidding. Items discussed are outlined below.

1. The possible effects on Point Pleasant design and schedule of the May 7, Public Utility Commission's directive were of major concern when the meeting was arranged. However, Mr. Flowers had received a copy of the PECo. press release issued the morning of the meeting and [illegible]hat cancellation or suspension of construction of Limerick No. 2 will bring no change. He was satisfied with the PECo. statement and had already based his responses to several newspaper reporters on the release. He also had informed the Bucks County Commissioners that PECo. would not be making any capacity changes or reducing its financial backing.

2. Several newspaper reporters had called and asked about the cost of the facilities being shared with PECo. Mr. Flowers quoted $10 to $12 million as the total current costs.

3. Mr. Flowers was pleased with the PECo. position in light of the PUC directive. He had read a copy of the directive and was unclear about item 3 which states that should PECo. only suspend construction, the PUC shall deny recovery of AFUDC on any additional investment in Unit No. 2. He felt this clause could cause PECo. to request a major capacity change in the Point Pleasant size. Mr. Flowers offered to contact Harrisburg officials in an attempt to clarify or reword this item if he was asked by PECo. to do so.

4. Mr. Flowers said that at present two Bucks County Commisioners still support the Point Pleasant project, but that as the opposition's pressure increases and as election time approaches their commitment may decrease. He therefore desires to issue specifications as soon as possible. The completion of final design is quite urgent.

5. Final design and specifications are scheduled for completion about June 15 according to E. H. Bourquad. Completion had been expected earlier but PECo. requests for reviews, studies and changes of design delayed work. Mr. Bourquad listed the following items as most time consuming.

Plans 15

D-35

a) Change from dual electric service to single service. This has already taken two weeks and may require more delay. It was necessary to review the use of VFD equipment and to relocate present equipment in the pumphouse to accomodate the VFD. Numerous on-site electric changes were necessary due to the change to single feed.

b) Studies and changes in HVAC. Drawings had essentially been completed but PECo.'s request to eliminate much ductwork caused a delay. PECo. also requested an independent review of the HVAC design which resulted in lost time.

c) Review of the need for an emergency diesel-generator consumed some extra time. It was Bourquad's opinion that the set is necessary but PECo. still questions that decision.

Mr. Flowers was very emphatic that completion of design is critical and stressed that no further changes shall be made unless the present design is definitely unworkable. No changes shall be studied or requested solely as a cost saving measure. Design is frozen.

6. Design shall continue on a basis of a 95MGD ultimate capacity but to be prepared for questions of the opposition, two reviews shall be undertaken.

a) F. H. Bourquad shall estimate the cost of the Point Pleasant facilities designed for a 72 MGD capacity. Included shall be the cost of redesign engineering effort and the time delay involved to redesign.

b) PECo. shall review the alternative water sources and determine if any alternative to Point Pleasant is now practical due to a reduced need of water. Alternatives shall include the use of the natural river flow, groundwater and upstream reservoirs.

7. Mr. Flowers responded to my inquiry concerning his response to Bruce E. Stewart's (Executive Director of NWRA) March 30 letter by saying that he had not had time to gather the requested information. He further stated that he intended to invite Mr. Stewart to the NWRA office to review existing material in the near future. I offered PECo.'s assistance in supplying the information but Mr. Flowers asked for us to wait until after he meets with Stewart.

Mr. Flowers expressed his disappointment that PECo. had not advised him of our interest in having the NWRA help in a public information program on behalf of Point Pleasant. If he had known of PECo.'s interest he may have acted more positively.

8. Mr. Flowers discussed the upcoming primary election battle in the Bucks County's 143th District for the Republican nomination to the State Legislature. Incumbent James C. Greenwood, 31 years old of Point Pleasant, has the endorsement of the party but is opposed by a conservative, former Democrat turned Republican, Margaret R. George. Mrs. George, 53 years old of Doylestown, and Greenwood are bitterly divided over the Point Pleasant water system. Mr. Greenwood is opposing the project and Mrs. George supports it. The winner of the primary will face Democrat James H. Farley, a New Hope book store owner, in the general election.

   Mr. Flowers is actively backing Mrs. George and feels if she is not nominated the Point Pleasant project faces a very difficult battle.

9. Mr. Flowers met with Col. Baldwin earlier this week and discussed the status of the COE permit for Point Pleasant. Col. Baldwin said the only problem is the historical review. A local college archeologist has prepared a report extremely critical of the Urban and Schortman evaluation which determined the unimportance of the project lands historically. The Pennsylvania Historical Commission is considering withdrawing its approval of the project and conditions covering construction such as a pre-construction site digs are being considered. Urban and Schortman have been asked to review their report and comment on its validity.

   Mr. Flowers is planning a briefing session with the COE in the near future to review all aspects of the permit, to update the COE on the current project activities and generally to help expedite the permit.

10. Mr. Flowers said that the DER is preparing a letter to the NCRA stating that a NPDES permit is not required for the energy dissipator and discharge into the Neshaminy Creek. Mr. Beechwood, DER, is drafting the letter and it is promised May 17.

    This is important to PECo. since a NPDES permit has been considered for the discharge into the East Branch of Perkiomen Creek. The situations are similar and the letter should apply to both locations.

11. The subject of easements to place the electric service in the pipe trench from the Point Pleasant pumping station to Tollgate Road was discussed briefly. Mr. Flowers said William J. Carlin, attorney, has been asked to secure the easements but has had some difficulty obtaining them. Mr. Flowers will check with Mr. Carlin and advise us of the status.

The meeting adjourned with agreement to keep each other informed on all subjects and to move ahead as rapidly as possible.

Prepared by: W. H. Dickinson
May 14, 1982

WHD/dmj 2/2

Copy to: V. S. Boyer
J. S. Kemper
J. L. Allen
D. Marano
E. J. Bradley

12-16-81

MECHANICAL ENGINEERING DIVISION
N2-1 2301 Market Street

MEMORANDUM

Subject: Limerick Generating Station, Units 1 & 2
Makeup Water System - Status Report

The current status of the various components of the Limerick makeup water system project are outlined in this report. Each major component is listed below with the current status of engineering, procurement, permits, and property acquisition. The current construction schedule and allocation of funds are also addressed for each component. Completion of the overall system is scheduled for the end of 1984. The system is required to be in operation by April, 1985, since the Schuylkill River can be expected to become unavailable in April or May.

1. Perkiomen Pumping Station and Pipeline to Limerick

Engineering and Procurement - Bechtel engineering has been completed, and the subcontracts have been awarded for construction of the pumping station and the pipeline. All long delivery major equipment is on order and scheduled for delivery before January, 1983.

Permits - All significant permits and approvals have been received. The requirement for application to the Public Utilities Commission for a finding of necessity is being reviewed by Legal. Minor permits, such as highway crossing permits, will be obtained by the subcontractor as required.

Property Acquisition - The property required for the pumping station is owned by the Power Company. Approximately 88% of the pipeline right-of-way, which is under existing overhead transmission lines, is available. Two properties for which only overhead rights exist remain to be settled. Negotiations with the owners of these properties are underway.

Construction Schedule - Field survey work is in progress. Construction is scheduled to start early in 1983 and be completed the end of 1984 as indicated on the attached schedule. Testing will immediately follow completion of construction.

Capital Authorization - $12,000,000 is included for these facilities under Limerick C.A. 091101-304.

D37-1

2. Pipeline from Bradshaw to East Branch Perkiomen

Engineering and Procurement - Final engineering for the pipeline has been completed by O'Brien & Gere Engineers, Inc. Preliminary bid documents, submitted by O'Brien & Gere, are under review by PECo. The package is scheduled to be issued for bids early in 1982. All material will be supplied by the construction contractor.

U.S. Geological Survey (USGS) has proposed that they design, construct, operate, and maintain the East Branch Gaging Station. This approach is now being planned pending receipt of their construction estimate which is expected shortly.

Permits - DRBC approval has been received. The application has been submitted to the DER for a pipeline stream crossing permit. Bucks County Conservation District approval of the Soil Erosion and Sedimentation Control Plan has been received. Application will be made to the DER for approval of the energy dissipator at the end of the pipeline after approval is received from the County Soil Conservation District. The project is covered by COE nationwide permit; therefore, separate approval is not required. Road crossing permits will be obtained prior to start of construction.

Property Accuisition - Approximately 93% of the required land has been acquired by easement or in fee, and negotiations are underway with the remaining owners.

Construction Schedule - The East Branch Gaging Station is scheduled for service late in 1982. Pipeline construction is scheduled for completion by the end of 1984, as indicated on the attached schedule. Testing prior to service will require completion of the Point Pleasant facilities.

Capital Authorization - $6,000,000 is included for construction under Limerick C.A. 091101-308. Engineering services are included under C.A. 091101-8332, E.A. 3322.

3. Bradshaw Reservoir

Engineering and Procurement - Final engineering for Bradshaw Reservoir and pumping station is in progress by E. H. Bourquard Associates, Inc. Completion of Engineering and issue of the package for bids is scheduled for early 1982. All material will be supplied by the contractor.

Permits - DRBC approval has been received. The DER permit application will be submitted shortly. The Soil Erosion and Sedimentation Control Plan has been approved by the Bucks County Conservation District. The need for application to the PUC for a Finding of Necessity is being reviewed by Legal.

Property Acquisition - The reservoir site is owned by the Power Company.

Construction Schedule - Construction is scheduled for completion by early 1984 as indicated on the attached schedule. Testing prior to service will require completion of the Point Pleasant facilities.

Capital Authorization - $4,000,000 is included for construction under Limerick C.A. 091101-307. Engineering services are included under C.A. 091101-8332, E.A. 3523.

4. Point Pleasant Pumping Station and Combined Transmission Main

Engineering and Procurement - Engineering for the Point Pleasant facilities by E. H. Bourquard Associates, Inc. for Neshaminy Water Resources Authority (NWRA) is approximately 75% complete. The pumping station design is under review by the Power Company. Completion of engineering and issue of the bid packages for the pumping station and the pipeline are scheduled for early 1982. All material and equipment will be supplied by the contractor.

Permits - Permits and approvals are the responsibility of NWRA. DRBC approval has been received. Outstanding are the COE and DER permits for the pumping station inlet structure in the Delaware River, the DER permit for pipeline stream crossings, and PENNDOT highway occupancy permits for road crossings. COE held a public hearing on September 15, 1981, and have arranged for field studies concerning the short-nosed sturgeon. The results of the studies will be sent to the National Marine Fisheries Service (NMFS) for review. This review is expected to be completed by April 1, 1982. Application has yet to be made for the DER permits.

Property Acquisition - The property required for the pumping station is owned by NWRA, and more than half of the pipeline right-of-way has been acquired.

Construction Schedule - As indicated on the attached construction schedule, construction is scheduled for completion by the end of 1983.

Capital Authorization - $300,000 has been allocated under C.A. 091101-8332 for the NWRA financing and management fee until the start of Limerick commercial operation. All other payments to NWRA will be incurred as expenses after initiation of water delivery.

5. Merrill Creek Reservoir

Engineering is approximately 50% complete and is scheduled to be finished by May, 1982. Application will then be made to the New Jersey Department of Environmental Protection. Hearings by DRBC and COE are expected to be held during 1982. Final DRBC approval is anticipated in August, 1982. Construction is scheduled to start early in 1983, and initial filling is scheduled for late 1984. Property acquisition is essentially complete.

The current cost estimate is $145,000,000, of which $65,000,000 (not including AFDC) is Philadelphia Electric Company's share. Approval of the Capital Authorization is expected by the end of 1981.

Summary - Engineering is essentially complete for the Perkiomen Pumping Station and Pipeline and the Bradshaw to East Branch pipeline. Engineering is in progress for the remaining components of the makeup water system, and the entire system is scheduled to be available for service by the end of 1984.

The DER permit for Bradshaw Reservoir and DER and COE permits for Point Pleasant are still open, as well as DRBC, COE, and DEP approval of Merrill Creek. Minor permits will be obtained as required and are not expected to impact the schedule.

The lawsuit brought against DRBC, NWRA, and PECo. by the Delaware Water Emergency Group to require preparation of a new Environmental Impact Statement has been dismissed by the Federal District Court. A public hearing was held by COE on September 15, 1981. A COE decision is expected early in 1982 pending favorable results from the short-nosed sturgeon study.

Property acquisition is in progress by the Power Company and NWRA. The Perkiomen Pumping Station, Bradshaw Reservoir, Point Pleasant Pumping Station, and Merrill Creek Reservoir sites have been acquired. Approximately 90% of the property required for the two PECO pipelines has been acquired.

Funds for all Power Company owned components of the makeup water system have been allocated under Limerick C.A. 091101.

Prepared by: D. L. Morad
December 16, 1981

DLM/dmc

Attachment

CALCULATION SHEET

PHILADELPHIA ELECTRIC CO.

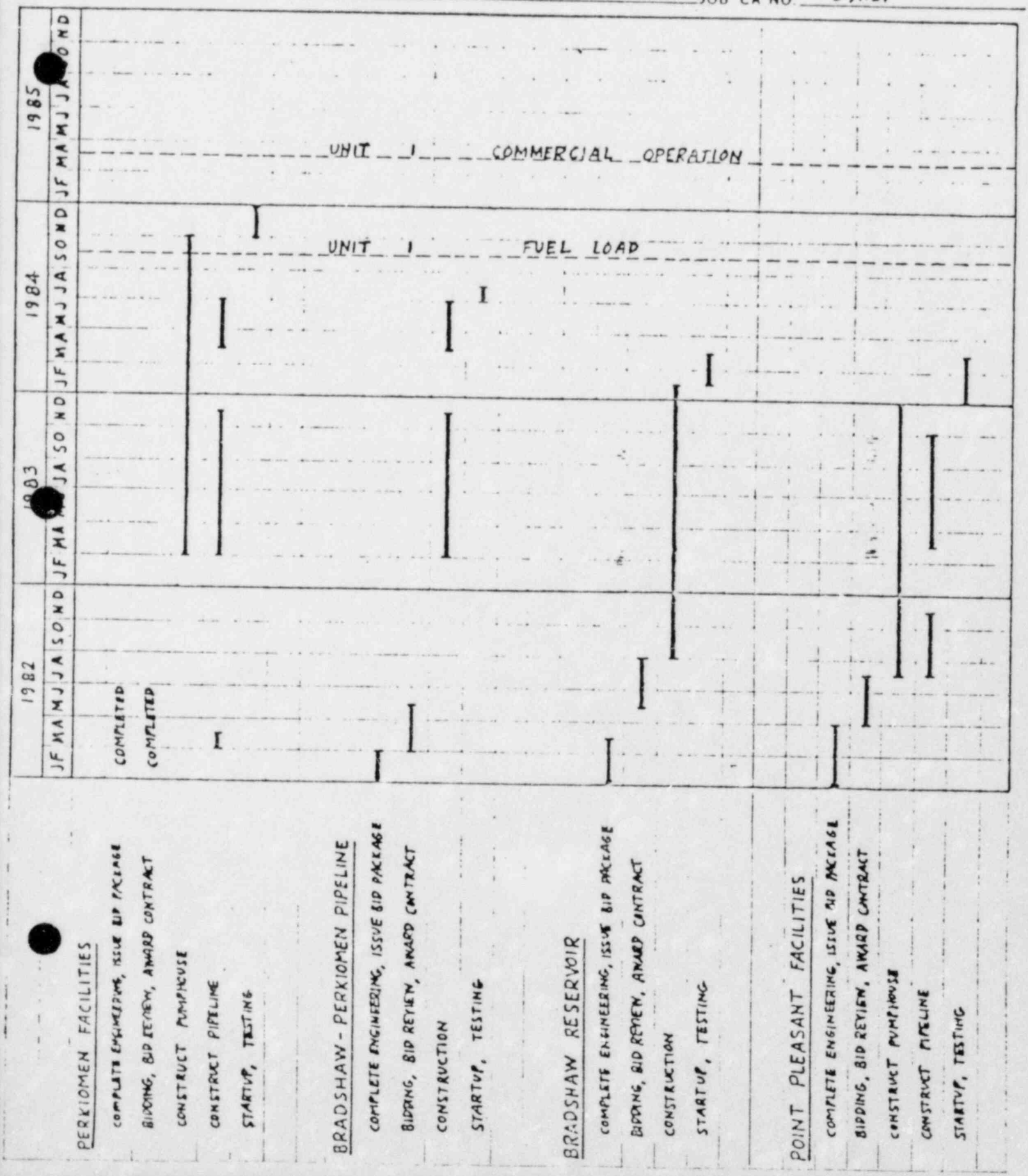
NAME D.L. MORAD

LOCATION LIMERICK GENERATING STATION, UNITS 1 & 2

DATE 12/9/81 SHEET NO. 1

SUBJECT MAKEUP WATER SYSTEM SCHEDULE

JOB CA NO. 091101



(Discussion off the record.)

JUDGE BRENNER: I've been corrected. He won't need it until the end of the day.

How much more time do you have with this panel, Mr. Sugarman?

MR. SUGARMAN: Very little.

JUDGE BRENNER: Why don't you conclude, then.

Whereupon,

W. HAINES DICKENSON
E. H. BOURQUARD
VINCENT S. BOYER and
PAUL L. HARMON,

the witnesses on the stand at the time of recess, resumed the stand and, having previously been duly sworn by the Chairman, were examined and testified further as follows:

CONTINUED CROSS-EXAMINATION

BY MR. SUGARMAN:

Q Mr. Harmon, yesterday I was asking you about the relative impact or susceptibility of the organisms of the shad to the intake and to damage by the intake at different velocities. With respect to short-nosed sturgeon, did you conduct any investigations with respect to short-nosed sturgeon?

A (WITNESS HARMON) You're talking about

experimental investigations or sampling type studies?

Q Either.

A (WITNESS HARMON) No, I did not, not directly for short-nosed sturgeon in that area.

Q Now, those eggs that you have that you haven't analyzed, might they be sturgeon eggs?

A (WITNESS HARMON) No, they might not. The one or two that I saw were somewhat smaller than sturgeon eggs could be expected to be.

Q Did you measure them?

A (WITNESS HARMON) Not with a micrometer. I visually --

Q Examined them.

A (WITNESS HARMON) Yes.

Q Do you disagree with the testimony that we heard the other day, I believe from Mr. Emery, that sturgeon eggs can be as small as, I believe it was, two and a half millimeters?

A (WITNESS HARMON) They are somewhat larger than that, in my recollection, generally.

Q Generally. And what would you estimate visually these eggs to have been in size?

A (WITNESS HARMON) Approximately two millimeters or so, or a little bit larger than that.

Q And would you want to express a definitive

opinion, based upon eyeballing those eggs, that they couldn't have been two and a half millimeters?

A (WITNESS HARMON) No. In fact, we're talking about two or three eggs in there, and I told you already we did not identify these conclusively. You asked me if the might be something, American shad or might be sturgeon. They might be anything.

I also mentioned yesterday, they might not be fish eggs. They may be plastic spheres. We have had problems with that before in industrialized areas.

Q You call Point Pleasant an industrialized area?

A (WITNESS HARMON) I call the Delaware River an industrialized river in some sections, and the potential exists.

Q Some sections?

A (WITNESS HARMON) Right.

Q And including the section in Bucks County?

(Panel of witnesses conferring.)

A (WITNESS HARMON) Well, you have the Lehigh River that enters the Delaware River. There is a potential in any inhabited area, industrialized area, such as the Lehigh Basin, to enter things in the water that might confuse us.

Q Well, as you say, they might be anything.

Does that anything include that they might be sturgeon eggs?

A (WITNESS HARMON) The possibility certainly exists.

Q In your testimony you indicate that the Point Pleasant intake would not affect the sturgeon. That is paragraph number 23 of your testimony. Paragraph number 25, you state that: "It is highly unlikely that short-nosed sturgeon young would encounter the intake screens."

Do you see any inconsistency between those two statements?

A (WITNESS HARMON) Not really, no.

Q Well, when you say that the Point Pleasant intake would not affect the species, do you mean it would probably not affect the species?

A (WITNESS HARMON) No. I think the effect on the species would be nonexistent with this type of intake design.

Q Well, what do you mean by "effect on species", then?

A (WITNESS HARMON) Endangering the species, lowering the population size of the species markedly.

Q So when you say "would not affect the species", you don't mean it would not affect members of

the species?

A (WITNESS HARMON) Yes, I mean it would not affect the species.

Q But you do not mean that it would not affect members of the species?

A (WITNESS HARMON) The potential exists for it to affect a member of a species.

Q Or members?

A (WITNESS HARMON) Or members.

Q Now, isn't it true that if the intake were located out in the area of the highest velocity in the stream that the potential impact on the short-nosed sturgeon would be less?

A (WITNESS HARMON) Not necessarily.

Q Isn't it likely?

A (WITNESS HARMON) No, I don't think so.

Q Haven't you testified previously that the more velocity, the less effect?

A (WITNESS HARMON) On certain life stages.

Q Well, let's talk about certain life stages, then.

A (WITNESS HARMON) We're still talking about sturgeon?

Q Let's talk about the larvae stage, the first ten days of life.

A (WITNESS HARMON) Which are very benthicly oriented.

Q And that is why you testified that they are unlikely to encounter, because you say the intake is about mid-depth?

A (WITNESS HARMON) It is up off the bottom.

Q How far off the bottom?

A (WITNESS HARMON) Two and a half feet or so.

Q And is that going to be true after the placement of riprap, too?

A (WITNESS HARMON) It's my understanding it is, yes.

Q And is it going to be true if debris collects at the bottom of the intake also?

A (WITNESS HARMON) In the wintertime?

Q Yes, and it remains there through April when the sturgeon spawn.

A (WITNESS HARMON) It still seems to me to be two, two and a half feet off the bottom, the same way it is designed to be.

Q Well, let's take your opinion that it is unlikely that they would encounter the intake screens. If they do encounter the intake screens, is there not a greater likelihood of damage to the sturgeon if the intake is in areas of slower velocity?

A (WITNESS HARMON) No.

Q Why not?

A (WITNESS HARMON) Well, the behavior of these larva is such that they are very, very closely oriented with the bottom, and whether the water is flowing by or fairly still, it is going to be very difficult for these young life stages to come in contact with this type of intake.

Q But if they do come in contact with the intake, is it more likely that they will be adversely affected if the intake is in areas of lower velocity than in areas of higher bypass velocity?

A (WITNESS HARMON) I don't think there would be any difference whether it is in the flowing current or still current in this instance.

Q Well, let's take the next ten days of the larvae stage.

A (WITNESS HARMON) What ten days are we in now?

Q We are in the second ten days of the larvae stage.

A (WITNESS HARMON) So you have got 20 days.

Q No, you have 10 to 20 days.

A (WITNESS HARMON) From 10 days old to 20 days old.

Q Right.

A (WITNESS HARMON) The very closely associated, benthic bottom orientation of these larvae persist for 40, 45 days. And even at that point when they tend to lose that strong bottom orientation, at that time period they would be larger than would be possible to go through the slots. So I don't see that there is hardly any potential for these larvae to interact with the screen in any meaningful way to them.

Q Well, the size is related, may be related to entrainment. But does the size protect them from impingement?

A (WITNESS HARMON) This type intake, with the velocity fields we're talking about and the swimming behavior of stream fishes, it is such a minute potential for any impingement that it is very difficult even to quantify.

Q Did you read Mr. Brundage's study?

A (WITNESS HARMON) Yes, I have.

Q Did you agree with him that ambient currents in the vicinity of the proposed intake exceed the maximum through-slot velocity by a factor of two even at very low flows; current velocities during April and May, when short-nosed sturgeon larvae are potentially present, wil be much greater; ambient current will tend

to sweep material off the screen face, thereby limiting exposure time and opportunity for extrusion? Do you disagree with Mr. Brundage?

A (WITNESS HARMON) No. I think that is a good generalization.

Q And he also says, with respect to avoidance capability --

JUDGE BRENNER: Mr. Sugarman, what page from the study are you reading from?

MR. SUGARMAN: This is page 79 of Mr. Brundage's study.

JUDGE BRENNER: What was the pretrial brief exhibit number, again?

MR. SUGARMAN: D-35.

JUDGE BRENNER: Thank you.

BY MR. SUGARMAN: (Resuming)

Q With respect to avoidance capability, Mr. Brundage states, among other things, that: "As a result of the microhydrodynamics of profile wire and the low maximum through-slot velocity of the proposed intake, the zone of influence will be very small." And then he relates the zone of influence and the avoidance capability to that factor and the bypass velocity.

Do you agree with him that the bypass velocity is relevant to the potential for loss of the short-nosed

sturgeon?

A (WITNESS HARMON) It is one of the relevant factors. It is a relevant factor in the evaluation, sure.

Q And then at page 83 he says: "Avoidance will also be greatly facilitated by ambient river currents which exceed the through-slot velocity even at very low river flow."

And then on the subject of impingement, again on page 84, he says at the bottom of page 84, he says: "Most specimens were impinged when intake velocity" -- I'm sorry. Page 85: "Ambient river currents at the proposed Point Pleasant intake site which exceed intake velocity by at least a factor of two will greatly reduce exposure time and will tend to sweep organisms off the screen face."

Now, Mr. Brundage of course referred to other factors as well, including the demersal tendencies and the benthic tendencies of the sturgeon. But do you agree that those are relevant characteristics, relevant factors in determining the risk to the short-nosed sturgeon of the intake?

A (WITNESS HARMON) As I said, I agree it's one of the relevant factors. And on page 83 you gave a partial quote there about the avoidance would be greatly

facilitated by ambient currents which exceeded through-slot velocity even at very low flow. It doesn't say anything about a one foot per second in relation to the .5 foot per second. He may be even referring there to a one to one ratio, as I referred to yesterday.

Q He may be, but at other places he refers to a two to one ratio, doesn't he?

A (WITNESS HARMON) He's all over the field on the velocity bypass to slot velocity ratio, as far as I can tell from this.

Q Do you agree with him, then, in the end that the double -- or that the ambient velocity, that if the ambient velocity is higher in relation to the through-screen velocity, that will help to reduce the susceptibility to the intake of short-nosed sturgeon?

A (WITNESS HARMON) I think it is a possibility, but it hasn't been demonstrated by experimental evidence. There have been studies that show with other species that there is hardly any improvement with a doubling of bypass velocity. Whether it holds with this species or not, I'm not too sure.

You have to have the fish encounter the screen, and whether they will be able to escape it depends upon a number of factors. And primarily we're talking about their behavior, we're talking about their

size. And then you also have this consideration of ambient velocities supporting their behavior, their burst-type behavior away from a device or a predator that they would like to escape from.

Q Did you conduct any experiments to determine this?

A (WITNESS HARMON) No. As I said, we haven't done any experimental studies with short-nosed sturgeon.

Q Now, you also in your deposition indicated that to test the outer edge of the boundary one would have to look at the distribution of organisms within the area; is that correct?

A (WITNESS HARMON) What part of my deposition was this?

Q Page 152, August 6th.

MR. CONNER: Do you mean the deposition?

MR. SUGARMAN: Yes.

BY MR. SUGARMAN: (Resuming)

Q I'm just asking you if that is true. I'm referring you to that page. You don't have to look at it. I'm not asking you to.

JUDGE BRENNER: He can look at it if he wants.

MR. SUGARMAN: I'm not telling him not to.

JUDGE BRENNER: Let's let him get it.

WITNESS HARMON: Can you give me your question again?

BY MR. SUGARMAN: (Resuming)

Q You said, in order to approximate the outer boundary of the eddy area you would have to look at the distribution of organisms within that area. Do you see that in the middle of the page?

A (WITNESS HARMON) Yes. We were talking about this area being a nursery area, I believe.

Q Yes.

A (WITNESS HARMON) And you are asking me: "If it is an attractive area, could you determine in some way what the outer bounds of that attractive area would be, the outer bounds meaning towards the channel?" Is that what you were referring to?

Q Right. And you said you would determine it by looking at the distribution of organisms within the area, right?

A (WITNESS HARMON) That is one of the factors, right, because we were talking about being attracted to certain species.

Q Well, I asked you. I said, what characteristics would you look at in trying to approximate the outer boundary, velocity? And your

answer was -- why don't you read your answer?

A (WITNESS HARMON) "Not directly. I'd be looking at distribution of the organisms within that area."

Q And then I asked you, "Has anybody done that in this pool?" And you said, "Not a study specifically to define the extent of the back eddy and its function as a nursery for young life stages of fishes, no."

