UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Philadelphia Electric Company	)	Dockets Nos. 50-352
	)	50-353
	)	
(Limerick Generating Station, Units 1 and 2)	)	

APPLICANT'S SUPPLEMENTAL RESPONSES TO "INTERROGATORIES OF DEL-AWARE UNLIMITED, INC. ADDRESSED TO APPLICANT PHILADELPHIA ELECTRIC COMPANY"

September 1, 1982

Interrogatory 1(d): Please state the anticipated velocities in one foot, five foot, and ten foot circumferential distances, at each point (or representative points) along such circumferences surrounding the proposed intake screens. Please indicate the anticipated velocity of the water at such points, noting the location of such points, when the flow of the Delaware River at Trenton is 2,000 CFS.

Response: To the extent Applicant has such information, it answered this interrogatory in its response filed August 20, 1982. Applicant has no further information responsive to this interrogatory and is not required to do research to respond to this interrogatory.

Interrogatory 1(f): Please state the anticipated distribution of the water sources between Tohickon Creek and the Delaware River through the intake at various flows in velocities, including velocities of 2,000, 2,500, 3,000, 3,200, 3,500, 4,000, 5,000, 6,000, 7,000, 8,000, 9,000, and 10,000 CFS in the Delaware River in combination with those of 200, 500, 750, 1,000, 1,500, 2,000, 2,500, and 3,000 CFS from the Tohickon Creek.

Answer: As Applicant stated in its August 20, 1982 response, Applicant has no currently available information responsive to this interrogatory.

Interrogatory 1(g): Please state whether PECO is presently committed to providing compensatory storage to maintain Delaware River flow and, if so, the location at which the storage will be maintained; the anticipated date of construction of such storage facility; whether an environmental impact statement has been prepared for such facility; whether application has been made to any agencies other than DRBC for approval of such facility, and, if so, the names of such agencies, the dates of such applications, and their present status.

Answer: As PECO witnesses stated at depositions on August 5, 1982 (Tr. 88-96), PECO is a joint applicant with six other utility companies for construction of a storage reservoir on Merrill Creek, in Harmony Township, Warren County, New Jersey. The project is needed to fulfill DRBC's requirement that utilities planning consumptive use of Delaware River water provide compensating flows to be released from storage when DRBC cannot maintain the flow at Trenton at more than 3,000 cfs.

The construction of the storage facility will begin promptly upon receipt of all necessary permits and approvals. It is expected that the facility will be ready for filling in 1985 and will be in full operation during 1986.

Application for project approval was filed with the DRBC on December 30, 1977. In mid-1982 the Commission issued the draft Environmental Impact Statement which is currently under review.

MERRILL CREEK RESERVOIR PROJECT
PERMITS OR APPROVALS

	Agency	Filing Date	Status
Federal			
Department of Army Permit for the Delaware River intake	USACOE	10/23/80	Pending
State			
Permit to Construct or Repair a Dam			
Ingersoll Rand Dam	NJDEP	4/21/80	Approved 5/27/8
Merrill Creek Dam	NJDEP	4/22/80	Pending

State (Cont'd)	Agency	Filing Date	Status
Water Lowering Permit Ingersoll Rand	NJDEP	3/27/80	Approved 1/27/8
Soil Erosion & Sediment Control Plan	NJDOA-WCSCD	12/12/81	Approved 1/27/8
County			
Warren County Road Crossing Permit	WCRD	6/11/81	Pending
Municipal			
Dam Demolition Permit - Ingersoll Rand	Harmony Township	5/28/80	Approved 5/28/8

Interrogatory 1(i): Bearing in mind that the intake will be operated by NWRA at low flow periods even if not operated for PECO's use, please state the anticipated minimum surface water elevation and clearance above the intake at the proposed location, and state what measures, if any, are planned to maintain a minimum water elevation sufficient to protect members of the public engaged in boating and tubing in the vicinity of the intake. Please describe in detail any such measures.

Answer: As explained at the depositions of PECO witnesses, the elevation of the surface water at the intake will be a minimum of 70 feet (Tr. at 121). The elevation of the water above the intake will be a minimum of 4 feet. This is a sufficient buffer to protect people engaged in boating and tubing.

