NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs Unit 1	0 5 0 0 0 3 1 7	1 OF 0 3

TITLE (4)
Loss of Circulating Water Caused by Fish Impingement

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0 8	2 8	8 4	8 4	-	0 0 9	-	0 0	0 9	2 7	8 4	N/A	0 5 0 0 0
												0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 1 9	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
M. T. Finley, Operational Safety Analyst	AREA CODE 3 0 1 2 6 0 - 4 8 7 4

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

At 2156 on August 28, 1984, Unit 1 was manually tripped while operating in MODE 1 at 99% power. This trip was caused by an imminent loss of circulating water due to the clogging of four of twelve Unit 1 traveling water screens with fish.

A lack of oxygen in the Chesapeake Bay, the ultimate heat sink, caused by seasonal factors and exacerbated by wind conditions, resulted in fish impingement that clogged Traveling Water Screen Nos. 11A, 11B, 12A, and 12B. Circulating Water Pump Nos. 11 and 12 were stopped, in accordance with established procedure, to prevent damage to their associated traveling water screens. The unit was manually tripped, by procedure, when it was known that the second circulating water pump would be stopped.

An evaluation of methods for minimizing the clogging of traveling water screens under these conditions is actively being pursued.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Calvert Cliffs Unit 1	0 5 0 0 0 3 1 7	8 4	— 0 0 9	— 0 0	0 2 OF 0 3

TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

At 2140 on August 28, 1984, during normal **MODE** 1 operation at 100% power, an alarm indicated to the Control Room Operator that the differential pressure across Traveling Water Screen (KE-SCN) Nos. 11A and 11B was high. The operator noted that screen differential pressure was 10" (water) and increasing and that the rotation of Traveling Water Screen Nos. 11A and 11B had been automatically started. The operator also noted that screen differential pressure was normal for the other five sets of screens for Unit 1 and that Traveling Water Screen Nos. 12A and 12B were rotating, apparently on their normal 10 minute per hour cycle.

At 2145 a technician at the intake noticed large numbers of fish, some of them dead, in the intake and notified the Control Room of this fact. At this time differential pressure across Traveling Water Screen Nos. 11A and 11B was 20" and still rising. By 2148 screen differential pressure had increased to 40" and Circulating Water Pump (KE-P) No. 11 was stopped in accordance with Operating Instruction (OI) 38A in order to prevent damage to the associated screens due to excessive differential pressure. A power reduction for the unit was commenced at this time.

At 2153 the differential pressure across Traveling Water Screen Nos. 12A and 12B began to rapidly increase. At 2156, with differential pressure across Traveling Water Screen Nos. 12A and 12B at about 40", the shear pin for No. 12A Traveling Water Screen sheared. The Shift Supervisor recognized the imminent loss of circulating water to Main Condenser Shell (SG-COND) No. 11 and, with reactor power at 99%, ordered Unit 1 tripped in accordance with OI 14 and Circulating Water Pump No. 12 stopped.

The actions in Emergency Operating Procedure (EOP) No. 1 were properly carried out following the trip. All safety systems functioned as expected. No personnel errors occurred during the event. All traveling water screens were checked and cleaned as necessary and the shear pin for Traveling Water Screen No. 12A was replaced prior to restart of the unit. Unit 2 traveling water screens were not affected.

The root cause of this event was fish impingement of the traveling water screens. A very large number of fish that were unable to avoid the traveling water screens impinged upon the screens and exceeded the fish removal capability of the screens. As a result, the differential pressure across two sets of traveling water screens rose rapidly, forcing operator action to protect the screens and turbine. The shear pin for the traveling water screen is designed to shear in order to protect the major components of the screen and had done so for Traveling Water Screen No. 12A during this fish overload condition.

The massive influx of fish into the traveling water screens was an abnormal occurrence. During the summer months the waters in the mid-portion of the Chesapeake Bay become almost completely devoid of oxygen below the first several meters. Fish in these waters can only function normally by making contact with the oxygenated surface layer. If westerly or southwesterly winds prevail for more than 24 hours at moderate speeds, the oxygenated surface water is physically blown away from the western shore, where the plant intake is located, and the anoxic bottom water upwells to the surface. When this happens, fish along the western shore of the bay become weak and disoriented in the oxygen starved environment. In this state the fish tend to congregate in large schools. If a school should enter the plant intake structure, the possibility exists that large numbers

of fish might impinge the traveling water screens in a short period of time.

There have been three similar events at Calvert Cliffs Nuclear Power Plant. All three previous events occurred at Unit 1 at similar times of the year, i.e., August or September, and were preceded by westerly or southwesterly winds.

Since this event occurred during **MODE** 1 operation at 100% power, the heat load on both the Circulating Water (KE) and Salt Water (BI) Systems, whose suctions are protected by the traveling water screens, was at a maximum for non-accident conditions. Therefore, the safety consequences of this event would not have been more severe under reasonable and credible alternative circumstances.

During the first fish impingement event of August 1975, it was noted that if the circulating water pumps were allowed to operate continuously with their associated traveling water screens clogged with fish, in spite of the high differential pressure indication in the Control Room, it is possible to lower the pressure head at the suction of a salt water pump (BI-P) enough to degrade pump operation. Since that event, procedural changes have been implemented that require stopping a circulating water pump when the differential pressure across its associated traveling water screens exceeds 40". Operating experience during the three fish impingement events that have occurred since the 1975 event has substantiated the fact that timely stoppage of the circulating water pumps prevents any degrading effect on the salt water system.

Attachment 1 is provided as a description of the Unit 1 intake structure. Each salt water pump takes suction on either of two adjacent circulating water pump wells. There are three salt water pumps, six circulating water pumps, and twelve traveling water screens for each unit.