Have you done that since the date of your deposition?

A (WITNESS HARMON) No, we haven't.

Q Now, Mr. Bourquard, when I asked you if you could define the outer boundary of the eddy, you said you would do it by determining velocities. And I asked you if you had made a determination of the outer boundary of the eddy, and you said, no, you hadn't. Do you recall that?

A (WITNESS BOURQUARD) Vaguely, yes. Where is it?

Q Page 188 and '89.

A (WITNESS BOYER) Of what?

Q Of the same deposition.

At the bottom of page 188, you say: "You have to follow the trail of the velocity on down to see whether it returned or didn't return."

"Question: How would you do that?"

"Answer: Use a flow meter.

"Question: Has that been done?

"Answer: I don't think so. You have had directional flows out there. They've used the flow meter to measure those velocities with" --

My question is, has the outer edge of the eddy been determined?

A (WITNESS BOURQUARD) No, not an exact measurement has been made, no.

Q Now, Mr. Bourquard, just so it's clear, you also, did you not, defined the eddy area as one where, like a wheel, so the water is constantly circulating?

A (WITNESS BOURQUARD) That sounds right. Where did I say that?

Q Page 158: "Your definition of an eddy is where the flow is reversed?

"Answer: Not necessarily. It is where the flow repeats itself. In other words, I don't know quite how to describe it. The water flows downstream and it's like a wheel. Then it comes up on the back side. This is the eddy. So the water to a certain extent is constantly circulating."

A (WITNESS BOURQUARD) Yes.

Q And that is your testimony. Would that still

be your description?

A (WITNESS BOURQUARD) Yes.

Q Now, you've testified that you saw -- that you aren't familiar with any ice problems in the area of the intake; is that correct, or am I mischaracterizing your testimony?

A (WITNESS BOURQUARD) I said I have been out there a number of times, but I have never seen enough ice to cause a problem. I don't remember where that was said. You would have to tell me exactly where.

Q Have you had the opportunity to examine Del-Aware's pretrial brief Exhibit No. 98?

A (WITNESS BOURQUARD) I don't know what that is.

Q It is approximately 27 photographs.

A (WITNESS BOURQUARD) I think I saw xerox copies of that, but I couldn't distinguish really what they showed.

Q Mr. Conner hasn't shown you the photographs? I'm talking about the prints.

A (WITNESS BOURQUARD) No, I haven't seen them.

Q Well, let me ask you to look at them now. This is Del-Aware 98 of pretrial.

JUDGE BRENNER: You're showing him all of them?

MR. SUGARMAN: I'm showing him all of them.

MR. CONNER: For the record, Mr. Sugarman, did you ever furnish us the photographs?

MR. SUGARMAN: Yes.

WITNESS BOYER: Yes, I think there was one set given to us up in Norristown.

BY MR. SUGARMAN: (Resuming)

Q Do you see the photograph labeled A-1?

JUDGE BRENNER: Mr. Sugarman, give us a chance, because the xerox copies are not useful and I have to find my prints.

MR. SUGARMAN: Didn't I provide the Board with a set?

JUDGE BRENNER: Yes, you provided the Board with one copy at a time different than when we had all of the other exhibits, and it is a matter of my not being as quick as you.

(Pause.)

JUDGE BRENNER: Now mine are not labeled as to which number is which.

MR. SUGARMAN: There are no labels on them on the back?

JUDGE BRENNER: No. And I don't feel like sitting here and comparing them with the xerox ones right now in order to do that.

MR. SUGARMAN: I don't want you to have to do that. I have here -- if I may approach the bench, I have here a fairly complete set.

JUDGE BRENNER: Let's go off the record.

(Discussion off the record.)

JUDGE BRENNER: Okay, we are back on the record.

Mr. Sugarman has now traded sets of the prints with me, so I have not quite the entire set, but I'm told most of them.

MR. SUGARMAN: I might say, sir, that in the printing of these some of them came out in reverse direction, so that left is right and right is left. That is not true on all copies. Some of the copies are correct.

JUDGE BRENNER: What about the xerox ones?

MR. SUGARMAN: The xerox ones are correct. They were taken from the original prints and all the original prints are correct.

JUDGE BRENNER: We will see what use you want to make of the reverse ones to determine whether it makes a difference.

BY MR. SUGARMAN: (Resuming)

Q Referring to page 1 of D-98, photograph 1-A, can you tell what area that photograph depicts, Mr.

Bourquard or any witness?

MR. CONNER: Objection. We wish to object to this line on two or three grounds. One, Mr. Sugarman said he had very little left to go through with this panel. I submit this is a deliberate attempt to stall and delay the proceeding, to go through 20 photographs which are not well identified in the record and have not been sworn to by any witness, as a basis merely for asking more questions of this panel, to take up more time.

He promised to complete within, I think it was, a half an hour when he said it this morning, when the Chairman asked him again.

JUDGE BRENNER: He didn't promise. Let me interrupt. I asked him for an estimate. But that is not a legal objection. He's entitled to pursue matters, and I certainly have not determined that he is deliberately stalling based upon half a question so far.

MR. CONNER: I am objecting to the line under 2.717, where the Board has the right to regulate the conduct of the hearing, and I submit that if we go through this, given the usual standards of performance, this will waste the entire morning.

I also object on the ground these photographs

have not been authenticated, and the witnesses will be asked to speculate on Mr. Sugarman's interpretation of them. There is no foundation for these pictures at this point.

JUDGE BRENNER: Mr. Sugarman, what is it you want to do? Do you want to show him pictures of ice and let him tell you that, yes, there's ice in the picture?

MR. SUGARMAN: Yes, sir.

JUDGE BRENNER: Why do you need him for that? Why don't you use Mr. McNutt? It would be redundant because, one, Mr. McNutt is here. He is going to be the one who is going to have to pick the spot. I'm not going to let you ask Mr. Bourquard, do you know what spot this is? You tell him what spot.

But even if we proceeded that way, what is the point of doing it through him, other than as distinguished from Mr. McNutt?

MR. SUGARMAN: Well, I want to know if they have any -- what I really want to ask Mr. Bourquard is, after --

JUDGE BRENNER: Let me guess where you're going. He told you what he said about what he has seen about ice, and you want to ask him, have you ever seen ice like this.

MR. SUGARMAN: What I want to ask him is if he

can tell whether this ice is sufficiently solid, is sufficiently pervasive and shows signs in some of the photographs of having the potential for being ice jams and ice dams.

JUDGE BRENNER: Why don't you pick two or three of your best ice pictures and, with your representation that included in the picture is the vicinity of the intake -- I don't mean the exact spot, but right around that very portion of the river -- and then we will let Mr. McNutt tell us.

MR. SUGARMAN: I will represent these are all in the area of the intake; and secondly, that they were all identified for Mr. Conner at Mr. McNutt's deposition.

JUDGE BRENNER: Well, as I said, pick two or three of your best ice pictures, and we will make sure Mr. McNutt on this record tells us where they were taken.

BY MR. SUGARMAN: (Resuming)

Q If you will look at Exhibit 1-C of this, or photograph 1-C of this exhibit, can you state whether that ice shows signs of clogging and jamming such that it could represent and contain an ice dam?

A (WITNESS BOYER) No, that is impossible to tell from that picture.

A (WITNESS BOURQUARD) It looks like just a sheet of ice on there.

A (WITNESS BOYER) That is typical of ice on rivers, which we have experienced at power plants on the Schuylkill and the Delaware and the Susquehanna.

Q And have you experienced ice dams on the Schuylkill, the Delaware and the Susquehanna?

A (WITNESS BOYER) You would have to define an ice dam.

Q Okay. An ice dam is a vertical accumulation of ice down into the water column and up into the air, and/or up into the air.

JUDGE BRENNER: Mr. Sugarman, excuse me. I've got a picture that looks like 1-C, comparing it to the xerox, but it is marked 4-C. No, my print is marked 4-C. I don't know what picture you're showing him. That is my immediate problem.

WITNESS BOYER: 1-C has no trees in it except on the shoreline. 4-C, our 4-C has trees right in the center of the picture and is at or on the shoreline.

JUDGE BRENNER: Mr. Sugarman, can you come up here for a minute? You just wanted to see if I'm awake. You did not put these photos in any sequence.

(Discussion off the record.)

JUDGE BRENNER: Let's go back on the record.

Mr. Sugarman has made sure we have at least one print for the Board to share of the ones he's going to use with this panel. We are still missing one. I'm not going to let him use it with the panel unless and until we get it.

In addition, unless the Board has a complete set and all of the other parties have a complete set and all of the other parties have a complete set for at least every photo that Mr. Sugarman plans to use with Mr. McNutt, I'm not going to allow it when Mr. McNutt comes on. So you can only use what the parties have in front of them, and I'm not going to stop in the middle while we hand them out or do this again.

All right, let's proceed.

BY MR. SUGARMAN: (Resuming)

Q Directing your attention to 1-C, can you tell on 1-C that there is -- that the ice is not smooth?

A (WITNESS BOYER) You can tell that this picture was taken down close to the ice, so that it would magnify irregularities in the ice surface. Ice surfaces, particularly after it has snowed and wind and sun have been on it, are very rarely smooth. So this would not be expected to be smooth. It appears to have snow on top and is what I would expect the river to look like during a cold period of the winter.

Q Does it have the potential for being a hanging dam?

A (WITNESS BOYER) No.

Q Why not?

A (WITNESS BOYER) Well, as long as it's frozen there it's not going to be hanging anything.

Q As long as it's frozen there?

A (WITNESS BOYER) Yes.

Q How does a hanging dam form?

A (WITNESS BOYER) During thaws.

Q A hanging dam forms during thaws?

A (WITNESS BOYER) My definition of a hanging dam -- leave out the "hanging"; of an ice dam. Make it an ice dam. My definition of an ice dam is one which occurs during thaws, when the ice starts to break up into chunks and accumulates in narrows and tends to form a block.

Q Well, if I told you that ice dams occur as a result of blocks of ice coming down the river, going under the ice that is already at a given location, and building up to the point where there is created an accumulation of ice under the surface, would you be able to disagree with that?

A (WITNESS BOYER) I would say it was due to a thaw, unless you are talking about backing up from some

sort of obstruction. In the vicinity, the near-in vicinity of the obstruction, you might get thin sheets of ice slide under other thin sheets of ice.

Q Have you ever heard of a hanging ice dam in the St. Lawrence River that practically blocked the river at temperatures of zero and less?

A (WITNESS BOYER) I'm not familiar with that. You would have to provide the literature and give me the complete description of the weather conditions and the ice conditions on the river, et cetera, before I would be able to make any statements about it.

Q Well, let's talk about the Susquehanna for a minute. On the Susquehanna you've observed the ice accumulations up in the air of up to 20 feet, haven't you?

A (WITNESS BOYER) I have observed ice conditions in the Susquehanna in the vicinity of our power plants and at other points in the Susquehanna River where, during thaws, there were ice dams occurred, where ice dams occurred.

Q And those ice dams interfered with the passage of water?

A (WITNESS BOYER) No, the water flows around it. It may back up some water, but the water will always seek a way downstream.

A (WITNESS DICKENSON) If I might interject, on the Susquehanna the ice dam problem is the elevation, the piling up above the surface. We have always gotten water underneath without any trouble. Water continues to flow through the dams along the bottom.

Q I understand that. I understand the description.

JUDGE BRENNER: Mr. Sugarman, I want to better focus the materiality of this whole ice issue in my own mind. What is Del-Aware's contention with respect to ice in the context of this proceeding?

MR. SUGARMAN: The contention is that the intake will become clogged with ice, ice will accumulate around the intake, and that it will necessitate some fairly substantial measures, whatever they will be, to go out and deal with the problem.

Furthermore, if I may, the tendency for the ice to accumulate or to treat that intake as -- or to become associated with an intake by being an obstruction in the river will also create the attraction; and also, the same hydraulics will tend to accumulate debris there and including some rocks of a foot to a foot and a half, and trees and so forth, in the area of the intake, because the same hydraulics that bring the ice there will bring the debris there.

JUDGE BRENNER: Okay. But you've already asked them about debris. I want to talk about ice now. Let me find out what the materiality is, depending upon the witnesses' position.

Gentlemen, is it your position that ice would never clog or come into contact with the intake such that the intake might require repair work?

WITNESS BOYER: I would hesitate to say never. I would say the probability of ice interfering with the operation of that intake is very low, on the order of one percent or something of that nature -- one time in 100 years, maybe one time in fifty years, perhaps.

The efforts required to remove whatever obstruction would be minimal. The inference is that this protrusion from the bottom of the river is going to form an attraction for ice, that is not the case. It does not occur with boulders, piers, bridge abutments and foundations and other things that are presently in the river, of which there is infinite experience. So there is no reason that this would be an attractive device.

Generally, when ice floes or ice blocks occur, the flows are high. The river flow would be up. The river elevation would be up three to four feet above the 70 foot that it is during lower flows, when there is a coverage of four feet above the intake structure, so that you are talking about eight feet of clear water above the intake structure. So the probability of ice getting down around it and attaching to it is very low.

Frazzle ice is a condition that can occur in the river and does occur occasionally, and provides some

need for attention on intake screen systems, but is generally readily solvable and prevented from forming any obstruction to intake flows by backwashing, air bubbling or something of this nature. We do have an air backwash system installed. The flows will be taken out in the wintertime, are going to be somewhat reduced from the maximum amount we are talking about.

So in taking all of those things into consideration, I would again say the probability of frazzle ice causing us to operate the air backwash might be once every three to five years, something of that order.

The problem of ice causing any maintenance activities out there of removal would -- well, maybe for debris you would say once a year you might go out and find some tree branch or something or some waterlogged thing that is caught in there. Boulders I would not expect, I would expect to be zero.

JUDGE BRENNER: Well, maybe you had better say for the record what frazzle ice is.

WITNESS BOYER: Frazzle ice occurs in waters of 32 degrees and sort of is ice forming in the water at various depths instead of floating on the surface, and it is very small pieces of ice that move along with the current.

JUDGE BRENNER: Is frazzle ice as solid as regular ice?

WITNESS BOYER: No. It is sort of a mushy -- what you would consider mush. The only place that it could solidify would be if it was on a surface and more frazzle ice was piled on top of it. Then you might get a little thickness of solid ice built up.

JUDGE BRENNER: If the intake were struck by a relatively solid chunk of ice -- and I, therefore, ask you to assume damage to the intake screen structure -- or due to freezing around it -- say it was crushed or otherwise mangled, to us a non-technical term, in some fashion, what would the maintenance or repair activities involve?

WITNESS BOYER: Well, if the screen section was damaged or blocked so that it could not be cleaned manually by divers, the remedy would be to unbolt the flange section of the screen and take it out and put in another one or make repairs externally and then put it back. So it is a matter of unbolting the flange.

A 30-inch or 40-inch --

(Witnesses conferring.)

JUDGE BRENNER: Mr. Bourquard, if you are testifying as opposed to talking to Mr. Boyer, I can't hear you.

WITNESS BOYER: I'm trying to get a confirmation on the diameter of the flange that would have to be unbolted so I can give you a better feel for it. Since we raised it, we had better give you the accurate --

JUDGE BRENNER: Well, I think you had better, if we don't want to hear about ice for the next ten hours.

WITNESS BOYER: Yes, it is a 24-inch flange that would be unbolted, which would present no problem to an underwater diver.

JUDGE BRENNER: Now in talking about what can be removed and replaced, is that just the screen or does that include the structural support around which the screen is placed?

WITNESS BOYER: Well, it is the screen and its supporting framework down to the T-section.

JUDGE BRENNER: And the T-section is --

WITNESS BOYER: Or Y-section, more properly.

JUDGE BRENNER: The Y-section still has -- is itself a support member rising from the bottom of the river about two or three feet?

WITNESS BOYER: That is right, and in my view it is impossible for that to be damaged by anything flowing down the river.

JUDGE BRENNER: Could you give me the structure of that and dimensions and what it is made out of?

WITNESS BOYER: It is a 36-inch steel --

(Witnesses conferring.)

WITNESS BOYER: Approximately 1/2-inch steel plate, constructed of 1/2-inch steel plate, and there are three guard posts embedded in the bottom of the river at the lead end of the intake, the total intake assembly. These guard posts are 12-inch steel pipe guardposts to sort of fend off or prevent -- take the impact of anything that might be flowing with any velocity downstream.

JUDGE MORRIS: What is the elevation of the top of those posts?

WITNESS BOYER: It is the same as the top of the screens, elevation 66.

JUDGE BRENNER: I don't quite have a full picture of the Y-structure post. It is a 1/2-inch steel plate. Is that the dimension?

WITNESS BOYER: It's 1/2-inch thick. It is apparently a rolled section, basically a Y-section with the bottom end of the Y connected to the piping embedded in the river and the two legs of the Y having flanges on them of 24-inch size, which would receive the

T-assemblies containing the screens.

JUDGE BRENNER: I'm not sure if I understand it. When it is a 1/2-inch steel plate rolled, what is the diameter of the structure?

WITNESS BOYER: It's 36 inches. It is a 36-inch cylinder made of 1/2-inch plate.

JUDGE BRENNER: Okay, now I've got it. Thank you.

WITNESS BOYER: Which is a pretty substantial piece of steel.

(Board conferring.)

JUDGE BRENNER: Mr. Sugarman, we're not going to cut you off on a close judgment call, I want you to know, but if you have any more questions you had better start focusing on the materiality to the maintenance work of the structure and what that would involve, because what we're talking about in your contention is a possible impact on the Point Pleasant historical district.

Your inference is they would have to get out there with heavy equipment and do dredging and so on if ice interferes with the structure. Your showing them pictures of the beautiful frozen river with ice on the top does nothing in terms of the nexus to what ice will do to that structure approximately two to three feet off

the bottom.

I asked these questions because we were interested in the structural integrity and if it had been made out of cardboard, you might have something. It is not made out of cardboard. The screens, I think -- I am not testifying, but I want you to understand the materiality. The screens are arguably -- not arguably. They are less strong than the basic structural members. However, we have got the testimony as to what "repair work" would be involved, and it is none in terms of the impact on Point Pleasant.

It is just getting a diver out there and putting the screen back on the Y-section. So then I asked them about the Y-section because I understand you are interested in getting closer to the river bed in terms of their repair work, and we have got the structural dimensions of that.

So unless you have got a scintilla of evidence that talks about -- which I will let you attempt to elicit in cross, if you want, or your representation that Mr. McNut is going to be qualified to say that that Y-section will be damaged by ice and his basis, we are just not going to make any progress unless you focus on that.

MR. SUGARMAN: Well, let me just ask one or

two questions about it of this panel and then I will leave it to Mr. McNut.

BY MR. SUGARMAN: (Resuming)

Q What tests have been made to determine the stability or the amount of ice pressure that would be required in order to adversely affect, either in structural integrity or in proper placement, the Y-section of the intake?

A (WITNESS BOURQUARD) We did not try to run a test on it to see what it would take to do it. It was designed so that the impact of ice coming down the river hitting it would not damage it.

A (WITNESS BOYER) I might add that we have experience with a pipe not quite similar to this, but it is an intake pipe for a water works in the middle of the Schuylkill River below our Cromby station, which was installed in 1953, approximately, and has been in service since that time and has never had any maintenance associated with it.

And it is just a protruding pipe of approximately 18 to 24 inches with a flat top that is to get water in from the sides rather than pull it down. And I would guess it is a couple of feet off the bottom, but my memory is a little hazy on that aspect.

Q Well, this pipe is approximately six to eight

feet off the bottom, is it not?

A (WITNESS BOYER) Which pipe?

Q The Y-section.

A (WITNESS BOYER) The top of the screen --

(Witnesses conferring.)

A (WITNESS BOYER) The top of the screen is elevation 66.

Q And the bottom of the river is elevation 58 to 60, so this is six to eight feet off the bottom.

A (WITNESS BOYER) Right.

(Witnesses conferring.)

A (WITNESS BOYER) Wait a minute.

JUDGE BRENNER: Mr. Boyer, let's back up because some of these questions came fast. The question, as I understand it, is the top of the Y-structure to the point at which you can no longer simply repair things.

WITNESS BOYER: The top of the Y I would call as elevation 62.5, with the river bottom of approximately 60 or 59.

BY MR. SUGARMAN: (Resuming)

Q Are you saying -- and perhaps you can clarify this -- are you saying that the top -- that the screens from the top of the Y to the top of the screens that the screens are not interdependent with the Y? In other

words, if the ice came along and knocked the screens out, that the structure and the ability to put a new screen in would not be affected at all, that there is no structural relationship between those screens and the Y?

A (WITNESS BOYER) I did not say that. The screens are. The screen section is attached and bolted to the Y.

Q But if the screens were knocked out, that wouldn't affect the Y at all?

A (WITNESS BOYER) What do you mean "knocked out"?

Q If some ice came down and knocked those screens off or twisted them, turned them, pushed them aside?

A (WITNESS BOYER) That will not occur.

Q Well, if it did occur, wouldn't you have to go in and straighten out the whole Y-section?

A (WITNESS BOYER) Even if it did occur, underwater welding is an accomplished process.

Q I'm not saying it can't be fixed. I am just saying it would be a major repair activity to fix it.

A (WITNESS BOYER) I would not call it major from the standpoint of underwater work or the amount of equipment and people that would be involved. It would still be one little boat or working barge with a few

people out there with some sort of lift on the working barge that they could handle the equipment.

MR. SUGARMAN: Thank you. That's all I have on that subject. I want to come back to the noise issue for just one question because I now have the drawing which shows what the character and nature of the substation is. These are the drawings I have been trying to get for a month and which they finally provided to me yesterday, and I just wanted to use this to show what the character of the substation is in relationship to the canal.

JUDGE BRENNER: No, we went witnesses home on the basis that the noise issue was complete. I made that very clear at the time. Why don't you tell me what your question is?

MR. SUGARMAN: My only question is does this plan, sheet 5 of 26 of the site plan and general profile, does it not show that the substation consists of six elements and that it is located less than fifty feet from the national historic landmark property?

JUDGE BRENNER: You just want to get a dimension for distance?

MR. SUGARMAN: That's right, and what is on here, this pad shows six elements. We were told there were two transformers.

JUDGE BRENNER: All right. I will let you ask just a few questions if you think the dimensions we have gotten in the record need clarification, but nothing about the noise per se because those experts are not here.

MR. SUGARMAN: Exactly.

JUDGE BRENNER: Mr. Conner?

MR. CONNER: He said "substation". Do you mean pump station?

MR. SUGARMAN: No, it says "substation" in here.

JUDGE BRENNER: Mr. Sugarman, when you ask these questions, bear in mind that this drawing is very large. It is not in the record. I want the record to be self-contained in the wording of the questions and the answers.

MR. SUGARMAN: What I'm going to do -- well, what I would like to do is to mark the portion of sheet 5 of 26, after making a copy of that portion of it, in 8-1/2 by 11.

JUDGE BRENNER: Let's see if we can avoid it, because you don't have the copies and I don't know if you will be able to get it in and I'm having a hard time with you this week with logistics with the reporter. So if you feel you need it after your questions, we will

let you do it, but maybe you could even make it easier on yourself.

MR. SUGARMAN: Maybe I won't, then.

BY MR. SUGARMAN: (Resuming)

Q The distance from Station 2.0, which is about the location of the canal boundary, back to --

(Witnesses conferring.)

A (WITNESS BOYER) If you want to go back, I will clear this up in a second for you. I will tell you what they are.

Q Go ahead.

A (WITNESS BOYER) This drawing is an enlargement of Policastro Exhibit 1 and the pieces of equipment that Mr. Sugarman is referring to show on Policastro 1. Referring to Policastro 1, if you look at the pump staton -- labeled "pump station" -- you will see to the right of that some squares with the word "substation" on it.

There are two parallel rows of equipment there, each row consisting of a transformer adjacent to the building. Next would be a circuit breaker and next is either a disconnect or pothead tower, which is the means for bringing cables up from underground and connecting them to an aerial cable and needs a supporting piece of steelwork. This is typical of what

we have in any substation provided for shopping centers or industrial concerns around this part of the country.

The transformer -- the closest edge of the transformer is approximately 85 feet from the canal bank.

JUDGE BRENNER: Let me note for the sake of the eyes of those reading this record later you are correct that we can look at Policastro 1. We could also look at Applicant's Exhibit 4, since it happens through mechanics that that exhibit was the larger copy in the record. That makes it a little easier. That is the one that we added this week.

Mr. Boyer.

MR. SUGARMAN: That is all I have, sir.

JUDGE BRENNER: Staff?

CROSS EXAMINATION ON BEHALF OF NRC STAFF

BY MS. HODGDON:

Q At page 16, paragraph 32 of your testimony, the first full sentence on that page, the channel bottom area under the intake will be rock, riprapped to prevent erosion. I would like to ask some questions about that.

Would someone describe the character of the bottom in the vicinity of the intake as it presently exists?

A (WITNESS BOURQUARD) Some of it is rock, exposed rock, and some of it is just earth on top of rock - soil on top of rock.

Q And would someone describe the riprap that will be placed under the intake?

A (WITNESS BOURQUARD) Yes. It would be approximately -- a rectangle of stones approximately a foot thick would be placed under the structure within the limits shown. It is kind of like laying flagstone, except they are thicker.

Q Is there any mortar involved?

A (WITNESS BOURQUARD) No.

JUDGE BRENNER: Wait a minute. This is not a conversation. A question first; then the answer. Why don't you repeat your question, Miss Hodgdon?

BY MS. HODGDON: (Resuming)

Q It is merely the rock? There is no mortar, no concrete? The rock is merely placed in the bottom?

A (WITNESS BOURQUARD) One thing -- I want to correct that. The rock is two feet thick. They are generally -- probably would be about one foot thick rocks and probably be a depth -- but the total depth of rock will be approximately two feet.

Q What is done with what has been referred to as construction rubble or the spoils of construction -- the

rock that might have been blasted or the silt that might have been removed?

A (WITNESS BOURQUARD) Well, if the rock is of sufficient size and character to be used for rock riprap, we would use it for rock riprap, and if the soil is suitable for backfill, we would use it for backfill.

Q Then you answer is that to the extent possible you preserve the construction rubble, the construction rock?

A (WITNESS BOURQUARD) We would utilize it as much as possible.

Q And you augment it with local rock?

A (WITNESS BOURQUARD) Yes.

JUDGE BRENNER: Let's go off the record.

(A discussion was held off the record.)

JUDGE BRENNER: Let's go back on.

BY MS. HODGDON: (Resuming)

Q I'm sorry. I meant local stone. I'm not sure whether local rock and local stone differ from one another. I am aware that there is a rock quarry in the vicinity or a stone quarry.

A (WITNESS BOURQUARD) We would probably attempt to utilize or we would attempt to utilize the rock from excavation at the project site.

Q Do I have from your testimony, then, the

dimensions of the rock riprap? You said two feet.

A (WITNESS BOURQUARD) By two feet depths of rock riprap, yes.

Q But the total --

(Witnesses conferring.)

A (WITNESS BOURQUARD) The blanket would be approximately 24 feet wide and roughly about 90 feet long.

Q When you say the "blanket", is that what has been referred to before as the pad, the bottom on which the intake structure sits?

A (WITNESS BOURQUARD) No.

Q No?

(Witnesses conferring.)

A (WITNESS BOURQUARD) The pad I think you are referring to is a concrete slab that is placed underground there and it supports the Y members that were mentioned previously.

Q That is why I am confused. The pad is under the riprap but not for the total dimension of the riprap?

A (WITNESS BOURQUARD) No, it does not extend out as far as the riprap does.

Q And the individual member stones of the riprap are two feet in length and depth?

A (WITNESS BOURQUARD) No. The total depth of rock would be two feet. There would be a variation in sizes of stone that would be placed there. We would not try to get them all the same size.

Q Approximately what is the height and the width of the stones?

A (WITNESS BOURQUARD) I would have to check the specifications to see.

A (WITNESS BOYER) Generally the stones are, as Mr. Bourquard mentioned, around a foot in thickness and they would not be probably more than a foot and a half in the other dimension. They could be from eight inches to a foot and a half in the other dimension. They are roughly circular or rectangular. Certainly no attempt is made to make them uniform. It is the size of the rock like a bunch of marble, so to speak, that are put down there in a layer of a depth of two marbles deep, so to speak, to fill up this area on top of the concrete foundation and covering the 24 foot wide by 90 foot long area of the river bottom.

