NRC FORM 195 (2-76)

U.S. NUCLEAR REGULATORY COMMISSION

DOCKET NUMBER 50-269/270/287

FILE NUMBER

NRC DISTRIBUTION FOR PART 50 DOCKET MATERIAL

TO:	FROM:	DATE OF DOCUMENT
Me. Edson G. Case	Duke Power Company Charlotte, North Carolina William O. Parker, Jr.	6/27/77
		DATE RECEIVED 6/29/77

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DESCRIPTION

RE their 4-21-77 ltr

(1-P)

PLANT NAME: Oconee Units 1-2-3

Rec'd For dist 7/7/77

RJL 7/12/77

ENCLOSURE

Response to request for additional information concerning Turbine Building flooding w/attached drawings.....

ACKNOWLEDGED

DO NOT REMOVE

(9-P)

NOTE: ONE CY Drawings Rec'd. It is being maintained as the Reg File cy & is being charged out to Clemson.

FOR ACTION/INFORMATION

	SAFETY			ENVIRONMENTAL
	ASSIGNED AD:			ASSIGNED AD: V. MOORE (LTR)
✓	BRANCH CHIEF:	Schwencer (5)		BRANCH CHIEF:
✓	PROJECT MANAGER:	Neighbors		PROJECT MANAGER:
✓	LICENSING ASSISTANT:	Sheppard		LICENSING ASSISTANT:
				B. HARLESS

INTERNAL DISTRIBUTION

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✓	NRC PDR	HEINEMAN		TEDESCO	DENTON & MULLER
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✓	OELD			LAINAS	
	GOSSICK & STAFF	ENGINEERING		IPPOLITO	ENVIRO TECH.
✓	HANAUER	KNIGHT		F. ROSA	ERNST
	MIPC	BOSNAK			BALLARD
	CASE	SIHWELL		OPERATING REACTORS	YOUNGBLOOD
	BOYD	PAWLICKI		STELLO	
			✓	EISENHUT	
	PROJECT MANAGEMENT	REACTOR SAFETY	✓	SHAO	SITE TECH.
	SKOVHOLT	ROSS	✓	BAER	GAMMILL (2)
	P. COLLINS	NOVAK	✓	BUTLER	
	HOUSTON	ROSZTOCZY	✓	GRIMES	SITE ANALYSIS
	MELTZ	CHECK			VOLLMER
	HELTEMES				BUNCH
	SK	AT&I			✓ J. COLLINS
		SALTZMAN			KREGER
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EXTERNAL DISTRIBUTION

				CONTROL NUMBER
✓	LPDR: Walhalla, SC			Misc
✓	TIC	✓	NSIC	771930269
	NAT LAB			
	REG IV (J. HANCHETT)			
✓	16 CYS ACRS SENT CATEGORY B			

DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

June 27, 1977

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

Mr. Edson G. Case, Acting Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. A. Schwencer, Chief
Operating Reactor Branch #1

Reference: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

My letter of April 21, 1977 submitted a report which evaluated the potential for flooding in the Oconee Nuclear Station Turbine Building. The attached additional information is provided per the request of members of your staff.

Very truly yours,

W. O. Parker, Jr.

William O. Parker, Jr. By HBS

MST:ge

Attachment

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
CONCERNING TURBINE BUILDING FLOODING

Question

1. Provide a copy of the November 9, 1976 turbine building flooding presentation which was made to the NRC staff. In addition, should it not be included in the presentation; provide the following additional information on all equipment threatened by flood waters which is used to attain and maintain a safe controlled shutdown.

   (a) Identify the components (including signal, control and power leads) being threatened and the system with which they are associated.

RESPONSE

The November 9, 1976 presentation was not prepared in a report form and therefore cannot be provided. The discussion centered around a description of Duke's Reportable Occurrence Report RO-287/76-18 submitted by letter dated October 25, 1976 and information pertaining to the design of the Oconee Condenser Circulating Water (CCW) System as described in the Oconee FSAR Section 9.6.

The Oconee FSAR Supplement 13 submitted January 29, 1973 provides an analysis of the effects upon safety-related equipment in the Turbine Building should failure occur in any non-Category I (seismic) equipment, particularly in the circulating water system and the Fire Protection System.

