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 FACIL: 50-323 Diablo Canyon Nuclear Power Plant, Unit 2, Pacific Ga      05000323  
 AUTH. NAME      AUTHOR AFFILIATION  
 SISK, D.P.      Pacific Gas & Electric Co.  
 RUEGER, G.M.      Pacific Gas & Electric Co.  
 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 93-001-01: on 930130, turbine & reactor trip occurred during testing. Possible causes include personnel error & contaminated turbine lube oil. Night order log entry issued & procedure revised. W/930623 ltr.

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Pacific Gas and Electric Company

77 Beale Street, Room 1451  
P.O. Box 770000  
San Francisco, CA 94177  
415/973-4684  
Fax 415/973-2313

Gregory M. Rueger  
Senior Vice President and  
General Manager  
Nuclear Power Generation

June 23, 1993

PG&E Letter No. DCL-93-158

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

Re: Docket No. 50-323, OL-DPR-82  
Diablo Canyon Unit 2  
Licensee Event Report 2-93-001-01  
Turbine Trip and Reactor Trip During Surveillance Testing Due to  
Unknown Cause

Gentlemen:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed revision to a Licensee Event Report regarding an automatic reactor trip due to a main turbine trip. This revision is being submitted to report the results of the root cause investigation of this event and completion of recommended procedural changes.

This event has in no way affected the health and safety of the public.

Sincerely,



Gregory M. Rueger

cc: Bobby H. Faulkenberry  
Ann P. Hodgdon  
Mary H. Miller  
Sheri R. Peterson  
CPUC  
Diablo Distribution  
INPO

DC2-93-OP-N008

Enclosure

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# LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) <b>DIABLO CANYON UNIT 2</b>	DOCKET NUMBER (2) <b>0 5 0 0 0 3 2 3</b>	PAGE (3) <b>1</b> OF <b>6</b>
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TITLE (4) **TURBINE TRIP AND REACTOR TRIP DURING SURVEILLANCE TESTING DUE TO UNKNOWN CAUSE**

EVENT DATE (5)			LER NUMBER (8)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)						
MON	DAY	YR	YR	SEQUENTIAL NUMBER		REVISION NUMBER	MON	DAY	YR	FACILITY NAMES		DOCKET NUMBER (6)				
01	30	93	93	-	0   0   1	- 0   1	06	23	93			0	5	0	0	0
OPERATING MODE (9)		1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)												

POWER LEVEL (10)	1   0   0	<input checked="" type="checkbox"/> 10 CFR <u>50.73(a)(2)(iv)</u> <input type="checkbox"/> OTHER - _____ (Specify in Abstract below and in text, NRC Form 366A)
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LICENSEE CONTACT FOR THIS LER (12)		TELEPHONE NUMBER	
DAVID P. SISK, SENIOR REGULATORY COMPLIANCE ENGINEER		AREA CODE <b>805</b>	<b>545-4420</b>

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	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input type="checkbox"/> YES (if yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO				

ABSTRACT (16)

On January 30, 1993, at 2147 PST, with Unit 2 at 100 percent power, a turbine trip and reactor trip occurred during a routine surveillance test. Plant operators stabilized the plant in Mode 3 (Hot Standby) in accordance with emergency operating procedures. A four-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(ii) on January 31, 1993, at 0009 PST.

The immediate cause of the main turbine trip was an inadvertent simulated low condenser vacuum signal that satisfied turbine protection logic.

Investigations have eliminated all but two possible root causes: personnel error or contaminated turbine lube oil. An operator holding a test lever may have inadvertently permitted the lever to move from the full-travel position, unblocking a turbine trip signal. Contaminates in the turbine lube oil may have blocked flow in an orifice, thus enabling the turbine trip. There is no firm evidence to verify or refute either possible cause.

Corrective actions include issuance of a Night Order Log entry for Operations personnel review, an Operations Department Incident Summary describing the event, implementation of a design change to improve performance of the surveillance test initiating in this event, and procedure revisions to clarify maintenance and testing requirements. These corrective actions resolve both possible root causes.



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TEXT (17)

I. Plant Conditions

Unit 2 was in Mode 1 (Power Operation) at 100 percent power.

II. Description of Event

A. Summary:

On January 30, 1993, at 2147 PST, Unit 2 experienced a turbine (TA)(TRB) trip followed by a reactor (AB)(RCT) trip from 100 percent power during the performance of a routine Surveillance Test Procedure (STP) M-21A, "Main Turbine/Generator Functional Tests."