Q How are they placed?

A (WITNESS BOURQUARD) They would be generally dumped off of a barge.

Q Will the stones be smooth or rough?

A (WITNESS BOURQUARD) They would probably be

whichever way they landed. I am sure they would not be absolutely smooth, but then they would be leveled off by hand if necessary. So there wouldn't be large protrusions.

Q I have one further question about that matter and that is what keeps them in place?

A (WITNESS BOURQUARD) Their weight and their interlocking characteristics, because they are of different sizes.

Q Now as regards the pipeline, is that also riprapped?

A (WITNESS BOURQUARD) No.

Q What is the surface over the pipeline, then?

A (WITNESS BOURQUARD) It would be the normal channel bottom. We would grade back to the normal channel bottom and it would be earth.

Q The character of the bottom is returned to what it was before after the pipeline is put in; is that correct?

A (WITNESS BOURQUARD) That would be correct.

Q Thank you.

The elevation of the river under the intake, then, where the riprap is placed, then, would it be at the same elevation as the river bottom prior to construction?

A (WITNESS BOURQUARD) We would attempt to restore it to the same contours as existed before construction.

Q I would like to ask Mr. Harmon a question about the riprap as it affects fish.

Do you foresee that the presence of the riprap will result in a change in the normal distribution of fish in the river?

A (WITNESS HARMON) No, I don't because the river bottom is already quite rocky in that area, and it would seem to me that the spaces between the rocks after they are placed would be filled up with sediment and you would have very much nearly the same bottom conformity that you have now there. So I don't see that this would affect fishes to any large extent.

Q Mr. Bourquard, I wanted to ask questions about the cleaning of the screens. Do you anticipate that there will be a more or less continuous pumping operation once the pumping begins?

A (WITNESS BOURQUARD) More or less continuous?

A (WITNESS BOYER) Over what period of time? Could you expand on that?

Q I was really going to backflushing and whether you closed -- you shut down pumping in order to backflush and how the backflushing is accomplished --

the cleaning of the screens.

A (WITNESS BOURQUARD) You would not necessarily have to shut down pumping. In other words, it could be set up. There are three pipes going out into the river there and you could shut down one-third of the pipes and then backflush that. In fact, you could even backflush to a certain extend while you were pumping.

Q How do you in fact plan to clean -- to backflush the screens?

A (WITNESS BOURQUARD) How do we plan to do it?

Q Yes.

A (WITNESS BOURQUARD) Well, at the gatewell, which is on shore, there will be an air tank with compressed air in it, and then there will be valves in the gatewell which would be operated by a man standing on top of the gatewell in which he would operate these valves to blow air in a line that goes out to the screens and the air is dispersed into the screen and it blows through the screens.

Q How often do you anticipate that the screens will need to be cleaned?

A (WITNESS BOURQUARD) We don't anticipate a need for cleaning at any time except during the leaf season. We will probably operate the air backwash system maybe once a week just to be sure that they are

working during the remainder of the year.

Q You mentioned the cleaning of leaves in your answer to question E-290.39. Could you find that or shall I read you your answer?

A (WITNESS BOURQUARD) Yes, I have it.

Q The second paragraph of the response reads, just the last part of the last sentence: "It is possible that during the leaf season backwashing may be necessary two or three times per week." I believe you stated yesterday in response to one of Mr. Sugarman's questions that during the leaf season backflushing could occur on a daily basis.

A (WITNESS BOURQUARD) Both are guesses because I don't know.

A (WITNESS BOYER) I might add from our experience with power plants with leaves, the leaf season is of relatively short duration and it occurs -- the leaf problem is of short duration and it occurs during the first marked increase in flow following the fall when the leaves have dropped off the trees. They have accumulated in all of the little stream backwaters and if a heavy rainfall occurs, the streams rise, wash down the leaves that are in these backwaters, and carry them into the main channel, and the leaves flow down the river, so that you will get a slug of leaves over a

period of a day or two.

And during that time you probably would be operating the backwash maybe even a couple of times a day. But we really need experience with this raised location and this type of intake screen with essentially parallel flow. The screens are self-cleaning to a great extent. Experiments that have been conducted on the Johnson screen with debris show that to a large extent the debris sort of bypasses the screens.

And there have been tests with the backwash, which provides a big burst of an air bubble and sort of blows air out through the slots and knocks the debris off. So there is a good possibility that leaves may not be a great problem with this. On the other hand, they could be attracted to the surface and remain there and we will need to use the backwash system as much as a couple of times a day.

What is involved is just a burst of air, a momentary burst of air, over a period of maybe ten seconds, something like that. Once you get that air bubble burst, your effectiveness of your air discharge is used up.

A (WITNESS BOURQUARD) I might point out too, in that same connection, that in visiting an installation similar to this in Eden, North Carolina, which I think I

mentioned previously, they just stop the pumps, and when they stop the pumps there is a back-surge from the pump and that cleans the leaves off for them -- a back-surge of water just by the stopping of the pumps, and that cleans the leaves off for them, and they seem to do very little backwashing.

Q I am not sure that you have completely clarified this apparent inconsistency between the two statements. Is it your testimony that you will clean the screens of debris when they need it, and the need to be based on experience?

A (WITNESS BOURQUARD) Basically, that is it, yes.

Q And further, that there are periods of how long a period would you say when cleaning might need to be done on a daily or twice daily basis?

A (WITNESS BOYER) I would say it would not extend over a week.

A (WITNESS BOURQUARD) I would say a week.

Q Then returning to the two or three times a week basis, how often do you anticipate that that might need to be done?

A (WITNESS BOURQUARD) Probably a month or so.

A (WITNESS BOYER) I would say about four weeks during the year you might have to do that.

Q I believe that completes my questions on leaves and debris and the clogging of the screens. I would like to ask some questions now about the bypass velocity versus the intake velocity.

JUDGE BRENNER: Ms. Hodgdon, before you leave this subject that you just covered, I wonder if I might

interject one or two questions.

MS. HODGDON: Please do.

JUDGE BRENNER: Gentlemen, what is the purpose of the stone rip rap under the intake screen structure?

WITNESS BOURQUARD: It is primarily to keep that area swept clean. It will present a relatively hard, unerodable surface to the flow as it comes down during times of flood, and the tendency should be that that would be similar to a rock bottom in that it should keep the space between the bottom of the screens and the channel bottom pretty well cleaned of most everything.

JUDGE BRENNER: What would be causing that possible erosion that you want to avoid? Would it be operation of the intake itself?

WITNESS BOURQUARD: No, it would be the flood flows in the Delaware River.

JUDGE BRENNER: In other words, the normal erosive processes that might have taken place had you never done any construction?

WITNESS BOURQUARD: Yes, that is correct.

WITNESS BOYER: You see, once you have disturbed the river bottom, and you are putting fill back in, you can't get it compacted to the same extent that it is presently, so the rip rap is solid material that will not erode away.

JUDGE BRENNER: Also, once you have post extruding from the ground, could that not cause localized erosion in the absence of rip rap?

WITNESS BOURQUARD: Possibly it could, yes. There would be an eddy behind it. I shouldn't have said eddy.

(General laughter.)

JUDGE BRENNER: Don't say pool either.

(General laughter.)

JUDGE BRENNER: Okay. Thank you.

Ms. Hodgdon?

BY MS. HODGDON: (Resuming)

Q Mr. Harmon, you stated yesterday that a half foot per second bypass velocity with the type of average and maximum through slot velocities will afford a substantial margin of protection for the types of fish in this region of the river. Is that a proper characterization of your statement of yesterday?

A (WITNESS HARMON) Yes, I think I went further in saying something like 20 to 80 percent protection.

Q What is the basis for this statement?

A (WITNESS HARMON) It is research that I have read in the literature.

Q Could you enlighten us on that research other than the Hansen 1979 paper which has been previously

referred to here?

A (WITNESS HARMON) Yes, there was a paper. The authors of the paper are Heuer, and I am not too good on the pronunciation, Heuer and Tomjanovich, and they did some work for TVA, and they included their paper in a workshop on larval exclusion systems for power plant cooling water intakes, and it is a NUREG, N-U-R-E-G, slash, CP-002, dated 1978, and they were working with various slot widths, flat plate type wedge wire screens, various intake through slot velocities, and various bypass velocities.

Q You said that dealt mostly with larvae, larval exclusion?

A (WITNESS HARMON) It is a larval exclusion system publication, and they dealt mostly with early life stages, larvae and early juveniles.

Q And the Hansen paper dealt not with larvae but with eggs?

A (WITNESS HARMON) Hansen has published several papers, and the one we were talking about dealt with striped bass eggs.

Q Was it Hansen who came up with the two to one bypass velocity standard, the two to one ratio of bypass velocity to intake velocity?

A (WITNESS HARMON) I am not aware that anybody

has come up with a definite standard of two to one.

Q We have heard this number mentioned on many occasions. Are you aware of what its origin is?

A (WITNESS HARMON) In the context of this particular intake, it seems to have a history back to a meeting that I attended with Mr. Bourquard at State College with, among other people, representatives of the Pennsylvania Fish Commission and the U.S. Fish and Wildlife Service, and at that point we were in a transition, and I am using the term "we" pretty loosely. The intake design was in a transition from a vertical traveling screen to the wedge wire screen design, and in the development document dated 1976 for cooling water intakes, there is a recommendation in there for these vertical traveling screens to keep your approach velocity at .5 feet per second, and the representative from the U.S. Fish and Wildlife Service thought we ought to maximize the velocity past the face of the screen since with vertical traveling screens this is an important factor in avoiding impingement and enhancing whatever the escape behavior the particular fish species might display.

And at that point there was some discussion about the prevailing velocities out in the river, and they were told that this wedge wire screen design was

going to have approximately .5 feet per second through slot velocity, and I believe that is where we got started with putting this intake in a very strong velocity field.

Q When did you say this meeting took place?

A (WITNESS HARMON) I believe it was on October 29th, 1980.

Q At State College?

A (WITNESS HARMON) Yes.

Q Who was the person present from Fish and Wildlife?

A (WITNESS HARMON) I believe it was Mr. McCoy.

Q I have no further questions on that, on the intake velocity versus the bypass velocity. I have one other question, and that regards the access road. The letter which -- the September 9th, 1981, letter from Bourquard Associates, Mr. Bourquard, to Colonel Baldwin, which was referred to yesterday, about which Mr. Sugarman asked questions, and I am not sure whether it was identified --

JUDGE BRENNER: Which date, again?

MS. HODGDON: September 9th. It is D-49. I don't believe it was introduced yesterday. Del-Aware 49 Pretrial.

BY MS. HODGDON: (Resuming)

Q I want to ask only one question about that, and reference is made in many places, so I don't know if you need to have it in front of you. It says that the temporary access road across the canal will be removed. Yesterday, there was -- Yesterday, Mr. Sugarman asked questions about a road which he identified on the blueprints, which I have not seen, and I am not sure just what road he is talking about. Mr. Bourquard answered that the road was 15 feet wide.

I want to know where the road is located, if you can show me on Policastro 1, and I also want to know what the purpose of it is.

A (WITNESS BOURQUARD) If you have Policastro 1 there, if you will look at where you see Delaware Division, Pennsylvania Canal, and go to the right of there --

Q Yes?

A (WITNESS BOURQUARD) -- yes, you will see a Point L. Go up the sheet from Point L, and there is a road that leads back toward the river to the gate well, and that is the road that was mentioned.

Q That road does not cross the canal?

A (WITNESS BOURQUARD) No.

Q There will be no road across the canal. Is that correct?

A (WITNESS BOURQUARD) Except for the one that already exists.

Q You do not plan -- your plans do not call for your building another road across the canal?

A (WITNESS BOURQUARD) That is correct, except for the temporary road.

Q Except for the temporary road, which was the sentence I just read. The access road will be removed.

A (WITNESS BOURQUARD) That is right.

Q Thank you. I now understand where the roads are and what their life expectancy is. Thank you. I do have one further question.

This concerns Mr. Harmon's testimony regarding the electromagnetic current meter or flow meter or current meter. Is that the same?

A (WITNESS HARMON) Yes, it is a flow or current meter. Yes.

Q And the method that was used to determine the velocity? I believe you said that was a Marsh-McBirney, and I haven't found the place in the testimony yet.

A (WITNESS HARMON) Yes.

Q Does that meter give an X and Y component of the velocity?

A (WITNESS HARMON) No, that meter simply reads off a velocity off a scale.

Q And then you did testify, did you not, that the meter, regarding the orientation of the meter, how it was oriented relative to the cross section center line so that you could be sure you were downstream to identify the current direction?

A (WITNESS HARMON) I oriented the sensor part of the meter, which includes a cable that is attached to a sensor that we attach to a waiting rod, a calibrated waiting rod. I oriented that directly facing into the current, and took the measurement at that point.

MR. HODGDON: Thank you. I have no further questions.

JUDGE BRENNER: Mr. Conner, we will let you do the redirect ahead of our questions this time. We change from time to time just to see if you are paying attention.

(General laughter.)

MR. CONNER: I must say, one may never be complacent.

(General laughter.)

MR. SUGARMAN: Mr. Chairman, before the redirect begins, there was one exhibit I referred to a number of times that I meant to mark, and I would like to mark it. It is the memorandum of the meeting of January 5th, 1982, which was referred to several times,

and it consists of a two-page memorandum and four figures, or six figures, and an excerpt of the Hansen paper. Mr. Bourquard's memo to the file.

JUDGE BRENNER: What was your pretrial brief number?

MR. SUGARMAN: D-34.

JUDGE BRENNER: Well, you know, the attachments have been in a number of times already.

MR. SUGARMAN: Yes.

JUDGE BRENNER: Unless you are telling me they are different, and that is based on my quick glance.

MR. SUGARMAN: A couple of the sheets are different. It is primarily the memorandum that I am interested in, but I thought for the sake of completeness we might as well have it all in.

JUDGE BRENNER: All right, we will mark the whole thing, if that is what you would like, so that will be 17.

(The document referred to was marked for identification as Del-Aware Exhibit Number 17.)

JUDGE BRENNER: And that is just for identification.

MR. SUGARMAN: Right.

(Pause.)

JUDGE BRENNER: As long as you are still pausing, Mr. Conner, the next witness is Mr. Phillippe, right?

MR. SUGARMAN: Well, sir, as you instructed, I arranged to have Mr. McCoy and Mr. Miller on their way today, and if they get here, I would take them ahead of Mr. Phillippe.

JUDGE BRENNER: Okay, but somebody is ready to go right on as soon as they are finished?

MR. SUGARMAN: Yes, sir. Mr. Phillippe is not here right at the moment, but he will be here shortly, so we will have him.

JUDGE BRENNER: I didn't notice that, because I don't know what he looks like. I don't know quite everyone in the room. Mr. Conner?

MR. CONNER: I don't understand what you are waiting on me for.

JUDGE BRENNER: Your redirect.

MR. CONNER: I thought you said I would redirect after the board had given its questions.

JUDGE BRENNER: I am sorry if I said that. I meant to say it the other way around, that we will take your redirect first.

REDIRECT EXAMINATION ON BEHALF OF THE APPLICANT

BY MR. CONNER:

Q Mr. Harmon, you were asked several questions by Mr. Sugarman about something being possible, such as shortnosed sturgeon eggs being in the vicinity, the possibility of them being in the vicinity of the intake. Do you recall that?

A (WITNESS HARMON) Yes.

Q Were you using "possible" in the sense of hypothetically possible, or in the sense that it might be probable?

A (WITNESS HARMON) In the hypothetical sense of something being possible.

Q Would you look at your study on Page 13 that was referred to by Mr. Sugarman? And I don't have a copy of it, but I believe it is the last sentence.

A (WITNESS HARMON) Yes.

JUDGE BRENNER: What study is this again? Let's get the date. It is not an exhibit in the case. Am I right?

MR. CONNER: That is correct.

JUDGE BRENNER: Okay. Why don't you give us the date again?

MR. CONNER: It is dated November, 1980.

JUDGE BRENNER: Is it that same study that was

asked about yesterday?

MR. CONNER: Yes.

JUDGE BRENNER: Okay.

BY MR. CONNER: (Resuming)

Q Would you read -- You were asked a question about the intake being in the main river current. Would you read that whole sentence for the record?

A (WITNESS HARMON) Yes. The sentance reads, the last sentence on Page 13, "The potential for interaction of the intake structure is minimal because the intake will be positioned out in the main river current, and not in the back eddies along shore where young fish, including American shad, appear to congregate."

Q And is that still your position?

A (WITNESS HARMON) Yes, it is.

Q You were asked questions about the outer edge of the eddy and measurements concerning it. Do you recall those questions?

A (WITNESS HARMON) Yes, I do.

Q Is the intake structure in the eddy?

A (WITNESS HARMON) Not in my opinion, it is not.

Q Mr. Bourquard, you were asked that same question about measuring the outer edge of the eddy. Is

the intake structure in the eddy?

A (WITNESS BOURQUARD) No.

JUDGE BRENNER: Is it in the main flow, Mr. Bourquard?

WITNESS BOURQUARD: Yes, it is in the main flow of the channel.

JUDGE BRENNER: And do you define the main flow as the maximum average flow area?

WITNESS BOURQUARD: No, I do not state that it is the area where the velocity is highest. I say the channel is the -- the main channel is the flow that is continuing on downstream, and it is definitely in that part of the channel.

JUDGE BRENNER: Do you think any water that continues on downstream -- that is your definition of the main flow?

WITNESS BOURQUARD: Yes.

JUDGE BRENNER: So when we look back through this record, anywhere where we saw the panel testify as to main flow, that is the definition we should apply?

WITNESS BOURQUARD: Yes, as far as my testimony is concerned. Yes.

WITNESS BOYER: I would modify that for what I define the channel to be, and not necessarily take all of the water which goes downstream. The channel is the

deeper portion, and where the main body of water flowing downstream is located. There is some additional water at lower velocities and shallower portions of the cross section of the river which is going downstream that I would not define as being in the main channel. In other words, at further cross sections downstream where the river expands, you may have a deeper section in which the main body of water is flowing, and a much shallower section for maybe a couple of hundred feet, and I would define the channel as being the deeper section of that part of the river.

JUDGE BRENNER: Okay. I don't want to pursue it now during your time, Mr. Conner. We may come back to it.

BY MR. CONNER: (Resuming)

Q Mr. Boyer, I have just handed you the deposition testimony of Gerald Hansler, executive director of the DRBC, and have shown you Page 110. Do you recall being asked questions about the increase in storage capacity in the Delaware relative to predicting flows and levels by Mr. Sugarman?

A (WITNESS BOYER) Yes.

Q Would you examine Mr. Hansler's testimony, if you are not already familiar with it, and advise us if you agree with the values that he has given there for

the increase in storage since the draught of the sixties?

A (WITNESS BOYER) Yes. He says that since the draught of the sixties, there is an addition of about 135 billion gallons.

MR. SUGARMAN: I want to object to this, because Mr. Boyer has shown no foundation for having an ability to give this testimony, and what this really is is a backward way of getting Mr. Hansler's deposition testimony into evidence here. To ask Mr. Boyer if he agrees with it is simply to offer an unqualified opinion by Mr. Boyer, or to offer Mr. Hansler's testimony at a time when Mr. Hansler is not available for cross examination. Mr. Hansler was here, and Mr. Conner could have asked the questions of Mr. Hansler.

JUDGE BRENNER: All right. These witnesses were asked a lot of questions about that, starting by you, Mr. Sugarman.

MR. SUGARMAN: That's right.

JUDGE BRENNER: They are entitled to talk about what they are relying upon. You have asked them about what he knew about it already quite extensively on cross, and we have that record. They are entitled to state what they are relying upon.

MR. SUGARMAN: I will say he volunteered it,

and I crossed him on it.

JUDGE BRENNER: You asked him an awful lot of questions about it, and I am not going to cut off the redirect.

MR. SUGARMAN: I am only objecting to this as far as it involves Mr. Hansler's --

JUDGE BRENNER: I know. I have ruled, and he is entitled to tell us what he is relying on.

WITNESS BOYER: Mr. Hansler then goes on to point out that the storage capability of the main stem of the Delaware since the draught of the sixties has been increased by 56 percent.

MR. CONNER: We have no further questions.

JUDGE BRENNER: Our questions are going to be more than just a few minutes, so we had better take the break now. We will come back at 10:35.

(Whereupon, a brief recess was taken.)

JUDGE COLE: I think we are about ready, gentlemen.

BOARD EXAMINATION

BY JUDGE COLE:

Q Del-Aware Exhibit 1-C, do you have that, Mr. Harmon? It is a response to Issue Number 4.

A (WITNESS BOYER) Can you identify it?

Q Del-Aware Exhibit 1-C.

A (WITNESS BOYER) I am afraid we didn't get copies of all of the exhibits.

(Pause.)

A (WITNESS BOYER) Okay.

Q Mr. Harmon, do you have that, sir?

A (WITNESS HARMON) Yes, I do. I have it in front of me now.

Q In the first paragraph of the response, it has to do with the assessments of the intake location. In the latter part of the first paragraph of the response, the statement appears, "The change in design was made to minimize adverse environmental impacts on the biota." Do you see that, sir?

A (WITNESS HARMON) Yes, I do.

Q Could you briefly describe to me what environmental impacts were involved that would be minimized by the change, and what is your estimation of

the magnitude of the difference?

A (WITNESS HARMON) Can I ask you whose responses are these?

JUDGE BRENNER: These are the DRBC responses to Del-Aware.

JUDGE COLE: Well, it is not fair to ask you that question then, sir, but I would appreciate it if you would have any comments on it.

WITNESS HARMON: I think the feeling here was that since bypass velocity, since it is one of the parameters that will help minimize entrainment, that the parties involved apparently felt that some bypass velocity would be desired, and the level that they were looking at was the .5 to one foot per second, and I think they wanted to move it out so that they would be sure of getting sufficient bypass velocity in their judgment to ensure further against any negative impacts.

BY JUDGE COLE: (Resuming)

Q All right, Mr. Harmon. Are you at all familiar with the origin of the bypass velocity criteria, how that came about?

A (WITNESS HARMON) You are talking about the so-called one foot per second bypass criteria?

Q Or a ratio that has been talked about here

today, sir, and yesterday and the day before.

A (WITNESS HARMON) Yes, as we discussed earlier this morning, there was -- during the transition from vertical traveling to the wedge wire screens, there was consideration due to various development documents dealing with impingement and entrainment that with vertical traveling screens you want to have a velocity past the face of these vertical traveling screens that will allow fish to either escape on their own or will carry them should they be in bad condition or otherwise immobilized past the face of vertical traveling screens where you have this type of alternative available, like in a river system, and it was felt with the wedge wire screens from the early research that was done that since fish display -- the larval fish, the very early life stages of fish display an avoidance response when they sense the screen face, that any bypass velocity that you can make use of would further carry them out of the potential zone of influence, and I think this is where people got involved with looking at the bypass velocity consideration.

Q So you say it was originally developed with respect to vertical traveling screens?

A (WITNESS HARMON) I think in the context of the discussions that I have been privy to in relation to

this intake, this is as far as -- to my knowledge, this is where the idea came up that there should be flow past the intake screens. Now, whether the intake screens under consideration at that point were vertical traveling or Johnson screens, I think there was a point of confusion on the parties involved at that point that were making some of these statements.

One of the meetings I attended, it didn't seem to me that the people from the regulatory or wildlife, Fish and Wildlife agencies were really clear on either the design or the protective nature of the wedge wire screens, and I know we had considerable discussion at that point on the protective features of this type of intake screen, and it seemed to me we were, quote, unquote, educating them to some extent at this point, and there was still some adherence back to some of the development document criteria that dealt with vertical traveling screens.

I think there was a point of confusion there on their part.

Q All right, sir. In your professional opinion, do you think similar criteria would apply to the wedge wire screens as would apply to vertical traveling screens with respect to bypass velocity and intake velocity ratios?

A (WITNESS HARMON) To the extent that if you can make use of some bypass velocity, I think it is a good thing to make use of. If it is a situation in a lake where you don't have bypass velocity, you still make very good use of this type of intake design. If the intake was located in a pooled section, say, down closer to the Lumberville dam, where the bypass velocity currents may be much, much less, you still would have an excellent intake design.

Q Thank you.

Mr. Bourquard, with respect to the intake, the wedge wire screen intake and the back wash system, you were asked several questions about the air back wash. Do you have any knowledge of the field experience and effectiveness of the air back wash on the wedge wire screens?

A (WITNESS BOURQUARD) Only from discussions with the people at Johnson Wedge Wire, and from an installation by the American Electric Power. I don't recall. I think it is at Point Pleasant, Kentucky. I think it is. I know it is the same as ours. And they indicated they thought it was very effective.

Q Is that a similar type installation, sir?

A (WITNESS BOURQUARD) Yes, it is in the Ohio River, and I don't remember the exact size of the

screens or what it was, but it was in the flow of the river, which attracted us to inquire about it, and the only thing they came up with -- in fact, they advised me about two things. One was to make sure you had large enough pipes carrying the air out to the intake screens so you could blow them off. They evidently had put a smaller size pipe in, and then had to go back and replace it. So we made sure this time we had adequate air pipes going out to the screens.

Q That was one thing I wanted to explore, sir, about the air back wash forcing the air into a header system, and the hydraulics of the air flowing from that system and outward. Have you looked at or performed any calculations to satisfy yourself that the air pushing out through these openings would effectively move air through all of the openings or just the top portion?

A (WITNESS BOURQUARD) We observed movies that were shown by the Johnson Wedge Wire people on tests that they had run on these screens, which showed that the air bursts, of course, did go upward, but also it went downward, too, but we do not have any computations on that.

A (WITNESS BOYER) I might add that the pipe is distributed, the air pipe is distributed along the length of the intake screen assembly, and the discharge of air moves water, moves the water that is, at the time of the operation of the backwash system, is occupying the internal diameter of the screen; so it is a combination water reversal through the jets. By jets I mean the space between the wedge wires themselves followed by the air bubble. And in the pictures that Mr. Bourquard referred to, the air bubble seemed to come out through the entire circumference of the screen -- maybe a little bit more to the top, but it certainly was on the entire circumference of the screen.

Q Well, that was part of my question, whether the removal of the water by air displacement is the mechanism by which it is cleaned or whether it is the air bubble.

A (WITNESS BOURQUARD) I think it is both, sir.

Q With respect to the design quantities for air in the backflush system, did you design that system, sir?

A (WITNESS BOURQUARD) Yes, we did, acting upon the advice of the Johnson wedge wire people.

Q What sort of quantities of air are involved in the backflushing of a system of this type?

A (WITNESS BOURQUARD) I don't have those in

front of me right now, Judge Cole. It is a hundred pounds pressure, and there are four-inch lines going out. And I could check the drawings to see what size the container is.

Q But this is in accordance with the equipment manufacturer's recommendations.

A (WITNESS BOURQUARD) That is correct, sir.

A (WITNESS BOYER) Really it is a sharp burst that you want, and the continuous flow of air is not really the cleansing medium and is not required. So the size of the pipes out there is to make sure you've got a reasonable volume of air close to the discharge pipe locations that can expand when the valve is open and enter into the water system.

Q In one of the documents that is before me there was some reference to operational experience on the Johnson wedge-wire screens. And this is for either Mr. Bourquard or Mr. Harmon. One of the major -- based upon what you know, what are the major problems with operating wedge-wire screen as intakes -- operational problems with respect to clogging?

A (WITNESS BOURQUARD) I would say leaves are the only problem.

A (WITNESS HARMON) I might add not in a situation like we have here but in an estuarine or

coastal situation where you have these, you would tend to get some biofouling of encrusting organisms. And that wouldn't occur here. We don't have those type of organisms, fouling-type organisms in the river here. But this has been the experience in some of the other types of test screens.

Q So you don't anticipate any biological fouling at this screen this is proposed for Point Pleasant?

A (WITNESS HARMON) No.

Q The screen location was moved from 200 to 245 feet out into the river. What was -- what instigated that change?

A (WITNESS BOURQUARD) Primarily to get higher velocities at lower flows, higher bypass velocities at lower flows.

Q But how did that come about? Was this prompted by velocity surveys or the views of other parties? How did that change come about to be made?

A (WITNESS BOURQUARD) It was the result of a number of meetings with the Corps of Engineers primarily, and discussing the advantages of various locations of the screen -- in other words, 25 feet out and 45 feet out and possibly further. And the 45 was selected on the basis of, you might say, generalized discussions.

