Florida
Power
CORPORATION

September 27, 1985
3F0985-25

Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
NUREG-0737, Item II.B.3
Post Accident Sampling System (PASS)

Dear Sir:

Florida Power Corporation is submitting this response in accordance with NRC letter dated August 26, 1985 (3N0885-25) in which you requested additional information for five of the eleven criteria summarized in your enclosed Interim Safety Evaluation. The individual responses to the five criteria are enclosed.

Sincerely,

E C Simpson

E. C. Simpson
Director, Nuclear Operations
Engineering & Licensing

Enclosure

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Requested Information
Criterion (2)

Provide a core damage procedure to include radionuclide concentrations and other physical parameters as indicators of core damage.

FPC Response
Criterion (2)

As stated in our March 30, 1984 (3F0384-11) submittal, we have a formal plant procedure for estimating percent core damage based upon in-containment radiation monitor readings for radiation in Rads/hr, Nobel Gas Activity in Curies and Iodine Activity in Curies. In addition, the Nuclear Fuel Management Department has a formal procedure for estimating core damage based upon reactor coolant radionuclide concentrations. This procedure incorporates a computer program which uses methods described in NUREG/CR-2507 titled "Background and Derivation of ANS-5.4 Standard Fission Product Release Model". The use of the plant procedure will give the initial damage estimate while the Nuclear Fuel Management procedure will give the longer term (after 3 hours for PASS analysis) estimate of core damage. The use of the above procedures provides the necessary estimate of core damage; the use of other physical parameters provides little additional information.

Requested Information
Criterion (4)

Provide the capability of measuring dissolved hydrogen or total gas in liquid samples.

FPC Response
Criterion (4)

Dissolved Hydrogen - The PASS liquid analysis phase separator has been modified. The modified system consists of spraying a liquid sample into the separator chamber with nitrogen injected into the spray for gas stripping. The separator chamber is operated at a pressure of -3.5 psig with level control by recirculation of liquid (i.e., sprayed back into chamber for additional gas stripping). The system is designed to measure gas concentrations up to 2,000 cc/kg with an accuracy of $\pm$ 20 cc/kg from 50 cc/kg to 2,000 cc/kg. The lower range (from 0 cc/kg to 50 cc/kg) has not demonstrated consistent $\pm$ 5 cc/kg accuracy when compared to lab samples of RCS in the range of 15 to 25 cc/kg. We are currently running comparisons of PASS samples with lab samples and recording all system parameters in order to determine the cause of the inconsistency.

Requested Information
Criterion (6)

Describe the shielding provisions to meet GDC-19.

FPC Response
Criterion (6)

See attached Dose Assessment Report (Attachment 1).

Requested Information
Criterion (10)

a) Provide information demonstrating applicability of procedures and instrumentation in the post-accident water chemistry and radiation environment.

b) Retrain operators on semi-annual basis.

c) Describe the accuracy, range, and sensitivity of the analytical measurements.

FPC Response
Criterion (10)

a) Attached is a NUS report (Attachment 2) documenting satisfactory peformance of Boron, Chloride, and pH analysis equipment. The peformance of the AIMS units is given in attached testing program summary.

In addition, attached is NRC Inspection Report No. 50-302/84-07 (Attachment 3) which gives results of actual PASS operation. The design problems identified in this report are resolved as follows:

1. Items 1 and 2 have been corrected by a system modification.

2. Item 3 - see Criterion 11 response.

3. Items 4 and 5 concerns do not need correction because the existing system has these capabilities.

4. The pH measurement has proven to be accurate within the required $\pm.3$ pH units.

5. See Criterion 4 response.

The PASS equipment is maintained by formal procedures on the following basis:

1. Dissolved H_2 monitor calibrated monthly.

2. PASS Cl^- calibrated and tested weekly when Reactor Coolant System SO_4 analysis is completed. Dionex Analysis Ion Chromatograph Instrument System calibrated prior to use.

3. PASS Boron titrator is calibrated daily using 1,000 ppm Boron STD for test.

4. PASS germanium detector is calibration checked daily.

5. The reactor building H_2 monitors are presently calibrated each refueling. However, a system modification which will be completed by December 31, 1985, will allow more frequent testing so that the reactor building H_2 monitors can also fulfill part of Technical Specification 3.6.4.1.

b) Operator training on PASS operation is conducted on an annual basis.

c) See our March 30, 1984 letter for information on range and accuracy. The sensitivity of the instrumentation is sufficient to achieve the stated accuracy within the required sampling time.

Requested Information
Criterion (11)

Provide information regarding heat tracing of containment air sample lines.

FPC Response
Criterion (11)

A detailed review of RB atmosphere sample lines has been completed with the resulting determination that heat tracing would reduce sample line losses if iodines were the radioisotopes of major concern. This is not the case for this type of sample and as such no heat tracing is required to meet the NUREG-0737 criteria. These criteria required analysis to quantify certain radioisotopes which are indicators of core damage (i.e., noble gases, iodine, cesium). The CR-3 PASS was configured to meet this criteria with two on-line isotopic monitors: one for gas, the other for liquid. The use of both systems provides input for core damage estimates, the gas system providing noble gas measurements, and the liquid system providing the measurement of iodine, cesium, and nonvolatile isotopes expected to remain with the liquid. This approach is consistent with the iodine behavior experienced at TMI where most of the iodine was released in the form of cesium iodine and, therefore, remained in the coolant rather than become airborne.

ATTACHMENT 1

CRITERION 6

DOSE ASSESSMENT REPORT

PART II

DOSE ASSESSMENT
TABLE OF CONTENTS

1.0 INTRODUCTION

On October 31, 1980, the NRC issued NUREG-0737, which incorporated into one document all TMI-related items approved for the implementation by the Commission at that time.

Concerning post-accident sampling capability, NUREG-0737 requires that a design and operational review of the reactor coolant and containment atmosphere sampling line systems should be performed to determine the capability of personnel to promptly obtain a sample under accident conditions. Radiation exposure to any individual could not exceed 3 rems and 18.75 rems to the whole body and extremities respectively. Accident conditions were to assume a Regulatory Guide 1.3 or 1.4 release of fission products.

The quantification of certain radionuclides that are indicators of core damage (nobles, iodines, cesiums, and non-volatile isotopes) and certain chemical analyses (boron and chloride) were also required.

Online monitoring could be used for sampling and analytical capability, however back-up sampling through grab samples would also be required.

2.0 SUMMARY

The purpose of Section II - Dose assessment is to establish man-rem dose assessments for personnel involved in obtaining

Liquid and gaseous samples during conditions specified in NUREG-0737.

The dose assessment for each operation consists of the following:

a) Brief description of the operation.

b) Definition of location and/or travel route required.

c) Time post-accident the operation is assumed to be performed.

d) Time duration required to perform the given operation.

e) Dose rate(s) at the location (s) and their source.

Sample collector dose rates for PART II of this report were calculated based on: (1) time post-accident for operation, (2) the explicit path traveled, (3) the distance the sample collector was from the souce(s), and (4) any shielding that was present at the specific location of the activity. A summary table of

the Zone Post-Accident Dose Rates Experienced by the Sample Collector is given on page 34.

Operations that are examined in this section are:

1. Liquid Sample Operations - Elevation 95'
   (a) Grab sample bomb isolation, removal, and installation.
   (b) Utilization of the in line AIM System to analyze samples.
   (c) Replenishment of the liquid nitrogen for the AIM detector.
   (d) Manual transfer of the sump sample cooler for Reactor Building Sump Sample Processing.
   (e) Replenishment of chemical reagents required for sample analyses.
   (f) Chloride analysis cart hook-up and operation.

2. Gaseous Sample Operations - Elevation 143'
   (a) Grab sample bomb isolation, removal, and installation.
   (b) Utilization of the in line AIM System to analyze samples.
   (c) Replenishment of the liquid nitrogen for the AIM detector.
   (d) Change-out of the iodine/air particulate cartridge/filters in RMA-1 & RMA-2 including transport of the samples and onsite counting.

(e) Change-out of the iodine/air particulate cartridge/filter in the Range units, including transport of the samples and onsite counting.

It should be noted that no attempt was made to evaluate the total number of personnel required for all post-accident sampling operations, nor cumulative doses to personnel who may work on more than one job or take more than one sample.

3.0 ASSUMPTIONS

(a) The time post-accident at which containment purge will be initiated based on hydrogen control is assumed to occur as per CR3 FSAR Section 14.B for intermittent purge (Reference No. 4).

(b) Sample lines will be flushed after each use as specified in References 1, 2, 3.

(c) Reach rods and tools required to remove iodine/air particulate cartridge/filters from the range manifold and RMA-1 and RMA-2 units on elevation 143' are available and in the Post Accident Sample System (PASS) area.

(d) During sampling operations, HP support will be present to maintain exposure ALARA.

(e) If the grab sample bomb (GSB) is shipped offsite, a shielded shipping cask which meets all DOT shipping requirements will be utilized.

(f) A walking speed of 50 feet per minute is assumed on any horizontal surface. A walking speed of 30 feet per minute is assumed for travel up and down stairs.

(g) During post-accident conditions, plant elevators will only be utilized to transport equipment (i.e. GSB) not personnel.

(h) Iodine/air particulate cartridge/filters will be transported using a small pig with the equivalent of 0.75 inches of No. 6 lead shot.

(i) It is assumed that the turbine building elevations 95' and 119' are low radiation areas, as is the Control Complex.

