BV-1 and 2 ODCM

Effective Through Issue 3, Revision 6

5-20-99

ATTACHMENT 2 TO:

ARERR (Region 1)

BEAVER VALLEY POWER STATION

UNIT NO. 1
and
UNIT NO. 2

OFFSITE DOSE

CALCULATION MANUAL

RTL A9.621B
Form RE 6.101-03
(08/98)

DUQUESNE LIGHT COMPANY
Beaver Valley Power Station

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BV-1 and 2 ODCM

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Revision No.	6
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Beaver Valley Power Station

BV-1 and 2 ODCM Review and Approval Record

Issue No. 3

Revision No. 6

Pages Issued	RSC Review		OSC Review and Approval		Approved By		Effective Date
	Meeting No.	Date	Meeting No.	Date	Signature	Date	
title xxix thru xxxii 3-1 3-6 3-11 C-1 thru C-56 E-2 thru E-4	BV-RSC-07-99	5/6/99	Poll 3263	5/12/99	Manager, Health Physics	5/17/99	5/20/99
					General Manager, Nuclear Operations	5/17/99	

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Beaver Valley Power Station

BV-1 and 2 ODCM Review and Approval Record

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Revision No. 5

Pages Issued	RSC Review		OSC Review and Approval		Approved By		Effective Date
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title i viii xxvii thru xxxi 1-17 thru 1-18 3-4 thru 3-14 C-2 thru C-4 C-19 C-37 C-39 C-47 thru C-48 F-10	BV-RSC-20-98	11/12/98	BV-OSC-46-98	11/18/98	Manager, Health Physics General Manager, Nuclear Operations	11-23-98 11-24-98	11/30/98

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			Meeting No.	Date	Meeting No.	Date	Signature	Date	
3	4	title i vii xiii xxvii thru xxix 3-4 thru 3-14 4-2 C-12 C-19 thru C-23 C-25 thru C-27 E-3 F-1 thru F-17	BV-RSC-98-05	3/6/98	Poll 3162	3/10/98	[signature] [signature]	3/11/98 3/11/98	3/13/98

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			Meeting No.	Date	Meeting No.	Date	Signature	Date	
3	3	Title xxvi 2-122	BV-RSC-97-14	6/9/97	OSC Poll 3101	6/9/97	[signature] Ronald L. LeGrand	6/9/97 6-9-97	6/9/97

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			Meeting No.	Date	Meeting No.	Date	Signature	Date	
3	2	Title vii xxv xxvi 1-19 1-20 1-27 1-32 3-2 3-3 C-10 C-13 C-14 C-19 thru C-22 C-25 thru C-27 C-44 C-50 thru C-54 E-3 F-15 thru F-17	BV-RSC-97-11	5/13/97	OSC Poll 3099	5/17/97	[illegible]	5/28/97	5/30/97
							Ronald J. [illegible]	5-30-97	

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DUQUESNE LIGHT COMPANY

BV-1 and 2 ODCM Review and Approval Sheet

Issue No.	Rev. No.	Pages Issued	RSC Review		OSC Review and Approval		Plant Manager or Designee Approval		Eff. Date
			Meeting No.	Date	Meeting No.	Date	Sign.	Date	
3	1	Title i thru xxv 1-22 thru 1-24 A-3 B-1 thru B-5 C-1 thru C-4 C-19 thru C-22 C-25 thru C-55 D-1 thru D-9 E-1 thru E-5 F-1 thru F-17	BV-RSC-95-18	10/4/95	BV-OSC-40-95	10/5/95	[illegible]	10/10/95	10/11/95

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BV-1 And 2 ODCM Review And Approval Sheet

Issue No.	Rev. No.	Pgs Issd.	RSC Review Meeting No.	RSC Review Date	OSC Review Meeting No.	OSC Review Date	Admin. Approv. Sign.	Admin. Approv. Date	Eff. Date
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DUQUESNE LIGHT COMPANY

Beaver Valley Power Station Unit 1
Docket No. 50-334
License No. DPR-66

Beaver Valley Power Station Unit 2
Docket No. 50-412
License No. NPF-73

BEAVER VALLEY POWER STATION UNIT 1 (BV-1)
BEAVER VALLEY POWER STATION UNIT 2 (BV-2)
OFFSITE DOSE CALCULATION MANUAL
(ODCM)

ISSUE 3
Revision 6

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--	1.1(2)-1	1.1-1
--	1.1(2)-2	1.1-2
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--	1.1(2)-4	1.1-4
--	1.1(2)-5	1.1-5
--	1.1(2)-6	1.1-6
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--	1.1(2)-8	1.1-8
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2.1-6	2.1(1)-6	--
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--	2.1(2)-1	2.1-1
--	2.1(2)-2	2.1-2
--	2.1(2)-3	2.1-3
--	2.1(2)-4	2.1-4
--	2.1(2)-5	2.1-5
--	2.1(2)-6	2.1-6
--	2.1(2)-7	2.1-7
--	2.1(2)-8	2.1-8
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2.1-18	2.1(1)-18	--
2.1-19	2.1(1)-19	--
2.1-20	2.1(1)-20	--
--	2.1(2)-17	2.1-17
--	2.1(2)-18	2.1-18
--	2.1(2)-19	2.1-19
--	2.1(2)-20	2.1-20
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--	1.1-1b	1.1-1
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--	1.2-1b	1.2-1
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FROM: PREVIOUS BV-1 ODCM ISSUE 2, REV. 2 AND EARLIER	TO: CURRENT BV-1 AND 2 ODCM ISSUE 3 AND LATER	FROM: PREVIOUS BV-2 ODCM ISSUE 1, REV. 3 AND EARLIER
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--	2.1-1b	2.1-1
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--	2.1-2b	2.1-2
2.2-1	2.2-1	2.2-1
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(Unnumbered)	B:1a	--
--	B:1b	(Unnumbered)
(Unnumbered)	B:2a	--
--	B:2b	(Unnumbered)
--	C:1.1	--
--	C:1.2	--
--	C:3.3-12	--
--	C:4.3-12	--
--	C:3.3-13	--
--	C:4.3-13	--
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--	C:4.11-2	--
--	C:3.12-1	--
--	C:3.12-2	--
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--	E:6.9-1	--
--	F:1a	--
--	F:1b	--
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--	F:2b	--
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--	F:4	--
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PREFACE

This OFFSITE DOSE CALCULATION MANUAL (ODCM) provides the information and methodologies to be used by Beaver Valley Power Station Unit 1 and Unit 2 (BV-1) and (BV-2) to assure compliance with the Administrative Controls Section of the operating Technical Specifications. They are intended to show compliance with 10 CFR 20.106 or 10 CFR 20.1302 as appropriate, 10 CFR 50.36a, Appendix I of 10 CFR 50, and 40 CFR 190.

This ODCM is based on the following United States Nuclear Regulatory Commission (USNRC) documents:

- NUREG-0472, Draft 7 for Rev. 3, September, 1982, Standard Radiological Effluent Technical Specifications For PWRs.
- NUREG-0133, October, 1978, Preparation Of Radiological Effluent Technical Specifications For Nuclear Power Plants.
- Generic Letter 89-01, January 31, 1989, Implementation Of Programmatic Controls For Radiological Effluent Technical Specifications In The Administrative Controls Section Of The Technical Specifications And The Relocation Of Procedural Details Of RETS To The ODCM Or To The PCP.
- NUREG-1301, April, 1991, Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls For Pressurized Water Reactors, Generic Letter 89-01, Supplement No. 1.
- Other miscellaneous inputs from the USNRC.

Specific plant procedures for implementation of this manual are included in various site manuals and documents. Procedures from the following manuals and documents are utilized by the operating staff to assure compliance with Technical Specifications and the Appendix C CONTROLS of the ODCM:

- Health Physics Manual (BVPS-HPM)
- Radiological Engineering Administrative Manual (REAM)
- Environmental Program Manual (EPM)
- Operating Manuals (OM)
- Maintenance Surveillance Procedures (MSP)
- Operational Surveillance Tests (OST)

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The ODCM has been prepared as generically as possible in order to minimize the need for future versions. However, some changes to the ODCM may be necessary in the future. Any such changes will be properly prepared, reviewed, and approved as indicated in the Administrative Control Section of the Technical Specifications. An implementation procedure for control of the ODCM is included in the REAM. In summary, any ODCM changes will be properly justified to ensure that ODCM changes will maintain the level of radioactive effluent control required by 10 CFR 20.106 or 10 CFR 20.1302 as appropriate, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50 and not adversely impact the accuracy or reliability of effluent dose, or setpoint calculation.

HISTORY OF ODCM CHANGES

(1) BV-1 ODCM, Issue 1 (Effective January, 1984)

This is the initial issue of the BV-1 ODCM, as prepared for implementation of the Radiological Effluent Technical Specifications (RETS). Implementation of this manual was commensurate with Amendment No. 66 to the Unit 1 Technical Specifications as approved by the NRC on March 28, 1983.

(2) BV-1 ODCM, Issue 1, Revision 1 (Effective October, 1984)

A description of the changes that were implemented with this revision are as follows:

- Table 1.3-1 was revised to include liquid dose factors for nuclides presently identified at BVPS and not included in the original table.
- Equations 2.1-19 and 2.1-22 were revised as approved at RSC Meeting No. BVPS-RSC-1-84 on January 31, 1984. The equations were revised to clarify flow rate terminology.
- Section 2.2.2 was revised to delete the food and ground pathways for gaseous dose rate calculations of I-131, tritium, and radionuclides in particulate form with half lives greater than 8 days.
- Table 2.2-13 was revised to include 7 organs rather than only the maximum organ. Also, the receptor was changed from infant to child, and addition/deletion of nuclides to be consistent with the Technical Specifications and nuclides identified at BV-1.

(3) BV-1 ODCM, Issue 1, Revision 2 (Effective July, 1986)

A description of the changes that were implemented with this revision are as follows:

- Provide a flow based monitor setpoint adjustment factor in Section 1.1.2. This change makes Section 1.1.2 consistent with Section 1.1.1 and current procedures.
- Revise the 31-day dose projection limits and methodology in Sections 1.3.2, 2.3.1.2, and 2.3.2.2. This change corrected the 31-day dose projection limits and changed the dose projection methodology to be consistent with proposed software.
- Revise the Gaseous Effluent Monitor Setpoints in Sections 2.1.1 and 2.1.2. They were revised due to pressure corrections determined for the detectors, changes in isotopic literature, and the addition of SPING Channel 5 alternate monitor data. The calculations supporting this item are contained in Calculation Packages ERS-SFL-85-031 and ERS-ATL-86-008.

(4) BV-1 ODCM, Issue 2, (Effective July, 1987)
BV-2 ODCM, Issue 1, Revision 1 (Effective July, 1987)

With the start-up of BV-2 in the second half of 1987, the BV-1 ODCM required revision and the BV-2 ODCM required initial implementation. A description of the changes are as follows:

- Produce functionally compatible BV-1 and BV-2 ODCMs which address site dose rate limits and meet regulatory requirements. Note that due to the scope of the revisions to the Unit 1 ODCM, it was re-issued as Issue 2. Also, for clarity, the draft BV-2 ODCM previously submitted to the NRC was regarded as Issue 1 (historical) and operation of BV-2 began with Issue 1, Revision 1 of the BV-2 ODCM.

- A shared liquid radwaste system, permitting mixing of waste for processing, the sharing of dilution water, and the apportionment of dose according to NUREG-0133 was incorporated into both ODCMs.

- A shared elevated gaseous radwaste system, permitting the mixing of gaseous radwaste and the apportionment of dose, according to NUREG-0133 was incorporated into both ODCMs.

- Separate ground level gaseous releases were maintained. The BV-1 ODCM was updated to incorporate the BV-2 five year meteorology base. Gaseous source terms were revised to that calculated for BV-1 in the BV-2 FSAR, and terms were added for calculation of a turbine building release.

- The gaseous effluent monitor alarm setpoints of both ODCMs were revised as required by revisions to meteorology, source terms, monitor efficiencies, and revised percentages of site dose rate limits.

- Formal justification was provided for use of the "T" factor in Containment Purge Dose Rate calculations. Whereas, the dose rate for a Containment Purge may be average over a time period not to exceed 960 minutes. Since the Containment air volume change time period is 60 minutes, then the maximum value for "T" is 16 (i.e., 960 minutes/ 60 minutes = 16).

(5) BV-1 ODCM, Issue 2, Revision 1 (Effective December, 1987)
BV-2 ODCM, Issue 1, Revision 2 (Effective December, 1987)

Sections 2.1.3 and 2.1.4 of both ODCMs were changed to delete a note concerning noble gas nuclides as requested by a NRC letter dated July 14, 1987 titled Beaver Valley Unit 2 - Offsite Dose Calculation Manual, ODCM (TAC 63996).

(6) BV-1 ODCM, Issue 2, Revision 2 (Effective June, 1989)
BV-2 ODCM, Issue 1, Revision 3 (Effective June, 1989)

A description of the changes that were implemented with this revision are as follows:

- Both ODCMs were revised for addition of Sections 1.4 and 2.4. This addition gives a description of and includes flow diagrams of the Liquid Radwaste System and the Gaseous Radwaste System. (See justification 1)

- Correct the following typos to BV-1 ODCM Equation 1.1-8:

  A. Show differentiation between the two f's. (See Justification 1)
  B. Add the division sign. (See Justification 1)

- Re-define F_k in equation 1.3-1 of both ODCMs, as allowed by the NRC. (See Justification 1)

- Correct typos to the following:

  A. BV-1 ODCM equation 1.3-7, add a division sign between the brackets. (See Justification 1)

  B. BV-1 ODCM equation 1.3-8, add a division sign between the brackets. (See Justification 1)

  C. Add the words "from each reactor unit" to five places (Sections 1.3.1, 1.3.2, 2.3.1.1, 2.3.1.2, and 2.3.2.2) of both ODCMs. This ensures compliance with the current requirements of the Technical Specifications. (See Justification 2)

  D. Equation 2.1-20 of both ODCMs, change the HHSP to HSP multiplier from 0.70 to 0.33. (See Justification 1)

  E. Equation 2.1-24 of both ODCMs, change the HHSP to HSP multiplier from 0.70 to 0.33. (See Justification 1)

  F. Correct punctuation in Section 2.3.2.1 of the BV-1 ODCM. (See Justification 2)

  G. Correct typos in Table 3.0-1 of both ODCMs. (See Justification 2)

  H. Correct typos in Figure 3.0-3 of both ODCMs. (See Justification 2)

- Add Reference (7) to Section 2 of the BV-1 ODCM. (See Justification 3)

- Add the words "from the site" to Section 2.2.2 of both ODCMs. This ensures compliance with the current requirements of the Technical Specifications. (See Justification 2)

- Revise BV-1 ODCM Table 2.2-2 to change the particulate and iodine radionuclide mix for the Unit 1 Ventilation Vent and to correct a typo for Xe-135m in the Containment Vacuum Pumps. (See Justification 3)

- Provide re-verified $P_{i\tau}$ values for the Beaver Valley site in Table 2.2-13 of both ODCMs. (See Justification 1)

- Correct the definition for the t_f value in the cow-meat pathway in Section 2.3.2.1 of both ODCMs. (See Justification 1)

- Provide re-verified R values for the Beaver Valley site in Tables 2.3-2 through 2.3-20 of both ODCMs. (See Justification 1)

- Change the particulate and iodine release fractions in Appendix B of the BV-1 ODCM. (See Justification 3)

The justification used for Change (6) to the ODCMs are as follows:

1. A letter dated March 2, 1989 (from the NRC) was received by Duquesne Light regarding acceptance of the Offsite Dose Calculation Manuals. The NRC acceptance of the BV-1 and BV-2 ODCMs was based on Technical Evaluation Reports (TER No. EGG-PHY-8194 and EGG-PHY-8217) provided by the Idaho National Engineering Laboratory.

   As stated in the letter, minor concerns are delineated in Section 4 of the TER. In general, these concerns are considered typos or additions and in one way impact any of the calculations currently being performed for dose contributions. However, one of these concerns is regarding the inability to reproduce the ODCM R values for the cow-meat, cow-milk and goat-milk pathways when using the ODCM/NUREG-0133 methodology. These R values (along with all other ODCM R values) were re-validated VIA Calculation Package No. ERS-ATL-89-014. The results of this package showed that the R values for the three aforementioned pathways were in error. Since the R values in error do not involve the controlling receptor for gaseous release (i.e.; the controlling receptor is VIA the Inhalation, Ground, and Vegetation pathways, <u>not</u> the pathways subject to error) than these changes to the ODCM will <u>not</u> adversely impact the accuracy or reliability of effluent dose calculations.

2. As requested by DLC letters ND3NSM:3431, ND1NSM:3522, and ND1NSM:3652, Technical Specifications were required to be verified in all plant implementing procedures. As part of this effort, wording errors/typos were identified in various sections of the ODCM. This revision corrects the anomalies identified during the verification effort.

3. As delineated in letter ND1SHP:776, dated February 12, 1988 (BVPS-1 ODCM Table 2.2-2, Appendix B) a series of apparent discrepancies were identified between ODCM Table 2.2-2 and similar tables of the BVPS-2 FSAR. Evaluation showed that apparent credit was given for continuous filtration of SLCRS releases which is invalid at Unit 1. However, the calculation package on which the BVPS-2 FSAR expected release tables are based, is correct (i.e.; no credit was taken for routine filtration for Unit 1 releases). Except for revising the ODCM, no further corrective action is necessary because the particulates and iodines in the ODCM were not used for gaseous effluent alarm setpoint. Therefore, this change does not adversely impact the accuracy or reliability of setpoint calculations.

(7) <u>BV-1 and 2 ODCM, Issue 3 (Effective August, 1995)</u>

The combined ODCM, as implemented by ISSUE 3, contains the following changes:

° Prior to ISSUE 3, BV-1 and BV-2 had individual ODCMs that were generically equal. In an effort to simplify the implementing documents, the ODCMs have been combined. This merger of the individual ODCMs will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50. Also, this merger will not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations. 8/95

- Revised Section 1.0 (Liquid Effluents) to show compliance with 10 CFR 20 Appendix B (20.1001 - 20.2401), Table 2, Col. 2 EC's. This includes the following:

  - Revising the alarm setpoints for monitors (RM-LW-104, RM-LW-116, and 2SGC-RQ100)
  - Updating the BV-1 monitor detection efficiencies
  - Updating discharge rate and dilution rate parameters for BV-1 and BV-2
  - Adding the alarm setpoints for monitors (RM-RW-100, RM-DA-100, 2SWS-RQ101, and 2SWS-RQ102)

- Revised Section 1.0 (Liquid Effluents) and Section 2.0 (Gaseous Effluents) to merge the BV-1 alarm setpoint calculations with the BV-2 alarm setpoint calculations. For all practical purposes, when Tables, Figures, and Equations were transferred to the combined ODCM, the numbering was kept generically equal. The only exception to this are as follows:

  - If a table was contained in both ODCMs, but each had data specific to BV-1 or BV-2, then an a or b was added to the table. For example, Table 1.1-1 was previously included in the BV-1 ODCM and the BV-2 ODCM. These tables are now numbered 1.1-1a and 1.1-1b denoting BV-1 and BV-2 respectively. A cross reference for ODCM tables is provided in the Table Of Contents.

  - If an equation was contained in both ODCMs, but each had data specific to BV-1 or BV-2, then a (1) or (2) was added to the equation. For example, Equation 1.1-1 was previously included in the BV-1 ODCM and the BV-2 ODCM. These equations are now numbered 1.1(1)-1 and 1.1(2)-1, denoting BV-1 and BV-2 respectively. A cross reference for ODCM equations is provided in the Table Of Contents.

- Revised Section 3.0 (Radiological Environmental Monitoring Program) to list the program requirements from the Radiological Assessment Branch Technical Position (Revision 1, 1979).

- Revised Section 4.0 (Information Related To 40 CFR 190) to provide clarified reporting requirements for the Special Report. The clarifications were taken from Generic Letter 89-01, Supplement No. 1 (NUREG-1301).

- Revised Appendix A to transfer the Batch Release dispersion parameters from Appendix A (Tables A-2 through A-5) to Section 2.3 (Tables 2.3-35 through 2.3-38). This revision was done for clarification. For example, all dispersion parameters are now included in one area of the ODCM.

- Added Appendix C: Procedural details for the Radiological Effluent Technical Specifications (RETS) were transferred from the Technical Specifications to Appendix C of the ODCM per Generic Letter 89-01 and Generic Letter 89-01, Supplement No. 1 (NUREG 1301).

This Appendix also includes selected Definitions and Tables as delineated in the Technical Specifications (Section 1) and selected Applicability and Surveillance Requirement statements as delineated in the Technical Specifications (Section 3/4 0). These were added to Appendix C for reference purposes, even though they are currently described in the Technical Specification.

° Added Appendix D: The bases for ODCM Controls were transferred from the Bases Section of the Technical Specifications to Appendix D of the ODCM per Generic Letter 89-01.

° Added Appendix E: The Annual Radioactive Effluent Release Report and the Annual Radiological Environmental Report reporting requirements are listed in this appendix to the ODCM.

° There are three differences (i.e., non-editorial changes) in this ODCM revision when compared to the previous BV-1 and BV-2 Technical Specifications. These are the only changes that are identified by revision bars. These differences are as follows:

- First Difference (LLD Definition Clarification):

  There was a sentence removed in the LLD Standard Deviation Definitions delineated in Appendix C Tables 4.11-1 and 4.11-2. This sentence stated: **"In calculating the LLD for a radionuclide determined by gamma ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., potassium in milk samples)."**

  It should be noted that this sentence was removed by justification of NUREG-0472, Rev. 2 (i.e., this revision to the NUREG removed the sentence from Tables 4.11-1 and 4.11-2). It should be noted that at BV-1 and 2, there are no other radionuclides normally present in effluent samples. However, there is applicability to environmental LLD calculations due to the existence of other radionuclides in environmental samples. This sentence, therefore, will not be removed from Appendix C, Table 4.12-1.

  8/95

  Removal of the sentence from Appendix C, Tables 4.11-1 and 4.11-2 does not adversely impact the accuracy or reliability of current or past effluent LLD calculations. This change maintains the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

  This change brings ODCM Appendix C, Tables 4.11-1 and 4.11-2 in generic agreement with NRC guidance (i.e., NUREG-0472) and industry standard.

- Second Difference (Change From Semi-Annual Report To Annual Report:

The frequency of the Radioactive Effluent Release Report was changed from Semi-Annual to Annual. This change is justified by Federal Register, Rules And Regulations (Vol. 57, No. 169, Monday, August 31, 1992), where as; 10 CFR Part 50.36a(a)(2) states, in part:

"Each licensee shall submit a report to the Commission annually that specifies the quantity of each of the principal radionuclides released to unrestricted areas in liquid and in gaseous effluents during the previous 12 months of operation...the time between submission of the reports must be no longer than 12 months..."

This change maintains the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

- Third Difference (Implementation Of New 10 CFR 20):

The definition for MEMBER(S) OF THE PUBLIC was revised to agree with the definition in New 10 CFR 20.1003.

The definition for UNRESTRICTED AREA was modified from the definition that was in the Technical Specifications prior to transferring to the ODCM. This modification was necessary to ensure that the ODCM dose model for gaseous releases is not affected. The modification involved adding the following sentence: "For gaseous release dose calculations, the UNRESTRICTED AREA should exclude any public road, railway, or waterway adjacent to or crossing the site that is not occupied continuously by MEMBER(S) OF THE PUBLIC".

The limits for liquid effluent concentration were changed from 1 times Old 10 CFR 20 Appendix B (20.1 - 20.601), Table II, Col. 2 MPC's to 10 times New 10 CFR 20 Appendix B (20.1001 - 20.2401), Table 2, Col. 2 EC's. This limit will now be referred to as the ODCM Effluent Concentration Limit (OEC). 8/95

For gaseous effluents, no changes were made to implement the New 10 CFR 20. As justification, when the utility adopted the RETS (1/1/84), compliance to 10 CFR 20 shifted from the MPC concept to the Unrestricted Area Dose Rate concept. The Dose Rate concept is the preferred method of controlling gaseous effluent release rate, and will continue to be used in-lieu of the MPC or EC concept.

Changing to the OEC limit for liquid effluents accommodates needed operational flexibility to facilitate implementation of the New 10 CFR 20 requirements.

For information, the general intent of the New Part 20 is that radiation doses to members of the public not exceed 100 mrems per year, which is more restrictive than the 500 mrems per year limit in the Old Part 20, and that fuel cycle licensees also comply with 40 CFR 190. The New Part 20 does not include a requirement on limiting radioactivity concentrations in effluents, which is less restrictive than the Old Part 20.

The basic requirements for RETS (i.e.; now the ODCM Appendix C Controls) are stated in 10 CFR 50.36a. These requirements indicate that compliance with the RETS will keep average annual releases of radioactive material in effluents to small percentages of the limits specified in the Old 10 CFR 20.106 (New 10 CFR 20.1302). These requirements also indicate that operational flexibility is allowed (with considerations for public health and safety) which may temporarily result in releases higher than such small percentages, but still within the MPC limits specified in the Old 10 CFR 20.106. The MPC's relate to an annual dose of 500 mrem. Also, 10 CFR 50.36a indicates that when using operational flexibility, best efforts shall be exerted to keep levels of radioactive materials in effluents to ALARA as set forth in 10 CFR 50 Appendix I.

As stated in the Introduction to Appendix B of the New 10 CFR 20, the liquid EC's are based on an annual dose of 50 mrem. Since a release concentration corresponding to a limiting dose rate of 500 mrem/year has been acceptable as a RETS limit for liquid effluents, it should not be necessary to reduce this limit by a factor of ten.

BV-1 and BV-2 has demonstrated that the use of the MPC's associated with the Old 10 CFR 20.106 has resulted in calculated maximum individual doses to a member of the public that are small percentages of the limits of 10 CFR 50 Appendix I. Therefore, the use of the OEC's, which correspond to an annual dose of 500 mrem (i.e.; 10 times the New 10 CFR 20 EC's) should not have a negative impact on the ability to continue to operate within the limits of 10 CFR 50 Appendix I, and 40 CFR 190.

Operational flexibility is also necessary in establishing a basis for effluent monitor setpoint calculations. As previously discussed, the EC's stated in the New 10 CFR 20 relate to a dose of 50 mrem in a year. This is too restrictive to base effluent monitor setpoint calculations. For many liquid effluent release situations, the monitor background is high, which could result in a monitor setpoint that is approximately equal to the monitor background. 8/95

In summary, to accommodate operational flexibility needed for effluent releases, the limits associated with the liquid release concentration (i.e.; the OEC) are based on 10 times the EC's stated in the New 10 CFR 20. The multiplier of 10 is used because the annual dose of 500 mrem (Old 10 CFR 20 MPC bases) is a factor of 10 higher than the annual dose of 50 mrem (New 10 CFR 20 EC bases). Compliance with the 100 mrem dose limit of the New 10 CFR 20.1302 will be demonstrated by operating within the dose limits of 10 CFR 50 Appendix I, and 40 CFR 190 (which are also ODCM Controls for liquid and gaseous effluents). Implementation of the New 10 CFR 20 for liquid effluents maintains the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

° SUMMARY:

Per Generic Letter 89-01, the transfer of RETS procedural details fulfills the goal of the USNRC Policy Statement for Technical Specification improvements. It is not the USNRC's (or DLC's) intent to reduce the level of radioactive effluent control. Rather, the intent is to provide programmatic controls for RETS (as delineated in Technical Specification 6.8.6) and allow for relocation of the procedural details of the RETS to the ODCM. 8/95

(8) BV-1 AND 2 ODCM, Issue 3, Revision 1 (Effective October, 1995)

A description of the changes that were implemented with this revision are as follows:

° Index: Editorial changes were made for clarity. (See justification 1)

° Section 1.0: Revised Nb-95 and Nb-97 dose factors in Table 1.3-1 due to changing the niobium bioaccumulation factor. (see justification 2)

° Appendix A: A change was made to Table 1.1 so that the letter A would proceed the table number. (See justification 1)

° Appendix B: A descriptive paragraph was added at the front of this Appendix. Also, changes were made to the tables so that the letter B would proceed the table numbers. (See justification 1)

° Appendix C: Descriptive paragraphs were added at the front of the Appendix (See justification 1). Removed the process flow rate operability and surveillance requirements for gaseous effluent radiation monitors 2RMQ-RQ301, 2RMQ-RQ303 and 2HVL-RQ112 from Tables 3.3-13 and 4.3-13 (See justification 3). Added alternate system effluent flow rate measuring devices for the three gaseous effluent pathways to Tables 3.3-13 and 4.3-13 (See justification 4). Revised Surveillance Requirements 4.11.1.1.3 and 4.11.1.1.4 and notes e and g of Table 4.11-1 to clarify Turbine Building sump sampling requirements (See justification 5). 10/95

° Appendix D: Descriptive paragraphs were added at the front of the Appendix. (See justification 1)

° Appendix E: Desriptive paragraphs were added at the front of the Appendix. (See justification 1)

° Appendix F: This is a new Appendix to the ODCM. It contains plant procedure references for Radiological Effluent Technical Specification (RETS) that were transferred from the Technical Specification Procedure Matrix. (See justification 1)

The justification used for change (8) to the ODCM are as follows:

1. These changes are considered editorial in nature. Therefore, these editorial changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also the editorial changes will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.

2. This change resulted from revising the bioaccumulation factor (BF) for niobium from the value posted in Table A-1 of Regulatory Guide 1.109, Revision 1, 1977 (30,000 pCi/kg per pCi/l). Since this change in niobium BF (as documented and justified in Appendix A to Calculation Package No. ERS-ATL-83-027) merely removes the conservatism associated with organism uptake, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, removing the conservatism will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation.

3. This change removes the process flow -rate operability and surveillance requirements for BV-2 Gaseous Effluent Radiation Monitors 2RMQ-RQ301, 2RMQ-RQ303 and 2HVL-RQ112 from Appendix C Tables 3.3-13 and 4.3-13. These items were removed from the ODCM by justification provided in Calculation Package No. ERS-ATL-90-021.

   It should be noted that a safety analysis and a no significant hazards evaluation were prepared and approved on this change prior to submitting it to the NRC via TSCR No. 2A-61 in 1992 However, the TSCR was withdrawn in 1993 in an effort to alleviate any further delays associated with approval of TSCR No. 1A-175/2A-37 (Generic Letter 89-01 implementation).

   Removal of these items from the ODCM will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also removal of these items will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation. The following is a summary of the justification. 10/95

   ° BVPS-1 and BVPS-2 is currently using, and will continue to use design (maximum) system flow rates in ODCM Dose & Dose Rate Calculations, rather than those flow rates observed during normal plant operation.

   ° BVPS-2 UFSAR Section 11.3.3 indicates that the source term for these three pathways are not significant. These pathways are not included in UFSAR Tables 11.3-1 through 11.3-4 that list the expected and design releases for each potentially radioactive pathway.

- The DLC commitment to Regulatory Guide 1.97, Rev. 2 (Section 1.8-1 of the BVPS-2 UFSAR) is not affected. This RG applies to instrumentation used during and after postulated accident conditions. These three process flow rate instruments were not used in any accidnet analysis, nor are they used to assess plant conditions during and following an accidnet.

- The DLC commitment to Regulatory Guide 1.21, Rev. 1 (Section 1.8-1 of the BVPS-2 UFSAR) is not affected. RG 1.21, Section C.2 (Location of Monitoring) states in part: "All major and potentially significant paths for release of radioactive material during normal reactor operation, including anticipated operational occurrences, should be monitored. Measurements of effluent volume, rates of release, and specific radionuclides should be made, insofar as practical . . " As previously stated, the three process flow rate instruments are located on effluent pathways that do not have a significant source term.

- BVPS-2 UFSAR Sections 9.4.13 and 9.4.16 indicate that the building ventilation system for these three pathways are non-safety related and are not required to perform any safety-related function.

- There is no effect to the Noble Gas Monitors located on these three pathways. The Noble Gas Monitors are still capable of performing their intended functions as described in BVPS-2 UFSAR Section 11.5.2.4.

4. This change adds alternate system effluent flowrate measuring devices for the three BV-1 Gaseous Effluent Pathways to Appendix C Tables 3.3-13 and 4.3-13. A 10 CFR 50.59 safety evaluation has concluded that no unreviewed safety question is involved by adding the alternate measuring devices to Appendix C Tables 3.3-13 and 4.3-13. This conclusion is based on the following:

- There is no increase in the probability or consequences of accidents or malfunctions of equipment important to safety.

- There is no creation of a possiblity for an accident or malfunction of a different type than any evaluated previously. 10/95

- There is no reduction in the margin of safety

Also, since this change merely adds alternate measuring devices that meet the same surveillance requirements of the primary channel, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, addition of the alternate flow rate measuring devices will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

5. This change to the ODCM clarifies Turbine Building sump sampling requirements and clarifies effluent related actions associated with detection of radioactivity in the secondary system. These clarifications are documented and justified in Calculation Package No. ERS-ATL-95-006. Also, since these clarifications were shown to meet the intent of NUREG-1301 (superseding NUREG-0472) and the BVPS-1 and 2 UFSAR's, then the clarification will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the clarifications will not adversely impact the accuracy or reliability of effluent dose or setpoint calculation. 10/95

   Also, a 10 CFR 50.59 safety evaluation has concluded that no unreviewed safety question is involved by clarifying these actions. This conclusion is based on the following:

   - There is no increase in the probability or consequences of accidents or malfunctions of equipment important to safety.
   - There is no creation of a possibility for an accident or malfunction of a different type than any evaluated previously.
   - There is no reduction in the margin of safety.

(9) <u>BV-1 and 2 ODCM, Issue 3, Revision 2 (Effective May 1997)</u>

A description of the changes that were implemented with this revision are as follows:

- Index: Editorial changes were made for clarity. (See Justification 1)
- Section 1.0: Clarifying statements were added to Tables 1.2-1a and 1.2-1b to show that the recirculation times listed are based on historical recirculation rates. Figure 1.4-3 was added to show BV-1 and 2 liquid Effluent Release Points. (See Justification 1) 5/97
- Section 3.0: Removed the option to perform broad leaf vegetation sampling at the site boundary in a sector with the highest D/Q. (See Justification 2)
- Appendix C: Added plant specific Mark Numbers to Tables 3.3-12, 4.3-12, 3.3-13 and 4.3-13 (See Justification 1). Corrected typographical errors on Surveillance Requirement 4.11.4.1.1 (See Justification 1). Added clarifying statements from NUREG-1301 and the Radiological Assessment Branch Technical Position to Tables 3.12-2 and 4.12-1 (See Justification 1). Removed the option to perform broad leaf vegetation sampling at the site boundary in a sector with the highest D/Q (See Justification 2).

5/97

- Appendix E: Corrected typographical error on Table 6.9-1. (See Justification 1)
- Appendix F: Added procedure detail to Tables 11, 12 and 13. (See Justification 1)

The justification used for Change (9) to the ODCM are as follows:

1. These changes are considered editorial in nature. The changes either correct typographical errors or add editorial details from previously approved station documents. Therefore, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

2. This change removes the option to perform broad leaf vegetation sampling at the site boundary (in a sector with the highest D/Q) in lieu of the garden census. Per NUREG-1301 and the Radiological Branch Technical Position, this option does not apply to plants with elevated releases. Since BV-1 and 2 have elevated releases, the option should not be exercised. A review of past garden census showed that the option was never exercised at BV-1 and 2.

   Since this change removes an option that should not be exercised, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, removal of the option will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

(10) BV-1 and 2 ODCM, Issue 3, Revision 3 (Effective June 1997)

6/97

A description of the change that was implemented with this revision is as follows:

- Section 2.0: A release point for the BV-2 Turbine Building Vent was added (for editorial purposes) to Figure 2.4-2.

The justification used for Change (10) to the ODCM is as follows:

- This change is considered editorial in nature. The change adds an equivalent item that was previously located on BV-2 Technical Specification Figure 5.1-2. Since BV-2 Technical Specification Amendment 83 removed this figure, then the gaseous release point for the BV-2 Turbine Building Vent needed transferred to the ODCM. Therefore, since this change is considered editorial, the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial change will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

(11) BV-1 and 2 ODCM, Issue 3, Revision 4 (Effective March 1998)

A description of the changes that were implemented with this revision are as follows:

- Index: Editorial changes were made for clarity.

- Section 3.0: The distances for the environmental monitoring sample points were revised to show a more accurate measurement from the center of the Unit 1 Containment Building. The actual sample locations and descriptions remain unchanged. Also, the 4 individual quadrant maps showing TLD locations were consolidated into 1 map. This is a Corrective Action to Condition Report CR 980353.

- Section 4.0: Added clarifying statements as to how doses due to radioactive effluents for MEMBERS OF THE PUBLIC conducting activities inside the site boundary are derived and reported. This is a Corrective Action to Condition Report CR 971578.

- Appendix C: Added statements to Action 23 of Table 3.3-12 to clarify that batch liquid releases may also be initiated with the same Action needed for resuming the release. This is a recommendation from the 1997 RETS Self-Assessment. A note was also added to this table to clarify that independent signatures on the discharge permit satisfy the requirement for "two technically qualified members of the Facility Staff independently verify the release rate calculation..." Added Action 29 to RM-GW-108B on Table 3.3-13. This addition ensures consistency with the other 7 continuous gaseous effluent pathway Actions for Noble Gas Monitor inoperability. Added plant specific Mark Numbers for primary and alternate instrumentation to Tables 3.3-13 and 4.3-13 as follows:

  – For Noble Gas Activity Monitors,

    RM-VS-109 Channel 5 was added as an alternate to RM-VS-101B.
    RM-VS-110 Channel 5 was added as an alternate to RM-VS-107B.
    RM-GW-109 Channel 5 was <u>not</u> added as an alternate to RM-GW-108B because it does not perform on auto-isolation of gaseous waste decay tank release upon upper activity alarm.

  – For Particulate Activity Monitors,

    RM-VS-109 Channel 1 was added as an alternate to RM-VS-101A.
    RM-VS-110 Channel 1 was added as an alternate to RM-VS-107A.
    RM-GW-109 Channel 1 was added as an alternate to RM-GW-108A.

- Appendix E: Corrected typographical errors on Table E:6.9-1

- Appendix F: Updated the procedure details for primary and alternate instrumentation included in Appendix C Tables 3.3-13 and 4.3-13. Reduced the amount of detail contained in reference to the Operating Manual L-5 logs so that the position of the surveillance on the logs can be changed without having a need to change the Tables in this Appendix. This is a Corrective Action to Condition Report CR 980129.

11/98

The justification used for Change (11) to the ODCM is as follows:

1. These changes are considered editorial in nature. The changes either correct typographical errors or add editorial details from previously approved station documents. Therefore, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculations.

(12) BV-1 and 2 ODCM Issue 3, Revision 5 (Effective November 1998)

A description of the changes that were implemented with this revision are as follows.

- Index: Editorial changes were made for clarity. (See Justification 1.)
- Section 1.0: Added clarification for calculation of radionuclide concentration when the Post Dose Correction Factor is >1. (See Justification 1).
- Section 3.0: Added an additional site location for the upstream environmental surface water sample. Added additional method after collecting and compositing this sample. (See Justification 2.)
- Appendix C: Revised the definitions for MEMBER(S) OF THE PUBLIC and UNRESTRICTED AREA to ensure compliance with 10 CFR 20.1003. (See Justification 1.) Added a definition for MEMBER(S) OF THE PUBLIC to ensure compliance with 40 CFR 190.02(k). (See Justification 1.) Added plant specific Mark Numbers for primary and alternate instrumentation to Table 3.3-13 that were inadvertently omitted from change (11) to the ODCM. (See Justification 1.) Added clarification to Table 4.11-2 as to where and when H-3 samples of Waste Gas Storage Tanks are to be obtained. This is a Corrective Action to Condition Report CR 981489. (See Justification 1.) Added clarification to note "e" of Table 4.11-2 as to the appropriate ventilation release path. This is a Corrective Action to CR 981490. (See Justification 1.). Corrected an obvious omission on Table 3.12-1 to ensure that 2 TLD's are used for determination of Direct Radiation. (See Justification 1.) Incorporated the appropriate changes to Table 3.12-1 that are described above for Section 3.0. (See Justification 2.)
- Appendix F: Added procedure details from the Chemistry Manual to Table 6. This is a Corrective Action to Condition Report CR 981488. (See Justification 1.)

11/98

The justifications used for Change (12) to the ODCM are as follows:

1. These changes are considered editorial in nature. The changes either correct typographical errors or add editorial details from previously approved station documents. Therefore, these changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculations.

2. These changes involve the upstream environmental surface water sample method and sample site. Since these changes were shown to meet the intent of NUREG-1301, and BVPS-1 and 2 UFSAR's, then the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the change will not adversely impact the accuracy or reliability of effluent dose or alarm setpoint calculations.

Also, a 10 CFR 10.50 safety evaluation has concluded that no unreviewed safety question is involved by adding an additional sample site and sample method. This evaluation is based on the following.

- There is no increase in the probability or consequences of accidents or malfunctions of equipment important to safety.
- There is no creation of a possibility for an accident or malfunction of a different type than any evaluated previously.
- There is no reduction in the margin of safety.

(13) BV-1 and 2 ODCM Issue 3, Revision 6 (Effective May 1999)

A description of the changes that were implemented with this revision is as follows:

- Index: Editorial changes were made for clarity.
- Section 3.0: Updated figure number and table reference. Removed a redundant upstream environmental surface water sampling location.
- Appendix C: Made editorial changes for clarity. Added definitions for SHUTDOWN and STARTUP. Changed definition for ODCM to ensure agreement with definition provided in Unit 1/2 Technical Specification Amendments 220/97. Changed designations for primary and alternate instruments on Tables 3.3-12, 4.3-12, 3.3-13 and 4.3-13 from "P" and "A" to "Pri" and "Alt". Clarified use of the Flow Rate Measurement Devices for the Cooling Tower Blowdown Line on Tables 3.3-12 and 4.3-12 to show that the Unit 1/2 combined instrument [FT-CW-101-1] is the primary and both of the individual Unit 1 and Unit 2 instruments [FT-CW-101] and [2CWS-FT101] are the alternates. Updated Actions 24, 25 and 26 of Table 3.3-12 to describe use of comparable alternate monitoring channels when the primary channels are INOPERABLE. Clarified Table 3.3-13 Action 28 applicability for Unit 2 gaseous effluent monitors. Clarified Table 3.3-13 Action 30 to show that applicability is for batch purges of the reactor containments. Changed reference of Special Report compliance requirement from Technical Specification 6.9.2f to 10 CFR 20.2203 and 10 CFR 50.4 as permitted by Unit 1/2 Technical Specification Amendments 220/97. Clarified note b of Table 4.11-2 regarding sampling and surveillances frequencies. Clarified Controls 3.12.1 and 3.12.2 to ensure compliance with NUREG-1301. 5/99
- Appendix E: Made editorial changes for clarity. Changed reference of Special Report compliance requirement from Technical Specification 6.9.2f to 10 CFR 20.2203 and 10 CFR 50.4 as permitted by Unit 1/2 Technical Specification Amendments 220/97. Changed submittal date of annual REMP report from May 1 to May 15 as permitted by Unit 1/2 Technical Specification Amendments 220/97. Changed column heading in Table E: 6.9-1 to ensure consistency with NUREG-1301.

The justification used for change (13) to the ODCM is as follows:

- All changes are considered editorial in nature. The changes either clarify the intent of the original specification or add equivalent items form the standard guidance document (NUREG-1301) or recent Technical Specification Amendments. Therefore, since these changes are considered editorial, the changes will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a and Appendix I to 10 CFR 50. Also, the editorial changes will not adversely impact the accuracy or reliability of effluent dose or setpoint calculations.