The following systems and their associated equipment located in the Turbine Building, which could be required to attain and maintain a safe shutdown, could be threatened by Turbine Building flood waters, if unprotected.

System	Equipment	Quantity	Quantity Protected	Comments
Feedwater	Emergency Feedwater Pumps (EFWP's)	3	3	Waterproof walls will be constructed to protect pumps
Service Water	Low Pressure Service Water Pumps (LPSWP's)	5	3	Waterproof walls will be constructed to protect pumps
Condenser Circulating Water	Emergency Feedwater Pump Turbine Oil Cooler Pumps	3	0	A line will be added from Low Pressure Service Water Pump to the Turbine Oil Coolers

Three of the five LPSWP's will be protected. The discharge lines are cross connected and only two pumps are required to supply all three units. This equipment is electrically driven. Power and control cables associated with these pumps will be located within the enclosure walls or above the maximum flood water elevation and therefore will be protected. Switchgear operating the pumps are currently located above the maximum flood water elevation.

The EFWP's are steam driven. The only electrical controls required for operation are associated with the steam admission valve. This is a pilot solenoid-operated pneumatic valve which fails open on loss of power. The valve itself, cabling and controls associated with it will be located within the pump enclosures or above the maximum flood water elevation and therefore will be protected.

Question 1(b)

With the aid of appropriate plan and elevation views locate the components.

RESPONSE

The equipment locations, both in plan and elevation views, are indicated on the attached Figure 2.

Question 1(c)

Relate the location of the above components with respect to the maximum level of the flood water if no modifications are made to the turbine building.

RESPONSE

The Oconee FSAR Supplement 13 dated January 29, 1973, outlines the current Turbine Building flood handling capability.

Question 1(d)

With the aid of drawings illustrate and describe the protective measures taken to lower the maximum flood water level or otherwise protect the equipment.

RESPONSE

Figure 1 illustrates the combination of protective measures which will be taken to minimize the Turbine Building flood water level and protect critical equipment. The attachment to Mr. W. O. Parker, Jr.'s letter of April 21, 1977, describes the operation of the Turbine Building drain during the design basis flood.

Question 1(e)

(Taking hydraulic jump into account) indicate the maximum level of the flood water in the vicinity of the above components after the modifications.

RESPONSE

The maximum water level in the vicinity of the drain is caused by the weir control as the flow is discharged through the opening in the south Turbine Building wall and passes over the straight drop spillway. The water surface elevation just upstream of the spillway is 780.4 feet or 5.4 feet above the basement floor. The most severe backwater profile in the Turbine Building results in a maximum water surface elevation of 781.1 feet or 6.1 feet above the basement floor. No hydraulic jump can occur in the Turbine Building due to the low velocities present. A hydraulic jump does occur downstream of the straight drop spillway in the spillway section and upstream of the flow transition section. The spillway section was sized to accommodate this jump without reducing the effectiveness of the spillway or hydraulically degrading the flow pattern at the entrance to the pipe.

Question 1(f)

Describe inspections, monitoring or surveillance activities that will be conducted to verify the continued acceptability of the protective measures over the life of the facility.

RESPONSE

The surveillance program for the EFWP's and the LPSWP's will remain unchanged since their safety function has not been altered. The redundant sump pumps provided for each waterproof equipment enclosure will be tested annually.

Civil works inspections are conducted every two years at Oconee. This will include an inspection of the civil and structural features associated with installation of the Turbine Building drain.

Question 1(g)

Identify and locate on drawings all flood water pathways that formerly existed between the turbine building and the areas housing essential equipment.

RESPONSE

Figure 2 locates and identifies the major Turbine/Auxiliary Building wall openings which consist of six access doorways at the basement level. Minor pipe sleeve penetrations also exist below the maximum flood water elevation.

Question 1(h)

Describe and discuss the extent of the protective measures taken to prevent flood waters from degrading equipment located in areas other than the Turbine Building.

RESPONSE

The Turbine/Auxiliary Building wall will be waterproofed below Elevation 783.5 feet. Flood waters will therefore be contained in the Turbine Building and thus prevented from degrading equipment located in areas other than the Turbine Building.