(j) Empty LN_2 tanks on elevation 143' (after replacement) will be left on elevation 143'.

OPERATION - Grab Sample Bomb (GSB) Isolation

LOCATION - Elevation 95', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Proceed to the post-accident sample area via the route specified by the access maps.
2. Isolate sample utilizing the GSB 3-way valves.
3. Return to the control complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=0 hours post-accident. This is conservative, because the GSB would not be utilized unless the AIM system failed.

TIME REQUIRED TO PERFORM THE OPERATION

1. Fifteen (15) seconds to isolate the sample.
2. Seventy (70) seconds to travel from the Control Complex (elevation 95') to the PASS area and back to the Control Complex.

DOSE RATES AND SOURCES

1. Zone No. 60 - 200 mrem/hr from adjacent zones.
2. Zone No. 18 - 30 mrem/hr direct shine from containment.
   - 2940 mrem/hr direct shine from rain forest with 2' shield wall.

OPERATIONAL DOSE - 85 mrem

OPERATION - Grab Sample Bomb (GSB) Installation

LOCATION - Elevation 95', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Procure GSB and cart and transport to post-accident sample area via the route specified by the access maps.
2. Position the GSB 3-way valves for sampling.
3. Push the GSB up the ramp onto the platform.
4. Align the connection points, close the cart to station locking mechanism, and pull the engagement lever forward.
5. Return to the control complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=0 hours post-accident. This is conservative, because the GSB would not be utilized unless the AIM System failed.

TIME REQUIRED TO PERFORM THE OPERATION

1. Ninety (90) seconds to install the GSB.
2. Seventy (70) seconds to travel from the Control Complex (elevation 95') to the PASS area and back to the Control Complex.

OPERATION - Grab Sample Bomb (GSB) Removal

LOCATION - Elevation 95', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Proceed to the post-accident sample area via the route specified by the access maps.
2. Install ramp in front of sample station.
3. Disconnect GSB cart from sample station.
4. Unlock GSB cart from sample station.
5. Remove GSB to the Turbine Building via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=0 hours post-accident. This is conservative, because the GSB would not be utilized unless the AIM System failed.

TIME REQUIRED TO PERFORM THE OPERATION

1. Twenty (20) seconds to install ramp.
2. Fifteen (15) seconds to remove GSB.
3. Three hundred twenty-six (326) seconds to travel from the Control Complex (elevation 95') to the PASS area and back through the Control Complex to the access hatch in the Turbine Building (elevation 95').
4. Thirty (30) seconds for the rigger to attach "grappel hooks" to the GSB so that the GSB can be lowered into a shipping cask.

DOSE RATES AND SOURCES

1. Zone No. 60 - 200 mrem/hr from adjacent zones.

2. Zone No. 18 - 30 mrem/hr direct shine from containment.

   - 2940 mrem/hr direct shine from rain forest with 2' shield wall.

3. GSB - 2653 mrem/hr contact dose rate.

   - 33 mrem/hr if GSB pulled by cart handle.

OPERATIONAL DOSE

43 mrem if the sample collector removes the GSB utilizing the cart handle.

229 mrem if the sample collector removes the GSB by pushing (contact).

23 mrem to the mechanic for rigging the GSB.

OPERATION - Utilization of AIM System

LOCATION - Elevation 95', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION - The AIM System is normally fully automated with control from the Count Room of the Control Complex - elevation 95'. There are two exceptions which might require personnel to leave the Control Complex. The first exception involves the manual adjustment of valves CAV-533 and CAV-539 located in the Post-Accident Sample Room, Zone No. 18, elevation 95'. Manual adjustment is required if valve CAV-484 does not provide the required system flow and pressure. The other exception requires the use of cross-tie valve CAV-500, located in Zone No. 19 of the Intermediate Building, elevation 95'. Valve CAV-500 is required if valves CAV-434 and CAV-436 are not available.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=0 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

Manual Adjustment Valves CAV-533, CAV-539

1. Ninety (90) seconds to adjust valves.
2. Eighty-seven (87) seconds to travel from the Control Complex (elevation-95') to the PASS Room and back to the Control Complex.

Manual Adjustment of Cross-Tie Valve CAV-500

1. Sixty (60) seconds to adjust the valve.

2. One hundred forty-five (145) seconds to travel from the Control Complex (elevation 95') to the valve CAV-500 and back to the Control Complex.

DOSE RATE AND SOURCES

1. Zone No. 60 - 200 mrem/hr. from adjacent zones.

2. Zone No. 18 - 30 mrem/hr direct shine from containment.

   - 2940 mrem/hr direct shine from rain forest with a 2 shield wall.

3. Zone No. 19 - 1000 mrem/hr from Zone No. 65.

4. PASS Room - 1000 mrem/hr from leaks and crud traps.

   - 1.35E+4 mrem/hr direct shine from rain forest with a 1.5' shield wall.

OPERATIONAL DOSE

389 mrem to adjust valves CAV-533 and CAV-539.

69 mrem to adjust cross-tie valve CAV-500.

OPERATION - Liquid Nitrogen (LN_2) Replacement

LOCATION - Elevation 95', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION -

1. Procure a LN_2 tank and proceed to the post-accident sample area via the route specified by the access maps.
2. Disconnect the empty LN_2 tank.
3. Connect the full LN_2 tank.
4. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=0 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. One hundred twenty (120) seconds to replace the LN_2 tanks.
2. Seventy (70) seconds to travel from the Control Complex (elevation-95') to the post-accident sample area and back to the Control Complex.

DOSE RATES AND SOURCES

1. Zone No. 60 - 200 mrem/hr from adjacent zones.
2. Zone No. 18 - 30 mrem/hr direct shine from containment.

   2940 mrem/hr direct shine from rain forest with a 2' shield wall.

OPERATIONAL DOSE - 110 mrem

OPERATION - Manual Transfer of the Sump Sample Cooler from the Reactor Building Sump Sample Processing

LOCATION - Main Control Board and PASS Mimic Panel

DESCRIPTION OF OPERATION - Transfer is no longer performed manually. CR3 Emergency Plan Implementing Procedure, EM-307, (Reference No. 3) addresses the system valve line-up necessary to obtain a sample from the Reactor Building sump. Operation is conducted from the Main Control Board and the PASS Mimic Panel.

TIME OPERATION PERFORMED POST-ACCIDENT - Not Applicable

TIME REQUIRED TO PERFORM THE OPERATION - Not Applicable

DOSE RATES AND SOURCES - Not Applicable

OPERATIONAL DOSE - None

OPERATION - Replenishment of Chemical Reagents (Chloride & Boron Analyses)

LOCATION - Elevation 95', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Prepare/obtain the necessary chemical reagents in containers suitable for quick connection.
2. Proceed to the post-accident sample area via the route specified by the access maps.
3. Remove the empty reagent containers and replace with the full reagent containers.
4. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=0 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. Thirty (30) seconds to replace reagent bottles on the chloride cart.
2. Sixty (60) seconds to replace reagent bottles in the wall rack West of the AIM System.
3. Two hundred forty (240) seconds to replace the reagent bottles above the AIM System.
4. Seventy (70) seconds to travel from the Control Complex (elevation-95') to the post-accident sample area and back to the Control Complex.

DOSE RATES AND SOURCES

1. Zone No. 60 - 200 mrem/hr from adjacent zones.

   Zone No. 18 - 30 mrem/hr direct shine from containment.

   - 2940 mrem/hr direct shine from rain forest with 2' shield wall.

   - 4 mrem/hr direct shine from rain forest with 4' shield wall.

OPERATIONAL DOSE

12 mrem - reagent bottle replacement on the chloride cart.

13 mrem - reagent bottle replacement in the Wall Rack West of the AIMS System.

14 mrem - reagent bottle replacement above the AIM System.

OPERATION - Chloride Analysis Cart Hook-Up and Operation

LOCATION - Elevation 95', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Procure the chloride analysis cart if the cart is not located at the Post-Accident Sample Station.
2. Proceed to the post-accident sample area via the route specified by the access maps.
3. Perform instrument checks and verifications.
4. Calibrate instrument and perform sample analysis.
5. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST ACCIDENT - The evaluation was performed at T=0 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. Six hundred (600) seconds to "hook-up" the chloride cart (if required).
2. Three thousand six hundred twenty-six (3626) seconds to perform the chloride calibration and analysis.
3. Eighty-eight(88) seconds to travel from the Control Complex (elevation 95') to the post-accident sample area with the Chloride Cart and back to the Control Complex.
4. Seventy (70) seconds to travel from the Control Complex (elevation 95') to the post-accident sample area and back to the Control Complex.

DOSE RATES AND SOURCES

1. Zone No. 60 - 200 mrem/hr from adjacent zones.

   Zone No. 18 - 30 mrem/hr direct shine from containment.

   - 2940 mrem/nr direct shine from the rain forest with a 2' shield wall.

   - 4 mrem/hr direct shine from the rain forest with a 4' shield wall.

   - <1 mrem/hr from sample lines in the PASS Room with a 2.5' shield wall.

OPERATIONAL DOSE

125 mrem - Chloride cart is "hooked-up" in PASS area.

146 mrem - Chloride cart must be brought to the PASS area.