References for ODCM Changes

1. BVPS-1 and 2 UFSAR:

   - BVPS-1 UFSAR Section 11.2.3; Gaseous Waste Disposal System
   - BVPS-1 UFSAR Section 11.2.4; Liquid Waste Disposal System
   - BVPS-2 UFSAR Section 11.2; Liquid Waste Management Systems
   - BVPS-2 UFSAR Section 11.3; Gaseous Waste Management Systems

2. Condition Reports:

   - CR 971578, MEMBERS OF THE PUBLIC Discrepancies
   - CR 980129, ODCM Procedure Matrix Discrepancies
   - CR 980353, EPMP 2.01 Discrepancies for Environmental Sampling Locations
   - CR 981488, Chemistry Related ODCM Procedures and ODCM Appendix F References
   - CR 981489, ODCM Table 4.11-2 Row. A (Waste Gas Storage Tank Discharge Tritium)
   - CR 981490, ODCM Table 4.11-2 Note e, and Related Chemistry Department Procedures
   - CR 990025, Unnecessary Radiation Monitor Setpoint Change After Waste Discharges

5/99

3. DLC Calculation Packages:

   - ERS-ATL-83-027; Liquid Waste Dose Factor Calculation for HPM-RP 6.5, Issue 3 and later
   - ERS-SFL-85-031; Gaseous Effluent Monitor Efficiency Data
   - ERS-ATL-86-008; ODCM Alarm Setpoint Revisions for Gaseous Monitors
   - ERS-HHM-87-014; Unit 1/2 ODCM Gaseous Effluent Monitor Alarm Setpoint Determinations
   - ERS-ATL-87-026; BVPS-1 and BVPS-2 ODCM T Factor Justification
   - ERS-ATL-89-014; Verification/Validation of ODCM R Values
   - ERS-ATL-90-021; Justification for Removal of Technical Specification Process Flowrate Measurement Requirements for 2RMQ-RQ301, 2RMQ-RQ303 and 2HVL-RQ112
   - ERS-ATL-95-006; Re-evaluation of TS/ODCM SR's 4.11.1.1.3, 4.11.1.1.4 and Notes e and g of TS/ODCM Table 4.11-1

4. DLC Letters:

   - ND1SHP:776, BVPS-1 ODCM Table 2.2-2, Appendix B, February 12, 1988
   - ND3NSM:3431; Technical Specification Verification Effort, August 11, 1988

- NDLNSM:3522; Technical Specification Verification Effort Checklist, September 14, 1988
- ND1NSM:3652; Technical Specification Verification Effort, November 21, 1988
- NPD3SHP:2466; Self Assessment of the Liquid and Gaseous Effluent Processes at BVPS - Final Report, July 16, 1997
- NPD3SHP:2257; ODCM Liquid Waste Recirculation Rates, February 11, 1998
- NPD3SHP:2643; Action 28 of ODCM Appendix C Table 3.3-13, January 14, 1999
- ND3MNO:4309; Response to Request for Technical Specification Interpretation, April 20, 1999. 5/99

5. EG&G Technical Evaluation Reports:

- EGG-PHY-8194; Technical Evaluation Report for the Evaluation of ODCM Updated through Issue 2, Revision 1, Beaver Valley Power Station, Unit 1, September 1988
- EGG-PHY-8217; Technical Evaluation Report for the Evaluation of ODCM updated through Issue 1, Revision 2, Beaver Valley Power Station, Unit 2, September 1988

6. NRC Letters:

- Unit 1 Technical Specification Amendment 66, March 28, 1983
- Beaver Valley Unit 2 - Offsite Dose Calculation Manual, ODCM (TAC 63996), July 14, 1987
- Beaver Valley Units 1 and 2 - Acceptance of the Offsite Dose Calculation Manuals (TAC 93996 and 67421), March 2, 1989
- Beaver Valley Power Station Unit Nos. 1 and 2 (TAC M86770 and M86771), Unit 1/2 Technical Specification Amendments 188/70, June 12, 1995
- Beaver Valley Power Station Unit Nos. 1 and 2 (TAC M93588 and M93589), Unit 1/2 Technical Specification Amendments 194/77, November 21, 1995 5/99
- Beaver Valley Power Station Unit Nos. 1 and 2 (TAC M96559 and M96560) Unit 1/2 Technical Specification Amendments 202/83, April 14 1997
- Beaver Valley Power Station, Unit Nos. 1 and 2 (TAC MA3839 and MA3840, Unit 1/2 Technical Specification Amendments 220/97, March 26, 1999

7. NUREG's:

- NUREG 0133; Preparation of Radiological Effluent Technical Specification for Nuclear Power Plants
- NUREG-0172; Age-Specific Radiation Dose Commitment Factors for a One-Year Chronic Intake
- NUREG-0472; Radiological Effluent Technical Specification for PWR's.

- NUREG-1301; Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors (Generic Letter 89-01, Supplement No. 1)

8. Regulatory Guide:

- RG-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.

1.0 LIQUID EFFLUENTS

BV-1 and BV-2 utilize the concept of a shared liquid radioactive waste system according to NUREG 0133. This permits the mixing of liquid radwaste for processing and allocating of dose due to release as defined in Section 1.4. In Section 1.1, effluent monitor setpoints for a conservative mix are based on the individual Units' specific parameters, but effluent monitor setpoints for analysis prior to release permit use of the total dilution flow available at the site.

Differences exist between setpoint presentations of the radiation monitoring systems of BV-1 and BV-2. There is a difference in setpoint terminology. Where BV-1 uses HIGH and HIGH-HIGH, the BV-2 equivalents are ALERT and HIGH. Also, there is the difference that BV-2 setpoints are presented in uCi/ml rather than cpm as in BV-1. This difference is due to BV-2 software which applies a conversion factor to the raw data (cpm). Note that the uCi/ml presentation is technically correct only for the specific isotopic mix used in the determination of the conversion factors. Therefore, BV-2 setpoints determined on analysis prior to release will be correct for properly controlling dose rate, but the indicated uCi/ml value may differ from the actual value.

1.1 Alarm Setpoints

1.1.1 BV-1 Monitor Alarm Setpoint Determination

This procedure determines the monitor HIGH-HIGH Alarm Setpoint that indicates if the concentration of radionuclides in the liquid effluent released from the site to unrestricted areas exceeds 10 times the EC's specified in 10 CFR 20, Appendix B (20.1001-20.2401), Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases or exceeds a concentration of 2E-4 uCi/ml for dissolved or entrained noble gases (see Reference 1.1.5).

The methodology described in Section 1.1.1.2 is an alternative method to be used to determine the (RM-LW-104 or RM-LW-116) monitor HIGH-HIGH Alarm Setpoint (HHSP). The methodology in Section 1.1.1.2 may be used for any batch release and shall be used when the respective total gamma activity concentration of the liquid effluent prior to dilution exceeds 4.26E-3 uCi/ml and 1.49E-2 uCi/ml. This concentration is equivalent to the respective HHSP's derived in Section 1.1.1.1 and allows for respective tritium concentrations up to 4.33E+0 uCi/ml and 1.52E+1 uCi/ml.

1.1.1.1 BV-1 Setpoint Determination Based On A Conservative Mix

The Alarm Setpoints for the liquid monitors should be set at the values listed as follows:

BV-1 LIQUID MONITOR SETPOINTS

		cpm Above Background		
	Monitor	CR	HHSP	HSP
° Liquid Waste Effluent Monitor	RM-LW-104	4.84E+5	4.84E+5	3.39E+5
° Laundry And Contaminated Shower Drains Monitor	RM-LW-116	1.69E+6	1.69E+6	1.19E+6
° Component Cooling/ Recirculation Spray Hx River Water Monitor	RM-RW-100	2.57E+4	2.57E+4	1.80E+4
° Aux Feed Pump Bay Drain Monitor	RM-DA-100	1.22E+4	1.22E+4	8.55E+3

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The setpoints for RM-LW-104 and RM-LW-116 are based on the following conditions, however, the setpoint bases for RM-RW-100 and RM-DA-100 can be found in Reference 1.1.5:

- Source terms given in Table 1.1-1a. These source terms have been generated from the computer code GALE, Revision 0 (NUREG-0017). The inputs to GALE are given in Appendix B.
- Dilution water flow rate of 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2).
- Discharge flow rate prior to dilution of 35 gpm for the Liquid Waste Effluent Monitor (RM-LW-104).
- Discharge flow rate prior to dilution of 15 gpm for the Laundry and Contaminated Shower Drains Monitor (RM-LW-116).

The above setpoints for (RM-LW-104 and RM-LW-116) can be varied based on actual operating conditions resulting in changes in the discharge and dilution flow rates as follows:

$$HHSP = \frac{743\ F}{f} \qquad [1.1(1)\text{-}1]$$

where:

HHSP = Monitor HIGH-HIGH Alarm Setpoint above background (ncpm).

743 = Most restrictive proportionality constant based on nominal flow conditions:
743 = 4.84E+5 ncpm x 35 gpm ÷ 22,800 gpm (RM-LW-104)
1112 = 1.69E+6 ncpm x 15 gpm ÷ 22,800 gpm (RM-LW-116)

F = Dilution water flow rate (gpm), BV-1 plus BV-2 Cooling Tower Blowdown Rate (not including release through the Emergency Outfall Structure).

f = Discharge flow rate prior to dilution (gpm).

1.1.1.1.1 BV-1 Mix Radionuclides

The "mix" (radionuclides and composition) of the liquid effluent was determined as follows:

a. The liquid source terms that are representative of the "mix" of the liquid effluent were determined. Liquid source terms are the radioactivity levels of the radionuclides in the effluent from Table 1.1-1a.

b. The fraction of the total radioactivity in the liquid effluent comprised by radionuclide "i" (S_i) for each individual radionuclide in the liquid effluent was determined as follows:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [1.1(1)\text{-}2]$$

where:

A_i = Annual release of radionuclide "i" (Ci/yr) in the liquid effluent from Table 1.1-1a.

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1.1.1.1.2 BV-1 Maximum Acceptable Concentration (All Radionuclides)

The maximum acceptable total radioactivity concentration (uCi/ml) of all radionuclides in the liquid effluent prior to dilution (C_t) was determined by:

$$C_t = \frac{F}{f \sum_i \frac{S_i}{OEC_i}} \qquad [1.1(1)\text{-}3]$$

where:

F = Dilution water flow rate (gpm), BV-1 plus BV-2 Cooling Tower Blowdown Rate (not including release through the Emergency Outfall Structure).

= 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2)

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

= 35 gpm for Liquid Waste Effluent Monitor (RM-LW-104).

= 15 gpm for Laundry and Contaminated Shower Drains Monitor (RM-LW-116).

OEC_i = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from Table 1.1-1a. The OEC is set at 10 times the new 10 CFR 20, Appendix B (20.1001-20.2401) Table 2, Col. 2 EC values.

S_i = The fraction of total radioactivity attributed to radionuclide "i", from Equation [1.1(1)-2].

1.1.1.1.3 BV-1 Maximum Acceptable Concentration (Individual Radionuclide)

The maximum acceptable radioactivity concentration (uCi/ml) of radionuclide "i" in the liquid effluent prior to dilution (C_i) was determined by:

$$C_i = S_i\, C_t \qquad [1.1(1)\text{-}4]$$

1.1.1.1.4 BV-1 Monitor Count Rate

The calculated monitor count rate (ncpm) above background attributed to the radionuclides, C.R., was determined by:

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$$C.R. = \sum_i C_i\, E_i \qquad [1.1(1)\text{-}5]$$

where:

E_i = Detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from Table 1.1-1a. If not listed there, from Reference 1.1.4.

1.1.1.1.5 BV-1 Monitor HHSP

The monitor HIGH-HIGH Alarm Setpoint above background (ncpm) should be set at the C.R. value. Since only one tank can be released at a time, adjustment of this value is not necessary to compensate for release from more than one source.

1.1.1.2 BV-1 Setpoint Determination Based On Analysis Prior To Release

The following method applies to liquid releases when determining the setpoint for the maximum acceptable discharge flow rate prior to dilution and the associated HIGH-HIGH Alarm Setpoint based on this flow rate for the Liquid Waste Effluent Monitor (RM-LW-104) and the Laundry and Contaminated Shower Drains Monitor (RM-LW-116) during all operational conditions.

The monitor alarm setpoint is set slightly above (a factor of 1.25) the count rate that results from the concentration of gamma emitting radionuclides in order to avoid spurious alarms. To compensate for this increase in the monitor alarm setpoint, the allowable discharge flow rate is reduced by the same factor.

When the discharge flow rate is limited by the radwaste discharge pump rate capacity or by administrative selection rather than the allowable flow rate determined form activity concentration, the alarm setpoint will be proportionally adjusted based upon the excess dilution factor provided.

1.1.1.2.1 BV-1 Maximum Acceptable Discharge Flow Rate

The maximum acceptable discharge flow rate (f) prior to dilution (gpm) is determined by:

$$f = \frac{F}{1.25 \sum_i \frac{C_i}{OEC_i}} \qquad [1.1(1)\text{-}6]$$

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where:

F = Dilution water flow rate, BV-1 plus BV-2 Cooling Tower Blowdown (gpm).

The dilution water flow rate may include the combined cooling tower blowdown flow from both units exiting the discharge structure (but excluding emergency outfall structure flow) when simultaneous liquid discharges are administratively prohibited.

C_i = Radioactivity concentration of radionuclide "i" in the liquid effluent prior to dilution (uCi/ml) from analysis of the liquid effluent to be released.

1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

OEC_i = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from Table 1.1-1a. The OEC is set at 10 times the new 10 CFR 20, Appendix B (20.1001-20.2401) Table 2, Col. 2 EC values.

1.1.1.2.2 BV-1 Monitor Count Rate

The calculated monitor count rate (ncpm) above background attributed to the radionuclides (C.R.) is determined by:

$$C.R. = 1.25 \sum_i C_i E_i \qquad [1.1(1)\text{-}7]$$

where:

E_i = The detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from Table 1.1-1a. If not listed there, from Reference 1.1.4.

1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

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1.1.1.2.3 BV-1 Monitor HHSP

The liquid effluent monitor HIGH-HIGH Alarm Setpoint above background (ncpm) should be set at the C.R. value adjusted by any excess dilution factor provided as defined in the following equation:

$$HHSP = C.R. \frac{f}{f'} \qquad [1.1(1)\text{-}8]$$

where:

HHSP = Monitor HIGH-HIGH Alarm Setpoint above background.

C.R. = Calculated monitor count rate (ncpm) from equation [1.1(1)-7].

f = Maximum acceptable discharge flow rate prior to dilution determined by equation [1.1(1)-6].

f' = Actual maximum discharge flow rate, to be maintained for the discharge. The reduced value of f may be due to pump limitations or administrative selection.

1.1.2 BV-2 Monitor Alarm Setpoint Determination

This procedure determines the monitor HIGH Alarm Setpoint that indicates if the concentration of radionuclides in the liquid effluent released from the site to unrestricted areas exceeds 10 times the EC's specified in 10 CFR 20, Appendix B (20.1001-20.2401), Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases or exceeds a concentration of 2E-4 uCi/ml for dissolved or entrained noble gases (see Reference 1.2.6).

The methodology described in Section 1.1.2.2 is an alternative method to be used to determine the (2SGC-RQ100) monitor HIGH Alarm Setpoint (HSP). The methodology in Section 1.1.2.2 may be used for any batch release and shall be used when the total gamma radioactivity concentration of the liquid effluent prior to dilution exceeds 9.55E-4 uCi/ml. This concentration is equivalent to a monitor response and HIGH Alarm Setpoint derived in Section 1.1.2.1 and allows for a tritium concentration of up to 2.19E+0 uCi/ml. The setpoint was obtained by use of a conversion factor of 5.09E-9 uCi/ml/cpm determined for the nuclide mix (see Reference 1.2.5).

1.1.2.1 BV-2 Setpoint Determination Based On A Conservative Mix

The HIGH Alarm Setpoint for the liquid monitors should be set at the values listed as follows:

BV-2 LIQUID MONITOR SETPOINTS

		uCi/ml Above Background		
	Monitor	DV	HSP	ASP
° Liquid Waste Effluent Monitor	2SGC-RQ100	9.84E-4	9.84E-4	6.89E-4
° Service Water Monitor	2SWS-RQ101	4.28E-5	4.28E-5	2.99E-5
° Service Water Monitor	2SWS-RQ102	4.28E-5	4.28E-5	2.99E-5

The setpoint for 2SGC-RQ100 is based on the following conditions, however, the setpoint bases for 2SWS-RQ101 and 2SWS-RQ102 can be found in Reference 1.2.6:

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- ° Source terms given in Table 1.1-1b. These source terms have been generated by using models and input similar to NUREG-0017. The inputs are given in Appendix B.
- ° Dilution water flow rate of 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2).
- ° Discharge flow rate prior to dilution of 80 gpm for the Liquid Waste Effluent Monitor (2SGC-RQ100).
- ° A software conversion factor of 5.09E-9 uCi/ml/cpm associated with Liquid Waste Effluent Monitor (2SGC-RQ100).

The above setpoint for (2SGC-RQ100) can be varied based on actual operating conditions resulting in the discharge and dilution flow rates as follows:

$$HSP = \frac{3.50E\text{-}6\ F}{f} \qquad [1.1(2)\text{-}1]$$

where:

HSP = Monitor HIGH Alarm Setpoint (uCi/ml) above background.

3.50E-6 = Proportionality constant based on nominal flow conditions:
3.50E-6 = 9.98E-4 net uCi/ml x 80 gpm ÷ 22,800 gpm

F = Dilution water flow rate, BV-1 plus BV-2 Cooling Tower Blowdown Rate (gpm).

f = Discharge flow rate prior to dilution (gpm).

1.1.2.1.1 BV-2 Mix Radionuclides

The "mix" (radionuclides and composition) of the liquid effluent was determined as follows:

a. The liquid source terms that are representative of the "mix" of the liquid effluent were determined. Liquid source terms are the radioactivity levels of the radionuclides in the effluent from Table 1.1-1b.

b. The fraction of the total radioactivity in the liquid effluent comprised by radionuclide "i" (S_i) for each individual radionuclide in the liquid effluent was determined as follows:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [1.1(2)\text{-}2]$$

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where:

A_i = Annual release of radionuclide "i" (Ci/yr) in the liquid effluent from Table 1.1-1b.

1.1.2.1.2 BV-2 Maximum Acceptable Concentration (All Radionuclides)

The maximum acceptable total radioactivity concentration (uCi/ml) of all radionuclides in the liquid effluent prior to dilution (C_t) was determined by:

$$C_t = \frac{F}{f \sum_i \frac{S_i}{OEC_i}} \qquad [1.1(2)\text{-}3]$$

where:

F = Dilution water flow rate (gpm), BV-1 plus BV-2 Cooling Tower Blowdown Rate (not including release out through the Emergency Outfall Structure).

= 22,800 gpm = (15,000 gpm BV-1 + 7,800 gpm BV-2).

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

= 80 gpm for Liquid Waste Process Effluent Monitor (2SGC-RQ100).

OEC_i = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from Table 1.1-1b. The OEC is set at 10 times the new 10 CFR 20, Appendix B (20.1001-20.2401) Table 2, Col. 2 EC values.

S_i = The fraction of total radioactivity attributed to radionuclide "i", from Equation [1.1(2)-2].

1.1.2.1.3 BV-2 Maximum Acceptable Concentration (Individual Radionuclide)

The maximum acceptable radioactivity concentration (uCi/ml) of radionuclide "i" in the liquid effluent prior to dilution (C_i) was determined by:

$$C_i = S_i \, C_t \qquad [1.1(2)-4]$$

1.1.2.1.4 BV-2 Monitor Display Value

The calculated monitor Display Value (uCi/ml) above background attributed to the radionuclides, D.V., was determined by:

$$D.V. = 5.09E\text{-}9 \sum_i C_i \, E_i \qquad [1.1(2)-5]$$

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where:

5.09E-9 = Conversion factor (uCi/ml/cpm), an average determined for the source term mix.

E_i = Detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from Table 1.1-1b.

1.1.2.1.5 BV-2 Monitor HSP

The monitor HIGH Alarm Setpoint above background (uCi/ml) should be set at the D.V. value.

1.1.2.2 BV-2 Setpoint Determination Based On Analysis Prior To Release

The following method applies to liquid releases when determining the setpoint for the maximum acceptable discharge flow rate prior to dilution and the associated HIGH Alarm Setpoint based on this flow rate for the Liquid Waste Effluent Monitor (2SGC-RQ100) during all operational conditions.

The monitor alarm setpoint is set slightly above (a factor of 1.25) the concentration reading that results from the concentration of gamma emitting radionuclides in order to avoid spurious alarms. To compensate for this increase in the monitor alarm setpoint, the allowable discharge flow rate is reduced by the same factor.

When the discharge flow rate is limited by the radwaste discharge pump rate capacity or by administrative selection rather than the allowable flow rate determined form activity concentration, the alarm setpoint will be proportionally adjusted based upon the excess dilution factor provided. 8/95

1.1.2.2.1 BV-2 Maximum Acceptable Discharge Flow Rate

The maximum acceptable discharge flow rate (f) prior to dilution (gpm) is determined by:

$$f = \frac{F}{1.25 \sum_i \frac{C_i}{OEC_i}} \qquad [1.1(2)\text{-}6]$$

where:

F = Dilution water flow rate, BV-1 plus BV-2 Cooling Tower Blowdown (gpm).

The dilution water flow rate may include the combined cooling tower blowdown flow from both units exiting the discharge structure (but excluding emergency outfall structure flow) when simultaneous liquid discharges from both plants are administratively prohibited.

C_i = Radioactivity concentration of radionuclide "i" in the liquid effluent prior to dilution (uCi/ml) from analysis of the liquid effluent to be released.

1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

OEC_i = The ODCM liquid effluent concentration limit for radionuclide "i" (uCi/ml) from Table 1.1-1b. The OEC is set at 10 times the new 10 CFR 20, Appendix B (20.1001-20.2401) Table 2, Col. 2 EC values.

1.1.2.2.2 BV-2 Monitor Display Value

The calculated monitor Display Value (uCi/ml) above background attributed to the radionuclides (D.V.) is determined by:

$$D.V. = (1.25)\ (5.09E\text{-}9)\ \sum_i C_i\ E_i \qquad [1.1(2)\text{-}7]$$

where:

E_i = The detection efficiency of the monitor for radionuclide "i" (cpm/uCi/ml) from Table 1.1-1b. If not listed there, from Reference 1.2.4.

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1.25 = A factor to prevent spurious alarms caused by deviations in the mixture of radionuclides which affect the monitor response.

5.09E-9 = Conversion factor (uCi/ml/cpm), an average determined for the source term mix.

1.1.2.2.3 BV-2 Monitor HSP

The liquid effluent monitor HIGH Alarm Setpoint above background (uCi/ml) should be set at the D.V. value adjusted by any excess dilution factor provided as defined in the following equation:

$$HSP = D.V.\ \frac{f'}{f} \qquad [1.1(2)\text{-}8]$$

where:

HSP = Monitor HIGH Alarm Setpoint above background.

D.V. = Calculated monitor concentration reading (uCi/ml) from equation [1.1(2)-7].

f = Maximum acceptable discharge flow rate prior to dilution determined by equation [1.1(2)-6].

f' = Actual maximum discharge flow rate, to be maintained for the discharge. The reduced value of f may be due to pump limitations or administrative selection.

TABLE 1.1-1a

BV-1 LIQUID SOURCE TERM

NUCLIDE	A_i ANNUAL RELEASE (Ci)**	OEC_i (uCi/ml)***	E_i DETECTION EFFICIENCY (cpm/uCi/ml)****
Cr-51	9.00E-5	5E-3	1.18E+7
Mn-54	2.00E-5	3E-4	8.59E+7
Fe-55	8.00E-5	1E-3	*****
Fe-59	5.00E-5	1E-4	9.17E+7
Co-58	7.70E-4	2E-4	1.16E+8
Co-60	1.00E-4	3E-5	1.73E+8
Np-239	5.00E-5	2E-4	8.49E+7
Br-83	6.00E-5	9E-3	1.36E+6
Rb-86	1.00E-5	7E-5	*****
Sr-89	2.00E-5	8E-5	*****
Sr-91	1.00E-5	2E-4	6.97E+7
Mo-99	3.90E-3	2E-4	2.84E+7
Tc-99m	5.37E-3	1E-2	8.96E+7
Te-127m	1.00E-5	9E-5	4.09E+4
Te-127	3.00E-5	1E-3	1.38E+6
Te-129m	7.00E-5	7E-5	4.02E+6
Te-129	5.00E-5	4E-3	1.12E+7
I-130	2.50E-4	2E-4	3.08E+8
Te-131m	9.00E-5	8E-5	1.82E+8
Te-131	2.00E-5	8E-4	1.20E+8
I-131	6.03E-2	1E-5	1.11E+8
Te-132	1.15E-3	9E-5	1.17E+8
I-132	5.38E-3	1E-3	2.66E+8
I-133	5.77E-2	7E-5	9.90E+7
I-134	1.00E-5	4E-3	2.70E+8
Cs-134	3.80E-3	9E-6	1.99E+8
I-135	1.34E-2	3E-4	1.19E+8
Cs-136	1.90E-3	6E-5	2.80E+8
Cs-137	2.70E-3	1E-5	8.01E+7
Ba-140	1.00E-5	8E-5	4.37E+7
La-140	1.00E-5	9E-5	2.00E+8
H-3	1.60E+2	1E-2	*****
All Others*	4.00E-5	1E-7	*****
TOTAL*	1.57E-1		

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*Excluding Tritium and Entrained Noble Gases
**Source Term for (RM-LW-104 and RM-LW-116) from Reference (1.1.2)
***ODCM Effluent Concentration Limit = 10 times the EC values of Reference (1.1.3)
****Detection Efficiency for (RM-LW-104 and RM-LW-116) from Reference (1.1.4)
*****Insignificant

TABLE 1.1-1b

BV-2 LIQUID SOURCE TERM

NUCLIDE	A_i ANNUAL RELEASE (Ci)***	OEC_i (uCi/ml)**	E_i DETECTION EFFICIENCY (cpm/uCi/ml)****
Cr-51	1.00E-4	5E-3	2.01E+7
Mn-54	2.50E-5	3E-4	1.27E+8
Fe-55	1.30E-4	1E-3	*****
Fe-59	6.50E-5	1E-4	1.26E+8
Co-58	1.10E-3	2E-4	1.82E+8
Co-60	1.60E-4	3E-5	2.38E+8
Np-239	3.20E-5	2E-4	1.65E+8
Br-83	2.90E-5	9E-3	2.42E+6
Br-84	5.90E-9	4E-3	1.38E+8
Rb-86	3.70E-5	7E-5	1.04E+7
Sr-89	2.20E-5	8E-5	1.83E+4
Sr-90	8.50E-7	5E-6	*****
Sr-91	5.30E-6	2E-4	1.04E+8
Mo-99	2.30E-3	2E-4	4.47E+7
Tc-99m	2.10E-3	1E-2	1.40E+8
Te-125m	1.90E-6	2E-4	3.94E+5
Te-127m	2.10E-5	9E-5	1.26E+5
Te-127	2.50E-5	1E-3	2.43E+6
Te-129m	8.20E-5	7E-5	6.53E+6
Te-129	5.30E-5	4E-3	1.96E+7
I-130	2.30E-4	2E-4	5.18E+8
Te-131m	5.20E-5	8E-5	2.85E+8
Te-131	9.40E-6	8E-4	1.88E+8
I-131	1.00E-1	1E-5	1.96E+8
Te-132	7.80E-4	9E-5	1.76E+8
I-132	2.30E-3	1E-3	4.22E+8
I-133	6.50E-2	7E-5	1.73E+8
I-134	4.60E-6	4E-3	4.06E+8
Cs-134	3.00E-2	9E-6	3.25E+8
I-135	9.20E-3	3E-4	1.71E+8
Cs-136	3.90E-3	6E-5	4.28E+8
Cs-137	2.20E-2	1E-5	1.28E+8
Ba-140	9.30E-6	8E-5	7.50E+7
La-140	8.40E-6	9E-5	3.08E+8

*Excluding Tritium and Entrained Noble Gses

**ODCM Effluent Concentration Limit = 10 times the EC values of Reference (1.2.1)

***Source Term for (2SGC-RQ100) from Reference (1.2.3)

****Detection Efficiency for (2SGC-RQ100) from References (1.2.2) and (1.2.4)

*****Insignificant

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TABLE 1.1-1b (continued)

BV-2 LIQUID SOURCE TERM

NUCLIDE	A_i ANNUAL RELEASE (Ci)***	OEC_i (uCi/ml)**	E_i DETECTION EFFICIENCY (cpm/uCi/ml)****
Y-90	6.00E-7	7E-5	*****
Y-91m	3.60E-6	2E-2	1.59E+8
Y-91	4.40E-6	8E-5	3.55E+5
Y-93	3.00E-7	2E-4	2.03E+7
Zr-95	4.00E-6	2E-4	1.35E+8
Nb-95	4.00E-6	3E-4	1.33E+8
Ru-103	2.70E-6	3E-4	1.71E+8
Ru-106	8.20E-7	3E-5	*****
Rh-103m	2.70E-6	6E-2	*****
Rh-106	8.20E-7	---	5.65E+7
Ce-141	4.00E-6	3E-4	7.75E+7
Ce-143	8.60E-7	2E-4	1.20E+8
Ce-144	2.60E-6	3E-5	1.87E+7
Pr-143	2.30E-6	2E-4	1.63E+0
Pr-144	2.60E-6	6E-3	3.40E+6
H-3	5.50E+2	1E-2	*****
TOTAL*	2.40E-1		

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*Excluding Tritium and Entrained Noble Gses
**ODCM Effluent Concentration Limit = 10 times the EC values of Reference (1.2.1)
***Source Term for (2SGC-RQ100) from Reference (1.2.3)
****Detection Efficiency for (2SGC-RQ100) from References (1.2.2) and (1.2.4)
*****Insignificant

REFERENCES

BV-1 LIQUID EFFLUENT MONITOR SETPOINTS

1.1.1 "Beaver Valley Power Station, Appendix I Analysis - Docket No. 50-334 and 50-412"; Table 2.1.3

1.1.2 "Beaver Valley Power Station, Appendix I Analysis - Docket No. 50-334 and 50-412"; Table 2.1.2

1.1.3 10 CFR 20, Appendix B, (20.1001-20.2401) Table 2, Column 2 EC's

1.1.4 Isotopic Efficiencies For Unit 1 Liquid Process Monitors; DLCo Calculation Package No. ERS-SFL-92-039

1.1.5 Process Alarm Setpoints For Liquid Effluent Monitors; DLCo Calculation Packge No. ERS-ATL-93-021

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REFERENCES

BV-2 LIQUID EFFLUENT MONITOR SETPOINTS

1.2.1 10 CFR 20, Appendix B, (20.1001-20.2401) Table 2, Column 2 EC's

1.2.2 Unit 2 DRMS Isotopic Efficiencies; DLCo Calculation Package No. ERS-SFL-86-026

1.2.3 Stone and Webster Computer Code LIQ1BB; "Normal Liquid Releases From A Pressurized Water Reactor"

1.2.4 Isotopic Efficiencies For 2SGC-RQI100; DLCo Calculation Package No. ERS-JWW-87-015

1.2.5 Conversion Factor for 2SGC-RQI100; DLCo Calculation Package No. ERS-WFW-87-021

1.2.6 Process Alarm Setpoints For Liquid Effluent Monitors; DLCo Calculation Packge No. ERS-ATL-93-021

1.2 Compliance With 10 CFR 20 EC Limits (ODCM Appendix C CONTROL 3.11.1.1)

1.2.1 Batch Releases

1.2.1.1 Pre-Release

The radioactivity content of each batch release will be determined prior to release in accordance with ODCM Appendix C, Table 4.11-1. In order to assure representative samples, at least two tank volumes of entrained fluid from each tank to be discharged shall be recirculated through the mixing eductors. This will be accomplished by recirculating the tank contents for at least the time periods indicated in Table 1.2-1a and 1.2-1b. BV-1 and BV-2 will show compliance with ODCM Appendix C CONTROL 3.11.1.1 in the following manner:

The activity of the various radionuclides in the batch release, determined in accordance with ODCM Appendix C, Table 4.11-1, is divided by the minimum dilution flow to obtain the concentration at the unrestricted area. This calculation is shown in the following equation:

$$Conc_i = \frac{C_i\ R}{MDF} \qquad [1.2\text{-}1]$$

where:

$Conc_i$ = Concentration of radionuclide "i" at the unrestricted area (uCi/ml).

C_i = Concentration of radionuclide "i" in the potential batch release (uCi/ml).

R = Release rate of the batch (gpm).

MDF = Minimum dilution flow (gpm). (May be combined BV-1/BV-2 flow when simultaneous liquid discharges are administratively prohibited).

The projected concentrations in the unrestricted area are compared to the OEC's. Before a release is authorized, Expression [1.2-2] must be satisfied.

$$\Sigma_i\ (Conc_i/OEC_i) \leq 1 \qquad [1.2\text{-}2]$$

where:

OEC_i = The ODCM effluent concentration limit of radionuclide "i" (uCi/ml) from Table 1.1-1a and 1.1-1b. The OEC is set at 10 times the new 10 CFR 20, Appendix B, (20.1001-20.2401) Table 2, Col. 2 EC values.

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1.2.1.2 Post-Release

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Following release from the batch tank, the Post Dose Correction Factor will be calculated in the following manner:

$$PDCF = \frac{(VA_t)/(DFA)}{(VI_t)/(DFI)} \quad [1.2\text{-}3]$$

where:

PCDF = Post Dose Correction Factor.

VAt = Actual Volume of tank released (gal).

DFA = Actual dilution flow during release (gpm).

VIt = Initial volume authorized for release (gal).

DFI = Initial dilution flow authorized for release (gpm).

The concentration of each radionuclide following release from the batch tank will be calculated in the unrestricted area in the following manner when the Post Dose Correction Factor shown in equation [1.2-3] is >1:

The average activity of radionuclide "i" during the time period of release is divided by the actual dilution flow during the period of release to obtain the concentration in the unrestricted area. This calculation is shown in the following equation:

(11/98)

$$Conc_{ik} = \frac{C_{ik}\ V_{tk}}{ADF_k} \quad [1.2\text{-}4]$$

where:

$Conc_{ik}$ = The concentration of radionuclide "i" (uCi/ml) at the unrestricted area, during the release period of time k.

Note: = Since discharge is from an isolated well-mixed tank at essentially a uniform rate, the difference between average and peak concentration within any discharge period is minimal.

C_{ik} = Concentration of radionuclide "i" (uCi/ml) in batch release during time period k.

V_{tk} = Volume of tank released during time period k (gal).

ADF_k = Actual volume of dilution flow during the time period of release k (gal).

To show compliance with ODCM Appendix C CONTROL 3.11.1.1, the following relationship must hold:

(11/98)

$$\Sigma_i(Conc_{ik}/OEC_i) \leq 1 \quad [1.2\text{-}5]$$

1.2.2 Continuous Releases

Continuous releases of liquid effluents do not presently occur at BV-1 or BV-2. If they did occur, the concentration of various radionuclides in the unrestricted area would be calculated using Equation [1.2-1] with C_{ik}, the concentration of isotope i in the continuous release. To show compliance with ODCM Appendix C CONTROL 3.11.1.1, Expression [1.2-5] must again hold.

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TABLE 1.2-1a

BV-1 RECIRCULATION TIMES REQUIRED BEFORE SAMPLING OF LIQUID DISCHARGE TANKS

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TANK DESCRIPTION	MARK NO.	APPROXIMATE RECIRCULATION TIME* (Based on Historical Recirc.Rates)
Laundry And Contaminated Shower Drain Tanks	1LW-TK-6A/6B	2.5 hrs = (1200 gal)(2)/(16 gpm)
Low Level Waste Drain Tanks	1LW-TK-3A/3B	1.5 hrs = (2000 gal)(2)/(45 gpm)
High Level Waste Drain Tanks**	1LW-TK-2A/2B	3.4 hrs = (5000 gal)(2)/(50 gpm)
Evaporator Test Tanks	1LW-TK-5A/5B	1.4 hrs = (3000 gal)(2)/(73 gpm)
Steam Generator Drain Tanks	1LW-TK-7A/7B	17.2 hrs =(35000 gal)(2)/(68 gpm)
Boron Recovery Test Tanks	1BR-TK-2A/2B	9.7 hrs =(13,000 gal)(2)/(45 gpm)

5/97

* The times listed are those approximated for two recirculations of a full tank with one recirculation pump in operation (using historical recirculation rates). Partially full tank recirculation times are directly proportional to the fraction of the tank capacity occupied by the entrained liquid waste after isolation. Actual recirculation times are determined prior to sampling using actual tank volumes and actual recirculation rates available in the BV-1 Control Room.

** Not normally a direct source of discharge.

TABLE 1.2-1b

BV-2 RECIRCULATION TIMES REQUIRED BEFORE SAMPLING OF LIQUID DISCHARGE TANKS

TANK DESCRIPTION	MARK NO.	APPROXIMATE RECIRCULATION TIME* (Based on Historical Recirc. Rates)
Liquid Waste Tanks	2LWS-TK21A/21B	11.5 hrs = (10,000 gal)(2)/(29 gpm)
Steam Generator Blowdown Hold Tanks	2SGC-TK21A/21B	25.8 hrs = (51,000 gal)(2)/(66 gpm)
Steam Generator Blowdown Test Tanks	2SGC-TK23A/23B	9.1 hrs = (18,000 gal)(2)/(66 gpm)

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* The times listed are those approximated for two recirculations of a full tank with one recirculation pump in operation (using historical recirculation rates). Partially full tank recirculation times are directly proportional to the fraction of the tank capacity occupied by the entrained liquid waste after isolation. Actual recirculation times are determined prior to sampling using actual tank volumes and actual recirculation rates available in the BV-2 Control Room.

1.3 Compliance With 10 CFR 50 Dose Limits (ODCM Appendix C CONTROLS 3.11.1.2 And 3.11.1.3)

BV-1 and 2 utilize the concept of a shared liquid radioactive waste system according to NUREG 0133. This permits mixing of the liquid radwaste for processing. Since the resulting effluent release cannot accurately be ascribed to a specific reactor unit, the treated effluent releases are allocated as defined below.

1.3.1 Cumulation Of Doses (ODCM Appendix C CONTROL 3.11.1.2)

The dose contribution from the release of liquid effluents will be calculated monthly for each batch release during the month and a cumulative summation of the total body and organ doses will be maintained for each calendar month, current calendar quarter, and the calendar year to date. The dose contribution will be calculated using the following equation:

$$D\tau = UAF \sum_i A_{i\tau} \sum_{k=1}^{m} \Delta t_k \, C_{ik} \, F_k \qquad [1.3\text{-}1]$$

where:

$D\tau$ = The cumulative dose commitment to the total body or any organ, τ, from the liquid effluents for the total time period $\sum_{k=1}^{m} \Delta t_k$ (mrem)

Δt_k = The length of the kth release over which C_{ik} and F_k are averaged for all liquid releases (hours).

C_{ik} = The average concentration of radionuclide, "i" (uCi/ml), in undiluted liquid effluent during time period Δt_k from any liquid release.

$A_{i\tau}$ = The site related ingestion dose commitment factor to the total body or any organ τ for each identified principal gamma and beta emitter (mrem-ml per hr-uCi).

m = Number of releases contributing to the cumulative dose, D_τ.

UAF = Unit allocation factor. Provides apportionment of dose between BV-1 and BV-2. Normally set at 0.5 for each unit. (Must total to 1.0).

F_k = The near field average dilution factor for C_{ik} during any liquid effluent release. Defined as the ratio of the average undiluted liquid waste flow to the product of the average flow from the site discharge structure during the report period to unrestricted receiving waters, times 3. (3 is the site specific applicable factor for the mixing effect of the BV-1 and BV-2 discharge structure).

$$= \frac{\text{Waste Flow}}{(3)(\text{Dilution Water Flow})}$$

The site specific applicable factor of 3 results in a conservative estimate of the near field dilution factor based upon Regulatory Guide 1.113 methodology and is a factor of 10 below the limit specified in NUREG-0133, Section 4.3.

The dose factor $A_{i\tau}$ was calculated for an adult for each isotope using the following equation from NUREG-0133.

$$A_{i\tau} = 1.14E5\ (730/D_w + 21BF_i)DF_{i\tau} \qquad [1.3\text{-}2]$$

where:

$1.14E5 = 1E6\ \frac{pCi}{uCi} \times 1E3\ \frac{ml}{l} \times \frac{1\ yr}{8760\ hr}$

730 = Adult water consumption rate (liters/yr).

D_w = Far field dilution factor from the near field area within 1/4 mile of the release point to the potable water intake for adult water consumption.

21 = Adult fish consumption (kg/yr).

BF_i = Bioaccumulation factor for radionuclide "i" in fish from Table A-1 of Regulatory Guide 1.109 Rev. 1 (pCi/kg per pCi/l). However, if data was not available from that reference, it was obtained from Table 6 of UC RL-50564, Revision 1.

The bioaccumulation factor for niobium (300 pCi/kg per pCi/l) was not obtained from either of the above references noted. It was otained from IAEA Safety Series No. 57. Justification for use of this value is documented in Appendix A to Calculation Package No. ERS-ATL-83-027.

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$DF_{i\tau}$ = Dose conversion factor for radionuclide "i" for adults for a particular organ τ from Table E-11 of Regulatory Guide 1.109, Rev. 1 (mrem/pCi). If none, from NUREG-0172 or Regulatory Guide 1.109, Rev. 0.

A table of $A_{i\tau}$ values for an adult at BV-1 and BV-2 are presented in Table 1.3-1.

The far field dilution factor (D_w) for BV-1 and BV-2 is 200. This value is based on a total dilution factor of 600 applicable to the Midland water intake located 1.3 miles downstream and on the opposite bank from BV-1 and BV-2 (i.e., 200 = 600 ÷ 3). The total dilution factor of 600 represents a conservative fully mixed annual average condition. Since the Midland intake is located on the opposite bank and is below the water surface, essentially fully mixed conditions would have to exist for the radioactive effluent to be transported to the intake.

The cumulative doses (from each reactor unit) for a calendar quarter and a calendar year are compared to ODCM Appendix C CONTROL 3.11.1.2 as follows:

For the calendar quarter,

$$D_\tau \leq 1.5 \text{ mrem total body} \qquad [1.3\text{-}3]$$

$$D_\tau \leq 5 \text{ mrem any organ} \qquad [1.3\text{-}4]$$

For the calendar year,

$$D_\tau \leq 3 \text{ mrem total body} \qquad [1.3\text{-}5]$$

$$D_\tau \leq 10 \text{ mrem any organ} \qquad [1.3\text{-}6]$$

If any of the limits in Expressions [1.3-3] through [1.3-6] are exceeded, a Special Report pursuant to both Section IV.A of Appendix I of 10 CFR 50 and Technical Specification 6.9.2f must be filed with the NRC at the identified locations.

1.3.2 Projection Of Doses (ODCM Appendix C CONTROL 3.11.1.3)

Doses due to liquid releases shall be projected at least once per 31 days in accordance with ODCM Appendix C CONTROL 3.11.1.3 and this section. The Liquid Radwaste Treatment System shall be used to reduce the radioactive materials in each liquid waste batch prior to its discharge, when the projected doses due to liquid effluent releases from each reactor unit, when averaged over 31 days would exceed 0.06 mrem to the total body or 0.2 mrem to any organ. Doses used in the projection are obtained according to equation [1.3-1]. The 31-day dose projection shall be performed according to the following equations:

When including pre-release data,

$$D_{31} = \left[\frac{A + B}{T}\right] 31 + C \qquad [1.3\text{-}7]$$

When not including pre-release data,

$$D_{31} = \left[\frac{A}{T}\right] 31 + C \qquad [1.3\text{-}8]$$

where:

D_{31} = Projected 31 day dose (mrem).
A = Cumulative dose for quarter (mrem).
B = Projected dose from this release (mrem).
T = Current days into quarter.
C = Value which may be used to anticipate plant trends (mrem).

