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SAN ONOFRE NUCLEAR GENERATING STATION

SEMI-ANNUAL OPERATING REPORT NO. 12

FOR THE PERIOD INCLUDING

JANUARY 1, 1973 TO JUNE 30, 1973

Submitted in Accordance With:

Operating License No. DPR-13

Submitted by:

Southern California Edison Company

San Diego Gas & Electric Company

SEMIANNUAL OPERATING REPORT

SAN ONOFRE NUCLEAR GENERATING STATION

UNIT 1

The following report is submitted in compliance with Section 6.5 of the Technical Specifications for the San Onofre Nuclear Generating Station, Unit 1.

A. OPERATIONS SUMMARY

1. Changes in Facility Design

No.	Title	Description
72-16	Install a defeat switch in the Events Recorder High Speed Control Circuit	This switch eliminates the need to change charts during reactor trip testing.
72-18	Relocate the Liquid Radwaste Sample Connection	This revision insures sample collection at a point downstream of all possible liquid radwaste effluent sources.
72-31	Change the decontamination Pad Drain Line Discharge	The decontamination pad drain will discharge directly to the monitor tanks to prevent overflow of various plant drains.
72-32	Install a Microwave Intrusion Alarm System	The alarm system is an added security measure.
73-03	Feedwater Heater Level Alarm Modification	This modification incorporates separate high and low feedwater heater level indication.
73-04	Condenser Bay Level Detection Alarm System	This modification incorporates a condenser bay level detection system that will annunciate flooding of the condenser bay.
73-05	138 KV Shoo-Fly line relocation	This modification relocates a section of the existing 138 KV shoo-fly line into the station.
73-07	Digital Counter for Turbine Speed monitoring	An Anadex digital counter was installed to monitor turbine-generator speed.
73-09	Provide a Recorder for Volume Control Tank Level	Incorporate a recorder to monitor volume control tank level. The recorder will provide a continuous indication of leak rate trends.
73-10	Replace Sphere Spray Valve Positioners	Existing valve positioners were replaced on sphere spray control valves 82 and 114 with an improved version.

No.	Title	Description
73-11	Replace RCS Cold Leg Loops B&C Indicators with Recorders.	The modification replaces existing indicators with a recorder which will record all three cold leg temperatures.
73-12	Modification to Region Six Fuel Assemblies	Incorporated fourteen Engineering design changes to the fuel assemblies loaded into the core for cycle four.
73-14	Install nine additional RTD's in RCS	This design change provided for the replacement of the remaining RTD's (between the Steam Generators and the RCP's) with an RTD/Thermowell system.
73-18	Rod Control Relays to be replaced	Provided for replacement of the Rod Control Square D half power time delay relays with Agastat model 7012 PC time delay relays.
73-19	Volume Control Tank indicator to be installed on the control console	Provided for the relocation of the volume control tank level indicator from the vertical board to the control console in parallel with the level recorder installed in accordance with Design Change 73-09.
73-25	Add N_2 Purge Line to the Cryogenic System	A 3/8" S.S. Purge line was installed between the nitrogen vent valve HCV-116 and a point just downstream to the dryer unit.
73-27	Refine unit differential unit protection circuitry.	Modifies unit differential relay current transformer circuits to preclude inadvertant grounding.

2. Performance Characteristics

The reactor and turbine plants were routinely monitored during the 6-month reporting period. No significant deviations in performance from expected values were noted. Average burnup of the core for Cycle 3 for the reporting period was 3354.9 MWD/MTM so that End of Life (EOL) Cycle 3 average burnup was 9710.9 MWD/MTM. EOL physics tests indicated substantial agreement with the predictions of WCAP-7799.

The reactor and turbine plants were continously on line for 142 consecutive days from January 10, 1973 to June 2, 1973. The plant was then removed from service for the third refueling.

3. Changes in Operating Methods

The following is a summary of those operating methods that were required due to changes in facility design or performance characteristics.

Design Change	Affected Procedure
72-32, Install Microwave Intrusion Alarm System	a) S-A-105, Security Patrol b) Station Security Procedure S-IV-1.1
73-04, Install Condenser Bay Level Detector Alarm System	New Instruction S-3-5.9, Condenser Bay Level Detection System
73-7, Provide Digital Counter to Monitor Turbine-Generator Speed	S-6-9, Operation During Major System Disturbance
73-11, Replace R.C.S. cold leg temperature Loop B&C Indicators with Recorders	S-0-105, Control room log. Daily Operating Report and Performance Summary.

4. Surveillance Tests and Inspections

All surveillance tests, checks and calibrations required by the Technical Specifications were performed at the frequency stipulated. All results were within required limits. Minor difficulties encountered are noted in Attachment I.

5. Periodic Containment Leak Rate Tests

1/9/73: Tests following a shutdown

Location	Leakage (Percent of Allowable)
POV-9, POV-9A	.039
POV-10, POV-10A	.058

5/29/73: Regular 6-month test

Location	Leakage (Percent of Allowable)
CV-10, CV-40, CV-116	2.26
CV-146, SV-1212-8	.266
CV-147, SV-1212-9	.266
CV-948, CV-949	2.05
Equipment Door	1.20
South Air Lock	0
North Air Lock	.396
POV-9, POV-9A	6.80
POV-10, POV-10A	.145
Flg. to Flg. & W. 4KV	.249
East Elect. Penet.	2.35
West Elect. Penet.	2.61

All results were within technical specification requirements.

6. Changes, Tests and Experiments Requiring Commission Authorization

Technical Specification Changes 8, 9, and 10 were approved during the reporting period by the Commission pursuant to 10CFR Part 50, Section 50.59 (a).

Technical Specification Changes

Change No. 8

The average burnup for the Cycle 3 core was limited to 19,000 MWD/MTM to insure that the analyses of the cold water accidents remained applicable.

Change No. 9

Definitions of an Abnormal Occurrence and of an Unusual Event were added to Section 1.0 of the Technical Specifications and Plant Reporting Requirements were added to Section 6.

Change No. 10

The use of alternate sample analysis methods during discharge of liquid radioactive wastes, at times when the liquid waste radiation monitor is out of service for maintenance, is allowed.

7. Plant Operating Staff Changes

There were no changes in the key supervisory or technical personnel in the plant operating staff during the reporting period.

8. Station Incidents

73-1

On November 2, 1972, chemical analysis of routine steam generator blowdown samples indicated a slight tritium concentration in the feedwater system. Analysis indicated a leak existed between the steam generator primary and secondary systems of approximately 2 gallons per day. The leak was isolated to "A" steam generator.

Sampling was continued on a daily basis and leak rates were calculated and plotted through January 5, 1973, at which time the leak rate was approximately 96 gallons per day.

At 12:11 AM, January 6, 1973, the unit was removed from service and the reactor manually shutdown by control rod motion and placed in a cold shutdown condition for locating and repairing steam generator tube leakage.

The steam generator secondary side was hydro tested to 800 PSIG, and a leaking tube was found. Selective eddy current testing was performed on 31 additional steam generator tubes and no wall thinning was indicated.

The previously identified leaking tube was plugged and the steam generator successfully hydrostatic tested.

The unit was returned to service at 11:57 AM, January 10, 1973. The turbine was off line 107.77 hours and the reactor subcritical for 102.55 hours.

73-2

At 8:45 AM, January 10, 1973, the reactor tripped at a power level of 3.9×10^{-6} amps during a normal startup following repairs to "A" Steam Generator.

The trip occurred when No. 4 Vital Bus was transferred from the backup power supply to the normal power supply. It was determined that Permissive Circuit P-7 was momentarily de-energized during the transfer, putting the "at-power" trips (power >10%) in service. Since the turbine was off line at the time, this caused a reactor trip.

It is believed that the control power switch to No. 4 Voltage Regulator was inadvertently opened by being bumped. A cover for the switch has been installed to prevent a recurrence.

The reactor was returned to criticality at 9:23 AM the same day. The reactor was subcritical for 0.63 hours during the incident.

73-3

The No. 2 diesel-generator was returned to service on February 13, 1973, following maintenance on the engine-generator coupling. During the load test to deomonstrate operability, the diesel engine tripped from high temperature. During the following two days, the diesel-generator was operated at various loads to determine the nature of the problem. This test program led to an inspection of the two cylinder bank cooling water thermostats. The diesel is a V-12 with one thermostat controlling cooling water to a bank of six cylinders.

The thermostats are a piston type and both were found to be sticking in their guide housings. Repairs consisted of lightly polishing the pistons and guides to remove minor deposits.

The diesel-generator was subsequently test operated at its rated load of 600 KW for one hour with the cooling water temperature remaining normal at 185°F.

This matter was reported to the Commission in Mr. Coe's letter of March 8,1973.

73-4

At 1:30 PM, on February 16, 1973, the No. 1 diesel-generator was removed from service for an inspection of the cooling water thermostats. At the completion of the inspection and during the routine test procedure for return to service after maintenance, an unusual amount of smoke was observed coming from the No. 1 diesel-generator exhaust. The diesel was removed from service and an investigation initiated to determine the cause. An inspection revealed that the west fuel injection pump on the diesel, which supplies fuel to the north cylinder bank, had a broken shaft. The diesel is a V-12 with one fuel injection pump supplying a bank of six cylinders. The injection pump was removed and sent off site for evaluation and repair.

This matter was reported to theCommission in Mr. Coe's letter of March 12, 1973.

73-5

At 10:57 PM, on February 20, 1973, Control Rod D-4 in Control Bank 2 Subgroup 6 was observed to have slipped from 200 to 145 steps on the Rod Position Recorder YR-404. Unit load was being reduced at the time for a condenser cleaning outage. Control Rod D-4 position was verified to be at 145 steps by a digital voltmeter. The lift coil disconnect switch for Control Rod D-4 was opened and the load reduction continued until Control Bank 2 position indication matched that of the slipped rod. The lift coil switch was then closed and Control Bank 2 exercised. Control Rod D-4 maintained its relative position to the bank and functioned properly.

At 1:30 am and 8:25 am, on February 21, 1973, reactor core thermocouple maps were taken and analyzed. The thermocouple maps indicated a normal core condition.

73-6

At 6:47 AM, on February 21, 1973, a moderate earthquake was felt at San Onofre. On-site and off-site seismic triggers initiated. The strong motion siesmograph

did not initiate. Threshold acceleration for these triggers is .01g. Vibration on the turbine No. 1 bearing increased from approximately .5 to 5.9 mils and returned to normal. No other unusual condition resulted from the earthquake.

This matter was reported to the Commission in Mr. Coe's letter of March 8, 1973.

73-7

On May 8, 1973, at approximately 9:00 a.m. the routine weekly Diesel Generator test was in progress. When an attempt was made to start the No. 2 Diesel Generator on air, it failed to start and an overcrank trip was initiated. The trip and annunciator were reset and a second air start was attempted which also proved unsuccessful. The No. 2 Diesel Generator was then started electrically in four seconds and the routine weekly testing continued. At 11:00 a.m. the routine test was completed and corrective maintenance initiated for inspection and repair of No. 2 Diesel Generator air start system. Inspection of the air start system revealed the air supply filter partially plugged which restricted the flow to the air start motor. The filter was removed, cleaned and replaced and two successful air starts were made on the No. 2 Diesel Generator.