Interrogatory 3: Please state the basis of any conclusions and describe in detail any studies leading to the conclusion that the intake as presently proposed will not be subject to frequent or occasional outage due to debris and ice conditions in the river. Also please describe any studies relating to the potential for ice damage, and describe any plans made or other measures considered in response to such potential.

Answer: As explained by PECO witnesses at deposition, PECO does not anticipate that ice and debris will cause any damage to the intake structure (Tr. 216-224). While there is ice in the Delaware River during the winter months, no ice jams in the Point Pleasant area at the intake site have been observed. If an ice jam were to occur, it would most likely occur upstream at the old bridge piers or at the Lumberville Dam and would not affect the Point Pleasant intake.

Further, the intake is 4 feet below the surface, and any ice or debris would likely pass over the intake. In the unlikely event that ice or debris reaches 4 feet below the surface and causes damage, it would present a minor maintenance problem of short duration. No dredging would be required; a diver would perform any necessary repair work. To further assure no damage will occur, the upstream end of each screen will be fitted with a nose cone to streamline the bypass flow and to fend off any material that might impact the screens. Also, three 12-inch diameter steel guard posts will be installed immediately upriver from the screens to provide added protection against ice or debris.

The intake will have minimal usage during the winter and early spring when floating ice, frazil ice, and debris may be present in the river. For these reasons, frazil ice is not likely to be a problem.

Interrogatory 9: With respect to the Merrill Creek Reservoir, please indicate the extent of compensatory storage which it is expected to provide, and the potential impact of the failure to obtain approval of such reservoir or some other alternate storage facility, on the operation of Limerick (assuming both Units 1 and 2 are operated).

Answer: Applicant provided this information at depositions August 5, 1982 (Tr. 88-96). As Applicant's witnesses explained, Merrill Creek could provide 200 cfs of flow for a period of 115 days. If the Merrill Creek project is not approved and no other water is available, no water will be taken from the Delaware other than as authorized by the DRBC.

Interrogatory 12: Please identify and describe the contents and conclusions of any reports, studies or other material relating to the phasing of the construction of the Point Pleasant diversion and the timing of the work in the river. In other words, please provide a complete description of and identify all information made available to PECO relating to the need to undertake constructing in the Delaware River during the first winter of project construction (i.e., 1982-83).

Answer: The timing and phasing of the construction at Point Pleasant was discussed fully at depositions on August 6, 1982 (Tr. 46-86). As explained by the NWRA witnesses, DRBC has required that NWRA undertake work in the river between November and March. It is necessary to begin during the winter months of 1982-1983 so that river work can be completed during the winter of 1983-1984. The letter of September 9, 1981 from E. H. Bourquard to the Corps of Engineers discusses phasing of construction work.

Interrogatory 13: Please identify all documents contituting, relating to, or considering the operating plan for the Point Pleasant intake, in and of itself, and as related to the Bradshaw Reservoir and/or proposed releases to the Perkiomen Creek. Please identify any final or presently final documents relating to or constituting such operating plan.

Answer: Applicant objected to this interrogatory to the extent that it requested information relating to proposed releases to the Perkiomen Creek. Except with regard to this issue, Applicant responded fully to this interrogatory in its August 20, 1982 response. One document, a letter from E. H. Bourquard to W. Haines Dickinson, dated August 10, 1982, which discusses the Point Pleasant Pumping Station and the Bradshaw Reservoir operations is added to the list of documents contained in the August 20, 1982 response and is attached.

Interrogatory 17a: Please describe PECO's present plans with respect to applying for a permit under Section 316(b) of the Clean Water Act and other federal water quality permits relating to the intake water.

Answer: No application will be filed by PE for any intake on the Delaware River under Section 316(b) of the Clean Water Act. Applications are not filed for intake structures as such under Section 316(b). As a matter of information, PECO will apply at the appropriate time for Section 402 NPDES permits with regard to the Limerick discharge into the Schuylkill River. This application will include the description of the intake structures on the Perkiomen and the Schuylkill from which PA DER may make an evaluation as to "best available technology" as to the intake structures.