TABLE 1.3-1

A_{it} VALUES FOR THE ADULT FOR THE BEAVER VALLEY SITE
(mrem/hr per uCi/ml)

NUCLIDE	BONE	LIVER	T-BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E-01	2.70E-01	2.70E-01	2.70E-01	2.70E-01	2.70E-01	2.70E-01
C-14	3.13E 04	6.26E 03	6.26E 03	6.26E 03	6.26E 03	6.26E 03	6.26E 03
Na-24	4.08E 02	4.08E 02	4.08E 02	4.08E 02	4.08E 02	4.08E 02	4.08E 02
P-32	4.62E 07	2.87E 06	1.79E 06	0.00E-01	0.00E-01	0.00E-01	5.19E 06
Cr-51	0.00E-01	0.00E-01	1.27E 00	7.62E-01	2.81E-01	1.69E 00	3.21E 02
Mn-54	0.00E-01	4.38E 03	8.35E 02	0.00E-01	1.30E 03	0.00E-01	1.34E 04
Mn-56	0.00E-01	1.10E 02	1.95E 01	0.00E-01	1.40E 02	0.00E-01	3.52E 03
Fe-55	6.59E 02	4.56E 02	1.06E 02	0.00E-01	0.00E-01	2.54E 02	2.61E 02
Fe-59	1.04E 03	2.45E 03	9.38E 02	0.00E-01	0.00E-01	6.83E 02	8.15E 03
Co-57	0.00E-01	2.10E 01	3.50E 01	0.00E-01	0.00E-01	0.00E-01	5.33E 02
Co-58	0.00E-01	8.95E 01	2.01E 02	0.00E-01	0.00E-01	0.00E-01	1.81E 03
Co-60	0.00E-01	2.57E 02	5.67E 02	0.00E-01	0.00E-01	0.00E-01	4.83E 03
Ni-63	3.12E 04	2.16E 03	1.05E 03	0.00E-01	0.00E-01	0.00E-01	4.51E 02
Ni-65	1.27E 02	1.65E 01	7.51E 00	0.00E-01	0.00E-01	0.00E-01	4.17E 02
Cu-64	0.00E-01	1.00E 01	4.70E 00	0.00E-01	2.52E 01	0.00E-01	8.53E 02
Zn-65	2.32E 04	7.37E 04	3.33E 04	0.00E-01	4.93E 04	0.00E-01	4.64E 04
Zn-69	4.93E 01	9.43E 01	6.56E 00	0.00E-01	6.13E 01	0.00E-01	1.42E 01
Br-83	0.00E-01	0.00E-01	4.04E 01	0.00E-01	0.00E-01	0.00E-01	5.82E 01
Br-84	0.00E-01	0.00E-01	5.24E 01	0.00E-01	0.00E-01	0.00E-01	4.11E-04
Br-85	0.00E-01	0.00E-01	2.15E 00	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Rb-86	0.00E-01	1.01E 05	4.71E 04	0.00E-01	0.00E-01	0.00E-01	1.99E 04
Rb-88	0.00E-01	2.90E 02	1.54E 02	0.00E-01	0.00E-01	0.00E-01	4.00E-09
Rb-89	0.00E-01	1.92E 02	1.35E 02	0.00E-01	0.00E-01	0.00E-01	1.12E-11
Sr-89	2.22E 04	0.00E-01	6.39E 02	0.00E-01	0.00E-01	0.00E-01	3.57E 03
Sr-90	5.48E 05	0.00E-01	1.34E 05	0.00E-01	0.00E-01	0.00E-01	1.58E 04
Sr-91	4.10E 02	0.00E-01	1.65E 01	0.00E-01	0.00E-01	0.00E-01	1.95E 03
Sr-92	1.55E 02	0.00E-01	6.72E 00	0.00E-01	0.00E-01	0.00E-01	3.08E 03
Y-90	5.80E-01	0.00E-01	1.55E-02	0.00E-01	0.00E-01	0.00E-01	6.15E 03
Y-91m	5.48E-03	0.00E-01	2.12E-04	0.00E-01	0.00E-01	0.00E-01	1.61E-02
Y-91	8.50E 00	0.00E-01	2.27E-01	0.00E-01	0.00E-01	0.00E-01	4.68E 03
Y-92	5.09E-02	0.00E-01	1.49E-03	0.00E-01	0.00E-01	0.00E-01	8.92E 02
Y-93	1.62E-01	0.00E-01	4.46E-03	0.00E-01	0.00E-01	0.00E-01	5.12E 03
Zr-95	2.53E-01	8.11E-02	5.49E-02	0.00E-01	1.27E-01	0.00E-01	2.57E 02
Zr-97	1.40E-02	2.82E-03	1.29E-03	0.00E-01	4.26E-03	0.00E-01	8.73E 02
Nb-95	4.47E 00	2.49E 00	1.34E 00	0.00E-01	2.46E 00	0.00E-01	1.51E 04
Nb-97	3.75E 02	9.49E-03	3.46E-03	0.00E-01	1.11E-02	0.00E-01	3.50E 01

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TABLE 1.3-1

A_{it} VALUES FOR THE ADULT FOR THE BEAVER VALLEY SITE
(mrem/hr per uCi/ml)

NUCLIDE	BONE	LIVER	T-BODY	THYROID	KIDNEY	LUNG	GI-LLI
Mo-99	0.00E-01	1.05E 02	2.00E 01	0.00E-01	2.38E 02	0.00E-01	2.43E 02
Tc-99m	8.97E-03	2.54E-02	3.23E-01	0.00E-01	3.85E-01	1.24E-02	1.50E 01
Tc-101	9.23E-03	1.33E-02	1.30E-01	0.00E-01	2.39E-01	6.79E-03	4.00E-14
Ru-103	4.51E 00	0.00E-01	1.94E 00	0.00E-01	1.72E 01	0.00E-01	5.26E 02
Ru-105	3.75E-01	0.00E-01	1.48E-01	0.00E-01	4.85E 00	0.00E-01	2.29E 02
Ru-106	6.70E 01	0.00E-01	8.48E 00	0.00E-01	1.29E 02	0.00E-01	4.34E 03
Ag-110m	9.48E-01	8.77E-01	5.21E-01	0.00E-01	1.72E 00	0.00E-01	3.58E 02
Sb-124	7.87E 00	1.49E-01	3.12E 00	1.91E-02	0.00E-01	6.13E 00	2.23E 02
Sb-125	5.03E 00	5.62E-02	1.20E 00	5.11E-03	0.00E-01	3.88E 00	5.54E 01
Te-125m	2.57E 03	9.30E 02	3.44E 02	7.72E 02	1.04E 04	0.00E-01	1.03E 04
Te-127m	6.49E 03	2.32E 03	7.90E 02	1.66E 03	2.63E 04	0.00E-01	2.17E 04
Te-127	1.05E 02	3.78E 01	2.28E 01	7.81E 01	4.29E 02	0.00E-01	8.32E 03
Te-129m	1.10E 04	4.11E 03	1.74E 03	3.78E 03	4.60E 04	0.00E-01	5.55E 04
Te-129	3.01E 01	1.13E 01	7.33E 00	2.31E 01	1.26E 02	0.00E-01	2.27E 01
Te-131m	1.66E 03	8.10E 02	6.75E 02	1.28E 03	8.21E 03	0.00E-01	8.05E 04
Te-131	1.89E 01	7.88E 00	5.96E 00	1.55E 01	8.27E 01	0.00E-01	2.67E 00
Te-132	2.41E 03	1.56E 03	1.47E 03	1.72E 03	1.50E 04	0.00E-01	7.39E 04
Te-134	3.10E 01	2.03E 01	1.25E 01	2.71E 01	1.96E 02	0.00E-01	3.44E-02
I-129	1.19E 02	1.02E 02	3.35E 02	2.63E 05	2.19E 02	0.00E-01	1.61E 01
I-130	2.75E 01	8.10E 01	3.20E 01	6.87E 03	1.26E 02	0.00E-01	6.97E 01
I-131	1.51E 02	2.16E 02	1.24E 02	7.08E 04	3.71E 02	0.00E-01	5.70E 01
I-132	7.37E 00	1.97E 01	6.90E 00	6.90E 02	3.14E 01	0.00E-01	3.71E 00
I-133	5.16E 01	8.97E 01	2.74E 01	1.32E 04	1.57E 02	0.00E-01	8.06E 01
I-134	3.85E 00	1.05E 01	3.74E 00	1.81E 02	1.66E 01	0.00E-01	9.12E-03
I-135	1.61E 01	4.21E 01	1.55E 01	2.78E 03	6.76E 01	0.00E-01	4.76E 01
Cs-134	2.98E 05	7.09E 05	5.79E 05	0.00E-01	2.29E 05	7.61E 04	1.24E 04
Cs-136	3.12E 04	1.23E 05	8.86E 04	0.00E-01	6.85E 04	9.39E 03	1.40E 04
Cs-137	3.82E 05	5.22E 05	3.42E 05	0.00E-01	1.77E 05	5.89E 04	1.01E 04
Cs-138	2.64E 02	5.22E 02	2.59E 02	0.00E-01	3.84E 02	3.79E 01	2.23E-03
Ba-139	9.69E-01	6.90E-04	2.84E-02	0.00E-01	6.45E-04	3.92E-04	1.72E 00
Ba-140	2.03E 02	2.55E-01	1.33E 01	0.00E-01	8.66E-02	1.46E-01	4.18E 02
Ba-141	4.71E-01	3.56E-04	1.59E-02	0.00E-01	3.31E-04	2.02E-04	2.22E-10
Ba-142	2.13E-01	2.19E-04	1.34E-02	0.00E-01	1.85E-04	1.24E-04	3.00E-19
La-140	1.51E-01	7.59E-02	2.01E-02	0.00E-01	0.00E-01	0.00E-01	5.57E 03
La-142	7.71E-03	3.51E-03	8.74E-04	0.00E-01	0.00E-01	0.00E-01	2.56E 01
Ce-141	2.63E-02	1.78E-02	2.02E-03	0.00E-01	8.26E-03	0.00E-01	6.80E 01

TABLE 1.3-1

A_{it} VALUES FOR THE ADULT FOR THE BEAVER VALLEY SITE
(mrem/hr per uCi/ml)

NUCLIDE	BONE	LIVER	T-BODY	THYROID	KIDNEY	LUNG	GI-LLI
Ce-143	4.64E-03	3.43E 00	3.79E-04	0.00E-01	1.51E-03	0.00E-01	1.28E 02
Ce-144	1.37E 00	5.73E-01	7.36E-02	0.00E-01	3.40E-01	0.00E-01	4.64E 02
Pr-143	5.54E-01	2.22E-01	2.75E-02	0.00E-01	1.28E-01	0.00E-01	2.43E 03
Pr-144	1.81E-03	7.53E-04	9.22E-05	0.00E-01	4.25E-04	0.00E-01	2.61E-10
Nd-147	3.79E-01	4.38E-01	2.62E-02	0.00E-01	2.56E-01	0.00E-01	2.10E 03
W-187	2.96E 02	2.47E 02	8.65E 01	0.00E-01	0.00E-01	0.00E-01	8.10E 04
Np-239	2.90E-02	2.85E-03	1.57E-03	0.00E-01	8.89E-03	0.00E-01	5.85E 02

1.4 Liquid Radwaste System

The liquid radwaste system has the capability to control, collect, process, store, recycle, and dispose of liquid radioactive waste generated as a result of plant operations, including anticipated operational occurrences. This system also uses some of the components of the steam generator blowdown system for processing.

Simplified flow diagrams of the liquid radwaste systems for BV-1 and BV-2 are provided as Figures 1.4-1 and 1.4-2 respectively. A diagram showing the liquid effluent release points is provided as Figure 1.4-3. Since the concept of a shared liquid radwaste system is used, then any liquid waste generated can be stored, processed and discharged from either BV-1 or BV-2.

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1.4.1 BV-1 Liquid Radwaste System Components

1.4.1.1 LW-TK-2A & 2B: High Level Waste Drain Tanks

There are two of these tanks, each tank has a capacity of 5,000 gallons. They are located on the northwest wall of the Auxiliary Building (elevation 735'). They receive liquid wastes from the vent and drain system with activity concentrations above 4E-4 uCi/ml.

1.4.1.2 LW-TK-3A & 3B: Low Level Waste Drain Tanks

There are two of these tanks, each tank has a capacity of 2,000 gallons. They are located in the northwest corner of the Auxiliary Building (elevation 735'). They receive liquid wastes from the vent and drain system with activity concentrations less than 4E-4 uCi/ml.

1.4.1.3 LW-I-2: Liquid Waste Demineralizer

The main purpose of the demineralizer is to clean liquid waste water of particulate and dissolved radioactive contaminants. There are four resin beds and a filter associated with this demineralizer. Each of the beds can be customized with different resins so that we can effectively remove chemical contaminants along with radioactive contaminants. Generally, beds 1 and 2 contain a Cation Resin and beds 3 and 4 contain a Mixed Bed Resin. This demineralizer is located in the Decon Building (elevation 735').

1.4.1.4 LW-TK-7A & 7B: Steam Generator Drain Tanks

There are two of these tanks, each tank has a capacity of 34,500 gallons. They are located in the Fuel Pool Leakage Monitoring Room (elevation 735'). They receive liquid waste that has been processed through the liquid waste demineralizer. Once this tank is full, it is put on recirculation through the demineralizer (for a minimum of two tank volumes) until the radioactivity concentration is acceptable for discharge.

1.4.1.5 RM-LW-104: Liquid Waste Discharge Radiation Monitor

This off-line gamma scintillator radiation monitor continuously analyzes liquid waste as it is being discharged. The upper activity alarm on this radiation monitor has a setpoint that would indicate we are approaching OEC limits for radioactive water leaving the site. If an upper activity alarm on this radiation monitor is received, it automatically terminates the discharge by closing the discharge line isolation valves.

1.4.2 BV-2 Liquid Radwaste System Components

1.4.2.1 2LWS-TK21A & 21B: Waste Drain Tanks

There are two of these tanks, each tank has a capacity of 10,000 gallons. They are located in the northeast corner of the Auxiliary Building (elevation 710′). They receive liquid wastes from the vent and drain system.

1.4.2.2 2SGC-IOE21A & 21B: Steam Generator Blowdown Cleanup Ion Exchangers

The main purpose of the ion exchangers is to clean liquid waste water of particulate and dissolved radioactive contaminants through an ion exchange process. There is a resin bed, outlets strainer, and cleanup filter associated with each of these ion exchangers. They are located in the Waste Handling Building (elevation 722′).

1.4.2.3 2SGC-TK23A & 23B: Steam Generator Blowdown Test Tanks

There are two of these tanks, each has a capacity of 18,000 gallons. They are located in the Auxiliary Building (elevation 755′). They receive liquid waste that has been processed through the cleanup ion exchangers. Once this tank is full, it is put on recirculation through the cleanup ion exchanger (for a minimum of two tank volumes) until the radioactivity concentration is acceptable for discharge.

1.4.2.4 2SGC-TK21A & 21B: Steam Generator Blowdown Hold Tanks

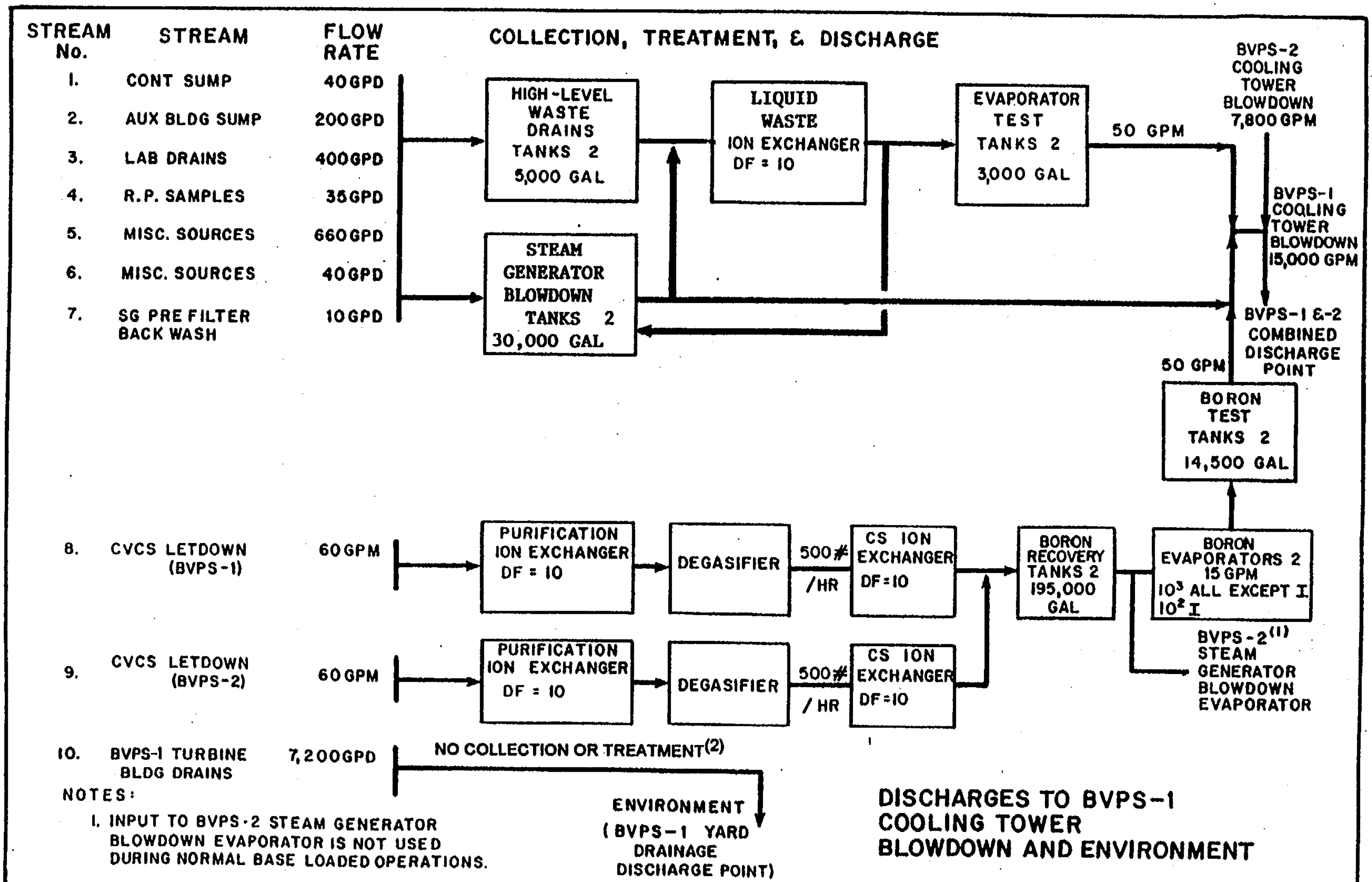
There are two of these tanks, each has a capacity of 50,000 gallons. They are located in the Waste Handling Building (elevation 722′). These tanks are used to store liquid waste when the radioactive concentration of the steam generator blowdown test tank is not acceptable for discharge. The contents of this tank is then processed through the Unit 1 or Unit 2 Liquid Radwaste Treatment System until the radioactivity concentration is acceptable for discharge.

1.4.2.5 2SGC-RQ-100: Liquid Waste Effluent Monitor

This off-line gamma scintillator radiation monitor continuously analyzes liquid waste as it is being discharged. The upper activity alarm on this radiation monitor has a setpoint that would indicate we are approaching OEC limits for radioactive water leaving the site. If an upper activity alarm is received, it automatically terminates the discharge by closing the discharge line isolation valves.

FIGURE 1.4-1

BV-1 LIQUID RADWASTE SYSTEM



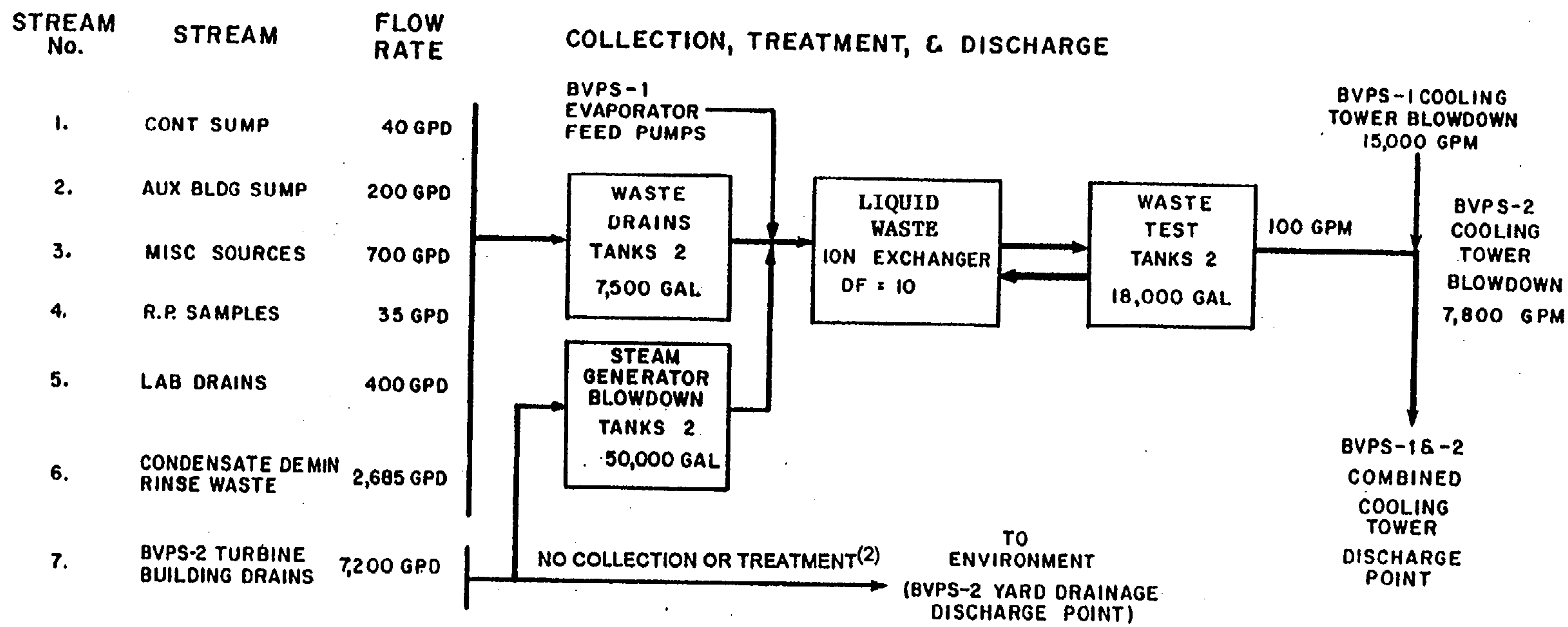
NOTES:

1. INPUT TO BVPS-2 STEAM GENERATOR BLOWDOWN EVAPORATOR IS NOT USED DURING NORMAL BASE LOADED OPERATIONS.

2. IF RADIOACTIVITY IS DETECTED, TURBINE BUILDING DRAINS CAN BE TRANSFERRED TO THE CHEMICAL WASTE SUMP AND TREATED AS LIQUID WASTE.

FIGURE 1.4-2

BV-2 LIQUID RADWASTE SYSTEM



NOTES:
1. NO STEAM GENERATOR BLOWDOWN IS DISCHARGED.
2. TURBINE BUILDING DRAINS ARE PROCESSED BY THE LIQUID WASTE SYSTEM UPON HIGH ACTIVITY.

DISCHARGES TO BVPS-2 COOLING TOWER BLOWDOWN AND ENVIRONMENT

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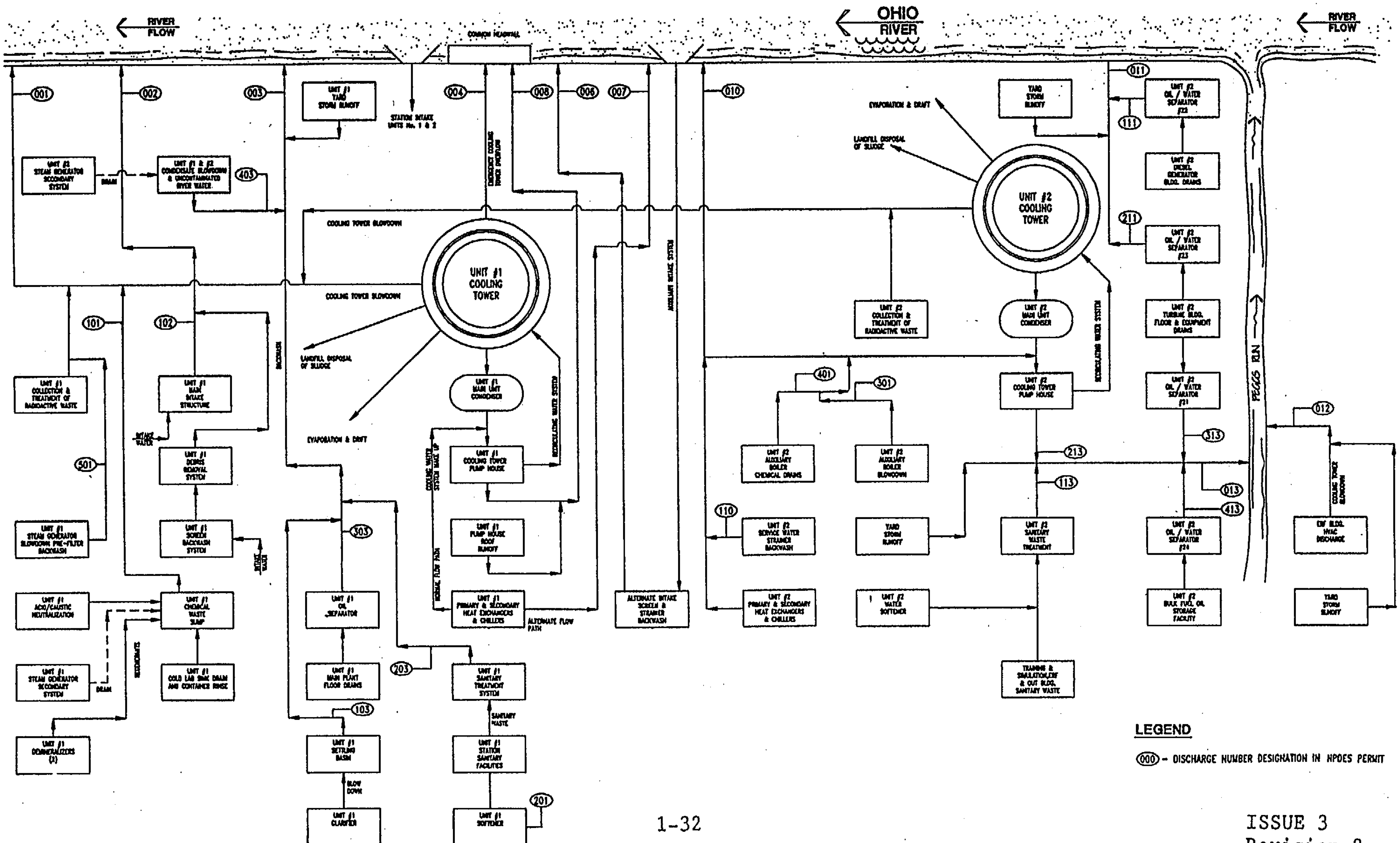
FIGURE 1.4-3

BV-1 AND 2 LIQUID EFFLUENT RELEASE POINTS



2.0 GASEOUS EFFLUENTS

ODCM Appendix C CONTROLS applicable to dose rate apply to the site. The site dose rate is due to the summation of releases from both units. ODCM Appendix C CONTROLS applicable to accumulated dose apply individually to each unit. Releases at the Beaver Valley site may be ground level or elevated in nature. All ground level releases are identified with a specific unit in the determination of site dose rate and dose attributed to that unit. Elevated releases from both units are considered to originate from a shared radwaste system and are discharged from a common release point, the Process Vent, at the top of the BV-1 cooling tower. At BV-1 and BV-2, the dose from the shared radwaste system via the Process Vent is normally apportioned equally to the units. However, a containment purge via the Process Vent shall be attributed to a specific unit.

2.1 Alarm Setpoints

2.1.1 BV-1 Monitor Alarm Setpoint Determination

ODCM Appendix C CONTROL 3.11.2.1 require that the dose rate in unrestricted areas due to noble gas radionuclides in the gaseous effluent released from the site shall be limited to $\leq$ 500 mrem/yr to the total body and to $\leq$ 3000 mrem/yr to the skin.

This section describes the methodology used to maintain the release of noble gas radionuclides within ODCM Appendix C CONTROL 3.11.2.1 for the site and determines monitor setpoints for BV-1.

The methodologies described in Section 2.1.1.2, 2.1.2.2, and 2.1.3.2 provide an alternate means of determining monitor alarm setpoints that may be used when an analysis is performed prior to release.

Control of the site dose rate limit due to noble gases is exercised by a total of 8 effluent stream monitors, of which 3 are located in BV-1 (alternates exists for these monitors), and 5 are located in BV-2. As previously noted, BV-2 elevated releases are via the BV-1 Process Vent.

Differences exist between the setpoint presentations of the radiation monitoring systems of BV-1 and BV-2. First, there is a difference in setpoint terminology. Where BV-1 uses HIGH and HIGH-HIGH the BV-2 equivalents are ALERT and HIGH. The second difference is that the BV-2 setpoint is presented in uCi/cc rather than cpm as in BV-1. This difference is due to BV-2 software which applies a conversion factor to the BV-2 raw data (cpm). The user is cautioned that the uCi/cc presentation is technically correct only for the specific isotopic mix used in the determination of the conversion factor. In practice, setpoints determined for a calculated mix are correct for that mix. Setpoints determined on analysis prior to release will be correct for properly controlling dose rate, but the indicated uCi/cc value may differ from the actual value.

All effluent monitors specified herein have HIGH-HIGH (BV-1) or HIGH (BV-2) Alarm Setpoints established at 30 percent of the site limit, and except 3 monitors noted below, HIGH (BV-1) or ALERT (BV-2) Alarm Setpoints established at 10 percent of the site limit.

Monitor Setpoint Specifications Based On Fraction Of Site Limit

UNIT, RELEASE POINT AND MONITOR	FRACTION OF SITE LIMITING DOSE R	
Unit 1, Ventilation Vent RM-VS-101B (Alt. RM-VS-109 CH #5)	30% (HIGH-HIGH)	10% (HIGH)
Unit 1, Containment Vent RM-VS-107B (Alt. RM-VS-110 CH #5)	30% (HIGH-HIGH)	10% (HIGH)
Units 1/2, Process Vent RM-GW-108B (Alt. RM-GW-109 CH #5)	30% (HIGH-HIGH)	10% (HIGH)
Unit 2, Containment Vent 2HVS*RQ109B	30% (HIGH)	10% (ALERT)
Unit 2, Ventilation Vent 2HVS-RQ101B	30% (HIGH)	10% (ALERT)
Unit 2, Waste Gas Storage Vault Vent 2RMQ-RQ303B	30% (HIGH)	0.1% (ALERT)
Unit 2, Decontamination Building Vent 2RMQ-RQ301B	30% (HIGH)	0.3% (ALERT)
Unit 2, Condensate Polishing Building Vent 2HVL-RQ112B	30% (HIGH)	0.6% (ALERT)
Units 1/2, Turbine Building Vent	< 0.1% (Unmonitored)	

With the monitor setpoints based on fractions of the site limit as defined above, the following criteria may be applied to determine that the dose rate due to noble gas released from the site complies with ODCM Appendix C CONTROL 3.11.2.1:

° The site dose rate is less than 50% of the site limit when all monitors are below the HIGH (BV-1) and ALERT (BV-2) Alarm Setpoints.

° With all monitors below the normal HIGH-HIGH (BV-1) and HIGH (BV-2) Alarm Setpoints, a combination of 3 HIGH (BV-1) or ALERT (BV-2) Alarms indicate releases may have exceeded site limits.

° To provide operational flexibility any 1 of the HIGH-HIGH (BV-1) or HIGH (BV-2), Containment, Ventilation, or Process Vent monitor setpoint may be doubled to 60% of the site limit if all other monitors in this group are held below the HIGH (BV-1) and ALERT (BV-2) Alarm Setpoints. From this condition any 1 monitor alarm would indicate the site dose rate limit may have been exceeded.

A release may be batch or continuous in nature. Batch refers to releases that are intermittent in radionuclide concentrations or flow, such as releases from gas storage tanks, containment ventings and purges, and systems or components with infrequent use. Batch releases may be due to operational variations which result in radioactive releases greater than 50% of the releases normally considered as continuous. Batch releases from these sources during normal operation, including anticipated operational occurrences, are defined as those which occur for a total of 500 hours or less in a calendar year, but not more than 150 hours in any quarter. The batch relative concentration value has been calculated in accordance with the guidelines provided in NUREG-0324 for short-term release. If simultaneous batch and continuous release out of one vent occurs, use the lowest setpoint obtained according to the following Sections 2.1.1.1 through 2.1.3.2.

2.1.1.1 <u>BV-1 Setpoint Determination Based On A Calculated Mix For Ventilation Vent And Containment Building Vent Releases (Ground Releases)</u>

The calculated monitor count rate above background (C.R.), in ncpm, the monitor HIGH-HIGH alarm setpoint above background (HHSP), and the monitor HIGH alarm setpoint above background (HSP) for each vent and operational condition should be as follows:

BV-1 ALARM SETPOINTS FOR GROUND RELEASES

	(P)PRIMARY* MONITOR / (A)ALTERNATE MONITOR	cpm ABOVE BACKGROUND C.R.	30% SITE LIMIT HHSP	10% SITE LIMIT HSP
°Continuous Release Via The BV-1 Ventilation Vent	(P)RM-VS-101B (A)RM-VS-109(5)	3.00E3 1.47E3	9.00E2 4.40E2	3.00E2 1.47E2
°Batch Release Of Containment Purge Via The BV-1 Ventilation Vent	(P)RM-VS-101B (A)RM-VS-109(5)	3.90E2 4.68E2	1.17E2 1.40E2	3.90E1 4.68E1
°Continuous Release Via The BV-1 Containment Building Vent	(P)RM-VS-107B (A)RM-VS-110(5)	6.44E3 3.38E3	1.93E3 1.01E3	6.44E2 3.38E2
°Batch Release Of Containment Purge Via The BV-1 Containment Building Vent	(P)RM-VS-107B (A)RM-VS-110(5)	1.93E3 1.01E3	5.80E2 3.04E2	1.93E2 1.01E2

*When the primary monitor is out of service, and ODCM Appendix C CONTROL 3.3.3.10 can be met for the respective alternate monitor, the alternate setpoints may be utilized.

The setpoints were determined using the following conditions and information:

- Source terms given in Table 2.1-1a. These gaseous source terms were derived from Stone & Webster computer codes GAS1BB (which is similar to the NRC CODE GALE, NUREG-0017) and DRAGON 4 (for the containment vacuum pump sources). Table 2.1-1a does not include particulates and iodines, which are not used in site noble gas dose rate calculations.
- Onsite meteorological data for the period January 1, 1976 through December 31, 1980.
- Discharge flow rate of 62,000 cfm for the BV-1 Ventilation Vent (Continuous).
- Discharge flow rate of 92,000 cfm for the BV-1 Ventilation Vent (Batch release of containment purge).

- Discharge flow rate of 49,300 cfm for the BV-1 Containment Vent (Both continuous and batch release of Containment Purge).
- Information listed under References - Gaseous Effluent Monitor Setpoints.

The calculation method given in Sections 2.1.1.1.1 through 2.1.1.1.7 was used to derive the monitor setpoints for the following operational conditions:

- Continuous release via the BV-1 Ventilation Vent.
- Continuous release via the BV-1 Containment Building Vent.
- Batch release of BV-1 Containment Purge via the BV-1 Ventilation Vent.
- Batch release of BV-1 Containment Purge via the BV-1 Containment Building Vent.

2.1.1.1.1 BV-1 Mix Radionuclides

The "mix" (noble gas radionuclides and composition) of the gaseous effluent was determined as follows:

a. The gaseous source terms that are representative of the "mix" of the gaseous effluent were selected. Gaseous source terms are the radioactivity of the noble gas radionuclides in the effluent. Gaseous source terms can be obtained from Table 2.1-1a.

b. The fraction of the total radioactivity in the gaseous effluent comprised of noble gas radionuclide "i" (S_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [2.1(1)-1]$$

where:

A_i = The total radioactivity or radioactivity concentration of noble gas radionuclide "i" in the gaseous effluent from Table 2.1-1a.

2.1.1.1.2 BV-1 Maximum Acceptable Release Rate (Whole Body Exposure)

The maximum acceptable total release rate (uCi/sec) of all noble gas radionuclides in the gaseous effluent (Q_t) based upon the whole body exposure limit was calculated by:

$$Q_t = \frac{500}{(X/Q) \sum_i K_i S_i} \qquad [2.1(1)-2]$$

where:

$(X/Q)_{vv}$ = The highest calculated annual average relative concentration of effluents released via the Ventilation Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-5.

= 1.03E-4 sec/m^3 for continuous releases.

$(X/q)_{vv}$ = The short term relative concentration of effluents released via the Ventilation Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-36.

= 3.32E-4 sec/m^3 for batch release of containment purge.

$(X/Q)_{cv}$ = The highest calculated annual average relative concentration of effluents released via the Containment Building Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-4.

= 9.24E-5 sec/m^3 for continuous releases.

$(X/q)_{cv}$ = The short term relative concentration of effluents released via the containment building vent for any area at or beyond the unrestricted area boundary for any sectors (sec/m^3) from Table 2.3-35.

= 3.08E-4 sec/m^3 for batch release of containment purge.

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from Table 2.2-11.

S_i = From equation [2.1(1)-1] above.

2.1.1.1.3 BV-1 Maximum Acceptable Release Rate (Skin Exposure)

Q_t was also determined based upon the skin exposure limit by:

$$Q_t = \frac{3000}{(X/Q) \sum_i (L_i + 1.1M_i) S_i} \qquad [2.1(1)-3]$$

where:

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i"(mrem/year/uCi/m^3) from Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i"(mrad/year/uCi/m^3) from Table 2.2-11.

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of the photons of interest, (mrem/mrad).

(X/Q) = Same as in Section 2.1.1.1.2.

2.1.1.1.4 BV-1 Maximum Acceptable Release Rate (Individual Radionuclide)

The maximum acceptable release rate (uCi/sec) of noble gas radionuclide "i" in the gaseous effluent (Q_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$Q_i = S_i \, Q_t \qquad [2.1(1)\text{-}4]$$

(NOTE: Use the lower of the Q_t values obtained in Section 2.1.1.1.2 and 2.1.1.1.3.)

2.1.1.1.5 BV-1 Maximum Acceptable Concentrations (Individual Radionuclide)

The maximum acceptable radioactivity concentration (uCi/cc) of noble gas radionuclide "i" in the gaseous effluent (C_i) for each individual noble gas radionuclide "i" in the gaseous effluent was determined by:

$$C_i = \frac{2.12E\text{-}3 \; Q_i}{F} \qquad [2.1(1)\text{-}5]$$

where:

F = The maximum acceptable effluent flow rate at the point of release (cfm).

= 62,000 cfm (BV-1 Ventilation Vent)

= 49,300 cfm (BV-1 Containment Building Vent)

2.12E-3 = Unit conversion factor (60 sec/min x 3.53E-5 ft^3/cc).

2.1.1.1.6 BV-1 Monitor Count Rate

The calculated monitor count rate (ncpm) above background attributed to the noble gas radionuclide (C.R.) was determined by:

$$C.R. = \sum_i C_i \, E_i \qquad [2.1(1)\text{-}6)]$$

where:

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from Table 2.1-2a.

2.1.1.1.7 BV-1 Monitor Setpoints

The monitor alarm setpoints above background were determined as follows:

a. The monitor HIGH-HIGH Alarm Setpoint above background (ncpm) was determined by:

$$HHSP = 0.30 \text{ C.R.} \qquad [2.1(1)\text{-}7]$$

b. The monitor HIGH Alarm Setpoint above background (ncpm) was determined by:

$$HSP = 0.10 \text{ C.R.} \qquad [2.1(1)\text{-}8]$$

NOTE: The values 0.3 for the HHSP and 0.1 for the HSP are fractions of the total radioactivity concentration that may be released via the monitored pathway to ensure that the site boundary limit is not exceeded due to simultaneous releases from both units.

2.1.1.2 BV-1 Setpoint Determination Based On Analysis Prior To Release For Ventilation Vent And Containment Building Vent Releases (Ground Releases)

When the setpoints established using "the calculated mix" for ground releases do not provide adequate flexibility for operational needs, the method described below may be used in lieu of that set forth in Step 2.1.1.1. In this case, the results of sample analysis are used to determine the source term "mix." This calculational method applies to gaseous releases via the Ventilation Vent and via the Containment Building Vent when determining the setpoint for the maximum acceptable discharge flow rate and the associated HIGH-HIGH Alarm Setpoint based on this flow rate for the Ventilation Vent Gas Monitor (RM-VS-101B) and the Containment Building Gas Monitor (RM-VS-107B) during the following operational conditions:

- Batch release of Containment Purge via the BV-1 Ventilation Vent.
- Batch release of Containment Purge via the BV-1 Containment Building Vent.

2.1.1.2.1 BV-1 Maximum Acceptable Release Rate

The maximum acceptable discharge flow rate from Containment Vent or Ventilation Vent during purging is determined as follows:

a. The maximum acceptable gaseous discharge flow rate (f) from the Containment Vent or Ventilation Vent (cfm) during purging based upon the whole body exposure limit is calculated by:

$$f = \frac{1.06\ S\ T}{(X/q)\ \sum_i K_i\ C_i} \qquad [2.1(1)\text{-}17]$$

where:

1.06 = 500 mrem/yr x 2.12E-3

500 mrem/yr = dose rate limit
2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

S = Percent of site dose rate released via this pathway. Up to 60% of the site dose rate is permissible for one release point under the alarm set point rules of Section 2.1.1. To exceed 60% of the site limit from one release point, the remaining release point limits must be correspondingly reduced or secured to provide the necessary margin below the site dose rate limit.

T = Maximum valve for T is 16 based on the limiting restriction in ODCM Appendix C CONTROL 3.11.2.1.a where the dose rate for a containment purge may be averaged over a time period not to exceed 960 minutes. (As containment air volume change time period is 60 minutes; T = 960/60 = 16). See Reference 2.1.6.

$(X/q)_{vv}$ = The highest calculated short term relative concentration of effluents released via the Ventilation Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-36.

= 3.32E-4 sec/m^3

$(X/q)_{cv}$ = The highest calculated short term relative concentration of effluents released via the Containment Building Vent for areas at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-37.

= 3.08E-4 sec/m^3

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from Table 2.2-11.

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

b. The flow rate (f) is also determined based upon the skin exposure limit as follows:

$$f = \frac{6.36\ S\ T}{(X/q)\ \sum_i (L_i + 1.1M_i)\ C_i} \qquad [2.1(1)-18]$$

where:

6.36 = 3000 mrem/yr x 2.12E-3

3000 mrem/yr = dose rate limit
2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i" (mrad/year/uCi/m^3) from Table 2.2-11.

(X/q) = Same as in Section 2.1.1.2.1.a.

c. The flow rate (f) is determined by selecting the smaller of the calculated (f) values based on the whole body exposure limit (Section 2.1.1.2.1.a) and based on the skin exposure limit (Section 2.1.1.2.1.b). The actual purge flow rate (cfm) must be maintained at or below this calculated (f) value or the discharge cannot be made from the vent.

2.1.1.2.2 BV-1 Monitor Setpoints

The monitor alarm setpoints above background are determined as follows:

a. The calculated monitor HIGH-HIGH Alarm Setpoint above background (ncpm) attributed to the noble gas radionuclides is determined by:

$$HHSP = \frac{f \sum_i C_i E_i}{F'} \qquad [2.1(1)\text{-}19]$$

where:

f = The maximum acceptable gaseous discharge flow rate (cfm) determined in Section 2.1.1.2.1.

F' = The maximum actual or design effluent flow rate (cfm) at the point of release.

