FORM 1/2-ADM-1611.F28, Rev. 2 RTL# A9.621A

Beaver Valley Power Station

Radiation Protection Technical Position/Evaluation/Calculation

Subject	No.	PAGE 1 OF
Process Alarm Setpoints For Liquid Effluent Monitors	**ERS-ATL-93-021**	34

Reference

HPP: 1-HPP-4.02.001, 002 & 013, 2-HPP-4.02.018 & 021, **EPP:** EPP-I-1a Table 7-1, **ITS:** 5.5.2, **CR:** 02011-00459-07, 02-06174-002, 06-06059-04, 08-50435 & 08-50765, **DCP:** 268, **ENV:** 1/2-ENV-05.04

Category

☐ Technical Position ■ Technical Evaluation ☐ Calculation

Unit 1 ■ Unit 2 ■

Purpose

The purpose of this calculation package is to provide consistent alarm setpoint methodology that is traceable to the ODCM bases for the following liquid effluent monitors:

1. For RMS Victoreen Monitors RM-1RW-100, RM-1RW-101, RM-1DA-100, RM-1LW-104 and RM-1LW-116.
2. For DRMS GA/Sorrento Monitors 2SGC-RQ100, 2SWS-RQ101 and 2SWS-RQ102.

☐ **ORIGINAL ISSUE**

☒ **REVISION # 4**

Revision description: The alarm setpoints for RM-1RW-100 is being changed to reflect decreased detector efficiency at elevated river temperatures. This revision becomes the setpoint basis for radiation monitor RM-1RW-100, replacing 8700-UR(B)-223.

Based on a change in BVPS procedure 1/2-ADM-1611, this revision is changed to a Technical Evaluation.

by	*checker/reviewer*	*independent review (calculation only)*
Michael G. Unfried 4/26/12 *date*	John T Lebda 4-24-12 *date*	N/A *date*

Checklist		Attachments
■ Purpose	■ Results	☐ Data Sheets
■ Methodology	■ References	☐ Illustrations
■ Input Data		■ Printouts
		☐ Code Listings

■ Transmittal to BVRC	☐ Supt, Rad Ops	■ Author: M. G. Unfried
■ Original RP ERF FILE	☐ Supv, RP Services	☐ EP:
■ MGR, Radiation Protection	■ Supv, Rad Waste/Effluents	☐
		☐

3	*By* ***Anthony T Lonnett, 12/19/2008*** *checker/reviewer* ***John T. Lebda, 12/23/2008*** *Indep review (calculation only)* ***NA, No Change in Methodology***	**SAP Order 200197646-0710:** Determine effect on the current alarm setpoints of Unit 1 Aux Feedwater Area Drain Radiation Monitor [RM-1DA-100], as previously provided in Calculation No. 8700-UR(B)-223, Rev 0 (Impact of Atmospheric Containment Conversion, Power Uprate, and Alternate Source Terms on the Alarm setpoints for the Radiation Monitors at BVPS-1) due to vendor upgrade FROM the Model 843-32 gamma scintillation detector TO the Model 843-32R replacement
2	*By* ***Anthony T Lonnett, 07/21/06*** *Checker/reviewer* ***Michael D Banko, 07/28/06*** *Indep review (calculation only)* ***NA, No Change in Methodology***	**CR05-06059-04:** Determine revised alarm setpoints for Unit 1 liquid radiation monitors due to vendor upgrade of Model 843-30 gamma scintillation detector with the Model 843-30R replacement detector.
1	*By* ***Anthony T Lonnett, 08/21/02*** *Checker/reviewer* ***Robert A Moore, 08/28/02*** *Indep review (calculation only)* ***NA, No Change in Methodology***	1. Add Zn-65 to ODCM Liquid Effluent Source Term per (CR02-06174-002) 2. Revise Unit 1 Source Term per S&W Calc UR(B)-160-3 3. Provide documentation that the EPP-EAL's are based on 2 x ODCM Limit for a UE and 200 x ODCM limit for an Alert
0	*By* ***Anthony T Lonnett, 07/12/93*** *checker/reviewer* ***DK Yourd, 09/08/93*** *Indep review (calculation only)* ***SF Lavie for RSC, 10/06/93***	Checklist ☒ Purpose ☒ Input Data ☒ Assumptions ☒ Results ☒ Methodology ☒ References Attachments ☐ Data Sheets ☒ Illustrations ☒ Printouts ☐ Code Listings

DISCUSSION

The objective of this evaluation package is to provide consistent alarm setpoint methodology that is traceable to ODCM setpoint methodology for all liquid effluent pathway radiation monitors at Unit 1 and Unit 2.

Revision 4 now calculates alarm set points for RM-1RW-100 using revised detector model 843-30 efficiencies provided by the manufacturer for elevated temperature that could occur following a LOCA..

Original Alarm Setpoint Bases

The original alarm setpoints for Unit 1 and Unit 2 effluent monitors were based on the following:

1. For monitors RM-1RW-100 (Component Cooling/Recirculation Spray Heat Exchanger River Water Monitor) and RM-1RW-101 (Component Cooling Heat Exchanger River Water Monitor) the setpoints were documented in Reference 1. The setpoints were based on 10 CFR 20 Appendix B to 20.1-20.601, Table II, Col. 2 MPCs (i.e., HSP = 1 MPC and HHSP = 10 MPC). Since operator actions (e.g., grab sampling and valving out the faulty heat exchanger) are the same for HSP or HHSP alarms, then 10 CFR 20 MPCs would be maintained.

2. For monitor RM-1DA-100 (Aux. Feed Pump Bay Drain Monitor), the setpoints were documented in Reference 2, and were based on MPCs (i.e., HSP = 0.25 MPC and HHSP = 8.3 MPC). Since Automatic Actions (e.g., termination of discharge) occur on a HSP alarm, then 10 CFR 20 MPCs would be maintained.

3. For monitors RM-1LW-104 (Liquid Waste Effluent Monitor) and RM-1LW-116 (Liquid Waste Contaminated Drain Monitor), the setpoints were documented in the ODCM, and were based on MPCs (i.e., HHSP = 0.8 MPC). Since Automatic Actions (e.g., termination of discharge) occur on a HHSP Alarm, then 10 CFR 20 MPCs would be maintained.

4. For monitor 2SGC-RQ100 (Liquid Waste Effluent Monitor), the setpoints were documented in the ODCM and were based on MPCs (i.e., HSP = 0.8 MPC). Since Automatic Actions (e.g., termination of discharge) occur on a HSP alarm, then 10 CFR 20 MPCs would be maintained.

5. For monitors 2SWS-RQ101 and 2SWS-RQ102 (Service Water Monitors), the setpoints were documented in Reference 21, and were based on two times the background in the process stream. Since this type of methodology would yield a very low setpoint, then it could be assumed that 10 CFR 20 MPCs would be maintained in the event of monitor alarms. However, this methodology is so conservative, it could result in nuisance alarms.

Technical Specification Requirements (Reference 6)

Technical Specification 5.5.2.a & b includes administrative requirements for alarm/trip setpoints that ensure maintenance of 10 x 10 CFR 20 ECs for liquid effluents. BVPS implements this TS requirement via the alarm setpoints of liquid effluent radiation monitors RM-1RW-100, RM-1RW-101, RM-1DA-100, RM-1LW-104, RM-1LW-116, and 2SGC-RQ100, 2SWS-RQ101, and 2SWS-RQ102.

BVPS-1 UFSAR Requirements (Reference 7)

1. Section 11.3.3.1 indicates that effluent flow to the environment will be automatically terminated or processed in the event of a HHSP alarm. This statement is generic; it is not intended as a specific requirement for all process monitors.

2. Section 11.3.3.3.10 does not contain any requirements for alarm setpoints of RM-1RW-101. However, it does indicate that the monitor is used to detect leakage from the RCS or an auxiliary system into the component cooling water system.

3. Section 11.3.3.3.11 indicates that a HHSP alarm on RM-1LW-116 will automatically terminate the discharge from the contaminated drain system.

4. Section 11.3.3.3.12 indicates that a HHSP alarm on RM-1LW-104 will automatically terminate the discharge from the liquid waste system.

5. Section 11.3.3.3.17 does not contain any requirement for alarm setpoints of RM-1RW-100. However, it does indicate that the monitor is used to detect a leak from the primary plant component cooling water heat exchangers or the recirculation spray heat exchangers.

6. Section 11.3.3.3.26 indicates that a HHSP alarm on RM-1DA-100 will automatically direct the auxiliary feedwater area drain tank discharge from the yard oil separator to the safeguards tunnel sump. NOTE: Even though the BVPS-1 UFSAR indicates that these automatic actions occur on a HHSP alarm, DCP-268 required these actions on a HSP alarm, and it is installed per the DCP-268 requirement (Reference 2).

BVPS-2 UFSAR Requirements (Reference 8)

1. Section 11.5.2.4.3 indicates that a HSP alarm on 2SGC-RQ100 will automatically terminate a discharge from the liquid waste system.

2. Section 11.5.2.5.7 indicates that a HSP alarm on 2SWS-RQ102 is indicative of a leaky component cooling heat exchanger.

3. Section 11.5.2.5.8 does not contain any requirements for alarm setpoint of 2SWS-RQ101. However, it does indicate that an activity measurement is indicative of a leaky component cooling heat exchanger. This monitor acts as a redundant channel to 2SWS-RQ102.

BVPS-1 USNRC SER Requirements (Reference 9)

Section 11.6 indicates that the process radiation monitoring system will detect, indicate, annunciate, and/or record the levels or fields of activity to verify compliance with 10 CFR 20 and keep radiation levels as low as practicable. This statement is generic, it is not intended as a specific requirement for all process monitors.

BVPS-2 USNRC SER Requirements (Reference 10)

Section 11.5.2 indicates that provisions to provide automatic termination of effluent releases and ensure control over discharges is in accordance with GDC 63.

Other Regulatory Commitments

None.

Offsite Dose Calculation Manual (ODCM) Requirements (Reference 3)

ODCM procedure 1/2-ODC-2.01 requires alarm setpoints that ensure maintenance of 10 x 10 CFR 20 ECs for liquid effluent monitors, RM-1LW-104, RM-1LW-116, RM-1RW-100, RM-1RW-101, RM-1DA-100, 2SGC-RQ100, 2SWS-RQ101, and 2SWS-RQ102.

Instrument Error Considerations

The original Unit 1 alarm setpoint calculations did not consider the effect of instrument and process errors on the alarm setpoints. Unit 2 alarm setpoints did assess this effect for most monitors, and the Unit 2 UFSAR does contain a commitment to Regulatory Guide 1.105 (Reference 11). The Radiation Safety Committee discussed this issue in meeting BV-RSC-25-87 (Reference 12). From these discussions, a position with regard to the applicability of RG 1.105 to the radiation monitors was developed and documented in ERS-SFL-87-036 (Reference 13). From this position, it is inferred that, as a licensing item, RG 1.105 does not apply to the liquid effluent monitors at Unit 1 and Unit 2.

BASES

The alarm setpoints will be calculated using current ODCM methodology for liquid effluent monitor setpoints.

INPUT DATA/ASSUMPTIONS References

1. Ai = Particulate Activity from the release path (Ci/yr) [3, 4, 14]
2. f = Maximum Acceptable Discharge Flowrate (gpm) [3, 18, 19, 25]
3. F = Dilution Water Flowrate (gpm) [3, 25, 26]
4. Ei = Monitor Sensitivity (cpm/uCi/cc) [15, 16, 17, 23, 24]

METHODOLOGY

An EXCEL spreadsheet was generated to perform the alarm setpoint calculations.

See Attachment 2 for historical (Old Method) alarm setpoints based on 1 x old 10 CFR 20 MPCs.

See Attachment 3 for current (New Method) alarm setpoints based on 10 x new 10 CFR 20 ECs.

1. Si values were calculated using ODCM 1/2-ODC-2.01 equation [1.1(1)-2) and 1.1(2)-2]:

$$S_i = \frac{A_i}{\sum_i A_i}$$

where: S_i = the fraction of total radioactivity

A_i = the appropriate individual nuclide source term values from ODCM 1/2-ODC-2.01 Table 1.1-1a and 1.1-1b or Calculation Package No. ERS-SFL-92-037.

NOTE 1: ODCM A_i values were derived by Stone and Webster and shown in Table 13 of Reference 4.

NOTE 2: Zn-65 was not projected as a source term radionuclide when the ODCM was originally developed. However, **SINCE** zinc may be added to the RCS, **THEN** Zn-65 needed to be added to the ODCM Liquid Effluent Source Term. See Attachment 4 for deviation of the Zn-65 activity that was added to ODCM 1/2-ODC-2.01 Tables 1.1-1a and 1.1-1b (Reference 22).

2. C_t value was calculated using ODCM 1/2-ODC-2.01 equation [1.1(1)-3 and 1.1(2)-3]:

$$C_t = \frac{F}{f \frac{\sum_i S_i}{OEC_i}}$$

where: = F = Dilution water flow rate (gpm)

= 22,800 gpm for RM-1LW-104, RM-1LW-116, and 2SGC-RQ100 (15,000 gpm + 7,800 gpm)

= 149,800 gpm for RM-1RW-100 and RM-1RW-101 (127,000 gpm + 15,000 gpm + 7,800 gpm)

= 86.9 gpm for RM-1DA-100: Assumes that the toal flow from Outfall 003 is the sum of 23.8 gpm (0.0343 MGD) from Internal Outfall 103 + 38.9 gpm (0.056 MGD) from Internal Outfall 303 + 24.3 gpm (35,000 gpd) as the approximate Make-up Rate for the Secondary System (References 25 & 26)

= 8400 gpm for 2SWS-RQ101 and 2SWS-RQ102

f = Maximum acceptable discharge flow rate prior to dilution (gpm)

= 35 gpm for RM-1LW-104

= 15 gpm for RM-1LW-116

= 80 gpm for 2SGC-RQ100

= 18,000 gpm for RM-1RW-100

= 9,000 gpm for RM-1RW-101

= 33.3 gpm for RM-1DA-100: Assumes 86% of the 38.9 gpm (0.056 MGD) from Internal Outfall 303 is from the Auxiliary Feed Pump Drain System

= 7220 gpm for 2SWS-RQ101 and 2SWS-RQ102

S_i = Previously described

3. C_i values were calculated using ODCM 1/2-ODC-2.01 equation [1.1(1)-4 and 1.1(2)-4]:

$$C_i = S_i \; C_t$$

where: C_i = max acceptable concentration for each radionuclide (uCi/ml)

S_i = previously described

C_t = previously described

4. The monitor count rate (CR) was calculated using ODCM 1/2-ODC-2.01 equation [1.1(1)-5 and 1.1(2)-5]:

$$CR = \sum_i C_i E_i$$

where: CR = monitor count rate attributed from each radionuclide in ncpm

Ci = previously described

Ei = detection efficiency for the appropriate monitor (cpm/uCi/cc)
References 15, 16, 17, 23 and 24

5. FOR UNIT 2 ONLY: The Unit 2 monitor display value (DV) was calculated using ODCM 1/2-ODC-2.01 equation [1.1(2)-5]:

$$DV = CF11 \sum_i C_i E_i$$

where: $CF11 = \sum_i C_i / \sum_i C_i E_i$ = Conversion factor (uCi/ml/cpm) is an average determined for the source term mix. Original derivations of the CF11 are shown in References 20 and 21.

E_i = Previously described

C_i = Previously described

6. The monitor alarm process setpoints were calculated as follows:

Unit 1: HHSP = 1.00 CR and HSP = 0.70 HHSP

Unit 2: HSP = 1.00 DV and ASP = 0.70 HSP

where: the process upper alarms (HHSP and HSP) and the process lower alarms (HSP and ASP) are the monitor alarm setpoints above background for the process stream (net cpm or net uCi/cc)

CR = previously described

1.00 and 0.70 = Fractions of total radioactivity concentration that may be released via the monitored pathway to ensure that the 10 CFR 20 MPCs, or 10 x 10 CFR 20 ECs are maintained.

The Emergency Preparedness Plan - Emergency Action Level (EPP-EAL) values were calculated as follows:

Unit 1 UE = 2 x ODCM Limit = 2 x HHSP

Unit 1 Alert = 200 x ODCM Limit = 200 x HHSP

Unit 2 UE = 2 x ODCM Limit = 2 x HSP

Unit 2 Alert = 200 x ODCM Limit = 200 x HSP

RESULTS

See Attachment 1 for the alarm setpoints (both Old Method and New Method) of liquid effluent monitors at Unit 1 and Unit 2. The alarm setpoints are normally adjusted to $\leq$ the values listed in the New Method.

Health Physics Procedure 1-HPP-4.02.001, page 17 of 42, requires update. Based on a change in BVPS procedure 1/2-ADM-1611, this revision is changed to a Technical Evaluation.

This revision also becomes the setpoint basis for radiation monitor RM-1RW-100. Consequently, the setpoint basis should no longer be specified as 8700-UR(B)-223, which is also being updated. Other output documents to be updated are 1/2-ODC-2.01 and setpoint document SPD-RM-1RW-100.

EPP-I-1a, page 52 of 55, does not require update because the ODCM values remain less than (or equal to) their current value of 2.09E4 cpm (HHSP) and 1.46E4 cpm (HSP). It is also noted that under the revised EALs, based on NEI 99-01, Rev. 5, which has received its NRC acceptance review (but awaits LAR approval), liquid effluent discharge pathways will no longer be considered for Unusual Event or Alert declarations.

REFERENCES

1. SWEC, Radiation Monitor Setpoints, DLS-12168; October 21, 1975
2. BVPS, DCP 268 - Radiation Alarm Setpoints, letter ND1ROC:635; April 16, 1982
3. BVPS, Offsite Dose Calculation Manual Procedure 1/2-ODC-2.01, ODCM: Liquid Effluents
4. SWEC, UR(B)-160, BVPS Liquid Radwaste Releases and Concentrations - Expected and Design Cases: Per Unit and Site, Revision 3; 1983
5. BVPS, Offsite Dose Calculation Manual Procedure 1/2-ODC-3.03, Control for RETS and REMP Programs, Table 3.3-12 of ODCM Control 3.3.3.9
6. BVPS, Units 1 and 2 Technical Specification 5.5.2.a and 5.5.2.b
7. BVPS, Updated Final Safety Analysis Report Unit 1, Section 11.3
8. BVPS, Updated Final Safety Analysis Report Unit 2, Section 11.5

9. USNRC, Safety Evaluation Report Related To The Operation Of The Beaver Valley Power Station Unit 1, (Through Supplement 3)

10. USNRC, Safety Evaluation Report Related To The Operation Of The Beaver Valley Power Station Unit 2, (Through Supplement 6)

11. USNRC, Instrument Setpoints, Regulatory Guide 1.105; 1976

12. BVPS, Minutes of Radiation Safety Committee Meeting 25-87, BV-RSC-25-87; 1987

13. BVPS, Applicability Of RG 1.105 To BVPS Radiation Monitors, ERS-SFL-87-036, Revision 0; 1987

14. BVPS, Alarm Trip Setpoints For RM-1RW-100A, B, C, D, ERS-SFL-92-037, Revision 0; 1993

15. BVPS, Isotopic Efficiencies For Unit 1 Liquid Process Monitors, ERS-SFL-92-039, Revision 0; 1992

16. BVPS, Unit 2 DRMS Isotopic Efficiencies, ERS-SFL-86-026, Revision 6; 1991

17. BVPS, Isotopic Efficiencies (2SGC-RQ100), ERS-JWW-87-015, Revision 0; 1987

    NOTE: Isotopic Efficiencies for 2SGC-RQ100 are superceded by ERS-SFL-86-026

18. BVPS, Unit 2 Liquid Release Rates, Memorandum, September 20, 1989, A. T. Lonnett

19. BVPS, Discharge Rate (RM-1LW-116), Memorandum, November 1, 1989, A. T. Lonnett

20. BVPS, Conversion Factor For 2SGC-RQ100, ERS-WFW-87-021, Revision 0; 1987

    NOTE: CF11 Conversion Factor for 2SGC-RQ100 is superceded by ERS-ATL-93-021

21. SWEC, Safety Limits For Liquid Process Monitors 2CCP-RQ100, 2SWS-RQ101, and 2SWS-RQ102, UR(B)-417, Revision 0; 1986

    NOTE: CF11 Conversion Factors for 2SWS-RQ101 and 102 are superceded by ERS-ATL-93-026

22. Westinghouse Letter dated August 1, 2002, Zinc Injection Project; Operational Value of Zn-65 for Beaver Valley Zinc Injection

23. FLUKE Bimedical Letter dated April 19, 2006, Revised Model 843-30R Efficiencies

24. Condition Report No. CR05-06059-04: Document liquid effluent monitor alarm setpoint bases for ODC, HPP, ENV and EPP-EAL implementing procedures.

25. FENOC, 1/2-ADM-0604, Preparation of the Discharge Monitoring Report

26. FENOC, Form 1/2-ENV-05.04.F04, RWDA-L Special Release Quantification

27. SAP Order 200197646-0710, Determine revised alarm setpoints for [RM-1DA-100] due to upgrade FROM the model 843-32 detector TO the Model 843-32-R detector. This upgrade was necessary due to repeat failures of Model 843-32 detectors as documented in CR08-50435, CR08-50765 & CR08-50899).

28. BVPS-1 Procedure 1-HPP-4.02.001, Rev. 11, Process Monitoring System

29. BVPS-1 Procedure 1/2-ADM-1611, Rev. 12, Radiation Protection Administrative Guide

30. BVPS-1 Calculation 8700-UR(B)-223, Rev. 0, Impact Of Atmospheric Cont Conv, Pwr Uprate, & Alt Source Terms On The Alarm Setpoints For The Rad Monitors At BVPS-1

31. BVPS Regulatiory Document 1/2-ODC-2.01, Rev. 10, ODCM: Liquid Effluents

32. BVPS-1 Setpoint Document SPD-RM-1RW-100, Rev. 1, Setpoint Document For RM-1RW-100

33. BVPS-1 Procedure EPP-I-1a, Rev. 13, Recognition And Classification Of Emergency Conditions

34. Calculation 10080-UR(B)-484, Rev. 0, including Addendum 1, Primary and Secondary Coolant Design/Techanical Soecification Activity Concentrations including Pre-Accident Iodine Spike concentrations and Equilibrium Iodine Appearance Rates Following Power Uprate

35. Fluke Biomedical report 950.373, Rev. 1, High Temperature Transient Test Report for Beaver Valley, Unit 1, 843-30 Gamma Scintillation Detector

ATTACHMENTS

1.	Summary - Process Alarm Setpoints	2 pages
2.	Historical Alarm Setpoints Based on 1 x Old 10 CFR 20 MPCs	8 pages
3.	Fluke Biomedical Report 950.373, High Temp Test Report for 843-30	3 pages
4.	Current Alarm Setpoints Based on 10 x New 10 CFR 20 ECs	9 pages
5.	Determination of Zn-65 Ci/yr value for ODCM	1 page
6.	Evaluation of the effect on [RM-1DA-100] Alarm Setpoints due to Detector Upgrade	2 pages
7.	Fluke Biomedical Letter dated April 19, 2006, Revised Model 843-30R Efficiencies	4 pages

Summary - Process Alarm Setpoints
For Liquid Effluent Monitors
(For Information Only - DO NOT USE)

Old / Previous ODCM Method -
OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

RM-1RW-100 Alarm Setpoints

HHSP = CR =	1.49E+03	cpm
HSP = CR x 0.7 =	1.04E+03	cpm
UE = 2 x HHSP =	2.97E+03	cpm
Alert = 200 x HHSP =	2.97E+05	cpm

RM-1RW-101 Alarm Setpoints

HHSP = CR =	1.14E+03	cpm
HSP = CR x 0.7 =	7.97E+02	cpm
UE = 2 x HHSP =	2.28E+03	cpm
Alert = 200 x HHSP =	2.28E+05	cpm

RM-1DA-100 Alarm Setpoints (Model 843-32R Detector)

HHSP = CR =	2.98E+02	cpm
HSP = CR x 0.7 =	2.09E+02	cpm
UE = 2 x HHSP =	5.97E+02	cpm
Alert = 200 x HHSP =	5.97E+04	cpm

RM-1LW-116 Alarm Setpoints

HHSP = CR =	1.04E+05	cpm
HSP = CR x 0.7 =	7.28E+04	cpm
UE = 2 x HHSP =	2.08E+05	cpm
Alert = 200 x HHSP =	2.08E+07	cpm

RM-1LW-104 Alarm Setpoints

HHSP = CR =	4.46E+04	cpm
HSP = CR x 0.7 =	3.12E+04	cpm
UE = 2 x HHSP =	8.92E+04	cpm
Alert = 200 x HHSP =	8.92E+06	cpm

2SGC-RQ100 Alarm Setpoints

HSP =	1.41E-04	uCi/ml
ASP =	9.84E-05	uCi/ml
CF11 =	5.61E-09	uCi/ml/cpm
UE = 2 x HSP =	2.81E-04	uCi/ml
Alert = 200 x HSP =	2.81E-02	uCi/ml

2SWS-RQ101 & Alarm Setpoints
2SWS-RQ102

HSP =	1.32E-06	uCi/ml
ASP =	9.23E-07	uCi/ml
CF11 =	5.71E-09	uCi/ml/cpm
UE = 2 x HSP =	2.64E-06	uCi/ml
Alert = 200 x HSP =	2.64E-04	uCi/ml

Summary - Process Alarm Setpoints
For Liquid Effluent Monitors
(For ODC 1/2-ODC-2.01 & Related HPP & ENV Procedures)

New / Current ODCM Method -
NEW METHOD - Based on: 10 x New 10 CFR 20 EC's

RM-1RW-100 Alarm Setpoints

HHSP = CR =	1.90E+04	cpm
HSP = CR x 0.7 =	1.33E+04	cpm
UE = 2 x HHSP =	3.79E+04	cpm
Alert = 200 x HHSP =	3.79E+06	cpm

NOTE: The net alarm setpoints for: All Monitors SHALL NOT be set at > than these values. Therefore, actual net setpoins SHALL be set at < or = to these values.

RM-1RW-101 Alarm Setpoints

HHSP = CR =	1.04E+04	cpm
HSP = CR x 0.7 =	7.29E+03	cpm
UE = 2 x HHSP =	2.08E+04	cpm
Alert = 200 x HHSP =	2.08E+06	cpm

RM-1-DA-100 Alarm Setpoints (843-32 and 843-32R Detector)

Re-Evaluated HHSP (843-32R) = CR =	1.22E+04	cpm, or 1.5% Increase from Current HHSP
Re-Evaluated HHSP (843-32) =	1.05E+04	cpm, or 12.8% decrease from Current HHSP
Current HHSP (843-32) =	1.20E+04	cpm
Re-Evaluated HSP (843-32R) = CR x 0.7 =	8.52E+03	cpm, or 1.1% Increase from Current HSP
Re-Evaluated HSP (843-32) =	7.33E+03	cpm, or 13.1% decrease from Current HSP
Current HSP (843-32) =	8.43E+03	cpm
Re-Evaluated UE-EAL (843-32R) = 2 x HHSP =	2.44E+04	cpm, or NO change from Current UE-EAL
Re-Evaluated UE-EAL (843-32) =	2.09E+04	cpm, or 14.2% decrease from Current UE-EAL
Current UE-EAL (843-32) =	2.44E+04	cpm
Re-Evaluated Alert-EAL (843-32R) = 200 x HHSP =	2.44E+06	cpm, or NO change from Current Alert-EAL
Re-Evaluated Alert-EAL (843-32) =	2.09E+06	cpm, or 14.2% decrease from Current Alert-EAL
Current Alert-EAL =	2.44E+06	cpm

NOTE 1:
See evaluation provided in Attachment 6 that indicates the current alarm setpoints for [RM-1DA-100], as previously provided in Calculation No. 8700-UR(B)-223, Rev 0, are still valid and do not require revision. Therefore, the alarm setpoints and the EPP-EAL values SHALL remain at the current values.

