A.1.1RO Conduct Of Operations ADMIN 006A1.02 - RO

TITLE: Determine required quantity of Boric Acid solution and Reactor Makeup water and integrator settings for makeup to the RWST.

TASK STANDARD: Determine the required quantity of Boric Acid and Reactor Makeup water to restore RWST level at the current Boric Acid Concentration, and correctly determine the setting of the Reactor Makeup system integrators and the potentiometer setting for the Boric Acid Flow controller.

PROGRAM APPLICABLE: SOT ___ SOCT _____ OLT _X_ LOCT_____

ACCEPTABLE EVALUATION METHOD: _X_ PERFORM ___ SIMULATE ___ DISCUSS

EVALUATION LOCATION: ____ SIMULATOR ___ CONTROL ROOM _X_ CLASSROOM

PROJECTED TIME: _20 MIN_ SIMULATOR IC NUMBER: _N/A_

ALTERNATE PATH ___ TIME CRITICAL ___ PRA_____

Examinee:	
Overall JPM Performance: Satisfactory ☐	Unsatisfactory ☐
Evaluator Comments (attach additional sheets if necessary)	

EXAMINER: ____________________

CONDITIONS

When I tell you to begin, you are to determine RWST Makeup quantity, Boric acid concentration, and integrator setting for make up to the RWST per FNP-1-SOP-2.3, Chemical And Volume Control System Reactor Makeup Control System, starting at Step 4.2.3.2 Makeup to Refueling Water Storage Tank (RWST). The conditions under which this task is to be performed are:

a. Unit 1 is at 100% power and stable.
b. RWST Level is at 37.7 feet.
c. RWST Boron concentration is at 2400 ppm.
d. On Service BAT concentration is 7500 ppm.
e. RWST Purification (Recirc) is NOT on-service.
f. The Reactivity Spreadsheet is not available.
g. You are the extra plant operator and have been directed by the Shift Supervisor to perform SOP-2.3 steps 4.2.3.2 – 4.2.3.6 to:
   1. Determine the quantity of blended flow required to raise level in the RWST from 37.7 feet to 39.5 feet while maintaining the current RWST Boron Concentration.
   2. Determine the integrator settings for:
      - FIS 113, BORIC ACID BATCH INTEG
      - FIS-168, TOTAL FLOW BATCH INTEG
   3. Determine the potentiometer setting to **makeup to the RWST at a reduced flow of 60 gpm total flow** for:
      - FK-113, BORIC ACID MKUP FLOW

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)

_____ START TIME

NOTE: This is a classroom setting ADMIN JPM task.

*1. Determines Gallons needed per RWST Tank curve 31B is 22,378 gallons. **491064 - 468686** = 22378	• Determines RWST Volume at 39.5 feet=491064 gals • Determines RWST Volume at 37.7 feet=484848 gals • Calculates total volume addition= 22378 gals **491064 - 468686** = 22378 gals [no tolerance: whole numbers from a table]	S / U

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)
*2. Determines Boric Acid amount from **Figure 1, SOP-2.3**, for the current concentration of 2400 ppm.	Determines from **Figure 1, SOP-2.3** ratio of Boric Acid amount to total amount from the ratio of Boric Acid flow to Total Flow. Then calculates total Boric Acid in gallons to obtain total 22,378 gals of blended solution at 2400 ppm: • 7664-7672 gals Boric Acid Solution	S / U
	PER FIG. 1 PAGE 1: $22378\left(\frac{41.1}{120}\right) = \mathbf{7664.465gals}$ PER FIG 1 PAGE 3: $22378\left(\frac{41.14}{120}\right) = \mathbf{7671.924}$ gals [tolerance: 7664.0-7672 based on using either page 1 or page 3 numbers and rounding to nearest whole number of 7664 or rounding up for conservative 7672 gals.]	
*3. Determines the totalizer settings for Total flow FIS-168, TOTAL FLOW BATCH INTEG and FIS-113, BORIC ACID BATCH INTEG: Based on Figure 1.	Determines totalizer settings are: • FIS-168=22378 gals • FIS-113=7664-7672 gals	 S / U S / U

NOTE: • **In element 5, FK-113 pot setting* is critical, but the manual position of FIS-168 demand which corresponds to 60 gpm is not critical, since this controller would need to be adjusted while flow was present. There is no corresponding demand that will ensure 60 gpm flow prior to initiating flow and adjusting as necessary.**

Examiner NOTE: • **In element 5, IF applicant desires to raise the setpoint above the minimum required, ask them what setpoint they are going to use and ensure it is greater than the minimum required.**

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)
*4. Determines the Minimum Flow controller potentiometer setting for FK-113, BORIC ACID MKUP FLOW for the 60 gpm Total flow directed by the Shift Supervisor at 2400 ppm Pot setting of 10.29 according to **Figure 1, SOP-2.3** would correspond to 120 gpm total flow at 2400. Since the Boric Acid Flow Controller pot only goes to 10.0, the total flow must be reduced to less than 120 gpm within the capacity of the system. The Shift Supervisor has directed 60 gpm total flow (120/2=60) in the initial conditions, and the boric acid flow for 120 gpm total flow must be divided by 2, and the pot setting must be divided by 2. FK-168 will need to be adjusted in manual to obtain 60 gpm. **Per Fig 1:** 10.29/2=5.145 Boric Acid FK-113 pot setting	States that FK-168 will need to be adjusted in manual to obtain 60 gpm. Based on **Figure 1**, states that **MINIMUM** setting for FK-113 is 5.145 pot setting*. [Tolerance of 5.14 to 5.15 based on the accuracy of the pot indication which is ½ the smallest increment of 0.02. The procedure directs initiating more boric acid flow than necessary to ensure the boric acid flow totalizer reaches the setpoint and stops Boric Acid Flow prior to the Total Flow totalizer reaching its setpoint. This flushes the Boric Acid from the lines and delivers it all to the RWST. There is no procedural requirement to limit the boric acid flow to a specified maximum amount.]	S / U

_____ **STOP TIME**

Terminate when all elements of the task have been completed.

CRITICAL ELEMENTS: Critical Elements are denoted with an asterisk (*) before the element number.

GENERAL REFERENCES:

1. FNP-1-SOP-2.3 Version 44.0
2. FNP-1-ARP-1.5 EG4, Version 49.0
3. K/A: G2.006A1.02 RO 3.0 SRO 3.6

GENERAL TOOLS AND EQUIPMENT:

Provide:

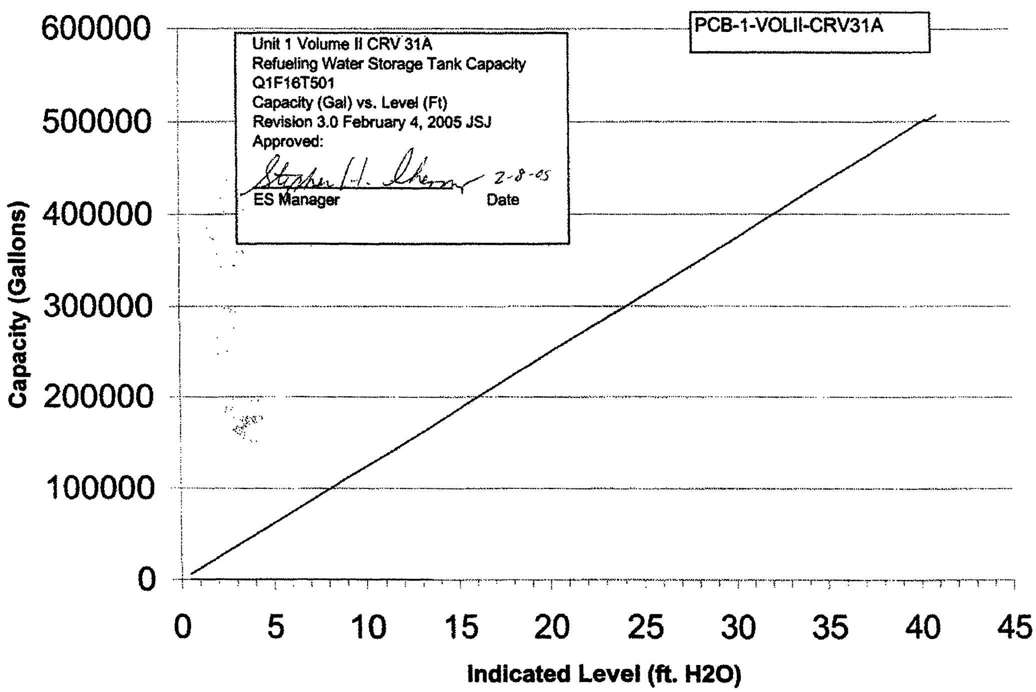
1. FNP-1-SOP-2.3, Version 44.0
2. Curves 31A & 31B
3. Calculator (or applicant may supply their own calculator)

COMMENTS:

CONDITIONS

When I tell you to begin, you are to determine RWST Makeup quantity, Boric acid concentration, and integrator setting for make up to the RWST per FNP-1-SOP-2.3, Chemical And Volume Control System Reactor Makeup Control System, starting at Step 4.2.3.2 Makeup to Refueling Water Storage Tank (RWST). The conditions under which this task is to be performed are:

a. Unit 1 is at 100% power and stable.
b. RWST Level is at 37.7 feet.
c. RWST Boron concentration is at 2400 ppm.
d. On Service BAT concentration is 7500 ppm.
e. RWST Purification (Recirc) is NOT on-service.
f. The Reactivity Spreadsheet is not available.
g. You are the extra plant operator and have been directed by the Shift Supervisor to perform SOP-2.3 steps 4.2.3.2 – 4.2.3.6 to:
    1. Determine the quantity of blended flow required to raise level in the RWST from 37.7 feet to 39.5 feet while maintaining the current RWST Boron Concentration.
    2. Determine the integrator settings for:
        - FIS 113, BORIC ACID BATCH INTEG
        - FIS-168, TOTAL FLOW BATCH INTEG
    3. Determine the potentiometer setting to **makeup to the RWST at a reduced flow of 60 gpm total flow** for:
        - FK-113, BORIC ACID MKUP FLOW


PCB-1-VOLII-CRV31A
Unit 1 Volume II CRV 31A
Refueling Water Storage Tank Capacity
Q1F16T501
Capacity (Gal) vs. Level (Ft)
Revision 3.0 February 4, 2005 JSJ
Approved:
2-8-05
ES Manager
Date
Capacity (Gallons)
600000
500000
400000
300000
200000
100000
0
0
5
10
15
20
25
30
35
40
45
Indicated Level (ft. H2O)

Unit 1 Volume II Curve 31B
Refueling Water Storage Tank Capacity
Q1F16T501
Level (ft. H_2O) vs. Capacity (Gallons)
Revision 4.0 February 4, 2005
Approved:

PCB-1-VOLII-CRV31B

2-8-05
ES Manager Date

Level (ft. H_2O)	Inventory Gallons
0.5	6186
1.0	12372
1.5	18559
2.0	24745
2.5	30931
3.0	37117
3.5	43303
4.0	49489
4.5	55676
5.0	61862
5.5	68048
6.0	74234
6.5	80420
7.0	86607
7.5	92793
8.0	98979
8.5	105165
9.0	111351
9.5	117537
10.0	123724
10.5	129910
11.0	136096
11.5	142282
12.0	148468
12.5	154655
13.0	160841
13.5	167027
14.0	174048
14.5	180264

Level (ft. H_2O)	Inventory Gallons
15.0	186480
15.5	192696
16.0	198912
16.5	205128
17.0	211344
17.5	217560
18.0	223776
18.5	229992
19.0	236208
19.5	242424
20.0	248640
20.5	254856
21.0	261072
21.5	267288
22.0	273504
22.5	279720
23.0	285936
23.5	292152
24.0	298368
24.5	304584
25.0	310800
25.5	317016
26.0	323232
26.5	329448
27.0	335664
27.5	341880
28.0	348096
28.5	354312
29.0	360528

Level (ft. H_2O)	Inventory Gallons
29.5	366744
30.0	372960
30.5	379176
31.0	385392
31.5	391608
32.0	397824
32.5	404040
33.0	410256
33.5	416472
34.0	422688
34.5	428904
35.0	435120
35.5	441336
36.0	447552
36.5	453768
37.0	459984
37.1	461227
37.2	462470
37.3	463714
37.4	464957
37.5	466200
37.6	467443
37.7	468686
37.8	469930
37.9	471173
38.0	472416
38.1	473659
38.2	474902
38.3	476146

Level (ft. H_2O)	Inventory Gallons
38.4	477389
38.5	478632
38.6	479875
38.7	481118
38.8	482362
38.9	483605
39.0	484848
39.1	486091
39.2	487334
39.3	488578
39.4	489821
39.5	491064
39.6	492307
39.7	493550
39.8	494794
39.9	496037
40.0	497280
40.1	498523
40.2	499766
40.3	501010
40.4	502253
40.5	501081
40.6	502318
40.7	503555
40.8	504793
40.9	506030
41.0	507267
41.2	509712

Total volume in gallons = 509712
Technical Specification SR 3.5.4.2 requires a minimum contained borated water volume of 471,000 gallons.

FARLEY NUCLEAR PLANT

SYSTEM OPERATING PROCEDURE

FNP-1-SOP-2.3

SAFETY RELATED

CHEMICAL AND VOLUME CONTROL SYSTEM
REACTOR MAKEUP CONTROL SYSTEM

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	**ALL**
Reference Use	
Information Use	

Approved:

J. L. Hunter (for)
Operations Manager

Date Issued 04/04/2008

TABLE OF CONTENTS

FARLEY NUCLEAR PLANT
UNIT 1
SYSTEM OPERATING PROCEDURE SOP-2.3

CHEMICAL AND VOLUME CONTROL SYSTEM
REACTOR MAKEUP CONTROL SYSTEM

1.0 Purpose

This procedure provides Initial Conditions, Precautions and Limitations, and Instructions for operation of the Reactor Makeup Control System. Instructions are included in the following sections:

2.0 Initial Conditions

2.1 The chemical and volume control system valves and electrical distribution systems are aligned per System checklist FNP-1-SOP-2.1A, CHEMICAL AND VOLUME CONTROL SYSTEM, with exceptions noted.

2.2 At least one RCP must be running prior to changing the boron concentration in the RCS. (SOER 94-02) (Section 3.0, Precaution and Limitation include additional clarification for this restriction).

2.3 Reactor makeup water is available to the reactor makeup control system per FNP-1-SOP-4.0, REACTOR MAKEUP WATER SYSTEM, if the operation being performed requires reactor makeup water.

2.4 Boric acid is available to the reactor makeup control system per FNP-1-SOP-2.6, CHEMICAL AND VOLUME CONTROL SYSTEM BORIC ACID SYSTEM, if the operation being performed requires boric acid.

3.0 Precautions and Limitations

3.1 The reactor makeup control system should be in automatic and adjusted to supply makeup equal in boron concentration to reactor coolant system concentration, except during reactor coolant system boration or dilution operations, or malfunctions of automatic control.

3.1.1 FK-168 is the M/A station used to control RMW to the blender flow control valve (FCV-114B). If the M/A station is in AUTO, then the Makeup Mode Selector Switch determines the origin of the set point as follows:

- With the Mode Selector Switch in AUTO, the set point is 120 gpm. The position of FCV-114B is determined by the difference between actual total flow and an internal set point of 120 gpm.
- With the Mode Selector Switch in MAN, DIL, or ALT DIL, the set point is determined by the potentiometer position. (AI-2005205348)

3.1.2 FK-113 is the M/A station used to control boric acid flow to the blender flow control valve (FCV-113A). When the makeup mode selector switch is in AUTO, FK-113 (M/A station) will only control FCV-113A automatically during periods of an AUTO makeup. Once the VCT level reaches 40 percent, the M/A station will shift to manual control. This maintains FK-113 output at the valve demand required for the desired blended boron concentration as determined by M/A station potentiometer setting based on total flow of 120 gpm. FK-113 should not routinely be left in AUTO since the output will continue to integrate up with no system flow. This would delay the valve response to an auto makeup and result in an over boration. (AI2005205348)

3.2 Actuation of the VCT LVL HI-LO annunciator (DF3) indicates a malfunction or improper operation of the reactor makeup control system.

3.3 The boron concentration in the pressurizer should not be less than that in the RCS loops by more than 50 ppm. Following or during a 5 ppm change of boron concentration in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

3.4 Observe the effects of changing RCS boron concentration in terms of resulting control rod motion, changes in Tavg, or S/R count rate. Stop boron concentration change operations and take corrective action if control rod motion is excessive or in the wrong direction, or Tave changes without subsequent rod motion.

3.5 WHEN the reactor is in the source range, THEN positive reactivity additions must only be made by one controlled method at a time.

3.6 The flow rate through the reactor coolant system shall be determined to be greater than 3000 gpm prior to the start of and at least once per hour during a dilution of the RCS by verifying at least one RCP is running.

NOTE: The following step is intended to prevent the occurrence of dilute pockets of Reactor coolant due to inadequate mixing while in shutdown conditions. This could occur if the RHR system is the sole source of RCS flow and a boration is made to reach the required shutdown margin (or refueling) boron concentration.

3.7 During shutdown operations, at least one RCP must be running prior to changing the RCS boron concentration unless directed to borate the RCS by any abnormal or emergency operating procedure. IF the RCS and PRZR boron concentration have been sampled with a RCP running, and verified adequate for refueling and/or shutdown margin, THEN filling or normal makeup to the RCS with water greater than or equal to the refueling and/or shutdown margin concentration is not applicable to this requirement. IF a boration is required to obtain the required boron concentration, AND no RCP is running, THEN the Shift Supervisor should consider alternate sampling methods to verify boron concentration requirements are satisfied throughout the RCS.

3.8 Both units' boric acid blenders should not be supplied with reactor makeup water simultaneously if SOP-4.0 Appendix 2 is in effect.

3.9 Simultaneous running of both RMW pumps can cause one pump to operate near shutoff head condition, which produces abnormal thrust bearing loading and could lead to pre-mature bearing failure. Simultaneous running of both pumps should be minimized. (IR 1-96-062)

3.10 ZAS injection will result in a continuous RCS dilution by as much as 1.7 gallons per hour, which could result in a rise in TAVG if not compensated for by boration, rod insertion, or increasing fission product poison inventory.

3.11 During periods of repetitive boration evolutions, to minimize the number of start/stop cycles on the boric acid pump, the handswitch may be placed in START and allowed to return to AUTO to maintain the boric acid pump running. WHEN it is no longer desired to maintain the boric acid pump running continuously, THEN place the handswitch in STOP and return to AUTO.

3.12 Large batch makeups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233) Large makeups can also cause seal injection temperature transients which can reduce RCP #1 seal leak off to a point at which seal damage occurs. (CR 2006104054)

3.13 The following list provides precautions and limitations related to VCT pressure reductions and gas accumulation in idle charging pump suctions.

- VCT pressure reductions ≥ 7 psig can result in gas dissolution sufficient to create idle charging pump suction voiding.
- Any VCT pressure reduction should be ≤ 5 psig in 4 hours to preclude void formation in charging pump suction piping.
- Pressure reduction rates exceeding preceding limitation should be documented by Condition Report.
- Idle Charging pump suctions should be vented when VCT pressure reduction rate has exceeded preceding limit.

4.0 Instructions

4.1 Automatic Makeup

4.1.1 Determine the existing RCS boron concentration by sample analysis or from an estimate based on the previous sample.

NOTE:	**ZAS injection will result in a continuous RCS dilution by as much as 1.7 gallons per hour causing the auto makeup to be inadequately set. A slightly higher set point may be required to maintain TAVG.**

4.1.2 Verify the following:

4.1.2.1 Verify BORIC ACID MKUP FLOW controller FK 113 set up per the following:

A) In Manual

B) Potentiometer is set to obtain a makeup value having a boron concentration equal to RCS boron concentration. The setting is obtained from one of the following: (AI2005205348)

- Reactivity Briefing Sheet
- Figure 1

4.1.2.2 Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.1.3 Position the MKUP MODE CONT SWITCH to STOP.

4.1.4 Position the MKUP MODE SEL SWITCH to AUTO.

NOTE:	**Automatic makeup may be stopped at any time by placing the MKUP MODE CONT SWITCH to STOP.**

4.1.5 Position the MKUP MODE CONT SWITCH to START.

4.1.6 IF 1B RMW PUMP is running and is not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

NOTE: Verify expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.

4.1.7 Verify proper automatic operation of the reactor makeup control system as follows:

4.1.7.1 WHEN VCT level decreases to 20%, THEN verify that makeup begins by observing the following:

(a) MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) open.

(b) Boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT.

(c) VCT level increasing.

4.1.7.2 WHEN VCT level increases to 40%, THEN verify that makeup stops by observing the following:

(a) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

(b) MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) closed.

(c) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(d) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2 Manual Makeup

CAUTION:	**Maintain VCT level between 26% and 61% during manual operation of the reactor makeup control system.** **Large batch makeups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233)**

NOTE:	**IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.**

4.2.1 Makeup to Top of Volume Control Tank

4.2.1.1 Verify the VCT capable of receiving makeup.

4.2.1.2 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Boron/Dilution Tables
- Nomographs

NOTE:
- **When making up to the VCT use the flow rate from figure 1 or the reactivity briefing sheet.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **The boric acid flow should not be through the top of the VCT to keep the nozzle from clogging.**
- **For blended flow set the boric acid integrator to the desired amount of acid and the total flow integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.1.3 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.1.2.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.1.4 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.1.2.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.1.5 IF necessary, THEN adjust LK-112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing gas space.

4.2.1.6 Position the MKUP MODE CONT SWITCH to STOP.

4.2.1.7 Position the MKUP MODE SEL SWITCH to MAN.

4.2.1.8 Open MKUP TO VCT Q1E21FCV114A (Q1E21V339).

NOTE:
- **Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.2.1.9 Position the MKUP MODE CONT SWITCH to START.

4.2.1.10 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP switch to STOP.

4.2.1.11 Verify makeup flows indicated on FI-113 and FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.1.12 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.2.1.13 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(c) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

4.2.1.13 Return MKUP TO VCT Q1E21FCV114A (Q1E21V339) control switch to AUTO.

4.2.1.14 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.1.15 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.1.16 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore FK-113 controller to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.2.1.17 IF LK-112 was adjusted, THEN return LK-112 setpoint to that required for current conditions.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.1.18 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.1.19 Position the MKUP MODE CONT SWITCH to START.

4.2.2 Makeup to Charging Pumps Suction Header

NOTE:	**<u>IF</u> waste gas system is shutdown, <u>THEN</u> VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.**

4.2.2.1 Verify VCT capable of receiving makeup.

4.2.2.2 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Boron/Dilution Tables
- Nomographs

NOTE:
- **When making up to the VCT use the flow rate from figure 1 or the reactivity briefing sheet.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the boric acid integrator to the desired amount of acid and the total flow integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.2.3 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.2.2.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.2.4 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.2.2.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.2.5 IF necessary, THEN adjust LK-112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing gas space.

4.2.2.6 Position MKUP MODE CONT SWITCH to STOP.

4.2.2.7 Position the MKUP MODE SEL SWITCH to MAN

4.2.2.8 Open MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337).

NOTE:
- **Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.2.2.9 Position MKUP MODE CONT SWITCH to START.

4.2.2.10 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP switch to STOP.

4.2.2.11 Verify boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.2.12 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.2.2.13 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(c) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

4.2.2.13 Return MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) control switch to AUTO.

4.2.2.14 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.2.15 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.2.16 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore FK-113 controller to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.2.2.17 IF LK-112 was adjusted, THEN return LK-112 setpoint to that required for current conditions.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.2.18 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.2.19 Position the MKUP MODE CONT SWITCH to START.

4.2.3 Makeup to Refueling Water Storage Tank (RWST)

CAUTION:	**Avoid operations that could result in RCS volume changes. Makeup to the VCT from the blender will not be available while making up to the RWST.**

NOTE:

- **Due to system interconnections, the RWST Purification Loop (Recirculation) should not be in operation using the Refueling Water Purification Pump while making up to the RWST. However, it is permissible to makeup while BARS is in operation.**
- **IF makeup to the RWST is due to BARS operation, THEN to minimize dilution of the RWST, boron concentration of the blended flow should be greater than or equal to the BARS reject flow concentration.**
- **IF desired to flush the line of acid following makeup, THEN remember to perform step 4.2.3.17 at an appropriate time prior to reaching the Total Flow Integrator setpoint.**

4.2.3.1 Verify the RWST capable of receiving makeup.

4.2.3.2 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Nomographs

4.2.3.3 IF the final boron concentration in the RWST is going to differ from the initial, THEN use the following formulas or the reactivity briefing sheets to determine the amount of water or acid to be added.

To dilute the RWST: $VA = \frac{CI - CF}{CF}(VI)$

To borate the RWST: $VA = \frac{CI - CF}{CF - CA}(VI)$

To determine final boron concentration:

$$CF = \frac{[CI \times VI] + [CA \times VA]}{VF}$$

Where:

VA = Volume of water or acid added to the RWST

VI = Initial water volume in RWST

VF = Final water volume in RWST

CI = Initial boron concentration in RWST

CF = Final boron concentration in RWST

CA = Boron concentration added to RWST

4.2.3.4 IF the RWST Purification (Recirc) is On-Service, THEN secure the Refueling Water Purification Pump.

NOTE:
- **When blended flow concentration of 2000 PPM is required, the makeup system may not be able to deliver boric acid flow for 120 gpm total flow. IF necessary, THEN the Total Flow may be set for < 120 gpm and the Boric Acid Flow rate adjusted proportionally to Total Flow.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the Boric Acid Integrator to the desired amount of acid and the Total Flow Integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **When making up to the RWST The boric acid flow rate should be such that it will finish first and the last thing in the line will be reactor makeup water.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.3.5 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.3.2 or 4.2.3.3.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.3.6 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.3.2 or 4.2.3.3.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.3.7 Position the MKUP MODE CONT SWITCH to STOP.

4.2.3.8 Position the MKUP MODE SEL SWITCH to MAN.

4.2.3.9 Open blender discharge to RWST valve 1-CVC-V-8434 (N1E21V238).

4.2.3.10 Open blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.3.11 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in the CLOSED position.

4.2.3.12 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in the CLOSED position.

4.2.3.13 IF making up to the RWST is due to the depletion of boron by the BARS system and it is desired to make-up with boric acid only, THEN close RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345).

NOTE:	**Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**

4.2.3.14 Position the MKUP MODE CONT SWITCH to START.

4.2.3.15 IF 1B RMW PUMP is running and not required for current plant operations, THEN position the 1B RMW PUMP switch in STOP.

4.2.3.16 Verify boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.3.17 IF desired to flush the acid from the line, THEN at the appropriate time to conclude the makeup with RMW only:

(a) Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) open.

(b) Close BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354)

4.2.3.18 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) closed IF in AUTO.

(c) BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354) closed.

4.2.3.19 Close blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.3.20 Close blender discharge to RWST valve 1-CVC-V-8434 (N1E21V238).

4.2.3.21 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in AUTO.

4.2.3.22 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in AUTO.

4.2.3.23 Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) in AUTO.

4.2.3.24 Verify BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354) in AUTO.

NOTE: The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.

4.2.3.25 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.3.26 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore FK-113 controller to the setpoint required for automatic makeup per step 4.1.2

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

NOTE: The following two steps are not required if operation in a mode other than automatic is required.

4.2.3.27 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.3.28 Position the MKUP MODE CONT SWITCH to START.

4.2.3.29 IF the Refueling Water Purification Pump was secured in Step 4.2.3.4, THEN perform the following:

(a) Start the RWP pump.

(b) Throttle SFP purification outlet to RWST 1-SFP-V-8793B (N1G31V021B) to establish 100 gpm on the SFP demineralizer FI-654.

4.2.3.30 Independently verify Closed the following:

- Blender Miscellaneous Discharge Isolation valve 1-CVC-V-8432 (Q1E21V237).
- Blender Discharge To RWST valve 1-CVC-V-8434 (N1E21V238).

4.2.4 Makeup to Recycle Holdup Tanks (RHT)

CAUTION: Avoid operations that could result in RCS volume changes. Makeup to the VCT from the blender will not be available while making up to a RHT.

NOTE: IF desired to flush the line of acid following makeup, THEN remember to perform step 4.2.4.18 at an appropriate time prior to reaching the Total Flow Integrator setpoint.

4.2.4.1 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Nomographs

4.2.4.2 IF the final boron concentration in the RHT is going to differ from the initial, THEN use the following formulas or the reactivity briefing sheets to determine the amount of water and/or acid to be added.

To dilute the RHT: $VA = \frac{CI - CF}{CF}(VI)$

To borate the RHT: $VA = \frac{CI - CF}{CF - CA}(VI)$

To use a blend: $CB = \frac{(CF \times VF) - (CI \times VI)}{VA}$

Where:

VA = Amt. of water and/or acid added to the RHT

VI = Initial quantity in RHT

VF = Final quantity in RHT

CI = Initial boron concentration in RHT

CF = Final boron concentration in RHT

CA = Boron concentration in BAT

CB = Boron concentration of blended flow (use Nomographs, Figure 1, OR Reactivity Briefing Sheet to determine the amount of water and acid required)

NOTE:
- **When blended flow concentration of 2000 PPM is required, the makeup system may not be able to deliver boric acid flow for 120 gpm total flow. IF necessary, THEN the Total Flow may be set for < 120 gpm and the Boric Acid Flow rate adjusted proportionally to Total Flow.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the Boric Acid Integrator to the desired amount of acid and the Total Flow Integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **When making up to the RHT The boric acid flow rate should be such that it will finish first and the last thing in the line will be reactor makeup water.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.4.3 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.4.1 or 4.2.4.2.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.4.4 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.4.1 or 4.2.4.2.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.4.5 Verify closed waste condensate pump discharge to RHT's 1-LWP-V-7229 (Q1G21V031)

4.2.4.6 Align RCDT discharge to WHT per the following:

A) Open RCDT Disch to WHT, 1-LWP-V-7137 (Q1G21V009) (100' PPR).

B) Close RCDT pump discharge to RHT iso, 1-CVC-V-8551 (Q1E21V315) (121' PPR).

4.2.4.7 Align the RHT that will be made up to on service AND secure the previous on service RHT per FNP-1-SOP-2.4, CHEMICAL AND VOLUME CONTROL SYSTEM BORON RECYCLE SYSTEM.

4.2.4.8 Place control switch for recycle evaporator feed demineralizer automatic bypass valve Q1E21TCV250 (Q1E21V361) to FILTER position. (The control switch is located on the liquid waste panel.)

4.2.4.9 Open blender discharge to RHT's valve 1-CVC-V-8553 (Q1E21V280).

4.2.4.10 Open blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.4.11 Position the MKUP MODE CONT SWITCH to STOP.

4.2.4.12 Position the MKUP MODE SEL SWITCH to MAN.

NOTE:	**Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**

4.2.4.13 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in the CLOSED position.

4.2.4.14 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in the CLOSED position.

4.2.4.15 Position the MKUP MODE CONT SWITCH to START.

4.2.4.16 IF 1B RMW PUMP is running and not required for current plant conditions, THEN place the 1B RMW PUMP handswitch to STOP.

4.2.4.17 Boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.4.18 IF desired to flush the acid from the line, THEN at the appropriate time to conclude the makeup with RMW only:

(a) Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) open.

(b) Close BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354)

4.2.4.19 Verify makeup automatically stops when batch integrator setpoints are reached by observing that boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.4.20 Close blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.4.21 Close blender discharge to RHT's valve 1-CVC-V-8553 (Q1E21V280).

4.2.4.22 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in AUTO.

4.2.4.23 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in AUTO.

4.2.4.24 Verify BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354) in AUTO.

4.2.4.25 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE: The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.

4.2.4.26 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.4.27 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.4.28 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.4.29 Position the MKUP MODE CONT SWITCH to START.

4.2.4.30 Align RCDT discharge to RHT per the following:

- Open RCDT pump discharge to RHT 1-CVC-V-8551 (Q1E21V315) (121'PPR).
- Close RCDT disch to WHT 1-LWP-V-7137 (Q1G21V009). (100' PPR)

4.2.4.31 Position control switch for recycle evaporator feed demineralizer automatic bypass valve Q1E21TCV250 (Q1E21V361) to the DEMIN position until red light is illuminated THEN place handswitch in AUTO position. (The control switch is located on the liquid waste panel.)

4.2.4.32 Remove batched up RHT from service and place another RHT on service IF required per FNP-1-SOP-2.4, CHEMICAL AND VOLUME CONTROL SYSTEM BORON RECYCLE SYSTEM.

4.2.4.33 Independently Verify the following:

- Verify MKUP TO VCT Q1E21FCV114A (Q1E21V339) in AUTO.
- Verify close blender discharge to RHT's valve 1-CVC-V-8553 (Q1E21V280).
- Verify open RCDT pump discharge to RHT 1-CVC-V-8551 (Q1E21V315) (121'PPR).
- Verify close RCDT DISCH to WHT 1-LWP-V-7137 (Q1G21V009). (100' PPR)

4.2.5 Makeup to SFP Through Temporary Connection

CAUTION: Avoid operations that could result in RCS volume changes. Makeup to the VCT from the blender will not be available while making up to the SFP.

NOTE: This procedure is intended for situations when normal makeup to the SFP is not available and should not be used for normal makeup to the SFP.

IF desired to flush the line of acid following makeup, THEN remember to perform step 4.2.5.14 at an appropriate time prior to reaching the batch integrator setpoint.

4.2.5.1 Verify that the SFP is capable of receiving makeup.

4.2.5.2 Verify blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237) closed.

NOTE: The following step will open a section of 2 inch diameter pipe approximately 40 feet long requiring a catch bag routed to the nearest equipment drain be rigged prior to commencing.

4.2.5.3 Remove blind flange from the temporary connection and install temporary hose routed to the SFP.

4.2.5.4 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Nomographs

NOTE:
- **When blended flow concentration of 2000 PPM is required, the makeup system may not be able to deliver boric acid flow for 120 gpm total flow. IF necessary, THEN the Total Flow may be set for < 120 gpm and the Boric Acid Flow rate adjusted proportionally to Total Flow.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the Boric Acid Integrator to the desired amount of acid and the Total Flow Integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **When making up to the SFP The boric acid flow rate should be such that it will finish first and the last thing in the line will be reactor makeup water.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.5.5 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.5.4.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.5.6 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.5.4.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.5.7 Position the MKUP MODE CONT SWITCH to STOP.

4.2.5.8 Position the MKUP MODE SEL SWITCH to MAN.

4.2.5.9 Open blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.5.10 Place MKUP to CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in the CLOSED position.

4.2.5.11 Place MKUP to VCT Q1E21FCV114A (Q1E21V339) in the CLOSED position.

NOTE:	**Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**

4.2.5.12 Position the MKUP MODE CONT SWITCH to START.

4.2.5.13 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

4.2.5.14 Boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.5.15 IF desired to flush the acid from the line, THEN at the appropriate time to conclude the makeup with RMW only:

(a) Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) open.

(b) Close BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354)

4.2.5.16 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(c) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

4.2.5.17 Close blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.5.18 Place the following valve control switches to AUTO:

(a) MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337).

(b) MKUP TO VCT Q1E21FCV114A (Q1E21V339).

4.2.5.19 Verify BORIC ACID TO BLENDER valve Q1E21FV113A (Q1E21V354) in AUTO.

4.2.5.20 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.5.21 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.5.22 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.5.23 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.5.24 Position the MKUP MODE CONT SWITCH to START.

4.2.5.25 Remove the temporary hose from the temporary connection and install blind flange.

4.2.5.26 Independently Verify the following:

- Verify Closed blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).
- RMW TO BLENDER Q1E21FCV114B (Q1E21V345) in AUTO.
- BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) in AUTO.

4.3 Boration

NOTE: Appendix B, OPERATOR AID FOR BORATION AND DILUTION, may be used without referring to this procedure section under the following conditions:

- **Routine boration for temperature control.**
- **Boration in response to an unplanned or unscheduled power change.**
- **Scheduled power changes.**

Figure 6 may be applied at the discretion of the SS when use of the emergency boration flowpath is desired.

CAUTION: At least one RCP must be operating to ensure that the boron concentration is equalized throughout the RCS and PRZR. Section 3.0, Precautions and Limitations, include additional clarification for this restriction.

4.3.1 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.3.2 Determine the existing Reactor Coolant boron concentration by sample analysis or from an estimate based on a previous sample.

4.3.3 Determine the magnitude of the boron concentration increase required from core physics curves or during normal operation, when compensating for xenon or core burnup, the magnitude may be estimated based on time in core life and previous experience.

4.3.4 Determine the volume of boric acid required for boration from the boron addition nomograph, Figure 2, from the boration/dilution tables, Reactivity Briefing Sheet or from estimate based on time in core life and previous experience.

NOTE:	**IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.**

4.3.5 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

NOTE:	**The boric acid flow required to achieve a desired boration rate may be determined from boron addition rate nomograph, Figure 3.**

4.3.6 Position the MKUP MODE CONT SWITCH to STOP.

4.3.7 Position the MKUP MODE SEL SWITCH to BOR.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.3.8 Set the Boric Acid MKUP Flow Controller and Boric Acid Batch Integrator to the flowrate and quantity values obtained from step 4.3.3 and 4.3.4.

NOTE:	• **Boration may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.** • **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.3.9 Position the MKUP MODE CONT SWITCH to START.

4.3.10 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

4.3.11 Verify that boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

NOTE: The following four steps are not required if operation in a mode other than automatic is preferred. For example: when frequent borations are required because of changing core conditions it may be desirable to leave the reactor makeup system aligned for the current operational need and minimize system manipulation. Use appendix C for guidance in repetitive borations.

4.3.12 Position the MKUP MODE SEL SWITCH to AUTO.

4.3.13 Position the MKUP MODE CONT SWITCH to START.

4.3.14 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.3.15 IF LK 112 setpoint was adjusted per Step 4.3.5, THEN return setpoint to that required for current conditions.

4.4 Dilution

CAUTION: At least one RCP must be in operation prior to performing any RCS dilution. (SOER 94-02)

NOTE:

- **Appendix B, OPERATOR AID FOR BORATION AND DILUTION, may be used without referring to this procedure section under the following conditions:**
  - **a) Routine dilution for temperature control.**
  - **b) Scheduled power changes.**
- **IF MKUP TO VCT Q1E21FCV114A is not operable, THEN Alternate Dilution is required in step 4.4.8.**

4.4.1 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.4.2 Determine the existing reactor coolant boron concentration by sample analysis, or from an estimate based on the previous sample.

4.4.3 Determine the magnitude of the boron concentration decrease required from core physics curves or during normal operation, when compensating for xenon or core burnup, the magnitude may be estimated based on time in core life and previous experience.

4.4.4 Determine the volume of reactor makeup water required for dilution from the dilution nomograph, Figure 4, from boration/dilution tables, Reactivity Briefing Sheet or from estimate based on time in core life and previous experience.

NOTE: IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.

4.4.5 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

NOTE:
- **The dilution water flow required to achieve a desired dilution rate may be determined from boron dilution rate nomograph, Figure 5.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.4.6 Set the PRI WTR MKUP FLOW (RMW) Controller and Total Flow Batch Integrator to the flow rate and quantity values obtained from step 4.4.3 and 4.4.4.

4.4.7 Position the MKUP MODE CONT SWITCH to STOP.

NOTE: The use of the ALT DIL MODE can affect the ability to control hydrogen concentration in the RCS.

4.4.8 Position the MKUP MODE SEL SWITCH to DIL or ALT DIL.

4.4.9 IF using the ALT DIL MODE AND it is desired to bypass the VCT and dilute straight to the charging pump suction, THEN place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) in close.

NOTE:
- **Dilution may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.4.10 Position the MKUP MODE CONT SWITCH to START.

4.4.11 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

4.4.12 Verify dilution operation by observing the following:

- IF using ALT DIL, MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- MKUP TO VCT Q1E21FCV114A opens, unless bypassing VCT.
- RMW TO BLENDER Q1E21FCV114B opens.
- Reactor makeup flow is displayed on FI-168 MAKEUP FLOW TO CHG/VCT.

4.4.13 Verify dilution automatically stops when the reactor makeup water batch integrator reaches its setpoint as follows:

- Reactor makeup flow returns to zero as displayed on FI-168 MAKEUP FLOW TO CHG/VCT.
- MKUP TO VCT Q1E21FCV114A closes.
- RMW TO BLENDER Q1E21FCV114B closes.
- IF ALT DIL was used, THEN MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.

4.4.14 IF VCT bypassed per step 4.4.9, THEN place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) to AUTO.

NOTE:	**The following three steps are not required if operation in a mode other than automatic is preferred. For example: when frequent dilutions are required because of changing core conditions it may be desirable to leave the reactor makeup system aligned for the current operational need and minimize system manipulation. Use appendix C for guidance in repetitive dilutions.**

4.4.15 Position the MKUP MODE SEL SWITCH to AUTO.

4.4.16 Position the MKUP MODE CONT SWITCH to START.

4.4.17 IF LK 112 setpoint was adjusted per Step 4.4.5, THEN return setpoint to that required for current conditions.

4.5 Combined Boration / Dilution

NOTE:	**Appendix B, OPERATOR AID FOR BORATION AND DILUTION, may be used without referring to this procedure section under the following conditions:** ▪ **Routine boration/dilution for temperature control.** ▪ **Scheduled power changes.**

NOTE:	**Early in the core cycle it is necessary to borate to compensate for burnup of discreet poisons. It is also desirable to maintain the discharge line from the blender clear of acid. This procedure section is designed to accomplish this by borating and then immediately diluting to flush the acid into the charging pump suction.**

4.5.1 Determine the volume of boric acid AND reactor makeup water required (to flush the line clear) based on Rx power, TAVG, Reactivity Briefing Sheet, reactivity change due to xenon, time in core life, and/or previous experience.

NOTE:	**IF the waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.**

4.5.2 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

4.5.3 Position the MKUP MODE CONT SWITCH to STOP.

4.5.4 Position the MKUP MODE SEL SWITCH to BOR.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.5.5 Set the Boric Acid Batch Integrator and Total Flow Batch Integrator to the quantities determined in step 4.5.1.

4.5.6 Set the Boric Acid Flow Controller to the desired flow rate.

NOTE:
- **Boration may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.5.7 Position the MKUP MODE CONT SWITCH to START.

4.5.8 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

4.5.9 Verify that boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

4.5.10 Position the MKUP MODE CONT SWITCH to STOP.

NOTE: The use of the ALT DIL MODE can affect the ability to control hydrogen concentration in the RCS.

4.5.11 Align the makeup system for flushing as follows:

- Position the MKUP MODE SEL SWITCH to ALT DIL.
- Place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) in close.
- Set the reactor makeup water flow controller to the desired flow rate.

NOTE:	• **Boration may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.** • **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.5.12 Position the MKUP MODE CONT SWITCH to START.

4.5.13 IF 1B RMW pump is running and not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

4.5.14 Verify proper dilution operation by observing the following:

- MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) opens.
- Reactor makeup flow on FI-168 is at the pre-selected rate as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.5.15 Verify dilution automatically stops when the total flow batch integrator reaches its setpoint by observing the following:

- Reactor makeup flow on FI-168 returns to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.
- MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) closed.

4.5.16 Place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) in AUTO.

NOTE:	**The following four steps are not required if operation in a mode other than automatic is preferred.**

4.5.17 Position the MKUP MODE SEL SWITCH to AUTO.

4.5.18 Position the MKUP MODE CONT SWITCH to START.

4.5.19 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position.(AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.5.20 IF LK 112 setpoint was adjusted in step 4.5.2, THEN return setpoint to that required for current conditions.

4.6 Verify Reactor Makeup Control System Aligned for Auto Makeup

4.6.1 Determine the existing RCS boron concentration by sample analysis or from an estimate based on the previous sample.

4.6.2 Verify the following:

4.6.2.1 BORIC ACID MKUP FLOW controller FK 113 is in the MAN position and the Potentiometer is set to the value obtained from the blended flow nomographs, Figure 1, or reactivity briefing sheet to obtain makeup value having a boron concentration equal to RCS boron concentration. (AI2005205348)

4.6.2.2 Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.6.3 Position the MKUP MODE CONT SWITCH to STOP.

4.6.4 Verify MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closed with handswitch in the AUTO position.

4.6.5 Verify BORIC ACID TO BLENDER Q1E21FCV113A closed with handswitch in the AUTO position.

4.6.6 Verify MKUP TO VCT Q1E21FCV114A closed with handswitch in the AUTO position.

4.6.7 Verify RMW TO BLENDER Q1E21FCV114B closed with handswitch in the AUTO position.

4.6.8 Verify 1A and 1B BATP secured with the on-service BATP handswitch in the AUTO position

4.6.9 Verify 1A (preferred) or 1B RMWP supplying Reactor Makeup System with water.

4.6.10 <u>IF</u> 1B RMW PUMP is running and is not required for current plant conditions, <u>THEN</u> position the 1B RMW PUMP handswitch to STOP and back to AUTO.

4.6.11 <u>IF</u> 1A RMW PUMP is running and is not required for current plant conditions, <u>THEN</u> position the 1A RMW PUMP handswitch to STOP and back to AUTO.

4.6.12 Position the MKUP MODE SEL SWITCH to AUTO.

4.6.13 Position the MKUP MODE CONT SWITCH to START.

4.7 Large Volume Boration of RCS

CAUTION: At least one RCP must be operating to ensure that the boron concentration is equalized throughout the RCS and PRZR. Section 3.0, Precautions and Limitations, include additional clarification for this restriction.

NOTE: To protect the RCP Seals, increase the monitoring of the Seal Injection filter DP, due to the possibility of RCS Crud Burst or other contaminants clogging the Filter.

4.7.1 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.7.2 Determine the existing reactor coolant boron concentration by sample analysis or from an estimate based on a previous sample.

4.7.3 Determine the magnitude of the boron concentration increase required from core physics curves or during normal operation, when compensating for xenon or core burnup, the magnitude may be estimated based on time in core life and previous experience.

NOTE: In the following step, the volume of boric acid to be used can be calculated by using the change in level of the on service boric acid tank OR by using the flow rate indicated on FI-110 multiplied by time to obtain gallons.

4.7.4 Determine the volume of boric acid required for boration from the boron addition nomograph, Figure 2, from the boration/dilution tables, Reactivity Briefing Sheet or from estimate based on time in core life and previous experience.

NOTE: IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.

4.7.5 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

4.7.6 Start a Boric Acid Transfer Pump.

NOTE:	**Boric acid flow may stopped at any time by closing MOV8104.**

4.7.7 Open Q1E21MOV8104 EMERG BORATE TO CHG PUMP SUCT to initiate boric acid flow.

4.7.8 Verify proper boric acid flow by flow indicated on FI-110 BORIC ACID EMERG BORATE flow indicator.

4.7.9 After the desired volume of boric acid has transferred, close Q1E21MOV8104 EMERG BORATE TO CHG PUMP SUCT.

4.7.10 Stop the Boric Acid Transfer Pump started in step 4.7.6.

4.7.11 IF LK 112 setpoint was adjusted per Step 4.7.5, THEN return setpoint to that required for current conditions.

5.0 References

5.1 Drawings P&ID - D-175039 - CVCS, sheets 3, 6 and 7

5.2 FSAR Chapter 9.3

5.3 PCN B92-0-8134, Reactor Makeup Water Cross-Tie

5.4 Safety Evaluation - Revised Operation of the Gaseous Waste Processing System to Allow Non-continuous Purge of the VCT, SECL-93-125, NEL-93-0231

TABLE 1

NOMOGRAPH CORRECTION FACTORS

Plant Conditions			Correction Factor (K) (See Note)
Pressure (psig)	T (AVG) (°F)	Pressurizer Level	
2235	547-570	Normal Operating	1.00
1600	500	No-Load	1.05
1200	450	No-Load	1.10
800	400	No-Load	1.16
400	350	No-Load	1.18
400	300	No-Load	1.20
400	300	Solid Water	1.35
400	200	No-Load	1.28
400	200	Solid Water	1.40
400	100	Solid Water	1.47

NOTE: CORRECTION FACTORS ARE APPLIED AS FOLLOWS:

(a) Boron Addition and Dilution Total Volume Nomographs

$$V_{(Corrected)} = K \times V_{(Nomograph)}$$

(b) Boron Addition and Dilution Rate Nomographs

$$\frac{dc}{dt}(\text{Corrected}) = \frac{1}{K} \times \frac{dc}{dt}(\text{Nomograph})$$

FIGURE 1

RCS BORON CONCENTRATION (PPM)	4% BORIC ACID FLOW (GPM)
0	0.0
100	1.71
200	3.4
300	5.1
400	6.9
500	8.6
600	10.3
700	12.0
800	13.7
900	15.4
1000	17.1
1100	18.9
1200	20.6
1300	22.3
1400	24.0
1500	25.7
1600	27.4
1700	29.1
1800	30.9
1900	32.6
2000	34.3
2100	36.0
2200	37.7
2300	39.4
2400	41.1
2500	42.9

Blended Flow Based on 120 GPM Auto Makeup

Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point
10	0.17	0.04	510	8.74	2.19	1010	17.31	4.33
20	0.34	0.09	520	8.91	2.23	1020	17.49	4.37
30	0.51	0.13	530	9.09	2.27	1030	17.66	4.41
40	0.69	0.17	540	9.26	2.31	1040	17.83	4.46
50	0.86	0.21	550	9.43	2.36	1050	18.00	4.50
60	1.03	0.26	560	9.60	2.40	1060	18.17	4.54
70	1.20	0.30	570	9.77	2.44	1070	18.34	4.59
80	1.37	0.34	580	9.94	2.49	1080	18.51	4.63
90	1.54	0.39	590	10.11	2.53	1090	18.69	4.67
100	1.71	0.43	600	10.29	2.57	1100	18.86	4.71
110	1.89	0.47	610	10.46	2.61	1110	19.03	4.76
120	2.06	0.51	620	10.63	2.66	1120	19.20	4.80
130	2.23	0.56	630	10.80	2.70	1130	19.37	4.84
140	2.40	0.60	640	10.97	2.74	1140	19.54	4.89
150	2.57	0.64	650	11.14	2.79	1150	19.71	4.93
160	2.74	0.69	660	11.31	2.83	1160	19.89	4.97
170	2.91	0.73	670	11.49	2.87	1170	20.06	5.01
180	3.09	0.77	680	11.66	2.91	1180	20.23	5.06
190	3.26	0.81	690	11.83	2.96	1190	20.40	5.10
200	3.43	0.86	700	12.00	3.00	1200	20.57	5.14
210	3.60	0.90	710	12.17	3.04	1210	20.74	5.19
220	3.77	0.94	720	12.34	3.09	1220	20.91	5.23
230	3.94	0.99	730	12.51	3.13	1230	21.09	5.27
240	4.11	1.03	740	12.69	3.17	1240	21.26	5.31
250	4.29	1.07	750	12.86	3.21	1250	21.43	5.36
260	4.46	1.11	760	13.03	3.26	1260	21.60	5.40
270	4.63	1.16	770	13.20	3.30	1270	21.77	5.44
280	4.80	1.20	780	13.37	3.34	1280	21.94	5.49
290	4.97	1.24	790	13.54	3.39	1290	22.11	5.53
300	5.14	1.29	800	13.71	3.43	1300	22.29	5.57
310	5.31	1.33	810	13.89	3.47	1310	22.46	5.61
320	5.49	1.37	820	14.06	3.51	1320	22.63	5.66
330	5.66	1.41	830	14.23	3.56	1330	22.80	5.70
340	5.83	1.46	840	14.40	3.60	1340	22.97	5.74
350	6.00	1.50	850	14.57	3.64	1350	23.14	5.79
360	6.17	1.54	860	14.74	3.69	1360	23.31	5.83
370	6.34	1.59	870	14.91	3.73	1370	23.49	5.87
380	6.51	1.63	880	15.09	3.77	1380	23.66	5.91
390	6.69	1.67	890	15.26	3.81	1390	23.83	5.96
400	6.86	1.71	900	15.43	3.86	1400	24.00	6.00
410	7.03	1.76	910	15.60	3.90	1410	24.17	6.04
420	7.20	1.80	920	15.77	3.94	1420	24.34	6.09
430	7.37	1.84	930	15.94	3.99	1430	24.51	6.13
440	7.54	1.89	940	16.11	4.03	1440	24.69	6.17
450	7.71	1.93	950	16.29	4.07	1450	24.86	6.21
460	7.89	1.97	960	16.46	4.11	1460	25.03	6.26
470	8.06	2.01	970	16.63	4.16	1470	25.20	6.30
480	8.23	2.06	980	16.80	4.20	1480	25.37	6.34
490	8.40	2.10	990	16.97	4.24	1490	25.54	6.39
500	8.57	2.14	1000	17.14	4.29	1500	25.71	6.43

BLENDED FLOW BASED ON 120 GPM AUTO MAKEUP

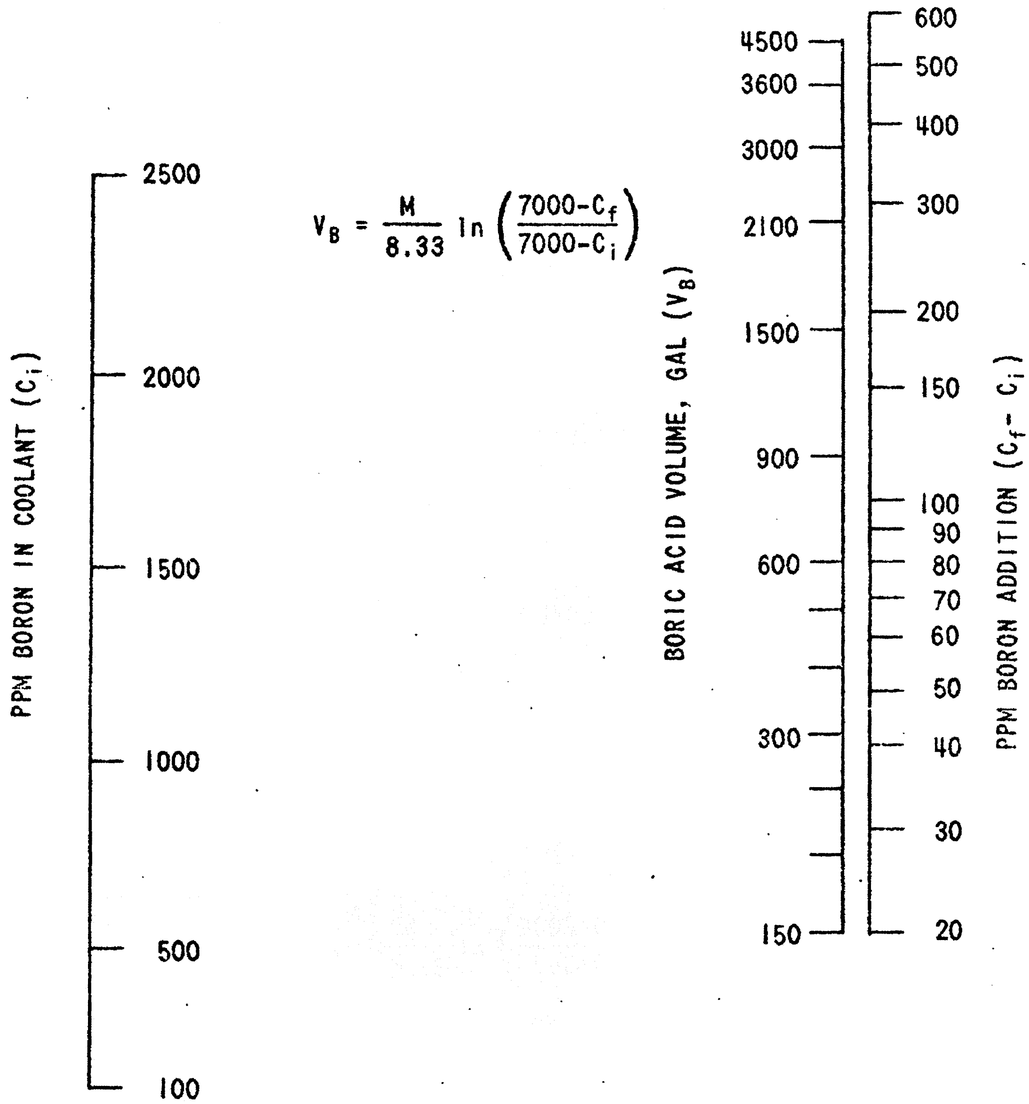
Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point
1510	25.89	6.47	1840	31.54	7.89	2170	37.20	9.30
1520	26.06	6.51	1850	31.71	7.93	2180	37.37	9.34
1530	26.23	6.56	1860	31.89	7.97	2190	37.54	9.39
1540	26.40	6.60	1870	32.06	8.01	2200	37.71	9.43
1550	26.57	6.64	1880	32.23	8.06	2210	37.89	9.47
1560	26.74	6.69	1890	32.40	8.10	2220	38.06	9.51
1570	26.91	6.73	1900	32.57	8.14	2230	38.23	9.56
1580	27.09	6.77	1910	32.74	8.19	2240	38.40	9.60
1590	27.26	6.81	1920	32.91	8.23	2250	38.57	9.64
1600	27.43	6.86	1930	33.09	8.27	2260	38.74	9.69
1610	27.60	6.90	1940	33.26	8.31	2270	38.91	9.73
1620	27.77	6.94	1950	33.43	8.36	2280	39.09	9.77
1630	27.94	6.99	1960	33.60	8.40	2290	39.26	9.81
1640	28.11	7.03	1970	33.77	8.44	2300	39.43	9.86
1650	28.29	7.07	1980	33.94	8.49	2310	39.60	9.90
1660	28.46	7.11	1990	34.11	8.53	2320	39.77	9.94
1670	28.63	7.16	2000	34.29	8.57	2330	39.94	9.99
1680	28.80	7.20	2010	34.46	8.61	2340	40.11	10.03
1690	28.97	7.24	2020	34.63	8.66	2350	40.29	10.07
1700	29.14	7.29	2030	34.80	8.70	2360	40.46	10.11
1710	29.31	7.33	2040	34.97	8.74	2370	40.63	10.16
1720	29.49	7.37	2050	35.14	8.79	2380	40.80	10.20
1730	29.66	7.41	2060	35.31	8.83	2390	40.97	10.24
1740	29.83	7.46	2070	35.49	8.87	2400	41.14	10.29
1750	30.00	7.50	2080	35.66	8.91	2410	41.31	10.33
1760	30.17	7.54	2090	35.83	8.96	2420	41.49	10.37
1770	30.34	7.59	2100	36.00	9.00	2430	41.66	10.41
1780	30.51	7.63	2110	36.17	9.04	2440	41.83	10.46
1790	30.69	7.67	2120	36.34	9.09	2450	42.00	10.50
1800	30.86	7.71	2130	36.51	9.13	2460	42.17	10.54
1810	31.03	7.76	2140	36.69	9.17	2470	42.34	10.59
1820	31.20	7.80	2150	36.86	9.21	2480	42.51	10.63
1830	31.37	7.84	2160	37.03	9.26	2490	42.69	10.67
						2500	42.86	10.71

NOTE:
- **Due to characteristics of the reactor makeup system piping, the maximum obtainable boric acid flow is less than 40 gpm.**
- **Numbers corresponding to boric acid flow approaching or greater than 40 gpm are useful only for calculating the boric acid flow corresponding to a blended flow of less than 120 gpm.**

Example: 2500 ppm 42.9 gpm with a pot setting of 10.7 for a blended flow of 120 gpm.
2500 ppm 42.9/2 gpm with a pot setting of 10.7/2 for a blended flow of 120/2 gpm.
2500 ppm 21.45 gpm with a pot setting of 5.35 for a blended flow of 60 gpm.