= 92,000 cfm (BV-1 Ventilation Vent -- design)

= 49,300 cfm (BV-1 Containment Vent -- design)

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from Table 2.1-2a.

b. When a HIGH-HIGH set point has been calculated according to this section, the monitor HIGH Alarm Setpoint above background (ncpm) is determined as follows:

$$HSP = HHSP \times 0.33 \qquad [2.1(1)\text{-}20]$$

2.1.2 BV-2 Monitor Alarm Setpoint Determination

See Section 2.1.1 for a description of Monitor Alarm Setpoint Determinations.

2.1.2.1 BV-2 Setpoint Determination Based On A Calculated Mix For Ventilation Vent, Containment Vent, Condensate Polishing Building Vent, Decontamination Building Vent, and Waste Gas Storage Vault Vent Releases

The table below gives the calculated monitor count rate above background (C.R.) in ncpm, and provides the equivalent monitor indication (D.V.) in net uCi/cc associated with the most limiting site dose rate limit (i.e., 500 mrem/yr Total Body or 3000 mrem/yr Skin). The HIGH alarm setpoint (HSP) in uCi/cc above background, and the ALERT alarm setpoint (ASP) in uCi/cc above background for each vent and operational condition should be as follows:

BV-2 ALARM SETPOINTS FOR GROUND RELEASES

			uCi/cc ABOVE BACKGROUND		
	MONITOR	C.R. ncpm	D.V. uCi/cc	30% SITE LIMIT HSP	* SITE LIMIT ASP
°Continuous Release Via The BV-2 Ventilation Vent	2HVS-RQ101B	8.26E3	3.01E-4	9.04E-5	3.01E-5
°Batch Release Of Containment Purge Via The BV-2 Ventilation Vent	2HVS-RQ101B	1.13E3	4.13E-5	1.24E-5	4.13E-6
°Continuous Release Via The BV-2 Containment Vent	2HVS*RQ109B	4.32E3	1.06E-4	3.17E-5	1.06E-5
°Batch Release Of Containment Purge Via The BV-2 Containment Vent	2HVS*RQ109B	2.09E3	4.05E-5	1.21E-5	4.05E-6
°Continuous Release Via The BV-2 Condensate Polishing Building Vent	2HVL-RQ112B	2.89E4	1.61E-3	4.82E-4	9.63E-6
°Continuous Release Via The BV-2 Decontamination Building Vent	2RMQ-RQ301B	5.66E4	3.15E-3	9.44E-4	9.44E-6
°Continuous Release Via The BV-2 Waste Gas Storage Vault Vent	2RMQ-RQ303B	8.03E5	2.24E-2	6.71E-3	2.24E-5

*Alert Setpoint from Section 2.1.2 Fraction Of Site Limiting Dose Rate.

The setpoints were determined using the following conditions:

- Source terms given in Table 2.1-1b. These gaseous source terms were derived from Stone & Webster computer codes GAS1BB (which is similar to the NRC CODE GALE, NUREG-0017) and DRAGON 4 (for the containment vacuum pump sources). Table 2.1-1b does not include particulates and iodines, which are not used in site noble gas dose rate calculations. The Containment Building Purge radionuclide mix was utilized for the purposes of determining an alarm setpoint for the Ventilation Vent on the basis of the proximity of the contiguous areas. The Decontamination Building and Condensate Polishing Building ventilation exhaust are not expected to be radioactive. However, for purposes of determining an alarm setpoint, it is conservatively assumed that Xe-133 is in the ventilation exhaust at concentrations that would result in the appropriate dose rate limits. The Waste Gas Storage Vault ventilation exhaust is also not normally radioactive. However, the monitor alarm setpoint is based on the assumption that the ventilation exhaust radionuclide spectrum is similar to the gaseous inventory in the system housed by the waste gas storage vault. This spectrum is listed in Table 2.1-1b under Gaseous Waste System.

- Onsite meteorological data for the period January 1, 1976 through December 31, 1980.

- Discharge flow rate of 23,700 cfm for the BV-2 Ventilation Vent (Continuous).

- Discharge flow rate of 53,700 cfm for the BV-2 Ventilation Vent (Batch release of containment purge).

- Discharge flow rate of 59,000 cfm for the BV-2 Containment Vent (Both continuous and batch release of containment purge).

- Discharge flow rate of 30,556 cfm for the BV-2 Condensate Polishing Building Vent.

- Discharge flow rate of 12,400 cfm for the BV-2 Decontamination Building Vent.

- Discharge flow rate of 2,000 cfm for the BV-2 Waste Gas Storage Vault Vent.

The calculation method given in Sections 2.1.2.1.1 through 2.1.2.1.7 was used to derive the alarm setpoints for the Ventilation Vent Gas Monitor (2HVS-RQ101B), Containment Vent Gas Monitor (2HVS*RQ109B), Condensate Polishing Building Vent Gas Monitor (2HVL-RQ112B), Decontamination Building Vet Gas Monitor (2RMQ-RQ301B), and Waste Gas Storage Vault Vent Gas Monitor (2RMQ-RQ303B) during the following operational conditions:

- Continuous release via the BV-2 Ventilation Vent.

- Continuous release via the BV-2 Containment Vent.

- Batch release of BV-2 Containment Purge via the BV-2 Ventilation Vent.
- Batch release of BV-2 Containment Purge via the BV-2 Containment Vent.
- Continuous release via the BV-2 Condensate Polishing Building Vent.
- Continuous release via the BV-2 Decontamination Building Vent.
- Continuous release via the BV-2 Waste Gas Storage Vault Vent.

2.1.2.1.1 BV-2 Mix Radionuclides

The "mix" (noble gas radionuclides and composition) of the gaseous effluent was determined as follows:

a. The gaseous source terms that are representative of the "mix" of the gaseous effluent were selected based on the relative stream composition and volumetric flowrate. Gaseous source terms are the radioactivity of the noble gas radionuclides in the effluent. Gaseous source terms can be obtained from Table 2.1-1b.

b. The fraction of the total radioactivity in the gaseous effluent comprised of noble gas radionuclide "i" (S_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [2.1(2)\text{-}1]$$

where:

A_i = The radioactivity concentration of noble gas radionuclide "i" in the gaseous effluent from Table 2.1-1b.

2.1.2.1.2 BV-2 Maximum Acceptable Release Rate (Whole Body Exposure)

The maximum acceptable total release rate (uCi/sec) of all noble gas radionuclides in the gaseous effluent (Q_t) based upon the whole body exposure limit was calculated by:

$$Q_t = \frac{500}{(X/Q) \sum_i K_i S_i} \qquad [2.1(2)\text{-}2]$$

where:

$(X/Q)_{VV}$ = The highest calculated annual average relative concentration of effluents released via the Ventilation Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-5.

= 1.03E-4 sec/m^3 for continuous releases.

$(X/q)_{vv}$ = The short term relative concentration of effluents released via the Ventilation Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-36.

= 3.32E-4 sec/m^3 for batch release of containment purge.

$(X/Q)_{cv}$ = The highest calculated annual average relative concentration of effluents released via the Containment Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-4.

= 9.24E-5 sec/m^3 for continuous releases.

$(X/q)_{cv}$ = The short term relative concentration of effluents released via the containment vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-35.

= 3.08E-4 sec/m^3 for batch release of containment purge.

$(X/Q)_{cp}$ = The highest calculated annual average relative concentration of effluents released via the Condensate Polishing Building Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-10.

= 7.35E-5 sec/m^3 for continuous releases.

$(X/Q)_{dv}$ = The highest calculated annual average relative concentration of effluents released via the Decontamination Building Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-8.

= 9.24E-5 sec/m^3 for continuous releases.

$(X/Q)_{wv}$ = The highest calculated annual average relative concentration of effluents released via the Waste Gas Storage Vault Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-9.

= 9.24E-5 sec/m^3 for continuous releases.

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" ($mrem/year/uCi/m^3$) from Table 2.2-11.

S_i = From equation [2.1(2)-1].

2.1.2.1.3 BV-2 Maximum Acceptable Release Rate (Skin Exposure)

Q_t was also determined based upon the skin exposure limit by:

$$Q_t = \frac{3000}{(X/Q) \sum_i (L_i + 1.1M_i) S_i} \qquad [2.1(2)\text{-}3]$$

where:

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i"(mrem/year/uCi/m^3) from Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i"(mrad/year/uCi/m^3) from Table 2.2-11.

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of the photons of interest, (mrem/mrad).

(X/Q) = Same as in Section 2.1.2.1.2.

2.1.2.1.4 BV-2 Maximum Acceptable Release Rate (Individual Radionuclide)

The maximum acceptable release rate (uCi/sec) of noble gas radionuclide "i" in the gaseous effluent (Q_i) for each noble gas radionuclide in the gaseous effluent was determined by:

$$Q_i = S_i Q_t \qquad [2.1(2)\text{-}4]$$

(NOTE: Use the lower of the Q_t values obtained in Section 2.1.2.1.2 and 2.1.2.1.3.)

2.1.2.1.5 BV-2 Maximum Acceptable Concentrations (Individual Radionuclide)

The maximum acceptable radioactivity concentration (uCi/cc) of noble gas radionuclide "i" in the gaseous effluent (C_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$C_i = \frac{2.12E\text{-}3\ Q_i}{F} \qquad [2.1(2)\text{-}5]$$

where:

F = The maximum acceptable effluent flow rate at the point of release (cfm) as listed in Section 2.1.2.1.

2.12E-3 = Unit conversion factor (60 sec/min x 3.53E-5 ft^3/cc).

2.1.2.1.6 BV-2 Monitor Count Rate

The calculated monitor count rate (ncpm) above background attributed to the noble gas radionuclide (C.R.) was determined by:

$$C.R. = \sum_i C_i E_i \qquad [2.1(2)\text{-}6)]$$

where:

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from Table 2.1-2b.

2.1.2.1.7 BV-2 Monitor Setpoints

The monitor alarm setpoints above background were determined as follows:

a. The monitor HIGH Alarm Setpoint above background (uCi/cc) was determined by:

$$HSP = \frac{0.30\ C.R.}{E_{i\ ave}} \qquad [2.1(2)\text{-}7]$$

b. The monitor ALERT Alarm Setpoint above background (uCi/cc) was determined by:

$$ASP = \frac{FR \times C.R.}{E_{i\ ave}} \qquad [2.1(2)\text{-}8]$$

where:

FR = Fraction of limiting dose rate for the respective radiation monitor (from Section 2.1.2).

$E_{i\ ave}$ = The C.R. of equation [2.1(2)-6] divided by the sum of the C_i for the respective mix.

2.1.2.2 <u>BV-2 Setpoint Determination Based On Analysis Prior To Release (Ground Releases)</u>

When the setpoints established using "the calculated mix" do not provide adequate flexibility for operational needs, the method described below may be used in lieu of that set forth in Section 2.1.2.1. In this case, the results of sample analysis are used to determine the appropriate nuclide mix. This calculational method applies when determining the setpoint for the maximum acceptable discharge flow rate and the associated HIGH Alarm Setpoint based on respective vent flow rate during the following operational conditions:

° Batch release of Containment Purge via the BV-2 Ventilation Vent.

° Batch release of Containment Purge via the BV-2 Containment Vent.

2.1.2.2.1 <u>BV-2 Maximum Acceptable Release Rate</u>

The maximum acceptable discharge flow rate from the Containment Vent or Ventilation Vent during purging is determined as follows:

a. The maximum acceptable gaseous discharge flow rate (f) from the Containment Vent or Ventilation Vent (cfm) during purging based upon the whole body exposure limit is calculated by:

$$f = \frac{1.06\ S\ T}{(X/q)\ \sum_i K_i\ C_i} \qquad [2.1(2)\text{-}17]$$

where:

1.06 = 500 mrem/yr x 2.12E-3

500 mrem/yr = dose rate limit, whole body exposure
2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

S = Percent of site dose rate released via this pathway. Up to 60% of the site dose rate is permissible for one release point under the alarm setpoint rules of Section 2.1.2. To exceed 60% of the site limit from one release point, the remaining release point limits must be correspondingly reduced or secured to provide the necessary margin below the site dose rate limit.

T = Maximum value for T is 16 based on the limiting restriction in ODCM Appendix C CONTROL 3.11.2.1.a where the dose rate for a containment purge may be averaged over a time period not to exceed 960 minutes. (As containment air volume change time period is 60 minutes; T = 960/60 = 16). See Reference 2.2.4.

$(X/q)_{vv}$ = The highest calculated short term relative concentration of effluents released via the Ventilation Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-36.

= 3.32E-4 sec/m^3

$(X/q)_{cv}$ = The highest calculated short term relative concentration of effluents released via the Containment Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-37.

= 3.08E-4 sec/m^3

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" ($mrem/year/uCi/m^3$) from Table 2.2-11.

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

b. The flow rate (f) is also determined based upon the skin exposure limit as follows:

$$f = \frac{6.36\ S\ T}{(X/q)\ \sum_i (L_i + 1.1M_i)\ C_i} \qquad [2.1(2)\text{-}18]$$

where:

6.36 = 3000 mrem/yr x 2.12E-3

3000 mrem/yr = dose rate limit, skin exposure
2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i" ($mrem/year/uCi/m^3$) from Table 2.2-11.

M_i = The air dose factor due to gamma emissions from noble gas radionuclide "i" ($mrad/year/uCi/m^3$) from Table 2.2-11.

(X/q) = Same as in Section 2.1.2.2.1.a.

c. The flow rate (f) is determined by selecting the <u>smaller</u> of the calculated (f) values based on the whole body exposure limit (Section 2.1.2.2.1.a) and based on the skin exposure limit (Section 2.1.2.2.1.b). The actual purge flow rate (cfm) must be maintained at or below this calculated (f) value or the discharge cannot be made from the vent.

2.1.2.2.2 BV-2 Monitor Setpoints

The monitor alarm setpoints above background are determined as follows:

a. The calculated monitor HIGH Alarm Setpoint above background (net uCi/cc) attributed to the noble gas radionuclides is determined by:

$$HSP = \frac{f \sum_i C_i E_i}{F' E_{i\ ave}} \qquad [2.1(2)\text{-}19]$$

where:

f = The maximum acceptable containment purge flow rate (cfm) determined in Section 2.1.2.2.1.

F' = The maximum actual or design effluent flow rate (cfm) at the point of release.

= 53,700 cfm (BV-2 Ventilation Vent -- design)

= 59,000 cfm (BV-2 Containment Vent -- design)

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from Table 2.1-2b.

$E_{i\ ave}$ = The C.R. of equation [2.1(2)-6] divided by the sum of the C_i for the respective mix.

NOTE: To enable maintaining a constant conversion factor from cpm to uCi/cc in the Digital Radiation Monitoring System software, the "calculated mix" is used rather than the analysis mix to calculate $E_{i\ ave}$ above. This does not cause any change in the function of the monitor setpoint to properly control dose rate. However, the monitor indicated uCi/cc value may differ from the actual value.

b. When a HIGH Alarm Setpoint has been calculated according to this section, the monitor ALERT Alarm Setpoint above background (net uCi/cc) is determined as follows:

$$ASP = HSP \times 0.33 \qquad [2.1(2)\text{-}20]$$

2.1.3 BV-1/2 Monitor Alarm Setpoint Determination

See Section 2.1.1 for a description of Monitor Alarm Setpoint Determination.

2.1.3.1 BV-1/2 Setpoint Determination Based On A Calculated Mix For Process Vent Releases (Elevated Releases)

The calculated monitor count rate above background (C.R.), in ncpm, the monitor HIGH-HIGH alarm setpoint above background (HHSP), and the monitor HIGH alarm setpoint above background (HSP) for each operational condition are as follows:

BV-2 AND ALARM SETPOINTS FOR ELEVATED RELEASES

	(P)PRIMARY* MONITOR / (A)ALTERNATE MONITOR	cpm ABOVE BACKGROUND C.R.	30% SITE LIMIT HHSP	10% SITE LIMIT HSP
°Continuous Release	(P)RM-GW-108B	3.83E7	1.15E7	3.83E6
	(A)RM-GW-109(5)	2.20E7	6.61E6	2.20E6
°Batch Release Of BV-1 Decay Tanks	(P)RM-GW-108B	3.93E5	1.18E5	3.93E4
	(A)RM-GW-109(5)	7.87E6	2.36E6	7.87E5
°Batch Release Of BV-2 Decay Tanks	(P)RM-GW-108B	2.11E5	6.33E4	2.11E4
	(A)RM-GW-109(5)	7.75E6	2.32E6	7.75E5
°Batch Release Of BV-1 Containment Purge	(P)RM-GW-108B	5.55E6	1.67E6	5.55E5
	(A)RM-GW-109(5)	7.37E6	2.21E6	7.37E5
°Batch Release Of BV-2 Containment Purge	(P)RM-GW-108B	5.38E6	1.16E6	5.38E5
	(A)RM-GW-109(5)	7.34E6	2.20E6	7.34E5

*When the primary monitor is out of service, and ODCM Appendix C CONTROL 3.3.3.10 can be met for the respective alternate monitor, the alternate setpoints may be utilized:

The setpoints were determined using a calculated mix from the FSAR and discharge flow rate of 1450 cfm for the BV-1/2 Process Vent.

The calculational method below was used to derive the monitor setpoints for the following operational conditions:

° Continuous release via the BV-1/2 Process Vent.

° Batch release of BV-1 or BV-2 Waste Gas Decay Tank via the BV-1/2 Process Vent.

° Batch release of BV-1 or BV-2 Containment Purge via the BV-1/2 Process Vent.

2.1.3.1.1 BV-1/2 Mix Radionuclides

The "mix" (noble gas radionuclides and composition) of the gaseous effluent was determined as follows:

a. The gaseous source terms that are representative of the "mix" of the gaseous effluent were evaluated. Gaseous source terms are the radioactivity of the noble gas radionuclides in the effluent. The gaseous source terms can be obtained from Tables 2.1-1a. and 2.1-1b.

b. The fraction of the total radioactivity in the gaseous effluent comprised by noble gas radionuclide "i" (S_i) for each individual noble gas radionuclide in the gaseous effluent was calculated by:

$$S_i = \frac{A_i}{\sum_i A_i} \qquad [2.1\text{-}9]$$

where:

A_i = The total radioactivity or radioactivity concentration of noble gas radionuclide "i" in the gaseous effluent from Table 2.1-1a and 2.1.1b.

2.1.3.1.2 BV-1/2 Maximum Acceptable Release Rate (Whole Body Exposure)

The maximum acceptable total release rate (uCi/sec) of all noble gas radionuclides in the gaseous effluent (Q_t) based upon the whole body exposure limit was determined by:

$$Q_t = \frac{500}{\sum_i V_i S_i} \qquad [2.1.10]$$

where:

V_i = The constant for noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrem/year/uCi/sec) from Table 2.2-12.

2.1.3.1.3 BV-1/2 Maximum Acceptable Release Rate (Skin Exposure)

Q_t was also determined based upon the skin exposure limit as follows:

$$Q_t = \frac{3000}{\sum_i [L_i(X/Q)_{pv} + 1.1B_i]S_i} \qquad [2.1\text{-}11]$$

where:

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i"(mrem/year/uCi/m^3) from Table 2.2-11.

$(X/Q)_{pv}$ = The highest calculated annual average relative concentration of effluents releases via the Process Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-6.

= 2.31E-6 sec/m^3

$(X/q)_{pv}$ = The short term relative concentration of effluents released via the Process Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-38.

= 1.07E-5 sec/m^3

B_i = The constant for long term releases (greater than 500 hrs/year) for noble gas radionuclide "i" accounting for the gamma radiation dose from the elevated finite plume (mrad/year/uCi/sec) from Table 2.2-12.

2.1.3.1.4 <u>BV-1/2 Maximum Acceptable Release Rate (Individual Radionuclide)</u>

The maximum acceptable release rate (uCi/sec) of noble gas radionuclide "i" in the gaseous effluent (Q_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$Q_i = S_i \, Q_t \qquad [2.1\text{-}12]$$

(NOTE: Use the <u>lower</u> of the Q_t values obtained in Section 2.1.3.1.2 and 2.1.3.1.3.)

2.1.3.1.5 <u>BV-1/2 Maximum Acceptable Concentrations (Individual Radionuclide)</u>

The maximum acceptable radioactivity concentration (uCi/cc) of noble gas radionuclide "i" in the gaseous effluent (C_i) for each individual noble gas radionuclide in the gaseous effluent was determined by:

$$C_i = \frac{2.12E\text{-}3 \; Q_i}{F} \qquad [2.1\text{-}13]$$

where:

2.12E-3 = Unit conversion factor (60 sec/min x 3.53E-5 ft^3/cc).

F = The maximum acceptable effluent flow rate at the point of release (cfm).

= 1450 cfm (BV-1/2 Process Vent)

2.1.3.1.6 BV-1/2 Monitor Count Rate

The calculated monitor count rate (ncpm) above background attributed to the noble gas radionuclide (C.R.) was determined by:

$$C.R. = \sum_i C_i E_i \qquad [2.1\text{-}14]$$

where:

E_i = The detection efficiency of the monitor for noble gas radionuclide "i" (cpm/uCi/cc) from Table 2.1-2a and 2.1-2b.

2.1.3.1.7 BV-1/2 Monitor Setpoints

The monitor alarm setpoints above background were determined as follows:

a. The monitor HIGH-HIGH Alarm Setpoint above background (ncpm) was determined by:

$$HHSP = 0.30\ C.R. \qquad [2.1\text{-}15]$$

b. The monitor HIGH Alarm Setpoint above background (ncpm) was determined by:

$$HSP = 0.10\ C.R. \qquad [2.1\text{-}16]$$

2.1.3.2 BV-1/2 Setpoint Determination Based On Analysis Prior To Release For Process Vent Releases (Elevated Releases)

The following calculation method applies to gaseous releases via the BV-1/2 Process Vent when the "calculated mix" does not provide adequate operational flexibility. This method is used to determine the setpoint for the maximum acceptable discharge flow rate and the associated HIGH-HIGH Alarm Setpoint based on this flow rate for the BV-1/2 Gaseous Waste Gas Monitor (RM-GW-108B) or alternate (RM-GW-109 CH #5) during the following operational conditions:

- ° Continuous release via the BV-1/2 Process Vent.
- ° Batch release of BV-1 or BV-2 Waste Gas Decay Tank via the BV-1/2 Process Vent.
- ° Batch release of BV-1 or BV-2 Containment Purge via the BV-1/2 Process Vent.

2.1.3.2.1 BV-1/2 Maximum Acceptable Release Rate

Determine the maximum acceptable discharge flow rate for the release from the Process Vent for the analyzed mix.

a. The maximum acceptable gaseous discharge flow rate (f) from the Process Vent (cfm) based upon the whole body exposure limit is determined by:

$$f = \frac{1.06\ S}{\sum_i V_i\ C_i} \qquad [2.1\text{-}21]$$

where:

1.06 = 500 mrem/yr x 2.12E-3

500 mrem/yr = dose rate limit, whole body exposure
2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

S = Percent of site dose rate released via this pathway. Up to 60% of the site dose rate is permissible for one release point under the alarm setpoint rules of Section 2.1.3. To exceed 60% of the site limit from one release point, the remaining release point limits must be correspondingly reduced or secured to provide the necessary margin below the site dose rate limit.

V_i = The constant for noble gas radionuclide "i" accounting for the gamma radiation from the elevated plume (mrem/year/uCi/sec) from Table 2.2-12.

C_i = The undiluted radioactivity concentration of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

b. Based upon the skin exposure limit, (f) is calculated by:

$$f = \frac{6.36\ S}{\sum_i [L_i\ (X/Q)_{pv} + 1.1B_i]\ C_i} \qquad [2.1\text{-}22]$$

where:

6.36 = 3000 mrem/yr x 2.12E-3

3000 mrem/yr = dose rate limit, skin exposure
2.12E-3 = unit conversion factor
= (60 sec/min x 3.53E-5 ft^3/cc)

L_i = The skin dose factor due to beta emissions from noble gas radionuclide "i" (mrem/year/uCi/m^3) from Table 2.2-11.

$(X/Q)_{pv}$ = The highest calculated annual average relative concentration of effluents released via the Process Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.2-6.

= 2.31E-6 sec/m^3

$(X/q)_{pv}$ = The short term relative concentration of effluents released via the Process Vent for any area at or beyond the unrestricted area boundary for all sectors (sec/m^3) from Table 2.3-38.

= 1.07E-5 sec/m^3

B_i = The constant for long-term releases (greater than 500 hrs/year) for noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrad/year/uCi/sec) from Table 2.2-12.

c. Select the smaller of the calculated f values based on the whole body exposure limit (Section 2.1.3.2.1.a) and based on the skin exposure limit (Section 2.1.3.2.1.b). The actual discharge flow rate (cfm) must be maintained at or below this f value.

2.1.3.2.2 BV-1/2 Monitor Setpoints

The monitor alarm setpoints above background are determined as follows:

a. The calculated monitor HIGH-HIGH Alarm Setpoint above background (ncpm) attributed to the noble gas radionuclides is determined by:

$$HHSP = \frac{f \sum_i C_i\ E_i}{F'} \qquad [2.1\text{-}23]$$

where:

$\dot{f}$ = The maximum acceptable gaseous discharge flow rate (cfm) determined in Section 2.1.3.2.1.

F' = The maximum actual or design effluent flow rate (cfm) at the point of release.

= 1450 cfm (BV-1/2 Process Vent -- design)

C_i = The undiluted radioactivity of noble gas radionuclide "i" in the gaseous source (uCi/cc) as determined by analysis of the gas to be released.

E_i = The detection efficiency of the respective monitor (RM-GW-108B) or (RM-GW-109 CH 5) for noble gas radionuclide "i" (cpm/uCi/cc) from Table 2.1-2a and 2.1-2b.

b. When a HIGH-HIGH Alarm Setpoint has been calculated according to this section the monitor HIGH Alarm setpoint above background (ncpm) is determined by:

$$HSP = HHSP \times 0.33 \qquad [2.1\text{-}24]$$

TABLE 2.1-1a

BV-1 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)**

NUCLIDE	CONTAINMENT VENT	VENTILATION VENT	TURBINE BUILDING VENT	PROCESS VENT		
	Long Term And CONTAINMENT BUILDING *	AUXILIARY BUILDING VENTILATION	TURBINE BUILDING VENTILATION	MAIN CONDENSER/ AIR EJECTOR	CONTAINMENT VACUUM PUMPS ***	GASEOUS WASTE SYSTEM
	Short Term	Long Term	Long Term	Long Term	Long Term	Short Term
Kr-83m	2.2E-02	4.2E-01	3.9E-05	2.7E-01	3.7E-04	0.0
Kr-85m	1.5E-01	1.9E+00	1.7E-04	1.2E+00	3.9E-03	7.3E-02
Kr-85	6.1E+01	2.5E+00	2.3E-04	1.6E+00	7.2E-01	2.3E+02
Kr-87	5.4E-02	1.3E+00	1.1E-04	8.2E-01	7.8E-04	0.0
Kr-88	2.4E-01	3.8E+00	3.5E-04	2.4E+00	5.0E-03	0.0
Kr-89	4.7E-04	1.2E-01	1.1E-05	7.7E-02	3.1E-06	0.0
Xe-131m	7.4E-01	1.3E-01	1.2E-05	8.0E-02	1.3E-02	1.3E+00
Xe-133m	8.9E-01	8.9E-01	8.1E-05	5.6E-01	2.2E-02	0.0
Xe-133	8.9E+01	3.6E+01	3.4E-03	2.3E+01	1.9E-00	2.3E+01
Xe-135m	4.5E-03	3.2E-01	2.9E-05	2.0E-01	4.4E-05	0.0
Xe-135	7.0E-01	4.5E+00	4.2E-04	2.8E+00	1.9E-02	0.0
Xe-137	1.0E-03	2.1E-01	2.1E-05	1.3E-01	6.3E-06	0.0
Xe-138	1.5E-02	1.1E+00	9.7E-05	6.6E-01	1.2E-04	0.0
Ar-41	2.5E+01	0.0	0.0	0.0	0.0	0.0

*Containment can be purged via Ventilation Vent, Containment Vent, or Process Vent
**Reference (2.1.2)
***Reference (2.1.8)

TABLE 2.1-1b

BV-2 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)**

NUCLIDE	VENTILATION VENT: Long Term And CONTAINMENT BUILDING * Short Term	CONTAINMENT VENT: AUXILIARY BUILDING VENTILATION Long Term	TURBINE BUILDING VENT: TURBINE BUILDING VENTILATION Long Term	PROCESS VENT: MAIN CONDENSER/ AIR EJECTOR Long Term	PROCESS VENT: CONTAINMENT VACUUM PUMPS *** Long Term	PROCESS VENT: GASEOUS WASTE SYSTEM Short Term
Kr-83m	4.0E-05	4.2E-01	3.9E-05	2.7E-01	3.7E-04	0.0
Kr-85m	1.4E-02	1.9E+00	1.7E-04	1.2E+00	3.9E-03	1.2E-02
Kr-85	6.1E+01	2.5E+00	2.3E-04	1.6E+00	7.2E-01	2.3E+02
Kr-87	5.3E-06	1.3E+00	1.1E-04	8.2E-01	7.8E-04	0.0
Kr-88	4.1E-03	3.8E+00	3.5E-04	2.4E+00	5.0E-03	0.0
Kr-89	0.0	1.2E-01	1.1E-05	7.7E-02	3.1E-06	0.0
Xe-131m	7.2E-01	1.3E-01	1.2E-05	8.0E-02	1.3E-02	8.3E-01
Xe-133m	7.6E-01	8.9E-01	8.1E-05	5.6E-01	2.2E-02	0.0
Xe-133	8.4E+01	3.6E+01	3.4E-03	2.3E+01	1.9E-00	8.2E+00
Xe-135m	0.0	3.2E-01	2.9E-05	2.0E-01	4.4E-05	0.0
Xe-135	2.4E-01	4.5E+00	4.2E-04	2.8E+00	1.9E-02	0.0
Xe-137	0.0	2.1E-01	2.1E-05	1.3E-01	6.3E-06	0.0
Xe-138	0.0	1.1E+00	9.7E-05	6.6E-01	1.2E-04	0.0
Ar-41	2.5E+01	0.0	0.0	0.0	0.0	0.0

*Containment can be purged via Ventilation Vent, Containment Vent, or Process Vent
**Reference (2.2.3)
***Reference (2.2.5)

TABLE 2.1-2a

BV-1 MONITOR DETECTOR EFFICIENCIES
(cpm/uCi/cc, CORRECTED)*

NUCLIDE	VENTILATION VENT		PROCESS VENT		CONTAINMENT VENT	
	PRIMARY MONITOR	ALTERNATE MONITOR	PRIMARY MONITOR	ALTERNATE MONITOR	PRIMARY MONITOR	ALTERNATE MONITOR
	RM-VS-101B	RM-VS-109 Channel 5	RM-GW-108B	RM-GW-109 Channel 5	RM-VS-107B	RM-VS-110 Channel 5
Kr-83m	--	--	--	--	--	--
Kr-85m	9.80 E7	2.39 E7	9.00 E7	2.43 E7	5.16 E7	2.57 E7
Kr-85	3.88 E5	2.47 E7	3.56 E5	2.51 E7	5.04 E7	2.67 E7
Kr-87	7.38 E7	2.95 E7	6.78 E7	3.00 E7	9.60 E7	3.19 E7
Kr-88	1.14 E8	2.11 E7	1.05 E8	2.14 E7	5.16 E7	2.28 E7
Kr-89	1.39 E8	2.93 E7	1.28 E8	2.98 E7	9.59 E7	3.16 E7
Kr-90	1.34 E8	3.05 E7	1.23 E8	3.10 E7	9.87 E7	3.29 E7
Xe-131m	2.25 E6	1.56 E7	2.07 E6	1.59 E7	2.94 E7	1.68 E7
Xe-133m	1.26 E7	1.94 E7	1.16 E7	1.97 E7	4.17 E7	2.09 E7
Xe-133	1.01 E7	1.24 E7	9.24 E6	1.26 E7	2.28 E7	1.33 E7
Xe-135m	7.15 E7	5.70 E6	6.58 E7	5.80 E6	1.51 E7	6.15 E6
Xe-135	1.12 E8	2.91 E7	1.03 E8	2.96 E7	6.42 E7	3.14 E7
Xe-137	3.16 E7	2.96 E7	2.91 E7	3.01 E7	1.05 E8	3.19 E7
Xe-138	1.15 E8	2.66 E7	1.06 E8	2.70 E7	7.35 E7	2.87 E7
Ar-41	7.17 E7	3.00 E7	6.59 E7	3.05 E7	7.19 E7	3.23 E7

* The listed detector efficiencies for the respective primary monitors (Victoreen) are corrected for the reduced pressures observed and documented during operation. Also listed are the alternate monitors (Eberline SPING Channel 5) efficiencies corrected for detector unique installation factors. (Pressure corrections are not required for the SPING Monitors.) See Reference (2.1.4) for additional information.

TABLE 2.1-2b

BV-2 MONITOR DETECTOR EFFICIENCIES
(cpm/uCi/cc)*

NUCLIDE	VENTILATION VENT 2HVS-RQ101B	CONTAINMENT VENT 2HVS-RQ109B	WASTE GAS STORAGE VAULT VENT 2RMQ-RQ303B	DECON BUILDING VENT 2RMQ-RQ301B	CONDENSATE POLISHING BUILDING VENT 2HVL-RQ112B
Kr-83m	--	--	--	--	--
Kr-85m	3.20E7	5.83E7	3.20E7	3.20E7	3.20E7
Kr-85	3.60E7	7.19E7	3.60E7	3.60E7	3.60E7
Kr-87	3.73E7	8.85E7	3.73E7	3.73E7	3.73E7
Kr-88	3.05E7	6.80E7	3.05E7	3.05E7	3.05E7
Kr-89	3.72E7	8.73E7	3.72E7	3.72E7	3.72E7
Kr-90	3.86E7	8.80E7	3.86E7	3.86E7	3.86E7
Xe-131m	2.44E7	4.61E4	2.44E7	2.44E7	2.44E7
Xe-133m	2.86E7	6.06E4	2.86E7	2.86E7	2.86E7
Xe-133	1.80E7	2.94E7	1.80E7	1.80E7	1.80E7
Xe-135m	7.22E6	1.55E4	7.22E6	7.22E6	7.22E6
Xe-135	3.86E7	7.48E7	3.86E7	3.86E7	3.86E7
Xe-137	3.78E7	9.07E7	3.78E7	3.78E7	3.78E7
Xe-138	3.52E7	7.74E7	3.52E7	3.52E7	3.52E7
Ar-41	3.79E7	7.90E7	3.79E7	3.79E7	3.79E7

*Reference (2.2.1)

REFERENCES

BV-1 GASEOUS EFFLUENT MONITOR SETPOINTS

2.1.1 "Beaver Valley Power Station, Appendix I Analysis - Docket No. 50-334 and 50-412"; Table 2.1.3

2.1.2 "Beaver Valley Power Station, Unit 2 FSAR"; Table 11.3-1

2.1.3 "Duquesne Light Co., Beaver Valley Nuclear Plant, Specification No. BVPS 414, Table V Nuclide Data, 5/30/74"; Table 1 and Figure 1, Table 3, and Figure 2

2.1.4 Unit 1 Gaseous Effluent Monitor Efficiency Data; DLCo Calculation Package No. ERS-SFL-85-031

2.1.5 Unit 1/Unit 2 ODCM Gaseous Alarm Setpoint Determinations; DLCo Calculation Package No. ERS-HHM-87-014

2.1.6 BVPS-1 and BVPS-2 ODCM T Factor Justification; DLCo Calculation Package No. ERS-ATL-87-026

2.1.7 Letter ND1SHP:776, dated February 12, 1988, BVPS-1 ODCM Table 2.2-2, Appendix B

2.1.8 Gaseous Releases From Containment Vacuum Pumps; Stone and Webster Calculation No. UR(B)-262

REFERENCES

BV-2 GASEOUS EFFLUENT MONITOR SETPOINTS

2.2.1 Unit 2 DRMS Isotopic Efficiencies; DLCo Calculation Package No. ERS-SFL-86-026

2.2.2 Unit 1/Unit 2 ODCM Gaseous Alarm Setpoint Determinations; DLCo Calculation Package No. ERS-HHM-87-014

2.2.3 "Beaver Valley Power Station, Unit 2 FSAR"; Table 11.3-2

2.2.4 BVPS-1 and BVPS-2 ODCM T Factor Justification; DLCo Calculation Package No. ERS-ATL-87-026

2.2.5 Gaseous Releases From Containment Vacuum Pumps; Stone and Webster Calculation No. UR(B)-262

2.2 Compliance With 10 CFR 20 Dose Rate Limits (ODCM Appendix C CONTROL 3.11.2.1)

2.2.1 Dose Rate Due To Noble Gases

The dose rate in unrestricted areas resulting from noble gas effluents from the site is limited to 500 mrem/yr to the total body and 3,000 mrem/yr to the skin. Site gaseous effluents are the total of BV-1 and BV-2 specific ground releases and a shared elevated release, the BV-1/2 Process Vent. Based upon NUREG-0133 the following basic expressions are used to show compliance with ODCM Appendix C CONTROL 3.11.2.1.a.

$$\sum_i [V_i Q_{is} + K_i(\overline{X/Q})_v \; Q_{iv}] < 500 \text{ mrem/yr} \qquad [2.2\text{-}1]$$

$$\sum_i \left[[L_i(\overline{X/Q})_s + 1.1B_i] \; Q_{is} + [L_i + 1.1M_i](\overline{X/Q})_v \; Q_{iv} \right] \leq 3000 \text{ mrem/yr} \qquad [2.2\text{-}2]$$

where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide "i", mrem/year/uCi/m^3.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide "i", mrem/year/uCi/m^3.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide "i", mrad/year/uCi/m^3.

V_i = The constant for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume, mrem/year/uCi/sec.

B_i = The constant for long-term releases (greater than 500 hrs/year) for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume, mrad/year/uCi/sec.

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of the photon of interest, mrem/mrad.

Q_{is} = The release rate of noble gas radionuclide "i" in gaseous effluents from free-standing stack, uCi/sec.

Q_{iv} = The release rate of noble gas radionuclide "i" in gaseous effluents from all vent releases, uCi/sec.

$(\overline{X/Q})_s$ = The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary for elevated releases (sec/m^3).

$(\overline{X/Q})_v$ = The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary for ground level releases (sec/m^3).

At the Beaver Valley site gaseous releases may occur from:

1. The Containment Vents atop the Containment Domes
2. The Ventilation Vents atop the Auxiliary Buildings
3. The Process Vent atop the BV-1 Cooling Tower
4. The Turbine Building Vents
5. The BV-2 Condensate Polishing Building Vent
6. The BV-2 Decontamination Building Vent
7. The BV-2 Waste Gas Storage Vault Vent

Effluent from the Containment Vents are assumed ground level in nature. At BV-1 the source of these releases is the Supplementary Leak Collection and Release System (SLCRS). At BV-2 the source of these releases is normal Auxiliary Building Ventilation. It is also possible to release Containment Purges from these vents. The Ventilation Vent Releases are ground level in nature. At BV-1 the sources of these releases are Containment Purges and normal Auxiliary Building Ventilation. At BV-2 the sources of these releases are Containment Purges and Contiguous Areas ventilation. The Turbine Building Vents Releases are ground level in nature and the source of these releases are the Turbine Building Ventilation. Release points 4, 5, 6, and 7 above are not normally radioactive release points. The Process Vent releases are elevated and the sources of these releases are the Main Condenser Air Ejectors and the Waste Gas Decay Tanks and Containment Vacuum Pumps.

Noble gas releases may normally occur from release points 1 through 3 above. To show compliance with the site limits of ODCM Appendix C CONTROL 3.11.2.1.a, Expressions [2.2-1] and [2.2-2] are now expressed in terms of the actual release points for the site. Note that the expressions for release points 4, 5, 6, and 7 are included for use if radioactive releases via these release points are identified in the future.

<u>For The Total Body Dose Rate:</u>

$$\sum_i V_i Q_{i_{pv}} + \sum_i K_i \, [(\overline{X/Q})_{cv} \, Q_{i_{cv1}} + (\overline{X/Q})_{vv} \, Q_{i_{vv1}} + (\overline{X/Q})_{tv} \, Q_{i_{tv1}} + (\overline{X/Q})_{cv} \, Q_{i_{cv2}} + (\overline{X/Q})_{vv} \, Q_{i_{vv2}} + (\overline{X/Q})_{tv} \, Q_{i_{tv2}} + (\overline{X/Q})_{cp} \, Q_{i_{cp2}} + (\overline{X/Q})_{dv} \, Q_{i_{dv2}} + (\overline{X/Q})_{wv} \, Q_{i_{wv2}} \,] \leq 500 \text{ mrem/yr} \qquad [2.2\text{-}3]$$

For The Skin Dose Rate:

$$\sum_i [L_i(\overline{X/Q})_{pv} + 1.1B_i]\, Q_{i_{pv}} + \Sigma_i\, [L_i + 1.1M_i]\, [(\overline{X/Q})_{cv}\, Q_{i_{cv1}} + (\overline{X/Q})_{vv}\, Q_{i_{vv1}} + (\overline{X/Q})_{tv}\, Q_{i_{tv1}} + (\overline{X/Q})_{cv}\, Q_{i_{cv2}} + (\overline{X/Q})_{vv}\, Q_{i_{vv2}} + (\overline{X/Q})_{tv}\, Q_{i_{tv2}} + (\overline{X/Q})_{cp}\, Q_{i_{cp2}} + (\overline{X/Q})_{dv}\, Q_{i_{dv2}} + (\overline{X/Q})_{wv}\, Q_{i_{wv2}}] \leq 3000 \text{ mrem/yr} \quad [2.2\text{-}4]$$

where:

$Q_{i_{pv}}$ = Release rate of radionuclide "i" from the BV-1/2 Process Vent, uCi/sec.

$Q_{i_{cv1}}$ = Release rate of radionuclide "i" from the BV-1 Containment Vent, uCi/sec.

$Q_{i_{cv2}}$ = Release rate of radionuclide "i" from the BV-2 Containment Vent, uCi/sec.

$Q_{i_{vv1}}$ = Release rate of radionuclide "i" from the BV-1 Ventilation Vent, uCi/sec.

$Q_{i_{vv2}}$ = Release rate of radionuclide "i" from the BV-2 Ventilation Vent, uCi/sec.

$Q_{i_{tv1}}$ = Release rate of radionuclide "i" from the BV-1 Turbine Building Vent, uCi/sec.

$Q_{i_{tv2}}$ = Release rate of radionuclide "i" from the BV-2 Turbine Building Vent, uCi/sec.

$Q_{i_{cp2}}$ = Release rate of radionuclide "i" from the BV-2 Condensate Polishing Building Vent, uCi/sec.

$Q_{i_{dv2}}$ = Release rate of radionuclide "i" from the BV-2 Decontamination Building Vent, uCi/sec.

$Q_{i_{wv2}}$ = Release rate of radionuclide "i" from the BV-2 Waste Gas Storage Vault Vent, uCi/sec.

$(\overline{X/Q})_{pv}$ = Highest calculated annual average relative concentration for releases from the Process Vent, sec/m^3.

$(\overline{X/Q})_{cv}$ = Highest calculated annual average relative concentration for releases from the Containment Vent, sec/m^3.

$(\overline{X/Q})_{vv}$ = Highest calculated annual average relative concentration for releases from the Ventilation Vent, sec/m^3.

$(\overline{X/Q})_{tv}$ = Highest calculated annual average relative concentration for releases for the Turbine Building Vent, sec/m^3.

$(\overline{X/Q})_{cp}$ = Highest calculated annual average relative concentration for releases for the BV-2 Condensate Polishing Building Vent, sec/m^3.

$(\overline{X/Q})_{dv}$ = Highest calculated annual average relative concentration for releases for the BV-2 Decontamination Building Vent, sec/m^3.

$(\overline{X/Q})_{wv}$ = Highest calculated annual average relative concentration for releases for the BV-2 Waste Gas Storage Vault Vent, sec/m^3.

Note that the release rate for a containment purge is based on an averaged release rate in uCi/sec for the entire purge (not to exceed 960 min in accordance with ODCM Appendix C CONTROL 3.11.2.1).