NOTE 2: SINCE the calculated Alert EAL values exceed the range of the instrument, THEN the actual Alert EAL values are "Not Applicable"

RM-1LW-116 Alarm Setpoints

HHSP = CR =	9.50E+05	cpm
HSP = CR x 0.7 =	6.65E+05	cpm
UE = 2 x HHSP =	1.90E+06	cpm
Alert = 200 x HHSP =	1.90E+08	cpm

RM-1LW-104 Alarm Setpoints

HHSP = CR =	4.07E+05	cpm
HSP = CR x 0.7 =	2.85E+05	cpm
UE = 2 x HHSP =	8.15E+05	cpm
Alert = 200 x HHSP =	8.15E+07	cpm

2SGC-RQ100 Alarm Setpoints

HSP =	1.14E-03	uCi/ml
ASP =	7.99E-04	uCi/ml
CF11 =	5.61E-09	uCi/ml/cpm
UE = 2 x HSP =	2.28E-03	uCi/ml
Alert = 200 x HSP =	2.28E-01	uCi/ml

2SWS-RQ101 & Alarm Setpoints
2SWS-RQ102

HSP =	4.30E-05	uCi/ml
ASP =	3.01E-05	uCi/ml
CF11 =	5.71E-09	uCi/ml/cpm
UE = 2 x HSP =	8.59E-05	uCi/ml
Alert = 200 x HSP =	8.59E-03	uCi/ml

RM-1RW-100 Alarm Setpoints

OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

Nuclide	Ai Annual Release (Ci)	Si	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	Si/MPC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	0.00E+00	0.00E+00	2E-03	2E-03	0.00E+00	0.00E+00	1.24E+07	0
Co-58	4.86E+00	1.19E-03	9E-05	9E-05	1.32E+01	1.45E-08	1.06E+08	2
Co-60	1.46E-01	3.57E-05	3E-05	3E-05	1.19E+00	4.37E-10	1.84E+08	0
Rb-88	6.21E+02	1.52E-01	3E-06	3E-06	5.06E+04	1.86E-06	3.73E+07	69
Sr-89	7.83E-01	1.91E-04	3E-06	3E-06	6.38E+01	2.34E-09	9.84E+03	0
Sr-90	1.66E-02	4.55E-06	3E-07	3E-07	1.52E+01	5.57E-11	0.00E+00	0
Y-90	2.27E-02	5.55E-06	2E-05	2E-05	2.77E-01	6.79E-11	0.00E+00	0
Sr-91	3.76E-01	9.24E-05	5E-05	5E-05	1.85E+00	1.13E-09	8.13E+07	0
Y-91	1.27E-01	3.10E-05	3E-05	3E-05	1.03E+00	3.80E-10	2.53E+05	0
Zr-95	1.32E-01	3.23E-05	6E-05	6E-05	5.38E-01	3.95E-10	1.06E+08	0
Nb-95	1.32E-01	3.23E-05	1E-04	1E-04	3.23E-01	3.95E-10	1.06E+08	0
Zr-97	7.56E-02	1.85E-05	2E-05	2E-05	9.24E-01	2.26E-10	1.17E+08	0
Mo-99	8.21E+02	1.52E-01	4E-05	4E-05	3.79E+03	1.86E-06	1.41E+08	262
Tc-99m	3.51E+02	8.58E-02	3E-03	3E-03	2.86E+01	1.05E-08	1.11E+08	117
Ru-103	6.48E-02	1.58E-05	8E-05	8E-05	1.98E-01	1.94E-10	1.13E+08	0
Ru-105	5.67E-03	1.39E-06	1E-04	1E-04	1.39E-02	1.70E-11	7.84E+07	0
Ru-106	4.32E-03	1.06E-06	1E-05	1E-05	1.06E-01	1.29E-11	0.00E+00	0
Rh-105	1.62E-02	3.96E-06	1E-04	1E-04	3.96E-02	4.85E-11	3.07E+07	0
Te-127m	3.51E-01	8.58E-05	5E-05	5E-05	1.72E+00	1.05E-09	1.62E+07	0
Te-127	1.92E-01	4.69E-05	2E-04	2E-04	2.35E-01	5.75E-10	1.48E+06	0
Sb-127	2.67E-03	6.53E-07	3E-06	3E-06	2.18E-01	7.99E-12	1.25E+08	0
Sb-129	6.21E-03	1.52E-06	3E-06	3E-06	5.06E-01	1.86E-11	1.47E+08	0
Te-129m	7.29E+00	1.78E-03	2E-05	2E-05	8.91E+01	2.18E-08	1.11E+05	0
Te-129	4.05E+00	9.90E-04	8E-04	8E-04	1.24E+00	1.21E-08	1.69E+07	0
Te-131m	4.32E+00	1.06E-03	4E-05	4E-05	2.64E+01	1.29E-08	1.15E+06	0
I-131	4.86E+02	1.19E-01	3E-07	3E-07	3.96E+05	1.45E-06	1.18E+08	172
Te-132	5.13E+01	1.25E-02	2E-05	2E-05	6.27E+02	1.54E-07	1.21E+08	19
I-132	1.70E+02	4.16E-02	8E-06	8E-06	5.19E+03	5.09E-07	3.16E+08	161
I-133	7.83E+02	1.91E-01	1E-06	1E-06	1.91E+05	2.34E-06	1.16E+08	272
I-134	1.05E+02	2.57E-02	2E-05	2E-05	1.28E+03	3.14E-07	3.17E+08	100
I-135	4.05E+02	9.90E-02	4E-06	4E-06	2.47E+04	1.21E-06	1.47E+08	178
Cs-137	2.46E+02	6.01E-02	2E-05	2E-05	3.01E+03	7.38E-07	9.30E+07	68
Ba-137m	2.27E+02	5.55E-02	2E-05	2E-05	2.77E+03	6.78E-07	9.85E+07	67
Ba-140	8.10E-01	1.98E-04	2E-05	2E-05	9.90E+00	2.42E-09	4.78E+07	0
La-140	2.97E-01	7.26E-05	2E-05	2E-05	3.63E+00	8.89E-10	2.22E+08	0
Ce-141	1.30E-01	3.18E-05	9E-05	9E-05	3.53E-01	3.89E-10	6.20E+07	0
Ce-143	9.72E-02	2.38E-05	4E-05	4E-05	5.94E-01	2.91E-10	7.87E+07	0
Ce-144	6.75E-02	1.65E-05	1E-05	1E-05	1.65E+00	2.02E-10	1.36E+07	0
Pr-143	1.27E-01	3.10E-05	5E-05	5E-05	6.21E-01	3.80E-10	0.00E+00	0
Pr-144	6.75E-02	1.65E-05	0E+00	0E+00	—	2.02E-10	2.32E+06	0
Nd-147	4.59E-02	1.12E-05	6E-05	6E-05	1.87E-01	1.37E-10	3.37E+07	0
H-3	0.00E+00	0.00E+00	3E-03	3E-03	0.00E+00	0.00E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-07	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	4.09E+03	1.00E+00			6.80E+05	1.22E-05		1487
Total H-3	0.00E+00				0.00E+00	0.00E+00		0
Total W/O H-3	4.09E+03				6.80E+05	1.22E-05		1487

Ai: RCS Activity, From Calc Package No. ERS-SFL-92-037
Ei: (843-30 Data) From Calc Package No. ERS-SFL-92-039

F = 149800 gpm = Dilution Flowrate (127,000 gpm + 15,000 gpm + 7,600 gpm)
f = 16000 gpm = Discharge flowrate (9,000 gpm / RPRWP; Assumes 2 RPRWPs operating)
Ct = 1.22E-05 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)
Ci = Si x Ct

CR = Sum (CiEi) = 1.49E+03 cpm
HHSP = CR = 1.49E+03 cpm
HSP = CR x 0.7 = 1.04E+03 cpm

RM-1RW-101 Alarm Setpoints

OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

Nuclide	AI Annual Release (Ci)	SI	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	SI/MPC (ml/uCi)	CI (uCi/ml)	EI Detection Efficiency (cpm/uCi/ml)	CI•EI Count Rate (ncpm)
Cr-51	1.30E-03	2.36E-06	2E-03	2E-03	1.18E-03	2.62E-08	1.24E+07	0
Mn-54	3.10E-04	5.63E-07	1E-04	1E-04	5.63E-03	6.72E-09	1.05E+08	1
Fe-55	1.60E-03	2.91E-06	8E-04	8E-04	3.63E-03	3.47E-08	0.00E+00	0
Fe-59	8.30E-04	1.51E-06	5E-05	5E-05	3.02E-02	1.80E-08	1.04E+08	2
Co-58	1.40E-02	2.54E-05	9E-05	9E-05	2.83E-01	3.03E-07	1.06E+08	32
Co-60	2.00E-03	3.63E-06	3E-05	3E-05	1.21E-01	4.33E-08	1.94E+08	8
Zn-65	2.69E-02	4.88E-05	1E-04	1E-04	4.88E-01	5.82E-07	5.02E+07	29
Np-239	1.40E-04	2.54E-07	1E-04	1E-04	2.54E-03	3.03E-09	0.00E+00	0
Br-83	2.50E-05	4.54E-08	3E-06	3E-06	1.51E-02	5.42E-10	1.48E+06	0
Br-84	2.70E-06	4.91E-09	3E-06	3E-06	1.64E-03	5.85E-11	3.16E+08	0
Br-85	2.80E-08	5.09E-11	0E+00	0E+00	—	6.07E-13	5.71E+06	0
Rb-86	7.50E-05	1.36E-07	2E-05	2E-05	6.81E-03	1.63E-09	0.00E+00	0
Rb-88	1.20E-04	2.18E-07	0E+00	0E+00	—	2.60E-09	3.73E+07	0
Sr-89	2.90E-04	5.27E-07	3E-06	3E-06	1.76E-01	6.28E-09	9.84E+03	0
Sr-90	1.10E-05	2.00E-08	3E-07	3E-07	6.66E-02	2.38E-10	0.00E+00	0
Y-90	9.40E-06	1.71E-08	2E-05	2E-05	8.54E-04	2.04E-10	0.00E+00	0
Sr-91	1.30E-05	2.36E-08	5E-05	5E-05	4.72E-04	2.82E-10	8.13E+07	0
Y-91m	8.70E-06	1.58E-08	3E-03	3E-03	5.27E-06	1.89E-10	1.07E+08	0
Y-91	5.70E-05	1.04E-07	3E-05	3E-05	3.45E-03	1.24E-09	2.53E+05	0
Y-93	7.40E-07	1.34E-09	3E-05	3E-05	4.48E-05	1.60E-11	0.00E+00	0
Zr-95	5.10E-05	9.27E-08	6E-05	6E-05	1.54E-03	1.11E-09	1.06E+08	0
Nb-95	5.20E-05	9.45E-08	1E-04	1E-04	9.45E-04	1.13E-09	1.06E+08	0
Mo-99	1.10E-02	2.00E-05	4E-05	4E-05	5.00E-01	2.38E-07	1.41E+08	34
Tc-99m	1.10E-02	2.00E-05	3E-03	3E-03	6.66E-03	2.38E-07	1.11E+08	26
Ru-103	3.40E-05	6.18E-08	8E-05	8E-05	7.72E-04	7.37E-10	1.13E+08	0
Ru-106	1.00E-05	1.82E-08	1E-05	1E-05	1.82E-03	2.17E-10	0.00E+00	0
Rh-103m	3.40E-05	6.18E-08	1E-02	1E-02	6.18E-06	7.37E-10	0.00E+00	0
Rh-106	1.00E-05	1.82E-08	0E+00	0E+00	—	2.17E-10	0.00E+00	0
Te-125m	2.50E-05	4.54E-08	1E-04	1E-04	4.54E-04	5.42E-10	2.40E+05	0
Te-127m	2.60E-04	4.72E-07	5E-05	5E-05	9.45E-03	5.63E-09	1.62E+07	0
Te-127	2.70E-04	4.91E-07	2E-04	2E-04	2.45E-03	5.85E-09	1.48E+06	0
Te-129m	1.10E-03	2.00E-06	2E-05	2E-05	9.09E-02	2.38E-08	1.11E+05	0
Te-129	6.70E-04	1.22E-06	8E-04	8E-04	1.52E-03	1.45E-08	1.69E+07	0
I-130	1.20E-04	2.18E-07	3E-06	3E-06	7.27E-02	2.60E-09	2.65E+08	1
Te-131m	1.60E-04	2.91E-07	4E-05	4E-05	7.27E-03	3.47E-09	1.15E+06	0
Te-131	3.00E-05	5.45E-08	0E+00	0E+00	—	6.50E-10	1.11E+08	0
I-131	1.60E-01	2.91E-04	3E-07	3E-07	9.69E+02	3.47E-06	1.18E+08	409
Te-132	4.30E-03	7.81E-06	2E-05	2E-05	3.91E-01	9.32E-08	1.21E+08	11
I-132	4.90E-03	8.90E-06	8E-06	8E-06	1.11E+00	1.06E-07	3.16E+08	34
I-133	4.00E-02	7.27E-05	1E-06	1E-06	7.27E+01	8.67E-07	1.16E+08	101
I-134	8.00E-05	1.45E-07	2E-05	2E-05	7.27E-03	1.73E-09	3.17E+08	1
Cs-134	4.60E-02	8.36E-05	9E-06	9E-06	9.29E+00	9.97E-07	2.42E+08	241
I-135	4.30E-03	7.81E-06	4E-06	4E-06	1.95E+00	9.32E-08	1.47E+08	14
Cs-136	8.90E-03	1.62E-05	6E-05	6E-05	2.69E-01	1.93E-07	3.19E+08	62
Cs-137	3.30E-02	6.00E-05	2E-05	2E-05	3.00E+00	7.15E-07	9.30E+07	67
Ba-137m	3.10E-02	5.63E-05	2E-05	2E-05	2.82E+00	6.72E-07	9.85E+07	66
Ba-140	1.10E-04	2.00E-07	2E-05	2E-05	9.99E-03	2.38E-09	4.78E+07	0
La-140	1.10E-04	2.00E-07	2E-05	2E-05	9.99E-03	2.38E-09	2.22E+08	1
Ce-141	5.10E-05	9.27E-08	9E-05	9E-05	1.03E-03	1.11E-09	6.20E+07	0
Ce-143	2.80E-06	5.09E-09	4E-05	4E-05	1.27E-04	6.07E-11	7.87E+07	0
Ce-144	3.20E-05	5.81E-08	1E-05	1E-05	5.81E-03	6.93E-10	1.36E+07	0
Pr-143	2.70E-05	4.91E-08	5E-05	5E-05	9.81E-04	5.85E-10	0.00E+00	0
Pr-144	3.20E-05	5.81E-08	0E+00	0E+00	—	6.93E-10	2.32E+06	0
H-3	5.50E+02	9.99E-01	3E-03	3E-03	3.33E+02	1.19E-02	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-07	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.40E+03	1.19E-02		1139
Total H-3	5.50E+02				3.33E+02	1.19E-02		0
Total W/O H-3	4.05E-01				1.06E+03	8.78E-06		1,139

AI: From ODCM 1/2-ODC-2.01 Table 1.1-1a (from Table 13 of S&W UR(B)-160)
EI: (843-30 Data) From Calc Package No: ERS-SFL-92-039

F = 149800 gpm = Dilution Flowrate (127,000 gpm + 15,000 gpm + 7,800 gpm)
f = 9000 gpm = Disch. flowrate (9,000 gpm / RPRWP: With 2 RPRWPs, flow is split between CCW & RSP)
CI = 1.19E-02 = Dilution Flowrate / (Discharge Flowrate x Sum SI/MPC)
CI = SI x CI

CR = Sum (CI•EI) = 1.14E+03 cpm
HHSP = CR = 1.14E+03 cpm
HSP = CR x 0.7 = 7.97E+02 cpm

RM-1DA-100 Alarm Setpoints (Model 843-32 Detector)

OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

Nuclide	Ai Annual Release (Ci)	Si	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	Si/MPC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	0.00E+00	0.00E+00	2E-03	2E-03	0.00E+00	0.00E+00	1.18E+07	0
I-131	1.33E+02	2.60E-01	3E-07	3E-07	8.68E+05	5.14E-07	1.11E+08	57
I-132	4.77E+01	9.33E-02	8E-06	8E-06	1.17E+04	1.84E-07	2.66E+08	49
I-133	1.97E+02	3.86E-01	1E-06	1E-06	3.86E+05	7.61E-07	9.90E+07	75
I-134	2.33E+01	4.58E-02	2E-05	2E-05	2.28E+03	9.01E-08	2.70E+08	24
I-135	1.10E+02	2.15E-01	4E-06	4E-06	5.38E+04	4.25E-07	1.19E+08	51
H-3	0.00E+00	0.00E+00	3E-03	3E-03	0.00E+00	0.00E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-07	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.11E+02	1.00E+00			1.32E+06	1.98E-06		256
Total H-3	0.00E+00				0.00E+00	0.00E+00		0
Total W/O H-3	5.11E+02				1.32E+06	1.98E-06		256

Ai: SGTR Source Term, From UR(B)-223
Ei: (843-30 Data) From Calc Package No. ERS-SFL-92-039
NOTE: Even though this monitor has a Model 843-32 detector, the vendor notes that the effidencies are the same as those for the Model 843-30 detector.

F = 88.9 gpm = Dilution Flowrate (Total from Outfall 003), as follows:
23.8 gpm = 0.0342 MGD from Internal Outfall 103 (Reference: 1/2-ADM-0604)
38.9 gpm = 0.056 MGD from Internal Outfall 303 (Reference: 1/2-ADM-0604)
24.3 gpm = 35,000 gpd from Secondary Make-up (Reference: Form 1/2-ENV-05.04.F04)

f = 33.3 gpm = Discharge flowrate from Aux Feed Pump Drains to Internal Outfall 303 as follows:
33.3 gpm = Internal Outfall 303 Adjusted for Aux Feed Drain (i.e., 38.9 gpm x 86%)

Ct = 1.08E-06 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)
Ci = Si x Ct

CR = Sum (CiEi) = 2.56E+02 cpm
HHSP = CR = 2.56E+02 cpm
HSP = CR x 0.7 = 1.79E+02 cpm

RM-1DA-100 Alarm Setpoints (Model 843-32R Detector)

OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

Nuclide	Ai Annual Release (Ci)	Si	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	Si/MPC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	0.00E+00	0.00E+00	2E-03	2E-03	0.00E+00	0.00E+00	0.00E+00	0
I-131	1.33E+02	2.60E-01	3E-07	3E-07	8.68E+05	5.14E-07	1.18E+08	61
I-132	4.77E+01	9.33E-02	8E-06	8E-06	1.17E+04	1.84E-07	3.16E+08	58
I-133	1.97E+02	3.86E-01	1E-06	1E-06	3.86E+05	7.61E-07	1.16E+08	88
I-134	2.33E+01	4.56E-02	2E-05	2E-05	2.28E+03	9.01E-08	3.17E+08	29
I-135	1.10E+02	2.15E-01	4E-06	4E-06	5.38E+04	4.25E-07	1.47E+08	62
H-3	0.00E+00	0.00E+00	3E-03	3E-03	0.00E+00	0.00E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-07	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.11E+02	1.00E+00			1.32E+06	1.98E-06		298
Total H-3	0.00E+00				0.00E+00	0.00E+00		0
Total W/O H-3	5.11E+02				1.32E+06	1.98E-06		298

Ai: SGTR Source Term, From UR(B)-223
Ei: (843-30R Data) From Calc Package No. ERS-SFL-92-039
NOTE: Even though this monitor has a Model 843-32R detector, the vendor notes that the efficiencies are the same as those for the Model 843-30R detector.

F = 86.9 gpm = Dilution Flowrate (Total from Outfall 003), as follows:
23.8 gpm = 0.0342 MGD from Internal Outfall 103 (Reference: 1/2-ADM-0604)
38.9 gpm = 0.056 MGD from Internal Outfall 303 (Reference: 1/2-ADM-0604)
24.3 gpm = 35,000 gpd from Secondary Make-up (Reference: Form 1/2-ENV-05.04.F04)

f = 33.3 gpm = Discharge flowrate from Aux Feed Pump Drains to Internal Outfall 303 as follows:
33.3 gpm = Internal Outfall 303 Adjusted for Aux Feed Drain (i.e., 38.9 gpm x 86%)

Ct = 1.98E-06 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)
Ci = Si x Ct

CR = Sum (CiEi) = 2.98E+02 cpm
HHSP = CR = 2.98E+02 cpm
HSP = CR x 0.7 = 2.09E+02 cpm

RM-1LW-118 Alarm Setpoints

OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

Nuclide	Ai Annual Release (Ci)	Si	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	Si/MPC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	1.30E-03	2.36E-06	2E-03	2E-03	1.18E-03	2.57E-06	1.24E+07	32
Mn-54	3.10E-04	5.63E-07	1E-04	1E-04	5.63E-03	6.13E-07	1.05E+08	64
Fe-55	1.60E-03	2.91E-06	8E-04	8E-04	3.63E-03	3.17E-06	0.00E+00	0
Fe-59	8.30E-04	1.51E-06	5E-05	5E-05	3.02E-02	1.04E-06	1.04E+08	171
Co-58	1.40E-02	2.54E-05	9E-05	9E-05	2.83E-01	2.77E-05	1.06E+08	2937
Co-60	2.00E-03	3.63E-06	3E-05	3E-05	1.21E-01	3.96E-06	1.94E+08	768
Zn-65	2.69E-02	4.88E-05	1E-04	1E-04	4.88E-01	5.31E-05	5.02E+07	2668
Np-239	1.40E-04	2.54E-07	1E-04	1E-04	2.54E-03	2.77E-07	0.00E+00	0
Br-83	2.50E-05	4.54E-08	3E-06	3E-06	1.51E-02	4.95E-08	1.48E+08	0
Br-84	2.70E-06	4.91E-09	3E-06	3E-06	1.64E-03	5.34E-09	3.16E+08	2
Br-85	2.80E-08	5.09E-11	0E+00	0E+00	----	5.54E-11	6.71E+06	0
Rb-86	7.50E-05	1.36E-07	2E-05	2E-05	6.81E-03	1.48E-07	0.00E+00	0
Rb-88	1.20E-04	2.18E-07	0E+00	0E+00	----	2.37E-07	3.73E+07	9
Sr-89	2.90E-04	5.27E-07	3E-06	3E-06	1.76E-01	5.74E-07	9.84E+03	0
Sr-90	1.30E-05	2.00E-08	3E-07	3E-07	6.66E-02	2.18E-08	0.00E+00	0
Sr-91	9.40E-06	1.71E-08	5E-05	5E-05	3.42E-04	1.86E-08	0.00E+00	0
Y-90	1.30E-05	2.36E-08	2E-05	2E-05	1.18E-03	2.57E-08	8.13E+07	2
Y-91m	8.70E-06	1.58E-08	3E-03	3E-03	5.27E-06	1.72E-08	1.07E+08	2
Y-91	5.70E-05	1.04E-07	3E-05	3E-05	3.45E-03	1.13E-07	2.53E+05	0
Y-93	7.40E-07	1.34E-09	3E-05	3E-05	4.48E-05	1.46E-09	0.00E+00	0
Zr-95	5.10E-05	9.27E-08	6E-05	6E-05	1.54E-03	1.01E-07	1.06E+08	11
Nb-95	5.20E-05	9.45E-08	1E-04	1E-04	9.45E-04	1.03E-07	1.06E+08	11
Mo-99	1.10E-02	2.00E-05	4E-05	4E-05	5.00E-01	2.18E-05	1.41E+08	3069
Tc-99m	1.10E-02	2.00E-05	3E-03	3E-03	6.66E-03	2.18E-05	1.11E+08	2416
Ru-103	3.40E-05	6.18E-08	8E-05	8E-05	7.72E-04	6.73E-08	1.13E+08	8
Ru-106	1.00E-05	1.82E-08	1E-05	1E-05	1.82E-03	1.98E-08	0.00E+00	0
Rh-103m	3.40E-05	6.18E-08	1E-02	1E-02	6.18E-06	6.73E-08	0.00E+00	0
Rh-106	1.00E-05	1.82E-08	0E+00	0E+00	----	1.98E-08	0.00E+00	0
Te-125m	2.50E-05	4.54E-08	1E-04	1E-04	4.54E-04	4.95E-08	2.40E+05	0
Te-127m	2.60E-04	4.72E-07	5E-05	5E-05	9.45E-03	5.15E-07	1.62E+07	8
Te-127	2.70E-04	4.91E-07	2E-04	2E-04	2.45E-03	5.34E-07	1.48E+06	1
Te-129m	1.10E-03	2.00E-06	2E-05	2E-05	9.99E-02	2.18E-06	1.11E+05	0
Te-129	6.70E-04	1.22E-06	8E-04	8E-04	1.52E-03	1.33E-06	1.69E+07	22
I-130	1.20E-04	2.18E-07	3E-06	3E-06	7.27E-02	2.37E-07	2.65E+08	63
Te-131m	1.60E-04	2.91E-07	4E-05	4E-05	7.27E-03	3.17E-07	1.15E+06	0
Te-131	3.00E-05	5.45E-08	0E+00	0E+00	----	5.94E-08	1.11E+08	7
I-131	1.60E-01	2.91E-04	3E-07	3E-07	9.69E+02	3.17E-04	1.18E+08	37362
Te-132	4.30E-03	7.81E-06	2E-05	2E-05	3.91E-01	8.51E-06	1.21E+08	1030
I-132	4.90E-03	8.90E-06	8E-06	8E-06	1.11E+00	9.70E-06	3.16E+08	3064
I-133	4.00E-02	7.27E-05	1E-06	1E-06	7.27E+01	7.92E-05	1.16E+08	9182
I-134	8.00E-05	1.45E-07	2E-05	2E-05	7.27E-03	1.58E-07	3.17E+08	50
Cs-134	4.60E-02	8.36E-05	9E-06	9E-06	9.29E+00	9.10E-05	2.42E+08	22029
I-135	4.30E-03	7.81E-06	4E-06	4E-06	1.95E+00	8.51E-06	1.47E+08	1251
Cs-136	8.90E-03	1.62E-05	6E-05	6E-05	2.69E-01	1.76E-05	3.19E+08	5618
Cs-137	3.30E-02	6.00E-05	2E-05	2E-05	3.00E+00	6.53E-05	9.30E+07	6073
Ba-137m	3.10E-02	5.63E-05	2E-05	2E-05	2.82E+00	6.13E-05	9.85E+07	6043
Ba-140	1.10E-04	2.00E-07	2E-05	2E-05	9.99E-03	2.18E-07	4.76E+07	10
La-140	1.10E-04	2.00E-07	2E-05	2E-05	9.99E-03	2.18E-07	2.22E+08	48
Ce-141	5.10E-05	9.27E-08	9E-05	9E-05	1.03E-03	1.01E-07	6.20E+07	6
Ce-143	2.80E-06	5.09E-09	4E-05	4E-05	1.27E-04	5.54E-09	7.87E+07	0
Ce-144	3.20E-05	5.81E-08	1E-05	1E-05	5.81E-03	6.33E-08	1.36E+07	1
Pr-143	2.70E-05	4.91E-08	5E-05	5E-05	9.81E-04	5.34E-08	0.00E+00	0
Pr-144	3.20E-05	5.81E-08	0E+00	0E+00	----	6.33E-08	2.32E+06	0
H-3	5.50E+02	9.99E-01	3E-03	3E-03	3.33E+02	1.09E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	3E-06	3E-06	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.40E+03	1.09E+00		104039
Total H-3	5.50E+02				3.33E+02	1.09E+00		0
Total W/O H-3	4.05E-01				1.06E+03	8.02E-04		104032

Ai: From ODCM 1/2-ODC-2.01 Table 1.1-1a (from Table 13 of S&W UR(B)-160)
Ei: (843-30 Data) From Calc Package No. ERS-SFL-92-039

F = 22800 gpm = Dilution Flowrate (15,000 gpm + 7,800 gpm)
f = 15 gpm = Discharge flowrate
Ct = 1.09E+00 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)
Ci = Si x Ct

CR = Sum (CiEi) = 1.04E+05 cpm
HHSP = CR = 1.04E+05 cpm
HSP = CR x 0.7 = 7.28E+04 cpm