It is concluded that the failure of the No. 2 Diesel Generator to air start was caused by the partially plugged air supply filter. It remained operable as the electric start was available and utilized. The No. 1 Diesel Generator remained operable during the entire incident. The air supply filters have been placed on PM cards for routine cleaning on a monthly basis.

73-8

A temporary station loss of off-site power occurred on June 7, 1973, while the reactor was shutdown for refueling operations. This situation resulted when the station's normal source of off-site power, "C" auxiliary transformer, was cleared for work and the alternate off-site power source, the main transformer and auxiliary transformers "A" and "B", tripped from operation of the unit differential relay. In addition, the Number 1 diesel generator voltage regulator failed during subsequent operations.

The cause of the unit differential relay operation was determined to be an inadvertent grounding at a terminal block of the main generator current trasformer leads between the differential relay and the test switch. The grounding operation was improperly conducted during preparations for a high potential test of the main generator.

To prevent a recurrence of this incident the test switch conductors were made continuous between the test switch and the differential relay eliminating the terminal block.

The No. 1 diesel generator voltage regulator was found with a failed capacitor and was subsequently repaired.

In preparation for refueling operations, the reactor was subcritical with a shutdown margin greater than 10%. Residual heat removal equipment was in operation during all periods except for short intervals subsequent to the initial loss of offsite power and failure of No. 1 diesel generator. Reactor coolant systems conditions were substantially unaffected by the incident.

This matter was reported to the Commission in Mr. Coe's letter of July 6, 1973.

B. POWER GENERATION

1.	Gross Thermal Power Generated (MWh)	4,590,576.00
2.	Gross Electrical Power Generated (MWh)	1,567,292.76
3.	Net Electrical Power Generated (MWh)	1,490,992.76
4.	Hours Reactor Critical	3,555.13
5.	Hours Generator On-Line	3,531.95
6.	Histogram of Thermal Power vs. Time (See Attachment II)	

C. SHUTDOWNS

73-1

1. Cause: To locate and repair primary to secondary tube leakage in "A" steam generator.
2. Shutdown Method: Manual shutdown by control rod motion.
3. Duration: 107.77 hours beginning 12:11 AM, January 6, 1973.
4. Unit Status: Cold shutdown.
5. Corrective Action: The leaking tube was plugged.

73-2

1. Cause: During a normal startup, following repairs to "A" steam generator, permissive circuit P-7 was momentarily de-energized during the transfer of No. 4 Vital Bus from the backup power supply to the normal power supply. This transfer of power supplies put the "at power" trips (power >10%) in service. Since the turbine was off line at the time, this caused a reactor trip.
2. Shutdown Method: Trip.
3. Duration: 0.63 hours beginning 8:45 AM, January 10, 1973.
4. Unit Status: Hot standby.
5. Corrective Action: A cover for the control power switch to No. 4 Voltage Regulator was installed. It is believed that this control power switch was inadvertently opened by being bumped, and that the cover will prevent a recurrence.

73-3

1. Cause: Refueling and unit overhaul.

2. Shutdown Method: Manual boration.

3. Duration: 695.83 hours from 12:37 AM June 2, 1973 to 12:00 PM June 30, 1973.

4. Unit Status: Cold Shutdown.

5. Corrective Action: Not Applicable.

D. Corrective Maintenance on Safety Related Equipment

EQUIPMENT	MALFUNCTION CAUSE	MALFUNCTION RESULT	EFFECT ON SAFE OPERATION	CORRECTIVE ACTION	SPECIAL PRECAUTIONS
Steam Generator "A"	Failed Tube	Primary to Secondary Leakage	None	Explosively plugged one tube	None
Loop "B" ΔT RTD (TE-410A)	Open Element in RTD	Erratic Indication	None	Replace RTD. Calibrated R/I converter	None
ORMS Channel 1215 Air Pump	Worn rotor vanes	Loss of pumping capacity	None	Replaced pump vanes and bearings	None
No. 2 Diesel-Generator	Bound thermostats	Engine high cooling water temperature	None	Cleaned and tested thermostats. Cleaned radiator	None
No. 2 Diesel-Generator	Partial loosening of coupling bolts	Increased vibration on the engine-generator coupling	None	Replaced coupling bolts and realigned the coupling	None
Control Rod Position System for Control Rod M-12	Failed capacitor and diode	Low signal output	None	Replaced indicator unit and calibrated	None
No. 1 Diesel Generator	Broken cam shaft on west fuel injection pump	Inoperative generator	None	Replaced cam shafts on east and west injection pumps.	None
Control Rod Position System for Control Rod M-6	Failed capacitor	Low output	None	Replaced rod position chassis	None
ORMS Monitor 1212 Air Pump	Bearing failed	Seized pump	None	Installed spare pump	None
Control Rod Position System for Control Rod M-12	Failed capacitor	Low signal output	None	Replaced rod position chassis	None

EQUIPMENT	MALFUNCTION		EFFECT ON SAFE OPERATION	CORRECTIVE ACTION	SPECIAL PRECAUTIONS
	CAUSE	RESULT			
ORMS Channel 1214	Selector Switch malfunctioned	Erratic indications	None	Serviced switch and tested channel	None
ORMS Monitor 1215 Vacuum Pump Motor	Bearings failed	Seized rotor	None	Replaced motor and pump bearings	None

The following major maintenance and inspection items were performed during the refueling.

REACTOR PLANT

1. A total of 27 RTD's and thermowells were installed in the reactor coolant system to alleviate problems associated with direct contact temperature devices. The thermowell/RTD system provides the capability to remove a failed RTD without a plant cooldown and draindown since the thermowell provides the pressure boundary for the system.

2. All three reactor coolant pump seals were disassembled for inspection. Due to excessive wear the No. 1 seals on reactor coolant pumps "A" and "B" were replaced. Also, seal No. 2 on pump "A" and seal No. 3 on "C" pump were replaced. Minor maintenance work and inspection of all reactor coolant pump motors was completed.

3. Installation of a third pressurizer level sensing line to provide complete isolation between level control channels was completed. Larger condensing pots were installed to reduce the effect of small leaks. The lines were hydrostatically tested at 3730 psig for three hours on each line.

4. As a result of increased steam generator tube failures occurring over the past year the following work was accomplished.

   a) Approximately 2610 "A" steam generator inlet side tubes and 1225 outlet side tubes were eddy current tested. Also, portions of two tubes were removed for further examination.

   b) Approximately 1311 "B" steam generator inlet side tubes and 516 outlet side tubes were eddy current tested.

   c) Approximately 772 "C" steam generator inlet side tubes and 362 outlet side tubes were eddy current tested.

   The eddy current testing indicated some fretting in all steam generators around the anti-vibration bars and dents between the tube sheet and the first tube support. As a result of the extensive examinations only five tubes in "B" steam generator and six tubes in "C" steam generator were plugged using an explosive plug method. Four tubes in "A" steam generator were also plugged, two that had samples cut out for metallurgical analysis sampling and two that were found to be leaking during the system leak test. Also, a leaking plug in "A" steam generator was re-welded.

TURBINE PLANT

1. The high pressure turbine spindle, No. 1 and No. 2 blade rings were shipped off site for repairs which consisted of re-installation of the first stage on the spindle and blade rings and installation of interstage inserts on the blade rings. Additionally, at the request of the manufacturer, non-destructive testing was accomplished on the last stages of both low pressure turbines. Two blades were found cracked at the blade root on the eleventh stage (generator end) of the No. 2 LP turbine. The entire blade group in which each cracked blade was located was replaced.

2. As a result of excessive inlet end erosion 5754 tubes in the No. 4 condenser waterbox were replaced. 5504 of these tubes are 90-10 Cu-Ni alloy and 250 are 70-30 Cu-Ni alloy. The new tubes extend 6 inches beyond the inlet side tube sheet in an attempt to mitigate the problem of inlet end erosion.

3. Due to excessive tube failures both west reheater tube bundles were removed and replaced with new bundles. All four reheaters had orifice plates installed on the inlet tube bundles to prevent tube end failures at the weld between the outlet of the tubes and the tube sheet. The orifice plates are designed to prevent slugs of water from forming in the long bend radius tubes. The new tubes are 80-20 Cu-Ni material similar to the original tubes.

E. Changes in Facility Design Carried Out Without Prior Commission Approval

No.	Title	Description	Safety Analysis Summary
72-16	Install a defeat switch in the Events Recorder High Speed Control Circuit	This switch eliminates the need to change charts during reactor trip testing	Failure of the switch will not disrupt operation of any of the instrumentation pertinent to reactor safety
72-18	Relocate the Liquid Radwaste Sample Connection	This revision ensures sample collection at a point downstream of all possible liquid radwaste effluent sources.	Rupture or leakage from this line will not result in releases that exceed limits previously evaluated in the FERSA.
72-31	Change the Decontamination Pad Drain Line Discharge	The decontamination pad drain will discharge to the monitor tanks to prevent overflow of various plant drains.	The drain line has no effect on any reactor safety related system.
72-32	Install a microwave Intrusion Alarm System	The alarm system is an added security measure due to the additional security hazard created by the opening of San Onofre Bluffs State Beach.	This charge did not involve a change in any reactor safety related system.
73-03	Feedwater Heater Level Alarm Modification	This modification incorporates separate high and low feedwater heater level indication.	The modification does not constitute a functional change in the feedwater system and is not connected to or associated with reactor protection or engineered safeguards.
73-04	Condenser Bay Level Detection Alarm System.	This modification incorporates a condenser bay level detection system that will annunciate flooding of the condenser bay.	The system did not involve any change in any reactor safety system.
73-05	138 KV Shoo-Fly Line Relocation	This modification relocates a section of the existing 138KV Shoo-fly line into San Onofre Generating Station.	The function of the power line is not changed. Relocation was required due to planned realignment of Highway 101.
73-07	Digital Counter for Turbine Speed Monitoring	An Anadex digital counter was installed to monitor turbine-generator speed on the south vertical control panel.	Addition of the digital counter facilitates recovery of accurate turbine speed data and is not connected to or associated with reactor protection or engineered safeguards.

No	Title	Description	Safety Analysis Summary
73-09	Provide a Recorder for Volume Control Tank Level	Incorporates a recorder to monitor volume control tank level. The recorder will be mounted on the north vertical board and will provide a continuous indication of leak rate trends.	The function of the volume control tank is not changed. Addition of the recorder facilitates the calculation of leak rate trends and in no way adversely affects reactor systems.
73-10	Replace Sphere Spray Valve Positioners	Fisher V/P type valve positioners were replaced on sphere spray control valves 82 and 114.	Replacement of the Fisher V/P type valve positioners with the Bailey valve positioners is not a functional change in the sphere spray valve control system and does not adversely effect plant safety.
73-11	Replace RCS Cold Leg Loops B&C Indicators with Recorders	The modification replaces Foxboro Model 65PV-OHG indicators with a Foxboro Model 643-OHR-0 recorder that will record all three cold leg temperatures.	Replacement of the two vertical scale indicators with a three pen recorder was not a functional change in the reactor coolant cold leg temperature system. The installation does not adversely affect plant safety.
73-12	Modification to Region six fuel assemblies	Incorporated fourteen engineering design changes to the fuel assemblies loaded into the core for cycle four.	Use of the modified fuel elements indicates that there should be no reduction in original design margins. New design indicates a flow reduction of less than 0.5%. However, improved mixing is expected to actually increase the minimum DNBR
73-14	Install nine additional RTD's in RCS	This design change provided for the replacement of the remaining RTD's (between the steam generators and the RCP's) with an identified RTD/Thermowell system.	Installation of the thermowells is well within state of the art practices. The spectrum of control and protection function affected by the installation has been investigated and it is concluded that this modification will have no adverse affect on plant safety.
73-18	Rod Control Relays to be replaced	Provided for replacement of the Rod Control Square D half power time delay relays with Agastat model 7012PC time delay relays.	Installation of the Agastat relays reduced drop out time under all conditions from 92 milliseconds to 22 milliseconds. Replacement does not affect the function of the rod control system and has no adverse affect on plant safety.