Five of the six access openings between the Turbine Building and Auxiliary Building will be permanently plugged and waterproofed. The remaining access opening will be provided with a watertight door. The pipe sleeve penetrations below Elevation 783.5 feet will be sealed and waterproofed.

Question 2

Section 3 indicates that the actual flooding rate that was experienced is considerably less than the assumed 1000 cubic feet per second (448,850 gpm). Drawing Number PO-133B shows that there are four condenser cooling water pumps, each designed for 177,000 gpm at 15.7 psi. Explain why the assumed flood rate should not be equal to the output of all four condenser cooling water pumps.

RESPONSE

The CCW System was mathematically modeled as a hydraulic network including the four CCW pumps which were modeled to pump in accordance with their head-discharge curves. The selection of an upper bound flood rate of 1000 cfs was the result of numerous computer simulations of this network, each assuming breaches of varying size and location in the CCW System. All credible flooding events related to water hammer overpressure, failure of expansion joints, failure of a condenser waterbox, or inadvertent opening of waterbox and pipe manways were investigated.

The CCW System is a pipe network with multiple intake and discharge points. The presence of additional discharge points within this network due to assumed breaches would not necessitate that the total network flow be discharged through these points. There is no credible event that would result in a flood rate equal to the combined flow of all four CCW pumps.

Question 3

With the aid of a diagram make layout of the Condenser Cooling Water Systems (CCW) for Units 1 and 2, show the take off points on the crossover line between Units 1 and 2 for the High Pressure Service Water and Low Pressure Service Water Systems. In addition, since these systems are essential service water systems provide a discussion which demonstrates that the functioning of these systems are immune to any single failure in the Condenser Cooling Water System, crossover line, or the condenser box non-seismic butterfly valves (termination point of the seismic Category 1 portion of the CCW system).

RESPONSE

Figure 3 shows the CCW System for Units 1, 2, and 3, the cross-over line and the branch connections for the LPSWP's. No credit is taken in this analysis for the High Pressure Service Water Pumps and thus the connections for these pumps are not shown.

Various conservative net positive suction head calculations have been performed which indicate that any single failure to the CCW System piping, the condenser waterbox, crossover line, or the condenser waterbox non-seismic butterfly valves will not jeopardize the proper operation of the LPSWP's. The calculations were performed for both the minimum and maximum operating lake levels assuming breaks at elevation 775 in either the CCW pipe or the crossover line. The calculations proved that there was no deficiency in NPSH due to the effect of excess water flowing through the crossover line to the break location.

Each of the three crossover valves will be backfitted with reach rods. Thus, if a break occurs in the Unit 1 CCW pipe, the valves at the Unit 1 intake structure along with the Unit 1 crossover valve will be closed to isolate the leak. Unit 2 and 3 CCW Systems will continue to supply water to the LPSWP's. A break in any one of the units CCW System would be similarly isolated. The available NPSH will increase following this operation due to the lower flow through the crossover line.

Question 4

Considering the length of the Condenser Cooling Water lines, describe and discuss the control system and timing features of the pumps and valves which precludes the occurrence of surge and water hammer events that could threaten the rubber expansion joints or other vulnerable areas of the condenser cooling water barrier. What is the design pressure rating of the condenser box rubber expansion joints?

RESPONSE

The CCW pump discharge butterfly valves have a closure timing of 60 seconds. Surge lines are present on each CCW System approximately 90 feet upsgream of the main condensers as shown on Figure 2. Round-trip travel time for a propagating water hammer wave from the condenser area to the surge line is approximately .07 seconds and therefore the lines are fully engaged in dampening water hammer and surge events which could be created at or pass through the exposed portions of the CCW System in the Turbine Building.

The main condenser inboard expansion joints are designed for a maximum working pressure of 50 psig. The outboard expansion joints are designed for a maximum working pressure of 45 psig.

Question 5

Drawing 12-10-90772 shows that some of the Condenser Circulating Water System butterfly valves are operated by air cylinders. Describe the peak pressures that would be experienced during the full flow if one were to slam shut due to a failure of an air hose, bell crank key or shaft.