RM-1LW-104 Alarm Setpoints

OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

Nuclide	Ai Annual Release (Ci)	Si	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	Si/MPC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	1.30E-03	2.36E-06	2E-03	2E-03	1.18E-03	1.10E-06	1.24E+07	14
Mn-54	3.10E-04	5.63E-07	1E-04	1E-04	5.63E-03	2.63E-07	1.05E+08	28
Fe-55	1.60E-03	2.91E-06	8E-04	8E-04	3.63E-03	1.36E-06	0.00E+00	0
Fe-59	8.30E-04	1.51E-06	5E-05	5E-05	3.02E-02	7.04E-07	1.04E+08	73
Co-58	1.40E-02	2.54E-05	9E-05	9E-05	2.83E-01	1.19E-05	1.06E+08	1259
Co-60	2.00E-03	3.63E-06	3E-05	3E-05	1.21E-01	1.70E-06	1.94E+08	329
Zn-65	2.69E-02	4.88E-05	1E-04	1E-04	4.88E-01	2.28E-05	5.02E+07	1143
Np-239	1.40E-04	2.54E-07	1E-04	1E-04	2.54E-03	1.19E-07	0.00E+00	0
Br-83	2.50E-05	4.54E-08	3E-06	3E-06	1.51E-02	2.12E-08	1.48E+06	0
Br-84	2.70E-06	4.91E-09	3E-06	3E-06	1.64E-03	2.29E-09	3.16E+08	1
Br-85	2.80E-08	5.09E-11	0E+00	0E+00	----	2.37E-11	6.71E+06	0
Rb-86	7.50E-05	1.36E-07	2E-05	2E-05	6.81E-03	6.36E-08	0.00E+00	0
Rb-88	1.20E-04	2.18E-07	0E+00	0E+00	----	1.02E-07	3.73E+07	4
Sr-89	2.90E-04	5.27E-07	3E-06	3E-06	1.76E-01	2.46E-07	9.84E+03	0
Sr-90	1.10E-05	2.00E-08	3E-07	3E-07	6.66E-02	9.33E-09	0.00E+00	0
Sr-91	9.40E-06	1.71E-08	5E-05	5E-05	3.42E-04	7.97E-09	0.00E+00	0
Y-90	1.30E-05	2.36E-08	2E-05	2E-05	1.18E-03	1.10E-08	8.13E+07	1
Y-91m	8.70E-06	1.58E-08	3E-03	3E-03	5.27E-06	7.38E-09	1.07E+08	1
Y-91	5.70E-05	1.04E-07	3E-05	3E-05	3.45E-03	4.83E-08	2.53E+05	0
Y-93	7.40E-07	1.34E-09	3E-05	3E-05	4.46E-05	6.28E-10	0.00E+00	0
Zr-95	5.10E-05	9.27E-08	6E-05	6E-05	1.54E-03	4.33E-08	1.06E+08	5
Nb-95	5.20E-05	9.45E-08	1E-04	1E-04	9.45E-04	4.41E-08	1.06E+08	5
Mo-99	1.10E-02	2.00E-05	4E-05	4E-05	5.00E-01	9.33E-06	1.41E+08	1315
Tc-99m	1.10E-02	2.00E-05	3E-03	3E-03	6.66E-03	9.33E-06	1.11E+08	1036
Ru-103	3.40E-05	6.18E-08	8E-05	8E-05	7.72E-04	2.88E-08	1.13E+08	3
Ru-106	1.00E-05	1.82E-08	1E-05	1E-05	1.82E-03	8.48E-09	0.00E+00	0
Rh-103m	3.40E-05	6.18E-08	1E-02	1E-02	6.18E-06	2.88E-08	0.00E+00	0
Rh-106	1.00E-05	1.82E-08	0E+00	0E+00	----	8.48E-09	0.00E+00	0
Te-125m	2.50E-05	4.54E-08	1E-04	1E-04	4.54E-04	2.12E-08	2.40E+05	0
Te-127m	2.60E-04	4.72E-07	5E-05	5E-05	9.45E-03	2.21E-07	1.62E+07	4
Te-127	2.70E-04	4.91E-07	2E-04	2E-04	2.45E-03	2.29E-07	1.48E+06	0
Te-129m	1.10E-03	2.00E-06	2E-05	2E-05	9.99E-02	9.33E-07	1.11E+05	0
Te-129	6.70E-04	1.22E-06	8E-04	8E-04	1.52E-03	5.68E-07	1.69E+07	10
I-130	1.20E-04	2.18E-07	3E-06	3E-06	7.27E-02	1.02E-07	2.65E+08	27
Te-131m	1.60E-04	2.91E-07	4E-05	4E-05	7.27E-03	1.36E-07	1.15E+06	0
Te-131	3.00E-05	5.45E-08	0E+00	0E+00	----	2.54E-08	1.11E+08	3
I-131	1.60E-01	2.91E-04	3E-07	3E-07	9.69E+02	1.36E-04	1.18E+08	16012
Te-132	4.30E-03	7.81E-06	2E-05	2E-05	3.91E-01	3.65E-06	1.21E+08	441
I-132	4.90E-03	8.90E-06	8E-06	8E-06	1.11E+00	4.16E-06	3.16E+08	1313
I-133	4.00E-02	7.27E-05	1E-06	1E-06	7.27E+01	3.39E-05	1.16E+08	3935
I-134	8.00E-05	1.45E-07	2E-05	2E-05	7.27E-03	6.78E-08	3.17E+08	22
Cs-134	4.60E-02	8.36E-05	9E-06	9E-06	9.29E+00	3.90E-05	2.42E+08	9441
I-135	4.30E-03	7.81E-06	4E-06	4E-06	1.95E+00	3.65E-06	1.47E+08	536
Cs-136	8.90E-03	1.62E-05	6E-05	6E-05	2.69E-01	7.55E-06	3.19E+08	2408
Cs-137	3.30E-02	6.00E-05	2E-05	2E-05	3.00E+00	2.80E-05	9.30E+07	2603
Ba-137m	3.10E-02	5.63E-05	2E-05	2E-05	2.82E+00	2.63E-05	9.85E+07	2590
Ba-140	1.10E-04	2.00E-07	2E-05	2E-05	9.99E-03	9.33E-08	4.78E+07	4
La-140	1.10E-04	2.00E-07	2E-05	2E-05	9.99E-03	9.33E-08	2.22E+08	21
Ce-141	5.10E-05	9.27E-08	9E-05	9E-05	1.03E-03	4.33E-08	6.20E+07	3
Ce-143	2.80E-06	5.09E-09	4E-05	4E-05	1.27E-04	2.37E-09	7.87E+07	0
Ce-144	3.20E-05	5.81E-08	1E-05	1E-05	5.81E-03	2.71E-08	1.36E+07	0
Pr-143	2.70E-05	4.91E-08	5E-05	5E-05	9.81E-04	2.29E-08	0.00E+00	0
Pr-144	3.20E-05	5.81E-08	0E+00	0E+00	----	2.71E-08	2.32E+06	0
H-3	5.50E+02	9.99E-01	3E-03	3E-03	3.33E+02	4.66E-01	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-07	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.40E+03	4.67E-01		44588
Total H-3	5.50E+02				3.33E+02	4.66E-01		0
Total W/O H-3	4.05E-01				1.06E+03	3.44E-04		44585

Ai: From ODCM 1/2-ODC-2.01 Table 1.1-1a (from Table 13 of S&W UR(B)-160)
Ei: (843-30 Data) From Calc Package No. ERS-SFL-92-039

F = 22800 gpm = Dilution Flowrate (15,000 gpm + 7,800 gpm)
f = 35 gpm = Discharge flowrate
Ct = 4.67E-01 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)
Ci = Si x Ct

CR = Sum (CiEi) = 4.46E+04 cpm
HHSP = CR = 4.46E+04 cpm
HSP = CR x 0.7 = 3.12E+04 cpm

2SGC-RQ100 Alarm Setpoints

OLD METHOD - Based on 1 x Old 10 CFR 20 MPC's

Nuclide	Ai Annual Release (Ci)	Si	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	Si/MPC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	1.00E-04	1.82E-07	2E-03	2E-03	9.09E-05	4.83E-08	2.01E+07	1
Mn-54	2.50E-05	4.54E-08	1E-04	1E-04	4.54E-04	1.21E-08	1.27E+08	2
Fe-55	1.30E-04	2.36E-07	8E-04	8E-04	2.95E-04	6.29E-08	0.00E+00	0
Fe-59	6.50E-05	1.18E-07	6E-05	5E-05	2.36E-03	3.14E-08	1.26E+08	4
Co-58	1.10E-03	2.00E-06	9E-05	9E-05	2.22E-02	5.32E-07	1.82E+08	97
Co-60	1.60E-04	2.91E-07	3E-05	3E-05	9.69E-03	7.74E-08	2.38E+08	18
Zn-65	5.10E-02	9.27E-05	1E-04	1E-04	9.27E-01	2.47E-05	6.50E+07	1605
Np-239	3.20E-05	5.82E-08	1E-04	1E-04	5.82E-04	1.55E-08	1.65E+08	3
Br-83	2.90E-05	5.27E-08	3E-06	3E-06	1.76E-02	1.40E-08	2.42E+06	0
Br-84	5.90E-09	1.07E-11	3E-06	3E-06	3.57E-06	2.85E-12	1.38E+08	0
Rb-86	3.70E-05	6.72E-08	2E-05	2E-05	3.36E-03	1.79E-08	1.04E+07	0
Sr-89	2.20E-05	4.00E-08	3E-06	3E-06	1.33E-02	1.06E-08	1.83E+04	0
Sr-90	8.50E-07	1.54E-09	3E-07	3E-07	5.15E-03	4.11E-10	0.00E+00	0
Sr-91	5.30E-06	9.63E-09	5E-05	5E-05	1.93E-04	2.56E-09	1.04E+08	0
Mo-99	2.30E-03	4.18E-06	4E-05	4E-05	1.04E-01	1.11E-06	4.47E+07	50
Tc-99m	2.10E-03	3.82E-06	3E-03	3E-03	1.27E-03	1.02E-06	1.40E+08	142
Te-125m	1.90E-06	3.45E-09	1E-04	1E-01	3.45E-05	9.19E-10	3.04E+05	0
Te-127m	2.10E-05	3.82E-08	5E-05	5E-05	7.63E-04	1.02E-08	1.26E+05	0
Te-127	2.50E-05	4.54E-08	2E-04	2E-04	2.27E-04	1.21E-08	2.43E+06	0
Te-129m	8.20E-06	1.49E-07	2E-05	2E-05	7.45E-03	3.96E-08	6.53E+06	0
Te-129	5.30E-05	9.63E-08	8E-04	8E-04	1.20E-04	2.56E-08	1.96E+07	1
I-130	2.30E-04	4.18E-07	3E-06	3E-06	1.39E-01	1.11E-07	5.18E+08	58
Te-131m	5.20E-05	9.45E-08	4E-05	4E-05	2.36E-03	2.51E-08	2.85E+08	7
Te-131	9.40E-06	1.71E-08	0E+00	0E+00	—	4.54E-09	1.88E+08	1
I-131	1.00E-01	1.82E-04	3E-07	3E-07	6.06E+02	4.83E-05	1.96E+08	9478
Te-132	7.80E-04	1.42E-06	2E-05	2E-05	7.09E-02	3.77E-07	1.76E+08	66
I-132	2.30E-03	4.18E-06	8E-06	8E-06	5.22E-01	1.11E-06	4.22E+08	469
I-133	6.50E-02	1.18E-04	1E-06	1E-06	1.18E+02	3.14E-05	1.73E+08	5437
I-134	4.60E-06	8.36E-09	2E-05	2E-05	4.18E-04	2.22E-09	4.06E+08	1
Cs-134	3.00E-02	5.45E-05	9E-06	9E-06	6.06E+00	1.45E-05	3.25E+08	4714
I-135	9.20E-03	1.67E-05	4E-06	4E-06	4.18E+00	4.45E-06	1.71E+08	761
Cs-136	3.90E-03	7.09E-06	6E-05	6E-05	1.18E-01	1.89E-06	4.28E+08	807
Cs-137	2.20E-02	4.00E-05	2E-05	2E-05	2.00E+00	1.06E-05	1.28E+08	1361
Ba-140	9.30E-06	1.69E-08	2E-05	2E-05	8.45E-04	4.50E-09	7.50E+07	0
La-140	8.40E-06	1.53E-08	2E-05	2E-05	7.63E-04	4.06E-09	3.08E+08	1
Y-90	6.00E-07	1.09E-09	2E-05	2E-05	5.45E-05	2.90E-10	0.00E+00	0
Y-91m	3.60E-06	6.54E-09	3E-03	3E-03	2.18E-06	1.74E-09	1.59E+08	0
Y-91	4.40E-06	8.00E-09	3E-05	3E-05	2.67E-04	2.13E-09	3.55E+05	0
Y-93	3.00E-07	5.45E-10	3E-05	3E-05	1.82E-05	1.45E-10	2.03E+07	0
Zr-95	4.00E-06	7.27E-09	6E-05	6E-05	1.21E-04	1.93E-09	1.35E+08	0
Nb-95	4.00E-06	7.27E-09	1E-04	1E-04	7.27E-05	1.93E-09	1.33E+08	0
Ru-103	2.70E-06	4.91E-09	8E-05	8E-05	6.13E-05	1.31E-09	1.71E+08	0
Ru-106	8.20E-07	1.49E-09	1E-05	1E-05	1.49E-04	3.96E-10	0.00E+00	0
Rh-103m	2.70E-06	4.91E-09	1E-02	1E-02	4.91E-07	1.31E-09	0.00E+00	0
Rh-106	8.20E-07	1.49E-09	0E+00	0E+00	—	3.96E-10	5.65E+07	0
Ce-141	4.00E-06	7.27E-09	9E-05	9E-05	8.08E-05	1.93E-09	7.75E+07	0
Ce-143	9.60E-07	1.56E-09	4E-05	4E-05	3.91E-05	4.16E-10	1.20E+08	0
Ce-144	2.60E-06	4.72E-09	1E-05	1E-05	4.72E-04	1.26E-09	1.87E+07	0
Pr-143	2.30E-06	4.18E-09	5E-05	5E-05	8.36E-05	1.11E-09	1.63E+00	0
Pr-144	2.60E-06	4.72E-09	0E+00	0E+00	—	1.26E-09	3.40E+06	0
H-3	5.50E+02	9.99E-01	3E-03	3E-03	3.33E+02	2.66E-01	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-07	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.07E+03	2.66E-01		25083
Total H-3	5.50E+02				3.33E+02	2.66E-01		0
Total W/O H-3	2.91E-01				7.38E+02	1.41E-04		25083

Ai: From ODCM 1/2-ODC-2.01 Table 1.1-1b (from Table 13 of S&W UR(B)-160)
Ei: (RO-53 Data) From Calc Package No. ERS-SFL-88-026

F = 22800 gpm = Dilution Flowrate (15,000 gpm + 7,800 gpm)
f = 60 gpm = Discharge flowrate
Ci = 2.66E-01 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)

Ci = Si x Ct

CR = Sum CiEi =	25083	cpm
Eia (W/O H-3) = (CR) / (Sum Ci) =	1.78E+08	cpm/uCi/ml
CF-11 Conversion Factor = 1 / Eia =	5.61E-09	uCi/ml/cpm
DV = CF11 x (Sum CiEi) =	1.41E-04	uCi/ml
HSP = DV =	1.41E-04	uCi/ml
ASP = DV x 0.7 =	9.84E-05	uCi/ml

2SWS-RQ101 & Alarm Setpoints
2SWS-RQ102

OLD METHOD - Based on: 1 x Old 10 CFR 20 MPC's

Nuclide	Ai Annual Release (Ci)	Si	Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	1 x Old 10 CFR 20 MPC Appendix B Table II, Col 2 (uCi/ml)	Si/MPC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	2.00E-03	7.51E-04	2E-03	2E-03	3.75E-01	1.58E-09	2.01E+07	0
Mn-54	3.30E-04	1.24E-04	1E-04	1E-04	1.24E+00	2.61E-10	1.27E+08	0
Fe-55	1.70E-03	6.38E-04	8E-04	8E-04	7.97E-01	1.35E-09	0.00E+00	0
Fe-59	1.10E-03	4.13E-04	5E-05	5E-05	8.26E+00	8.71E-10	1.26E+08	0
Co-58	1.70E-02	6.38E-03	9E-05	9E-05	7.09E+01	1.35E-08	1.82E+08	2
Co-60	2.10E-03	7.88E-04	3E-05	3E-05	2.63E+01	1.66E-09	2.38E+08	0
Zn-65	5.10E-02	1.91E-02	1E-04	1E-04	1.91E+02	4.04E-08	6.50E+07	3
Np-239	1.30E-03	4.88E-04	1E-04	1E-04	4.88E+00	1.03E-09	1.65E+08	0
Br-83	5.50E-03	2.06E-03	3E-06	3E-06	6.88E+02	4.35E-09	2.42E+06	0
Br-84	3.00E-03	1.13E-03	3E-06	3E-06	3.75E+02	2.38E-09	1.38E+08	0
Br-85	3.50E-04	1.31E-04	0E+00	0E+00	----	2.77E-10	9.04E+06	0
Rb-88	9.10E-05	3.41E-05	2E-05	2E-05	1.71E+00	7.20E-11	1.04E+07	0
Rb-88	2.30E-01	8.63E-02	0E+00	0E+00	----	1.82E-07	4.84E+07	9
Sr-89	3.70E-04	1.39E-04	3E-06	3E-06	4.63E+01	2.93E-10	1.83E+04	0
Sr-90	1.10E-05	4.13E-06	3E-07	3E-07	1.38E+01	8.71E-12	0.00E+00	0
Sr-91	7.20E-04	2.70E-04	5E-05	5E-05	5.40E+00	5.70E-10	1.04E+08	0
Mo-99	9.00E-02	3.38E-02	4E-05	4E-05	8.44E+02	7.13E-08	4.47E+07	3
Tc-99m	5.40E-02	2.03E-02	3E-03	3E-03	6.75E+00	4.28E-08	1.40E+08	6
Te-125m	3.10E-05	1.16E-05	1E-04	1E-04	1.16E-01	2.45E-11	3.94E+05	0
Te-127m	3.00E-04	1.13E-04	5E-05	5E-05	2.25E+00	2.38E-10	1.26E+05	0
Te-127	9.40E-04	3.53E-04	2E-04	2E-04	1.76E+00	7.44E-10	2.43E+06	0
Te-129m	1.50E-03	5.63E-04	2E-05	2E-05	2.81E+01	1.19E-09	6.53E+06	0
Te-129	1.80E-03	6.75E-04	8E-04	8E-04	8.44E-01	1.43E-09	1.96E+07	0
I-130	2.30E-03	8.63E-04	3E-06	3E-06	2.88E+02	1.82E-09	5.18E+08	1
Te-131m	2.70E-03	1.01E-03	4E-05	4E-05	2.53E+01	2.14E-09	2.85E+08	1
Te-131	1.30E-03	4.88E-04	0E+00	0E+00	----	1.03E-09	1.68E+08	0
I-131	2.90E-01	1.09E-01	3E-07	3E-07	3.63E+05	2.30E-07	1.96E+08	45
Te-132	2.90E-02	1.09E-02	2E-05	2E-05	5.44E+02	2.30E-08	1.76E+08	4
I-132	1.10E-01	4.13E-02	8E-06	8E-06	5.16E+03	8.71E-08	4.22E+08	37
I-133	4.20E-01	1.58E-01	1E-06	1E-06	1.58E+05	3.33E-07	1.73E+08	58
I-134	5.40E-02	2.03E-02	2E-05	2E-05	1.01E+03	4.28E-08	4.06E+08	17
Cs-134	2.70E-02	1.01E-02	9E-06	9E-06	1.13E+03	2.14E-08	3.25E+08	7
I-135	2.10E-01	7.88E-02	4E-06	4E-06	1.97E+04	1.66E-07	1.71E+08	28
Cs-136	1.40E-02	5.25E-03	6E-05	6E-05	8.76E+01	1.11E-08	4.28E+08	5
Cs-137	1.90E-02	7.13E-03	2E-05	2E-05	3.56E+02	1.50E-08	1.28E+08	2
Ba-137m	1.90E-02	7.13E-03	2E-05	2E-05	3.56E+02	1.50E-08	1.33E+08	2
Ba-140	2.30E-04	8.63E-05	2E-05	2E-05	4.32E+00	1.82E-10	7.50E+07	0
La-140	1.60E-04	6.00E-05	2E-05	2E-05	3.00E+00	1.27E-10	3.08E+08	0
Y-90	1.30E-08	4.88E-07	2E-05	2E-05	2.44E-02	1.03E-12	0.00E+00	0
Y-91m	4.20E-04	1.58E-04	3E-03	3E-03	5.25E-02	3.33E-10	1.59E+08	0
Y-91	6.80E-05	2.55E-05	3E-06	3E-06	8.51E-01	5.38E-11	3.55E+05	0
Y-93	3.80E-05	1.43E-05	3E-06	3E-06	4.75E-01	3.01E-11	2.03E+07	0
Zr-95	8.30E-05	2.36E-05	6E-06	6E-06	3.94E-01	4.99E-11	1.35E+08	0
Nb-95	5.30E-05	1.99E-05	1E-04	1E-04	1.99E-01	4.20E-11	1.33E+08	0
Ru-103	4.70E-05	1.76E-05	8E-06	8E-06	2.20E-01	3.72E-11	1.71E+08	0
Ru-106	1.10E-05	4.13E-06	1E-05	1E-05	4.13E-01	8.71E-12	0.00E+00	0
Rh-103m	5.20E-05	1.95E-05	1E-02	1E-02	1.95E-03	4.12E-11	0.00E+00	0
Rh-106	1.20E-05	4.50E-06	0E+00	0E+00	----	9.50E-12	5.65E+07	0
Ce-141	7.40E-05	2.78E-05	9E-05	9E-05	3.09E-01	5.86E-11	7.75E+07	0
Ce-143	4.30E-05	1.61E-05	4E-05	4E-05	4.03E-01	3.40E-11	1.20E+08	0
Ce-144	3.50E-05	1.31E-05	1E-05	1E-05	1.31E+00	2.77E-11	1.87E+07	0
Pr-143	5.30E-05	1.99E-05	5E-05	5E-05	3.98E-01	4.20E-11	1.03E+00	0
Pr-144	3.80E-05	1.43E-05	0E+00	0E+00	----	3.01E-11	3.40E+06	0
H-3	1.00E+00	3.75E-01	3E-03	3E-03	1.25E+02	7.92E-07	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-07	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	2.66E+00	1.00E+00			5.51E+05	2.11E-06		231
Total H-3	1.00E+00				1.25E+02	7.92E-07		0
Total W/O H-3	1.66E+00				5.51E+05	1.32E-06		231

Ai: From S & W Calc Package No. UR(B) 299-0
Ei: (RD-53 Data) From Calc Package No. ERS-SFL-86-026

F = 8400 gpm = Dilution Flowrate
f = 7220 gpm = Discharge flowrate
Ci = 2.11E-06 = Dilution Flowrate / (Discharge Flowrate x Sum SiMPC)

Ci = Si x Ci

CR = Sum CiEi =	231	cpm
Eia (W/O H-3) = (CR) / (Sum Ci) =	1.75E+08	cpm/uCi/ml
CF-11 Conversion Factor = 1 / Eia =	5.71E-09	uCi/ml/cpm
DV = CF11 x (Sum CiEi) =	1.32E-06	uCi/ml
HSP = DV =	1.32E-06	uCi/ml
ASP = DV x 0.7 =	9.23E-07	uCi/ml

FLUKE. Biomedical	Document Number	Revision	Size
	950.373	1	PLN
	Title: High Temperature Transient Test Report for Beaver Valley, Unit 1, 843-30 Gamma Scintillation Detector		

ATTACHMENT 3 – Page 1 of 4 Pages
Detector Efficiency (cpm/uCi/cc)

BVPS Unit 1 Liquid Radiation Monitors

Gamma Sensitivities of the 841-34 & 843-30 with 80 kev Baseline to Liquids,

Calculated 165F Transient Response, Monitors:

RM-1RW-100: Component Cooling / Recirc Spray Heat Exchanger River Water Monitors

		Original 843-30 Detection Efficiency (cpm/uCi/ml)	165 F Transient 843-30 Detection Efficiency (cpm/uCi/ml)	Correction Factor:	165 F Transient 843-30 Detection Efficiency (cpm/uCi/ml)	Correction Factor:
	Nuclide					
1	Cr-51	1.18E+07	8.67E06	0.565	8.67E+06	0.735
2	Co-58	1.16E+08	8.29E+07	0.715	9.01E+07	0.777
3	Co-60	1.73E+08	1.72E+08	0.991	1.73E+08	1.001
4	Rb-88	3.36E+07	3.36E+07	1.001	3.35E+07	0.996
5	Sr-89	7.84E+03	7.99E+03	1.019	8.51E+03	1.086
6	Sr-90	0.00E+00	0.00E+00	0.000	0.00E+00	0.000
7	Y-90	0.00E+00	0.00E+00	0.000	0.00E+00	0.000
8	Sr-91	6.97E+07	6.43E+07	0.922	6.94E+07	0.996
9	Y-91	2.60E+05	2.23E+05	0.857	2.26E+05	0.869
10	Zr-95	8.60E+07	8.06E+07	0.936	8.90E+07	1.035
11	Zr-97	2.21E+07	8.85E+07	4.005	9.81E+07	4.440
12	Nb-95	8.64E+07	8.17E+07	0.945	8.98E+07	1.039
13	Mo-99	2.84E+07	6.23E+07	2.194	8.29E+07	2.919
14	Tc-99m	8.96E+07	4.37E+07	0.488	6.10E+07	0.681
15	Ru-103	9.50E+07	7.45E+07	0.784	8.89E+07	0.936
16	Ru-105	1.30E+08	4.68E+07	0.360	5.76E+07	0.443
17	Ru-106	0.00E+00	0.00E+00	0.000	0.00E+00	0.000
18	Rh-105	2.96E+07	1.65E+07	0.556	2.14E+07	0.725
19 Note 1	Te-127m	4.09E+04	1.73E+04	0.422	3.04E+04	0.744
20	Te-127	1.38E+06	8.73E+05	0.633	1.09E+06	0.791
21	Sb-127	1.09E+08	8.50E+07	0.780	9.92E+07	0.910
22	Sb-129	1.50E+08	1.12E+08	0.749	1.23E+08	0.822
23	Te-129m	4.02E+06	6.24E+04	0.016	8.13E+04	0.020
24	Te-129	1.12E+07	1.12E+07	0.999	1.32E+07	1.183
25	Te-131m	1.82E+08	4.71E+05	0.003	6.59E+05	0.004

FLUKE biomedical	Document Number	Revision	Size
	950.373	1	PLN
	Title: High Temperature Transient Test Report for Beaver Valley, Unit 1, 843-30 Gamma Scintillation Detector		

		Attachment 3	- Page 2 of 4 Pages			
		Original 843-30	165 F Transient 843-30		155 F Transient 843-30	
	Nuclide	Detection Efficiency (cpm/uCi/ml)	Detection Efficiency (cpm/uCi/ml)	Correction Factor:	Detection Efficiency (cpm/uCi/ml)	Correction Factor:
26	I-131	1.11E+08	8.86E+07	0.818	8.63E+07	0.778
27	Te-132	1.17E+08	5.50E+07	0.470	7.53E+07	0.644
28	I-132	2.66E+08	2.39E+08	0.900	2.65E+08	0.996
29	I-133	9.90E+07	8.00E+07	0.808	9.31E+07	0.941
30	I-134	2.70E+08	2.48E+08	0.918	2.69E+08	0.995
31	I-135	1.19E+08	1.21E+08	1.014	1.26E+08	1.062
32 Note 2	Cs-137	8.01E+07	6.81E+07	0.850	7.69E+07	1.130
33	Ba-137m	See Cs-137	0.00E+00	0.000	0.00E+00	0.000
34	Ba-140	4.37E+07	2.87E+07	0.656	3.52E+07	0.805
35	La-140	2.00E+08	1.74E+08	0.872	1.87E+08	0.934
36	Ce-141	5.07E+07	2.42E+07	0.478	3.39E+07	0.668
37	Ce-143	7.27E+07	4.42E+07	0.608	5.60E+07	0.771
38	Ce-144	1.06E+07	5.36E+06	0.508	7.43E+06	0.701
39	Pr-143	1.04E+00	0.00E+00	0.000	0.00E+00	0.000
40	Pr-144	2.25E+06	1.92E+06	0.854	2.01E+06	0.894
41	Nd-147	3.12E+07	2.46E+07	0.788	2.94E+07	0.944
		Additional	Isotopes			
42	H-3	0.00E+00	0.00E+00	0.000	0.00E+00	0.000
43	Ar-41	8.59E+07	8.53E+07	0.993	8.56E+07	0.996
44	Kr-79	6.32E+07	3.02E+07	0.478	3.80E+07	0.601
45	Kr-81	4.49E+06	2.26E+06	0.504	3.02E+06	0.672
46	Kr-85	4.25E+05	3.28E+05	0.772	3.93E+05	0.926
47	Kr-85m	9.94E+07	4.79E+07	0.482	6.63E+07	0.667
48	Kr-87	8.28E+07	6.08E+07	0.734	6.94E+07	0.838
49	Kr-88	1.29E+08	1.00E+08	0.778	1.05E+08	0.815
50	Kr-89	1.57E+08	1.19E+08	0.760	1.31E+08	0.837
51	Kr-90	1.48E+08	1.23E+08	0.832	1.39E+08	0.938
52	Xe-131M	2.28E+06	1.04E+06	0.455	1.46E+06	0.638
53	Xe-133	9.72E+06	8.20E+06	0.843	8.69E+06	0.894
54	Xe-133m	1.32E+07	6.29E+06	0.476	8.59E+06	0.650
55	Xe-135	1.18E+08	5.92E+07	0.502	7.96E+07	0.675