BLENDED FLOW BASED ON 120 GPM AUTO MAKEUP

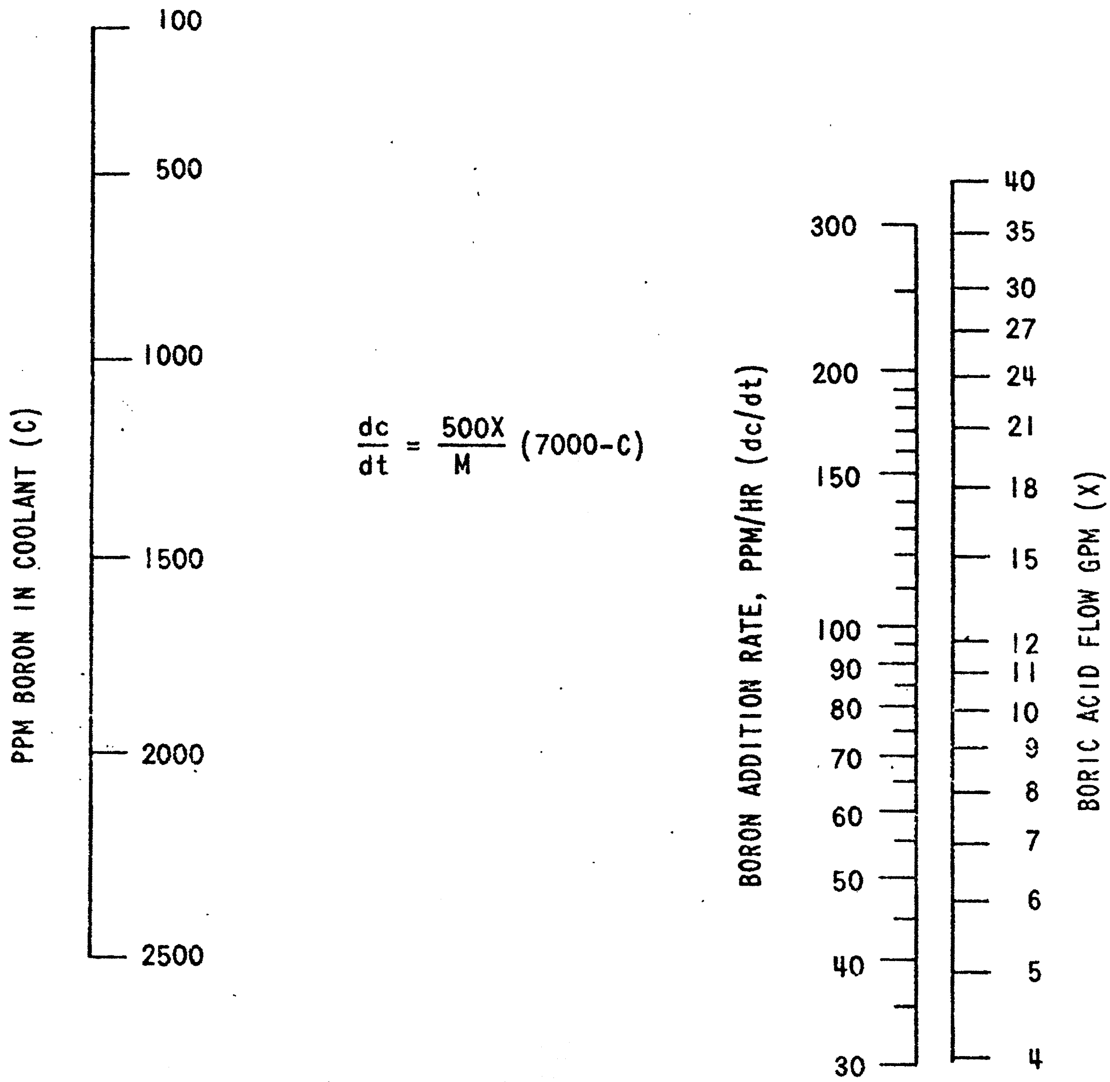
FIGURE 2



The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 2. Boron Addition - Refer to Table 1 for Correction Factors

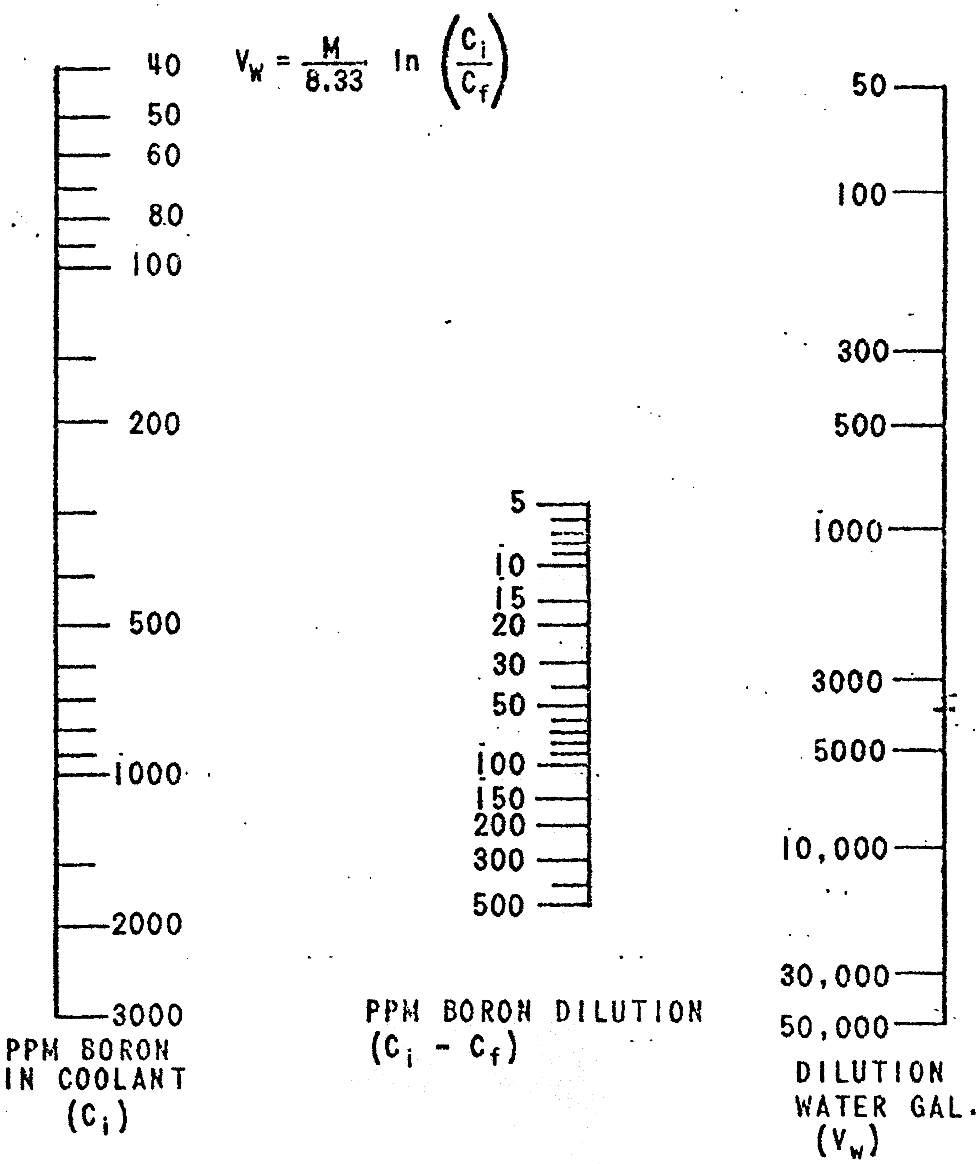
FIGURE 3



The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 3. Boron Addition Rate - Refer to Table 1 for Correction Factors

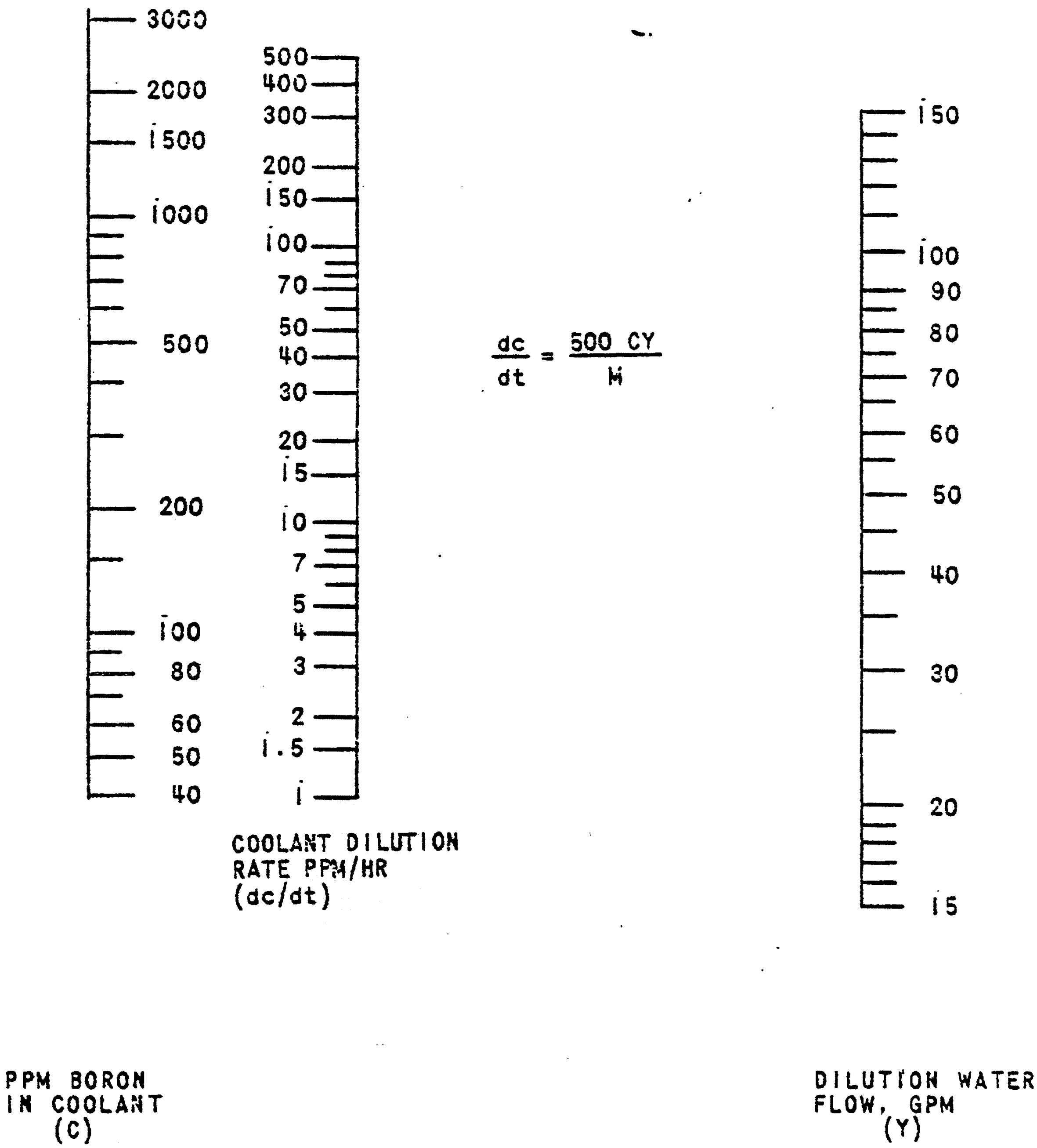
FIGURE 4



The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 4 Boron Dilution - Refer to Table 1 for Correction Factors

FIGURE 5



The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 5. Boron Dilution Rate - Refer to Table 1 for Correction Factors

FIGURE 6

USE OF EMERGENCY BORATION FLOWPATH (w/o AOP-27 ENTRY REQUIRED)

1. **Start a Boric Acid Transfer Pump.**
2. **Open EMERG BORATE TO CHG PUMP SUCT Q1E21MOV8104.**
3. **WHEN Boration Complete, THEN Close EMERG BORATE TO CHG PUMP SUCT Q1E21MOV8104.**
4. **Secure the Boric Acid Transfer Pump.**

Ref. FNP-1-SOP-2.3

Ensure operator aid is updated if this figure is revised.

APPENDIX A

Operation of the Chemical and Volume Control System Reactor Makeup Control System with the Makeup Mode Control Switch Inoperable

1.0 Purpose

Allow makeup to the VCT for Boration or Dilution when the AUTO function is failed.

2.0 Initial Conditions

The Makeup Mode Control Switch is failed and plant operations require either Boration or Dilution.

3.0 Precautions and Limitations.

3.1 When selecting FCV-114B and FCV-113A to OPEN the valves will go to full open, not a throttled position, causing the flowrate to be higher than normal.

3.2 A controlled mixing of boron and RMW will not be possible for a blended flow to the VCT.

3.3 Large batch makeups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233)

4.0 Instructions

NOTE: Flowrate of makeup to the RCS may be indicated on Reactor Makeup Flow Indicator Q1E21FI-168. If not, flowrate must be estimated by VCT level rise.

4.1 Boration

4.1.1 Determine the amount of Boration desired

4.1.2 Verify an inservice BATP running.

- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.1.3 Place Boric Acid to Blender Q1E21FCV113A to Open.

4.1.4 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B to open.

4.1.5 After desired amount of acid has entered the RCS close MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B.

4.1.6 Close BORIC ACID TO BLENDER Q1E21FCV113A.

NOTE: <u>IF</u> repeated borations are expected, <u>THEN</u> the inservice BATP may remain running until after the final boration is completed.

4.1.7 Secure the inservice BATP.

4.2 Dilution

4.2.1 Determine the Amount of Dilution desired.

4.2.2 Verify one RMWP supplying Reactor Makeup System with water.

4.2.3 Place RMW to Blender Q1E21FCV 114B to Open.

- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.2.4 Place MKUP TO CHG PUMP SUCTION Q1E21FCV113B to Open

4.2.5 After desired amount of water has entered the RCS close MKUP TO CHG PUMP SUCTION Q1E21FCV113B.

4.2.6 Close RMW TO BLENDER Q1E21FCV114B

APPENDIX B

OPERATOR AID FOR BORATION AND DILUTION

1.0 Boration

NOTE:	**The Boric Acid Integrator ONLY needs to be verified when changed. This should be documented with an Autolog Entry.**

☐ ☐ ☐ ☐ 1.1 IF necessary, THEN set the boric acid integrator to the desired quantity.

☐ ☐ ☐ ☐ 1.2 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint as desired.

☐ ☐ ☐ ☐ 1.3 Position the MKUP MODE CONT SWITCH to STOP.

☐ ☐ ☐ ☐ 1.4 Position the MKUP MODE SEL SWITCH to BOR.

☐ ☐ ☐ ☐ 1.5 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 1.6 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

☐ ☐ ☐ ☐ 1.7 Verify the boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

☐ ☐ ☐ ☐ 1.8 If desired to clear the line of acid, perform the applicable steps of Appendix B section 2.0.

NOTE:	**The following three steps are not required if operation in a mode other than automatic is preferred. Refer to appendix C.**

☐ ☐ ☐ ☐ 1.9 Position the MKUP MODE SEL SWITCH to AUTO.

☐ ☐ ☐ ☐ 1.10 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 1.11 IF LK 112 setpoint was adjusted per Step 1.2, THEN return setpoint to that required for current conditions.

APPENDIX C

OPERATOR AID FOR REPETITIVE BORATION AND DILUTION

CAUTION:	**Without automatic makeup care should be taken to maintain VCT level between 26% and 61% during repetitive operation of the reactor makeup control system.**

1.0 Boration

NOTE:	**During periods of repetitive boration evolutions, to minimize the number of start/stop cycles on the boric acid pump, the handswitch may be placed in START and allowed to return to AUTO to maintain the boric acid pump running. WHEN it is no longer desired to maintain the boric acid pump running continuously, THEN place the handswitch in STOP and return to AUTO.**

☐ ☐ ☐ ☐ 1.1 The Reactor Makeup Control system has been previously aligned for Boration.

☐ ☐ ☐ ☐ 1.2 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 1.3 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

☐ ☐ ☐ ☐ 1.4 Verify the boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

NOTE:	**WHEN it is no longer desired to maintain the line full of acid, THEN perform the applicable steps of Appendix B section 2.0 to flush the line.**

☐ ☐ ☐ ☐ 1.5 IF repetitive borations are no longer required THEN verify the system is aligned for Automatic makeup per steps 1.9 through 1.11 of Appendix B.

CAUTION:	Without automatic makeup care should be taken to maintain VCT level between 26% and 61% during repetitive operation of the reactor makeup control system.

2.0 Dilution

☐ ☐ ☐ ☐ 2.1 The Reactor Makeup Control system has been previously aligned for Dilution or Alternate Dilution.

☐ ☐ ☐ ☐ 2.2 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 2.3 Verify proper dilution operation by observing the following:

- IF using ALT DIL, MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- MKUP TO VCT Q1E21FCV114A opens, unless bypassing VCT.
- RMW TO BLENDER Q1E21FCV114B opens.
- Reactor makeup flow is displayed on FI-168 MAKEUP FLOW TO CHG/VCT.

☐ ☐ ☐ ☐ 2.4 Verify the dilution automatically stops when the total flow batch integrator reaches its setpoint by observing the following:

- Reactor makeup flow returns to zero as displayed on FI-168 MAKEUP FLOW TO CHG/VCT.
- MKUP TO VCT Q1E21FCV114A closes or is closed if bypassing the VCT.
- RMW TO BLENDER Q1E21FCV114B closes.
- IF ALT DIL was used, THEN MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.

☐ ☐ ☐ ☐ 2.5 IF repetitive dilutions are no longer required THEN verify the system is aligned for Automatic makeup per steps 2.8 through 2.11 of Appendix B.

APPENDIX D

Operation of the Chemical and Volume Control System Reactor Makeup Control System with FIS 168 Total Flow Batch Integrator Unreliable

1.0 Purpose

Allow makeup to the VCT for a dilution when the AUTO function is failed because FIS-168 Total Flow Batch Integrator is unreliable.

2.0 Initial Conditions

2.1 FIS-168 Total Flow Batch Integrator is failed or unreliable, and plant operations require a dilution.

2.2 The Chemical and Volume Control System is aligned for auto operation.

3.0 Precautions and Limitations

3.1 When selecting FCV-114B to OPEN the valve will go to full open, not a throttled position, causing the flow rate to be higher than normal.

3.2 A controlled mixing of boron and RMW will not be possible for a blended flow to the VCT.

3.3 Large batch make ups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233)

4.0 Instructions

NOTE:	**Flow rate of makeup to the RCS may be indicated on Reactor Makeup Flow Indicator Q1E21FI-168. If not and flow rate is desired, flow rate must be estimated by VCT level rise.**

4.1 Dilution

4.1.1 Determine the amount of dilution desired.

4.1.2 Verify one RMWP supplying Reactor Makeup System with water.

- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.1.3 Place RMW to Blender Q1E21FCV114B to Open.

4.1.4 Place MKUP TO CHG PUMP SUCTION Q1E21FCV113B to Open.

CAUTION: Due to valve stroke time, position to close MKUP TO CHG PUMP SUCTION Q1E21FCV113B two gallons prior to achieving the desired amount of dilution water.

4.1.5 WHEN desired, THEN close MKUP TO CHG PUMP SUCTION Q1E21FCV113B.

4.1.6 Close RMW TO BLENDER Q1E21FCV114B.

4.1.7 Place MKUP TO CHG PUMP SUCTION Q1E21FCV113B to AUTO.

4.1.8 Place RMW to Blender Q1E21FCV114B to AUTO.

NOTE: The following steps are required to reset the Total Flow Batch Integrator.

4.1.9 Position the MKUP MODE CONT SWITCH to STOP.

4.1.10 Position the MKUP MODE CONT SWITCH to START.

A.1.1SRO Conduct Of Operations ADMIN 006A1.02 - SRO

TITLE: Determine required quantity of Boric Acid solution and Reactor Makeup water and integrator settings for makeup to the RWST, and determine which TS ACTIONS are required, if any.

TASK STANDARD: Determine the required quantity of Boric Acid and Reactor Makeup water to restore RWST level at the current Boric Acid Concentration, and correctly determine the setting of the Reactor Makeup system integrators and the potentiometer setting for the Boric Acid Flow controller. Determines that LCO 3.5.4 CONDITION B is in effect, and restoring RWST to greater than 37.9 feet in 1 hour is required.

PROGRAM APPLICABLE: SOT ___ SOCT _____ OLT _X_ LOCT_____

ACCEPTABLE EVALUATION METHOD: _X_ PERFORM ___ SIMULATE ___ DISCUSS

EVALUATION LOCATION: ____ SIMULATOR ___ CONTROL ROOM _X_ CLASSROOM

PROJECTED TIME: _20 MIN_ SIMULATOR IC NUMBER: _N/A_

ALTERNATE PATH ___ TIME CRITICAL ___ PRA_____

Examinee:				
Overall JPM Performance:	**Satisfactory**	☐	**Unsatisfactory**	☐
Evaluator Comments (attach additional sheets if necessary)				

EXAMINER: ____________________

CONDITIONS

When I tell you to begin, you are to determine RWST Makeup quantity, Boric acid concentration, and integrator setting for make up to the RWST per FNP-1-SOP-2.3, Chemical And Volume Control System Reactor Makeup Control System, starting at Step 4.2.3.2 Makeup to Refueling Water Storage Tank (RWST). The conditions under which this task is to be performed are:

a. Unit 1 is at 100% power and stable.
b. RWST Level is at 37.7 feet.
c. RWST Boron concentration is at 2400 ppm.
d. On Service BAT concentration is 7500 ppm.
e. RWST Purification (Recirc) is NOT on-service.
f. The Reactivity Spreadsheet is not available.
g. You are the extra Shift Support Supervisor and have been directed by the Shift Supervisor to perform SOP-2.3 steps 4.2.3.2 – 4.2.3.6 to:
   1. Determine the quantity of blended flow required to raise level in the RWST from 37.7 feet to 39.5 feet while maintaining the current RWST Boron Concentration.
   2. Determine the integrator settings for:
      - FIS 113, BORIC ACID BATCH INTEG
      - FIS-168, TOTAL FLOW BATCH INTEG
   3. Determine the potentiometer setting to **makeup to the RWST at a reduced flow of 60 gpm total flow** for:
      - FK-113, BORIC ACID MKUP FLOW
   4. Determine which TS ACTION(S) is(are) required, if any.

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)
____ **START TIME**		

NOTE: • This is a classroom setting ADMIN JPM task.

*1. Determines Gallons needed per RWST Tank curve 31B is 22,378 gallons. **491064 - 468686** = 22378	• Determines RWST Volume at 39.5 feet=491064 gals • Determines RWST Volume at 37.7 feet=484848 gals • Calculates total volume addition= 22378 gals **491064 - 468686** = 22378 gals [no tolerance: whole numbers from a table]	S / U

EVALUATION CHECKLIST

ELEMENTS:		STANDARDS:	RESULTS: (CIRCLE)
*2.	Determines Boric Acid amount from **Figure 1, SOP-2.3**, for the current concentration of 2400 ppm.	Determines from **Figure 1, SOP-2.3** ratio of Boric Acid amount to total amount from the ratio of Boric Acid flow to Total Flow. Then calculates total Boric Acid in gallons to obtain total 22,378 gals of blended solution at 2400 ppm: • 7664-7672 gals Boric Acid Solution	S / U
		PER FIG. 1 PAGE 1: $22378\left(\frac{41.1}{120}\right) = \mathbf{7664.465gals}$ PER FIG 1 PAGE 3: $22378\left(\frac{41.14}{120}\right) = \mathbf{7671.924}$ gals [tolerance: 7664.0-7672 based on using either page 1 or page 3 numbers and rounding to nearest whole number of 7664 or rounding up for conservative 7672 gals.]	
*3.	Determines the totalizer settings for Total flow FIS-168, TOTAL FLOW BATCH INTEG and FIS-113, BORIC ACID BATCH INTEG: Based on Figure 1.	Determines totalizer settings are: • FIS-168=22378 gals • FIS-113=7664-7672 gals	 S / U S / U

NOTE: • **In element 5, FK-113 pot setting* is critical, but the manual position of FIS-168 demand which corresponds to 60 gpm is not critical, since this controller would need to be adjusted while flow was present. There is no corresponding demand that will ensure 60 gpm flow prior to initiating flow and adjusting as necessary.**

Examiner NOTE: • **In element 5, IF applicant desires to raise the setpoint above the minimum required, ask them what setpoint they are going to use and ensure it is greater than the minimum required.**

CRITICAL ELEMENTS: Critical Elements are denoted with an asterisk (*) before the element number.

GENERAL REFERENCES:

1. FNP-1-SOP-2.3 Version 44.0
2. FNP-1-ARP-1.5 EG4, Version 49.0
3. Tech Specs & Basis Amendment No. 146 (Unit 1), Amendment No. 137 (Unit 2)
4. K/A: G2.006A1.02 RO 3.0 SRO 3.6

GENERAL TOOLS AND EQUIPMENT:

Provide:

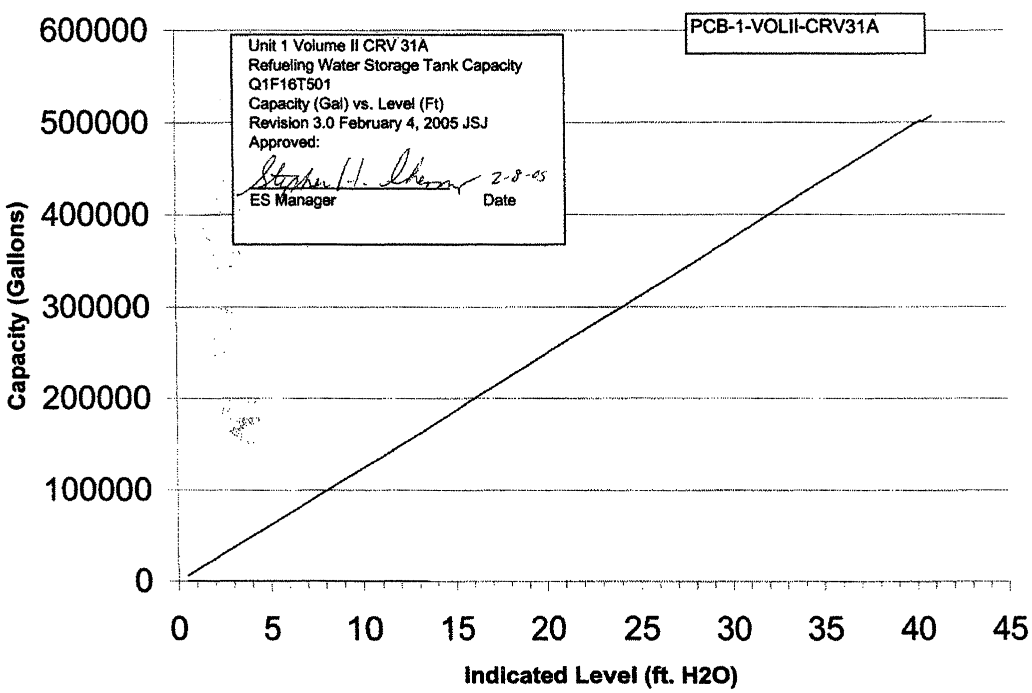
1. FNP-1-SOP-2.3, Version 44.0.
2. Curves 31A & 31B
3. Calculator (or applicant may supply their own calculator)
4. LCO 3.5.4 & Basis.

COMMENTS:

CONDITIONS

When I tell you to begin, you are to determine RWST Makeup quantity, Boric acid concentration, and integrator setting for make up to the RWST per FNP-1-SOP-2.3, Chemical And Volume Control System Reactor Makeup Control System, starting at Step 4.2.3.2 Makeup to Refueling Water Storage Tank (RWST). The conditions under which this task is to be performed are:

a. Unit 1 is at 100% power and stable.
b. RWST Level is at 37.7 feet.
c. RWST Boron concentration is at 2400 ppm.
d. On Service BAT concentration is 7500 ppm.
e. RWST Purification (Recirc) is NOT on-service.
f. The Reactivity Spreadsheet is not available.
g. You are the extra Shift Support Supervisor and have been directed by the Shift Supervisor to perform SOP-2.3 steps 4.2.3.2 – 4.2.3.6 to:
   1. Determine the quantity of blended flow required to raise level in the RWST from 37.7 feet to 39.5 feet while maintaining the current RWST Boron Concentration.
   2. Determine the integrator settings for:
      - FIS 113, BORIC ACID BATCH INTEG
      - FIS-168, TOTAL FLOW BATCH INTEG
   3. Determine the potentiometer setting to **makeup to the RWST at a reduced flow of 60 gpm total flow** for:
      - FK-113, BORIC ACID MKUP FLOW
   4. Determine which TS ACTION(S) is(are) required, if any.


PCB-1-VOLII-CRV31A
Unit 1 Volume II CRV 31A
Refueling Water Storage Tank Capacity
Q1F16T501
Capacity (Gal) vs. Level (Ft)
Revision 3.0 February 4, 2005 JSJ
Approved:
2-8-05
ES Manager
Date
600000
500000
400000
300000
200000
100000
0
Capacity (Gallons)
0
5
10
15
20
25
30
35
40
45
Indicated Level (ft. H2O)

Unit 1 Volume II Curve 31B
Refueling Water Storage Tank Capacity
Q1F16T501
Level (ft. H_2O) vs. Capacity (Gallons)
Revision 4.0 February 4, 2005
Approved:

[illegible] 2-8-05
ES Manager Date

PCB-1-VOLII-CRV31B

Level (ft. H_2O)	Inventory Gallons
0.5	6186
1.0	12372
1.5	18559
2.0	24745
2.5	30931
3.0	37117
3.5	43303
4.0	49489
4.5	55676
5.0	61862
5.5	68048
6.0	74234
6.5	80420
7.0	86607
7.5	92793
8.0	98979
8.5	105165
9.0	111351
9.5	117537
10.0	123724
10.5	129910
11.0	136096
11.5	142282
12.0	148468
12.5	154655
13.0	160841
13.5	167027
14.0	174048
14.5	180264
15.0	186480
15.5	192696
16.0	198912
16.5	205128
17.0	211344
17.5	217560
18.0	223776
18.5	229992
19.0	236208
19.5	242424
20.0	248640
20.5	254856
21.0	261072
21.5	267288
22.0	273504
22.5	279720
23.0	285936
23.5	292152
24.0	298368
24.5	304584
25.0	310800
25.5	317016
26.0	323232
26.5	329448
27.0	335664
27.5	341880
28.0	348096
28.5	354312
29.0	360528
29.5	366744
30.0	372960
30.5	379176
31.0	385392
31.5	391608
32.0	397824
32.5	404040
33.0	410256
33.5	416472
34.0	422688
34.5	428904
35.0	435120
35.5	441336
36.0	447552
36.5	453768
37.0	459984
37.1	461227
37.2	462470
37.3	463714
37.4	464957
37.5	466200
37.6	467443
37.7	468686
37.8	469930
37.9	471173
38.0	472416
38.1	473659
38.2	474902
38.3	476146
38.4	477389
38.5	478632
38.6	479875
38.7	481118
38.8	482362
38.9	483605
39.0	484848
39.1	486091
39.2	487334
39.3	488578
39.4	489821
39.5	491064
39.6	492307
39.7	493550
39.8	494794
39.9	496037
40.0	497280
40.1	498523
40.2	499766
40.3	501010
40.4	502253
40.5	501081
40.6	502318
40.7	503555
40.8	504793
40.9	506030
41.0	507267
41.2	509712

Total volume in gallons = 509712
Technical Specification SR 3.5.4.2 requires a minimum contained borated water volume of 471,000 gallons.

FARLEY NUCLEAR PLANT

SYSTEM OPERATING PROCEDURE

FNP-1-SOP-2.3

SAFETY RELATED

CHEMICAL AND VOLUME CONTROL SYSTEM
REACTOR MAKEUP CONTROL SYSTEM

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	**ALL**
Reference Use	
Information Use	

Approved:

J. L. Hunter (for)
Operations Manager

Date Issued 04/04/2008

TABLE OF CONTENTS

FARLEY NUCLEAR PLANT
UNIT 1
SYSTEM OPERATING PROCEDURE SOP-2.3

CHEMICAL AND VOLUME CONTROL SYSTEM
REACTOR MAKEUP CONTROL SYSTEM

1.0 Purpose

This procedure provides Initial Conditions, Precautions and Limitations, and Instructions for operation of the Reactor Makeup Control System. Instructions are included in the following sections:

2.0 Initial Conditions

2.1 The chemical and volume control system valves and electrical distribution systems are aligned per System checklist FNP-1-SOP-2.1A, CHEMICAL AND VOLUME CONTROL SYSTEM, with exceptions noted.

2.2 At least one RCP must be running prior to changing the boron concentration in the RCS. (SOER 94-02) (Section 3.0, Precaution and Limitation include additional clarification for this restriction).

2.3 Reactor makeup water is available to the reactor makeup control system per FNP-1-SOP-4.0, REACTOR MAKEUP WATER SYSTEM, if the operation being performed requires reactor makeup water.

2.4 Boric acid is available to the reactor makeup control system per FNP-1-SOP-2.6, CHEMICAL AND VOLUME CONTROL SYSTEM BORIC ACID SYSTEM, if the operation being performed requires boric acid.

3.0 Precautions and Limitations

3.1 The reactor makeup control system should be in automatic and adjusted to supply makeup equal in boron concentration to reactor coolant system concentration, except during reactor coolant system boration or dilution operations, or malfunctions of automatic control.

3.1.1 FK-168 is the M/A station used to control RMW to the blender flow control valve (FCV-114B). If the M/A station is in AUTO, then the Makeup Mode Selector Switch determines the origin of the set point as follows:

- With the Mode Selector Switch in AUTO, the set point is 120 gpm. The position of FCV-114B is determined by the difference between actual total flow and an internal set point of 120 gpm.
- With the Mode Selector Switch in MAN, DIL, or ALT DIL, the set point is determined by the potentiometer position. (AI-2005205348)

3.1.2 FK-113 is the M/A station used to control boric acid flow to the blender flow control valve (FCV-113A). When the makeup mode selector switch is in AUTO, FK-113 (M/A station) will only control FCV-113A automatically during periods of an AUTO makeup. Once the VCT level reaches 40 percent, the M/A station will shift to manual control. This maintains FK-113 output at the valve demand required for the desired blended boron concentration as determined by M/A station potentiometer setting based on total flow of 120 gpm. FK-113 should not routinely be left in AUTO since the output will continue to integrate up with no system flow. This would delay the valve response to an auto makeup and result in an over boration. (AI2005205348)

3.2 Actuation of the VCT LVL HI-LO annunciator (DF3) indicates a malfunction or improper operation of the reactor makeup control system.

3.3 The boron concentration in the pressurizer should not be less than that in the RCS loops by more than 50 ppm. Following or during a 5 ppm change of boron concentration in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

3.4 Observe the effects of changing RCS boron concentration in terms of resulting control rod motion, changes in Tavg, or S/R count rate. Stop boron concentration change operations and take corrective action if control rod motion is excessive or in the wrong direction, or Tave changes without subsequent rod motion.

3.5 <u>WHEN</u> the reactor is in the source range, <u>THEN</u> positive reactivity additions must only be made by one controlled method at a time.

3.6 The flow rate through the reactor coolant system shall be determined to be greater than 3000 gpm prior to the start of and at least once per hour during a dilution of the RCS by verifying at least one RCP is running.

NOTE: The following step is intended to prevent the occurrence of dilute pockets of Reactor coolant due to inadequate mixing while in shutdown conditions. This could occur if the RHR system is the sole source of RCS flow and a boration is made to reach the required shutdown margin (or refueling) boron concentration.

3.7 During shutdown operations, at least one RCP must be running prior to changing the RCS boron concentration unless directed to borate the RCS by any abnormal or emergency operating procedure. <u>IF</u> the RCS and PRZR boron concentration have been sampled with a RCP running, and verified adequate for refueling and/or shutdown margin, <u>THEN</u> filling or normal makeup to the RCS with water greater than or equal to the refueling and/or shutdown margin concentration is not applicable to this requirement. <u>IF</u> a boration is required to obtain the required boron concentration, <u>AND</u> no RCP is running, <u>THEN</u> the Shift Supervisor should consider alternate sampling methods to verify boron concentration requirements are satisfied throughout the RCS.

3.8 Both units' boric acid blenders should not be supplied with reactor makeup water simultaneously if SOP-4.0 Appendix 2 is in effect.

3.9 Simultaneous running of both RMW pumps can cause one pump to operate near shutoff head condition, which produces abnormal thrust bearing loading and could lead to pre-mature bearing failure. Simultaneous running of both pumps should be minimized. (IR 1-96-062)

3.10 ZAS injection will result in a continuous RCS dilution by as much as 1.7 gallons per hour, which could result in a rise in TAVG if not compensated for by boration, rod insertion, or increasing fission product poison inventory.

3.11 During periods of repetitive boration evolutions, to minimize the number of start/stop cycles on the boric acid pump, the handswitch may be placed in START and allowed to return to AUTO to maintain the boric acid pump running. WHEN it is no longer desired to maintain the boric acid pump running continuously, THEN place the handswitch in STOP and return to AUTO.

3.12 Large batch makeups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233) Large makeups can also cause seal injection temperature transients which can reduce RCP #1 seal leak off to a point at which seal damage occurs. (CR 2006104054)

3.13 The following list provides precautions and limitations related to VCT pressure reductions and gas accumulation in idle charging pump suctions.

- VCT pressure reductions ≥ 7 psig can result in gas dissolution sufficient to create idle charging pump suction voiding.
- Any VCT pressure reduction should be ≤ 5 psig in 4 hours to preclude void formation in charging pump suction piping.
- Pressure reduction rates exceeding preceding limitation should be documented by Condition Report.
- Idle Charging pump suctions should be vented when VCT pressure reduction rate has exceeded preceding limit.

4.0 Instructions

4.1 Automatic Makeup

4.1.1 Determine the existing RCS boron concentration by sample analysis or from an estimate based on the previous sample.

NOTE: ZAS injection will result in a continuous RCS dilution by as much as 1.7 gallons per hour causing the auto makeup to be inadequately set. A slightly higher set point may be required to maintain TAVG.

4.1.2 Verify the following:

4.1.2.1 Verify BORIC ACID MKUP FLOW controller FK 113 set up per the following:

A) In Manual

B) Potentiometer is set to obtain a makeup value having a boron concentration equal to RCS boron concentration. The setting is obtained from one of the following: (AI2005205348)

- Reactivity Briefing Sheet
- Figure 1

4.1.2.2 Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.1.3 Position the MKUP MODE CONT SWITCH to STOP.

4.1.4 Position the MKUP MODE SEL SWITCH to AUTO.

NOTE: Automatic makeup may be stopped at any time by placing the MKUP MODE CONT SWITCH to STOP.

4.1.5 Position the MKUP MODE CONT SWITCH to START.

4.1.6 IF 1B RMW PUMP is running and is not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

NOTE: Verify expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.

4.1.7 Verify proper automatic operation of the reactor makeup control system as follows:

4.1.7.1 WHEN VCT level decreases to 20%, THEN verify that makeup begins by observing the following:

(a) MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) open.

(b) Boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT.

(c) VCT level increasing.

4.1.7.2 WHEN VCT level increases to 40%, THEN verify that makeup stops by observing the following:

(a) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

(b) MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) closed.

(c) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(d) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2 Manual Makeup

CAUTION: **Maintain VCT level between 26% and 61% during manual operation of the reactor makeup control system.**

Large batch makeups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233)

NOTE: IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.

4.2.1 Makeup to Top of Volume Control Tank

4.2.1.1 Verify the VCT capable of receiving makeup.

4.2.1.2 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Boron/Dilution Tables
- Nomographs

NOTE:
- **When making up to the VCT use the flow rate from figure 1 or the reactivity briefing sheet.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **The boric acid flow should not be through the top of the VCT to keep the nozzle from clogging.**
- **For blended flow set the boric acid integrator to the desired amount of acid and the total flow integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.1.3 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.1.2.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.1.4 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.1.2.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.1.5 IF necessary, THEN adjust LK-112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing gas space.

4.2.1.6 Position the MKUP MODE CONT SWITCH to STOP.

4.2.1.7 Position the MKUP MODE SEL SWITCH to MAN.

4.2.1.8 Open MKUP TO VCT Q1E21FCV114A (Q1E21V339).

NOTE:
- **Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.2.1.9 Position the MKUP MODE CONT SWITCH to START.

4.2.1.10 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP switch to STOP.

4.2.1.11 Verify makeup flows indicated on FI-113 and FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.1.12 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.2.1.13 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(c) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

4.2.1.13 Return MKUP TO VCT Q1E21FCV114A (Q1E21V339) control switch to AUTO.

4.2.1.14 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.1.15 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.1.16 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore FK-113 controller to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.2.1.17 IF LK-112 was adjusted, THEN return LK-112 setpoint to that required for current conditions.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.1.18 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.1.19 Position the MKUP MODE CONT SWITCH to START.

4.2.2 Makeup to Charging Pumps Suction Header

NOTE:	**<u>IF</u> waste gas system is shutdown, <u>THEN</u> VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.**

4.2.2.1 Verify VCT capable of receiving makeup.

4.2.2.2 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Boron/Dilution Tables
- Nomographs

NOTE:
- **When making up to the VCT use the flow rate from figure 1 or the reactivity briefing sheet.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the boric acid integrator to the desired amount of acid and the total flow integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.2.3 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.2.2.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.2.4 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.2.2.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.2.5 IF necessary, THEN adjust LK-112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing gas space.

4.2.2.6 Position MKUP MODE CONT SWITCH to STOP.

4.2.2.7 Position the MKUP MODE SEL SWITCH to MAN

4.2.2.8 Open MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337).

NOTE:
- **Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.2.2.9 Position MKUP MODE CONT SWITCH to START.

4.2.2.10 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP switch to STOP.

4.2.2.11 Verify boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.2.12 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.2.2.13 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(c) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

4.2.2.13 Return MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) control switch to AUTO.

4.2.2.14 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.2.15 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.2.16 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore FK-113 controller to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.2.2.17 IF LK-112 was adjusted, THEN return LK-112 setpoint to that required for current conditions.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.2.18 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.2.19 Position the MKUP MODE CONT SWITCH to START.

4.2.3 Makeup to Refueling Water Storage Tank (RWST)

CAUTION: Avoid operations that could result in RCS volume changes. Makeup to the VCT from the blender will not be available while making up to the RWST.

NOTE:

- **Due to system interconnections, the RWST Purification Loop (Recirculation) should not be in operation using the Refueling Water Purification Pump while making up to the RWST. However, it is permissible to makeup while BARS is in operation.**
- **IF makeup to the RWST is due to BARS operation, THEN to minimize dilution of the RWST, boron concentration of the blended flow should be greater than or equal to the BARS reject flow concentration.**
- **IF desired to flush the line of acid following makeup, THEN remember to perform step 4.2.3.17 at an appropriate time prior to reaching the Total Flow Integrator setpoint.**

4.2.3.1 Verify the RWST capable of receiving makeup.

4.2.3.2 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Nomographs

4.2.3.3 IF the final boron concentration in the RWST is going to differ from the initial, THEN use the following formulas or the reactivity briefing sheets to determine the amount of water or acid to be added.

To dilute the RWST: $VA = \frac{CI - CF}{CF}(VI)$

To borate the RWST: $VA = \frac{CI - CF}{CF - CA}(VI)$

To determine final boron concentration:

$$CF = \frac{[CI \times VI] + [CA \times VA]}{VF}$$

Where:

VA = Volume of water or acid added to the RWST

VI = Initial water volume in RWST

VF = Final water volume in RWST

CI = Initial boron concentration in RWST

CF = Final boron concentration in RWST

CA = Boron concentration added to RWST

4.2.3.4 IF the RWST Purification (Recirc) is On-Service, THEN secure the Refueling Water Purification Pump.

NOTE:
- **When blended flow concentration of 2000 PPM is required, the makeup system may not be able to deliver boric acid flow for 120 gpm total flow. IF necessary, THEN the Total Flow may be set for < 120 gpm and the Boric Acid Flow rate adjusted proportionally to Total Flow.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the Boric Acid Integrator to the desired amount of acid and the Total Flow Integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **When making up to the RWST The boric acid flow rate should be such that it will finish first and the last thing in the line will be reactor makeup water.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.3.5 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.3.2 or 4.2.3.3.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.3.6 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.3.2 or 4.2.3.3.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.3.7 Position the MKUP MODE CONT SWITCH to STOP.

4.2.3.8 Position the MKUP MODE SEL SWITCH to MAN.

4.2.3.9 Open blender discharge to RWST valve 1-CVC-V-8434 (N1E21V238).

4.2.3.10 Open blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.3.11 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in the CLOSED position.

4.2.3.12 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in the CLOSED position.

4.2.3.13 IF making up to the RWST is due to the depletion of boron by the BARS system and it is desired to make-up with boric acid only, THEN close RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345).

NOTE:	**Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**

4.2.3.14 Position the MKUP MODE CONT SWITCH to START.

4.2.3.15 IF 1B RMW PUMP is running and not required for current plant operations, THEN position the 1B RMW PUMP switch in STOP.

4.2.3.16 Verify boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.3.17 IF desired to flush the acid from the line, THEN at the appropriate time to conclude the makeup with RMW only:

(a) Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) open.

(b) Close BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354)

4.2.3.18 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) closed IF in AUTO.

(c) BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354) closed.

4.2.3.19 Close blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.3.20 Close blender discharge to RWST valve 1-CVC-V-8434 (N1E21V238).

4.2.3.21 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in AUTO.

4.2.3.22 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in AUTO.

4.2.3.23 Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) in AUTO.

4.2.3.24 Verify BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354) in AUTO.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.3.25 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.3.26 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore FK-113 controller to the setpoint required for automatic makeup per step 4.1.2

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.3.27 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.3.28 Position the MKUP MODE CONT SWITCH to START.

4.2.3.29 IF the Refueling Water Purification Pump was secured in Step 4.2.3.4, THEN perform the following:

(a) Start the RWP pump.

(b) Throttle SFP purification outlet to RWST 1-SFP-V-8793B (N1G31V021B) to establish 100 gpm on the SFP demineralizer FI-654.

4.2.3.30 Independently verify Closed the following:

- Blender Miscellaneous Discharge Isolation valve 1-CVC-V-8432 (Q1E21V237).
- Blender Discharge To RWST valve 1-CVC-V-8434 (N1E21V238).

4.2.4 Makeup to Recycle Holdup Tanks (RHT)

CAUTION:	**Avoid operations that could result in RCS volume changes. Makeup to the VCT from the blender will not be available while making up to a RHT.**

NOTE:	**IF desired to flush the line of acid following makeup, THEN remember to perform step 4.2.4.18 at an appropriate time prior to reaching the Total Flow Integrator setpoint.**

4.2.4.1 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Nomographs

4.2.4.2 IF the final boron concentration in the RHT is going to differ from the initial, THEN use the following formulas or the reactivity briefing sheets to determine the amount of water and/or acid to be added.

To dilute the RHT: $VA = \frac{CI - CF}{CF}(VI)$

To borate the RHT: $VA = \frac{CI - CF}{CF - CA}(VI)$

To use a blend: $CB = \frac{(CF \times VF) - (CI \times VI)}{VA}$

Where:

VA = Amt. of water and/or acid added to the RHT

VI = Initial quantity in RHT

VF = Final quantity in RHT

CI = Initial boron concentration in RHT

CF = Final boron concentration in RHT

CA = Boron concentration in BAT

CB = Boron concentration of blended flow (use Nomographs, Figure 1, OR Reactivity Briefing Sheet to determine the amount of water and acid required)

NOTE:
- **When blended flow concentration of 2000 PPM is required, the makeup system may not be able to deliver boric acid flow for 120 gpm total flow. IF necessary, THEN the Total Flow may be set for < 120 gpm and the Boric Acid Flow rate adjusted proportionally to Total Flow.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the Boric Acid Integrator to the desired amount of acid and the Total Flow Integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **When making up to the RHT The boric acid flow rate should be such that it will finish first and the last thing in the line will be reactor makeup water.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.4.3 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.4.1 or 4.2.4.2.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.4.4 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.4.1 or 4.2.4.2.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.4.5 Verify closed waste condensate pump discharge to RHT's 1-LWP-V-7229 (Q1G21V031)

4.2.4.6 Align RCDT discharge to WHT per the following:

A) Open RCDT Disch to WHT, 1-LWP-V-7137 (Q1G21V009) (100' PPR).

B) Close RCDT pump discharge to RHT iso, 1-CVC-V-8551 (Q1E21V315) (121' PPR).

4.2.4.7 Align the RHT that will be made up to on service AND secure the previous on service RHT per FNP-1-SOP-2.4, CHEMICAL AND VOLUME CONTROL SYSTEM BORON RECYCLE SYSTEM.

4.2.4.8 Place control switch for recycle evaporator feed demineralizer automatic bypass valve Q1E21TCV250 (Q1E21V361) to FILTER position. (The control switch is located on the liquid waste panel.)

4.2.4.9 Open blender discharge to RHT's valve 1-CVC-V-8553 (Q1E21V280).

4.2.4.10 Open blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.4.11 Position the MKUP MODE CONT SWITCH to STOP.

4.2.4.12 Position the MKUP MODE SEL SWITCH to MAN.

NOTE: Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.

4.2.4.13 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in the CLOSED position.

4.2.4.14 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in the CLOSED position.

4.2.4.15 Position the MKUP MODE CONT SWITCH to START.

4.2.4.16 <u>IF</u> 1B RMW PUMP is running and not required for current plant conditions, <u>THEN</u> place the 1B RMW PUMP handswitch to STOP.

4.2.4.17 Boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.4.18 <u>IF</u> desired to flush the acid from the line, <u>THEN</u> at the appropriate time to conclude the makeup with RMW only:

(a) Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) open.

(b) Close BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354)

4.2.4.19 Verify makeup automatically stops when batch integrator setpoints are reached by observing that boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.4.20 Close blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.4.21 Close blender discharge to RHT's valve 1-CVC-V-8553 (Q1E21V280).

4.2.4.22 Place MKUP TO VCT Q1E21FCV114A (Q1E21V339) in AUTO.

4.2.4.23 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in AUTO.

4.2.4.24 Verify BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354) in AUTO.

4.2.4.25 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE: The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.

4.2.4.26 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.4.27 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

NOTE:	**The following two steps are not required if operation in a mode other than automatic is required.**

4.2.4.28 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.4.29 Position the MKUP MODE CONT SWITCH to START.

4.2.4.30 Align RCDT discharge to RHT per the following:

- Open RCDT pump discharge to RHT 1-CVC-V-8551 (Q1E21V315) (121'PPR).
- Close RCDT disch to WHT 1-LWP-V-7137 (Q1G21V009). (100' PPR)

4.2.4.31 Position control switch for recycle evaporator feed demineralizer automatic bypass valve Q1E21TCV250 (Q1E21V361) to the DEMIN position until red light is illuminated THEN place handswitch in AUTO position. (The control switch is located on the liquid waste panel.)

4.2.4.32 Remove batched up RHT from service and place another RHT on service IF required per FNP-1-SOP-2.4, CHEMICAL AND VOLUME CONTROL SYSTEM BORON RECYCLE SYSTEM.

4.2.4.33 Independently Verify the following:

- Verify MKUP TO VCT Q1E21FCV114A (Q1E21V339) in AUTO.
- Verify close blender discharge to RHT's valve 1-CVC-V-8553 (Q1E21V280).
- Verify open RCDT pump discharge to RHT 1-CVC-V-8551 (Q1E21V315) (121'PPR).
- Verify close RCDT DISCH to WHT 1-LWP-V-7137 (Q1G21V009). (100' PPR)

4.2.5 Makeup to SFP Through Temporary Connection

CAUTION: Avoid operations that could result in RCS volume changes. Makeup to the VCT from the blender will not be available while making up to the SFP.

NOTE: This procedure is intended for situations when normal makeup to the SFP is not available and should not be used for normal makeup to the SFP.

IF desired to flush the line of acid following makeup, THEN remember to perform step 4.2.5.14 at an appropriate time prior to reaching the batch integrator setpoint.

4.2.5.1 Verify that the SFP is capable of receiving makeup.

4.2.5.2 Verify blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237) closed.

NOTE: The following step will open a section of 2 inch diameter pipe approximately 40 feet long requiring a catch bag routed to the nearest equipment drain be rigged prior to commencing.

4.2.5.3 Remove blind flange from the temporary connection and install temporary hose routed to the SFP.

4.2.5.4 Determine both the quantity and concentration (boric acid, reactor makeup water, or blend) of makeup by one of the following:

- Reactivity Briefing Sheet
- Figure 1
- Nomographs

NOTE:
- **When blended flow concentration of 2000 PPM is required, the makeup system may not be able to deliver boric acid flow for 120 gpm total flow. IF necessary, THEN the Total Flow may be set for < 120 gpm and the Boric Acid Flow rate adjusted proportionally to Total Flow.**
- **Flow rates may be adjusted using the controllers in manual or automatic.**
- **For blended flow set the Boric Acid Integrator to the desired amount of acid and the Total Flow Integrator to the desired amount of reactor makeup water PLUS the boric acid for the "total amount".**
- **When making up to the SFP The boric acid flow rate should be such that it will finish first and the last thing in the line will be reactor makeup water.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.2.5.5 Set the boric acid flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.5.4.

- For boric acid only set the boric acid integrator to the desired value and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0.

4.2.5.6 Set the reactor makeup water flow controllers and batch integrators to the calculated flow rate and quantity value obtained in step 4.2.5.4.

- For boric acid only set the total flow integrator to 0 and RMW TO BLENDER Q1E21FCV114B (Q1E21V345) should be taken to close to ensure that only acid flow is obtained.
- For reactor makeup water only set the boric acid integrator to 0 and the total flow integrator to the desired value.

4.2.5.7 Position the MKUP MODE CONT SWITCH to STOP.

4.2.5.8 Position the MKUP MODE SEL SWITCH to MAN.

4.2.5.9 Open blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.5.10 Place MKUP to CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) in the CLOSED position.

4.2.5.11 Place MKUP to VCT Q1E21FCV114A (Q1E21V339) in the CLOSED position.

NOTE: Makeup may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.

4.2.5.12 Position the MKUP MODE CONT SWITCH to START.

4.2.5.13 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

4.2.5.14 Boric acid flow on FI-113 and reactor makeup flow on FI-168 are at the pre-selected rates as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.2.5.15 IF desired to flush the acid from the line, THEN at the appropriate time to conclude the makeup with RMW only:

(a) Verify RMW TO BLENDER valve Q1E21FCV114B (Q1E21V345) open.

(b) Close BORIC ACID TO BLENDER valve Q1E21FCV113A (Q1E21V354)

4.2.5.16 Verify makeup automatically stops when batch integrator setpoints are reached by observing the following:

(a) Boric acid flow on FI-113 and reactor makeup flow on FI-168 return to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.

(b) RMW TO BLENDER Q1E21FCV114B (Q1E21V345) closed.

(c) BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) closed.

4.2.5.17 Close blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).

4.2.5.18 Place the following valve control switches to AUTO:

(a) MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337).

(b) MKUP TO VCT Q1E21FCV114A (Q1E21V339).

4.2.5.19 Verify BORIC ACID TO BLENDER valve Q1E21FV113A (Q1E21V354) in AUTO.

4.2.5.20 IF required THEN Return RMW TO BLENDER Q1E21FCV114B (Q1E21V345) control switch to AUTO.

NOTE: The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.

4.2.5.21 Set the boric acid and/or total flow batch integrators to the required quantities as needed for normal system operation.

4.2.5.22 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

NOTE: The following two steps are not required if operation in a mode other than automatic is required.

4.2.5.23 Position the MKUP MODE SEL SWITCH to AUTO.

4.2.5.24 Position the MKUP MODE CONT SWITCH to START.

4.2.5.25 Remove the temporary hose from the temporary connection and install blind flange.

4.2.5.26 Independently Verify the following:

- Verify Closed blender miscellaneous discharge isolation valve 1-CVC-V-8432 (Q1E21V237).
- RMW TO BLENDER Q1E21FCV114B (Q1E21V345) in AUTO.
- BORIC ACID TO BLENDER Q1E21FCV113A (Q1E21V354) in AUTO.

4.3 Boration

NOTE: Appendix B, OPERATOR AID FOR BORATION AND DILUTION, may be used without referring to this procedure section under the following conditions:

- **Routine boration for temperature control.**
- **Boration in response to an unplanned or unscheduled power change.**
- **Scheduled power changes.**

Figure 6 may be applied at the discretion of the SS when use of the emergency boration flowpath is desired.

CAUTION: At least one RCP must be operating to ensure that the boron concentration is equalized throughout the RCS and PRZR. Section 3.0, Precautions and Limitations, include additional clarification for this restriction.

4.3.1 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.3.2 Determine the existing Reactor Coolant boron concentration by sample analysis or from an estimate based on a previous sample.

4.3.3 Determine the magnitude of the boron concentration increase required from core physics curves or during normal operation, when compensating for xenon or core burnup, the magnitude may be estimated based on time in core life and previous experience.

4.3.4 Determine the volume of boric acid required for boration from the boron addition nomograph, Figure 2, from the boration/dilution tables, Reactivity Briefing Sheet or from estimate based on time in core life and previous experience.

NOTE:	**IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.**

4.3.5 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

NOTE:	**The boric acid flow required to achieve a desired boration rate may be determined from boron addition rate nomograph, Figure 3.**

4.3.6 Position the MKUP MODE CONT SWITCH to STOP.

4.3.7 Position the MKUP MODE SEL SWITCH to BOR.

NOTE:	**The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.3.8 Set the Boric Acid MKUP Flow Controller and Boric Acid Batch Integrator to the flowrate and quantity values obtained from step 4.3.3 and 4.3.4.

NOTE:	• **Boration may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.** • **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.3.9 Position the MKUP MODE CONT SWITCH to START.

4.3.10 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

4.3.11 Verify that boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

NOTE:	**The following four steps are not required if operation in a mode other than automatic is preferred. For example: when frequent borations are required because of changing core conditions it may be desirable to leave the reactor makeup system aligned for the current operational need and minimize system manipulation. Use appendix C for guidance in repetitive borations.**

4.3.12 Position the MKUP MODE SEL SWITCH to AUTO.

4.3.13 Position the MKUP MODE CONT SWITCH to START.

4.3.14 IF the boric acid and/or reactor makeup water flow controllers were adjusted, THEN perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position. (AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.3.15 IF LK 112 setpoint was adjusted per Step 4.3.5, THEN return setpoint to that required for current conditions.

4.4 Dilution

CAUTION:	**At least one RCP must be in operation prior to performing any RCS dilution. (SOER 94-02)**

NOTE:

- **Appendix B, OPERATOR AID FOR BORATION AND DILUTION, may be used without referring to this procedure section under the following conditions:**
  - **a) Routine dilution for temperature control.**
  - **b) Scheduled power changes.**
- **IF MKUP TO VCT Q1E21FCV114A is not operable, THEN Alternate Dilution is required in step 4.4.8.**

4.4.1 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.4.2 Determine the existing reactor coolant boron concentration by sample analysis, or from an estimate based on the previous sample.

4.4.3 Determine the magnitude of the boron concentration decrease required from core physics curves or during normal operation, when compensating for xenon or core burnup, the magnitude may be estimated based on time in core life and previous experience.

4.4.4 Determine the volume of reactor makeup water required for dilution from the dilution nomograph, Figure 4, from boration/dilution tables, Reactivity Briefing Sheet or from estimate based on time in core life and previous experience.

NOTE: IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.

4.4.5 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

NOTE:
- **The dilution water flow required to achieve a desired dilution rate may be determined from boron dilution rate nomograph, Figure 5.**
- **The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.**

4.4.6 Set the PRI WTR MKUP FLOW (RMW) Controller and Total Flow Batch Integrator to the flow rate and quantity values obtained from step 4.4.3 and 4.4.4.

4.4.7 Position the MKUP MODE CONT SWITCH to STOP.

NOTE:	**The use of the ALT DIL MODE can affect the ability to control hydrogen concentration in the RCS.**

4.4.8 Position the MKUP MODE SEL SWITCH to DIL or ALT DIL.

4.4.9 IF using the ALT DIL MODE AND it is desired to bypass the VCT and dilute straight to the charging pump suction, THEN place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) in close.

NOTE:
- **Dilution may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.4.10 Position the MKUP MODE CONT SWITCH to START.

4.4.11 IF 1B RMW PUMP is running and not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

4.4.12 Verify dilution operation by observing the following:

- IF using ALT DIL, MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- MKUP TO VCT Q1E21FCV114A opens, unless bypassing VCT.
- RMW TO BLENDER Q1E21FCV114B opens.
- Reactor makeup flow is displayed on FI-168 MAKEUP FLOW TO CHG/VCT.

4.4.13 Verify dilution automatically stops when the reactor makeup water batch integrator reaches its setpoint as follows:

- Reactor makeup flow returns to zero as displayed on FI-168 MAKEUP FLOW TO CHG/VCT.
- MKUP TO VCT Q1E21FCV114A closes.
- RMW TO BLENDER Q1E21FCV114B closes.
- IF ALT DIL was used, THEN MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.