All other terms remain the same as those defined previously.

For the site, 4 potential modes of release are possible. The release modes identify the various combinations of sources of radioactivity and their release points which are used to determine the controlling locations. They are presented in Table 2.2-1. For Modes 1, 2, and 3, the controlling location for implementation of ODCM Appendix C CONTROL 3.11.2.1.a is 0.35 miles NW. Inserting the appropriate X/Q's from Tables 2.2-4 through 2.2-10 for this location, Expressions [2.2-3] and [2.2-4] become:

<u>For The Total Body Dose Rate:</u>

$$\sum_i V_i Q_{i_{pv}} + \sum_i K_i \, [9.24E\text{-}5\ Q_{i_{cv1}} + 1.03E\text{-}4\ Q_{i_{vv1}} + 7.35E\text{-}5\ Q_{i_{tv1}} + 9.24E\text{-}5\ Q_{i_{cv2}} + 1.03E\text{-}4\ Q_{i_{vv2}} + 7.35E\text{-}5\ Q_{i_{tv2}} + 9.24E\text{-}5\ Q_{i_{dv2}} + 9.24E\text{-}5\ Q_{i_{wv2}} + 7.35E\text{-}5\ Q_{i_{cp2}}] \leq 500 \text{ mrem/yr} \quad [2.2\text{-}5]$$

<u>For The Skin Dose Rate:</u>

$$\sum_i [7.0E\text{-}10\ L_i + 1.1B_i]\ Q_{i_{pv}} + \sum_i [L_i + 1.1M_i]\ [9.24E\text{-}5\ Q_{i_{cv1}} + 1.03E\text{-}4\ Q_{i_{vv1}} + 7.35E\text{-}5\ Q_{i_{tv1}} + 9.24E\text{-}5\ Q_{i_{cv2}} + 1.03E\text{-}4\ Q_{i_{vv2}} + 7.35E\text{-}5\ Q_{i_{tv2}} + 9.24E\text{-}5\ Q_{i_{dv2}} + 9.24E\text{-}5\ Q_{i_{wv2}} + 7.35E\text{-}5\ Q_{i_{cp2}}] \leq 3000 \text{ mrem/yr} \quad [2.2\text{-}6]$$

For the release Mode 4, the controlling location is 0.75 miles N. Inserting the appropriate X/Q's from Tables 2.2-4 through 2.2-10 for this location, Expressions [2.2-3 and 2.2-4] become:

For The Total Body Dose Rate:

$$\sum_i V_i Q_{i_{pv}} + \sum_i K_i \,[3.95E\text{-}6\, Q_{i_{cv1}} + 4.99E\text{-}6\, Q_{i_{vv1}} + 4.26E\text{-}6\, Q_{i_{tv1}} + 3.95E\text{-}6\, Q_{i_{cv2}} + 4.99E\text{-}6\, Q_{i_{vv2}} + 4.26E\text{-}6\, Q_{i_{tv2}} + 3.95E\text{-}6\, Q_{i_{dv2}} + 3.95E\text{-}6\, Q_{i_{wv2}} + 4.26E\text{-}6\, Q_{i_{cp2}}\,] \leq 500 \text{ mrem/yr} \qquad [2.2\text{-}7]$$

For The Skin Dose Rate:

$$\sum_i [2.31E\text{-}6\, L_i + 1.1B_i]\, Q_{i_{pv}} + \sum_i [L_i + 1.1M_i]\,[3.95E\text{-}6\, Q_{i_{cv1}} + 4.99E\text{-}6\, Q_{i_{vv1}} + 3.95E\text{-}6\, Q_{i_{cv2}} + 4.99E\text{-}6\, Q_{i_{vv2}} + 4.26E\text{-}6\, Q_{i_{tv2}} + 4.26E\text{-}6\, Q_{i_{tv1}} + 3.95E\text{-}6\, Q_{i_{dv}} + 3.95E\text{-}6\, Q_{i_{wv}} + 4.26E\text{-}6\, Q_{i_{cp}}\,] \leq 3000 \text{ mrem/yr} \qquad [2.2\text{-}8]$$

The determination of controlling location for implementation of ODCM Appendix C CONTROL 3.11.2.1.a for noble gases is a function of the following parameters:

1. Radionuclide mix and their isotopic release rate
2. Release mode
3. Meteorology

The incorporation of these 3 parameters into Expressions [2.2-3] and [2.2-4] resulted in the expressions for the controlling locations as presented in Expressions [2.2-5 through 2.2-8].

The radionuclide mix used to determine controlling locations was based on source terms calculated with the Stone and Webster Engineering Corporation computer code GAS1BB which is similar to the NRC GALE code. Inputs were based on operating modes of the respective plants. The code inputs utilized are presented in Appendix B. The source term is presented in Tables 2.2-2a and 2.2-2b as a function of release type and release point.

The X/Q values utilized in the equations for implementation of ODCM Appendix C CONTROL 3.11.2.1.a are based upon the maximum long-term annual average X/Q in the unrestricted area. Table 2.2-3 presents the distances from the release points to the nearest unrestricted area for each of the 16 sectors as well as to the nearest vegetable garden, cow, goat, and beef animal. Tables 2.2-4 through 2.2-10 present the long-term annual average ($\overline{X/Q}$) values for the Process Vent, Containment Vent, Ventilation Vent, Turbine Building Vent, and if applicable for BV-2, Decontamination Building Vent, Waste Gas Storage Vault Vent, and the Condensate Polishing Building Vent release points to the special locations presented in Table 2.2-3. A description of their derivation is provided in Appendix A.

For release modes 1, 2, and 3, dose calculations were performed using the highest calculated site boundary X/Q values applicable to the release points involved and the projected radionuclide mix applicable to the release source. In that a simultaneous, continuous elevated release could contribute to the dose at a given location, the selection of the two highest sector X/Q values at the site boundary considered this contribution. From these results, the distance and sector associated with the highest calculated site boundary dose were selected as the controlling location.

For Modes 1, 2, and 3 the controlling location is 0.35 miles NW. In Mode 1, the dominant release is the Auxiliary Building Ventilation (BV-1 Ventilation Vent and BV-2 Containment Vent). In Modes 2 and 3, the dominant release is a. Containment Purge from the respective Ventilation Vent or Containment Vent.

For release Mode 4, a similar evaluation was performed. Long-term annual average X/Q values were calculated at the mid-point of the 10 standard distances listed in Table 2.2-4 through 2.2-10. In that a simultaneous, ground level release could contribute to the dose at a given location, the selection of the two highest X/Q values at the controlling distance considered this contribution. Since the two maximum X/Q values occurred in the 0.5 - 1.0 mile radial band, the controlling distance was selected at 0.75 miles. From the calculated dose results, the controlling sector was shown to be North. In this mode, the dominant release is a Containment Purge via the Process Vent. Neither of the controlling receptor locations are presently inhabited.

Values for K_i, L_i, and M_i, which were used in the determination of the controlling receptor location and which are to be used in Expressions [2.2-5] through [2.2-8] to show compliance with ODCM Appendix C CONTROL 3.11.2.1.2, are presented in Table 2.2-11. Values taken from Table B-1 of NRC Regulatory Guide 1.109, Revision 1, were multiplied by 1E6 to convert picocuries^{-1} to microcuries^{-1} for use in Table 2.2-11.

Values for V_i and B_i for the finite plume model can be expressed as shown in Equation [2.2-9] and [2.2-10]. Values were calculated using the NRC code RABFIN at the site boundary location which would receive the highest total dose from combined Process Vent, Ventilation Vent, and Turbine Building Vent, and Containment Vent releases. These values are presented in Table 2.2-12 and calculated from the following relation:

$$B_i = \frac{K}{r_d} \sum_j \sum_k \sum_l \frac{f_{jk} \, A_{li} \, u_a \, E_l \, I}{u_j} \qquad [2.2\text{-}9]$$

where:

I = The results of numerical integration over the plume spatial distribution of the airborne activity as defined by the meteorological condition of wind speed (u_j) and atmospheric stability class "k" for a particular wind direction.

K = A numerical constant representing unit conversions.

$$= \frac{(260\ \text{mrad})(\text{radians})\ (m^3)\ (\text{transformation})}{(\text{sec})(\text{Mev})(\text{Ci})} \left[\frac{16\ \text{sectors}}{2\pi\ \text{radians}}\right] \left[1E\text{-}6\ \frac{\text{Ci}}{\text{uCi}}\right] \left[3.15E7\ \frac{\text{sec}}{\text{yr}}\right]$$

$= 2.1E4$ mrad (m^3) (transformation)/yr(Mev)(uCi).

r_d = The distance from the release point to the receptor location, meters.

u_j = The mean wind speed assigned to the "j" th wind speed class, meters/sec.

f_{jk} = The joint frequency of occurrence of the "j" th wind speed class and kth stability class (dimensionless).

A_{li} = The number of photons of energy corresponding to the "l" th energy group emitted per transformation of the "i" th radionuclide, number/transformation.

E_l = The energy assigned to the "l" th energy group, Mev.

u_a = The energy absorption coefficient in air for photon energy H_l, meters^{-1}.

The V_i factor is computed with conversion from air dose to tissue depth dose, thus:

$$V_i = 1.1\ \frac{K}{r_d} \sum_j \sum_k \sum_l \frac{f_{jk}\ A_{li}\ u_a\ E_l\ I_e\ {-u_T}\ T_d}{u_j} \qquad [2.2\text{-}10]$$

where:

u_T = The tissue energy absorption coefficient for photons of energy E_l, cm^2/gm.

T_d = The tissue density thickness taken to represent the total body dose ($5 gm/cm^2$).

1.1 = The ratio of the tissue to air absorption coefficients over the energy range of photons of interest, mrem/mrad.

2.2.2 Dose Rate Due To Radioiodines And Particulates

The dose rate in unrestricted areas resulting from the of inhalation of I-131, tritium, and all radionuclides in particulate form (excluding C-14) with half lives greater than 8 days released in gaseous effluents from the site shall be limited to 1,500 mrem/yr to any organ. Based upon NUREG-0133, the following basic expression is used to show compliance with ODCM Appendix C CONTROL 3.11.2.1.b:

$$\sum_i P_{i\tau} \left[\overline{(X/Q)}_s \, Q_{is} + \overline{(X/Q)}_v \, Q_{iv}\right] \leq 1{,}500 \text{ mrem/yr} \qquad [2.2\text{-}11]$$

where:

$P_{i\tau}$ = Dose parameter for any organ τ for each identified radionuclide "i", mrem/yr per uCi/m^3.

Q_{is} = The release rate of radionuclide "i", in gaseous effluents from elevated releases, uCi/sec.

Q_{iv} = The release rate of radionuclide "i", in gaseous effluents from ground level releases, uCi/sec.

$\overline{(X/Q)}_s$ = The highest calculated annual average relative concentration at the unrestricted area boundary for elevated releases, sec/m^3.

$\overline{(X/Q)}_v$ = The highest calculated annual average relative concentration at the unrestricted area boundary for ground level releases, sec/m^3.

NOTE: The dispersion parameters specified in Section 2.2.2 are limited to the site boundary as defined above.

Releases may occur from any of the site vents in the release modes listed in Table 2.2-1. To show compliance with ODCM Appendix C CONTROL 3.11.2.1.b, Expression [2.2-11] is now expressed in terms of the actual release points for the site.

$$\sum_i P_{i\tau} \left[\overline{(X/Q)}_{pv} \, Q_{i_{pv}} + \overline{(X/Q)}_{cv} \, Q_{i_{cv1}} + \overline{(X/Q)}_{vv} \, Q_{i_{vv1}} + \overline{(X/Q)}_{tv} \, Q_{i_{tv1}} + \overline{(X/Q)}_{cv} \, Q_{i_{cv2}} + \overline{(X/Q)}_{vv} \, Q_{i_{vv2}} + \overline{(X/Q)}_{tv} \, Q_{i_{tv2}} + \overline{(X/Q)}_{cp} \, Q_{i_{cp2}} + \overline{(X/Q)}_{dv} \, Q_{i_{dv2}} + \overline{(X/Q)}_{wv} \, Q_{i_{wv2}}\right] \leq 1500 \text{ mrem/yr} \qquad [2.2\text{-}12]$$

where:

$\overline{(X/Q)}_{pv}$ = Highest calculated annual average relative concentration for releases from the Process Vent, sec/m^3.

$\overline{(X/Q)}_{cv}$ = Highest calculated annual average relative concentration for releases from the Containment Vents, sec/m^3.

$(\overline{X/Q})_{vv}$ = Highest calculated annual average relative concentration for releases from the Ventilation Vents, sec/m^3.

$(\overline{X/Q})_{tv}$ = Highest calculated annual average relative concentration for releases for the Turbine Building Vents, sec/m^3.

$(\overline{X/Q})_{cp}$ = Highest calculated annual average relative concentration for releases for the BV-2 Condensate Polishing Building Vent, sec/m^3.

$(\overline{X/Q})_{dv}$ = Highest calculated annual average relative concentration for releases for the BV-2 Decontamination Building Vent, sec/m^3.

$(\overline{X/Q})_{wv}$ = Highest calculated annual average relative concentration for release from the BV-2 Waste Gas Storage Vault Vent, sec/m^3.

$Q_{i_{pv}}$ = Long-term release rate of radionuclide "i" from the BV-1/2 Process Vent, uCi/sec.

$Q_{i_{cv1}}$ = Long-term release rate of radionuclide "i" from the BV-1 Containment Vent, uCi/sec.

$Q_{i_{cv2}}$ = Long-term release rate of radionuclide "i" from the BV-2 Containment Vent, uCi/sec.

$Q_{i_{vv1}}$ = Long-term release rate of radionuclide "i" from the BV-1 Ventilation Vent, uCi/sec.

$Q_{i_{vv2}}$ = Long-term release rate of radionuclide "i" from the BV-2 Ventilation Vent, uCi/sec.

$Q_{i_{tv1}}$ = Long-term release rate of radionuclide "i" from the BV-1 Turbine Building Vent, uCi/sec.

$Q_{i_{tv2}}$ = Long-term release rate of radionuclide "i" from the BV-2 Turbine Building Vent, uCi/sec.

$Q_{i_{cp2}}$ = Long-term release rate of radionuclide "i" from the BV-2 Condensate Polishing Building Vent, uCi/sec.

$Q_{i_{dv2}}$ = Long-term release rate of radionuclide "i" from the BV-2 Decontamination Building Vent, uCi/sec.

$Q_{i_{wv2}}$ = Long-term release rate of radionuclide "i" from the BV-2 Waste Gas Storage Vault Vent, uCi/sec.

All other terms are the same as those defined previously.

The Turbine Building Vent, Condensate Polishing Building Vent, Decontamination Building Vent, and Waste Gas Storage Vault Vent are not normal radioactive release points. These release points are included only for use if radioactive releases via these vents are identified in the future. In the calculation to show compliance with ODCM Appendix C CONTROL 3.11.2.1.b only the inhalation pathway is considered.

Values of the organ dose parameters, $P_{i\tau}$, were calculated using methodology given in NUREG-0133. For the child age group, the following equation was used for all nuclides. The $P_{i\tau}$, values are presented in Table 2.2-13.

$$P_{i\tau} = 3.7E9\ DFA_{i\tau} \qquad [2.2\text{-}13]$$

where:

3.7E9 = Breathing rate of child (3,700 m^3/yr) x unit conversion factor (1E6 pCi/uCi).

$DFA_{i\tau}$ = The organ inhalation dose factor for a child from Table 6 of USNRC NUREG-0172, Nov. 1977, for organ τ, nuclide "i", in units of mrem/pCi.

For release modes 1 through 4, the controlling location is the site boundary, 0.35 miles NW.

Expression [2.2-12] becomes:

$$\sum_i P_{i\tau} [7.00E\text{-}10\ Q_{i_{pv}} + 9.24E\text{-}5\ Q_{i_{cv1}} + 1.03E\text{-}4\ Q_{i_{vv1}} + 7.35E\text{-}5\ Q_{i_{tv1}} + 9.24E\text{-}5\ Q_{i_{cv2}} + 1.03E\text{-}4\ Q_{i_{vv2}} + 7.35E\text{-}5\ Q_{i_{tv2}} + 7.35E\text{-}5\ Q_{i_{cp2}} + 9.24E\text{-}5\ Q_{i_{dv2}} + 9.24E\text{-}5\ Q_{i_{wv2}} \leq 1500 \text{ mrem/yr} \qquad [2.2\text{-}14]$$

The determination of the controlling location for implementation of ODCM Appendix C CONTROL 3.11.2.1.b for radioiodines and particulates is a function of the same 3 parameters as for noble gases plus a fourth, the actual receptor pathways. The incorporation of these parameters into Expression [2.2-12] results in the respective equations for each release mode at the site boundary controlling locations. The radionuclide mix was again based upon the source terms presented in Tables 2.2-2a and 2.2-2b as a function of release type and release point.

In the determination of the controlling site boundary for each release mode, the highest 2 site boundary X/Q values for each release point were utilized in conjunction with the radionuclide mix and the release rate for each release point to determine the controlling location.

The $P_{i\tau}$ values are presented in Table 2.2-13.

The X/Q values in Expression [2.2-14] were obtained from Tables 2.2-4 through 2.2-10.

A description of the derivation of the X/Q values is provided in Appendix A.

TABLE 2.2-1

MODES OF GASEOUS RELEASE FROM BEAVER VALLEY SITE VENTS FOR IMPLEMENTATION OF 10 CFR 20 AND 10 CFR 50

RELEASE POINT	MODE 1	MODE 2	MODE 3	MODE 4
BVPS-1 - BVPS-2[2] Process Vent (pv)	Main Cond. Air Ejector, Waste Gas, Containment Vacuum	Same As Mode 1	Same As Mode 1	Same As Mode 1 And Containment Purge
BVPS-1 Ventilation[1] Vent (vv1)	Aux. Bldg. Ventilation	Containment Purge[3]	Same As Mode 1	Same As Mode 1
BVPS-1 Containment[1] Vent (cv1)	Leakage Collection Exhaust	Same As Mode 1	Same As Mode 1 And Containment Purge[3]	Same As Mode 1
BVPS-1 Turbine Bldg.[1] Vent (tv1)	Turbine Bldg. Exhaust*	Same As Mode 1*	Same As Mode 1*	Same As Mode 1*
BVPS-2 Ventilation[1] Vent (vv2)	Contiguous Areas	Containment Purge[3]	Same As Mode 1	Same As Mode 1
BVPS-2 Containment[1] Vent (cv2)	Aux. Bldg. Ventilation	Same As Mode 1	Same As Mode 1 And Containment Purge[3]	Same As Mode 1
BVPS-2 Turbine Bldg.[1] Vent (tv2)	Turbing Bldg. Exhaust*	Same As Mode 1*	Same As Mode 1*	Same As Mode 1*
BVPS-2 Condensate[1] Polishing Bldg. Vent (cp2)	*	*	*	*
BVPS-2 Decontamination[1] Bldg. Vent (dv2)	*	*	*	*
BVPS-2 Waste Gas[1] Storage Vault Vent (wv2)	*	*	*	*

*Not normally a radioactive release point

NOTE: For the purpose of implementing 10 CFR 50, batch discharges may use continuous meteorology since short term meteorology is used at the time of the annual report.

[1] Continuous ground level meteorology is applicable

[2] Continuous elevated meteorology is applicable

[3] Mode established by purge from one unit, all other release points remain same as Mode 1

TABLE 2.2-2a

BV-1 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)**

NUCLIDE	CONTAINMENT VENT	VENTILATION VENT	TURBINE BUILDING VENT	PROCESS VENT		
	Long Term And CONTAINMENT BUILDING *	AUXILIARY BUILDING VENTILATION	TURBINE BUILDING VENTILATION	MAIN CONDENSER/ AIR EJECTOR	CONTAINMENT VACUUM PUMPS ***	GASEOUS WASTE SYSTEM
	Short Term	Long Term	Long Term	Long Term	Long Term	Short Term
Kr-83m	2.2E-02	4.2E-01	3.9E-05	2.7E-01	3.7E-04	0.0
Kr-85m	1.5E-01	1.9E+00	1.7E-04	1.2E+00	3.9E-03	1.2E-02
Kr-85	6.1E+01	2.5E+00	2.3E-04	1.6E+00	7.2E-01	2.3E+02
Kr-87	5.4E-02	1.3E+00	1.1E-04	8.2E-01	7.8E-04	0.0
Kr-88	2.4E-01	3.8E+00	3.5E-04	2.4E+00	5.0E-03	0.0
Kr-89	4.7E-04	1.2E-01	1.1E-05	7.7E-02	3.1E-06	0.0
Xe-131m	7.4E-01	1.3E-01	1.2E-05	8.0E-02	1.3E-02	8.3E-01
Xe-133m	8.9E-01	8.9E-01	8.1E-05	5.6E-01	2.2E-02	0.0
Xe-133	8.9E+01	3.6E+01	3.4E-03	2.3E+01	1.9E-00	8.2E+00
Xe-135m	4.5E-03	3.2E-01	2.9E-05	2.0E-01	4.4E-05	0.0
Xe-135	7.0E-01	4.5E+00	4.2E-04	2.8E+00	1.9E-02	0.0
Xe-137	1.0E-03	2.1E-01	2.1E-05	1.3E-01	6.3E-06	0.0
Xe-138	1.5E-02	1.1E+00	9.7E-05	6.6E-01	1.2E-04	0.0
I-131	1.2E-03	4.6E-02	6.5E-04	2.1E-02	4.7E-04	0.0
I-132	0.0	0.0	0.0	0.0	2.5E-06	0.0
I-133	2.0E-04	6.7E-02	8.7E-04	3.0E-02	8.4E-05	0.0
I-134	0.0	0.0	0.0	0.0	4.7E-07	0.0
I-135	0.0	0.0	0.0	0.0	1.4E-05	0.0
Co-58	7.5E-04	6.0E-02	0.0	0.0	1.6E-05	0.0
Co-60	3.4E-04	2.7E-02	0.0	0.0	7.4E-06	0.0
Mn-54	2.2E-04	1.8E-02	0.0	0.0	4.9E-06	0.0
Fe-59	7.5E-05	6.0E-03	0.0	0.0	1.6E-06	0.0
Sr-89	1.7E-05	1.3E-03	0.0	0.0	3.7E-07	0.0
Sr-90	3.0E-06	2.0E-04	0.0	0.0	6.6E-08	0.0
Cs-134	2.2E-04	1.8E-02	0.0	0.0	4.9E-06	0.0
Cs-137	3.8E-04	3.0E-02	0.0	0.0	8.4E-06	0.0
C-14	1.0E+00	0.0	0.0	0.0	0.0	7.0E+00
Ar-41	2.5E+01	0.0	0.0	0.0	0.0	0.0

*Containment can be purged via Ventilation Vent, Containment Vent, or Process Vent
**Reference 2.1.2
***See Section 2.1.1.1

TABLE 2.2-2b

BV-2 RADIONUCLIDE MIX FOR GASEOUS EFFLUENTS
(Ci/yr)**

	VENTILATION VENT	CONTAINMENT VENT	TURBINE BUILDING VENT	PROCESS VENT		
NUCLIDE	Long Term And CONTAINMENT BUILDING * Short Term	AUXILIARY BUILDING VENTILATION Long Term	TURBINE BUILDING VENTILATION Long Term	MAIN CONDENSER/ AIR EJECTOR Long Term	CONTAINMENT VACUUM PUMPS *** Long Term	GASEOUS WASTE SYSTEM Short Term
Kr-83m	4.0E-05	4.2E-01	3.9E-05	2.7E-01	3.7E-04	0.0
Kr-85m	1.4E-02	1.9E+00	1.7E-04	1.2E+00	3.9E-03	1.2E-02
Kr-85	6.1E+01	2.5E+00	2.3E-04	1.6E+00	7.2E-01	2.3E+02
Kr-87	5.3E-06	1.3E+00	1.1E-04	8.2E-01	7.8E-04	0.0
Kr-88	4.1E-03	3.8E+00	3.5E-04	2.4E+00	5.0E-03	0.0
Kr-89	0.0	1.2E-01	1.1E-05	7.7E-02	3.1E-06	0.0
Xe-131m	7.2E-01	1.3E-01	1.2E-05	8.0E-02	1.3E-02	8.3E-01
Xe-133m	7.6E-01	8.9E-01	8.1E-05	5.6E-01	2.2E-02	0.0
Xe-133	8.4E+01	3.6E+01	3.4E-03	2.3E+01	1.9E-00	8.2E+00
Xe-135m	0.0	3.2E-01	2.9E-05	2.0E-01	4.4E-05	0.0
Xe-135	2.4E-01	4.5E+00	4.2E-04	2.8E+00	1.9E-02	0.0
Xe-137	0.0	2.1E-01	2.1E-05	1.3E-01	6.3E-06	0.0
Xe-138	0.0	1.1E+00	9.7E-05	6.6E-01	1.2E-04	0.0
I-131	2.7E-05	4.6E-03	6.5E-04	2.1E-02	4.7E-04	0.0
I-132	0.0	0.0	0.0	0.0	2.5E-06	0.0
I-133	2.6E-06	6.7E-03	8.7E-04	3.0E-02	8.4E-05	0.0
I-134	0.0	0.0	0.0	0.0	4.7E-07	0.0
I-135	0.0	0.0	0.0	0.0	1.4E-05	0.0
Co-58	7.5E-02	6.0E-04	0.0	0.0	1.6E-05	0.0
Co-60	3.4E-02	2.7E-04	0.0	0.0	7.4E-06	0.0
Mn-54	2.2E-02	1.8E-04	0.0	0.0	4.9E-06	0.0
Fe-59	7.5E-03	6.0E-05	0.0	0.0	1.6E-06	0.0
Sr-89	1.7E-03	1.3E-05	0.0	0.0	3.7E-07	0.0
Sr-90	3.0E-04	2.0E-06	0.0	0.0	6.6E-08	0.0
Cs-134	2.2E-02	1.8E-04	0.0	0.0	4.9E-06	0.0
Cs-137	3.8E-02	3.0E-04	0.0	0.0	8.4E-06	0.0
C-14	1.0E+00	0.0	0.0	0.0	0.0	7.0E+00
Ar-41	2.5E+01	0.0	0.0	0.0	0.0	0.0

Containment can be purged via Ventilation Vent, Containment Vent, or Process Ver
**Reference 2.2.3
***See Section 2.1.2.1

TABLE 2.2-3

DISTANCES OF LIMITING MAXIMUM INDIVIDUAL RECEPTORS TO RELEASE POINTS
FOR ANNUAL X/Q VALUES*
(meters)

DOWN-WIND SECTOR	SITE BOUNDARY			VEGETABLE GARDEN		MILK COW		MILK GOAT		MEAT ANIMAL		RESIDENT	
	GROUND		ELEV.	GROUND	ELEV.	GROUND	ELEV.	GROUND	ELEV.	GROUND	ELEV.	GROUND	ELEV.
	(1)	(2)											
N	670	579	413	2,623	2,423	—	—	4,651	4,418	4,152	3,919	2,527	2,295
NNE	535	792	632	2,704	2,461	—	—	6,276	6,033	2,848	2,605	2,639	2,461
NE	490	442	327	724	901	7,741	7,526	20,760	20,545	7,741	7,526	708	790
ENE	490	448	394	1,674	1,658	—	—	6,824	6,671	—	—	708	1,562
E	545	546	551	1,979	1,922	7,065	6,998	4,265	4,200	4,265	4,200	756	1,922
ESE	575	607	672	1,577	1,619	—	—	2,865	2,899	1,577	1,619	1,577	1,650
SE	575	701	815	1,835	1,961	5,729	5,848	5,729	5,848	3,299	3,420	1,835	1,961
SSE	655	762	912	1,738	1,933	5,053	5,244	9,977	10,166	1,770	1,964	1,432	1,628
S	850	887	1,054	3,138	3,372	3,347	3,539	—	—	2,253	2,487	2,189	2,423
SSW	975	1,064	1,226	2,317	2,560	3,347	3,590	5,616	5,859	2,317	2,560	1,223	1,466
SW	1,435	1,439	1,574	2,221	2,439	—	—	2,993	3,210	2,414	2,632	2,221	2,439
WSW	595	561	660	2,301	2,463	5,182	5,341	—	—	2,446	2,608	2,301	2,463
W	685	640	681	3,556	3,635	5,118	5,195	—	—	4,088	4,166	3,556	3,635
WNW	810	701	676	3,605	3,590	4,538	4,521	22,529	22,507	3,605	3,590	3,605	3,590
NW	655	567	482	1,464	1,415	—	—	10,944	10,832	4,570	4,461	1,432	1,383
NNW	645	558	420	1,464	1,285	—	—	15,450	15,262	3,959	3,774	1,143	1,253

NOTE: *Distances for ground releases are measured from the centerpoint between the BV-1 and BV-2 Containment Buildings. Distances for elevated release are measured from the BV-1 Cooling Tower. Elevated release is applicable to the Process Vent. Ground release is applicable to all other release points. Site boundary ground releases: (1) BV-2 Turbine Building and Condensate Polishing Building.
(2) All other ground release points.

TABLE 2.2-4

BV-1 AND 2 CONTAINMENT VENTS ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS GROUND LEVEL RELEASES, FOR SPECIAL DISTANCES
(IDENTIFIED IN TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
DOWN-WIND SEC-TOR	SITE BOUN-DARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANI-MAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	125.0	12.80	—	5.360	6.27	13.50	233.0	39.5	18.70	11.80	7.68	5.82	4.240	3.480	2.660	2.280
NNE	50.2	6.92	—	2.040	6.42	7.16	148.0	26.8	10.80	6.62	4.60	3.44	2.690	2.190	1.830	1.560
NE	102.0	47.40	1.200	0.265	1.20	49.10	120.0	21.6	11.60	6.99	4.81	3.55	2.370	1.910	1.450	1.230
ENE	85.8	12.50	—	0.124	—	42.20	103.0	18.4	9.55	5.70	4.14	3.04	2.340	1.880	1.260	1.060
E	54.5	6.16	0.807	1.910	1.91	32.60	89.5	15.7	6.08	3.65	2.49	1.83	1.300	1.040	0.859	0.726
ESE	31.1	6.92	—	3.010	6.92	6.92	59.1	10.5	5.16	3.10	1.95	1.43	1.020	0.815	0.612	0.517
SE	27.8	6.70	0.994	0.994	2.74	6.70	65.9	12.0	5.89	3.54	2.41	1.77	1.160	0.931	0.768	0.649
SSE	24.1	6.68	1.030	0.372	6.50	9.01	67.2	12.0	5.46	3.30	1.91	1.41	0.997	0.803	0.665	0.563
S	27.5	3.40	3.090	—	5.57	5.81	99.9	17.5	6.77	4.11	2.84	2.10	1.490	1.200	0.999	0.848
SSW	23.8	6.31	3.700	1.740	6.31	19.30	110.0	19.9	7.83	4.80	3.33	2.48	1.940	1.580	1.190	1.020
SW	22.3	13.90	—	9.050	12.30	13.90	160.0	29.2	16.10	9.94	5.85	4.37	3.430	2.790	2.110	1.800
WSW	163.0	19.30	5.720	—	17.70	19.30	283.0	49.8	23.50	14.60	10.30	7.72	5.690	4.650	3.620	3.090
W	278.0	15.70	9.540	—	13.00	15.70	615.0	103.0	49.00	31.00	15.40	11.70	9.320	7.660	6.460	5.550
WNW	487.0	40.70	30.100	1.810	40.70	40.70	1290.0	203.0	92.10	59.20	40.60	31.20	25.000	20.700	14.200	12.200
NW	924.0	194.00	—	8.660	40.50	200.00	1710.0	262.0	123.00	79.80	55.00	42.30	34.000	28.200	19.400	16.700
NNW	302.0	63.00	—	1.720	15.40	92.30	547.0	86.4	40.80	26.20	17.60	13.50	10.100	8.350	6.560	5.660

TABLE 2.2-5

BV-1 AND 2 VENTILATION VENTS ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES FOR CONTINUOUS GROUND LEVEL RELEASES, FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS

($1E-7$ sec/m^3)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
DOWN-WIND SEC-TOR	SITE BOUN-DARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANI-MAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	152.0	15.00	—	5.980	7.06	15.90	276.0	49.9	22.70	13.70	8.75	6.52	4.69	3.810	2.900	2.470
NNE	62.3	7.66	—	2.150	7.08	7.95	189.0	32.0	12.20	7.31	4.99	3.69	2.87	2.320	1.920	1.630
NE	132.0	57.90	1.240	0.269	1.24	60.20	156.0	24.8	12.70	7.51	5.09	3.73	2.47	1.980	1.500	1.270
ENE	110.0	13.60	—	1.270	—	50.40	135.0	20.6	10.20	6.01	4.31	3.14	2.41	1.930	1.290	1.080
E	67.8	6.66	0.828	1.990	1.99	38.80	116.0	17.7	6.57	3.86	2.61	1.90	1.34	1.070	0.883	0.774
ESE	38.0	7.64	—	3.200	7.64	7.64	76.7	11.9	5.59	3.29	2.05	1.49	1.05	0.842	0.630	0.531
SE	33.3	7.27	1.030	1.030	2.88	7.27	86.2	13.5	6.37	3.75	2.53	1.84	1.20	0.960	0.790	0.666
SSE	29.1	7.41	1.080	0.382	7.19	10.10	87.0	13.7	5.98	3.53	2.02	1.48	1.04	0.833	0.688	0.531
S	32.8	3.65	3.300	—	6.10	6.38	127.0	20.3	7.56	4.48	3.04	2.23	1.57	1.260	1.050	0.885
SSW	28.7	7.08	4.040	1.850	7.08	22.90	140.0	23.6	8.87	5.28	3.60	2.66	2.07	1.670	1.260	1.070
SW	26.2	15.70	—	9.980	13.80	15.70	204.0	34.8	18.40	11.40	6.38	4.71	3.66	2.960	2.230	1.900
WSW	201.0	22.40	6.230	—	20.40	22.40	347.0	61.3	27.70	16.60	11.40	8.49	6.19	5.020	3.880	3.300
W	345.0	18.00	10.600	—	14.70	18.00	715.0	132.0	60.30	36.50	17.70	13.20	10.40	8.440	7.060	6.040
WNW	598.0	48.60	35.000	1.920	48.60	48.60	1410.0	269.0	120.00	73.00	48.50	36.40	28.70	23.400	15.900	13.600
NW	1030.0	262.00	—	9.520	47.80	271.00	1820.0	350.0	164.00	100.00	66.60	50.10	39.50	32.300	21.900	18.800
NNW	345.0	83.40	—	1.840	18.10	121.00	601.0	114.0	52.80	32.20	21.00	15.80	11.60	9.460	7.360	6.310

TABLE 2.2-6

BV-1 AND 2 PROCESS VENT ANNUAL AVERAGE, ELEVATED RELEASE, X/Q VALUES FOR CONTINUOUS GROUND LEVEL RELEASES, FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS

(1E-7 sec/m^3)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
DOWN-WIND SEC-TOR	SITE* BOUN-DARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANI-MAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	0.0082	6.720	—	1.910	2.27	6.790	0.0289	23.1000	8.2700	5.32	2.56	1.91	1.480	1.200	0.996	0.846
NNE	0.0280	6.690	—	1.430	6.14	6.890	0.0175	14.5000	6.9800	5.47	3.27	2.69	1.770	1.430	1.290	1.100
NE	0.0110	.074	1.610	0.350	1.61	0.055	0.0069	0.1160	.2300	7.10	5,38	3.68	2.880	2.090	1.880	1.570
ENE	0.0110	9.090	—	1.770	—	0.525	0.0135	0.3310	7.2800	6.02	4,75	3.22	2.620	2.030	1.710	1.100
E	0.0360	8.300	1.240	2.870	2.87	8.300	0.0124	17.1000	7.8600	6.20	3.67	2.83	2.190	1.730	1.280	1.200
ESE	0.0420	11.600	—	4.570	11.60	11.200	0.0208	12.7000	8.1400	4.78	3.00	2.20	1.360	1.160	0.830	0.737
SE	0.0750	7.890	1.230	1.230	3.05	7.890	0.4770	7.4000	7.5700	4.45	2.79	2.05	1.460	1.180	0.811	0.686
SSE	0.2060	7.390	1.160	0.357	7.20	9.770	0.3030	9.4400	6.9300	4.06	2.58	1.89	1.170	0.937	0.646	0.546
S	5.740	3.760	3.490	—	6.06	6.310	0.7960	8.5100	8.4900	4.98	3.37	2.47	1.380	1.110	0.774	0.655
SSW	7.640	3.610	2.140	0.872	3.61	5.820	26.1000	9.1000	4.0300	3.11	2.11	1.56	1.030	0.834	0.807	0.684
SW	6.500	3.900	—	2.560	3.47	3.900	36.1000	15.9000	4.9300	3.12	1.77	1.57	1.201	1.060	1.150	0.977
WSW	0.126	4.350	1.420	—	3.98	4.350	0.3870	17.8000	4.9000	3.53	2.36	1.64	1.460	1.210	0.920	0.781
W	0.029	2.490	0.764	—	2.02	2.490	0.0147	8.7200	6.2300	3.68	2.50	1.84	0.741	1.120	0.851	0.795
WNW	0.033	2.530	1.780	0.163	2.53	2.530	0.0202	0.0549	0.0809	3.07	2,50	1.84	1.110	0.686	0.791	0.731
NW	0.007	0.074	—	0.305	1.67	0.073	0.0084	0.0650	0.1170	3.66	2.30	1.69	1.210	0.903	0.804	0.683
NNW	0.008	6.460	—	0.224	1.81	6.590	0.0135	6.7800	5.0200	2.96	1.93	1.49	1.050	0.849	0.705	0.599

*Elevated release X/Q value at site boundary location where ground level release X/Qs maximize.