No.	Title	Description	Safety Analysis Summary
73-19	Volume Control Tank indicator to be installed on the control console.	Provided for the relocation of the volume control tank level indicator from the vertical board to the control console in parallel with the level recorder to be installed in accordance with Design Change 73-09.	The relocation is not connected to or associated with the reactor protection or engineered safeguard systems.
73-25	Add N_2 Purge line to the Cryogenic System	Calls for the installation of a 3/8" S.S. Line between the nitrogen vent valve HCV116 and a point just downstream to the dryer unit.	The change is not connected to or associated with reactor protection or engineered safeguard systems.
73-27	Refine unit differential Unit Protection Circuitry	Provide for modification of the unit differential relay current transformer circuit to preclude inadvertent grounding.	The modification did not constitute a functional change in the generator protection circuit and does not adversely affect plant safety.

F. RADIOACTIVE EFFLUENT RELEASES

Attached are tables which summarize radioactive releases from the plant for the subject reporting period. An independent laboratory performs some of these analyses on monthly composite samples. As a consequence, the last two months shown in the Liquid Releases table for this reporting period have no strontium-89 or 90 values. These data will be included in future reports as they become available from the contractor.

1. Gaseous Effluents
   a) Gross Radioactivity Releases
      1) Total gross radioactivity released was 8.60×10^{3} curies.
      2) The maximum gross radioactivity release rate for a one hour period was 2.92×10^{8} µCi/hr.
      3) Total gross radioactivity by nuclide is shown in Table I.
      4) The percent of technical specification limit for noble gases is 0.951 percent.

   b) Iodine Releases
      1) The total quantity of radioactive iodine released was 0.140 curies.
      2) The percent of technical specification limit for iodine-131 is 0.0478 percent.

   c) Particulate Releases
      1) The total gross radioactivity released was 6.02×10^{-4} curies
      2) No alpha activity was detected.
      3) The total gross radioactivity for nuclides with half lives greater than eight days was 6.02×10^{-4} curies.
      4) The percent of technical specification limit for particulate radioactivity is 2.60×10^{-5} percent.

2. Liquid Effluents
   a) Total gross radioactivity released, excluding tritium and noble gases, was 8.94 curies. The average concentration released to unrestricted areas was 2.81×10^{-8} µCi/ml.
   b) The maximum concentration of gross radioactivity released to the unrestricted area was 3.95×10^{-5} µCi/ml.
   c) The total tritium released to the unrestricted area was 2.86×10^{3} curies. The average tritium concentration released to the unrestricted area was 8.99×10^{-6} µCi/ml. Alpha radioactivity released to the unrestricted area was 2.79×10^{-3} curies through April, 1973. The average alpha concentration released through April, 1973 was 8.80×10^{-12} µCi/ml.
   d) The total dissolved gas radioacitivty released to the unrestricted area was 49.5 curies. This quantity yielded an average concentration of 1.56×10^{-7} µCi/ml released to the unrestricted area.
   e) The total volume of liquid waste released was 5.33×10^{6} liters.
   f) The total volume of dilution water was 3.18×10^{11} liters.
   g) Total gross radioactivity by nuclide is shown in Table II.
   h) The percent of the technical specification limit is 1.03 percent.

G. SOLID WASTE

1. A total of 2.45×10^{3} cubic feet of solid waste was shipped off site.

2. A total of 172 curies was estimated to have been shipped during the past 6 months.

3. Waste shipments were made on January 30, February 7, 8, 9, 13, 14, 15, 27, March 12 and June 27. All shipments were made under a burial contract with Nuclear Fngineering Co., Inc. The burial site is in Beatty, Nevada.

H. ENVIRONMENTAL MONITORING

1. Media sampled and analyzed during this reporting period are shown below.

Radiation Levels

a) A diagram showing the location of twelve combination film badge/TLD packs is shown in Figure I.
b) Twenty-two film badge/TLD packs were evaluated during the reporting period.
c) No locations were found to be above local background levels.
d) All sample points showed less than the detection limit for the film badge/TLD packs.

Marine Specimens

a) Two locations were sampled during this reporting period.
b) One lobster and two fish were collected and analyzed.
c) All radioactivity levels were within the previously observed range.
d) A kelp bass collected at the circulating water outfall showed the highest total radioactivity. Data are shown below and are reported in nCi/Kg dry weight.

	β-^{40}K
Highest	6.6
Lowest	1.7
Average	3.8

Vegetable Samples

a) There is one sampling location for vegetable samples.
b) Four different vegetables were collected and analyzed.
c) Levels of radioactivity were within the previously observed range.
d) Cauliflower collected during the first quarter of 1973 showed the highest level of radioactivity of the samples analyzed for this reporting period. Data are shown below and are reported as nCi/Kg.

	β-^{40}K
Highest	17
Lowest	4
Average	10

All vegetable samples are collected from the Highland Ranch which is located 1.5 miles northeast of the plant.

Air Samples

a) Samples are collected from two stations.
b) A total of 42 samples were counted during this period.
c) No sampling locations showed levels above local backgrounds.
d) Samples collected from the Camp Pendleton site showed the highest activity levels for this period. Data are shown below and are reported in pCi/m^3 for total β and fCi/Kg for gross α.

	Total β	Gross α
Highest	0.08	1
Lowest	0.02	Not Detectable
Average	0.04	0.04

Drinking Water Samples

a) Samples are collected from two sites.
b) Four samples were collected during this period.
c) No sampling locations showed levels above normal background.
d) Samples collected from the San Clemente reservoir showed the highest activity levels for this period. Data are shown below and are reported in pCi/l.

Filtrate and Suspended Solids

	Gross β	Gross α
Highest	27.2	26.2
Lowest	22.3	6.1
Average	24.5	17.5

Beach Sand Samples

a) Samples are collected from one location about 0.2 miles south of the plant.
b) Two samples were collected during this period.
c) Activity levels were not above the normal background.
d) Data are shown below and are reported in nCi/Kg.

	Gross Y
Highest	14
Lowest	13
Average	13.5

Ocean Bottom Sediment Samples

a) Samples are collected from two locations.
b) Two samples were collected for this period.

c) No samples showed levels above local backgrounds.
d) The sample collected at the outfall tunnel showed the highest total activity level. Data are shown below and are reported in nCi/Kg.

	Gross β
Highest	45
Lowest	36
Average	40.5

Secondary Coolant Water Samples

a) Samples are collected from one location.
b) Two samples were taken during this period.
c) Activity levels were not significantly above previously observed values.
d) The sample collected during the first quarter of 1973 showed the highest activity level based on gross β-^{40}K values. Data are shown below and are reported in ρCi/cc.

	Gross β-^{40}K
Highest	81
Lowest	26
Average	54

2. Radiation and radioactivity levels are estimated to be significantly below levels required to produce 1% of those that could result from continuous exposure to 10CFR20 unrestricted area limits.

3. No statistically significant variations of off-site environmental concentrations were observed.

I. OCCUPATIONAL PERSONNEL RADIATION EXPOSURE

An expanded classification and reporting scheme for occupational radiation exposures is being initiated with this report. As before, all persons required to wear film badges while on site will be included in the tabulation. Exposures will be grouped according to the following levels:

<100 mrem
100-500 mrem
501-1250 mrem
1251-2500 mrem
>2500 mrem

Individuals with exposures greater than 500 mrem for the reporting period will be further classified according to the following six job categories:

Administrative and Engineering - This category includes Station and general office administrative and engineering personnel.

Chemical-Radiation Technicians - These individuals perform all radiation monitoring and other health physics functions.

Contractors - The major portion of exposure accumulated by these persons occurs while working on steam generators and/or performing the required in-service inspections during refuelings.

Maintenance - Major exposures to these persons occur during refuelings while working on steam generators, reactor coolant pumps and other equipment within the containment. Routine jobs which result in above average exposures include baling of radioactive trash and changing of reactor coolant or radioactive waste system filters and ion exchange resin beds.

Nuclear Instrument Technicians - These persons perform all instrument calibrations, repairs and tests.

Operations - These individuals are responsible for performing all plant equipment and reactor operational functions.

The classifications established in Technical Specification 6.5A(9) have not been maintained prior to the June 5, 1973 issuance of Technical Specification 6.5. Accordingly, those classifications are not used in this report.

Personnel occupational radiation exposures for January through June, 1973 are shown below:

Exposure (mrem)	No. Persons
<100	262
100-500	136
501-1250	106
1251-2500	61
>2500	1

A total of 168 individuals received exposures greater than 500 mrem. These exposures are shown below as a function of the job category.

Category	No of Persons
Administrative and Engineering	4
Chemical-Radiation Technician	9
Contractors	89
Maintenance	48
Nuclear Instrument Technicians	4
Operations	14