4.4.14 IF VCT bypassed per step 4.4.9, THEN place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) to AUTO.

NOTE:	**The following three steps are not required if operation in a mode other than automatic is preferred. For example: when frequent dilutions are required because of changing core conditions it may be desirable to leave the reactor makeup system aligned for the current operational need and minimize system manipulation. Use appendix C for guidance in repetitive dilutions.**

4.4.15 Position the MKUP MODE SEL SWITCH to AUTO.

4.4.16 Position the MKUP MODE CONT SWITCH to START.

4.4.17 IF LK 112 setpoint was adjusted per Step 4.4.5, THEN return setpoint to that required for current conditions.

4.5 Combined Boration / Dilution

NOTE: Appendix B, OPERATOR AID FOR BORATION AND DILUTION, may be used without referring to this procedure section under the following conditions:

- **Routine boration/dilution for temperature control.**
- **Scheduled power changes.**

NOTE: Early in the core cycle it is necessary to borate to compensate for burnup of discreet poisons. It is also desirable to maintain the discharge line from the blender clear of acid. This procedure section is designed to accomplish this by borating and then immediately diluting to flush the acid into the charging pump suction.

4.5.1 Determine the volume of boric acid AND reactor makeup water required (to flush the line clear) based on Rx power, TAVG, Reactivity Briefing Sheet, reactivity change due to xenon, time in core life, and/or previous experience.

NOTE: IF the waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.

4.5.2 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

4.5.3 Position the MKUP MODE CONT SWITCH to STOP.

4.5.4 Position the MKUP MODE SEL SWITCH to BOR.

NOTE: The Boric Acid and/or Total Flow Batch Integrators ONLY need to be verified when changed. This should be documented with an Autolog Entry.

4.5.5 Set the Boric Acid Batch Integrator and Total Flow Batch Integrator to the quantities determined in step 4.5.1.

4.5.6 Set the Boric Acid Flow Controller to the desired flow rate.

NOTE:	• **Boration may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.** • **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.5.7 Position the MKUP MODE CONT SWITCH to START.

4.5.8 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

4.5.9 Verify that boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

4.5.10 Position the MKUP MODE CONT SWITCH to STOP.

NOTE:	**The use of the ALT DIL MODE can affect the ability to control hydrogen concentration in the RCS.**

4.5.11 Align the makeup system for flushing as follows:

- Position the MKUP MODE SEL SWITCH to ALT DIL.
- Place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) in close.
- Set the reactor makeup water flow controller to the desired flow rate.

NOTE:
- **Boration may be stopped at any time by positioning the MKUP MODE CONT SWITCH to STOP.**
- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.5.12 Position the MKUP MODE CONT SWITCH to START.

4.5.13 IF 1B RMW pump is running and not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP.

4.5.14 Verify proper dilution operation by observing the following:

- MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) opens.
- Reactor makeup flow on FI-168 is at the pre-selected rate as displayed on MAKEUP FLOW TO CHG/VCT indicator.

4.5.15 Verify dilution automatically stops when the total flow batch integrator reaches its setpoint by observing the following:

- Reactor makeup flow on FI-168 returns to zero as displayed on MAKEUP FLOW TO CHG/VCT indicator.
- MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B (Q1E21V337) closed.

4.5.16 Place MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) in AUTO.

NOTE:	**The following four steps are not required if operation in a mode other than automatic is preferred.**

4.5.17 Position the MKUP MODE SEL SWITCH to AUTO.

4.5.18 Position the MKUP MODE CONT SWITCH to START.

4.5.19 <u>IF</u> the boric acid and/or reactor makeup water flow controllers were adjusted, <u>THEN</u> perform the following:

(a) Verify the BORIC ACID MKUP FLOW controller FK 113 is in the MAN position.(AI2005205348)

(b) Restore controller FK-113 to the setpoint required for automatic makeup per step 4.1.2.

(c) Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.5.20 <u>IF</u> LK 112 setpoint was adjusted in step 4.5.2, <u>THEN</u> return setpoint to that required for current conditions.

4.6 Verify Reactor Makeup Control System Aligned for Auto Makeup

4.6.1 Determine the existing RCS boron concentration by sample analysis or from an estimate based on the previous sample.

4.6.2 Verify the following:

4.6.2.1 BORIC ACID MKUP FLOW controller FK 113 is in the MAN position and the Potentiometer is set to the value obtained from the blended flow nomographs, Figure 1, or reactivity briefing sheet to obtain makeup value having a boron concentration equal to RCS boron concentration. (AI2005205348)

4.6.2.2 Verify FK-168 PRI WTR MKUP FLOW controller in Auto.

4.6.3 Position the MKUP MODE CONT SWITCH to STOP.

4.6.4 Verify MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closed with handswitch in the AUTO position.

4.6.5 Verify BORIC ACID TO BLENDER Q1E21FCV113A closed with handswitch in the AUTO position.

4.6.6 Verify MKUP TO VCT Q1E21FCV114A closed with handswitch in the AUTO position.

4.6.7 Verify RMW TO BLENDER Q1E21FCV114B closed with handswitch in the AUTO position.

4.6.8 Verify 1A and 1B BATP secured with the on-service BATP handswitch in the AUTO position

4.6.9 Verify 1A (preferred) or 1B RMWP supplying Reactor Makeup System with water.

4.6.10 IF 1B RMW PUMP is running and is not required for current plant conditions, THEN position the 1B RMW PUMP handswitch to STOP and back to AUTO.

4.6.11 IF 1A RMW PUMP is running and is not required for current plant conditions, THEN position the 1A RMW PUMP handswitch to STOP and back to AUTO.

4.6.12 Position the MKUP MODE SEL SWITCH to AUTO.

4.6.13 Position the MKUP MODE CONT SWITCH to START.

4.7 Large Volume Boration of RCS

CAUTION: At least one RCP must be operating to ensure that the boron concentration is equalized throughout the RCS and PRZR. Section 3.0, Precautions and Limitations, include additional clarification for this restriction.

NOTE: To protect the RCP Seals, increase the monitoring of the Seal Injection filter DP, due to the possibility of RCS Crud Burst or other contaminants clogging the Filter.

4.7.1 During or following a change of boron concentration of greater than 5 ppm in the RCS, the pressurizer spray must be operated to equalize the concentration throughout the system. Automatic operation of the spray should be initiated by manual operation of the pressurizer heaters when there is a steam bubble in the pressurizer.

4.7.2 Determine the existing reactor coolant boron concentration by sample analysis or from an estimate based on a previous sample.

4.7.3 Determine the magnitude of the boron concentration increase required from core physics curves or during normal operation, when compensating for xenon or core burnup, the magnitude may be estimated based on time in core life and previous experience.

NOTE: In the following step, the volume of boric acid to be used can be calculated by using the change in level of the on service boric acid tank OR by using the flow rate indicated on FI-110 multiplied by time to obtain gallons.

4.7.4 Determine the volume of boric acid required for boration from the boron addition nomograph, Figure 2, from the boration/dilution tables, Reactivity Briefing Sheet or from estimate based on time in core life and previous experience.

NOTE: IF waste gas system is shutdown, THEN VCT level should be maintained such that VCT pressure is not lowered to the point where the pressure regulator will admit more H_2 or N_2 to the VCT. Repeatedly allowing pressure to drop to this point will eventually result in having to start up the waste gas system to remove excess VCT gas. In addition, VCT level changes should be limited to prevent excessive perturbation of the RCP seals.

4.7.5 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint down to the pot setting corresponding to the desired VCT level to prevent compressing the gas space.

4.7.6 Start a Boric Acid Transfer Pump.

NOTE:	**Boric acid flow may stopped at any time by closing MOV8104.**

4.7.7 Open Q1E21MOV8104 EMERG BORATE TO CHG PUMP SUCT to initiate boric acid flow.

4.7.8 Verify proper boric acid flow by flow indicated on FI-110 BORIC ACID EMERG BORATE flow indicator.

4.7.9 After the desired volume of boric acid has transferred, close Q1E21MOV8104 EMERG BORATE TO CHG PUMP SUCT.

4.7.10 Stop the Boric Acid Transfer Pump started in step 4.7.6.

4.7.11 <u>IF</u> LK 112 setpoint was adjusted per Step 4.7.5, <u>THEN</u> return setpoint to that required for current conditions.

5.0 References

5.1 Drawings P&ID - D-175039 - CVCS, sheets 3, 6 and 7

5.2 FSAR Chapter 9.3

5.3 PCN B92-0-8134, Reactor Makeup Water Cross-Tie

5.4 Safety Evaluation - Revised Operation of the Gaseous Waste Processing System to Allow Non-continuous Purge of the VCT, SECL-93-125, NEL-93-0231

TABLE 1

NOMOGRAPH CORRECTION FACTORS

Plant Conditions			Correction Factor (K) (See Note)
Pressure (psig)	T (AVG) (°F)	Pressurizer Level	
2235	547-570	Normal Operating	1.00
1600	500	No-Load	1.05
1200	450	No-Load	1.10
800	400	No-Load	1.16
400	350	No-Load	1.18
400	300	No-Load	1.20
400	300	Solid Water	1.35
400	200	No-Load	1.28
400	200	Solid Water	1.40
400	100	Solid Water	1.47

NOTE: CORRECTION FACTORS ARE APPLIED AS FOLLOWS:

(a) Boron Addition and Dilution Total Volume Nomographs

$$\mathbf{V_{(Corrected)} = K \times V_{(Nomograph)}}$$

(b) Boron Addition and Dilution Rate Nomographs

$$\frac{dc}{dt}(\text{Corrected}) = \frac{1}{K} \times \frac{dc}{dt}(\text{Nomograph})$$

FIGURE 1

RCS BORON CONCENTRATION (PPM)	4% BORIC ACID FLOW (GPM)
0	0.0
100	1.71
200	3.4
300	5.1
400	6.9
500	8.6
600	10.3
700	12.0
800	13.7
900	15.4
1000	17.1
1100	18.9
1200	20.6
1300	22.3
1400	24.0
1500	25.7
1600	27.4
1700	29.1
1800	30.9
1900	32.6
2000	34.3
2100	36.0
2200	37.7
2300	39.4
2400	41.1
2500	42.9

Blended Flow Based on 120 GPM Auto Makeup

Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point
10	0.17	0.04	510	8.74	2.19	1010	17.31	4.33
20	0.34	0.09	520	8.91	2.23	1020	17.49	4.37
30	0.51	0.13	530	9.09	2.27	1030	17.66	4.41
40	0.69	0.17	540	9.26	2.31	1040	17.83	4.46
50	0.86	0.21	550	9.43	2.36	1050	18.00	4.50
60	1.03	0.26	560	9.60	2.40	1060	18.17	4.54
70	1.20	0.30	570	9.77	2.44	1070	18.34	4.59
80	1.37	0.34	580	9.94	2.49	1080	18.51	4.63
90	1.54	0.39	590	10.11	2.53	1090	18.69	4.67
100	1.71	0.43	600	10.29	2.57	1100	18.86	4.71
110	1.89	0.47	610	10.46	2.61	1110	19.03	4.76
120	2.06	0.51	620	10.63	2.66	1120	19.20	4.80
130	2.23	0.56	630	10.80	2.70	1130	19.37	4.84
140	2.40	0.60	640	10.97	2.74	1140	19.54	4.89
150	2.57	0.64	650	11.14	2.79	1150	19.71	4.93
160	2.74	0.69	660	11.31	2.83	1160	19.89	4.97
170	2.91	0.73	670	11.49	2.87	1170	20.06	5.01
180	3.09	0.77	680	11.66	2.91	1180	20.23	5.06
190	3.26	0.81	690	11.83	2.96	1190	20.40	5.10
200	3.43	0.86	700	12.00	3.00	1200	20.57	5.14
210	3.60	0.90	710	12.17	3.04	1210	20.74	5.19
220	3.77	0.94	720	12.34	3.09	1220	20.91	5.23
230	3.94	0.99	730	12.51	3.13	1230	21.09	5.27
240	4.11	1.03	740	12.69	3.17	1240	21.26	5.31
250	4.29	1.07	750	12.86	3.21	1250	21.43	5.36
260	4.46	1.11	760	13.03	3.26	1260	21.60	5.40
270	4.63	1.16	770	13.20	3.30	1270	21.77	5.44
280	4.80	1.20	780	13.37	3.34	1280	21.94	5.49
290	4.97	1.24	790	13.54	3.39	1290	22.11	5.53
300	5.14	1.29	800	13.71	3.43	1300	22.29	5.57
310	5.31	1.33	810	13.89	3.47	1310	22.46	5.61
320	5.49	1.37	820	14.06	3.51	1320	22.63	5.66
330	5.66	1.41	830	14.23	3.56	1330	22.80	5.70
340	5.83	1.46	840	14.40	3.60	1340	22.97	5.74
350	6.00	1.50	850	14.57	3.64	1350	23.14	5.79
360	6.17	1.54	860	14.74	3.69	1360	23.31	5.83
370	6.34	1.59	870	14.91	3.73	1370	23.49	5.87
380	6.51	1.63	880	15.09	3.77	1380	23.66	5.91
390	6.69	1.67	890	15.26	3.81	1390	23.83	5.96
400	6.86	1.71	900	15.43	3.86	1400	24.00	6.00
410	7.03	1.76	910	15.60	3.90	1410	24.17	6.04
420	7.20	1.80	920	15.77	3.94	1420	24.34	6.09
430	7.37	1.84	930	15.94	3.99	1430	24.51	6.13
440	7.54	1.89	940	16.11	4.03	1440	24.69	6.17
450	7.71	1.93	950	16.29	4.07	1450	24.86	6.21
460	7.89	1.97	960	16.46	4.11	1460	25.03	6.26
470	8.06	2.01	970	16.63	4.16	1470	25.20	6.30
480	8.23	2.06	980	16.80	4.20	1480	25.37	6.34
490	8.40	2.10	990	16.97	4.24	1490	25.54	6.39
500	8.57	2.14	1000	17.14	4.29	1500	25.71	6.43

BLENDED FLOW BASED ON 120 GPM AUTO MAKEUP

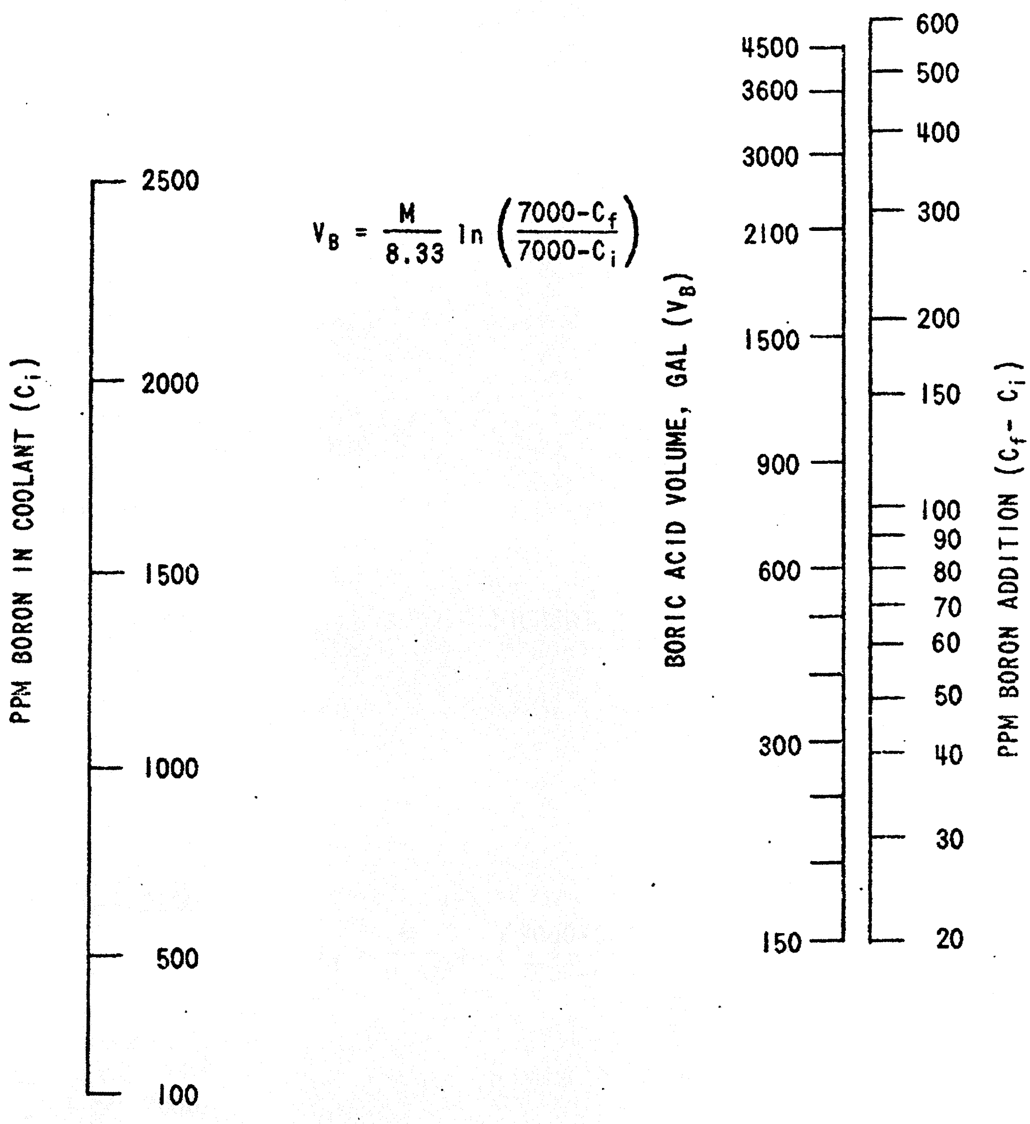
Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point	Coolant Boron Conc (ppm)	4 wt. % / 7000 ppm Boric acid flow (gpm)	FK-113 Pot Set Point
1510	25.89	6.47	1840	31.54	7.89	2170	37.20	9.30
1520	26.06	6.51	1850	31.71	7.93	2180	37.37	9.34
1530	26.23	6.56	1860	31.89	7.97	2190	37.54	9.39
1540	26.40	6.60	1870	32.06	8.01	2200	37.71	9.43
1550	26.57	6.64	1880	32.23	8.06	2210	37.89	9.47
1560	26.74	6.69	1890	32.40	8.10	2220	38.06	9.51
1570	26.91	6.73	1900	32.57	8.14	2230	38.23	9.56
1580	27.09	6.77	1910	32.74	8.19	2240	38.40	9.60
1590	27.26	6.81	1920	32.91	8.23	2250	38.57	9.64
1600	27.43	6.86	1930	33.09	8.27	2260	38.74	9.69
1610	27.60	6.90	1940	33.26	8.31	2270	38.91	9.73
1620	27.77	6.94	1950	33.43	8.36	2280	39.09	9.77
1630	27.94	6.99	1960	33.60	8.40	2290	39.26	9.81
1640	28.11	7.03	1970	33.77	8.44	2300	39.43	9.86
1650	28.29	7.07	1980	33.94	8.49	2310	39.60	9.90
1660	28.46	7.11	1990	34.11	8.53	2320	39.77	9.94
1670	28.63	7.16	2000	34.29	8.57	2330	39.94	9.99
1680	28.80	7.20	2010	34.46	8.61	2340	40.11	10.03
1690	28.97	7.24	2020	34.63	8.66	2350	40.29	10.07
1700	29.14	7.29	2030	34.80	8.70	2360	40.46	10.11
1710	29.31	7.33	2040	34.97	8.74	2370	40.63	10.16
1720	29.49	7.37	2050	35.14	8.79	2380	40.80	10.20
1730	29.66	7.41	2060	35.31	8.83	2390	40.97	10.24
1740	29.83	7.46	2070	35.49	8.87	2400	41.14	10.29
1750	30.00	7.50	2080	35.66	8.91	2410	41.31	10.33
1760	30.17	7.54	2090	35.83	8.96	2420	41.49	10.37
1770	30.34	7.59	2100	36.00	9.00	2430	41.66	10.41
1780	30.51	7.63	2110	36.17	9.04	2440	41.83	10.46
1790	30.69	7.67	2120	36.34	9.09	2450	42.00	10.50
1800	30.86	7.71	2130	36.51	9.13	2460	42.17	10.54
1810	31.03	7.76	2140	36.69	9.17	2470	42.34	10.59
1820	31.20	7.80	2150	36.86	9.21	2480	42.51	10.63
1830	31.37	7.84	2160	37.03	9.26	2490	42.69	10.67
						2500	42.86	10.71

NOTE:
- **Due to characteristics of the reactor makeup system piping, the maximum obtainable boric acid flow is less than 40 gpm.**
- **Numbers corresponding to boric acid flow approaching or greater than 40 gpm are useful only for calculating the boric acid flow corresponding to a blended flow of less than 120 gpm.**

Example: 2500 ppm 42.9 gpm with a pot setting of 10.7 for a blended flow of 120 gpm.
2500 ppm 42.9/2 gpm with a pot setting of 10.7/2 for a blended flow of 120/2 gpm.
2500 ppm 21.45 gpm with a pot setting of 5.35 for a blended flow of 60 gpm.

BLENDED FLOW BASED ON 120 GPM AUTO MAKEUP

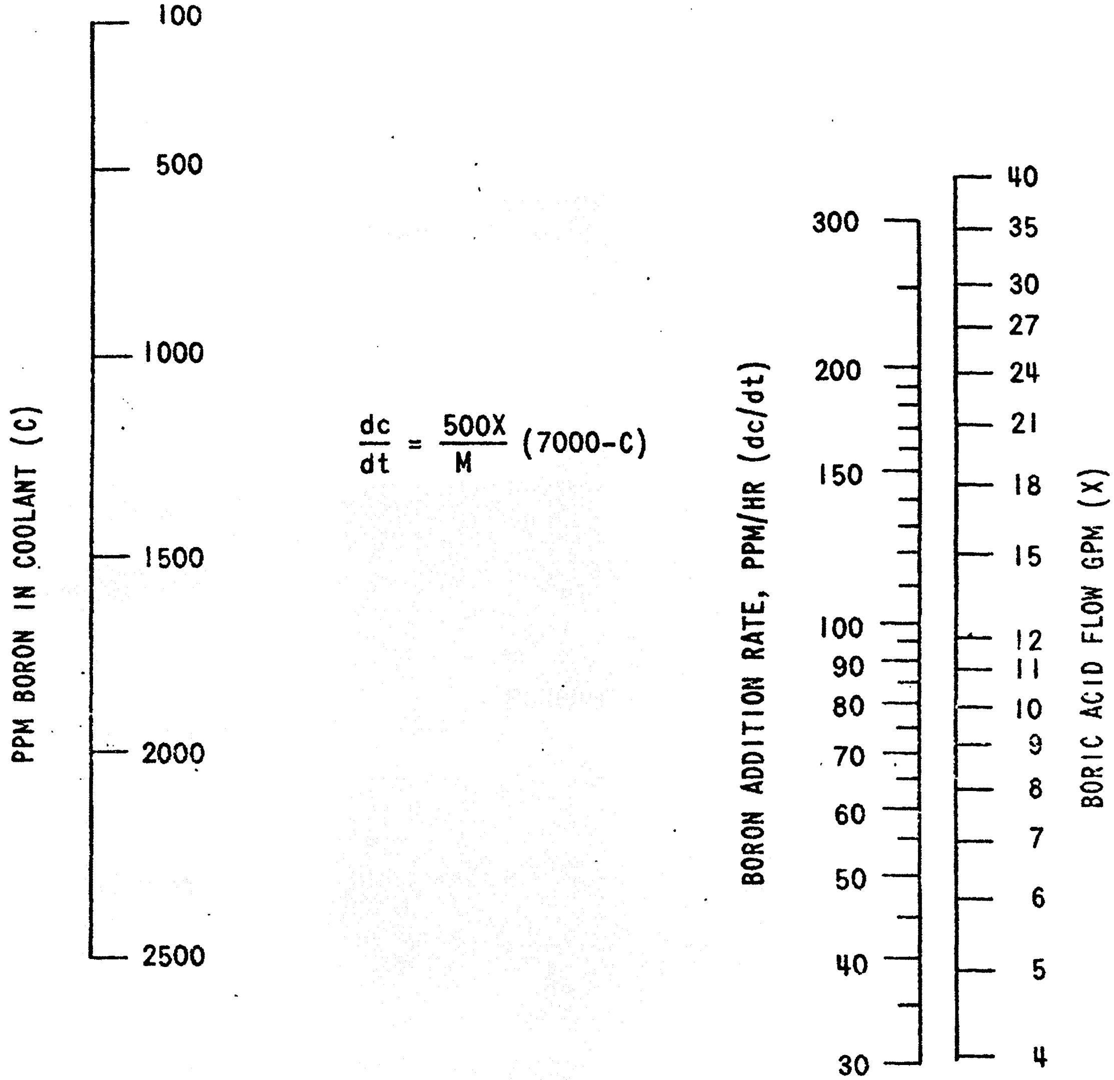
FIGURE 2



The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 2. Boron Addition - Refer to Table 1 for Correction Factors

FIGURE 3

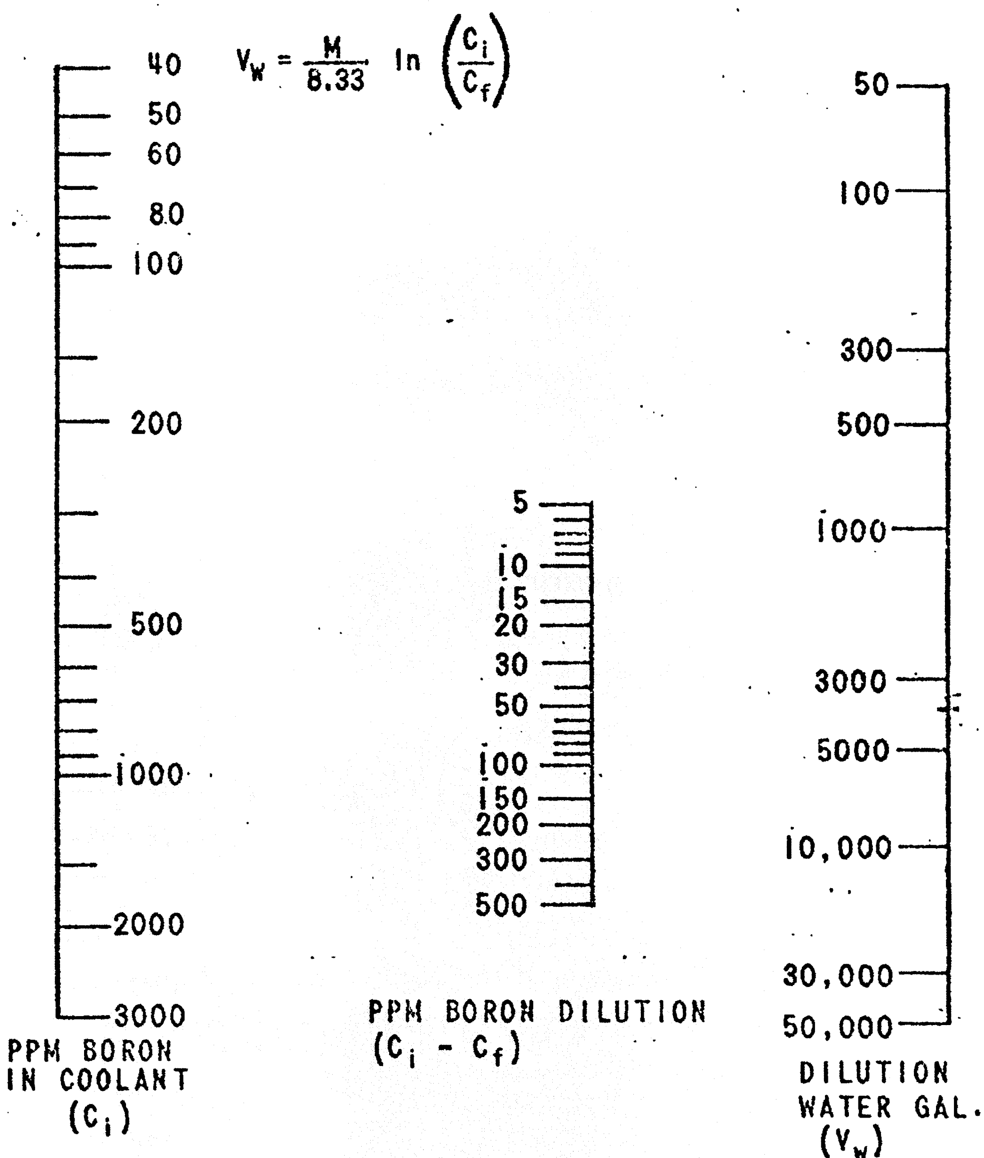


$$\frac{dc}{dt} = \frac{500X}{M}(7000-C)$$

The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 3. Boron Addition Rate - Refer to Table 1 for Correction Factors

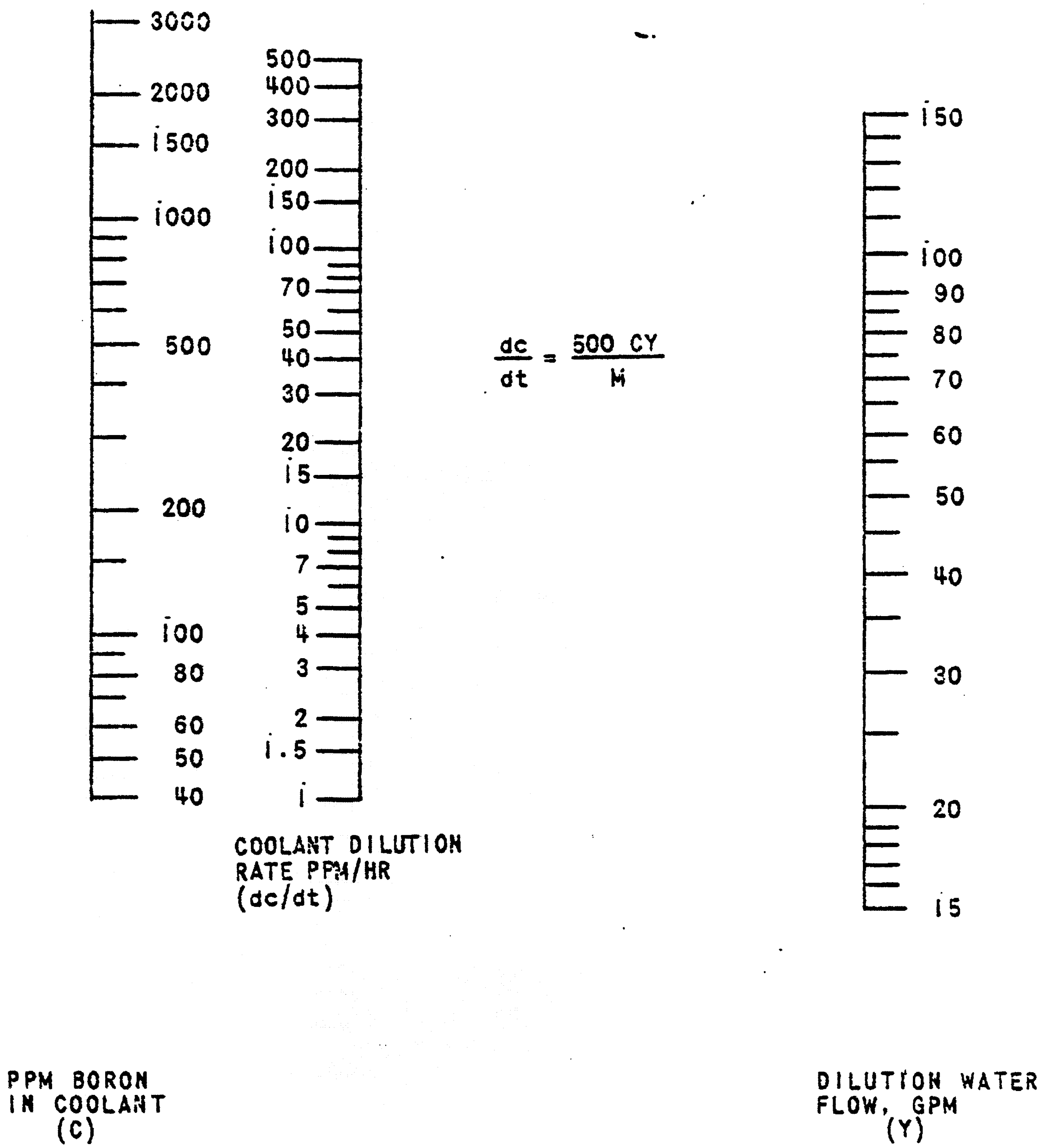
FIGURE 4



The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 4 Boron Dilution - Refer to Table 1 for Correction Factors

FIGURE 5



The mass, M, for the above formula can be obtained from the Boron/Dilution table for the appropriate RCS temp.

Figure 5. Boron Dilution Rate - Refer to Table 1 for Correction Factors

FIGURE 6

<u>USE OF EMERGENCY BORATION FLOWPATH (w/o AOP-27 ENTRY REQUIRED)</u>

1. **Start a Boric Acid Transfer Pump.**
2. **Open EMERG BORATE TO CHG PUMP SUCT Q1E21MOV8104.**
3. **<u>WHEN</u> Boration Complete, <u>THEN</u> Close EMERG BORATE TO CHG PUMP SUCT Q1E21MOV8104.**
4. **Secure the Boric Acid Transfer Pump.**

Ref. FNP-1-SOP-2.3

Ensure operator aid is updated if this figure is revised.

APPENDIX A

Operation of the Chemical and Volume Control System Reactor Makeup Control System with the Makeup Mode Control Switch Inoperable

1.0 Purpose

Allow makeup to the VCT for Boration or Dilution when the AUTO function is failed.

2.0 Initial Conditions

The Makeup Mode Control Switch is failed and plant operations require either Boration or Dilution.

3.0 Precautions and Limitations.

3.1 When selecting FCV-114B and FCV-113A to OPEN the valves will go to full open, not a throttled position, causing the flowrate to be higher than normal.

3.2 A controlled mixing of boron and RMW will not be possible for a blended flow to the VCT.

3.3 Large batch makeups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233)

4.0 Instructions

NOTE: Flowrate of makeup to the RCS may be indicated on Reactor Makeup Flow Indicator Q1E21FI-168. If not, flowrate must be estimated by VCT level rise.

4.1 Boration

4.1.1 Determine the amount of Boration desired

4.1.2 Verify an inservice BATP running.

- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.1.3 Place Boric Acid to Blender Q1E21FCV113A to Open.

4.1.4 Place MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B to open.

4.1.5 After desired amount of acid has entered the RCS close MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B.

4.1.6 Close BORIC ACID TO BLENDER Q1E21FCV113A.

NOTE: IF repeated borations are expected, THEN the inservice BATP may remain running until after the final boration is completed.

4.1.7 Secure the inservice BATP.

4.2 Dilution

4.2.1 Determine the Amount of Dilution desired.

4.2.2 Verify one RMWP supplying Reactor Makeup System with water.

4.2.3 Place RMW to Blender Q1E21FCV 114B to Open.

- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.2.4 Place MKUP TO CHG PUMP SUCTION Q1E21FCV113B to Open

4.2.5 After desired amount of water has entered the RCS close MKUP TO CHG PUMP SUCTION Q1E21FCV113B.

4.2.6 Close RMW TO BLENDER Q1E21FCV114B

APPENDIX B

OPERATOR AID FOR BORATION AND DILUTION

1.0 Boration

NOTE:	**The Boric Acid Integrator ONLY needs to be verified when changed. This should be documented with an Autolog Entry.**

☐ ☐ ☐ ☐ 1.1 IF necessary, THEN set the boric acid integrator to the desired quantity.

☐ ☐ ☐ ☐ 1.2 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint as desired.

☐ ☐ ☐ ☐ 1.3 Position the MKUP MODE CONT SWITCH to STOP.

☐ ☐ ☐ ☐ 1.4 Position the MKUP MODE SEL SWITCH to BOR.

☐ ☐ ☐ ☐ 1.5 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 1.6 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

☐ ☐ ☐ ☐ 1.7 Verify the boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

☐ ☐ ☐ ☐ 1.8 If desired to clear the line of acid, perform the applicable steps of Appendix B section 2.0.

NOTE:	**The following three steps are not required if operation in a mode other than automatic is preferred. Refer to appendix C.**

☐ ☐ ☐ ☐ 1.9 Position the MKUP MODE SEL SWITCH to AUTO.

☐ ☐ ☐ ☐ 1.10 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 1.11 IF LK 112 setpoint was adjusted per Step 1.2, THEN return setpoint to that required for current conditions.

OPERATOR AID FOR BORATION AND DILUTION

2.0 Dilution

NOTE:	**The Total Batch Integrator ONLY needs to be verified when changed. This should be documented with an Autolog Entry.**

☐ ☐ ☐ ☐ 2.1 IF necessary, THEN set the total batch integrator to the desired quantity.

☐ ☐ ☐ ☐ 2.2 IF necessary, THEN adjust LTDN TO VCT FLOW LK 112 setpoint as desired.

☐ ☐ ☐ ☐ 2.3 Position the MKUP MODE CONT SWITCH to STOP.

☐ ☐ ☐ ☐ 2.4 Align the makeup system for dilution as follows:

- Position the MKUP MODE SEL SWITCH to DIL or ALT DIL.
- IF using ALT DIL AND it is desired to bypass the VCT, THEN place the MKUP TO VCT valve Q1E21FCV114A in close.

☐ ☐ ☐ ☐ 2.5 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 2.6 Verify proper dilution operation by observing the following:

- IF using ALT DIL, MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- MKUP TO VCT Q1E21FCV114A opens, unless bypassing VCT.
- RMW TO BLENDER Q1E21FCV114B opens.
- Reactor makeup flow is displayed on FI-168 MAKEUP FLOW TO CHG/VCT.

☐ ☐ ☐ ☐ 2.7 Verify the dilution automatically stops when the total flow batch integrator reaches its setpoint by observing the following:

- Reactor makeup flow returns to zero as displayed on FI-168 MAKEUP FLOW TO CHG/VCT.
- MKUP TO VCT Q1E21FCV114A closes.
- RMW TO BLENDER Q1E21FCV114B closes.
- IF ALT DIL was used, THEN MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.

NOTE:	**The following four steps are not required if operation in a mode other than automatic is preferred. Refer to appendix C.**

☐ ☐ ☐ ☐ 2.8 IF VCT was bypassed, THEN verify MKUP TO VCT valve Q1E21FCV114A (Q1E21V339) in AUTO.

☐ ☐ ☐ ☐ 2.9 Position the MKUP MODE SEL SWITCH to AUTO.

☐ ☐ ☐ ☐ 2.10 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 2.11 IF LK 112 setpoint was adjusted per Step 2.2, THEN return setpoint to that required for current conditions.

APPENDIX C

OPERATOR AID FOR REPETITIVE BORATION AND DILUTION

CAUTION: **Without automatic makeup care should be taken to maintain VCT level between 26% and 61% during repetitive operation of the reactor makeup control system.**

1.0 Boration

NOTE: **During periods of repetitive boration evolutions, to minimize the number of start/stop cycles on the boric acid pump, the handswitch may be placed in START and allowed to return to AUTO to maintain the boric acid pump running. WHEN it is no longer desired to maintain the boric acid pump running continuously, THEN place the handswitch in STOP and return to AUTO.**

☐ ☐ ☐ ☐ 1.1 The Reactor Makeup Control system has been previously aligned for Boration.

☐ ☐ ☐ ☐ 1.2 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 1.3 Verify proper boration operation by observing the following:

- On service boric acid pump started.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- BORIC ACID TO BLENDER Q1E21FCV113A opens.
- Boric acid flow is displayed on FI-113 MAKEUP FLOW TO CHG/VCT.

☐ ☐ ☐ ☐ 1.4 Verify the boration automatically stops when the boric acid batch integrator reaches its setpoint as follows:

- Boric acid flow returns to zero as displayed on FI-113 MAKEUP FLOW TO CHG/VCT.
- MKUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.
- BORIC ACID TO BLENDER Q1E21FCV113A closes.

NOTE: **WHEN it is no longer desired to maintain the line full of acid, THEN perform the applicable steps of Appendix B section 2.0 to flush the line.**

☐ ☐ ☐ ☐ 1.5 IF repetitive borations are no longer required THEN verify the system is aligned for Automatic makeup per steps 1.9 through 1.11 of Appendix B.

CAUTION:	**Without automatic makeup care should be taken to maintain VCT level between 26% and 61% during repetitive operation of the reactor makeup control system.**

2.0 Dilution

☐ ☐ ☐ ☐ 2.1 The Reactor Makeup Control system has been previously aligned for Dilution or Alternate Dilution.

☐ ☐ ☐ ☐ 2.2 Position the MKUP MODE CONT SWITCH to START.

☐ ☐ ☐ ☐ 2.3 Verify proper dilution operation by observing the following:

- IF using ALT DIL, MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B opens.
- MKUP TO VCT Q1E21FCV114A opens, unless bypassing VCT.
- RMW TO BLENDER Q1E21FCV114B opens.
- Reactor makeup flow is displayed on FI-168 MAKEUP FLOW TO CHG/VCT.

☐ ☐ ☐ ☐ 2.4 Verify the dilution automatically stops when the total flow batch integrator reaches its setpoint by observing the following:

- Reactor makeup flow returns to zero as displayed on FI-168 MAKEUP FLOW TO CHG/VCT.
- MKUP TO VCT Q1E21FCV114A closes or is closed if bypassing the VCT.
- RMW TO BLENDER Q1E21FCV114B closes.
- IF ALT DIL was used, THEN MAKEUP TO CHG PUMP SUCTION HDR Q1E21FCV113B closes.

☐ ☐ ☐ ☐ 2.5 IF repetitive dilutions are no longer required THEN verify the system is aligned for Automatic makeup per steps 2.8 through 2.11 of Appendix B.

Ensure posted operator aid is revised with any revision to this appendix

APPENDIX D

Operation of the Chemical and Volume Control System Reactor Makeup Control System with FIS 168 Total Flow Batch Integrator Unreliable

1.0 Purpose

Allow makeup to the VCT for a dilution when the AUTO function is failed because FIS-168 Total Flow Batch Integrator is unreliable.

2.0 Initial Conditions

2.1 FIS-168 Total Flow Batch Integrator is failed or unreliable, and plant operations require a dilution.

2.2 The Chemical and Volume Control System is aligned for auto operation.

3.0 Precautions and Limitations

3.1 When selecting FCV-114B to OPEN the valve will go to full open, not a throttled position, causing the flow rate to be higher than normal.

3.2 A controlled mixing of boron and RMW will not be possible for a blended flow to the VCT.

3.3 Large batch make ups during power operations to the VCT or Charging pump suction, especially early in core life, can result in unintended reactor power changes. The reactivity affects should be considered when planning batch size. Small batches should be used at any time in core life. (CR2004106233)

4.0 Instructions

NOTE:	**Flow rate of makeup to the RCS may be indicated on Reactor Makeup Flow Indicator Q1E21FI-168. If not and flow rate is desired, flow rate must be estimated by VCT level rise.**

4.1 Dilution

4.1.1 Determine the amount of dilution desired.

4.1.2 Verify one RMWP supplying Reactor Makeup System with water.

- **Verify the expected Reactivity changes by observing VCT level, Tavg, SR SUR, IR SUR, and Control Rod Motion. Stop the Make-Up System operation and take corrective action if any change is excessive or in the wrong direction.**

4.1.3 Place RMW to Blender Q1E21FCV114B to Open.

4.1.4 Place MKUP TO CHG PUMP SUCTION Q1E21FCV113B to Open.

CAUTION: Due to valve stroke time, position to close MKUP TO CHG PUMP SUCTION Q1E21FCV113B two gallons prior to achieving the desired amount of dilution water.

4.1.5 WHEN desired, THEN close MKUP TO CHG PUMP SUCTION Q1E21FCV113B.

4.1.6 Close RMW TO BLENDER Q1E21FCV114B.

4.1.7 Place MKUP TO CHG PUMP SUCTION Q1E21FCV113B to AUTO.

4.1.8 Place RMW to Blender Q1E21FCV114B to AUTO.

NOTE: The following steps are required to reset the Total Flow Batch Integrator.

4.1.9 Position the MKUP MODE CONT SWITCH to STOP.

4.1.10 Position the MKUP MODE CONT SWITCH to START.

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.4 Refueling Water Storage Tank (RWST)

LCO 3.5.4 The RWST shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RWST boron concentration not within limits. OR RWST borated water temperature not within limits.	A.1 Restore RWST to OPERABLE status.	8 hours
B. RWST inoperable for reasons other than Condition A.	B.1 Restore RWST to OPERABLE status.	1 hour
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 3. AND C.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.5.4.1	----------------------------NOTE---------------------------- Only required to be performed when ambient air temperature is < 35°F. -- Verify RWST borated water temperature is ≥ 35°F.	24 hours
SR 3.5.4.2	Verify RWST borated water volume is ≥ 471,000 gallons.	7 days
SR 3.5.4.3	Verify RWST boron concentration is ≥ 2300 ppm and ≤ 2500 ppm.	7 days

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.4 Refueling Water Storage Tank (RWST)

BASES

BACKGROUND

The RWST supplies borated water to the Chemical and Volume Control System (CVCS) during abnormal operating conditions, to the refueling pool during refueling, and to the ECCS and the Containment Spray System during accident conditions.

The RWST supplies both trains of the ECCS and the Containment Spray System through separate, redundant supply headers during the injection phase of a loss of coolant accident (LOCA) recovery. A motor operated isolation valve is provided in each header to isolate the RWST from the ECCS once the system has been transferred to the recirculation mode. The recirculation mode is entered when pump suction is manually transferred to the containment sump following receipt of the RWST — Low alarm. Use of a single RWST to supply both trains of the ECCS and Containment Spray System is acceptable since the RWST is a passive component, and passive failures are not required to be assumed to occur coincidentally with Design Basis Events.

The switchover from normal operation to the injection phase of ECCS operation requires changing centrifugal charging pump suction from the CVCS volume control tank (VCT) to the RWST through the use of isolation valves. Each set of isolation valves is interlocked so that the VCT isolation valves will begin to close once the RWST isolation valves are fully open. Since the VCT is under pressure, the preferred pump suction will be from the VCT until the tank is isolated. This will result in a delay in obtaining the RWST borated water. The effects of this delay are discussed in the Applicable Safety Analyses section of these Bases.

During normal operation in MODES 1, 2, and 3, the residual heat removal (RHR) pumps are aligned to take suction from the RWST.

The ECCS and Containment Spray System pumps are provided with recirculation lines that ensure each pump can maintain minimum flow requirements when operating at or near shutoff head conditions.

When the suction for the ECCS and Containment Spray System pumps is transferred to the containment sump, the RWST flow paths must be isolated to prevent a release of the containment sump

(continued)

BASES

BACKGROUND (continued)

contents to the RWST, which could result in a release of contaminants to the atmosphere and the eventual loss of suction head for the ECCS pumps.

This LCO ensures that:

a. The RWST contains sufficient borated water to support the ECCS during the injection phase;

b. Sufficient water volume exists in the containment sump to support continued operation of the ECCS and Containment Spray System pumps at the time of transfer to the recirculation mode of cooling; and

c. The reactor remains subcritical following a LOCA.

Insufficient water in the RWST could result in insufficient cooling capacity when the transfer to the recirculation mode occurs. Improper boron concentrations could result in a reduction of SDM or excessive boric acid precipitation in the core following the LOCA, as well as excessive caustic stress corrosion of mechanical components and systems inside the containment.

APPLICABLE SAFETY ANALYSES

During accident conditions, the RWST provides a source of borated water to the ECCS and Containment Spray System pumps. As such, it provides containment cooling and depressurization, core cooling, and replacement inventory and is a source of negative reactivity for reactor shutdown (Ref. 1). The design basis transients and applicable safety analyses concerning each of these systems are discussed in the Applicable Safety Analyses section of B 3.5.2, "ECCS — Operating"; B 3.5.3, "ECCS — Shutdown"; and B 3.6.6, "Containment Spray and Cooling Systems." These analyses are used to assess changes to the RWST in order to evaluate their effects in relation to the acceptance limits in the analyses.

The RWST must also meet volume, boron concentration, and temperature requirements for non-LOCA events. The volume is not an explicit assumption in non-LOCA events since the required volume is a small fraction of the available volume. The deliverable volume limit is set by the LOCA and containment analyses. For the RWST, the deliverable volume is different from the total volume contained

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

since, due to the design of the tank, more water can be contained than can be delivered. The minimum boron concentration is an explicit assumption in the main steam line break (MSLB) analysis to ensure the required shutdown capability. The minimum boron concentration limit is an important assumption in ensuring the required shutdown capability. The maximum boron concentration is an explicit assumption in the inadvertent ECCS actuation analysis, although the results are very insensitive to small changes in boron concentrations. The minimum temperature is an assumption in both the MSLB and inadvertent ECCS actuation analyses.

The MSLB analysis has considered a delay associated with the interlock between the VCT and RWST isolation valves, and the results show that the departure from nucleate boiling design basis is met. The delay has been established as 27 seconds, with offsite power available, or 42 seconds without offsite power. This response time includes 2 seconds for electronics delay, a 10 second stroke time for the RWST valves, and a 15 second stroke time for the VCT valves.

For a large break LOCA analysis, the minimum water volume limit of 321,000 gallons and the lower boron concentration limit of 2300 ppm are used to compute the post LOCA sump boron concentration necessary to assure subcriticality. The large break LOCA is the limiting case since the safety analysis assumes that all control rods are out of the core.

A water volume of 506,600 gallons and the upper limit on boron concentration of 2500 ppm are used to determine the maximum allowable time to switch to hot leg recirculation following a LOCA. The purpose of switching from cold leg to hot leg injection is to avoid boron precipitation in the core following the accident.

In the ECCS analysis, the containment spray temperature is assumed to be equal to the RWST lower temperature limit of 35°F. If the lower temperature limit is violated, the containment spray further reduces containment pressure, which decreases the rate at which steam can be vented out the break and increases peak clad temperature. An upper temperature assumption of 120°F is used in the small break LOCA analysis and containment OPERABILITY analysis. Exceeding this temperature would result in a higher peak clad temperature, because there would be less heat transfer from the core to the

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

injected water for the small break LOCA and higher containment pressures due to reduced containment spray cooling capacity. For the containment response following an MSLB, the lower limit on boron concentration and the upper assumption on RWST water temperature are used to maximize the total energy release to containment.

The RWST satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The RWST ensures that an adequate supply of borated water is available to cool and depressurize the containment in the event of a Design Basis Accident (DBA), to cool and cover the core in the event of a LOCA, to maintain the reactor subcritical following a DBA, and to ensure adequate level in the containment sump to support ECCS and Containment Spray System pump operation in the recirculation mode.

To be considered OPERABLE, the RWST must meet the water volume, boron concentration, and temperature limits established in the SRs.

APPLICABILITY

In MODES 1, 2, 3, and 4, RWST OPERABILITY requirements are dictated by ECCS and Containment Spray System OPERABILITY requirements. Since both the ECCS and the Containment Spray System must be OPERABLE in MODES 1, 2, 3, and 4, the RWST must also be OPERABLE to support their operation. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops — MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops — MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation — High Water Level," and LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation — Low Water Level.

ACTIONS

A.1

With RWST boron concentration or borated water temperature not within limits, they must be returned to within limits within 8 hours. Under these conditions neither the ECCS nor the Containment Spray

(continued)

BASES

ACTIONS

A.1 (continued)

System can perform its design function. Therefore, prompt action must be taken to restore the tank to OPERABLE condition. The 8 hour limit to restore the RWST temperature or boron concentration to within limits was developed considering the time required to change either the boron concentration or temperature and the fact that the contents of the tank are still available for injection.

B.1

With the RWST inoperable for reasons other than Condition A (e.g., water volume), it must be restored to OPERABLE status within 1 hour.

In this Condition, neither the ECCS nor the Containment Spray System can perform its design function. Therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the plant in a MODE in which the RWST is not required. The short time limit of 1 hour to restore the RWST to OPERABLE status is based on this condition simultaneously affecting redundant trains.

C.1 and C.2

If the RWST cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.4.1

The RWST borated water temperature should be verified every 24 hours to be above the minimum limit assumed in the accident analyses. This Frequency is sufficient to identify a temperature change that would approach the limit and has been shown to be acceptable through operating experience.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.4.1 (continued)

The SR is modified by a Note that eliminates the requirement to perform this Surveillance when ambient air temperature is within the operating limit of the RWST. With ambient air temperature within the limit, the RWST temperature should not exceed the limit.

SR 3.5.4.2

The RWST water volume should be verified every 7 days to be above the required minimum level in order to ensure that a sufficient initial supply is available for injection and to support continued ECCS and Containment Spray System pump operation on recirculation. Since the RWST volume is normally stable and is protected by an alarm, a 7 day Frequency is appropriate and has been shown to be acceptable through operating experience.

SR 3.5.4.3

The boron concentration of the RWST should be verified every 7 days to be within the required limits. This SR ensures that the reactor will remain subcritical following a LOCA. Further, it assures that the resulting sump pH will be maintained in an acceptable range so that boron precipitation in the core will not occur and the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. Since the RWST volume is normally stable, a 7 day sampling Frequency to verify boron concentration is appropriate and has been shown to be acceptable through operating experience.

REFERENCES

1. FSAR, Chapter 6 and Chapter 15.

A.1.2SR0&RO Equipment Control ADMIN 015A1.04 – SRO & RO

TITLE: Perform A Quadrant Power Tilt Ratio Calculation

TASK STANDARD: Determine the Quadrant Power Tilt Ratio by performing the required Surveillance Calculation, STP-7.0, and determine that the upper and lower QPTR values are satisfactory.

PROGRAM APPLICABLE: SOT ___ SOCT ___ OLT _X_ LOCT _X

ACCEPTABLE EVALUATION METHOD: _X_ PERFORM ___ SIMULATE ___ DISCUSS

EVALUATION LOCATION: _X_CLASSROOM __ CONTROL ROOM ___ PLANT

PROJECTED TIME: _20 MIN_ SIMULATOR IC NUMBER: _N/A

ALTERNATE PATH ___ TIME CRITICAL ___ PRA

Examinee:				
Overall JPM Performance:	**Satisfactory**	☐	**Unsatisfactory**	☐
Evaluator Comments (attach additional sheets if necessary)				

EXAMINER: ____________________

CONDITIONS

When I tell you to begin, you are to PERFORM A QUADRANT POWER TILT RATIO CALCULATION. The conditions under which this task is to be performed are:

a. Reactor power is 100%.
b. All PR NI detectors are operable.
c. You are directed by Shift Supervisor to perform STP-7.0 and determine if the acceptance criteria are met.

EVALUATION CHECKLIST

ELEMENTS:		STANDARDS:	RESULTS: (CIRCLE)
_____ START TIME			
*1.	Obtain normalized currents from Core Physics Curve Book.	Examinee demonstrates where to obtain normalized current values from the provided Data Sheet 1 (Curve 71) and records them on calculation sheet.	S / U
*2.	Record data from power range detector A and detector B.	Values obtained from the provided Data Sheet 2 (as would be indicated on NI-41, 42, 43, 44 Drawer displays) and recorded.	S / U
*3.	Calculate upper and lower quadrant power tilt ratios.	Upper ratio calculated at 1.004.	S / U
		Lower ratio calculated at 1.011.	S / U
		[no tolerance after rounding to 4 significant digits, since all calculation rounding differences occur at greater than 4 significant digits.]	
4.	Enter the greater of the upper or lower quadrant power tilt ratio which is the lower.	Lower QPTR ratio recorded: 1.01 entered.	S / U
		[Tolerance of 1.01 to 1.011 when rounded to 4 significant digits. Rounding to more digits does not make this unsat as long as rounding to 4 significant digits would be 1.011]	

EVALUATION CHECKLIST

ELEMENTS:		STANDARDS:	RESULTS: (CIRCLE)

NOTE: PROMPTING OF THE EXAMINEE TO VERBALIZE THE PERFORMANCE OF ELEMENT 5 MAY BE REQUIRED.

*5.	Assess acceptance criteria met	Determination made that acceptance criteria was met.	S / U
6.	Records power level	Current avg power level recorded from initial conditions sheet.	S / U

_____ **STOP TIME**

Terminate when power level is recorded.

CRITICAL ELEMENTS: Critical Elements are denoted with an asterisk (*) preceding the element number.

GENERAL REFERENCES

1. FNP-1-STP-7.0, Version 17.0
2. K/As: 015A1.04 RO-3.5 SRO-3.7

GENERAL TOOLS AND EQUIPMENT

Provide:
1. FNP-1-STP-7.0, Version 17.0
2. Calculator (or the Applicant may supply a calculator)
3. DATA sheets 1 & 2 of this ADMIN JPM

COMMENTS

QUADRANT POWER TILT RATIO CALCULATION
CALCULATION SHEET - **KEY**

UPPER QUADRANT POWER TILT

Channel	Detector A Indicated Current	÷	* Detector A 100% Current	=	Detector A Calibrated Output	Total Number Operable Upper Detectors	$\frac{1}{\text{Average Upper Detector Calibrated Output}}$	X	Maximum Detector A Calibrated Output	=	Upper Quadrant Power Tilt Ratio
N41B	187.3	÷	160.61	=	1.1662						
N42B	179.2	÷	154.00	=	1.1636						
N42B	190.1	÷	164.57	=	1.1551						
N44B	178.2	÷	153.56	=	1.1605						
Total Detector A Calibrated Output				=	4.6454	÷ 4	= $\frac{1}{1.1613}$	X	1.1662	=	1.0042

*Obtained from Curve 71, 0% AFD Current

LOWER QUADRANT POWER TILT

Channel	Detector B Indicated Current	÷	* Detector B 100% Current	=	Detector B Calibrated Output	Total Number Operable Lower Detectors	$\frac{1}{\text{Average Lower Detector Calibrated Output}}$	X	Maximum Detector B Calibrated Output	=	Lower Quadrant Power Tilt Ratio
N41B	176.9	÷	156.95	=	1.1271						
N42B	175.9	÷	150.06	=	1.1722						
N43B	203.0	÷	173.91	=	1.1673						
N44B	183.5	÷	156.98	=	1.1689						
Total Detector B Calibrated Output				=	4.6355	÷ 4	= $\frac{1}{1.1589}$	X	1.1722	=	1.0114

*Obtained from Curve 71, 0% AFD Current

% Power 100%

Record Maximum of Upper or Lower Quadrant Tilt Ratio 1.01

ACCEPTANCE CRITERIA: Maximum of Upper or Lower Quadrant Power Tilt Ratio does not exceed 1.02

DATA SHEET 1
As obtained from Curve 71:

	DETECTOR A 100% CURRENT	DETECTOR B 100% CURRENT
N41	160.61	156.95
N42	154.00	150.06
N43	164.57	173.91
N44	153.56	156.98

DATA SHEET 2
As obtained from NI Drawer meter readings:

	DETECTOR A INDICATED CURRENT	DETECTOR B INDICATED CURRENT
N41	187.3	176.9
N42	179.2	175.9
N43	190.1	203.0
N44	178.2	183.5

HANDOUT

CONDITIONS

When I tell you to begin, you are to PERFORM A QUADRANT POWER TILT RATIO CALCULATION. The conditions under which this task is to be performed are:

a. Reactor power is 100%.
b. All PR NI detectors are operable.
c. You are directed by Shift Supervisor to perform STP-7.0 and determine if the acceptance criteria are met.

FARLEY NUCLEAR PLANT

SURVEILLANCE TEST PROCEDURE

FNP-1-STP-7.0

SAFETY RELATED

QUADRANT POWER TILT RATIO CALCULATION

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	ALL
Reference Use	
Information Use	

Approved:

TODD YOUNGBLOOD
Operations Manager

Date Issued 8-4-03

FARLEY NUCLEAR PLANT
SURVEILLANCE TEST REVIEW SHEET

SURVEILLANCE TEST NO. FNP-1-STP-7.0	TECHNICAL SPECIFICATION REFERENCE SR 3.2.4.1
TITLE QUADRANT POWER TILT RATIO CALCULATION	MODE(S) REQUIRING TEST: 1 (>50% Rated Thermal Power)

TEST RESULTS (TO BE COMPLETED BY TEST PERFORMER)

PERFORMED BY ______________________ DATE/TIME ______________________

COMPONENT OR TRAIN TESTED (if applicable) ______________________

[ ] ENTIRE STP PERFORMED [ ] FOR SURVEILLANCE CREDIT

[ ] PARTIAL STP PERFORMED: [ ] NOT FOR SURVEILLANCE CREDIT

REASON FOR PARTIAL: ______________________

TEST COMPLETED: [ ] Satisfactory [ ] Unsatisfactory

[ ] The following deficiencies occurred:

____

____

[ ] Corrective action taken or initiated:

____

____

____

SHIFT SUPPORT SUPERVISOR REVIEW

REVIEWED BY ______________________ DATE ______________________

[ ] Procedure properly completed and satisfactory

[ ] Comments: ______________________

____

ENGINEERING SUPPORT
REACTOR ENG. REVIEW
(If applicable)
[ ] Satisfactory and Approved

SCREENED BY ______________________ DATE ______________________

REVIEWED BY ______________________ DATE ______________________

[ ] Comments: ______________________

____

TABLE OF CONTENTS

FARLEY NUCLEAR PLANT
UNIT 1
SURVEILLANCE TEST PROCEDURE STP-7.0

QUADRANT POWER TILT RATIO CALCULATION

1.0 Purpose

To determine the quadrant power tilt ratio using power range nuclear instrumentation.