Q Were you involved in any of that, Mr. Harmon?

A (WITNESS HARMON) No. NWRA did not call on me for that.

Q Question E-240.25 in the interrogatory response, do you have that, sir?

A (WITNESS BOYER) Yes.

Q Could you turn to the last page of that three-page question and response, Table E-240.245-1? The title of the table was "Days of Water Unavailability at Limerick Without Perkiomen Creek." And I guess I just have one question.

How it is prompted by the appearance of the years 1966, '63,'57 and '64 underneath the third, fourth, fifth, and sixth column headings on that table; for example, worst in five years, then you have underlined 1966; the next column, worst in ten years, you have underlined 1963; and so on and so forth.

How were those numbers prepared in the column, and what does the year mean?

A (WITNESS DICKENSON) In response to the question, in our office we reviewed a report prepared by Tibbits, Abbott, McCarthy and Stratten for the company that was prepared back in the early '70s. That is why if you noticed on the front page this tabulation covered the period from 1931 to 1970, and TAMS, Tibbits, Abbott,

McCarthy and Stratten, had statistically analyzed and put in graph form the number of days in each month by each year that the USGS flow record showed water would either be below the 530 or 560 CFS limitations on the Schulkill, and then moving over to the Delaware the number of days that would be below 3000 CFS at Trenton in those various months by years.

And they listed the number of days, and then at the far righthand end they totalized the number of years. So we went over this 40 years of record and found the worst year, plotted them, the total number of days against the years, and in the 40 years that they reviewed, the worst year was 148 days of shortage, and that happened to be the year 1964. So then to provide the additional information, those 164 days appeared in those months that we list here. So then we went back for 20 years on this curve and saw the number of days where the curve passed 20 years, you see, frequency. And this was the year that it just so happened to be typical or the year that broke out.

Q So this is, under worst in five years, this would be the typical example that you would expect to occur once in five years.

A (WITNESS DICKENSON) Yes.

Q And a representative of that particular

occurrence that would have the once in five years happened to be the year 1966.

A (WITNESS DICKENSON) Yes. That happened to fall at the five-year increment where the curve passed through.

Q So this really is an expected return period.

A (WITNESS DICKENSON) These are expected return periods, and this would be typical of that return. That shows generally the months that it would occur and the frequency of days per month.

Q Okay. I understand now. Thank you.

A (WITNESS DICKENSON) But it was based on, as I say, the TAMS report and only came up to the year 1971.

Q So the year is just an example.

A (WITNESS DICKENSON) Generally it is just an example. It did occur this way, and it was plotted on our curve.

Q I understand, sir.

The January 22nd, 1982 letter, Mr. Bourquard, that you wrote to Mr. Roy E. Denmark, Jr., Applicant's Exhibit No. 2, had several attachments to it, one of which was the hydraulics of Point Pleasant pumping station, hydraulics of water intake. I guess that is also Del-Aware Prehearing Exhibit 20-1. I don't know whether it is really part of Applicant's Exhibit No. 2.

Maybe it's part of Del-Aware Prehearing Exhibit 31.

A (WITNESS BOURQUARD) Is this dated April 30, 1982?

Q Yes, sir.

A (WITNESS BOURQUARD) I have a copy, yes.

Q I can't find it in Del-Aware 3.

A (WITNESS BOYER) It's Prehearing D 20-1.

Q Okay. Let's use Prehearing D 20-1. And on page 2 of Del-Aware Prehearing Exhibit 20-1 under the heading of "Effect on River Flow," in the last paragraph of that section, Mr. Bourquard, you referred to the Yarnell equation, hydraulic computations based upon the Yarnell equation.

A (WITNESS BOURQUARD) Yes, sir.

Q Could you tell me what the Yarnell equation is and what it is supposed to demonstrate, sir?

A (WITNESS BOURQUARD) I don't remember all of the exact terms in the Yarnell equation. In fact, this was a question that the staff had asked, too, and we furnished them a copy of the formula, but I don't have it with me. And it is primarily an equation which judges the rise in upstream water surface as a result of bridge piers.

Q The latter part of that paragraph, calculated results were in the ten thousandths of a foot.

A (WITNESS BOURQUARD) Yes, sir.

Q In other words, nil. And that is part of the quote also.

A (WITNESS BOURQUARD) Yes.

Q But how many ten thousandths of a foot were you talking about, sir?

A (WITNESS BOURQUARD) Offhand I don't remember, but it would be probably somewhere between 1 and 10 I would gather.

Q All right, sir.

With respect to determining the impact on the water surface elevation at Point Pleasant as a result of taking water out at Point Pleasant, could you tell me how we would go about calculating that impact, or are you saying that you used the Yarnell equation to do that, sir?

A (WITNESS BOURQUARD) To get the drawdown due to water being withdrawn?

Q Yes, sir.

A (WITNESS BOURQUARD) No, sir, I did not use that. I took the rating curve that we had developed and took the flow at say 31, at 3150 CFS and then the flow level at 3000 even and subtracted those two, because that would be how much the water level would drop as a result of withdrawal of about 150 CFS.

Q And did you make that calculation and an estimate of the drawdown?

A (WITNESS BOURQUARD) Yes, sir. And I think I got about .06 feet.

Q All right, sir. Is it safe to say that the control point, the hydraulic control point for elevation at Point Pleasant is located at the dam a couple of miles downstream?

A (WITNESS BOURQUARD) The Lumberville Dam, yes, sir.

Q Do ou know at what elevation you would get no water traveling over the side wings of the Lumberville Dam?

A (WITNESS BOURQUARD) From the survey by Pickering, Courts I think that is 70.9 or 70.7. That is an approximate elevation. It is not an exact 70.7 all the way across there. The 70.7 is what they have.

Q Is your estimate based upon the difference in water level reflected at the Lumberville Dam when the flow is not going over the wing dams?

A (WITNESS BOURQUARD) I would say that it is affected by whatever the conditions were that existe there.

(Panel of witnesses conferring.)

Q If the flow in the river were such that there

was no water traveling over the wing dams and we were to take water out at Point Pleasant, how would you -- what would your best estimate then be, how would you go about estimating the impact on the water level at Point Pleasant? Would you still use the rating curve?

A (WITNESS BOURQUARD) I would think the rating curve would still apply.

A (WITNESS BOYER) Yes. If you look at the rating curve.

Q Sir, the rating curve is --

A (WITNESS BOYER) It is part of D 20-1.

JUDGE BRENNER: It is this case as Del-Aware Exhibit 11 for identification, and the further explanatory sheets are in as Del-Aware Exhibit 13 for identification.

BY JUDGE COLE: (Resuming)

Q Let's look at the rating curve, sir.

A (WITNESS BOYER) Yes, sir.

Q And right around 3000 we've got a group of numbers, a group of points. How accurate do you think that would be in assessing the water level at Point Pleasant?

A (WITNESS BOURQUARD) I would think they were pretty good.

A (WITNESS BOYER) Those are elevations and

flows.

A (WITNESS BOURQUARD) No. They were elevations and flows at Trenton when the flow was very low. It was around 3000 or less for almost a month.

A (WITNESS BOYER) But they were Trenton values. I calculated what it would be at Point Pleasant compared to the actual elevations at Point Pleasant.

Q All right, sir. Do you have any knowledge of the dimensions of the center section, the center flow section of the wing dam at Lumberville?

A (WITNESS BOURQUARD) The Pickering, Courts survey shows it to be just about a hundred feet across.

Q And a depth of up to the top of the wing wall to the bottom of the opening?

A (WITNESS BOURQUARD) It looks like about 5.7 feet.

A (WITNESS BOYER) Correction.

(Panel of witnesses conferring.)

A (WITNESS BOYER) Okay. The average -- right. The average would be around 5.7 feet.

Q All right, sir. Now, if we were to take water out upstream when the flow was through that section and not over the wing wall and that were in fact the hydraulic control of the upstream water level, do you think that this chart would accurately reflect the water

level differences that would be reflected back up to Point Pleasant?

A (WITNESS BOURQUARD) Yes, sir, I do.

Q Under those flow conditions?

A (WITNESS BOURQUARD) I think actually some of the ones that were made in -- that I mentioned there at around 3000, that this condition probably did occur at the Lumberville Dam during that period of time based on flow measurements down at Trenton.

A (WITNESS BOYER) I would expect the rating curve to have a slight change of slope at the point where it was in the weir at Lumberville. But I think Mr. Bourquard's estimate can be made with confidence based on the rating curve data which is plotted from a series of points which went -- the lowest of which appears to be about 2700 CFS.

Now, if it was in the weir section at Lumberville, then the change in the shape of the curve was not enough to be apparent because of the close proximity in flow of the other points and the lack of great divergence of the slope of the curve between flowing over the wing dam and in the center..

A (WITNESS BOURQUARD) One thing I might point out, Mr. Cole, is that one of the measurements that is used on there, on October 1st, 1980 the water surface

elevation at Point Pleasant was 70.63, which is below the top of the wing dam. So the flow at that time pretty well had to be going through that slot.

Q Assuming the top of the wing dam is 70.7.

A (WITNESS BOYER) That's right. Assuming they are all tied back to absolutely the same benchmarks, and the benchmarks have been settled or something like that or updated or dams haven't settled or something.

And I would also point out that --

(Panel of witnesses conferring.)

A (WITNESS BOYER) That the value at 3700 on the rating curve, which practically falls right on the curve along with the other points -- I think the curve fit is very good down in that region -- was a USGS measured value at the Lumberville Bridge, which is only a short distance -- what is it, a couple of miles?

(Panel of witnesses conferring.)

A (WITNESS BOYER) It is only about a mile or so down below Point Pleasant. So that is an accurate calibration of the rating curve and confirmation of the rating curve because it has measured flow in the river with no corrections other than what were made in connection with that particular flow analysis, which would include a diversion to the Raritan Canal and was a measured elevation at Point Pleasant at that time, and

that is shown on the rating curve by the little X.

Q I can see that, sir. But what were the flow conditions at the Lumberville wing dam at that time?

A (WITNESS BOYER) I can't state that, but whatever they were --

A (WITNESS BOURQUARD) Well, they would be around, I would say, at the Lumberville wing dam they would probably be or probably they should be 3,340 CFS.

(Panel of witnesses conferring.)

A (WITNESS BOURQUARD) Because what passed over the wing dam did not go down the Delaware and Raritan Canal.

A (WITNESS BOYER) That record sheet does not show any measurement at the Lumberville wing dam at the time that these were taken.

Q All right, sir. But do you agree that the hydraulic conditions would be different with flow over the wing dam as compared to when flow is not passing over the wing dam, the hydraulic response would be, would or should be significantly different?

A (WITNESS BOURQUARD) Yes.

A (WITNESS BOYER) I wouldn't say significantly.

A (WITNESS BOURQUARD) They would be -- you're overflowing an area of around 10 or 900 feet long, and all of a sudden it reduces down to a 100-foot width. So

there would be some slope in the shape of the rating curve there.

A (WITNESS BOYER) But when I say significantly I'm talking about the increment when it is just within the weir dam. Within the weir there would be no change. As you get a foot down in the weir there would be some change. When you get three feet down in the weir there would be what I would consider should be a noticeable difference, noticeable maybe by half a foot, up to that range. And if you get down to the very bottom, well, then you have no flow in the river, and I guess that is the --

Q But I'm talking about the relative impact of taking out approximately 150 CFS when you're flowing over the wing dam as compared to not flowing over the wing dam, and what do you think would be the difference in hydraulic response upstream?

A (WITNESS BOYER) I say they are really represented by the rating curve and should be able to be obtained from the rating curve as Mr. Bourquard did it.

A (WITNESS BOURQUARD) The 2700 CFS flow that is used in the rating curve was evidently taken at a time when the flow was in the slot section of the wing dam, so it would reflect that.

(Board conferring.)

(Panel of witnesses conferring.)

JUDGE BRENNER: Wait a minute. We had this problem before. I don't want somebody else up there testifying unless you want to swear them in.

WITNESS BOYER: I was just going to ask him to do something for me.

JUDGE BRENNER: You can ask him on the record if you want, unless you just need a document. Then, of course, you can ask for that.

WITNESS BOYER: That's all right.

BY JUDGE COLE: (Resuming)

Q Mr. Harmon, with respect to the velocity measurements, you made two such sets of measurements, did you not, sir?

A (WITNESS HARMON) Yes, sir.

Q Was there any attempt made to make a flow balance based upon the velocity measurements?

A (WITNESS HARMON) I'm not sure what a flow balance is.

Q Well, I believe yesterday Mr. Sugarman referred to a hyironet. Do you know what he meant by that?

A (WITNESS HARMON) If the question is directed to me, I'm not sure what he meant by that. And I didn't create any river flow estimates from those velocity

measurements at all.

Q Mr. Bourquard?

A (WITNESS BOURQUARD) Yes. We made an estimate for using the velocity measurements that Mr. Harmon had made on I think it was November 7th, and these measurements went all the way across the river, and they pretty well jibed with our rating curve.

A (WITNESS DICKENSON) Yes. I'm looking for the answer. It was one of the answers to the NRC's questions. We took a cross-sectional area times the velocities and came up with a similar answer to the flow as measured at Trenton, and it is in one of these answers. I was looking it up for you.

Q All right, sir. I would appreciate that.

JUDGE BRENNER: Just to orient the witnesses, the question is geared to whether or not there was some check on the work represented by the calculations that were extensively discussed yesterday of measuring at Trenton and accounting for storage area and so on. And we didn't hear anything about it in response to Mr. Sugarman's questions or on redirect, so we were wondering if that check existed.

WITNESS BOURQUARD: Yes, sir. They were checked.

JUDGE BRENNER: I guess Mr. Dickenson is

Looking for the reference.

WITNESS DICKENSON: Yes. In Question E-240.27 to the NRC's questions we calculated the depths. And as Mr. Bourquard said, it was November 7, 1980 that this was done. And the measured flow at Trenton was 2950 cubic feet per second, and the calculated discharge up at Point Pleasant was 2840 cubic feet per second. This was based and done by breaking down the cross-section taken from the contour map and so forth and then taking the velocities at the different depths and at the different stations going across the river and assuming that each of these blocks has a certain velocity and a certain cross-section and then adding them up. And we came out with the 2840.

BY JUDGE COLE: (Resuming)

Q And that is amazingly close to 97 percent of the flow at Trenton also. Was that used as part of the basis for the 97 percent?

A (WITNESS DICKENSON) No, it was not. No, the 97 percent was an earlier number, of course, and was strictly the ratio of the drainage area.

BY JUDGE BRENNER:

Q I just want to make sure I understand one or two things, and then we will go back to Judge Cole.

On Applicant's Exhibit 2, which is the January

22nd letter to Mr. Denmark, Table 1 of that table is the velocity measurement table of Mr. Harmon which he was asked about, and the November 1980 table, it says flow 3000 plus or minus CFS.

I take it the 3000 was selected based upon the rating curve, is that correct?

A (WITNESS BOURQUARD) Yes, sir.

Q When you answered Judge Morris the other day, you thought -- do you recall what you said the plus or minus would represent in your mind?

A (WITNESS BOURQUARD) I said approximately a hundred or so CFS.

Q And so your later check after the velocity measurements were taken and going through the process Mr. Dickenson just described gave you the number of 2850.

A (WITNESS BOURQUARD) Yes, sir.

JUDGE BRENNER: Okay.

BY JUDGE COLE: (Resuming)

Q I just want to get back, for one minute back to the drawdown on page 13 of the testimony, item 27. It is stated that the drawdown was conservatively determined to be no more than three-quarters of an inch if all four pumps are operating and when the flow is 3000 CFS in the river.

How was that calculated?

A (WITNESS BOURQUARD) That was calculated on the basis of the rating curve. In other words, the .06 feet is about -- you multiply that by 12. You get about .72 inches. So that is the three-quarters.

Q Could you do that again, sir?

A (WITNESS BOURQUARD) I came up with a loss on the rating curve of approximately .06 feet or at least a drawdown of .06 feet. And in that there's 12 inches in a foot. I multiplied that by 12 and got .72 and then just said three-quarters of an inch.

Q Thank you.

Mr. Boyer, yesterday you said these pumps were variable speed pumps, did you not, sir? Do you recall that?

A (WITNESS BOYER) I said that they would be started in a variable speed mode and then brought up to speed and then operated at speed. It is a mechanism for reducing the starting current and the impact on the electrical requirements. But it does extend the time period over which the pump comes up to its rated flow and therefore gives a short time period where the flow is increasing gradually rather than a sudden almost a maximum demand in one second.

JUDGE COLE: All right, sir. Thank you.

That's all I have. Thank you.

BY JUDGE MORRIS:

Q While we're on the rating curve, I have a very small detail question. Were the points on the curve the data that are on page 2 of the January 4, 1982?

A (WITNESS BOURQUARD) Yes, sir.

Q Do you see a small discrepancy there that I do? For example, if you look at the Trenton gauge data for May 11, the discharge is 5900.

A (WITNESS BOURQUARD) Yes, sir.

Q If you look at the rating curve do you see a point plotted at 5,900?

A (WITNESS BOURQUARD) It does look like there is a mis-plot there.

(Panel of witnesses conferring.)

No, there is no dot there.

Q So there is a mis-plot at that point. Is that correct? Or is that point missing; one or the other?

(Panel of witnesses conferring.)

A (WITNESS BOYER) It might appear that that point is missing from being circled and clearly identified on that plot, because if you plot that flow in there, --

Q As I say, it is a very small point, and I think if you plot it in there it falls very close to the curve as drawn.

A (WITNESS DICKENSON) I have just counted the dots. It's the first time I've noticed that, but I've just counted the dots and there are only 21 dots, circles and Xs and there are 22 items on this list. So I don't know whether that is the one that was missed or what. We will have to check.

Q I really don't think it is going to change the shape of the curve a bit.

A (WITNESS BOURQUARD) We must have failed to

plot it.

Q Would you look also at Item 14, May 29.

(Panel of witnesses conferring.)

A (WITNESS BOURQUARD) I think there was a dot there but I think it got washed away in the process.

Q The reason I bring this up is I'm sure somebody will detect this some day and I would like to establish now, in your opinion, whether those apparent errors would change this curve in any way.

A (WITNESS BOURQUARD) No, sir, they do not change the curve.

A (WITNESS BOYER) But we will re-examine each one and reconfirm that.

Q Thank you. Mr. Bourquard, I believe the other day you made reference to some core borings that were made in the vicinity of the proposed intake.

A (WITNESS BOURQUARD) Yes, sir.

Q Did you, at that time, know the water level of the river?

A (WITNESS BOURQUARD) I'm sure it was recorded at some time, yes.

Q And did you also record the elevation of the level of the water from the river bottom where you made the core borings?

A (WITNESS BOURQUARD) I'm sure that is

recorded. Yes, sir.

Q Is that data anywhere in this record?

A (WITNESS BOURQUARD) I do not think so. No, sir.

Q Do you know whether an effort was made to compare those data with the contour lines drawn on Applicant's Exhibit --

A (WITNESS BOURQUARD) Yes, sir, they were. And as I mentioned before, when we did the core borings we measured the top, the ground surface at the place where the core borings were being made, and they pretty well jibed with the contours of the old survey.

Q Judge Brenner is taking the words out of my mouth. What do you mean by pretty well?

A (WITNESS BOURQUARD) I would say within a half a foot or a foot. I think you have to understand that they may not fall exactly on a contour line as such, so in between there, if we got something that is somewhere close to, you might say, the connection, if a straight line is drawn between the two contours we would assume that was a reasonable fit.

Q Can you describe the locations of these core borings?

A (WITNESS BOURQUARD) I can show you a plan that has that on it. They are basically -- to describe them,

they are basically -- there were, I think, about eight rows of borings out in the river at about 100-foot intervals, and they went out I think at 50-foot spacing. The ones on the outer limits did not go out as far. To really describe it I would have to show you a drawing that locates these bore holes.

Q Do you have one handy?

(Panel of witnesses conferring.)

A (WITNESS BOURQUARD) I'm sorry, Mr. Morris, I do not have a plan here. They are separate from the contract plans, and they only show with the sub-surface information.

Q I was hoping to see the plot so I wouldn't have to recapitulate what you said, but I guess you said that there were eight lines out from the shore.

A (WITNESS BOURQUARD) Yes, I think there were eight lines that went out at about 100-foot intervals.

Q And was the middle of that approximately where the intake pipes are?

A (WITNESS BOURQUARD) Let's see. A, B, C, D, E -- it went down A, B, C, D, E, F, G, H, and D was the center line of the intake, and the borings went out about 50 feet past the intake site.

Q So roughly two or three hundred feet?

A (WITNESS BOURQUARD) Yes, sir.

Q And again, the contours were conformed to within the range of a half to one foot?

A (WITNESS BOURQUARD) Yes, sir.

Q While we're still looking at the river bottom, there was a discussion the other day about whether the state line dividing New Jersey and Pennsylvania was the middle of the river or whether it was properly represented by the USGS topographical map. Have you had a chance to examine that question any further?

A (WITNESS BOURQUARD) As far as we are concerned, we consider the USGS map as being the correct location of the Pennsylvania-New Jersey line.

Q So to answer my question, I guess you have not pursued it any further?

A (WITNESS BOURQUARD) No, sir.

Q Judge Brenner wanted to tie down the location of the furthest outboring a little better. And I characterized it as being out about 300 feet from the Pennsylvania shore; is that correct?

A (WITNESS BOURQUARD) I would say that was about right.

Q Would that have been in New Jersey?

A (WITNESS BOURQUARD) It could have been. I would doubt it, though.

MR. SUGARMAN: Could I hear the end of that

answer?

WITNESS BOURQUARD: Well, I won't say I doubt it. I take that back.

JUDGE BRENNER: He said I doubt it and then he took it back.

BY JUDGE MORRIS (Resuming):

Q My crude scaling shows it five feet past the line.

A (WITNESS BOURQUARD) It may be.

Q Gentlemen, I'm not quite sure to whom to address this question, but the way the intake arrays are oriented on Exhibit 4 they seem to point in the direction of the river, and one can infer that the general direction of the river flow is parallel, at least roughly parallel to the intake array axis. Has any consideration been given to the effect or a change in effect on aquatic organisms including fish impingement or entrainment, depending upon the lack of parallelness between the axis of the array and the flow of the current?

A (WITNESS BOYER) Yes. And Paul may be able to add to that. In conversation with the people who have run these tests on the Johnson screens, there are almost compensating effects as you go from parallel flow to perpendicular flow in relation to the orientation of the

screen. So that a slight alignment or misalignment in relation to flow from direct parallelism with the flow is not really significant or meaningful.

A (WITNESS HARMON) In fact, the screens, the same design here, can be used mounted perpendicular to the flow, direction of flow. In other words, they can be rotated 180 degrees -- or 90 degrees, pardon me.

A (WITNESS BOYER) That would impose a different relevant cross-sectional area, but I mean as far as the localized effect of impingement and entrainment of fish, there isn't sufficient data to show any change in those characteristics.

Q You said there wasn't sufficient data for that?

A (WITNESS BOYER) Well, there have been some tests run. There have been tests run on screens that are normal to the flow or where the screen axis is perpendicular to the flow, and there have been some tests run where -- in plumes where they are parallel to the flow. And from the limited amount of data under the same set of conditions because you have got to get the same type of eggs to see whether they are going to be in the water column or not, there is no evidence which points to one screen being more effective than the other; one position being more effective than the other.

I would say it would really come down to the

relative cross-sectional area. If you are normal to it, you have a larger cross-section and perhaps a greater potential for exposure than if you are parallel. But within the sphere of the screen, within a foot diameter of the screen, the probability of impingement or entrainment is not changed.

Q Are you planning any further measurements in the river to look at the direction of flow, either before or after installation?

A (WITNESS BOURQUARD) No, sir.

A (WITNESS BOYER) I'm sure there will be some measurements taken in the river after we get in service, to check velocities and whatnot.

A (WITNESS BOURQUARD) We are required by DRBC, that is, the NWRA is required by the DRBC to monitor the results of the operation of the intake.

A (WITNESS BOYER) And if I remember right, a condition of our NWRA permit requires a report on the operation, in which we would be expected to include some measurements and sampling.

Q But this would be performance of the screens rather than measuring directions of flow?

A (WITNESS BOURQUARD) Yes, I would think so.

Q Do you have any opinion about the probability of misalignment? Is it likely, or how likely might it

be that you would be 30 degrees off, say?

A (WITNESS BOURQUARD) I would say there is practicality no possibility of being 30 degrees off. I would say if we were off at all, we might be a fraction of a degree, but the contractor would certainly be able to stake it out much better than that.

Q Well, will the intake structure be perpendicular to the intake piping, or will it be adjustable?

A (WITNESS BOURQUARD) No, sir, it will be perpendicular to the intake piping.

Q If you were to hypothesize or were surprised and found you were 30 degrees off, would it be possible to attach the piping to the array non-perpendicularly?

A (WITNESS BOYER) Yes, it is a matter of the flange connection. The bolt circle of the Y.

Q To change the subject, there was a lot of discussion about how you define an eddy and where is the edge of the eddy. And we have seen the velocity profiles which start off with positive flow down the river and then cross the zero axis and show negative flow which means flow up the river, but isn't it true that there is no precise dividing line between what you would call main channel of flow and what you would call the eddy?

I will repeat, no precise dividing line.

A (WITNESS BOURQUARD) I would agree with that.

Q Would you also agree that it changes, depending upon flow elevation?

A (WITNESS BOURQUARD) I would say there would be some change; a limited amount I would think, but some.

Q By limited amount, how would you quantify that, Mr. Bourquard?

A (WITNESS BOURQUARD) Well, I would say roughly maybe five or ten feet, but I have not measured it to see other than observing the two flow measurement we have and it looks like there could possibly be maybe a five or ten-foot shift, depending upon how much you moved into the downward flow and through that, and considered that as part of the eddy.

Q So then, the five to ten feet would be for the difference in flows of 3000 to 4500?

A (WITNESS BOURQUARD) Yes, sir. But that is nothing more than a judgment. In looking at the sheets I couldn't say that exactly.

Q Is the eddy smaller or larger for larger flow?

A (WITNESS BOURQUARD) I think the eddy, for a real large flow it gets pretty well wiped out.

Q I'm not talking about overflows of the bar.

A (WITNESS BOURQUARD) I think it moves out a

little way with a 4500 flow, further than with the 3000. It seemed like it seemed to shrink a little, if I remember the figures correctly.

(Panel of witnesses conferring.)

It may move out a little for the lower flow.

JUDGE MORRIS: Thank you very much.

WITNESS BOYER: I have a comment perhaps for Judge Cole if it would be appropriate now, relative to one of his former questions.

JUDGE COLE: Sure.

WITNESS BOYER: You were interested in the effect of the weir at Lumberville. One way to perhaps see what the change in the rating curve would be would be to plot an elevation of 65 feet at essentially zero flow. And since we are on log paper I drew another scale starting with 10,000 flow on the lefthand side. And in fact, it would be the same as the scale on the top of the page of the rating curve I happen to be looking on which has the log paper identification, and would make the lefthand scale .01 or 10 cubic feet per second which would be essentially zero.

So I'm saying essentially zero flow at elevation 65, which is no water over the Lumberville dam at all. And then you assume that the pool was level and would be 65. There would be no flow down the river and

it would be 65 feet in the river at Point Pleasant.

BY JUDGE COLE:

Q Where do we get the 65, sir? I have Del-Aware Exhibit 1B which shows that the minimum elevation of the weir is 64.5.

A (WITNESS BOYER) Well, there is a dip in the bottom of the weir. The line, the basic large percentage of that is at 65. I took it as 65; you can take it as 64 1/2 if you like.

Q That is a legitimate approximation?

A (WITNESS BOYER) Right. And I drew -- from the datapoints we have from 2700 feet, cubic feet per second on up, I plotted them in and then extended the line from that point down to essentially zero or 10 cubic foot flow at 65. And I observe where it crosses the 1000 cubic foot line of flow, which would be on the presently plotted curve, the lefthand margin, would be 1000. And I find that it is 99 -- pardon me, it is at 69.4 on my replot. And if I extend the present rating curve that we have to the lefthand margin, I would get about 69.3. So essentially, I am not showing any difference.

So what I'm saying is within the accuracy of the data we have plotted here and the curves and the scales we have, you essentially won't see any difference. Particularly, especially in the range we're

talking about. I would have expected a lower value.