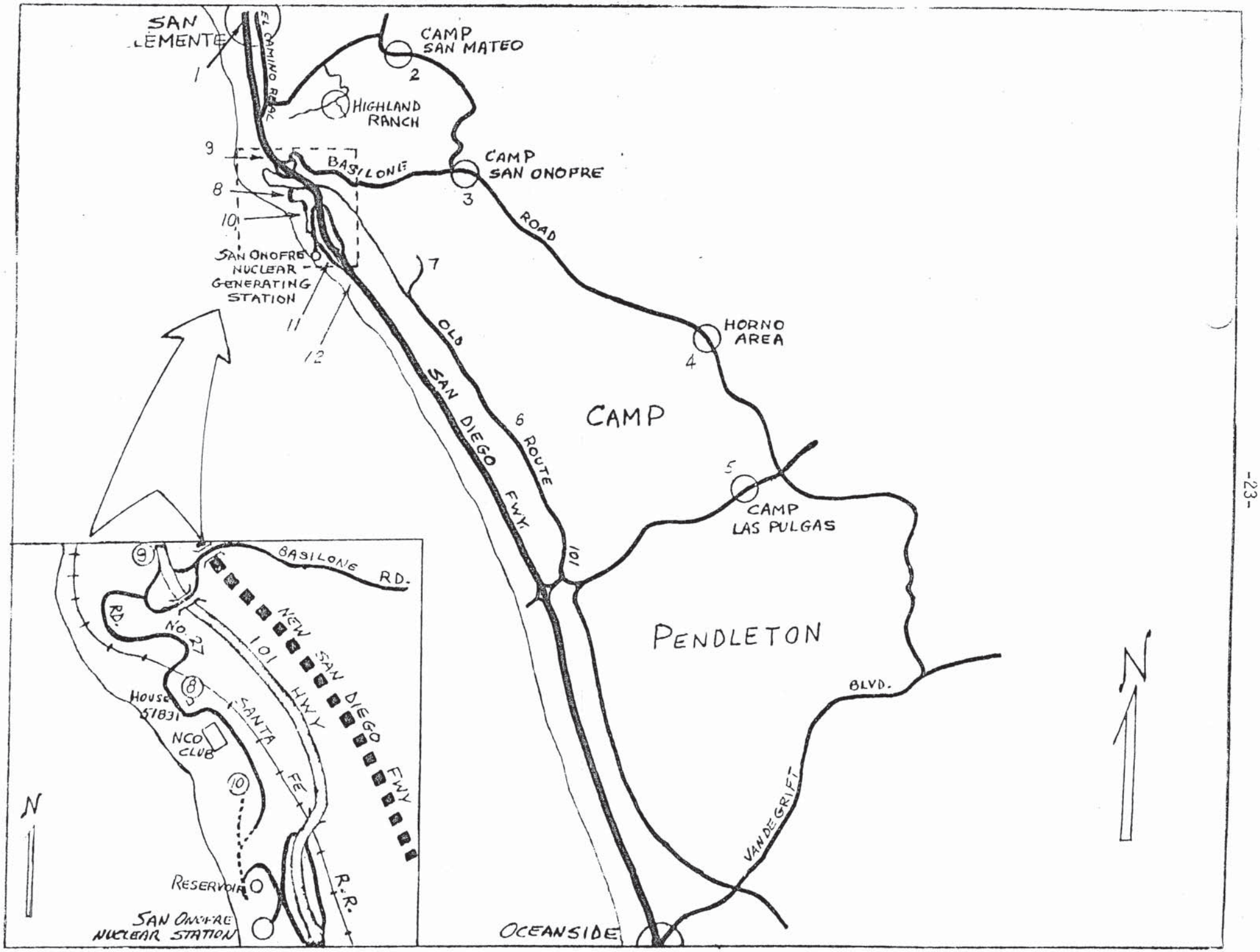
Corrections:

1) The semi-annual AEC reports for 1972 reported a combined total of 191 barrels and ten 168 ft^3 boxes of solid waste as having been shipped off-site. These annual totals should be corrected to show 195 barrels and 14 boxes.

2) The gaseous isotopic summary of releases for January 1, 1972 to June 30, 1972 reported the release of 3.82×10^{-5} curies of iodine-131. This value should be corrected to read 4.42×10^{-5} curies.

TEST DEVIATIONS FROM REQUIREMENTS

TEST	MINIMUM FREQUENCY	RESULTS	CAUSE	CORRECTIVE ACTION IF REQUIRED
Area Radiation Monitors	Once/Day	All tests within limits except as follows: 1. 4-10-73 Channel 1232 out of limits high 2. 5-10-73 Channel 1237 activity increased	1. Increased background due to increased sphere activity. 2. Increased activity due to installation of new check source on 5-9-73.	1. Channel limits increased to compensate for increased background 2. None
Diesel-Generators	Once/Week	All tests within limits except as follows: 1. 3-9-73 9:03P #1 diesel air start failed 2. 5-8-73 8:45A #2 diesel air start failed	1. Plugged air supply filter 2. Plugged air supply filter	1. Air filter cleaned-retested satisfactory 2. Air filter cleaned-retested satisfactory
No flow test of S.I.S. and containment spray system	Refueling	All tests within limits except as follows: 1. Sphere evacuation horn failed. 2. MOV-358 open contact would not seal in 3. CV-875B opened only 30%	1. Auxilairy contact on emerg. siren out of adjustment 2. Broken spring in contactor 'A' pallet switch 3. Binding between limit switch and limit switch actuating lever	1. Adjusted aux. contact-retested satisfactory 2. Spring replaced-retested satisfactory 3. Adjusted alignment of limit switch-retested satisfactory
Liquid monitor channel 1218	Once/week	All tests within limits except as follows: 1. 1-26-73: calibration reading not within limits 2. 2-23-73: Test signal out of limits 3. 3-2-73: Test signal out of limits		1. Adjusted-recalibrated satisfactory 2. Readjusted test signal-retested satisfactory 3. Readjusted test-retested satisfactory
Gas monitor channel 1214	Once/week	1. 1-12-73: Test signal out of limits 2. 1-26-73: Test signal out of limits		1. Readjusted test signal-retested satisfactory 2. Readjusted test signal-retested satisfactory


SAN CLEMENTE
EL CAMINO REAL
CAMP SAN MATEO
HIGHLAND RANCH
BASILONE
CAMP SAN ONOFRE
ROAD
SAN ONOFRE NUCLEAR GENERATING STATION
OLD SAN DIEGO FWY.
ROUTE 101
HORNO AREA
CAMP
CAMP LAS PULGAS
PENDLETON
BLVD.
VANDEGRIFT
OCEANSIDE
1
2
3
4
5
6
7
8
9
10
11
12
BASILONE RD.
NEW 101
SAN DIEGO FWY
HWY
SANTA FE
R.R.
RD.
No. 27
HOUSE 51831
NCO CLUB
RESERVOIR
SAN ONOFRE NUCLEAR STATION
N
N

. AIRBORNE RELEASES

TABLE I

	UNITS	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1. Total Noble Gases	Curies	3.49(3)	4.15(1)	2.69(2)	1.36(2)	2.37(2)	4.42(3)							8.60(3)
2. Total Halogens	Curies	NDA*	NDA	NDA	NDA	NDA	1.40(-1)							1.40(-1)
3. Total Particulate Gross Radioactivity (β,γ)	Curies	NDA	NDA	NDA	NDA	NDA	6.02(-4)							6.02(-4)
4. Total Tritium	Curies	4.33(1)	NDA	NDA	NDA	NDA	3.66(1)							7.99(1) 64
5. Total Particulate Gross Alpha Radioactivity	Curies	NDA	NDA	NDA	NDA	NDA	NDA							NDA
6. Max. Noble Gas Release Rate	μCi/sec	4.57(4)	6.71(2)	8.10(4)	2.02(3)	5.77(3)	1.24(4)							8.10(4)
7. Percent of Applicable Limit For:														
a. Noble Gases	%	2.32	5.99(-3)	2.87(-1)	9.12(-2)	1.66(-1)	2.91							9.51(-1)
b. Halogens	%	-	-	-	-	-	2.86(-1)							4.78(-2)
c. Particulates	%	-	-	-	-	-	1.56(-4)							2.60(-5)
8. Isotope Released:	Curies													
Particulates		NDA	NDA	NDA	NDA	NDA								
Cs-137							2.20(-4)							2.20(-4)
Ba-La-140							NDA							NDA
Sr-90							NDA							NDA
Sr-89							NDA							NDA
Co-58							2.57(-4)							2.57(-4)
Co-60							1.25(-4)							1.25(-4)
Halogens		NDA	NDA	NDA	NDA	NDA								
I-131							1.40(-1)							1.40(-1)
I-133							NDA							NDA
I-135							NDA							NDA
Gases														
Kr-85		3.11(1)	2.01	1.04(1)	1.63	4.61(-1)	6.75							5.24(1)
Xe-133		2.54(3)	3.64(1)	1.98(2)	1.16(2)	1.67(2)	2.64(3)							5.70(3)
Kr-88		NDA	NDA	NDA	NDA	NDA	NDA							NDA
Kr-87		NDA	NDA	NDA	NDA	NDA	NDA							NDA
Kr-85m		4.78(-1)	NDA	1.19(-2)	5.19(-2)	4.34(-2)	4.71(-1)							1.06
Xe-138		NDA	NDA	NDA	NDA	NDA	NDA							NDA
Xe-135m		NDA	NDA	NDA	NDA	NDA	NDA							NDA
Ar-41		NDA	NDA	NDA	NDA	NDA	NDA							NDA
Others as Appropriate (Specify)														
Xe-131M		4.99(2)	2.22	1.71(1)	1.09(1)	2.43(1)	7.86(2)							1.34(3)
Xe-133M		4.09(2)	8.75(-1)	3.90(1)	6.59	4.32(1)	9.64(2)							1.45(3)
Xe-135		2.34(1)	NDA	4.54	4.49(-1)	2.93	2.14(1)							5.27(1)
Uniden.		3.17(-2)	NDA	NDA	NDA	1.66(-2)	7.94(-2)							1.28(-1)

*NDA No Detectable Activity

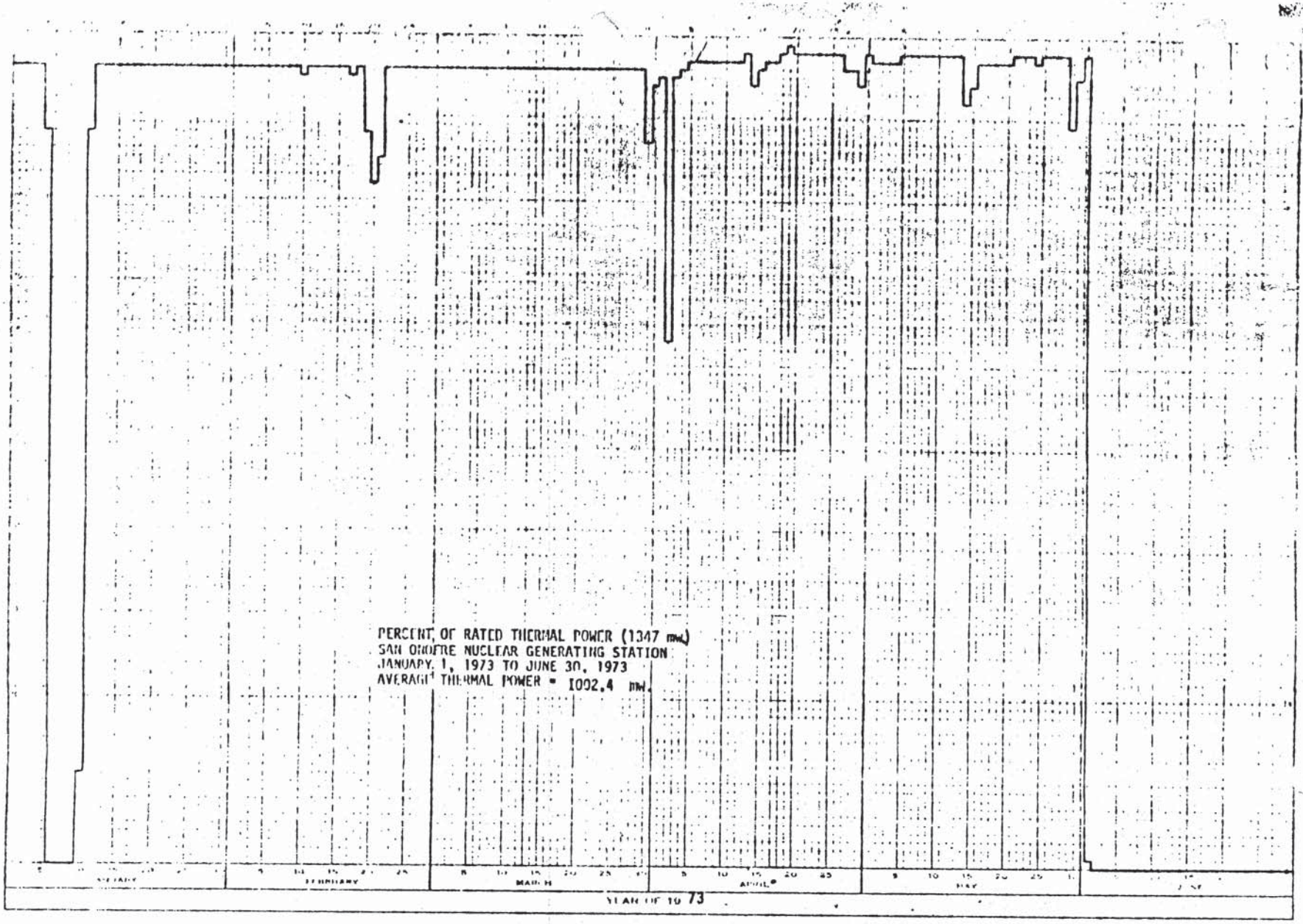
TABLE II
REPORT OF RADIOACTIVE EFFLUENTS