2.0 Acceptance Criteria

The quadrant power tilt ratio shall be ≤ 1.02.

3.0 Initial Conditions

CMR 3.1 The version of the procedure has been verified to be the current version and correct unit for the task. (OR 1-98-498).

NOTE: This STP may be performed at less than 50% power for verification of power range instrument indications. In this case, the STP is not for surveillance credit.

CMR 3.2 Above 50% of rated thermal power.

N/A 3.3 IF DVM is used to collect data, THEN have I&C obtain a Fluke 45 or equivalent with shielded test leads with NO exposed metal connectors.

DVM Serial No. ______________ Cal. due ____________________

4.0 Precautions and Limitations

4.1 Reactor power, rod position and reactor coolant temperature should be constant while taking data.

4.2 A QPTR calculation should be done prior to rescaling of Power Range Nuclear Instruments, and after completing the rescaling of ALL Power Ranges Nuclear Instruments. A QPTR calculation performed between individual Power Range rescaling may provide erroneous results

4.3 If one Power Range NI is inoperable and thermal power is ≤ 75% RTP, the remaining power range channels can be use for calculating QPTR.(SR 3.2.4.1)

4.4 Above 75% RTP, with one Power Range NI inoperable, QPTR must be determined by SR 3.2.4.2

5.0 Instructions

4NOTE:	**QPTR may be determined using detector current meter data with normalized currents from Curve 71A, 71B, 71C, AND 71D, or by using detector currents read by DVM with normalized currents from Curve 71A,71B,71C, AND 71D, DVM data is obtained using Attachment 2.**

5.1 Obtain normalized currents from Curve 71, and enter on the Calculation Sheet.

NOTE:	**With input from one Power Range Neutron Flux channel inoperable and THERMAL POWER ≤ 75% RTP, the remaining three power range channels can be used for calculating QPTR.**

CAUTION: DVM readings may be taken in only one drawer at a time.

5.2 Read detector current meters in NI-41B, 42B, 43B, and 44B POWER RANGE B drawer DETECTOR A and DETECTOR B or have I&C obtain detector currents using Attachment 2 for the desired detectors.

5.3 Enter total number of operable detectors in space provided on the Calculation Sheet.

5.4 Calculate the upper and lower Quadrant Power Tilt Ratios.

5.5 Record the greater of the upper or lower Quadrant Power Tilt Ratio value in the space provided.

ACCEPTANCE CRITERIA:	**Maximum value of upper or lower Quadrant Power Tilt Ratio shall be ≤ 1.02.**

5.6 Record the Power Level (Avg.) in the space provided.

6.0 References

6.1 FSAR - Chapter 4.1.

6.2 Unit 1 Technical Specification 3.2.4

ATTACHMENT 1

QUADRANT POWER TILT RATIO CALCULATION
CALCULATION SHEET

UPPER QUADRANT POWER TILT

Channel	Detector A Indicated Current	÷	* Detector A 100% Current	=	Detector A Calibrated Output	Total Number Operable Upper Detectors	1 / Average Upper Detector Calibrated Output	X	Maximum Detector A Calibrated Output	=	Upper Quadrant Power Tilt Ratio
N41B		÷		=							
N42B		÷		=							
N43B		÷		=							
N44B		÷		=							
Total Detector A Calibrated Output		=		÷		=	1 /	X		=	

*Obtained from Curve 71, 0% AFD Current

LOWER QUADRANT POWER TILT

Channel	Detector B Indicated Current	÷	* Detector B 100% Current	=	Detector B Calibrated Output	Total Number Operable Lower Detectors	1 / Average Lower Detector Calibrated Output	X	Maximum Detector B Calibrated Output	=	Lower Quadrant Power Tilt Ratio
N41B		÷		=							
N42B		÷		=							
N43B		÷		=							
N44B		÷		=							
Total Detector B Calibrated Output		=		÷		=	1 /	X		=	

*Obtained from Curve 71, 0% AFD Current

% Power ____________________

Record Maximum of
Upper or Lower Quadrant Tilt Ratio _______________

ACCEPTANCE CRITERIA:	**Maximum of Upper or Lower Quadrant Power Tilt Ratio does not exceed 1.02**

ATTACHMENT 2

USING A DVM TO OBTAIN DETECTOR CURRENT VALUES

ACCEPTANCE CRITERIA:	**Maximum of Upper or Lower Quadrant Power Tilt Ratio shall be ≤ 1.02.USING A DVM TO OBTAIN DETECTOR CURRENT VALUES**

NOTE: Detector current values may be obtained for as many drawers as required. Unused spaces in the Table should be marked NA.

1.0 Obtaining NI Detector Currents using a DVM.

CAUTION: DVM readings may be taken in only one drawer at a time.

1.1 Using a Fluke 45 or equivalent (Do Not use a Fluke 8600) and shielded test leads connect and obtain detector voltage readings as follows:

NOTE: Voltage values should be in the 2 to 3 volt range.

N/A
I&C 1.1.1 For Upper Detector connect to TP301 (+) and TP305 (-) and record voltage in appropriate space of table below.

N/A
I&C 1.1.2 For Lower Detector connect to TP302 (+) and TP305 (-) and record voltage in appropriate space of table below.

NOTE: To calculate detector currents use the following formula:

$$\frac{\text{Measured Detector Voltage}}{2.083} \times \text{Curve 71 "0\% AFD, 100\% Current" Value} = \text{Calculated Detector Current}$$

N/A 1.2 Using the 0% AFD, 100% current value from Curve 71, calculate the detector current value and record in appropriate space of table below.

	N41		N42		N43		N44	
	Upper Detector	Lower Detector	Upper Detector	Lower Detector	Upper Detector	Lower Detector	Upper Detector	Lower Detector
	DVM Voltage	DVM Voltage	DVM Voltage	DVM Voltage	DVM Voltage	DVM Voltage	DVM Voltage	DVM Voltage
Step 1.1								
	Calculated Current	Calculated Current	Calculated Current	Calculated Current	Calculated Current	Calculated Current	Calculated Current	Calculated Current
Step 1.2								

A.2R Equipment Control ADMIN 004A2.22 - RO

TITLE: Perform an RCS Leakage Test

TASK STANDARD: Perform an RCS Leakage Test by performing the required Surveillance Calculation, STP-9.0, and identify that the RCS leakrate does NOT meet acceptance criteria.

PROGRAM APPLICABLE: SOT ____ SOCT ___ OLT _X_ LOCT _X

ACCEPTABLE EVALUATION METHOD: _X_ PERFORM ____ SIMULATE ___ DISCUSS

EVALUATION LOCATION: ____ SIMULATOR ___ CONTROL ROOM _X_ CLASSROOM

PROJECTED TIME: _20 MIN_ SIMULATOR IC NUMBER: ___NA___

ALTERNATE PATH ___ TIME CRITICAL ___ PRA

Examinee:	
Overall JPM Performance: **Satisfactory** ☐	**Unsatisfactory** ☐
Evaluator Comments (attach additional sheets if necessary)	

EXAMINER: ____________________

CONDITIONS

When I tell you to begin, you are to perform an RCS Leakage Test. The conditions under which this task is to be performed are:

a. The unit is in Mode 1 at 100% power.
b. You are directed by the Shift Supervisor to
   - determine RCS leakage per STP-9.0, STEPS 5.4 to 5.9
     - WHEN step 5.9 is complete, THEN another operator will complete the STP starting at step 5.10
   - determine whether or not RCS leakage acceptance criteria is met

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)

_____ START TIME

NOTE:	**A Key is provided at the end of this ADMIN JPM with expected values filled in. The applicant must obtanin some of the values from the Handout and some from curve 28B, RCDT gallons vs. level.**

1*.	Step 5.4 Read and record initial readings on data sheet 1.	Records initial readings on data sheet 1.	S / U
2*.	Step 5.5 Records final values on data sheet 1.	Records final values on data sheet 1.	S / U
3*.	Step 5.6 Records the R-11, R-12, and Ctmt Sump lvl. Readings.	Records the R-11, R-12, and Ctmt Sump lvl. Readings.	S / U

CUE IF REQUESTED: "Other leakage is 0 gpm".

NOTE:	**[IF applicant inquires about any "other leakage" it is 0 gpm. This is information that is obtainable in the plant from turnover, and since there is no "other known leakage" provided, it may be assumed to be 0 gpm OR it may be requested. Either is acceptable].** **Step 5.7 has already been marked NA in the handout.**

4*.	Step 5.8 Calculates identified and unidentified leakages using the formulas on STP-9.0 data sheet 1.	Calculates identified and unidentified leakages using the formulas on STP-9.0 data sheet 1.	S / U

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)
5*. Step 5.9 Marks NA on step: "IF unidentified leakage is more negative than -0.2, THEN re-perform leak rate measurement."	Marks NA on step 5.9 due to leakrate being positive.	S / U
6*. Compares actual Leak rates with the acceptance criteria, and determines that the Unidentified Leakage does not meet acceptance criteria.	Determines that the Identified leakage MEETS acceptance criteria, but the Unidentified Leakage does NOT meet acceptance criteria.	S / U

_____ **STOP TIME**

Terminate JPM when determination of acceptance criteria is complete for leak rate.

CRITICAL ELEMENTS: Critical Elements are denoted with an asterisk (*) before the element number.

GENERAL REFERENCES

1. FNP-1-STP-9.0, Version 42.0
2. Plant tank curves 27A, 27B, 27C, 28A, & 28B
3. K/A: 004 A2.22 RO-3.2SRO-3.1

GENERAL TOOLS AND EQUIPMENT

Provide:
1. FNP-1-STP-9.0, Version 42.0
2. Plant tank curves 27A, 27B, 27C, 28A, & 28B
3. Calculator (or the Applicant may supply a calculator)
4. Plant Conditions at 1000 & 1200

COMMENTS

KEY: STP-9.0, DATA SHEET 1, RCS Leakage

All tolerances based on differences in rounding. One calc was performed rounding to the least significant digits at each step of the calculation, and one was performed using all digits in the calculator until the end of each step of the calculations to round to the least significant digits.

INSTRUMENT	NAME	INITIAL	FINAL	FINAL – INITIAL
Computer (MCB)	TIME	*1000*	*1200*	A = *120* Minutes
TE0453 (TI0453)	LIQ PRZR TEMP	*650.8* °F	*650.8* °F	No significant change (≤ 1 °F)
PC0482, PT0455, PT0456 or PT0457 (PI 455, PI 456 or PI 457)	PRZR PRESS (Note 1)	*2239.4* psig	*2239.4* psig	No significant change (≤5 psig)
TC0484 (preferred), OR TY0412K, OR TY0422K, OR TY0432K (Note 7) (Average of TI 412D, 422D & 432D)	RCS TAVG (Note 1)	*571.9* °F	*571.9* °F	ΔT = *0* °F Maximum change of 0.3°F allowed if TAVG is 545°F or greater, 0.1°F if TAVG is less than 545°F.
RCS Temperature Correction Factor	CF (Note 5)	*99.7* OR *NA*	N/A	B = ΔT × CF = *0* Gal.
LC 1600 OR Average of LT0459, LT0460 & LT0461 (LI-459, 460, 461)	PRZR LVL	*47.8* %	*47.8* %	C = 56.3 × *0* % = *0* Gal.
LT0115 (LI 115)	VCT LVL	*51.0* %	*37.3* %	D = 14.18 × *(–)12.7* % = *(–)194 to 194.3* Gal.
LI 1003 Waste Pnl or BOP LS261 Pos 6	RCDT LVL	*36.4* % *127.69* *Gal	*38.1* % *133.71* *Gal	E = *6.01 to 6.02* Gal. (Enter 0 if negative)
LT0470 (LI 470)	PRT LVL (Note 2)	*69.7* % *NA* *Gal	*69.7* % *NA* *Gal	F = *0* Gal. (Enter 0 if negative)
FIS 168	TOTAL FLOW BATCH INTEG	*3489* Gal. *NA* Gal.	*3489* Gal. *NA* Gal.	G = *0* Gal. Dilution and Blended Makeup

*From Tank Curve Book

KEY (continued): STP-9.0, DATA SHEET 1, RCS Leakage

Total Leakage

$$= \frac{\mathbf{B - C - D + G}}{\mathbf{A}} = \frac{(\ 0\ ) - (\ 0\ ) - (\ \text{(-)194 to (-)194.3}\ ) + (\ 0\ )}{(\ 120\ )} = \frac{\text{(+)1.617 to (+)1.62}}{\text{(Note 6)}} \ \mathbf{GPM}$$

Identified Leakage

$$= \frac{\mathbf{E + F}}{\mathbf{A}} = \frac{(\ \text{6.01 to 6.02}\ ) + (\ 0\ )}{(\ 120\ )} + \frac{0}{\text{Other leakage}} = \frac{\text{0.050 no tolerance}}{\text{(Note 6)}} \ \mathbf{GPM}$$

Other Leakage:	Source	Rate (GPM)
	0	*0*

$$\text{Unidentified Leakage} = \overset{\text{Total}}{\frac{\text{1.617 to 1.62}}{\text{Total Leakage}}} - \overset{\text{Other}}{\frac{\text{0.050 no tolerance}}{\text{Identified Leakage}}} = \frac{\text{1.567 to 1.57}}{\text{(Notes 3, 4, \& 6)}} \ \mathbf{GPM}$$

ACCEPTANCE CRITERIA:	
	• Identified Leakage ≤ 10 gpm
	• Unidentified Leakage ≤ 1 gpm

A.2R (2 pages) HANDOUT

Plant Conditions at 1000:

INSTRUMENT Computer Points	**NAME**		
N/A	TIME	***1000***	
TE0453	LIQ PRZR TEMP	***650.8***	°F
PC0482	PRZR PRESS	***2239.4***	psig
TC0484	RCS TAVG	***571.9***	°F
LC 1600	PRZR LVL	***47.8***	%
LT0115	VCT LVL	***51.0***	%
BOP LS261 Pos 6	RCDT LVL	***36.4***	% *Gal
LT0470	PRT LVL	***69.7***	% *Gal
FIS 168	TOTAL FLOW BATCH INTEG	***3489***	Gal.

Plant Conditions at 1200:

INSTRUMENT Computer Points	**NAME**		
N/A	TIME	***1200***	
TE0453	LIQ PRZR TEMP	***650.8***	°F
PC0482	PRZR PRESS	***2239.4***	Psig
TC0484	RCS TAVG	***571.9***	°F
LC 1600	PRZR LVL	***47.8***	%
LT0115	VCT LVL	***37.3***	%
BOP LS261 Pos 6	RCDT LVL	***38.1***	% *Gal
LT0470	PRT LVL	***69.7***	% *Gal
FIS 168	TOTAL FLOW BATCH INTEG	***3489***	Gal.
R-11	CTMT Particulate Rad Monitor	***187***	CPM
R-12	CTMT Gas Rad Monitor	***75***	CPM
Q1G21LI3282A	Ctmt. Sump lvl	***18***	Inches
Q1G21LI3282B	Ctmt. Sump lvl	***18***	Inches

CONDITIONS

When I tell you to begin, you are to perform an RCS Leakage Test. The conditions under which this task is to be performed are:

a. The unit is in Mode 1 at 100% power.

b. You are directed by the Shift Supervisor to

- determine RCS leakage per STP-9.0, STEPS 5.4 to 5.9
  - WHEN step 5.9 is complete, THEN another operator will complete the STP starting at step 5.10
- determine whether or not RCS leakage acceptance criteria is met

FARLEY NUCLEAR PLANT

SURVEILLANCE TEST PROCEDURE

FNP-1-STP-9.0

SAFETY RELATED

RCS LEAKAGE TEST

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	**ALL**
Reference Use	
Information Use	

Approved:

J. L. Hunter (for)
Operations Manager

Date Issued: 05/30/2008

FARLEY NUCLEAR PLANT
SURVEILLANCE TEST REVIEW SHEET

SURVEILLANCE TEST NO. FNP-1-STP-9.0	TECHNICAL SPECIFICATION REFERENCE SR 3.4.13.1
TITLE RCS LEAKAGE TEST	MODE(S) REQUIRING TEST: 1, 2, 3, 4

TEST RESULTS (TO BE COMPLETED BY TEST PERFORMER)

PERFORMED BY ______________________ DATE/TIME ______________________

COMPONENT OR TRAIN TESTED (if applicable) ______________________

[ ] ENTIRE STP PERFORMED [ ] FOR SURVEILLANCE CREDIT

[ ] PARTIAL STP PERFORMED: [ ] NOT FOR SURVEILLANCE CREDIT

REASON FOR PARTIAL: ______________________

TEST COMPLETED: [ ] Satisfactory [ ] Unsatisfactory

[ ] The following deficiencies occurred:

____

____

[ ] Corrective action taken or initiated:

____

____

____

SHIFT SUPERVISOR/ SHIFT SUPPORT SUPERVISOR REVIEW

REVIEWED BY ______________________ DATE ______________________

[ ] Procedure properly completed and satisfactory

[ ] Comments: ______________________

____

ENGINEERING SUPPORT GROUP SCREENING (IF APPLICABLE)

SCREENED BY ______________________ DATE ______________________

REVIEWED BY ______________________ DATE ______________________

[ ] Satisfactory and Approved

[ ] Comments: ______________________

____

TABLE OF CONTENTS

Procedure Contains	Number of Pages
STRS	1
Body	6
Data Sheet 1	3

FARLEY NUCLEAR PLANT
UNIT 1
SURVEILLANCE TEST PROCEDURE STP-9.0

RCS LEAKAGE TEST

1.0 Purpose

To determine identified and unidentified reactor coolant system leakage by performance of an RCS water inventory balance.

NOTE: Asterisked steps (*) are those associated with Acceptance Criteria.

2.0 Acceptance Criteria

2.1 Unidentified leakage is ≤ 1 gpm.

2.2 Identified leakage ≤ 10 gpm.

NOTE: FNP-1-STP-9.0 RCS Leakage Test (SR 3.4.13.1) is only required to be performed during steady state operation. AI 2004201338

3.0 Initial Conditions

CVR 3.1 The version of this procedure has been verified to be the current version. (OR 1-98-498)

CVR 3.2 This procedure has been verified to be the correct unit for the task. (OR 1-98-498)

CVR 3.3 Reactor power and reactor coolant temperature should be stabilized and held approximately constant for 1 hour prior to and during the test. (In Mode 3 or 4 not required until 12 hours of steady state operation.)

CVR 3.4 The pressurizer level and pressure control systems are in automatic or are in manual control and are stable.

CVR 3.5 The level of the VCT is in the normal operating band high enough to prevent the occurrence of an Auto Makeup during the test.

CVR 3.6 The CVCS system is aligned per FNP-1-SOP-2.1A, CHEMICAL & VOLUME CONTROL SYSTEM.

CVR 3.7 Notify the Shift Chemist and Shift Radiochemist of the performance of the test to ensure that no sampling of the RCS or CVCS will be done during this test.

NA 3.8 IF required for step 5.2, THEN ensure the following instrument is in calibration.

- Calibrated Digital Voltmeter FNP I.D. #
  Cal Due Date

4.0 Precautions And Limitations

4.1 No sampling of the RCS or CVCS shall be done during this test.

4.2 Any of the following will render this test void:

4.2.1 Emergency boration

4.2.2 Diversion of letdown to the recycle holdup tanks.

4.2.3 Make up from any source which does not go through the boric acid blender.

4.2.4 Boration of less than 10 gpm, due to Batch Integrator counter inaccuracies.

4.3 To minimize the inaccuracy introduced into the calculation by RCS temperature changes, RCS temperature should be maintained as follows:

4.3.1 IF RCS temp is < 545 ^{0}F, THEN the RCS temperature should not change by more than 0.1 ^{0}F during the test.

4.3.2 IF RCS temp is ≥ 545 ^{0}F, THEN the RCS temperature should not change by more than 0.3 ^{0}F during the test.

4.3.3 IF required to maintain RCS temperature, THEN control rods, turbine load or boron concentration should be adjusted as necessary.

4.4 The calculation assumes that changes in RCS volume due to PZR temperature / pressure fluctuations are negligible. Pressurizer parameters should be maintained stable to minimize inaccuracy.

4.5 The following guidelines should be followed to maximize precision:

- IF available, THEN computer points should be used for obtaining data. Otherwise, the available indications are to be read as accurately as possible.
- For RCS Tavg, the computer point data should be entered to include three decimal places(i.e., 572.204 ^{0}F).
- For other computer points and RCDT level, the data should be entered to include at least one decimal place (i.e., 50.1 %).
- Identified and unidentified leakage rates are to be reported in two decimal places (e.g., 0.07 gpm).
- IF possible, THEN normal makeup to the VCT should be avoided.

4.6 IF the RCDT or PRT level indication is invalid, THEN use 0 gpm for RCDT or PRT portion of identified leakage unless leakage into the RCDT or PRT is to be determined using another approved method.

4.7 To ensure that the STP-9.0 Computer Program remains current, the Engineering Support Group should be notified of any revision or TCN to the Data Sheet 1.

5.0 Instructions

5.1 The RCDT system is aligned as follows:

CVR 5.1.1 RCDT level is in the normal operating band.

CVR 5.1.2 Close RCDT PUMPS DISCH LINE ISO Q1G21HV7136

> **NOTE:** **The following step is only required if increased accuracy is necessary for determination of leak rate into PRT or the MCB PRT level indicator has a problem.**

I&C NA / CV 5.2 IF required, THEN have I&C connect a calibrated digital voltmeter across the output of LQY-470, location C5-231.

CVR 5.3 Place VCT HI LVL DIVERT VLV, Q1E21LCV115A, in the VCT position.

> **NOTE:** **Batch Integrator readings will be taken prior to and at the conclusion of each make up evolution.**

____ 5.4 Read and record initial readings on data sheet 1.

> **NOTE:** **A time span of at least 2 hours should be used during normal steady state plant operations, however if plant conditions dictate, a shorter time span may be used. (30 minutes minimum).**

____ 5.5 After the desired time span (normally 2 hours) record final values on data sheet 1.

____ 5.6 Record the following readings (recorded for trending purposes):

Rad Monitor R-11______________CPM

Rad Monitor R-12______________CPM

Ctmt. Sump lvl. Q1G21LI3282A______________Inches

Ctmt. Sump lvl. Q1G21LI3282B______________Inches

NA 5.7 IF the RCS leakrate program is to be used, THEN verify that the program is revision 3.

NOTE:	**If the RCS leakrate program is used, then the remainder of data sheet 1 may be left blank.**

____ *5.8 Calculate identified and unidentified leakages using the RCS leakrate program or formulas on data sheet 1.

ACCEPTANCE CRITERIA:	• Identified Leakage ≤ 10 gpm • Unidentified Leakage ≤ 1 gpm

____ 5.9 IF unidentified leakage is more negative than -0.2, THEN re-perform leak rate measurement.

__/__ IV 5.10 Open RCDT PUMPS DISCH LINE ISO Q1G21HV7136.

__/__ IV 5.11 Place VCT HI LVL DIVERT VLV, Q1E21LCV115A in the AUTO position.

____ 5.12 IF computer point LC0500 is available, THEN review the RCS leakrate trend (last 30 days if possible) on IPC to determine if any abnormal trends exist.

____ 5.13 IF unidentified leakage is >0.15 gpm, THEN re-perform leak rate measurement to confirm the results.

____ 5.14 IF unidentified leakage is confirmed to be >0.15 gpm, THEN perform the following: (steps may be performed in any order)

____ 5.14.1 Perform inspection to identify the leakage path(s) (AOP-1.0, attachments 2 through 5).

____ 5.14.2 Perform evaluation including any recent maintenance, plant evolutions or filter alignments to locate source of leakage, determine corrective actions and the effects of the leakage.

____ 5.14.3 IF leakage is NOT known to be outside CTMT, THEN request chemistry sample CTMT via R-67 for iron analysis.

____ 5.14.4 Submit CR to document the leakage and actions taken.

I&C ___/___ IV 5.15 IF applicable, THEN have I&C remove the calibrated digital voltmeter installed in step 5.2.

_____ 5.16 Update OPS home page (ULR Data spreadsheet) with unidentified leakage rate.

_____ 5.17 IF used for RCS leakrate calculation, THEN attach the computer generated Data Sheet 1 to this procedure.

6.0 References

6.1 P&ID D-175037 - RCS, sheet 2

6.2 P&ID D-175039 - CVCS, sheet 2

6.3 P&ID D-175042 - Waste Processing System, sheet 1

DATA SHEET 1
RCS Leakage

INSTRUMENT	NAME	INITIAL	FINAL	FINAL – INITIAL
Computer (MCB)	TIME			A = Minutes
TE0453 (TI0453)	LIQ PRZR TEMP	°F	°F	No significant change (≤ 1 °F)
PC0482, PT0455, PT0456 or PT0457 (PI 455, PI 456 or PI 457)	PRZR PRESS (Note 1)	psig	psig	No significant change (≤5 psig)
TC0484 (preferred), OR TY0412K, OR TY0422K, OR TY0432K (Note 7) (Average of TI 412D, 422D & 432D)	RCS TAVG (Note 1)	°F	°F	ΔT = °F Maximum change of 0.3°F allowed if TAVG is 545°F or greater, 0.1°F if TAVG is less than 545°F.
RCS Temperature Correction Factor	CF (Note 5)		N/A	B = ΔT × CF = Gal.
LC 1600 OR Average of LT0459, LT0460 & LT0461 (LI-459, 460, 461)	PRZR LVL	%	%	C = 56.3 × % = Gal.
LT0115 (LI 115)	VCT LVL	%	%	D = 14.18 × % = Gal.
LI 1003 Waste Pnl or BOP LS261 Pos 6	RCDT LVL	% *Gal	% *Gal	E = Gal. (Enter 0 if negative)
LT0470 (LI 470)	PRT LVL (Note 2)	% *Gal	% *Gal	F = Gal. (Enter 0 if negative)
FIS 168	TOTAL FLOW BATCH INTEG	Gal. Gal.	Gal. Gal.	G = Gal. Dilution and Blended Makeup

*From Tank Curve Book

Total Leakage

$$= \frac{B - C - D + G}{A} = \frac{(\quad) - (\quad) - (\quad) + (\quad)}{(\quad)} = \underset{\text{(Note 6)}}{\underline{\qquad\qquad}} \text{GPM}$$

Identified Leakage

$$= \frac{E + F}{A} = \frac{(\quad) + (\quad)}{(\quad)} + \underset{\text{Other leakage}}{\underline{\qquad\qquad}} = \underset{\text{(Note 6)}}{\underline{\qquad\qquad}} \text{GPM}$$

Other Leakage: <u>Source</u> <u>Rate (GPM)</u>

Total Other

$$\text{Unidentified Leakage} = \underset{\text{Total Leakage}}{\underline{\qquad\qquad}} - \underset{\text{Identified Leakage}}{\underline{\qquad\qquad}} = \underset{\text{(Notes 3, 4, \& 6)}}{\underline{\qquad\qquad}} \text{GPM}$$

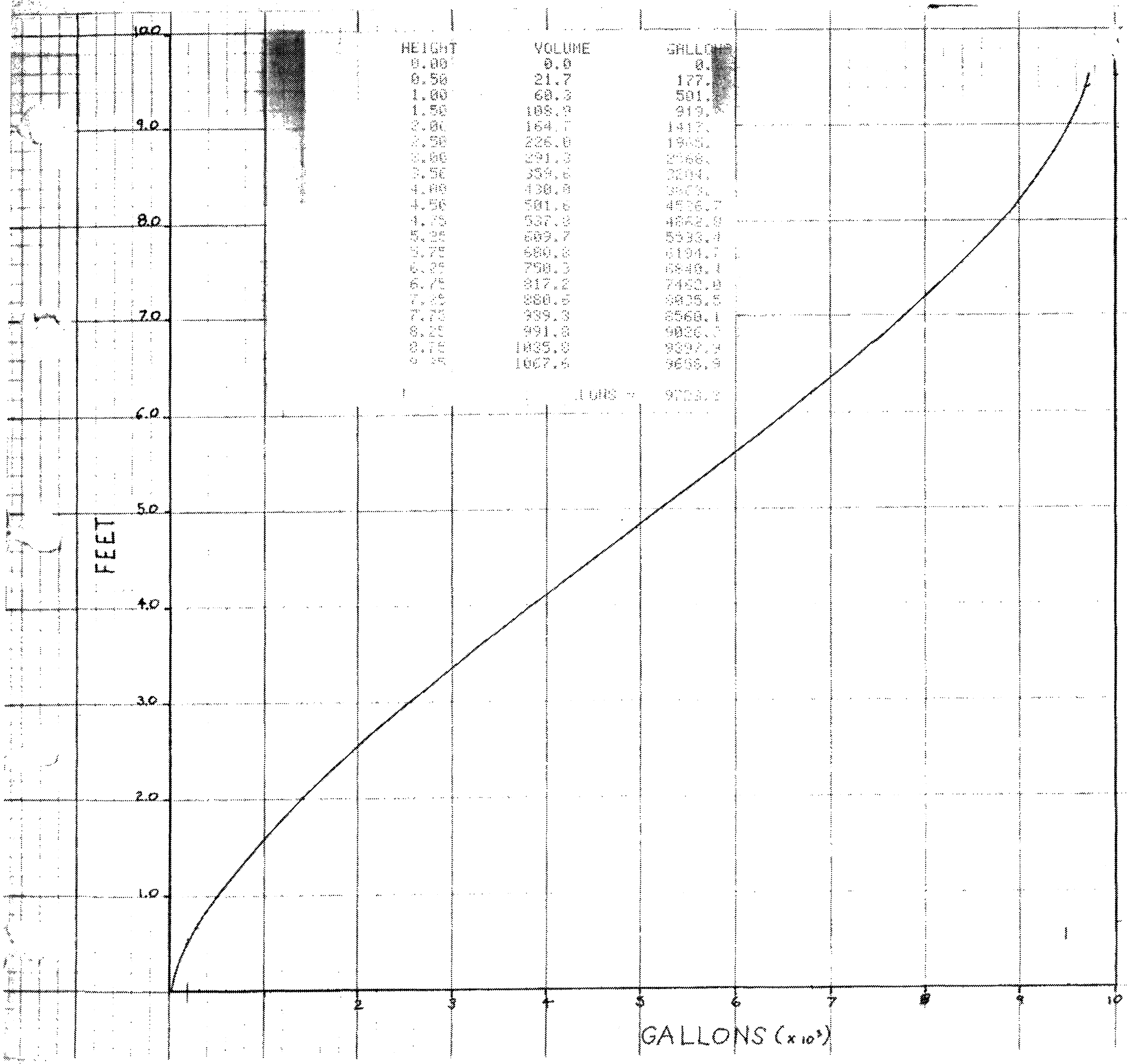
ACCEPTANCE CRITERIA:	• Identified Leakage ≤ 10 gpm • Unidentified Leakage ≤ 1 gpm

NOTES:

1. **IF TAVG < 530°F, THEN use: PI-402A (PT0402) and PI-403A (PT0403), 1C and 1A Loop RCS WR PRESS (Avg. of Readings) AND TR-410 (TE0410) and TR-413 (TE0413), RCS COLD AND HOT LEG TEMP (Avg. of Readings)**
2. **Calibrated fluke may be used for PRT level determination if deemed necessary.**
3. **For reporting purposes values between –0.2 and 0 gpm shall be reported as 0 gpm. Values more negative than –0.2 gpm indicate a potential problem and therefore shall be reported as is.**
4. **If unidentified leakage > 0.9 but < 1 gpm, test should be reperformed with ZAS secured. At maximum injection rate, ZAS can introduce ~0.03 gpm error into calculation.**
5. **Obtain CF from Table 1 using the nearest value of RCS temperature. N/A if RCS Leakrate program is used.**
6. **Leakage calculations are to be reported in two decimal places (e.g., 0.07 gpm).**
7. **TC0484 is preferred for RCS Tavg, but an individual loop temperature may be used if desired due to instability in the average reading.**

TABLE 1

RCS Temp (^{0}F)	Correction Factor (gal/ ^{0}F)	RCS Temp (^{0}F)	Correction Factor (gal/ ^{0}F)
200	24.3	545	83.5
225	26.6	547	84.5
250	28.9	550	86.1
275	31.2	555	88.8
300	33.5	560	91.7
325	36.6	565	94.8
350	39.8	570	98.2
375	42.9	571	98.9
400	46.0	572	99.7
425	51.4	573	100.5
450	56.7	574	101.2
475	62.1	575	101.9
500	67.4	577.2	103.6
525	76.3		



HEIGHT	VOLUME	GALLONS
0.00	0.0	0.
0.50	21.7	177.
1.00	60.3	501.
1.50	109.9	919.
2.00	164.7	1417.
2.50	226.0	1965.
3.00	291.3	2568.
3.50	359.6	3204.
4.00	430.0	[illegible]
4.50	501.6	4536.7
4.75	537.2	4862.9
5.25	609.7	5533.4
5.75	680.8	6194.7
6.25	750.3	6840.4
6.75	817.2	7462.0
7.25	880.5	8035.5
7.75	939.3	8560.1
8.25	991.8	9026.[illegible]
8.75	1035.0	9397.[illegible]
9.25	1067.5	9656.9

LONS = [illegible]

VOLUME II CURVE 27A
PRESSURIZER RELIEF TANK CAPACITY

CAPACITY (GAL) VS LEVEL (FEET)
REV. 1 March 8,1978 GAF

APPROVED: PCB-1-VOL2-CRV27A

Jackie D. Woodard 4-5-78
TECHNICAL SUPERINTENDENT DATE

PCB1 VOL 2 CRV 27A
R. 1

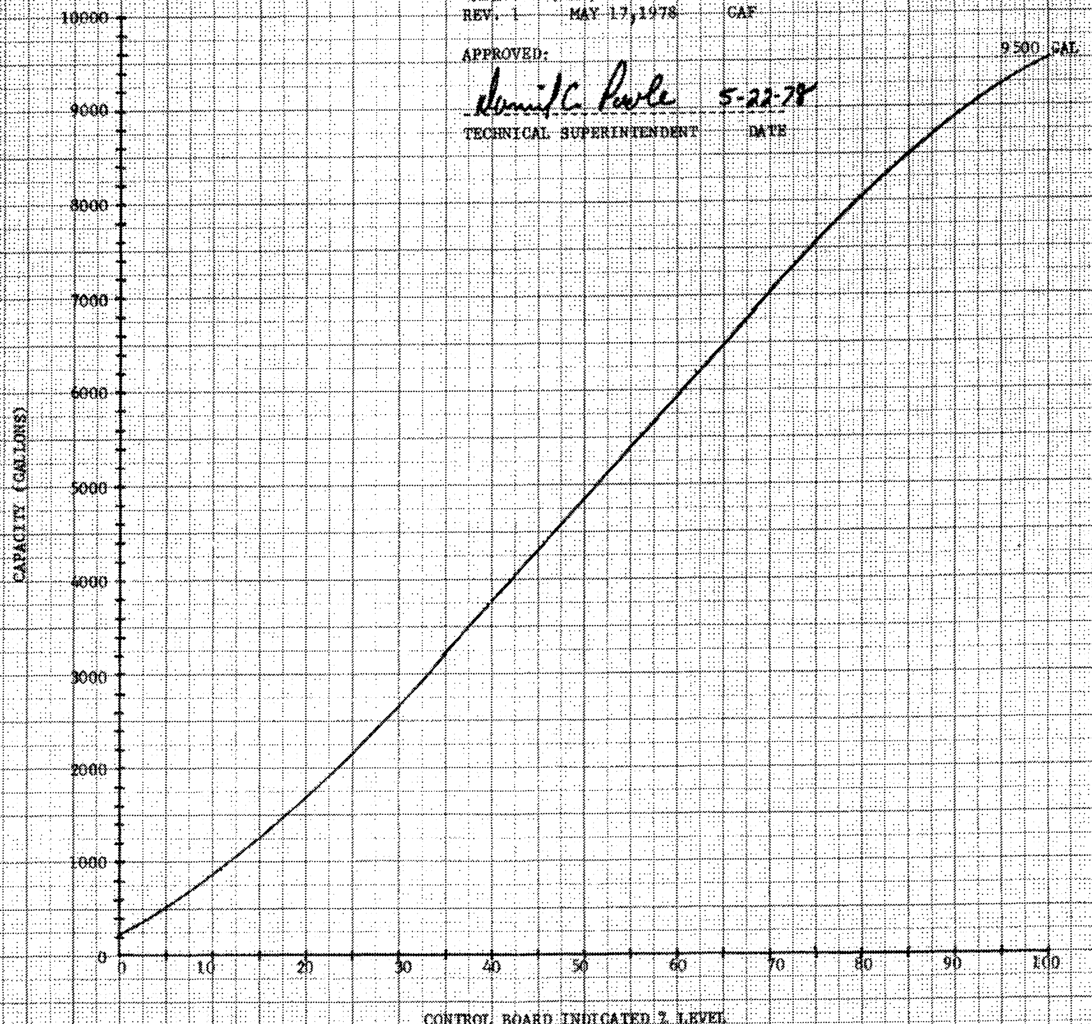
PCB1 VOL2 CRV27B
R1

PCB-1-VOL2-CRV27B

VOLUME II CURVE 27B
PRESSURIZER RELIEF TANK CAPACITY
NIB32D001
CAPACITY (GAL) VS % LEVEL
REV. 1 MAY 17,1978 CAF

APPROVED:

[signature] 5-22-78
TECHNICAL SUPERINTENDENT DATE



VOLUME II CURVE 27C
PRESSURIZER RELIEF TANK CAPACITY TABLE
N1B32T001
CAPACITY (GAL) VS % LEVEL
REV. 0 May 7, 1980 GAF

APPROVED: PCB-1-Vol2-CRV27C

Kenneth W. McCracken 5/15/80
TECHNICAL SUPERINTENDENT DATE

% LEVEL	GALLONS	% LEVEL	GALLONS	% LEVEL	GALLONS	% LEVEL	GALLONS
0.0	222.12	26.0	2272.29	52.0	5086.38	78.0	7842.44
1.0	272.10	27.0	2372.49	53.0	5198.21	79.0	7936.83
2.0	325.39	28.0	2473.73	54.0	5309.92	80.0	8029.90
3.0	381.81	29.0	2575.91	55.0	5421.45	81.0	8121.58
4.0	441.16	30.0	2678.98	56.0	5532.79	82.0	8211.80
5.0	503.28	31.0	2782.92	57.0	5643.89	83.0	8300.53
6.0	568.05	32.0	2887.70	58.0	5754.68	84.0	8387.71
7.0	635.34	33.0	2993.24	59.0	5865.14	85.0	8473.23
8.0	705.02	34.0	3099.49	60.0	5975.22	86.0	8557.06
9.0	776.99	35.0	3206.43	61.0	6084.90	87.0	8639.11
10.0	851.16	36.0	3314.00	62.0	6194.11	88.0	8719.29
11.0	927.43	37.0	3422.18	63.0	6302.82	89.0	8797.57
12.0	1005.71	38.0	3530.89	64.0	6411.00	90.0	8873.84
13.0	1085.89	39.0	3640.10	65.0	6518.57	91.0	8948.01
14.0	1167.94	40.0	3749.78	66.0	6625.51	92.0	9019.98
15.0	1251.77	41.0	3859.86	67.0	6731.76	93.0	9089.66
16.0	1337.29	42.0	3970.32	68.0	6837.30	94.0	9156.95
17.0	1424.47	43.0	4081.11	69.0	6942.08	95.0	9221.72
18.0	1513.20	44.0	4192.21	70.0	7046.02	96.0	9283.84
19.0	1603.42	45.0	4303.55	71.0	7149.09	97.0	9343.19
20.0	1695.10	46.0	4415.08	72.0	7251.27	98.0	9399.61
21.0	1788.17	47.0	4526.79	73.0	7352.51	99.0	9452.90
22.0	1882.56	48.0	4638.62	74.0	7452.71	100.0	9502.88
23.0	1978.22	49.0	4750.54	75.0	7551.86		
24.0	2075.11	50.0	4862.50	76.0	7649.89		
25.0	2173.14	51.0	4974.46	77.0	7746.78		

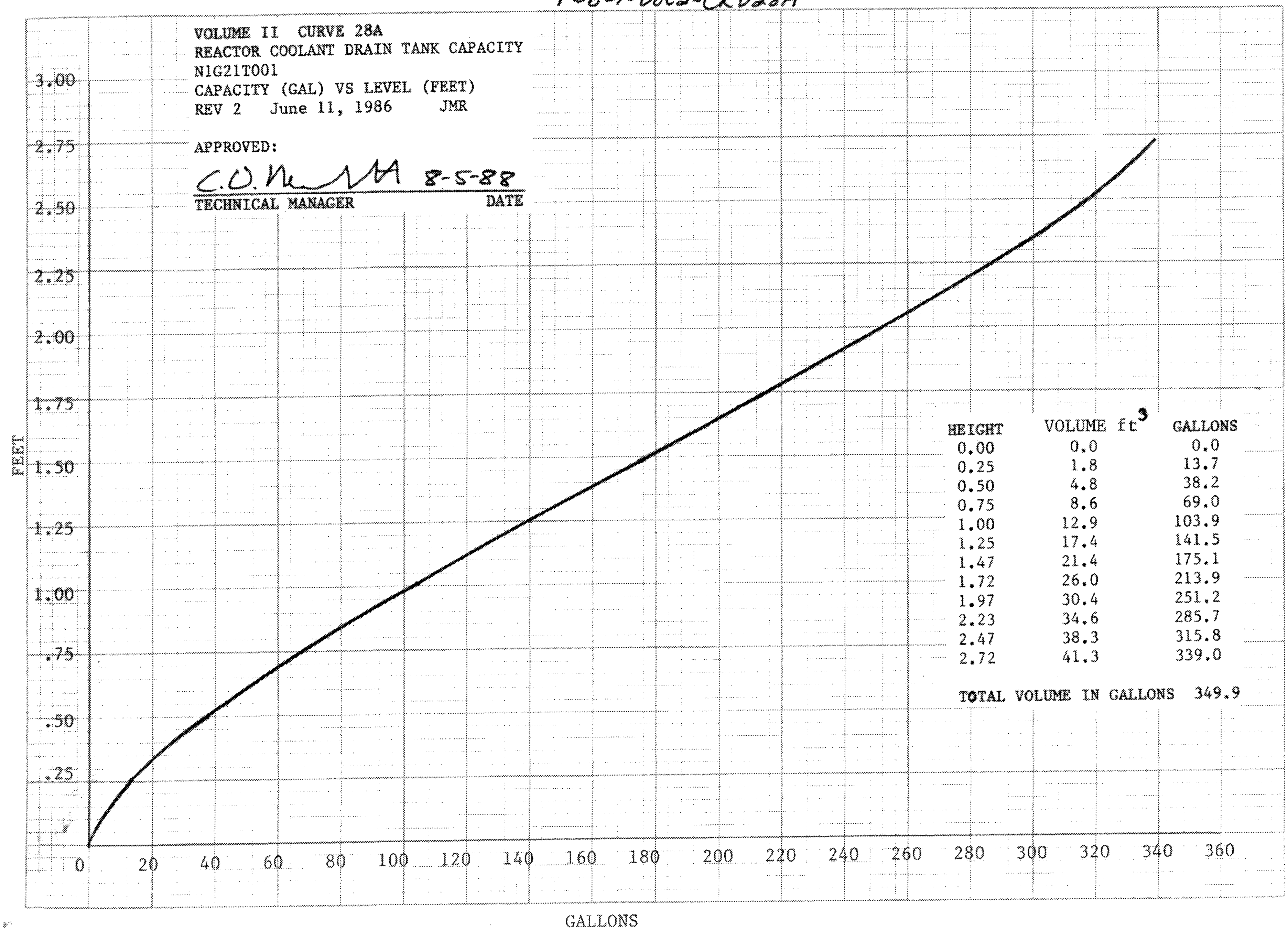
PCB-1-VOL2-CRV28A

VOLUME II CURVE 28A
REACTOR COOLANT DRAIN TANK CAPACITY
N1G21T001
CAPACITY (GAL) VS LEVEL (FEET)
REV 2 June 11, 1986 JMR

APPROVED:

C.O. [illegible] 8-5-88

TECHNICAL MANAGER DATE



HEIGHT	VOLUME ft^3	GALLONS
0.00	0.0	0.0
0.25	1.8	13.7
0.50	4.8	38.2
0.75	8.6	69.0
1.00	12.9	103.9
1.25	17.4	141.5
1.47	21.4	175.1
1.72	26.0	213.9
1.97	30.4	251.2
2.23	34.6	285.7
2.47	38.3	315.8
2.72	41.3	339.0

TOTAL VOLUME IN GALLONS 349.9

Unit 1

Volume II Curve 28B
Reactor Coolant Drain Tank Capacity PCB-1-VOL2-CRV28B
N1G21T001
Capacity (Gallons) vs % Level
Rev. 2, December 14, 1981, C.A.P.

Approved:

C.D. [signature] 1-28-82
Technical Superintendent Date

% LEVEL	GALLONS
0.0	18.28
1.0	20.45
2.0	22.69
3.0	25.00
4.0	27.37
5.0	29.81
6.0	32.31
7.0	34.87
8.0	37.49
9.0	40.16
10.0	42.88
11.0	45.65
12.0	48.46
13.0	51.33
14.0	54.23
15.0	57.18
16.0	60.17
17.0	63.20
18.0	66.26
19.0	69.36
20.0	72.50
21.0	75.67
22.0	78.87
23.0	82.10
24.0	85.36
25.0	88.64
26.0	91.96
27.0	95.29
28.0	98.66
29.0	102.04
30.0	105.45
31.0	108.88
32.0	112.32
33.0	115.79
34.0	119.27
35.0	122.77
36.0	126.28
37.0	129.81
38.0	133.35
39.0	136.90
40.0	140.46
41.0	144.04
42.0	147.62
43.0	151.21
44.0	154.81
45.0	158.41
46.0	162.02
47.0	165.63
48.0	169.24
49.0	172.86
50.0	176.48
51.0	180.09
52.0	183.71
53.0	187.32
54.0	190.94
55.0	194.54
56.0	198.15
57.0	201.74
58.0	205.33
59.0	208.92
60.0	212.49
61.0	216.05
62.0	219.60
63.0	223.14
64.0	226.67
65.0	230.19
66.0	233.68
67.0	237.17
68.0	240.63
69.0	244.08
70.0	247.50
71.0	250.91
72.0	254.30
73.0	257.66
74.0	261.00
75.0	264.31
76.0	267.60
77.0	270.86
78.0	274.09
79.0	277.29
80.0	280.45
81.0	283.59
82.0	286.69
83.0	289.75
84.0	292.78
85.0	295.77
86.0	298.72
87.0	301.63
88.0	304.49
89.0	307.31
90.0	310.08
91.0	312.80
92.0	315.46
93.0	318.08
94.0	320.64
95.0	323.14
96.0	325.58
97.0	327.96
98.0	330.27
99.0	332.50
100.0	334.67

A.2S Equipment Control ADMIN 004A2.22 - SRO

TITLE: Perform an RCS Leakage Test & determine Tech Spec requirements if applicable.

TASK STANDARD: Perform an RCS Leakage Test by performing the required Surveillance Calculation, STP-9.0, and identify that the RCS leakrate does NOT meet acceptance criteria, then determine proper Tech Spec TS 3.4.13 CONDITION B for Pressure boundary Leakage.

PROGRAM APPLICABLE: SOT ___ SOCT ___ OLT _X_ LOCT _X

ACCEPTABLE EVALUATION METHOD: _X_ PERFORM ____ SIMULATE ___ DISCUSS

EVALUATION LOCATION: ____ SIMULATOR ___ CONTROL ROOM _X_ CLASSROOM

PROJECTED TIME: _25 MIN_ SIMULATOR IC NUMBER: ___NA___

ALTERNATE PATH ___ TIME CRITICAL ___ PRA

Examinee:		
Overall JPM Performance:	**Satisfactory** ☐	**Unsatisfactory** ☐
Evaluator Comments (attach additional sheets if necessary)		

EXAMINER: ____________________

CONDITIONS

When I tell you to begin, you are to perform an RCS Leakage Test and identify if any Tech Spec ACTIONS are applicable, and if so, which ACTION(S). The conditions under which this task is to be performed are:

a. The unit is in Mode 1 at 100% power.
b. You are directed by the Shift Supervisor to
   - determine RCS leakage per STP-9.0, STEPS 5.4 to 5.9
     - WHEN step 5.9 is complete, THEN another operator will complete the STP starting at step 5.10
   - determine whether or not RCS leakage acceptance criteria is met
   - IF acceptance criteria is NOT met, THEN determine proper Tech Spec ACTION(S).

EVALUATION CHECKLIST

ELEMENTS:		STANDARDS:	RESULTS: (CIRCLE)

_____ START TIME

NOTE:	**A Key is provided at the end of this ADMIN JPM with expected values filled in. The applicant must obtanin some of the values from the Handout and some from curve 28B, RCDT gallons vs. level.**

1*.	Step 5.4 Read and record initial readings on data sheet 1.	Records initial readings on data sheet 1.	S / U
2*.	Step 5.5 Records final values on data sheet 1.	Records final values on data sheet 1.	S / U
3*.	Step 5.6 Records the R-11, R-12, and Ctmt Sump lvl. Readings.	Records the R-11, R-12, and Ctmt Sump lvl. Readings.	S / U

CUE IF REQUESTED: "Other leakage is 0 gpm".

NOTE:	**[IF applicant inquires about any "other leakage" it is 0 gpm. This is information that is obtainable in the plant from turnover, and since there is no "other known leakage" provided, it may be assumed to be 0 gpm OR it may be requested. Either is acceptable].** **Step 5.7 has already been marked NA in the handout.**

EVALUATION CHECKLIST

ELEMENTS:		STANDARDS:	RESULTS: (CIRCLE)
4*.	Step 5.8 Calculates identified and unidentified leakages using the formulas on STP-9.0 data sheet 1.	Calculates identified and unidentified leakages using the formulas on STP-9.0 data sheet 1.	S / U
5*.	Step 5.9 Marks NA on step: "IF unidentified leakage is more negative than -0.2, THEN re-perform leak rate measurement."	Marks NA on step 5.9 due to leakrate being positive.	S / U
6*.	Compares actual Leak rates with the acceptance criteria, and determines that the Unidentified Leakage does not meet acceptance criteria.	Determines that the Identified leakage MEETS acceptance criteria, but the Unidentified Leakage does NOT meet acceptance criteria.	S / U

NOTE: **An inspection to identify the exact source of leakage, possibly requiring a containment entry, OR isolation of the leak will be required to prove that the leakage in NOT pressure boundary, and until it is proved other wise it must be assumed to be pressure boundary leakage.**

7*.	Determines that Tec h Spec 3.4.13 in NOT met, AND CONDITION B is in effect for "Pressure boundary LEAKAGE exists".	Determines that **Tech Spec 3.4.13** in **NOT** met,	S / U
		AND	
		CONDITION B is in effect for "Pressure boundary LEAKAGE exists".	S / U
		Be in **MODE 3 in 6 hours** AND BE **MODE 5 in 36 hours** is required.	S / U

_____ **STOP TIME**

Terminate JPM when determination of applicable Tech Spec ACTION is complete for leak rate.

CRITICAL ELEMENTS: Critical Elements are denoted with an asterisk (*) before the element number.

GENERAL REFERENCES

1. FNP-1-STP-9.0, Version 42.0
2. Plant tank curves 27A, 27B, 27C, 28A, & 28B
2. K/A: 004 A2.22 RO-3.2SRO-3.1
3. Tech Spec 3.4.13 AND Basis

GENERAL TOOLS AND EQUIPMENT

Provide:

1. FNP-1-STP-9.0, Version 42.0
2. Plant tank curves 27A, 27B, 27C, 28A, & 28B
3. Calculator (or the Applicant may supply a calculator)
4. Plant Conditions at 1000 & 1200
5. Tech Spec 3.4.13 AND Basis

COMMENTS

KEY: STP-9.0, DATA SHEET 1, RCS Leakage

All tolerances based on differences in rounding. One calc was performed rounding to the least significant digits at each step of the calculation, and one was performed using all digits in the calculator until the end of each step of the calculations to round to the least significant digits.

INSTRUMENT	NAME	INITIAL	FINAL	FINAL – INITIAL
Computer (MCB)	TIME	***1000***	***1200***	A = ***120*** Minutes
TE0453 (TI0453)	LIQ PRZR TEMP	***650.8*** °F	***650.8*** °F	No significant change (≤ 1 °F)
PC0482, PT0455, PT0456 or PT0457 (PI 455, PI 456 or PI 457)	PRZR PRESS (Note 1)	***2239.4*** psig	***2239.4*** psig	No significant change (≤5 psig)
TC0484 (preferred), <u>OR</u> TY0412K, <u>OR</u> TY0422K, <u>OR</u> TY0432K (Note 7) (Average of TI 412D, 422D & 432D)	RCS TAVG (Note 1)	***571.9*** °F	***571.9*** °F	ΔT = ***0*** °F Maximum change of 0.3°F allowed if TAVG is 545°F or greater, 0.1°F if TAVG is less than 545°F.
RCS Temperature Correction Factor	CF (Note 5)	***99.7*** <u>***OR***</u> ***NA***	N/A	B = ΔT × CF = ***0*** Gal.
LC 1600 <u>OR</u> Average of LT0459, LT0460 & LT0461 (LI-459, 460, 461)	PRZR LVL	***47.8*** %	***47.8*** %	C = 56.3 × ***0*** % = ***0*** Gal.
LT0115 (LI 115)	VCT LVL	***51.0*** %	***37.3*** %	D = 14.18 × ***(–)12.7*** % = ***(–)194 to 194.3*** Gal.
LI 1003 Waste Pnl or BOP LS261 Pos 6	RCDT LVL	***36.4*** % ***127.69*** *Gal	***38.1*** % ***133.71*** *Gal	E = ***6.01 to 6.02*** Gal. (Enter 0 if negative)
LT0470 (LI 470)	PRT LVL (Note 2)	***69.7*** % ***NA*** *Gal	***69.7*** % ***NA*** *Gal	F = ***0*** Gal. (Enter 0 if negative)
FIS 168	TOTAL FLOW BATCH INTEG	***3489*** Gal. ***NA*** Gal.	***3489*** Gal. ***NA*** Gal.	G = ***0*** Gal. Dilution and Blended Makeup

*From Tank Curve Book

KEY (continued): STP-9.0, DATA SHEET 1, RCS Leakage

Total Leakage

$$= \frac{\mathbf{B - C - D + G}}{\mathbf{A}} = \frac{(\ 0\ ) - (\ 0\ ) - (\ (-)194 \text{ to } (-)194.3\ ) + (\ 0\ )}{(\ 120\ )} = \frac{(+)1.617 \text{ to } (+)1.62}{\text{(Note 6)}} \text{ GPM}$$

Identified Leakage

$$= \frac{\mathbf{E + F}}{\mathbf{A}} = \frac{(\ 6.01 \text{ to } 6.02\ ) + (\ 0\ )}{(\ 120\ )} + \frac{0}{\text{Other leakage}} = \frac{0.050 \text{ no tolerance}}{\text{(Note 6)}} \text{ GPM}$$

Other Leakage:	Source	Rate (GPM)
	0	*0*

$$\text{Unidentified Leakage} = \frac{\overset{\text{Total Other}}{1.617 \text{ to } 1.62}}{\text{Total Leakage}} - \frac{0.050 \text{ no tolerance}}{\text{Identified Leakage}} = \frac{1.567 \text{ to } 1.57}{\text{(Notes 3, 4, \& 6)}} \text{ GPM}$$

ACCEPTANCE CRITERIA:	• Identified Leakage ≤ 10 gpm • Unidentified Leakage ≤ 1 gpm

Plant Conditions at 1000:

INSTRUMENT Computer Points	**NAME**	
N/A	TIME	***1000***
TE0453	LIQ PRZR TEMP	***650.8*** °F
PC0482	PRZR PRESS	***2239.4*** psig
TC0484	RCS TAVG	***571.9*** °F
LC 1600	PRZR LVL	***47.8*** %
LT0115	VCT LVL	***51.0*** %
BOP LS261 Pos 6	RCDT LVL	***36.4*** % *Gal
LT0470	PRT LVL	***69.7*** % *Gal
FIS 168	TOTAL FLOW BATCH INTEG	***3489*** Gal.

Plant Conditions at 1200:

INSTRUMENT Computer Points	**NAME**	
N/A	TIME	***1200***
TE0453	LIQ PRZR TEMP	***650.8*** °F
PC0482	PRZR PRESS	***2239.4*** Psig
TC0484	RCS TAVG	***571.9*** °F
LC 1600	PRZR LVL	***47.8*** %
LT0115	VCT LVL	***37.3*** %
BOP LS261 Pos 6	RCDT LVL	***38.1*** % *Gal
LT0470	PRT LVL	***69.7*** % *Gal
FIS 168	TOTAL FLOW BATCH INTEG	***3489*** Gal.
R-11	CTMT Particulate Rad Monitor	***187*** CPM
R-12	CTMT Gas Rad Monitor	***75*** CPM
Q1G21LI3282A	Ctmt. Sump lvl	***18*** Inches
Q1G21LI3282B	Ctmt. Sump lvl	***18*** Inches

CONDITIONS

When I tell you to begin, you are to perform an RCS Leakage Test and identify if any Tech Spec ACTIONS are applicable, and if so, which ACTION(S). The conditions under which this task is to be performed are:

a. The unit is in Mode 1 at 100% power.
b. You are directed by the Shift Supervisor to
   - determine RCS leakage per STP-9.0, STEPS 5.4 to 5.9
     - WHEN step 5.9 is complete, THEN another operator will complete the STP starting at step 5.10
   - determine whether or not RCS leakage acceptance criteria is met
   - IF acceptance criteria is NOT met, THEN determine proper Tech Spec ACTION(S).

FARLEY NUCLEAR PLANT

SURVEILLANCE TEST PROCEDURE

FNP-1-STP-9.0

S
A
F
E
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R
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D

RCS LEAKAGE TEST

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	**ALL**
Reference Use	
Information Use	

Approved:

J. L. Hunter (for)
Operations Manager

Date Issued: 05/30/2008

FARLEY NUCLEAR PLANT
SURVEILLANCE TEST REVIEW SHEET

SURVEILLANCE TEST NO. FNP-1-STP-9.0	TECHNICAL SPECIFICATION REFERENCE SR 3.4.13.1
TITLE RCS LEAKAGE TEST	MODE(S) REQUIRING TEST: 1, 2, 3, 4

TEST RESULTS (TO BE COMPLETED BY TEST PERFORMER)

PERFORMED BY ______________________ DATE/TIME ______________

COMPONENT OR TRAIN TESTED (if applicable) ______________________

[ ] ENTIRE STP PERFORMED [ ] FOR SURVEILLANCE CREDIT

[ ] PARTIAL STP PERFORMED: [ ] NOT FOR SURVEILLANCE CREDIT

REASON FOR PARTIAL: ______________________

TEST COMPLETED: [ ] Satisfactory [ ] Unsatisfactory

[ ] The following deficiencies occurred:

____

____

[ ] Corrective action taken or initiated:

____

____

____

SHIFT SUPERVISOR/ SHIFT SUPPORT SUPERVISOR REVIEW

REVIEWED BY ______________________ DATE ______________

[ ] Procedure properly completed and satisfactory

[ ] Comments: ______________________

____

ENGINEERING SUPPORT GROUP SCREENING (IF APPLICABLE)

SCREENED BY ______________________ DATE ______________
REVIEWED BY ______________________ DATE ______________

[ ] Satisfactory and Approved
[ ] Comments: ______________________

____

TABLE OF CONTENTS

FARLEY NUCLEAR PLANT
UNIT 1
SURVEILLANCE TEST PROCEDURE STP-9.0

RCS LEAKAGE TEST

1.0 Purpose

To determine identified and unidentified reactor coolant system leakage by performance of an RCS water inventory balance.

NOTE:	**Asterisked steps (*) are those associated with Acceptance Criteria.**

2.0 Acceptance Criteria

2.1 Unidentified leakage is ≤ 1 gpm.

2.2 Identified leakage ≤ 10 gpm.

NOTE:	**FNP-1-STP-9.0 RCS Leakage Test (SR 3.4.13.1) is only required to be performed during steady state operation. AI 2004201338**

3.0 Initial Conditions

CVR 3.1 The version of this procedure has been verified to be the current version. (OR 1-98-498)

CVR 3.2 This procedure has been verified to be the correct unit for the task. (OR 1-98-498)

CVR 3.3 Reactor power and reactor coolant temperature should be stabilized and held approximately constant for 1 hour prior to and during the test. (In Mode 3 or 4 not required until 12 hours of steady state operation.)