OPERATION - Grab Sample Bomb (GSB) Isolation

LOCATION - Elevation 143', Zone No. 32, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Proceed to the post-accident sample area via the route specified by the access maps.
2. Isolate sample utilizing the GSB 3-way valves.
3. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=20 hours post-accident. The AIM System is an inline monitor, utilized for its sampling and analytical capabilities. The GSB would only be used in case of AIM System failure. This evaluation does not consider samples from the Reactor Building Purge Exhaust Duct, because purge is not initiated until 312 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. Fifteen (15) seconds to isolate the sample.
2. One thousand two hundred (1200) seconds to travel from the Control Complex (elevation 95') to the post-accident sample area (elevation 143') and back to the Control Complex.

DOSE RATES AND SOURCES

1. Zone Nos. 60, 59, 51, 47, 32, the area between Zone Nos. 47 & 48, and the designated stairwells between elevations 95' and 143' are all 30 mrem/hr.
2. Mini-Purge Filter - 54 mrem/hr (T=24 days, maximum build-up and decay on filters assuming purge begins at 312 hours).

OPERATIONAL DOSE - 13 mrem

OPERATION - Grab Sample Bomb (GSB) Installation

LOCATION - Elevation 143', Zone No. 32, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Procure GSB and cart and transport to post-accident sample area via the route specified by the access maps.
2. Position the GSB 3-way valves for sampling.
3. Push the GSB up the ramp onto the platform.
4. Align the connection points close the cart to station locking mechanism, and pull the engagement lever forward.
5. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=20 hours post-accident. The AIM System is an inline monitor, utilized for its sampling and analytical capabilities. The GSB would only be used in case of AIM System failure. This evaluation does not consider samples from the Reactor Building Purge Exhaust Duct, because purge is not initiated until 312 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. Fifty (50) seconds to remove the ramp from the wall.
2. Twenty (20) seconds to set-up the ramp.
3. Ninety (90) seconds to install the GSB.
4. One thousand two hundred sixty one (1261) seconds to travel

from the Turbine Building (elevation 119') to the post-accident sample area (elevation 143') and to the Control Complex (elevation 95').

DOSE RATE AND SOURCES

1. Zone Nos. 60, 59, 51, 47, 32, 52, the Hot/Cold Machine Shop, the area between Zone Nos. 47 & 48, and the designated stairwells traveled between elevations 95' and 143' are all 30 mrem/hr.
2. Zone No. 23 - 3.9E+4 mrem/hr from a one inch make-up line and the seal return coolers.
3. Zone No. 24 - 150 mrem/hr (East side), 1.5E+4 mrem/hr (West side) from the make-up tank.
4. Zone No. 25 - 375 mrem/hr make-up tank.
5. Mini-Purge Filter - 54 mrem/hr (T=24 days, maximum build-up and decay on filters assuming purge begins at 312 hours).

OPERATIONAL DOSE - 586 mrem

OPERATION - Grab Sample Bomb (GSB) Removal

LOCATION - Elevation 143', Zone No. 32, Post-Accident Sample Station

DESCRIPTION OF OPERATION -

1. Proceed to the post-accident sample area via the route specified by the access maps.
2. Install ramp in front of the sample station.
3. Disconnect GSB from the sample station
4. Unlock GSB cart from the sample station.
5. Remove GSB to the Turbine Building via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=20 hours post-accident. The AIM System is an inline monitor, utilized for its sampling and analytical capabilities. The GSB would only be used in case of AIM System failure. This evaluation does not consider samples from the Reactor Building Purge Exhaust Duct, because purge is not initiated until 312 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. Fifty (50) seconds to remove the ramp from the wall.
2. Twenty (20) seconds to set-up the ramp.
3. Fifteen (15) seconds to remove the GSB.
4. One thousand two hundred sixty one (1261) seconds to travel from the Control Complex (elevation 95') to the post-accident

sample area (elevation 143') and to the access hatch of the Turbine Building (elevation 119').

5. Thirty (30) seconds for the rigger to attach "grappel hooks" to the GSB so that the GSB can be lowered into a shipping cask.

DOSE RATES AND SOURCES

1. Zone Nos. 60, 59, 51, 47, 32, 52, the Hot/Cold Machine Shop, the area between Zone Nos. 47 & 48, and the designated stairwells traveled between elevations 95' and 143' are all 30 mrem/hr.
2. Zone No. 23 - 3.9E+4 mrem/hr from a one-inch make-up line and the seal return coolers.
3. Zone No. 24 - 150 mrem/hr (East side), 1.5E+4 mrem/hr (West side) from the make-up tank.
4. Zone No. 25 - 375 mrem/hr make-up tank
5. Mini-Purge Filter - 54 mrem/hr (T=24 days, maximum buildup and decay on filters assuming purge begins at 312 hours).
6. GSB - 31.8 mrem/hr contact dose rate
   - 4.8 mrem/hr if GSB pulled by cart handle

OPERATIONAL DOSE

585 mrem if the sample collector removes the GSB utilizing the cart handle.

588 mrem if the sample collector removes the GSB by pushing (contact).

1 mrem to the mechanic for rigging the GSB.

OPERATION - Utilization of AIM System

LOCATION - Elevation 143', Zone No. 18, Post-Accident Sample Station

DESCRIPTION OF OPERATION - The AIM System is fully automated with controls in the Count Room of the Control Complex - elevation 95'. Personnel are not required to perform any activities outside the Control Complex for this operation.

TIME OPERATION PERFORMED POST-ACCIDENT - Not Applicable

TIME REQUIRED TO PERFORM THE OPERATION - Not Applicable

DOSE RATES AND SOURCES - Not Applicable

OPERATIONAL DOSE - None

OPERATION - Liquid Nitrogen LN_2 Replacement

LOCATION - Elevation 143', Zone No. 32, Post-Accident Sample Station

DESCRIPTION OF OPERATION -

1. Procure a LN_2 tank and proceed to the post-accident sample area via the route specified by the access maps.
2. Disconnect the empty LN_2 tank.
3. Connect the full LN_2 tank.
4. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - The evaluation was performed at T=20 hours post-accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. One hundred twenty (120) seconds to replace the LN_2 tanks.
2. One thousand two hundred sixty one (1261) seconds to travel from the Turbine Building (elevation 119') to the post-accident sample area (elevation 143') and to the Control Complex (elevation 95').

DOSE RATES AND SOURCE

1. Zone Nos. 60, 59, 51, 47, 32, 52, the Hot/Cold Machine Shop, the area between Zone Nos. 47 & 48, and the designated stairwells traveled between elevations 95' and 143' are all 30 mrem/hr.

2. Zone No. 23 - 3.9E+4 mrem/hr from a one inch make-up line and the seal return coolers.
3. Zone No. 24 - 150 mrem/hr (East side), 1.5E+4 mrem/hr (West side) from the make-up tank.
4. Zone No. 25 - 375 mrem/hr make-up tank.
5. Mini-Purge Filter - 54 mrem/hr (T=24 days, maximum build-up and decay on filters assuming purge begins at 312 hours).

<u>OPERATIONAL DOSE</u> - 586 mrem

OPERATION - Iodine/Air Particulate Cartridge/Filter Replacement; RMA-1 and RMA-2

LOCATION - Elevation 143', Zone No. 32, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Procure appropriate cartridge/filter and lead pig and proceed to the post-accident sample area via the route specified by the access maps.
2. Utilizing long-handled wrenches or reach rods and portable shielding (if required by H.P. support), reverse the position of the 3-way manual valve.
3. Perform required valve adjustments and line purge as necessary.
4. Open shield door while monitoring for radiation fields. Release the spring held cartridge/filter and remove filter using the tong extractors. Place the cartridge/filter in a lead pig.
5. Install new cartridge/filter.
6. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST-ACCIDENT - Any time before the plant begins normal operation after the accident.

TIME REQUIRED TO PERFORM THE OPERATION

1. Three hundred (300) seconds to remove the old filter and replace it with a new filter.

2. One thousand two hundred (1200) seconds to travel from the Control Complex (elevation 95') to the post-accident sample area (elevation 143') and back to the Control Complex.

DOSE RATE AND SOURCE - RMA-1 and RMA-2 iodine/air particulate cartridge/filters are utilized during normal operations. During elevated radiation source term conditions, sample flow is diverted to the Range Manifold. Due to minimal sample flow rate, the presence of HEPA and charcoal filters upstream of RMA-1 and RMA-2 and the long decay time before filter change out, the dose rates will be negligible.

OPERATIONAL DOSE - Minimal

OPERATION - Iodine/Air Particulate Cartridge/Filter Replacement; Range Manifold

LOCATION - Elevation 143', Zone No. 32, Post-Accident Sample Station

DESCRIPTION OF OPERATION

1. Procure appropriate cartridge/filter and lead pig and proceed to the post-accident sample area via the route specified by the access maps.
2. Utilizing long-handled wrenches or reach rods and portable shielding (if required by H.P. support), reverse the position of the 3-way manual valve.
3. Perform required valve adjustments and line purge as necessary.
4. Open shield door while monitoring for radiation fields. Release the spring held cartridge/filter and remove filter using the tong extractors. Place the cartridge/filter in a lead pig.
5. Install new cartridge/filter.
6. Return to the Control Complex via the route specified by the access maps.

TIME OPERATION PERFORMED POST ACCIDENT - The evaluation was performed at T=312 days post-accident, based on the initiation of containment atmosphere purge to control hydrogen generation.

TIME REQUIRED TO PERFORM THE OPERATION

1. Three hundred (300) seconds to remove the old filter and replace the new filter.

2. One thousand two hundred (1200) seconds to travel from the Control Complex (elevation 95') to the post-accident sample area (elevation 143') and back to the Control Complex.