Facility: San Onofre Nuclear Generating Station Docket: 50 - 206 Year: 1973

LIQUID RELEASES

	UNITS	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1. Gross Radioactivity (β,γ)														
a) Total Release	Curies	2.94	2.56	4.17(-2)	1.33(-1)	3.79(-1)	2.75							8.94
b) Avg. Concentration Released	µCi/ml	5.67(-8)	4.77(-8)	7.00(-12)	2.36(-9)	6.50(-9)	6.93(-8)							2.21(-8)
c) Max. Concentration Released	µCi/ml	1.02(-6)	8.02(-8)	3.97(-7)	3.52(-7)	8.15(-8)	3.95(-5)							3.95(-5)
2. Tritium														
a) Total Release	Curies	8.44 (2)	1.94(2)	3.08(2)	5.99(2)	7.08(2)	2.13 (2)							2.86 (3)
b) Avg. Concentration Released	µCi/ml	1.63 (-5)	3.68(-6)	5.21(-6)	1.06(-5)	1.21(-5)	7.14(-4)							8.99(-6)
3. Dissolved Noble Gases														
a) Total Release	Curies	1.11 (1)	3.89(-1)	5.36(-2)	9.77(-2)	1.21	3.66 (1)							4.95 (1)
b) Avg. Concentration Released	µCi/ml	2.15 (-7)	7.37(-9)	3.27(-10)	1.73(-9)	2.08(-8)	9.22(-7)							1.56(-7)
4. Gross Alpha Radioactivity														
a) Total Release	Curies	2.59(-3)	3.3 (-5)	6.8 (-5)	9.9(-5)	IA	IA							2.7 (-3)
b) Avg. Concentration Released	µCi/ml	5.00(-11)	6.3 (-13)	1.2(-12)	1.8(-12)	IA	IA							8.09(-12)
5. Volume of liquid waste to discharge canal	Liters	2.59 (6)	3.32 (5)	3.41(5)	4.96(5)	7.04(5)	8.71(5)							3.33(6)
6. Volume of Dilution Water	Liters	5.18(10)	5.28(10)	5.91(10)	5.64(10)	5.83(10)	3.97(10)							3.18(11)
7. Isotopes Released	Curies													
Ba + La-140		NDA	NDA	NDA	NDA	NDA	NDA							NDA
Sr-89		2.59(-4)	6.3 (-5)	6.8 (-6)	3.5(-5)	IA	IA							3.64(-4)
I-131		3.63(-2)	3.71(-2)	8.43(-4)	6.31(-4)	1.51(-2)	8.70(-2)							2.37(-1)
Xe-133		3.34	3.24(-2)	1.84(-2)	1.94(-2)	1.33(-2)	3.58(1)							4.52(1)
Xe-135		3.74(-2)	NDA	NDA	6.38(-4)	1.88(-4)	5.61(-2)							9.43(-2)
Cs-137) combined		6.4 (-1)	2.47	4.02(-2)	1.02(-1)	3.27(-1)	1.80							5.39
Cs-134)														
Co-60		1.81(-3)	1.16(-2)	3.61(-4)	1.54(-2)	NDA	0							2.92(-2)
Co-58		2.19(-1)	NDA	NDA	NDA	7.24(-3)	6.59(-1)							9.24(-1)
Cr-51		NDA	NDA	NDA	NDA	2.86(-2)	1.83(-2)							4.69(-2)
Mn-54		3.89(-3)	NDA	NDA	1.54(-2)	IA	IA							1.93(-2)
Zn-65		NDA	NDA	NDA	NDA	IA	IA							NDA
Sr-90		1.54(-4)	4.0(-5)	2.4 (-5)	1.1(-4)	IA	IA							4.33(-4)
I-133		2.17(-2)	NDA	NDA	NDA	NDA	NDA							3.39(-2)
Unidentified		NDA	NDA	NDA	NDA	1.12(-3)	1.86(-1)							1.87(-1)
C-14		1.82	2.0(-2)	3.4 (-4)	NDA	IA								1.84
Fe-59		3.38(-3)	NDA	NDA	NDA	IA	IA							9.03(-3)
Cs-136		8.74(-2)	2.3(-2)	NDA	NDA	IA	IA							9.04(-2)
Xe-131M		2.70	3.57(-1)	3.52(-2)	7.76(-2)	1.20	7.17(-1)							4.09
Ag-110M		NDA	2.4 (-3)	NDA	NDA	IA	IA							2.4(-3)
Others (Specify)														
8. Percent of Tech. Spec. Limit For Total Activity Released	%	8.72(-1)	7.54(-1)	1.23(-2)	3.56(-2)	1.69(-1)	5.94							1.03

**IA - Independent Analyst
*NDA- No Detectable Activity


PERCENT OF RATED THERMAL POWER (1347 mw)
SAN ONOFRE NUCLEAR GENERATING STATION
JANUARY 1, 1973 TO JUNE 30, 1973
AVERAGE THERMAL POWER = 1092.4 mw
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
YEAR OF 1973

SAN ONOFRE NUCLEAR GENERATING STATION
SEMI-ANNUAL OPERATING REPORT NO. 13

FOR THE PERIOD INCLUDING

JULY 1, 1973 TO DECEMBER 31, 1973

Submitted in Accordance With:

Operating License No. DPR-13

Submitted by:

Southern California Edison Company

San Diego Gas & Electric Company

SEMI-ANNUAL OPERATING REPORT

SAN ONOFRE NUCLEAR GENERATING STATION

UNIT I

The following report is submitted in compliance with Section 6.5 of the Technical Specifications for the San Onofre Nuclear Generating Station, Unit 1.

A. OPERATIONS SUMMARY

At the start of the reporting period, the unit was shutdown to complete refueling operations. The unit was returned to service on July 28, 1973, at 405 MWe gross in compliance with an AEC directive limiting output to 90% of full power pending the Commission's review of the Cycle IV Safety Analysis including a Fuel Densification Report. The unit was released for full power operation August 21, 1973, upon completion of the AEC's review of the Fuel Densification Study.

The unit operated continuously until October 21, 1973, except to effect repairs of leaking pressurizer safety valves, turbine stop valves and a leaking high pressure turbine flange. The unit was removed from service October 21, 1973, due to a blade failure on the No. 1 Low Pressure turbine. The unit returned to service January 22, 1974, and reached full power operation (450 MWe) the following day.

1. Changes in Facility Design

No.	Title	Description
73-01	Stabilizer Control Unit Addition	This control unit improves the damping of oscillations which occur during system disturbances.
73-02	Installation of Pressure Filters in Domestic Water Supply	These filters bring the water from the plant reservoir up to standards for supply to the domestic water system.
73-08	Ammonia Degasser Vent Piping Modification	This change prevents steam and ammonia vapor from backing up into the condenser vacuum pump separators and pump casings.
73-17	Westinghouse W-2 Type Switch Modification	Modifying the W-2 type control switches improves the reliability of the control switches and the connected circuitry.
73-20	Local Backup Protection for the Auxiliary Transformers	The addition of local backup protection for the auxiliary transformers 4160 volt air circuit breaker improves equipment protection and plant reliabilit...

No.	Title	Description
73-23	Modification of the Start Circuits of the Control Rod Cooling System Fans	This change provides a seal-in circuit after "auto-start" and provides a separate seal-in circuit for a manual start. This prevents the fans from cycling on and off when the auto-start sensing device is on the set point.
73-24	Modification to Strong Motion Accelerograph System	This modification consists of the installation of an "end-of-tape" alarm and the replacement of off-site triggers. It results in a total upgrade and increase in reliability of seismic monitoring.
73-26	Separation of Reheater Drain Receivers	This change provides separate tube bundle drain receivers on each reheater-moisture separator. The modification incorporates an essentially parallel system to that already installed to provide level control of the additional drain receiver on each reheater.
73-28	Modify Refueling Water Storage Tank Fill Line	This installation prevents water overflowing from the Refueling Water Storage Tank from entering an uncontrolled water pathway.
73-31	Replace Sample Pig, Detector and Preamplifier for ORMS Channel 1218	The replacement sample pig incorporates a removable liner which simplifies and improves decontamination efforts. Included with the revised sample pig, is a more sensitive scintillation detector and its associated preamplifier.

2. Performance Characteristics

At the start of the reporting period, the unit was shutdown to complete refueling operations. The unit returned to service July 28, 1973.

The reactor and turbine plants were routinely monitored during the 6-month reporting period. No significant deviations in performance from expected values were noted. Average burnup of the core for Cycle 4 for the reporting period was 1771.2 MWD/MTM. BOL physics tests indicated substantial agreement with the predictions of WCAP 8160.

3. Changes in Operating Methods

The following is a summary of those operating methods that were required due to changes in facility design or performance characteristics.

Design Change	Affected Procedure
73-01 Stabilizer Control Unit	a) S-6-20 - Power System Stabilizer Unit 1 (new instruction)

Design Change	Affected Procedure
73-01 Stabilizer Control Unit	b) S-6-32 - Main Generator Voltage Regulator Operations
73-02 Domestic Water Supply Pressure Filters	a) S-11-2 - Operation of Domestic Water Filters and Chlorinator
73-26 Separation of Reheater Drain Receiver	a) S-9-2 - Turbine Reheater Operation b) Check off form PSSO-181, Reheater Operation c) S-9-5 - Reheater Hydrostatic Test d) Check off form PSSO-237, Reheater Hydrostatic Test

4. Surveillance Tests and Inspections

All surveillance tests, checks and calibrations required by the Technical Specifications were performed at the frequency stipulated. All results are within required limits. Minor difficulties encountered are noted in Attachment I.

5. Periodic Containment Leak Rate Tests

7/5/73: Tests following the replacement of fuel transfer tube sealing flange.

Location	Leakage (% of Allowable)
Fuel Transfer Tube Seal	0.002
Fuel Transfer Tube Blind Flange	0.496

Regular 6-month test - July 1973

Location	Leakage (% of Allowable)
CV-10, CV-40, CV-116	1.179
CV-146, SV-1212-8	0.790
CV-147, SV-1212-9	0.880
CV-948, CV-949	1.944
Equipment Door	0.035
South Air Lock	0.000
North Air Lock	1.837
POV-9, POV-9A	0.086
POV-10, POV-10A	0.097
Flange to Flange and West 4KV	0.402
East Electrical Penetration	1.181
West Electrical Penetration	1.837

The reactor plant was at 87% of full power (405 MWe gross). Procedures as outlined in Operating Instruction S-3-5.27 for a moderate earthquake were conducted.