RESPONSE

A complete response will follow at a later date. The Turbine Building drain has been designed to mitigate the consequences of all credible flooding events regardless of cause.

Question 6

In regard to drawing number PO-133B, provide clarification why the intake portion of the Condenser Cooling Water Systems is considered seismic Category I when it terminates at the condenser boxes with non-seismic Category I valves.

RESPONSE

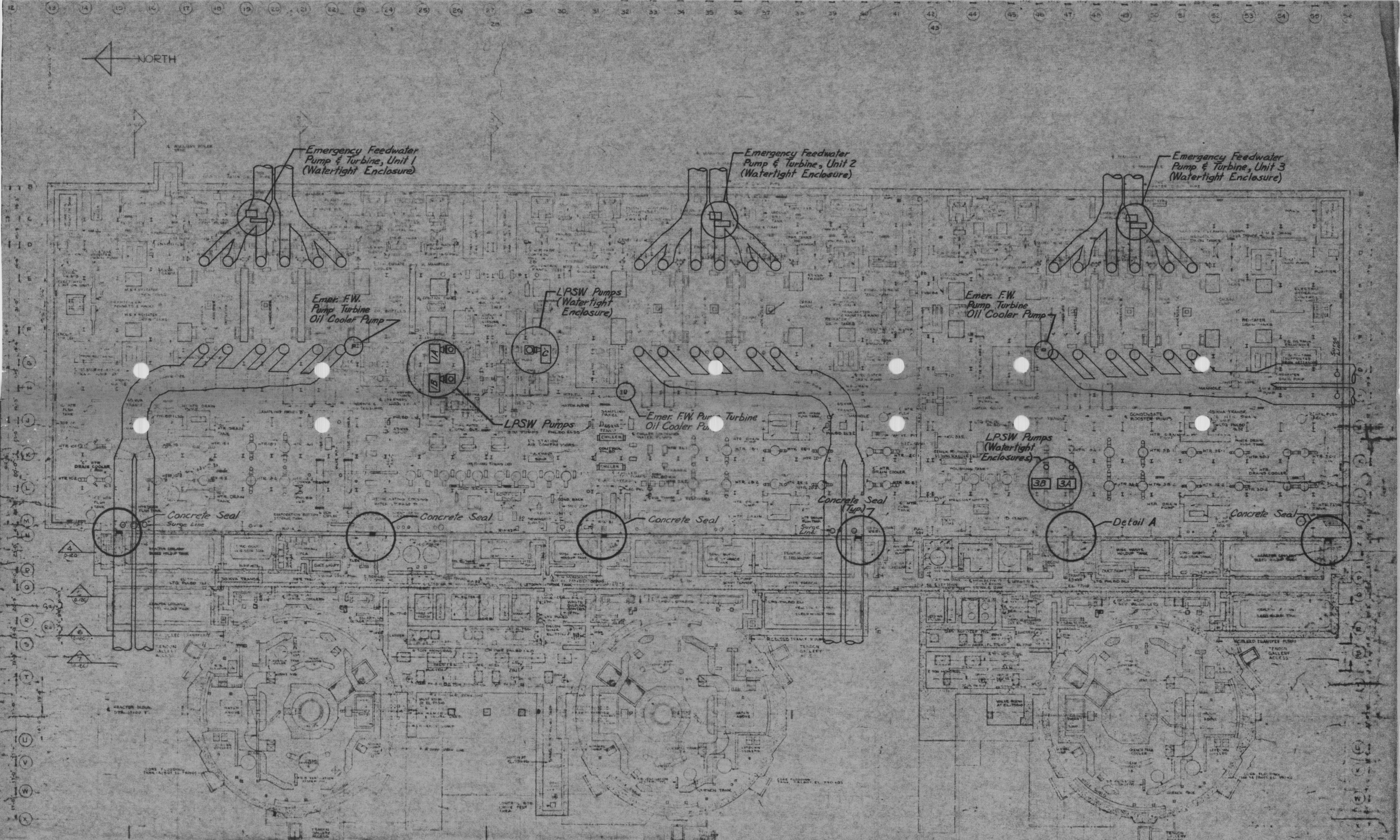
The intake portion of the CCW System is designed for seismic conditions to assure a source of water to the LPSWP's. The design is discussed in the Oconee FSAR, Appendix 1C, Section 1C.3.4.1. As stated in the response to question 3, the LPSWP's will continue to operate satisfactorily for any break in the CCW System. In addition, the loss of any condenser inlet valve will produce a leak rate considerably less than the 1000 cfs for which the proposed drain was designed.