FLUKE Biomedical	Document Number	Revision	Size
	950.373	1	PLN
	Title: High Temperature Transient Test Report for Beaver Valley, Unit 1, 843-30 Gamma Scintillation Detector		

ATTACHMENT 3 – Page 3 of 4 Pages

		Original 843-30 Detection Efficiency (cpm/uCi/ml)	165 F Transient 843-30 Detection Efficiency (cpm/uCi/ml)	Correction Factor:	155 F Transient 843-30 Detection Efficiency (cpm/uCi/ml)	Correction Factor:
56	Xe-135m	7.84E+07	6.22E+07	0.794	7.36E+07	0.939
57	Xe-137	3.49E+07	2.55E+07	0.730	3.05E+07	0.875
58	Xe-138	1.28E+08	8.89E+07	0.694	1.01E+08	0.793
59	I-130	3.08E+08	1.82E+08	0.592	2.12E+08	0.689
60	I-136	1.37E+08	2.34E+08	1.711	2.76E+08	2.015
61	Na-24	1.73E+08	8.62E+07	0.498	8.58E+07	0.496
62	Mn-54	8.59E+07	8.27E+07	0.963	8.95E+07	1.042
63	Mn-56	1.13E+08	1.19E+08	1.057	1.24E+08	1.099
64	Fe-59	9.17E+07	8.79E+07	0.958	9.04E+07	0.986
65	Co-57	7.97E+07	4.43E+07	0.556	6.06E+07	0.761
66	Co-60m	2.15E+05	0.00E+00	0.000	0.00E+00	0.000
67	Ni-65	3.98E+07	3.82E+07	0.960	3.92E+07	0.985
68	Cu-64	3.55E+07	4.07E+05	0.011	4.08E+05	0.011
69	Zn-65	4.67E+07	4.32E+07	0.925	4.44E+07	0.951
70	Br-83	1.36E+06	9.94E+05	0.731	1.17E+06	0.863
71	Br-84	9.75E+07	2.42E+08	2.478	2.64E+08	2.706
72	Br-85	6.19E+06	5.38E+06	0.870	5.75E+06	0.929
73	Rb-89	1.57E+08	1.31E+08	0.836	1.34E+08	0.854
74	Sr-92	9.16E+07	8.71E+07	0.950	8.99E+07	0.982
75 Note 3	Y-90m	2.02E+11	1.25E+08	0.001	1.61E+08	0.001
76	Y-91m	8.98E+07	7.36E+07	0.820	8.61E+07	0.959
77	Y-92	2.35E+07	2.19E+07	0.932	2.34E+07	0.997
78	Tc-99	2.15E+02	3.76E+02	1.749	4.41E+02	2.053
79	Rh-106	3.26E+07	2.69E+07	0.824	3.10E+07	0.951
80	Ag-110m	2.79E+08	2.62E+08	0.940	2.86E+08	1.020
81	Sb-124	1.69E+08	1.52E+08	0.901	1.66E+08	0.974
82	Sb-125	8.71E+07	6.37E+07	0.731	7.67E+07	0.880
83	Te-125m	1.83E+05	1.24E+05	0.678	1.64E+05	0.897
84	Te-131	1.20E+08	4.84E+07	0.403	6.53E+07	0.544
85	Te-133	1.66E+08	1.02E+08	0.613	1.21E+08	0.729

RM-1RW-100 Alarm Setpoints (ERS-ATL-93-021)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
Nuclide	Ai RCS Concent. (uCi/g)	Si Nuclide Fraction (-)	EC Effluent Concent. (uCi/ml)	10 x EC ODCM Limit (uCi/ml)	Si/10 EC EC Fraction (ml/uCi)	Ci Isotopic Concent. (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Monitor Count Rate (ncpm)
Cr-51	0.00E+00	0.00E+00	5E-04	5E-03	0.00E+00	0.00E+00	6.67E+06	0.00E+00
Co-58	1.38E-02	7.05E-04	2E-05	2E-04	3.52E+00	1.54E-07	8.29E+07	1.27E+01
Co-60	1.59E-03	8.12E-05	3E-06	3E-05	2.71E+00	1.77E-08	1.72E+08	3.04E+00
Rb-88	2.75E+00	1.40E-01	4E-04	4E-03	3.51E+01	3.06E-05	3.36E+07	1.03E+03
Sr-89	3.49E-03	1.78E-04	8E-06	8E-05	2.23E+00	3.88E-08	7.99E+03	3.10E-04
Sr-90	2.16E-04	1.10E-05	5E-07	5E-06	2.21E+00	2.40E-09	0.00E+00	0.00E+00
Y-90	5.94E-05	3.03E-06	7E-06	7E-05	4.33E-02	6.61E-10	0.00E+00	0.00E+00
Sr-91	1.45E-03	7.41E-05	2E-05	2E-04	3.70E-01	1.61E-08	6.43E+07	1.04E+00
Y-91	4.78E-04	2.44E-05	8E-06	8E-05	3.05E-01	5.32E-09	2.23E+05	1.19E-03
Zr-95	6.32E-04	3.23E-05	2E-05	2E-04	1.61E-01	7.03E-09	8.05E+07	5.66E-01
Zr-97	3.91E-04	2.00E-05	9E-06	9E-05	2.22E-01	4.35E-09	8.85E+07	3.85E-01
Nb-95	6.41E-04	3.27E-05	3E-05	3E-04	1.09E-01	7.13E-09	8.17E+07	5.83E-01
Mo-99	7.62E-01	3.89E-02	2E-05	2E-04	1.95E+02	8.48E-06	6.23E+07	5.28E+02
Tc-99m	4.09E-01	2.09E-02	1E-03	1E-02	2.09E+00	4.55E-08	4.37E+07	1.99E+02
Ru-103	5.97E-04	3.05E-05	3E-05	3E-04	1.02E-01	6.64E-09	7.45E+07	4.95E-01
Ru-105	1.39E-04	7.10E-06	7E-05	7E-04	1.01E-02	1.55E-09	4.68E+07	7.24E-02
Ru-106	2.21E-04	1.13E-05	3E-06	3E-05	3.76E-01	2.46E-09	0.00E+00	0.00E+00
Rh-105	3.69E-04	1.89E-05	5E-05	5E-04	3.77E-02	4.10E-09	1.65E+07	6.77E-02
Te-127m	3.36E-03	1.72E-04	9E-06	9E-05	1.91E+00	3.74E-08	1.73E+04	6.47E-04
Te-127	1.17E-02	5.98E-04	1E-04	1E-03	5.98E-01	1.30E-07	8.73E+05	1.14E-01
Sb-127	3.01E-05	1.54E-06	1E-05	1E-04	1.54E-02	3.35E-10	8.50E+07	2.85E-02
Sb-129	3.87E-05	1.98E-06	4E-05	4E-04	4.94E-03	4.30E-10	1.12E+08	4.82E-02
Te-129m	1.44E-02	7.36E-04	7E-06	7E-05	1.05E+01	1.60E-07	6.24E+04	9.99E-03
Te-129	1.43E-02	7.31E-04	4E-04	4E-03	1.83E-01	1.59E-07	1.12E+07	1.78E+00
Te-131m	3.60E-02	1.84E-03	8E-06	8E-05	2.30E+01	4.00E-07	4.71E+05	1.89E-01
I-131	2.89E+00	1.48E-01	1E-06	1E-05	1.48E+04	3.21E-05	6.86E+07	2.21E+03
Te-132	3.00E-01	1.53E-02	9E-06	9E-05	1.70E+02	3.34E-06	5.50E+07	1.84E+02
I-132	1.13E+00	5.77E-02	1E-04	1E-03	5.77E+01	1.26E-05	2.39E+08	3.00E+03
I-133	4.32E+00	2.21E-01	7E-06	7E-05	3.15E+03	4.81E-05	8.00E+07	3.84E+03
I-134	6.32E-01	3.23E-02	4E-04	4E-03	8.07E+00	7.03E-06	2.48E+08	1.74E+03
I-135	2.48E+00	1.27E-01	3E-05	3E-04	4.22E+02	2.76E-05	1.21E+08	3.34E+03
Cs-137/Ba-137m	3.79E+00	1.94E-01	1E-06	1E-05	1.94E+04	4.22E-05	6.81E+07	2.87E+03
Ba-140	4.10E-03	2.09E-04	8E-06	8E-05	2.62E+00	4.56E-08	2.87E+07	1.31E+00
La-140	1.41E-03	7.20E-05	9E-06	9E-05	8.00E-01	1.57E-08	1.74E+08	2.73E+00
Ce-141	6.18E-04	3.16E-05	3E-05	3E-04	1.05E-01	6.87E-09	2.42E+07	1.66E-01
Ce-143	4.56E-04	2.33E-05	2E-05	2E-04	1.16E-01	5.07E-09	4.42E+07	2.24E-01
Ce-144	4.69E-04	2.40E-05	3E-06	3E-05	7.99E-01	5.22E-09	5.36E+06	2.80E-02
Pr-143	5.75E-04	2.94E-05	2E-05	2E-04	1.47E-01	6.40E-09	0.00E+00	0.00E+00
Pr-144	4.72E-04	2.41E-05	6E-04	6E-03	4.02E-03	5.25E-09	1.92E+06	1.01E-02
Nd-147	2.41E-04	1.23E-05	2E-05	2E-04	6.16E-02	2.68E-09	2.46E+07	6.59E-02
Total	1.96E+01	1.00E+00			3.82E+04			1.90E+04

F = 149800 = Dilution Flowrate (127,000 + 15,000 + 7,800)
f = 18000 = Discharge Flowrate (9,000 gpm / RPRWP: Assumes 2 RPRWPs operating)
Ct = 2.18E-04 = Dilution Flowrate / (Discharge Flowrate x Sum SiMPC)
Ci = Si x Ct

CR = Sum (CiEi) 1.90E+04 cpm
HHSP = CR = 1.90E+04 cpm
HSP = CR x 0.7 1.33E+04 cpm

Column Definitions:
A - Nuclide list
B - Relative Nuclide Mix, design RCS concentration, from Reference 34
C - Nuclide Fraction - Col. B / Total of Col. B
D - Effluent Concentration Limit from 10 CFR 20, Appendix B, Table 2, Column 2
E - ODCM release limit = 10 x EC
F - Fraction of 10 EC limit = Col. C / Col. E
G - Isotopic concentration corresponding to 10 EC with dilution - Col. C x dilution flow / (discharge flow x Total of Col. F)
H - Detector isotopic efficiencies, from Fluke report 950.373
I - Col. G x Col. H

RM-1RW-100 Alarm Setpoints (10080-UR(B)-223 Rev. 1 duplication)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
	Ai	Si	EC	10 x EC	Si/10 EC	Ci	Ei	CiEi
	RCS	Nuclide	Effluent	ODCM		Isotopic	Detection	Monitor
Nuclide	Concent.	Fraction	Concent.	Limit	EC Fraction	Concent.	Efficiency	Count Rate
	(uCi/g)	(-)	(uCi/ml)	(uCi/ml)	(ml/uCi)	(uCi/ml)	(cpm/uCi/ml)	(ncpm)
Cr-51	0.00E+00	0.00E+00	5E-04	5E-03	0.00E+00	0.00E+00	1.18E+07	0.00E+00
Co-58	1.38E-02	7.05E-04	2E-05	2E-04	3.52E+00	1.54E-07	1.16E+08	1.78E+01
Co-60	1.59E-03	8.12E-05	3E-06	3E-05	2.71E+00	1.77E-08	1.73E+08	3.06E+00
Rb-88	2.75E+00	1.40E-01	4E-04	4E-03	3.51E+01	3.06E-05	0.00E+00	0.00E+00
Sr-89	3.49E-03	1.78E-04	8E-06	8E-05	2.23E+00	3.88E-08	0.00E+00	0.00E+00
Sr-90	2.16E-04	1.10E-05	5E-07	5E-06	2.21E+00	2.40E-09	0.00E+00	0.00E+00
Y-90	5.94E-05	3.03E-06	7E-06	7E-05	4.33E-02	6.61E-10	0.00E+00	0.00E+00
Sr-91	1.45E-03	7.41E-05	2E-05	2E-04	3.70E-01	1.61E-08	6.97E+07	1.12E+00
Y-91	4.78E-04	2.44E-05	8E-06	8E-05	3.05E-01	5.32E-09	2.60E+05	1.38E-03
Zr-95	6.32E-04	3.23E-05	2E-05	2E-04	1.61E-01	7.03E-09	8.60E+07	6.05E-01
Zr-97	3.91E-04	2.00E-05	9E-06	9E-05	2.22E-01	4.35E-09	2.21E+07	9.61E-02
Nb-95	6.41E-04	3.27E-05	3E-05	3E-04	1.09E-01	7.13E-09	8.64E+07	6.16E-01
Mo-99	7.62E-01	3.89E-02	2E-05	2E-04	1.95E+02	8.48E-06	2.84E+07	2.41E+02
Tc-99m	4.09E-01	2.09E-02	1E-03	1E-02	2.09E+00	4.55E-06	8.96E+07	4.08E+02
Ru-103	5.97E-04	3.05E-05	3E-05	3E-04	1.02E-01	6.64E-09	9.50E+07	6.31E-01
Ru-105	1.39E-04	7.10E-06	7E-05	7E-04	1.01E-02	1.55E-09	1.30E+08	2.01E-01
Ru-106	2.21E-04	1.13E-05	3E-06	3E-05	3.76E-01	2.46E-09	0.00E+00	0.00E+00
Rh-105	3.69E-04	1.89E-05	6E-05	5E-04	3.77E-02	4.10E-09	2.96E+07	1.21E-01
Te-127m	3.36E-03	1.72E-04	9E-06	9E-05	1.91E+00	3.74E-08	4.09E+04	1.53E-03
Te-127	1.17E-02	5.98E-04	1E-04	1E-03	5.98E-01	1.30E-07	1.38E+06	1.80E-01
Sb-127	3.01E-05	1.54E-06	1E-05	1E-04	1.54E-02	3.35E-10	1.09E+08	3.65E-02
Sb-129	3.87E-05	1.98E-06	4E-05	4E-04	4.94E-03	4.30E-10	1.50E+08	6.46E-02
Te-129m	1.44E-02	7.36E-04	7E-06	7E-05	1.05E+01	1.60E-07	4.02E+06	6.44E-01
Te-129	1.43E-02	7.31E-04	4E-04	4E-03	1.83E-01	1.59E-07	1.12E+07	1.78E+00
Te-131m	3.60E-02	1.84E-03	8E-06	8E-05	2.30E+01	4.00E-07	1.82E+08	7.29E+01
I-131	2.89E+00	1.48E-01	1E-06	1E-05	1.48E+04	3.21E-05	1.11E+08	3.57E+03
Te-132	3.00E-01	1.53E-02	9E-06	9E-05	1.70E+02	3.34E-06	1.17E+08	3.90E+02
I-132	1.13E+00	5.77E-02	1E-04	1E-03	5.77E+01	1.26E-05	2.66E+08	3.34E+03
I-133	4.32E+00	2.21E-01	7E-06	7E-05	3.15E+03	4.81E-05	9.90E+07	4.76E+03
I-134	6.32E-01	3.23E-02	4E-04	4E-03	8.07E+00	7.03E-06	2.70E+08	1.90E+03
I-135	2.48E+00	1.27E-01	3E-05	3E-04	4.22E+02	2.76E-05	1.19E+08	3.28E+03
Cs-137/Ba-137m	3.79E+00	1.94E-01	1E-06	1E-05	1.94E+04	4.22E-05	6.81E+07	2.87E+03
Ba-140	4.10E-03	2.09E-04	8E-06	8E-05	2.62E+00	4.56E-08	4.37E+07	1.99E+00
La-140	1.41E-03	7.20E-05	9E-06	9E-05	8.00E-01	1.57E-08	2.00E+08	3.14E+00
Ce-141	6.18E-04	3.16E-05	3E-05	3E-04	1.05E-01	6.87E-09	5.07E+07	3.49E-01
Ce-143	4.56E-04	2.33E-05	2E-05	2E-04	1.16E-01	5.07E-09	7.27E+07	3.69E-01
Ce-144	4.69E-04	2.40E-05	3E-06	3E-05	7.99E-01	5.22E-09	1.06E+07	5.53E-02
Pr-143	5.75E-04	2.94E-05	2E-05	2E-04	1.47E-01	6.40E-09	1.04E+00	6.65E-09
Pr-144	4.72E-04	2.41E-05	6E-04	6E-03	4.02E-03	5.25E-09	2.25E+06	1.18E-02
Nd-147	2.41E-04	1.23E-05	2E-05	2E-04	6.16E-02	2.68E-09	3.12E+07	8.36E-02
Total	1.96E+01	1.00E+00			3.82E+04			2.09E+04

F = 149800 = Dilution Flowrate (127000 + 15,000 + 7,800) (from DIN No. 42)
f = 18000 = Discharge flowrate (9,000 gpm / RPRWP: Assumes 2 RPRWP's operating) (from DIN No. 42)
Ct = 2.18E-04 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC).
Ci = Si x Ct

CR = Sum (CiEi) 2.09E+04 cpm
HHSP = CR = 2.09E+04 cpm
HSP = CR x 0.7 1.46E+04 cpm

Column Definitions:
A - Nuclide list, from DIN No. 42
B - Relative Nuclide Mix, design RCS concentration, from DIN No. 43
C - Nuclide Fraction - Col. B / Total of Col. B
D - Effluent Concentration Limit from 10CFR20, Appendix B, Table 2, Column 2
E - ODCM release limit = 10 x EC, from DIN No. 42
F - Fraction of 10 EC limit = Col. C / Col. E
G - Isotopic concentration corresponnding to 10 EC with dilution - Col. C x dilution flow / (discharge flow x Total of Col. F)
H - Detector isotopic efficiencies, from Fluke report 950.373
I - Col. G x Col. H
*Adjusted for -21% high temperature estimated response reduction based on Fluke test data

RM-1RW-101 Alarm Setpoints

NEW METHOD - Based on: 10 x New 10 CFR 20 EC's

Nuclide	Ai Annual Release (Ci)	Si	New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	10 x New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	SVEC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	1.30E-03	2.36E-06	5E-04	5E-03	4.72E-04	2.57E-07	1.24E+07	3
Mn-54	3.10E-04	5.63E-07	3E-05	3E-04	1.88E-03	6.14E-08	1.05E+08	6
Fe-55	1.60E-03	2.91E-06	1E-04	1E-03	2.91E-03	3.17E-07	0.00E+00	0
Fe-59	8.30E-04	1.51E-06	1E-05	1E-04	1.51E-02	1.64E-07	1.04E+08	17
Co-58	1.40E-02	2.54E-05	2E-05	2E-04	1.27E-01	2.77E-06	1.06E+08	294
Co-60	2.00E-03	3.63E-06	3E-06	3E-05	1.21E-01	3.96E-07	1.94E+08	77
Zn-65	2.69E-02	4.88E-05	5E-06	5E-05	9.76E-01	5.32E-06	5.02E+07	267
Np-239	1.40E-04	2.54E-07	2E-05	2E-04	1.27E-03	2.77E-08	0.00E+00	0
Br-83	2.50E-05	4.54E-08	9E-04	9E-03	5.05E-06	4.95E-09	1.48E+06	0
Br-84	2.70E-06	4.91E-09	4E-04	4E-03	1.23E-06	5.35E-10	3.16E+08	0
Br-85	2.80E-08	5.09E-11	0E+00	0E+00	----	5.54E-12	6.71E+06	0
Rb-86	7.50E-05	1.36E-07	7E-06	7E-05	1.95E-03	1.48E-08	0.00E+00	0
Rb-88	1.20E-04	2.18E-07	4E-04	4E-03	5.45E-05	2.38E-08	3.73E+07	1
Sr-89	2.90E-04	5.27E-07	8E-06	8E-05	6.59E-03	5.74E-08	9.84E+03	0
Sr-90	1.10E-05	2.00E-08	5E-07	5E-06	4.00E-03	2.18E-09	0.00E+00	0
Y-90	9.40E-06	1.71E-08	7E-06	7E-05	2.44E-04	1.86E-09	0.00E+00	0
Sr-91	1.30E-05	2.36E-08	2E-05	2E-04	1.18E-04	2.57E-09	8.13E+07	0
Y-91m	8.70E-06	1.58E-08	2E-03	2E-02	7.90E-07	1.72E-09	1.07E+08	0
Y-91	5.70E-05	1.04E-07	8E-06	8E-05	1.29E-03	1.13E-08	2.53E+05	0
Y-93	7.40E-07	1.34E-09	2E-05	2E-04	6.72E-06	1.47E-10	0.00E+00	0
Zr-95	5.10E-05	9.27E-08	2E-05	2E-04	4.63E-04	1.01E-08	1.06E+08	1
Nb-95	5.20E-05	9.45E-08	3E-05	3E-04	3.15E-04	1.03E-08	1.06E+08	1
Mo-99	1.10E-02	2.00E-05	2E-05	2E-04	9.99E-02	2.18E-06	1.41E+08	307
Tc-99m	1.10E-02	2.00E-05	1E-03	1E-02	2.00E-03	2.18E-08	1.11E+08	242
Ru-103	3.40E-05	6.18E-08	3E-05	3E-04	2.06E-04	6.73E-09	1.13E+08	1
Ru-106	1.00E-05	1.82E-08	3E-06	3E-05	6.06E-04	1.98E-09	0.00E+00	0
Rh-103m	3.40E-05	6.18E-08	6E-03	6E-02	1.03E-06	6.73E-09	0.00E+00	0
Rh-106	1.00E-05	1.82E-08	0E+00	0E+00	----	1.98E-09	0.00E+00	0
Te-125m	2.50E-05	4.54E-08	2E-05	2E-04	2.27E-04	4.95E-09	2.40E+05	0
Te-127m	2.60E-04	4.72E-07	9E-06	9E-05	5.25E-03	5.15E-08	1.62E+07	1
Te-127	2.70E-04	4.91E-07	1E-04	1E-03	4.91E-04	5.35E-08	1.48E+06	0
Te-129m	1.10E-03	2.00E-06	7E-06	7E-05	2.86E-02	2.18E-07	1.11E+05	0
Te-129	6.70E-04	1.22E-06	4E-04	4E-03	3.04E-04	1.33E-07	1.69E+07	2
I-130	1.20E-04	2.18E-07	2E-05	2E-04	1.09E-03	2.38E-08	2.65E+08	6
Te-131m	1.60E-04	2.91E-07	8E-06	8E-05	3.63E-03	3.17E-08	1.15E+06	0
Te-131	3.00E-05	5.45E-08	8E-05	8E-04	6.81E-05	5.94E-09	1.11E+08	1
I-131	1.60E-01	2.91E-04	1E-06	1E-05	2.91E+01	3.17E-05	1.18E+08	3738
Te-132	4.30E-03	7.81E-06	9E-06	9E-05	8.68E-02	8.51E-07	1.21E+08	103
I-132	4.90E-03	8.90E-06	1E-04	1E-03	8.90E-03	9.70E-07	3.16E+08	307
I-133	4.00E-02	7.27E-05	7E-06	7E-05	1.04E+00	7.92E-06	1.16E+08	919
I-134	8.00E-05	1.45E-07	4E-04	4E-03	3.63E-05	1.58E-08	3.17E+08	5
Cs-134	4.60E-02	8.36E-05	9E-07	9E-06	9.29E+00	9.11E-06	2.42E+08	2204
I-135	4.30E-03	7.81E-06	3E-05	3E-04	2.60E-02	8.51E-07	1.47E+08	125
Cs-136	8.90E-03	1.62E-05	6E-06	6E-05	2.69E-01	1.76E-06	3.19E+08	562
Cs-137	3.30E-02	6.00E-05	1E-06	1E-05	6.00E+00	6.53E-06	9.30E+07	608
Ba-137m	3.10E-02	5.63E-05	1E-06	1E-05	5.63E+00	6.14E-06	9.85E+07	605
Ba-140	1.10E-04	2.00E-07	8E-06	8E-05	2.50E-03	2.18E-08	4.76E+07	1
La-140	1.10E-04	2.00E-07	9E-06	9E-05	2.22E-03	2.18E-08	2.22E+08	5
Ce-141	5.10E-05	9.27E-08	3E-05	3E-04	3.09E-04	1.01E-08	6.20E+07	1
Ce-143	2.80E-06	5.09E-09	2E-05	2E-04	2.54E-05	5.54E-10	7.87E+07	0
Ce-144	3.20E-05	5.81E-08	3E-06	3E-05	1.94E-03	6.34E-09	1.36E+07	0
Pr-143	2.70E-05	4.91E-08	2E-05	2E-04	2.45E-04	5.35E-09	0.00E+00	0
Pr-144	3.20E-05	5.81E-08	6E-04	6E-03	9.69E-06	6.34E-09	2.32E+08	0
H-3	5.50E+02	9.99E-01	1E-03	1E-02	9.99E+01	1.09E-01	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-08	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.53E+02	1.09E-01		10408
Total H-3	5.50E+02				9.99E+01	1.09E-01		0
Total W/O H-3	4.05E-01				5.28E+01	8.02E-05		10408

Ai: From DDCM 1/2-ODC-2.01 Table 1.1-1a (from Table 13 of S&W UR(B)-160)
Ei: (643-30 Data) From Calc Package No: ERS-SFL-92-039

F = 149600 gpm = Dilution Flowrate (127,000 gpm + 15,000 gpm + 7,800 gpm)
f = 9000 gpm = Disch. flowrate (9,000 gpm / RPRWP: With 2 RPRWPs, flow is split between CCW & RSP)
Ct = 1.09E-01 = Dilution Flowrate / (Discharge Flowrate x Sum SVMPC)
Ci = Si x Ct

CR = Sum (CiEi) = 1.04E+04 cpm
HHSP = CR = 1.04E+04 cpm
HSP = CR x 0.7 = 7.28E+03 cpm

RM-1DA-100 Alarm Setpoints (Model 843-32 Detector)

NEW METHOD - Based on: 10 x New 10 CFR 20 EC's

Nuclide	Ai Annual Release (Ci)	SI	New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	10 x New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	SI/EC (ml/uCi)	CI (uCi/ml)	EI Detection Efficiency (cpm/uCi/ml)	CiEI Count Rate (ncpm)
Cr-51	0.00E+00	0.00E+00	5E-04	5E-03	0.00E+00	0.00E+00	1.18E+07	0
I-131	1.33E+02	2.60E-01	1E-06	1E-05	2.60E+04	2.10E-05	1.11E+08	2329
I-132	4.77E+01	9.33E-02	1E-04	1E-03	9.33E+01	7.53E-08	2.66E+08	2002
I-133	1.97E+02	3.86E-01	7E-06	7E-05	5.51E+03	3.11E-05	9.90E+07	3077
I-134	2.33E+01	4.56E-02	4E-04	4E-03	1.14E+01	3.66E-06	2.70E+08	993
I-135	1.10E+02	2.15E-01	3E-05	3E-04	7.18E+02	1.74E-05	1.19E+08	2065
H-3	0.00E+00	0.00E+00	1E-03	1E-02	0.00E+00	0.00E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-08	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.11E+02	1.00E+00			3.24E+04	8.06E-05		10466
Total H-3	0.00E+00				0.00E+00	0.00E+00		0
Total W/O H-3	5.11E+02				3.24E+04	8.06E-05		10466

EI (843-30R Data) From Calc Package No. ERS-SFL-92-039

NOTE: Even though this monitor has a Model 843-32 detector, the vendor notes that the efficiencies are the same as those for the Model 843-30 detector.