B. Background:

STP M-21A tests the main turbine/generator (TRB/GEN) lube oil system pumps (TD)(P) and main turbine trip (JJ) features associated with the turbine autostop oil system (JJ) (low vacuum trip, low bearing lube oil pressure trip, overspeed trip, and thrust bearing wear trip).

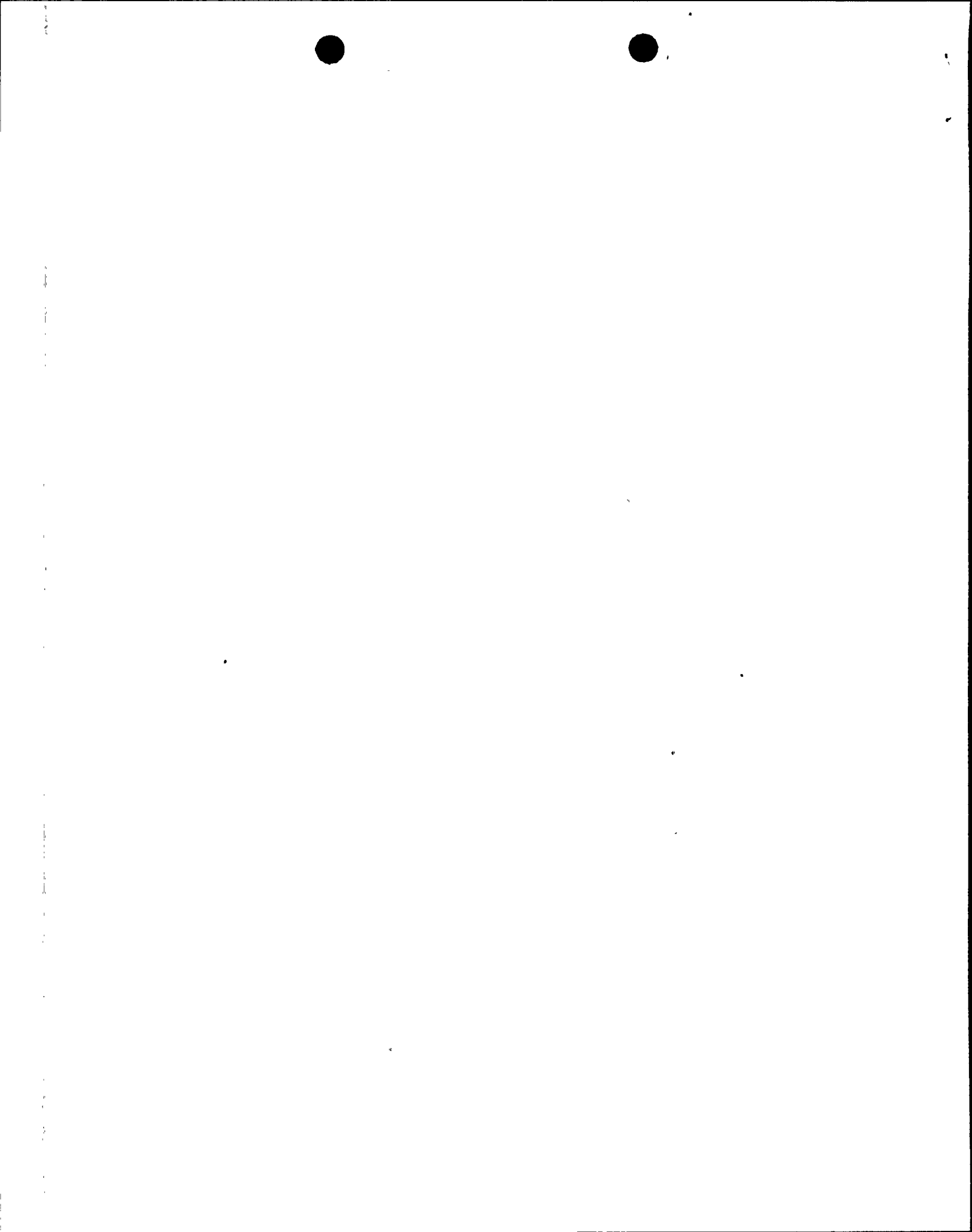
Surveillance testing of the main turbine protective functions is performed monthly. An Operations crew performing this testing typically consists of a "test director", a "valve operator", and a "test lever operator."

Testing these turbine trip features at power requires the turbine trip block valve (JJ)(V) to be held closed while these features are in the trip condition to prevent an actual turbine trip during testing. The block valve is manually kept closed during this testing by the "test lever operator" using a lever in a panel at the turbine front standard.