CVR 3.4 The pressurizer level and pressure control systems are in automatic or are in manual control and are stable.

CVR 3.5 The level of the VCT is in the normal operating band high enough to prevent the occurrence of an Auto Makeup during the test.

CVR 3.6 The CVCS system is aligned per FNP-1-SOP-2.1A, CHEMICAL & VOLUME CONTROL SYSTEM.

CVR 3.7 Notify the Shift Chemist and Shift Radiochemist of the performance of the test to ensure that no sampling of the RCS or CVCS will be done during this test.

NA 3.8 IF required for step 5.2, THEN ensure the following instrument is in calibration.

- Calibrated Digital Voltmeter FNP I.D. #
  Cal Due Date

4.0 Precautions And Limitations

4.1 No sampling of the RCS or CVCS shall be done during this test.

4.2 Any of the following will render this test void:

4.2.1 Emergency boration

4.2.2 Diversion of letdown to the recycle holdup tanks.

4.2.3 Make up from any source which does not go through the boric acid blender.

4.2.4 Boration of less than 10 gpm, due to Batch Integrator counter inaccuracies.

4.3 To minimize the inaccuracy introduced into the calculation by RCS temperature changes, RCS temperature should be maintained as follows:

4.3.1 IF RCS temp is < 545 ^{0}F, THEN the RCS temperature should not change by more than 0.1 ^{0}F during the test.

4.3.2 IF RCS temp is ≥ 545 ^{0}F, THEN the RCS temperature should not change by more than 0.3 ^{0}F during the test.

4.3.3 IF required to maintain RCS temperature, THEN control rods, turbine load or boron concentration should be adjusted as necessary.

4.4 The calculation assumes that changes in RCS volume due to PZR temperature / pressure fluctuations are negligible. Pressurizer parameters should be maintained stable to minimize inaccuracy.

4.5 The following guidelines should be followed to maximize precision:

- IF available, THEN computer points should be used for obtaining data. Otherwise, the available indications are to be read as accurately as possible.
- For RCS Tavg, the computer point data should be entered to include three decimal places(i.e., 572.204 ^{0}F).
- For other computer points and RCDT level, the data should be entered to include at least one decimal place (i.e., 50.1 %).
- Identified and unidentified leakage rates are to be reported in two decimal places (e.g., 0.07 gpm).
- IF possible, THEN normal makeup to the VCT should be avoided.

4.6 IF the RCDT or PRT level indication is invalid, THEN use 0 gpm for RCDT or PRT portion of identified leakage unless leakage into the RCDT or PRT is to be determined using another approved method.

4.7 To ensure that the STP-9.0 Computer Program remains current, the Engineering Support Group should be notified of any revision or TCN to the Data Sheet 1.

5.0 Instructions

5.1 The RCDT system is aligned as follows:

CVR 5.1.1 RCDT level is in the normal operating band.

CVR 5.1.2 Close RCDT PUMPS DISCH LINE ISO Q1G21HV7136

NOTE:	**The following step is only required if increased accuracy is necessary for determination of leak rate into PRT or the MCB PRT level indicator has a problem.**

I&C NA / CV 5.2 IF required, THEN have I&C connect a calibrated digital voltmeter across the output of LQY-470, location C5-231.

CVR 5.3 Place VCT HI LVL DIVERT VLV, Q1E21LCV115A, in the VCT position.

NOTE:	**Batch Integrator readings will be taken prior to and at the conclusion of each make up evolution.**

____ 5.4 Read and record initial readings on data sheet 1.

NOTE:	**A time span of at least 2 hours should be used during normal steady state plant operations, however if plant conditions dictate, a shorter time span may be used. (30 minutes minimum).**

____ 5.5 After the desired time span (normally 2 hours) record final values on data sheet 1.

____ 5.6 Record the following readings (recorded for trending purposes):

Rad Monitor R-11______________CPM

Rad Monitor R-12______________CPM

Ctmt. Sump lvl. Q1G21LI3282A______________Inches

Ctmt. Sump lvl. Q1G21LI3282B______________Inches

NA 5.7 IF the RCS leakrate program is to be used, THEN verify that the program is revision 3.

NOTE:	**If the RCS leakrate program is used, then the remainder of data sheet 1 may be left blank.**

____ *5.8 Calculate identified and unidentified leakages using the RCS leakrate program or formulas on data sheet 1.

ACCEPTANCE CRITERIA:	• Identified Leakage ≤ 10 gpm
	• Unidentified Leakage ≤ 1 gpm

____ 5.9 IF unidentified leakage is more negative than -0.2, THEN re-perform leak rate measurement.

__/__ IV 5.10 Open RCDT PUMPS DISCH LINE ISO Q1G21HV7136.

__/__ IV 5.11 Place VCT HI LVL DIVERT VLV, Q1E21LCV115A in the AUTO position.

____ 5.12 IF computer point LC0500 is available, THEN review the RCS leakrate trend (last 30 days if possible) on IPC to determine if any abnormal trends exist.

____ 5.13 IF unidentified leakage is >0.15 gpm, THEN re-perform leak rate measurement to confirm the results.

____ 5.14 IF unidentified leakage is confirmed to be >0.15 gpm, THEN perform the following: (steps may be performed in any order)

____ 5.14.1 Perform inspection to identify the leakage path(s) (AOP-1.0, attachments 2 through 5).

____ 5.14.2 Perform evaluation including any recent maintenance, plant evolutions or filter alignments to locate source of leakage, determine corrective actions and the effects of the leakage.

____ 5.14.3 IF leakage is NOT known to be outside CTMT, THEN request chemistry sample CTMT via R-67 for iron analysis.

____ 5.14.4 Submit CR to document the leakage and actions taken.

I&C __/__ IV 5.15 IF applicable, THEN have I&C remove the calibrated digital voltmeter installed in step 5.2.

____ 5.16 Update OPS home page (ULR Data spreadsheet) with unidentified leakage rate.

____ 5.17 IF used for RCS leakrate calculation, THEN attach the computer generated Data Sheet 1 to this procedure.

6.0 References

6.1 P&ID D-175037 - RCS, sheet 2

6.2 P&ID D-175039 - CVCS, sheet 2

6.3 P&ID D-175042 - Waste Processing System, sheet 1

DATA SHEET 1
RCS Leakage

INSTRUMENT	NAME	INITIAL	FINAL	FINAL – INITIAL
Computer (MCB)	TIME			A = Minutes
TE0453 (TI0453)	LIQ PRZR TEMP	°F	°F	No significant change (≤ 1 °F)
PC0482, PT0455, PT0456 or PT0457 (PI 455, PI 456 or PI 457)	PRZR PRESS (Note 1)	psig	psig	No significant change (≤5 psig)
TC0484 (preferred), OR TY0412K, OR TY0422K, OR TY0432K (Note 7) (Average of TI 412D, 422D & 432D)	RCS TAVG (Note 1)	°F	°F	ΔT = °F Maximum change of 0.3°F allowed if TAVG is 545°F or greater, 0.1°F if TAVG is less than 545°F.
RCS Temperature Correction Factor	CF (Note 5)		N/A	B = ΔT × CF = Gal.
LC 1600 OR Average of LT0459, LT0460 & LT0461 (LI-459, 460, 461)	PRZR LVL	%	%	C = 56.3 × % = Gal.
LT0115 (LI 115)	VCT LVL	%	%	D = 14.18 × % = Gal.
LI 1003 Waste Pnl or BOP LS261 Pos 6	RCDT LVL	% *Gal	% *Gal	E = Gal. (Enter 0 if negative)
LT0470 (LI 470)	PRT LVL (Note 2)	% *Gal	% *Gal	F = Gal. (Enter 0 if negative)
FIS 168	TOTAL FLOW BATCH INTEG	Gal. Gal.	Gal. Gal.	G = Gal. Dilution and Blended Makeup

*From Tank Curve Book

Total Leakage

$$= \frac{B - C - D + G}{A} = \frac{(\quad\quad) - (\quad\quad) - (\quad\quad) + (\quad\quad)}{(\quad\quad)} = \underset{\text{(Note 6)}}{\underline{\hspace{3cm}}}\ \text{GPM}$$

Identified Leakage

$$= \frac{E + F}{A} = \frac{(\quad\quad) + (\quad\quad)}{(\quad\quad)} + \underset{\text{Other leakage}}{\underline{\hspace{3cm}}} = \underset{\text{(Note 6)}}{\underline{\hspace{3cm}}}\ \text{GPM}$$

Other Leakage: Source Rate (GPM)

$$\text{Unidentified Leakage} = \underset{\text{Total Leakage}}{\overset{\text{Total Other}}{\underline{\hspace{3cm}}}} - \underset{\text{Identified Leakage}}{\underline{\hspace{3cm}}} = \underset{\text{(Notes 3, 4, \& 6)}}{\underline{\hspace{3cm}}}\ \text{GPM}$$

ACCEPTANCE CRITERIA:	• Identified Leakage ≤ 10 gpm • Unidentified Leakage ≤ 1 gpm

NOTES:

1. **IF TAVG < 530°F, THEN use: PI-402A (PT0402) and PI-403A (PT0403), 1C and 1A Loop RCS WR PRESS (Avg. of Readings) AND TR-410 (TE0410) and TR-413 (TE0413), RCS COLD AND HOT LEG TEMP (Avg. of Readings)**
2. **Calibrated fluke may be used for PRT level determination if deemed necessary.**
3. **For reporting purposes values between –0.2 and 0 gpm shall be reported as 0 gpm. Values more negative than –0.2 gpm indicate a potential problem and therefore shall be reported as is.**
4. **If unidentified leakage > 0.9 but < 1 gpm, test should be reperformed with ZAS secured. At maximum injection rate, ZAS can introduce ~0.03 gpm error into calculation.**
5. **Obtain CF from Table 1 using the nearest value of RCS temperature. N/A if RCS Leakrate program is used.**
6. **Leakage calculations are to be reported in two decimal places (e.g., 0.07 gpm).**
7. **TC0484 is preferred for RCS Tavg, but an individual loop temperature may be used if desired due to instability in the average reading.**

TABLE 1

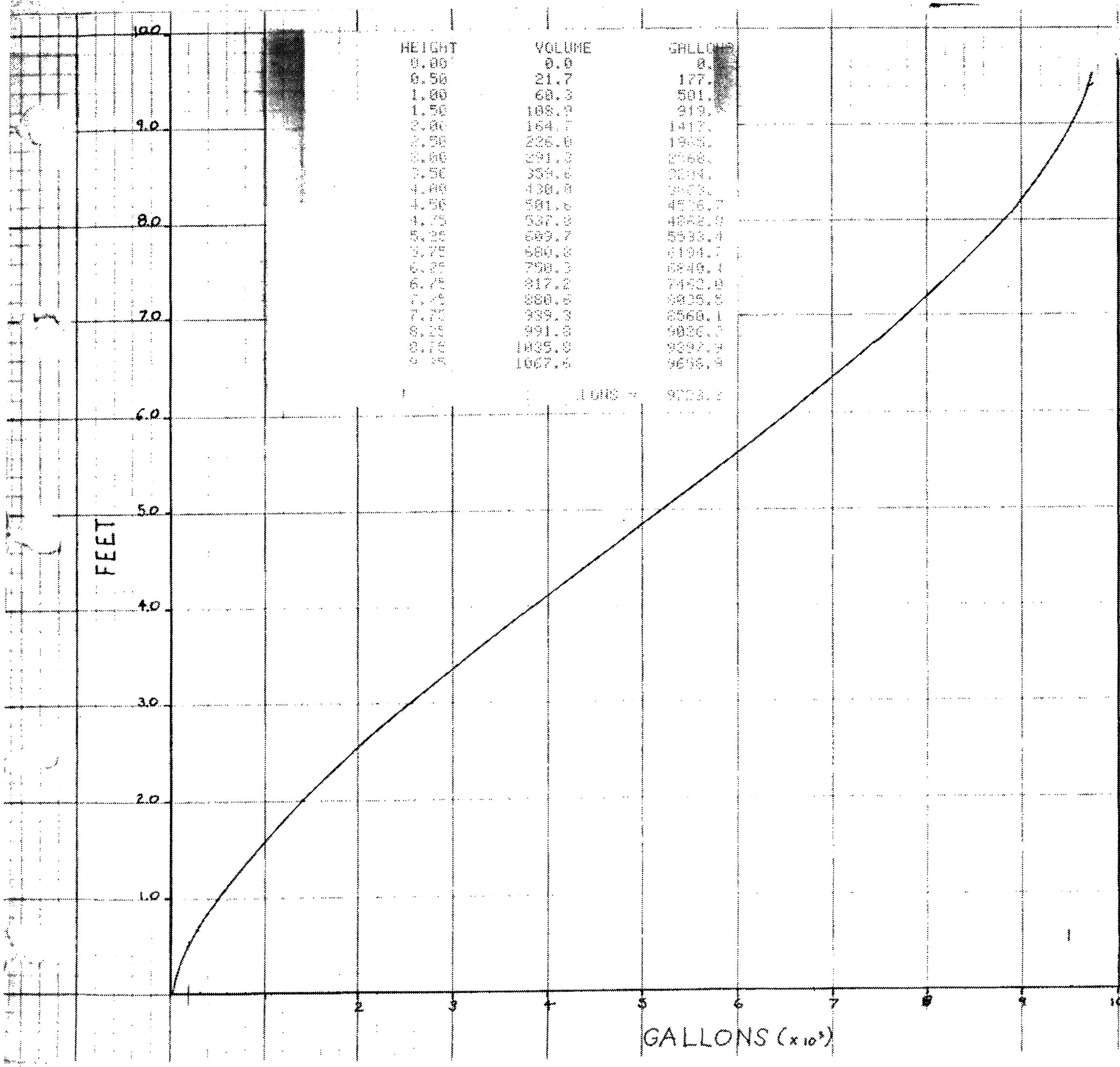
RCS Temp (°F)	Correction Factor (gal/ °F)		RCS Temp (°F)	Correction Factor (gal/ °F)
200	24.3		545	83.5
225	26.6		547	84.5
250	28.9		550	86.1
275	31.2		555	88.8
300	33.5		560	91.7
325	36.6		565	94.8
350	39.8		570	98.2
375	42.9		571	98.9
400	46.0		572	99.7
425	51.4		573	100.5
450	56.7		574	101.2
475	62.1		575	101.9
500	67.4		577.2	103.6
525	76.3			

VOLUME II CURVE 27A
PRESSURIZER RELIEF TANK CAPACITY

CAPACITY (GAL) VS LEVEL (FEET)
REV. 1 March 8,1978 GAF

APPROVED: PCB-1-VOL2 CRV27A

Jackie D Woodard 4-5-78
TECHNICAL SUPERINTENDENT DATE



HEIGHT	VOLUME	GALLONS
0.00	0.0	0.
0.50	21.7	177.
1.00	60.3	501.
1.50	108.9	919.
2.00	164.7	1417.
2.50	226.0	1965.
3.00	291.3	2568.
3.50	359.6	3204.
4.00	430.8	[illegible]
4.50	501.6	4536.7
4.75	537.2	4862.0
5.25	609.7	5533.4
5.75	680.8	6194.7
6.25	750.3	6840.4
6.75	817.2	7452.0
7.25	880.6	8035.5
7.75	939.3	8560.1
8.25	991.8	9026.[illegible]
8.75	1035.9	9397.4
9.25	1067.6	9696.9

[illegible]LONS = 9723.2

PCB1 VOL2 CRV 27A
R. 1

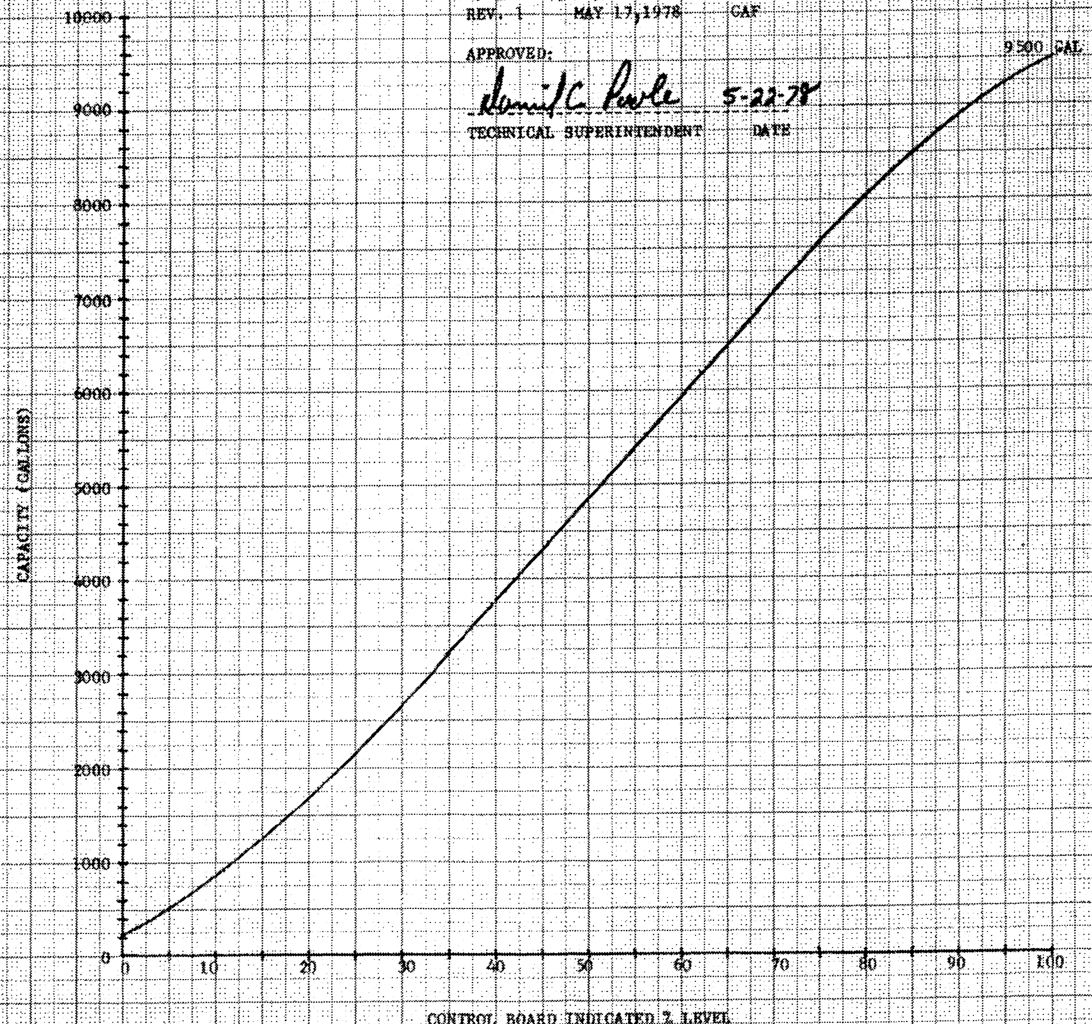
PCBI VOL2 CRV27B
R1

PCB-1-VOL2-CRV27B

VOLUME II CURVE 27B
PRESSURIZER RELIEF TANK CAPACITY
NIB32D001
CAPACITY (GAL) VS % LEVEL
REV. 1 MAY 17,1978 GAF

APPROVED:

5-22-78
TECHNICAL SUPERINTENDENT DATE



VOLUME II CURVE 27C
PRESSURIZER RELIEF TANK CAPACITY TABLE
N1B32T001
CAPACITY (GAL) VS % LEVEL
REV. 0 May 7, 1980 GAF

APPROVED: PCB-1-Vol2-CRV27C

Kenneth W. McCracken 5/15/80
TECHNICAL SUPERINTENDENT DATE

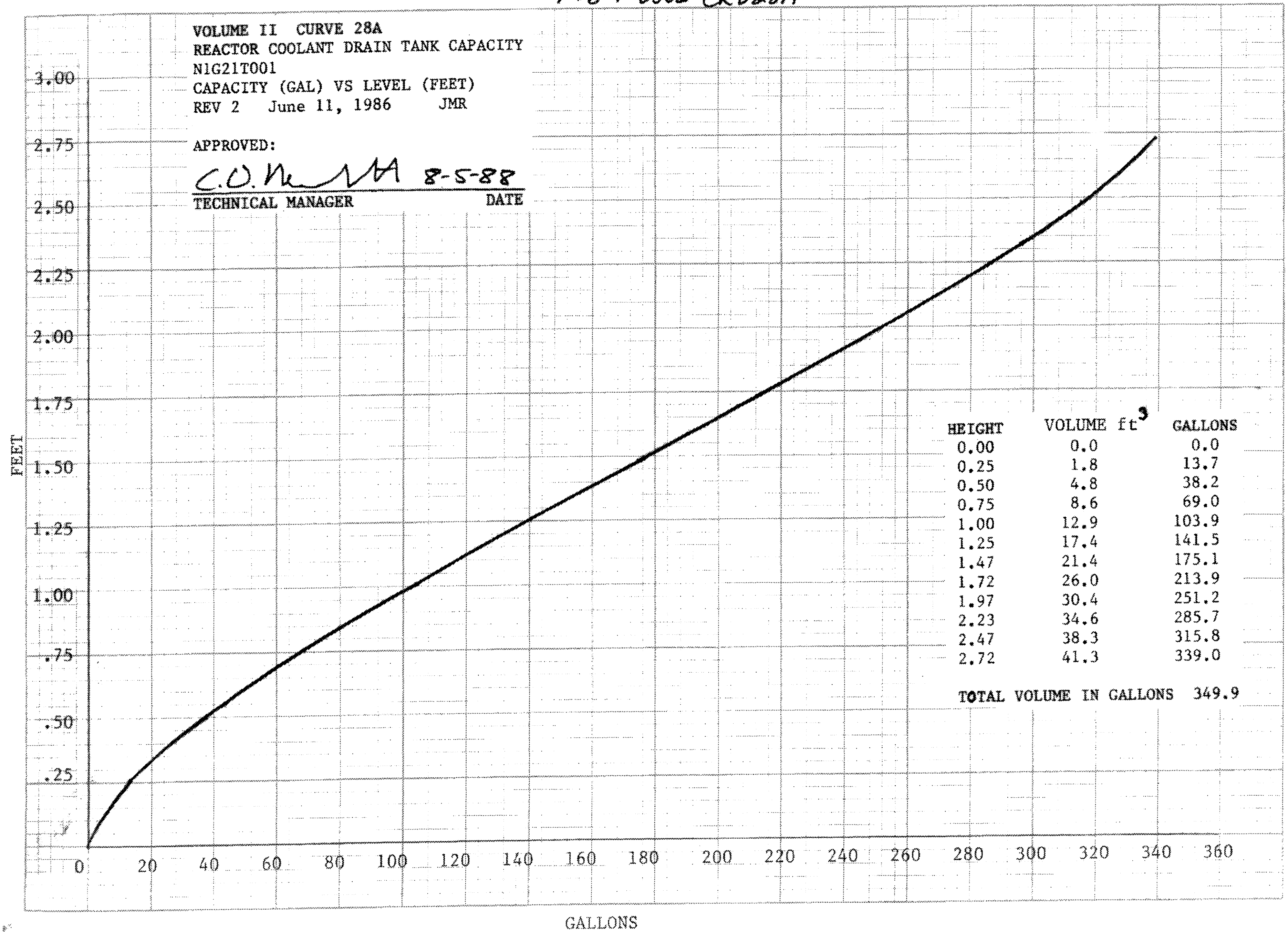
% LEVEL	GALLONS	% LEVEL	GALLONS	% LEVEL	GALLONS	% LEVEL	GALLONS
0.0	222.12	26.0	2272.29	52.0	5086.38	78.0	7842.44
1.0	272.10	27.0	2372.49	53.0	5198.21	79.0	7936.83
2.0	325.39	28.0	2473.73	54.0	5309.92	80.0	8029.90
3.0	381.81	29.0	2575.91	55.0	5421.45	81.0	8121.58
4.0	441.16	30.0	2678.98	56.0	5532.79	82.0	8211.80
5.0	503.28	31.0	2782.92	57.0	5643.89	83.0	8300.53
6.0	568.05	32.0	2887.70	58.0	5754.68	84.0	8387.71
7.0	635.34	33.0	2993.24	59.0	5865.14	85.0	8473.23
8.0	705.02	34.0	3099.49	60.0	5975.22	86.0	8557.06
9.0	776.99	35.0	3206.43	61.0	6084.90	87.0	8639.11
10.0	851.16	36.0	3314.00	62.0	6194.11	88.0	8719.29
11.0	927.43	37.0	3422.18	63.0	6302.82	89.0	8797.57
12.0	1005.71	38.0	3530.89	64.0	6411.00	90.0	8873.84
13.0	1085.89	39.0	3640.10	65.0	6518.57	91.0	8948.01
14.0	1167.94	40.0	3749.78	66.0	6625.51	92.0	9019.98
15.0	1251.77	41.0	3859.86	67.0	6731.76	93.0	9089.66
16.0	1337.29	42.0	3970.32	68.0	6837.30	94.0	9156.95
17.0	1424.47	43.0	4081.11	69.0	6942.08	95.0	9221.72
18.0	1513.20	44.0	4192.21	70.0	7046.02	96.0	9283.84
19.0	1603.42	45.0	4303.55	71.0	7149.09	97.0	9343.19
20.0	1695.10	46.0	4415.08	72.0	7251.27	98.0	9399.61
21.0	1788.17	47.0	4526.79	73.0	7352.51	99.0	9452.90
22.0	1882.56	48.0	4638.62	74.0	7452.71	100.0	9502.88
23.0	1978.22	49.0	4750.54	75.0	7551.86		
24.0	2075.11	50.0	4862.50	76.0	7649.89		
25.0	2173.14	51.0	4974.46	77.0	7746.78		

PCB-1-Vol2-CRV28A

VOLUME II CURVE 28A
REACTOR COOLANT DRAIN TANK CAPACITY
N1G21T001
CAPACITY (GAL) VS LEVEL (FEET)
REV 2 June 11, 1986 JMR

APPROVED:

C.O. [signature] 8-5-88
TECHNICAL MANAGER DATE



HEIGHT	VOLUME ft^3	GALLONS
0.00	0.0	0.0
0.25	1.8	13.7
0.50	4.8	38.2
0.75	8.6	69.0
1.00	12.9	103.9
1.25	17.4	141.5
1.47	21.4	175.1
1.72	26.0	213.9
1.97	30.4	251.2
2.23	34.6	285.7
2.47	38.3	315.8
2.72	41.3	339.0

TOTAL VOLUME IN GALLONS 349.9

Unit 1

Volume II Curve 28B
Reactor Coolant Drain Tank Capacity PCB-1-VOL2-CRV28B
N1G21T001
Capacity (Gallons) vs % Level
Rev. 2, December 14, 1981, C.A.P.

Approved:

C.D. [signature] 1-28-82
Technical Superintendent Date

% LEVEL	GALLONS	% LEVEL	GALLONS
0.0	18.28	51.0	180.09
1.0	20.45	52.0	183.71
2.0	22.69	53.0	187.32
3.0	25.00	54.0	190.94
4.0	27.37	55.0	194.54
5.0	29.81	56.0	198.15
6.0	32.31	57.0	201.74
7.0	34.87	58.0	205.33
8.0	37.49	59.0	208.92
9.0	40.16	60.0	212.49
10.0	42.88	61.0	216.05
11.0	45.65	62.0	219.60
12.0	48.46	63.0	223.14
13.0	51.33	64.0	226.67
14.0	54.23	65.0	230.19
15.0	57.18	66.0	233.68
16.0	60.17	67.0	237.17
17.0	63.20	68.0	240.63
18.0	66.26	69.0	244.08
19.0	69.36	70.0	247.50
20.0	72.50	71.0	250.91
21.0	75.67	72.0	254.30
22.0	78.87	73.0	257.66
23.0	82.10	74.0	261.00
24.0	85.36	75.0	264.31
25.0	88.64	76.0	267.60
26.0	91.96	77.0	270.86
27.0	95.29	78.0	274.09
28.0	98.66	79.0	277.29
29.0	102.04	80.0	280.45
30.0	105.45	81.0	283.59
31.0	108.88	82.0	286.69
32.0	112.32	83.0	289.75
33.0	115.79	84.0	292.78
34.0	119.27	85.0	295.77
35.0	122.77	86.0	298.72
36.0	126.28	87.0	301.63
37.0	129.81	88.0	304.49
38.0	133.35	89.0	307.31
39.0	136.90	90.0	310.08
40.0	140.46	91.0	312.80
41.0	144.04	92.0	315.46
42.0	147.62	93.0	318.08
43.0	151.21	94.0	320.64
44.0	154.81	95.0	323.14
45.0	158.41	96.0	325.58
46.0	162.02	97.0	327.96
47.0	165.63	98.0	330.27
48.0	169.24	99.0	332.50
49.0	172.86	100.0	334.67
50.0	176.48		

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE;

b. 1 gpm unidentified LEAKAGE;

c. 10 gpm identified LEAKAGE; and

d. 150 gallons per day primary to secondary LEAKAGE through any one steam generator (SG).

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	A.1 Reduce LEAKAGE to within limits.	4 hours
B. Required Action and associated Completion Time of Condition A not met. OR Pressure boundary LEAKAGE exists. OR Primary to secondary LEAKAGE not within limit.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.13.1	-----NOTES----- 1. Not required to be performed in MODE 3 or 4 until 12 hours of steady state operation. 2. Not applicable to primary to secondary LEAKAGE. ---------- Verify RCS operational LEAKAGE is within limits by performance of RCS water inventory balance.	-----NOTE----- Only required to be performed during steady state operation ---------- 72 hours
SR 3.4.13.2	-----NOTE----- Not required to be performed until 12 hours after establishment of steady state operation. ---------- Verify primary to secondary LEAKAGE is ≤ 150 gallons per day through any one SG.	72 hours

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.13 RCS Operational LEAKAGE

BASES

BACKGROUND

Components that contain or transport the coolant to or from the reactor core make up the RCS. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

10 CFR 50, Appendix A, GDC 30 (Ref. 1), requires means for detecting and, to the extent practical, identifying the source of reactor coolant LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting leakage detection systems.

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring reactor coolant LEAKAGE into the containment area is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur that is detrimental to the safety of the facility and the public.

A limited amount of leakage inside containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS leakage detection.

This LCO deals with protection of the reactor coolant pressure boundary (RCPB) from degradation and the core from inadequate cooling, in addition to preventing the accident analyses radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident (LOCA).

BASES

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is typically seen as a precursor to a LOCA; the amount of leakage can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes that primary to secondary LEAKAGE from all steam generators (SGs) is 1 gpm as a result of accident induced conditions. The LCO requirement to limit primary to secondary LEAKAGE through any one SG to less than or equal to 150 gpd (i.e. total leakage less than or equal to 450 gpd) is significantly less than the conditions assumed in the safety analysis (with leakage assumed to occur at room temperature in both cases).

Primary to secondary LEAKAGE is a factor in the dose releases outside containment resulting from a steam line break (SLB) accident. To a lesser extent, other accidents or transients involve secondary steam release to the atmosphere, such as a steam generator tube rupture (SGTR). The leakage contaminates the secondary fluid.

The FSAR (Ref. 3) analysis for SGTR assumes the contaminated secondary fluid is released via the main steam safety valves. The majority of the activity released to the atmosphere results from the tube rupture. Therefore, the 1 gpm primary to secondary LEAKAGE safety analysis assumption is relatively inconsequential.

The SLB is more limiting for primary to secondary LEAKAGE. The safety analysis for the SLB assumes 500 gpd and 470 gpd primary to secondary LEAKAGE in the faulted and intact steam generators respectively as an initial condition. The dose consequences resulting from the SLB accident are bounded by a small fraction (i.e., 10%) of the limits defined in 10 CFR 100. The RCS specific activity assumed was 0.5 μCi/gm DOSE EQUIVALENT I-131 at a conservatively high letdown flow of 145 gpm, with either a pre-existing or an accident initiated iodine spike. These values bound the Technical Specifications values.

The RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

No pressure boundary LEAKAGE is allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable as the leak itself could cause further deterioration, resulting in higher LEAKAGE. Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.

b. Unidentified LEAKAGE

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment can detect within a reasonable time period. Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS Makeup System. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include pressure boundary LEAKAGE or controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). Violation of this LCO could result in continued degradation of a component or system.

d. Primary to Secondary LEAKAGE Through Any One SG

The limit of 150 gpd per each SG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 4). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with SG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

BASES

APPLICABILITY

In MODES 1, 2, 3, and 4, the potential for RCPB LEAKAGE is greatest when the RCS is pressurized.

In MODES 5 and 6, LEAKAGE limits are not required because the reactor coolant pressure is far lower, resulting in lower stresses and reduced potentials for LEAKAGE.

LCO 3.4.14, "RCS Pressure Isolation Valve (PIV) Leakage," measures leakage through each individual PIV and can impact this LCO. Of the two PIVs in series in each isolated line, leakage measured through one PIV does not result in RCS LEAKAGE when the other is leak tight. If both valves leak and result in a loss of mass from the RCS, the loss must be included in the allowable identified LEAKAGE.

ACTIONS

A.1

Unidentified LEAKAGE or identified LEAKAGE in excess of the LCO limits must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

B.1 and B.2

If any pressure boundary LEAKAGE exists, or primary to secondary LEAKAGE is not within limit, or if unidentified or identified LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be brought to lower pressure conditions to reduce the severity of the LEAKAGE and its potential consequences. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. The reactor must be brought to MODE 3 within 6 hours and MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the factors that tend to degrade the pressure boundary.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. In MODE 5, the pressure stresses acting on the RCPB are much lower, and further deterioration is much less likely.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.13.1

Verifying RCS LEAKAGE to be within the LCO limits ensures the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance.

The RCS water inventory balance must be met with the reactor at steady state operating conditions and near operating pressure. The Surveillance is modified by two Notes. Note 1 states that this SR is not required to be performed in MODES 3 and 4 until 12 hours of steady state operation near operating pressure have been established.

Steady state operation is required to perform a proper inventory balance; calculations during maneuvering are not useful and a Note requires the Surveillance to be met when steady state is established. For RCS operational LEAKAGE determination by water inventory balance, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

An early warning of pressure boundary LEAKAGE or unidentified LEAKAGE is provided by the automatic systems that monitor the containment atmosphere radioactivity and the containment air cooler condensate flow rate. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. These leakage detection systems are specified in LCO 3.4.15, "RCS Leakage Detection Instrumentation."

Note 2 states that this SR is not applicable to primary to secondary LEAKAGE. This is because LEAKAGE of 150 gpd cannot be measured accurately by an RCS water inventory balance.

The 72 hour Frequency is a reasonable interval to trend LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. A Note under the Frequency column states that this SR is required to be performed during steady state operation.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.13.2

This SR verifies that primary to secondary LEAKAGE is less than or equal to 150 gpd through any one SG. Satisfying the primary to secondary LEAKAGE limit ensures that the operational LEAKAGE performance criterion in the Steam Generator Program is met. If this SR is not met, compliance with LCO 3.4.17, "Steam Generator Tube Integrity," should be evaluated. The 150 gpd limit is measured at room temperature as described in Reference 5. The operational LEAKAGE rate limit applies to LEAKAGE through any one SG. If it is not practical to assign the LEAKAGE to an individual SG, all the primary to secondary LEAKAGE should be conservatively assumed to be from one SG.

The Surveillance is modified by a Note which states that the Surveillance is not required to be performed until 12 hours after establishment of steady state operation. For RCS primary to secondary LEAKAGE determination, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

The Surveillance Frequency of 72 hours is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. During normal operation the primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling in accordance with EPRI guidelines.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 30.
2. Regulatory Guide 1.45, May 1973.
3. FSAR, Section 3.1.2.6, 5.2.7, 10.4, 11.0, 12.0 and 15.0.
4. NEI 97-06, "Steam Generator Program Guidelines."
5. EPRI TR-104788, "Pressurized Water Reactor Primary-to-Secondary Leak Guidelines."

A.3 SRO&RO Radiation Control ADMIN G2.3.4 - SRO and RO

TITLE: Determine If Any Radiation Dose Limits Will Be Exceeded

TASK STANDARD: Calculate Dose expected for two workers, and determine that the job cannot be performed by one worker due to FNP Admin dose limit, and the job cannot be performed by the other worker due to the RWP Digital Alarming Dosimeter (DAD) Alarm limit.

PROGRAM APPLICABLE: SOT ___ SOCT ___ OLT _X_ LOCT _____

ACCEPTABLE EVALUATION METHOD: _X_ PERFORM ___ SIMULATE ___ DISCUSS

EVALUATION LOCATION: ____ SIMULATOR ___ CONTROL ROOM _X_ CLASSROOM

PROJECTED TIME: _30 MIN_ SIMULATOR IC NUMBER: _NA_________

ALTERNATE PATH ___ TIME CRITICAL ___ PRA _____

Examinee:		
Overall JPM Performance:	**Satisfactory** ☐	**Unsatisfactory** ☐
Evaluator Comments (attach additional sheets if necessary)		

EXAMINER: ______________________

CONDITIONS

When I tell you to begin, you are to DETERMINE IF ANY RADIATION DOSE LIMITS WILL BE EXCEEDED during a containment entry to inspect and take pictures at the 1A RCP seal area. The conditions under which this task is to be performed are:

a. A power reduction to 12% has been performed on Unit 1.
b. The ED and the HP Supervisor on-call have approved personnel entry inside the 105' Missile Barrier.
c. The transit route is <2 mr/hr except as noted on the provided survey maps.
d. HP has determined the lowest dose route is down the containment stairwell to the 105' level, outside the bio shield, go inside the bio shield at the south east entrance, proceed past the C loop to the A loop area, and ascend the ladder to the A RCP LOWER platform to access the 1A RCP Seal area (See survey maps).
e. HP estimates that it will take 3 minutes to travel inside the bio shield and ascend the ladder to the 1A RCP.
f. The workers estimate that it will take 36 minutes at the RCP seal area for the inspection.
g. NO contact with any RCP Cubical surfaces will be needed for the inspection.
h. Worker A year to date accumulated dose is 1700 mr.
i. Worker B year to date accumulated dose is 1650 mr.
j. The containment survey maps have been marked during the pre-job brief with the expected transit route in red.
k. A radiological pre-job brief has been performed.
l. Your task is to prepare for the seal inspection on the 2A RCP. You are to determine:
   1.) what predicted dose both workers will receive, and
   2.) if workers A and B will be able to perform the task without exceeding any dose limits.

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)
____ START TIME		
*1. Calculates dose that will be received from entry into the bio shield to the RCP. (500mr/hr)(3min/trip)(2trips)(1hr/60mins) =50mr	Calculates dose that 25mr will be received, inside the bio shield traveling to the RCP for a total of 50mr for the entry and return trips.	S / U
*2. Calculates dose that will be received near the RCP. (450 mr/hr)(36min) (1hr/60mins)=270mr	Calculates dose that 270mr will be received by each worker near the RCP.	S / U

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)
*3. Calculates total dose that will be received by each worker. 270mr+50mr=320mr	Calculates dose that will be received by each worker during the entire entry for a total of 320mr.	S / U
*4. Calculates yearly dose which would be accumulated if the job was performed and dose accumulated as estimated. 320+1700=2020mr>ADMIN limit 320+1650=1970mr< ADMIN limit, but > DAD limit	Calculates the estimated yearly dose after job would be 2020mr for worker A and 1,970mr for worker B.	S / U

NOTE TO EVALUATOR: Examinee may indicate that permission from HP is required for both workers to raise their DAD dose alarm setpoints to greater than 320mr AND/OR an admin dose extension above 1220 mr is required for worker A to perform the job.

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)
*5. Determines that the DAD Alarm limit is exceeded by BOTH workers, and the annual admin dose limit would be exceeded by worker A ONLY.	Determines that the DAD limit (above 300mr for the job) would be exceeded by BOTH workers, and the ADMIN limit would be exceeded by worker A only (above the limit of 2,000 mr).	S / U

____STOP TIME

Terminate when both worker doses have been determined and evaluation of limits is complete.

CRITICAL ELEMENTS: Critical Elements are denoted with an asterisk (*) preceding the element number.

GENERAL REFERENCES:

1. FNP-0-M-001, Version 18.0
2. KA: G2.3.4 RO-3.2 SRO-3.7

GENERAL TOOLS AND EQUIPMENT

Provide:

1. FNP-0-M-001, HP Manual, Version 18.0
2. Containment Survey Maps
3. RWP
4. Calculator (or the Applicant may supply a calculator)

COMMENTS:

KEY:

	Worker A	Worker B
Initial Dose	**1700mr**	**1650mr**
Trip to pump	3minx500mr/hr = 25mr	3minx500mr/hr = 25mr
At pump	36minx450mr/hr = 270mr	36minx450mr/hr = 270mr
Trip from pump	3minx500mr/hr = 25mr	3minx500mr/hr = 25mr
Total dose for job	**320mr**	**320mr**
Margin left to 2000mr/qtr admin limit	300mr	350mr
Margin left to 300mr DAD limit	300mr	300mr
Total IF Job was performed	1700+320=2020mr	1650+320=1970mr
Limiting dose which could be received	**300mr due to the ADMIN AND the DAD limits**	**300mr due to the DAD limit ONLY**

Worker A cannot perform the task due to exceeding the FNP ADMIN 2000mr/qtr limit, AND the DAD alarm dose limit of 300mr.

Worker B cannot perform the task due to exceeding the DAD dose limit of 300mr, but does NOT exceed the FNP ADMIN dose limit of 2000mr/qtr.

ONLY with an increased DAD dose limit approval by Health Physics (HP) AND an FNP admin dose limit extension could Worker A perform the job.
(must take into account the 25mr on the return trip or it will appear that Worker A can perform the task without exceeding his ADMIN Yearly margin or DAD limit)

ONLY with an increased DAD dose limit approval by Health Physics (HP) could Worker B perform the job.
(must take into account the 25mr on the return trip or it will appear that Worker B can perform the task without exceeding his DAD dose margin)

Limiting dose which could be received	**300mr due to the ADMIN or DAD limit**	**300mr due to the DAD limit**

CONDITIONS

When I tell you to begin, you are to DETERMINE IF ANY RADIATION DOSE LIMITS WILL BE EXCEEDED during a containment entry to inspect and take pictures at the 1A RCP seal area. The conditions under which this task is to be performed are:

a. A power reduction to 12% has been performed on Unit 1.
b. The ED and the HP Supervisor on-call have approved personnel entry inside the 105' Missile Barrier.
c. The transit route is <2 mr/hr except as noted on the provided survey maps.
d. HP has determined the lowest dose route is down the containment stairwell to the 105' level, outside the bio shield, go inside the bio shield at the south east entrance, proceed past the C loop to the A loop area, and ascend the ladder to the A RCP LOWER platform to access the 1A RCP Seal area (See survey maps).
e. HP estimates that it will take 3 minutes to travel inside the bio shield and ascend the ladder to the 1A RCP.
f. The workers estimate that it will take 36 minutes at the RCP seal area for the inspection.
g. NO contact with any RCP Cubical surfaces will be needed for the inspection.
h. Worker A year to date accumulated dose is 1700 mr.
i. Worker B year to date accumulated dose is 1650 mr.
j. The containment survey maps have been marked during the pre-job brief with the expected transit route in red.
k. A radiological pre-job brief has been performed.
l. Your task is to prepare for the seal inspection on the 2A RCP. You are to determine:
   1.) what predicted dose both workers will receive, and
   2.) if workers A and B will be able to perform the task without exceeding any dose limits.

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SOUTHERN NUCLEAR COMPANY
JOSEPH M. FARLEY NUCLEAR PLANT
HEALTH PHYSICS MANUAL

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PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	
Reference Use	
Information Use	**ALL**

D. E. GRISSETTE
Nuclear Plant General Manager

Date Issued 2-12-04

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6		X	X	X	X	X					
7		X	X	X	X	X					
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HEALTH PHYSICS MANUAL

1.0 Purpose

The purpose of the Health Physics Manual is to establish the Administrative controls necessary to ensure Farley Nuclear Plant's (FNP) compliance with applicable regulations, licenses, industry standards and company policy for radiation protection. The Health Physics Group is responsible for the development and administration of a health physics program to provide effective radiation protection for plant employees, contractors and visitors during operations, maintenance, refueling, and during emergencies.

This manual is supplemented by radiation protection procedures and radiation protection training programs. Activities for the administration and conduct of the health physics program are included in Administrative Procedure (FNP-0-AP-17), Radiation Control and Protection Procedures (RCPs) and Dosimetry Procedures (DOSs). Terms are defined in Appendix A.

2.0 References

2.1 10CFR20, Standards for Protection Against Radiation.

2.2 10CFR19, Notices, Instructions, and Reports to Workers; Inspections.

2.3 Regulatory Guide 8.7, Instructions for Recording and Reporting Occupational Radiation Exposure Data.

2.4 Regulatory Guide 8.27, Radiation Protection Training for Personnel at Light-Water-Cooled Nuclear Power Plants.

2.5 Regulatory Guide 8.8, Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear Power Stations will be As Low As Is Reasonably Achievable.

2.6 Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Practicable.

2.7 NUREG-0041, Manual of Respiratory Protection Against Airborne Radioactive Materials.

2.8 INPO 91-014 Guidelines For Radiological Protection At Nuclear Power Stations.

2.9 FNP-0-AP-90, Alara Policy and Implementation.

2.10 NCRP-91, Recommendations On Limits For Exposure To Ionizing Radiation.

2.11 Southern Nuclear Company, Radiation Protection Policies and Interpretations.

2.12 FNP-0-TCP-15.0, Training Material Development, Revisions and Approvals.

2.13 FNP-0-RCP-0, General Guidance and Special Instructions to Health Physics Personnel.

2.14 FNP-0-DOS-1, Personnel Monitoring.

3.0 Responsibilities

The success of the FNP Health Physics Program depends largely on the training, self-discipline and cooperation of each individual. The following list some specific responsibilities of individuals, supervisory personnel, the Health Physics Group, and the Dosimetry section.

3.1 Individuals

3.1.1 Take reasonable precautions to avoid unnecessary exposure and minimize those exposures that are considered necessary. That is, maintain radiation exposure As Low As Reasonably Achievable (ALARA).

3.1.2 Report promptly to Shift Supervisor and HP Supervision all injuries that involve radioactive contamination, sickness or any physical condition which might alter their capability for radiation work.

3.1.3 Report to HP personnel any new or unusual situations which could lead to unnecessary exposure.

3.1.4 Report to HP personnel any unanticipated change in contamination, real or suspected.

3.1.5 Understand their "rights" as defined in 10CFR19, "Notices, Instructions, and Reports to Workers; Inspections."

3.1.6 Review and follow the requirements of the Radiation Work Permit under which work is being performed.

3.1.7 Report to HP Supervision or Dosimetry Section any known or anticipated non FNP related radiation exposure such as medical exposure or exposure at off-site locations, as described in section 4.1.4.

3.1.8 Leave the area and then notify the Control Room if you find any permanently installed plant fixed area radiation monitor or any permanently installed plant fixed air monitor alarming. If it can be determined that the alarm is not due to a radiological hazard (e.g. Maintenance, Calibration Repair, Outstanding Deficiency Report, etc.), then exiting area and notification is not required.

3.1.9 Leave the area and notify HP personnel if you find any HP portable area radiation monitor or any HP portable air monitor alarming. If it can be determined that the alarm is not due to a radiological hazard (e.g. Maintenance, Calibration Repair, Outstanding Deficiency Report, etc.), then exiting area and notification is not required.

3.1.10 Comments for improving the manual or any part of the Health Physics Program may be submitted at any time to Health Physics Supervision.

3.2 Supervisory Personnel

3.2.1 Ensure that employees under their supervision review radiation hazards in their work area and periodically check employees in the field to ensure that radiation protection measures are being utilized.

3.2.2 Take reasonable steps to ensure jobs are planned to avoid unnecessary exposure of employees.

3.2.3 Personnel will be rotated in so far as practical for uniformity of occupational radiation exposure within each group.

3.2.4 Utilize any available method (e.g. ALARA suggestions, Lesson learn, etc.) to provide input to the ALARA Staff or an ALARA Committee Member concerning suggestions for further reducing personnel dose.

3.2.5 Be alert for new or unusual situations which might lead to unnecessary exposure.

3.3 Health Physics Group

3.3.1 Establish and apply radiation protection standards and practices for maintaining occupational radiation exposures ALARA.

3.3.2 Inform management of the current radiation exposure via periodic reports.

3.3.3 Collect data and prepare reports on Health Physics related occurrences as described in FNP-0-RCP-10. *HP will periodically trend data associated with radiological practices to determine if adverse trends are developing.

3.3.4 Report to Shift Supervisor and HP Supervision as soon as possible, known or suspected overexposures due to external radiation or from internal or external contamination.

*NRC Commitment

3.4 Dosimetry Section

3.4.1 Coordinate the issuing and reading of thermoluminescence dosimeters (TLDs).

3.4.2 Provide exposure reports to supervisors upon their request.

4.0 Radiation Protection Standards

This section outlines the maximum permissible exposure to external and internal radiation as set forth in 10CFR20; and Southern Nuclear Company (SNC) administrative limits. The exposure limits and regulations prescribed in this manual shall be applicable to all persons on the Farley Nuclear Plant site.

4.1 Exposure Limits For Personnel

4.1.1 Occupational Exposure - Summation of Internal and External

The provisions of 10CFR20 require the calculation of a "combined" exposure for personnel who receive occupational exposure to internally deposited radionuclides as well as external radiation. Internal dose is only required to be summed with external exposure when the committed effective dose equivalent for an individual has reached 200 DAC-hrs (Derived Air Concentration - hours) within a working year, this number is equal to 10% of one ALI (Annual Limit on Intake). However, SNC Policy is that Internal Dose (CEDE), whether determined by WBC (Whole Body Count), DAC-hours, or bioassay will be recorded and reported at a per intake event threshold of 10 mrem (This level is consistent with the sensitivity of the Panasonic TLD systems used at Southern Company nuclear plants). In all cases, the limits specified in 10CFR20 for internal and external exposure serve to keep the total effective dose equivalent to any individual within acceptable limits.

4.1.2 Internal Exposure

The plant staff will, as a general practice, use process or other engineering controls, to limit concentrations of radioactive materials in air below the limits defined in 10CFR20.1204. When it is impracticable to apply process or other engineering controls to limit concentrations of radioactive material in air to less than 30% (for other than noble gases) of the specified regulatory limits, other precautionary measures, such as increased surveillance, reduction in working times, or use of respiratory protective equipment, shall be considered to minimize the intake of radioactive material by personnel entering the area.

For purposes of evaluating internal exposures which do occur, the following options should be considered.

- Continued tracking of an individuals internal exposure until it is verified the internal exposure is below 10% of the ALI.
- If feasible based on the isotopes involved, a bioassay may be performed. The results of the bioassay can then be used to determine any applicable dose.
- Appropriate calculations may be performed to determine the applicable dose. This approach is particularly useful when alpha emitting isotopes are involved which may not be detected by Whole Body Count bioassays.

4.1.3 Radiation Exposure Limits

The following exposure limits are based upon federal regulations, industry standards, and Company Policy. The maximum permissible radiation dose an occupational worker may receive in the course of their duties shall be limited to the following (this applies to ionizing radiation).

Annual Dose Limits (Whichever is More Limiting)		Maximum Dose in Rem Per Calendar Year
1)	Total Effective Dose Equivalent (TEDE)	5
2)	Total Organ Dose Equivalent (TODE) Sum of Deep Dose Equivalent and Committed Dose Equivalent to an individual organ or tissue other than lens of eye.	50
3)	Lens dose equivalent (LDE)	15
4)	Shallow dose equivalent to skin of the whole body (SDE-WB) or the skin of any extremity (SDE-EX).	50

4.1.3.1 During any calendar year the dose to the whole body of any individual shall not exceed 5 rem TEDE or 50 rem TODE and the lifetime exposure limits of 4.1.3.7 must be complied with.

4.1.3.2 Individuals under 18 years of age shall not be badged as radiation workers at Farley Nuclear Plant.

4.1.3.3 Any employee who discloses that she is or may be pregnant will complete the election form (DOS Form 931 in FNP-0-DOS-2) to accept or decline a prenatal radiation exposure limit of 500 mrem (0.5 rem) for the embryo or fetus for the term of the pregnancy as recommended in 10CFR20.1208.

4.1.3.4 Members of the general public, including Escorted Visitors that are not considered radiation workers, shall not be allowed to receive more than 100 mrem of exposure from reactor produced sources for the calendar year.

4.1.3.5 A worker must be appropriately respirator qualified, and medically tested if the use of a respiratory protection device is to be utilized. Appropriate measures shall be taken (e.g. trending of DAC-hours, bioassay analysis) to ensure personnel do not exceed the limits set forth in 10CFR20, Appendix B, Table I for intake of radionuclides.

4.1.3.6 Annual Administrative Exposure Guidelines

In order to maintain the occupational exposure of personnel ALARA, the following administrative exposure guidelines shall apply. To exceed these guidelines, a dose extension request form must be obtained, completed and signed by the worker and a member of their supervision and authorized by <u>the appropriate personnel</u> as listed in the following table.

Category	Annual Dose Guidelines (mrem)[1]				Approvals Required for Dose Extension
	TEDE	TODE	LDE	SDE-SK, & SDE-EXT	
Escorted Visitor (Non- Radworker)[2]	100	1,000	300	1,000	None Allowed
Concurrently Badged[8,10]	450	4,500	1,350	4,500	HP Superintendent
Declared Pregnant Woman[6,7,8]	450/term	—	—	—	None Allowed
Escorted Radiation Worker (ERW)[3,4,8,9]	500	5,000	1,500	5,000	None Allowed
Radiation Workers Less Than Fully Documented[4,8,9]	2,000	20,000	6,000	20,000	As Noted Below
Radiation Workers Fully Documented[5,8,9]					
	>2,000	>20,000	>6,000	>20,000	HP Manager or Health Physics and Chemistry Manager (or designee)
	>4,000	>40,000	>12,000	>40,000	Assistant General Manager (Ops.) or the Nuclear Plant General Manager (or designee)
	>4,500	>45,000	>13,500	>45,000	Project Vice President

FOOTNOTES:

1. The annual dose for an individual shall include any dose that was occupationally received while being employed by any other facility during that year unless the individual is considered an Escorted Visitor at Farley Nuclear Plant.
2. Escorted Visitor (Non-Radiation Worker) includes Visitors, Guests who have not been Radiation Worker trained and whose access to Radiation Control Areas and exposure margins will be limited.
3. Escorted Radiation Workers (ERW) will have been briefed as a radiation worker but have not received Radiation Worker Training.
4. "Less Than Fully Documented" means the individual has disclosed their current year and lifetime cumulative dose on a written, signed statement from the individual or the individual's most recent employer or on an up-to-date NRC Form-4. This individual is not eligible for Planned Special Exposure (PSE) jobs.

5. "Fully Documented" means that all documentation records have been obtained for the individual and an up-to-date NRC Form 4 has been signed.
6. The dose to the embryo/fetus shall be limited to 50 mrem during the remainder of the pregnancy if the dose to the embryo/fetus is found to exceed 500 mrem, or is within 50 mrem of this dose by the time the woman declares pregnancy.
7. Efforts shall be made to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman in order to satisfy the NRC limit of 500 mrem during the entire pregnancy.
8. Radiation Worker as defined in Appendix A.
9. Radiation Workers may have their annual or lifetime dose limits extended up to the 10CFR20 limits, using appropriate DOS Forms.
10. Concurrently badged personnel are expected to have their dosimetry service terminated at the other Southern Nuclear sites (Hatch, Vogtle) prior to exceeding this limit.

4.1.3.7 Lifetime Exposure Limits

Lifetime Occupational Exposure Guidelines

Lifetime Exposure	Action to Permit Additional Exposure
TEDE Exposure in Rem < Age in Years and < 50 Rem	1) Follow FNP Administrative Guidelines
TEDE Exposure in Rem > Age in Years	1) Health Physics and Chemistry Manager (or designee) approval (complete DOS Form 944) Concurrence is to be based on the need for additional exposure. 2) Perform a formal ALARA review of the worker's exposure history annually, while they are badged at your site and their exposure remains greater than their age. 3) Implement ALARA actions deemed necessary to assure lifetime dose will not exceed 75 Rem during worker's employment career. 4) Set individual's TEDE dose limit to <u>1000 mrem/yr</u>. 5) Plant Operations Assistant General Manager approval required to exceed 1000 mrem/yr TEDE (DOS Form 943)
TEDE Exposure > 50 Rem	1) Nuclear Plant General Manager (or designee) approval required(complete DOS Form 944) 2) All the actions required to exceed age in years (above). 3) NPGM approval required to exceed 1000 mrem/yr TEDE (DOS Form 943).
TEDE Exposure > 75 Rem	1) Vice President approval required (complete DOS Form 944). 2) All actions required to exceed 50 Rem lifetime. 3) Vice President approval required to exceed 1000 mrem/yr TEDE (DOS Form 943).
TEDE Exposure > 100 Rem	It is intended that no worker should receive exposure that will take his lifetime exposure above 100 Rem. Should a situation arise where exposure beyond 100 Rem needs to be considered, Executive Vice President approval in writing is required (complete DOS Form 944).

4.1.3.8 Planned Special Exposure

A planned special exposure must meet all the criteria stated in 10CFR20.1206, and comply with FNP-0-AP-93.

Planned special exposures are limited to 5 Rem TEDE in any one calendar year. No one individual can receive an accumulated TEDE exposure due to PSEs in excess of 25 Rem during the worker's lifetime.

4.1.4 Accumulation of Radiation Exposure

4.1.4.1 Medical Exposure

Each employee is required to notify HP Supervision of therapeutic radiation treatment or diagnostic radiation (excluding annual chest X-rays, X-rays for broken bones, and routine dental X-rays). HP Supervision will determine if the medical exposure will affect the occupational exposure status of any individual.

4.1.4.2 Radiation Exposure at Off-site Locations

An individual assigned to Farley Nuclear Plant who plans to visit other facilities where they may be exposed to radiation is expected to notify the Dosimetry Section prior to departure and as soon as possible upon return. This individual normally obtains a termination whole body count and normally has their dosimetry terminated prior to departure. Upon return to site, the individual will normally initiate paperwork, as necessary, to restart their dosimetry and get a startup whole body count. Note that exit whole body counts (WBC) performed at plants Hatch and/or Vogtle can serve as an incoming WBC when transfer is directly between these facilities.

Concurrently badged individuals (limited to Southern Nuclear and Southern Company Services employees) are exempt from this requirement for SNC sites.

4.1.4.3 Other Non-Employment Related Exposure

An individual shall not cause themselves to be exposed to ionizing radiation for other than medical reasons, when not on the job for SNC, without prior authorization of the General Manager. All exposure (excluding permitted medical exposure as indicated above), including accidental exposure received off the job shall be reported to HP Supervision upon return to work.

4.1.5 Dosimetry Records

Personnel who are to be monitored at FNP as a Radiation Worker shall provide the Dosimetry Section with an up-to-date NRC Form 4 or equivalent signed by the individual or a written statement that includes the names of all facilities that have provided monitoring of occupational exposure for the current year and an estimate of dose received signed by the individual.

5.0 Personnel Monitoring

This section describes the types of dosimetry devices which can be worn, and bioassay sampling that may be performed.

5.1 Responsibilities

5.1.1 It is the responsibility of each radiation worker to wear personnel monitoring devices in the prescribed manner and to assure their safekeeping. The loss, damage or contamination of any dosimetry requires notification of Health Physics or Dosimetry personnel.

5.1.2 The Health Physics Group will administer the personnel monitoring program consistent with the requirements of 10CFR20.

5.2 Issue Of Dosimetry Devices

5.2.1 Individuals reporting as a radiation worker at FNP must meet the requirements of FNP-0-AP-42. A startup whole body count (if necessary) will be scheduled by the individual's supervision with the dosimetry section, at which time the individual will sign for receipt of their TLD. Personnel are required to undergo a whole body count upon initiation and termination of permanent TLDs unless otherwise authorized by an HP Manager. Note that exit whole body counts at plants Hatch or Vogtle can serve as an incoming whole body count at Farley Nuclear Plant when transfer is directly between facilities (i.e. no other employment involving radioactive material between employments at Southern Company Nuclear plants).

5.2.2 TLDs will be issued on an individual basis by a Dosimetry representative.

5.2.3 Digital alarming dosimeters (DAD) will normally be self-issued from the racks at the RCA entrance and returned to the racks at the RCA entrance. When necessary, HP may implement an alternate method of Access Control.