F = 86.9 gpm = Dilution Flowrate (Total from Outfall 003), as follows:
23.8 gpm = 0.0342 MGD from Internal Outfall 103 (Reference: 1/2-ADM-0604)
38.9 gpm = 0.056 MGD from Internal Outfall 303 (Reference: 1/2-ADM-0604)
24.3 gpm = 35,000 gpd from Secondary Make-up (Reference: Form 1/2-ENV-05.04.F04)

f = 33.3 gpm = Discharge flowrate from Aux Feed Pump Drains to Internal Outfall 303 as follows:
33.3 gpm = Internal Outfall 303 Adjusted for Aux Feed Drain (i.e., 38.9 gpm x 86%)

CI = 8.06E-05 = Dilution Flowrate / (Discharge Flowrate x Sum SI/MPC)
CI = SI x CI

CR = Sum (CiEi) = 1.05E+04 cpm
HHSP = CR = 1.05E+04 cpm
HSP = CR x 0.7 = 7.33E+03 cpm

RM-1DA-100 Alarm Setpoints (Model 843-32R Detector)

NEW METHOD - Based on: 10 x New 10 CFR 20 EC's

Nuclide	AI Annual Release (Ci)	SI	New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	10 x New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	SI/EC (ml/uCi)	Ci (uCi/ml)	EI Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	0.00E+00	0.00E+00	5E-04	5E-03	0.00E+00	0.00E+00	0.00E+00	0
I-131	1.33E+02	2.60E-01	1E-06	1E-05	2.60E+04	2.10E-05	1.18E+08	2476
I-132	4.77E+01	9.33E-02	1E-04	1E-03	9.33E+01	7.53E-06	3.16E+08	2378
I-133	1.97E+02	3.86E-01	7E-06	7E-05	5.51E+03	3.11E-05	1.16E+08	3606
I-134	2.33E+01	4.56E-02	4E-04	4E-03	1.14E+01	3.68E-06	3.17E+08	1165
I-135	1.10E+02	2.15E-01	3E-05	3E-04	7.16E+02	1.74E-05	1.47E+08	2551
H-3	0.00E+00	0.00E+00	1E-03	1E-02	0.00E+00	0.00E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-08	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.11E+02	1.00E+00			3.24E+04	8.06E-05		12177
Total H-3	0.00E+00				0.00E+00	0.00E+00		0
Total W/O H-3	5.11E+02				3.24E+04	8.06E-05		12177

EI: (843-30R Data) From Calc Package No. ERS-SFL-92-039.

NOTE: Even though this monitor has a Model 843-32R detector, the vendor notes that the efficiencies are the same as those for the Model 843-30R detector.

F = 86.9 gpm = Dilution Flowrate (Total from Outfall 003), as follows:
23.6 gpm = 0.0342 MGD from Internal Outfall 103 (Reference: 1/2-ADM-0604)
38.9 gpm = 0.056 MGD from Internal Outfall 303 (Reference: 1/2-ADM-0604)
24.3 gpm = 35,000 gpd from Secondary Make-up (Reference: Form 1/2-ENV-05.04.F04)

f = 33.3 gpm = Discharge flowrate from Aux Feed Pump Drains to Internal Outfall 303 as follows:
33.3 gpm = Internal Outfall 303 Adjusted for Aux Feed Drain (i.e., 38.9 gpm x 86%)

Ci = 8.06E-05 = Dilution Flowrate / (Discharge Flowrate x Sum SI/MPC)
Ci = SI x Ci

CR = Sum (CiEi) = 1.22E+04 cpm
HHSP = CR = 1.22E+04 cpm
HSP = CR x 0.7 = 8.52E+03 cpm

RM-1LW-116 Alarm Setpoints

New Method - Based on: 10 x New 10 CFR 20 EC's

Nuclide	AI Annual Release (Ci)	SI	New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	10 x New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	SI/EC (ml/uCi)	CI (uCi/ml)	EI Detection Efficiency (cpm/uCi/ml)	CIEI Count Rate (ncpm)
Cr-51	1.30E-03	2.36E-06	5E-04	5E-03	4.72E-04	2.35E-05	1.24E+07	291
Mn-54	3.10E-04	5.63E-07	3E-05	3E-04	1.88E-03	5.60E-06	1.05E+08	588
Fe-55	1.60E-03	2.91E-06	1E-04	1E-03	2.91E-03	2.89E-05	0.00E+00	0
Fe-59	8.30E-04	1.51E-06	1E-05	1E-04	1.51E-02	1.50E-05	1.04E+08	1561
Co-58	1.40E-02	2.54E-05	2E-05	2E-04	1.27E-01	2.53E-04	1.06E+08	26830
Co-60	2.00E-03	3.63E-06	3E-05	3E-05	1.21E-01	3.62E-05	1.94E+08	7015
Zn-65	2.69E-02	4.88E-05	5E-06	5E-05	9.76E-01	4.86E-04	5.02E+07	24375
Np-239	1.40E-04	2.54E-07	2E-05	2E-04	1.27E-03	2.53E-06	0.00E+00	0
Br-83	2.50E-05	4.54E-08	9E-04	9E-03	5.05E-06	4.52E-07	1.48E+06	1
Br-84	2.70E-06	4.91E-09	4E-04	4E-03	1.23E-06	4.88E-08	3.16E+08	15
Br-85	2.80E-08	5.09E-11	0E+00	0E+00	---	5.06E-10	6.71E+06	0
Rb-86	7.50E-05	1.36E-07	7E-06	7E-05	1.95E-03	1.36E-06	0.00E+00	0
Rb-88	1.20E-04	2.18E-07	4E-04	4E-03	5.45E-05	2.17E-06	3.73E+07	81
Sr-89	2.90E-04	5.27E-07	8E-06	8E-05	6.59E-03	5.24E-06	9.84E+03	0
Sr-90	1.10E-05	2.00E-08	5E-07	5E-06	4.00E-03	1.99E-07	0.00E+00	0
Sr-91	9.40E-06	1.71E-08	2E-05	2E-04	8.54E-05	1.70E-07	0.00E+00	0
Y-90	1.30E-05	2.36E-08	7E-06	7E-05	3.37E-04	2.35E-07	8.13E+07	19
Y-91m	8.70E-06	1.58E-08	2E-03	2E-02	7.90E-07	1.57E-07	1.07E+08	17
Y-91	5.70E-05	1.04E-07	8E-06	8E-05	1.29E-03	1.03E-06	2.53E+05	0
Y-93	7.40E-07	1.34E-09	2E-05	2E-04	6.72E-06	1.34E-08	0.00E+00	0
Zr-95	5.10E-05	9.27E-08	2E-05	2E-04	4.63E-04	9.22E-07	1.06E+09	98
Nb-95	5.20E-05	9.45E-08	3E-05	3E-04	3.15E-04	9.40E-07	1.06E+08	100
Mo-99	1.10E-02	2.00E-05	2E-05	2E-04	9.99E-02	1.99E-04	1.41E+08	28041
Tc-99m	1.10E-02	2.00E-05	1E-03	1E-02	2.00E-03	1.99E-04	1.11E+08	22075
Ru-103	3.40E-05	6.18E-08	3E-05	3E-04	2.06E-04	6.15E-07	1.13E+08	69
Ru-106	1.00E-05	1.82E-08	3E-06	3E-05	6.06E-04	1.81E-07	0.00E+00	0
Rh-103m	3.40E-05	6.18E-08	6E-03	6E-02	1.03E-06	6.15E-07	0.00E+00	0
Rh-106	1.00E-05	1.82E-08	0E+00	0E+00	---	1.81E-07	0.00E+00	0
Te-125m	2.50E-05	4.54E-08	2E-05	2E-04	2.27E-04	4.52E-07	2.40E+05	0
Te-127m	2.60E-04	4.72E-07	9E-06	9E-05	5.25E-03	4.70E-06	1.62E+07	76
Te-127	2.70E-04	4.91E-07	1E-04	1E-03	4.91E-04	4.88E-06	1.48E+06	7
Te-129m	1.10E-03	2.00E-06	7E-06	7E-05	2.86E-02	1.99E-05	1.11E+05	2
Te-129	6.70E-04	1.22E-06	4E-04	4E-03	3.04E-04	1.21E-05	1.69E+07	205
I-130	1.20E-04	2.18E-07	2E-05	2E-04	1.09E-03	2.17E-06	2.65E+08	575
Te-131m	1.60E-04	2.91E-07	8E-06	8E-05	3.63E-03	2.89E-06	1.15E+06	3
Te-131	3.00E-05	5.45E-08	6E-05	6E-04	6.81E-05	5.42E-07	1.11E+08	60
I-131	1.60E-01	2.91E-04	1E-06	1E-05	2.91E+01	2.89E-03	1.18E+08	341336
Te-132	4.30E-03	7.81E-06	9E-06	9E-05	8.68E-02	7.77E-05	1.21E+08	9407
I-132	4.90E-03	8.90E-06	1E-04	1E-03	8.90E-03	8.86E-05	3.16E+08	27994
I-133	4.00E-02	7.27E-05	7E-06	7E-05	1.04E+00	7.23E-04	1.16E+08	83888
I-134	8.00E-05	1.45E-07	4E-04	4E-03	3.63E-05	1.45E-06	3.17E+08	458
Cs-134	4.60E-02	8.36E-05	9E-07	9E-06	9.29E+00	8.32E-04	2.42E+08	201258
I-135	4.30E-03	7.81E-06	3E-05	3E-04	2.60E-02	7.77E-05	1.47E+08	11428
Cs-136	8.90E-03	1.62E-05	6E-06	6E-05	2.69E-01	1.61E-04	3.19E+08	51329
Cs-137	3.30E-02	6.00E-05	1E-06	1E-05	6.00E+00	5.97E-04	9.30E+07	55485
Ba-137m	3.10E-02	5.63E-05	1E-06	1E-05	5.63E+00	5.60E-04	9.85E+07	55205
Ba-140	1.10E-04	2.00E-07	8E-06	8E-05	2.50E-03	1.99E-06	4.78E+07	95
La-140	1.10E-04	2.00E-07	9E-06	9E-05	2.22E-03	1.99E-06	2.22E+08	441
Ce-141	5.10E-05	9.27E-08	3E-05	3E-04	3.09E-04	9.22E-07	6.20E+07	57
Ce-143	2.80E-06	5.09E-09	2E-05	2E-04	2.54E-05	5.06E-08	7.87E+07	4
Ce-144	3.20E-05	5.81E-08	3E-06	3E-05	1.94E-03	5.79E-07	1.36E+07	8
Pr-143	2.70E-05	4.91E-08	2E-05	2E-04	2.45E-04	4.88E-07	0.00E+00	0
Pr-144	3.20E-05	5.81E-08	6E-04	6E-03	9.69E-06	5.79E-07	2.32E+06	1
H-3	5.50E+02	9.99E-01	1E-03	1E-02	9.99E+01	9.94E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-08	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.53E+02	9.95E+00		950500
Total H-3	5.50E+02				9.99E+01	9.94E+00		0
Total W/O H-3	4.05E-01				5.28E+01	7.33E-03		950429

AI: From ODCM 1/2-ODC-2.01 Table 1.1-1a (from Table 13 of S&W UR(B)-160)
EI: (843-30 Data) From Calc Package No. ERS-SFL-92-039

F = 22800 gpm = Dilution Flowrate (15,000 gpm + 7,800 gpm)
f = 15 gpm = Discharge flowrate
Ct = 9.95E+00 = Dilution Flowrate / (Discharge Flowrate x Sum SI/MPC)
CI = SI x Ct

CR = Sum (CIEI) = 9.50E+05 cpm
HHSP = CR = 9.50E+05 cpm
HSP = CR x 0.7 = 6.65E+05 cpm

RM-1LW-104 Alarm Setpoints

NEW METHOD - Based on: 10 x New 10 CFR 20 EC's

Nuclide	Ai Annual Release (Ci)	Si	New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	10 x New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	Si/EC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	1.30E-03	2.36E-06	5E-04	5E-03	4.72E-04	1.01E-05	1.24E+07	125
Mn-54	3.10E-04	5.63E-07	3E-05	3E-04	1.88E-03	2.40E-06	1.05E+08	252
Fe-55	1.60E-03	2.91E-06	1E-04	1E-03	2.91E-03	1.24E-05	0.00E+00	0
Fe-59	8.30E-04	1.51E-06	1E-05	1E-04	1.51E-02	6.43E-06	1.04E+08	669
Co-58	1.40E-02	2.54E-05	2E-05	2E-04	1.27E-01	1.08E-04	1.06E+08	11498
Co-60	2.00E-03	3.63E-06	3E-06	3E-05	1.21E-01	1.55E-05	1.94E+08	3006
Zn-65	2.69E-02	4.88E-05	5E-06	5E-05	9.76E-01	2.08E-04	5.02E+07	10446
Np-239	1.40E-04	2.54E-07	2E-05	2E-04	1.27E-03	1.08E-06	0.00E+00	0
Br-83	2.50E-05	4.54E-08	9E-04	9E-03	5.05E-06	1.94E-07	1.48E+06	0
Br-84	2.70E-06	4.91E-09	4E-04	4E-03	1.23E-06	2.09E-08	3.16E+08	7
Br-85	2.80E-08	5.09E-11	0E+00	0E+00	---	2.17E-10	6.71E+06	0
Rb-86	7.50E-05	1.36E-07	7E-06	7E-05	1.95E-03	5.81E-07	0.00E+00	0
Rb-88	1.20E-04	2.18E-07	4E-04	4E-03	5.45E-05	9.30E-07	3.73E+07	35
Sr-89	2.90E-04	5.27E-07	8E-06	8E-05	6.59E-03	2.25E-06	9.84E+03	0
Sr-90	1.10E-05	2.00E-08	5E-07	5E-06	4.00E-03	8.52E-08	0.00E+00	0
Sr-91	9.40E-06	1.71E-08	2E-05	2E-04	8.54E-05	7.28E-08	0.00E+00	0
Y-90	1.30E-05	2.36E-08	7E-06	7E-05	3.37E-04	1.01E-07	8.13E+07	8
Y-91m	8.70E-06	1.58E-08	2E-03	2E-02	7.90E-07	6.74E-08	1.07E+08	7
Y-91	5.70E-05	1.04E-07	8E-06	8E-05	1.29E-03	4.42E-07	2.53E+05	0
Y-93	7.40E-07	1.34E-09	2E-05	2E-04	6.72E-06	5.73E-09	0.00E+00	0
Zr-95	5.10E-05	9.27E-08	2E-05	2E-04	4.63E-04	3.95E-07	1.06E+08	42
Nb-95	5.20E-05	9.45E-08	3E-05	3E-04	3.15E-04	4.03E-07	1.06E+08	43
Mo-99	1.10E-02	2.00E-05	2E-05	2E-04	9.99E-02	8.52E-05	1.41E+08	12018
Tc-99m	1.10E-02	2.00E-05	1E-03	1E-02	2.00E-03	8.52E-05	1.11E+08	9461
Ru-103	3.40E-05	6.18E-08	3E-05	3E-04	2.06E-04	2.63E-07	1.13E+08	30
Ru-106	1.00E-05	1.82E-08	3E-06	3E-05	6.06E-04	7.75E-08	0.00E+00	0
Rh-103m	3.40E-05	6.18E-08	6E-03	6E-02	1.03E-06	2.63E-07	0.00E+00	0
Rh-106	1.00E-05	1.82E-08	0E+00	0E+00	---	7.75E-08	0.00E+00	0
Te-125m	2.50E-05	4.54E-08	2E-05	2E-04	2.27E-04	1.94E-07	2.40E+05	0
Te-127m	2.60E-04	4.72E-07	9E-06	9E-05	5.25E-03	2.01E-06	1.62E+07	33
Te-127	2.70E-04	4.91E-07	1E-04	1E-03	4.91E-04	2.09E-06	1.48E+06	3
Te-129m	1.10E-03	2.00E-06	7E-06	7E-05	2.86E-02	8.52E-06	1.11E+05	1
Te-129	6.70E-04	1.22E-06	4E-04	4E-03	3.04E-04	5.19E-06	1.69E+07	88
I-130	1.20E-04	2.18E-07	2E-05	2E-04	1.09E-03	9.30E-07	2.65E+08	246
Te-131m	1.60E-04	2.91E-07	8E-06	8E-05	3.63E-03	1.24E-06	1.15E+06	1
Te-131	3.00E-05	5.45E-08	8E-05	8E-04	6.81E-05	2.32E-07	1.11E+08	26
I-131	1.60E-01	2.91E-04	1E-06	1E-05	2.91E+01	1.24E-03	1.18E+08	146287
Te-132	4.30E-03	7.81E-06	9E-06	9E-05	8.68E-02	3.33E-05	1.21E+08	4031
I-132	4.90E-03	8.90E-06	1E-04	1E-03	8.90E-03	3.80E-05	3.16E+08	11997
I-133	4.00E-02	7.27E-05	7E-06	7E-05	1.04E+00	3.10E-04	1.16E+08	35952
I-134	8.00E-05	1.45E-07	4E-04	4E-03	3.63E-05	6.20E-07	3.17E+08	196
Cs-134	4.60E-02	8.36E-05	9E-07	9E-06	9.29E+00	3.56E-04	2.42E+08	86254
I-135	4.30E-03	7.81E-06	3E-05	3E-04	2.60E-02	3.33E-05	1.47E+08	4898
Cs-136	8.90E-03	1.62E-05	6E-06	6E-05	2.69E-01	6.90E-05	3.19E+08	21998
Cs-137	3.30E-02	6.00E-05	1E-06	1E-05	6.00E+00	2.56E-04	9.30E+07	23779
Ba-137m	3.10E-02	5.63E-05	1E-06	1E-05	5.63E+00	2.40E-04	9.85E+07	23659
Ba-140	1.10E-04	2.00E-07	8E-06	8E-05	2.50E-03	8.52E-07	4.78E+07	41
La-140	1.10E-04	2.00E-07	9E-06	9E-05	2.22E-03	8.52E-07	2.22E+08	189
Ce-141	5.10E-05	9.27E-08	3E-05	3E-04	3.09E-04	3.95E-07	8.20E+07	24
Ce-143	2.60E-06	5.09E-09	2E-05	2E-04	2.54E-05	2.17E-08	7.87E+07	2
Ce-144	3.20E-05	5.81E-08	3E-06	3E-05	1.94E-03	2.48E-07	1.35E+07	3
Pr-143	2.70E-05	4.91E-08	2E-05	2E-04	2.45E-04	2.09E-07	0.00E+00	0
Pr-144	3.20E-05	5.81E-08	6E-04	6E-03	9.69E-06	2.48E-07	2.32E+06	1
H-3	5.50E+02	9.99E-01	1E-03	1E-02	9.99E+01	4.26E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-08	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.53E+02	4.26E+00		407357
Total H-3	5.50E+02				9.99E+01	4.26E+00		0
Total W/O H-3	4.05E-01				5.28E+01	3.14E-03		407327

Ai: From ODCM 1/2-ODC-2.01 Table 1.1-1a (from Table 13 of S&W UR(B)-160)
Ei: (843-30 Data) From Calc Package No. ERS-SFL-92-039

F = 22800 gpm = Dilution Flowrate (15,000 gpm + 7,600 gpm)
f = 35 gpm = Discharge flowrate
Ci = 4.26E+00 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)
Ci = Si x Ct

CR = Sum (CiEi) = 4.07E+05 cpm
HHSP = CR = 4.07E+05 cpm
HSP = CR x 0.7 = 2.85E+05 cpm

2SGC-RQ100 Alarm Setpoints

NEW METHOD - Based on: 10 x New 10 CFR 20 EC's

Nuclide	Ai Annual Release (Ci)	Si	New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	10 x New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	Si/EC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	1.00E-04	1.82E-07	5E-04	5E-03	3.63E-05	3.92E-07	2.01E+07	8
Mn-54	2.60E-05	4.64E-08	3E-05	3E-04	1.51E-04	9.81E-08	1.27E+08	12
Fe-55	1.30E-04	2.36E-07	1E-04	1E-03	2.36E-04	5.10E-07	0.00E+00	0
Fe-59	6.50E-05	1.18E-07	1E-05	1E-04	1.18E-03	2.55E-07	1.26E+08	32
Co-58	1.10E-03	2.00E-06	2E-05	2E-04	9.99E-03	4.32E-06	1.82E+08	786
Co-60	1.60E-04	2.91E-07	3E-06	3E-05	9.69E-03	6.28E-07	2.38E+08	149
Zn-65	5.10E-02	9.27E-05	5E-03	5E-05	1.85E+00	2.00E-04	6.50E+07	13025
Np-239	3.20E-05	6.82E-08	2E-05	2E-04	2.91E-04	1.26E-07	1.65E+08	21
Br-83	2.90E-05	5.27E-08	9E-04	9E-03	5.86E-06	1.14E-07	2.42E+06	0
Br-84	5.90E-09	1.07E-11	4E-04	4E-03	2.68E-09	2.32E-11	1.38E+08	0
Rb-86	3.70E-05	6.72E-08	7E-06	7E-05	9.61E-04	1.45E-07	1.04E+07	2
Sr-89	2.20E-05	4.00E-08	9E-06	8E-05	5.00E-04	8.63E-08	1.83E+04	0
Sr-90	8.50E-07	1.54E-09	5E-07	5E-06	3.09E-04	3.34E-09	0.00E+00	0
Sr-91	5.30E-06	9.63E-09	2E-05	2E-04	4.82E-05	2.08E-08	1.04E+08	2
Mo-99	2.30E-03	4.18E-06	2E-05	2E-04	2.09E-02	9.03E-06	4.47E+07	403
Tc-99m	2.10E-03	3.82E-06	1E-03	1E-02	3.82E-04	8.24E-06	1.40E+08	1154
Te-125m	1.90E-06	3.45E-09	2E-05	2E-04	1.73E-05	7.46E-09	3.94E+05	0
Te-127m	2.10E-05	3.82E-08	9E-06	9E-05	4.24E-04	8.24E-08	1.26E+05	0
Te-127	2.50E-05	4.54E-08	1E-04	1E-03	4.54E-05	9.81E-08	2.43E+06	0
Te-129m	8.20E-05	1.49E-07	7E-06	7E-05	2.13E-03	3.22E-07	6.53E+06	2
Te-129	5.30E-05	9.63E-08	4E-04	4E-03	2.41E-05	2.08E-07	1.96E+07	4
I-130	2.30E-04	4.18E-07	2E-05	2E-04	2.09E-03	9.03E-07	5.18E+08	468
Te-131m	5.20E-05	9.45E-08	8E-06	8E-05	1.18E-03	2.04E-07	2.85E+08	58
Te-131	9.40E-06	1.71E-08	8E-05	8E-04	2.14E-05	3.69E-08	1.88E+08	7
I-131	1.00E-01	1.82E-04	1E-06	1E-05	1.82E+01	3.92E-04	1.96E+08	76924
Te-132	7.80E-04	1.42E-06	9E-06	9E-05	1.57E-02	3.06E-06	1.76E+08	539
I-132	2.30E-03	4.18E-06	1E-04	1E-03	4.18E-03	9.03E-06	4.22E+08	3809
I-133	6.50E-02	1.18E-04	7E-06	7E-05	1.69E+00	2.55E-04	1.73E+08	44133
I-134	4.60E-06	8.36E-09	4E-04	4E-03	2.09E-06	1.81E-08	4.06E+08	7
Cs-134	3.00E-02	5.45E-05	9E-07	9E-06	6.06E+00	1.18E-04	3.25E+08	38266
I-135	9.20E-03	1.67E-05	3E-05	3E-04	5.57E-02	3.61E-05	1.71E+08	6174
Cs-136	3.90E-03	7.09E-06	6E-06	6E-05	1.18E-01	1.53E-05	4.28E+08	6551
Cs-137	2.20E-02	4.00E-05	1E-06	1E-05	4.00E+00	8.63E-05	1.28E+08	11052
Ba-140	9.30E-06	1.69E-08	8E-06	8E-05	2.11E-04	3.65E-08	7.50E+07	3
La-140	8.40E-06	1.53E-08	9E-06	9E-05	1.70E-04	3.30E-08	3.08E+08	10
Y-90	6.00E-07	1.09E-09	7E-06	7E-05	1.56E-05	2.35E-09	0.00E+00	0
Y-91m	3.60E-06	6.54E-09	2E-03	2E-02	3.27E-07	1.41E-08	1.59E+08	2
Y-91	4.40E-06	8.00E-09	8E-06	8E-05	9.99E-05	1.73E-08	3.65E+05	0
Y-93	3.00E-07	5.45E-10	2E-05	2E-04	2.73E-06	1.18E-09	2.03E+07	0
Zr-95	4.00E-06	7.27E-09	2E-05	2E-04	3.63E-05	1.57E-08	1.35E+08	2
Nb-95	4.00E-06	7.27E-09	3E-05	3E-04	2.42E-05	1.57E-08	1.33E+08	2
Ru-103	2.70E-06	4.91E-09	3E-05	3E-04	1.64E-05	1.06E-08	1.71E+08	2
Ru-106	8.20E-07	1.49E-09	3E-06	3E-05	4.97E-05	3.22E-09	0.00E+00	0
Rh-103m	2.70E-06	4.91E-09	6E-03	6E-02	8.18E-08	1.06E-08	0.00E+00	0
Rh-106	8.20E-07	1.49E-09	0E+00	0E+00	—	3.22E-09	5.65E+07	0
Ce-141	4.00E-06	7.27E-09	3E-05	3E-04	2.42E-05	1.57E-08	7.75E+07	1
Ce-143	8.60E-07	1.56E-09	2E-05	2E-04	7.81E-06	3.38E-09	1.20E+08	0
Ce-144	2.60E-06	4.72E-09	3E-06	3E-05	1.57E-04	1.02E-08	1.87E+07	0
Pr-143	2.30E-06	4.18E-09	2E-05	2E-04	2.09E-05	9.03E-09	1.63E+00	0
Pr-144	2.60E-06	4.72E-09	6E-04	6E-03	7.87E-07	1.02E-08	3.40E+06	0
H-3	5.50E+02	9.99E-01	1E-03	1E-02	9.99E+01	2.16E+00	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-08	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	5.50E+02	1.00E+00			1.32E+02	2.16E+00		203612
Total H-3	5.50E+02				9.99E+01	2.16E+00		0
Total W/O H-3	2.91E-01				3.20E+01	1.14E-03		203612

Ai: From ODCM 1/2-ODC-2.01 Table 1.1-1b (from Table 13 of S&W UR(B)-160)
Ei: (RD-53 Data) From Calc Package No. ERS-SFL-88-026

F = 22800 gpm = Dilution Flowrate (15,000 gpm + 7,800 gpm)
f = 60 gpm = Discharge flowrate
Ct = 2.16E+00 = Dilution Flowrate / (Discharge Flowrate x Sum Si/MPC)
Ci = Si x Ct

CR = Sum CiEi =	203612	cpm
Eia (W/O H-3) = (CR) / (Sum Ci) =	1.78E+08	cpm/uCi/ml
CF-11 Conversion Factor = 1 / Eia =	5.61E-09	uCi/ml/cpm
DV = CF11 x (Sum CiEi) =	1.14E-03	uCi/ml
HSP = DV =	1.14E-03	uCi/ml
ASP = DV x 0.7 =	7.99E-04	uCi/ml