TABLE 2.2-7

BV-1 AND 2 TURBINE BUILDING VENTS ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES FOR CONTINUOUS GROUND LEVEL RELEASES, FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS

(1E-7 sec/m^3)

DOWN-WIND SEC-TOR	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
	SITE BOUN-DARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANI-MAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	105.0	14.00	—	5.740	6.74	14.80	244.0	42.6	20.50	12.70	8.18	6.15	4.45	3.640	2.770	2.380
NNE	102.0	7.37	—	2.130	6.83	7.64	161.0	28.8	11.40	6.94	4.79	3.56	2.78	2.250	1.870	1.590
NE	96.6	51.90	1.230	0.268	1.23	53.80	132.0	23.0	12.10	7.24	4.95	3.64	2.42	1.950	1.480	1.250
ENE	84.1	13.20	—	1.280	—	46.30	115.0	19.4	9.89	5.85	4.23	3.09	2.38	1.900	1.270	1.070
E	60.7	6.49	.829	1.980	1.98	35.70	99.2	16.6	6.32	3.75	2.55	1.87	1.32	1.060	0.871	0.735
ESE	37.1	7.25	—	3.100	7.25	7.25	65.8	11.1	5.36	3.19	2.00	1.46	1.03	0.829	0.621	0.524
SE	41.8	7.06	1.020	1.020	2.85	7.06	73.5	12.6	6.12	3.64	2.47	1.81	1.18	0.945	0.779	0.658
SSE	34.0	7.16	1.070	0.384	6.96	9.69	74.2	12.7	5.71	3.41	1.97	1.45	1.02	0.818	0.676	0.572
S	32.7	3.64	3.310	—	6.00	6.27	109.0	18.6	7.13	4.29	2.94	2.17	1.53	1.230	1.020	0.866
SSW	29.7	6.73	3.890	1.800	6.73	20.90	120.0	21.3	8.31	5.03	3.46	2.57	2.00	1.620	1.230	1.040
SW	24.1	14.80	—	9.550	13.10	14.80	174.0	31.2	17.20	10.40	6.10	4.54	3.54	2.870	2.170	1.850
WSW	159.0	20.80	6.010	--	19.10	20.80	301.0	53.6	25.30	15.60	10.80	8.09	5.93	4.830	3.750	3.200
W	264.0	16.90	10.100	—	13.90	16.90	636.0	111.0	53.90	33.50	16.50	12.40	9.82	8.040	6.760	5.790
WNW	404.0	44.50	32.500	1.870	44.50	44.50	1310.0	218.0	104.00	65.40	44.20	33.60	26.70	22.000	15.000	12.900
NW	735.0	216.00	—	9.100	43.90	222.00	1720.0	279.0	140.00	88.80	60.30	45.90	36.60	30.100	20.600	17.700
NNW	247.0	71.00	—	1.820	17.00	99.40	557.0	924.0	45.90	28.90	19.20	14.60	10.80	8.880	6.950	5.980

TABLE 2.2-8
FOR INFORMATION ONLY - USED IN CALCULATION OF BV-2 CONTRIBUTION TO SITE DOSE RATE LIMITS

BV-2 DECONTAMINATION BUILDING VENT ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS GROUND LEVEL RELEASES, FOR SPECIAL DISTANCES
(IDENTIFIED IN TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS
(1E-7 sec/m^3)

DOWN-WIND SEC-TOR	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
	SITE BOUN-DARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANI-MAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	125.00	12.80	—	5.360	6.27	13.50	233.0	39.50	18.70	11.80	7.68	5.82	4.240	3.480	2.660	2.280
NNE	50.20	6.92	—	2.040	6.42	7.16	148.0	26.80	10.80	6.62	4.60	3.44	2.690	2.190	1.830	1.560
NE	102.00	47.40	1.20	0.265	1.20	49.10	120.0	21.60	11.60	6.99	4.81	3.55	2.370	1.910	1.450	1.230
ENE	85.80	12.50	—	1.240	—	42.20	103.0	18.40	9.55	5.70	4.14	3.04	2.340	1.880	1.260	1.060
E	54.50	6.16	0.807	1.910	1.91	32.60	89.5	15.70	6.08	3.65	2.49	1.83	1.300	1.040	0.859	0.726
ESE	31.10	6.92	—	3.010	6.92	6.92	59.1	10.50	5.16	3.10	1.95	1.43	1.020	0.815	0.612	0.517
SE	27.80	6.70	0.994	0.994	2.74	6.70	65.9	12.00	5.89	3.54	2.41	1.77	1.160	0.931	0.768	0.649
SSE	24.10	6.68	1.030	0.372	6.50	9.01	67.2	12.00	5.46	3.30	1.91	1.41	0.997	0.803	0.665	0.563
S	27.50	3.40	3.090	—	5.57	5.81	99.9	17.50	6.77	4.11	2.84	2.10	1.490	1.200	0.999	0.848
SSW	23.80	6.31	3.700	1.740	6.31	19.30	110.0	19.90	7.83	4.80	3.33	2.48	1.940	1.580	1.190	1.020
SW	22.30	13.90	—	9.050	12.30	13.90	160.0	29.20	16.10	9.94	5.85	4.37	3.430	2.790	2.110	1.800
WSW	163.00	19.30	5.720	—	17.70	19.30	283.0	49.80	23.50	14.60	10.30	7.72	5.690	4.650	3.620	3.090
W	278.00	15.70	9.540	—	13.00	15.70	615.00	103.00	49.00	31.00	15.40	11.70	9.320	7.660	6.460	5.550
WNW	487.00	40.70	30.100	1.810	40.70	40.70	1290.00	203.00	92.10	59.20	40.60	31.20	25.000	20.700	14.200	12.200
NW	924.00	194.00	—	8.660	40.50	200.00	1710.00	262.00	123.00	79.80	55.00	42.30	34.000	28.200	19.400	16.700
NNW	302.00	63.00	—	1.720	15.40	92.30	547.00	86.40	40.80	26.30	17.60	13.50	10.100	8.350	6.560	5.660

TABLE 2.2-9

FOR INFORMATION ONLY - USED IN CALCULATION OF BV-2 CONTRIBUTION TO SITE DOSE RATE LIMITS

BV-2 WASTE GAS STORAGE VAULT VENT ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS GROUND LEVEL RELEASES, FOR SPECIAL DISTANCES
(IDENTIFIED IN TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS

($1E-7$ sec/m^3)

DOWN-WIND SEC-TOR	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
	SITE BOUN-DARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANI-MAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	125.00	12.80	—	5.360	6.27	13.50	233.0	39.50	18.70	11.80	7.68	5.82	4.240	3.480	2.660	2.280
NNE	50.20	6.92	—	2.040	6.42	7.16	148.0	26.80	10.80	6.62	4.60	3.44	2.690	2.190	1.830	1.560
NE	102.00	47.40	1.20	0.265	1.20	49.10	120.0	21.60	11.60	6.99	4.81	3.55	2.370	1.910	1.450	1.230
ENE	85.80	12.50	—	1.240	—	42.20	103.0	18.40	9.55	5.70	4.14	3.04	2.340	1.880	1.260	1.060
E	54.50	6.16	0.807	1.910	1.91	32.60	89.5	15.70	6.08	3.65	2.49	1.83	1.300	1.040	0.859	0.726
ESE	31.10	6.92	—	3.010	6.92	6.92	59.1	10.50	5.16	3.10	1.95	1.43	1.020	0.815	0.612	0.517
SE	27.80	6.70	0.994	0.994	2.74	6.70	65.9	12.00	5.89	3.54	2.41	1.77	1.160	0.931	0.768	0.649
SSE	24.10	6.68	1.030	0.372	6.50	9.01	67.2	12.00	5.46	3.30	1.91	1.41	0.997	0.803	0.665	0.563
S	27.50	3.40	3.090	—	5.57	5.81	99.9	17.50	6.77	4.11	2.84	2.10	1.490	1.200	0.999	0.848
SSW	23.80	6.31	3.700	1.740	6.31	19.30	110.0	19.90	7.83	4.80	3.33	2.48	1.940	1.580	1.190	1.020
SW	22.30	13.90	—	9.050	12.30	13.90	160.0	29.20	16.10	9.94	5.85	4.37	3.430	2.790	2.110	1.800
WSW	163.00	19.30	5.720	—	17.70	19.30	283.0	49.80	23.50	14.60	10.30	7.72	5.690	4.650	3.620	3.090
W	278.00	15.70	9.540	—	13.00	15.70	615.00	103.00	49.00	31.00	15.40	11.70	9.320	7.660	6.460	5.550
WNW	487.00	40.70	30.100	1.810	40.70	40.70	1290.00	203.00	92.10	59.20	40.60	31.20	25.000	20.700	14.200	12.200
NW	924.00	194.00	—	8.660	40.50	200.00	1710.00	262.00	123.00	79.80	55.00	42.30	34.000	28.200	19.400	16.700
NNW	302.00	63.00	—	1.720	15.40	92.30	547.00	86.40	40.80	26.30	17.60	13.50	10.100	8.350	6.560	5.660

TABLE 2.2-10
FOR INFORMATION ONLY - USED IN CALCULATION OF BV-2 CONTRIBUTION TO SITE DOSE RATE LIMITS

BV-2 CONDENSATE POLISHING BUILDING VENT ANNUAL AVERAGE, GROUND LEVEL, X/Q VALUES
FOR CONTINUOUS GROUND LEVEL RELEASES, FOR SPECIAL DISTANCES
(IDENTIFIED IN TABLE 2.2-3), AND SELECTED CONTROL LOCATIONS

($1E-7\ sec/m^3$)

	INDIVIDUAL RECEPTORS						DISTANCES TO THE CONTROL LOCATION, IN MILES									
DOWN-WIND SEC-TOR	SITE BOUN-DARY	VEGE-TABLE GARDEN	MILK COW	MILK GOAT	MEAT ANI-MAL	RESI-DENCE	0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N	105.0	14.00	—	5.740	6.74	14.80	244.0	42.6	20.50	12.70	8.18	6.15	4.45	3.640	2.770	2.380
NNE	102.0	7.37	—	2.130	6.83	7.64	161.0	28.8	11.40	6.94	4.79	3.56	2.78	2.250	1.870	1.590
NE	96.6	51.90	1.230	0.268	1.23	53.80	132.0	23.0	12.10	7.24	4.95	3.64	2.42	1.950	1.480	1.250
ENE	84.1	13.20	—	1.280	—	46.30	115.0	19.4	9.89	5.85	4.23	3.09	2.38	1.900	1.270	1.070
E	60.7	6.49	.829	1.980	1.98	35.70	99.2	16.6	6.32	3.75	2.55	1.87	1.32	1.000	0.871	0.735
ESE	37.1	7.25	—	3.100	7.25	7.25	65.8	11.1	5.36	3.19	2.00	1.46	1.03	0.829	0.621	0.524
SE	41.8	7.06	1.020	1.020	2.85	7.06	73.5	12.6	6.12	3.64	2.47	1.81	1.18	0.945	0.779	0.658
SSE	34.0	7.16	1.070	0.384	6.96	9.69	74.2	12.7	5.71	3.41	1.97	1.45	1.02	0.818	0.676	0.572
S	32.7	3.64	3.310	—	6.00	6.27	109.0	18.6	7.13	4.29	2.94	2.17	1.53	1.230	1.020	0.866
SSW	29.7	6.73	3.890	1.800	6.73	20.90	120.0	21.3	8.31	5.03	3.46	2.57	2.00	1.620	1.230	1.040
SW	24.1	14.80	—	9.550	13.10	14.80	174.0	31.2	17.20	10.40	6.10	4.54	3.54	2.870	2.170	1.850
WSW	159.0	20.80	6.010	—	19.10	20.80	301.0	53.6	25.30	15.60	10.80	8.09	5.93	4.830	3.750	3.200
W	264.0	16.90	10.100	—	13.90	16.90	636.0	111.0	53.90	33.50	16.50	12.40	9.82	8.040	6.760	5.790
WNW	404.0	44.50	32.500	1.870	44.50	44.50	1310.0	218.0	104.00	65.40	44.20	33.60	26.70	22.000	15.000	12.900
NW	735.0	216.00	—	9.100	43.90	222.00	1720.0	279.0	140.00	88.80	60.30	45.90	36.60	30.100	20.600	17.700
NNW	247.0	71.00	—	1.820	17.00	99.40	557.0	924.0	45.90	28.90	19.20	14.60	10.80	8.880	6.950	5.980

TABLE 2.2-11

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS*

NUCLIDE	K_i TOTAL BODY DOSE FACTOR mrem/yr Per uCi/m^3	L_i SKIN DOSE FACTOR mrem/yr Per uCi/m^3	M_i GAMMA AIR DOSE FACTOR mrad/yr Per uCi/m^3	N_i BETA AIR DOSE FACTOR mrad/yr Per uCi/m^3
Kr-83m	7.56E-02	--	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

*The listed dose factors are for radionuclides that may be detected in gaseous effluents.

TABLE 2.2-12

DOSE PARAMETERS FOR FINITE ELEVATED PLUMES
BEAVER VALLEY SITE*

NOBLE GAS NUCLIDE	V_i[1] TOTAL BODY DOSE RATE mrem/yr Per uCi/sec	B_i[1,2] GAMMA AIR DOSE RATE mrad/yr Per uCi/sec	V_i[3] TOTAL BODY DOSE RATE mrem/yr Per uCi/sec	B_i[3] GAMMA AIR DOSE RATE mrad/yr Per uCi/sec
Kr-83m	3.19E-10	1.75E-8	4.58E-8	3.96E-5
Kr-85m	7.81E-5	1.16E-4	4.70E-4	7.06E-4
Kr-85	1.55E-6	2.35E-6	5.54E-6	8.40E-6
Kr-87	5.13E-4	7.74E-4	1.45E-3	2.19E-3
Kr-88	1.39E-3	2.09E-3	4.09E-3	6.16E-3
Kr-89	7.99E-4	1.20E-3	1.25E-3	1.88E-3
Xe-131m	1.64E-5	2.47E-5	1.67E-4	3.09E-4
Xe-133m	1.38E-5	2.11E-5	1.32E-4	2.61E-4
Xe-133	1.05E-5	1.56E-4	1.54E-4	2.76E-4
Xe-135m	2.41E-4	3.66E-4	6.21E-4	9.50E-4
Xe-135	1.41E-4	2.12E-4	6.96E-4	1.05E-3
Xe-137	6.00E-5	9.05E-5	9.66E-5	1.46E-4
Xe-138	8.11E-4	1.22E-3	2.22E-3	3.34E-3
Ar-41	1.02E-3	1.53E-3	2.68E-3	4.02E-3

*The listed dose parameters are for radionuclides that may be detected in gaseous effluents.

[1] V_i and B_i values used to implement Modes 1, 2, and 3 of Section 2.2.1 (10CFR20)

[2] B_i values used to implement Modes 1, 2, 3, and 4 of Section 2.3.1 (10CFR50)

[3] V_i and B_i values to implement Mode 4 of Section 2.2.1 (10CFR20) and to implement monitor setpoint determinations of Section 2.1.2 and 2.1.4

Table 2.2-13

P_{iT} VALUES FOR A CHILD FOR THE BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03
2 P-32	2.60E+06	1.14E+05	9.88E+04	0.00E+00	0.00E+00	0.00E+00	4.22E+04
3 Cr-51	0.00E+00	0.00E+00	1.54E+02	8.55E+01	2.43E+01	1.70E+04	1.08E+03
4 Mn-54	0.00E+00	4.29E+04	9.51E+03	0.00E+00	1.00E+04	1.58E+06	2.29E+04
5 Fe-59	2.07E+04	3.34E+04	1.67E+04	0.00E+00	0.00E+00	1.27E+06	7.07E+04
6 Co-57	0.00E+00	9.03E+02	1.07E+03	0.00E+00	0.00E+00	5.07E+05	1.32E+04
7 Co-58	0.00E+00	1.77E+03	3.16E+03	0.00E+00	0.00E+00	1.11E+06	3.44E+04
8 Co-60	0.00E+00	1.31E+04	2.26E+04	0.00E+00	0.00E+00	7.07E+06	9.62E+04
9 Zn-65	4.25E+04	1.13E+05	7.03E+04	0.00E+00	7.14E+04	9.95E+05	1.63E+04
10 Rb-86	0.00E+00	1.98E+05	1.14E+05	0.00E+00	0.00E+00	0.00E+00	7.99E+03
11 Sr-89	5.99E+05	0.00E+00	1.72E+04	0.00E+00	0.00E+00	2.16E+06	1.67E+05
12 Sr-90	1.01E+08	0.00E+00	6.44E+06	0.00E+00	0.00E+00	1.48E+07	3.43E+05
13 Y-91	9.14E+05	0.00E+00	2.44E+04	0.00E+00	0.00E+00	2.63E+06	1.84E+05
14 Zr-95	1.90E+05	4.18E+04	3.70E+04	0.00E+00	5.96E+04	2.23E+06	6.11E+04
15 Nb-95	2.35E+04	9.18E+03	6.55E+03	0.00E+00	8.62E+03	6.14E+05	3.70E+04
16 Nb-97	4.29E-01	7.70E-02	3.60E-02	0.00E+00	8.55E-02	3.42E+03	2.78E+04
17 Mo-99	0.00E+00	1.72E+02	4.26E+01	0.00E+00	3.92E+02	1.35E+05	1.27E+05
18 Tc-99m	1.78E-03	3.48E-03	5.77E-02	0.00E+00	5.07E-02	9.51E+02	4.81E+03
19 Ru-103	2.79E+03	0.00E+00	1.07E+03	0.00E+00	7.03E+03	6.62E+05	4.48E+04
20 Ru-106	1.36E+05	0.00E+00	1.69E+04	0.00E+00	1.84E+05	1.43E+07	4.29E+05
21 Ag-110m	1.69E+04	1.14E+04	9.14E+03	0.00E+00	2.12E+04	5.48E+06	1.00E+05
22 Sb-124	5.74E+04	7.40E+02	2.00E+04	1.26E+02	0.00E+00	3.24E+06	1.64E+05
23 Sb-125	9.84E+04	7.59E+02	2.07E+04	9.10E+01	0.00E+00	2.32E+06	4.03E+04
24 Te-127m	2.49E+04	8.55E+03	3.02E+03	6.07E+03	6.36E+04	1.48E+06	7.14E+04
25 Te-129m	1.92E+04	6.85E+03	3.04E+03	6.33E+03	5.03E+04	1.76E+06	1.82E+05
26 I-131	4.81E+04	4.81E+04	2.73E+04	1.62E+07	7.88E+04	0.00E+00	2.84E+03
27 I-133	1.66E+04	2.03E+04	7.70E+03	3.85E+06	3.38E+04	0.00E+00	5.48E+03
28 Cs-134	6.51E+05	1.01E+06	2.25E+05	0.00E+00	3.30E+05	1.21E+05	3.85E+03
29 Cs-136	6.51E+04	1.71E+05	1.16E+05	0.00E+00	9.55E+04	1.45E+04	4.18E+03
30 Cs-137	9.07E+05	8.25E+05	1.28E+05	0.00E+00	2.82E+05	1.04E+05	3.62E+03
31 Ba-140	7.40E+04	6.48E+01	4.33E+03	0.00E+00	2.11E+01	1.74E+06	1.02E+05
32 La-140	6.44E+02	2.25E+02	7.55E+01	0.00E+00	0.00E+00	1.83E+05	2.26E+05
33 Ce-141	3.92E+04	1.95E+04	2.90E+03	0.00E+00	8.55E+03	5.44E+05	5.66E+04
34 Ce-144	6.77E+06	2.12E+06	3.61E+05	0.00E+00	1.17E+06	1.20E+07	3.89E+05

Calculated per ODCM equation 2.2-13

2.3 Compliance With 10 CFR 50 Dose Limits (ODCM Appendix C CONTROLS 3.11.2.2 And 3.11.2.3) (Gaseous)

At the Beaver Valley site all elevated gaseous releases are considered to originate from a shared radwaste system. The effluent from both units are mixed and discharged from a common release point, the Process Vent, at the top of the Unit 1 Cooling Tower. The resulting dose for the purpose of implementing 10 CFR 50 is normally apportioned equally to each unit. The only exception would be a Containment Purge via the Process Vent. The resulting dose shall be attributed to the contributing reactor unit. Since this operation is expected to be rare, equations are shown throughout this section with the apportionment set at 0.5.

2.3.1 Dose Due To Noble Gases

2.3.1.1 Cumulation Of Doses

Section II.B.1 of Appendix I of 10 CFR 50 (ODCM Appendix C CONTROL 3.11.2.2) limits the releases of gaseous effluents from each reactor such that the estimated annual gamma air dose is limited to 10 millirad and the beta air dose is limited to 20 millirad. In addition, ODCM Appendix C CONTROL 3.11.2.4 requires use of radwaste system if air doses when averaged over 31 days exceed 0.2 mrad for gamma and 0.4 mrad for beta. Based upon NUREG-0133, the air dose limits in the unrestricted area due to noble gases released in gaseous effluents are defined by the following expressions:

<u>During Any Calendar Quarter, For Gamma Radiation:</u>

$$3.17\text{E-}8 \sum_i \left[M_i \, [(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv}] + [B_i Q_{is} + b_i q_{is}] \right] \leq 5 \text{ mrad} \qquad [2.3\text{-}1]$$

<u>During Any Calendar Quarter, For Beta Radiation:</u>

$$3.17\text{E-}8 \sum_i N_i \left[(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv} + (\overline{X/Q})_s Q_{is} + (\overline{X/q})_s q_i s \right] \leq 10 \text{ mrad} \qquad [2.3\text{-}2]$$

<u>During Any Calendar Year, For Gamma Radiation:</u>

$$3.17\text{E-}8 \sum_i \left[M_i \, [(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv}] + [B_i Q_{is} + b_i q_{is}] \right] \leq 10 \text{ mrad} \qquad [2.3\text{-}3]$$

<u>During Any Calendar Year, For Beta Radiation:</u>

$$3.17\text{E-}8 \sum_i N_i \left[(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv} + (\overline{X/Q})_s Q_{is} + (\overline{X/q})_s q_i s \right] \leq 20 \text{ mrad} \qquad [2.3\text{-}4]$$

Averaged Over 31 Days, For The Gamma Radiation Projection:

$$3.17E\text{-}8 \sum_i \left[M_i\ [(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv}] + [B_i Q_{is} + b_i q_{is}]\right] \leq 0.2 \text{ mrad} \quad [2.3\text{-}5]$$

Averaged Over 31 Days, For The Beta Radiation Projection:

$$3.17E\text{-}8 \sum_i N_i \left[(\overline{X/Q})_v Q_{iv} + (\overline{X/q})_v q_{iv} + (\overline{X/Q})_s Q_{is} + (\overline{X/q})_s q_{is}\right] \leq 0.4 \text{ mrad} \quad [2.3\text{-}6]$$

where:

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide "i" (mrad/yr per uCi/m^3).

N_i = The air dose factor due to beta emissions for each identified noble gas radionuclide "i" (mrad/yr per uCi/m^3).

$(\overline{X/Q})_v$ = The annual average relative concentration for areas at or beyond the unrestricted area boundary for long-term vent releases greater than 500 hrs/year (sec/m^3).

$(\overline{X/q})_v$ = The relative concentration for areas at or beyond the unrestricted area boundary for short-term vent releases equal to or less than 500 hrs/year (sec/m^3).

$(\overline{X/Q})_s$ = The annual average relative concentration for areas at or beyond the unrestricted area boundary for long-term free standing stack releases greater than 500 hrs/year (sec/m^3).

$(\overline{X/q})_s$ = The relative concentration for areas at or beyond the unrestricted area boundary for short-term free standing stack releases equal to or less than 500 hrs/year (sec/m^3).

q_{is} = Release of noble gas radionuclide "i" in gaseous effluents for short-term stack releases equal to or less than 500 hrs/year (uCi).

q_{iv} = Release of noble gas radionuclide "i" in gaseous effluents for short-term vent releases equal to or less than 500 hrs/year (uCi).

Q_{is} = Release of noble gas radionuclide "i" in gaseous effluents for long-term free standing stack releases greater than 500 hrs/year (uCi).

Q_{iv} = Release of noble gas radionuclide "i" in gaseous effluents for long-term vent releases greater than 500 hrs/year (uCi).

B_i = The constant for long-term releases (greater than 500 hrs/year) for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrad/yr per uCi/sec).

b_i = The constant for short-term releases (equal to or less than 500 hrs/year) for each identified noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrad/yr per uCi/sec).

3.17E-8 = The inverse of the number of seconds in a year.

NUREG 0133 permits eliminating the short-term release term and short-term meteorological terms in the determination of doses when short-term releases are sufficiently random in both time of day and duration to be represented by annual average dispersion conditions.

This special consideration is applied in Expressions [2.3-1] through [2.3-6], however, a summary of the "real time" meteorological data coupled with the corresponding releases shall be included in the Semi-Annual Radioactive Effluent Release Report.

Short-term releases are also evaluated annually in computer codes technically consistent with XOQDOQ and GASPAR for inclusion in the Annual Radiological Environmental Report.

The incorporation of this option and the release modes of Table 2.3-1 results in the following expressions to show compliance with 10 CFR 50 for the calendar quarter or year.

For Release Modes 1, 2, 3, And 4

During Any Month, Calendar Quarter, Or Year:

Gamma Radiation:

$$3.17E\text{-}8 \sum_i \left[M_i [(\overline{X/Q})_{cv} Q_{i_{cv}} + (\overline{X/Q})_{vv} Q_{i_{vv}} + (\overline{X/Q})_{cp} Q_{i_{cp}} + (\overline{X/Q})_{dv} Q_{i_{dv}} + (\overline{X/Q})_{wv} Q_{i_{wv}}] + 0.5\, B_i Q_{i_{pv}} \right] \quad [2.3\text{-}7]$$

$$\leq \begin{array}{l} 0.2 \text{ mrad (per 31 days)} \\ 5.0 \text{ mrad (per quarter)} \\ 10.0 \text{ mrad (per year)} \end{array}$$

Beta Radiation:

$$3.17E\text{-}8 \sum_i N_i \left[(\overline{X/Q})_{cv} Q_{i_{cv}} + (\overline{X/Q})_{vv} Q_{i_{vv}} + (\overline{X/Q})_{cp} Q_{i_{cp}} + (\overline{X/Q})_{dv} Q_{i_{dv}} + (\overline{X/Q})_{wv} Q_{i_{wv}} + 0.5\ (\overline{X/Q})_{pv} Q_{i_{pv}} \right]$$

$$\begin{array}{ll} & 0.4 \text{ mrad (per 31 days)} \\ \leq & 10.0 \text{ mrad (per quarter)} \\ & 20.0 \text{ mrad (per year)} \end{array} \qquad [2.3\text{-}8]$$

where:

$(\overline{X/Q})_{cv}$ = Annual average relative concentration for releases from the Containment Building Vent (sec/m^3).

$(\overline{X/Q})_{vv}$ = Annual average relative concentration for releases from the Ventilation Vent (sec/m^3).

$(\overline{X/Q})_{pv}$ = Annual average relative concentration for releases from the Process Vent (sec/m^3).

$(\overline{X/Q})_{tv}$ = Annual average relative concentration for releases from the Turbine Building Vent (sec/m^3).

$Q_{i_{cv}}$ = Release of radionuclide "i" from the Containment Building Vent (uCi).

$Q_{i_{vv}}$ = Release or radionuclide "i" from the Ventilation Vent (uCi).

$Q_{i_{pv}}$ = Release of radionuclide "i" from the Process Vent (uCi).

$Q_{i_{tv}}$ = Release of radionuclide "i" from the Turbine Building Vent (uCi).

$Q_{i_{cp}}$ = Release of radionuclide "i" from the Condensate Polishing Building Vent (uCi).

$Q_{i_{dv}}$ = Release of radionuclide "i" from the Decontamination Building Vent (uCi).

$Q_{i_{wv}}$ = Release of radionuclide "i" from the Waste Gas Storage Vault Vent (uCi).

For Modes 1, 2, 3, and 4 the controlling location is 0.35 miles NW. Substitution of the appropriate X/Q values into Expressions [2.3-7] and [2.3-8] results in the following:

Release Modes 1, 2, 3, And 4

During Any Month, Calendar Quarter, Or Year:

Gamma Radiation:

$$3.17E-8 \sum_i \left[M_i [9.24E-5\ Q_{i_{cv}} + 1.03E-4\ Q_{i_{vv}} + 7.35E-5\ Q_{i_{tv}} + 7.35E-5\ Q_{i_{cp}} + 9.24E-5\ Q_{i_{dv}} + 9.24E-5\ Q_{i_{wv}}] + 0.5\ B_i Q_{i_{pv}} \right]$$

$\leq$ 0.2 mrad (per 31 days) [2.3-9]
5.0 mrad (per quarter)
10.0 mrad (per year)

Beta Radiation:

$$3.17E-8 \sum_i N_i \left[9.24E-5\ Q_{i_{cv}} + 1.03E-4\ Q_{i_{vv}} + 7.35E-5\ Q_{i_{tv}} + 7.35E-5\ Q_{i_{cp}} + 9.24E-5\ Q_{i_{dv}} + 9.24E-5\ Q_{i_{wv}} + (0.5)\ 7.0E-10\ Q_{i_{pv}} \right]$$

$\leq$ 0.4 mrad (per 31 days) [2.3-10]
10.0 mrad (per quarter)
20.0 mrad (per year)

The determination of the controlling locations for implementation of 10 CFR 50 is a function of the following parameters:

(1) Radionuclide mix and their isotopic release
(2) Release mode
(3) Meteorology

The incorporation of these parameters into Expressions [2.3-7] and [2.3-8] resulted in the expressions for the controlling locations as presented in Expressions [2.3-9] and [2.3-10]. The radionuclide mix was based upon source terms calculated using the NRC GALE Code (inputs presented in Appendix B) and is presented in Tables 2.2-2a and 2.2-2b as a function of release type and release point.

As in Section 2.2.1, for each release mode, the two highest boundary X/Q values for each release point and release duration were utilized in conjunction with the radionuclide mix and release for each release point to determine the controlling site boundary location. Since elevated releases occur from the BVPS site and their maximum X/Q values may not decrease with distance (i.e., the site boundary may not have highest X/Q values), the two highest X/Q values for those distances, greater than the site boundary, were also considered in conjunction with the radionuclide mix to determine the controlling location. These values of X/Q were obtained for the midpoint of the 10 standard distance intervals previously presented in Tables 2.2-4 through 2.2-10.

For each release mode, a particular combination of release point mix and meteorology dominates in the determination of the controlling location. For Release Modes 1, 2, 3, and 4 the controlling release is the Ventilation Vent. For Release Mode 3, the controlling release is the Containment Building Vent.

Values for M_i and N_i, which were used in the determination of the controlling location and which are to be used by BV-1 and BV-2 in Expressions [2.3-9] and [2.3-10] to show compliance with 10 CFR 50 were presented in Table 2.2-11. Values taken from Table B-1 of Regulatory Guide 1.109, Revision 1 were multiplied by 1E6 to convert from picocuries^{-1} to microcuries^{-1} for use in Table 2.2-11.

In the determination of the controlling location for Modes 1, 2, 3, and 4, Tables 2.2-4 through 2.2-7 are utilized for X/Q values. The B_i values to be utilized are the same values which were presented in Table 2.2-12. A description of the derivation of the various X/Q values is presented in Appendix A.

The following relationship should hold for BV-1 or BV-2 to show compliance with ODCM Appendix C CONTROL 3.11.2.2:

<u>For The Calendar Quarter</u>:

$D_\gamma \leq 5$ mrad [2.3-11]

$D_\beta \leq 10$ mrad [2.3-12]

<u>For The Calendar Year</u>:

$D_\gamma \leq 10$ mrad [2.3-13]

$D_\beta \leq 20$ mrad [2.3-14]

where:

D_γ = The air dose from gamma radiation (mrad).

D_β = The air dose from beta radiation (mrad).

The quarterly limits given above represent one-half the annual design objective of Section II.B.1 of Appendix I of 10 CFR 50. If any of the limits of Expressions [2.3-11] through [2.3-14] are exceeded, a special report pursuant to both Section IV.A of Appendix I of 10 CFR 50 and ODCM Appendix C CONTROL 3.11.2.2.a must be filed with the NRC at the identified locations.

In addition, ODCM Appendix C CONTROL 3.1.2.4 requires that the gaseous radwaste system must be used to reduce radioactive materials in that waste when projected doses from each reactor unit when averaged over 31 days exceed any of the following:

$D_\gamma \leq 0.2$ mrad [2.3-15]

$D_\beta \leq 0.4$ mrad [2.3-16]

2.3.1.2 Projection Of Doses (Noble Gas)

Doses due to gaseous releases from BV-1 and BV-2 shall be projected at least once per 31 days in accordance with ODCM Appendix C CONTROL 4.11.2.4 and this section. (See also Section 2.3.2.2 Projection Of Doses). The Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge in accordance with ODCM Appendix C CONTROL 3.11.2.4 when the projected gaseous effluent air dose due to gaseous effluent releases from each reactor unit, when averaged over 31 days, would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. (See also Section 2.3.2.2 Projection Of Doses for additional specifications). The doses used in the 31-day dose projection will be calculated using Expressions [2.3-9] and [2.3-10] as appropriate. The 31-day dose projection shall be performed according to the following equations:

When Including Pre-Release Data,

$$D_{31} = \left[\frac{A + B}{T}\right](31) + C \qquad [2.3\text{-}17]$$

When Not Including Pre-Release Data,

$$D_{31} = \left[\frac{A}{T}\right](31) + C \qquad [2.3\text{-}18]$$

where:

D_{31} = Projected 31 day dose (mrad).

A = Cumulative dose for quarter (mrad).

B = Projected dose from this release (mrad).

T = Current days into quarter.

C = Value which may be used to anticipate plant trends (mrad).

2.3.2 Dose Due To Radioiodines And Particulates

2.3.2.1 Cumulation Of Doses

Section IIC of Appendix I of 10 CFR 50 (ODCM Appendix C CONTROLS 3.11.2.3 and 3.11.2.4) limits the release of radioiodines and radioactive material in particulate form from each reactor unit such that estimated dose or dose commitment to an individual in an unrestricted area from all pathways of exposure is not in excess of 15 mrem to any organ. In addition, ODCM Appendix C CONTROL 3.11.2.4 requires the use of gaseous radwaste treatment system when the projected dose due to gaseous effluent releases from each reactor unit, when averaged over 31 days, would exceed 0.3 mrem to any organ. Based upon NUREG-0133, the dose to an organ of an individual from radioiodines and particulates, and radionuclides other than noble gases with half-lives greater than 8 days in gaseous effluents released to unrestricted areas, can be determined by the following expression:

<u>During Any Month, Calendar Quarter, Or Year:</u>

$$3.17E\text{-}8 \sum_i R_{i\tau} \left[W_s Q_{is} + w_s q_{is} + W_v Q_{iv} + w_v q_{iv}\right] \leq \begin{array}{l} 0.3 \text{ mrem (per 31 days)} \\ 7.5 \text{ mrem (per quarter)} \\ 15.0 \text{ mrem (per calendar year)} \end{array} \qquad [2.3\text{-}19]$$

where:

Q_{is} = Release of radionuclide "i" for long-term free standing stack releases greater than 500 hrs/yr (uCi).

Q_{iv} = Release of radionuclide "i" for long-term vent releases greater than 500 hrs/yr (uCi).

q_{is} = Release of radionuclide "i" for short-term free standing stack releases equal to or less than 500 hrs/yr (uCi).

q_{iv} = Release of radionuclide "i" for short-term vent releases equal to or less than 500 hrs/yr (uCi).

W_s = Dispersion parameter for estimating dose to an individual at the controlling location for long-term free standing stack releases greater than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, $(\overline{W/Q})_s$.

= meters^{-2} for the food and ground plane pathway, $(\overline{D/Q})_s$.

W_v = The dispersion parameter for estimating the dose to an individual at the controlling location for long-term vent releases greater than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, $(\overline{X/Q})_v$.

= meters^{-2} for the food and ground plane pathway, $(\overline{D/Q})_v$.

W_s = Dispersion parameter for estimating the dose to an individual at the controlling location for short-term stack releases equal to or less than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, $(\overline{X/q})_s$.

= meters^{-2} for the food and ground plane pathway, $(\overline{D/q})_s$.

W_v = The dispersion parameter for estimating the dose to an individual at the controlling location for short-term vent releases equal to or less than 500 hrs/yr.

= sec/m^3 for the inhalation pathway, $(\overline{X/q})_v$.

= meters^{-2} for the food and ground plane pathway, $(\overline{D/q})_v$.

3.17E-8 = The inverse of the number of seconds in a year.

$R_{i\tau}$ = The dose factor for each identified radionuclide "i" for the organ "τ" of interest (mrem/yr per uCi/sec per m^{-2} or mrem/yr per uCi/m^3).

Radionuclides and particulates may be released from any of the BV-1 and BV-2 vents in the release modes identified in Table 2.3-1. As described previously in Section 2.3.1.1, NUREG 0133 permits use of long-term annual average dispersion calculations which with the release modes of Table 2.3-1 results in the following expressions to show compliance with ODCM Appendix C CONTROLS 3.11.2.3 and 3.11.2.4. For a particular organ, Expression [2.3-19] becomes:

$$3.17E\text{-}8 \sum_i R_{i\tau}\begin{bmatrix} 0.5\, W_{pv}Q_{i_{pv}} + W_{cv}Q_{i_{cv}} + W_{vv}Q_{i_{vv}} + W_{tv}Q_{i_{tv}} + W_{cp}Q_{i_{cp}} + \\ W_{dv}Q_{i_{dv}} + W_{wv}Q_{i_{wv}} \end{bmatrix}$$

$$\leq \begin{matrix} 0.3 \text{ mrem (per 31 days)} \\ 7.5 \text{ mrem (per quarter)} \\ 15.0 \text{ mrem (per calendar year)} \end{matrix} \qquad [2.3\text{-}20]$$

where:

W_{pv} = Dispersion parameter for releases from the Process Vent.

W_{cv} = Dispersion parameter for releases from the Containment Building Vent.

W_{vv} = Dispersion parameter for releases from the Ventilation Vent.

W_{tv} = Dispersion parameter for releases from the Turbine Building Vent.

W_{cp} = Dispersion parameter for releases from the Condensate Polishing Building Vent.

W_{dv} = Dispersion parameter for releases from the Decontamination Building Vent.

W_{wv} = Dispersion parameter for releases from the Waste Gas Storage Vault Vent.

$Q_{i_{pv}}$ = Release of radionuclide "i" from the Process Vent (uCi).

$Q_{i_{cv}}$ = Release of radionuclide "i" from the Containment Building Vent (uCi).

$Q_{i_{vv}}$ = Release of radionuclide "i" from the Ventilation Vent (uCi).

$Q_{i_{tv}}$ = Release of radionuclide "i" from the Turbine Building Vent (uCi).

$Q_{i_{cp}}$ = Release of radionuclide "i" from the Condensate Polishing Building Vent (uCi).

$Q_{i_{dv}}$ = Release of radionuclide "i" from the Decontamination Building Vent (uCi).

$Q_{i_{wv}}$ = Release of radionuclide "i" from the Waste Gas Storage Vault Vent (uCi).

The Turbine Building Vent is not normally a radioactive release point. It is included only for use if a radioactive release is identified in the future.

In determining the dose at a particular location, dispersion parameter W, is a function of the pathway. For the food and ground plane pathway, W is in terms of D/Q. If the inhalation pathway is considered, W is in terms of X/Q., Incorporation of the various pathways into Expression [2.3-20] results in the following expression for a particular organ:

$$3.17E\text{-}8 \sum_i \left[\begin{array}{l} [R_{i\tau_G} + R_{i\tau_M} + R_{i\tau_V} + R_{i\tau_B}][0.5\, W_{pv}Q_{i_{pv}} + W_{cv}Q_{i_{cv}} + W_{vv}Q_{i_{vv}} + \\ W_{tv}Q_{i_{tv}} + W_{cp}Q_{i_{cp}} + W_{dv}Q_{i_{dv}} + W_{wv}Q_{i_{wv}}] + R_{i\tau_I}[0.5\,(X/Q)_{pv}Q_{i_{pv}} \\ + (X/Q)_{cv}Q_{i_{cv}} + (X/Q)_{vv}Q_{i_{vv}} + (X/Q)_{tv}Q_{i_{tv}} + (X/Q)_{cp}Q_{i_{cp}} + \\ (X/Q)_{dv}Q_{i_{dv}} + (X/Q)_{wv}Q_{i_{wv}}] \end{array} \right]$$

$$\leq \begin{array}{l} 0.3 \text{ mrem (per 31 days)} \\ 7.5 \text{ mrem (per quarter)} \\ 15.0 \text{ mrem (per year)} \end{array} \qquad [2.3\text{-}21]$$

where:

$R_{i\tau_G}$ = Dose factor for an organ "τ" for radionuclide "i" for the ground plane exposure pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_M}$ = Dose factor for an organ "τ" for radionuclide "i" for either the cow milk or goat milk pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_V}$ = Dose factor for an organ "τ" for radionuclide "i" for the vegetable pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_B}$ = Dose factor for an organ "τ" for radionuclide "i" for the meat pathway (mrem/yr per uCi/sec per m^{-2}).

$R_{i\tau_I}$ = Dose factor for an organ "τ" for radionuclide "i" for the inhalation pathway (mrem/yr per uCi/m^3).

It should be noted that W_{pv}, W_{cv}, W_{vv}, W_{tv}, W_{cp}, W_{dv}, and W_{wv} in Expression [2.3-21] are in terms of D/Q(m^{-2}).

Values of the dose factor, $R_{i\tau}$, were calculated using the methodology of NUREG-0133. The following equations were used for all nuclides except tritium:

$$R_{i\tau_I} = K'(BR)_a(DFA_{i\tau})_a$$

$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}22]$$

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

$(BR)_a$ = The breathing rate of the receptor of age group "a" (m^3/yr).

$(DFA_{i\tau})_a$ = Each organ inhalation dose factor for the receptor of age group "a" for the "i" th radionuclide (mrem/pCi). Inhalation dose factors $(DFA_{i\tau})$ by organ for the various age groups are given in Table E-7 through E-10 of Regulatory Guide 1.109, Rev. 1 or Tables 5 through 8 of NUREG-0172.

The breathing rates $(BR)_a$ used for the various age groups are tabulated below, as given in Table E-5 of the Regulatory Guide 1.109.

Age Group(a)	Breathing Rate (m^3/yr)
Infant	1400
Child	3700
Teen	8000
Adult	8000

$$R_{i\tau_G} = K'K''\,(SF)DFG_{i\tau}[(1 - e^{-\lambda_i t})/\lambda_i]$$

$$= m^2\text{-mrem/yr per uCi/sec} \qquad [2.3\text{-}23]$$

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

K'' = A constant of unit conversion (8760 hr/year).

λ_i = The decay constant for the "i" th radionuclide (sec^{-1}).

t = The exposure time (4.73E8 sec or 15 years).

$DFG_{i\tau}$ = The groundplane dose conversion factor for organ "τ" for the "i" th radionuclide (mrem/hr per pCi/m^2). A tabulation of $DFG_{i\tau}$ values is presented in Table E-6 of Regulatory Guide 1.109.

SF = The shielding factor (dimensionless). A shielding factor of 0.7 as suggested in Table E-15 of Regulatory Guide 1.109 is used.

$$R_{i\tau_M} = K'\frac{Q_F(U_{ap})}{\lambda_i + \lambda_w}F_m(r)(DFL_{i\tau})_a\left[\frac{f_p f_s}{Y_p} + \frac{(1 - f_p f_s)e^{-\lambda_i t_h}}{Y_S}\right]e^{-\lambda_i t_f}$$

$$= m^2\text{-mrem/yr per uCi/sec} \qquad [2.3\text{-}24]$$

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

Q_F = The animal's consumption rate, wet weight (kg/day).

U_{ap} = The receptor's milk consumption rate, for age "a" (liters/yr).

Y_p = The agricultural productivity by unit area of pasture feed grass (kg/m^2).

Y_S = The agricultural productivity by unit area of stored feed (kg/m^2).

F_m = The stable element transfer coefficients (days/liter).

r = Fraction of deposited activity retained on animals feed grass.

$(DFL_{i\tau})_a$ = The maximum organ ingestion dose factor for the "i" th radionuclide for the receptor in age group "a" (mrem/pCi). Ingestion dose factors $(DFL_{i\tau})_a$ for the various age groups are given in Table E-11 through E-14 of Regulatory Guide 1.109 or Tables 1 through 4 of NUREG-0172.

λ_i = The decay constant for the "i" th radionuclide (sec^{-1}).

λ_w = The decay constant for removal of activity on leaf and plant surfaces by weathering 5.73E-7 sec^{-1} (corresponding to a 14 day half-life).

t_f = The transport time from pasture, to animal, to milk, to receptor (sec).

t_h = The transport time from pasture, to harvest, to animal, to milk, to receptor (sec).

f_p = Fraction of the year that the animal is on pasture (dimensionless).

f_s = Fraction of the animal feed that is pasture grass while the animal is on pasture (dimensionless).

Tabulated below are the parameter values used for cow's milk and their reference to Regulatory Guide 1.109.

Parameter		Value	Table
r (dimensionless)		1.0 for radioiodine	E-15
		0.2 for particulates	E-15
F_m (days/liter)		each stable element	E-1 (cow milk)
			E-2 (goat milk)
U_{ap} (liters/yr) -	infant	330	E-5
	child	330	E-5
	teen	400	E-5
	adult	310	E-5
$(DLF_{i\tau})_a$ (mrem/pCi)		each radionuclide	E-11 to E-14
Y_p (kg/m^2)		0.7	E-15
Y_s (kg/m^2)		2.0	E-15
t_f (seconds)		1.73E5 (2 days)	E-15
t_h (seconds)		7.78E6 (90 days)	E-15
Q_F (kg/day)		50	E-3
f_p		0.5	--
f_s		1.0	--

For goat's milk, all values remain the same except for Q_F which is 6 kg/day.

$$R_{i\tau_B} = K'\frac{Q_F(U_{ap})}{\lambda_i + \lambda_w}F_f(r)(DFL_{i\tau})_a\left[\frac{f_p f_s}{Y_p} + \frac{(1 - f_p f_s)e^{-\lambda_i t_h}}{Y_s}\right]e^{-\lambda_i t_f}$$

$$= m^2\text{-mrem/yr per uCi/sec} \qquad [2.3\text{-}25]$$

where:

F_f = The stable element transfer coefficients (days/kg).

U_{ap} = The receptor's meat consumption rate for age "a" (kg/yr).

t_f = The average time from slaughter of meat animal to consumption (sec).

t_h = The transport time from crop field to receptor (sec).

All parameter values are the same as the milk pathway parameter values except F_f which is obtained from Table E-1, t_f which is obtained from Table E-15 and U_{ap} which is obtained from Table E-5. The values as obtained from Regulatory Guide 1.109, are as follows:

Parameter		Value	Table
F_f (days/kg)		each stable element	E-1
t_f (seconds)		1.73E6 (20 days)	E-15
U_{ap} (kg/yr) -	infant	0	E-5
	child	41	E-5
	teen	65	E-5
	adult	110	E-5

Man is considered to consume 2 types of vegetation (fresh and stored) that differ only in the time period between harvest and consumption; therefore:

$$R_{i\tau_V} = K'\left[\frac{(r)}{Y_v(\lambda_i + \lambda_w)}\right](DLF_{i\tau})_a\left[U_a^L f_L e^{-\lambda_i t_L} + U_a^S f_g e^{-\lambda_i t_h}\right]$$

$$= m^2\text{-mrem/yr per uCi/sec} \qquad [2.3\text{-}26]$$

where:

K' = A constant of unit conversion (1E6 pCi/uCi).

U_a^L = The consumption rate of fresh leafy vegetation by the receptor in age group "a" (kg/yr).

U_a^S = The consumption rate of stored vegetation by the receptor in age group "a" (kg/yr).

f_L = The fraction of the annual intake of fresh leafy vegetation grown locally.

f_g = The fraction of the annual intake of stored vegetation grown locally.

t_L = The average time between harvest of leafy vegetation and its consumption (seconds).

t_h = The average time between harvest of stored vegetation and its consumption (seconds).

Y_v = The vegetation area density (kg/m^2).

all other factors are defined previously.

Tabulated below are the appropriate parameter values and their reference to Regulatory Guide 1.109.

Parameter		Value	Table
r (dimensionless)		1.0 for radioiodines	E-15
		0.2 for particulates	E-15
$(DFL_{i\tau})_a$ (mrem/pCi)		each stable element	E-11 to E-14
U_a^L (kg/yr)	- infant	0	E-5
	child	26	E-5
	teen	42	E-5
	adult	64	E-5
U_a^S (kg/yr)	- infant	0	E-5
	child	520	E-5
	teen	630	E-5
	adult	520	E-5
f_L (dimensionless)		1.0	E-15
F_g (dimensionless)		0.76	E-15
t_L (seconds)		8.6E4 (1 day)	E-15
t_h (seconds)		5.18E6 (60 days)	E-15
Y_v (kg/m^2)		2.0	E-15

As discussed in Section 2.2.2 for tritium, the parameter W for the food pathway is based upon X/Q. The ground plane pathway is not appropriate for tritium. Therefore, the left-hand portion of Expression [2.3-20] may be expressed for purposes of implementation of 40 CFR 190, discussed in Section 4.0, as:

<u>For Tritium:</u>

$$3.17E\text{-}8\ (R_{T\tau_M} + R_{T\tau_V} + R_{T\tau_B} + R_{T\tau_I})\ [0.5\ (X/Q)_{pv}Q_{T_{pv}} + (X/Q)_{cv}Q_{T_{cv}} + (X/Q)_{vv}Q_{T_{vv}} + (X/Q)_{tv}Q_{T_{vv}} + (X/Q)_{cp}Q_{\tau_{cp}} + (X/Q)_{dv}Q_{\tau_{dv}} + (X/Q)_{wv}Q_{\tau_{wv}}\ ] \qquad [2.3\text{-}27]$$

where:

$R_{T\tau_M}$ = Dose factor for organ "τ" for tritium for the milk pathway (mrem/yr per uCi/sec^3).