DOSE RATE AND SOURCE

1. Zone Nos. 60, 59, 51, 47, 32, the area between Zone Nos. 47 & 49, and the designated stairwells between elevations 95' and 143' are all 30 mrem/hr.
2. Unshielded filter/cartridge at two (2) feet is 25 mrem/hr.
3. Shielded filter/cartridge (contact) is 62 mrem/hr.
4. Sample line, 5/8 inch diameter, two feet away is 40 mrem/hr.
5. Mini-Purge Filter - 54 mrem/hr (T=24 days, maximum build-up and decay on filters assuming purge begins at 312 hours).

OPERATIONAL DOSE - 35 mrem.

OPERATIONAL DOSE

SUMMARY TABLE

(mrems)

DOSE ASSESSMENT (ELEVATION 95')	
GRAB SAMPLE BOMB ISOLATION	85
GRAB SAMPLE BOMB INSTALLATION	35
GRAB SAMPLE BOMB REMOVAL - Utilizing Cart Handle	43
- GSB Contact	229
- Mechanic	23
AIM SYSTEM - Valves CAV-533 & CAV-539	389
- Valve CAV-500	69
LIQUID NITROGEN REPLACEMENT	110
MANUAL TRANSFER OF SUMP SAMPLE COOLER FOR THE REACTOR BUILDING SUMP SAMPLE PROCESSING	NONE
REPLENISHMENT OF CHEMICAL REAGENTS (Chloride & Boron Analyses) - Chloride Cart	12
- Wall Rack West of AIMS	13
- Above AIMS	14
CHLORIDE ANALYSIS CART HOOK-UP AND OPERATION - Cart Hooked-Up	125
- Cart Not Hooked-Up	146
DOSE ASSESSMENT (ELEVATION 143')	
GRAB SAMPLE BOMB ISOLATION	13
GRAB SAMPLE BOMB INSTALLATION	586
GRAB SAMPLE BOMB REMOVAL - Utilizing Cart Handle	585
- GSB Contact	588
- Mechanic	1
AIM SYSTEM	NONE
LIQUID NITROGEN REPLACEMENT	586
FILTER CHANGE-OUT RMA-1 & RMA-2	MINIMAL
FILTER CHANGE-OUT RANGE MANIFOLD	35

ZONE POST-ACCIDENT DOSE RATES EXPERIENCED BY THE SAMPLE COLLECTOR SUMMARY TABLE (mrems)

ZONE	DOSE RATE (MR/HR)	TIME POST-ACCIDENT (HRS)	COMMENT
18	34	0	4 FT. CONC.
18	3.97E + 3	0	2 FT. CONC.
PASS ROOM	1.45E + 4	0	1.5 FT. CONC.
19	1.00E + 3	0	
23	3.90E + 4	20	
24	1.50E + 2	20	EAST OF MAKE-UP TANK DOORWAY
24	1.5E + 4	20	MAKE-UP TANK DOORWAY
25	3.75E + 2	20	
32	30	20	
47	30	20	
51	30	20	
59	30	20	
60	30	20	EAST COL. LINE 303
60	2.00E + 2	0	WEST COL. LINE 303

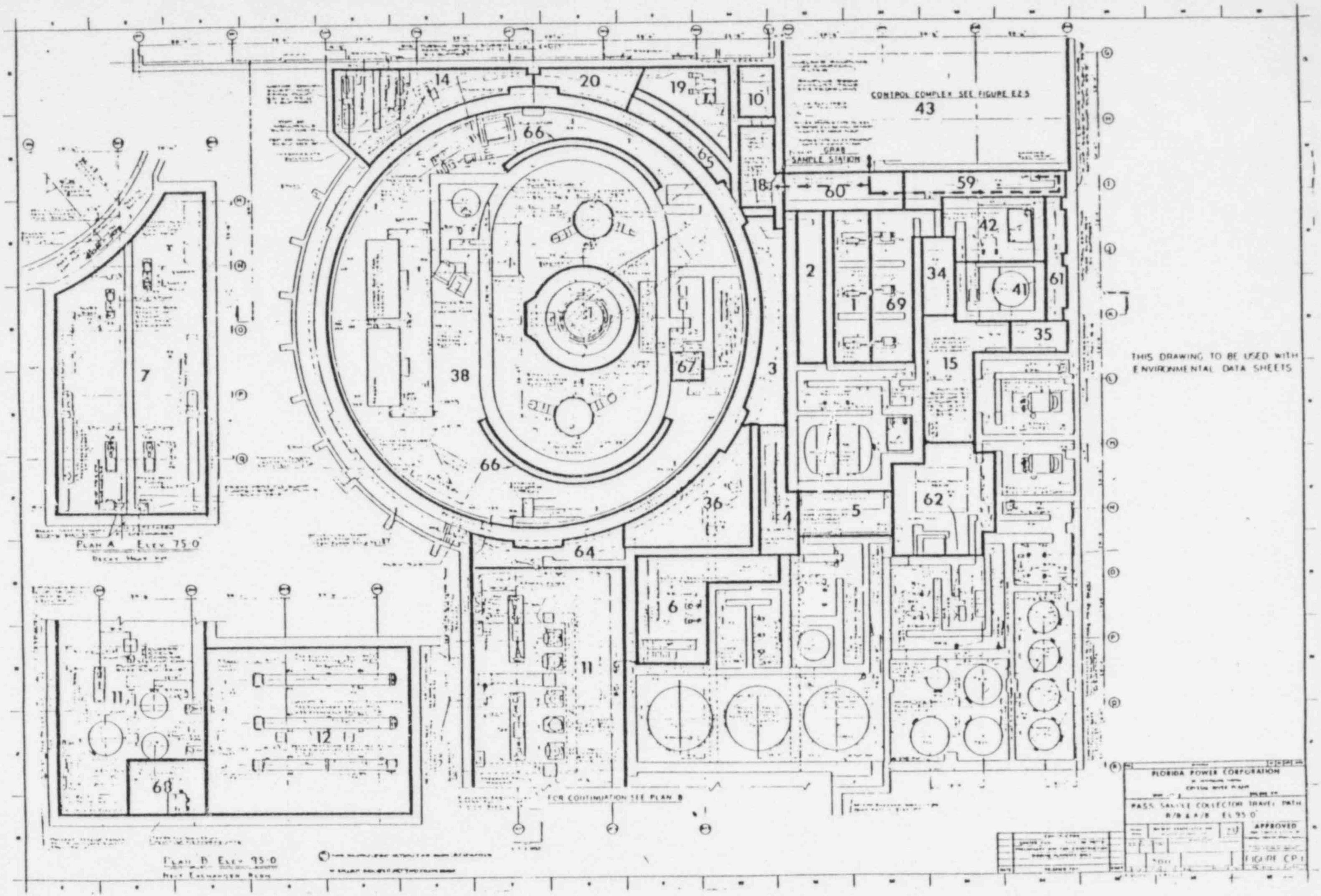
REFERENCES

1. EM-305, 12/19/83, Emergency Plan Implementing Procedure, "Post-Accident Sampling and Analysis of Effluent Releases from the Plant Using the Automated Isotopic Measuring System (A.I.M.S.)."

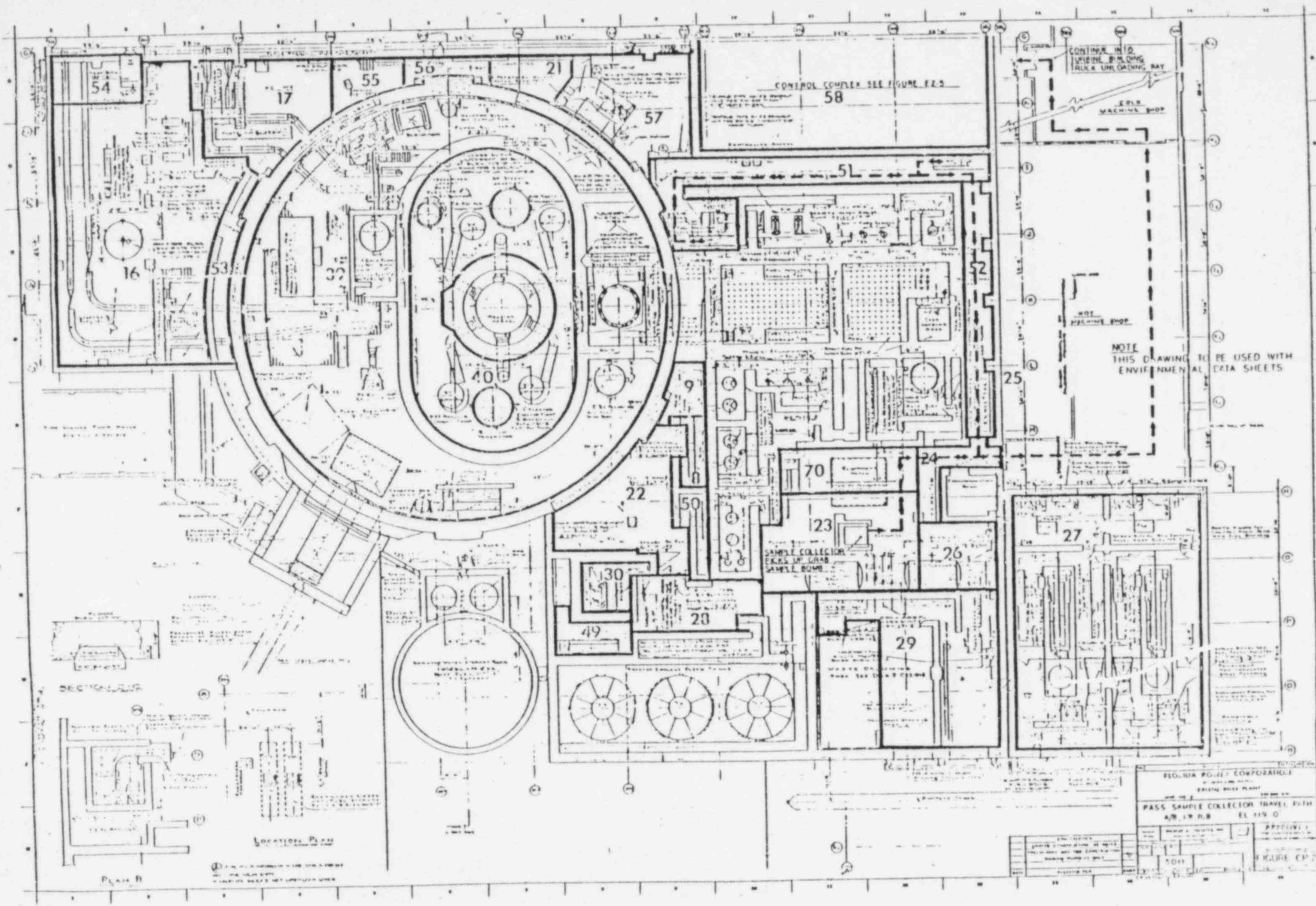
2. EM-306, 12/19/83, Emergency Plan Implementing Procedure, "Post Accident Sampling of the Reactor Building Atmosphere Using the Automated Isotopic Measuring System (A.I.M.S.)."