C. Event Description:

On January 30, 1993, at approximately 2100 PST, Operations personnel conducted a pre-test briefing among the crew to perform STP M-21A. This briefing emphasized the need for maintaining the test lever in the required position during the test.

On January 30, 1993, at 2105 PST, Operations personnel began STP M-21A. The performance of this test progressed somewhat more slowly than usual, requiring the operator to hold the test lever in the test position longer than normal. The "test lever operator" has stated, as have other personnel involved in performing this test, that during this test the test lever was held continuously in the required position. The "test lever operator" stated that he did shift his weight during the testing.





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On January 30, 1993, at 2147 PST, Unit 2 experienced a turbine trip followed by a reactor trip from 100 percent power during the performance of the routine STP M-21A.

During the low vacuum trip test, the main turbine tripped even though the test lever was apparently being held in the block (test lever full-travel) position. Following the turbine trip, the reactor tripped as designed. All safety systems functioned as required. The plant response was essentially normal with the exception of the main feedwater system No. 2 heater drain pump (SJ)(P), which failed to trip. A pressure transient during the trip caused a gasket leak in a flange (SM)(PSF) on the heater drain pump discharge piping (SM)(PSP). Two other flanges in the line were observed to have been affected by the pressure transient.

Following the trip, the "test director" instructed the "test lever operator" to release the test lever since it was still being maintained in the test position.

D. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

E. Dates and Approximate Times for Major Occurrences:

1. January 30, 1993, at 2147 PST: Event/discovery date. Unit 2 main turbine tripped during performance of STP M-21A.
2. January 31, 1993, at 0009 PST: A four-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(ii).

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

Alarms and other indications in the control room (NA) provided immediate notification to the control room operators that the event had occurred.



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**H. Operator Actions:**

Plant operators stabilized the plant in Mode 3 (Hot Standby) in accordance with Emergency Operating Procedures (EOPs) E-0, "Reactor Trip or Safety Injection," and E-0.1, "Reactor Trip Recovery."

**I. Safety System Responses:**

1. The main turbine tripped.
2. The reactor trip breakers (JC)(BKR) opened and all control and shutdown rods fell into the core.
3. The auxiliary feedwater pumps (BA)(P) started.