5.2.4 Special purpose TLDs will be issued as necessary by a Dosimetry representative (e.g. extremity TLDs, multibadge pack, etc.).

5.3 Processing TLDs

TLDs will normally be processed on a tri-annual basis or as needed.

5.4 Wearing Dosimetry Devices

NOTE:	**Escorted visitors will have only a DAD; they will not have a TLD.**

5.4.1 The following requirements are established with regard to wearing dosimetry devices. Dosimetry devices, except extremity dosimeters (finger rings, etc.) are to be worn on the whole body. The whole body is defined for purposes of external exposure as the head, trunk, (including male gonads), arms above the elbow, or legs above the knee.

There will be occasions when HP directs personnel to reposition their whole body dosimetry devices to a portion of the whole body that is expected to receive the highest dose.

Even though it is acceptable to wear dosimetry on the whole body as indicated above, the administrative configuration listed below is more restrictive and represents a good practice as opposed to a minimum requirement.

NOTE:	The front side of the human body is defined to be the half of the human body that is forward of an imaginary plane projected through the middle of the body and parallel to the shoulders.

The following applies to the administrative dosimetry placement area. Dosimetry is normally worn on the front side of the body at or above the thighs and at or below the shoulders. The dosimetry is normally worn in plain view. Except for specialized activities which represent a significant Beta hazard dosimetry may be placed under clothing or in the pocket of protective clothing for contamination control or foreign material exclusion control purposes. For activities involving a Beta hazard the TLD needs to be worn with the Beta window oriented so as to measure the associated Beta dose. The TLD and the electronic dosimeter will normally be placed in proximity of each other (within approximately 6 inches).

5.4.2 Extremity TLDs are specifically labeled as to a particular extremity (e.g. left hand, right foot, etc.) and must be worn on that extremity, whenever required. Finger rings may be worn on any finger of the appropriate hand. Feet TLDs will normally be placed on the inside of the appropriate shoe on the bottom. Exceptions to the placement of extremity TLDs must be specified by HP Supervision.

5.4.3 HP will perform periodic observations of compliance with these administrative guidelines. Failure to meet the administrative guidelines does not represent a violation of requirements, but will be used to determine the need for corrective actions to assure adherence to desired dosimetry configuration standards.

5.5 Multibadging

5.5.1 It is required that a worker's normal whole body TLD be removed before the multibadge pack can be issued to a worker.

5.5.2 Removal of an individual from multibadge status will be performed by Dosimetry upon notification multibadging is no longer required.

5.6 Bioassay

5.6.1 Whole Body Counting

5.6.1.1 Whole body counting will be used as the primary method for establishing concentrations of internally deposited radionuclides.

5.6.1.2 Whole body counting of radiation workers will be performed prior to issuing dosimetry and upon termination of dosimetry unless otherwise authorized by HP Supervision. Special occasion counts may be required by HP when deemed necessary.

5.6.1.3 Exit whole body counts at plants Hatch or Vogtle can serve as an incoming whole body count provided the individual has had no employments or visits to other nuclear facilities between the work assignments at Southern Nuclear fleet facilities.

5.6.2 Urinalysis

Urinalysis may be employed to determine tritium uptakes and to supplement whole body counting when other soluble radionuclides are suspected.

5.6.3 Other Analysis

Other analyses of body excreta (i.e. fecal analysis) or tissue (biops) may be performed as deemed necessary by HP Supervision or SNC medical consultants.

5.7 Medical Examinations

The following medical examinations may be required by HP Supervision or FNP medical consultants.

5.7.1 Complete or partial physical for persons involved in incidents where regulatory limits may have been exceeded.

5.7.2 Special testing such as blood count may be required for individuals whose exposure exceeds regulatory limits.

6.0 Radiation Exposure Control

This section covers the administrative procedures and radiation protection measures which apply to a Radiation Controlled Area (RCA).

6.1 Responsibilities

6.1.1 It is each individual radiation worker's responsibility to obey applicable Radiation Work Permits and to report to their respective work supervisor and HP personnel any circumstances where there is doubt as to the radiological safety of an operation.

6.1.2 Unexpected radiological deterioration of the work area involving a radiological contamination or radiation dose rate problem etc. must be reported to HP personnel as soon as possible.

6.1.3 It is each workers responsibility to perform their work in such a manner that their exposure is kept ALARA.

6.1.4 It is the Health Physics Group's responsibility to designate areas according to radiological hazards present (e.g. establish Radiological Posting) and prescribe precautionary measures to be taken when working in these areas.

6.1.5 For tasks performed under the Advance Radiation Worker (ARW) program, ARW's are authorized to determine precautionary methods for their own work and perform self monitoring without additional HP assistance as long as they do so in accordance with FNP-0-ACP-10, Radworker Self Monitoring Guidelines.

6.2 Special instructions

NOTE:	Plant Management in special cases where the inability to take frequent breaks imposes physical hardships on personnel have allowed fluids to be provided to radworkers due to heat stress (e.g. Containment Cool Room during outage).

6.2.1 Eating, drinking, smoking, or chewing in an RCA is not considered a good practice, and will be administratively monitored.

6.2.2 Unprotected open wounds present on the body will normally be evaluated prior to entry into the RCA such that appropriate actions to prevent internal contamination may be taken. Upon notification, the HP Staff will inspect any questionable wound. There may be cases where certain wounds shall cause Health Physics personnel to restrict a person to less contaminated areas and in some cases wounds may be serious enough to cause an individual to be denied access to the RCA.

6.3 Classification Of Areas Within An RCA

NOTE:	It may be necessary to temporarily secure access to an area or areas which have developed a radiological hazard by staging an HP representative instead of posting of the area. In this case, the HP representative will maintain positive control of the area to prevent unauthorized entry until it can be posted or the hazard can be secured/removed. Posting and securing of the area will be done in a timely manner.

Each area within the RCA shall be evaluated and conspicuously posted with the appropriate caution signs. The following list the primary radiological postings that a radworker may see while within the RCA.

a. Radiation Area

b. High Radiation Area

c Radiological Exclusion Area (Locked High Radiation Area)

d. Very High Radiation Area

e. Airborne Radioactivity Area

f. Radioactive Materials Storage Area

g. Contaminated Area

h. Radiological Restricted Areas

6.4 Radiation Work Permit

The Radiation Work Permit (RWP) including Special Radiation Work Permit (SRWP) is the fundamental administrative document for providing precautions and other radiological information for use in performing activities within an RCA.

All personnel working under the authority of an RWP shall not deviate from the requirements of the RWP unless authorized by HP. In special cases the presence of HP personnel may be substituted for an RWP with the approval of HP Supervision (e.g. HP Foreman, etc.)

6.5 Use Of Tools Inside The RCA

6.5.1 Workers may obtain tools from those assigned to the RCA (e.g. Hot Tool Room, group's tool/equipment storage location inside the RCA, etc). This helps to reduce the amount of tools/equipment within the RCA and helps to provide a more efficient work environment.

6.5.2 Workers are expected to work carefully using tools so as to control the spread of contamination. Actions such as wiping tools periodically and at completion of work or bagging tools when not in use may be used to assist in contamination control.

6.5.3 Any tool or material brought into the RCA will be considered potentially contaminated and will not be removed from the RCA until it has been surveyed by a HP Technician or monitored by an automated equipment monitor as allowed by Health Physics.

6.5.4 HP Supervision may authorize a conditional release of tools and items which have fixed contamination. Such tools must be controlled as directed by HP.

6.5.5 Tools designated for permanent use in the RCA may be identified as for RCA Use Only (e.g. orange paint, stenciled "for RCA use only", etc.), and stored in appropriate storage locations within the RCA. FNP will be transitioning from orange paint to fluorescent pink for consistence with Southern Nuclear Fleet facilities.

6.5.6 Tool(s) that have known contamination levels in excess of HP procedural guidance need to have HP's concurrence for the tool(s) to be used in clean areas so that proper radiological controls can be implemented.

6.5.7 The worker is responsible for making sure tools used in contaminated areas are handled in such a manner that minimizes the potential of spreading contamination above procedural limits in clean areas of the RCA (e.g. surveyed and/or bagged prior to removal from the area, etc.).

6.5.8 Tools requiring decontamination will normally be sent to the decontamination room for cleaning or other arrangements can be made with the HP Group to decontaminate the tools (e.g. send to decon area in NFA, immediately wipe down tools, etc.).

6.6 Radioactive Component Control

This section applies to radioactive components, valves, fittings, parts, special tools etc, that are contaminated. It normally does not apply to waste, mops and other miscellaneous contaminated items.

6.6.1 When it is necessary to store a valve or equipment parts removed from a contaminated system, the responsible group must get HP personnel to check the part for radiation and contamination levels and label the item as required by 10CFR20 and plant procedures. The component may then be placed in an appropriate radioactive materials storage area.

6.6.2 Items covered under this section which need to be released from an RCA to a clean area shall be conditionally released per HP procedures.

6.7 Radioactive Waste Control

This section applies to radioactive waste including: compressible and non-compressible trash, liquid waste from various plant sources and spent resins.

6.7.1 It is considered a good practice to avoid introducing cardboard and wooden boxes into the RCA. If it is necessary to introduce cardboard boxes or wooden boxes for the purpose of safe handling or storage, then the responsible party needs to take the appropriate actions to minimize the potential of cross contamination of the boxes and to have them removed when their need is no longer valid.

6.7.2 Glassware and light bulbs normally need to be placed in specially marked containers or otherwise identified to minimize the potential for injury when sorting activities are performed.

6.7.3 It is a good practice to segregate waste materials for disposal. This separation of waste materials aides in reducing: the volume of radioactive waste, the manpower required for handling of radioactive waste, and the radiation exposure of personnel involved in radioactive waste reduction.

Color of Container (e.g. nylon bags, drum)	Material to be Deposited
Green	Potentially clean waste
Purple	Protective clothing
Yellow	Contaminated trash

6.8 Radiological Protective Clothing

6.8.1 For work inside the RCA, radiological protective clothing will normally be stated on the appropriate RWP. Radiological Protective clothing may be cloth, paper, plastic or a combination of these materials. It needs to be worn in the manner that normally precludes inadvertent personnel contamination.

6.8.2 Radiological protective clothing will not be worn outside an RCA except as permitted in HP procedures.

6.9 Partial Entry into a Contaminated Area

A partial entry into a contaminated area is sometimes necessary to perform maintenance or operations activities. The following guidelines must be met when a partial entry is necessary:

6.9.1 Ensure those portions of the body which will be in contact with potentially contaminated components are protected to minimize the potential of becoming contaminated.

6.9.2 After working across a contaminated area boundary, use caution when removing protective material which came in contact with contaminated components/material, and place in the nearest appropriate container.

6.10 Step Off Pads (SOPs)

SOPs are normally provided at points where protective clothing is normally expected to be removed. In some cases, contaminated areas do not lend themselves to the convenient use of a SOP. When this is the case prior to entering the contaminated area, individuals should consider actions and materials (such as clothing bags) needed when exiting the area. HP will provide temporary arrangements for this type activity upon request. Each person exiting the Contaminated Area needs to use additional caution so that potential of spreading contamination is minimized. For example use undress procedures as if there was a SOP present.

6.11 Securing Materials/Equipment That Cross Contamination Boundaries

It is considered a good expectation to secure items which must cross contamination boundaries (tape or ty-wrap lines, cables, hoses inside and outside the contaminated area to the floor or other structures) so that the lines do not slide back-and-forth between the contaminated and clean areas. This will reduce the potential for accidentally spreading contamination, generating tripping hazards, damaging equipment, etc.

6.12 Respiratory Protection

6.12.1 The primary objective of the FNP respiratory protection program is to minimize the unnecessary intake of radioisotopes, while taking into consideration all aspects of radiological jobs being performed that might normally require the use of respiratory protection. The use of respirators should be considered ONLY after it has been documented that the use of engineering controls is not possible as a means for reducing the concentration of radioactive materials in air below the limits defined in 10CFR20.1204. The program must also provide protection against oxygen deficient, nuisance, and toxic atmospheres inside RCAs. The respiratory protection program can help meet the requirements of 10CFR20 by reducing overall TEDE exposures, through the use of less respiratory protection devices in some cases. This is normally accomplished by the application of engineering controls such as process, containment, and ventilation equipment and by the preplanning of work. However, it is necessary that some work functions be performed in confined or localized areas where the atmospheric hazards warrant protection and other controls are not feasible. In these cases, respiratory protection devices may be used to provide the necessary protection (e.g. Inside the steam generator channel-head, due to changing radiological conditions inside the bowl; pulling off insulation can frequently be performed much faster when wearing respirators, thus reducing the overall time and exposure for the work).

6.12.2 The HP Group is responsible for administering the radiological respiratory protection program inside RCAs. This includes issue, cleaning, decontamination, inspection, maintenance, sanitizing, repair, and storage of respiratory protection equipment. The HP Group will determine the radiological hazards associated with each job to ensure the selection and issuance of the proper respiratory devices. HP will maintain records to permit periodic evaluation of the adequacy of the program.

The Training Group is responsible for the training and fit testing of personnel for the specific respirators required. Additionally, the Safety and Health Department is responsible for periodically conducting pulmonary function tests and issuing a list of personnel medically qualified to wear respirators.

6.12.3 Respiratory protection devices will be provided to protect personnel from airborne radioactivity in accordance with 10CFR20.1703 and the FNP ALARA program. The use of Respirators for Radiological Protection will be reviewed by the HP Foreman prior to their issuance in accordance with HP procedures. Respirators may be used at lower airborne concentrations than specified in 10CFR20 provided they do not increase anticipated TEDE by increasing work duration, limiting mobility restricting vision or by introducing any other physical constraints. Full face particulate respirators normally are considered for use when cutting or grinding on radioactively contaminated items and full face air supplied respirators normally are considered for use when welding or burning on radioactively contaminated items. These requirements will be evaluated and modified as the radiological work conditions dictate. Personnel who are required to wear respirators must be clean shaven in the area where the mask seals with the face. Facial conditions in the seal area must remain similar to those when the individual was fitted and qualified and the individual must be medically certified able to wear a respirator. It is each individual's responsibility to notify the HP Group if their facial conditions in the seal area has changed since having been fitted and qualified to wear a respirator (e.g. scar, facial structure change, dentures, etc.). If so, the individual must be recertified by having another respirator fit test performed by the Training Group.

6.12.4 If respiratory protection is required, it is normally specified on the applicable RWP or by a member of HP Supervision. Nasal smears are normally taken and analyzed after using a respirator. A respirator will not be issued to individuals who do not have a current medical certification date.

6.13 Radioactive Source Control

Health Physics procedure, FNP-0-RCP-55 gives guidance on the proper handling of radioactive sources used at FNP.

6.14 Climbing in the Overhead inside RCA

The area normally checked when an HP Technician performs a survey is up to a height of approximately eight (8) feet. For this reason, areas higher than ~ 8' in the overhead require a survey before any climbing. Areas which have permanently installed ladders and/or platforms are routinely surveyed and do not require additional survey unless specifically posted.

7.0 Radioactive Material Spills

If you are unsure whether liquid found inside the RCA is radioactive or not, always assume that it is radioactive and do the following:

7.1 Individual

7.1.1 For areas where water is present but no active leak or spill is in progress, verify the water is contained (i.e. not spreading to additional areas) and evaluate the need for HP or HPS support to remove the water.

7.1.2 Avoid walking through or otherwise spreading the water to additional areas.

7.1.3 If a safety hazard exists, initiate action to prevent personnel injury by having the area posted, coordinating removal of the water, etc.

7.1.4 Stop or confine active spills immediately, if possible.

7.1.5 Notify the Shift Supervisor and HP of any active spills.

7.1.6 Warn personnel concerning active spills until HP personnel arrive.

7.2 Health Physics (Control of Radioactive Material Spill Area(s))

7.2.1 Clear personnel from active spill areas and restrict entry until the radiological concern can be identified and proper controls implemented.

7.2.2 Ensure personnel involved with an active spill situation are properly monitored, recommend necessary steps to return the area to a normal condition and decontaminate personnel as required.

7.2.3 Do not let work resume until the area is returned to an acceptable condition and the cause of the spill is corrected or confined.

APPENDIX A

DEFINITIONS

1) ADULT

Means an individual 18 or more years of age.

2) ALARA

As Low As Reasonably Achievable (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in 10CFR20 as is practical, taking into account the state of technology, the economics of improvements relative to: the state of technology, benefits to the public health and safety, other societal and socioeconomic considerations, and utilization of nuclear energy and licensed materials in the public interest.

3) ANNUAL LIMIT ON INTAKE (ALI)

The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man which would result in a committed effective dose equivalent of 5 rems or a committed dose equivalent of 50 rems to any individual organ or tissue (ALI values for intake by ingestion and inhalation of selected radionuclides are given in 10CFR20, Appendix B, Table 1, Columns 1 and 2).

4) BIOASSAY

Means the determination of kinds, quantities, concentrations, or locations of radioactive material in the human body either by direct measurement (in vivo (whole body count) counting) or by analysis and evaluation of materials excreted or removed from the human body (in vitro counting).

5) COMMITTED DOSE EQUIVALENT (CDE)

The dose equivalent to an organ or tissue that will be received from an intake of radioactive material by an individual during the 50 year period following the intake.

6) COMMITTED EFFECTIVE DOSE EQUIVALENT (CEDE)

The sum of the products of the weighting factors (w_t) applicable to each of the body organs or tissues which are irradiated and the committed dose equivalent (CDE) to these organs or tissues. CEDE = Σ (w_t)(CDE)

7) CONCURRENTLY BADGED

SNC or Southern Company Services employees who have been approved by management to be currently dosimetry badged at more than one of SNC's nuclear plants.

8) DECLARED PREGNANT WOMAN

Means a woman who has voluntarily informed the licensee, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant woman withdraws the declaration in writing or is no longer pregnant.

9) DEEP DOSE EQUIVALENT (DDE)

Applies to external whole body exposure and is taken as the dose equivalent at a tissue depth of 1 cm (1000 mg/cm^2).

10) DERIVED AIR CONCENTRATION (DAC)

Means the concentration of a given radionuclide in air which, if breathed by an individual (reference man) for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air/hour) results in an intake of one ALI. DAC values are given in Table 1, Column 3, of Appendix B to 10CFR20.

11) DERIVED AIR CONCENTRATION - HOUR (DAC - hour)

The product of the concentration of radioactive material in air (expressed as the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours. A licensee may take 2,000 DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 5 rem.

12) EMBRYO/FETUS

The developing human organism from conception until the time of birth.

13) ESCORTED RADIATION WORKERS (ERW)

A radiation worker that has not completed radiation worker training (but may have completed it at another site or have previously completed it and is now out of date) but have been briefed or trained consistent with the work to be performed. They will be under the escort of a trained radiation worker for all radiation control area entries.

14) ESCORTED VISITOR

An Escorted Visitor is an individual that is not a radiation worker nor are they considered trained with regard to radiation work. An Escorted Visitor may tour the radiation control area, observe work activities and perform minor work tasks which involve minimal association with radioactive materials. An Escorted Visitor is not permitted to enter high radiation areas, very high radiation areas, contaminated areas or airborne areas.

15) EXPOSURE MARGIN

The amount of exposure an individual has remaining before he/she will exceed an annual or lifetime dose limit.

16) EXTERNAL DOSE

That portion of the dose equivalent received from radiation sources outside the body.

17) EXTREMITIES

The hands, elbows, arms below the elbow, feet, knees and legs below the knees.

18) LENS DOSE EQUIVALENT (LDE)

Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg/cm^2).

19) INTERNAL DOSE

That portion of the dose equivalent received from radioactive material taken into the body.

20) MEMBER OF GENERAL PUBLIC

Means an individual in a controlled or unrestricted area. However, an individual is not a member of the public during any period in which the individual receives an occupational dose. Escorted Visitors allowed to enter the Radiation Controlled Area are considered members of the general public.

APPENDIX A

21) MINOR

An individual less than 18 years of age.

22) OCCUPATIONAL DOSE

Dose received by an individual in a restricted area or in the course of employment in which the individual's assigned duties involve exposure to radiation. Occupational dose does not include dose received from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the general public.

23) PLANNED SPECIAL EXPOSURE (PSE)

An infrequent exposure to radiation, separate from and in addition to the routine annual dose limits. PSEs are to be used only under exceptional circumstances, not as a routine method of extending dose limitations. Approval for a PSE must be obtained in writing from the Executive Vice President before the exposure occurs.

24) **RADIATION WORKER** - personnel who have completed necessary training or substitute training (as in the case of Escorted Radiation Workers) and are authorized to perform work inside the plant's posted radiation controlled areas.

25) SHALLOW DOSE EQUIVALENT, WHOLE BODY SKIN (SDE, WB)

Applies to the external exposure of the skin of the whole body and is taken as the dose equivalent at a tissue depth of 0.007 cm (7 mg/cm^2) averaged over an area of 10 cm^2.

26) SHALLOW DOSE EQUIVALENT, MAXIMUM EXTREMITY (SDE, EX)

Applies to the external exposure of the skin of the extremity receiving the highest dose and is taken as the dose equivalent at a tissue depth of 0.007 cm (7 mg/cm^2) averaged over an area of 10 cm^2.

27) TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE)

The sum of the deep dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

28) TOTAL ORGAN DOSE EQUIVALENT (TODE)

The sum of the deep dose equivalent (for external exposures) and the committed dose equivalent recorded for the maximally exposed internal organ.

APPENDIX A

29) WEEK

7 consecutive days starting on Sunday.

30) WHOLE BODY

Those areas of the body consisting of the head, the trunk (including male gonads), arms above the elbow, or legs above the knee.

31) YEAR

The period of time, beginning in January, used to determine compliance with 10CFR20. The starting date of the year may change provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

A.4SRO Emergency Plan ADMIN G2.4.44- SRO

TITLE: Evaluate plant conditions during a site area emergency to determine if a follow-up message or an upgrade notification is warranted, and complete all required forms.

TASK STANDARD: Classify an emergency event and determine an upgrade from SAE to GE is required, fill out all forms for emergency notification, and initiate correct Protective Action Recommendations (PARS) within the time allowed.

PROGRAM APPLICABLE: SOT ___ SOCT ___ OLT _X_ LOCT_____

ACCEPTABLE EVALUATION METHOD: _X_ PERFORM _X_ SIMULATE ___ DISCUSS

EVALUATION LOCATION: _X_ SIMULATOR _X_ CONTROL ROOM _X_ CLASSROOM

PROJECTED TIME: 30 MIN SIMULATOR IC NUMBER: N/A

ALTERNATE PATH ____ TIME CRITICAL _X_ PRA

THIS JPM IS TIME CRITICAL

Examinee:		
Overall JPM Performance:	**Satisfactory** ☐	**Unsatisfactory** ☐
Evaluator Comments (attach additional sheets if necessary)		

EXAMINER: ____________________

CONDITIONS

When I tell you to begin, you are to **EVALUATE PLANT CONDITIONS DURING A SITE AREA EMERGENCY TO DETERMINE IF A FOLLOWUP MESSAGE OR AN UPGRADE NOTIFICATION IS WARRANTED, AND COMPLETE ALL REQUIRED FORMS**. The conditions under which this task is to be performed are:

a. Unit 1 was at 100% power when a Large Break LOCA occurred.
b. A Site Area Emergency (SAE) has been declared for Unit 1, FS1 - Loss or Potential Loss of ANY Two Barriers due to:
   - Potential loss of the Fuel Clad Barrier (4. RVLS Plenum LEVEL less than 0%).
   - Loss of the RCS Barrier (2. RCS subcooling less than 16°F {less than 45° F Adverse}).
c. Unit 2 is unaffected and has remained at 100%.
d. EIP-9.0, Guideline 2, Site Area Emergency, has been performed up to step D.3.
e. The Control Room reports the following current conditions on Unit 1:
   - RVLS lights are all red
   - RCS subcooling is 12°F
   - RE-27A and RE-27B, Containment Radiation Monitors, are both 100 R/hr and rising.
   - RE-14, Plant Vent, RE-21, Vent Stack Particulate, and RE-22, Vent Stack Gas, are in alarm.
   - The Shift Radio Chemist has projected dose to be 1.3 REM TEDE at the site boundary.
   - Wind Direction = from 95°.
   - Wind Speed = 2.8 mph.
   - ΔT = +1.5°F.
f. Another SRO is standing by to make any requested announcements, callouts, or notifications.
g. This JPM contains time critical elements.
h. A pre-job brief is not required.
i. You are the ED and are required to evaluate plant conditions and determine which is warranted:
   - an upgrade in classification per EIP-9.0, Step 4.0,

   OR
   - a follow-up message per EIP-9.0, Step 6.0,

   AND then fill out all applicable forms and paperwork.

EXAMINER NOTES: DO NOT START THE TIME UNTIL THE APPLICANT UNDERSTANDS THE TASK.
• **An EXAMINER'S KEY is available for all forms**
• **On Guideline 1, boxes are circled instead of checked on the KEY to ensure the content of the boxes are legible. Circling the boxes, checking inside the boxes, or "x'ing" inside the boxes are all acceptable for the applicant.**

EVALUATION CHECKLIST

ELEMENTS:	**STANDARDS:**	**RESULTS: (CIRCLE)**

EVALUATION CHECKLIST

ELEMENTS:		STANDARDS:	RESULTS: (CIRCLE)
____ **TIME CRITICAL START TIME**			

NOTE: • THE TIME IT TAKES TO CLASSIFY THE EVENT IS TIME CRITICAL AND MUST BE COMPLETED IN 15 MINUTES.

*1.	Classify the event using **Data Sheet 1** from EIP-9.2.	**Data Sheet 1** completed through step 9, including signature, date and time. Event classified as a **GENERAL EMERGENCY – FG1**: • Fuel clad barrier loss - #5, Containment Radiation Monitoring, • RCS barrier loss - #2, RCS Leak Rate, and • CTMT barrier loss – 7, Other indications.	S / U

_____ **TIME CRITICAL STOP / START TIME**

NOTE: • THE TIME IT TAKES TO COMPLETE AND APPROVE THE DECLARATION FORM PER THE FOLLOWING ELEMENTS IS TIME CRITICAL AND MUST BE COMPLETED IN 15 MINUTES.

*2.	Directs notification of personnel on site.	Directs notification of personnel on site.	S / U

NOTE: ELEMENT 4 WAS ACCOMPLISHED WHEN THE SITE AREA EMERGENCY WAS DECLARED. EVEN THOUGH THE PROCEDURE STATES TO PERFORM IT, THE APPLICANT MAY REALIZE IT DOESN'T NEED TO BE PERFORMED AGAIN. THERE ARE NO ADVERSE CONSEQUENCES IF PERFORMED AGAIN OR NOT. THIS IS NOT A CRITICAL STEP.

3.	Directs callout the ERO staff.	Individual requested to activate the ERO callout system per FNP-0-EIP-8.3, Table 2. (Cue: The request to initiate ERO callout is acknowledged.)	S / U

EVALUATION CHECKLIST

ELEMENTS:		STANDARDS:	RESULTS: (CIRCLE)
NOTE: ACCURATE COMPLETION OF CERTAIN STEPS OF EIP-9.0, GENERAL EMERGENCY NOTIFICATION FORM, IS ESSENTIAL TO ENSURE ADEQUATE NOTIFICATION OF STATE AND LOCAL AGENCIES. THESE STEPS ARE SHOWN AS THE STANDARDS FOR ELEMENT NUMBER 6 (critical tasks are based on shaded portions of Guideline 1 form which annotate the items which affect EP Performance Indicators (PIs).			
*4.	Complete EIP-9.0, Guideline 1 **General Emergency** Red Verbal Notification Form.	Correct form selected	S / U
		LINE 1 - Indicates **Drill OR Actual Event**	S / U
		LINE 4 - Indicates **General** and identifies **RG1** as criteria for **EAL#**	S / U
		LINE 5 - Evaluates PARs and determines that PAR 3 is appropriate, and based on 95° wind direction, the following zones should be evacuated: **A, B5, C5, D5, E5, F5, I5, J5, K5, C10, D10** and **E10.**	S / U
		NO zones are sheltered	S / U
		LINE 6 - Evaluates emergency release and marks – **Is Occuring**	S / U
		LINE 9 - Accurately completes met tower **wind direction and wind speed** data.	S / U
		LINE 10 - Completes declaration **time/date - Matches Step 8 on EIP-9.2 Data Sheet 1**	S / U

NOTE: **IF EXAMINEE ASKS FOR TIME OF SHUTDOWN, SUBTRACT 25 MINUTES FROM THE START OF THIS TASK AND PROVIDE THAT TIME.**

		LINE 11 - Indicates **Unit 1**	S / U

NOTE: STOP TIME IS AFTER LINE 17 IS COMPLETE: "APPROVED BY" SIGNATURE, TIME AND DATE IS FILLED IN.

EVALUATION CHECKLIST

ELEMENTS:	STANDARDS:	RESULTS: (CIRCLE)

_______ TIME CRITICAL STOP TIME

Terminate JPM when initial notification form is completed

CRITICAL ELEMENTS: Critical Elements are denoted with an Asterisk (*) before the element number.

GENERAL REFERENCES:

1. FNP-0-EIP-9.0 Version 59
2. FNP-0-EIP-9.2 Version 7
3. NMP-EP-109 Version 2.0
4. KA: G2.4.44 RO-2.4 SRO-4.4

GENERAL TOOLS AND EQUIPMENT:

Provide:

1. FNP-0-EIP-9.0, Guideline 1 and Figure 6
2. FNP-0-EIP-9.2, Data Sheet 1
3. NMP-EP-109 Version 2.0
4. Handouts of SAE paperwork already filled out.

COMMENTS:

CONDITIONS

When I tell you to begin, you are to **EVALUATE PLANT CONDITIONS DURING A SITE AREA EMERGENCY TO DETERMINE IF A FOLLOWUP MESSAGE OR AN UPGRADE NOTIFICATION IS WARRANTED, AND COMPLETE ALL REQUIRED FORMS**. The conditions under which this task is to be performed are:

a. Unit 1 was at 100% power when a Large Break LOCA occurred.
b. A Site Area Emergency (SAE) has been declared for Unit 1, FS1 - Loss or Potential Loss of ANY Two Barriers due to:
   - Potential loss of the Fuel Clad Barrier (4. RVLS Plenum LEVEL less than 0%).
   - Loss of the RCS Barrier (2. RCS subcooling less than 16°F {less than 45° F Adverse}).
c. Unit 2 is unaffected and has remained at 100%.
d. EIP-9.0, Guideline 2, Site Area Emergency, has been performed up to step D.3.
e. The Control Room reports the following current conditions on Unit 1:
   - RVLS lights are all red
   - RCS subcooling is 12°F
   - RE-27A and RE-27B, Containment Radiation Monitors, are both 100 R/hr and rising.
   - RE-14, Plant Vent, RE-21, Vent Stack Particulate, and RE-22, Vent Stack Gas, are in alarm.
   - The Shift Radio Chemist has projected dose to be 1.3 REM TEDE at the site boundary.
   - Wind Direction = from 95°.
   - Wind Speed = 2.8 mph.
   - ΔT = +1.5°F.
f. Another SRO is standing by to make any requested announcements, callouts, or notifications.
g. This JPM contains time critical elements.
h. A pre-job brief is not required.
i. You are the ED and are required to evaluate plant conditions and determine which is warranted:
   - an upgrade in classification per EIP-9.0, Step 4.0,

   OR

   - a follow-up message per EIP-9.0, Step 6.0,

   AND then fill out all applicable forms and paperwork.

FARLEY NUCLEAR PLANT

EMERGENCY PLAN IMPLEMENTING PROCEDURE 9.0

FNP-0-EIP-9.0

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EMERGENCY ACTIONS

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	
Reference Use	ALL
Information Use	

Approved:

W.L. Bargeron
Plant Manager

Date Issued 8-13-07

LIST OF EFFECTIVE PAGES

EMERGENCY ACTIONS

TABLE OF CONTENTS

TABLE OF CONTENTS

EMERGENCY ACTIONS

1.0 Purpose

The purpose of this procedure is to provide guidelines for actions, and for notification guidance for a declared emergency. The classification of emergencies will be performed using FNP-0-EIP-9.2 as directed by this procedure. Dose assessment will be performed by using FNP-0-EIP-9.1, FNP-0-EIP-9.3 or FNP-0-EIP-9.5 as directed by this procedure. Development of Protective Action Recommendations (PARs) will be performed using NMP-EP-109 as directed by this procedure.

2.0 References

See Table 1.

3.0 General:

3.1 This procedure provides guidance to use FNP-0-EIP-9.2 for the criteria for the classification of an emergency based on plant status and radiological hazards (i.e., direct radiation and inhalation hazards which may result from the passage of a cloud of radioactive material released from the plant).

3.2 Assessment of radioactive liquid releases will be made using the NOUE and ALERT criteria of FNP-0-EIP-9.2.

3.3 Definitions:

Definitions that are required for emergency classification are included in FNP-0-EIP-9.2

3.4 Protective Action Recommendation (PAR) guidance is provided in NMP-EP-109 to aid in establishing protective action recommendations. If the EOF is staffed and responsible for dose assessment, then the EOF will normally develop and recommend PAR upgrades to the Emergency Director. Once approved by the Emergency Director, PAR upgrades will be communicated to the agencies by EOF if the EOF is responsible for offsite communications.

3.5 If steam generator water level falls below the break point during a steam generator tube rupture, off-site dose rate may be significantly higher (up to 10 times) due to volatilization of iodine.

3.6 Initial Notification or upgrade should be made from the Control Room or TSC. It is not necessary to transfer the information to the EOF to make the upgrade notification. The EOF, if staffed, should be informed as soon as possible.

3.7 Communication guidance for making the initial verbal notification is on the Emergency Initial Notification Form, in the appropriate guideline.

3.8 Guidance for when the emergency response facilities should be manned and the level of manning required is included in Table 2. It is recommended that the TSC and the EOF be fully staffed initially at the ALERT level. If the full staff is not required, individuals can be released on a case-by-case basis.

3.9 At the NOUE level or below, it may be desirable to partially staff the TSC in order to relieve the Control Room staff of offsite communications and notifications. FNP-0-EIP-6.0 provides a listing of positions that should be considered for partial TSC activation.

3.10 EIP-6, Figure 3, provides a list of information that should be considered when updating plant staff over the public address system.

4.0 <u>Classify emergency</u> based on the most severe plant conditions OR projected off-site dose/dose rate conditions, <u>WHICHEVER</u> results in the higher emergency classification. Figure 2 provides a flowpath for dose assessment methods and plant conditions criteria.

4.1 Plant Conditions
Use FNP-0-EIP-9.2 to determine the highest indicated emergency classification based on plant conditions or radiation monitor readings.

4.2 Dose Assessment

NOTE:	**All of the step 4.2 substeps will normally be accomplished by the On Shift Dose Analyst with the exception of step 4.2.6. Step 4.2.6 must be performed by the Shift Supervisor, Shift Manager, or Emergency Director.**

4.2.1 Initial evaluation of off-site dose.

The On Shift Dose Analyst (Shift Radio Chemist) when asked to perform dose assessment should initially evaluate effluent monitors (R-14, R-21, R-22, R-29, R-60 series, R-15 series R-18 and R-23B) as follows:

4.2.1.1 If there are no effluent radiation monitors that are in alarm or have up-scaled by a factor of 10 or more,
<u>And</u> there are no other indications of an off-site radioactive release in progress,
<u>Then</u> The On Shift Dose Analyst should report to the ED that there is no indication of a radioactive release based on effluent monitors and **NO** additional dose assessment per step 4.2 is required. Continue to perform this assessment periodically not to exceed 30 minutes until the requirement is terminated by the ED.

4.2.1.2 If any effluent radiation monitor is in alarm or has up-scaled by a factor of 10 or more,
Or there are other indications of an off-site radioactive release in progress,
Then For initial dose assessment from the TSC, proceed to step 4.2.4.

4.2.2 For dose assessment from the EOF or long term dose assessment from the TSC, go to EIP-9.3, PERSONNEL COMPUTER-AUTOMATED DOSE ASSESSMENT and perform dose assessment using the MIDAS program. Return to step 4.2.6 for evaluation of dose information.

4.2.3 If the MIDAS program is inoperable, then for dose assessment from the EOF or from the TSC, go to EIP-9.1, AUTOMATED DOSE ASSESSMENT and perform dose assessment using the ARDA program to obtain dose information. Return to step 4.2.6 for evaluation of dose information.

4.2.4 If the ARDA System is operable and has been automatically activated, then go to EIP-9.1, AUTOMATED DOSE ASSESSMENT and perform dose assessment using the ARDA program to obtain dose information. Return to step 4.2.6 for evaluation of dose information.

4.2.5 If the ARDA system per EIP 9.1, AUTOMATED DOSE ASSESSMENT is NOT operable, then go to EIP-9.3, PERSONAL COMPUTER-AUTOMATED DOSE ASSESSMENT and perform dose assessment using the MIDAS program. Return to step 4.2.6 for evaluation of dose information.

NOTE:	**Evaluating the dose assessment information in Step 4.2.6 must be performed by the Shift Supervisor, Shift Manager, or Emergency Director in the Control Room or TSC, the Dose Assessment Supervisor or EOF Manager in the EOF.**

4.2.6 Using the dose information obtained from EIP-9.1 or EIP-9.3, determine the highest indicated emergency classification from the "Radiological" criteria in FNP-0-EIP-9.2.

NOTE:	**If a General Emergency or site area emergency is indicated in the following step, the Emergency Director should consider directing long term dose assessment be performed from the TSC per step 4.2.2.**

4.2.7 If a General Emergency or Site Area Emergency was indicated from step 4.2.6 then go to step 4.3.

4.2.8 If a General Emergency or Site Area Emergency was not indicated in step 4.2.6 then continue dose assessment using FNP-0-EIP-9.1 or 9.3.

4.3 Determine the correct emergency classification, declare the emergency at the time the classification was verified, determine PARs and make notifications.

4.3.1 Compare the emergency classifications determined in FNP-0-EIP-9.2, from steps 4.1 and 4.2 to determine the highest required emergency classification and declare the emergency. Do not wait for dose assessment results from step 4.2 to classify the event if plant conditions require an initial classification or an upgrade classification. As soon as a criteria for classification has been met, the event should be classified by the Shift Manager or ED and an upgrade can be done later if required.

4.3.2 If a General Emergency classification was determined in step 4.3.1, determine the required protective action recommendations using NMP-EP-109.

5.0 Perform actions and initial notification to offsite authorities upon initial entry or upgrade into a classification using the applicable guideline:

Guideline 1, Section II - General Emergency

Guideline 2, Section II - Site Area Emergency

Guideline 3, Section II - Alert

Guideline 4, Section II - Notification of Unusual Event

6.0 Continue reassessment of emergency classification per step 4.0 or 7.0, as appropriate, and transmit follow-up message/periodic update message as follows:

6.1 Transmit Follow-up Messages:

6.1.1 Transmit a follow up message as soon as possible following an initial or upgrade verbal notification Refer to step 6.2 for time limits for other follow-up messages. Transmit message no later than one hour after the verbal notification has been transmitted over the ENN. The goal should be no longer than 30 minutes.

6.1.2 Use, Figure 6 for guidance in completing and transmitting the "Emergency Message" for Follow Up/Periodic Update.

6.1.3 When performing dose assessment, transcribe dose information from the form being printed on a blank Figure 6 or use the form being printed by MIDAS. Fill in the remaining information. Transmit follow up message by telecopy.

NOTE: EFFORTS WILL BE MADE TO TRANSMIT FOLLOW-UP REPORTS EVERY HALF HOUR.

6.2 Transmit subsequent "Follow Up Message/Periodic Update Message" reports per step 6.1.

6.2.1 At a minimum of once per hour. The hourly requirement may be waived while in a NOUE declaration, if this is agreed to by the state and local agencies.

6.2.2 Following a significant change in dose rate that does not require a change in emergency classification.

6.2.3 Following a significant change in plant conditions that does not require a change in emergency classification.

7.0 TERMINATING THE EMERGENCY CLASSIFICATION

7.1 Termination of an emergency classification shall be done in accordance with FNP-0-EIP-9.2 step 6.4 and FNP-0-EIP-28.0.

7.2 The emergency classification will not normally be downgraded from a higher emergency classification to a lower one. When all criteria for classification have been cleared the classification will be terminated.

APPENDIX 1
ONSITE AND OFF SITE STAGING AREAS

1. During security events when there is terrorist activity on site that would prevent off site resources from accessing the site, staging areas have been established off site to assemble these resources for ready access to the site when access becomes available.

2. When resources are able to access the site, they may not be able to go directly to the scene where they are needed. On site staging areas have been established on-site to assemble these resources for ready access to the location that they are needed.

3. Off site staging area #1 is located at the Oakey Grove Baptist Church located at the intersection of HC Road 33 and Nuclear Plant Road

4. Off site staging area #2 is located at the West Bank Dam Site Located off of Alabama Highway 95 between Alabama Highway 52 and Nuclear Plant Road.

5 On site staging area #1 is located in upper parking lot at the Training Center. See attached map which can be sent to off site resources.

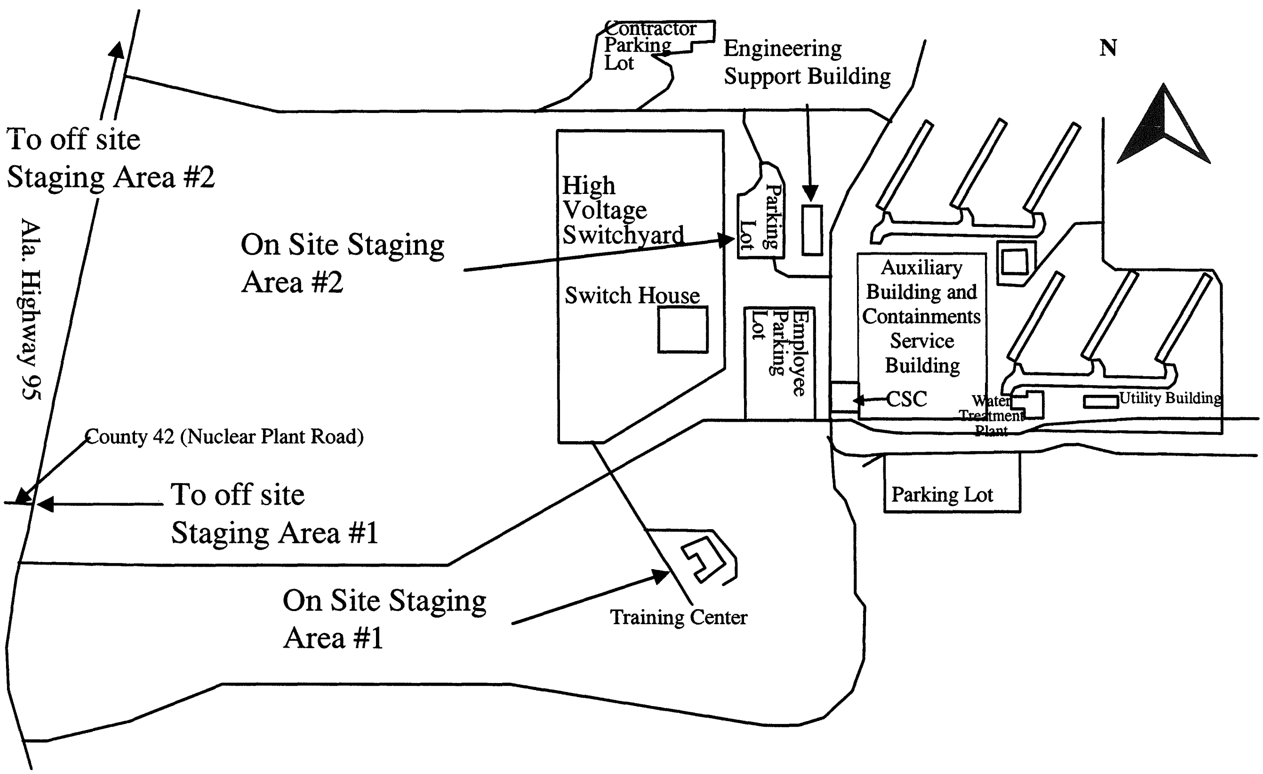
6. On site staging area #2 is located in at the parking lot behind the Engineering Support Building. See attached map which can be sent to off site resources.

7. If it is necessary to use a staging area select the best one to use based on plant conditions, radiological/meteorological and physical hazards.

9. Inform off site resources of the staging area. This can be done by direct contact from the Control Room, TSC or security. HCEMA should be contacted and request their support in coordinating these activities and communicating with these agencies.

APPENDIX 1
ONSITE AND OFF SITE STAGING AREAS

STAGING AREA MAP



GUIDELINE 1

GENERAL EMERGENCY

I. Purpose of Classification

The classification of General Emergency applies to those events which are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential loss of containment integrity or HOSTILE ACTION that results in an actual loss of physical control of the facility. The potential for release of radioactive material for the General Emergency classification is more than 1000 Ci of I-131 equivalent or more than 10^6 Ci of Xe-133 equivalent.

The purpose of the declaration of a General Emergency is to:

(a) Initiate predetermined protective actions for the public.

(b) Provide continuous assessment of information from licensee and offsite measurement.

(c) Initiate additional measures as indicated by event releases or potential releases and,

(d) Provide current information for and consultation with offsite authorities and the public.

A General Emergency would be declared based on FNP-0-EIP-9.2

II. Emergency Director Actions

NOTE: THE SHIFT MANAGER SHALL PERFORM THE DUTIES OF THE EMERGENCY DIRECTOR UNTIL HIS ARRIVAL AND ASSUMPTION OF DUTIES.

Initials

A. Notify personnel on site

____ 1. If the Plant Emergency alarm has not already been activated, then announce over the public address system "All Plant Personnel Report to Designated Assembly Area," activate the PEA for 30 seconds and repeat the announcement.

____ 2. Announce the classification, and the condition, request setup of the TSC and OSC and give needed evacuation instructions over plant public address system.

GUIDELINE 1

GENERAL EMERGENCY

B. Callout the ERO staff

_____ 1. Activate the ERO callout system per FNP-0-EIP-8.3, Table 2. (Located in the Unit 2 SS desk)

NOTE:	**IF POSSIBLE AND TIME PERMITTING, DISCUSS WITH ALABAMA RADIATION CONTROL AND GEORGIA EMERGENCY MANAGEMENT AGENCY ABOUT THE PARs PRIOR TO ANNOUNCING THEM OVER THE ENN.**

C Complete Notification form

_____ 1. Fill in the General Emergency Initial Notification Form (last pages of this guideline), including developing protective action recommendations per step L. Take into account the zones and evacuation time estimates shown in Figure 1.

NOTE:	**INITIAL NOTIFICATIONS WILL NORMALLY BE MADE BY THE OPERATIONS SHIFT COMMUNICATOR, BUT MAY BE MADE BY OPERATIONS STAFF, TSC STAFF OR OTHER QUALIFIED PERSON USING THE INITIAL NOTIFICATION FORM (LAST PAGES OF THIS GUIDELINE).**
NOTE:	**INITIAL AND UPGRADE CLASSIFICATIONS AND NOTIFICATIONS SHOULD BE PERFORMED BY THE CONTROL ROOM OR THE TSC STAFF, WITH THE EOF INFORMED AS SOON AS POSSIBLE.**

D. Initial Notifications

______1. Within 15 minutes of declaration, verbally notify the state and local agencies using the General Emergency Initial Notification Form (last pages of this guideline).

______2. Verify notifications complete and documented on the General Emergency Initial Notification Form (last pages of this guideline).

______3. Complete Figure 6, follow-up message. Instructions for completing the form are available as part of the figure.

______4. Within one hour of the General Emergency Initial Notification Form (Verbal Notification) transmittal, fax Figure 6, follow-up message to state and local agencies. The goal should be within 30 minutes of the verbal notification.

______5. Complete Figure 5, NRC notification message. Instructions for completing the form are available in Figure 5.

GUIDELINE 1

GENERAL EMERGENCY

______6. Provide the information on Figure 5, to the NRC as soon as possible, but within one hour of the declaration per the instructions on Figure 5.

E. Emergency Organization Notifications

_____ 1. On-call Emergency Director

_____ 2. On-call EOF Manager

_____ 3. SNC Duty Manager

_____ 4. Notify Security of Emergency, incoming personnel and access restrictions (4611).

F. Other Notifications

_____ 1. Have Regulatory ERDS activated to transmit data to the NRC within one hour of the declaration of the emergency (EIP-8-3, step 10).

_____ 2. If personnel injury or fire is involved, refer to FNP-0-EIP-11.0 and 13.0 respectively for additional actions and EIP-8.0 steps 5.0 and 6.0 for additional notification requirements.

_____ 3. U.S. Army EOD group at Fort Benning, GA, if necessary.

_____ 4. Savannah River Operations Office, if necessary.

_____ 5. If there is a security event involved ensure appropriate notifications and actions of FNP-0-AOP-49 and FNP-0-SP 37.0 are performed

_____ 6. If there is a security event involved and access to the plant from off site is restricted by local law enforcement (LLE) and it is desired to bring a plant employee to the site or additional off site resources such as fire departments or law enforcement then perform the following:

- Contact the Houston County EMA to arrange a route and provide the names of individuals or resources that require access to the plant for relay to LLE.
- In conjunction with Houston County EMA determine on site and off site staging areas for off-site resources using Appendix 1
- Inform the individuals and resources that are coming to the site of the required route to the site. Individuals must have a company picture ID to get through the roadblocks

GUIDELINE 1

GENERAL EMERGENCY

G. In Plant Protective Actions

_____ 1. Ensure personnel accountability per EIP-10.0.

_____ 2. Plan and initiate reentry's per EIP-14.0.

_____ 3. Ensure proper Control Room response.

_____ 4. Assign an individual to provide periodic plant status updates.

_____ 5. Assign an individual to maintain a log of important Emergency Director activities.

_____ 6. Assign an individual to keep a record of all off-site communications.

______7. Determine what should be done with a unit that is not affected by the declared emergency. Consider the effect on the emergency unit, manpower utilization, plant and grid stability, and other relevant factors.

______8. In the event of mass casualties refer to FNP-0-EIP-11.0 step 15 to arrange for triage and additional ambulances.

H. Off-Site Support

_____ 1. Ensure Field Monitoring teams have been dispatched per EIP-4.0.

_____ 2. Provide information to the EOF Manager for use in press releases and recovery planning.

I. Information to Off Site Authorities

_____ 1. Provide periodic plant status updates, meteorological and dose estimates and release projections based on plant conditions and foreseeable contingencies.

J. Re-Assess plant conditions

_____ 1. Continue to assess plant and radiological conditions to ensure the correct emergency classification is declared.

_____ 2. If plant and radiological conditions no longer require the current emergency classification terminate the emergency class using FNP-0-EIP-28.0.

K. Long term concerns

_____ 1. Within 8 hours, provide for full TSC and OSC reliefs.

GUIDELINE 1

GENERAL EMERGENCY

_____ 2. Within 16 hours, provide for 24 hour TSC and OSC coverage.

_____ 3. If an LOSP has occurred evaluate the event to ensure that an adequate supply of fuel oil is available for the Diesel Generators for 7 days. Refer to REA 00-2337 and FNP-0-SOP-42.0 Figure 1.

L. Protective action recommendation guidance

_____ 1. Make Protective Action Recommendations (PARs) for all General Emergency declarations in accordance with NMP-EP-109. If an upgrade to PARS is required after making this notification use figure 4 to transmit the new PARS to the state and county agencies.

GUIDELINE 1
GENERAL EMERGENCY
RED VERBAL NOTIFICATION FORM

1. A DRILL B ACTUAL EVENT MESSAGE # _______

2. A INITIAL NOTIFICATION: TIME____________DATE___/___/___AUTHENTICATION # **N/A**

3. SITE: **FARLEY NUCLEAR PLANT** (334) 814-4662, 814-4663
Confirmation Phone # (334) 794-0800, 899-5156 (ext 4662, 4663)

4. EMERGENCY CLASSIFICATION: D GENERAL EMERGENCY
BASED ON EAL #__________

5. PROTECTIVE ACTION RECOMMENDATIONS:

B EVACUATE A B-5 C-5 D-5 E-5 F-5 I-5 J-5 K-5
B-10 C-10 D-10 E-10 F-10 G10 H10 I-10 J-10 K-10

C SHELTER A B-5 C-5 D-5 E-5 F-5 I-5 J-5 K-5

D Advise Remainder of EPZ to Monitor Local Radio/TV Stations/ TARs for Additional Information and CONSIDER THE USE OF KI (POTASSIUM IODIDE) IN ACCORDANCE WITH STATE PLANS AND POLICY.

E OTHER______________________________

6. EMERGENCY RELEASE: A None B Is Occurring C Has Occurred

7. RELEASE SIGNIFICANCE: A Not applicable B Within normal operating limits C Above normal operating limits D Under evaluation

8. EVENT PROGNOSIS: A Improving B Stable C Degrading

9. METEOROLOGICAL DATA: Wind Direction from _______ degrees Wind Speed _______ mph
35 foot elevation preferred Precipitation _______ Stability Class A B C D E F G

10. A DECLARATION Time ______________ Date _____/_____/_____

11. AFFECTED UNIT(S): 1 2 All

12. UNIT STATUS:
(Unaffected Unit(s) Status Not Required for Initial Notifications)
A U1 _____% Power Shutdown at Time ____________ Date ___/_____/____
B U2 _____% Power Shutdown at Time ____________ Date ___/_____/____

13. REMARKS: ☐ No additional remarks ☐ read additional remarks on separate page

17. APPROVED BY: ______________________ Title Emergency Director Time ______Date___/___/____

NOTE: The information that is highlighted on this form must be correct for the notification to be considered correct.

A.______Line 1 check box A or B. Select B only if it is an actual event in the plant

B.______Line 1 Number each verbal initial and follow-up messages sequentially starting at 001 for the first verbal message.

C. Line 2 Notification time to be completed by ENN communicator just prior to making the ENN notification

D.______Line 4 Enter the EAL number as listed in EIP-9.2 Example RA1, FS1 etc.

E.______Line 5 Refer to NMP-EP-109, Protective Action Recommendations to determine appropriate Protective Action Recommendations (PARs). Mark box B or C and the appropriate zones for evacuation or sheltering. Box D is pre marked Mark and complete box E if PAR 4 is required or there are other PARS beyond NMP-EP-109.

F.______Line 6 An emergency release is occurring if an effluent monitor has increased by a factor of 10 over and above normal operating levels OR is in alarm. The effluent monitors are R-18, R-23B, R-15, R-14, R-22. R-60 (A,B,C,D) and R-29B(NG)

- Mark box A if no emergency release is in progress or has occurred
- Mark box B if an emergency release is in progress
- Mark box C if an emergency release has occurred, but is currently stopped

G.______Line 7 Release Significance. Mark box A, B, C or D. Normal limits are being exceeded if an effluent monitor listed in step F above is in alarm

- Mark box A if 6A is marked
- Mark box B if 6B or 6C is marked and **NO** effluent monitor is or has been in alarm.
- Mark box C if 6B or 6C is marked and **ANY** effluent monitor is or has been in alarm.
- Mark box D if 6B or 6C is marked and it can not be determined if an effluent monitor is or has been in alarm.

GUIDELINE 1
GENERAL EMERGENCY
RED VERBAL NOTIFICATION FORM

H.______Line 8 Event Prognosis. Mark box A, B or C.

- A should be marked if mitigation efforts appear successful , progressing toward termination/recovery.
- B should be marked if escalation to a higher classification is unlikely based on current conditions.
- C should be marked if escalation to a higher emergency classification or PAR change is likely.

I.______Line 9 Meteorological Data

- Fill in the meteorological data required (35 foot elevation preferred).
- When possible use 15 minute average data, available from EP_WEATHER.
- If stability class is not available it can be calculated from delta temperature from the below table

ΔT (200' elev. temp, °F - 35' elev. temp, °F)	Stability Class
<-1.74	A
-1.74 to <-1.56	B
-1.56 to <-1.38	C
-1.38 to <-0.46	D
-0.46 to < 1.38	E
1.38 t o 3.60	F
>3.60	G

J.______Line 10 Time is for the declaration checked in line 4

K.______Line 11 Mark the unit that is involved with the emergency declaration, or all if both units are affected.

L.______Line 12 Fill in the per cent power or the time of shutdown for units involved with the event

M.______Line 13 If additional remarks are required mark the box for additional remarks and write them on a separate paper and have them read over the ENN, or mark the box for no additional remarks

N.______The Emergency Director must sign the form with time and date.

0. Within 15 minutes of declaration time, using the ENN contact the state and local agencies listed below.

P.______Verify the Southern LINC ENN Radio being used is turned on

Q.______If the Southern LINC display does not show "WIDE AREA, FEP ENN" when group is pressed in step R, THEN perform the following:

- Press the button with the square until the top line is indicated, then press the arrow buttons until "WIDE AREA" is displayed, then press the button under OK. Press the button with the square until the second line is indicated then press the arrow buttons until "FEP ENN" is displayed, and then press the button under OK.

R______Press group pushbutton, verify display shows WIDE AREA, FEP ENN. Correct per above step if necessary. Pickup handset or leave in cradle, press to talk (PTT), wait for the chirp and announce "This is name/title at Farley Nuclear Plant. Please obtain a GENERAL EMERGENCY RED initial notification form and monitor the ENN." Release the PTT.

S.______Contact one state and county agency listed in each of the four boxes below.

Indicate the time of initial attempt to contact any Alabama agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Alabama agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

ALABAMA State Agencies In preferred order

- Alabama Radiation Control at Montgomery EOC. ENN (1305), OPX (6628), (334-206-5391), (334-324-0076)
- AEMA ENN (1306), OPX(6619), (205-280-2312, 205-280-2310)
- Alabama Radiation Control at Alabama Forward EOC, ENN (1307), OPX 6621), (334-793-1565)
- HOUSTON COUNTY ENN (1307), OPX (6621), (334-794-9720, 793-9655, 677-4807, 4808)

Time________Name____________________________Acknowledged □

GUIDELINE 1
GENERAL EMERGENCY
RED VERBAL NOTIFICATION FORM

Indicate the time of initial attempt to contact any Georgia agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Georgia agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

GEORGIA State Agencies In preferred order
- GEMA at Atlanta EOC, ENN (1304), OPX (6629), (404-635-7200)
- GEMA at Georgia Forward EOC, ENN (1308) OPX (6626), (229-723-4826)
- EARLY COUNTY, ENN(1308) OPX (6622),(229-723-3577, 3578, 4826)

Time________Name____________________________Acknowledged ☐

Indicate the time of initial attempt to contact Houston County. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request Houston County acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

HOUSTON COUNTY
- HOUSTON COUNTY, ENN(1307), OPX (6621), (334-794-9720, 793-9655, 334-677-4807, 4808)

Time________Name____________________________Acknowledged ☐

Indicate the time of initial attempt to contact Early County. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request Early County acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

EARLY COUNTY
- EARLY COUNTY, ENN(1308) OPX (6622), (229-723-3577, 3578, 4826)

Time________Name____________________________Acknowledged ☐

T._____Fill in the date and time on line 2 using the time that the first state agency contact ATTEMPT was made

U._____PTT and announce on the ENN "**Please prepare to receive a GENERAL EMERGENCY, RED initial notification message with acknowledgment**", then slowly read the GE initial notification form over the ENN. Release the PTT after reading two or three lines to allow individuals to respond.

V._____Have the agencies contacted above, acknowledge receipt of the message and fill in the acknowledge checkbox above when they do.

W._____If any required agency could not be contacted on the ENN, then use numbers listed with each agency or in FNP-0-EIP-8.1 to contact them by any available means as soon as possible.

X_____Fax a copy of the previous page GENERAL EMERGENCY RED VERBAL NOTIFICATION FORM to the State of Florida, EOF using speed dial #10

Y._____Wait for the Fax report indicating the fax was received then verify the state of Florida has received the Fax by calling. (800-320-0519) (850-413- 9911)

GUIDELINE 2

SITE AREA EMERGENCY

I. Purpose of Classification

The classification of Site Area Emergency applies to those events which are in progress or have occurred involving actual or likely major failures of plant functions needed for protection of the public from radiation or contamination or HOSTILE ACTION that results in intentional damage or malicious acts; (1) toward site personnel or equipment that could lead to the likely failure of or; (2) that prevent effective access to equipment needed for the protection of the public. The potential for release of radioactive material for the Site Area Emergency classification is up to 1000 Ci of I-131 equivalent, or 10^4 to 10^6 Ci of Xe-133 equivalent. The purpose of the declaration of a Site Area Emergency is to:

(a) Assure that response centers are manned,

(b) Assure that monitoring teams are dispatched,

(c) Assure that personnel involved in an evacuation effort of near site areas are at their duty stations if the situation worsens, and,

(d) Provide current information for and consultation with offsite authorities and the public.