2SWS-RQ101 & Alarm Setpoints
2SWS-RQ102

NEW METHOD - Based on: 10 x New 10 CFR 20 EC's

Nuclide	Ai Annual Release (Ci)	SI	New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	10 x New 10 CFR 20 EC Appendix B Table 2, Col 2 (uCi/ml)	SI/EC (ml/uCi)	Ci (uCi/ml)	Ei Detection Efficiency (cpm/uCi/ml)	CiEi Count Rate (ncpm)
Cr-51	2.00E-03	7.51E-04	5E-04	5E-03	1.50E-01	5.16E-08	2.01E+07	1
Mn-54	3.30E-04	1.24E-04	3E-05	3E-04	4.13E-01	8.52E-09	1.27E+08	1
Fe-55	1.70E-03	6.38E-04	1E-04	1E-03	6.38E-01	4.39E-08	0.00E+00	0
Fe-59	1.10E-03	4.13E-04	1E-05	1E-04	4.13E+00	2.84E-08	1.26E+08	4
Co-58	1.70E-02	6.38E-03	2E-05	2E-04	3.19E+01	4.39E-07	1.82E+08	80
Co-60	2.10E-03	7.88E-04	3E-06	3E-05	2.63E+01	5.42E-08	2.38E+08	13
Zn-65	5.10E-02	1.91E-02	5E-06	5E-05	3.83E+02	1.32E-06	6.50E+07	86
Np-239	1.30E-03	4.88E-04	2E-05	2E-04	2.44E+00	3.35E-08	1.65E+08	6
Br-83	5.50E-03	2.06E-03	9E-04	9E-03	2.29E-01	1.42E-07	2.42E+06	0
Br-84	3.00E-03	1.13E-03	4E-04	4E-03	2.81E-01	7.74E-08	1.38E+08	11
Br-85	3.50E-04	1.31E-04	0E+00	0E+00	—	9.03E-09	9.04E+06	0
Rb-86	9.10E-05	3.41E-05	7E-06	7E-05	4.88E-01	2.35E-09	1.04E+07	0
Rb-88	2.30E-01	8.63E-02	4E-04	4E-03	2.16E+01	5.94E-06	4.84E+07	287
Sr-89	3.70E-04	1.39E-04	8E-06	8E-05	1.74E+00	9.55E-09	1.83E+04	0
Sr-90	1.10E-05	4.13E-06	5E-07	5E-06	8.26E-01	2.84E-10	0.00E+00	0
Sr-91	7.20E-04	2.70E-04	2E-05	2E-04	1.35E+00	1.86E-08	1.04E+08	2
Mo-99	9.00E-02	3.38E-02	2E-05	2E-04	1.69E+02	2.32E-06	4.47E+07	104
Tc-99m	5.40E-02	2.03E-02	1E-03	1E-02	2.03E+00	1.39E-06	1.40E+08	195
Te-125m	3.10E-05	1.16E-05	2E-05	2E-04	5.82E-02	8.00E-10	3.94E+05	0
Te-127m	3.00E-04	1.13E-04	9E-06	9E-05	1.25E+00	7.74E-09	1.26E+05	0
Te-127	9.40E-04	3.53E-04	1E-04	1E-03	3.53E-01	2.43E-08	2.43E+06	0
Te-129m	1.50E-03	5.63E-04	7E-06	7E-05	8.04E+00	3.87E-08	8.53E+06	0
Te-129	1.80E-03	6.75E-04	4E-04	4E-03	1.69E-01	4.65E-08	1.96E+07	1
I-130	2.30E-03	8.63E-04	2E-05	2E-04	4.32E+00	5.94E-08	5.18E+08	31
Te-131m	2.70E-03	1.01E-03	8E-06	8E-05	1.27E+01	6.97E-08	2.85E+08	20
Te-131	1.30E-03	4.88E-04	8E-05	8E-04	6.10E-01	3.35E-08	1.88E+08	6
I-131	2.90E-01	1.09E-01	1E-06	1E-05	1.09E+04	7.48E-06	1.96E+08	1467
Te-132	2.90E-02	1.09E-02	9E-06	9E-05	1.21E+02	7.48E-07	1.76E+08	132
I-132	1.10E-01	4.13E-02	1E-04	1E-03	4.13E+01	2.84E-06	4.22E+08	1198
I-133	4.20E-01	1.58E-01	7E-06	7E-05	2.25E+03	1.08E-05	1.73E+08	1875
I-134	5.40E-02	2.03E-02	4E-04	4E-03	5.07E+00	1.39E-06	4.06E+08	566
Cs-134	2.70E-02	1.01E-02	9E-07	9E-06	1.13E+03	6.97E-07	3.25E+08	226
I-135	2.10E-01	7.88E-02	3E-05	3E-04	2.63E+02	5.42E-06	1.71E+08	927
Cs-136	1.40E-02	5.25E-03	6E-06	6E-05	8.76E+01	3.61E-07	4.28E+08	155
Cs-137	1.90E-02	7.13E-03	1E-06	1E-05	7.13E+02	4.90E-07	1.28E+08	63
Ba-137m	1.90E-02	7.13E-03	1E-06	1E-05	7.13E+02	4.90E-07	1.33E+08	65
Ba-140	2.30E-04	8.63E-05	8E-06	8E-05	1.08E+00	5.94E-09	7.50E+07	0
La-140	1.60E-04	6.00E-05	9E-06	9E-05	6.67E-01	4.13E-09	3.08E+08	1
Y-90	1.30E-06	4.88E-07	7E-06	7E-05	6.97E-03	3.35E-11	0.00E+00	0
Y-91m	4.20E-04	1.58E-04	2E-03	2E-02	7.88E-03	1.08E-08	1.59E+08	2
Y-91	6.60E-05	2.65E-05	8E-06	8E-05	3.19E-01	1.75E-09	3.65E+05	0
Y-93	3.60E-05	1.43E-05	2E-05	2E-04	7.13E-02	9.81E-10	2.03E+07	0
Zr-95	6.30E-05	2.36E-05	2E-05	2E-04	1.18E-01	1.63E-09	1.35E+08	0
Nb-95	5.30E-05	1.99E-05	3E-05	3E-04	6.63E-02	1.37E-09	1.33E+08	0
Ru-103	4.70E-05	1.76E-05	3E-05	3E-04	5.88E-02	1.21E-09	1.71E+08	0
Ru-106	1.10E-05	4.13E-06	3E-06	3E-05	1.38E-01	2.84E-10	0.00E+00	0
Rh-103m	5.20E-05	1.95E-05	6E-03	6E-02	3.25E-04	1.34E-09	0.00E+00	0
Rh-106	1.20E-05	4.50E-06	0E+00	0E+00	—	3.10E-10	6.85E+07	0
Ce-141	7.40E-05	2.78E-05	3E-05	3E-04	9.26E-02	1.91E-09	7.75E+07	0
Ce-143	4.30E-05	1.61E-05	2E-05	2E-04	8.07E-02	1.11E-09	1.20E+08	0
Ce-144	3.50E-05	1.31E-05	3E-06	3E-05	4.38E-01	9.03E-10	1.87E+07	0
Pr-143	5.30E-05	1.99E-05	2E-05	2E-04	9.94E-02	1.37E-09	1.63E+00	0
Pr-144	3.80E-05	1.43E-05	6E-04	6E-03	2.38E-03	9.81E-10	3.40E+06	0
H-3	1.00E+00	3.75E-01	1E-03	1E-02	3.75E+01	2.58E-05	0.00E+00	0
All Others	0.00E+00	0.00E+00	1E-08	1E-07	0.00E+00	0.00E+00	0.00E+00	0
Total	2.66E+00	1.00E+00			1.69E+04	6.88E-05		7525
Total H-3	1.00E+00				3.75E+01	2.58E-05		0
Total W/O H-3	1.66E+00				1.69E+04	4.30E-05		7525

Ai: From S & W Calc Package No. UR(B) 299-0
Ei: (RD-53 Data) From Calc Package No. ERS-SFL-88-026

F = 8400 gpm = Dilution Flowrate
f = 7220 gpm = Discharge flowrate
Ct = 6.88E-05 = Dilution Flowrate / (Discharge Flowrate x Sum SI/MPC)
Ci = SI x Ct

CR = Sum CiEi =	7525	cpm
Eia (W/O H-3) = (CR) / (Sum Ci) =	1.75E+08	cpm/uCi/ml
CF-11 Conversion Factor = 1 / Eia =	5.71E-09	uCi/ml/cpm
DV = CF11 x (Sum CiEi) =	4.30E-05	uCi/ml
HSP = DV =	4.30E-05	uCi/ml
ASP = DV x 0.7 =	3.01E-05	uCi/ml

Determination of Zn-65 Ci/yr value for ODCM Table 1.1-1a & 1.1-1b

Unit 1 (For ODCM 1/2-ODC-2.01 Table 1.1-1a):

1) Letdown Volume Determination:

60 gpm = RCS Letdown Rate from 1/2-ODC-3.01 Table B:1a
3.15E+07 gal = Total RCS Volume Letdown in 1 yr , or
gal = gpm x 60 min/hr x 24 hr/day x 365 day/yr
1.19E+11 ml = Total Volume converted to ml , or
ml = gal x 3785 ml/gal

2) Determination of Activity Input to Liquid Waste in 1 yr

4.50E-03 uCi/ml = Estimate of RCS Zn-65 Concentration
5.37E+08 uCi = Estimate of RCS Zn-65 Activity Input to LW in 1 yr
5.37E+02 Ci = Zn-65 Liquid Waste Input Activity converted to Ci, or
Ci = uCi x 1E-6 Ci/uCi

3) Determination of Zn-65 Activity Release for 1/2-ODC-2.01 Table 1.1-1a

20000 DF = Total Zn-65 Decontamination Factor thru all CVCS & LW Filters & Demineralizers.
NOTE: This value was derived from the values listed in ODCM 1/2-ODC-3.01 Table B:1a. Although this table lists "other" DF's as 1E+7, a more appropriate value of 20000 is used (ie; the lowest of all DF's listed).
2.69E-02 Ci = Estimate of Zn-65 Activity Release per year , or
Ci = Ci / DF)

Unit 2 (For ODCM 1/2-ODC-2.01 Table 1.1-1b):

1) Letdown Volume Determination:

57 gpm = RCS Letdown Rate from 1/2-ODC-3.01 Table B:1b
3.00E+07 gal = Total RCS Volume Letdown in 1 yr , or
gal = gpm x 60 min/hr x 24 hr/day x 365 day/yr
1.13E+11 ml = Total Volume converted to ml , or
ml = gal x 3785 ml/gal

2) Determination of Activity Input to Liquid Waste in 1 yr

4.50E-03 uCi/ml = Estimate of RCS Zn-65 Concentration
5.10E+08 uCi = Estimate of RCS Zn-65 Activity Input to LW in 1 yr
5.10E+02 Ci = Zn-65 Liquid Waste Input Activity converted to Ci, or
Ci = uCi x 1E-6 Ci/uCi

3) Determination of Zn-65 Activity Release for 1/2-ODC-2.01 Table 1.1-1b

10000 DF = Total Zn-65 Decontamination Factor thru all CVCS & LW Filters & Demineralizers.
NOTE: This value was derived from the values listed in ODCM 1/2-ODC-3.01 Table B:1b. Although this table lists "other" DF's as high as 1E+5, a more appropriate value of 10000 is used (ie; the lowest of all "other" DF's listed).
5.10E-02 Ci = Estimate of Zn-65 Activity Release per year , or
Ci = Ci / DF)

Evaluation of the effect on [RM-1DA-100] Alarm Setpoints due to Detector Upgrade

CONCLUSION:

The alarm setpoints for the analog drawer/meter face of [RM-1DA-100], as previously provided in Calculation No. 8700-UR(B)-223, Rev 0, are still valid and do not require revision. Therefore, the alarm setpoints SHALL remain at the current values, as follows:

HHSP = 1.20E+04 cpm
HSP = 8.43E+03 cpm

The EPP Emergency Action Level values, as documented in EAL 7.2 (Liquid Effluents) Table 7-1 (Effluent Radiation Monitor EALs), are still valid and do not require revision. Therefore, the EPP-EAL values SHALL remain at the current values, as follows:

EPP UE EAL = 2.44E+04 cpm
EPP Alert EAL = NA; Range Exceeded

However, IF the analog drawer/meter face of [RM-1DA-100] is upgraded to a digital drawer/meter face, THEN the revised setpoints shall be applied. This would require changes to 1/2-ODC-2.01, 1-HPP-4.02.013 and EPP-I-1a Table 7-1.

DISCUSSION:

On 11/16/08, Unit 1 Aux Feedwater Area Drain Radiation Monitor [RM-1DA-100] was removed from service for calibration via 1MSP-43.70-I. Several attempts were made to calibrate the monitor using the existing Model 843-32 Detector, along with two (2) other new Model 843-32 Detectors, but the attempts were unsuccessful (See CR08-50435 & CR08-50765). The vendor was contacted for resolution, and they suggested that the Model 843-32 Detector be replaced with the upgraded Model 843-32R Detector, because the original Model 843-32 Detectors are no longer manufactured, and any available Model 843-32 Detectors (although new) may not give desired results. For information, the Model 843-32 Detectors were last manufactured ~14 years ago, and the crystals may exhibit different characteristics than those provided at time of manufacture.

In order to change FROM the Model 843-32 Detector TO the Model 843-32R Detector, an evaluation of the alarm setpoints needed performed. Specifically, the evaluation needed to determine effect on the current alarm setpoints of [RM-1DA-100], as previously provided in Calculation No. 8700-UR(B)-223, Rev 0 (Impact of Atmospheric Containment Conversion, Power Uprate, and Alternate Source Terms on the Alarm setpoints for the Radiation Monitors at BVPS-1), due to vendor upgrade FROM the Model 843-32 gamma scintillation detector TO the Model 843-32R replacement gamma scintillation detector.

On 12/18/08, the vendor provided documentation of the efficiencies for the 843-32R Detector, indicating that the efficiencies are the same as those previously provided for the 843-30R Detector. Using this technical bass, calculations were performed using the efficiencies for the Model 843-30R Detector. The results indicated that any calculated changes in alarm setpoints, and any calculated changes in EPP-EAL values were insignificant, and therefore, should remain at the values shown in the calculation of record. Specifically the calculation of record is 8700-UR(B)-223, Rev 0. A comparison of the setpoints and EPP-EAL values are as follows:

HHSP Summary
Re-Evaluated HHSP (843-32R) = CR = 1.22E+04 cpm, or 1.5% increase from Current HHSP
Re-Evaluated HHSP (843-32) = 1.05E+04 cpm, or 12.6% decrease from Current HHSP
Current HHSP (843-32) = 1.20E+04 cpm
HSP Summary
Re-Evaluated HSP (843-32R) = CR x 0.7 = 8.52E+03 cpm, or 1.1% increase from Current HSP
Re-Evaluated HSP (843-32) = 7.33E+03 cpm, or 13.1% decrease from Current HSP
Current HSP (843-32) = 8.43E+03 cpm
UE-EAL Summary
Re-Evaluated UE-EAL (843-32R) = 2 x HHSP = 2.44E+04 cpm, or NO change from Current UE-EAL
Re-Evaluated UE-EAL (843-32) = 2.09E+04 cpm, or 14.2% decrease from Current UE-EAL
Current UE-EAL (843-32) = 2.44E+04 cpm
Alert-EAL Summary
Re-Evaluated Alert-EAL (843-32R) = 200 x HHSP = 2.44E+06 cpm, or NO change from Current Alert-EAL
Re-Evaluated Alert-EAL (843-32) = 2.09E+06 cpm, or 14.2% decrease from Current Alert-EAL
Current Alert-EAL = 2.44E+06 cpm
NOTE: SINCE the calculated Alert-EAL values exceed the range of the instrument, THEN the actual Alert-EAL values are "Not Applicable"

EVALUATION:

Part 1: **Significance of Changes**

The changes noted above are considered insignificant for the following reasons:

1. HHSP Values: The calculated HHSP values, although shown in three (3) significant figures, are not able to be set to that accuracy on the meter face. Specifically, [RM-1DA-100] has an analog meter face that covers five decades (i.e., 10 to 1E+6 cpm), which restricts the end-user to interpolate a setpoint (i.e., 1.22E+04 cpm, 1.05E+04 cpm and 1.20E+04 cpm) beyond one (1) significant figure. In summary, the calculated HHSP values of 1.22E+04 cpm, 1.05E+04 cpm and 1.20E+04 cpm would all be read as the identical value of 1E+04 cpm.

2. HSP Values: The calculated HSP values, although shown in three (3) significant figures, are not able to be set to that accuracy on the meter face. Specifically, [RM-1DA-100] has an analog meter face that covers five decades (i.e., 10 to 1E+6 cpm), which restricts the end-user to be able to interpolate the setpoint (i.e., 8.52E+03 cpm, 7.33E+03 cpm and 8.43E+03 cpm) equal to or beyond one (1) significant figure. Specifically, SINCE the meter face has "hash marks" at 1, 2, 4, 6, 8 & 10, THEN the end-user would also have difficulty interpolating setpoints between 7E+03 and 9E+03 cpm. In summary, the calculated HSP values of 8.52E+03 cpm, 7.33E+03 cpm and 8.43E+03 cpm would most likely be set at the 8E+03 cpm "hash mark", which makes these values identical.

3. Alert Values: The calculated Alert-EAL values, although shown in three (3) significant figures, are not able to be read to that accuracy on the meter face. Specifically, [RM-1DA-100] has an analog meter face that covers five decades (i.e., 10 to 1E+6 cpm), which restricts the end-user to interpolate a reading (i.e., 2.44E+06 cpm, 2.09E+06 cpm and 2.44E+06 cpm) beyond the range of the instrument. In summary, the calculated Alert-EAL values of 2.44E+06 cpm, 2.09E+06 cpm and 2.44E+06 cpm are "Not Applicable", because they exceed the maximum instrument range of 1E+06 cpm.

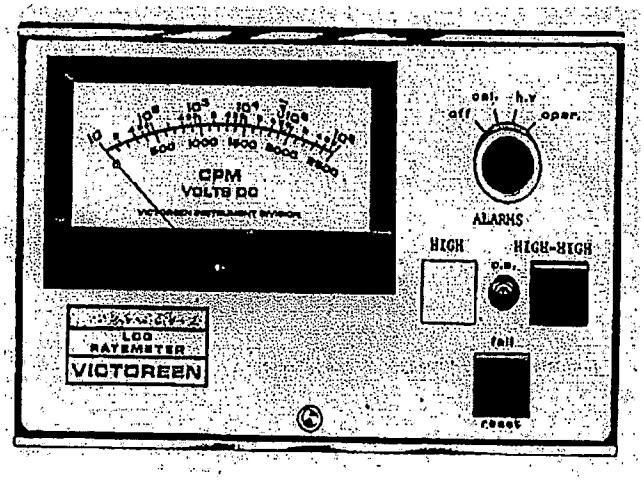
4. UE-EAL Values: The calculated UE-EAL values, although shown in three (3) significant figures, are not able to be read to that accuracy on the meter face. Specifically, [RM-1DA-100] has an analog meter face that covers five decades (i.e., 10 to 1E+6 cpm), which restricts the end-user to interpolate a reading (i.e., 2.44E+04 cpm, 2.09E+04 cpm and 2.44E+04 cpm) beyond one (1) significant figure. In summary, the calculated UE-EAL values of 2.44E+04 cpm, 2.09E+04 cpm and 2.44E+04 cpm would all be read as the identical value of 2E+04 cpm.

5. Summary of Differences: The differences between all the Re-Evaluated and Current values range from -14.2% change to +1.5% change. In summary, the difference between all Re-Evaluated and Current values are insignificant, because they represent similar values when read on the meter face.

6. Setpoint Truncation Practice: The actual practice for alarm setpoint adjustment of radiation monitors with analog meter faces is to truncate the 2nd and 3rd significant figure from the net alarm setpoint. For example, a calculated net alarm setpoint of up to 1.99E+04 cpm is truncated to 1E+4 cpm prior to adjustment of the alarm setpoint. In summary all Re-Evaluated and Current values are similar when read on the meter face.

7. Impact on Digital Upgrade: All justifications provided in Items 1-6 above are valid only during periods where the analog drawer/meter face is installed in [RM-1DA-100. Therefore, IF the analog drawer/meter face of [RM-1DA-100] is upgraded to a digital drawer/meter face, THEN the revised setpoints shall be applied. This would require changes to 1/2-ODC-2.01, 1-HPP-4.02.013 and EPP-I-1a Table 7-1.

Part 2: **Graphic of Victoreen Analog Meter Face**



ERS-AFL-03-021 Rev. 4
ATTACHMENT 7 Pl. of 4

FLUKE Biomedical

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Date: April 19, 2006

Page: 1 of 7 Pages

Subject: Revised Model 843-30R Efficiencies

Mr. Vakharia

Enclosed are revised isotopic efficiencies for the Model 843-30R Gamma Scintillation detector used in your liquid and gaseous effluent radiation monitors. Four (4) sets of efficiency tables are enclosed. Each table reflects the efficiency for each of the sampling geometries used in your plant.

The source of the efficiency data is our primary isotopic calibration report 958.402. This report documents the primary isotopic calibration performed on the Model 843-30R detector in our Model 841-334 three (3) Liter Off-line liquid sampling geometry. The Model 841-334 is our current version of your Model 841-3N three (3) liter Off-line sampling geometry. The sample volume and detector location in both sampling geometries is the same, and the data taken with our Model 841-334 will apply directly to your Model 841-3N.

To obtain revised efficiencies for your Letdown monitor and Gaseous effluent monitors, the ratio between your original liquid monitor efficiency and the new efficiency was calculated for each isotope. The efficiency ratio was then applied to the previous letdown monitor and gaseous effluent monitor isotopic efficiencies, and a new efficiency was calculated. We believe this approach is valid because the detector response has been validated in report 958.402. What changes in the letdown and gaseous effluent monitors is the sampling geometry. By knowing the response difference of the detector from the primary liquid isotopic calibration, and the previous response of the letdown and gaseous monitor sampling geometries, a new efficiency for the letdown and gaseous geometries may be obtained by multiplying the original efficiencies by the difference in detector efficiencies.

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ATTACHMENT 7 P. 2 of 4

The results of this analysis are provided on the four (4) tables enclosed.

Please feel free to contact us should you have any questions or comments on the above.

Sincerely Yours,

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BVPS Unit 1 Liquid Radiation Monitors Rev. 1.01 4/17/2006
Gamma Sensitivities of the 841-3N & 843-30 with 67 kv Baseline to Liquids

Monitors: RM-1LW-104 and RM-1LW-116: Liquid Waste and Laundry Drains Effluent Monitors
RM-1SS-100 and RM-1BD-100: Steam Generator Secondary Blowdown Sample and Blowdown Monitors
RM-1AS-100: Auxiliary Steam Condensate Monitor
RM-1CC-100: Component Cooling Water Monitor
RM-1RW-101: Component Cooling Heat Exchanger River Water Monitor
RM-1RW-100A, RM-1RW-100B, and RM-1RW-100C: Recirc Spray Heat Exchanger River Water Monitors
RM-1RW-100: Component Cooling / Recirc Spray Heat Exchanger River Water Monitors
RM-1DA-100: Aux Feedwater Area Drain Tank

	Nuclide	(1) 843-30 Detection Efficiency (cpm/uCi/ml)	(2) 843-30 Detection Efficiency (cpm/uCi/ml)	(3) 843-30R Detection Efficiency (cpm/uCi/ml)	CF
1	Cr-51		1.18E+07	1.24E+07	1.0476
2	Co-58	1.18E+08	1.16E+08	1.06E+08	0.9113
3	Co-60	1.72E+08	1.73E+08	1.94E+08	1.1186
4	Rb-88	3.36E+07		3.73E+07	1.1088
5	Sr-89	7.84E+03		9.84E+03	1.2547
6	Sr-90	0.00E+00		0.00E+00	0.0000
7	Y-90	1.72E+04		0.00E+00	0.0000
8	Sr-91	1.27E+08	6.97E+07	8.13E+07	1.1667
9	Y-91	2.58E+05	2.60E+05	2.53E+05	0.9750
10	Zr-95	8.73E+07	8.60E+07	1.06E+08	1.2312
11	Nb-95	8.37E+07	8.64E+07	1.06E+08	1.2288
12	Zr-97		2.21E+07	1.17E+08	5.3105
13	Mo-99	2.42E+07	2.84E+07	1.41E+08	4.9605
14	Tc-99m	9.00E+07	8.96E+07	1.11E+08	1.2432
15	Ru-103		9.50E+07	1.13E+08	1.1911
16	Ru-105		1.30E+08	7.84E+07	0.6035
17	Ru-106			0.00E+00	0.0000
18	Rh-105		2.96E+07	3.07E+07	1.0373
19	Te-127m		4.09E+04	1.62E+07	395.9642
20	Te-127		1.38E+06	1.48E+06	1.0739
21	Sb-127		1.09E+08	1.25E+08	1.1499
22	Sb-129		1.50E+08	1.47E+08	0.9812
23	Te-129m		4.02E+06	1.11E+05	0.0277
24	Te-129	1.91E+07	1.12E+07	1.69E+07	1.5132
25	Te-131m		1.82E+08	1.15E+06	0.0063
26	I-131	1.06E+08	1.11E+08	1.18E+08	1.0660
27	Te-132	1.17E+08	1.17E+08	1.21E+08	1.0318
28	I-132	2.75E+08	2.66E+08	3.16E+08	1.1884
29	I-133	1.01E+08	9.90E+07	1.16E+08	1.1733
30	I-134	2.42E+08	2.70E+08	3.17E+08	1.1766
31	I-135	1.22E+08	1.19E+08	1.47E+08	1.2323
32	Cs-137	7.65E+07	8.01E+07	9.30E+07	1.1616
33	Ba-137m		8.01E+07	9.85E+07	1.2298
34	Ba-140	5.21E+07	4.37E+07	4.78E+07	1.0937
35	La-140	1.73E+08	2.00E+08	2.22E+08	1.1118
36	Ce-141		5.07E+07	6.20E+07	1.2239
37	Ce-143		7.27E+07	7.87E+07	1.0832
38	Ce-144	1.08E+07	1.06E+07	1.36E+07	1.2837
39	Pr-143		1.04E+00	0.00E+00	0.0000
40	Pr-144	2.21E+06	2.25E+06	2.32E+06	1.0323
41	Nd-147		3.12E+07	3.37E+07	1.0806
42	H-3		0.00E+00	0.00E+00	0.0000
43	Ar-41		8.59E+07	9.54E+07	1.1103
44	Kr-79		6.32E+07	5.32E+07	0.8412
45	Kr-81		4.49E+06	4.51E+06	1.0050
46	Kr-85	7.60E+05	4.25E+05	4.98E+07	117.273
47	Kr-85m	9.45E+07	9.94E+07	1.17E+08	1.1729
48	Kr-87	1.39E+08	8.28E+07	8.73E+07	1.0540
49	Kr-88	1.11E+08	1.29E+08	1.30E+08	1.0114
50	Kr-89		1.57E+08	1.62E+08	1.0334
51	Kr-90		1.48E+08	1.79E+08	1.2127
52	Xe-131M		2.28E+06	2.63E+06	1.1517

BVPS Unit 1 Liquid Radiation Monitors Rev. 1.01 4/17/2006

Gamma Sensitivities of the 841-3N & 843-30 with 67 kv Baseline to Liquids

Monitors: RM-1LW-104 and RM-1LW-116: Liquid Waste and Laundry Drains Effluent Monitors
RM-1SS-100 and RM-1BD-100: Steam Generator Secondary Blowdown Sample and Blowdown Monitors
RM-1AS-100: Auxiliary Steam Condensate Monitor
RM-1CC-100: Component Cooling Water Monitor
RM-1RW-101: Component Cooling Heat Exchanger River Water Monitor
RM-1RW-100A, RM-1RW-100B, and RM-1RW-100C: Recirc Spray Heat Exchanger River Water Monitors
RM-1RW-100: Component Cooling / Recirc Spray Heat Exchanger River Water Monitors
RM-1DA-100: Aux Feedwater Area Drain Tank

	Nuclide	(1) 843-30 Detection Efficiency (cpm/uCi/ml)	(2) 843-30 Detection Efficiency (cpm/uCi/ml)	(3) 843-30R Detection Efficiency (cpm/uCi/ml)	CF
53	Xe-133	9.25E+06	9.72E+06	9.01E+06	0.9266
54	Xe-133m	1.61E+07	1.32E+07	1.37E+07	1.0341
55	Xe-135	1.19E+08	1.18E+08	1.22E+08	1.0379
56	Xe-135m	7.78E+07	7.84E+07	9.27E+07	1.1829
57	Xe-137		3.49E+07	3.93E+07	1.1248
58	Xe-138	3.20E+08	1.28E+08	1.33E+08	1.0413
59	I-130		3.08E+08	2.65E+08	0.8589
60	I-136		1.37E+08	3.72E+08	2.7153
61	Na-24		1.73E+08	9.52E+07	0.5500
62	Mn-54	8.80E+07	8.59E+07	1.05E+08	1.2172
63	Mn-56	1.35E+08	1.13E+08	1.42E+08	1.2564
64	Fe-59	9.00E+07	9.17E+07	1.04E+08	1.1294
65	Co-57		7.97E+07	1.04E+08	1.3014
66	Co-60m		2.15E+05	0.00E+00	0.0000
67	Ni-65		3.98E+07	4.48E+07	1.1258
68	Cu-64		3.55E+07	4.51E+05	0.0127
69	Zn-65		4.67E+07	5.02E+07	1.0742
70	Br-83		1.36E+06	1.48E+06	1.0859
71	Br-84	1.16E+08	9.75E+07	3.16E+08	3.2442
72	Br-85		6.19E+06	6.71E+06	1.0837
73	Rb-89	1.57E+08		1.52E+08	0.9659
74	Sr-92	8.54E+07	9.16E+07	1.03E+08	1.1228
75	Y-90m		2.02E+11	2.37E+08	0.0012
76	Y-91m		8.98E+07	1.07E+08	1.1959
77	Y-92	2.14E+07	2.35E+07	2.74E+07	1.1654
78	Tc-99		2.15E+02	3.97E+02	1.8456
79			3.26E+07	3.84E+07	1.1779
80	Ag-110m		2.79E+08	3.35E+08	1.1999
81	Sb-124		1.69E+08	1.95E+08	1.1512
82	Sb-125		8.71E+07	1.01E+08	1.1541
83	Te-125m		1.83E+05	2.40E+05	1.3131
84	Te-131		1.20E+08	1.11E+08	0.9241
85	Te-133		1.66E+08	1.59E+08	0.9592
86	Te-133m		2.68E+08	8.96E+06	0.0334
87	Te-134	7.27E+07	1.97E+08	2.26E+08	1.1458
88	I-129	0.00E+00		0.00E+00	0.0000
89	Cs-134	2.06E+08	1.99E+08	2.42E+08	1.2156
90	Cs-134m		1.13E+07	1.43E+07	1.2623
91	Cs-136	3.02E+08	2.80E+08	3.19E+08	1.1388
92	Cs-138	1.51E+08		1.95E+08	1.2901
93	Ba-139		2.07E+07	3.21E+07	1.5530
94	Np-237		8.49E+07	1.08E+07	0.1269

(1) Original Gamma Sensitivities from Addendum to BVPS Spec No. BVS-414, Table V, 10-7-74
(2) Adjusted Gamma Sensitivities from Calculation Package No. ERS-SFL-92-039
(3) Gamma Sensitivities from Fluke Biomedical for Replacement Detector

Beaver Valley Power Station

Radiation Protection Technical Position/Evaluation/Calculation

Subject	No.	PAGE 1 OF
Liquid Monitor Alert Emergency Action Level (EAL) Set Points	**ERS-LMR-14-001**	10

Reference

HPP_____EPP : NEI 99-01 rev 6 T/S _____ CR _____ DCP_____

Category	Unit 1	Unit 2
☐ Technical Position ■ Technical Evaluation ☐ Calculation	☒	☒

Purpose

NEI 99-01 Revision 6 changed the methodology for calculating Alert set points for Liquid Radiation Monitors. The previous Alert set points were to be 200 x ODCM set points. However, they are now to be calculated for 10 mrem TEDE or 50 mrem thyroid CDE.