**III. Cause of the Event**

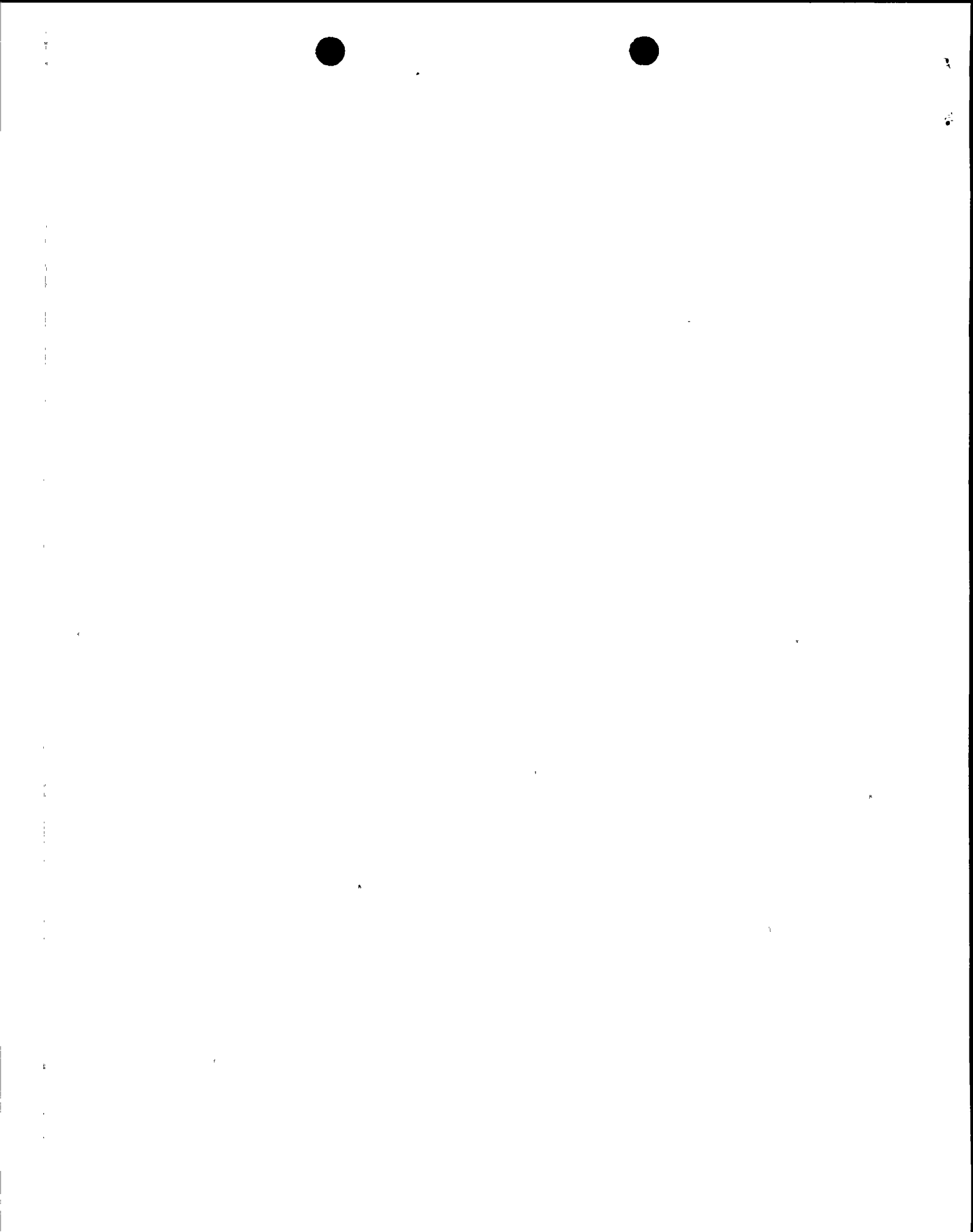
**A. Immediate Cause:**

The turbine tripped on simulated low condenser vacuum (high condenser back pressure) during the performance of STP M-21A. The reactor tripped due to the turbine trip with reactor power greater than P-9 (50 percent).

**B. Root Cause:**

The root cause for this event could not be positively determined; however, investigation has eliminated all but two possible causes.

1. One possible cause is personnel error. The "test lever operator" may have permitted the test lever to move from the full-travel position sufficiently during testing to allow the autostop oil pressure to decrease to the turbine trip value.
  - a. The test lever has no reference marks or other characteristics, other than the turbine tripping, to indicate that it is or is not in the proper, full-travel position during testing.
  - b. The "test lever operator" is required to hold the test lever in the full-travel position for a significant time period during regular testing. During this event, the test steps were performed out of sequence, which resulted in the test lever being required to be in the full-travel position longer than normal.
2. The other possible cause is contamination in the turbine lube oil system (TD). Contamination could have been sufficient to block flow through the orifices (TD)(OR) that supply oil to the



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autostop oil header during test conditions and thus limit header pressure to less than the value required to prevent the turbine from tripping.

Inspection of the flow orifices following the trip identified some blockage; however, the observed blockage should not have resulted in a turbine trip. The oil system pressure and flow transient resulting from the turbine trip may have dislodged some of the blockage so that the blockage observed in the flow orifices following the turbine trip was not representative of the full extent of that present at the time of the turbine trip.

No firm evidence was identified to support or refute either possible root cause.

**IV. Analysis of the Event**

A reactor trip due to a turbine trip is a previously analyzed Condition II event described in the Final Safety Analysis Report (FSAR) Update Section 15.2.7, "Loss of External Electrical Load and/or Turbine Trip." The FSAR Update shows that following a turbine trip/reactor trip, the automatic steam dump system (SB) accommodates the excess steam generation. Reactor coolant temperatures and pressure do not significantly increase if the steam dump system and pressurizer pressure control system (JD) are functioning properly. Since the 10 percent steam dump and pressurizer control system functioned as designed, the health and safety of the public were not adversely affected, and there were no adverse consequences or safety implications resulting from this event.