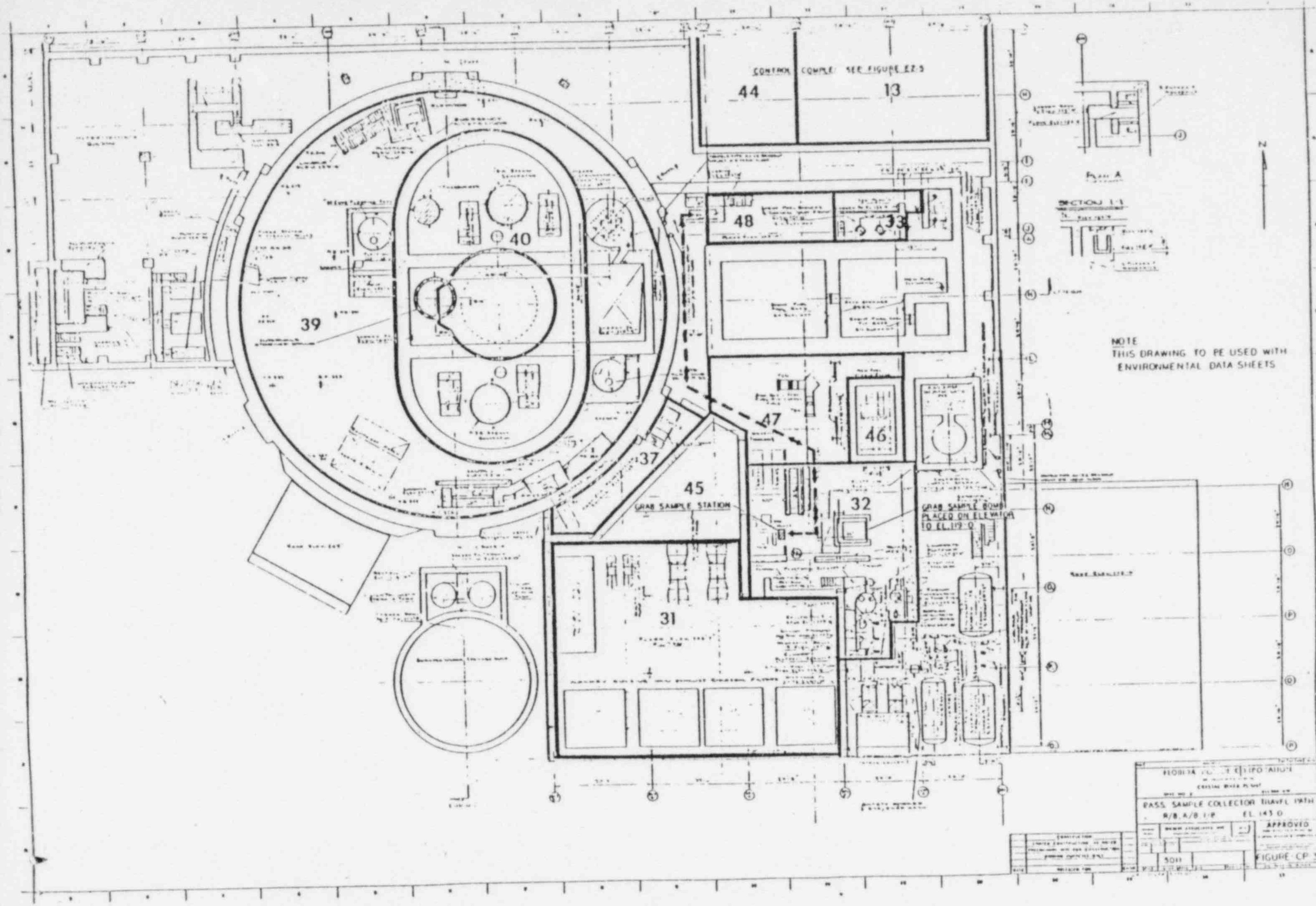
3. EM-307, 12/19/83, Emergency Plan Implementing Procedure, "Sampling and Analysis of the Reactor Coolant System, the Reactor Building Sump, and the Miscellaneous Waste Storage Tank Under Accident Conditions."

4. Florida Power Corporation, FSAR for Crystal River Unit-3, Section 14B.



CONTROL COMPLEX SEE FIGURE E2.5
43
GRAB
SAMPLE STATION
THIS DRAWING TO BE USED WITH
ENVIRONMENTAL DATA SHEETS
FOR CONTINUATION SEE PLAN B
PLAN A ELEV 75.0
PLAN B ELEV 95.0
FLORIDA POWER CORPORATION
PASS SAMPLE COLLECTOR TRAVEL PATH
EL 95.0
APPROVED
FIGURE CP1


CONTINUE INTO TURBINE BUILDING TRUCK UNLOADING BAY
COLD MACHINE SHOP
HOT MACHINE SHOP
CONTROL COMPLEX SEE FIGURE E2.5
58
NOTE
THIS DRAWING TO BE USED WITH ENVIRONMENTAL DATA SHEETS
54
55
56
21
17
57
16
53
40
51
25
24
70
9
22
50
23
SAMPLE COLLECTOR PICKS UP GRAB SAMPLE BOMB
26
27
30
28
49
29
SECTION
LOCATION PLAN
PLAN B
FLORIDA POWER CORPORATION
CRYSTAL RIVER PLANT
PASS SAMPLE COLLECTOR TRAVEL PATH
EL 119'0"
FIGURE


CONTROL COMPLEX SEE FIGURE EZ-5
44
13
48
33
40
39
47
46
37
45
GRAB SAMPLE STATION
32
GRAB SAMPLE BOMB PLACED ON ELEVATOR TO EL.119'-0
31
N
PLAN A
SECTION 1-1
NOTE
THIS DRAWING TO BE USED WITH ENVIRONMENTAL DATA SHEETS
FLORIDA POWER CORPORATION
PASS SAMPLE COLLECTOR TRAVEL PATH
R/B, A/B, I/P EL 143'-0
APPROVED
FIGURE CP-3

ATTACHMENT 2

CRITERION 10

NUS PASS ACCEPTANCE

NUS CORPORATION

2536 COUNTRYSIDE BOULEVARD
CLEARWATER FLORIDA 33515 2094
(813) 796-2264

PPD-DSD-228
Project 8972
January 6, 1984

Mr. Daniel J. Wilder
Florida Power Corporation
Crystal River Plant #3
P. O. Box 1241
Crystal River, Florida 32629

Subject: Acceptance Demonstration of NUS Supplied Post-Accident Sampling Equipment

Revision 1

Contract No. F9012205X

Dear Mr. Wilder:

Enclosed is the information required as documentation of the satisfactory performance of the NUS Corporation PASS equipment installed at the Crystal River-3 Nuclear Plant. The acceptance testing report outlines the equipment demonstrations witnessed by you and David Worley on September 21, November 10, and December 21, 1983.

The following items are also included with this report:

1. The original equipment printouts

2. A copy of the NRC matrix compositions

The documents submitted with this report demonstrate the ability of the NUS Corporation PASS equipment to perform within the specifications of the contract. This concludes the requirements of the contract.

Should you require any additional information in regard to this project, please feel free to contact me.

Sincerely,

William J. Moore

William J. Moore

WJM/es

NUS POST-ACCIDENT SAMPLING EQUIPMENT

ACCEPTANCE DEMONSTRATION

The Ionics DigiChem 3250 Boron Analyzer and the Dionex 2010i Ion Chromatograph were both demonstrated following final installation and modification. The performance of each unit will be addressed individually.

Ionics 3250 Boron Analyzer

The DigiChem 3250 unit was calibrated on September 21, 1983 following installation at the CR-3 plant. Calibration was performed using a 1000 ppm boron standard prepared by the CR-3 plant staff. Following calibration, standard solutions of 100, 1000, and 4000 ppm boron were prepared by the CR-3 staff and analyzed in the presence of Danny Wilder.