73-11

At 12:51 PM, August 17, 1973, Unit 1 automatic load limit runback was initiated which resulted in a load reduction from 405 MW gross to 315 MW gross.

No 2 Inverter, which normally supplies power to Power Range Channel 1205, and the Rod Position Voltage Regulator, failed and the load transferred to the backup power source. The resultant voltage transient caused an automatic load limit runback. Due to the short duration of the voltage transient, the 'Nuclear Dropped Rod-Rod Stop" and "Rod Position-Rod Bottom" alarms normally associated with a load limit runback were not initiated. Cause of the runback was determined from the permissive information display board, "Auto Rod Withdrawal Not Reset". This indicated the runback was from a nuclear dropped rod signal or a rod bottom signal. At 1:05 PM, an in-core thermocouple map was made and evaluated which indicated core conditions normal. All control rods were verified to be in their proper position on the Rod Position Recorder. At 1:45 PM, unit load was returned to 405 MW gross.

It was concluded that the load limit runback was due to a voltage transient caused by the failure of the No. 2 Inverter and the transfer of the power load to the alternate source.

73-12

At 10:30 AM on October 16, 1973, the No. 2 diesel-generator was removed from service for inspection and repairs. During routine testing, excessive smoke was observed coming from the exhaust. An investigation revealed that a loose screw in the governor end fuel pump caused the No. 2 north cylinder to receive excess fuel thereby causing excessive exhaust smoke. There were indications that the screw had been cross-threaded during its installation.

During the investigation, it was also noted that the south bank of cylinders was running colder than the north bank. Excessive wear was noted on the fuel rack forks of the generator end fuel pump. This caused the south bank to run leaner and therefore colder than the north bank. This problem was not advanced to a degree where diesel performance was significantly affected. Both fuel pumps were overhauled and worn or damaged parts were replaced as necessary. The wear on the fuel rack forks was noted to some degree on the forks from both fuel pumps.

In accorance with Technical Specification requirements, No. 1 diesel-generator remained operable during the time the No. 2 diesel-generator was out of service.

73-13

On October 21, 1973, the unit was being removed from service to investigate turbine problems indicated by bearing vibration and condenser salt water leakage. Upon tripping the turbine and removal from the system grid, a safety injection reactor trip occurred shortly thereafter. Reconstruction of the sequence of events was completed with the aid of operator's logs, events recorder and various other recorded reactor and turbine plant parameters as well as statements of personnel involved. This incident is discussed in detail in letters to Mr. H. Engelken dated October 22, 1973, and to Mr. John F. O'Leary dated October 31, 1973.

73-14

At 2:00 PM, October 28, 1973, an earthquake was determined to have occurred by the triggering of on-site triggers and detectable ground motion at San Onofre. Off-site communications verified that an earthquake had been felt at the Huntington Beach Generating Station.

The reactor plant was in a cold shutdown condition. Procedures as outlined in Operating Instruction S-3-5.27, Earthquake, were conducted.

73-15

At 10:33 AM, November 29, 1973, a system disturbance occurred when an IRD-9 relay at Villa Park substation was accidentally bumped. This caused a false trip of the Villa Park-Santiago 220 KV line and resulted in the Santiago area load being separated with SDG&E. The SDG&E system frequency dropped to 59.2 HZ at which point protective relays operated to separate the two systems at San Onofre. The 60 east 220 KV pcb failed to open and the SDG&E system frequency declined to 58.8 HZ at which point the Santiago area load was dropped by load shedding relays at Santiago substation. SDG&E system frequency then recovered to 60 HZ. At 10:35 AM, the Santiago substation operator attempted to pick up his area load. SDG&E system frequency again fell to 59.2 HZ at which point the system separation relays again operated and this time the 60 east 220 KV pcb operated properly.

The SCE system was subsequently returned to normal and the intertie pcb's reclosed at 10:55 AM. Unit 1 remained in the cold shutdown configuration throughout the incident with auxiliary power being supplied continuously without disruption.

73-16

At 1:47 PM, December 18, 1973, while conducting sphere penetration leak rate tests, excessive leakage was observed on the sphere equalizing and instrument vent header penetration. Computer analysis determined the leakage to be 138% of the allowable of 0.2% of the containment volume in 24 hours.

A visual inspection revealed that CV116, the sphere equalizing valve, was leaking around the valve seats. To determine the leakage through the valve, a blank flange was bolted on the valve and the penetration retested. The leakage dropped to 0.5 percent of the allowable.

The valve was subsequently repaired and the penetration leak tested satisfactorily on December 21, 1973. The final leak rate was 0.85% of allowable. This incident is discussed in a letter to Mr. John F. O'Leary dated January 14, 1974.

B. POWER GENERATION

1.	Gross Thermal Power Generated (MWH)	2,439,871
2.	Gross Electrical Power Generated (MWH)	829,800
3.	Net Electrical Power Generated (MWH)	781,495
4.	Hours Reactor Critical	2,020.42
5.	Hours Generator On-Line	1,970.51
6.	Histogram of Thermal Power vs Time (see Attachment II)	

C. SHUTDOWNS

73-4

1. Cause: To repair leaking pressurizer safety valves and to repair leaking High Pressure Turbine Horizontal Flange.

2. Shutdown Method: Manual shutdown by control rod motion

3. Duration: 65.07 hours beginning 10:33 AM, August 8, 1973

4. Unit Status: Cold shutdown

5. Corrective Action: The seats on the leaking pressurizer safety valves were resurfaced. The leaking turbine flange bolts were retorqued.

73-5

1. Cause: On October 21, 1973, the unit was being removed from service to investigate turbine problems indicated by turbine bearing vibration and condenser salt water leakage. Upon tripping the turbine and removal from the system grid, a safety injection reactor trip occurred shortly thereafter. (See Station Incident 73-13)

2. Shutdown Method: Manual load reduction

3. Duration: 2489.93 hours from 1:20 AM, October 21, 1973 to 1:16 PM, January 22, 1974.

4. Unit Status: Cold shutdown

5. Corrective Action: Inspection of the No. 1 Low Pressure Turbine indicated that blade No. 41 on the 10th stage, generator end, failed at the root due to a fatigue induced fracture. The blade broke loose and caused impact damage to the 10th and 11th rotating stages and minor impact damage to the last stage stationary blading. All last stage blading, generator end, has been replaced, as has approximately 50% of the 10th stage blading. A cracked steeple has been removed and a specially constructed bridge block installed in its place.

The safety injection piping welds on all loops were non-destructively tested and no abnormalities were found. Although there were no apparent indications related to the incident, the loop B safety injection piping between the containment penetration and the cold leg of the reactor coolant system loop has been replaced to facilitate an expedient return to service. A complete stress analysis would have required unavailable time to complete.

EQUIPMENT	MALFUNCTION CAUSE	RESULT	ON SAFE OPERATION	CORRECTIVE ACTION	SPECIAL PRECAUTIONS
od Control Slave ycler No. 6	Worn motor	Noisy operation	None	Replaced motor with spare and rebuilt worn unit	None
IOV 850B	Failed motor attachment	Motor end bell damage	None	Repaired end bell and replaced end bell	None
team Generators and C	Tube failure and tube thinning	Minor leakage	None	A-Steam Generator plugged 7 thinning tubes C-Steam Generator plugged 2 leaking tubes, plugged 6 thinning tubes	None
RMS Channel 1212 onitor	Failed pump bearing	Noisy operation	None	Replaced unit with spare	None
). 1 Diesel ijection Pumps	Control rack wear	Control slow	None	Replaced rack control forks	None
od Control Slave 'cler No. 8	Loose bearing fit	Noisy operation	None	Replaced motor	None
ifety Injection ieck Valve 867B	NA	NA	None	Replaced missing capscrew	None
essurizer relief nk Valve CV542	Corroded limit switches	Indication erratic	None	Replaced one switch and repaired the other	None

In addition, the following maintenance and inspection items have been accomplished during the October 21, 1973, outage resulting from Station Incident 73-13.

The safety injection piping welds on all loops were non-destructively tested. Results show no apparent indications related to the safety injection incident. A complete stress analysis of the piping is underway and will require considerable time to complete. To facilitate an expedient return to service, the loop B safety injection piping between the containment penetration and the cold leg of the reactor coolant system loop has been replaced. Concurrently with this installation, an on-line venting system for the safety injection loops was also installed.

Inspection of the No. 1 Low Pressure Turbine indicated that blade No. 41 on the next-to-the-last (10th) stage, generator end, failed at the root due to a fatigue induced fracture. The blade broke loose and caused impact damage to the 10th and 11th rotating stages and minor impact damage to the last stage stationary blading. Debris also entered the condenser, causing several condenser tube failures.

The entire turbine spindle was tested using non-destructive techniques as was the No. 2 low pressure turbine. This testing located four cracked blades on the 7th stage governor end, a cracked steeple and seven additional cracked blades on the 10th stage generator end, and two cracked blades on the 11th stage generator end of No. 1 Low Pressure Turbine. Some of the blade cracks were found on the face of the root section and were not visible from the blade ends. Four groups of six blades each were replaced on the seventh stage. All cracks were at the blade root and were determined to be fatigue induced. Subsequent investigation showed that the failed blade (No. 41) was vibrating near the fifth harmonic in the axial mode.

All last stage blading, generator end, of the No. 1 Low Pressure Turbine has been replaced as has approximately 50% of the 10th stage blading. The cracked steeple has been removed and a specially constructed bridge block installed in its place. A similar device has been installed 180° away to provide proper balancing of the turbine wheel.

Inspection of the No. 2 Low Pressure Turbine revealed no blade cracking. Several minor tenon cracks were found which were subsequently polished out.

Additional maintenance activities during the outage included condenser, reheater and feedwater heater repair together with improvement of the in-core aeroball flux monitoring system.

E. CHANGES IN FACILITY DESIGN CARRIED OUT WITHOUT PRIOR COMMISSION APPROVAL.

No.	Title	Description	Safety Analysis Summary
73-01	Stabilizer Control Unit Addition	This Control Unit improves the damping of oscillations which occur during system disturbances.	The modification will improve the bulk power system dynamic performance without affecting local steady state or transient stability limits previously analyzed and documented in the FSAR.
73-02	Installation of Pressure Filters in Domestic Water Supply	These filters bring the water from the plant reservoir up to standards for supply to the domestic water system.	The installation of the Domestic Water Filters is not related to any equipment important to safety.
73-08	Ammonia Degasser Vent Piping Modification	This change prevents steam and ammonia vapor from backing up into the vacuum pump separators and pump casings.	The air removal system is not part of any safety-related equipment.
73-17	Westinghouse W-2 Type Switches Modification	Modifying the W-2 Type Control Switches improves the reliability of the control switches and the connected circuitry.	This modification does not constitute a functional change in the switch operation or associated circuits, and does not adversely affect plant safety.
73-20	Local Backup Protection for the Auxiliary Transformers	The addition of local backup protection for the auxiliary transformers 4160 volt air circuit breaker improves equipment protection and plant reliability.	Providing local backup protection for these transformers will not affect any reactor safety related function.
73-23	Modification of the Start Circuits of the Control Rod Cooling System Fans	This change provides a seal-in circuit after "auto-start" and provides a separate seal-in circuit for a manual start. This prevents the fans from cycling on and off when the auto-start sensing device is on the set point.	This change did not involve a change in any reactor safety related system.