Note: This Technical Evaluation is not an implementing document. Any application of the information contained herein must be reviewed and approved using the established review/approval process for that application.

☐ **ORIGINAL ISSUE**

☒ **REVISION # 1**

Made correction to page 3: annual drinking water ingestion volume of 730 liters per year, not per day.

by	*checker/reviewer*	*independent review (calculation only)*
Lara M Renz 4-20-15	John Lebda 4.20.15	

Checklist		Attachments
■ Purpose	■ Results	■ Data Sheets
■ Methodology	■ References	☐ Illustrations
■ Input Data		☐ Printouts
		☐ Code Listings

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DISCUSSION:

This technical evaluation used ODCM source terms for liquid discharges, radiation monitor nuclide detection efficiencies, and nuclide dose conversion factors to calculate radiation monitor readings that correspond to offsite doses of 10 mrem TEDE and 50 mrem child thyroid. These monitor indicator values may be used for an Alert level in Emergency Plan Emergency Action Levels (EAL), EPP-I-1a and EPP-I-1b, when NEI 99-01 revision 6 is implemented (Reference 1). The calculated radiation monitor readings may be used for Emergency Action Level (EAL) determination following an accident with consequent release of radioactivity, and when the results of more rigorous assessments are not available.

METHODOLOGY

The bases for the EAL values for the four emergency classifications are:

Unusual Event (UE): ODCM limit multiplied by two (x2) for greater than 60 minutes. ODCM limits are calculated in ERS-ATL-93-021 (Reference 2).

Alert: Effluent pathway radiation monitor indication that corresponds to 10 mrem TEDE or 50 mrem child thyroid dose. The lower of the two values is used. Gaseous doses are calculated at the site boundary; liquid doses are calculated at Midland Water Intake.

There are no liquid effluent pathways associated with a Site Area or General Emergency.

INPUT DATA/ASSUMPTIONS	References
1. A_i = Particulate Activity from the release path (Ci/yr)	[3, 5]
2. ALIg = Ingestion Annual Limit of Intake from 10 CFR 20 Appendix B Table 2	[4]
3. F = Dilution Water Flowrate = 22,800 GPM (= 15,000 GPM BV-1 + 7,800 GPM BV-2)	[3]
4. ODCM site specific mixing effect of the discharge structure = 3	[3]
5. ODCM river dilution factor = 200	[3]
6. f = Maximum Acceptable Discharge Flowrate (GPM) = 35 gpm for RM-1LW-104 = 15 gpm for RM-1LW-116 = 80 gpm for 2SGC-RQ100	[3]
7. Ei = Monitor Sensitivity (cpm/uCi/cc)	[6, 7]
8. DCF = Dose Conversion Factors for child thyroid from RG 1.109	[9]

Release source terms (A_i) used to determine the monitor EAL values are listed in the spreadsheets in Attachments 1 through 3.

NEI 99-01 revision 6 discusses assumptions and requirements for this set point calculation. Site-specific dose receptor points are expected to be used in the calculation with a one hour exposure duration. The ODCM liquid effluent receptor point is a down river potable drinking water intake structure with in ¼ mile of

the release point. With the assumption that the release concentration is fully mixed by the Ohio River, the nearest drinking water supply is at the Midland Water Intake (at 1.3 miles down river from the release point). ICRP 23 (Reference 8) gives an annual drinking water ingestion volume of 1950 ml per day (for adults). USNRC Regulatory Guide 1.109 Table E-5 (Reference 9) gives an annual drinking water ingestion volume of 730 liters per year (for adults), which equates to approximately 2000 ml per day. In order to equate this to drinking water per hour, it is assumed that all 2000 ml are consumed during the one hour release. For child thyroid doses, the ICRP 23 value of 1400 ml is utilized in the same way.

Radiation monitor nuclide detection efficiencies for each monitor and for each nuclide are taken from ERS-SFL-92-039 [Unit 1] and ERS-SFL-86-026 [Unit 2] (Reference 6 and 7). Due to the availability of both 843-30 and 843-30R detectors at Unit 1, set points for both detectors were calculated (Reference 6). Detection Efficiencies are listed in the spreadsheets in Attachments 1 through 3.

The TEDE conversion factors were derived from 10 CFR 20 stochastic ALIg with 1 ALI = 5000 mrem CEDE, and 1 CEDE = 1 TEDE for a liquid ingestion scenario with the assumption that no external exposure occurs during this release.

NEI 99-01 revision 6 acknowledges that the use of EPA PAG guidance provides adult thyroid dose conversion factors, which are not always consistent with state required methodologies. BVPS has previously agreed with the states of PA, OH and WV that child thyroid doses will be calculated. This technical evaluation will remain consistent with past practices. The child thyroid dose conversion factors (DCF) are taken from USNRC Regulatory Guide 1.109 Table E-13 (units of mrem/pCi ingested) (Reference 9). DCFs are listed in the spreadsheets in Attachments 1 through 3.

The following is a description of the math performed by the EXCEL spreadsheets used in this Technical Evaluation.

An EXCEL spreadsheet was made utilizing the ODCM default source term for each unit and radiation monitor combination. Each spreadsheet consists of 15 columns with a row for each radionuclide. At the bottom of each spreadsheet, there is a section to total the count rate (CR) in cpm for 10 mrem TEDE and the count rate in cpm for 50 mrem child thyroid. Unit 2 is calculated for both cpm and uCi/ml. Details of all spreadsheet math is provided below:

Column 1 – List of the individual isotopes that comprise the ODCM source term. Each isotope occupies a row.

NOTE: Isotopes individually listed in the ODCM but not included in the dose calculation are Br-85 (172s half-life), Rh-106 (29.9s half-life). As short lived daughters of longer lived parents, production & intake limits are included with the parent values. Because of the short half life, the initial individual quantities are assumed to be insignificant. Ba-137m and Cs-137 isotopes are also individually listed in the ODCM. However, Ba-137m (2.55 min half life) will contribute to the count rate at the monitor, but will be decayed by the time it reaches Midland Water Intake. All Ba-137m daughter isotopes that an individual is exposed to are included in the Cs-137 dose factors. Therefore, Ba-137m is included in total count rate, but not dose calculations.

Column 2 – $[A_i]$ - Total release quantity (Ci) for each isotope, specific to Unit 1 or Unit 2.

Column 3 - Stochastic Annual Limit of Intake (ALIg) for ingestion taken from 10 CFR 20 Appendix B Table 2.

Column 4 – TEDE mrem amount associated with each individual radionuclide, based upon 10 CFR 20 definition 1 ALI = 5000 mrem TEDE.

Col 4 = [(Col 2 uCi * 1E6 uCi/Ci) / Col 3 uCi] * 5000 mrem / ALI

Column 5 – Intake amount scaled to 10 mrem TEDE:

Col 5 = [(Col 2 uCi * 1E6 uCi/Ci) / Σ col 4 mrem] * 10 mrem

Column 6 – Concentration of individual radionuclide at Midland Water Intake equal to 10 mrem TEDE for a one hour adult intake. (Assumes water ingestion occurs over a 1 hour period.)

Col 6 = [Col 5 uCi / (2000 ml/hr)]

Column 7 and 10 – Concentration of individual radionuclide at associated BVPS radiation monitor equal to 10 mrem TEDE for a one hour adult intake. The concentrations at the radiation monitor(s) were calculated using:

$$C_i = \frac{F * 3 * 200}{f} * C_t$$

Col 7 = [(22800 * 3 * 200) gpm/ f gpm] * Col 6 uCi/ ml]

where: C_i = Liquid effluent concentration prior to dilution

C_t = Liquid effluent concentration after dilution

F = Dilution water flow rate (gpm)

= 22,800 gpm (15,000 gpm U1 CTBD+ 7,800 gpm U2 CTBD)

3 = ODCM site specific mixing effect of the discharge structure

200 = ODCM river dilution factor

f = Maximum acceptable discharge flow rate prior to dilution (gpm)

= 35 gpm for RM-1LW-104

= 15 gpm for RM-1LW-116

= 80 gpm for 2SGC-RQ100

Column 8 & 11 – [E_i] - List of the monitor specific isotope detection efficiencies. A set of calculations is done for the 843-30 and the 843-30R detectors available for Unit 1 monitors (isotope efficiencies in units of cpm/uCi/ml).

Column 9 & 12 –The monitor count rate (CR) was calculated using: [Reference 2]

$$CR = \sum_i C_i * E_i$$

where: CR = monitor count rate attributed from each radionuclide in ncpm

C_i = previously described

E_i = detection efficiency for the appropriate monitor (cpm/uCi/cc)[References 6 and 7]

FOR UNIT 2 ONLY:

The Unit 2 monitor display value (DV) was calculated using:

$$DV = CF11 \sum_i C_i E_i$$

where:

CF11 = 5.61E-9 uCi/ml/cpm; calculated in ERS-ATL-93-021: [Reference 2]

E_i = Previously described

C_i = Previously described

Application of Monitor Background: Because the liquid monitors do not have a background subtract feature, the indicated values are net values. Therefore, monitor background needs to be accounted for when changing the set points on a monitor.

Column 13 – Dose Conversion Factors (DCF) for child thyroid taken from Regulatory Guide 1.109 (Reference 9) in mrem/pCi ingested.

Column 14 – Converted RG 1.109 DCFs into mrem/uCi.

Col 14 = [Col 13 mrem / pCi* 1E6 pCi/ uCi]

Column 15 – Child Thyroid dose per hour from ingestion concentrations equal to 10 mrem TEDE. (Assumes water ingestion occurs over a 1 hour period.)

Col 15 = [Col 14 mrem / uCi * Col 6 uCi / ml * 1400 ml / hr]

Conversion of Child Thyroid Dose to a Count Rate equal to 50 mrem Committed Dose Equivalent (CDE):

$$\text{CR for 50 mrem CDE (CThy)} = \frac{\text{CR for 10 mrem TEDE}}{\sum_i \text{CDE}_i \,/\, 50\ \text{mrem}}$$

RESULTS

An EXCEL spreadsheet was generated to perform the alarm set point calculations. See Attachments 1 through 3.

Alarm Set Point Calculation Summary - Unit 1 [all units in cpm]				
	10 mrem TEDE	50 mrem Child Thyroid	Minimum Set Point	Monitor Range
RM-1LW-104 843-30	1.81E+09	5.89E+08	5.89E+08	10 to 1E6
RM-1LW-104 843-30R	2.09E+09	6.80E+08	6.80E+08	10 to 1E6
RM-1LW-116 843-30	4.22E+09	1.38E+09	1.38E+09	10 to 1E6
RM-1LW-116 843-30R	4.87E+09	1.59E+09	1.59E+09	10 to 1E6

Alarm Set Point Calculation Summary - Unit 2 [all units in uCi/ml]				
	TEDE	Child Thyroid	Minimum Set Point	Display Range
2SCG-RQ100	5.89E+00	2.42E+00	2.42E+00	5.6E-8 to 5.6E-2

Readability/Range Discussion:

As displayed in the tables above, all calculated set points are significantly greater (>4000%) than the range of the associated instrument. Generally when an over range EAL value occurs, it has been acceptable to choose a value of approximately 80% of the high range of the monitor. For example, 80% of 1E6 = 8E5 cpm. However, if this value would be employed as an EAL indication, an ALERT level would be declared significantly sooner than required for 10 mrem TEDE and/or 50 mrem child thyroid dose. More specifically, even at the 95% range values, ALERT EAL indication would be declared at doses less than 0.1 mrem TEDE and less than 1 mrem child thyroid for all available radiation detectors at both units. These values are far below the required EAL thresholds of 10 mrem TEDE and 50 mrem thyroid, which, if employed, would cycle plant and industry resources unnecessarily.

Conclusions/Recommendations:

NEI 99-01 recognizes that this Initiating Condition may result in a value beyond the display range of the monitor. Therefore, guidance states that if the calculated set point is greater than approximately 110% of the highest accurate monitor reading, then developers may choose not to include this monitor value as an EAL indication and are instructed to identify an alternate EAL threshold. The only viable alternate methodology is a liquid isotopic sample analysis. Sampling methodology is covered under its own distinct EAL according to NEI 99-01 revision 6. Therefore, it is recommended that BVPS EALs do not contain a liquid effluent monitor threshold value that equates to 1% of the PAG for an ALERT classification.

REFERENCES

1. NEI 99-01, Development of Emergency Action Levels for Non-Passive Reactors, Revision 6, 2012.
2. FENOC, Process Alarm Set Points for Liquid Effluent Monitors, ERS-ATL-93-021, Revision 4, 2012.
3. FENOC, Offsite Dose Calculation Manual Procedure 1/2-ODC-2.01, ODCM: Liquid Effluents, Revision 14, 2014.
4. 10 CFR 20 Appendix B Table 2.
5. SWEC, UR(B)-160, BVPS Liquid Radwaste Releases and Concentrations - Expected and Design Cases: Per Unit and Site, Revision 3; 1983
6. FENOC, Isotopic Efficiencies For Unit 1 Liquid Process Monitors, ERS-SFL-92-039, Revision 3; 2010.
7. FENOC, Unit 2 DRMS Isotopic Efficiencies, ERS-SFL-86-026, Revision 6; 1991
8. ICRP 23, Report of the Task Group on Reference Man, 1974.
9. Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Revision 1, 1977.

ATTACHMENTS

1. (see page 8) Unit 1 Liquid Monitors Alert EAL Set Points for 843-30 Detectors
2. (see page 9) Unit 1 Liquid Monitors Alert EAL Set Points for 843-30R Detectors
3. (see page 10) Unit 2 Liquid Monitors Alert EAL Set Points

Attachment 1 - Unit 1 Liquid Monitors Alert EAL Set Points for 843-30 Detectors

Unit 1 Liquid Monitors Alert EAL Set Points

843-30 Detectors

		RG 1.109 Annual (ml)		ICRP 23 total daily (ml)	RG 1.109 Daily (ml) = /365.25 days	Annual ml	ODCM site specific mixing effect of the discharge structure =	3
Adult water intake =	7.30E+05	ml		1950	2.00E+03		ODCM river dilution factor =	200
Child water intake =	5.10E+05	ml		1400	1.40E+03		U1/U2 Combined CTBD (gpm) =	22800
							Discharge Rate (gpm) =	35
							Discharge Rate (gpm) =	15

NUCLIDE	A_i ANNUAL RELEASE (Ci)	10 CFR 20 stochastic Alg (uCi)	TEDE (mrem)	Intake for 10 mrem TEDE (uCi)	C_i Midland intake conc for hour intake (uCi/ml)	C_i =(22800*3*200)/35* LW-104 undiluted conc (uCi/ml)	E_i DETECTION EFFICIENCY (cpm/uCi/ml)	10 mrem TEDE LW-104 (cpm)	=(22800*3*200)/15* LW-116 undiluted conc (uCi/ml)	DETECTION EFFICIENCY (cpm/uCi/ml)	10 mrem TEDE LW-116 (cpm)	RG 1.109 Child thyroid DCF (mrem/pCi ingested)	RG 1.109 Child thyroid DCF (mrem/uCi ingested)	Cthy CDE (mrem)
Cr-51	1.30E-03	4.E+04	1.63E+02	2.64E-04	1.92E-07	5.16E-02	1.18E+07	6.09E+05	1.20E-01	1.18E+07	1.42E+06	4.94E-09	4.94E-03	9.11E-07
Mn-54	3.70E-04	2.E+03	7.75E+02	6.29E-05	3.15E-08	1.23E-02	8.59E+07	1.06E+06	2.87E-02	8.59E+07	2.47E+06			
Fe-55	1.60E-03	9.E+03	8.89E+02	3.25E-04	1.62E-07	6.35E-02	0.00E+00	0.00E+00	1.48E-01	0.00E+00	0.00E+00			
Fe-59	8.30E-04	8.E+02	5.19E+03	1.68E-04	8.43E-08	3.29E-02	9.17E+07	3.02E+06	7.69E-02	9.17E+07	7.05E+06			
Co-58	1.40E-02	1.E+03	7.00E+04	2.84E-03	1.42E-06	5.56E-01	1.16E+08	6.45E+07	1.30E+00	1.16E+08	1.50E+08			
Co-60	2.00E-03	5.E+02	2.00E+04	4.06E-04	2.03E-07	7.94E-02	1.73E+08	1.37E+07	1.85E-01	1.73E+08	3.20E+07			
Zn-65	2.69E-02	4.E+02	3.36E+05	5.46E-03	2.73E-06	1.07E+00	4.67E+07	4.99E+07	2.49E+00	4.67E+07	1.16E+08			
Np-239	1.40E-04	2.E+03	3.57E+02	2.84E-05	1.42E-08	5.56E-03	0.00E+00	0.00E+00	1.30E-02	0.00E+00	0.00E+00			
Br-83	2.50E-05	7.E+04	1.79E+00	5.07E-06	2.54E-09	9.92E-04	1.36E+06	1.35E+03	2.32E-03	1.36E+06	3.15E+03			
Br-84	2.50E-05	3.E+04	4.17E+00	5.07E-06	2.54E-09	9.92E-04	9.75E+07	9.68E+04	2.32E-03	9.75E+07	2.26E+05			
Br-85	2.73E-06		0.00E+00	5.48E-07	2.74E-10	1.07E-04	6.19E+06	6.63E+02	2.50E-04	6.19E+06	1.55E+03			
Rb-86	7.50E-05	5.E+02	7.50E+02	1.52E-05	7.62E-09	2.98E-03	0.00E+00	0.00E+00	6.95E-03	0.00E+00	0.00E+00			
Sr-89	2.93E-04	5.E+02	2.90E+03	5.89E-05	2.95E-08	1.15E-02	0.00E+00	0.00E+00	2.69E-02	0.00E+00	0.00E+00			
Sr-90	1.10E-05	4.E+01	1.38E+03	2.23E-06	1.12E-09	4.37E-04	0.00E+00	0.00E+00	1.02E-03	0.00E+00	0.00E+00			
Y-90	9.40E-06	5.E+02	9.40E+01	1.91E-06	9.55E-10	3.73E-04	0.00E+00	0.00E+00	8.71E-04	0.00E+00	0.00E+00			
Y-91m	8.70E-06	1.E+05	4.35E-01	1.77E-06	8.84E-10	3.45E-04	8.98E+07	3.10E+04	8.06E-01	8.98E+07	7.24E+04			
Y-91	5.70E-05	6.E+02	4.75E+02	1.16E-05	5.79E-09	2.26E-03	2.60E+05	5.86E+02	5.28E-03	2.60E+05	1.37E+03			
Y-93	7.60E-07	1.E+03	3.70E+00	1.50E-07	7.52E-11	2.94E-05	0.00E+00	0.00E+00	6.85E-05	0.00E+00	0.00E+00			
Zr-95	5.10E-05	1.E+03	2.55E+02	1.04E-05	5.18E-09	2.02E-03	8.60E+07	1.74E+05	4.72E-03	8.60E+07	4.06E+05			
Nb-95	5.20E-05	2.E+03	1.30E+02	1.06E-05	5.29E-09	2.06E-03	8.64E+07	1.78E+05	4.82E-03	8.64E+07	4.16E+05			
Sr-91	1.30E-05	2.E+05	3.25E+01	2.64E-06	1.32E-09	5.16E-04	6.97E+07	3.60E+04	1.20E-03	6.97E+07	8.39E+04			
Mo-99	1.10E-02	1.E+03	5.50E+04	2.23E-03	1.12E-06	4.37E-01	2.84E+07	1.24E+07	1.02E+00	2.84E+07	2.89E+07			
Tc-99m	1.10E-02	8.E+04	6.88E+02	2.23E-03	1.12E-06	4.37E-01	8.95E+07	3.91E+07	1.02E+00	8.95E+07	9.13E+07			
Ru-103	3.40E-05	2.E+03	6.50E+01	6.90E-06	3.45E-09	1.35E-03	9.50E+07	1.28E+05	3.15E-03	9.50E+07	2.99E+05			
Ru-106	1.00E-05	2.E+02	2.50E+02	2.03E-06	1.02E-09	3.97E-04	0.00E+00	0.00E+00	9.26E-04	0.00E+00	0.00E+00			
Rh-103m	3.40E-05	4.E+05	3.95E-01	6.90E-06	3.45E-09	1.35E-03	0.00E+00	0.00E+00	3.15E-03	0.00E+00	0.00E+00			
Te-125m	2.50E-05	1.E+03	1.25E+02	5.07E-06	2.54E-09	9.92E-04	1.83E+05	1.82E+02	2.32E-03	1.83E+05	4.24E+02	3.20E-06	3.20E+00	1.13E-05
Te-127m	2.60E-04	6.E+02	2.17E+03	5.28E-05	2.64E-08	1.03E-02	4.09E+04	4.22E+02	2.41E-02	4.09E+04	9.85E+02	6.91E-06	6.91E+00	2.55E-04
Te-127	2.70E-04	7.E+03	1.93E+02	5.48E-05	2.74E-08	1.07E-02	1.38E+06	1.48E+04	2.50E-02	1.38E+06	3.45E+04	3.26E-07	3.26E-01	1.25E-05
Te-129m	1.10E-03	5.E+02	1.10E+04	2.23E-04	1.12E-07	4.37E-02	4.02E+06	1.76E+05	1.02E-01	4.02E+06	4.10E+05	1.57E-05	1.57E+01	2.45E-03
Te-129	6.70E-04	3.E+04	1.12E+02	1.36E-04	6.80E-08	2.66E-02	1.12E+07	2.98E+05	6.21E-02	1.12E+07	6.95E+05	9.56E-08	9.56E-02	9.08E-06
I-130	1.20E-04	1.E+03	6.00E+02	2.44E-05	1.22E-08	4.76E-03	3.08E+08	1.47E+06	1.11E-02	3.08E+08	3.42E+06	6.50E-04	6.50E+02	1.11E-02
Te-131m	1.60E-04	6.E+02	1.33E+03	3.25E-05	1.62E-08	6.35E-03	1.82E+08	1.15E+06	1.48E-02	1.82E+08	2.70E+06	5.12E-06	5.12E+00	1.15E-04
Te-131	3.00E-05	6.E+03	2.50E+01	6.09E-06	3.05E-09	1.19E-03	1.20E+08	1.43E+05	2.78E-03	1.20E+08	3.33E+05	6.35E-08	6.35E-02	2.70E-07
I-131	1.60E-01	9.E+01	8.89E+06	3.25E-02	1.62E-05	6.35E+00	1.11E+08	7.05E+08	1.48E+01	1.11E+08	1.64E+09	5.72E-03	5.72E+03	1.30E+02
Te-132	4.30E-03	7.E+02	3.07E+04	8.73E-04	4.37E-07	1.71E-01	1.17E+08	2.00E+07	3.98E-01	1.17E+08	4.66E+07	6.51E-06	6.51E+00	3.57E-03
I-132	4.90E-03	9.E+03	2.72E+03	9.95E-04	4.98E-07	1.95E-01	2.66E+08	5.17E+07	4.54E-01	2.66E+08	1.21E+08	6.82E-05	6.82E+01	4.74E-02
I-133	4.00E-02	5.E+02	4.00E+05	8.12E-03	4.06E-06	1.59E+00	9.90E+07	1.57E+08	3.70E+00	9.90E+07	3.67E+08	1.36E-03	1.36E+03	7.71E+00
I-134	8.00E-05	3.E+04	1.33E+01	1.62E-05	8.12E-09	3.18E-03	2.70E+08	8.57E+05	7.41E-03	2.70E+08	2.00E+06	1.79E-05	1.79E+01	2.03E-04
Cs-134	4.60E-02	7.E+01	3.29E+06	9.34E-03	4.67E-06	1.83E+00	1.99E+08	3.63E+08	4.26E+00	1.99E+08	8.48E+08			
I-135	4.30E-03	3.E+03	7.17E+03	8.73E-04	4.37E-07	1.71E-01	1.19E+08	2.03E+07	3.98E-01	1.19E+08	4.74E+07	2.79E-04	2.79E+02	1.70E-01
Cs-136	8.90E-03	4.E+02	1.11E+05	1.81E-03	9.04E-07	3.53E-01	2.80E+08	9.89E+07	8.24E-01	2.80E+08	2.31E+08			
Cs-137	3.30E-02	1.E+02	1.65E+06	6.70E-03	3.35E-06	1.31E+00	8.01E+07	1.05E+08	3.06E+00	8.01E+07	2.45E+08			
Ba-137m	3.10E-02	1.E+02		6.29E-03	3.15E-06	1.23E+00	8.01E+07	9.86E+07	2.87E+00	8.01E+07	2.30E+08			
Ba-140	1.10E-03	6.E+02	9.17E+02	2.23E-05	1.12E-08	4.37E-03	4.37E+07	1.91E+05	1.02E-02	4.37E+07	4.45E+05			
La-140	1.10E-04	6.E+02	9.17E+02	2.23E-05	1.12E-08	4.37E-03	2.00E+08	8.73E+05	1.02E-02	2.00E+08	2.04E+06			
Ce-141	5.10E-05	2.E+03	1.28E+02	1.04E-05	5.18E-09	2.02E-03	5.07E+07	1.03E+05	4.72E-03	5.07E+07	2.39E+05			
Ce-143	2.80E-06	1.E+03	1.40E+01	5.68E-07	2.84E-10	1.11E-04	7.27E+07	8.08E+03	2.59E-04	7.27E+07	1.89E+04			
Ce-144	3.20E-05	3.E+02	5.33E+02	6.50E-06	3.25E-09	1.27E-03	1.06E+07	1.35E+04	2.96E-03	1.06E+07	3.14E+04			
Pr-143	2.70E-05	1.E+03	1.35E+02	5.48E-06	2.74E-09	1.07E-03	1.04E+00	1.11E-03	2.50E-03	1.04E+00	2.60E-03			
Pr-144	3.20E-05	4.E-04	4.00E+00	6.50E-06	3.25E-09	1.27E-03	2.25E+06	2.86E+03	2.96E-03	2.25E+06	6.67E+03			
H-3	5.50E+02	8.E+04	3.44E+07	1.12E+02	5.59E-02	2.18E+04	0.00E-00	0.00E+00	5.09E+04	0.00E+00	0.00E+00	2.03E-07	2.03E-01	1.58E+01
Total =	5.50E+02		4.93E+07				CRin cpm =	1.81E+09			4.22E+09			1.54E+02
							CRin cpm =	5.89E+08	<<<< based on 50 mrem Cthy >>>>		1.38E+09			

Isotopes in individually listed in the ODCM but not included in the dose calculation are Br-85 (172s half-life), Rh-106 (29.9s half-life. As short lived daughters of longer lived parents, production & intake limits are included with the parent values. Because of the short half life, the initial individual quantities are assumed to be insignificant.