The following results were obtained:

Date: 9-21-83

Standard, ppm boron	Results	Allowable Error
100	102.0, 102.3	± 50 ppm
1000	994.2, 1013.0, 1002.0	± 50 ppm
4000	4012.0, 4012.0	± 200 ppm

A second demonstration was performed on November 10, 1983 in the presence of Danny Wilder. A calibration check was performed using the 1000 ppm FPC standard. Results showed the unit's accuracy was still within specifications after seven weeks of inactivity. A 100 ppm boron standard was analyzed as requested and the following results obtained:

Date: 11-10-83

Calibration Check	Results	Allowable Error
1000 ppm std.	982.6 ppm	± 50 ppm
100 ppm std.	107.3 ppm	± 50 ppm

The NRC matrix solution (I.D.#2) was tested at the request of Danny Wilder to verify the equipment's ability to analyze a caustic liquid sample. The matrix sample was successfully analyzed and the results are presented below.

Date: 11-10-83

Standard	Results
1800 ppm boron	1798.0

On December 21, 1983, a final demonstration of the Ionics 3250 was performed to verify the proper operation of a newly installed "prom." The unit was recalibrated using an FPC 1000 ppm boron standard, and a calibration check performed.

A pH analysis was then performed using NRC matrix solutions 1 and 2. Five pH readings were taken for each solution, using the Ionics 3250 pH sequence. The results of the analysis are given below.

Date: 12-21-83

NRC Matrix #1 (non-caustic)

pH Readings

5.926

5.235

4.342 Average = 5.539

5.776

6.415

NRC Matrix #2 (caustic)

pH Readings

8.253

9.088

9.481 Average = 9.058

9.430

9.040

Dionex 2010i Ion Chromatograph

The Dionex 2010i was first demonstrated to David Worley and Danny Wilder on November 10, 1983. The NRC caustic matrix solution (#2) containing 10 ppm chloride was analyzed in the unit for use as a calibration fluid. The unit was first allowed to stabilize. Stabilization was determined by two identical chloride readings of 16.123 ppm. The unit was then calibrated to the correct chloride

content of 10 ppm and two additional runs were made for verification. The retention time window was then increased in the calibration to allow for analysis of the non-caustic matrix. Following this adjustment, two runs were made with the non-caustic matrix (#1) containing 10 ppm chloride. The results of these runs are given below.

Date: 11-10-83

Standard, ppm Cl	Results, ppm Cl	Allowable Error
Initial runs - stabilization using matrix #2		
10.00	16.123	---
10.00	16.123	---
Verification of calibration		
10.00	9.999	± 1 ppm
10.00	10.013	± 1 ppm
Analysis of matrix #1		
10.00	10.000	± 1 ppm
10.00	10.001	± 1 ppm

A second demonstration was performed with the Dionex 2010i on December 21, 1983. The purpose of this test was to verify the chloride content of the matrix solutions used in the 11/10/83 demonstration. A standard solution of 10 ppm chloride was prepared by the CR-3 staff and used to calibrate the ion chromatograph. Matrix solution #1 was then tested for chlorides and the following results were obtained.

Date: 12-21-83

Calibration check

Standard	Results, ppm Cl
10.00 ppm ct	9.974

NRC Matrix #1

Run#	Results, ppm Cl
10	9.938
11	9.550
12	*
13	9.705

*Insufficient time was allowed for the elution of the sulfate peak in run #11. This resulted in the simultaneous emergence of the sulfate and chloride peak in run #12, producing a false chloride value.

TABL

PWR MATRIX SAMPLES FOR POST-ACCIDENT CHLORIDE ANALYSIS QUALIFICATION

MATRIX ID	PURPOSE	mL OF STOCK DILUTED TO 1L						gNaOH Diluted to 1L (1)	ppm IN MATRIX												ppm Na (Added as NaOH)
		A	B	C	D	E	F		I^-	Cs^+	Ba^{++}	La^{+3}	Ce^{+4}	Cl^-	B	Li^+	NO_3^-	NH_4^+	K^+	Ac^-	
☆ 1	NRC Matrix-RCS (no caustic)	10	10	10	400	10	0	0	40	250	10	5.0	5.0	10	2000	2.0	150	5.0	20	2.9	0
☆ 2	NRC Matrix-Sump (caustic)	10	10	10	400	10	0	11.24	40	250	10	5.0	5.0	10	2000	2.0	150	5.0	20	2.9	6,458
3	NRC Matrix-RCS Low Cl (no caustic)	10	10	10	400	0	0	0	40	250	10	5.0	5.0	3.83	2000	2.0	139	1.3	12.3	0	0
4	NRC Matrix-Sump Low Cl (caustic)	10	10	10	400	0	0	11.24	40	250	10	5.0	5.0	3.83	2000	2.0	139	1.3	12.3	0	6,458
5	NRC Matrix-RCS 0 Cl (no caustic)	10	10	0	400	0	0	0	40	250	10	0	5.0	0	2000	2.0	139	1.3	12.3	0	0
6	NRC Matrix-Sump 0 Cl (caustic)	10	10	0	400	0	0	11.24	40	250	10	0	5.0	0	2000	2.0	139	1.3	12.3	0	6,458
7	Matric-Cl Testing (no caustic)	10	10	0	400	0	1.0	0	40	250	10	0	5.0	0.1	2000	2.0	139	1.3	12.4	0	0
8	Matrix-Cl Testing (caustic)	10	10	0	400	0	1.0	11.24	40	250	10	0	5.0	0.1	2000	2.0	139	1.3	12.4	0	6,458
9	Matrix-Cl Testing (no caustic)	10	10	0	400	0	5.0	0	40	250	10	0	5.0	0.5	2000	2.0	139	1.3	12.9	0	0
10	Matrix-Cl Testing (caustic)	10	10	0	400	0	5.0	11.24	40	250	10	0	5.0	0.5	2000	2.0	139	1.3	12.9	0	6,458
11	Matrix-Cl Testing (no caustic)	10	10	0	400	0	10	0	40	250	10	0	5.0	1.0	2000	2.0	139	1.3	13.4	0	0
12	Matrix-Cl Testing (caustic)	10	10	0	400	0	10	11.24	40	250	10	0	5.0	1.0	2000	2.0	139	1.3	13.4	0	6,458
13	Matrix-Cl Testing (no caustic)	10	10	0	400	0	25	0	40	250	10	0	5.0	2.5	2000	2.0	139	1.3	15.1	0	0
14	Matrix-Cl Testing (caustic)	10	10	0	400	0	25	11.24	40	250	10	0	5.0	2.5	2000	2.0	139	1.3	15.1	0	6,458
NRC MATRIX	-----	--	--	--	---	--	--	---	40	250	10	5	5	10	2000	2	150	5	20	--	AS REQUIRED

(1) Common laboratory grade NaOH contains approximately 50 ppm chloride. If chloride-free NaOH cannot be obtained, use 16.30 g of $NaOH \cdot H_2O$ (Alfa No. 89818) rather than 11.24 g of NaOH as indicated.

BORON ANALYZER

Analysis of Florida Power Corporation Boron Standards
Performed September 21, 1983

01

RATE?(1-99)
99

STEPS? (1-9999)
9999

DISPENSE BURETTE
01

RATE?(1-99)
99

STEPS? (1-9999)
6000

REPEAT SEQ
02

COUNT
2

LOW 1.000

102.3

BORON 102.3 PPM

LOW 1.000

102.0

BORON 102.0 PPM

100 ppm Boron Standard

MIDDLE 1.000

994.2

BORON 994.2 PPM

MIDDLE 1.000

REPEAT SEQ
03

COUNT
2

MIDDLE 1.000

1013.

BORON 1013. PPM

MIDDLE 1.000

1002.

BORON 1002. PPM

DISPENSE BURETTE
01

RATE?(1-99)
99

STEPS? (1-9999)
2500

DISPENSE BURETTE

1000 ppm Boron Standard

REPEAT SEQ
04

COUNT
2

HIGH 1.000

4012.

BORON 4012. PPM

HIGH 1.000

4012.