Only one salt water pump is necessary to meet the system design function of providing cooling water for the service water (BI) and component cooling water (CC) heat exchangers and the Emergency Core Cooling System pump room cooler (VF) during a loss of coolant incident (LOCI). A massive fish impingement, more severe than ever observed, of all the traveling water screens and the failure of operators to stop the circulating water pumps in accordance with procedure would be necessary for degradation of the salt water system's ability to mitigate the consequences of a LOCI. Therefore, the overall safety significance of this event is considered minimal.

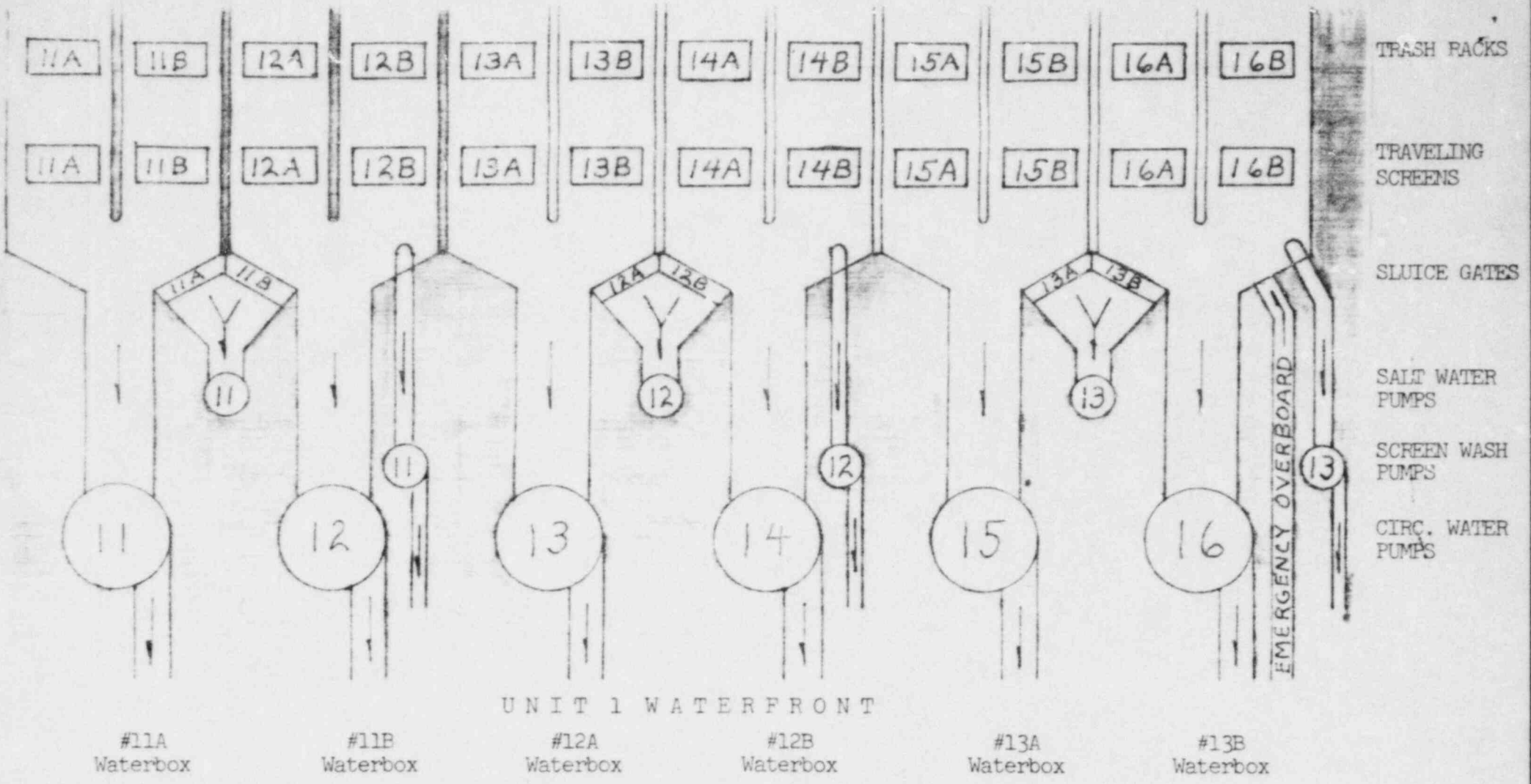
Several long term corrective actions are currently being evaluated to prevent recurrence of this event:

1. Blocking and/or filtering the mercury vapor lights above the intake structure to minimize fish attraction.

2. Installing a sound system to act as a "behavioral barrier" to fish.

3. Upgrading the traveling water screens to a dual-flow or center-flow type that would be activated continuously to improve the capability for fish removal.

The contact for further discussion of this event is M. T. Finley, (301) 260-4374.



ATTACHMENT 1

BALTIMORE GAS AND ELECTRIC COMPANY

P.O. BOX 1475

BALTIMORE, MARYLAND 21203

NUCLEAR POWER DEPARTMENT
CALVERT CLIFFS NUCLEAR POWER PLANT
LUSBY, MARYLAND 20657

September 27, 1984

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Docket No. 50-317
License No. DPR 53

Dear Sirs:

The attached LER 84-09 is being sent to you as required by 10 CFR 50.73.

Should you have any questions regarding this report, we would be pleased to discuss them with you.

Very truly yours,

L. B. Russell
Plant Superintendent

LBR:MTF:mdh

cc: Dr. Thomas E. Murley
Director, Office of Management Information
and Program Control
Messrs: A. E. Lundvall, Jr.
J. A. Tiernan

Add: NRR/DHFS/LQB 1 1 LTR ENCL
Ryan 2/DRSS/EPRPB 1 1

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