Q You've got an elevation of 69.4 feet.

A (WITNESS BOYER) 69.4, right.

Q At 1000 cfs?

A (WITNESS BOYER) At 1000 cfs on my expanded scale with zero as 65 feet. And what it would infer is that our rating curve is probably a little low, being extended below 2700. If we assume that flow was over the Lumberville dam or it infers that some of those points may have been in the weir section, some of those flow values may have been in the weir section and the change of slope of the curve which would occur is not a sharp change. It is a change that you can't see in the scales that these are plotted to.

Q Or it might also mean, sir, that the hydrologic regime at the Lumberville dam is such that even when some flow is going over the top of the wing dam, the largest proportion of the flow is traveling through the center section.

A (WITNESS BOYER) That's true.

Q And the impact of the wing dam might not be as large as you thought initially.

A (WITNESS BOYER) Particularly with low levels of flow over the dam. That's probably what it means.

JUDGE COLE: All right, sir, thank you.

BY JUDGE BRENNER:

Q Gentlemen, we spent a lot of time some weeks ago on your calculations, your measurements and calculations of bypass velocity at different flows. And I did not pull out the transcript -- I wonder if you can recall for me what the velocity was at 4500 that you used. This is -- I'm going to lead to the calculation or extrapolation that you made, Mr. Boyer, for 2500.

A (WITNESS BOYER) Right. I still have my notes in the margin here.

Q Did you take your 4500 velocity from one of Mr. Harmon's tables?

A (WITNESS BOYER) Yes. It is Figure E240.27-3.

Q Do you have the velocity that you used?

A (WITNESS BOYER) Well, let's address ourselves to the west screen, which is the lefthand side curve, and first, I obtained --

Q Is that the one you used when you ended up with the .8 last week for 2500?

A (WITNESS BOYER) Well, I did it for both of them but they both came out the same, as I recall. But I took at the bottom of the elevation at the bottom of the screens for the 4500 flow, I took 1.6 and for the 3000 flow it was .97.

(Panel of witnesses conferring.)

1.62. I see some numbers here -- 1.62 and .97 is a difference of .65 divided by 3, was .22, which added to or subtracted from the .97 would be .75. So at the bottom of the screen I would expect the projected velocity of .75. Then I did the same thing for the elevation at the top of the screen and I had a reading of 2.17 for the 4500 flow, and 1.20 for the 3000 flow; a difference of .97. One-third of that is .32, subtracted from the 1.20 is .88, and the .88 and .75 averaged together give us a little over .8.

Q All right, sir. Just to try to simplify it, if I want to stay with one depth representing the midpoint of the screen, using Mr. Harmon's chart on Figure E240.27-1 and -2, and also, his tables which we find both in Del-Aware Exhibit 9 for identification and in Applicant's Exhibit 2, would I use a seven-foot depth? I want to find out how close the measurements were to thse numbers as distinguished from --

A (WITNESS BOYER) Yes. It is 40 inches diameter, and half of that is 20 inches or one foot, eight; and four feet down is five and a half feet. Say you would average between the 4 and the 7.

Q Let me ask the question this way. Where is the seven-foot depth in relation to the depth of the intake, and we will take it separately since it will

differ at 4500 cfs and then at 3000.

A (WITNESS BOYER) Well, if I can call your attention to 240.27-3 again, you will see that each of those curves is plotted by the elevation, and so, the one foot, four foot, seven foot figures are shown there. And you can see the difference in elevation is taken into account by the fact that the water surface elevation changed, and the plotted points are at the correct elevation.

Q Yes, sir, I know. I want to ascertain where Mr. Harmon's closest measuring points are.

A (WITNESS BOYER) Well, it would be to the center line, and it would be the seven foot.

(Panel of witnesses conferring.)

If you are interested in the closest measuring point, it would be the seven foot depth on both curves, which would sort of bracket the center line. And then you would have to move over a little bit -- if you were using the table of data you would have to move over a correct for the actual distance from the shore of the west screen and the east screen.

Q I know, maybe we ought to do that with Mr. Harmon. Mr. Harmon, if I look at E240.27-1 and -2, is station 8 183 feet from the shore?

A (WITNESS HARMON) I believe that's right.

Q And as you indicated, then, it is 100 feet between stations?

A (WITNESS HARMON) Yes.

Q For the indication of the location of the intake on that chart, you told us it would be station 8 plus 62, which is 245 feet from the shore, correct?

A (WITNESS HARMON) Yes.

Q Does that 245 feet represent the farthest out portion of the west screen?

A (WITNESS HARMON) It is the centerline.

Q Between the two rows of screens?

A (WITNESS HARMON) Yes, sir.

Q So the farthest out portion would be where?

(Panel of witnesses conferring.)

A (WITNESS HARMON) The centerline of the east or New Jersey screen array would be about 5.6 feet further out.

Q All right. And conversely, the west screen would be 5.6 feet closer?

A (WITNESS HARMON) Yes.

Q So the intake extends at its furthest point just a little shore of 251 feet. Well no, I'm sorry, the centerline is just a little short of 251 feet.

A (WITNESS HARMON) Yes, sir.

Q And the centerline of the west array would be

239 feet, if I was interested in the velocity at that point?

A (WITNESS HARMON) Yes, sir.

Q As I look at the two tables I have in front of me with your measuring points and from which I take it these curves were developed, I'm not sure what points are actually measured points because I see different distances in the two tables.

One table I'm looking at is Table 1 which was attached to your July 28th letter to Mr. Bourguard, which is Del-Aware Exhibit 9 for identification. The other table is Table 1 to Applicant's Exhibit 2, which is the January 22nd, 1982 letter to Mr. Denmark. And in order to compare these tables I would have to use the July 23rd table and the one that accompanied the submission to Mr. Denmark.

And looking at the seven-foot depth for the flow of approximately 4500 cfs, you have a datapoint for station 8 plus 49, which is 233 feet. Then a datapoint, staying with that same table, for station 8 plus 74, which would be 257 feet. Yet when I go to the other table I see a datapoint for 250 feet. Are they all measured?

A (WITNESS HARMON) You're referring to the two dates? Yes. The intervals between the stations at

which we measured velocities were not constant between the two dates that the velocity surveys were made.

Q I'm staying with the July 23rd data but I'm looking at the two tables. One table, the table accompanying Exhibit 9, is given in feet; 200 feet, 225 feet, 250 feet.

A (WITNESS BOYER) Wait until we find that.

(Pause.)

JUDGE MORRIS: This follows page 2225 of the transcript.

WITNESS HARMON: Okay. Go ahead, I'm sorry.

BY JUDGE BRENNER (Resuming):

Q Did you actually measure the velocity at all of those points, because there is a point missing from the table that was sent to Mr. Denmark. That is the 250 foot point; yet that point is indicated in the other table.

(Panel of witnesses conferring.)

I guess the real question is are all of these measured points, or is one of the tables an approximation derived from the other tables or what?

A (WITNESS HARMON) They are all measured. I can't see the number that you say is missing there. It appears to be included in this table. I have -- at 250 feet I have a reading of 3.0, which would correspond in

feet.

Q Your readings at 250 feet that you sent to Mr. Bourquard are identical to the readings at station 8 plus 74 in the letter to Mr. Denmark. Those are two different distances from shore. However, did you actually measure it twice, seven feet apart?

(Panel of witnesses conferring.)

What were your intervals for velocity measurements on July 23rd as you went farther out into the river?

A (WITNESS HARMON) Our interval between stations was 25 feet. That 250-foot measurement corresponds to 8 plus 74, and the 8 plus 49 is our 225-foot measurement.

Q Well, is that accurate? Are those the same distances?

A (WITNESS BOURQUARD) The 250 relates directly to the intake centerline station that is shown. I don't have the sheets in front of me, but 250 should be the 8 plus 64, or the 8 plus 74 are the same point along the intake alignment.

Q I'm sorry, I thought 8 plus 74 was 257 feet. What is station 8 plus 74 in feet from shore?

(Panel of witnesses conferring.)

A (WITNESS BOURQUARD) His measurements are from the bank; the 250 is from the bank, and the intake

stationing, the ones I show in the letter to Mr. Denmark is the intake centerline stationing, which the zero point is actually up near River Road.

Q Yes, sir, but I thought we were told that station 8 plus 62 represents the centerline, which was 245 feet into the river. And from that, I concluded that station 8 was 183 feet into the river, and I asked you that question and you confirmed it.

A (WITNESS BOYER) But you will note that it is plotted on the 8 plus 74 station, which happened to be at the time that he took it, 250 feet from the bank. And Mr. Bourquard corrected it from 250 feet to make it on the station 8 plus 74, and it is plotted on the curve at 8 plus 74.

In other words, he thought -- 250 feet, he thought he was out just about to where the intake was, and actually when it was corrected for the station to the point where he had used it as reference to the bank, he found he was a little bit further out than that. But the curves are plotted on that, and the data that is plotted on Figure 3 is picked off the curve for the centerline or the east and west screen locations.

(Panel of witnesses conferring.)

Q Mr. Harmon, is it the case that your 250 feet reported in Table 1 to your letter to Mr. Bourquard is

the uncorrected distance? Yesterday you testified you made some corrections.

A (WITNESS HARMON) No, I didn't make the corrections. I reported to him our measurements from the stream bank, the actual water's edge, in my 28 July 1981 letter to him. He relabeled these according to his 6 plus 00 and 8 plus type designations for distance from the 6 plus 00 baseline.

Q All right. Staying with your table then, the one that is reported in feet -- do you have it in front of you?

A (WITNESS HARMON) Yes, sir.

Q Is that 250-foot distance and the other distances, are those the ones corrected by you with respect to the error you discussed yesterday, or uncorrected?

A (WITNESS HARMON) These measurements are uncorrected by anybody that I know of that I reported to him in feet. They are based on our actual measurements from the river bank.

Q Did you testify yesterday that when you thought you were at 246 feet, it was actually 236 feet, for example? Was that one of your corrections?

(Panel of witnesses conferring.)

A (WITNESS HARMON) This pertained to our

November 7, 1980 measurements. Yes, I testified that we thought we were 75 meters or 246 feet offshore when in reality when we recalibrated the instrument we found that we were actually 236 feet offshore.

Q And that error doesn't apply to your Table 1 for July 23rd?

A (WITNESS HARMON) No, it does not.

Q And your 250 feet is from the shore line?

A (WITNESS HARMON) Yes, sir.

Q Mr. Bourquard, is station 8 183 feet from the shore line?

A (WITNESS BOURQUARD) Yes.

(Panel of witnesses conferring.)

Station 8 plus 0; is that what you're asking, sir?

Q Let me ask it this way. You report the centerline of the intake structure as station 8 plus 62.

A (WITNESS BOURQUARD) Yes.

Q I thought you testified that that represents 245 feet from shore.

A (WITNESS HARMON) Approximately 245 feet out, yes, sir.

Q So therefore, my question is: does that mean, consistent with that, that station 8 would be 183 feet from shoreline?

A (WITNESS BOURQUARD) Yes.

Q So if I wanted to accurately report Mr. Harmon's measurement location transferring his distance from the shoreline to your table, noting it by station plus feet, should I then put his 250-foot column to station 8 plus 67? And I don't have a calculator in front of me, so you might check me.

A (WITNESS BOURQUARD) No, I think that is at 8 plus 74.

A (WITNESS BOYER) Yes. As you said before, 8 plus 74.

Q How far is 8 plus 74 in feet from the shoreline, Mr. Bourquard? Is it not 257 feet?

A (WITNESS BOYER) Yes.

(Pause.)

A (WITNESS BOURQUARD) We have a different shoreline on the two days, and on that day --

Q Wait a minute. I'm sorry. I thought this was all July 23rd.

A (WITNESS BOURQUARD) It is.

Q I'm sorry I interrupted your explanation.

A (WITNESS BOURQUARD) I think the problem is in the approximation of using 200 feet out and 245 feet out. These were -- this is why we went to the intake centerline station to actually state where these

velocities were located. Because at one elevation, water surface elevation, an intake that was 200 feet out may be, at another one, a different distance out. So to correlate these, we set up an intake centerline station and used that for both sets of measurements.

Q Yes, sir. But then we have the job of applying Mr. Harmon's measurements to your new system accurately.

A (WITNESS BOURQUARD) We took the cross-section we had of the river there and used that to measure the 250 feet out from there. And these other stations are the stations at which the other measurements were located.

Q I still don't know how far from either the east array or the west array centerlines or the centerline of those two parallel lines -- staying now only with the distance dimension and not worrying about depth for the moment -- how far from those Mr. Harmon had measured velocities. And even if I am willing to then draw a curve to cover a point between measured points of velocity, I don't know which points to put his measurements at in going from his distances expressed every 25 feet from shore to the station plus feet method of expressing it. And then, therefore, knowing that I've got the accurate velocities at the location of the

intake.

So can you help me with all of that?

A (WITNESS BOURQUARD) If you refer to Table 1 of my January 22nd letter, --

Q Yes, sir, I have it.

A (WITNESS BOURQUARD) The station which is of the west -- yes, the west array, the center line of the west array -- would be about 8 plus 47. So on his July 3rd measurement, the closest one would be 8 plus 49.

Q Excuse me, sir. I'm confused. I thought the centerline was 8 plus 62, and therefore, the centerline of the west array would be approximately eight plus 56 and a half.

A (WITNESS BOURQUARD) About 57.

Q I thought you just 8 plus 47 a moment ago.

A (WITNESS BOURQUARD) I'm sorry. I think I did say 47 but it is 56.

Q Okay.

A (WITNESS BOURQUARD) The closest to that, which is about, oh, eight feet away, is the one at 8 plus 49.

Q But, sir, the 8 plus 49 values in that table are the same values in Mr. Harmon's table of 225 feet. And your table is merely derived from Mr. Harmon's table.

A (WITNESS BOURQUARD) Yes.

Q Well, how do you know that Mr. Harmon's 225 feet data is the station you just gave me. Because if I calculate it using 245 as the equivalent of 8 plus 62, I would get a different number, sir.

(Panel of witnesses conferring.)

JUDGE BRENNER: We're going to break for lunch soon, so I will let you think about that. Let me ask a few more questions so you will see what I'm interested in beyond that. I was interested in the sensitivity of distance to velocity as measured by Mr. Harmon on the different days.

And when I started off until you just told me what the situation was, I thought I had the datapoints going, looking at the seven-foot depth for the 4500 flow; that is, the July 23rd flow; I thought had measurements at 233 feet which in my mind was my own changing of the station 8 plus 49 data of 1.6.

I then thought staying with that same table I had, the next measurement at 257 feet of 2.6 feet per second which was my distance for station 8 plus 74, I thought they were kind of odd measuring distances for Mr. Harmon. Then I also thought I had a datapoint in between those two also of 2.6, looking at 250 feet from Mr. Harmon's Table 1.

WITNESS BOYER: No.

BY JUDGE BRENNER (Resuming):

Q And I'm wondering about that progression. You've now explained the progression problem but now I don't understand why these distances for reporting of velocities in your table, Mr. Bourquard, are accurate distances. And these distances from shore in turn are what was used to give the velocities not only for 3000 and 4500, but also the extrapolation -- and Mr. Boyer was kind enough to go through his extrapolation again -- as to the mathematics of it, down to .8.

Looking at 3000 cfs, the only datapoints I have before me are in the November 7, 1980 table, and I don't get a very good feel for sensitivity of velocity by distance out at any depth, and I'm looking particularly at the seven foot depth as an approximation. Because the only points I have in the area of immediate interest are station 8 plus 60 feet, which I thought was 243 feet. And you can later tell me whether that's right or not.

And then all of a sudden -- not all of a suiden, but then it jumps another 70 feet to the next reported point, station 9 plus 30. So if you are giving me the velocities as part of the equation, calculating back down for the west array and the east array, I don't know what velocity you used other than drawing a line

between the two.

But we are particularly interested in the velocity at those different points. And I want to know how close the measured points were as distinguished from drawing lines to get the points. So maybe you can straighten out the measurements, which we need to do as a starting point, when we come back from lunch.

I am then going to -- I want to give you a forecast so you can think about where I'm going. I am then interested in whether velocities, given those same distances, were measured some short distance downstream from the centerline of the intake; say, 100 feet as an approximation. Because I know you had a table that you presented to Mr. Bourquard of 100 feet upstream.

All right, I do have the downstream table for the 24th, and I'm wondering if we have a downstream table for the lower flow condition, also. And maybe I can ask that now. Did you measure the velocities 100 feet downstream during the lower flow conditions?

A (WITNESS HARMON) No. In November 1980 we had a transsect 500 feet downstream.

Q What was your estimate of the flow on that date?

A (WITNESS HARMON) 3000 cfs, approximately.

Q We don't have those before us in the record

that I know of.

A (WITNESS HARMON) They are in my report of November 1980, the biological evaluation of the proposed water intake.

(Panel of witnesses conferring.)

Q Ms. Minton thinks it might be D77. Which table is it? I think it is D77.

A (WITNESS HARMON) If it's in D77 -- I'm not sure whether the entire document is in there, but it would be page 15 in that report, Table 1. Table 1 gives two sets of transsects -- two transsects.

Q I have it, sir, thank you. And I will take a look at it during the lunch break. But I don't have an equivalent table for November 7th. All right, this is the equivalent table now for feet from shore. Did you do the same thing as you did on July 23rd? Every 25 feet take a velocity reading?

A (WITNESS HARMON) No. In our November survey our distances were 25 meters apart.

Q And happily, you've given me the feet in parentheses in your table in that study.

A (WITNESS HARMON) Yes. And if you don't have them corrected, they should be corrected, as we discussed earlier. Do you want me to read you the corrected parenthetical feet meaurements?

Q Yes. I guess I misremembered the testimony. I thought you said it was already corrected in your table.

A (WITNESS HARMON) Not in this report. If you have this report before you.

Q All right, yes, if you could read the corrected ones I would appreciate it.

A (WITNESS HARMON) I will be reading them off. The 25 meter measurement corresponds to a corrected 82 feet, which is the same as the original; 50 meters is 162 feet instead of 164. 75 meters is 236 feet instead of 246. 100 meters is 308 feet instead of 328 feet. Do you want the rest of them?

Q You might as well.

A (WITNESS HARMON) Okay. 125 meters corresponds to 372 feet instead of 410 feet. 150 meters corresponds to 408 feet instead of 492 feet. And the 175 meters corresponds to 480 feet instead of 574 feet.

Q Mr. Bourquard, when you applied Mr. Harmon's datapoints to your means of expressing it in terms of stations plus feet for November 7, 1980, did you use his corrected distances?

A (WITNESS BOURQUARD) Yes.

Q Okay. Over lunch I'm going to look at those tables. Will I find discrepancies if I attempt to

equate station 8 with 183 feet?

A (WITNESS BOURQUARD) If you attempt to equate 8 plus 00 with 183 --

(Panel of witnesses conferring.)

JUDGE BRENNER: Maybe the best thing to do is break. We've all go tables to look at.

WITNESS BOYER: Let me just point one thing out. I would just take a second. Using the 8 plus 62 as 245 feet out, it would make the shoreline at 6 plus 25.

JUDGE BRENNER: I'm sorry, I don't understand that. 6 plus 25?

WITNESS BOYER: Well, forget it. Somebody had marked on mine, but apparently it wasn't right.

JUDGE BRENNER: Let's break. I didn't mean to cut you off, but I merely wanted to set a foundation to get the sensitivity for some numbers, and I had trouble putting the two tables together and now I find I'm not the only one with trouble.

Let's come back at 1:50, and we are adjourned.

(Whereupon, at 12:30 p.m., the hearing in the above-entitled matter was recessed for lunch, to reconvene at 1:50 p.m. the same day.)

AFTERNOON SESSION

(2:05 p.m.)

JUDGE BRENNER: We can go back on the record.

We now have a chart in front of us and I guess we will just turn it over to the panel, to see if they can explain what we viewed as apparent discrepancies between the different tables that were discussed this morning.

We have one table that has not been identified for the record, and I think we should do it since it is going to come up in terms of the measurement reported by Mr. Harmon at 3,000 cfs on November 7, 1980. Let's make this Board Exhibit 1. This is page 15, containing Table 1, from a report entitled "Biological Evaluation of the Proposed Water Intake in the Delaware River at Point Pleasant, Pennsylvania, for Neshaminy Water Resources Authority," by P.L. Harmon, Pottstown Ecological Laboratory, dated November 1980.

(The document referred to was marked Board Exhibit No. 1 for identification.)

JUDGE BRENNER: Continue, Mr. Boyer.

Whereupon,

W. HAINES DICKENSON

E. H. BOURQUARD
VINCENT S. BOYER and
PAUL L. HARMON,

the witnesses on the stand at the time of recess, resumed the stand and, having previously been duly sworn by the Chairman, were examined and testified further as follows:

BOARD EXAMINATION -- CONTINUED

WITNESS BOYER: Yes. I will discuss the apparent discrepancy between plotted velocity figures and on distances in the river, the distance being the value that is subject to question. The confusion has arisen because of the use of the Policastro 4 chart, not his name but the chart, which was made some years ago, and the shore line is at a different shore line than the actual shore line existing there today.

And when a distance of the selected spot of the intake was scaled off that drawing, which was in retrospect perhaps not the best way to have done it, but it was picked out as 200 feet and it's actually only 193 feet. So the distances from the shore line to the 245 feet is actually less, but it is still in the position on the station that we say it is, 8 plus 62. And the velocities are plotted correctly.

Now, I will go through this process. On

11-7-80, the flow was 3,000 cubic feet per second and the river elevation was 70.8. There were no stakes in the area that would give the party who was taking the velocity measurements a true position. They were interested in getting velocity at different distances from shore, without the thought of necessarily it being used in the context that they are being used, and the concern for accuracy might not have been as great. But they did a good job.

The Harmon values corrected -- and I only put down those in the bracket, that bracket, the intake, 236 foot distance and 308 foot distance -- were converted by Bourquard to 8 plus 59 station and 9 plus 31 station. They were actually plotted as 8 plus 60, one foot above, and one foot below, 9 plus 30. Some rounding off apparently was done at that time.

Taking those values, the calculated shore line would be 6 plus 23. If you subtract these distances, you get 6 plus 23 as being the calculated shore line that was used in determining those stations.

On July 23, 1981 --

BY JUDGE BRENNER:

Q I'm sorry, I don't understand how 6 plus 23 could be --

A (WITNESS BOYER) 6 plus 23 plus 236 feet out

would give you 8 plus 39. In other words, Bourquard's values are the proper distance out, and you obtain them from Harmon's data. He had to use 6 plus 23 as the shore line. That is back working, in retrospect, what he did to get those values, the mechanism Harmon used, the exact shore line by that where the water meets the beach.

MR. SUGARMAN: Mr. Chairman, may I at some point ask that the witnesses who did this work testify to it, instead of Mr. Boyer presenting his version of it? I think that there's a real question as to how this was done, and this testimony is total hearsay, with witnesses who have the direct evidence right here with us.

JUDGE BRENNER: Well, you are premature. I asked some questions of those witnesses, and you will have your opportunity to follow up on my questions of those witnesses who are here.

MR. SUGARMAN: I understand that, sir. But my point is that this witness is putting testimony in the record.

JUDGE BRENNER: You can cross-examine the other witnesses and Mr. Boyer after, and you will get it that way. I want to hear one explanation and then, to the extent you have questions about it, you can ask the

witnesses how they did it.

WITNESS BOYER: Thank you.

On July 23, 1981, flow measurements were taken at the range of 4500 cfs. The river elevation was 71.4 feet, and you will note it was six-tenths of a foot higher than in the earlier November.

Harmon's data at 200 feet out and 225 and 250 feet out were converted by Bourquard to 8 plus 24, 8 plus 49, and 8 plus 74, respectively, which by subtraction would give a surveyed shore line of 6 plus 24. And actually, that was a surveyed shore line at that time, and the measurements went from the surveyed shore line 200 feet out to get his 8 plus 24 station.

The 6 plus 24 compares to the 6 plus 23 reasonably well, considering that this one is probably in error, if any, since this was a surveyed value, this was taken from a guesstimate off a chart from the river flow and what-not.

MR. SUGARMAN: Can we have what he is referring to as "this" identified? Which one is less accurate?

WITNESS BOYER: Yes, good point. The November 1980 data would be less accurate than the July 1981, as far as the shore line measurement.

Now, subsequent to this it was determined to

install the screens out in the river and a spot on the chart had been selected which was felt to be reasonably far out, from velocity measurements and from riverbed contour. The selected spot was designated on the chart and a survey was made, and it was found that that chart, point on the chart was at station 8 plus 17.

It was scaled off the chart as being 200 feet out, and so it became known as the 200 foot out distance. But that was a scaled value from a chart. This would give the estimated shore line as 6 plus 17, when we really knew that it was 6 plus 24 at the flows we are interested in. It is 6 plus 17 at some higher flows. The 200-foot distance is thus a nominal distance and is actually 193 feet from the present shore line of 6 plus 24.

In summary, the November 1980 data, there were no stakes, so it is possibly a few feet of error existing in that. The July '81 is better, although the values come within a foot, if you correct for water elevation about 1.8 feet.

After staking, the survey line was run and the point in the river previously selected was measured and staked out to be 8 plus 17, and it is actually 193 feet distance from the 624-foot shore line. But the terminology of the 200 feet was still maintained because

it was sort of a chart value and when you're measuring on that chart to lay out it you would use the 200 feet. So this discontinuity got created into this thing at that time and when it was not realized that the discussions we've been having the last few days would be going on.

The plotted velocities are at the correct station positions, and really it is the shore line which was off.

And that concludes the summary, and we would be willing to answer any questions.

BY JUDGE MORRIS:

Q So how many feet from the surveyed shore line is now the center line of the intake structure?

A (WITNESS BOYER) It would be 245 feet minus 7, or 238 feet from the 624 foot shore line.

BY JUDGE BRENNER: (Resuming)

Q You may station 6 plus 24?

A (WITNESS BOYER) Station 6 plus 24, yes.

Q Okay. Mr. Bourquard, you got data from Mr. Harmon expressed in a linear distance from the shore, correct?

A (WITNESS BOURQUARD) That is correct.

Q On his November 7th, 1980, data did you have Mr. Harmon's corrections to his linear distance before

you converted it to your expression of distance in terms of stations plus feet?

A (WITNESS BOURQUARD) Yes, I did.

Q How did you know what shore line, what point in your method of expressing distance of stations plus feet? Is there a label for that method so I don't have to keep saying stations plus feet?

A (WITNESS BOURQUARD) The stationing.

Q All right. In transposing it to station nomenclature, how did you know what point to start the count at?

A (WITNESS BOURQUARD) We had a cross-section in the vicinity of the intake line, where you took the elevation of the water level at that time and saw where it contacted the bank, which I think was 6 plus 23, and used that as zero of his stationing.

Q I'm sorry. Run that by me again. I didn't comprehend it.

A (WITNESS BOURQUARD) We knew the water level at the time he made the measurement was about 70.8. So then we went back to a cross-section at the intake centerline, and went back and saw where 70.8 approximately intersected this cross-section and used that stationing.

A (WITNESS BOYER) This was a depth contour that

he was referring to.

Q How did you know the elevation was 70.8, again?

A (WITNESS BOURQUARD) Well, it was measured at the time he made the measurement.

Q Now, for July 23, 1981, looking at Table 1 to Applicant's Exhibit 2, the water surface elevation indicated there is 71.4. That is a measured value at Point Pleasant also?

A (WITNESS BOURQUARD) Yes, sir.

Q Now, wouldn't that give you a different starting point in your station nomenclature than 6 plus 24?

A (WITNESS BOURQUARD) Well, at the time that measure was made we had a man there with a transit, and the area had been stationed and we knew exactly where the station was.

Q Well, I thought Mr. Boyer stated that it would be within a foot or so the same starting point for the shore line.

A (WITNESS BOYER) On the 6 plus 23 and the other, 6 plus 24, is that what you mean?

Q Yes. Is that right? You're nodding yes?

A (WITNESS BOURQUARD) For these two sets of measurements, yes.

Q Does that make sense to you, that those two different elevations would have essentially the same starting point for the shore line?

A (WITNESS BOURQUARD) No. They are different water levels. But I'm not too sure that Paul was exactly at the intake centerline at the time he made this. There are some variations in the shore line there and he could have been five feet or so on one side or the other, and come to a different point.

Q Could he have been ten feet on one side or the other?