BORON 4012. PPM

REPEAT SEQ
04

COUNT
1

4000 ppm Boron Standard

BORON ANALYZER

November 10, 1983 Demonstration

Calibration Check	100 ppm Boron Std.	NRC Caustic Matrix Solution(I.D. # 2)
982.6	REPEAT SEQ 02	REPEAT SEQ 03
BORON 982.6 PPM	COUNT 1	COUNT 1
	LOW 1.000	MIDDLE 1.000
	107.3	1798.
	BORON 107.3 PPM	BORON 1798. PPM
		2000

BORON ANALYZER

pH Determination of NRC Matrix Solutions
Performed December 21, 1983

REPEAT SEQ
06

COUNT
5

5.926

5.235

4.342

5.776

6.415

Matrix #1 (Non-Caustic)

REPEAT SEQ
06

COUNT
3

8.253

9.088

9.481

REPEAT SEQ
06

COUNT
2

9.438

9.048

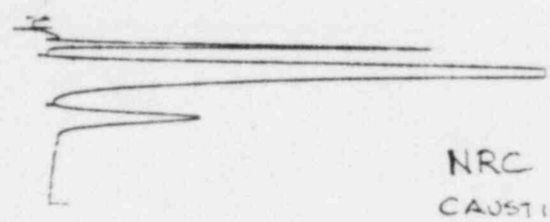
Matrix #2 (Caustic)

ION CHROMATOGRAPH

Calibration Using Caustic NRC Matrix (I.D. #2)

Performed November 10, 1983

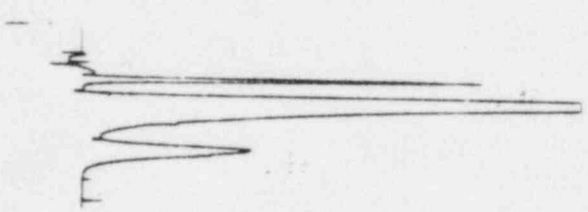
DJW



NRC
CAUSTIC MATRIX
(I.D #2)
100 uS output

DJW

	[illegible]	CAL#	AMOUNT
	[illegible]	1	16.123

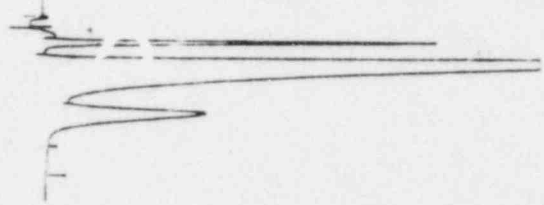


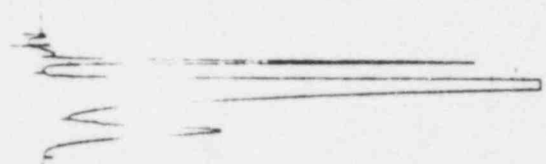
	HEIGHT TYPE	CAL#	AMOUNT
[illegible]	[illegible]2208 +SHL	1	16.123

DJW

TOTAL [illegible] [illegible]2200
MUL FACTOR 1.0000E+00

CALIBRATION





ION CHROMATOGRAPH

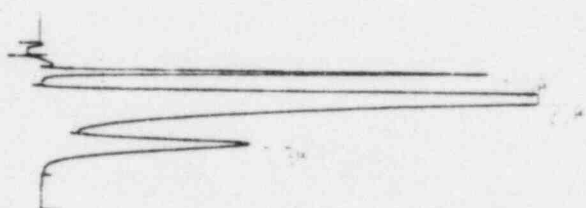
Analysis of Non-Caustic NRC Matrix (I.D. #1)

Performed November 10, 1983

INCREASE
RETENTION TIME WINDOW

AMT/HEIGHT
1.1375E+06

DJW

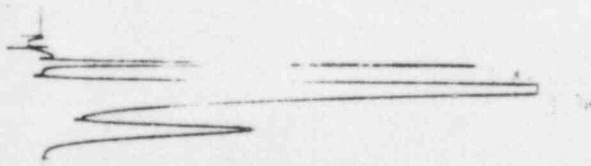


NON-CAUSTIC
NRC MATRIX
(I.D. # 1)
100 uS output

	HEIGHT	TYPE	CAL#	AMOUNT
[illegible]	0092320	*SHD	1R	10.000

DJW

MUL FACTOR= 1.0000E+00

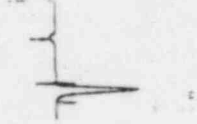


[illegible]	[illegible]	TYPE	CAL#	AMOUNT
[illegible]	[illegible]260	[illegible]	1F	[illegible]

[illegible] [illegible]
MUL FACTOR 1.0000E+00

ION CHROMATOGRAPH

Calibration Using FPC Prepared 10 ppm Chloride
Performed December 21, 1983



STOP

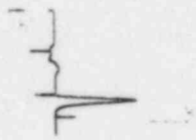
RUN # [illegible]16 DEC/21/83 14:38:4[illegible]

ESTD

RT	HEIGHT	TYPE	CAL#	AMOUNT
2.25	12[illegible]157	PB	1	9.93[illegible]

TOTAL AREA= 1274200
MUL FACTOR= 1.0000E+00

ESCAPE

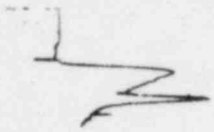


STOP

RUN # [illegible] DEC/21/83 14:54:[illegible]

ESTD

RT	HEIGHT	TYPE	CAL#	AMOUNT
2.29	12[illegible]351	BB	1	9.550



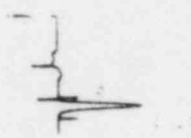
STOP

RUN # [illegible] DEC/21/83 14:59:[illegible]

ESTD

RT	HEIGHT	TYPE	CAL#	AMOUNT
2.27	1[illegible]547	V[illegible]	1	15.065

TOTAL [illegible] .500
MUL FACTOR= 1.0000E+00



STOP

RUN # [illegible] DEC/21/83 15:11:51

ESTD

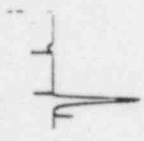
RT	HEIGHT	TYPE	CAL#	AMOUNT
2.26	[illegible]4225	PB	1	9.705

TOTAL [illegible] 1244.00
MUL FACTOR= 1.0000E+00

ION CHROMATOGRAPH

Analysis of NRC Matrix #2 (Non-Caustic)

Performed December 21, 1983



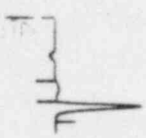
STOP

RUN #   DEC/21/83 14:03:19

ESTD

RT	HEIGHT	TYPE	CAL#	AMOUNT
2.27	1277159	PB	1R	3.499

TOTAL HEIGHT= 1282200
MUL FACTOR= 1.0000E+00



STOP

RUN # 6   DEC/21/83 14:02:33

ESTD

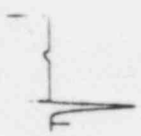
RT	HEIGHT	TYPE	CAL#	AMOUNT
2.26	1277216	BB	1R	3.46[illegible]

TOTAL HEIGHT= 1277200
MUL FACTOR= 1.0000E+00

ESTD CALIB RUNS 1
REF % RTW 10.00 % RTW 10.00

CAL#	RT	AMT	AMT/HEIGHT
1	[illegible]	1.0000E+01	2.7104E-06

EDIT CALIB



STOP

RUN # DEC/21/83 14:22:48

ESTD

RT	HEIGHT	TYPE	CAL#	AMOUNT
2.28	12.8029	PR	1	9.974

TOTAL HEIGHT 12.8700
MUL FACTOR 1.0000E+00

Please note the following important revisions to the PASS Operating Manual.

1. Page 2-2: Ion Chromatograph Startup

   Item 2. "Place valve A in OFF."

   Corrected to: "Place valve A in ON."

   This correction is the result of modifying valve A to control the flow of acid regenerants to the fibrous suppressor columns. Valve A was previously inoperative.

2. Page 2-3: Ion Chromatograph Startup

   Item 7, comment 5. The output range of the conductivity detector will reset to 30μS whenever the unit is turned off. Operators should insure that the proper output is set when the unit is turned back on.

Please replace current Operating Manual pages with the enclosed revisions.

PASS TESTING PROGRAM

PURPOSE: DEVELOP A TWO LEVEL PROGRAM THAT FUNCTIONALLY TESTS THE POST ACCIDENT SAMPLING SYSTEM, NOBLE GAS UPGRADE, AND CONTAINMENT HYDROGEN MONITORING SYSTEM.

LEVEL I. TEST THE THREE MODIFICATIONS UP TO, BUT NOT INCLUDING AN ACTUAL SYSTEM ANALYSIS OF REACTOR COOLANT OR CONTAINMENT ATMOSPHERE.

LEVEL II: UTILIZE THE P.A.S.S. SYSTEM TO ANALYZE A REACTOR COOLANT SAMPLE AND INJECT A 'HOT' TEST GAS INTO THE NOBLE GAS AIMS MANIFOLDS.

TEST RESULTS

A. CONTAINMENT HYDROGEN MONITORING SYSTEM

BOTH HYDROGEN ANALYZERS CALIBRATED WITHIN ±0.2% OF THE 4 CERTIFIED TEST GAS BOTTLES.

B. NOBLE GAS AIMS DETECTORS

NOBLE GAS VENT MANIFOLD

	Alara	Aims	% Difference
Xe - 133	1.109E-0	1.186E-0	6.94
Xe - 133m	1.875E-2	1.724E-2	8.05
Xe - 135	9.921E-2	1.196E-1	20.55
Kr - 85m	5.075E-3	6.070E-3	19.61

NOBLE GAS CONTAINMENT MANIFOLD

	Alara	Aims	% Difference
Xe - 133	1.365E-0	1.144E-0	16
Xe - 133m	2.443E-2	2.84E-2	16
Xe - 135	1.736E-1	1.757E-1	1.2
Kr - 85m	1.292E-2	1.13E-2	12.5

NOTE: $\% \text{ Difference} = \left(\frac{(\text{Alara} - \text{Aims})}{\text{Alara}} \right) \times 100$

TEST RESULTS

C. PASS

	Counting Room Equip	Aims	% Difference
Xe - 133	5.40E-1	4.815E-1	+ 10.8
Xe - 133m	1.23E-2	5.89E-3	+ 52.1
Xe - 135	1.31E-1	1.365E-1	- 4.2
Xe - 135m	1.09E-1	4.387E-2	+ 59.7
Kr - 85m	1.83E-2	2.116E-2	- 15.6
F-18	8.283E-2	3.418E-1	- 312.65
Ce - 139	2.639E-3	3.095E-3	- 17.28
Nb - 95	3.136E-3	4.933E-3	- 57.3
I - 131	7.466E-3	5.36E-3	+ 28.2
I - 132	9.699E-2	1.425E-1	- 46.9
I - 133	6.955E-2	8.073E-2	- 16.08
I - 134	1.661E-1	1.635E-1	+ 1.56
I - 135	1.157E-1	1.33E-1	- 15
Ru - 106	6.606E-2	2.683E-1	- 306
Cs - 138	1.81E-1	1.746E-1	3.5
Ba - 139	2.525E-2	1.512E-2	40.12