Interrogatory 17b: Please describe any studies or reports relating to the compliance of the intake with EPA guidelines requiring application of best available technology pursuant to Section 316 of the Clean Water Act, and identify any documents, reports or contacts relating to the necessity for compliance with the requirements of that section.

Answer: PECO has large intake structures at all of its generating stations and thus has kept abreast of developments in design for many years. The basic study relating to this subject was the "Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact." This document contains information on the background to Section 316(b) of the Clean Water Act. It was published by the EPA under the administration of Russell E. Train in 1976.

Other basic references concerning wedgewire screens are the "Passive Intake Screen Workshop" dated December 4-5, 1979 and "Larval Exclusion Systems for Power Plant Cooling Water Intakes" from Proceedings of the Workshop Held at Shelter Island Inn, San Diego California February 7-8, 1978. The intake at Point Pleasant will use wedgewire screens. These screens are generally accepted by fishery biologists as being state of the art to further reduce impingement and entrainment of aquatic life.

Interrogatory 20: Please identify and describe the contents and conclusions of any reports, or evaluations of reports, submitted by intervenors or other opponents of PECO in any proceeding before an agency, and made available to PECO of its technical consultants (including, but not limited to, reports by GKY Associates, Ezra Golub, and Edwin Beemer) relating to hydrolics, hydrology, location of the intake and the ambient velocities, the effects of blasting, or any other impacts. Please identify any reports relating to water quality information submitted by intervenor or any other opponent of PECO to the Pennsylvania Department of Environmental Resources, the Corps of Engineers, or any other agency, and made available to PECO or any of its technical consultants.

Answer: PECO responded fully to this interrogatory, as clarified in Intervenor's Motion to Compel Answers, in its August 20, 1982 response.

Interrogatory 21: Please describe the extent to which the data in the NWRA Environmental Report of February, 1979, was considered in preparing the July 1979 Report and identify all documents in which such data was considered. Please describe the coordination between the NWRA Environmental Report of February, 1979, and PECO concerning the collection, analysis, interpretation, and/or presentation of water quality data for the Delaware River. Please identify all documents constituting, reflecting, or prepared in the course of such consideration.

Answer: PECO responded to this interrogatory in its August 20, 1982 response.

E. H. BOURQUARD ASSOCIATES, INC.
WATER RESOURCES ENGINEERING
1400 RANDOLPH STREET
(EXIT NO. 24, INTERSTATE 83)
HARRISBURG, PA.
17104-3497

TELEPHONE (717) 230-9505

WATER SUPPLY
WASTEWATER DISPOSAL
WATER RESOURCES
HYDRAULIC STUDIES
FLOOD INSURANCE STUDIES

FLOOD CONTROL PROJECTS
DAMS & RESERVOIRS
DRAINAGE-STORMWATER
HYDROLOGIC STUDIES
ENVIRONMENTAL STUDIES

August 10, 1982

Haines Dickinson, Supervising Engineer,
Hydraulics Branch, Civil Section,
Philadelphia Electric Company,
Mechanical Engineering Division,
2301 Market St., 2N-1,
Philadelphia, PA 19101

Re: PPPS Pumps/Bradshaw Reservoir Operation

Dear Haines:

As I was leaving Sugarman's office last Friday, Vince Boyer asked for any additional information we have on (1) slope stability of the Bradshaw Reservoir dikes, and (2) number or frequency of drawdowns of the Reservoir pool.

The "Supplemental Data" and "Slope Stability" documents submitted at the depositions cover the slope stability data; however, we do have some general data on pump operation which I converted to drawdowns. This is explained in the following paragraphs.

The Bradshaw operating pool will contain 18 M.G. of storage and initially this was to be divided into four increments of 4.5 M.G. each for starting/stopping of the PPPS pumps. However, after examination of the operating characteristics, it was concluded that usage of a larger initial increment would reduce the number of stop/starts for most of the year. Shown on Sheet No. 1 attached is a tabulation of the start/stop elevations with increments of 6, 5, 4 and 3 M.G. Utilizing these increments, a graph of pump operations for various outflows from Bradshaw Reservoir was developed and is shown on Sheet No. 12 attached.