A (WITNESS BOURQUARD) I don't know. It wasn't staked out at that time, Mr. Brenner.

Q Mr. Harmon, how do you know you were on the centerline when you made your measurements, talking about the centerline measurements? I understand you were upstream and downstream at other times.

A (WITNESS HARMON) We had a site plan that we used and there were several features on that we referenced to and felt we were fairly close to the centerline of the intake. We may have been off by five or ten feet on the shore line.

Q When did you realize you had that error in linear distance from the shore during your November 7, 1980, measurements, approximately?

A (WITNESS HARMON) It was a couple of months later. In talking with Mr. Bourquard, he was looking over our values and it seems that the river is wider than it should have been. So he questioned it and we went back and calibrated the instrument.

Q That was your viewfinder?

A (WITNESS HARMON) A split-image rangefinder.

Q Having made -- after calibrating it, was your method of applying the adjustment to the instrument just an after the fact look at how it would have changed your calculations at each location? You didn't actually go back out in the river and try to see where you were?

A (WITNESS HARMON) No. We supplied our comparable results to Mr. Bourquard and then he applied the revised distances to the velocities.

Q Mr. Bourquard, were you involved to the extent that you understand what the error was in lack of calibration of the rangefinder and what Mr. Harmon had to do to make the adjustments?

A (WITNESS BOURQUARD) Oh, yes. I don't know what was wrong with the rangefinder. I assume some kind of adjustment on it. But I took the results. In order to determine that they were consistent, I plotted a curve of them and we used that curve for the adjustment of the distance that he had given.

Q How accurate, given what you finally ended up with, applying the way Mr. Harmon first measured his distances and then applying the adjustments after the fact that had to be made, given the error in the rangefinder -- given those and anything else you think you should apply that you want to tell us about, what do you think the accuracy is of the distances from the shore reported in Mr. Harmon's linear feet terminology? How accurate do you think those distances are?

A (WITNESS BOURQUARD) I think they are reasonably close. With regard to the adjustments, he actually went out and used a tape to measure the distances that we used to prepare the curve for adjusting those. So there was no reason to believe that there would be any mistake in those at all.

Q Well, when you kind of go out there and take a tape, don't you have to worry about whether your angles are the same, as that might affect distance and so on?

A (WITNESS BOURQUARD) Your angle? No.

Q Mr. Harmon?

A (WITNESS HARMON) No. You measure distances in a straight line.

Q What I mean is, how do you know you've got that straight line, the perpendicular to shore line?

A (WITNESS HARMON) Well, you site it across

from an observer. The person with the instrument is at the intake site and you site across to your boat in the water, and then also you line that boat up with a known target on the opposite shore, which was the easily identifiable house that we lined up on over there.

And by the same token, when we calibrated the instrument later it was, as I described earlier, in a parking lot, and we laid out the measurements with tape in a straight line.

Q Did you use the same methods both on November 7, 1980, and on July 23, 1981? And I understand you had a calibration error that you corrected for your July measurements.

A (WITNESS HARMON) No. The November measurement was the only one we made with the split-image rangefinder. The July data were obtained with the aid of a surveyor's crew that had a transit and a stadia rod.

Q Why were the measurements on November 7th taken so much farther apart than the measurements on July 23, 1981, that is intervals of linear distance from the shore, one being every 25 meters and the other being every 25 feet, as I recall?

A (WITNESS HARMON) Basically, I don't recall. Did you give us any guidance?

A (WITNESS BOURQUARD) I don't recall. We were mainly looking for where the current was located when the first set of measurements were made.

Q That's what we're all looking for.

A (WITNESS HARMON) Arbitrary spacing I guess was the basis for the November '80 measurements. As a result of these measurements, we felt we needed a finer picture a little bit later, and that is why we went to the 25-foot spacing in July.

Q Yes. But you don't have as fine a picture of the flow in the range of approximately 3,000 cfs, do you?

A (WITNESS HARMON) That is correct.

A (WITNESS BOYER) I would point out, however, that one of the measurements that was made was almost right on the centerline of the 3,000 cfs. So that is certainly a good point.

Q Do you mean the 236 feet?

A (WITNESS BOYER) Yes, the station 8 60, yes.

Q Well, I once thought it was almost right on the centerline also. All right, I see what you are saying. I should think of the centerline now with the adjustment you just gave Judge Morris of subtracting approximately 7 feet, is that right, Mr. Bourquard or Mr. Boyer?

A (WITNESS BOURQUARD) The only thing you are subtracting the seven feet from is in identifying the two locations. In other words, the 200 foot out became a designated location based upon a water line that was considerably back from the present water line, and the terminology remained with it. And when we moved it 45 feet further out then it became the intake at 245 feet out and not at 8 plus 62, which would have been correct.

A (WITNESS BOYER) The only error on these charts is that if you drew a shore line it might have been 7 feet off.

A (WITNESS BOURQUARD) If you take the trouble and look at the Policastro exhibit, which is the one we used, and measure out from there to the existing intake site, you will see a measure of about 245 feet. But that map was made when the water level was higher.

Q Mr. Harmon, when you made your measurements in July, July 23, 1981 -- do you have a measurement 100 feet downstream of where you thought that centerline would be, as well as a measurement or measurements at where you thought the centerline would be, correct?

A (WITNESS HARMON) Correct, with this addition: that we were located, in the July velocity surveys, we were located on station by surveyors. So I

would say that we were exactly on the centerline and we were exactly 100 feet upstream and downstream.

Q Thank you.

Now, on that day you report your measurements in the area of interest at distances of 225 feet and 250 feet, and if I want to convert that to the station nomenclature I would use 8 plus 49 and 8 plus 74 respectively; is that right?

A (WITNESS HARMON) That is right.

Q Do you agree, Mr. Bourquard?

A (WITNESS BOURQUARD) Yes. You just add 624 to your stationing.

Q Do you mean 6 plus 24?

A (WITNESS BOURQUARD) 6 plus 24, yes.

Q Well, 6 isn't 600?

A (WITNESS BOURQUARD) Yes, it is.

Q It is 600 from your 00, okay. I have enough trouble with the 100 from the shore without worrying about your zero point.

So the centerline of the intake is approximately, not quite but approximately, midway between those two data distance points, is that right?

A (WITNESS BOURQUARD) Yes, sir, 13 feet one way and it looks like 12 feet the other.

Q There is a range at Point Pleasant between

those two points, that is going from 8 plus 49 to 8 plus 74, of 1.6 feet per second to 2.6 feet per second. As I go farther from shore, do you think that progression would be linear -- "Linear" is not the word -- that progression would be at the same rate with distance, would be at approximately an even rate with distance, that is, if I was halfway between those points velocity would be halfway between those points, or would there be more of a change?

A (WITNESS BOURQUARD) What you are speaking of, Mr. Brenner, is exactly why I plotted that curve. That is the next exhibit -- I shouldn't say exhibit, but I don't have your exhibit number.

Q Do you mean the 240.27-2?

A (WITNESS BOURQUARD) Yes, sir. And I was trying to establish a relationship at these various depths from the plot, so I plotted these against stationing and then drew smooth curves between the points.

Q Why wasn't the velocity measured at the centerline point? Mr. Harmon, did you consider that in terms of, you were out there looking at the velocities to assist you in your assessment of the aquatic impacts, am I correct?

A (WITNESS HARMON) Yes, data was collected for

that reason. And the reason why we didn't measure at the exact present intake centerline was because at that point we thought it was 200 feet offshore and we tried to cover that possibility, as well as getting smaller increments of 25 feet.

Q All right. If you move 100 feet downstream, the velocity increases slightly at a distance of 225 feet, from 1.6 to 1.2, and decreases slightly at a distance of 250 feet, from 2.6 feet per second to 2.4 feet per second, looking at the 7-foot depth. Do you have that?

A (WITNESS HARMON) Yes.

Q You have to look at your two tables. Would that be, both the magnitude of those changes and the inconsistent direction of those changes at those two distances, would that be expected from contours of the river bottom as depicted in Applicant's Exhibit 4, which was earlier Policastro Exhibit 1, and also looking at whatever you want to look at, including the direction of the shore line?

(Panel of witnesses conferring.)

A (WITNESS HARMON) You're talking about the 100 feet downstream, you're talking about the 200 and 225-foot distance and the 7-foot depth?

Q 225 and 250-foot distances, but everything

else you said was correct. I picked those distances because I thought they bracketed the intake.

A (WITNESS HARMON) Yes. I don't see anything unexpected about them. There is some variation there.

(Panel of witnesses conferring.)

A (WITNESS HARMON) It appears that the velocity is following the contours of the channel there. There is some relationship anyway.

Q I don't understand why the velocity would have gone down at 250, yet up at 225, moving from the intake location to 100 feet downstream. I was wondering.

A (WITNESS HARMON) It is only .2 of a foot per second.

Q Just localized flow conditions would account for that?

A (WITNESS HARMON) Yes, some condition, whether the river is widening out a little bit at that point or some other factor.

Q Is 250 feet distance from shore 100 feet downstream from the intake in deeper water and, therefore, more in the main flow than 250 feet out at the location of the intake, such that you would expect the velocity to go up?

(Witnesses conferring.)

A (WITNESS HARMON) There is a minor change in depth and something that is not shown on these figures, that from being out in the field there are numerous occasions, is that the flow tends to angle from New Jersey towards Pennsylvania as it passes past the intake location.

Q That is consistent with what one might think from looking at the exhibit and not knowing more, isn't that correct?

A (WITNESS HARMON) Yes, I think so.

Q I think I interrupted you. I am sorry.

A (WITNESS HARMON) I'm fine.

Q I infer, although the variations are small, that one should be wary of correlating an increased flow with moving out into that depth, given the fact that although the flow increased at the 225 -- not flow but velocity increased at the 225-foot distance, as they got a little deeper by going downstream, yet just 25 feet further out it decreased.

And if I look at the total differential it is .4 variation. Is there any localized flow condition there that you know of at that depth?

A (WITNESS HARMON) Not that I know of. If you are referring to a large object or boulder or anything, there is nothing that I know of there that would cause an unusual difference. This is to me, to my mind, a relatively small difference and it is just characteristic of the flows in that area there.

Q All right. Looking at your measurements in November -- I guess it is November 7, 1980 -- you have measurements where you thought the center line was and

also approximately 500 feet downstream, correct?

A (WITNESS HARMON) In November '80?

Q Yes. I wish I had all of your data on one table, Mr. Harmon.

A (WITNESS HARMON) No, our velocity measurements bracketed the intake location at the intake transect.

Q Maybe I confused you. I am talking about upstream and downstream. I am looking at page 15 from your study, Table 1, which we have marked as Board Exhibit 1, and I should indicate that the exhibit, as identified, has the handwritten corrections which you read into the record.

But in any event, in terms of location, the one location was where you thought the intake site was going out in a transect, and the other location, I thought, was 500 feet downstream from the intake.

A (WITNESS HARMON) That's right.

Q That is what I was trying to say and I didn't say it well. Looking at -- oh, I don't know, let's stay with the seven-foot depth for convenience, although if you think that it would make a difference, feel free to offer some other observation at another depth. As you go downstream at the 236-foot distance, the velocity decreases, based on your measurements, from 1.1 feet per

second to 0.7 feet per second, and, similarly, although not to the exact extent, the velocity decreases at 308 feet, your next measuring point.

And I am giving these in your corrected differences from 1.6 feet per second to 1.0 feet per second. As I look at Policastro Exhibit 1, I, not knowing anything, would assume that at 500 feet downstream at those same distances, I would have had a velocity increase rather than a velocity decrease, because it appears that what we've called the main flow or close to the main flow appears to come closer to the Pennsylvania shore, consistent with what you just stated before.

Can you tell me why, and my next question is going to be why did you pick a distance of 500 feet down for your next measurement?

A (WITNESS HARMON) If you look at the 162-foot measurement, you will notice that those are considerably higher than they were upstream at the intake location as well. So you have -- there are several changes going on here. You have a change in depth and also quite a velocity change there.

Q So you are saying the flow coming closer to shore is more markedly noticed at a closer distance of 162 feet?

A (WITNESS HARMON) Yes.

Q Is it oid that the flow -- not flow; I have to be careful -- that the velocity decreased at all and as much as it did at the 236-foot and 308-foot distances when you went 500 feet downstream?

A (WITNESS HARMON) I don't think so, not just in my field observations and seeing the way the main body of the current spreads out from upshore or upstream, say at the Tohicken mouth, where the river is quite narrow and where it spreads out and it gets as much as 500 feet downriver of the intake location.

Q Do you think -- let's, for simplification stay with the 236-foot distance, since that is in the proximity of where you think the intake was on that day. And at a depth of seven feet, as I said before, the change is from 1.1 feet per second, decreasing by .4 down to 0.7.

Would that be a fairly straight line decrease as you go from the center line of the intake downstream to your measuring point 500 feet down at that distance?

A (WITNESS HARMON) I would think so, but all I have is these two measurements and my field experience. But it seems to me that that is a reasonable statement.

Q Could there be an increase in velocity as you started downstream before getting to 500 feet downstream

and then ending up with that decrease staying with that distance 236 feet out from shore?

A (WITNESS HARMON) There could be some slight variation.

Q In order to ascertain better how well you are into the main flow or within the influence of the main flow for the purposes of your assessment of aquatic impact, shouldn't you have had measurements at a flow of about 3,000 cfs at closer intervals downstream, such as you did for the higher flow period in July 23, 1981, given the contours?

A (WITNESS HARMON) Well, what we felt at the time we went out there was that the intake would be located about 200 feet out from shore and it was to be located in the main river current out there, and we felt that being in the velocities that we observed in that area that the aquatic impacts due to this intake design would be minimal, and we made our valuation based upon the data we had at the time and on the research that was available in the literature on thes types of screens and the work other people have done.

Q Mr. Bourquard, how did you pick eight plus 62 as the place to extend the intake out to -- given the assumption that you wanted to extend the intake out for the reasons you previously discussed?

A (WITNESS BOURQUARD) Basically we were looking for a velocity of about one foot a second.

Q At what flow, sir?

A (WITNESS BOURQUARD) At about 3,000 cfs. That was one of the factors that position the intake and it had been recommended to us at the time we were viewing establishing a location.

Q And what did you use to ascertain that you would encounter a velocity of one foot per second at 3,000 cfs at that distance?

A (WITNESS BOURQUARD) From the flow velocity plots.

Q Mr. Harmon's measurements on November 7?

A (WITNESS BOURQUARD) That's right, and the July surveys. Both of them were involved in the selection.

Q If you, looking at Mr. Harmon's November 7, 1980, Table 1 in Applicant's Exhibit Number 2, the velocity increases from 1.1 to 1.6 at a seven-foot depth, as you go from eight plus 60 to nine plus 30.

A (WITNESS BOURQUARD) Let me get back to my stationing nomenclature.

Q All right. I will back you up. It is as he goes from 236 feet to 308 feet, correct?

A (WITNESS BOURQUARD) Yes, I see that now.

Q Well, why didn't you go out to that distance to get a higher velocity?

A (WITNESS BOURQUARD) Well, we had a velocity of one foot per second there.

Q I'm sorry. I can't hear you.

A (WITNESS BOURQUARD) At eight plus 60 we had a velocity at a seven-foot depth of 1.1.

Q Well, my question is why did you stop there? Why didn't you go out to that 308-foot distance to get a velocity of 1.6?

A (WITNESS BOURQUARD) That was considered more than adequate -- the one foot per second.

Q What were the considerations in not having a greater margin for even more than adequate?

A (WITNESS BOURQUARD) Well, as I think this came up before, it is a matter of cost in extending the intake out.

Q And did you do an analysis of what the increase in cost would be?

A (WITNESS BOURQUARD) Well, I think at the time I had come up with an estimate of about $1,000 a foot. We had considered, I think, several intakes, I think at eight plus 17 and another about ten feet further and about 25 feet further and 45, and the possibility of the velocities that would exist at these various intakes,

and then selected the one at eight plus 62.

Q Well, sir, you will forgive me. I am not an engineer, but 45 feet further struck me in the first place as not being a very even increment and now I understand. Although the increment is the same, the total distance out is not 245.

Why not 250 or 275 or 300, particularly when, as you approach 300, you get that velocity increase at 3,000 cfs? Was the cost of $1,000 per foot the only reason?

A (WITNESS BOURQUARD) Well, we felt it was more than adequate where it was.

Q Well, how did you pick that spot? You must have done some assessment.

A (WITNESS BOURQUARD) I think in my letter of January 22 I showed a curve, a set of curves, which Mr. Boyer had used in developing his .8 foot per second velocity. We had looked at it earlier in the morning.

Q You are talking about E-240.27-3? It probably is Exhibit number 3 in your copy.

A (WITNESS BOURQUARD) Yes, sir.

Q Okay.

A (WITNESS BOURQUARD) And if I remember correctly, we had similar curves like this for other places and this was the one that gave us this one foot

or more feet per second at both arrays of the screen.

Q But, sir, Mr. Harmon's measurements were not at that distance, so it is not even as if you picked a distance out to where his measurement was. I am wondering how you picked your distance, given his different measurements.

A (WITNESS BOURQUARD) His measurements are on that chart there for the 3,000 and the 4,500 cfs.

Q He didn't locate his measurements at precisely the point where you ended up putting the intake and you didn't locate your intake at precisely the points where he did his measuring, so I understand his measuring gave you some input which you considered valuable velocity information.

But I don't understand why you stopped at eight plus 62 as a center line as opposed to going farther out or, for that matter, not going that far out.

So I am seeking from you an engineering reason and then, from Mr. Harmon, a biological reason.

A (WITNESS BOURQUARD) Well, for me, going out that far -- I had proposed going out a lesser distance.

Q Because of cost?

A (WITNESS BOURQUARD) Because of cost, yes, sir. And when we were agreeable to going out to this distance, because we did get this one foot per second

velocity which I felt like was going overboard, but we went along with it.

Q And you had reasonable assurance as an engineer that you knew the distance at which Mr. Harmon measured that data point, given his methods of figuring out where he was?

A (WITNESS BOURQUARD) Yes. I felt they were reasonable and weren't that far off, if they were off at all.

Q Reasonable enough that you would put the intake within a few feet of that 1.1 feet per second measurement?

A (WITNESS BOURQUARD) Yes.

Q You didn't think you ought to go another ten or twenty feet in case he was ten or twenty feet off?

A (WITNESS BOURQUARD) No, I did not.

Q Is cost the only reason why you didn't put the intake out to his 1.6 feet per second?

A (WITNESS BOURQUARD) Well, we did not want to go into New Jersey.

Q Why not?

A (WITNESS BOURQUARD) Well, probably because of permits.

Q What permits?

A (WITNESS BOURQUARD) I don't know, but I'm

sure we would have had to get additional permits if we had.

Q Well, as your counsel knows, in order for us to evaluate in a cost-benefit analysis, institutional inhibitions, they have been called at times, as against possible environmental benefit, somebody is going to have to tell us what they are. Was any analysis performed of what would be entailed differently from what you have done if you had ended up in New Jersey waters?

A (WITNESS BOURQUARD) No, not that I am aware of, and basically it was going back to the same thing. We felt like we were more than adequate in going out where we had obtained the velocity we had and it was a point of diminishing return to keep going out further.

Q Well, I understand that, sir, but you also told me you did not want to go into New Jersey.

A (WITNESS BOURQUARD) That is correct. That is one item. We did not want to do that either.

Q Mr. Boyer, can you enlighten us?

A (WITNESS BOYER) Sir, I would say that to avoid another regulatory agency involved in interstate things is desirable where it is appropriate to be able to do so. If there was a necessity for us to go into New Jersey to get high velocities, we would have either

gone into New Jersey or perhaps even moved to an intake somewhere else, if we thought that problem was going to be that severe. Neither of these conditions arose in this case.

There seems to be --

Q Well, my question -- I will let you continue, but what else would you have to have done in terms of permitting with regulatory agencies in New Jersey? Did you perform an assessment of that or have somebody do it for you for your planning?

A (WITNESS BOYER) No, we didn't do it.

Q So you don't know if you needed to do anything else?

A (WITNESS BOYER) We would have needed some permits from New Jersey if we were in the bottom of the river in Jersey, yes. We know that. We would have had to go through their agency and they would have had to coordinate it with the Pennsylvania and DRBC and others.

Q Using the station nomenclature, Mr. Bourquard, can you tell me where the New Jersey line is at the location of the center line? At least I assumed you would prefer that nomenclature because of its survey precision. If you want to give it to me in some other form, that is okay, and I guess I see you measuring what

looks like Policastro Exhibit 1.

Is that the way you are going to do it?

A (WITNESS BOURQUARD) Yes.

Q Well, I could do that too. Don't you know where the New Jersey line is in terms of all of your surveys along that center line of the intake?

A (WITNESS BOURQUARD) No, not exactly. No, sir. I do not know exactly where it is.

Q All right. Why don't you do your measurement, then? You will probably do it better than I could.

A (WITNESS BOURQUARD) It looks like about nine plus 20 to nine plus 25 -- somewhere in that range.

Q Close to the data point of Mr. Harmon's of 1.6 feet per second, which was nine plus 30, is that right, at 3,000 cfs on November 7, 1981?

A (WITNESS BOURQUARD) Yes.

A (WITNESS BOYER) And beyond the maximum velocity.

Q I was going to ask you about that. Thank you, Mr. Boyer. Could you tell me where the peak of the curve is on Figure E-240.27-1? I find the seven-foot curve convenient, but if you think I should be using another one, feel free to tell me.

You see, I thought the peak of that depth was very close to that nine plus 30.

A (WITNESS BOYER) Right.

Q You see, I have the peak right at nine plus 30, but I may be reading the graph wrong.

A (WITNESS BOURQUARD) I don't think it is that close, Mr. Brenner. I mean, if it is at 9-30, it may be at 9-28 or so.

Q Surely, but that plotted point, which is the nine plus 30 point, is right in that vicinity.

A (WITNESS BOURQUARD) Yes.

Q The peak is not a very sharp peak, Mr. Bourquard. Is that your point, that if I was at nine plus 30 I would be very close to that same velocity?

A (WITNESS BOURQUARD) That is correct. It is fairly flat there.

Q Well, did you consider going within ten feet of the New Jersey line to get very close to that peak?

A (WITNESS BOURQUARD) No. This was actually our furthest point we considering going out.

A (WITNESS BOYER) People go to New Jersey to get in the sunshine, but there is no reason to go to New Jersey just to go to New Jersey to get higher velocities when they aren't needed. Longer runs of suction piping means longer runs to get water to the pumps, greater possibility of cavitation in pumps or problems with getting water in through the intakes.

It may introduce larger size pipe needed to

decrease friction drops. I think his cost estimate of $1,000 per foot is low.

A (WITNESS BOURQUARD) I would agree with that.

A (WITNESS BOYER) You certainly don't want to go out any further than you reasonably need to. There seems to be a prevailing impression on certain parties in this hearing that one foot per second is a magic velocity and if you don't have that, why the world's going to come to an end. That is not the case. That is not the case.

These screens work in intakes with no bypass velocity and work well.

MR. SUGARMAN: I would offer to stipulate that the world won't come to an end if we don't get one foot per second.

JUDGE BRENNER: Or if we don't go to New Jersey.

(Laughter.)

WITNESS BOYER: It may come to an end if we don't get the plant built and the power to the people.

(Laughter.)

BY JUDGE BRENNER: (Resuming)

Q Mr. Boyer, we have got all the data as to how you arrived at your figures, including your interpolation back to 2,500 cfs and your reason for

giving us the 0.8 velocity at that flow. And depending upon what we feel the margins for error are in terms of your data base and your calculations, we would need to explore the sensitivity of this, so you shouldn't infer from our questions, at least, any preconceived goal. We are interested in a full record on this point.

A (WITNESS BOYER) And it doesn't -- the installation at present does not prevent modifications to it in the future, should it ever be proven necessary to get relatively lower intake slot velocities or something of that nature -- not moving it, but to modify the intake to make it more environmentally acceptable if there should be some factors that no one foresees now that would occur.

Q Well, Mr. Boyer, I asked Mr. Bourguard, and I probably meant to include you, if you had anything to add. Let me express the invitation right now for you to add. I don't understand how that one point was picked. I understand you had the goal of wanting to move farther out and I don't understand how that one point is picked. Maybe I am naive, but I would have thought that there would have been some sensitivity analyses at different distances with all of the considerations -- cost, flow, et cetera.

Do you know how that point was arrived at?

A (WITNESS BOYER) No, I wasn't party to that particular meeting, but certainly every foot you go out is a higher cost, so that is a consideration and you have to figure the benefits. As far as we are concerned, the benefits from above half a foot per second are negligible.

There are more fish killed by the fish commission sampling and seining up there than this intake is ever going to bother.

Q Mr. Harmon, when you took your velocity measurements, did you know that the state line would be of some consideration for the managers of the project? I don't mean the biological consideration.

A (WITNESS HARMON) I had no idea it would be any consideration.

Q You might have measured the velocity right around the state line if you had known that, would you, do you think?

A (WITNESS HARMON) Probably not.

(Laughter.)

Q Mr. Bourquard, when you were moving the intake out to get to the one foot per second, recognizing nobody on this panel thinks it is a magic number, but that was one of the criteria you gave me in terms of how you located that, correct?

A (WITNESS BOURQUARD) Yes, sir.

Q Did you consider the fact that maybe the velocities at flows under 3,000 cfs would be pertinent?

A (WITNESS BOURQUARD) In fact, one of the bases for the selection of that one foot per second was Figure 6, which was mentioned before in connection with the Hansen report, and I very seriously questioned the adequacy or the validity of that one foot per second at the time because it was three points plotted with straight lines and that just doesn't make sense.

Q Okay, sir, but my question is: Given the fact that when you located this you had the one foot per second in your mind because others apparently prevailed, you yourself wouldn't have thought you could go out that far, did you consider the fact that you would have to -- that if you were looking for one foot per second, putting aside your view of the lack of wisdom in doing that, you should consider flows at under 3,000?

A (WITNESS BOURQUARD) We were aware there would be times when there would be flows less than 3,000.

Q So in fact you may not have reached the one foot per second for flows at which this will be operating for Limerick, is that correct?

A (WITNESS BOURQUARD) It is possible. I consider it very remote and not very frequent.

Q In looking at the measurement in the range of 3,000 cfs, plus or minus 100, as you indicated, that Mr. Harmon made on November 7, 1980, Mr. Harmon, at a point very close to the center line, if he was where he now thinks he was, measured a velocity of 1.1 feet per second. The water surface elevation measured at Point Pleasant -- and I'm looking at Table 1 of Applicant's Exhibit 2 -- is 70.8 mean sea level, correct?

A (WITNESS BOURQUARD) That is correct.

Q At that, the Lumberville Dam would be overtopped slightly?

A (WITNESS BOURQUARD) It should be pretty close to the top of the dam. In other words, it may be a little bit spilling over and maybe not. I don't really know.

Q If at 2,500 cfs, would you expect that the wings would be slightly overtopped, close to overtopped, or not being overtopped?

A (WITNESS BOURQUARD) I would suspect they are not overtopped.

Q Given that change in the flow in relationship to the wings of the dam or possible change between when Mr. Harmon measured the 1.1 feet per second at a depth of seven feet at station eight plus 60, and the flow dynamics and conditions at Point Pleasant at a lower

flow, say 2,500 cfs, when the wings of the dam would not be overtopped, would you expect the velocity to react in a straight line extrapolated fashion of the same type that Mr. Boyer assumed in making his calculation?

A (WITNESS BOURQUARD) Yes. I would say it would generally follow the regular relationship between discharge and velocity because there is not much change in the channel section.

Q Well, isn't there quite a change in the hydrodynamics, if that is the right word, at the dam at Lumberville?

A (WITNESS BOURQUARD) At Lumberville yes, but not at Point Pleasant.

Q Why would you not expect it to have an effect at Point Pleasant?

A (WITNESS BOURQUARD) Well, the drop in water level would be less at Point Pleasant and I would suspect that it would occur at the dam.

Q Well, considering the velocity and flow patterns, the water is now flowing only through the weir and not over the wings. Would that change the flow patterns at Point Pleasant?

A (WITNESS BOURQUARD) I would say no. That is almost -- well, that is almost a mile downstream, I think, or nine-tenths of a mile.

Q And you wouldn't expect it to have an influence back upstream?

A (WITNESS BOURQUARD) Not that far, no, sir.