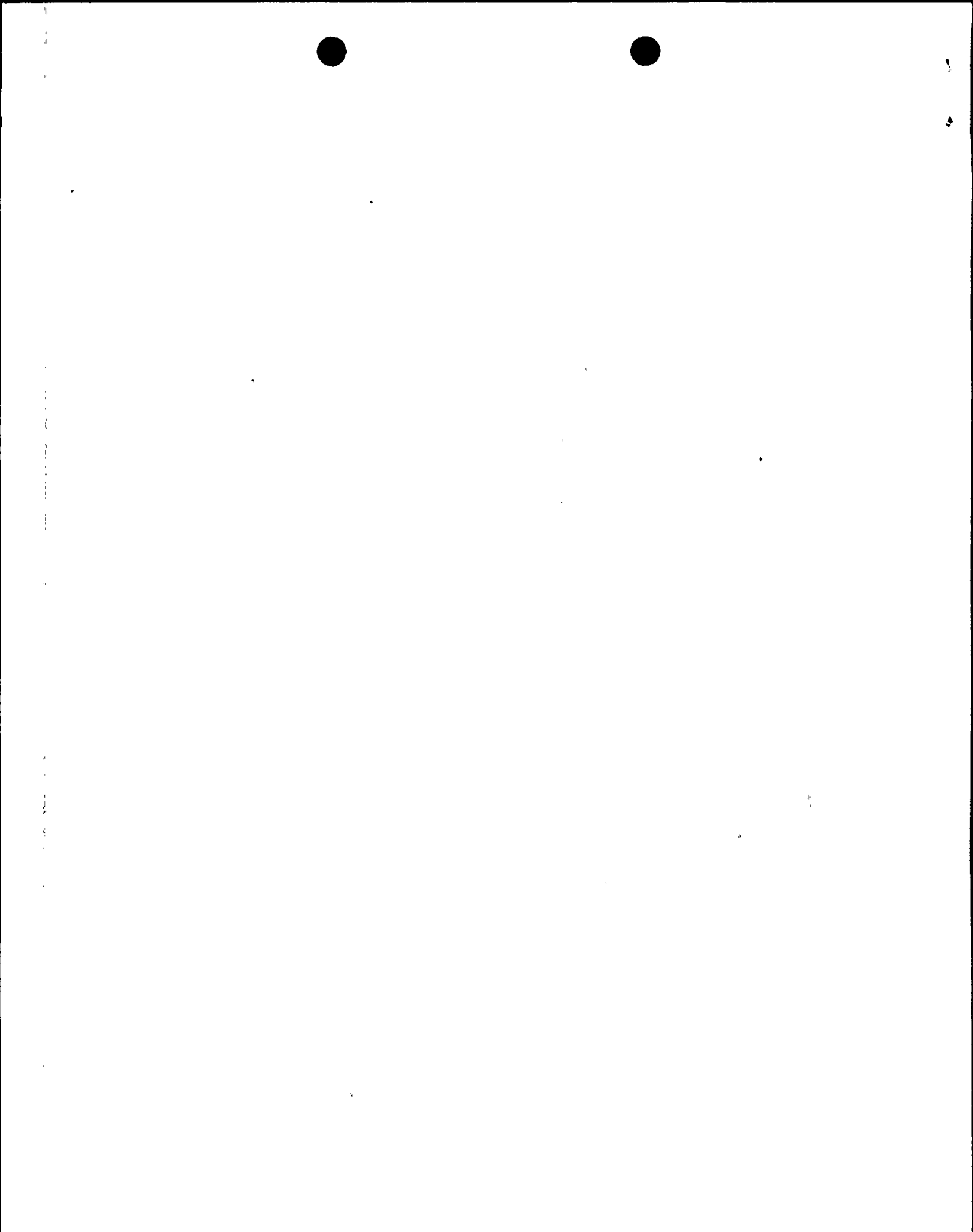
**V. Corrective Actions**

**A. Immediate Corrective Actions:**

Plant operators stabilized the plant in accordance with EOPs E-0 and E-0.1.

**B. Corrective Actions to Prevent Recurrence:**

1. An Operations Department Incident Summary has been issued describing the Unit 2 main turbine trip/reactor trip.
2. An Operations Department Night Order Log entry has been made to inform operators of the potential for a turbine trip/reactor trip during performance of STP M-21A.
3. A design change is being implemented to enhance the controls and instrumentation used by personnel during performance of STP M-21A, thus minimizing the potential for personnel error.



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4. STP M-21A was revised to:
  - a. regroup the procedure steps to minimize the time that the test lever is required to be in test position.
  - b. add additional steps to make the best use of gauges installed during the last refueling outage.
  - c. add steps to give directions to the operators for actions to be taken in case of equipment failure during performance of the STP.
  
5. Maintenance Procedure M-20.1, "Preparation for Main Turbine Lube Oil Flush," is being revised to specifically clean all autostop oil orifices. This maintenance will be performed periodically during future refueling outages.

VI. Additional Information

- A. Failed Components:
 

None.
  
- B. Previous Similar Events:
 

None.