Sheet No. 2 shows the projected average daily outflows for each month in the years 1990, 2000 and 2010. These include both PECO's and NWRA's needs and a 10% loss allowance. By applying these outflows to the curves on Sheet No. 12, it was determined how many pumps would be operated at PPPS and the number of hours operating and not operating. For example, in January and February when the outflow is the same for all three projection years, one pump would run for 8 hours and then be off for 20 hours. During March, April and May, the number of hours on would increase and the number off would decrease; in May 1990, one pump would be on for 12½ hours and then off for 10½ hours. By May of 2010, one pump would operate almost continuously to keep up with outflow.

During June, July and August, increased outflows require two pumps to operate continuously and the third pump to recycle. For example, in June of 2000, the third pump would be on for 11 hours and off for 7 hours, thus making a cycle every 18 hours. In September and October, outflows require one pump to operate continuously and a second pump to recycle. For the last two months of the year, one pump will take care of the outflow.

The number and depth of drawdowns are developed in the last three columns. Only one pump and only the top increment of operating pool storage would be used from January through May. Thus the drawdown is 1.0 feet and the number of drawdowns during the month equals the hours in the month divided by the hours in the pump cycle. For example, in May of 2000, the number of drawdowns would be 30 x 24 = 720 hours divided by 8 + 19 or 27 hours, which equals 26.7 drawdowns during the month.

At the start of June when outflows require operation of 3 pumps, there would be a one-time drawdown to the bottom of the third increment for a total of 2.6 feet. After this and during June, July and August, the third pump would be recycling in the third increment with drawdowns of 0.7 feet. In September and October, the second pump would be recycling in the second increment with drawdowns of 0.9 feet.

The above pump operation and drawdown frequencies are, as previously mentioned, based on pool increments of 6, 5, 4 and 3 M.G. When in actual operation, it may be desirable to use other pool increments, which can easily be done. In fact, changes in increments for various times of the year would probably be in order so as to permit operation with a reduced force during certain seasons. Also, with only three pumps in the initial installation, there will probably be only 3 increments in the pool until the fourth is installed. In any case, the operating drawdown will be limited to 3.2 feet total.

The frequency of a drawdown of 14.2 feet when the Reservoir would be dropped to silt storage level (Elev. 420.8) is unpredictable, but once a year might be a reasonable guess. Completely draining the Reservoir to Elev. 414.5 could result in a drawdown of 20.5 feet; a frequency of once every 5 years for a periodic examination of the bottom and slopes might be considered possible.

Any questions, please give me a call.

Best regards,

EHB/bs
Encl.As Noted

E. H. Bourquard

SUBJECT _____

COMPUTED BY _____ DATE 12-9-87 CHECKED BY _____

Brod. Res. Oper. Pool: 4 Units @ 6, 5, 4 and 3 M.C

Δ W.S	Elev.	Stor. MC	Δ Stor. MC	Action on PPPS
	435.0	70		↑ 1st Pump
1.0			6	
	434.0	64		↓ 1st Pump On ↑ 2nd Pump
0.9			5	
	433.1	59		↓ 2nd Pump On ↑ 3rd Pump
0.7			4	
	432.4	55		↓ 3rd Pump On ↑ 4th Pump
0.6			3	
	431.8	52		↓ 4th Pump On

NOTES

1. The four operating pool increments set up for four pumping units in operation which, for these computations, is assumed to be the case by 1990.

2. Common elevations for both starting and stopping pumps are assumed to simplify the computations.

PROJECT
SUBJECT Operation of Pt Pleas. Pump is Constant Outflow
COMPUTED BY JH DATE 4-8-81 CHECKED BY GS 4-16-81

Adjusted Reservoir Use
Δ Stor = 6,543 MG

Pump No. 4 Stops
Pump No. 3 Stops
Pump No. 2 Stops
Pump No. 1 Stops
Pump No. 4 Starts
Pump No. 3 Starts
Pump No. 2 Starts
Pump No. 1 Starts