(e) A Site Area Emergency would be declared for plant conditions that warrant activation of emergency centers and monitoring teams.

A Site Area Emergency would be declared Based on FNP-0-EIP-9.2

II. Emergency Director Actions

NOTE: THE SHIFT MANAGER SHALL PERFORM THE DUTIES OF THE EMERGENCY DIRECTOR UNTIL HIS ARRIVAL AND ASSUMPTION OF DUTIES.

<u>Initials</u>

A Notify personnel on site

____ 1. If the plant emergency alarm has not already been activated, then announce over the public address system, "All plant personnel report to designated assembly areas", activate the PEA for 30 seconds, then repeat announcement.

____ 2. Announce the condition, request setup of the TSC and OSC, and give needed evacuation instructions over plant public address system.

GUIDELINE 2

SITE AREA EMERGENCY

B. Callout the ERO staff

_____ 1. Activate the ERO callout system per FNP-0-EIP-8.3, Table 2. (located in the Unit 2 SS desk)

C Complete Notification form

_____ 1.. Fill in the SITE AREA Emergency Initial Notification Form (last pages of this guideline).

NOTE:	**INITIAL NOTIFICATIONS WILL NORMALLY BE MADE BY THE OPERATIONS SHIFT COMMUNICATOR, BUT MAY BE MADE BY OPERATIONS STAFF, TSC STAFF OR OTHER QUALIFIED PERSON USING THE INITIAL NOTIFICATION FORM (LAST PAGES OF THIS GUIDELINE).**
NOTE:	**INITIAL AND UPGRADE CLASSIFICATIONS AND NOTIFICATIONS SHOULD BE DONE FROM THE CONTROL ROOM OR THE TSC, WITH THE EOF INFORMED AS SOON AS POSSIBLE.**

D. Initial Notifications

______1. Within 15 minutes of declaration verbally notify the state agencies using the Site Area Emergency Initial Notification Form (last pages of this guideline).

______2. Verify notifications complete and documented on the Site Area Emergency Initial Notification Form (last pages of this guideline).

______3. Complete Figure 6, follow-up message. Instructions for completing the form are available as part of the Figure.

______4. Within one hour of the Site Area Emergency Initial Notification Form (Verbal Notification) transmittal, fax Figure 6, follow-up message to state and local agencies. The goal should be within 30 minutes of the verbal notification.

______5. Complete Figure 5, NRC notification message. Instructions for completing the form are available in Figure 5.

______6. Provide the information on Figure 5, to the NRC as soon as possible, but within one hour of the declaration per the instructions on Figure 5.

E. Emergency Organization Notifications

_____ 1. On-call Emergency Director

GUIDELINE 2

SITE AREA EMERGENCY

_____ 2. On-call EOF Manager

_____ 3. SNC Duty Manager

_____ 4. Notify Security of Emergency, incoming personnel and access restrictions (4611).

F. Other Notifications

_____ 1. Have Regulatory ERDS activated to transmit data to the NRC within one hour of the declaration of the emergency (EIP 8.3, step 10).

_____ 2. If personnel injury or fire is involved, refer to FNP-0-EIP-11.0 and 13.0 respectively for additional actions and EIP-8.0 steps 5.0 and 6.0 for additional notifications.

_____ 3. U.S. Army EOD group at Fort Benning, GA, if necessary.

_____ 4. Savannah River Operations Office, if necessary.

_____ 5. If there is a security event involved, ensure appropriate notifications and actions of FNP-0-AOP-49 and FNP-0-SP 37.0 are performed.

_____ 6. If there is a security event involved and access to the plant from off site is restricted by local law enforcement (LLE) and it is desired to bring a plant employee to the site or additional off site resources such as fire departments or law enforcement then perform the following:
- Contact the Houston County EMA to arrange a route and provide the names of individuals or resources that require access to the plant for relay to LLE.
- In conjunction with Houston County EMA determine on site and off site staging areas for off-site resources using Appendix 1
- Inform the individuals and resources that are coming to the site of the required route to the site. Individuals must have a company picture ID to get through the roadblocks

G. In Plant Protective Actions

_____ 1. Ensure personnel accountability per EIP-10.0.

_____ 2. Plan and initiate reentries per EIP-14.0.

_____ 3. Ensure proper Control Room response.

_____ 4. Assign an individual to provide periodic plant status updates.

GUIDELINE 2

SITE AREA EMERGENCY

_____ 5. Assign an individual to maintain a log of important Emergency Director activities.

_____ 6. Assign an individual to keep a record of all off site communications.

_____ 7. Determine what should be done with a unit that is not affected by the declared emergency. Consider the effect on the emergency unit, manpower utilization, plant and grid stability and other relevant factors.

______8. In the event of mass casualties refer to FNP-0-EIP-11.0 step 15 to arrange for triage and additional ambulances.

H. Off Site Support

_____ 1. Ensure Field Monitoring teams have been dispatched per EIP-4.0.

_____ 2. Provide information to the EOF Manager for use in press releases and recovery planning.

I. Information to Off Site Authorities

_____ 1. Provide periodic plant status updates, meteorological and dose estimates and release projections based on plant conditions and foreseeable contingencies.

J. Re-Assess plant conditions

_____ 1. Continue to assess plant and radiological conditions to ensure the correct emergency classification is declared.

_____ 2. If a higher emergency classification is required immediately go to the appropriate guideline.

_____ 3. If plant and radiological conditions no longer require the current emergency classification terminate the emergency class using FNP-0-EIP-28.0.

K. Long term concerns

_____ 1. Within 8 hours, provide for full TSC and OSC reliefs.

_____ 2. Within 16 hours, provide for 24 hour TSC and OSC coverage.

_____ 3. If an LOSP has occurred evaluate the event to ensure that an adequate supply of fuel oil is available for the Diesel Generators for 7 days. Refer to REA 00-2337 and FNP-0-SOP-42.0 Figure 1.

GUIDELINE 2

SITE AREA EMERGENCY

L. Protective action recommendation guidance

a. Protective Action Recommendations other than NONE should not be made for a Site Area Emergency..

b. If it is determined that PARs are required, then the emergency classification should be upgraded to a General Emergency

GUIDELINE 2
SITE AREA EMERGENCY
ORANGE VERBAL NOTIFICATION FORM

1. A DRILL B ACTUAL EVENT MESSAGE # _______
2. A INITIAL NOTIFICATION: TIME____________ DATE___/___/___ AUTHENTICATION # **N/A**
3. SITE: **FARLEY NUCLEAR PLANT** (334) 814-4662, 814-4663
Confirmation Phone # (334) 794-0800, 899-5156 (ext 4662, 4663)
4. EMERGENCY CLASSIFICATION: C SITE AREA EMERGENCY
BASED ON EAL #__________
5. PROTECTIVE ACTION RECOMMENDATIONS: A NONE
6. EMERGENCY RELEASE: A None B Is Occurring C Has Occurred
7. RELEASE SIGNIFICANCE: A Not applicable B Within normal operating limits C Above normal operating limits D Under evaluation
8. EVENT PROGNOSIS: A Improving B Stable C Degrading
9. METEOROLOGICAL DATA: Wind Direction from _______ degrees Wind Speed _______ mph
35 foot elevation preferred Precipitation _______ Stability Class A B C D E F G
10. A DECLARATION Time ____________ Date ___/___/___
11. AFFECTED UNIT(S): 1 2 All
12. UNIT STATUS: A U1 _____% Power Shutdown at Time __________ Date ___/___/___
(Unaffected Unit(s) Status Not Required for Initial Notifications) B U2 _____% Power Shutdown at Time __________ Date ___/___/___
13. REMARKS: ☐ No additional remarks ☐ read additional remarks on separate page

17. APPROVED BY: ____________________ Title Emergency Director Time ______ Date___/___/___

NOTE: The information that is highlighted on this form must be correct for the notification to be considered correct.

A.______Line 1 check box A or B. Select B only if it is an actual event in the plant

B.______Line 1 Number each verbal initial and follow-up messages sequentially starting at 001 for the first verbal message.

C. Line 2 Notification time to be completed by ENN communicator just prior to making the ENN notification

D.______Line 4 Enter the EAL number as listed in the EIP-9.2. Example RA1, FS1 etc.

E.______Line 5 There are no Protective Action Recommendations (PARS) for a Site Area Emergency and box A, NONE is marked.

F.______Line 6 An emergency release is occurring if an effluent monitor has increased by a factor of 10 over and above normal operating levels OR is in alarm. The effluent monitors are R-18, R-23B, R-15, R-14, R-22 R-60 (A,B,C,D)and R-29B(NG)

- Mark box A if no emergency release is in progress or has occurred
- Mark box B if an emergency release is in progress
- Mark box C if an emergency release has occurred, but is currently stopped

G.______Line 7 Release Significance. Mark box A, B, C or D. Normal limits are being exceeded if an effluent monitor listed in step F above is in alarm

- Mark box A if 6A is marked
- Mark box B if 6B or 6C is marked and **NO** effluent monitor is or has been in alarm.
- Mark box C if 6B or 6C is marked and **ANY** effluent monitor is or has been in alarm.
- Mark box D if 6B or 6C is marked and it can not be determined if an effluent monitor is or has been in alarm.

H.______Line 8 Event Prognoses. Mark box A, B or C.

- A should be marked if mitigation efforts appear successful, progressing toward termination/recovery.
- B should be marked if escalation to a higher classification is unlikely based on current conditions.
- C should be marked if escalation to a higher emergency classification or PAR change is likely.

GUIDELINE 2
SITE AREA EMERGENCY
ORANGE VERBAL NOTIFICATION FORM

I. Line 9 Meteorological Data
- Fill in the meteorological data required (35 foot elevation preferred).
- When possible use 15 minute average data, available from the EP_WEATHER.
- If stability class is not available it can be calculated from delta temperature from the below table

ΔT (200' elev. temp, °F - 35' elev. temp, °F)	Stability Class
<-1.74	A
-1.74 to <-1.56	B
-1.56 to <-1.38	C
-1.38 to <-0.46	D
-0.46 to < 1.38	E
1.38 t o 3.60	F
>3.60	G

J.______Line 10 Time is for the declaration checked in line 4
K.______Line 11 Mark the unit that is involved with the emergency declaration, or all if both units are affected.
L.______Line 12 Fill in the per cent power or the time of shutdown for units involved with the event
M.______Line 13 If additional remarks are required mark the box for additional remarks and write them on a separate paper and have them read over the ENN, or mark the box for no additional remarks
N.______The Emergency Director must sign the form with time and date.
0. Within 15 minutes of declaration time, using the ENN contact the state and local agencies listed below.
P.______Verify the Southern LINC ENN Radio being used is turned on
Q.______If the Southern LINC display does not show "WIDE AREA, FEP ENN" when group is pressed in step R, THEN perform the following:
- Press the button with the square until the top line is indicated, then press the arrow buttons until "WIDE AREA" is displayed, then press the button under OK. Press the button with the square until the second line is indicated then press the arrow buttons until "FEP ENN" is displayed, and then press the button under OK.

R______Press group pushbutton, verify display shows WIDE AREA, FEP ENN. Correct per above step if necessary. Pickup handset or leave in cradle, press to talk (PTT), wait for the chirp and announce "This is name/title at Farley Nuclear Plant. Please obtain a SITE AREA EMERGENCY ORANGE initial notification form and monitor the ENN." Release the PTT.

S.______Contact one state agency listed in each of the two boxes below.

Indicate the time of initial attempt to contact any Alabama agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Alabama agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

ALABAMA State Agencies In preferred order
- Alabama Radiation Control at Montgomery EOC. ENN (1305), OPX (6628), (334-206-5391), (334-324-0076)
- AEMA ENN (1306), OPX(6619), (205-280-2312, 205-280-2310)
- Alabama Radiation Control at Alabama Forward EOC, ENN (1307), OPX 6621), (334-793-1565)
- HOUSTON COUNTY ENN (1307), OPX (6621), (334-794-9720, 793-9655, 677-4807, 4808)

Time________Name____________________________Acknowledged □

GUIDELINE 2
SITE AREA EMERGENCY
ORANGE VERBAL NOTIFICATION FORM

Indicate the time of initial attempt to contact any Georgia agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Georgia agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

GEORGIA State Agencies In preferred order

- GEMA at Atlanta EOC, ENN (1304), OPX (6629), (404-635-7200)
- GEMA at Georgia Forward EOC, ENN (1308) OPX (6626), (229-723-4826)
- EARLY COUNTY, ENN(1308) OPX (6622),(229-723-3577, 3578, 4826)

Time________Name____________________________Acknowledged ☐

T._____Fill in the date and time on line 2 using the time that the first state agency contact ATTEMPT was made

U._____PTT and announce on the ENN "**Please prepare to receive a SITE AREA EMERGENCY, ORANGE initial notification message with acknowledgment**", then slowly read the SAE initial notification form over the ENN. Release the PTT after reading two or three lines to allow individuals to respond.

V._____Have the agencies contacted above, acknowledge receipt of the message and fill in the acknowledge checkbox above when they do.

W._____If any required agency could not be contacted on the ENN, then use numbers listed with each agency or in FNP-0-EIP-8.1 to contact them by any available means as soon as possible.

X_____Fax a copy of the previous page SITE AREA EMERGENCY ORANGE VERBAL NOTIFICATION FORM to the State of Florida, EOF using speed dial #10

Y._____Wait for the Fax report indicating the fax was received then verify the state of Florida has received the Fax by calling. (800-320-0519) (850-413- 9911)

GUIDELINE 3

ALERT

I. Purpose of Classification

The classification of Alert applies to situations in which events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of hostile action. The potential for release of radioactive material for the Alert classification is up to 10 curies of I-131 equivalent, or up to 10^4 curies of Xe-133 equivalent. The purpose of offsite alert is to assure that emergency personnel are readily available to respond if the situation becomes more serious or to perform confirmatory radiation monitoring, if required, and to provide offsite authorities current status information for possible further action.

(a) An Alert would be declared for plant conditions that warrant precautionary activation of the technical support center, operations support centers, and the Emergency Operations Facility.

An Alert would be declared based on FNP-0-EIP-9.2

II. Emergency Director Actions

NOTE: THE SHIFT MANAGER SHALL PERFORM THE DUTIES OF THE EMERGENCY DIRECTOR UNTIL HIS ARRIVAL AND ASSUMPTION OF DUTIES.

A Notify personnel on site

____ 1. If the Plant Emergency alarm has not already been activated, then announce over the public address system "All Plant Personnel Report to Designated Assembly Area," activate the PEA for 30 seconds and repeat the announcement.

____ 2. Announce the classification and the condition, request setup of the TSC and OSC, and give needed evacuation instructions over plant public address system.

B. Callout the ERO staff

____ 1.. Activate the ERO callout system per FNP-0-EIP-8.3, Table 2. (located in the Unit 2 SS desk)

C Complete Notification form

____ 1. Fill in the ALERT Initial Notification Form (last pages of this guideline).

GUIDELINE 3

ALERT

NOTE:	**INITIAL NOTIFICATIONS WILL NORMALLY BE MADE BY THE OPERATIONS SHIFT COMMUNICATOR, BUT MAY BE MADE BY OPERATIONS STAFF, TSC STAFF OR OTHER QUALIFIED PERSON USING THE INITIAL NOTIFICATION FORM (LAST PAGES OF THIS GUIDELINE).**
NOTE:	**INITIAL AND UPGRADE CLASSIFICATIONS AND NOTIFICATIONS SHOULD BE DONE FROM THE CONTROL ROOM OR THE TSC, WITH THE EOF INFORMED AS SOON AS POSSIBLE.**

D. Initial Notifications

______1. Within 15 minutes of declaration, verbally notify the state and local agencies using the Alert Initial Notification Form (last pages of this guideline).

______2. Verify notifications complete and documented on the Alert Initial Notification Form (last pages of this guideline).

______3. Complete Figure 6, follow-up message. Instructions for completing the form are available as part of the figure.

______4. Within one hour of the Alert Initial Notification Form (Verbal Notification) transmittal, fax Figure 6, follow-up message to state and local agencies. The goal should be within 30 minutes of the verbal notification.

______5. Complete Figure 5, NRC notification message. Instructions for completing the form are available in Figure 5.

______6. Provide the information on Figure 5, to the NRC as soon as possible, but within one hour of the declaration per the instructions on Figure 5.

E. Emergency Organization Notifications

_____ 1. On-call Emergency Director

_____ 2. On-call EOF Manager

_____ 3. SNC Duty Manager

_____ 4. Notify Security of Emergency, incoming personnel and access restrictions. (4611)

F. Other Notifications

_____ 1. Have Regulatory ERDS activated to transmit data to the NRC within one hour of the declaration of the emergency (EIP-8.3, step 10)

GUIDELINE 3

ALERT

_____ 2. If personnel injury or fire is involved, refer to FNP-0-EIP-11.0 and 13.0 respectively for additional actions and EIP-8.0 steps 5.0 and 6.0 for additional notifications

_____ 3. U.S. Army EOD group at Fort Benning, GA, if necessary

_____ 4. Savannah River Operations Office, if necessary

_____ 5. If there is a security event involved, ensure appropriate notifications and actions of FNP-0-AOP-49 and FNP-0-SP 37.0 are performed

_____ 6. If there is a security event involved and access to the plant from off site is restricted by local law enforcement (LLE) and it is desired to bring a plant employee to the site or additional off site resources such as fire departments or law enforcement then perform the following:
- Contact the Houston County EMA to arrange a route and provide the names of individuals that require access to the plant for relay to LLE.
- In conjunction with Houston County EMA determine on site and off site staging areas for off-site resources using Appendix 1
- Inform the individuals and resources that are coming to the site of the required route to the site. Individuals must have a company picture ID to get through the roadblocks

G. In Plant Protective Actions

_____ 1. Ensure personnel accountability per EIP-10.0.

_____ 2. Plan and initiate re-entries per EIP-14.0.

_____ 3. Ensure proper Control Room response

_____ 4. Assign an individual to provide periodic plant status updates

_____ 5. Assign an individual to maintain a log of important Emergency Director activities

_____ 6. Assign an individual to keep a record of all off site communications

_____ 7. Determine what should be done with a unit that is not affected by the declared emergency. Consider the effect on the emergency unit, manpower utilization, plant and grid stability, and other relevant factors.

GUIDELINE 3

ALERT

______8. In the event of mass casualties refer to FNP-0-EIP-11.0 step 15 to arrange for triage and additional ambulances.

H. Off Site Support

_____ 1. Ensure Field Monitoring teams have been dispatched per EIP 4.0.

_____ 2. Provide information to the EOF Manager for use in press releases and recovery planning

I. Information to Off Site Authorities

_____ 1. Provide periodic plant status updates, meteorological and dose estimates and release projections based on plant conditions and foreseeable contingencies.

J. Re-Assess plant conditions

_____ 1. Continue to assess plant and radiological conditions to ensure the correct emergency classification is declared.

_____ 2. If a higher emergency classification is required immediately go to the appropriate guideline

_____ 3. If plant and radiological conditions no longer require the current emergency classification terminate the emergency class using FNP-0-EIP-28.0.

K. Long term concerns

_____ 1. Within 8 hours, provide for full TSC and OSC reliefs

_____ 2. Within 16 hours, provide for 24 hour TSC and OSC coverage

_____ 3. If an LOSP has occurred evaluate the event to ensure that an adequate supply of fuel oil is available for the Diesel Generators for 7 days. Refer to REA 00-2337 and FNP-0-SOP-42.0 Figure 1.

L. Protective action recommendation guidance

_____ 1. Protective Action Recommendations are not required. Block A of line 5 on the notification form should be checked.

GUIDELINE 3

ALERT

YELLOW VERBAL NOTIFICATION FORM

1. A DRILL B ACTUAL EVENT MESSAGE # _______
2. A INITIAL NOTIFICATION: TIME____________DATE___/___/___AUTHENTICATION # **N/A**
3. SITE: **FARLEY NUCLEAR PLANT** Confirmation Phone # (334) 814-4662, 814-4663 (334) 794-0800, 899-5156 (ext 4662, 4663)
4. EMERGENCY CLASSIFICATION: B ALERT
   BASED ON EAL #____________
5. PROTECTIVE ACTION RECOMMENDATIONS: A NONE
6. EMERGENCY RELEASE: A None B Is Occurring C Has Occurred
7. RELEASE SIGNIFICANCE: A Not applicable B Within normal operating limits C Above normal operating limits D Under evaluation
8. EVENT PROGNOSIS: A Improving B Stable C Degrading
9. METEOROLOGICAL DATA: Wind Direction from _______ degrees Wind Speed _______mph
   35 foot elevation preferred Precipitation _______ Stability Class A B C D E F G
10. A DECLARATION Time ______________ Date ____/____/____
11. AFFECTED UNIT(S): 1 2 All
12. UNIT STATUS: (Unaffected Unit(s) Status Not Required for Initial Notifications)
    A U1 _____% Power Shutdown at Time ____________ Date ___/_____/____
    B U2 _____% Power Shutdown at Time ____________ Date ___/_____/____
13. REMARKS: ☐ No additional remarks ☐ read additional remarks on separate page

17. APPROVED BY: ______________________ Title Emergency Director Time ______Date___/___/_____

NOTE: The information that is highlighted on this form must be correct for the notification to be considered correct.

A.______Line 1 check box A or B. Select B only if it is an actual event in the plant

B.______Line 1 Number each verbal initial and follow-up messages sequentially starting at 001 for the first verbal message.

C. Line 2 Notification time to be completed by ENN communicator just prior to making the ENN notification

D.______Line 4 Enter the EAL number as listed in the EIP-9.2. Example RA1, FS1 etc.

E.______Line 5 Normally there are no Protective Action Recommendations (PARS) for an Alert and box A, NONE should be marked.

F.______Line 6 An emergency release is occurring if an effluent monitor has increased by a factor of 10 over and above normal operating levels OR is in alarm. The effluent monitors are R-18, R-23B, R-15, R-14, R-22 and R029B(NG)

- Mark box A if no emergency release is in progress or has occurred
- Mark box B if an emergency release is in progress
- Mark box C if an emergency release has occurred, but is currently stopped

G.______Line 7 Release Significance. Mark box A, B, C or D. Normal limits are being exceeded if an effluent monitor listed in step F above is in alarm

- Mark box A if 6A is marked
- Mark box B if 6B or 6C is marked and **NO** effluent monitor is or has been in alarm.
- Mark box C if 6B or 6C is marked and **ANY** effluent monitor is or has been in alarm.
- Mark box D if 6B or 6C is marked and it can not be determined if an effluent monitor is or has been in alarm.

H.______Line 8 Event Prognoses. Mark box A, B or C.

- A should be marked if mitigation efforts appear successful, progressing toward termination/recovery.
- B should be marked if escalation to a higher classification is unlikely based on current conditions.
- C should be marked if escalation to a higher emergency classification or PAR change is likely.

GUIDELINE 3
ALERT
YELLOW VERBAL NOTIFICATION FORM

I.______Line 9 Meteorological Data
- Fill in the meteorological data required (35 foot elevation preferred).
- When possible use 15 minute average data, available from the EP_WEATHER.
- If stability class is not available it can be calculated from delta temperature from the below table

ΔT (200' elev. temp, °F - 35' elev. temp, °F)	Stability Class
<-1.74	A
-1.74 to <-1.56	B
-1.56 to <-1.38	C
-1.38 to <-0.46	D
-0.46 to < 1.38	E
1.38 to 3.60	F
>3.60	G

J.______Line 10 Time is for the declaration checked in line 4
K.______Line 11 Mark the unit that is involved with the emergency declaration, or all if both units are affected.
L.______Line 12 Fill in the per cent power or the time of shutdown for units involved with the event
M.______Line 13 If additional remarks are required mark the box for additional remarks and write them on a separate paper and have them read over the ENN, or mark the box for no additional remarks
N.______The Emergency Director must sign the form with time and date.
0. Within 15 minutes of declaration time, using the ENN contact the state and local agencies listed below.
P.______Verify the Southern LINC ENN Radio being used is turned on
Q.______If the Southern LINC display does not show "WIDE AREA, FEP ENN" when group is pressed in step R, THEN perform the following:
- Press the button with the square until the top line is indicated, then press the arrow buttons until "WIDE AREA" is displayed, then press the button under OK. Press the button with the square until the second line is indicated then press the arrow buttons until "FEP ENN" is displayed, and then press the button under OK.

R______Press group pushbutton, verify display shows WIDE AREA, FEP ENN. Correct per above step if necessary. Pickup handset or leave in cradle, press to talk (PTT), wait for the chirp and announce "This is name/title at Farley Nuclear Plant. Please obtain a ALERT YELLOW initial notification form and monitor the ENN." Release the PTT.
S.______Contact one state agency listed in each of the two boxes below.

Indicate the time of initial attempt to contact any Alabama agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Alabama agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

ALABAMA State Agencies In preferred order
- Alabama Radiation Control at Montgomery EOC. ENN (1305), OPX (6628), (334-206-5391), (334-324-0076)
- AEMA <u>ENN (1306), OPX(6619), (205-280-2312, 205-280-2310)</u>
- Alabama Radiation Control at Alabama Forward EOC, ENN (1307), OPX 6621), (334-793-1565)
- HOUSTON COUNTY <u>ENN (1307),</u> OPX (6621), (334-794-9720, 793-9655<u>, 677-4807, 4808)</u>

Time_________Name_____________________________Acknowledged □

GUIDELINE 3
ALERT
YELLOW VERBAL NOTIFICATION FORM

Indicate the time of initial attempt to contact any Georgia agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Georgia agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

GEORGIA State Agencies In preferred order

- GEMA at Atlanta EOC, ENN (1304), OPX (6629), (404-635-7200)
- GEMA at Georgia Forward EOC, ENN (1308) OPX (6626), (229-723-4826)
- EARLY COUNTY, ENN(1308) OPX (6622),(229-723-3577, 3578, 4826)

Time________Name___________________________Acknowledged ☐

T._____Fill in the date and time on line 2 using the time that the first state agency contact ATTEMPT was made

U._____PTT and announce on the ENN "**Please prepare to receive an ALERT, YELLOW initial notification message with acknowledgment**", then slowly read the ALERT initial notification form over the ENN. Release the PTT after reading two or three lines to allow individuals to respond.

V._____Have the agencies contacted above, acknowledge receipt of the message and fill in the acknowledge checkbox above when they do.

W._____If any required agency could not be contacted on the ENN, then use numbers listed with each agency or in FNP-0-EIP-8.1 to contact them by any available means as soon as possible.

X_____Fax a copy of the previous page ALERT YELLOW VERBAL NOTIFICATION FORM to the State of Florida, EOF using speed dial #10

Y._____Wait for the Fax report indicating the fax was received then verify the state of Florida has received the Fax by calling. (800-320-0519) (850-413- 9911)

GUIDELINE 4

NOUE

I. Purpose of Classification

The classification of Notification of Unusual Event applies to situations in which events are in process or have occurred which could indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occur.

(a) A NOTIFICATION OF UNUSUAL EVENT would be required for any plant condition that warrants increased awareness on the part of state and/or local offsite authorities or involve other than normal plant shutdown.

A Notification of Unusual Event would be declared based on FNP-0-EIP-9.2

II. Emergency Director Actions

NOTE: THE SHIFT MANAGER SHALL PERFORM THE DUTIES OF THE EMERGENCY DIRECTOR UNTIL HIS ARRIVAL AND ASSUMPTION OF DUTIES.

Initials

A Notify personnel on site

_____ 1. Announce the classification and condition and give needed evacuation instructions over plant public address system.

_____ 2. Evacuate affected areas of the plant as appropriate.

B. Callout the ERO staff as appropriate

_____ 1.. Activate the ERO callout system per FNP-0-EIP-8.3, Table 2. (located in the Unit 2 SS desk) if it is desired to callout the entire TSC and EOF staff. For partial staffing refer to steps E1 and E2 and the note above E1.

C Complete Notification form

_____ 1.. Fill in the NOUE Initial Notification Form (last pages of this guideline).

GUIDELINE 4

NOUE

NOTE:	**INITIAL NOTIFICATIONS WILL NORMALLY BE MADE BY THE OPERATIONS SHIFT COMMUNICATOR, BUT MAY BE MADE BY OPERATIONS STAFF, TSC STAFF OR OTHER QUALIFIED PERSON USING THE INITIAL NOTIFICATION FORM (LAST PAGES OF THIS GUIDELINE).**
NOTE:	**INITIAL AND UPGRADE CLASSIFICATIONS AND NOTIFICATIONS SHOULD BE DONE FROM THE CONTROL ROOM OR THE TSC, WITH THE EOF INFORMED AS SOON AS POSSIBLE.**

D. Initial Notifications

______1. Within 15 minutes of declaration, verbally notify the state and local agencies using the NOUE Initial Notification Form (last pages of this guideline).

______2. Verify notifications complete and documented on the NOUE Initial Notification Form (last pages of this guideline).

______3. Complete Figure 6, follow-up message. Instructions for completing the form are available as part of the figure.

______4. Within one hour of the NOUE Initial Notification Form (Verbal Notification) transmittal, fax Figure 6, follow-up message to state and local agencies. The goal should be within 30 minutes of the verbal notification.

______5. Complete Figure 5, NRC notification message. Instructions for completing the form are available in Figure 5.

______6. Provide the information on Figure 5, to the NRC as soon as possible, but within one hour of the declaration per the instructions on Figure 5.

E. Emergency Organization Notifications

NOTE:	**TABLE 2 PROVIDES GUIDANCE AS TO THE REQUIRED LEVEL OF ACTIVATION OF THE TSC AND EOF. LEVEL OF ACTIVATION, IF ANY, IS AT THE DISCRETION OF THE ED/EOF MANAGER. SEE EIP-6 FOR GUIDANCE. THE COMPLETE EOF AND TSC STAFF CAN BE CALLED OUT USING THE ERO CALLOUT SYSTEM PER FNP-0-EIP-8.3, TABLE 2 IF DESIRED.**

____ 1. TSC Staff, if activated by the ED

____ 2. EOF Staff, if activated by the EOF Manager

GUIDELINE 4

NOUE

_____ 3. On-call Emergency Director

_____ 4. On-call EOF Manager

_____ 5. SNC Duty Manager

_____ 6. Notify Security of Emergency, incoming personnel and access restrictions (4611).

F. Other Notifications

_____ 1. If personnel injury or fire is involved, refer to FNP-0-EIP-11.0 and 13.0 respectively for additional notifications.

_____ 2. U.S. Army EOD group at Fort Benning, GA, if necessary

_____ 3. Savannah River Operations Office, if necessary

_____ 4. If there is a security event involved, ensure appropriate notifications and actions of FNP-0-AOP-49 and FNP-0-SP 37.0 are performed.

_____ 5. If there is a security event involved and access to the plant from off site is restricted by local law enforcement (LLE) and it is desired to bring a plant employee to the site or additional off site resources such as fire departments or law enforcement then perform the following:

- Contact the Houston County EMA to arrange a route and provide the names of individuals or resources that require access to the plant for relay to LLE.
- In conjunction with Houston County EMA determine on site and off site staging areas for off-site resources using Appendix 1
- Inform the individuals and resources that are coming to the site of the required route to the site. Individuals must have a company picture ID to get through the roadblocks

G. In Plant Protective Actions

_____ 1. Ensure personnel accountability per EIP-10.0, if any areas of the plant were evacuated due to hazardous conditions.

_____ 2. Plan and initiate re entries per EIP-14.0, if any areas of the plant were evacuated due to hazardous conditions.

_____ 3. Ensure proper Control Room response.

_____ 4. Assign an individual to provide periodic plant status updates.

GUIDELINE 4

NOUE

_____ 5. Assign an individual to maintain a log of important Emergency Director activities.

_____ 6. Assign an individual to keep a record of all off site communications.

_____ 7. Determine what should be done with a unit that is not affected by the declared emergency. Consider the effect on the emergency unit, manpower utilization, plant and grid stability, and other relevant factors.

______8. In the event of mass casualties refer to FNP-0-EIP-11.0 step 15 to arrange for triage and additional ambulances.

H. Off- Site Support

_____ 1. Ensure Field Monitoring teams have been dispatched per EIP-4.0 if a radiological release is suspected.

_____ 2. Provide information to the EOF Manager for use in press releases and recovery planning.

I. Information to Off-Site Authorities

_____ 1. Provide periodic plant status updates, meteorological and dose estimates and release projections based on plant conditions and foreseeable contingencies.

J. Re-Assess plant conditions

_____ 1. Continue to assess plant and radiological conditions to ensure the correct emergency classification is declared.

_____ 2. If a higher emergency classification is required immediately go to the appropriate guideline.

_____ 3. If plant and radiological conditions no longer require the current emergency classification terminate the emergency class using FNP-0-EIP-28.0.

K. Long term concerns

_____ 1. Within 8 hours, provide for full TSC and OSC reliefs.

_____ 2. Within 16 hours, provide for 24 hour TSC and OSC coverage.

GUIDELINE 4

NOUE

_____ 3. If an LOSP has occurred evaluate the event to ensure that an adequate supply of fuel oil is available for the Diesel Generators for 7 days. Refer to REA 00-2337 and FNP-0-SOP-42.0 Figure 1.

L. Protective action recommendation guidance

_____ 1. Protective Action Recommendations are not required. Block A of Line 5 on the notification form should be checked.

GUIDELINE 4
NOTIFICATION OF UNUSUAL EVENT
BLUE VERBAL NOTIFICATION FORM

1. A DRILL   B ACTUAL EVENT   MESSAGE # _______

2. A INITIAL   NOTIFICATION: TIME____________DATE___/___/___AUTHENTICATION # **N/A**

3. SITE: **FARLEY NUCLEAR PLANT**   (334) 814-4662, 814-4663
Confirmation Phone # (334) 794-0800, 899-5156 (ext 4662, 4663)

4. EMERGENCY CLASSIFICATION: A UNUSUAL EVENT
BASED ON EAL #__________

5. PROTECTIVE ACTION RECOMMENDATIONS: A NONE

6. EMERGENCY RELEASE: A None   B Is Occurring   C Has Occurred

7. RELEASE SIGNIFICANCE: A Not applicable   B Within normal operating limits   C Above normal operating limits   D Under evaluation

8. EVENT PROGNOSIS: A Improving   B Stable   C Degrading

9. METEOROLOGICAL DATA: Wind Direction from _______ degrees   Wind Speed _______mph
(35 foot elevation preferred)   Precipitation _______   Stability Class A B C D E F G

10. A DECLARATION   Time ____________ Date ____/____/____

11. AFFECTED UNIT(S): 1 2 All

12. UNIT STATUS:
(Unaffected Unit(s) Status Not Required for Initial Notifications)
A U1 _____% Power   Shutdown at Time ____________ Date ___/____/____
B U2 _____% Power   Shutdown at Time ____________ Date ___/____/____

13. REMARKS: ☐ No additional remarks   ☐ read additional remarks on separate page

17. APPROVED BY: ______________________   Title Emergency Director   Time ______Date___/___/____

NOTE: The information that is highlighted in grey on this form must be correct for the notification to be considered correct.

A._____Line 1 check box A or B. Select B only if it is an actual event in the plant

B._____Line 1 Number each verbal initial and follow-up messages sequentially starting at 001 for the first verbal message.

C. Line 2 Notification time to be completed by ENN communicator just prior to making the ENN notification

D._____Line 4 Enter the EAL number as listed in the guidelines. Example RA!, FS! etc.

E._____Line 5 Normally there are no Protective Action Recommendations (PARS) for a Notification of Unusual Event and box A, NONE should be marked.

F._____Line 6 An emergency release is occurring if an effluent monitor has increased by a factor of 10 over and above normal operating levels OR is in alarm. The effluent monitors are R-18, R-23B, R-15, R-14, R-22 R-60 (A,B,C,D)and R-29B(NG)

- Mark box A if no emergency release is in progress or has occurred
- Mark box B if an emergency release is in progress
- Mark box C if an emergency release has occurred, but is currently stopped

G._____Line 7 Release Significance. Mark box A, B, C or D. Normal limits are being exceeded if an effluent monitor listed in step F above is in alarm

- Mark box A if 6A is marked
- Mark box B if 6B or 6C is marked and **NO** effluent monitor is or has been in alarm.
- Mark box C if 6B or 6C is marked and **ANY** effluent monitor is or has been in alarm.
- Mark box D if 6B or 6C is marked and it can not be determined if an effluent monitor is or has been in alarm.

H._____Line 8 Event Prognoses. Mark box A, B or C.

- A should be marked if mitigation efforts appear successful, progressing toward termination/recovery.
- B should be marked if escalation to a higher classification is unlikely based on current conditions.
- C should be marked if escalation to a higher emergency classification or PAR change is likely.

GUIDELINE 4
NOTIFICATION OF UNUSUAL EVENT
BLUE VERBAL NOTIFICATION FORM

I.______Line 9 Meteorological Data
- Fill in the meteorological data required (35 foot elevation preferred).
- When possible use 15 minute average data, available from the EP_WEATHER.
- If stability class is not available it can be calculated from delta temperature from the below table

ΔT (200' elev. temp, °F - 35' elev. temp, °F)	Stability Class
<-1.74	A
-1.74 to <-1.56	B
-1.56 to <-1.38	C
-1.38 to <-0.46	D
-0.46 to < 1.38	E
1.38 t o 3.60	F
>3.60	G

J.______Line 10 Time is for the declaration checked in line 4
K.______Line 11 Mark the unit that is involved with the emergency declaration, or all if both units are affected.
L.______Line 12 Fill in the per cent power or the time of shutdown for units involved with the event
M.______Line 13 If additional remarks are required mark the box for additional remarks and write them on a separate paper and have them read over the ENN, or mark the box for no additional remarks
N.______The Emergency Director must sign the form with time and date.
0. Within 15 minutes of declaration time, using the ENN contact the state and local agencies listed below.
P.______Verify the Southern LINC ENN Radio being used is turned on
Q.______If the Southern LINC display does not show "WIDE AREA, FEP ENN" when group is pressed in step R, THEN perform the following:
- Press the button with the square until the top line is indicated, then press the arrow buttons until "WIDE AREA" is displayed, then press the button under OK. Press the button with the square until the second line is indicated then press the arrow buttons until "FEP ENN" is displayed, and then press the button under OK.

R______Press group pushbutton, verify display shows WIDE AREA, FEP ENN. Correct per above step if necessary. Pickup handset or leave in cradle, press to talk (PTT), wait for the chirp and announce "This is name/title at Farley Nuclear Plant. Please obtain a Notification Of Unusual Event blue initial notification form and monitor the ENN." Release the PTT.
S.______Contact one state agency listed in each of the two boxes below.

Indicate the time of initial attempt to contact any Alabama agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Alabama agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

ALABAMA State Agencies In preferred order
- Alabama Radiation Control at Montgomery EOC. ENN (1305), OPX (6628), (334-206-5391), (334-324-0076)
- AEMA ENN (1306), OPX(6619), (205-280-2312, 205-280-2310)
- Alabama Radiation Control at Alabama Forward EOC, ENN (1307), OPX 6621), (334-793-1565)
- HOUSTON COUNTY ENN (1307), OPX (6621), (334-794-9720, 793-9655, 677-4807, 4808)

Time________Name____________________________Acknowledged □

GUIDELINE 4
NOTIFICATION OF UNUSUAL EVENT
BLUE VERBAL NOTIFICATION FORM

Indicate the time of initial attempt to contact any Georgia agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Georgia agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

GEORGIA State Agencies In preferred order

- GEMA at Atlanta EOC, ENN (1304), OPX (6629), (404-635-7200)
- GEMA at Georgia Forward EOC, ENN (1308) OPX (6626), (229-723-4826)
- EARLY COUNTY, ENN(1308) OPX (6622),(229-723-3577, 3578, 4826)

Time________Name___________________________Acknowledged ☐

T._____Fill in the date and time on line 2 using the time that the first state agency contact ATTEMPT was made

U._____PTT and announce on the ENN "**Please prepare to receive a Notification Of Unusual Event, BLUE initial notification message with acknowledgment**", then slowly read the NOUE initial notification form over the ENN. Release the PTT after reading two or three lines to allow individuals to respond.

V._____Have the agencies contacted above, acknowledge receipt of the message and fill in the acknowledge checkbox above when they do.

W._____If any required agency could not be contacted on the ENN, then use numbers listed with each agency or in FNP-0-EIP-8.1 to contact them by any available means as soon as possible.

X_____Fax a copy of the previous page NOTIFICATION OF UNUSUAL EVENT BLUE VERBAL NOTIFICATION FORM to the State of Florida, EOF using speed dial #10

Y._____Wait for the Fax report indicating the fax was received then verify the state of Florida has received the Fax by calling. (800-320-0519) (850-413- 9911)

TABLE 1

REFERENCES

- Joseph M. Farley Nuclear Plant Emergency Plan
- FNP-0-RCP-25, Health Physics Activities During a Radiological Accident
- FNP-0-EIP-9.2, Emergency Classification
- FNP-0-EIP-29, Long Term Dose Assessment
- FNP-0-EIP-20, Chemistry and Environmental Support to the Emergency Plan
- FNP-0-M-007, Emergency Dose Calculation Method
- FNP-0-TCP-61.0, EMERGENCY ACTION LEVEL TECHNICAL BASIS
- NMP-EP-109, Protective Action Recommendations
- FNP-0-M-011, Offsite Dose Calculation Manual
- EPA "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents"
- NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants"
- FNP-0-CCP-641, "Operation of the Plant Vent Stack Monitoring System"
- NT-86-0014, Gaseous Releases, Emergency Classifications
- NT-87-0543, Protective Action Recommendation Policy
- ALA 88-694, Westinghouse "Potential Radiological Impact of Steam Generator Tube Uncover"
- FNP-0-CCP-1300, Chemistry and Environmental Activities During a Radiological Accident
- SCS letter File: ENG 15 94-0466 Log: FP 94-0364, Containment Dose R-27 to DEI Conversion

TABLE 2

EMERGENCY FACILITY ACTIVATION

	Unusual Event	Alert	Site Area Emergency	General Emergency
Technical Support Center	*	Activate#	Activate#	Activate
Operations Support Center	*	Activate#	Activate#	Activate
Emergency Operations Facility	**	Activate#	Activate#	Activate
APC Corporate Headquarters	**	Activate#	Activate#	Activate
Emergency News Center	**	Activate#	Activate#	Activate

NOTE:

* No action, standby or activation at the discretion of the Emergency Director

** No action, standby or activation at the discretion of the Corporate Duty Manager

Activation will be to the extent deemed necessary by the Emergency Director and Corporate Duty Manager

TABLE 3

CONSIDERATIONS FOR EMERGENCY CLASSIFICATION BASED ON SECURITY EVENTS

IF THERE IS A POTENTIAL HAZARD TO THE SAFETY OF PERSONNEL DUE TO THE SECURITY EVENT THAT IS IN PROGRESS, THE PROVISIONS OF THE EIPs MAY HAVE TO BE MODIFIED TO ENSURE THAT PLANT PERSONNEL ARE PROTECTED. CONSIDERATION SHOULD BE GIVEN TO THE SAFETY OF PERSONNEL WHO ARE ON SITE AND THOSE WHO WILL BE REPORTING TO THE SITE. THE FOLLOWING LIST DESCRIBES SOME OF THE ACTIONS THAT MIGHT BE DIFFERENT:

1. Do not delay declaring the emergency, some specific actions in the guidelines may have to be altered.

2. Contact security for recommendations to determine hazardous areas prior to taking any actions that would move people to different areas of the plant.

3. Ensure that control room or other supervisory personnel do not dispatch personnel to areas of the plant until it has been determined that those areas are safe.

4. If activating the plant emergency alarm (PEA) would put personnel at risk while proceeding to assembly areas, do not activate the alarm. In lieu of the PEA, consider making an appropriate announcement over the plant page with specific instructions such as to remain inside buildings, evacuate specific areas or other appropriate announcements based on security recommendations.

5. If having the TSC staff report to the plant site would put them at risk, consider a manual callout of a minimum staff with specific instructions identifying where to report in lieu of using the ERO Callout System to activate.

6. Consider use of alternate facilities for the TSC staff.

7. If the ERO Callout system is used to activate the TSC staff, consider using message number 2 to have the TSC staff report to the Emergency News Center.

8. After security reports that the security hazards have been eliminated, return to full implementation of the EIPs as appropriate.

TABLE 4

INFORMATION LIKELY TO BE REQUESTED BY THE NRC IF AN EMERGENCY IS DECLARED (NRC INFORMATION NOTICE 98-08)

1. Is there any change to the classification of the event? If so, what is the reason?

2. What is the ongoing/imminent damage to the facility, including affected equipment and safety features?

3. Have toxic or radiological releases occurred or been projected, including changes in the release rate? If so, what is the projected onsite and offsite releases and what is the basis of assessment?

4. What are the health effect/consequences to onsite/offsite people? How many onsite/offsite people are/will be affected and to what extent?

5. Is the event under control? When was control established, or what is the planned action to bring the event under control? What is the mitigative action underway or planned?

6. What onsite protective measures have been taken or planned?

7. What offsite protective actions have been recommended to state/local officials?

8. What is the status of State/local/other Federal agencies' responses, if known?

9. If applicable, what is the status of public information activities, such as alarm, broadcast, or press releases (regulatee/state/local/other federal agencies)? Has a Joint Information Center (Emergency News Center) been activated?

10 MILE EMERGENCY PLANNING ZONE

The boxes in each quadrant and at the top of the drawing, represent the time in minutes that it would take to evacuate the zones in that quadrant during a **WD** (week day), **WN** (week night), **WE** (week end) and AW (adverse weather conditions). The time includes a 15 minute allowance for notification.

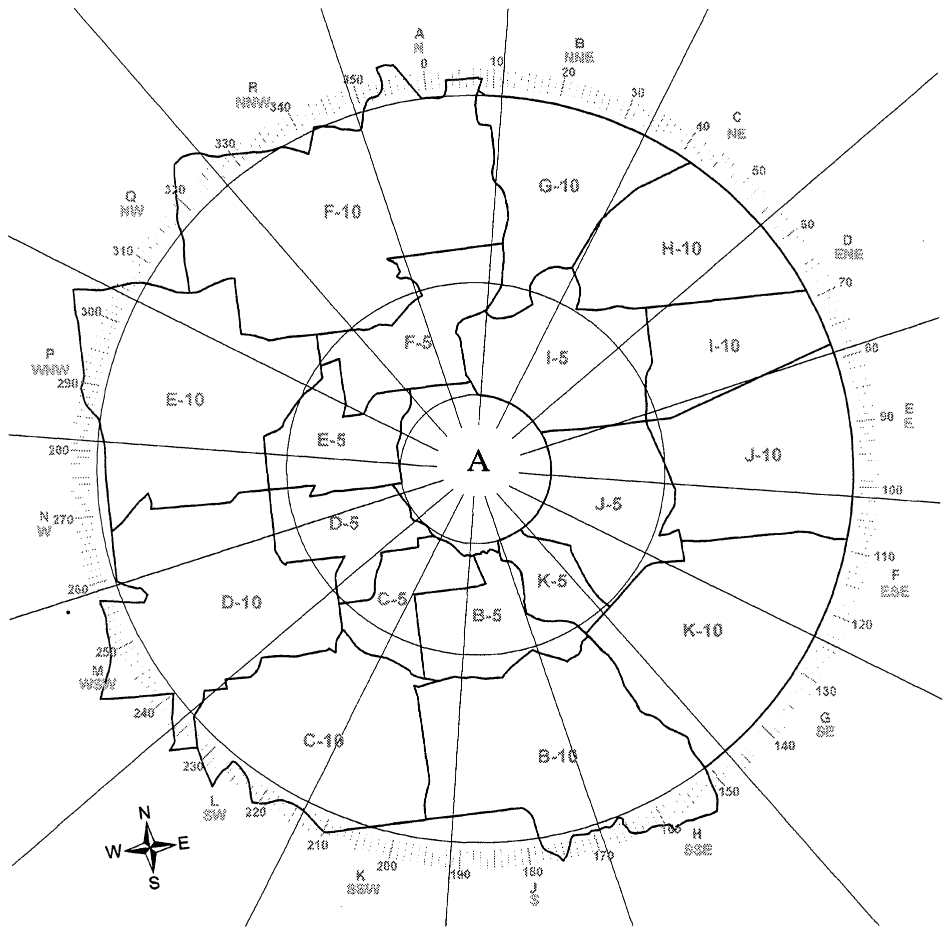
Zones	WD	WN	WE	AW
2 Mile Zone A	95	80	90	95
10 Mile All Sectors	140	115	115	150

270-360 Quadrant, 100%
Evacuation Times

Zones	WD	WN	WE	AW
5 Mile	105	90	95	110
10 mile	115	100	105	120

000-090 Quadrant, 100%
Evacuation Times

Zones	WD	WN	WE	AW
5 Mile	105	95	100	110
10 mile	110	105	110	120



180-270 Quadrant, 100%
Evacuation Times

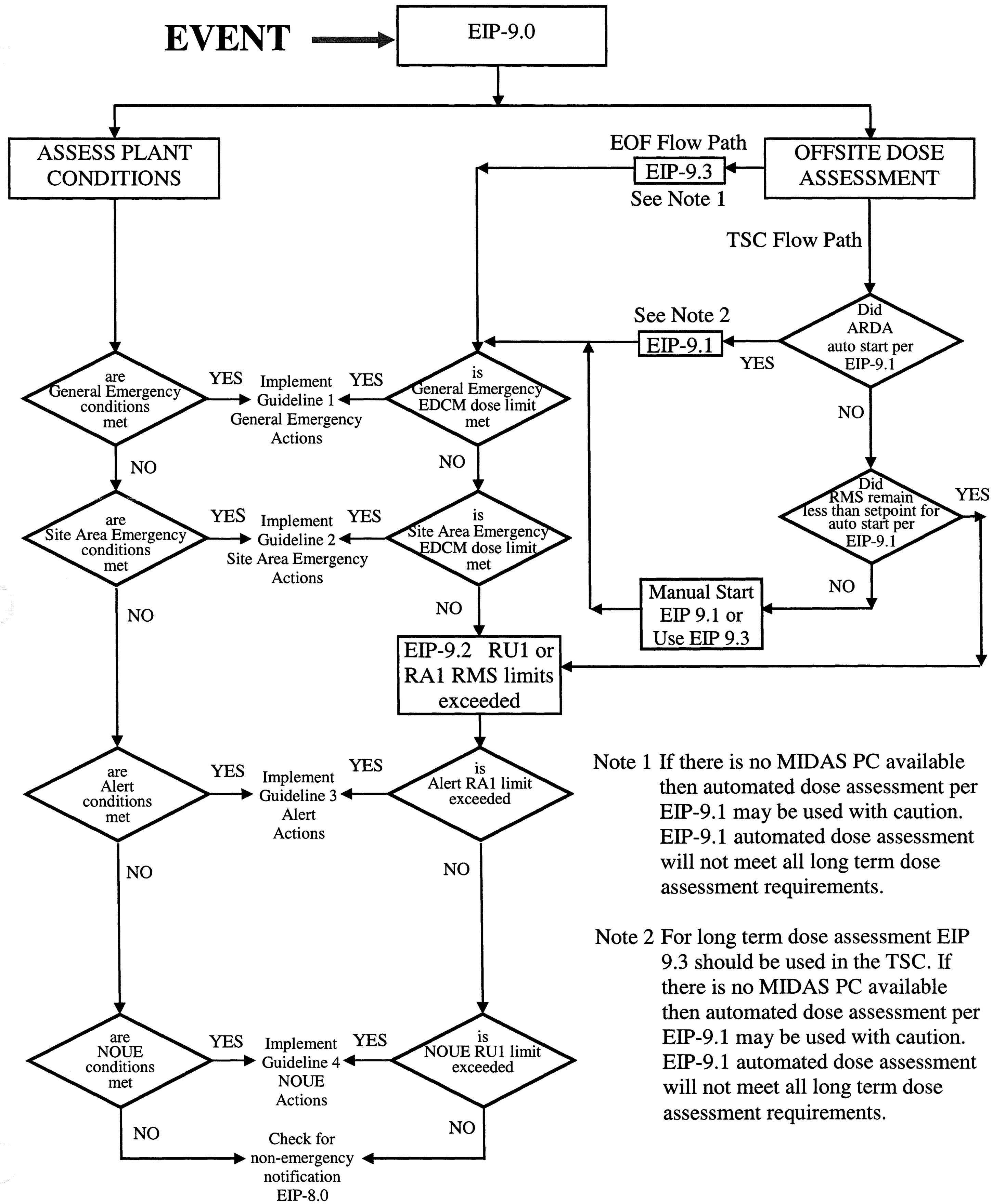
Zones	WD	WN	WE	AW
5 Mile	100	95	95	105
10 mile	140	110	115	150

090-180 Quadrant, 100%
Evacuation Times

Zones	WD	WN	WE	AW
5 Mile	105	95	100	110
10 mile	110	100	105	115

Figure 1

EVENT FLOWPATH



Note 1 If there is no MIDAS PC available then automated dose assessment per EIP-9.1 may be used with caution. EIP-9.1 automated dose assessment will not meet all long term dose assessment requirements.

Note 2 For long term dose assessment EIP 9.3 should be used in the TSC. If there is no MIDAS PC available then automated dose assessment per EIP-9.1 may be used with caution. EIP-9.1 automated dose assessment will not meet all long term dose assessment requirements.

FIGURE 2

FIGURE 3 DELETED

FIGURE 4

PAR UPGRADE

1. A DRILL B ACTUAL EVENT MESSAGE # _______

2. A PAR UPGRADE NOTIFICATION: TIME____________DATE___/___/___AUTHENTICATION # **N/A**

3. SITE: **FARLEY NUCLEAR PLANT** Confirmation Phone # (334) 814-4662, 814-4663 (334) 794-0800, 899-5156 (ext 4662, 4663)

5. PROTECTIVE ACTION RECOMMENDATIONS CHANGES

THE FOLLOWING EVACUATION ZONE RECOMMENDATIONS ARE THE CURRENT UPDATED EVACUATION ZONE RECOMMENDATIONS INCLUDING ANY EVACUATION ZONES THAT WERE PREVIOUSLY RECOMMENDED

B EVACUATE A B-5 C-5 D-5 E-5 F-5 I-5 J-5 K-5

B-10 C-10 D-10 E-10 F-10 G10 H10 I-10 J-10 K-10

THE FOLLOWING SHELTERING ZONE RECOMMENDATIONS ARE THE CURRENT UPDATED SHELTERING ZONE RECOMMENDATIONS INCLUDING ANY SHELTERING ZONES THAT WERE PREVIOUSLY RECOMMENDED. IF A SHELTERING ZONE RECOMMENDATION HAS BEEN CHANGED TO EVACUATION IT WILL NOT BE DISPLAYED.

C SHELTER A B-5 C-5 D-5 E-5 F-5 I-5 J-5 K-5

D OTHER Advise Remainder of EPZ to Monitor Local Radio/TV Stations/ TARs for Additional Information and Consider the use of KI (potassium iodide) in accordance with State plans and policy.

THE FOLLOWING OTHER RECOMMENDATIONS FOR PROTECTIVE ACTIONS HAVE BEEN ADDED

E OTHER ______________________________

10. A PAR UPGRADE Time ____________ Date ___/___/___

13. REMARKS:

____

____

____

17. APPROVED BY: ______________________ Title □ Emergency Director □ EOF Manager

NOTE: The information that is highlighted on this form must be correct for the notification to be considered correct

A.______Line 1 check box A or B. Select B only if it is an actual event in the plant

B.______Line 1 Number each verbal initial and follow-up messages sequentially starting at 001 for the first verbal message.

C. Line 2 Notification time to be completed by ENN communicator just prior to making the ENN notification

D.______Line 5B Indicate all zones that an evacuation recommendation is being made. Be sure to include any zones that were previously recommended for evacuation.

E.______Line 5C Indicate all zones that a sheltering recommendation is being made. Be sure to include any zones that were previously recommended for sheltering, unless those zones are now evacuation zones. If a zone recommendation changes from sheltering to evacuation it should not be displayed as a sheltering zone.

F.______Line 5E If there are additional other PARS mark box 5E and list the additional other protective actions

J.______Line 10 Time is for the PAR UPGRADE indicated in line 5.

K.______Line 13 If additional remarks are required write them on line 13. Consider listing the reason for the upgrade.

L.______The Emergency Director Must approve any PAR upgrade. The Emergency Director or the EOF Manager must sign the form.

M. Within 15 minutes of PAR UPGRADE time, using the ENN contact the state and local agencies listed below.

N.______Verify the Southern LINC ENN Radio being used is turned on

O.______If the Southern LINC display does not show "WIDE AREA, FEP ENN" when group is pressed in step P, THEN perform the following:

- Press the button with the square until the top line is indicated, then press the arrow buttons until "WIDE AREA" is displayed, then press the button under OK. Press the button with the square until the second line is indicated then press the arrow buttons until "FEP ENN" is displayed, and then press the button under OK.

P______Press group pushbutton; verify display shows WIDE AREA, FEP ENN. Correct per above step if necessary. Pickup handset or leave in cradle, press to talk (PTT), wait for the chirp and announce "This is name/title at Farley Nuclear Plant. Please obtain a PAR Upgrade initial notification form and monitor the ENN." Release the PTT.

FIGURE 4 **PAR UPGRADE**

Q._____Contact one state and county agency listed in each of the four boxes below.

Indicate the time of initial attempt to contact any Alabama agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Alabama agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

ALABAMA State Agencies In preferred order

- Alabama Radiation Control at Montgomery EOC. ENN (1305), OPX (6628), (334-206-5391), (334-324-0076)
- AEMA ENN (1306), OPX(6619), (205-280-2312, 205-280-2310)
- Alabama Radiation Control at Alabama Forward EOC, ENN (1307), OPX 6621), (334-793-1565)
- HOUSTON COUNTY ENN (1307), OPX (6621), (334-794-9720, 793-9655, 677-4807, 4808)

Time________Name____________________________Acknowledged ☐

Indicate the time of initial attempt to contact any Georgia agency. Circle agency actually contacted. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request one Georgia agency in the order listed below acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

GEORGIA State Agencies In preferred order

- GEMA at Atlanta EOC, ENN (1304), OPX (6629), (404-635-7200)
- GEMA at Georgia Forward EOC, ENN (1308) OPX (6626), (229-723-4826)
- EARLY COUNTY, ENN(1308) OPX (6622),(229-723-3577, 3578, 4826)

Time________Name____________________________Acknowledged ☐

Indicate the time of initial attempt to contact Houston County. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request Houston County acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

HOUSTON COUNTY

- HOUSTON COUNTY, ENN(1307), OPX (6621), (334-794-9720, 793-9655, 334-677-4807, 4808)

Time________Name____________________________Acknowledged ☐

Indicate the time of initial attempt to contact Early County. Indicate the name of the individual contacted. Underlined phone numbers staffed 24 hours a day

PTT and request Early County acknowledge manning of the ENN. State agency name and ask if they are on the line. Release the PTT after each request.

EARLY COUNTY

- EARLY COUNTY, ENN(1308) OPX (6622), (229-723-3577, 3578, 4826)

Time________Name____________________________Acknowledged ☐

FIGURE 4

PAR UPGRADE

T.______Fill in the date and time on line 2 using the time that the first state agency contact ATTEMPT was made

U.______PTT and announce on the ENN "**Please prepare to receive a PAR UPGRADE notification message with acknowledgment"**, then slowly read the PAR UPGRADE notification form over the ENN. Release the PTT after reading two or three lines to allow individuals to respond.

V.______Have the agencies contacted above, acknowledge receipt of the message and fill in the acknowledge checkbox above when they do.

W.______If any required agency could not be contacted on the ENN, then use numbers listed with each agency or in FNP-0-EIP-8.1 to contact them by any available means as soon as possible.

X ______Include the new PARs on the next follow-up message.

FIGURE 5 **NRC NOTIFICATION**

1. For initial and upgrade declarations complete pages two and three of this figure for transmittal to the NRC. Instructions for completing this figure are located on pages four and five.

2. For initial and upgrade declarations notify NRC Headquarters. Read pages two and three of this figure over the ENS to the NRCOC Immediately after State Notification and within one hour of Declaration.