Ba-137m and Cs-137 isotopes are also individually listed in the ODCM. However, Ba-137m (2.55 min half life) will contribute to the count rate at the monitor, but will be decayed by the time it reaches Midland Water Intake. All Ba-137m daughter isotopes that an individual is exposed to are included in the Cs-137 dose factors. Therefore, Ba-137m is included in total count rate, but not dose calculations.

Assumes daily drinking water intake occurs in 1 hour period at Midland water intake.

*Flow rates from 1/2-ODC-2.01

Source Term for (RM-1LW-104 and RM-1LW-116) from 1/2-ODC-2.01 (Stone and Webster Calculation Package UR(B)-160)

Detection Efficiency for (RM-1LW-104 and RM-1LW-116) from 1/2-ODC-2.01 (Calculation Package ERS-SFL-92-039)

Assumptions -

Dose calculation is for one hour exposure. Reference Man daily water intake in one hour.

Intake concentration is calculated using CT blowdown flow rate (default 15000+7800 gpm) prior to the river with ODCM outfall and river dilution prior to intake.

Attachment 2 - Unit 1 Liquid Monitors Alert EAL Set Points for 843-30R Detectors

Unit 1 Liquid Monitors Alert EAL Set Points

843-30R Detectors

	RG 1.109 Annual (ml)		ICRP 23 total daily (ml)	RG 1.109 Daily (ml) = / 365.25 days	Annual ml	ODCM site specific mixing effect of the discharge structure =	3
Adult water intake =	7.30E+05	ml	1950	2.00E+03		ODCM river dilution factor =	200
Child water intake =	5.10E+05	ml	1400	1.40E+03		U1/U2 Combined CTBD (gpm) =	22800
						Discharge Rate (gpm) =	35
						Discharge Rate (cpm) =	35

NUCLIDE	A ANNUAL RELEASE (Ci)	10 CFR 20 stochastic ALIg uCi	TEDE mrem	Intake for 10 mrem TEDE uCi	C_i Midland intake conc for hour intake uCi/ml	C =(22800*3*200)/35* LW-104 undiluted conc uCi/ml	ε_1 DETECTION EFFICIENCY (cpm/uCi/ml)	10 mrem TEDE LW-104 cpm	=(22800*3*200)/35* LW-116 undiluted conc uCi/ml	DETECTION EFFICIENCY (cpm/uCi/ml)	10 mrem TEDE LW-116 cpm	RG 1.109 Child thyroid DCF mrem/pCi ingested	RG 1.109 Child thyroid DCF mrem/uCi ingested	Cthy CDE mrem
Cr-51	1.30E-03	4.E+04	1.65E+02	2.64E-04	1.32E-07	5.16E-02	1.24E+07	6.40E+05	1.20E-01	1.24E+07	1.48E+06	4.94E-09	4.94E-03	9.11E-07
Mn-54	3.10E-04	2.E+03	7.75E+02	6.29E-05	3.15E-08	1.23E-02	1.05E+08	1.29E+06	2.87E-02	1.05E+08	3.01E+06			
Fe-55	1.60E-03	9.E+03	8.89E+02	3.25E-04	1.62E-07	6.35E-02	0.00E+00	0.00E+00	1.48E-01	0.00E+00	0.00E+00			
Fe-59	8.30E-04	8.E+02	5.19E+03	1.68E-04	8.43E-08	3.29E-02	1.04E+08	3.43E+06	7.68E-02	1.04E+08	8.00E+06			
Co-58	1.40E-02	1.E+03	7.00E+04	2.84E-03	1.42E-06	5.56E-01	1.06E+08	5.89E+07	1.30E+00	1.06E+08	1.37E+08			
Co-60	2.00E-03	5.E+02	2.00E+04	4.06E-04	2.03E-07	7.94E-02	1.94E+08	1.54E+07	1.85E-01	1.94E+08	3.59E+07			
Zn-65	2.69E-02	4.E+02	3.36E+05	5.46E-03	2.73E-06	1.07E+00	5.02E+07	5.38E+07	2.49E+00	5.02E+07	1.25E+08			
Np-239	1.40E-04	2.E+03	3.50E+02	2.84E-05	1.42E-08	5.56E-03	0.00E+00	0.00E+00	1.30E-02	0.00E+00	0.00E+00			
Br-83	2.50E-05	7.E+04	1.75E+00	5.07E-06	2.54E-09	9.92E-04	1.48E+06	1.47E+03	2.32E-03	1.48E+06	3.43E+03			
Br-84	2.50E-05	3.E+04	4.17E+00	5.07E-06	2.54E-09	9.92E-04	3.16E+08	3.14E+05	2.32E-03	3.16E+08	7.32E+05			
Br-85	2.70E-06		0.00E+00	5.48E-07	2.74E-10	1.07E-04	6.71E+06	7.19E+02	2.50E-04	6.71E+06	1.68E+03			
Rb-86	7.50E-05	5.E+02	7.50E+02	1.52E-05	7.62E-09	2.98E-03	0.00E+00	0.00E+00	6.95E-03	0.00E+00	0.00E+00			
Sr-89	2.90E-04	5.E+02	2.90E+03	5.89E-05	2.95E-08	1.15E-02	9.84E+03	1.13E+02	2.69E-02	9.84E+03	2.64E+02			
Sr-90	1.10E-05	4.E+01	1.38E+03	2.23E-06	1.12E-09	4.37E-04	0.00E+00	0.00E+00	1.02E-03	0.00E+00	0.00E+00			
Y-90	9.40E-06	5.E+02	9.40E+01	1.91E-06	9.55E-10	3.73E-04	0.00E+00	0.00E+00	8.71E-04	0.00E+00	0.00E+00			
Y-91m	8.70E-06	1.E+05	4.35E-01	1.77E-06	8.84E-10	3.45E-04	1.07E+08	3.70E+04	8.06E-04	1.07E+08	8.62E+04			
Y-91	5.70E-05	6.E+02	4.75E+02	1.16E-05	5.79E-09	2.26E-03	2.53E+05	5.72E+02	5.28E-03	2.53E+05	1.34E+03			
Y-93	7.40E-07	1.E+03	3.70E+00	1.50E-07	7.52E-11	2.94E-05	0.00E+00	0.00E+00	6.85E-05	0.00E+00	0.00E+00			
Zr-95	5.10E-05	1.E+03	2.55E+02	1.04E-05	5.18E-09	2.02E-03	1.06E+08	2.15E+05	4.72E-03	1.06E+08	5.01E+05			
Nb-95	5.20E-05	2.E+03	1.30E+02	1.06E-05	5.28E-09	2.06E-03	1.06E+08	2.19E+05	4.82E-03	1.06E+08	5.11E+05			
Sr-91	1.30E-05	2.E+03	3.25E+01	2.64E-06	1.32E-09	5.16E-04	8.13E+07	4.20E+04	1.20E-03	8.13E+07	9.75E+04			
Mo-99	1.10E-02	1.E+03	5.50E+04	2.23E-03	1.12E-06	4.37E-01	1.41E+08	6.16E+07	1.02E+00	1.41E+08	1.44E+08			
Tc-99m	1.10E-02	8.E+04	6.88E+02	2.23E-03	1.12E-06	4.37E-01	1.11E+08	4.85E+07	1.02E+00	1.11E+08	1.13E+08			
Ru-103	3.40E-05	2.E+03	8.50E+01	6.90E-06	3.45E-09	1.35E-03	1.13E+08	1.53E+05	3.15E-03	1.13E+08	3.56E+05			
Ru-106	1.00E-05	7.E+02	2.50E+02	2.03E-06	1.02E-09	3.97E-04	0.00E+00	0.00E+00	9.26E-04	0.00E+00	0.00E+00			
Rh-103m	3.40E-05	4.E+05	3.95E-01	6.90E-06	3.45E-09	1.35E-03	0.00E+00	0.00E+00	3.15E-03	0.00E+00	0.00E+00			
Te-125m	2.50E-05	1.E+03	1.25E+02	5.07E-06	2.54E-09	9.92E-04	2.40E+05	2.38E+02	2.32E-03	2.40E+05	5.56E+02	3.20E-06	3.20E+00	1.13E-05
Te-127m	2.60E-04	6.E+02	2.17E+03	5.28E-05	2.64E-08	1.03E-02	1.62E+07	1.67E+05	2.41E-02	1.62E+07	3.90E+05	6.91E-06	6.91E+00	2.55E-04
Te-127	2.70E-04	7.E+03	1.93E+02	5.48E-05	2.74E-08	1.07E-02	1.48E+06	1.59E+04	2.50E-02	1.48E+06	3.70E+04	3.35E-07	3.35E-01	1.25E-05
Te-129m	1.10E-03	5.E+02	1.10E+01	2.23E-04	1.12E-07	4.37E-02	1.11E+05	4.85E+03	1.02E-01	1.11E+05	1.13E+04	1.57E-05	1.57E+01	2.45E-03
Te-129	6.70E-04	3.E+04	1.12E+02	1.36E-04	6.80E-08	2.66E-02	1.69E+07	4.49E+05	6.21E-02	1.69E+07	1.05E+06	9.56E-08	9.56E-02	9.08E-06
I-130	1.20E-04	1.E+03	6.00E+02	2.44E-05	1.22E-08	4.76E-03	2.65E+08	1.26E+06	1.11E-02	2.65E+08	2.95E+06	6.50E-04	6.50E+02	1.11E-02
Te-131m	1.60E-04	6.E+02	1.33E+03	3.25E-05	1.62E-08	6.35E-03	1.15E+06	7.30E+03	1.48E-02	1.15E+06	1.70E+04	5.12E-06	5.12E+00	1.16E-04
Te-131	3.00E-05	6.E+03	2.50E+01	6.09E-06	3.05E-09	1.19E-03	1.11E+08	1.32E+05	2.78E-03	1.11E+08	3.08E+05	6.75E-08	6.35E-02	2.70E-07
I-131	1.60E-01	9.E+01	8.89E+06	3.25E-02	1.62E-05	6.35E+00	1.18E+08	7.49E+08	1.48E+01	1.18E+08	1.75E+09	5.72E-03	5.72E+03	1.30E+02
Te-132	4.30E-03	7.E+02	3.07E+04	8.73E-04	4.37E-07	1.71E-01	1.21E+08	2.07E+07	3.98E-01	1.21E+08	4.82E+07	6.51E-06	6.51E+00	3.97E-03
I-132	4.90E-03	9.E+03	2.72E+03	9.95E-04	4.98E-07	1.95E-01	3.16E+08	6.15E+07	4.54E-01	3.16E+08	1.43E+08	6.82E-05	6.82E+01	4.74E-02
I-133	4.00E-02	5.E+02	4.00E+05	8.12E-03	4.06E-06	1.59E+00	1.15E+08	1.84E+08	3.70E+00	1.15E+08	4.30E+08	1.36E-03	1.36E+03	7.71E+00
I-134	8.00E-05	3.E+04	1.33E+01	1.62E-05	8.12E-09	3.18E-03	3.17E+08	1.01E+06	7.41E-03	3.17E+08	2.35E+06	1.75E-05	1.75E+01	2.03E-04
Cs-134	4.60E-02	7.E+01	9.29E+06	9.34E-03	4.67E-06	1.83E+00	2.42E+08	4.42E+08	4.26E+00	2.42E+08	1.03E+09			
I-135	4.30E-03	3.E+03	7.17E+03	8.73E-04	4.37E-07	1.71E-01	1.47E+08	2.51E+07	3.98E-01	1.47E+08	5.85E+07	7.79E-04	2.79E+02	1.70E-01
Cs-136	8.90E-03	4.E+02	1.11E+05	1.81E-03	9.04E-07	3.53E-01	3.19E+08	1.13E+08	8.24E-01	3.19E+08	2.63E+08			
Cs-137	3.30E-02	1.E+02	1.65E+06	6.70E-03	3.35E-06	1.31E+00	9.30E+07	1.22E+08	3.05E+00	9.30E+07	2.84E+08			
Ba-137m	3.10E-02	1.E+02		6.29E-03	3.15E-06	1.23E+00	9.85E+07	1.21E+08	2.87E+00	9.85E+07	2.83E+08			
Ba-140	1.30E-04	6.E+02	9.17E+02	2.23E-05	1.12E-08	4.37E-03	4.78E+07	2.09E+05	1.02E-02	4.78E+07	4.87E+05			
La-140	1.10E-04	9.E+02	9.17E+02	2.73E-05	1.12E-08	4.37E-03	2.22E+08	9.69E+05	1.02E-02	2.22E+08	2.26E+06			
Ce-141	5.10E-05	2.E+03	1.28E+02	1.04E-05	5.18E-09	2.02E-03	6.20E+07	1.26E+05	4.72E-03	6.20E+07	2.93E+05			
Ce-143	2.80E-06	1.E+03	1.40E+01	5.68E-07	2.84E-10	1.11E-04	7.87E+07	8.75E+03	2.59E-04	7.87E+07	2.04E+04			
Ce-144	3.20E-05	3.E+02	5.33E+02	6.50E-06	3.25E-09	1.27E-03	1.36E+07	1.73E+04	2.96E-03	1.36E+07	4.03E+04			
Pr-143	2.70E-05	1.E+03	1.35E+02	5.48E-06	2.74E-09	1.07E-03	0.00E+00	0.00E+00	2.50E-03	0.00E+00	0.00E+00			
Pr-144	3.20E-05	4.E+04	4.00E+00	6.50E-06	3.25E-09	1.27E-03	2.32E+06	2.95E+03	2.96E-03	2.32E+06	6.88E+03			
H-3	5.50E+02	8.E+04	3.44E+07	1.12E+02	5.59E-02	2.18E+04	0.00E-00	0.00E+00	5.09E+04	0.00E+00	0.00E+00	2.03E-07	2.03E-01	1.58E+01
Total =	5.50E+02		4.99E+07				CR in cpm =	2.09E+09			4.87E+09			1.54E+02
							CR in cpm =	6.80E+08	<<<<based on 50 mrem Cthy >>>>		1.59E+09			

Isotopes individually listed in the ODCM but not included in the dose calculation are Br-85 (172s half-life), Rh-106 (29.9s half-life. As short lived daughters of longer lived parents, production & intake limits are included with the parent values. Because of the short half life, the initial individual quantities are assumed to be insignificant.

Ba-137m and Cs-137 isotopes are also individually listed in the ODCM. However, Ba-137m (2.55 min half life) will contribute to the count rate at the monitor, but will be decayed by the time it reaches Midland Water Intake. All Ba-137m daughter isotopes that an individual is exposed to are included in the Cs-137 dose factors. Therefore, Ba-137m is included in total count rate, but not dose calculations.

Assumes daily drinking water intake occurs in 1 hour period at Midland water intake.

*Flow rates from 1/2-ODC-2.01

Source Term for (RM-1LW-104 and RM-1LW-116) from 1/2-ODC-2.01 (Stone and Webster Calculation Package UR(B)-160)

Detection Efficiency for (RM-1LW-104 and RM-1LW-116) from 1/2-ODC-2.01 (Calculation Package ERS-SFL-92-038)

Assumptions -

Dose calculation is for one hour exposure. Reference Man daily water intake in one hour.

Intake concentration is calculated using CT blowdown flow rate (default 15000+7800 gpm) prior to the river with ODCMoutfall and river dilution prior to intake.

Attachment 3 - Unit 2 Liquid Monitors Alert EAL Set Points

Unit 2 Liquid Monitor Alert EAL Set Points

		RG 1.109 Annual (ml)		ICRP 23 total daily (ml)	RG 1.109 Daily (ml) =	Annual ml / 365.25 days	ODCM site specific mixing effect of the discharge structure =	3				
Adult water intake =	7.30E+05	ml	1950	2.00E+03		ODCM river dilution factor =	200					
Child water intake =	5.10E+05	ml	1400	1.40E+03		U1/U2 Combined CTBD (gpm) =	22800					
						Discharge Rate (gpm) =	80					

NUCLIDE	A_i ANNUAL RELEASE (Ci)	10 CFR 20 stochastic ALIg uCi	TEDE mrem	Intake for 10 mrem TEDE uCi	C_i Midland intake conc for hour intake uCi/ml	C_i =(22600*3*200)/80* 25GC-100undiluted conc uCi/ml	E_i DETECTION EFFICIENCY (cpm/uCi/ml)	10 mrem TEDE 25GC-100 cpm	RG 1.109 Child thyroid DCF mrem/pCi ingested	RG 1.109 Child thyroid DCF mrem/uCi ingested	Cthy CDE mrem
Cr-51	1.00E-04	4.E+04	1.25E-05	2.24E-05	1.12E-08	1.92E-03	2.01E+07	3.86E+04	4.94E-09		7.75E-08
Mn-54	2.50E-05	2.E+03	6.25E-05	5.61E-06	2.81E-06	4.80E-04	1.27E+08	6.10E+04			
Fe-55	1.30E-04	9.E+03	7.22E-05	2.92E-05	1.46E-08	2.50E-03	0.00E+00	0.00E+00			
Fe-59	6.50E-05	8.E+02	4.06E-04	1.46E-05	7.30E-09	1.25E-03	1.26E+08	1.57E+05			
Co-58	1.10E-03	1.E+03	5.50E-03	2.47E-04	1.24E-07	2.11E-02	1.82E+08	3.84E+05			
Co-60	1.60E-04	5.E+02	1.60E-03	3.59E-05	1.80E-08	3.07E-03	2.38E+08	7.31E+05			
Zn-65	5.10E-02	4.E+02	6.38E-01	1.14E-02	5.73E-06	9.79E-01	6.50E+07	6.37E+07			
Np-239	3.20E-05	2.E+03	8.00E-05	7.18E-06	3.59E-09	6.14E-04	1.65E+08	1.01E+05			
Br-83	2.90E-05	7.E+01	2.07E-06	6.51E-06	3.26E-09	5.57E-04	2.42E+08	1.35E+05			
Br-84	5.90E-09	3.E+04	9.83E-10	1.32E-09	6.63E-13	1.13E-07	1.38E+08	1.56E+01			
Rb-86	3.70E-05	5.E+02	3.70E-04	8.30E-06	4.16E-09	7.11E-04	1.04E+07	7.39E+03			
Sr-89	2.20E-05	5.E+02	2.20E-04	4.94E-06	2.47E-09	4.22E-04	1.83E+04	7.73E+00			
Sr-90	8.50E-07	4.E+01	1.06E-04	1.91E-07	9.55E-11	1.63E-05	0.00E+00	0.00E+00			
Y-90	6.00E-07	5.E+02	6.00E-06	1.35E-07	6.74E-11	1.15E-05	0.00E+00	0.00E+00			
Y-91m	3.60E-06	1.E+05	1.80E-07	8.08E-07	4.04E-10	6.91E-05	1.59E+08	1.10E+04			
Y-91	4.40E-06	6.E+02	3.67E-05	9.88E-07	4.94E-10	8.45E-05	3.55E+05	3.00E+01			
Y-93	3.00E-07	1.E+03	1.50E-06	6.73E-08	3.37E-11	5.76E-06	2.03E+07	1.17E+02			
Zr-95	4.00E-06	1.E+03	2.00E-05	8.98E-07	4.49E-10	7.68E-05	1.35E+08	1.04E+04			
Nb-95	4.00E-06	2.E+03	1.00E-05	8.98E-07	4.49E-10	7.68E-05	1.33E+08	1.02E+04			
Sr-91	5.30E-06	2.E+03	1.33E-05	1.19E-06	5.95E-10	1.02E-04	1.04E+08	1.06E+04			
Mo-99	2.90E-03	1.E+03	1.15E-02	5.16E-04	2.58E-07	4.42E-02	4.47E+07	1.97E+06			
Tc-99m	2.10E-03	8.E+04	1.31E-04	4.71E-04	2.36E-07	4.03E-02	1.40E+08	5.65E+06			
Ru-103	2.70E-06	2.E+03	6.75E-06	6.06E-07	3.03E-10	5.18E-05	1.71E+08	8.87E+03			
Ru-106	8.20E-07	2.E+02	0.00E+00	1.84E-07	9.21E-11	1.57E-05	0.00E+00	0.00E+00			
Rh-103m	2.70E-06	4.E+05	3.38E-08	6.06E-07	3.03E-10	5.18E-05	0.00E+00	0.00E+00			
Rh-106	8.20E-07	8.E+03	5.13E-07	1.84E-07	9.21E-11	1.57E-05	5.65E+07	8.90E+02			
Te-125m	1.90E-05	1.E+03	9.50E-06	4.26E-07	2.13E-10	3.65E-05	3.94E+05	1.44E+01	3.20E-06	3.70E+00	9.53E-07
Te-127m	2.10E-05	6.E+02	1.75E-04	4.71E-06	2.36E-09	4.03E-04	1.26E+05	5.09E+01	6.91E-06	6.91E+00	2.28E-05
Te-127	2.50E-05	7.E+03	1.79E-05	5.61E-06	2.81E-09	4.80E-04	2.43E+06	1.17E+03	3.26E-07	3.26E-01	1.28E-06
Te-129m	8.20E-05	5.E+02	8.20E-04	1.84E-05	9.21E-09	1.57E-03	6.53E+06	1.03E+04	1.57E-05	1.57E+01	2.02E-04
Te-129	5.30E-05	3.E+01	8.83E-06	1.19E-05	5.95E-09	1.02E-03	1.96E+07	1.99E+04	9.56E-08	9.56E-02	7.94E-07
I-130	2.30E-04	1.E+03	1.15E-03	5.16E-05	2.58E-08	4.42E-03	5.18E+08	2.29E+06	6.50E-04	6.50E+02	2.34E-02
Te-131m	5.20E-05	6.E+02	4.33E-04	1.17E-05	5.84E-09	9.99E-04	2.85E+08	2.85E+05	5.12E-06	5.12E+00	4.17E-05
Te-131	9.40E-06	6.E+03	7.83E-06	2.11E-06	1.06E-09	1.81E-04	1.88E+08	3.39E+04	6.35E-08	6.35E-02	9.36E-08
I-131	1.00E-01	9.E+01	5.56E+00	2.24E-02	1.12E-05	1.92E+00	1.96E+08	3.76E+08	5.72E-03	5.72E+03	8.97E+01
Te-132	7.80E-04	7.E+02	5.57E-03	1.75E-04	8.76E-08	1.50E-02	1.76E+08	2.64E+06	6.51E-06	6.51E+00	7.96E-04
I-132	2.30E-03	9.E+03	1.28E-03	5.16E-04	2.58E-07	4.42E-02	4.22E+08	1.86E+07	6.42E-05	6.42E+01	2.46E-02
I-133	6.50E-02	5.E+02	6.50E-01	1.46E-02	7.30E-06	1.25E+00	1.73E+08	2.16E+08	1.36E-03	1.36E+03	1.39E+01
I-134	4.80E-06	3.E+04	7.67E-07	1.03E-06	5.12E-10	8.83E-05	4.06E+08	3.59E+04	1.75E-05	1.75E+01	1.29E-05
Cs-134	3.00E-02	7.E+01	2.14E+00	6.73E-03	3.37E-06	5.76E-01	3.25E+08	1.87E+08			
I-135	9.20E-03	3.E+03	1.53E-02	2.06E-03	1.03E-06	1.77E-01	1.71E+08	3.02E+07			
Cs-136	3.90E-03	4.E+02	4.88E-02	8.75E-04	4.38E-07	7.49E-02	4.28E+08	3.21E+07			
Cs-137	2.20E-02	1.E+02	1.10E+00	4.94E-03	2.47E-06	4.22E-01	1.28E+08	5.41E+07	2.79E-04	2.79E+02	4.02E-01
Ba-137m	2.10E-02	1.E+02	0.00E+00	4.71E-03	2.36E-06	4.03E-01	1.33E+08	5.36E+07			
Ba-140	9.30E-06	6.E+02	7.75E-05	2.09E-06	1.04E-09	1.79E-04	7.50E+07	1.34E+04			
La-140	8.40E-06	5.E+02	7.00E-05	1.89E-06	9.43E-10	1.61E-04	3.08E+08	4.97E+04			
Ce-141	4.00E-06	2.E+01	1.00E-05	8.98E-07	4.49E-10	7.68E-05	7.75E+07	5.95E+03			
Ce-143	8.50E-07	1.E+03	4.30E-06	1.93E-07	3.66E-11	1.65E-05	1.20E+08	1.98E+03			
Ce-144	2.60E-06	3.E+02	4.33E-05	5.84E-07	2.92E-10	4.99E-05	1.87E+07	9.34E+02			
Pr-143	2.30E-06	1.E+03	1.15E-05	5.16E-07	2.58E-10	4.42E-05	1.63E+00	7.20E-05			
Pr-144	2.60E-06	4.E+04	3.25E-07	5.84E-07	2.92E-10	4.99E-05	3.40E+06	1.70E+02			
H-3	5.50E+02	8.E+04	3.44E+01	1.23E+02	6.18E-02	1.06E+04	0.00E+00	0.00E+00			
Total		8.E+04				1.06E+04			2.03E-07	2.03E-01	1.73E+01
			4.46E+01				CR in cpm =	1.05E+09			1.22E+02
							CR in cpm =	4.32E+08		<<<< based on 50 mrem Cthy	5.00E+01
							DV in uCi/ml =	5.89E+00			
							DV in uCi/ml =	2.42E+00			

CF 11 from OEC Calcs = 5.51E-09 uCi/ml/cpm

Isotopes individually listed in the ODCM but not included in the dose calculation are Br-85 (172s half-life), Rh-106 (29.9s half-life. As short lived daughters of longer lived parents, production & intake limits are included with the parent values. Because of the short half life, the initial individual quantities are assumed to be insignificant.

Ba-137m and Cs-137 isotopes are also individually listed in the ODCM. However, Ba-137m (2.55 min half life) will contribute to the count rate at the monitor, but will be decayed by the time it reaches Midland Water Intake. All Ba-137m daughter isotopes that an individual is exposed to are included in the Cs-137 dose factors. Therefore, Ba-137m is included in total count rate, but not dose calculations.

Assumes daily drinking water intake occurs in 1 hour period at Midland water intake.
*Flow rates from 1/2-ODC-2.01
Source Term for (RM-1LW-104 and RM-1LW-116) from 1/2-ODC-2.01 (Stone and Webster Calculation Package UR(B)-160)
Detection Efficiency for (RM-1LW-104 and RM-1LW-116) from 1/2-ODC-2.01 (Calculation Package ERS-SFL-92-039)
ODCM source term CF11 Conversion factor from ERS-ATL-93-021.
Assumptions -
Dose calculation is for one hour exposure. Reference Man daily water intake in one hour.
Intake concentration is calculated using CT blowdown flow rate (default 15000-7800 gpm) prior to the river with ODCM outfall and river dilution prior to intake.