Question 7

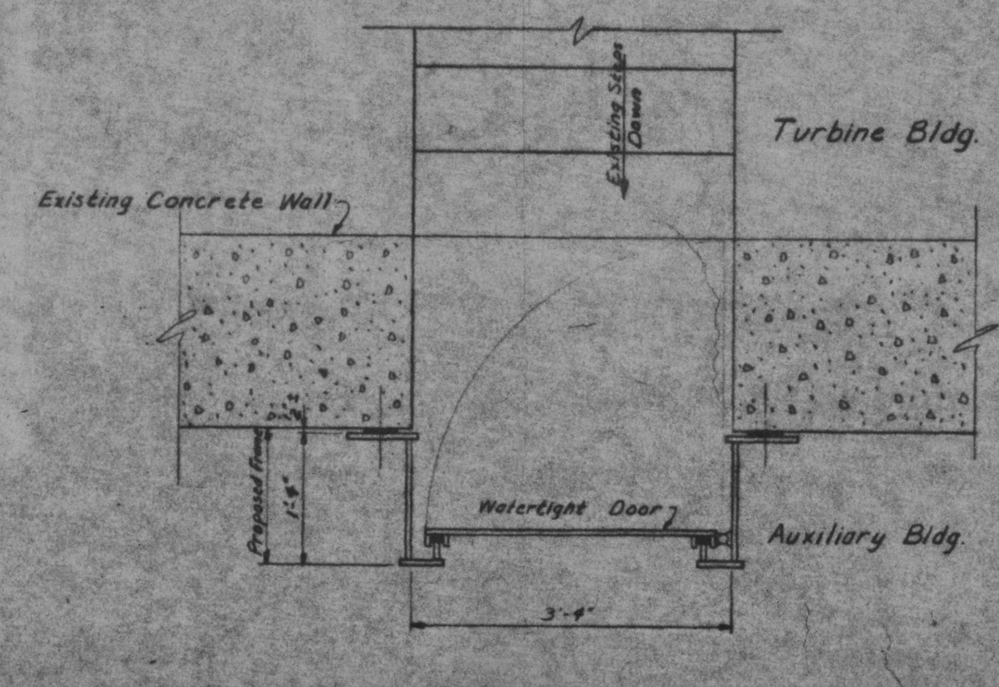
The description of the proposed modifications presented in your April 21, 1977 letter is conceptual. Indicate your schedule for the submittal to NRC of the final detailed design modifications which are needed for our evaluation of the proposed modifications.

RESPONSE

The April 21, 1977 submittal of the description of the proposed modifications was conceptual in nature. However, due to the relative simplicity of this design, no further submittals beyond this response for additional information is considered necessary for NRC review.



Equipment	Unit No.	Top of Base El.	℄ Equip. El.	Bottom Motor Casing El.
LPSW Pump	1	777+1	781+1½	779+8½
	2	776+4	780+4½	778+11½
	3	"	"	"
Emer. Feed Water Pump	1	775+4	777+6	775+7 9/16
	2	"	"	"
	3	"	"	"
Emer. FW Pump Turbine Oil Cooler Pump	1	775+6¾	776+0	Not Applicable
	2	"	"	"
	3	"	"	"