   If the NRC requests it, pages two and three can be faxed to the NRC

   Contact numbers for the NRC are listed below

   ☐ ENS (301-816-5100; 301-951-0550; 301-415-0550)
   ☐Commercial (1-301-816-5100; 1-301-951-0550; 1-301-415-0550 Date/Time

____________________	__________	________
Person contacted	date	time

SHARED

FIGURE 5 NRC NOTIFICATION

SIMILAR to NRC FORM 361

U.S. NUCLEAR REGULATORY COMMISSION OPERATIONS CENTER

REACTOR PLANT EVENT NOTIFICATION WORKSHEET

EN #

NRC OPERATION TELEPHONE NUMBER: PRIMARY -- 301-816-5100, BACKUPS -- [1st] 301-951-0550, [2nd] 301-415-0550 and [3rd] 301-415-0553

NOTIFICATION TIME	FACILITY OR ORGANIZATION	UNIT	NAME OF CALLER	CALL BACK # ENS 700-221-0807
	FARLEY NUCLEAR PLANT			Commercial # 334-899-5156

EVENT TIME & ZONE	EVENT DATE	POWER/MODE BEFORE	POWER/MODE AFTER
Central time			

EVENT CLASSIFICATIONS			1-Hr. Non-Emergency 10 CFR 50.72(b)(1)							
	GENERAL EMERGENCY	GEN/AAEC			TS Deviation	ADEV		(v)(A)	Safe S/D Capability	AINA
	SITE AREA EMERGENCY	SIT/AAEC	**4-Hr. Non-Emergency 10 CFR 50.72(b)(2)**					(v)(B)	RHR Capability	AINB
	ALERT	ALE/AAEC		(i)	TS Required S/D	ASHU		(v)(C)	Control of Rad Release	AINC
	UNUSUAL EVENT	UNU/AAEC		(iv)(A)	ECCS Discharge to RCS	ACCS		(v)(D)	Accident Mitigatio	AIND
	50.72 NON-EMERGENCY	(see next columns)		(iv)(B)	RPS Actuation (scram)	ARPS		(xii)	Offsite Medical	AMED
	PHYSICAL SECURITY (73.71)	DDDD		(xi)	Offsite Notification	APRE		(xiii)	Loss Comm/Asmt/Resp	ACOM
	MATERIAL/EXPOSURE	B???	**8-Hr. Non-Emergency 10 CFR 50.72(b)(3)**				**60-Day Optional 10 CFR 50.73(a)(1)**			
	FITNESS FOR DUTY	HFIT		(ii)(A)	Degraded Condition	ADEG			Invalid Specified System Actuation	AINV
	OTHER UNSPECIFIED REQMT	(see last column)		(ii)(B)	Unanalyzed Condition	AUNA	**Other Unspecified Requirement (Identify)**			
	INFORMATION ONLY	NINF		iv)(A)	Specified System Actuation	AESF				NONR
										NONR

DESCRIPTION

Include: Systems affected, actuations and their initiating signals, causes, effect of event on plant, actions taken or planned, etc. (Continue on back)

NOTIFICATIONS	YES	NO	WILL BE	ANYTHING UNUSUAL OR NOT UNDERSTOOD?	☐ YES (Explain above)	☐ NO
NRC RESIDENT						
STATE(s)				DID ALL SYSTEMS FUNCTION AS REQUIRED?	☐ YES	☐ NO (Explain above)
LOCAL						
OTHER GOV AGENCIES				MODE OF OPERATION UNTIL CORRECTED:	ESTIMATED RESTART DATE:	ADDITIONAL INFO ON BACK ☐ YES ☐ NO
MEDIA/PRESS RELEASE						

FIGURE 5

NRC NOTIFICATION

ADDITIONAL INFORMATION

RADIOLOGICAL RELEASES: CHECK OR FILL IN APPLICABLE ITEMS ***(specific details/explanations should be covered in event description)***

	LIQUID RELEASE		GASEOUS RELEASE		UNPLANNED RELEASE		PLANNED RELEASE		ONGOING		TERMINATED
	MONITORED		UNMONITORED		OFFSITE RELEASE		T. S. EXCEEDED		RM ALARMS		AREAS EVACUATED
	PERSONNEL EXPOSED OR CONTAMINATED				OFFSITE PROTECTIVE ACTIONS RECOMMENDED				*State release path in description		

	Release Rate (Ci/sec)	% T. S. LIMIT	HOO GUIDE	Total Activity (Ci)	% T. S. LIMIT	HOO GUIDE
Noble Gas			0.1 Ci/sec			1000 Ci
Iodine			10 uCi/sec			0.01 Ci
Particulate			1 uCi/sec			1 mCi
Liquid *(excluding tritium and dissolved noble gases)*			10 uCi/min			0.1 Ci
Liquid (tritium)			0.2 Ci/min			5 Ci
Total Activity						

	PLANT STACK	CONDENSER/AIR EJECTOR	MAIN STEAM LINE	SG BLOWDOWN	OTHER
RAD MONITOR READINGS					
ALARM SETPOINTS					
% T. S. LIMIT *(if applicable)*					

RCS OR SG TUBE LEAKS: CHECK OR FILL IN APPLICABLE ITEMS: ***(specific details/explanations should be covered in event description)***

LOCATION OF THE LEAK *(e.g., SG #, valve, pipe, etc.)*

LEAK RATE	UNITS: gpm/gpd	T. S. LIMITS	SUDDEN OR LONG-TERM DEVELOPMENT
LEAK START DATE	TIME	COOLANT ACTIVITY **AND UNITS:** PRIMARY	SECONDARY

LIST OF SAFETY RELATED EQUIPMENT NOT OPERATIONAL

EVENT DESCRIPTION *(Continued from front)*

INSTRUCTIONS FOR COMPLETING FIGURE 1 NRC REACTOR PLANT EVENT NOTIFICATION WORKSHEET

FNP's official notification to the NRC of a declared emergency will be done using this Figure. The NRC Event Notification Worksheet in this figure is similar to the one that the NRC has at the NRCOC. During a declared emergency they will be asking questions from this worksheet. A copy of this figure may be sent to the NRC by Fax if the communicator desires. The general instructions for completing this form are listed below:

1. Not all of the form is required to be completed; only the information that is available at the time is required to be completed. The NRC should be informed that this information is not available at the current time. Inform the NRC that the missing information will be provided when it is available.

FORM 361 Page One

2. On the top line of page one the **EN#** is the event number assigned by the NRC, request this number from the NRC.
3. **NOTIFICATION TIME** is the time that the official notification using this figure was made to the NRC.
4. Fill in appropriate **UNIT** number or both as applicable.
5. The **NAME OF CALLER** is the person talking to the NRC at the time that the information on this form is read or faxed to the NRC
6. **CALL BACK** phone numbers are already filled in unless there are different numbers that you want the NRC to use.
7. **EVENT DATE and TIME** is the declaration time of the current event.
8. **POWER/MODE BEFORE and AFTER**. The before information is the power and mode just prior to the current declaration. The after information is the current power and mode
9. Under **EVENT CLASSIFICATION** the block for the declared emergency should be checked. Other blocks in that section may be checked if directed by the Emergency Director or EOF Manager.
10. The **DESCRIPTION** should be similar to the description provided in Figure 6.
11. For **NOTIFICATIONS,** complete the information requested. Refer to the facility management for clarification if the answer is not readily known.
12. FOR **ANYTHING UNUSUAL OR NOT UNDERSTOOD** indicate plant response that was not as expected and there is no explanation for it. If YES is checked provide explanation in description section.
13. For **DID ALL SYSTEMS FUNCTION AS REQUIRED** check no if safety systems or systems that are relevant to the event did not perform required function. If NO is checked provide explanation in description section.
14. **MODE OF OPERATION UNTIL CORRECTED**: - fill in TS mode number.
15. **ESTIMATED RESTART DATE** leave blank unless a firm date is known.
16. **ADDITIONAL INFORMATION ON BACK** should be checked NO unless the description is too large to fit on page 1 description section

Page Two

16. **RADIOLOGICAL RELEASES** check the applicable boxes and complete the data as appropriate only if an emergency radiological release is in progress that by itself would require any emergency classification.
    - LIQUID RELEASE / GASEOUS RELEASE – one or both based on releases in progress
    - UNPLANNED RELEASE or PLANNED RELEASE - check only one based on what caused the release
    - ONGOING or TERMINATED - check ongoing unless all emergency releases are terminated.
    - MONITORED or UNMONITORED - Check monitored unless the release is known not to be monitored by one of the effluent monitors.
    - OFFSITE RELEASE and T. S. EXCEEDED - Check both boxes if the release by itself would require any emergency classification bases on ODCM or EDCM.
    - RM ALARMS - Check this box if any alarm is in that would cause ARDA to activate.
    - AREAS EVACUATED - Check this box if on site areas have been evacuated due to a radiation problem.
    - PERSONNEL EXPOSED OR CONTAMINATED - Check this box if the exposure or contamination is above 10 CFR 20 limits.
    - OFFSITE PROTECTIVE ACTIONS RECOMMENDED - Check this box if PARs have been recommended and transmitted to the states.
    - Complete the release rate information if it has already been calculated using EDCM or ODCM calculations. It is not necessary to perform calculations just to complete this form.
    - From the ODCM calculations request that Chemistry/Environmental staff calculate the % of TS. This can be accomplished using the ARDA ODCM page. Divide the "Previous Hour" total iodine and noble gas values by the NOUE limits listed on the page.
    - The HOO guide is information that the Headquarters Operations Officer (HOO) would use. It is not for FNP use.
    - Complete the RADIATION MONITOR READINGS for those monitors that are in alarm that would cause the ARDA to actuate. Refer to EIP-9.1.
    - Complete the ALARM SETPOINTS for any radiation monitor reading that is entered. Refer to EIP-9.1.
    - TS limits for rad monitors in alarm are not applicable.
17. **RCS OR SG TUBE LEAKS** Fill in the appropriate data if there is a leak or rupture in progress that exceeds technical specification limits.

EMERGENCY NOTIFICATION FORM

1._____Complete page two (or a similar form)of this form as a follow-up notification.

- All initial and upgrade emergency classifications should be performed using the initial verbal notification form in the back of Guidelines 1 through 4.
- Follow-up messages are required to be sent at least once per hour or whenever plant conditions change that could affect the emergency condition.
- Instructions for completing this form are included starting on page 4 of this figure, if required.
- Number each verbal initial and follow-up messages sequentially starting at 001 for the first verbal message.
- Determine the stability class from either dose assessment program, from the EP_WEATHER program if available or from the table below.

ΔT (200' elev. temp, °F - 35' elev. temp, °F)	Stability Class
<-1.74	A
-1.74 to <-1.56	B
-1.56 to <-1.38	C
-1.38 to <-0.46	D
-0.46 to < 1.38	E
1.38 to 3.60	F
>3.60	G

2._____Fill in line 2 Notification time/date and line 17 notified by (person doing the faxing)

3._____Fax page two to state, local and company agencies using the speed dial button determined in page 3.

4._____Verify that the following agencies received the fax using the ENN in the group mode or numbers listed below.

4.1.____Verify the Southern LINC ENN Radio being used is turned on

4.2.____If the Southern LINC display does not show "WIDE AREA, FEP ENN" when group is pressed perfrm the following:

4.2.1._____Press the button with the square until the top line is indicated, then press the arrow buttons until "WIDE AREA" is displayed, then press the button under OK. Press the button with the square until the second line is indicated then press the arrow buttons until "FEP ENN" is displayed, then press the button under OK.

4.3____Press group pushbutton, verify display shows WIDE AREA, FEP ENN. Correct per 3.2.1 if necessary. Request each agency individually

Person Contacted	Date/Time	
____________________	____________________	Alabama Radiation Control at Montgomery EOC ENN (1305), OPX (6628), phone (334-206-5391)
____________________	____________________	AL Radiation Control at Alabama FEOC/Houston Co ENN(1307), OPX (6621), (334-794-9720, 793-9655, 334-677-4807, 4808)
____________________	____________________	GEMA at Atlanta EOC ENN (1304), OPX (6629), (404-635-7200)
____________________	____________________	GEMA at Georgia FEOC/Early County ENN(1308) OPX (6622)(229-723-3577, 3578, 4826)
____________________	____________________	AEMA at Clanton EOC ENN (1306)
____________________	____________________	FDEM at Tallahassee (**Not on the ENN**) (800-320-0519) (850-413- 9911)
____________________	____________________	TSC/EOF

Southern Nuclear Emergency Notification Form

FIGURE 6

1. [A] DRILL [B] ACTUAL EVENT MESSAGE # _______

2. [A] INITIAL [B] FOLLOW-UP NOTIFICATION: TIME____________ DATE___/___/___ AUTHENTICATION # **N/A**

3. SITE: **FARLEY NUCLEAR PLANT**

(334) 814-4662, 814-4663
Confirmation Phone # (334) 794-0800, 899-5156 (ext 4662, 4663)

4. EMERGENCY CLASSIFICATION: [A] UNUSUAL EVENT [B] ALERT [C] SITE AREA EMERGENCY [D] GENERAL EMERGENCY

BASED ON EAL #____________ EAL DESCRIPTION: ______________________________

5. PROTECTIVE ACTION RECOMMENDATIONS: [A] NONE

[B] EVACUATE ______________________________

[C] SHELTER ______________________________

[D] Advise Remainder of EPZ to Monitor Local Radio/TV Stations/ TARs for Additional Information and CONSIDER THE USE OF KI (POTASSIUM IODIDE) IN ACCORDANCE WITH STATE PLANS AND POLICY.

[E] OTHER ______________________________

6. EMERGENCY RELEASE: [A] None [B] Is Occurring [C] Has Occurred

7. RELEASE SIGNIFICANCE: [A] Not applicable [B] Within normal operating limits [C] Above normal operating limits [D] Under evaluation

8. EVENT PROGNOSIS: [A] Improving [B] Stable [C] Degrading

9. METEOROLOGICAL DATA: Wind Direction from _______ degrees Wind Speed _______ mph

35 foot elevation preferred Precipitation _______ Stability Class [A] [B] [C] [D] [E] [F] [G]

10. [A] DECLARATION [B] TERMINATION Time ____________ Date ____/____/____

11. AFFECTED UNIT(S): [1] [2] [All]

12. UNIT STATUS: (Unaffected Unit(s) Status Not Required for Initial Notifications)

[A] U1 _____% Power Shutdown at Time ____________ Date ___/___/___

[B] U2 _____% Power Shutdown at Time ____________ Date ___/___/___

13. REMARKS: ______________________________

FOLLOW-UP INFORMATION (Lines 14 through 16 Not Required for Initial Notifications)

EMERGENCY RELEASE DATA. NOT REQUIRED IF LINE 6 A IS SELECTED.

14. RELEASE CHARACTERIZATION: TYPE: [A] Elevated [B] Mixed [C] Ground UNITS: [A] Ci [B] Ci/sec [C] µCi/sec

MAGNITUDE: Noble Gases:__________ Iodines:__________ Particulates:__________ Other: __________

FORM: [A] Airborne Start Time __________ Date ___/___/___ Stop Time __________ Date ___/___/___

[B] Liquid Start Time __________ Date ___/___/___ Stop Time __________ Date ___/___/___

15. PROJECTION PARAMETERS: Projection period: ________Hours Estimated Release Duration ________Hours

Projection performed: Time _________ Date ___/___/___ Accident Type:____________

16. PROJECTED DOSE:

DISTANCE	TEDE (mrem)	Adult Thyroid CDE (mrem)
Site boundary		
2 Miles		
5 Miles		
10 Miles		

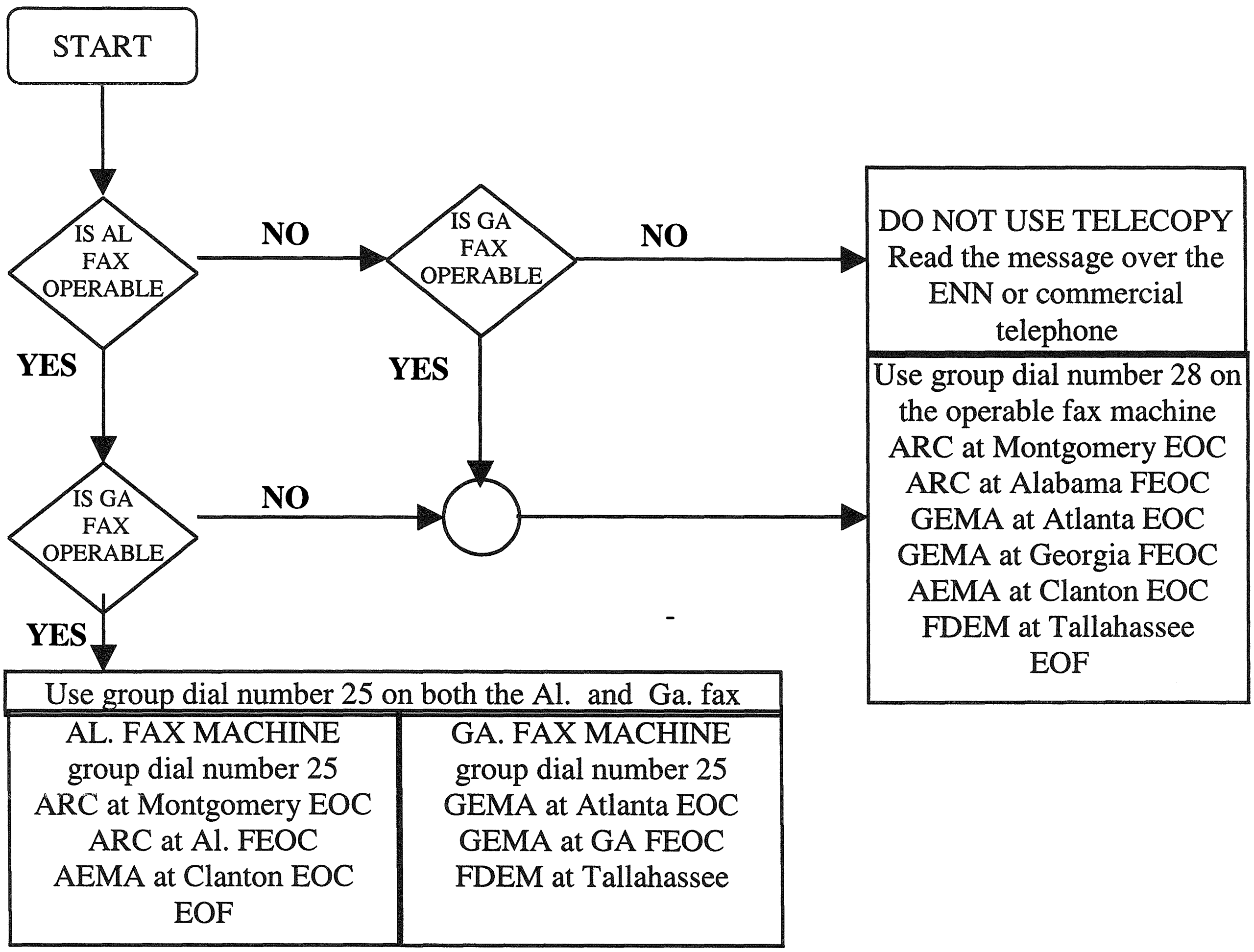
17. APPROVED BY: ______________________ Title ☐ Emergency Director ☐ EOF Manager Time ______ Date___/___/___

NOTIFIED BY: ____________________

RECEIVED BY: ____________________ Time ______ Date___/___/___
(To be completed by receiving organization)

TELECOPY GROUP DIAL NUMBERS

Telecopy (fax) the follow-up Emergency Notification Form (Fig. 6 page 2) to all of the locations using the group dial numbers listed on the below flow chart. When the activity report is received retransmit the form to any location that did not receive the form using the individual speed dial numbers listed below. Verify that the form has been received at all locations using page 1 of this figure.



Refer to FNP-0-EIP-8.1 or FIG. 6 for OPX/commercial numbers.

LOCATION	FAX IND SPEED DIAL	ENN PHONE NUMBER
Alabama Office of Radiation Control At Montgomery EOC	1	11
Alabama Office of Radiation Control At Alabama Forward EOC	3	13
Alabama Emergency Management Agency at Clanton EOC	7	51
FNP EOF (from opposite location)	5	63
Georgia Emergency Management Agency at Atlanta EOC	2	21
Georgia Emergency Management Agency at Georgia Forward EOC	4	22
Florida Department of Emergency Management at Tallahassee	8	none

EMERGENCY NOTIFICATION FORM GUIDANCE

Emergency Notification Form (ENF) Guidance is provided below. The guidance is provided for filling out the ENF (FIGURE 6, page 2). This attachment can be used as guidance when filling out the form or for training.

Line 1

- Mark A or B. Except for actual emergencies A should be checked in training and for drills/exercises.
- Number each verbal initial and follow-up messages sequentially starting at 001 for the first verbal message.

Line 2

- B / Follow-Up is already marked. All initial notifications should be made using the pages in the guidelines.
- Notification time and date should be completed by the individual doing the faxing when the form is faxed.

Line 3

- No action required. Extensions 4662 and 4663 ring at the unit 2 SS desk and in the TSC at the ED/TSC Manager's desk.

Line 4

- Check A, B, C or D (only one) as appropriate. Check no boxes if this is a termination.
- Enter the EAL number as listed in the guidelines. Example RG1, SA2 etc.
- Enter the description of the EAL as listed in Initiating Condition of EIP-9.2 of the Hot or Cold Matrix.

Line 5

- Refer to Step L of the appropriate FNP-0-EIP-9.0 Guideline and NMP-EP-109 to determine appropriate Protective Action Recommendations (PARs).
- If there are no protective action recommendations, mark box A and proceed to step 6.
- For a General Emergency boxes B or C should always be marked and the appropriate zones for evacuation or sheltering should be filled in.
- For a General Emergency boxesD should always be marked
- Mark and complete box E only if there are additional PARs such as PAR 4 from NMP-EP-109

Line 6

- An emergency release is occurring if an effluent monitor has increased by a factor of 10 over and above normal operating levels OR is in alarm. The effluent monitors are R-18, R-23B, R-15, R-14, R-22 R-60 (A,B,C,D)and R-29B(NG)
- Mark box A if no emergency release is in progress or has occurred
- Mark box B if an emergency release is in progress
- Mark box C if an emergency release has occurred, but is currently stopped

Line 7

- Release Significance. Mark box A, B, C or D. Normal limits are being exceeded if an effluent monitor listed in line 6 above is in alarm
- Mark box A if 6A is marked
- Mark box B if 6B or 6C is marked and **NO** effluent monitor is or has been in alarm.
- Mark box C if 6B or 6C is marked and **ANY** effluent monitor is or has been in alarm.
- Mark box D if 6B or 6C is marked and it can not be determined if an effluent monitor is or has been in alarm.

Line 8

- Check A, B or C.
- A should be checked if mitigation efforts appear successful , progressing toward termination/recovery.
- B should be checked if escalation to a higher classification is unlikely based on current conditions.
- C should be checked if escalation to a higher emergency classification or PAR change is likely.

Line 9

- Fill in the meteorological data required (35 foot elevation preferred). Note that line 9 meteorological data must be the same data that was used in performing the dose assessment calculation information provided on lines 14, 15 and 16.
- When possible use 15 minute average data, available from the NR ERDS MIDAS page or the EP_WEATHER program
- If stability class is not available it can be calculated from delta temperature from the below table

ΔT (200' elev. temp, °F - 35' elev. temp, °F)	Stability Class
<-1.74	A
-1.74 to <-1.56	B
-1.56 to <-1.38	C
-1.38 to <-0.46	D
-0.46 to < 1.38	E
1.38 t o 3.60	F
>3.60	G

Line 10

- Check A or B. Time is for the declaration checked in line 4 or the time of termination.. Termination should only be done per FNP-0-EIP-28.0. If this is a termination, go to line 17.

Line 11

- Mark the unit that is involved with the emergency declaration, or all if both units are affected.

Line 12

- Fill in the per cent power or the time of shutdown for both units even if one is not involved with the event

Line 13

- Provide a brief, concise summary of plant conditions that requires the classification and other pertinent information. Avoid the use of acronyms and jargon.
- If additional information that will not fit in the space provided continue the information on Figure 7 and fax with Figure 6 sheet 2

Line 14 – Not required if 6A (Emergency Release NONE) is marked.

- TYPE - Box C is pre marked. Our dose assessment models always assume a ground release.
- UNITS –Box C is premarked. The ARDA and MIDAS programs provide release rate in µCuries/Sec.
- MAGNITUDE – fill in the values using the output from MIDAS or ARDA
- FORM – Mark A or B as appropriate and fill in the times for start and stop of release as appropriate.

Line 15 – Not required if 6A (Emergency Release NONE) is marked.

- Fill in 4 hours for the Projection time and the Estimated Release Duration. If a better time is known for the release duration it should be used but only if it is used in the dose assessment as well.
- Fill in the time that the dose projection was performed from the MIDAS or the ARDA printout.
- Complete the Accident Type from the MIDAS printout if Midas is being used for dose assessment

Line 16 – Not required if 6A (Emergency Release NONE) is marked.

- Fill in the values using the output from MIDAS or ARDA

Line 17

- The Emergency Director or EOF Manager must sign the form with time and date.
- The time and date are the time that the ED/EOF Manager actually signs the form.

EMERGENCY NOTIFICATION
CONTINUATION SHEET

13. (Continued) Additional Comments: Message Number________________

Procedure Owner: Walter H. Lee / Emergency Planning Supervisor / Corporate
(Print: Name / Title / Site)

Approved By: Original signed by Walter H. Lee on 05/01/2008
(Peer Team Champion/Procedure Owner's Signature / Date)

Effective Dates:

05/02/2008	05/02/2008	05/02/2008	05/02/2008
Corporate	FNP	HNP	VEGP

The individuals listed below are the members of the Peer Team responsible for writing and maintaining this procedure.

Corporate	Charles K. Brown
	Chris E. Boone
	Clint S. Hartfield
Plant Farley	Robert J. Vanderbye
Plant Hatch	Rachelle G. Reddick
Plant Vogtle	Lawrence E. Mayo

PROCEDURE USAGE REQUIREMENTS		SECTIONS
Continuous Use:	Procedure must be open and readily available at the work location. Follow procedure step by step unless otherwise directed by the procedure.	
Reference Use:	Procedure or applicable section(s) available at the work location for ready reference by person performing steps.	**ALL**
Information Use:	Available on site for reference as needed.	

Revision Description

Version Number	Revision Description
1.0	Implements a common fleet procedure for developing offsite Protective Action Recommendations (PARs). The procedure incorporates the revised guidance from RIS 2004-13, RIS 2004-13, Supplement 1 and RIS 2005-08.
2.0	This procedure change adds separate definitions for "uncontrolled release" and "controlled release", incorporates procedural recommendations for completing the emergency notification forms, and adds human factoring to the PAR Worksheet 1, based on user feedback.

TABLE OF CONTENTS

1.0 PURPOSE

This procedure provides guidelines for determining Protective Action Recommendations (PARs) which will be communicated to offsite authorities during a General Emergency. PARs are provided as an input to the protective action decision (PAD) making process for the development of protective action orders. Protective action orders are communicated to the general public by offsite authorities to avoid or reduce the exposure incurred from an accident condition that results in a significant radiological effluent release or has the potential for a release based on degraded plant conditions.

2.0 APPLICABILITY

Protective actions are recommended to offsite authorities to avoid or reduce the radiological exposure that may be incurred by the public from an accident condition that results in a significant radiological effluent release or has the potential for a release based on degraded plant conditions.

This procedure is performed, as required, during drills, exercises, and declared emergencies following declaration of a General Emergency. Attachments 2, 3, and 4 are site–specific and non-applicable site attachments may be removed and discarded to ensure usage of the correct site-specific attachment.

3.0 REFERENCES

3.1 NRC IN 83-28, Protective Actions Based on Plant Conditions

3.2 EPA-400-R-92-001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, October, 1991

3.3 NRC IN 91-72, "Issuance of a Revision to the EPA Manual of Protective Action Guides and Protective Actions for Nuclear Incidents"

3.4 NRC IN 92-08, "Revised Protective Action Guidance for Nuclear Incidents"

3.5 NRC RIS 2003-12, "Clarification of NRC Guidance for Modifying Protective Actions"

3.6 NUREG-0654/FEMA REP 1, Supplement 3

3.7 NRC RIS 2004-13, "Consideration of Sheltering in Licensee's Range of Protective Action Recommendations", August 2, 2004

3.8 NRC RIS 2004-13, Supplement 1, "Consideration of Sheltering in Licensee's Range of Protective Action Recommendations, Dated Aug. 2004", March 10, 2005

3.9 NRC RIS 2005-08, Endorsement of NEI Guidance "Range of Protective Actions for Nuclear Power Plant Incidents", June 6, 2005

4.0 DEFINITIONS

4.1 EPA PROTECTIVE ACTION GUIDELINE (PAG) - exposure levels determined by the Environmental Protection Agency for the evacuation of the offsite public following a release of radioactive materials. These levels have been established at one (1) Rem TEDE or five (5) Rem CDE Thyroid. (VCMT# 1985304906)

4.2 PROTECTIVE ACTION RECOMMENDATIONS (PARs) – shelter, evacuation, monitor, and/or KI recommendations made by SNC to appropriate state agencies. PARs are made by SNC personnel based on the Attachment 1 Flowchart whenever a General Emergency is declared. Additionally, if in the opinion of the ED, conditions warrant the issuance of PARs, a General Emergency will be declared (SNC will not issue PARs for any accident classified below a General Emergency).

4.3 UNCONTROLLED RELEASE - is a radiological effluent release that cannot be immediately stopped via positive control action (Example: Vent stack release from a known or unknown Containment leakage pathway which is not under the control of the shift and requires time to terminate.)

4.4 CONTROLLED RELEASE - is a planned radiological effluent release that can be immediately terminated by the licensee (Example: closure of the Post LOCA CTMT vent valves that were manually opened to lower Containment pressure.).

4.5 PUFF RELEASE - A controlled release that is projected to exceed the PAGs and will be terminated in less than an hour or an uncontrolled release that was projected to exceed the PAGs and has been terminated.

4.6 TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE) - The sum of the deep dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

4.7 COMMITTED DOSE EQUIVALENT (CDE) - The dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

4.8 TONE ALERT RADIO (TAR) – Radio used to provide emergency information to the public living in the 10 mile emergency planning zone around the sites.

5.0 RESPONSIBILITIES

5.1 The Emergency Director (ED) has the non-delegable responsibility for approving PARs (VCMT#1985304893).

5.1.1 The EOF Manager may sign approval for the ED after receiving verbal approval from the ED.

5.2 Once the TSC is operational, the TSC has responsibility for developing and communicating offsite PARs until relieved of that responsibility by the EOF.

5.3 Approved PARs may be communicated to applicable offsite authorities by the Control Room, TSC or EOF staffs as directed by the ED.

6.0 PRECAUTIONS AND LIMITIATIONS

6.1 Evacuation and Shelter Recommendations

6.1.1 PARs are only applicable when entering a General Emergency.

6.1.2 Evacuation is the preferred action unless conditions impose a greater risk from the evacuation than from the dose received.

6.1.3 Shelter is a preferred action when a 'Puff' type release has occurred.

6.1.4 A plant condition based PAR to shelter a 2-mile radius and 5 miles downwind may be issued when a Puff Release has occurred.

6.1.5 If onsite plant events are underway which would make evacuation dangerous (such as known hostile action) then sheltering should be considered over evacuation recommendations.

6.1.6 When prior knowledge of offsite impediments to evacuation exist (such as flooding, bridge/road closings, or other travel restrictions), then sheltering should be considered over evacuation recommendations.

6.1.7 A recommendation to evacuate or shelter a partial zone is not allowed.

6.1.8 Once an evacuation recommendation for an area has been given, it should not be reduced to a shelter recommendation.

6.2 ED Judgment

6.2.1 The ED may elect to modify PARs based on judgment, if conditions warrant.

6.2.2 The ED shall upgrade to a General Emergency if PARs are determined to be needed and not already in a General Emergency.

6.2.3 Protective action guidelines shall not imply an acceptable dose.

6.2.4 PARs are inherently conservative such that expanding the evacuation zone as an added precaution would result in a greater risk from the evacuation than from the radiological consequences of a release. It also would dilute the effectiveness of the offsite resources used to accommodate the evacuation.

6.3 Recommendations Beyond the 10 mile EPZ

6.3.1 Many assumptions exist in dose assessment calculations, involving both source term and meteorological factors, which make computer predictions over long distances less reliable. The ED should use the recommendation of the dose assessment staff when making recommendations beyond 10 miles

6.3.2 While evaluating the need to develop PAR 4 recommendations, issuance of appropriate PAR 1, 2, or 3 recommendations should not be delayed.

6.4 Ingestion Pathway and Relocation Responsibilities

6.4.1 Protective actions taken in areas affected by plume deposition following the release are determined and controlled by offsite governmental agencies. SNC is not expected to develop offsite recommendations involving ingestion or relocation issues following plume passage.

6.4.2 SNC may be requested to provide resources to support the determination of post plume protective actions.

6.5 Continuing Assessment

6.5.1 Weather should not normally influence SNC protective action recommendations for the public except for changes in plume trajectory. The States and Counties are the most knowledgeable concerning current weather conditions and weather forecast information. The States and Counties may incorporate existing or forecast weather in their decisions regarding implementation of recommended protective actions.

6.5.2 Only the MUTUALY AGREED UPON protective action recommendations specified in Attachment 1 should be recommended unless there are obvious relevant factors (e.g., severe natural phenomena like hurricanes) that probably were not anticipated when the PARs were developed and that would make the standard PAR recommendations impractical or obviously non-conservative. In such events, the ED should use judgment as appropriate.

6.5.3 Actual field readings from Field Monitoring Teams should be compared to dose assessment results and used as a dose projection method to validate calculated PARs and to determine whether the plant or dose based protective actions are adequate. (VCMT# 1986309134)

6.5.4 When available, actual sample data from monitored or unmonitored release points should be utilized in conjunction with other dose assessment and projection methods to validate calculated PARs and to determine whether the plant based protective actions are adequate.

6.5.5 VEGP and FNP off-site dose rates may be significantly higher (up to 10 times) due to volatilization of iodine if a steam generator (SG) water level falls below the break point during a SG tube rupture

7.0 PROCESS DESCRIPTION

Guidance is provided in the form of attachments. Attachment 1, Action Checklist for Off-Site PAR Development", Attachment 2, "Farley Site Specific Data Sheets", Attachment 3, "Hatch Site Specific Data Sheets", Attachment 4 "Vogtle Site Specific Data Sheets", and Attachment 5 "PAR Worksheet" direct the initial and supplemental actions.

8.0 RECORDS

Records generated during actual emergencies will be maintained as QA records in accordance with applicable administrative procedure.

9.0 COMMITMENTS

Farley – None
Hatch - 1989301429, 1990303261, 1990303410
Vogtle – 1985304693, 1985304906, 1986309134

Attachment 1
(Page 1 of 3)

* Continuing Activity

Action Checklist for PAR Development

> **NOTE:** ONLY THE MUTUALY AGREED UPON PROTECTIVE ACTIONS SPECIFIED BELOW SHOULD BE RECOMMENDED UNLESS THERE ARE OBVIOUS RELEVANT FACTORS (E.G., SEVERE NATURAL PHENOMENA LIKE HURICANES) THAT PROBABLY WERE NOT ANTICIPATED WHEN THE PARS WERE DEVELOPED AND THAT WOULD MAKE THE STANDARD PAR RECOMMENDATIONS IMPRACTICAL OR OBVIOUSLY NON-CONSERVATIVE. IN SUCH EVENTS, THE ED SHOULD USE JUDGMENT AS APPROPRIATE.

A. INITIAL ACTIONS — Please Check

1. * Precautions and Limitations are applicable in development of Protective Action Recommendations (PARs) in subsequent steps. Attachment 5, Figure 1, "PAR WORKSHEET", may be used to record affected zones or sectors. ☐

2. * Determine General Emergency PARs using the Attachment 1 Flowchart. ☐
   - PAR 1 – Shelter to 2 miles and 5 mile downwind zones
   - PAR 2 – Evacuate to 2 miles and 5 mile downwind zones
   - PAR 3 – Evacuate to 5 miles and 10 mile downwind zones
   - PAR 4 – Guidance for PARs Beyond the 10 Mile EPZ

> **CAUTION - PAR Revisions must include previous PARs**

3. For PAR 1, 2, and 3, determine the affected zones using Site specific Table 1. An electronic program may also be used. ☐

> **NOTE:** Once conditions requiring a PAR change are available, PARs should be developed as soon as possible. (**The expectation for development is 15 minutes after the change in conditions.**)

4. Communicate developed PARs to the ED for review and approval. ☐

> **NOTE:** Once PARs are developed they should be communicated to appropriate agencies as soon as possible. (The expectation for communication is 15 minutes after development, as directed by position specific instructions.)

5. Communicate ED approved PARs to offsite agencies using appropriate procedural guidance. On the ENN Form ensure that the following PAR information is selected: ☐
   - Select block 5.B and record the "Evacuate" zones OR select block 5.C and record the "Shelter" zones
   - Select block 5.D
   - IF PAR 4 selected THEN additionally select block 5.E "Other" and provide "Affected Sectors" and "To Miles".

* Continuing Activity

Attachment 1
(Page 2 of 3)

Action Checklist for PAR Development (Cont)

B. SUPPLEMENTAL ACTIONS — Please Check

1. * Continue assessment actions applying applicable Precautions & limitations. ☐

2. * IF a release is in progress THEN it is appropriate to dispatch Field Monitoring Teams (FMT) to downwind and adjacent areas as soon as possible. FMT data should be used to validate calculated exposure rates by comparison with actual field exposure rates to ensure issued PARs remain conservative. ☐

3. * For PAR 4, determine the affected sectors using Site specific Table 2. The following considerations apply when developing PARs beyond 10 miles: ☐
   - IF a release is in progress anddose assessment calculations indicate a possible need to issue PARs beyond 10 miles, THEN it is appropriate to re-perform dose assessment calculations to verify calculation assumptions and accuracy prior to issuing PARs beyond 10 miles.
   - Use any available FMT readings, IF available, to validate accuracy of the projection model prior to issuing PARs beyond 10 miles.
   - IF dose assessment calculations indicate the need to recommend actions beyond 10 miles, THEN consult with affected State agency(s) to compare/ validate model assumptions prior to issuing PARs beyond 10 miles.

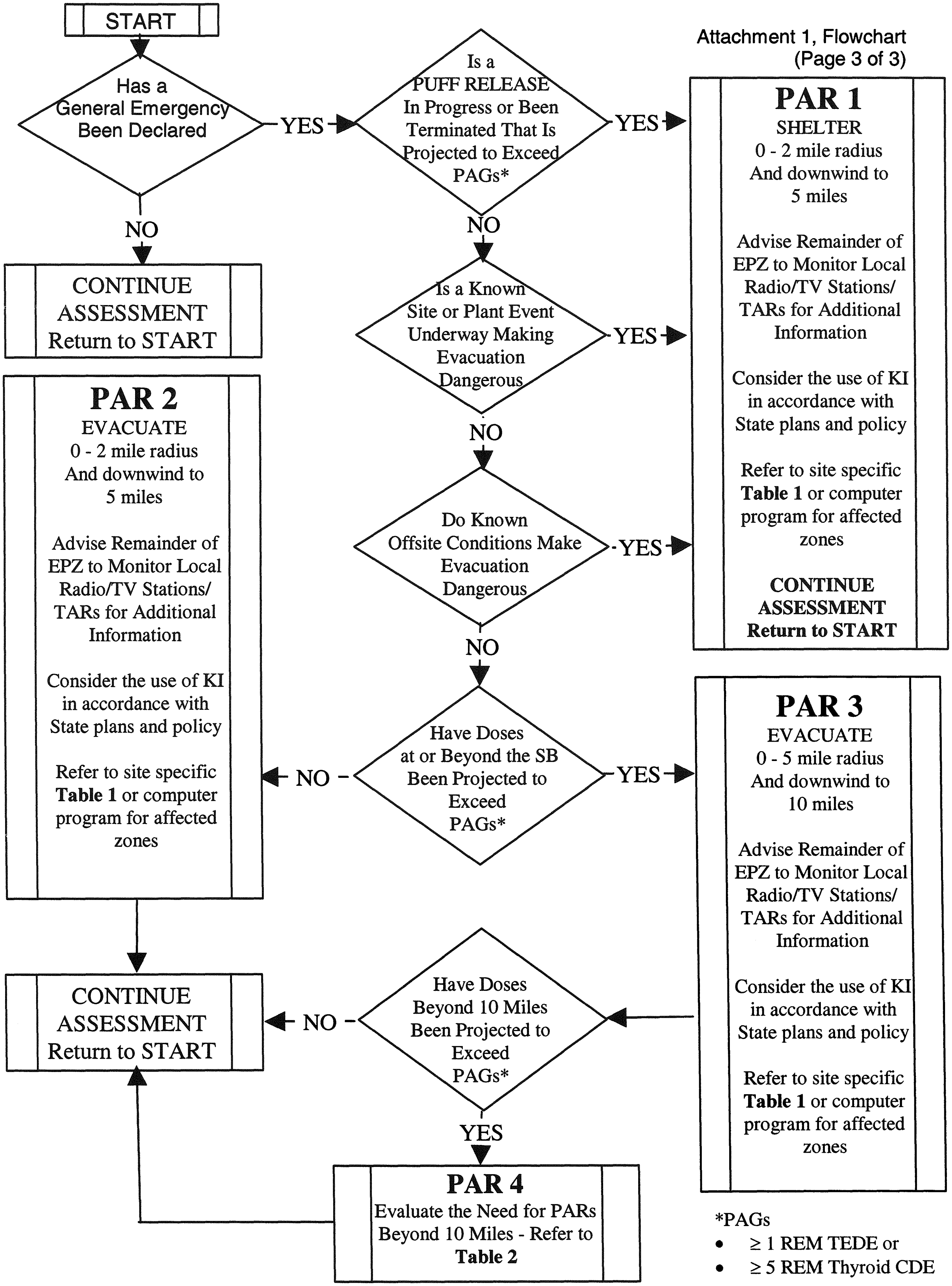
4. * IF conditions requiring PAR 1 entry are eliminated or dose projections change such that additional PARs are required THEN return to the Initial Actions section. Once conditions requiring PAR change are available, PARs should be developed as soon as possible. (The expectation for development is 15 minutes after the change in conditions.) Once PARs are developed they should be communicated to appropriate agencies as soon as possible. (The expectation for communication is 15 minutes after development, as directed by position specific instructions.) ☐

5. * Apply dose projection results in continuing assessment activities. Dose assessment results should be used to refine (but not reduce) protective action recommendations after adequate data becomes available. ☐

6. Utilize real time meteorological and effluent radiation monitor readings in continuing assessment activities. IF radiation monitor readings provide sufficient data for assessment, THEN, it is NOT appropriate to wait for field monitoring data to become available to confirm or expand a PAR within the 10-mile EPZ. ☐

7. Dose projections are NOT required to support the decision process in development of the plant condition based PARs utilizing the PAR flowchart if no release is in progress. It is expected that a dose projection will be performed as soon as practicable at a General Emergency with a release in progress to determine if PAR change is needed. ☐

Attachment 1, Flowchart
(Page 3 of 3)



*PAGs
- ≥ 1 REM TEDE or
- ≥ 5 REM Thyroid CDE

Attachment 2
Table 1

PLANT FARLEY
AFFECTED ZONES FOR PROTECTIVE ACTION RECOMMENDATIONS

	PAR 1 and 2	PAR 3
WIND DIRECTION FROM (degrees)	AFFECTED ZONES	AFFECTED ZONES
N, > 349 - 11	A, B5, C5, J5, K5	A, B5, C5, D5, E5, F5, I5, J5, K5, B10, C10, K10
NNE, >11 – 34	A, B5, C5, D5, K5	A, B5, C5, D5, E5, F5, I5, J5, K5, B10, C10, D10
NE, >34 – 56	A, B5, C5, D5	A, B5, C5, D5, E5, F5, I5, J5, K5, B10, C10, D10
ENE, >56 – 79	A, C5, D5, E5	A, B5, C5, D5, E5, F5, I5, J5, K5, C10, D10, E10
E, >79-101	A, D5, E5, F5	A, B5, C5, D5, E5, F5, I5, J5, K5, C10, D10, E10
ESE, >101 – 124	A, D5, E5, F5	A, B5, C5, D5, E5, F5, I5, J5, K5, D10, E10, F10
SE, >124-146	A, E5, F5	A, B5, C5, D5, E5, F5, I5, J5, K5, E10, F10
SSE, >146 - 169	A, E5, F5, I5	A, B5, C5, D5, E5, F5, I5, J5, K5, E10, F10, G10
S, >169 - 191	A, E5, F5, I5	A, B5, C5, D5, E5, F5, I5, J5, K5, F10, G10, H10
SSW, >191 - 214	A, F5, I5	A, B5, C5, D5, E5, F5, I5, J5, K5, F10, G10, H10, I10
SW, >214-236	A, F5, I5, J5	A, B5, C5, D5, E5, F5, I5, J5, K5, F10, G10, H10, I10, J10
WSW, >236-259	A, I5, J5	A, B5, C5, D5, E5, F5, I5, J5, K5, G10, H10, I10, J10
W, >259 – 281	A, I5, J5	A, B5, C5, D5, E5, F5, I5, J5, K5, H10, I10, J10, K10
WNW, >281 – 304	A, I5, J5, K5	A, B5, C5, D5, E5, F5, I5, J5, K5, I10, J10, K10
NW, >304 - 326	A, B5, J5, K5	A, B5, C5, D5, E5, F5, I5, J5, K5, B10, J10, K10
NNW, >326 - 349	A, B5, C5, J5, K5	A, B5, C5, D5, E5, F5, I5, J5, K5, B10, K10

Attachment 2
Table 2

PLANT FARLEY
GUIDANCE FOR PARS BEYOND THE 10 MILE EPZ

1. Calculate the Evacuation Distance by determining the maximum Projected Distance where MIDAS dose projections exceed PAGs and adding 5 miles to the projected distance.
   __________ **Projected Distance (miles) + 5 miles = _______ Evacuation Distance (miles)**

2. Determine the affected sectors for the current 15 minute average (From) wind direction
   ______________________________ **Affected Sectors**

3. Recommend Evacuation from 10 miles to the Evacuation Distance (calculated in step 1) for the Affected Sectors (determined in step 2).

4. Check Line 5, Item E – Other on the Emergency Notification Form and record the recommended sectors and distance range in miles for Evacuation. (Note: Refer to 50 mile IPZ map as necessary)

PAR 4

WIND DIRECTION FROM (degrees)	AFFECTED SECTORS
N, > 349 - 11	H, J, K
NNE, >11 – 34	J, K, L
NE, >34 – 56	K, L, M
ENE, >56 – 79	L, M, N
E, >79-101	M, N, P
ESE, >101 – 124	N, P, Q
SE, >124-146	P, Q, R
SSE, >146 - 169	Q, R, A
S, >169 - 191	R, A, B
SSW, >191 - 214	A, B, C
SW, >214-236	B, C, D
WSW, >236-259	C, D, E
W, >259 – 281	D, E, F
WNW, >281 – 304	E, F, G
NW, >304 - 326	F, G, H
NNW, >326 - 349	G, H, J

Attachment 3
Table 1

PLANT HATCH
AFFECTED ZONES FOR PROTECTIVE ACTION RECOMMENDATIONS

	PAR 1 and 2	PAR 3
WIND DIRECTION FROM (degrees)	**AFFECTED ZONES**	**AFFECTED ZONES**
N, > 349 - 11	A, B5, C5	A, B5, C5, D5, E5, C10, D10, E10
NNE, >11 – 34	A, B5, C5	A, B5, C5, D5, E5, D10, E10, F10
NE, >34 – 56	A, B5, C5	A, B5, C5, D5, E5, E10, F10, G10
ENE, >56 – 79	A, C5	A, B5, C5, D5, E5, E10, F10, G10
E, >79-101	A, C5, D5	A, B5, C5, D5, E5, F10, G10, H10
ESE, >101 – 124	A, C5, D5	A, B5, C5, D5, E5, G10, H10, I10
SE, >124-146	A, C5, D5, E5	A, B5, C5, D5, E5, G10, H10, I10
SSE, >146 - 169	A, C5, D5, E5	A, B5, C5, D5, E5, H10, I10, J10
S, >169 - 191	A, D5, E5	A, B5, C5, D5, E5, I10, J10
SSW, >191 - 214	A, D5, E5	A, B5, C5, D5, E5, I10, J10
SW, >214-236	A, E5	A, B5, C5, D5, E5, J10, K10, L10
WSW, >236-259	A, B5, E5	A, B5, C5, D5, E5, J10, K10, L10
W, >259 – 281	A, B5, E5	A, B5, C5, D5, E5, B10, K10, L10
WNW, >281 – 304	A, B5, E5	A, B5, C5, D5, E5, B10, C10, D10, K10, L10
NW, >304 - 326	A, B5	A, B5, C5, D5, E5, B10, C10, D10
NNW, >326 - 349	A, B5, C5	A, B5, C5, D5, E5, B10, C10, D10, E10

Attachment 3
Table 2

PLANT HATCH
GUIDANCE FOR PARS BEYOND THE 10 MILE EPZ

1. Calculate the Evacuation Distance by determining the maximum Projected Distance where MIDAS dose projections exceed PAGs and adding 5 miles to the projected distance.
   __________ **Projected Distance (miles) + 5 miles =** _______ **Evacuation Distance (miles)**

2. Determine the affected sectors for the current 15 minute average (From) wind direction
   ________________________________ **Affected Sectors**

3. Recommend Evacuation from 10 miles to the Evacuation Distance (calculated in step 1) for the Affected Sectors (determined in step 2).

4. Check Line 5, Item E – Other on the Emergency Notification Form and record the recommended sectors and distance range in miles for Evacuation. (Note: Refer to 50 mile IPZ map as necessary)

PAR 4

WIND DIRECTION FROM (degrees)	AFFECTED SECTORS
N, > 349 - 11	H, J, K
NNE, >11 – 34	J, K, L
NE, >34 – 56	K, L, M
ENE, >56 – 79	L, M, N
E, >79-101	M, N, P
ESE, >101 – 124	N, P, Q
SE, >124-146	P, Q, R
SSE, >146 - 169	Q, R, A
S, >169 - 191	R, A, B
SSW, >191 - 214	A, B, C
SW, >214-236	B, C, D
WSW, >236-259	C, D, E
W, >259 – 281	D, E, F
WNW, >281 – 304	E, F, G
NW, >304 - 326	F, G, H
NNW, >326 - 349	G, H, J

Attachment 4
Table 1

PLANT VOGTLE
AFFECTED ZONES FOR PROTECTIVE ACTION RECOMMENDATIONS

	PAR 1 and 2	PAR 3
WIND DIRECTION FROM (degrees)	AFFECTED ZONES	AFFECTED ZONES
N, > 349 - 11	A, B5, C5, SRS to 2 Miles	A, B5, C5,D5, E5, F5, B10, C10, D10, SRS to 5 Miles
NNE, >11 – 34	A, B5, C5, SRS to 2 Miles	A, B5, C5, D5, E5, F5, C10, D10, SRS to 5 Miles
NE, >34 – 56	A, B5, C5, D5, SRS to 2 Miles	A, B5, C5, D5, E5, F5, C10, D10, E10, SRS to 5 Miles
ENE, >56 – 79	A, C5, D5, E5, SRS to 2 Miles	A, B5, C5, D5, E5, F5, D10, E10, F10,SRS to 5 Miles
E, >79-101	A, C5, D5, E5, F5, SRS to 2 Miles	A, B5, C5, D5, E5, F5, D10, E10, F10, SRS to 5 Miles
ESE, >101 – 124	A, D5, E5, F5, SRS to 2 Miles	A, B5, C5, D5, E5, F5, E10, F10, G10,SRS to 5 Miles
SE, >124-146	A, D5, E5, F5, SRS to 2 Miles	A, B5, C5, D5, E5, F5, E10, F10, G10,SRS to 10 Miles
SSE, >146 - 169	A, E5, F5, SRS to 5 Miles	A, B5, C5, D5, E5, F5, F10, G10, SRS to 10 Miles
S, >169 - 191	A, F5, SRS to 5 Miles	A, B5, C5, D5, E5, F5, F10, G10, SRS to 10 Miles
SSW, >191 - 214	A, F5, SRS to 5 Miles	A, B5, C5, D5, E5, F5, G10, SRS to 10 Miles
SW, >214-236	A, SRS to 5 Miles	A, B5, C5, D5, E5, F5, SRS to 10 Miles
WSW, >236-259	A, SRS to 5 Miles	A, B5, C5, D5, E5, F5, H10, SRS to 10 Miles
W, >259 – 281	A, B5, SRS to 5 Miles	A, B5, C5, D5, E5, F5, B10, H10, SRS to 10 Miles
WNW, >281 – 304	A, B5, SRS to 5 Miles	A, B5, C5, D5, E5, F5, B10, C10, H10, SRS to 10 Miles
NW, >304 - 326	A, B5, SRS to 5 Miles	A, B5, C5, D5, E5, F5, B10, C10, H10, SRS to 10 Miles
NNW, >326 - 349	A, B5, SRS to 2 Miles	A, B5, C5, D5, E5, F5, B10, C10, D10, SRS to 5 Miles

Attachment 4
Table 2

PLANT VOGTLE
GUIDANCE FOR PARS BEYOND THE 10 MILE EPZ

1. Calculate the Evacuation Distance by determining the maximum Projected Distance where MIDAS dose projections exceed PAGs and adding 5 miles to the projected distance.
   __________**Projected Distance (miles) + 5 miles =** _______ **Evacuation Distance (miles)**

2. Determine the affected sectors for the current 15 minute average (From) wind direction
   ________________________________ **Affected Sectors**

3. Recommend Evacuation from 10 miles to the Evacuation Distance (calculated in step 1) for the Affected Sectors (determined in step 2).

4. Check Line 5, Item E – Other on the Emergency Notification Form and record the recommended sectors and distance range in miles for Evacuation.. (Note: Refer to 50 mile IPZ map as necessary)

PAR 4

WIND DIRECTION FROM (degrees)	AFFECTED SECTORS
N, > 349 - 11	H, J, K
NNE, >11 – 34	J, K, L
NE, >34 – 56	K, L, M
ENE, >56 – 79	L, M, N
E, >79-101	M, N, P
ESE, >101 – 124	N, P, Q
SE, >124-146	P, Q, R
SSE, >146 - 169	Q, R, A
S, >169 - 191	R, A, B
SSW, >191 - 214	A, B, C
SW, >214-236	B, C, D
WSW, >236-259	C, D, E
W, >259 – 281	D, E, F
WNW, >281 – 304	E, F, G
NW, >304 - 326	F, G, H
NNW, >326 - 349	G, H, J

Attachment 5
Figure 1

PAR WORKSHEET

INSTRUCTIONS:

1. Check the box for the applicable PAR (1, 2, 3, or 4).
2. Record the 15 minute average "wind direction from" for the selected PAR.
   Use met instrumentation corresponding to primary release point(s) (BWR) OR ground level release (PWR).
3. Use the applicable "**Site Specific**" PAR table (Table 1 or 2) to determine the affected zones.

CAUTION:	PAR Revisions must include previous PARs.

On the ENN Form for the selected PAR:

- Select block 5.B and record the "Evacuate" zones OR select block 5.C and record the "Shelter" zones"
- Select block 5.D
- IF PAR 4 is selected, THEN additionally select block 5.E "Other" and provide "Affected Sectors" and "To Miles"

☐ PAR 1	**Wind direction from**	
	ENN Line 5 [C] Shelter Zones	
	ENN Line 5 [D]	Advise remainder of EPZ to Monitor Local Radio/TV Stations /Tone Alert Radios. Consider the use of KI (Potassium Iodide) in accordance with State Plans and Policy

☐ PAR 2	**Wind direction from**	
	ENN Line 5 [B] Evacuate Zones	
	ENN Line 5 [D]	Advise remainder of EPZ to Monitor Local Radio/TV Stations /Tone Alert Radios. Consider the use of KI (Potassium Iodide) in accordance with State Plans and Policy

☐ PAR 3	**Wind direction from**	
	ENN Line 5 [B] Evacuate Zones	
	ENN Line 5 [D]	Advise remainder of EPZ to Monitor Local Radio/TV Stations /Tone Alert Radios. Consider the use of KI (Potassium Iodide) in accordance with State Plans and Policy

☐ PAR 4	**Wind direction from**	
	ENN Line 5 [B] Evacuate Zones	
	ENN Line 5 [D]	Advise remainder of EPZ to Monitor Local Radio/TV Stations/ Tone Alert Radios. Consider the use of KI (Potassium Iodide) in accordance with State Plans and Policy
	ENN Line 5 [E] OTHER	Evacuate Affected Sectors ________________ to _________miles

Approval: ______________________________ ____________/__________

Emergency Director **Date/Time**

HANDOUT

DATA SHEET 1
CLASSIFICATION DETERMINATION

1. ✓ Have the On Shift Dose Analyst (Shift Radio Chemist) commence performing the calculations for dose assessment per EIP-9.0 step 4.2.
2. ✓ IF the affected Unit is in Modes 1, 2, 3, or 4, go to step 4.
3. N/A IF the affected Unit is in Modes 5, 6, or Defueled, go to step 6.
4. ✓ Evaluate the status of the fission product barriers using Figure 1 or the "Fission Product Barrier Matrix" linked document.
   a. ✓ Fuel Cladding Integrity ☐ LOSS ☑ POTENTIAL LOSS ☐ INTACT
   (See Figure 1 or "Fission Product Barrier Matrix" linked document.)
   b. ✓ Reactor Coolant System ☑ LOSS ☐ POTENTIAL LOSS ☐ INTACT
   Integrity (See Figure 1 or "Fission Product Barrier Matrix" linked document.)
   c. ✓ Containment Integrity ☐ LOSS ☐ POTENTIAL LOSS ☑ INTACT
   (See Figure 1 or "Fission Product Barrier Matrix" linked document.)
5. ✓ Use Figure 2 or the "Emergency Classification Hot Matrix" linked document .to evaluate and determine the Hot Initiating Condition based on events which are in progress, considering past events, and their impact on current plant conditions. When using Figure 2 refer to the Threshold Value page associated with the Initiating Condition chosen to ensure that the Threshold is met. When using the "Emergency Classification Hot Matrix" linked document refer to the Threshold Value page for the IC if desired to evaluate the basis. Proceed to step 7.
6. N/A Use Figure 3 or the "Emergency Classification Cold Matrix" linked document to evaluate and determine the Cold Initiating Condition based on events which are in progress, considering past events, and their impact on current plant conditions. When using Figure 3 refer to the Threshold Value page associated with the Initiating Condition chosen to ensure that the Threshold is met. When using the "Emergency Classification Cold Matrix" linked document refer to the Threshold Value page for the IC if desired to evaluate the basis.
7. ✓ Check ☑ One:
   - ☐ General Emergency (EIP-9.0 Guideline 1)
   - ☑ Site Area Emergency (EIP-9.0 Guideline 2)
   - ☐ Alert (EIP-9.0 Guideline 3)
   - ☐ Notification Of Unusual Event (EIP-9.0 Guideline 4)

   Comments: FS1

8. ✓ Assume the position of Emergency Director, sign this form and indicate the date and time of classification below.

Signature: Shawn Smith Date: To / da / y Time: Time
Emergency Director

9. ✓ Go to the FNP-0-EIP-9.0 Guideline indicated in step 7 to perform appropriate actions for the declared emergency. Classification time is the time indicated in step 8.

HANDOUT

GUIDELINE 2

SITE AREA EMERGENCY

I. Purpose of Classification

The classification of Site Area Emergency applies to those events which are in progress or have occurred involving actual or likely major failures of plant functions needed for protection of the public from radiation or contamination or HOSTILE ACTION that results in intentional damage or malicious acts; (1) toward site personnel or equipment that could lead to the likely failure of or; (2) that prevent effective access to equipment needed for the protection of the public. The potential for release of radioactive material for the Site Area Emergency classification is up to 1000 Ci of I-131 equivalent, or 10^4 to 10^6 Ci of Xe-133 equivalent. The purpose of the declaration of a Site Area Emergency is to:

(a) Assure that response centers are manned,

(b) Assure that monitoring teams are dispatched,

(c) Assure that personnel involved in an evacuation effort of near site areas are at their duty stations if the situation worsens, and,

(d) Provide current information for and consultation with offsite authorities and the public.

(e) A Site Area Emergency would be declared for plant conditions that warrant activation of emergency centers and monitoring teams.

A Site Area Emergency would be declared Based on FNP-0-EIP-9.2

II. Emergency Director Actions

NOTE: THE SHIFT MANAGER SHALL PERFORM THE DUTIES OF THE EMERGENCY DIRECTOR UNTIL HIS ARRIVAL AND ASSUMPTION OF DUTIES.

Initials

A Notify personnel on site

SB 1. If the plant emergency alarm has not already been activated, then announce over the public address system, "All plant personnel report to designated assembly areas", activate the PEA for 30 seconds, then repeat announcement.

SB 2. Announce the condition, request setup of the TSC and OSC, and give needed evacuation instructions over plant public address system.