NOTE: $\% \text{ Difference} = \left(\frac{\left(\text{Counting Room Equip} - \text{Aims}\right)}{\text{nting Room Equip}} \right) \times 100$

TEST RESULTS

C. PASS (Cont.)

	Lab Results	Pass	Clarification Letter Acceptance Criteria
BORON	865 PPM	860 PPM	± 50 PPM
CHLORIDE	<50 PPB	12.7 PPB	± 50 PPB
PH	6.6	6.52	± .3 PH
DISSOLVED HYDROGEN	- EQUIPMENT PROBLEM - NO RESULTS		

P.A.S.S. TRAINING AGENDA

1. REVIEW OF SYSTEM PRINTS

2. REVIEW OF TRAINING MANUAL

3. PASS SYSTEM WALKDOWN

4. PASS SYSTEM's VALVE LINE-UP

5. VALVE LINE-UP AND GENERAL EQUIPMENT LOCATION QUIZ (VERBAL)

6. GRAB SAMPLER INSTRUCTION AND PRACTICE

7. GRAB SAMPLER QUIZ (DEMONSTRATE ABILITY TO MANIPULATE THE GRAB SAMPLERS)

8. CMCOLL PRACTICE SESION

9. CMCOLL QUIZ (DEMONSTRATE ABILITY TO UTILIZE THE NUCLEAR DATA CMCOLL PROGRAM TO PERFORM VARIOUS SYSTEM OPERATIONS)

10. PASS (LIQUID) SYSTEM FLOW DEMONSTRATION
    UTILIZE CAV-484 TO DEMONSTRATE THE TECHNIQUE OF ESTABLISHING FLOW IN THE PASS LIQUID SYSTEM

11. REVIEW

12. FINAL EXAM (WRITTEN)

13. DEVELOP AND REVIEW SYSTEM OPERATING PROCEDURES (OPTIONAL)

NEW EMERGENCY PROCEDURES DEVELOPED
FOR P.A.S.S

EM-305 POST ACCIDENT SAMPLING AND ANALYSIS OF EFFLUENT RELEASES FROM THE PLANT USING THE AUTOMATED ISOTOPIC MEASURING SYSTEM (AIMS)

EM-306 POST ACCIDENT SAMPLING OF THE REACTOR BUILDING ATMOSPHERE USING THE AUTOMATIC ISOTOPIC MEASURING SYSTEM (AIMS)

EM-307 SAMPLING AND ANALYSIS OF THE REACTOR COOLANT SYSTEM, THE R. B. SUMP AND THE MISCELLANEOUS WASTE STORAGE TANK UNDER ACCIDENT CONDITIONS

ATTACHMENT 3

CRITERION 10

NRC REPORT NO. 50-302/84-07

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

Report No.: 50-302/84-07

Licensee: Florida Power Corporation
3201 34th Street, South
St. Petersburg, FL 33733

Docket No.: 50-302

License No.: DPR-72

Facility Name: Crystal River 3

Inspection at Crystal River site near Crystal River, Florida

Inspector: L. A. Franklin — 4.26.84 Date Signed

Accompanying Personnel: A. C. Stalker, EG&G Idaho, Inc.

Approved by: G. R. Jenkins, Section Chief — 4/26/84 Date Signed
Emergency Preparedness and Radiological
Programs Branch
Division of Radiation Safety and Safeguards

SUMMARY

Inspection on February 27 - March 2, 1984

Areas Inspected

This special, announced inspection involved 64 inspector-hours on site in the areas of post accident sampling system, posting and labeling, and plant tours.

Results

Of the three areas inspected, no violations or deviations were identified in two areas; one apparent violation was found in one area.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*E. Morris Howard, Director, Site Nuclear Operations
*P. McKee, Plant Manager
*G. L. Boldt, Plant Operations Manager
R. Clarke, Plant Health Physics Manager
*S. Robinson, Radwaste Manager
*D. Wilder, Chemical Waste Supervisor
M. Siapno, Health Physics Supervisor
R. Browning, Health Physics Supervisor
*J. L. Bute, Nuclear Compliance Specialist
*M. S. Mann, Nuclear Compliance Supervisor
*J. Roberts, Nuclear Chemistry Manager
*D. McCollough, Chief Nuclear Chemist
*R. Fuller, Site Nuclear Service Manager
D. Betts, Quality Audits Supervisor, Corporate
*W. A. Clemons, Compliance Superintendent
*V. R. Roppel, Manager, Plant Engineering and Technical Services
*W. Rossfeld, Compliance Manager
*W. D. Worley, Chemistry Specialist
*M. Penovich, Nuclear Operations, Licensing
*F. Sullivan, Nuclear Plant, Engineer II

Other licensee employees contacted included four technicians and three office personnel.

NRC Resident Inspector

*T. F. Stetka, Senior Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on March 2, 1984, with those persons indicated in paragraph 1 above.

3. Licensee Action on Previous Enforcement Matters

Not inspected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Licensee Action on NUREG 0737 Items

(Closed) (11.B.3) Post Accident Sampling System

A review of the system design and installation was made. The review consisted of spot checking and tracing a number of lines in the sampling system and comparing these with the drawings and system descriptions. No discrepancies were noted with the physical installation. A safety analysis has been performed and there are no unreviewed safety questions.

System procedures have been prepared, reviewed and approved as required by Technical Specification 6.8.1. However, the review that was performed for the Emergency Plan Implementing Procedure, EM 307, on December 19, 1983, and approved December 30, 1983, was inadequate in that EM 307, which covers the post accident sampling system value lineups, contains a direct conflict with operating procedure OP-301. EM 307 requires certain valves be open for normal sample paths and to return those samples to containment. OP 301 requires that the same valves be closed. As a result, should a sample be required, the normal return path would be unavailable and the highly contaminated water would be sent to the radioactive waste system in the auxiliary building. The safety significance of using this alternate method of sampling depends upon the amount of core damage present at the time the sample is drawn, but it is not anticipated that this improper lineup would have significantly affected other plant recovery operations. Failure to perform an adequate review is a violation of Technical Specification 6.8.1 (50-302/84-07-01).

The system has been designed with adequate shielding so that a sample can be taken and analyzed within the radiation exposure limits prescribed by NRC. However, there are a large number of manually operated valves, some inside the reactor building, that must be kept open during operation so that the system would be available in the event of an accident. An adequate system of controls for these valves must be developed and implemented. This item will be examined during future inspection (IFI 84-07-02).

The licensee has an adequate formal training and retraining program with documented hands-on training. Thirteen staff members have been trained in the operation of the system. This appears to be a sufficient number of experienced system operators.

The licensee has a written acceptance test program and properly recorded results. The program included both the installation of the equipment and the testing of the chemical procedures using the NRC mandated standard test matrix. The recalibration and periodic test program has not yet been completely codified in a set of formal procedures. This will be examined during future inspections (IFI 84-07-03).

Reactor coolant samples were analyzed and all of the results were acceptable except for the hydrogen and the pH. Both of these results were outside of the acceptance criteria. Containment atmosphere samples were taken for

noble gases and iodines. The results were acceptable except for the Xe-133 results which were outside of the acceptance criterion. No containment hydrogen samples were run due to the problem of not being able to open the containment isolation valves during plant power operations. This will be examined during future inspections (IFI 84-07-04).

The following design problems were noted:

1) The stripped gas from the reactor coolant hydrogen analysis is routed to the waste gas system. The return should go to containment.

2) A drain tank in the PASS system needs to be shielded in the event that it were to fill with reactor coolant.

3) The containment air sample lines are not heat traced so that moisture in the system could affect the results of the sample.

4) A purge system should be installed in sample lines to prevent blockage and excessive plateout.

5) The ventilation exhaust from the sample station should be filtered at some point through charcoal absorbers and HEPA filters.

These items will be examined during future inspections (IFI 50-302/84-07-05).

6. Plant Tours

The inspector toured all elevations of the Auxiliary Building. Independent measurements of radiation levels in selected areas were taken. All monitored areas were properly posted and all stored equipment was properly labeled. The Auxiliary Building offgas system has developed minor leakage into the building which, at times, is showing activity levels up to 1E-9 uci/ml. This leakage has been occurring since December 1983. The isotope identified by the licensee, is Rubidium-88. This leakage has resulted in minor clothing contaminations, primarly of the security force whose uniform material traps this particulate. It has further been found that in some cases, the security force uniforms are being contaminated by Lead-214 which is emanating from the coal fired power plants adjacent to this plant. The offgas leakage, while not a significant radiological hazard, is a matter of concern to both plant personnel and the inspector. Plant management has formed a task group to attempt to locate the precise location of these leaks and to seal them. The task group started this work February 6, and initially had some success in reducing activity Leaks. As of February 27, the activity levels were down to normal background levels. However, with the testing of the post accident sampling system during this inspection, additional pressure on the offgas system revealed additional leakage and activity levels up to 6E-9 µci/ml were noted. During this inspection, the task group was engaged in attempting to locate the source of this leakage.

No violations or deviations were identified.