No.	Title	Description	Safety Analysis Summary
73-24	Modification to Strong Motion Accelerograph System	This modification consists of the installation of an "end-of-tape" alarm and the replacement of off-site triggers. This modification results in a total upgrade and increase in reliability of seismic monitoring.	This modification does not involve a change in any safety related system.
73-26	Separation of Reheater Drain Receivers	This change provides separate tube bundle drain receivers on each reheater-moisture separator. It incorporates an essentially parallel system to that already installed to provide level control of the additional drain receiver on each reheater.	The modification does not involve a change in any reactor safety related equipment.
73-28	Modify Refueling Water Storage Tank Fill Line	This installation prevents water overflowing from the Refueling Water Storage Tank from entering an uncontrolled water pathway.	A system functional modification is not involved. Thus, the modification does not involve a change in any safety related system.
73-31	Replace Sample Pig, Detector and Preamplifier for ORMS Channel 1218	The replacement sample pig incorporates a removable liner which simplifies and improves decontamination efforts. Included with the revised sample pig is a more sensitive scintillation detector and its associated preamplifier.	All of the revised components are compatible with the existing channel drawer and therefore will not adversely affect any of the indicating, recording, controlling and alarming functions of the channel.

F. RADIOACTIVE EFFLUENT RELEASES

Attached are tables which summarize radioactive releases from the plant for the subject reporting period. An independent laboratory performs some of these analyses on monthly composite samples. As a consequence, the November data do not contain strontium 89 or 90 values. These data will be included in a future report as they become available.

1. Gaseous Effluents

a) Gross Radioactivity Releases

1) Total gross radioactivity releases was 2.06×10^{3} curies

2) The maximum gross radioactivity release rate for a one hour period was 3.05×10^{7} μCi/hr

3) Total gross radioactivity data by nuclide released are shown in Table 1.

4) The percent of technical specification limit for noble gases is 2.49×10^{-1} percent.

b) Iodine Releases

1) The total quantity of radioactive iodine released was 5.11×10^{-1} curies.

2) The percent of technical specification limit for iodine-131 is 9.50×10^{-2} percent.

c) Particulate Releases

1) The total gross radioactivity released was 1.18 curies.

2) No alpha activity was detected.

3) The total gross radioactivity for nuclides with half lives greater than eight days was 1.18 curies

4) The percent of technical specification limit for particulate radioactivity is 4.63×10^{-2} percent

2. Liquid Effluents

a) Total gross radioactivity released, excluding tritium and noble gases, was 7.04 curies. The average concentration released to unrestricted areas was 3.65×10^{-8} μCi/ml.

b) The maximum concentration of gross radioactivity released to the unrestricted area was 1.65×10^{-5} μCi/ml.

c) The total tritium released to the unrestricted area was 1.21×10^{3} curies. The average tritium concentration released to the unrestricted area was 6.27×10^{-6} μCi/ml. Alpha radioactivity released to the unrestricted area was 7.7×10^{-4} curies through October, 1973. The average alpha concentration released to the unrestricted area was 4.0×10^{-12} μCi/ml (based on total dilution water volume for period).

d) The total dissolved gas radioactivity released to the unrestricted area was 4.10 curies. This quantity yielded an average concentration of 2.12×10^{-8} μCi/ml released to the unrestricted area.

e) The volume of liquid waste released was 3.70×10^{6} liters.

f) The total volume of dilution water was 1.93×10^{11} liters.

g) Total gross radioactivity by nuclide is shown in Table II.

h) The percent of the technical specification limit for liquid releases is 4.53×10^{-1}.

G. SOLID WASTE

1. A total of 1.53×10^{3} cubic feet of solid waste was shipped off site.

2. A total of 2.09×10^{2} curies was estimated to have been shipped during the past six months.

3. Waste shipments were made on August 30, October 24 and December 20, 1973. All shipments were made under a burial contract with Nuclear Engineering Co., Inc. The burial site is in Beatty, Nevada.

4. A total of nine spent fuel assemblies were shipped off-site during the reporting period. They were shipped to the General Electric Reprocessing Center, Morris, Ill.

H. ENVIRONMENTAL MONITORING

1. Media sampled, analyzed and reported to SCE during the second and third quarters of 1973 are shown below.

Radiation Levels

a) A diagram showing the location of twelve combination film badge/TLD packs is shown in Figure I.

b) Twenty-three film badge/TLD packs were evaluated during the reporting period.

c) No locations were found to be above local background levels.

d) All sample points showed less than the detection limit for film badge/TLD packs.

Marine Specimens

a) Three locations were sampled during this reporting period.

b) Five fish, two abalones, three tunicates and one lobster were analyzed and reported during this period.

c) All radioactivity levels were within the previously observed range.

d) A Tunicate collected from the New Kelp Bed showed the highest radioactivity level. Data are shown below for flesh and are reported as nCi/Kg dry weight.

	β-^{40}K
Highest	20
Lowest	<1
Average	5.8

Kelp and Algae

a. One location was sampled during this reporting period.

b. Four different samples were analyzed and reported during this period.

c. All radioactivity levels were within the previously observed range.

d. A sample of Bottom Kelp collected from the New Kelp Bed showed the highest radioactivity level. Data are shown below and are reported as nCi/Kg dry weight.

	β-^{40}K
Highest	28
Lowest	13
Average	21

Vegetable Samples

a. There is one sampling location for vegetable samples.

b. Seven different vegetable samples were collected and analyzed.

c. Levels of radioactivity were within the previously observed range.

d. A cucumber collected during the second quarter of 1973 showed the highest radioactivity content of the vegetables analyzed. Data are shown below and are reported as nCi/Kg dry weight.

	β-^{40}K
Highest	8
Lowest	<3
Average	5

Air Samples

a. Samples are collected from two stations.

b. A total of 49 samples were counted during this period.

c. No sample showed radioactivity levels above normal background.

d. A sample collected from the Camp Pendleton site showed the highest activity level for this period. Data are shown below and are reported in pCi/m^3 for total β and in fCi/m^3 for gross α.

	Total β	Gross α
Highest	0.09	1.6
Lowest	0.02	Not detectable
Average	0.04	0.07

Drinking Water Samples

a. Samples were collected from two sites.

b. Four samples were collected during this period.

c. No sampling location showed activity levels above normal background.

d. A sample collected from the Capistrano Beach reservoir showed the highest activity level for this period. Data are shown below and are reported in pCi/l.

	Filtrate plus Suspended Solids	
	Gross β	Gross α
Highest	32.0	<20.4
Lowest	18.2	< 3.2
Average	24.3	<10.5

Beach Sand Samples

a. Samples are collected from one location about 0.2 miles south of the plant.

b. Two samples were collected during this period.

c. Activity levels were within those previously observed.

d. Data are shown below and are reported in nCi/Kg.

	Gross γ
Highest	14
Lowest	9
Average	11.5

Ocean Bottom Sediment Samples

a. Samples are collected from two locations.

b. Four samples were collected during this period.

c. Activity levels were within those previously observed.

d. A sample collected at the intake tunnel showed the highest activity level. Data are shown below and are reported in nCi/Kg.

	Gross β
Highest	63
Lowest	48
Average	57

Secondary Coolant Water Samples

a. Samples were collected from one location.

b. One sample was collected during this period.

c. The activity level was within the previously observed range.

d. The third quarter sample showed 12 fCi/cc.

Rabbit Samples

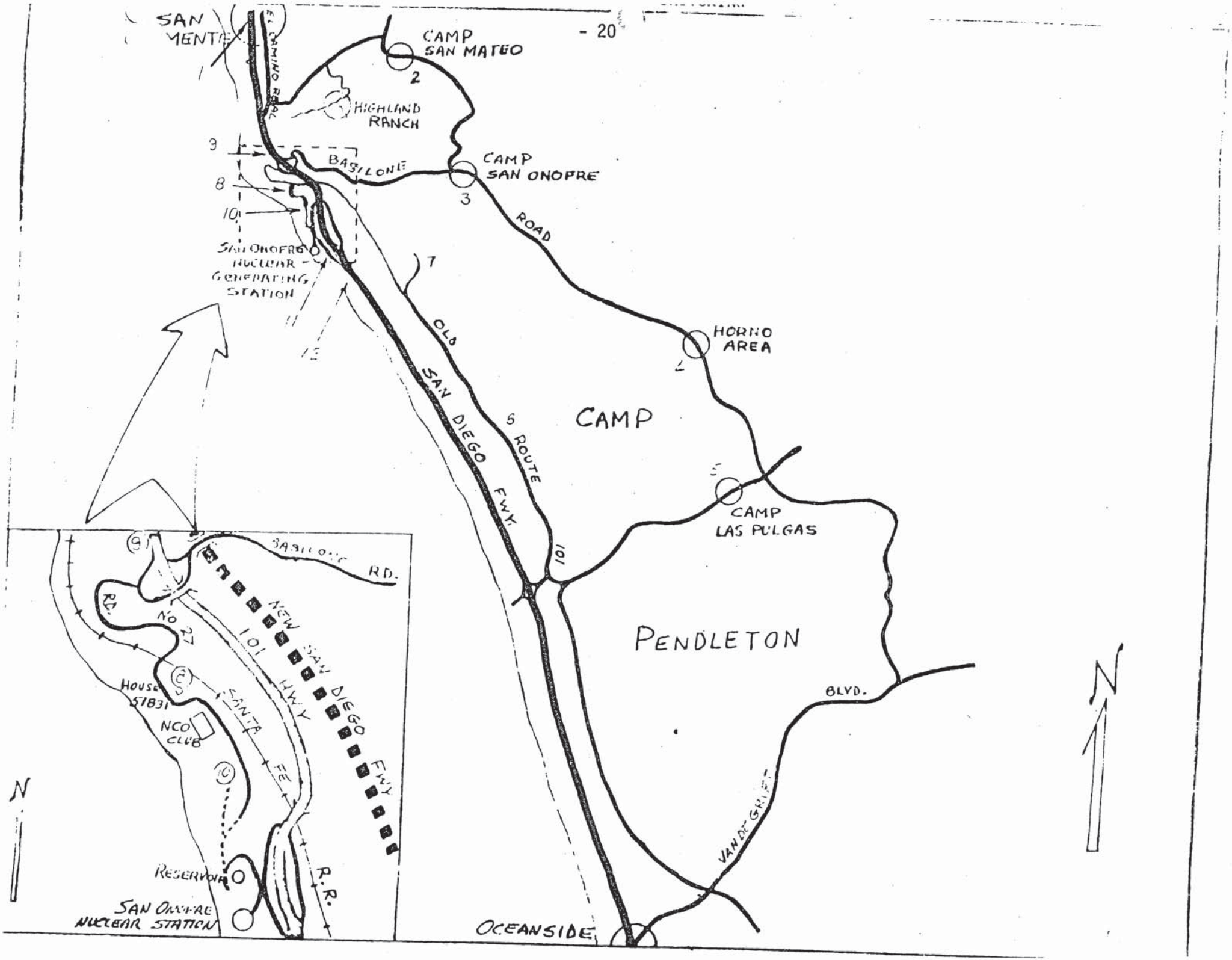
a. Specimens were collected from two locations.

b. Three specimens were collected and analyzed during this reporting period.

c. All radioactivity levels were within background levels or those previously observed.

d. A rabbit collected north of the plant site showed the highest total radioactivity levels. Data are shown below and are reported in pCi/gram of calcium for strontium and in pCi/gram of thyroid tissue for iodine.