Q Have there been any analysis or observations made of the effect on velocity and flow patterns at Point Pleasant when the Lumberville Dam is not overtopped as compared to when it is overtopped?

A (WITNESS BOURQUARD) Other than the extent that probably when the 3,000 cfs flow measurement was made it probably wasn't overtopped or there wasn't sufficient water flowing over the top of the -- that is, the upper part of the dam to be of any consequence.

Q I'm sorry. I thought we didn't know whether it was overtopped or not at that flow.

A (WITNESS BOURQUARD) I don't think it is, but I think a goodly part of the flow is, as Mr. Cole brought out, is passing through the slot at that time and only a minor part of the flow is spilling over the long spillway.

Q But nobody on this panel has any velocity measurements at flows of approximately 2,500 cfs at Point Pleasant?

A (WITNESS BOURQUARD) No, sir.

A (WITNESS BOYER) There haven't been any flows of that nature since the general concern relative to

this point has come up.

Q When was that?

A (WITNESS BOYER) Pardon?

Q You said since the general concern relative to this point has come up. I don't know what the time frame is.

A (WITNESS BOYER) Well, it is the last year and a half or so, or the last year, I guess I had better say.

Q There have been no flows of about 2,500 cfs at Point Pleasant in the last year or year and a half?

A (WITNESS BOYER) Well, not to my knowledge, but I haven't been calling them up every day to find out. I mean, I have inquired at various time, and they have been down to 4,000-4,300 range, but not down below that.

Q We don't know how accurate it is yet, but Mr. McCoy reports a flow at Trenton in January 1981 of 1,900 cfs, and I won't quibble with you as to whether that is a -- how close to a year and a half that is. Do you think that is the most recent period of flows at or below 2,500 cfs?

A (WITNESS BOYER) I would suspect that that was January '81 or so.

Q I infer from what you said before that you had no opportunity to measure it due to flow conditions

since the time when --

A (WITNESS BOYER) When the question started to arise about the flows and flows less than 3,000, et cetera.

Q So in January 1981 you didn't think it necessary to consider flows?

A (WITNESS BOYER) That's right.

Q The answer was no?

A (WITNESS BOYER) No.

Q Do you expect flows of about 3,000 cfs at Point Pleasant in this present time frame right now?

A (WITNESS BOYER) I don't know. Do you mean in the next month or so?

Q Well, the flows in the recent past or a week and a half ago were 3,800 cfs. Do you think they will decrease?

A (WITNESS BOYER) I wouldn't expect them to unless we don't have any rain from now for the next month or something of that nature.

Q I will address the whole panel. Mr. Harmon? Mr. Bourquard?

A (WITNESS BOURQUARD) I would not think so. We are past September and October now.

A (WITNESS HARMON) It has been a fairly wet year, also.

Q And fairly cool also.

Mr. Harmon, you were asked about this briefly by Mr. Sugarman, but not precisely the same aspect that I was interested in. I believe page seven of your testimony, although I don't have it in front of me, you state that shortnose sturgeon were never observed in the Lumberville -- the shortnose sturgeon has never been observed in the Lumberville pool.

A (WITNESS HARMON) That is correct.

Q I guess my question is what has the extent of the looking been by aquatic experts, and I don't mean just you but by whatever information has been available to you?

A (WITNESS HARMON) The state and federal fish agencies have been sampling in this stretch of the river, even a wider area of the river, for a number of years and have not taken any, to my knowledge. And the only reported presence since 1900 has been down at the Lewis Seine Haul Fishery some miles down the river, and that was only on two occasions in the same year.

MR. SUGARMAN: I'm sorry. I missed that last answer. Could I have that?

JUDGE BRENNER: We could have the reporter read it back.

MR. SUGARMAN: Whatever is most convenient. I

apologize.

JUDGE BRENNER: That happens to all of us.

(The reporter read the record as requested.)

WITNESS HARMON: I might correct that to read on two occasions. One was in '75 and one was in '81. At least the total number taken were two specimens in '75 and eleven in 1981.

JUDGE BRENNER: Thank you. That's all I have.

We will take a fifteen-minute break until 3:45 and then come back with one more round of questioning based upon questions since each of you last had the opportunity.

(Whereupon, at 3:00 p.m., the afternoon recess was taken, to reconvene at 3:45 p.m.)

JUDGE BRENNER: All right. We are ready to proceed. We have one more tiny area of interest that I neglected to cover, which I intended to.

BY JUDGE BRENNER: (Resuming)

Q Mr. Harmon, did you calibrate the meter that you measured the velocities with on November 7, 1980 and also on July 23, 1981?

A (WITNESS HARMON) The velocity meter has an internal calibration to it and we calibrated it using that calibration method.

Q You will have to tell me a tiny bit more, at least.

A (WITNESS HARMON) There is a position on the meter with a switch where you turn it and when it lines up at an appropriate bracketed area on the meter, the meter is calibrated electronically and, according to the manufacturer, this meter either works or it doesn't work, and if it is working and it is in that calibration area, then your meter is calibrated.

The sensitivity on the meter is plus or minus .05 feet per second or two percent -- plus or minus two percent of scale.

Q Did you use the same meter on July 23, 1981 that you had used on November 7, 1980?

A (WITNESS HARMON) Yes, we did.

Q The very same meter?

A (WITNESS HARMON) Yes.

Q Was it just one meter that was used for all of those measurements on both days?

A (WITNESS HARMON) Yes, it was.

JUDGE BRENNER: All right. We will go back to the sequence of the parties -- Mr. Sugarman, the Staff, and then redirect. Questions should be on information that has not already been brought out in the extensive examination of these witnesses. Just because we touched on a subject doesn't mean the whole thing has to be gone over again if the same questions were asked. You are nodding and understanding, Mr. Sugarman.

MR. SUGARMAN: Yes, sir, I understand and I understand that that is your wish and also the purpose of this.

JUDGE BRENNER: Incidentally, before we get too far away, it is my personal view that the handy visual writing out more than a chart that Mr. Boyer prepared was very helpful to us here, but is not necessary for the record because all of the information in effect is now in the record, so we won't do anything further with it.

Mr. Sugarman.

RECROSS EXAMINATION

BY MR. SUGARMAN:

Q Mr. Harmon, I would like to start with the question that you were asked about the corrections to the rangefinder, the split-image rangefinder. You did your measurements on November 7, 1980. How long after that was it before you realized that an error had been made and did your calibration measurements?

MR. CONNER: We would object to that question. This was gone into by Mr. Sugarman as part of his original cross examination and that is all in the record now, so I would object to that coming in again.

JUDGE BRENNER: I will give a better reason. I asked him that. Do you not recall the answer?

MR. SUGARMAN: I do recall the answer and I intend to show that that is not the correct answer.

JUDGE BRENNER: So you just want it repeated again for more current foundation?

MR. SUGARMAN: That's right. I will do it the other way if you like.

JUDGE BRENNER: He said a few months after.

MR. SUGARMAN: He said a couple.

JUDGE BRENNER: All right. Why don't you pursue it from that point instead of asking the same question again?

BY MR. SUGARMAN: (Resuming)

Q Wasn't it on March 10, 1981 that you did your calibration, which is five months after the measurements were made?

A (WITNESS HARMON) The corrections to the results that were reported to Mr. Bourquard, it was drawn to my attention a couple of a few months after we made our measurements. As I recall, it was early in the next spring. It may have been March or April. We discussed this with Mr. Bourquard and I sent him a letter in May 1981 that tabulated the old and the revised measurements for his records.

Q Between November 7, 1980, and May 1981, who had custody of that split-range finder?

A (WITNESS HARMON) We had custody of it in our building at Pottstown.

Q Were you personally the person who had charge of it during that time?

A (WITNESS HARMON) It was under my custody in our data vault.

Q Did anybody use it between November 1980 and March 1981?

A (WITNESS HARMON) Not to my knowledge.

Q Do you know that nobody used it?

A (WITNESS HARMON) To my knowledge no one used it.

Q Do you know whether it was off by the same amount in March 1981 that it was off in November 1980?

A (WITNESS HARMON) I see no reason why there would be any change if nobody used the meter.

Q But you don't know whether anybody used the meter?

A (WITNESS HARMON) Not to my knowledge.

Q And couldn't it have changed from disuse as well as from use?

A (WITNESS HARMON) Anything is possible, and in the area that we were interested in in our measurements,

as you will note when I describe the changes, at 164 feet there was a 2-foot difference and at 246 feet there was a 10-foot difference. And that is the extent of the difference that was measured later.

Q For all you know, somebody corrected the difference and the calibration was then off by a smaller amount in March 1981; couldn't that have happened, too? I mean, you smile, but you realize the intake was based on this calibration.

A (WITNESS HARMON) It was under my control and it was not used in any official business between those two dates. And since we didn't realize that it was off, there was no reason for anyone to send it to the factory for recalibration or adjustment. I mean, I sign every invoice that goes in there and if we got an invoice for any repair it would have been documented.

Q You testified that the state and federal fish sampling programs in the river took no sturgeon in this reach of the river. Isn't it true that those sampling programs are sampling for shad and are not doing bottom sampling in the channel, which is where you would expect to find the sturgeon with gill nets? In other words, that the sampling techniques are not appropriate for finding sturgeon; isn't that correct?

A (WITNESS HARMON) I believe a variety of

sampling gear is used by the agencies.

Q Did you hear Mr. Emery and Mr. Kaufmann's testimony about the nature of the sampling programs that they perform?

A (WITNESS HARMON) They used electrofishing, I recall that.

Q And they use hall seining?

A (WITNESS HARMON) Some seines, yes.

Q And near the shore.

A (WITNESS HARMON) Near the shore, yes.

Q Are they in the channel?

A (WITNESS HARMON) It depends upon how near the shore the channel is.

Q Well, if you were sampling for sturgeon would you use the procedures that they are using, that they described?

A (WITNESS HARMON) Not a specific program for them, no.

Q Would you expect to find sturgeon with those sampling programs?

A (WITNESS HARMON) You might with electrofishing.

Q Would you expect to? Would it be the optimal way to do it?

A (WITNESS HARMON) It is not the optimal way to

to it.

Q Mr. Boyer, you testified that there have been no flows in the last year, year and a half, at Trenton in the 2500 cfs range. Do you recall that testimony?

A (WITNESS BOYER) I said to my knowledge, right.

Q I ask you if you would take a look at Del-Aware Exhibit 2 and ask you what the flows were in October 1981, which is less than a year ago, as shown on that exhibit. Those flows were taken by project personnel or were recorded by project personnel.

JUDGE BRENNER: Mr. Sugarman, could you remind me of what Del-Aware Exhibit 2 is, please?

MR. SUGARMAN: It's the tabulation of data that went into the rating curve.

WITNESS BOYER: Yes, this tabulation shows in October '81 there were the low flows which were plotted used on the rating curve. Perhaps my year or year and a half was a little bit too expansive. Maybe I will retract it to the last six or eight months. But it has been since the discussions relating to the 3,000 and lower flows became popular.

BY MR. SUGARMAN: (Resuming)

Q So you're now saying that that discussion became popular only within the last six or eight

months?

A (WITNESS BOYER) Well, I'm trying to remember. I don't have anything specific to relate it to. I didn't make a mark on the wall when the first 3,000 cfs question came up, so I don't recall exactly. I'm just giving you my best guesstimate. I thought it was a longer time period, but maybe time has passed faster.

JUDGE BRENNER: Time flies when you're having fun, Mr. Boyer.

(Laughter.)

BY MR. SUGARMAN: (Resuming)

Q Judge Brenner asked about the change and Judge Cole asked about changes that might be expected in the rating curve when the flows -- or when the elevation is less than 70.7 and the flows over the weir or the flows over the wing dam are through the weir alone. What would the effect on the cross-section available for current be with and without the maximum flow at the D&R Canal outlet? How much would that change the cross-section up and down when the elevations are 70.7 and below?

A (WITNESS BOYER) Boy, that is an involved question.

Q Well, what is the cross-section of the D&R

Canal?

A (WITNESS BOYER) Well, it is not the cross-section that's important. It is the flow through it.

Q All right. What would the cross-section be and what would the flow be? Do you have a rating curve for that?

A (WITNESS BOURQUARD) It varies.

A (WITNESS BOYER) That is sort of a regulated flow.

Q Well, on September 12, 1981, you indicated that the elevation was --

A (WITNESS BOYER) Where? Pardon me.

Q On Del-Aware 2, that the elevation was 70.7, the flow through the wings was 3300, the flow through the D&R Canal was 300 cfs.

MR. CONNER: We object to that question as unintelligible based upon these documents. He's talking about the wing dam and there's nothing on Del-Aware 2 that we see on that.

MR. SUGARMAN: No, there isn't. But in their testimony they stated that 300 of that flow was out through the D&R Canal, and that the rest was over the wing dam.

JUDGE BRENNER: I understood the question, so

it was intelligible by me. But it was rather compound, exacerbated by the speed. Why don't you break it out.

BY MR. SUGARMAN: (Resuming)

Q What was the -- what is the cross-sectional area in the D&R Canal at the elevation of 71.27?

A (WITNESS BOYER) Well, the cross-section doesn't change greatly with elevation, I believe. It is given on this data sheet as 233, if I am interpreting the data sheet correctly. That would probably be square feet.

Q And the flow through that cross-section on that date, at that time, was what?

A (WITNESS BOYER) The flow was 304.

Q Cfs?

A (WITNESS BOYER) Cfs, I presume.

Q All right.

A (WITNESS BOYER) It is not labeled.

Q Now, wouldn't that, wouldn't the change in that discharge through the D&R Canal up and down have a significant influence on the rating curve at Point Pleasant when the flows are lower than necessary to get over the rings?

A (WITNESS BOYER) That is not a clear question, or if it was a question. The flows through the Raritan Canal as they vary -- and at this point it was

relatively high and equal to roughly ten percent of the flow in the river -- would be passing down past Point Pleasant and would be included in the rating curve plottings, at least as far as the elevation goes, at Point Pleasant, and should be taken into account in the adjustments to the Trenton gauge.

Q Well, when you are trying to convert Trenton data back to Point Pleasant and you have sometimes that -- sometimes the D&R Canal is in operation and sometimes it isn't in operation; doesn't that substantially affect the available cross-section for flow when the flow is not up to the level of the wings on the wing dam, and therefore doesn't the question whether there is flow through the D&R Canal substantially affect the relationship between Point Pleasant and Trenton?

A (WITNESS BOYER) Now that's a long question, but the answer is no, because you are getting that flow in place of over the wing dams.

Q Well, let me break it up. What is the cross-section of the weir, the physical cross-section of the weir as part of that wing dam? How many square feet?

A (WITNESS BOYER) It is roughly 100 feet by -- 65 to 70 is 5.7, so it's 570 feet, square feet.

Q 570 square feet. And what would the flow --

and the D&R Canal cross-section, as you say, doesn't change drastically, so it is probably on the order of 200 feet?

A (WITNESS BOYER) But the cross-section --

A (WITNESS BOURQUARD) There is a control section which controls the flow that enters the canal.

A (WITNESS BOYER) The cross-section that is shown there isn't meaningful, though.

A (WITNESS BOURQUARD) Only to the extent that it was used in measuring the flow, yes.

Q Well, is it or is it not the cross-section? You answered that it was when I asked you what the cross-section was.

A (WITNESS BOYER) Well, I read the cross-section off the chart, which you had indicated to me, so I did you the favor of reading the square foot value as recorded there.

Q I didn't indicate to you.

A (WITNESS BOYER) Well, you asked me to look at this exhibit and to read you the -- give you the square footage.

JUDGE BRENNER: Mr. Boyer, you don't have to respond to that kind of comment. And Mr. Sugarman, you don't have to make that kind of comment. Ask a question and get an answer and ask another question.

BY MR. SUGARMAN: (Resuming)

Q Well, what is the cross-section of the D&R Canal?

A (WITNESS BOYER) I don't know.

Q Does any witness know?

A (WITNESS BOURQUARD) The cross-section at the point where this discharge measure was taken is 233 square feet.

Q Okay. We are back to that.

If the cross-section is 233 square feet and if it is reduced somewhat at lower elevations, then wouldn't it constitute as much as 25 percent or more of the total cross-section available for discharge at Point Pleasant?

A (WITNESS BOURQUARD) That would be fairly obvious that it wouldn't, because you have measurements here which show that at the time 304 cfs was flowing down the Raritan Canal, 3,300 and some were flowing down the Delaware River. So that should prove right there that there is no direct relationship between the cross-sectional area of the river and the cross-section area of the Delaware & Raritan Canal.

Q Well, does it prove that, given that you had a half a foot of flow over top of the wings at that time?

A (WITNESS BOURQUARD) I don't know that we had

half a foot of flow.

Q Well, what is the top of the wings? 70.7. What was the elevation? 71.27.

A (WITNESS BOURQUARD) No, that was the elevation up at Point Pleasant, not necessarily at the dam itself.

Q Are you saying that there is no correlation between the elevation at the wing dam and the elevation at Point Pleasant?

MR. CONNER: We object to this. This line has been gone into extensively, and there was nothing new generated by the Board's questions.

JUDGE BRENNER: I'm going to overrule that objection. I inquired as to the effect on the local dynamics in the vicinity of Point Pleasant, given a differential between above the wing dam, the wings of the wing dam, and below the wings of the wing dam. And Mr. Sugarman is entitled to pursue that with his questions as to the effect of the Delaware & Raritan Canal.

Mr. Sugarman, at some point, I don't think we have ever established for the record in lo, these many days, of talking about the Delaware & Raritan Canal and other things, as to precisely where in the river it enters in relation to the wing dam, Point Pleasant, the

bridge, and so on. So you might want to get it for the record at some point.

BY MR. SUGARMAN: (Resuming)

Q You may answer the question.

A (WITNESS BOURQUARD) What question?

Q The question is: Didn't you have a further cross-section area consisting of a half a foot of flow over the top of the wing dam?

A (WITNESS BOYER) No. You are making a statement, and show me where it comes from.

Q Well, you're saying that --

A (WITNESS BOURQUARD) The cross-section of the Delaware River at the point opposite where this other reading was made, the 233, was 2,395 square feet. So if you want to compare something, compare that to the 233.

Q And you're saying then that the cross-section available at the wing dam has nothing to do with the flows -- with the velocities and flows at Point Pleasant?

A (WITNESS BOURQUARD) That the cross-section at the wing dam?

Q Right.

A (WITNESS BOURQUARD) I would say it does, yes.

Q Okay. Then I will come back to it.

I'm still trying to get an answer. If the wing dam cross-section on that day at Point Pleasant -- you're saying that the flow was ten times over the wing dam what it was through the D&R Canal, and I'm asking you what the effect of that, of that availability of a half a foot of flow over the top of the wing dam, has to do with that difference in flow?

A (WITNESS BOYER) Well, let me address this. The fact that we have neglected the Delaware & Raritan Canal, which happens to come up just above the Lumberville wing dam -- is that not correct?

A (WITNESS BOURQUARD) Yes.

A (WITNESS BOYER) Is a conservative factor in the rating curve which we drew up. By that I mean --

Q Why is it conservative?

A (WITNESS BOYER) By that I mean, the calculations of the rating curve as we saw earlier, corrected for the drainage area, estimated drainage area relationship of 97 percent and for change in storage of the river, in the river in non-equilibrium river conditions -- another factor that should have been in my view introduced in there was the flow through the Delaware & Raritan Canal, to put that correction factor in for -- to get the flow at Point Pleasant, since it is passing Point Pleasant and does not pass Trenton.

However, understand that the flow of the Delaware & Raritan Canal is variable. 304 cubic feet per second was -- that was flowing through it on the day that this measurement was made, is reported to me to be a relatively high value, and Bo I think would confirm that.

A (WITNESS BOURQUARD) Yes. Some of that flows back into the Delaware River further downstream, I understand.

A (WITNESS BOYER) Normally, it is not that high, as I understand. So since it requires a special measurement, a velocity measurement to be made to determine the flow in that canal and would require a person to go down there and do it, it has not been included in any of the values.

At higher flows it is relatively insignificant. At lower flows the addition of this flow would raise the rating curve, that is, raise the flows for the given elevation at Point Pleasant, and thereby make our rating curve conservative. So by omitting it altogether we were conservative.

The reason it was used in this particular measurement was that this was a USGS measurement and they were measuring the river flow by meters in the immediate area of Point Pleasant. So it was appropriate

to include the flow in the Delaware & Raritan Canal.

Q Well, Mr. Boyer, how do you know which of these other values at low flows -- let's say that on Del-Aware 2, items 15 through 18 and item 2, all of which are low flow values -- how do you know whether they did or did not include 300 cfs that might have gone out at the D&R Canal?

In other words, isn't it possible that on some of these days the D&R Canal was in operation at 300 cfs and on other days it wasn't, or that it might have been 500 cfs on some of these days and zero on others? You have no way of knowing that, do you?

A (WITNESS BOURQUARD) Yes. The only thing I can say is that the Delaware Canal is fairly limited in its ability to carry water. In the New Jersey study they say that it has the capacity of about 75 mgd, which is about 100 cfs, and so not too much or not more than 100 cfs would bypass the gate there.

Q But on September 12, 1981, 300 cfs was bypassing.

A (WITNESS BOURQUARD) Some of that evidently went back into the Delaware River at a place they call Kingwood. I don't know where that is. I have just been advised -- not just, but I have been advised that some of the water in the canal, there is a spillover further

downstream in which some of the water is returned.

Q How much?

A (WITNESS BOURQUARD) I don't know.

Q And you say Kingwood?

A (WITNESS BOURQUARD) Kingwood.

Q Kingwood is the township in which Byron, New Jersey, is located, isn't it? That is upstream of the Lumberville wing dam.

A (WITNESS BOURQUARD) I'm sorry, but this is where it was mentioned to me as being. I may have been quoted wrong.

Q In any event, you have made no analysis to isolate the flows from the D&R Canal out of these values; is that correct?

A (WITNESS BOURQUARD) Other than to go back and examine the New Jersey report, water management report, and find out that the capacity of the canal, that the takeout was limited to 75 mgd, yes.

JUDGE MORRIS: Mr. Sugarman, I'm not sure I know where you're going, but I have a question in my mind that seems logical at this point.

MR. SUGARMAN: Please.

JUDGE MORRIS: Am I correct that the maximum diversion in the canal is about 300 cubic feet per second?

WITNESS BOURQUARD: Yes. At this particular time it was 304 CFS, yes, sir.

JUDGE MORRIS: And if you use that number and enter your rating curve how much difference in the elevation would that make at Point Pleasant?

WITNESS BOURQUARD: Maybe one or two-tenths of a foot.

JUDGE MORRIS: Thank you.

BY MR. SUGARMAN: (Resuming)

Q That could be considerable, could it not, at the low flows? I mean you used that -- one or two-tenths of a foot relates to as much as 300 or 400 or 500 CFS, and therefore to as much as a quarter of a foot in velocity, doesn't it?

A (WITNESS BOURQUARD) I think in going down the canal it has to be at a pretty high level to get this type of flow going in the D&R Canal.

A (WITNESS BOYER) A further clarification to

your statement which happened to be in error, because in response to Dr. Morris' question Mr. Bourquard gave him the estimated change in elevation of Point Pleasant due to a 300 cubic foot diversion or a 300 cubic foot change which he said was a couple of tenths; so, therefore, it can't be 500 because he was a giving a number for 300. It can't be anything else because he was picking off the curve for that amount.

Q But a couple of tenths -- let me rephrase my question then. Thank you very much.

A couple of tenths of a foot change in elevation could make a substantial change in flow on the rating curve, could it not, at the low flow?

A (WITNESS BOURQUARD) It could, but what it would do would be to increase our flow past Point Pleasant.

Q If the flow was in there it would increase it, but if the flow is out -- in other words, if on some occasions in your rating curve there was a 300-foot diversion at the D&R Canal and on another occasions there was not, then it would drop it, right?

A (WITNESS BOURQUARD) No, it wouldn't drop it, because that flow, if we are relating it to Trenton, that flow would not be affected.

Q Shouldn't that factor be included as a 20

percent change in the cross-section, and as up to a 20 percent flow -- that is, at 2000 CFS -- a 300 CFS withdrawal would be -- I'm sorry -- 15 percent of flow. Shouldn't that factor be included in creating a rating curve since it is a variable flow?

MR. CONNER: Objection. This is argumentative, and the question has been asked and answered. The witnesses have stated the basis for their answer, and Mr. Sugarman is merely arguing with them.

JUDGE BRENNER: No. He is probing as opposed to arguing. There is always some arguing in cross examination, and he is entitled to follow up.

JUDGE COLE: Mr. Sugarman, I would like to ask a question. Well, you can get an answer to your question first. You have a question pending, right?

MR. SUGARMAN: Yes, sir.

JUDGE COLE: Well, I will wait until the answer is given to that before I ask mine.

WITNESS BOURQUARD: I am only estimating this, but at 2000 CFS through above the wing dam, I would doubt that you would get too much flow going down the Chesapeake and Delaware. But I'm only estimating on the basis of 304 went down at 7127. You would certainly get a lesser amount when you got down below there. I'm sorry. That was the Delaware and Raritan Canal.

JUDGE COLE: I don't know where the Chesapeake and Delaware came into this. You're talking about the Delaware and Raritan Canal?

WITNESS BOURQUARD: Yes, sir, I am.

JUDGE COLE: Does anybody know how the flow is controlled into the Delaware and Raritan Canal?

WITNESS BOURQUARD: I have not seen the control gates, but I understand there are control gates on it.

JUDGE COLE: Do you know if these control gates are operated on a periodic basis or are they just set and left that way?

WITNESS BOURQUARD: I don't know, sir.

JUDGE COLE: Okay. Thank you.

BY MR. SUGARMAN: (Resuming)

Q You were asked by Judge Brenner, Mr. Bourquard, whether you -- why you selected 3000 CFS as the --

JUDGE BRENNER: Mr. Sugarman, I'm sorry. Are you leaving the Delaware and Raritan Canal?

MR. SUGARMAN: Yes, sir.

JUDGE BRENNER: I didn't think you would leave it that quickly, although I am pleased you are. But I have a question or two on it, if I might.

MR. SUGARMAN: Certainly.

JUDGE BRENNER: Mr. Boyer, referring to your answer in which you stated not considering the flow into the canal from the Delaware would be conservative for reasons of determining elevation at Point Pleasant -- and I understood it in that context -- do you know whether the flow into the Delaware and Raritan Canal was considered in calculating the fact that the flow at Point Pleasant on November 7, 1980 was approximately 3000 CFS? That is the day when Mr. Harmon made his measurements.

(Panel of witnesses conferring.)

WITNESS BOYER: That value was taken from the rating curve, and the rating curve data does not take into account the flows through the Delaware and Raritan Canal except the one small x-ed value that is on there, which is fairly close to that.

JUDGE BRENNER: If the canal was receiving, if that is the right word, 300 CFS from the Delaware on that day, then the flow by Point Pleasant would actually have been closer to 3300 rather than 300 CFS? Do I have that right?

WITNESS BOURQUARD: No, it would not be, Mr. Brenner. As I understand it, there is a spillover point when the flow at the entrance exceeds the available capacity downstream. It evidently spills over at some

point back into the Delaware River.

JUDGE BRENNER: You don't know where that point is?

WITNESS BOURQUARD: No. I said Kingwood, and I don't know whether that's right or I heard it wrong.

JUDGE BRENNER: Putting the spillover point aside, because I can't determine the net figure since you don't know it, am I right in the dynamics that the Delaware and Raritan Canal draws off 300 CFS below Point Pleasant but above the Lumberville Dam and therefore also above Trenton?

WITNESS BOURQUARD: No, sir.

JUDGE BRENNER: Where am I wrong?

WITNESS BOURQUARD: I think you are wrong in that the Delaware and Raritan Canal, the flow that is diverted out of the Delaware River, the channel that takes it only has the capacity of around 75 MGD. I don't know what that is. That's a little over 100 CFS, if it operates for a day. And at some point downstream any excess spills back into the Delaware River. But I can't tell you exactly where that point is.

JUDGE BRENNER: I thought that the flow into the Delaware and Raritan Canal is measured by USGS on July 6, 1981 as 304 CFS.

WITNESS BOURQUARD: It was at the upstream

point above the spillover area.

JUDGE BRENNER: It is your testimony that anything over approximately 100 CFS goes back into the river?

WITNESS BOURQUARD: That is my understanding, yes. And I think that is covered in a publication of the New Jersey Department, the State Water Management Plan.