Adjusted Reservoir Outflow in MGD

0 10 20 30 40 50 60 70 80

PPPS Pumps / Brad Res. Operation under Average Conditions

Month of Year	Average Daily Outflow in Calendar Year			No. of PPPS Pumps Operating in:						No of Pool Drawdowns During Month in:		
	1990	2000	2010	1990		2000		2010		1990	2000	2010
				on	off	on	off	on	off			
Jan. 31	7.1	7.1	7.1	One pump on for 8 hours then no pumping for 20 hours						26.6 D.O. of 1.0 ft.		
Feb. 28	7.1	7.1	7.1							24.0 "		
Mar. 31	7.1	7.4	8.2	8	20	8	19	8½	18	26.6 - 1.0'	27.6 - 1.0'	28.1 - 1.0'
Apr. 30	8.1	10.1	12.1	8½	18	9½	14½	11	12	27.2 - 1.0'	30 - 1.0'	31.3 - 1.0'
May 31	13.7	19.0	24.0	12½	10½	24½	7½	Almost Continuous		32.3 - 1.0' (One drawdown of 2.6 ft.)	23.2 - 1.0'	1 - 1.0'
June 30	53.5	64.8	69.5	2 Cont. 1 - 5/33		2 Cont. 1 - 11/1		2 Cont. 1 - 2½		18.9 - 0.7'	40 - 0.7'	23.2 - 0.7'
July 31	56.0	62.9	67.9	2 Cont. 1 - 5/15		2 Cont. 1 - 10/17½		2 Cont. 1 - 19/5		37.2 - 0.7'	42.5 - 0.7'	31.0 - 0.7
Aug. 31	55.3	62.2	67.0	2 Cont. 1 - 5/10		2 Cont. 1 - 7/8		2 Cont. 1 - 17/6		35.4 - 0.7'	43.8 - 0.7'	32.3 - 0.7'
Sep. 30	39.3	39.3	39.3	1 Cont. 1 - 11/9		1 Cont. 1 - 11/9		1 Cont. 1 - 11/9		36 - 0.9'	36 - 0.9'	36 - 0.9'
Oct. 31	37.1	37.9	41.3	1 Cont. 1 - 9½/9		1 Cont. 1 - 10/9		1 Cont. 1 - 14/1		40.2 - 0.9	39.2 - 0.9'	35.4 - 0.9
				on	off	on	off	on	off			
Nov. 30	7.1	8.1	11.8	8	20	8½	18	10½	12½	25.7 - 1.0'	27.2 - 1.0'	31.3 - 1.0
Dec. 31	8.1	7.7	10.3	8	20	8	18½	9½	13½	26.6 - 1.0	28.1 - 1.0	32.3 - 1.0

NOTES: "on" is no. of hours one pump operates and "off" is no. of hours no pump operates

"2 Cont." means that two pumps operate continuously.

"1 - 11/7" means one pump is on for 11 hours and then off for 7 hours

26.6 - 1.0' means that 26.6 hours during the month the Reservoir is drawn down 1.0 foot