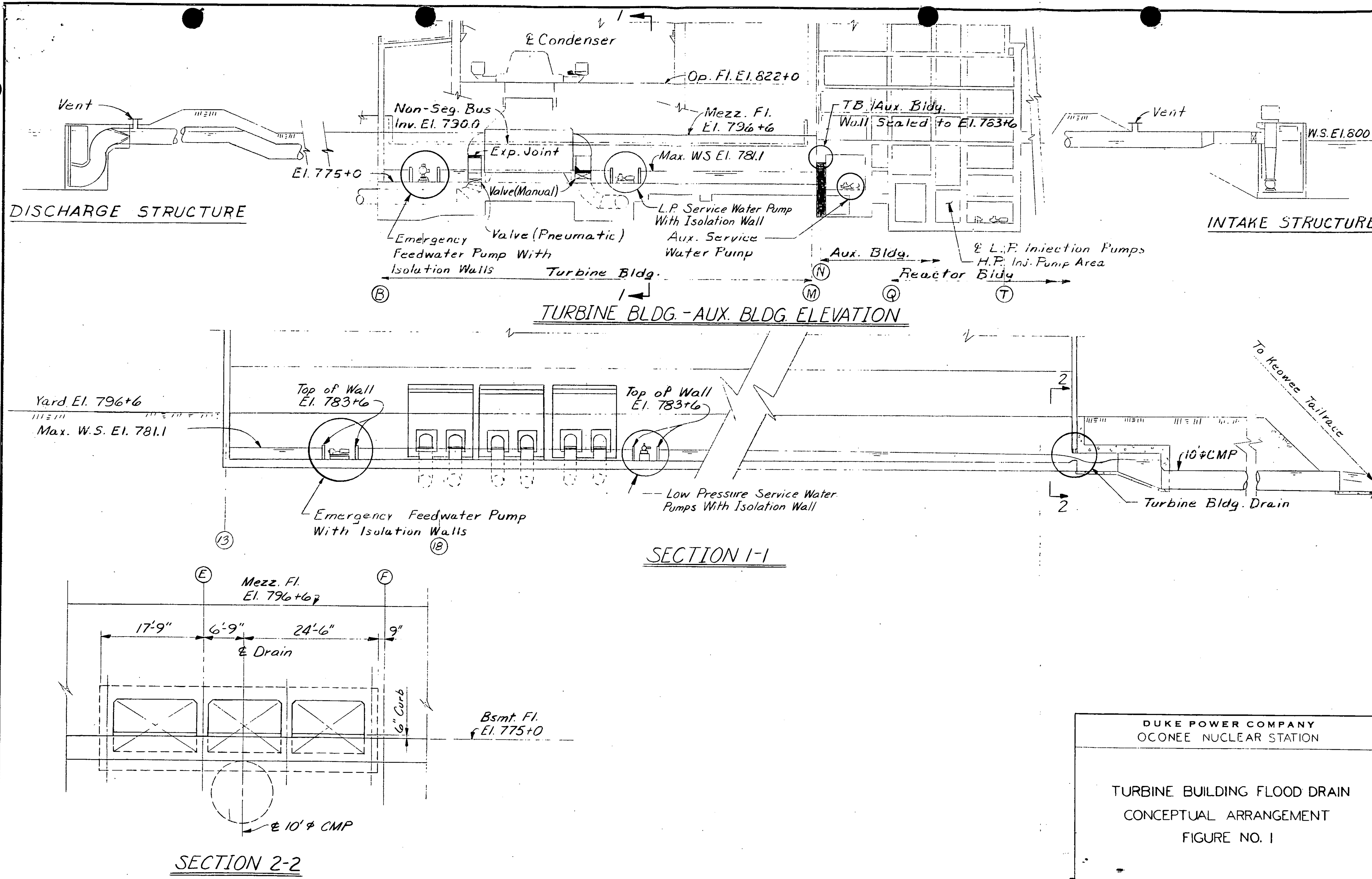


DETAIL A

DUKE POWER COMPANY
OCONEE NUCLEAR STATION-UNITS 1,2 & 3

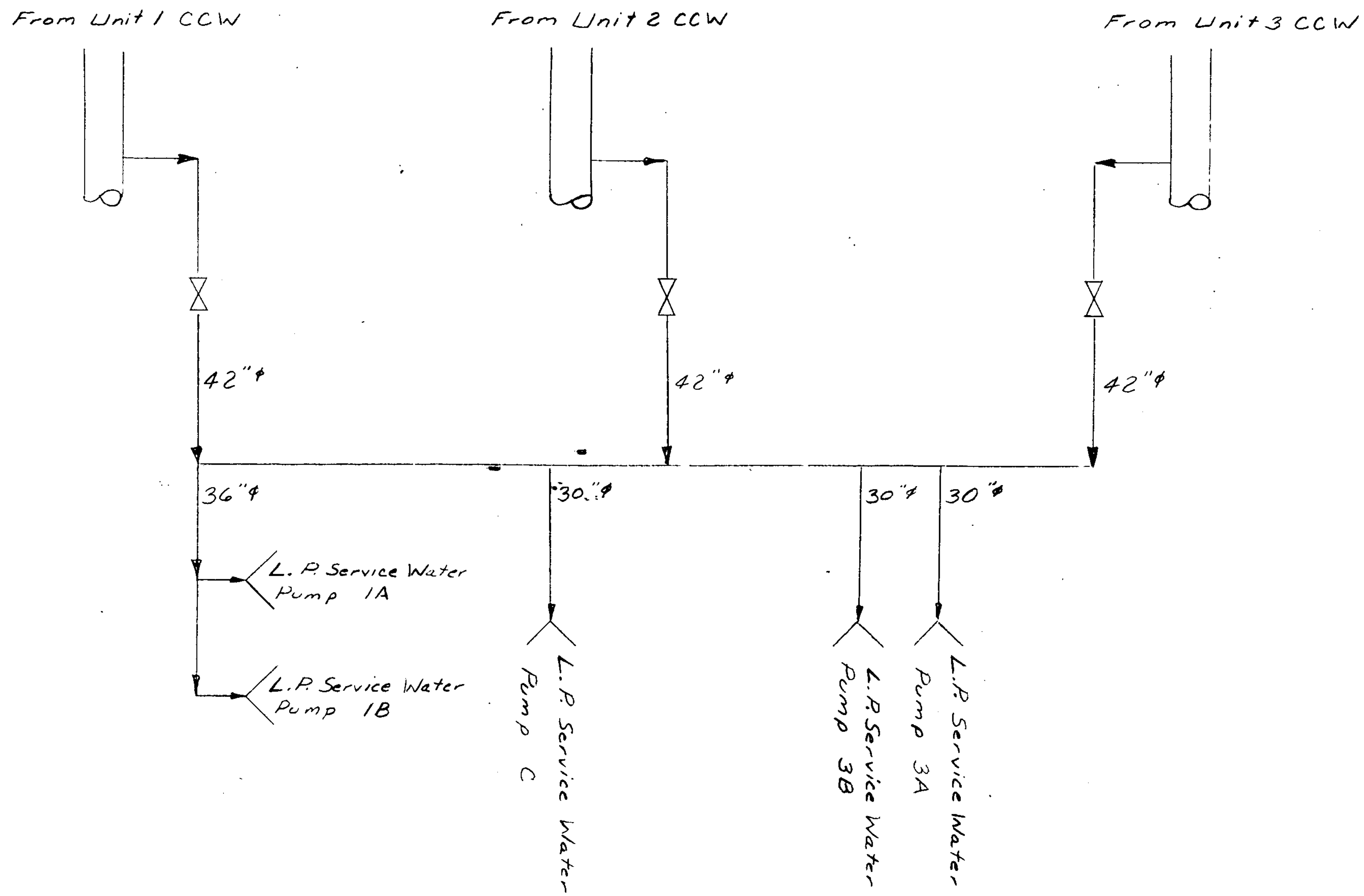
TURBINE BUILDING FLOOD DRAIN
GENERAL ARRANGEMENT
EQUIPMENT AND ACCESS LOCATIONS
FIGURE NO. 2

SCALE 1" = 20' | DWG NO OS-02 | REV



DUKE POWER COMPANY
OCONEE NUCLEAR STATION

TURBINE BUILDING FLOOD DRAIN
CONCEPTUAL ARRANGEMENT
FIGURE NO. 1



DUKE POWER COMPANY
OCONEE NUCLEAR STATION–UNITS 1,2 & 3

TURBINE BUILDING FLOOD DRAIN
CCW CROSSOVER
LPSW CONNECTIONS
FIGURE NO. 3