JUDGE BRENNER: Well, unless and until we pin your understanding down a little better, let's assume that this 300 CFS on July 6, 1981 was the amount taken on November 6th, 1980, if I have the right date. Was that the date of your measurements, Mr. Harmon? That is the date I want.

WITNESS HARMON: That is November 7th, 1980.

JUDGE BRENNER: Thank you. A day that will swim before me after this hearing for eternity.

(Laughter.)

JUDGE BRENNER: I just want to get the dynamics down, Mr. Bourquard.

If the Delaware and Raritan Canal's allotted portion was not considered in arriving at the calculation of approximately 3000 CFS, then is it not correct to add 300 CFS?

WITNESS BOURQUARD: No. We have no assurance

that 300 CFS was going down the Delaware Canal at that time and was continuing on down the Delaware -- I mean the Raritan Canal.

JUDGE BRENNER: Do you know how much was going into the Delaware and Raritan Canal on November 7, 1980?

WITNESS BOURQUARD: No, sir. But I would assume it is not in excess of the 75 MGD, which is the capacity of it according to the State of New Jersey.

JUDGE BRENNER: Well, then why was the calculation for July 6th, 1981 used as 304 CFS?

WITNESS BOURQUARD: Because that was the measured amount above the point where it spills back into the Delaware River.

WITNESS BOYER: In other words, they were taking an actual measurement of river flow, and they had to measure it both across the river and across the canal to get the total.

JUDGE BRENNER: At Lumberville.

WITNESS BOYER: At Lumberville, yes.

JUDGE BRENNER: Mr. Harmon reported is velocity measurements for November 7, 1980 as being velocities for an approximate flow of 3000 CFS, correct?

WITNESS HARMON: Yes.

JUDGE BRENNER: Is it conservative not to include the Delaware and Raritan Canal if one is

interested in learning the lower extent of the velocities at 3000 CFS in the vicinity of Point Pleasant? And I am coming back to your thought that it would always be conservative, Mr. Boyer.

WITNESS BOYER: I'm sorry. I didn't hear your question. I was looking at some other material.

JUDGE BRENNER: If one is interested in learning what the lower extent of the velocities are in the vicinity of Point Pleasant at 3000 CFS is it conservative to exclude consideration of the inflow from the Delaware to the Canal in assuming that the flow on the day Mr. Harmon made his measurements was 3000 CFS?

I will rephrase that if you have trouble.

WITNESS BOYER: I have to think about that for a moment, because the rating curve is based on flow data, elevations at Point Pleasant versus flow at Trenton adjusted for drainage area and other factors.

Now, there was one factor X which we would say would be the net outgoing amount from the Delaware and Raritan Canal. And assuming that that amount X did not return and be measured at Trenton, it would be an additional flow past Point Pleasant which would increase the velocity and increase the elevation slightly.

JUDGE BRENNER: Don't worry about elevation for the moment. It's complicated enough.

WITNESS BOYER: It would increase the velocity slightly, the total volume of water, and as compared to the calculated value; and therefore I thought that would be -- I think that is in a conservative direction.

JUDGE BRENNER: Well, let me try it a different way. You may be right, but I'm not sure. If one wanted to report that number 1.1 feet per second as the velocity at 7 feet -- and I don't have the table in front of me -- and whatever that distance was that we have bandied about -- if in fact that is the velocity for 3000 plus your factor X for the canal -- that is, 3000 plus 100 or plus 200 or plus 304, if I use the inflow on July 6th without worrying about the net balance, since I don't know what the net balance is, then actually that is the velocity at 3300 CFS, and therefore the velocity at 3000 CFS might be something lower.

WITNESS BOYER: That's true.

JUDGE BRENNER: And if I was interested in knowing the low velocity of 3000 CFS, it would not be conservative to exclude the canal.

WITNESS BOYER: Right.

JUDGE BRENNER: I was just trying to understand the dynamics of the river.

JUDGE COLE: Mr. Bourguard, you stated that

the D&R Canal had a hydraulic capacity of 75 MGD with the flows in excess of that going back into the Delaware River at some point, is that correct?

WITNESS BOURQUARD: Yes, sir.

JUDGE COLE: Is this hydraulic capacity of 75 MGD -- do you have any knowledge as to the sensitivity of that capacity with respect to elevation in the vicinity of the intake in the pool created by the wing dam?

WITNESS BOURQUARD: No, I do not know how it relates directly to that. I know that the USGS has a gauging station on the Raritan Canal in which they measure these diversions, and I have never seen any of the readings over 100.

JUDGE COLE: My question is might it be expected, a flow of 75 MGD, regardless of the flow in the river. It depends upon how the hydraulic system is set up.

WITNESS BOURQUARD: I'm afraid I don't know the answer to that, no, sir.

(Board conferring.)

JUDGE MORRIS: Mr. Boyer, could you estimate the change in the velocity that 300 cubic feet per second might make in the range of 3000?

WITNESS BOYER: Yes. I think Mr. Bourquard

gave that as a couple of tenths. Wait a minute. You said velocity.

JUDGE MORRIS: Yes. Velocity this time.

WITNESS BOYER: Well, at 500 CFS estimate was a couple of tenths of a foot. Whatever value you want to pick would be the proportional amount of that two-tenths of a foot. If you said 300, it might be roughly half of that, one-tenth.

I think we will have to get statistics on the Delaware and Raritan Canal, which we will do, but if it is a relatively constant amount at all times, it's not going to affect the value. And if it was a pronounced amount, I would expect to see it in the rating curves, some point being out of line.

MR. SUGARMAN: May I continue?

JUDGE BRENNER: Please proceed.

BY MR. SUGARMAN: (Resuming)

Q If an unknown amount of the flow, or as you say, Mr. Bourquard, everything over 100 CFS was going back into the Delaware River, how do you know it didn't go back in above the gauging station at the Lumberville Bridge which was a mile or two downstream from the wing dam?

A (WITNESS BOURQUARD) I was advised that it didn't.

Q When? When were you advised?

A (WITNESS BOURQUARD) At the time the measurement was made. In other words, we had discussions with the USGS and asked them what happened to this water, and it was reported in a telephone conversation.

Q As long as you had that data, Mr. Bourquard, relating that data, as Mr. Boyer has said a number of times, that being the only station at which you had a direct point of comparison, and that is why the X on the rating curve relating the flow in the area of Point Pleasant on that date where the USGS made that survey, did you relate -- did you make any determination of what the relationship between the flow at Point Pleasant on that day was in relationship to the flow at Trenton on that day or the next day to allow time of travel?

A (WITNESS BOURQUARD) No, we did not, other than just to observe that there was a flow at Trenton, and we probably looked it up. But in that we had an exact measurement of the flow past the Point Pleasant, there was no reason to relate that necessarily to the Trenton flow.

Q Wouldn't it help to determine whether your 97 percent estimate was a good estimate to use?

A (WITNESS BOURQUARD) Not necessarily. It

would depend upon flow conditions that day.

Q Well, the only direct data relationship point -- it would be the only direct relationship point you had, is that right?

A (WITNESS BOURQUARD) Well, the data relationship we had is very exact data, on September 7th at the site.

Q I'm talking about confirming or calibrating your 97 percent of the watershed estimate.

JUDGE BRENNER: Mr. Bourquard, how did we get September 7th at the site?

WITNESS BOURQUARD: September 12th. I'm sorry.

JUDGE BRENNER: Okay.

WITNESS BOURQUARD: And you evidently have the record of flow there on September the 12th which, according to our report, was 4070 CFS, and on the 13th it was 3660, and so that should follow pretty well along with the measurement that we ended up with.

BY MR. SUGARMAN: (Resuming)

Q You had what?

A (WITNESS BOURQUARD) We had 4070 on the 12th and 3660 on the 13th.

JUDGE BRENNER: Mr. Sugarman, now we are repeating testimony.

MR. SUGARMAN: No, sir. This has never been

testified to before, I'm sure.

JUDGE BRENNER: You're sure we never got the Trenton flow data for September 12th and 13th?

MR. SUGARMAN: Yes. I'm reasonably sure. I could be wrong, but I don't believe so.

JUDGE BRENNER: I could be wrong, too, but I'm reasonably sure we got it.

BY MR. SUGARMAN: (Resuming)

Q Which of those two values relates to, or to which of those values does the 97 percent correlate?

A (WITNESS BOURQUARD) It would be somewhere in between.

Q Well, is somewhere in between a very precise way of doing it?

A (WITNESS BOYER) You made a misstatement on that, to which value does the 97 percent correlate. The 97 percent is a factor representing drainage areas between two points.

Q Wasn't the 97 percent the sole basis for all of the low numbers in the rating curve?

A (WITNESS BOURQUARD) For a number of them, yes.

Q And I will ask you, wasn't it or isn't it true -- and this is going to be a compound question, sir, to avoid the question of connecting up -- isn't it true that the USGS measurement was made early in the morning

on September 12th, which by your estimate of time of travel would bring it to Trenton on the 12th, and the value at Trenton on the 12th as you just stated it was 4070 CFS, and that number is approximately 90 percent or the value at the Point Pleasant that day was 90 percent of Trenton and not 97 percent of Trenton?

A (WITNESS BOYER) You would have to take -- these are average values for the day. You would have to take a period of time and look at rainfall and so forth. I say a 10 percent change in flow in daily averages is a nonequilibrium condition and one that is suspect as a basis to make detailed, microscopic comparisons on.

Q Mr. Boyer, are you not assuming that the error is in the 10 percent variance? Might it not be in the 97 percent estimation?

A (WITNESS BOYER) I'm not assuming anything along that line.

Q Then why do you say that it is a 10 percent variance in flow on that day?

A (WITNESS BOYER) I'm saying the difference between 3650 and 4070 is roughly 10 percent.

Q But those are different locations. The 3640 or the 3660 is at Point Pleasant. The 4070 is at Trenton.

A (WITNESS BOYER) No. Those values were both at Trenton.

Q No, sir. It is September 12th, 1981, sir, was the point that you have frequently referred to as the point that is close to the curve, that shows that it is a good fit, which is the only value that you have at Point Pleasant on the entire rating curve, and it is based on that one date, September 12th, 1981. And the ratio of the flow at Point Pleasant on that day, adding back in the D&R Canal flow, is 90 percent of the value at Trenton on that day, not 97 percent.

(Panel of witnesses conferring.)

A (WITNESS BOYER) The numbers that I have, which I thought were just reported, were 4070 average flow at Trenton on the 12th, 3660 average flow at Trenton on the 13th when that was the starting point from my conversation or estimate of the 10 percent value.

Q But the time of travel from Point Pleasant to Trenton is 12 hours, and the value at Point Pleasant was at 9:40 a.m., so that by the time of travel that water would be down to Trenton before the day, September 13th, started.

A (WITNESS BOYER) Well, you have to --

A (WITNESS BOURQUARD) It would be a relationship between it. It doesn't automatically come

to midnight on September 12th and automatically drop to 3660.

Q I understand that, but what basis do you have for taking the average between the two?

A (WITNESS BOYER) I did not take the average.

Q Well, then, what value would you use for the flow at Trenton to correlate to that 3660 at Point Pleasant?

A (WITNESS BOYER) I would need a lot more information before I would attempt to make the correlation.

Q Well, then, if that is the case, then how can you have such confidence in your rating curve? That's the only value on there that correlates Point Pleasant to Trenton, and every other low value uses that 97 percent.

A (WITNESS BOURQUARD) Only when the water level is relatively constant. And it is a pretty well known hydrologic fact that generally watersheds contribute on the basis of the drainage area.

A (WITNESS BOYER) And regardless of that, it is all relative as long as you use the same factor for everything and plot it, why, you're going to have a series of curves that are at least consistent. And whether the flow with the velocities we measured are

actually 3000 or 2500 at the flow we measured and got 1 foot per second or at 3500, that is the value. That corresponds to calculated flows using the mechanism we have with flows at Trenton. That is the values we have been talking about.

Q Then you would be off by a uniform amount for every calculation. The curve would be valid but at a wrong level.

A (WITNESS BOYER) And all our data would be valid.

Q Your data might be valid for relative flow conditions, but it would not be good for velocity when your only basis for relating Mr. Harmon's velocity measurements was your rating curve.

JUDGE BRENNER: Mr. Boyer, he didn't put a question mark at the end of that, but I was going to ask the same question; so let's put a question mark at the end of his last statement.

Why do you say it wouldn't matter if the flows -- I understand why you feel the curve would be consistent, as long as you are consistent in all of your points of relationship. But why wouldn't it matter if the flows were -- you said 3500 at Point Pleasant -- if we are examining what the approximate velocities will be and we are interested in 3000 among other points.

WITNESS BOYER: But you're only interested in 3000 because it is tied in to a 3000 at Trenton.

JUDGE BRENNER: No, sir. What if I'm interested in knowing what the bypass velocity is going to be at Point Pleasant in river flow conditions of approximately 3000 among other possible flow conditions from the point of view of assessing potential biological impact?

WITNESS BOYER: Well, it's all relative to what you expect the river to get to be, and we are saying 3000 is the minimum flow which triggers things at Trenton as far as slow flow determinations, and 2500 has been stated by Mr. Hansler as being the lowest he expects it to get and so forth.

And as long as our values and calculations of flow at Point Pleasant are tied in to those with some reasonable, sound basis, and we do it the same way all the time, and we relate our velocity measurements to some values there, then we are really tying it in to Trenton values. So it is going to be relative to the point of concern.

JUDGE BRENNER: All right. I understand your position.

BY MR. SUGARMAN: (Resuming)

Q Mr. Bourquard, would you agree with me if I

told you that the water that is wasted out of the Delaware and Raritan Canal is wasted in the Millstone River 500 feet upstream of the USGS station where the measurements are taken?

A (WITNESS BOURQUARD) I would agree with you because I said I did not know where it spilled over, but it came in above the gauge.

Q Do you know whether -- it came into where above the gauge?

A (WITNESS BOURQUARD) The Delaware River.

Q Above what gauge?

A (WITNESS BOURQUARD) The Trenton gauge.

Q I'm talking about above the station where the D&R Canal measurements are made.

A (WITNESS BOURQUARD) No, I would not agree with that.

Q Well, when USGS says --

A (WITNESS BOURQUARD) Say that again. Oh, yes. When you said D and something measurements there, I thought you were indicating the measurements that we had had USGS make.

Yes. I would agree that that sounds logical that it would spill over above the point where they measure what part of the water is being diverted into New Jersey.

Q But you don't know where that is in in relationship to the Delaware River?

A (WITNESS BOURQUARD) No. I'm afraid I don't. I know it comes in above the gauge at Trenton, but just where I don't know. And being as you have that, that probably shows what water is diverted out of there. So wouldn't it be desirable to read a few of those figures?

Q Well, here are some zeros -- well, I would be happy to ask you the questions, but --

A (WITNESS BOYER) Give us the document then.

JUDGE MORRIS: Mr. Sugarman, what document are you perusing?

MR. SUGARMAN: This is the water resources data for New Jersey, USGS, for 1974.

WITNESS BOYER: 1974?

MR. SUGARMAN: Well, I will be guided by the Board. If you want me to give the witnesses the document, I will give them the document now. I don't know what they can tell from it.

JUDGE BRENNER: I don't want to sit here while they read a document that you're showing them for the first time now. If they want to see it after we adjourn today, please make it available to them.

MR. SUGARMAN: I will do so.

JUDGE BRENNER: How much more do you have, Mr.

Sugarman, approximately?

MR. SUGARMAN: I haven't estimated. I just made notes in reference to the questions that were asked today.

JUDGE BRENNER: Okay. Do you think you will finish in 5 minutes?

MR. SUGARMAN: No, sir.

JUDGE BRENNER: A half hour?

MR. SUGARMAN: I don't know. Possibly. I don't know.

JUDGE BRENNER: We've gotten a lot of information from this panel, and I don't want the same thing, even though they are asked slightly. If we have got the information, we've got it.

MR. SUGARMAN: I'm not doing that, sir. I'm going through and bringing out information that was not brought out that I think should be brought out for the panel's questions to be and the answers to be properly evaluated.

BY MR. SUGARMAN: (Resuming)

Q Mr. Bourquard, Judge Brenner asked you today about why you didn't move the intake out further, and pointed out to you that on Policastro 1 the intake was approximately 60 feet from the New Jersey line. Looking at Del-Aware 17, your memorandum of January 5, 1982,

didn't you say in there that the possible objection to the station selected, 8 plus 62, is the closeness to the Pennsylvania-New Jersey line, and that the areal extent of the riprap under the intake assemblies will be reduced to eliminate any intrusion into New Jersey?

Didn't you say that in that memorandum?

A (WITNESS BOURQUARD) I would assume so if you're reading from it.

Q I am reading from it. Why was it necessary to reduce the areal extent of the riprap to eliminate any intrusion into New Jersey if the New Jersey line was 60 feet or 70 feet away from the end of the intake?

A (WITNESS BOURQUARD) Mr. Brenner did not ask me how far the New Jersey line was from the intake. What he asked was --

JUDGE BRENNER: Give us just one minute.

(Board conferring.)

JUDGE BRENNER: All right. We wanted to check something. Thank you. Go ahead.

BY MR. SUGARMAN: (Resuming)

Q You said Judge Brenner did not ask you how far the intake was from the New Jersey line?

A (WITNESS BOURQUARD) He asked me what would be the stationing of the New Jersey-Pennsylvania line, and I used the center line stationing and gave him the

station as best as I could from the Policastro exhibit, what it would be.

Q You're now saying then that the state line is where the Policastro exhibit is where it shows it is?

A (WITNESS BOURQUARD) Yes. I'm saying that is where it is within the ability to read it off of that exhibit, but along the alignment of the intake center line.

Q Well, I don't understand then why it was necessary to reduce the areal extent of the riprap under the intake assemblies to eliminate any intrusion into New Jersey, if it was 50 feet or 60 feet.

A (WITNESS BOURQUARD) You know, this came up before. I am sure it is in our testimony, our prior testimony. And at that time I think I told you we did that to make very sure and even to give equipment space to work in there.

Q Well, are you saying then that the New Jersey line is within -- is substantially less than 60 feet away from the end of the intake?

A (WITNESS BOURQUARD) I think it is, yes. I don't have a measurement here.

Q I had -- do you have Addendum 1 and Addendum 2 to the bid documents?

A (WITNESS BOURQUARD) No, I do not.

Q Do you recall the license that is contained in those bid documents granted by the Commonwealth of Pennsylvania for you to occupy the bottom of the river bed?

A (WITNESS BOURQUARD) Yes.

Q Do you recall the drawing on there that shows that the intake is approximately 2 feet from the New Jersey line?

A (WITNESS BOURQUARD) No.

Q Do you have Addendum 1, Mr. Dickenson?

A (WITNESS DICKENSON) No.

A (WITNESS BOURQUARD) I have Addendum 1 here.

Q Does it have in it the license from the Commonwealth of Pennsylvania to utilize the bed of the Delaware River?

A (WITNESS BOURQUARD) Yes.

Q Is there a drawing attached to that?

A (WITNESS BOURQUARD) Yes.

Q And does it show the location of the licensed area in relationship to the state line?

A (WITNESS BOURQUARD) Yes, it does.

Q And how far away is it?

A (WITNESS BOURQUARD) I don't know. This is a licensed area. Now, this is not the intake. In fact, I think they would have given us the right to go to the

state line if they had wanted to or if we had asked for it. So you are implying by this that we are over on the state line, and we are not. This is strictly the area which they have given us the right to use.

Q May I look at it?

A (WITNESS BOURQUARD) Sure.

A (WITNESS BOYER) I thought you had it.

Q I did have it. Somebody borrowed it.

MR. CONNER: You have both our copies.

JUDGE BRENNER: Let's cut out the chitchat and let's get to the questions and answers.

(Pause.)

BY MR. SUGARMAN: (Resuming)

Q What this document shows, Mr. Bourquard, is that the licensed area extends 20 feet past the end of the intake pad, is that correct?

A (WITNESS BOURQUARD) I don't have it in front of me now.

(Counsel handing document to witness.)

A (WITNESS BOURQUARD) Yes.

Q And that in turn is what, how many feet would you say from the Jersey line?

A (WITNESS BOURQUARD) From the pad it is another 20 feet approximately or more.

Q Is that the upstream end?

A (WITNESS BOURQUARD) At the upstream end it looks like it's about 20 feet.

Q Did you reduce the areal extent of the riprap under the intake in order to eliminate any intrusion into New Jersey?

A (WITNESS BOURQUARD) Partly that and partly because it wasn't necessary.

Q Referring again to Del-Aware 17, didn't at least one of the officials at the Corps of Engineers want you to put it out further, beyond 8 plus 62?

JUDGE BRENNER: Mr. Sugarman, what is "it?"

MR. SUGARMAN: The intake.

WITNESS BOURQUARD: They possibly did, if that is what I say in my memorandum.

BY MR. SUGARMAN: (Resuming)

Q And Judge Brenner asked you if you considered flows of 3000 CFS or less in locating the intake, and you said that yes, you were aware that there would be flows of less than 3000 CFS in which the intake would operate.

Judge Cole this morning asked you about your memo of April 30, 1982, which was D 20-1, and on page 3 of that memo didn't you say, "Another confirming factor is that the maximum withdrawal rate of 95 MGG will only occur when the river flow is 3000 CSF or greater, and

such a withdrawal would constitute only 5 percent of the 3000 flow," et cetera?

A (WITNESS BOURQUARD) If you are reading that, yes.

(Pause.)

Q Isn't it really -- Mr. Bourquard, isn't what really happened in terms of locating the intake that you picked that location at Point Pleasant for the intake when it was on the shore, acquired the land and then you were faced with the problem of moving the intake in order to satisfy fish and wildlife concerns, and you had to operate within a location that you had picked based upon a shoreline location for the intake?

MR. CONNER: Objection. This is certainly beyond anything the Board raised.

MR. SUGARMAN: It is directly within --

JUDGE BRENNER: It is related to my questions as to how they located the intake once they decided they had to move further out.

MR. CONNER: Then I would remove my objection, because if that's all it is we have gone through this over and over again in the direct cross examination.

JUDGE BRENNER: He's entitled to follow up and probe. I didn't get any simple answers to my questions on it.

Good luck, Mr. Sugarman.

MR. SUGARMAN: Thank you, sir.

BY MR. SUGARMAN: (Resuming)

Q Isn't that what happened is you selected the location based upon a shoreline location for all of the reasons stated in your Design Report No. 2, that it was 800 feet downstream of the Tohicken, and then you acquired the land, and then you had to start moving the intake, and so you were never able to select a location based on considerations, on free considerations. Your selection of a river location had to take into account the fact that you had already acquired the land at this location.

A (WITNESS BOURQUARD) Well, we had acquired the land, but actually that location was selected not just on the fact that we were going to have a shoreline intake. It happened to be one of the best locations to bring water out of the Point Pleasant area in the direction that we wanted it to go in.

Q One of the best?

A (WITNESS BOURQUARD) Probably the best.

Q Probably the best?

Now, in answering Judge Brenner's questions this morning and Mr. Boyer preparing his chart, have you estimated the difference in the shoreline elevations

between the Policastro Exhibit 1 and the cross-section of January 22, 1982 which you used to obtain elevations such as the 70.8?

Do you understand the question?

A (WITNESS BOURQUARD) Not really, no.

Q How much has the shoreline moved between the time Major did his survey in 1967 until the cross-section was prepared that was submitted with your letter of January 22, 1982 that you referred to, Exhibit 4?

A (WITNESS BOURQUARD) I don't think the shoreline as such moved. The water level dropped -- not dropped, but in other words, there was a different water level at the two times, and it is approximately 7 feet between those two water levels in a horizontal direction.

Q In addition to the 7 feet between those two water levels that you alluded to did you plot the difference in the stationing of the elevations on those two contour maps or those two cross-section contours?

Do you understand what I'm asking you?

A (WITNESS BOURQUARD) Not really, not.

Q Well, let me put it this way. I looked at this morning, and I make, according to Mr. Boyer, 6 plus 23 was the shoreline that was used to backtrack to the shoreline from Mr. Harmon's measurements.

A (WITNESS BOURQUARD) Yes.

Q But on Policastro Exhibit 1, which is the 1967 survey, 6 plus 25, that is, station 6 plus 25, represents an elevation of 70.8, whereas on your January 22 --

A (WITNESS BOURQUARD) Where did you get that?

Q Here it is in 1 to 100.

(Counsel handing document to witness.)

A (WITNESS BOURQUARD) Six plus 23 we used.

Q To represent what elevation?

A (WITNESS BOURQUARD) 70.8.

Q On what exhibit?

A (WITNESS BOURQUARD) Four.

Q Well, was Exhibit 4 taken from the 1967 Major survey?

JUDGE BRENNER: Mr. Sugarman, we're going to have to come to a logical stopping point soon. What is Exhibit 4? Whose Exhibit 4?

MR. SUGARMAN: That is Exhibit 4 to Mr. Bourquard's letter of January 22nd, 1982. It has not previously been marked, but it was referred to in answer to your questions this morning for the first time.

WITNESS BOURQUARD: Ask me that again.

JUDGE BRENNER: Wait a minute. I had it in front of me at one time even though you say it is not in

the case. Where is it in your pretrial exhibits?

MR. SUGARMAN: It would have been in 31, I believe.

JUDGE BRENNER: Let's go off the record.

(Discussion off the record.)

JUDGE BRENNER: Let's go back on the record.

It's becoming very difficult to keep up with the paper battle in terms of references and so on. We are going to adjourn for the day. I would like copies tomorrow morning of this Attachment 4 to -- as I understand it, it is an attachment to the January 22nd letter, as Ms. Hodgdon just informs me, which I appreciate.

Ms. Hodgdon was kind enough to inform me that the letter with all of the attachments is part of Exhibit 1 to Mr. Wescott's proposed testimony -- the portion proposed on Point Pleasant as distinguished from the one we will not be hearing on the Bradshaw Reservoir.

We will look for it when we get back tomorrow morning, and we can pick up with reference to that because it is going to presumably get into the record that way, at least for identification. We also may have this as 240.27-4 in the response to questions, which is in the record.

I know it is hard, Mr. Sugarman, and everybody else, but when you are using these documents, I want you to try to refer to the one that we already have under some nomenclature, because we have been getting multiple copies in the record, and also the contrary, no copies in the record of things. So try to be careful, and we will come back tomorrow morning on it.

We would also like to hear tomorrow whether there is any stipulation reached with respect to the need for Professor Lewis and Mr. Richter.

MR. SUGARMAN: There has been a stipulation reached as far as Professor Lewis is concerned.

JUDGE BRENNER: Well, I would assume that anything that relates to him would also obviate the neet for Mr. Richter. But why don't you tell us tomorrow what the situation is.

MR. SUGARMAN: I would also like to inform the Board on the current status of the Pennsylvania PUC order on Unit 2.

JUDGE BRENNER: Yes. I haven't forgotten that. We will save that for the time when we come back to the subject of those contentions.

Mr. Conner.

MR. CONNER: The Board asked us for information concerning Point Pleasant construction. Do

you want that tonight?

JUDGE BRENNER: Why don't you leave it for us as soon as we adjourn, and we will be able to read it overnight.

MR. CONNER: The other thing I wanted to mention is for the record we have -- Mr. Brundage is here ready to go on in the morning, so at 9:00 as you direct, or first thing as you said.

JUDGE BRENNER: Okay. I want the parties to discuss whether we can finish this panel in about an hour, so we don't have to interrupt their testimony again and then get right to Mr. Brundage. And then I want all of the parties to discuss and tell us what the sequence is after Mr. Brundage. And we will start at 8:30 tomorrow morning.

MR. SUGARMAN: On that point, sir, Mr. Conner, I don't know, informed me that he will object to Mr. Miller and Mr. McCoy.

JUDGE BRENNER: Mr. Sugarman, I said I want the parties to discuss it and let us know tomorrow morning.

Okay. We are adjourned until 8:30.

(Whereupon, at 5:05 p.m., the hearing was recessed, to be reconvened at 8:30 a.m., the following day, Thursday, October 21, 1982.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

in the matter of: Philadelphia Electric Company (Limerick Generating Station Units 1 and 2)

Date of Proceeding: October 20, 1982

Docket Number: 50-352 OL & 50-353 OL

Place of Proceeding: Bethesda, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Ray Heer

Official Reporter (Typed)

Ray Heer

Official Reporter (Signature)