$R_{T\tau_V}$ = Dose factor for organ "τ" for tritium for the vegetable pathway (mrem/yr per uCi/m^3).

$R_{T\tau_B}$ = Dose factor for organ "τ" for tritium for the beef pathway (mrem/yr per uCi/m^3).

$R_{T\tau_I}$ = Dose factor for organ "τ" for tritium for the inhalation pathway (mrem/yr per uCi/m^3).

Expression [2.3-27] is used to show compliance with 40 CFR 190, as discussed in Section 4.0.

The concentration of tritium in milk is based on the airborne concentration rather than the deposition. Therefore, the $R_{T\tau_M}$ is based on [X/Q]:

$$R_{T\tau_M} = K'K'''F_m Q_F U_{ap} (DLF_{i\tau})_a [0.75(0.5/H)]$$
$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}28]$$

where:

K′" = A constant of unit conversion (1000 gm/kg).

H = Absolute humidity of the atmosphere (8 gm/m^3).

0.75 = The fraction of total feed that is water.

0.5 = The ratio of the specific activity of the feed grass water to the atmospheric water.

and other parameters and values are the same as for $R_{i\tau_M}$.

The concentration of tritium in vegetation is based on the airborne concentration rather than the deposition. Therefore, the $R_{t\tau_V}$ is based on [X/Q]:

$$R_{T\tau_V} = K'K'''[U_a^L f_L + U_a^S f_g](DFL_{i\tau})_a [0.75(0.5/H)]$$
$$= \text{mrem/yr per uCi/m}^3 \qquad [2.3\text{-}29]$$

where all terms have been defined above.

The concentration of tritium in meat is based on its airborne concentration rather than the deposition. Therefore, the $R_{T\tau_B}$ is based on [X/Q]:

$$R_{T\tau_B} = K'K'''F_f Q_F U_{ap} (DFL_{i\tau})_a [0.75(0.5/H)]$$
$$= \text{mrem/yr per uCi/m}^3 \quad [2.3\text{-}30]$$

where all terms have been defined above.

To show compliance with ODCM Appendix C CONTROLS 3.11.2.3 and 3.11.2.4, Equation [2.3-21] is evaluated at the controlling pathway location. For Release Modes 1 through 4, the controlling location is a residence 0.89 miles in the NW sector. Inserting appropriate X/Q values from Tables 2.2-4 to 2.2-10 and D/Q values from Tables 2.3-28 to 2.3-34, Expression [2.3-21] becomes:

<u>Release Modes 1 Through 4</u>

<u>Per Month, Calendar Quarter, Or Year:</u>

$$3.17\text{E-}8\ \Sigma_i \left[\begin{array}{l} [R_{i\tau_G} + R_{i\tau_V}][(0.5)4.22\text{E-}10\ Q_{i_{pv}} + 1.56\text{E-}8\ Q_{cv} + 1.56\text{E-}8 \\ Q_{i_{vv}} + 1.55\text{E-}8\ Q_{i_{tv}} + 1.55\text{E-}8\ Q_{i_{cp}} + 1.56\text{E-}8\ Q_{i_{dv}} + 1.56\text{E-}8 \\ Q_{i_{wv}}] + R_{i\tau_I}[(0.5)\ 7.30\text{E-}9\ Q_{i_{pv}} + 2.00\text{E-}5\ Q_{i_{cv}} + 2.71\text{E-}5\ Q_{i_{vv}} \\ + 2.22\text{E-}5\ Q_{i_{tv}} + 2.22\text{E-}5\ Q_{i_{cp}} + 2.00\text{E-}5\ Q_{i_{dv}} + 2.00\text{E-}5\ Q_{i_{wv}}] \end{array} \right]$$

$$\le \begin{array}{l} 0.3 \text{ mrem (per 31 days)} \\ 7.5 \text{ mrem (per quarter} \\ 15.0 \text{ mrem (per year)} \end{array} \quad [2.3\text{-}31]$$

For tritium, for purposes of implementation of 40 CFR 190, as discussed in Section 4.0, Expression [2.3-28] reduces to:

$$3.17\text{E-}8\ [R_{T\tau_V} + R_{T\tau_I}][(0.5)7.30\text{E-}9\ Q_{i_{pv}} + 2.00\text{E-}5\ Q_{i_{cv}} + 2.71\text{E-}5\ Q_{i_{vv}} + 2.22\text{E-}5\ Q_{i_{tv}} + 2.22\text{E-}5\ Q_{i_{cp}} + 2.00\text{E-}5\ Q_{i_{dv}} + 2.00\text{E-}5\ Q_{i_{wv}}] \quad [2.3\text{-}32]$$

The determination of a controlling locating for implementation of ODCM Appendix C CONTROLS 3.11.2.3 and 3.11.2.4 for radioiodines and particulates is a function of:

(1) Radionuclide mix and their isotopic release
(2) Release mode
(3) Meteorology
(4) Exposure pathway
(5) Receptor's age

The incorporation of these parameters into Expression [2.3-19] results in the respective equations for each release mode at the controlling location.

In the determination of the controlling location for each release mode, the radionuclide mix of radioiodines and particulates was based upon the source terms calculated using the GALE code. This mix was presented in Tables 2.2-2a and 2.2-2b as a function of release mode and release point. For the ground plane exposure pathway, all radionculides (excluding H-3 and C-14) were considered in the determination of the controlling location. For the inhalation and food pathways H-3 and C-14 were also considered in determination of the controlling location.

In the determination of the controlling location for each release mode, all of the exposure pathways, as presented in Table 2.2-3, were evaluated. These include cow milk, goat milk, beef and vegetable ingestion and inhalation and ground plane exposure. An infant was assumed to be present at all milk pathway locations. A child was assumed to be present at all vegetable garden and beef animal locations. The ground plane and inhalation exposure pathways were considered to be present at all locations.

For the determination of the controlling location, the highest D/Q and X/Q values for each release point and release mode for the vegetable garden, cow milk, and goat milk pathways were selected. The organ dose was calculated at each of these locations using the radionuclide mix and release of Tables 2.2-2a and 2.2-2b Based upon these calculations, it was determined that the controlling location for Release Modes 1 through 4 is the residence (vegetable garden)/child pathway.

For Release Modes 1 through 4, the controlling release point and mix is the Ventilation Vent.

Tables 2.3-2 through 2.3-20 present R_i values for the total body, GI-tract, bone, liver, kidney, thyroid, and lung organs for the ground plane, inhalation, cow milk, goat milk, vegetable, and meat ingestion pathways for the infant, child, teen, and adult age groups as appropriate to the pathways. These values were calculated using the methodology described in NUREG-0133 using a grazing period of 6 months.

In the determination of the controlling location for Release Modes 1-4, Tables 2.2-4 through 2.2-10 are utilized for X/Q's Tables 2.3-28 through 2.3-34 are utilized for long term D/Q values. A description of the derivation of the various X/Q and D/Q values is presented in Appendix A.

Long-term D/Q values for the Process Vent, Containment Building Vent, the Ventilation Vent, Turbine Building Vent, Condensate Polishing Building Vent, Decontamination Building Vent, and the Waste Gas Storage Vault Vent are provided for the midpoints of the following distances:

0.0-0.5 mi., 0.5-1.0 mi., 1.0-1.5 mi., 1.5-2.0 mi., 2.0-2.5 mi.,
2.5-3.0 mi., 3.0-3.5 mi., 3.5-4.0 mi., 4.0-4.5 mi., 4.5-5.0 mi.

The values appear in Tables 2.3-21 through 2.3-27. These values may be utilized if an additional special location arises different from those presented in the special locations of Table 2.2-3.

The following relationship should hold for BV-1 or BV-2 to show compliance with ODCM Appendix C CONTROL 3.11.2.3.

<u>For The Calendar Quarter:</u>

$D_\tau \leq 7.5$ mrem to any organ [2.3-33]

<u>For The Calendar Year:</u>

$D_\tau \leq 15$ mrem to any organ [2.3-34]

where:

D_τ = The dose to any organ from radioiodines and particulates (mrem).

The quarterly limits given above represent one-half the annual design objective of Section IIC of Appendix I of 10 CFR 50. If any of the limits of Expressions [2.3-33] and [2.3-34] are exceeded, a special report pursuant to both Section IV.A of Appendix I of 10 CFR 50 and ODCM Appendix C CONTROL 3.11.2.3.a must be filed with the NRC at the identified locations.

2.3.2.2 Projection Of Doses (Radioiodines And Particulates)

Doses due to gaseous releases from BV-1 or BV-2 shall be projected at least once per 31 days in accordance with ODCM Appendix C CONTROL 4.11.2.4 and this section. (See also Section 2.3.1.2 Projection Of Doses). The appropriate portions of the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge in accordance with ODCM Appendix C CONTROL 3.11.2.4 when the projected doses due to gaseous effluent releases from each reactor unit, when averaged over 31 days, would exceed 0.3 mrem to any organ. (See also Section 2.3.1.2 Projection Of Doses for additional specifications). Doses resulting from the gaseous effluent release of radioiodines and particulates will be calculated for use in the 31-day dose projection using Expression [2.3-31]. The 31-day dose projection shall be performed according to the following equations:

When Including Pre-Release Data,

$$D_{31} = \left[\frac{A + B}{T}\right](31) + C \qquad [2.3\text{-}35]$$

When Not Including Pre-Release Data,

$$D_{31} = \left[\frac{A}{T}\right](31) + C \qquad [2.3\text{-}36]$$

where:

D_{31} = Projected 31 day dose (mrem).

A = Cumulative dose for quarter (mrem).

B = Projected dose for this release (mrem).

T = Current days into quarter.

C = Value which may be used to anticipate plant trends (mrem).

TABLE 2.3-1

MODES OF GASEOUS RELEASE FROM BEAVER VALLEY SITE VENTS FOR IMPLEMENTATION OF 10 CFR 20 AND 10 CFR 50

RELEASE POINT	MODE 1	MODE 2	MODE 3	MODE 4
BVPS-1 - BVPS-2[2] Process Vent (pv)	Main Cond. Air Ejector, Waste Gas, Containment Vacuum	Same As Mode 1	Same As Mode 1	Same As Mode 1 And Containment Purge
BVPS-1 Ventilation[1] Vent (vv1)	Aux. Bldg. Ventilation	Containment Purge[3]	Same As Mode 1	Same As Mode 1
BVPS-1 Containment[1] Vent (cv1)	Leakage Collection Exhaust	Same As Mode 1	Same As Mode 1 And Containment Purge[3]	Same As Mode 1
BVPS-1 Turbine Bldg.[1] Vent (tv1)	Turbine Bldg. Exhaust*	Same As Mode 1*	Same As Mode 1*	Same As Mode 1*
BVPS-2 Ventilation[1] Vent (vv2)	Contiguous Areas	Containment Purge[3]	Same As Mode 1	Same As Mode 1
BVPS-2 Containment[1] Vent (cv2)	Aux. Bldg. Ventilation	Same As Mode 1	Same As Mode 1 And Containment Purge[3]	Same As Mode 1
BVPS-2 Turbine Bldg.[1] Vent (tv2)	Turbing Bldg. Exhaust*	Same As Mode 1*	Same As Mode 1*	Same As Mode 1*
BVPS-2 Condensate[1] Polishing Bldg. Vent (cp2)	*	*	*	*
BVPS-2 Decontamination[1] Bldg. Vent (dv2)	*	*	*	*
BVPS-2 Waste Gas[1] Storage Vault Vent (wv2)	*	*	*	*

*Not normally a radioactive release point

NOTE: For the purpose of implementing 10 CFR 50, batch discharges may use continuous meteorology since short term meteorology is used at the time of the annual report.

[1]Continuous ground level meteorology is applicable
[2]Continuous elevated meteorology is applicable
[3]Mode established by purge from one unit, all other release points remain same as Mode 1

Table 2.3-2

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Adult

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03
2	P-32	1.32E+06	7.71E+04	5.01E+04	0.00E+00	0.00E+00	0.00E+00	8.64E+04
3	Cr-51	0.00E+00	0.00E+00	1.00E+02	5.95E+01	2.28E+01	1.44E+04	3.32E+03
4	Mn-54	0.00E+00	3.96E+04	6.30E+03	0.00E+00	9.84E+03	1.40E+06	7.74E+04
5	Fe-59	1.18E+04	2.78E+04	1.06E+04	0.00E+00	0.00E+00	1.02E+06	1.88E+05
6	Co-57	0.00E+00	6.92E+02	6.71E+02	0.00E+00	0.00E+00	3.70E+05	3.14E+04
7	Co-58	0.00E+00	1.58E+03	2.07E+03	0.00E+00	0.00E+00	9.28E+05	1.06E+05
8	Co-60	0.00E+00	1.15E+04	1.48E+04	0.00E+00	0.00E+00	5.97E+06	2.85E+05
9	Zn-65	3.24E+04	1.03E+05	4.66E+04	0.00E+00	6.90E+04	8.64E+05	5.34E+04
10	Rb-86	0.00E+00	1.35E+05	5.90E+04	0.00E+00	0.00E+00	0.00E+00	1.66E+04
11	Sr-89	3.04E+05	0.00E+00	8.72E+03	0.00E+00	0.00E+00	1.40E+06	3.50E+05
12	Sr-90	9.92E+07	0.00E+00	6.10E+06	0.00E+00	0.00E+00	9.60E+06	7.22E+05
13	Y-91	4.62E+05	0.00E+00	1.24E+04	0.00E+00	0.00E+00	1.70E+06	3.85E+05
14	Zr-95	1.07E+05	3.44E+04	2.33E+04	0.00E+00	5.42E+04	1.77E+06	1.50E+05
15	Nb-95	1.41E+04	7.82E+03	4.21E+03	0.00E+00	7.74E+03	5.05E+05	1.04E+05
16	Nb-97	2.22E-01	5.62E-02	2.05E-02	0.00E+00	6.54E-02	2.40E+03	2.42E+02
17	Mo-99	0.00E+00	1.21E+02	2.30E+01	0.00E+00	2.91E+02	9.12E+04	2.48E+05
18	Tc-99m	1.03E-03	2.91E-03	3.70E-02	0.00E+00	4.42E-02	7.64E+02	4.16E+03
19	Ru-103	1.53E+03	0.00E+00	6.58E+02	0.00E+00	5.83E+03	5.05E+05	1.10E+05
20	Ru-106	6.91E+04	0.00E+00	8.72E+03	0.00E+00	1.34E+05	9.36E+06	9.12E+05
21	Ag-110m	1.08E+04	1.00E+04	5.94E+03	0.00E+00	1.97E+04	4.63E+06	3.02E+05
22	Sb-124	3.12E+04	5.89E+02	1.24E+04	7.55E+01	0.00E+00	2.48E+06	4.06E+05
23	Sb-125	5.34E+04	5.95E+02	1.26E+04	5.40E+01	0.00E+00	1.74E+06	1.01E+05
24	Te-127m	1.26E+04	5.77E+03	1.57E+03	3.29E+03	4.58E+04	9.60E+05	1.50E+05
25	Te-129m	9.76E+03	4.67E+03	1.58E+03	3.44E+03	3.66E+04	1.16E+06	3.83E+05
26	I-131	2.52E+04	3.58E+04	2.05E+04	1.19E+07	6.13E+04	0.00E+00	6.28E+03
27	I-133	8.64E+03	1.48E+04	4.52E+03	2.15E+06	2.58E+04	0.00E+00	8.88E+03
28	Cs-134	3.73E+05	8.48E+05	7.28E+05	0.00E+00	2.87E+05	9.76E+04	1.04E+04
29	Cs-136	3.90E+04	1.46E+05	1.10E+05	0.00E+00	8.56E+04	1.20E+04	1.17E+04
30	Cs-137	4.78E+05	6.21E+05	4.28E+05	0.00E+00	2.22E+05	7.52E+04	8.40E+03
31	Ba-140	3.90E+04	4.90E+01	2.57E+03	0.00E+00	1.67E+01	1.27E+06	2.18E+05
32	La-140	3.44E+02	1.74E+02	4.58E+01	0.00E+00	0.00E+00	1.36E+05	4.58E+05
33	Ce-141	1.99E+04	1.35E+04	1.53E+03	0.00E+00	6.26E+03	3.62E+05	1.20E+05
34	Ce-144	3.43E+06	1.43E+06	1.84E+05	0.00E+00	8.48E+05	7.78E+06	8.16E+05

Calculated per ODCM equation 2.3-22

Table 2.3-3

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Teen

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03
2 P-32	1.89E+06	1.10E+05	7.16E+04	0.00E+00	0.00E+00	0.00E+00	9.28E+04
3 Cr-51	0.00E+00	0.00E+00	1.35E+02	7.50E+01	3.07E+01	2.10E+04	3.00E+03
4 Mn-54	0.00E+00	5.11E+04	8.40E+03	0.00E+00	1.27E+04	1.98E+06	6.68E+04
5 Fe-59	1.59E+04	3.70E+04	1.43E+04	0.00E+00	0.00E+00	1.53E+06	1.78E+05
6 Co-57	0.00E+00	9.44E+02	9.20E+02	0.00E+00	0.00E+00	5.86E+05	3.14E+04
7 Co-58	0.00E+00	2.07E+03	2.78E+03	0.00E+00	0.00E+00	1.34E+06	9.52E+04
8 Co-60	0.00E+00	1.51E+04	1.98E+04	0.00E+00	0.00E+00	8.72E+06	2.59E+05
9 Zn-65	3.86E+04	1.34E+05	6.24E+04	0.00E+00	8.64E+04	1.24E+06	4.66E+04
10 Rb-86	0.00E+00	1.90E+05	8.40E+04	0.00E+00	0.00E+00	0.00E+00	1.77E+04
11 Sr-89	4.34E+05	0.00E+00	1.25E+04	0.00E+00	0.00E+00	2.42E+06	3.71E+05
12 Sr-90	1.08E+08	0.00E+00	6.68E+06	0.00E+00	0.00E+00	1.65E+07	7.65E+05
13 Y-91	6.61E+05	0.00E+00	1.77E+04	0.00E+00	0.00E+00	2.94E+06	4.09E+05
14 Zr-95	1.46E+05	4.58E+04	3.15E+04	0.00E+00	6.74E+04	2.69E+06	1.49E+05
15 Nb-95	1.86E+04	1.03E+04	5.66E+03	0.00E+00	1.00E+04	7.51E+05	9.68E+04
16 Nb-97	3.14E-01	7.78E-02	2.84E-02	0.00E+00	9.12E-02	3.93E+03	2.17E+03
17 Mo-99	0.00E+00	1.69E+02	3.22E+01	0.00E+00	4.11E+02	1.54E+05	2.69E+05
18 Tc-99m	1.38E-03	3.86E-03	4.99E-02	0.00E+00	5.76E-02	1.15E+03	6.13E+03
19 Ru-103	2.10E+03	0.00E+00	8.96E+02	0.00E+00	7.43E+03	7.83E+05	1.09E+05
20 Ru-106	9.84E+04	0.00E+00	1.24E+04	0.00E+00	1.90E+05	1.61E+07	9.60E+05
21 Ag-110m	1.38E+04	1.31E+04	7.99E+03	0.00E+00	2.50E+04	6.75E+06	2.73E+05
22 Sb-124	4.30E+04	7.94E+02	1.68E+04	9.76E+01	0.00E+00	3.34E+06	3.98E+05
23 Sb-125	7.38E+04	8.08E+02	1.72E+04	7.04E+01	0.00E+00	2.74E+06	9.92E+04
24 Te-127m	1.80E+04	8.16E+03	2.18E+03	4.38E+03	6.54E+04	1.66E+06	1.59E+05
25 Te-129m	1.39E+04	6.58E+03	2.25E+03	4.58E+03	5.19E+04	1.98E+06	4.05E+05
26 I-131	3.54E+04	4.91E+04	2.64E+04	1.46E+07	8.40E+04	0.00E+00	6.49E+03
27 I-133	1.22E+04	2.05E+04	6.22E+03	2.92E+06	3.59E+04	0.00E+00	1.03E+04
28 Cs-134	5.02E+05	1.13E+06	5.49E+05	0.00E+00	3.75E+05	1.46E+05	9.76E+03
29 Cs-136	5.15E+04	1.94E+05	1.37E+05	0.00E+00	1.10E+05	1.78E+04	1.09E+04
30 Cs-137	6.70E+05	8.48E+05	3.11E+05	0.00E+00	3.04E+05	1.21E+05	8.48E+03
31 Ba-140	5.47E+04	6.70E+01	3.52E+03	0.00E+00	2.28E+01	2.03E+06	2.29E+05
32 La-140	4.79E+02	2.36E+02	6.26E+01	0.00E+00	0.00E+00	2.14E+05	4.87E+05
33 Ce-141	2.84E+04	1.90E+04	2.17E+03	0.00E+00	8.88E+03	6.14E+05	1.26E+05
34 Ce-144	4.89E+06	2.02E+06	2.62E+05	0.00E+00	1.21E+06	1.34E+07	8.64E+05

Calculated per ODCM equation 2.3-22

Table 2.3-4

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Child

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03
2	P-32	2.60E+06	1.14E+05	9.88E+04	0.00E+00	0.00E+00	0.00E+00	4.22E+04
3	Cr-51	0.00E+00	0.00E+00	1.54E+02	8.55E+01	2.43E+01	1.70E+04	1.08E+03
4	Mn-54	0.00E+00	4.29E+04	9.51E+03	0.00E+00	1.00E+04	1.58E+06	2.29E+04
5	Fe-59	2.07E+04	3.34E+04	1.67E+04	0.00E+00	0.00E+00	1.27E+06	7.07E+04
6	Co-57	0.00E+00	9.03E+02	1.07E+03	0.00E+00	0.00E+00	5.07E+05	1.32E+04
7	Co-58	0.00E+00	1.77E+03	3.16E+03	0.00E+00	0.00E+00	1.11E+06	3.44E+04
8	Co-60	0.00E+00	1.31E+04	2.26E+04	0.00E+00	0.00E+00	7.07E+06	9.62E+04
9	Zn-65	4.25E+04	1.13E+05	7.03E+04	0.00E+00	7.14E+04	9.95E+05	1.63E+04
10	Rb-86	0.00E+00	1.98E+05	1.14E+05	0.00E+00	0.00E+00	0.00E+00	7.99E+03
11	Sr-89	5.99E+05	0.00E+00	1.72E+04	0.00E+00	0.00E+00	2.16E+06	1.67E+05
12	Sr-90	1.01E+08	0.00E+00	6.44E+06	0.00E+00	0.00E+00	1.48E+07	3.43E+05
13	Y-91	9.14E+05	0.00E+00	2.44E+04	0.00E+00	0.00E+00	2.63E+06	1.84E+05
14	Zr-95	1.90E+05	4.18E+04	3.70E+04	0.00E+00	5.96E+04	2.23E+06	6.11E+04
15	Nb-95	2.35E+04	9.18E+03	6.55E+03	0.00E+00	8.62E+03	6.14E+05	3.70E+04
16	Nb-97	4.29E-01	7.70E-02	3.60E-02	0.00E+00	8.55E-02	3.42E+03	2.78E+04
17	Mo-99	0.00E+00	1.72E+02	4.26E+01	0.00E+00	3.92E+02	1.35E+05	1.27E+05
18	Tc-99m	1.78E-03	3.48E-03	5.77E-02	0.00E+00	5.07E-02	9.51E+02	4.81E+03
19	Ru-103	2.79E+03	0.00E+00	1.07E+03	0.00E+00	7.03E+03	6.62E+05	4.48E+04
20	Ru-106	1.36E+05	0.00E+00	1.69E+04	0.00E+00	1.84E+05	1.43E+07	4.29E+05
21	Ag-110m	1.69E+04	1.14E+04	9.14E+03	0.00E+00	2.12E+04	5.48E+06	1.00E+05
22	Sb-124	5.74E+04	7.40E+02	2.00E+04	1.26E+02	0.00E+00	3.24E+06	1.64E+05
23	Sb-125	9.84E+04	7.59E+02	2.07E+04	9.10E+01	0.00E+00	2.32E+06	4.03E+04
24	Te-127m	2.49E+04	8.55E+03	3.02E+03	6.07E+03	6.36E+04	1.48E+06	7.14E+04
25	Te-129m	1.92E+04	6.85E+03	3.04E+03	6.33E+03	5.03E+04	1.76E+06	1.82E+05
26	I-131	4.81E+04	4.81E+04	2.73E+04	1.62E+07	7.88E+04	0.00E+00	2.84E+03
27	I-133	1.66E+04	2.03E+04	7.70E+03	3.85E+06	3.38E+04	0.00E+00	5.48E+03
28	Cs-134	6.51E+05	1.01E+06	2.25E+05	0.00E+00	3.30E+05	1.21E+05	3.85E+03
29	Cs-136	6.51E+04	1.71E+05	1.16E+05	0.00E+00	9.55E+04	1.45E+04	4.18E+03
30	Cs-137	9.07E+05	8.25E+05	1.28E+05	0.00E+00	2.82E+05	1.04E+05	3.62E+03
31	Ba-140	7.40E+04	6.48E+01	4.33E+03	0.00E+00	2.11E+01	1.74E+06	1.02E+05
32	La-140	6.44E+02	2.25E+02	7.55E+01	0.00E+00	0.00E+00	1.83E+05	2.26E+05
33	Ce-141	3.92E+04	1.95E+04	2.90E+03	0.00E+00	8.55E+03	5.44E+05	5.66E+04
34	Ce-144	6.77E+06	2.12E+06	3.61E+05	0.00E+00	1.17E+06	1.20E+07	3.89E+05

Calculated per ODCM equation 2.3-22

Table 2.3-5

R VALUES FOR BEAVER VALLEY SITE

(mrem/yr per uCi/cu meter)

Pathway = Inhalation
Age Group = Infant

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02
2	P-32	2.03E+06	1.12E+05	7.74E+04	0.00E+00	0.00E+00	0.00E+00	1.61E+04
3	Cr-51	0.00E+00	0.00E+00	8.95E+01	5.75E+01	1.32E+01	1.28E+04	3.57E+02
4	Mn-54	0.00E+00	2.53E+04	4.98E+03	0.00E+00	4.98E+03	1.00E+06	7.06E+03
5	Fe-59	1.36E+04	2.35E+04	9.48E+03	0.00E+00	0.00E+00	1.01E+06	2.48E+04
6	Co-57	0.00E+00	6.51E+02	6.41E+02	0.00E+00	0.00E+00	3.79E+05	4.86E+03
7	Co-58	0.00E+00	1.22E+03	1.82E+03	0.00E+00	0.00E+00	7.77E+05	1.11E+04
8	Co-60	0.00E+00	8.02E+03	1.18E+04	0.00E+00	0.00E+00	4.51E+06	3.19E+04
9	Zn-65	1.93E+04	6.26E+04	3.11E+04	0.00E+00	3.25E+04	6.47E+05	5.14E+04
10	Rb-86	0.00E+00	1.90E+05	8.82E+04	0.00E+00	0.00E+00	0.00E+00	3.04E+03
11	Sr-89	3.98E+05	0.00E+00	1.14E+04	0.00E+00	0.00E+00	2.03E+06	6.40E+04
12	Sr-90	4.09E+07	0.00E+00	2.59E+06	0.00E+00	0.00E+00	1.12E+07	1.31E+05
13	Y-91	5.88E+05	0.00E+00	1.57E+04	0.00E+00	0.00E+00	2.45E+06	7.03E+04
14	Zr-95	1.15E+05	2.79E+04	2.03E+04	0.00E+00	3.11E+04	1.75E+06	2.17E+04
15	Nb-95	1.57E+04	6.43E+03	3.78E+03	0.00E+00	4.72E+03	4.79E+05	1.27E+04
16	Nb-97	3.42E-01	7.29E-02	2.63E-02	0.00E+00	5.70E-02	3.32E+03	2.69E+04
17	Mo-99	0.00E+00	1.65E+02	3.23E+01	0.00E+00	2.65E+02	1.35E+05	4.87E+04
18	Tc-99m	1.40E-03	2.88E-03	3.72E-02	0.00E+00	3.11E-02	8.11E+02	2.03E+03
19	Ru-103	2.02E+03	0.00E+00	6.79E+02	0.00E+00	4.24E+03	5.52E+05	1.61E+04
20	Ru-106	8.68E+04	0.00E+00	1.09E+04	0.00E+00	1.07E+05	1.16E+07	1.64E+05
21	Ag-110m	9.98E+03	7.22E+03	5.00E+03	0.00E+00	1.09E+04	3.67E+06	3.30E+04
22	Sb-124	3.79E+04	5.56E+02	1.20E+04	1.01E+02	0.00E+00	2.65E+06	5.91E+04
23	Sb-125	5.17E+04	4.77E+02	1.09E+04	6.23E+01	0.00E+00	1.64E+06	1.47E+04
24	Te-127m	1.67E+04	6.90E+03	2.07E+03	4.87E+03	3.75E+04	1.31E+06	2.73E+04
25	Te-129m	1.41E+04	6.09E+03	2.23E+03	4.21E+03	3.18E+04	1.68E+06	6.90E+04
26	I-131	3.79E+04	4.44E+04	1.96E+04	1.48E+07	5.18E+04	0.00E+00	1.06E+03
27	I-133	1.32E+04	1.92E+04	5.60E+03	3.56E+06	2.24E+04	0.00E+00	2.16E+03
28	Cs-134	3.96E+05	7.03E+05	7.45E+04	0.00E+00	1.90E+05	7.97E+04	1.33E+03
29	Cs-136	4.83E+04	1.35E+05	5.29E+04	0.00E+00	5.64E+04	1.18E+04	1.43E+03
30	Cs-137	5.49E+05	6.12E+05	4.55E+04	0.00E+00	1.72E+05	7.13E+04	1.33E+03
31	Ba-140	5.60E+04	5.60E+01	2.90E+03	0.00E+00	1.34E+01	1.60E+06	3.84E+04
32	La-140	5.05E+02	2.00E+02	5.15E+01	0.00E+00	0.00E+00	1.68E+05	8.48E+04
33	Ce-141	2.77E+04	1.67E+04	1.99E+03	0.00E+00	5.25E+03	5.17E+05	2.16E+04
34	Ce-144	3.19E+06	1.21E+06	1.76E+05	0.00E+00	5.38E+05	9.84E+06	1.48E+05

Calculated per ODCM equation 2.3-22

Table 2.3-6

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Ground

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	P-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3	Cr-51	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06	4.66E+06
4	Mn-54	1.39E+09	1.39E+09	1.39E+09	1.39E+09	1.39E+09	1.39E+09	1.39E+09
5	Fe-59	2.73E+08	2.73E+08	2.73E+08	2.73E+08	2.73E+08	2.73E+08	2.73E+08
6	Co-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7	Co-58	3.79E+08	3.79E+08	3.79E+08	3.79E+08	3.79E+08	3.79E+08	3.79E+08
8	Co-60	2.15E+10	2.15E+10	2.15E+10	2.15E+10	2.15E+10	2.15E+10	2.15E+10
9	Zn-65	7.47E+08	7.47E+08	7.47E+08	7.47E+08	7.47E+08	7.47E+08	7.47E+08
10	Rb-86	8.99E+06	8.99E+06	8.99E+06	8.99E+06	8.99E+06	8.99E+06	8.99E+06
11	Sr-89	2.16E+04	2.16E+04	2.16E+04	2.16E+04	2.16E+04	2.16E+04	2.16E+04
12	Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
13	Y-91	1.07E+06	1.07E+06	1.07E+06	1.07E+06	1.07E+06	1.07E+06	1.07E+06
14	Zr-95	2.45E+08	2.45E+08	2.45E+08	2.45E+08	2.45E+08	2.45E+08	2.45E+08
15	Nb-95	1.37E+08	1.37E+08	1.37E+08	1.37E+08	1.37E+08	1.37E+08	1.37E+08
16	Nb-97	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
17	Mo-99	4.00E+06	4.00E+06	4.00E+06	4.00E+06	4.00E+06	4.00E+06	4.00E+06
18	Tc-99m	1.84E+05	1.84E+05	1.84E+05	1.84E+05	1.84E+05	1.84E+05	1.84E+05
19	Ru-103	1.08E+08	1.08E+08	1.08E+08	1.08E+08	1.08E+08	1.08E+08	1.08E+08
20	Ru-106	4.22E+08	4.22E+08	4.22E+08	4.22E+08	4.22E+08	4.22E+08	4.22E+08
21	Ag-110m	3.44E+09	3.44E+09	3.44E+09	3.44E+09	3.44E+09	3.44E+09	3.44E+09
22	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	Te-127m	9.17E+04	9.17E+04	9.17E+04	9.17E+04	9.17E+04	9.17E+04	9.17E+04
25	Te-129m	1.98E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07
26	I-131	1.72E+07	1.72E+07	1.72E+07	1.72E+07	1.72E+07	1.72E+07	1.72E+07
27	I-133	2.45E+06	2.45E+06	2.45E+06	2.45E+06	2.45E+06	2.45E+06	2.45E+06
28	Cs-134	6.86E+09	6.86E+09	6.86E+09	6.86E+09	6.86E+09	6.86E+09	6.86E+09
29	Cs-136	1.51E+08	1.51E+08	1.51E+08	1.51E+08	1.51E+08	1.51E+08	1.51E+08
30	Cs-137	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10
31	Ba-140	2.05E+07	2.05E+07	2.05E+07	2.05E+07	2.05E+07	2.05E+07	2.05E+07
32	La-140	1.92E+07	1.92E+07	1.92E+07	1.92E+07	1.92E+07	1.92E+07	1.92E+07
33	Ce-141	1.37E+07	1.37E+07	1.37E+07	1.37E+07	1.37E+07	1.37E+07	1.37E+07
34	Ce-144	6.96E+07	6.96E+07	6.96E+07	6.96E+07	6.96E+07	6.96E+07	6.96E+07

Calculated per ODCM equation 2.3-23

Table 2.3-7

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Vegetation
Age Group = Adult

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	2.26E+03	2.26E+03	2.26E+03	2.26E+03	2.26E+03	2.26E+03
2	P-32	1.40E+09	8.74E+07	5.43E+07	0.00E+00	0.00E+00	0.00E+00	1.58E+08
3	Cr-51	0.00E+00	0.00E+00	4.64E+04	2.78E+04	1.02E+04	6.16E+04	1.17E+07
4	Mn-54	0.00E+00	3.13E+08	5.97E+07	0.00E+00	9.31E+07	0.00E+00	9.59E+08
5	Fe-59	1.26E+08	2.96E+08	1.14E+08	0.00E+00	0.00E+00	8.28E+07	9.88E+08
6	Co-57	0.00E+00	1.17E+07	1.95E+07	0.00E+00	0.00E+00	0.00E+00	2.97E+08
7	Co-58	0.00E+00	3.07E+07	6.89E+07	0.00E+00	0.00E+00	0.00E+00	6.23E+08
8	Co-60	0.00E+00	1.67E+08	3.69E+08	0.00E+00	0.00E+00	0.00E+00	3.14E+09
9	Zn-65	3.17E+08	1.01E+09	4.56E+08	0.00E+00	6.75E+08	0.00E+00	6.36E+08
10	Rb-86	0.00E+00	2.19E+08	1.02E+08	0.00E+00	0.00E+00	0.00E+00	4.33E+07
11	Sr-89	9.97E+09	0.00E+00	2.86E+08	0.00E+00	0.00E+00	0.00E+00	1.60E+09
12	Sr-90	6.05E+11	0.00E+00	1.48E+11	0.00E+00	0.00E+00	0.00E+00	1.75E+10
13	Y-91	5.11E+06	0.00E+00	1.37E+05	0.00E+00	0.00E+00	0.00E+00	2.81E+09
14	Zr-95	1.17E+06	3.77E+05	2.55E+05	0.00E+00	5.91E+05	0.00E+00	1.19E+09
15	Nb-95	1.42E+05	7.92E+04	4.26E+04	0.00E+00	7.83E+04	0.00E+00	4.81E+08
16	Nb-97	2.16E-06	5.46E-07	1.99E-07	0.00E+00	6.37E-07	0.00E+00	2.02E-03
17	Mo-99	0.00E+00	6.15E+06	1.17E+06	0.00E+00	1.39E+07	0.00E+00	1.43E+07
18	Tc-99m	3.10E+00	8.77E+00	1.12E+02	0.00E+00	1.33E+02	4.30E+00	5.19E+03
19	Ru-103	4.77E+06	0.00E+00	2.06E+06	0.00E+00	1.82E+07	0.00E+00	5.57E+08
20	Ru-106	1.93E+08	0.00E+00	2.44E+07	0.00E+00	3.72E+08	0.00E+00	1.25E+10
21	Ag-110m	1.05E+07	9.75E+06	5.79E+06	0.00E+00	1.92E+07	0.00E+00	3.98E+09
22	Sb-124	1.04E+08	1.96E+06	4.11E+07	2.51E+05	0.00E+00	8.07E+07	2.94E+09
23	Sb-125	1.37E+08	1.53E+06	3.25E+07	1.39E+05	0.00E+00	1.05E+08	1.50E+09
24	Te-127m	3.49E+08	1.25E+08	4.26E+07	8.92E+07	1.42E+09	0.00E+00	1.17E+09
25	Te-129m	2.51E+08	9.38E+07	3.98E+07	8.64E+07	1.05E+09	0.00E+00	1.27E+09
26	I-131	8.08E+07	1.16E+08	6.62E+07	3.79E+10	1.98E+08	0.00E+00	3.05E+07
27	I-133	2.09E+06	3.63E+06	1.11E+06	5.33E+08	6.33E+06	0.00E+00	3.26E+06
28	Cs-134	4.67E+09	1.11E+10	9.08E+09	0.00E+00	3.59E+09	1.19E+09	1.94E+08
29	Cs-136	4.27E+07	1.69E+08	1.21E+08	0.00E+00	9.38E+07	1.29E+07	1.91E+07
30	Cs-137	6.36E+09	8.70E+09	5.70E+09	0.00E+00	2.95E+09	9.81E+08	1.68E+08
31	Ba-140	1.29E+08	1.61E+05	8.42E+06	0.00E+00	5.49E+04	9.24E+04	2.65E+08
32	La-140	1.98E+03	9.97E+02	2.63E+02	0.00E+00	0.00E+00	0.00E+00	7.32E+07
33	Ce-141	1.97E+05	1.33E+05	1.51E+04	0.00E+00	6.19E+04	0.00E+00	5.10E+08
34	Ce-144	3.29E+07	1.38E+07	1.77E+06	0.00E+00	8.16E+06	0.00E+00	1.11E+10

All nuclides (except H-3) calculated per ODCM equation 2.3-26
H-3 calculated per ODCM equation 2.3-29

Table 2.3-8

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Vegetation
Age Group = Teen

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	2.59E+03	2.59E+03	2.59E+03	2.59E+03	2.59E+03	2.59E+03
2	P-32	1.61E+09	9.98E+07	6.24E+07	0.00E+00	0.00E+00	0.00E+00	1.35E+08
3	Cr-51	0.00E+00	0.00E+00	6.17E+04	3.43E+04	1.35E+04	8.81E+04	1.04E+07
4	Mn-54	0.00E+00	4.54E+08	9.01E+07	0.00E+00	1.36E+08	0.00E+00	9.32E+08
5	Fe-59	1.79E+08	4.19E+08	1.62E+08	0.00E+00	0.00E+00	1.32E+08	9.90E+08
6	Co-57	0.00E+00	1.79E+07	3.00E+07	0.00E+00	0.00E+00	0.00E+00	3.33E+08
7	Co-58	0.00E+00	4.36E+07	1.00E+08	0.00E+00	0.00E+00	0.00E+00	6.01E+08
8	Co-60	0.00E+00	2.49E+08	5.60E+08	0.00E+00	0.00E+00	0.00E+00	3.24E+09
9	Zn-65	4.24E+08	1.47E+09	6.87E+08	0.00E+00	9.42E+08	0.00E+00	6.23E+08
10	Rb-86	0.00E+00	2.74E+08	1.29E+08	0.00E+00	0.00E+00	0.00E+00	4.05E+07
11	Sr-89	1.51E+10	0.00E+00	4.34E+08	0.00E+00	0.00E+00	0.00E+00	1.80E+09
12	Sr-90	7.51E+11	0.00E+00	1.85E+11	0.00E+00	0.00E+00	0.00E+00	2.11E+10
13	Y-91	7.84E+06	0.00E+00	2.10E+05	0.00E+00	0.00E+00	0.00E+00	3.21E+09
14	Zr-95	1.72E+06	5.43E+05	3.74E+05	0.00E+00	7.98E+05	0.00E+00	1.25E+09
15	Nb-95	1.92E+05	1.07E+05	5.87E+04	0.00E+00	1.03E+05	0.00E+00	4.56E+08
16	Nb-97	2.00E-06	4.97E-07	1.81E-07	0.00E+00	5.81E-07	0.00E+00	1.19E-02
17	Mo-99	0.00E+00	5.65E+06	1.08E+06	0.00E+00	1.29E+07	0.00E+00	1.01E+07
18	Tc-99m	2.74E+00	7.64E+00	9.90E+01	0.00E+00	1.14E+02	4.24E+00	5.02E+03
19	Ru-103	6.82E+06	0.00E+00	2.92E+06	0.00E+00	2.41E+07	0.00E+00	5.70E+08
20	Ru-106	2.38E+08	0.00E+00	3.90E+07	0.00E+00	5.97E+08	0.00E+00	1.48E+10
21	Ag-110m	1.52E+07	1.43E+07	8.72E+06	0.00E+00	2.74E+07	0.00E+00	4.03E+09
22	Sb-124	1.54E+08	2.84E+06	6.02E+07	3.50E+05	0.00E+00	1.35E+08	3.11E+09
23	Sb-125	2.14E+08	2.34E+06	5.01E+07	2.05E+05	0.00E+00	1.88E+08	1.67E+09
24	Te-127m	5.52E+08	1.96E+08	6.56E+07	1.31E+08	2.24E+09	0.00E+00	1.37E+09
25	Te-129m	3.62E+08	1.34E+08	5.73E+07	1.17E+08	1.51E+09	0.00E+00	1.36E+09
26	I-131	7.69E+07	1.08E+08	5.78E+07	3.14E+10	1.85E+08	0.00E+00	2.13E+07
27	I-133	1.94E+06	3.29E+06	1.00E+06	4.59E+08	5.77E+06	0.00E+00	2.49E+06
28	Cs-134	7.10E+09	1.67E+10	7.75E+09	0.00E+00	5.31E+09	2.03E+09	2.08E+08
29	Cs-136	4.38E+07	1.72E+08	1.16E+08	0.00E+00	9.37E+07	1.48E+07	1.39E+07
30	Cs-137	1.01E+10	1.35E+10	4.69E+09	0.00E+00	4.59E+09	1.78E+09	1.92E+08
31	Ba-140	1.38E+08	1.69E+05	8.90E+06	0.00E+00	5.74E+04	1.14E+05	2.13E+08
32	La-140	1.81E+03	8.88E+02	2.36E+02	0.00E+00	0.00E+00	0.00E+00	5.10E+07
33	Ce-141	2.83E+05	1.89E+05	2.17E+04	0.00E+00	8.90E+04	0.00E+00	5.41E+08
34	Ce-144	5.27E+07	2.18E+07	2.83E+06	0.00E+00	1.30E+07	0.00E+00	1.33E+10

All nuclides (except H-3) calculated per ODCM equation 2.3-26
H-3 calculated per ODCM equation 2.3-29

Table 2.3-9

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Vegetation
Age Group = Child