	^{89}Sr	^{90}Sr	^{131}I
Highest	<2	5	<11
Lowest	<1	3	< 2
Average	1.3	4	< 6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HORNO
AREA
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A total of 98 individuals received exposures greater than 500 mrem during this reporting period. These exposures are shown below as a function of the job category.

Category	No. Persons
Administrative and Engineering	1
Chemical Radiation Technicians	3
Contractors	52
Maintenance	34
Nuclear Instrument Technicians	2
Operations	6

Following is a tabulation of personnel who received exposures greater than 2500 mrem during 1973. Major causes are defined and the number of persons who received exposure due to each cause is shown.

Cause	No. Persons
1. Steam generator tube inspection and repair	14
2. Valve repair during refueling; other maintenance items	4
3. Nuclear instrumentation repair and calibration	2
4. Spent fuel shipments and decontamination	1
5. Inspections	1
Total	22

CORRECTIONS

The previous report for the January 1, 1973, to June 30, 1973, period should be corrected to show the following values in curies for carbon-14 released as liquid waste:

	January	February	March	April	May	June	Total
C-14	1.0(-3)	1.0(-3)	3.4(-4)	NDA	8.3(-4)	4(-4)	3.6(-3)

These changes are based on the following information:

Discussion with our contractor, LFE Environmental, indicated that carbon-14 analyses performed prior to February 1973 included no chemical steps for separating carbon-14 from other fission, corrosion and activation products. As a consequence, carbon-14 values were effectively based on a gross beta count rather than an isotopic analysis.

An improved technique was employed for the February 1973 monthly composite sample. Subsequent analyses (March 1973 and later) included a distillation as CO_2 followed by radiochemical separation as $BaCO_3$.

Analytical data from March 1973 through September 1973 show monthly carbon-14 discharges of from no detectable activity to a maximum of $\leq 8.3 \times 10^{-4}$ curies (May 1973).

Analysis of the reactor coolant in May 1973 yielded a value of $2 \pm 1 \times 10^{-7}$ μCi/cm for carbon-14. If the entire liquid release for January 1973 had been undiluted reactor coolant, a total carbon-14 release of $5 \pm 2.5 \times 10^{-4}$ curies would have resulted. Had the entire February 1973 release been undiluted reactor coolant, only $6.6 \pm 3.3 \times 10^{-5}$ curies would have been released.

From the above data, carbon-14 releases for January and February 1973 have been estimated at 1×10^{-3} curies each. This value is believed to be conservative by greater than a factor of ten. Previously reported values were 1.82 curies for January and 2.0×10^{-2} for February 1973.

Additionally, the units reported for Secondary Coolant Water Samples (section H) should have been reported as fCi/cc rather than pCi/cc.

:dkm

TABLE 1

GASEOUS RELEASES

AIRBORNE RELEASES

	UNITS	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1. Total Noble Gases	Curies	1.15(1)	4.02(2)	3.78(1)	1.61(3)	1.82	2.10(-3	2.06(3)
2. Total Halogens	Curies	1.19(-1)	3.92(-1)	NDA	NDA	NDA	NDA	5.11(-1)
3. Total Particulate Gross Radioactivity (β,γ)	Curies	5.33(-1)	NDA	NDA	1.55(-3)	6.49(-1)	NDA	1.18
4. Total Tritium	Curies	4.79	3.30(1)	NDA	8.13(1)	6.96(1)	NDA	1.89(2)
5. Total Particulate Gross Alpha Radioactivity	Curies	NDA	NDA	NDA	NDA	NDA	NDA	NDA
6. Max. Noble Gas Release Rate	µCi/sec	2.25(2)	5.44(3)	5.70(2)	8.47(3)	1.04(2)	1.20(-1)	8.47(3)
7. Percent of Applicable Limit For:								
a. Noble Gases	%	7.29(-3)	3.41(-1)	7.29(-2)	1.05	1.45(-4)	1.39(-6)	2.49(-1)
b. Halogens	%	2.46(-1)	4.38(-1)	--	-	-	-	1.11(-1)
c. Particulates	%	1.49(-1)	--	--	3.07(-4)	1.34(-1)	-	4.63(-2)
8. Isotope Released:	Curies							
Particulates								
Cs-137 + Cs-134		NDA	NDA	NDA	1.55(-3)	NDA	NDA	1.55(-3)
Ba-La-140		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Sr-90		NDA	NDA	NDA	NDA"	NDA	NDA	NDA
Sr-89		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Co-58		3.74(-1)	NDA	NDA	NDA	5.32(-1)	NDA	9.06(-1)
Co-60		1.59(-1)	NDA	NDA	NDA	1.17(-1)	NDA	2.76(-1)
Halogens								
I-131		1.19(-1)	1.64(-1)	NDA	NDA	NDA	NDA	2.83(-1)
I-133		NDA	2.28(-1)	NDA	NDA	NDA	NDA	2.28(-1)
I-135		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Gases								
Kr-85		1.57(-1)	2.06	NDA	NDA	NDA	NDA	2.22
Xe-133		8.15(-1)	3.55(2)	3.54(1)	1.41(3)	1.79	2.10(-3)	1.80(3)
Kr-88		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Kr-87		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Kr-85m		3.17(-2)	8.49(-3)	NDA	NDA	NDA	NDA	4.02(-2)
Xe-138		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Xe-135m		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Ar-41		NDA	NDA	NDA	NDA	NDA	NDA	NDA
Others as Appropriate (Specify)								
	Xe-131M	4.25	1.52(1)	1.71	6.11(1)	NDA	NDA	8.23(1)
	Xe-133M	6.19	2.82(1)	7.04(-1)	1.35(2)	3.38(-2)	NDA	1.70(2)
	Xe-135	3.78(-2)	2.10	NDA	2.34(-1)	NDA	NDA	2.37
	Uniden.	NDA	3.77(-2)	NDA	NDA	NDA	NDA	3.77(-2)

TABLE II - LIQUID RELEASES

**IA - Independent Analyst
*NDA- No Detectable Activity

	UNITS	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTAL
1. Gross Radioactivity (β,γ)								
a) Total Release	Curies	4.06	4.46(-1)	8.09(-1)	1.61	1.16(-1)	0	7.04
b) Avg. Concentration Released	µCi/ml	1.58(-7)	7.56(-7)	1.74(-8)	3.93(-8)	5.27(-9)	0	3.65(-8)
c) Max. Concentration Released	µCi/ml	2.74(-6)	1.70(-6)	6.80(-7)	1.65(-5)	1.51(-7)	0	1.65(-5)
2. Tritium								
a) Total Release	Curies	5.31(1)	2.56(2)	1.72(2)	5.26(2)	2.02(2)	0	1.21(3)
b) Avg. Concentration Released	µCi/ml	2.07(-6)	4.42(-6)	3.69(-6)	1.29(-5)	9.18(-6)	0	6.27(-6)
3. Dissolved Noble Gases								
a) Total Release	Curies	4.12(-2)	7.97(-1)	4.34(-1)	2.63	1.97(-1)	0	4.10
b) Avg. Concentration Released	µCi/ml	1.60(-9)	1.38(-8)	9.31(-9)	6.43(-8)	8.95(-9)	0	2.12(-8)
4. Gross Alpha Radioactivity								
a) Total Release	Curies	4.7(-4)	1.1(-4)	2.1(-5)	1.7(-4)	IA	0	7.7(-4)
b) Avg. Concentration Released	µCi/ml	1.8(-11)	1.9(-12)	4.5(-13)	4.2(-12)	IA	0	4.0(-12)
5. Volume of liquid waste to discharge canal	Liters	1.04 (6)	5.19(5)	3.37(5)	1.42(6)	3.86(5)	0	3.70(6)
6. Volume of Dilution Water	Liters	2.57(10)	5.79(10)	4.66(10)	4.09(10)	2.20(10)	6.81(7)	1.93(11)
7. Isotopes Released	Curies							
Ba + La-140		NDA	NDA	NDA	NDA	NDA	0	NDA
Sr-89		5.2(-5)	7.8(-5)	2.4(-5)	3(-5)	IA	0	1.8(-4)
I-131		2.97(-2)	1.82(-3)	9.36(-4)	5.89(-4)	NDA	0	3.30(-2)
Xe-133		3.32(-3)	2.02(-2)	2.50(-3)	1.08(-1)	1.35(-1)	0	2.69(-1)
Xe-135		NDA	NDA	NDA	1.05(-3)	8.95(-4)	0	1.95(-3)
Cs-137) combined		3.92	3.45(-1)	7.02(-1)	1.46	6.67(-2)	0	6.49
Cs-134)							0	
Co-60		4.74(-3)	1.38(-2)	2.55(-2)	3.25(-2)	3.03(-3)	0	7.96(-2)
Co-58		8.14(-2)	7.71(-2)	7.92(-2)	1.13(-1)	3.21(-2)	0	3.83(-1)
Cr-51		1.97(-2)	NDA	1.82(-3)	NDA	1.44(-2)	0	3.59(-2)
Mn-54		NDA	8.41(-3)	NDA	5.1(-3)	IA	0	1.35(-2)
Zn-65		NDA	NDA	NDA	NDA	IA	0	NDA
Sr-90		9.8(-5)	3.3(-5)	2.0(-4)	1.0(-3)	IA	0	1.33(-3)
I-133		NDA	NDA	NDA	NDA	NDA	0	NDA
Unidentified		NDA	NDA	NDA	NDA	NDA	0	NDA
C-14		3.1(-4)	1.0(-4)	2.0(-4)	9(-4)	IA	0	1.5(-3)
Fe-59		NDA	NDA	NDA	NDA	IA	0	NDA
Cs-136		NDA	NDA	NDA	NDA	IA	0	NDA
Xe-131M		3.78(-2)	7.77(-1)	4.31(-1)	2.52	6.09(-2)	0	3.83
Ag-110M		NDA	NDA	NDA	NDA	IA	0	NDA
Ce-141		NDA	NDA	NDA	NDA	IA	0	NDA
Ce-144		NDA	NDA	NDA	NDA	IA	0	NDA
Others (Specify)							0	
8. Percent of Tech. Spec. Limit For Total Activity Released	%	2.07	9.28(-2)	1.96(-1)	4.56(-1)	[illegible]	0	[illegible]

ATTACHMENT I

TEST DEVIATIONS

TEST	MINIMUM FREQUENCY	RESULTS	CAUSE	CORRECTIVE ACTION REQUIRED
Gas Monitor Channel 1214	Once/Week	1. 9/7/73 Test reading out of specification	1. Oscillator bulb failed	1. Changed oscillator bulb and made minor adjustment to channel. Retested satisfactorily
Liquid Monitor Channel 1218	Once/Week	1. 9/14/73 Test reading out of specification	1. Calibration required	1. Channel calibrated and retested satisfactorily.

ATTACHMENT II