COMPUTED BY _____ DATE _____

CHECKED BY _____

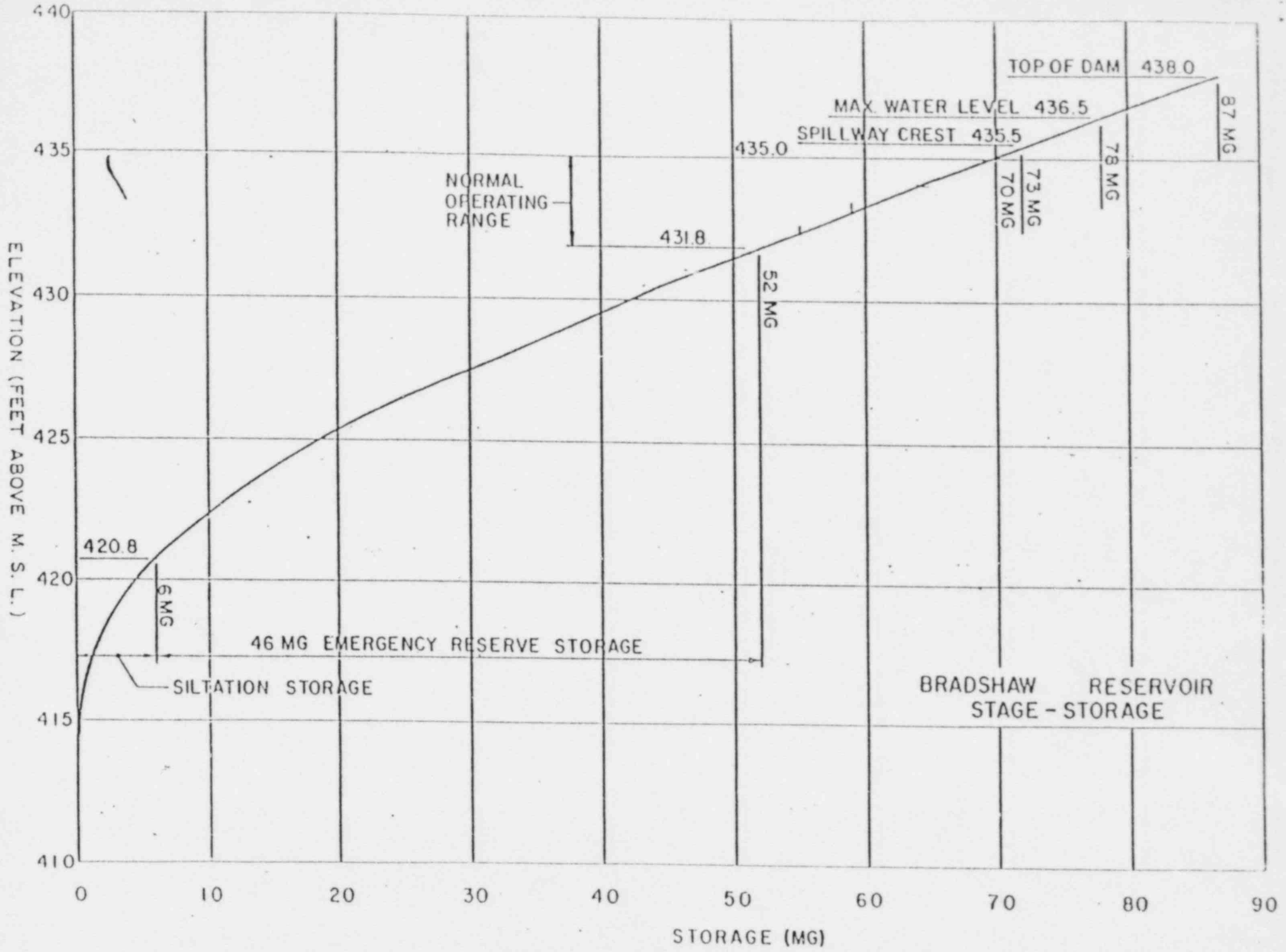
TOP OF DAM 438.0
MAX WATER LEVEL 436.5
SPILLWAY CREST 435.5
435.0
NORMAL OPERATING RANGE
431.8
420.8
87 MG
78 MG
73 MG
70 MG
52 MG
6 MG
46 MG EMERGENCY RESERVE STORAGE
SILTATION STORAGE
BRADSHAW RESERVOIR
STAGE - STORAGE
ELEVATION (FEET ABOVE M.S.L.)
STORAGE (MG)
440
435
430
425
420
415
410
0
10
20
30
40
50
60
70
80
90

EXHIBIT 2

VERIFICATION

Commonwealth of Pennsylvania)
) ss
County of Philadelphia)

Vincent S. Boyer, being first duly sworn, states that he is Senior Vice President of Philadelphia Electric Company, the Applicant herein; that he has read the contents of "Applicant's Supplemental Responses to 'Interrogatories of Del-AWARE Unlimited, Inc. Addressed to Applicant Philadelphia Electric Company'" and that the statements and matters set forth therein are true and correct to the best of his knowledge, information and belief.

Vincent S. Boyer

Subscribed and sworn to before me this 1st day of September, 1982.

Patricia A. Scholl

Notary Public

PATRICIA O. SCHOLL
Notary Public, Philadelphia, Philadelphia Co.
My Commission Expires February 10, 1986