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	4.01E+03	4.01E+03	4.01E+03	4.01E+03	4.01E+03	4.01E+03
2	P-32	3.37E+09	1.58E+08	1.30E+08	0.00E+00	0.00E+00	0.00E+00	9.32E+07
3	Cr-51	0.00E+00	0.00E+00	1.17E+05	6.50E+04	1.78E+04	1.19E+05	6.21E+06
4	Mn-54	0.00E+00	6.65E+08	1.77E+08	0.00E+00	1.86E+08	0.00E+00	5.58E+08
5	Fe-59	3.98E+08	6.43E+08	3.20E+08	0.00E+00	0.00E+00	1.87E+08	6.70E+08
6	Co-57	0.00E+00	2.99E+07	6.04E+07	0.00E+00	0.00E+00	0.00E+00	2.45E+08
7	Co-58	0.00E+00	6.44E+07	1.97E+08	0.00E+00	0.00E+00	0.00E+00	3.76E+08
8	Co-60	0.00E+00	3.78E+08	1.12E+09	0.00E+00	0.00E+00	0.00E+00	2.10E+09
9	Zn-65	8.13E+08	2.17E+09	1.35E+09	0.00E+00	1.36E+09	0.00E+00	3.80E+08
10	Rb-86	0.00E+00	4.52E+08	2.78E+08	0.00E+00	0.00E+00	0.00E+00	2.91E+07
11	Sr-89	3.60E+10	0.00E+00	1.03E+09	0.00E+00	0.00E+00	0.00E+00	1.39E+09
12	Sr-90	1.24E+12	0.00E+00	3.15E+11	0.00E+00	0.00E+00	0.00E+00	1.67E+10
13	Y-91	1.86E+07	0.00E+00	4.99E+05	0.00E+00	0.00E+00	0.00E+00	2.48E+09
14	Zr-95	3.86E+06	8.48E+05	7.55E+05	0.00E+00	1.21E+06	0.00E+00	8.85E+08
15	Nb-95	4.11E+05	1.60E+05	1.14E+05	0.00E+00	1.50E+05	0.00E+00	2.96E+08
16	Nb-97	3.65E-06	6.59E-07	3.08E-07	0.00E+00	7.31E-07	0.00E+00	2.03E-01
17	Mo-99	0.00E+00	7.71E+06	1.91E+06	0.00E+00	1.65E+07	0.00E+00	6.38E+06
18	Tc-99m	4.71E+00	9.24E+00	1.53E+02	0.00E+00	1.34E+02	4.69E+00	5.26E+03
19	Ru-103	1.53E+07	0.00E+00	5.90E+06	0.00E+00	3.86E+07	0.00E+00	3.97E+08
20	Ru-106	7.45E+08	0.00E+00	9.30E+07	0.00E+00	1.01E+09	0.00E+00	1.16E+10
21	Ag-110m	3.21E+07	2.17E+07	1.73E+07	0.00E+00	4.04E+07	0.00E+00	2.58E+09
22	Sb-124	3.52E+08	4.57E+06	1.23E+08	7.77E+05	0.00E+00	1.95E+08	2.20E+09
23	Sb-125	4.99E+08	3.85E+06	1.05E+08	4.63E+05	0.00E+00	2.78E+08	1.19E+09
24	Te-127m	1.32E+09	3.56E+08	1.57E+08	3.16E+08	3.77E+09	0.00E+00	1.07E+09
25	Te-129m	8.41E+08	2.35E+08	1.31E+08	2.71E+08	2.47E+09	0.00E+00	1.03E+09
26	I-131	1.43E+08	1.44E+08	8.17E+07	4.76E+10	2.36E+08	0.00E+00	1.28E+07
27	I-133	3.53E+06	4.37E+06	1.65E+06	8.12E+08	7.28E+06	0.00E+00	1.76E+06
28	Cs-134	1.60E+10	2.63E+10	5.55E+09	0.00E+00	8.15E+09	2.93E+09	1.42E+08
29	Cs-136	8.24E+07	2.27E+08	1.47E+08	0.00E+00	1.21E+08	1.80E+07	7.96E+06
30	Cs-137	2.39E+10	2.29E+10	3.38E+09	0.00E+00	7.46E+09	2.68E+09	1.43E+08
31	Ba-140	2.77E+08	2.42E+07	1.62E+07	0.00E+00	7.89E+04	1.45E+05	1.40E+08
32	La-140	3.25E+03	1.13E+03	3.83E+02	0.00E+00	0.00E+00	0.00E+00	3.16E+07
33	Ce-141	6.56E+05	3.27E+05	4.86E+05	0.00E+00	1.43E+05	0.00E+00	4.08E+08
34	Ce-144	1.27E+08	3.98E+07	6.78E+06	0.00E+00	2.21E+07	0.00E+00	1.04E+10

All nuclides (except H-3) calculated per ODCM equation 2.3-26
H-3 calculated per ODCM equation 2.3-29

Table 2.3-10

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Meat
Age Group = Adult

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	3.25E+02	3.25E+02	3.25E+02	3.25E+02	3.25E+02	3.25E+02
2	P-32	3.95E+09	2.46E+08	1.53E+08	0.00E+00	0.00E+00	0.00E+00	4.44E+08
3	Cr-51	0.00E+00	0.00E+00	5.86E+03	3.50E+03	1.29E+03	7.78E+03	1.47E+06
4	Mn-54	0.00E+00	6.49E+06	1.24E+06	0.00E+00	1.93E+06	0.00E+00	1.99E+07
5	Fe-59	2.14E+08	5.04E+08	1.93E+08	0.00E+00	0.00E+00	1.41E+08	1.68E+09
6	Co-57	0.00E+00	4.01E+06	6.66E+06	0.00E+00	0.00E+00	0.00E+00	1.02E+08
7	Co-58	0.00E+00	1.42E+07	3.18E+07	0.00E+00	0.00E+00	0.00E+00	2.87E+08
8	Co-60	0.00E+00	5.12E+07	1.13E+08	0.00E+00	0.00E+00	0.00E+00	9.61E+08
9	Zn-65	2.54E+08	8.09E+08	3.66E+08	0.00E+00	5.41E+08	0.00E+00	5.10E+08
10	Rb-86	0.00E+00	4.11E+08	1.92E+08	0.00E+00	0.00E+00	0.00E+00	8.11E+07
11	Sr-89	2.41E+08	0.00E+00	6.92E+06	0.00E+00	0.00E+00	0.00E+00	3.87E+07
12	Sr-90	8.41E+09	0.00E+00	2.06E+09	0.00E+00	0.00E+00	0.00E+00	2.43E+08
13	Y-91	8.94E+05	0.00E+00	2.39E+04	0.00E+00	0.00E+00	0.00E+00	4.92E+08
14	Zr-95	1.47E+06	4.71E+05	3.19E+05	0.00E+00	7.39E+05	0.00E+00	1.49E+09
15	Nb-95	1.89E+06	1.05E+06	5.64E+05	0.00E+00	1.04E+06	0.00E+00	6.37E+09
16	Nb-97	**********	**********	**********	0.00E+00	***********	0.00E+00	***********
17	Mo-99	0.00E+00	8.51E+04	1.62E+04	0.00E+00	1.93E+05	0.00E+00	1.97E+05
18	Tc-99m	3.83E-21	1.08E-20	1.38E-19	0.00E+00	1.64E-19	5.30E-21	6.40E-18
19	Ru-103	8.57E+07	0.00E+00	3.69E+07	0.00E+00	3.27E+08	0.00E+00	1.00E+10
20	Ru-106	1.97E+09	0.00E+00	2.49E+08	0.00E+00	3.80E+09	0.00E+00	1.27E+11
21	Ag-110m	4.77E+06	4.41E+06	2.62E+06	0.00E+00	8.67E+06	0.00E+00	1.80E+09
22	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	Te-127m	8.38E+08	3.00E+08	1.02E+08	2.14E+08	3.40E+09	0.00E+00	2.81E+09
25	Te-129m	9.33E+08	3.48E+08	1.48E+08	3.21E+08	3.89E+09	0.00E+00	4.70E+09
26	I-131	9.13E+06	1.31E+07	7.48E+06	4.28E+09	2.24E+07	0.00E+00	3.45E+06
27	I-133	3.12E-01	5.42E-01	1.65E-01	7.96E+01	9.46E-01	0.00E+00	4.87E-01
28	Cs-134	4.53E+08	1.08E+09	8.81E+08	0.00E+00	3.49E+08	1.16E+08	1.89E+07
29	Cs-136	1.02E+07	4.04E+07	2.91E+07	0.00E+00	2.25E+07	3.08E+06	4.59E+06
30	Cs-137	5.90E+08	8.06E+08	5.28E+08	0.00E+00	2.74E+08	9.10E+07	1.56E+07
31	Ba-140	2.44E+07	3.06E+04	1.60E+06	0.00E+00	1.04E+04	1.75E+04	5.02E+07
32	La-140	3.16E-02	1.59E-02	4.21E-03	0.00E+00	0.00E+00	0.00E+00	1.17E+03
33	Ce-141	1.16E+04	7.83E+03	8.88E+02	0.00E+00	3.64E+03	0.00E+00	2.99E+07
34	Ce-144	1.03E+06	4.32E+05	5.55E+04	0.00E+00	2.56E+05	0.00E+00	3.50E+08

All nuclides (except H-3) calculated per ODCM equation 2.3-25
H-3 calculated per ODCM equation 2.3-30

Table 2.3-11

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Meat
Age Group = Teen

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	1.94E+02	1.94E+02	1.94E+02	1.94E+02	1.94E+02	1.94E+02
2 P-32	3.34E+09	2.07E+08	1.29E+08	0.00E+00	0.00E+00	0.00E+00	2.80E+08
3 Cr-51	0.00E+00	0.00E+00	4.69E+03	2.60E+03	1.03E+03	6.69E+03	7.88E+05
4 Mn-54	0.00E+00	4.95E+06	9.81E+05	0.00E+00	1.48E+06	0.00E+00	1.01E+07
5 Fe-59	1.71E+08	4.00E+08	1.54E+08	0.00E+00	0.00E+00	1.26E+08	9.45E+08
6 Co-57	0.00E+00	3.22E+06	5.40E+06	0.00E+00	0.00E+00	0.00E+00	6.01E+07
7 Co-58	0.00E+00	1.09E+07	2.52E+07	0.00E+00	0.00E+00	0.00E+00	1.51E+08
8 Co-60	0.00E+00	3.97E+07	8.95E+07	0.00E+00	0.00E+00	0.00E+00	5.17E+08
9 Zn-65	1.79E+08	6.21E+08	2.90E+08	0.00E+00	3.97E+08	0.00E+00	2.63E+08
10 Rb-86	0.00E+00	3.43E+08	1.61E+08	0.00E+00	0.00E+00	0.00E+00	5.08E+07
11 Sr-89	2.03E+08	0.00E+00	5.83E+06	0.00E+00	0.00E+00	0.00E+00	2.42E+07
12 Sr-90	5.44E+09	0.00E+00	1.34E+09	0.00E+00	0.00E+00	0.00E+00	1.53E+08
13 Y-91	7.53E+05	0.00E+00	2.02E+04	0.00E+00	0.00E+00	0.00E+00	3.09E+08
14 Zr-95	1.18E+06	3.71E+05	2.55E+05	0.00E+00	5.45E+05	0.00E+00	8.56E+08
15 Nb-95	1.47E+06	8.17E+05	4.50E+05	0.00E+00	7.92E+05	0.00E+00	3.49E+09
16 Nb-97	***********	***********	***********	0.00E+00	***********	0.00E+00	***********
17 Mo-99	0.00E+00	7.03E+04	1.34E+04	0.00E+00	1.61E+05	0.00E+00	1.26E+05
18 Tc-99m	3.04E-21	8.48E-21	1.10E-19	0.00E+00	1.26E-19	4.71E-21	5.57E-18
19 Ru-103	6.98E+07	0.00E+00	2.98E+07	0.00E+00	2.46E+08	0.00E+00	5.83E+09
20 Ru-106	1.28E+09	0.00E+00	2.09E+08	0.00E+00	3.19E+09	0.00E+00	7.94E+10
21 Ag-110m	3.61E+06	3.42E+06	2.08E+06	0.00E+00	6.52E+06	0.00E+00	9.60E+08
22 Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23 Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24 Te-127m	7.07E+08	2.51E+08	8.41E+07	1.68E+08	2.87E+09	0.00E+00	1.76E+09
25 Te-129m	7.82E+08	2.90E+08	1.24E+08	2.52E+08	3.27E+09	0.00E+00	2.93E+09
26 I-131	7.59E+06	1.06E+07	5.71E+06	3.10E+09	1.83E+07	0.00E+00	2.10E+06
27 I-133	2.61E-01	4.42E-01	1.35E-01	6.17E+01	7.75E-01	0.00E+00	3.34E-01
28 Cs-134	3.60E+08	8.48E+08	3.93E+08	0.00E+00	2.69E+08	1.03E+08	1.05E+07
29 Cs-136	7.98E+06	3.14E+07	2.11E+07	0.00E+00	1.71E+07	2.69E+06	2.53E+06
30 Cs-137	4.90E+08	6.51E+08	2.27E+08	0.00E+00	2.22E+08	8.61E+07	9.27E+06
31 Ba-140	2.02E+07	2.47E+04	1.30E+06	0.00E+00	8.38E+03	1.66E+04	3.11E+07
32 La-140	2.60E-02	1.28E-02	3.40E-03	0.00E+00	0.00E+00	0.00E+00	7.33E+02
33 Ce-141	9.72E+03	6.49E+03	7.46E+02	0.00E+00	3.06E+03	0.00E+00	1.86E+07
34 Ce-144	8.72E+05	3.61E+05	4.68E+04	0.00E+00	2.15E+05	0.00E+00	2.19E+08

All nuclides (except H-3) calculated per ODCM equation 2.3-25
H-3 calculated per ODCM equation 2.3-30

Table 2.3-12

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Meat
Age Group = Child

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	2.34E+02	2.34E+02	2.34E+02	2.34E+02	2.34E+02	2.34E+02
2 P-32	6.29E+09	2.94E+08	2.43E+08	0.00E+00	0.00E+00	0.00E+00	1.74E+08
3 Cr-51	0.00E+00	0.00E+00	7.31E+03	4.06E+03	1.11E+03	7.41E+03	3.88E+05
4 Mn-54	0.00E+00	5.66E+06	1.51E+06	0.00E+00	1.59E+06	0.00E+00	4.75E+06
5 Fe-59	3.04E+08	4.91E+08	2.45E+08	0.00E+00	0.00E+00	1.42E+08	5.12E+08
6 Co-57	0.00E+00	4.21E+06	8.52E+06	0.00E+00	0.00E+00	0.00E+00	3.45E+07
7 Co-58	0.00E+00	1.28E+07	3.91E+07	0.00E+00	0.00E+00	0.00E+00	7.45E+07
8 Co-60	0.00E+00	4.72E+07	1.39E+08	0.00E+00	0.00E+00	0.00E+00	2.61E+08
9 Zn-65	2.68E+08	7.15E+08	4.44E+08	0.00E+00	4.50E+08	0.00E+00	1.25E+08
10 Rb-86	0.00E+00	4.87E+08	2.99E+08	0.00E+00	0.00E+00	0.00E+00	3.13E+07
11 Sr-89	3.85E+08	0.00E+00	1.10E+07	0.00E+00	0.00E+00	0.00E+00	1.49E+07
12 Sr-90	7.03E+09	0.00E+00	1.78E+09	0.00E+00	0.00E+00	0.00E+00	9.47E+07
13 Y-91	1.42E+06	0.00E+00	3.81E+04	0.00E+00	0.00E+00	0.00E+00	1.90E+08
14 Zr-95	2.09E+06	4.59E+05	4.09E+05	0.00E+00	6.57E+05	0.00E+00	4.79E+08
15 Nb-95	2.54E+06	9.90E+05	7.07E+05	0.00E+00	9.30E+05	0.00E+00	1.83E+09
16 Nb-97	***********	***********	***********	0.00E+00	***********	0.00E+00	***********
17 Mo-99	0.00E+00	9.79E+04	2.42E+04	0.00E+00	2.09E+05	0.00E+00	8.09E+04
18 Tc-99m	5.33E-21	1.05E-20	1.73E-19	0.00E+00	1.52E-19	5.31E-21	5.95E-18
19 Ru-103	1.26E+08	0.00E+00	4.85E+07	0.00E+00	3.18E+08	0.00E+00	3.26E+09
20 Ru-106	3.12E+09	0.00E+00	3.89E+08	0.00E+00	4.21E+09	0.00E+00	4.85E+10
21 Ag-110m	5.99E+06	4.04E+06	3.23E+06	0.00E+00	7.53E+06	0.00E+00	4.81E+08
22 Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23 Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24 Te-127m	1.33E+09	3.59E+08	1.58E+08	3.19E+08	3.80E+09	0.00E+00	1.08E+09
25 Te-129m	1.47E+09	4.11E+08	2.29E+08	4.75E+08	4.33E+09	0.00E+00	1.80E+09
26 I-131	1.41E+07	1.42E+07	8.04E+06	4.68E+09	2.32E+07	0.00E+00	1.26E+06
27 I-133	4.84E-01	5.99E-01	2.27E-01	1.11E+02	9.98E-01	0.00E+00	2.41E-01
28 Cs-134	6.35E+08	1.04E+09	2.20E+08	0.00E+00	3.23E+08	1.16E+08	5.62E+06
29 Cs-136	1.38E+07	3.78E+07	2.45E+07	0.00E+00	2.01E+07	3.00E+06	1.33E+06
30 Cs-137	9.02E+08	8.63E+08	1.27E+08	0.00E+00	2.81E+08	1.01E+08	5.40E+06
31 Ba-140	3.72E+07	3.26E+06	2.17E+06	0.00E+00	1.06E+04	1.94E+04	1.89E+07
32 La-140	4.76E-02	1.66E-02	5.61E-03	0.00E+00	0.00E+00	0.00E+00	4.63E+02
33 Ce-141	1.83E+04	9.13E+03	1.36E+04	0.00E+00	4.00E+03	0.00E+00	1.14E+07
34 Ce-144	1.64E+06	5.15E+05	8.77E+04	0.00E+00	2.85E+05	0.00E+00	1.34E+08

All nuclides (except H-3) calculated per ODCM equation 2.3-25
H-3 calculated per ODCM equation 2.3-30

Table 2.3-13

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Adult

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	7.63E+02	7.63E+02	7.63E+02	7.63E+02	7.63E+02	7.63E+02
2	P-32	1.45E+10	9.01E+08	5.60E+08	0.00E+00	0.00E+00	0.00E+00	1.63E+09
3	Cr-51	0.00E+00	0.00E+00	2.38E+04	1.42E+04	5.24E+03	3.15E+04	5.98E+06
4	Mn-54	0.00E+00	5.95E+06	1.13E+06	0.00E+00	1.77E+06	0.00E+00	1.82E+07
5	Fe-59	2.40E+07	5.63E+07	2.16E+07	0.00E+00	0.00E+00	1.57E+07	1.88E+08
6	Co-57	0.00E+00	9.10E+05	1.51E+06	0.00E+00	0.00E+00	0.00E+00	2.31E+07
7	Co-58	0.00E+00	3.67E+06	8.22E+06	0.00E+00	0.00E+00	0.00E+00	7.43E+07
8	Co-60	0.00E+00	1.12E+07	2.46E+07	0.00E+00	0.00E+00	0.00E+00	2.10E+08
9	Zn-65	9.80E+08	3.12E+09	1.41E+09	0.00E+00	2.09E+09	0.00E+00	1.96E+09
10	Rb-86	0.00E+00	2.19E+09	1.02E+09	0.00E+00	0.00E+00	0.00E+00	4.32E+08
11	Sr-89	1.16E+09	0.00E+00	3.33E+07	0.00E+00	0.00E+00	0.00E+00	1.86E+08
12	Sr-90	3.16E+10	0.00E+00	7.76E+09	0.00E+00	0.00E+00	0.00E+00	9.14E+08
13	Y-91	6.78E+03	0.00E+00	1.81E+02	0.00E+00	0.00E+00	0.00E+00	3.73E+06
14	Zr-95	7.40E+02	2.37E+02	1.61E+02	0.00E+00	3.72E+02	0.00E+00	7.52E+05
15	Nb-95	6.77E+04	3.77E+04	2.03E+04	0.00E+00	3.72E+04	0.00E+00	2.29E+08
16	Nb-97	2.81E-12	7.11E-13	2.60E-13	0.00E+00	8.30E-13	0.00E+00	2.62E-09
17	Mo-99	0.00E+00	2.11E+07	4.01E+06	0.00E+00	4.77E+07	0.00E+00	4.88E+07
18	Tc-99m	2.83E+00	7.99E+00	1.02E+02	0.00E+00	1.21E+02	3.91E+00	4.73E+03
19	Ru-103	8.29E+02	0.00E+00	3.57E+02	0.00E+00	3.16E+03	0.00E+00	9.68E+04
20	Ru-106	1.43E+04	0.00E+00	1.81E+03	0.00E+00	2.77E+04	0.00E+00	9.27E+05
21	Ag-110m	4.16E+07	3.84E+07	2.28E+07	0.00E+00	7.56E+07	0.00E+00	1.57E+10
22	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	Te-127m	3.44E+07	1.23E+07	4.19E+06	8.79E+06	1.40E+08	0.00E+00	1.15E+08
25	Te-129m	4.95E+07	1.85E+07	7.84E+06	1.70E+07	2.07E+08	0.00E+00	2.49E+08
26	I-131	2.52E+08	3.60E+08	2.06E+08	1.18E+11	6.17E+08	0.00E+00	9.50E+07
27	I-133	3.29E+06	5.72E+06	1.75E+06	8.41E+08	9.99E+06	0.00E+00	5.14E+06
28	Cs-134	3.89E+09	9.27E+09	7.58E+09	0.00E+00	3.00E+09	9.96E+08	1.62E+08
29	Cs-136	2.23E+08	8.82E+08	6.35E+08	0.00E+00	4.91E+08	6.73E+07	1.00E+08
30	Cs-137	4.99E+09	6.82E+09	4.47E+09	0.00E+00	2.32E+09	7.70E+08	1.32E+08
31	Ba-140	2.28E+07	2.87E+04	1.49E+06	0.00E+00	9.74E+03	1.64E+04	4.70E+07
32	La-140	3.84E+00	1.93E+00	5.11E-01	0.00E+00	0.00E+00	0.00E+00	1.42E+05
33	Ce-141	3.99E+03	2.70E+03	3.06E+02	0.00E+00	1.25E+03	0.00E+00	1.03E+07
34	Ce-144	2.54E+05	1.06E+05	1.36E+04	0.00E+00	6.29E+04	0.00E+00	8.58E+07

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

Table 2.3-14

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Teen

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	9.94E+02	9.94E+02	9.94E+02	9.94E+02	9.94E+02	9.94E+02
2	P-32	2.67E+10	1.66E+09	1.04E+09	0.00E+00	0.00E+00	0.00E+00	2.25E+09
3	Cr-51	0.00E+00	0.00E+00	4.15E+04	2.31E+04	9.10E+03	5.93E+04	6.97E+06
4	Mn-54	0.00E+00	9.91E+06	1.96E+06	0.00E+00	2.95E+06	0.00E+00	2.03E+07
5	Fe-59	4.18E+07	9.76E+07	3.77E+07	0.00E+00	0.00E+00	3.08E+07	2.31E+08
6	Co-57	0.00E+00	1.60E+06	2.68E+06	0.00E+00	0.00E+00	0.00E+00	2.98E+07
7	Co-58	0.00E+00	6.17E+06	1.42E+07	0.00E+00	0.00E+00	0.00E+00	8.51E+07
8	Co-60	0.00E+00	1.89E+07	4.26E+07	0.00E+00	0.00E+00	0.00E+00	2.46E+08
9	Zn-65	1.51E+09	5.23E+09	2.44E+09	0.00E+00	3.34E+09	0.00E+00	2.21E+09
10	Rb-86	0.00E+00	3.99E+09	1.87E+09	0.00E+00	0.00E+00	0.00E+00	5.91E+08
11	Sr-89	2.14E+09	0.00E+00	6.12E+07	0.00E+00	0.00E+00	0.00E+00	2.55E+08
12	Sr-90	4.47E+10	0.00E+00	1.10E+10	0.00E+00	0.00E+00	0.00E+00	1.25E+09
13	Y-91	1.25E+04	0.00E+00	3.35E+02	0.00E+00	0.00E+00	0.00E+00	5.11E+06
14	Zr-95	1.29E+03	4.08E+02	2.81E+02	0.00E+00	6.00E+02	0.00E+00	9.42E+05
15	Nb-95	1.16E+05	6.41E+04	3.53E+04	0.00E+00	6.21E+04	0.00E+00	2.74E+08
16	Nb-97	5.13E-12	1.27E-12	4.65E-13	0.00E+00	1.49E-12	0.00E+00	3.04E-08
17	Mo-99	0.00E+00	3.80E+07	7.25E+06	0.00E+00	8.70E+07	0.00E+00	6.81E+07
18	Tc-99m	4.90E+00	1.37E+01	1.77E+02	0.00E+00	2.04E+02	7.59E+00	8.98E+03
19	Ru-103	1.47E+03	0.00E+00	6.30E+02	0.00E+00	5.20E+03	0.00E+00	1.23E+05
20	Ru-106	2.03E+04	0.00E+00	3.32E+03	0.00E+00	5.08E+04	0.00E+00	1.26E+06
21	Ag-110m	6.87E+07	6.50E+07	3.95E+07	0.00E+00	1.24E+08	0.00E+00	1.83E+10
22	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	Te-127m	6.34E+07	2.25E+07	7.54E+06	1.51E+07	2.57E+08	0.00E+00	1.58E+08
25	Te-129m	9.06E+07	3.36E+07	1.43E+07	2.92E+07	3.79E+08	0.00E+00	3.40E+08
26	I-131	4.57E+08	6.39E+08	3.43E+08	1.87E+11	1.10E+09	0.00E+00	1.26E+08
27	I-133	6.01E+06	1.02E+07	3.11E+06	1.42E+09	1.79E+07	0.00E+00	7.71E+06
28	Cs-134	6.76E+09	1.59E+10	7.38E+09	0.00E+00	5.06E+09	1.93E+09	1.98E+08
29	Cs-136	3.80E+08	1.50E+09	1.01E+09	0.00E+00	8.15E+08	1.28E+08	1.20E+08
30	Cs-137	9.05E+09	1.20E+10	4.19E+09	0.00E+00	4.10E+09	1.59E+09	1.71E+08
31	Ba-140	4.12E+07	5.05E+04	2.65E+06	0.00E+00	1.71E+04	3.39E+04	6.35E+07
32	La-140	6.89E+00	3.39E+00	9.01E-01	0.00E+00	0.00E+00	0.00E+00	1.94E+05
33	Ce-141	7.32E+03	4.89E+03	5.62E+02	0.00E+00	2.30E+03	0.00E+00	1.40E+07
34	Ce-144	4.67E+05	1.93E+05	2.51E+04	0.00E+00	1.15E+05	0.00E+00	1.17E+08

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

Table 2.3-15

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Child

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	1.57E+03	1.57E+03	1.57E+03	1.57E+03	1.57E+03	1.57E+03
2 P-32	6.59E+10	3.09E+09	2.54E+09	0.00E+00	0.00E+00	0.00E+00	1.82E+09
3 Cr-51	0.00E+00	0.00E+00	8.46E+04	4.70E+04	1.28E+04	8.58E+04	4.49E+06
4 Mn-54	0.00E+00	1.48E+07	3.95E+06	0.00E+00	4.16E+06	0.00E+00	1.24E+07
5 Fe-59	9.70E+07	1.57E+08	7.82E+07	0.00E+00	0.00E+00	4.55E+07	1.63E+08
6 Co-57	0.00E+00	2.73E+06	5.52E+06	0.00E+00	0.00E+00	0.00E+00	2.24E+07
7 Co-58	0.00E+00	9.43E+06	2.89E+07	0.00E+00	0.00E+00	0.00E+00	5.50E+07
8 Co-60	0.00E+00	2.94E+07	8.67E+07	0.00E+00	0.00E+00	0.00E+00	1.63E+08
9 Zn-65	2.95E+09	7.87E+09	4.89E+09	0.00E+00	4.96E+09	0.00E+00	1.38E+09
10 Rb-86	0.00E+00	7.40E+09	4.55E+09	0.00E+00	0.00E+00	0.00E+00	4.76E+08
11 Sr-89	5.29E+09	0.00E+00	1.51E+08	0.00E+00	0.00E+00	0.00E+00	2.05E+08
12 Sr-90	7.55E+10	0.00E+00	1.91E+10	0.00E+00	0.00E+00	0.00E+00	1.02E+09
13 Y-91	3.08E+04	0.00E+00	8.24E+02	0.00E+00	0.00E+00	0.00E+00	4.11E+06
14 Zr-95	3.00E+03	6.60E+02	5.88E+02	0.00E+00	9.45E+02	0.00E+00	6.89E+05
15 Nb-95	2.61E+05	1.02E+05	7.26E+04	0.00E+00	9.54E+04	0.00E+00	1.88E+08
16 Nb-97	1.25E-11	2.25E-12	1.05E-12	0.00E+00	2.50E-12	0.00E+00	6.94E-07
17 Mo-99	0.00E+00	6.92E+07	1.71E+07	0.00E+00	1.48E+08	0.00E+00	5.72E+07
18 Tc-99m	1.12E+01	2.20E+01	3.65E+02	0.00E+00	3.20E+02	1.12E+01	1.25E+04
19 Ru-103	3.49E+03	0.00E+00	1.34E+03	0.00E+00	8.78E+03	0.00E+00	9.01E+04
20 Ru-106	6.49E+04	0.00E+00	8.10E+03	0.00E+00	8.76E+04	0.00E+00	1.01E+06
21 Ag-110m	1.49E+08	1.01E+08	8.05E+07	0.00E+00	1.87E+08	0.00E+00	1.20E+10
22 Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23 Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24 Te-127m	1.56E+08	4.21E+07	1.86E+07	3.74E+07	4.46E+08	0.00E+00	1.27E+08
25 Te-129m	2.23E+08	6.24E+07	3.47E+07	7.20E+07	6.56E+08	0.00E+00	2.72E+08
26 I-131	1.11E+09	1.11E+09	6.33E+08	3.68E+11	1.83E+09	0.00E+00	9.92E+07
27 I-133	1.46E+07	1.81E+07	6.83E+06	3.36E+09	3.01E+07	0.00E+00	7.28E+06
28 Cs-134	1.56E+10	2.56E+10	5.40E+09	0.00E+00	7.93E+09	2.85E+09	1.38E+08
29 Cs-136	8.58E+08	2.36E+09	1.53E+09	0.00E+00	1.26E+09	1.87E+08	8.29E+07
30 Cs-137	2.18E+10	2.09E+10	3.08E+09	0.00E+00	6.80E+09	2.45E+09	1.31E+08
31 Ba-140	9.94E+07	8.71E+06	5.80E+06	0.00E+00	2.84E+04	5.19E+04	5.04E+07
32 La-140	1.65E+01	5.77E+00	1.94E+00	0.00E+00	0.00E+00	0.00E+00	1.61E+05
33 Ce-141	1.80E+04	8.99E+03	1.34E+04	0.00E+00	3.94E+03	0.00E+00	1.12E+07
34 Ce-144	1.15E+06	3.61E+05	6.15E+04	0.00E+00	2.00E+05	0.00E+00	9.41E+07

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

Table 2.3-16

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Cow Milk
Age Group = Infant

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	2.38E+03	2.38E+03	2.38E+03	2.38E+03	2.38E+03	2.38E+03
2 P-32	1.36E+11	7.99E+09	5.27E+09	0.00E+00	0.00E+00	0.00E+00	1.84E+09
3 Cr-51	0.00E+00	0.00E+00	1.34E+05	8.75E+04	1.91E+04	1.70E+05	3.91E+06
4 Mn-54	0.00E+00	2.76E+07	6.25E+06	0.00E+00	6.11E+06	0.00E+00	1.01E+07
5 Fe-59	1.81E+08	3.16E+08	1.25E+08	0.00E+00	0.00E+00	9.35E+07	1.51E+08
6 Co-57	0.00E+00	6.36E+06	1.03E+07	0.00E+00	0.00E+00	0.00E+00	2.17E+07
7 Co-58	0.00E+00	1.89E+07	4.70E+07	0.00E+00	0.00E+00	0.00E+00	4.70E+07
8 Co-60	0.00E+00	6.00E+07	1.42E+08	0.00E+00	0.00E+00	0.00E+00	1.43E+08
9 Zn-65	3.97E+09	1.36E+10	6.27E+09	0.00E+00	6.60E+09	0.00E+00	1.15E+10
10 Rb-86	0.00E+00	1.88E+10	9.28E+09	0.00E+00	0.00E+00	0.00E+00	4.81E+08
11 Sr-89	1.01E+10	0.00E+00	2.89E+08	0.00E+00	0.00E+00	0.00E+00	2.07E+08
12 Sr-90	8.22E+10	0.00E+00	2.09E+10	0.00E+00	0.00E+00	0.00E+00	1.03E+09
13 Y-91	5.79E+04	0.00E+00	1.54E+03	0.00E+00	0.00E+00	0.00E+00	4.15E+06
14 Zr-95	5.33E+03	1.30E+03	9.22E+02	0.00E+00	1.40E+03	0.00E+00	6.47E+05
15 Nb-95	4.87E+05	2.01E+05	1.16E+05	0.00E+00	1.44E+05	0.00E+00	1.69E+08
16 Nb-97	2.63E-11	5.62E-12	2.03E-12	0.00E+00	4.39E-12	0.00E+00	1.77E-06
17 Mo-99	0.00E+00	1.77E+08	3.45E+07	0.00E+00	2.64E+08	0.00E+00	5.83E+07
18 Tc-99m	2.34E+01	4.82E+01	6.21E+02	0.00E+00	5.19E+02	2.52E+01	1.40E+04
19 Ru-103	7.06E+03	0.00E+00	2.36E+03	0.00E+00	1.47E+04	0.00E+00	8.59E+04
20 Ru-106	1.34E+05	0.00E+00	1.67E+04	0.00E+00	1.58E+05	0.00E+00	1.01E+06
21 Ag-110m	2.75E+08	2.01E+08	1.33E+08	0.00E+00	2.88E+08	0.00E+00	1.04E+10
22 Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23 Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24 Te-127m	3.16E+08	1.05E+08	3.83E+07	9.14E+07	7.79E+08	0.00E+00	1.28E+08
25 Te-129m	4.58E+08	1.57E+08	7.06E+07	1.76E+08	1.15E+09	0.00E+00	2.74E+08
26 I-131	2.31E+09	2.72E+09	1.20E+09	8.95E+11	3.18E+09	0.00E+00	9.72E+07
27 I-133	3.08E+07	4.49E+07	1.31E+07	8.17E+09	5.28E+07	0.00E+00	7.60E+06
28 Cs-134	2.51E+10	4.69E+10	4.73E+09	0.00E+00	1.21E+10	4.95E+09	1.27E+08
29 Cs-136	1.68E+09	4.93E+09	1.84E+09	0.00E+00	1.97E+09	4.02E+08	7.49E+07
30 Cs-137	3.48E+10	4.07E+10	2.89E+09	0.00E+00	1.09E+10	4.43E+09	1.27E+08
31 Ba-140	2.05E+08	2.05E+05	1.05E+07	0.00E+00	4.86E+04	1.26E+05	5.02E+07
32 La-140	3.45E+01	1.36E+01	3.50E+00	0.00E+00	0.00E+00	0.00E+00	1.60E+05
33 Ce-141	3.57E+04	2.18E+04	2.57E+03	0.00E+00	6.72E+03	0.00E+00	1.13E+07
34 Ce-144	1.65E+06	6.75E+05	9.25E+04	0.00E+00	2.73E+05	0.00E+00	9.47E+07

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

Table 2.3-17

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Adult

	Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1	H-3	0.00E+00	1.56E+03	1.56E+03	1.56E+03	1.56E+03	1.56E+03	1.56E+03
2	P-32	1.74E+10	1.08E+09	6.72E+08	0.00E+00	0.00E+00	0.00E+00	1.96E+09
3	Cr-51	0.00E+00	0.00E+00	2.85E+03	1.70E+03	6.28E+02	3.78E+03	7.17E+05
4	Mn-54	0.00E+00	7.14E+05	1.36E+05	0.00E+00	2.12E+05	0.00E+00	2.19E+06
5	Fe-59	3.12E+05	7.32E+05	2.81E+05	0.00E+00	0.00E+00	2.05E+05	2.44E+06
6	Co-57	0.00E+00	1.09E+05	1.82E+05	0.00E+00	0.00E+00	0.00E+00	2.77E+06
7	Co-58	0.00E+00	4.40E+05	9.86E+05	0.00E+00	0.00E+00	0.00E+00	8.91E+06
8	Co-60	0.00E+00	1.34E+06	2.96E+06	0.00E+00	0.00E+00	0.00E+00	2.52E+07
9	Zn-65	1.18E+08	3.74E+08	1.69E+08	0.00E+00	2.50E+08	0.00E+00	2.36E+08
10	Rb-86	0.00E+00	2.63E+08	1.22E+08	0.00E+00	0.00E+00	0.00E+00	5.18E+07
11	Sr-89	2.43E+09	0.00E+00	6.99E+07	0.00E+00	0.00E+00	0.00E+00	3.91E+08
12	Sr-90	6.64E+10	0.00E+00	1.63E+10	0.00E+00	0.00E+00	0.00E+00	1.92E+09
13	Y-91	8.14E+02	0.00E+00	2.18E+01	0.00E+00	0.00E+00	0.00E+00	4.48E+05
14	Zr-95	8.87E+01	2.85E+01	1.93E+01	0.00E+00	4.47E+01	0.00E+00	9.02E+04
15	Nb-95	8.13E+03	4.52E+03	2.43E+03	0.00E+00	4.47E+03	0.00E+00	2.74E+07
16	Nb-97	3.38E-13	8.54E-14	3.12E-14	0.00E+00	9.96E-14	0.00E+00	3.15E-10
17	Mo-99	0.00E+00	2.53E+06	4.81E+05	0.00E+00	5.72E+06	0.00E+00	5.86E+06
18	Tc-99m	3.39E-01	9.59E-01	1.22E+01	0.00E+00	1.46E+01	4.70E-01	5.67E+02
19	Ru-103	9.95E+01	0.00E+00	4.29E+01	0.00E+00	3.80E+02	0.00E+00	1.16E+04
20	Ru-106	1.72E+03	0.00E+00	2.18E+02	0.00E+00	3.32E+03	0.00E+00	1.11E+05
21	Ag-110m	4.99E+06	4.61E+06	2.74E+06	0.00E+00	9.07E+06	0.00E+00	1.88E+09
22	Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23	Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24	Te-127m	4.13E+06	1.48E+06	5.03E+05	1.05E+06	1.68E+07	0.00E+00	1.38E+07
25	Te-129m	5.94E+06	2.22E+06	9.41E+05	2.04E+06	2.48E+07	0.00E+00	2.99E+07
26	I-131	3.02E+08	4.32E+08	2.48E+08	1.42E+11	7.40E+08	0.00E+00	1.14E+08
27	I-133	3.95E+06	6.87E+06	2.09E+06	1.01E+09	1.20E+07	0.00E+00	6.17E+06
28	Cs-134	4.67E+08	1.11E+09	9.09E+08	0.00E+00	3.60E+08	1.19E+08	1.95E+07
29	Cs-136	6.70E+08	2.65E+09	1.90E+09	0.00E+00	1.47E+09	2.02E+08	3.01E+08
30	Cs-137	1.50E+10	2.05E+10	1.34E+10	0.00E+00	6.95E+09	2.31E+09	3.96E+08
31	Ba-140	2.74E+06	3.44E+03	1.79E+05	0.00E+00	1.17E+03	1.97E+03	5.64E+06
32	La-140	4.60E-01	2.32E-01	6.13E-02	0.00E+00	0.00E+00	0.00E+00	1.70E+04
33	Ce-141	4.79E+02	3.24E+02	3.68E+01	0.00E+00	1.51E+02	0.00E+00	1.24E+06
34	Ce-144	3.05E+04	1.27E+04	1.64E+03	0.00E+00	7.55E+03	0.00E+00	1.03E+07

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

Table 2.3-18

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Teen

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	2.03E+03	2.03E+03	2.03E+03	2.03E+03	2.03E+03	2.03E+03
2 P-32	3.21E+10	1.99E+09	1.24E+09	0.00E+00	0.00E+00	0.00E+00	2.70E+09
3 Cr-51	0.00E+00	0.00E+00	4.98E+03	2.77E+03	1.09E+03	7.11E+03	8.37E+05
4 Mn-54	0.00E+00	1.19E+06	2.36E+05	0.00E+00	3.55E+05	0.00E+00	2.44E+06
5 Fe-59	5.44E+05	1.27E+06	4.90E+05	0.00E+00	0.00E+00	4.00E+05	3.00E+06
6 Co-57	0.00E+00	1.92E+05	3.21E+05	0.00E+00	0.00E+00	0.00E+00	3.57E+06
7 Co-58	0.00E+00	7.40E+05	1.71E+06	0.00E+00	0.00E+00	0.00E+00	1.02E+07
8 Co-60	0.00E+00	2.27E+06	5.11E+06	0.00E+00	0.00E+00	0.00E+00	2.96E+07
9 Zn-65	1.81E+08	6.27E+08	2.93E+08	0.00E+00	4.01E+08	0.00E+00	2.66E+08
10 Rb-86	0.00E+00	4.79E+08	2.25E+08	0.00E+00	0.00E+00	0.00E+00	7.09E+07
11 Sr-89	4.49E+09	0.00E+00	1.29E+08	0.00E+00	0.00E+00	0.00E+00	5.35E+08
12 Sr-90	9.39E+10	0.00E+00	2.32E+10	0.00E+00	0.00E+00	0.00E+00	2.64E+09
13 Y-91	1.50E+03	0.00E+00	4.01E+01	0.00E+00	0.00E+00	0.00E+00	6.14E+05
14 Zr-95	1.55E+02	4.90E+01	3.37E+01	0.00E+00	7.19E+01	0.00E+00	1.13E+05
15 Nb-95	1.39E+04	7.69E+03	4.23E+03	0.00E+00	7.45E+03	0.00E+00	3.29E+07
16 Nb-97	6.15E-13	1.53E-13	5.57E-14	0.00E+00	1.79E-13	0.00E+00	3.65E-09
17 Mo-99	0.00E+00	4.56E+06	8.70E+05	0.00E+00	1.04E+07	0.00E+00	8.17E+06
18 Tc-99m	5.88E-01	1.64E+00	2.13E+01	0.00E+00	2.45E+01	9.11E-01	1.08E+03
19 Ru-103	1.77E+02	0.00E+00	7.56E+01	0.00E+00	6.24E+02	0.00E+00	1.48E+04
20 Ru-106	2.44E+03	0.00E+00	3.98E+02	0.00E+00	6.10E+03	0.00E+00	1.52E+05
21 Ag-110m	8.24E+06	7.80E+06	4.75E+06	0.00E+00	1.49E+07	0.00E+00	2.19E+09
22 Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23 Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24 Te-127m	7.61E+06	2.70E+06	9.05E+05	1.81E+06	3.08E+07	0.00E+00	1.90E+07
25 Te-129m	1.09E+07	4.03E+06	1.72E+06	3.51E+06	4.55E+07	0.00E+00	4.08E+07
26 I-131	5.48E+08	7.67E+08	4.12E+08	2.24E+11	1.32E+09	0.00E+00	1.52E+08
27 I-133	7.21E+06	1.22E+07	3.73E+06	1.71E+09	2.15E+07	0.00E+00	9.26E+06
28 Cs-134	8.11E+08	1.91E+09	8.86E+08	0.00E+00	6.07E+08	2.32E+08	2.38E+07
29 Cs-136	1.14E+09	4.49E+09	3.02E+09	0.00E+00	2.44E+09	3.85E+08	3.61E+08
30 Cs-137	2.71E+10	3.61E+10	1.26E+10	0.00E+00	1.23E+10	4.77E+09	5.14E+08
31 Ba-140	4.94E+06	6.06E+03	3.18E+05	0.00E+00	2.05E+03	4.07E+03	7.62E+06
32 La-140	8.27E-01	4.06E-01	1.08E-01	0.00E+00	0.00E+00	0.00E+00	2.33E+04
33 Ce-141	8.79E+02	5.87E+02	6.74E+01	0.00E+00	2.76E+02	0.00E+00	1.68E+06
34 Ce-144	5.60E+04	2.32E+04	3.01E+03	0.00E+00	1.39E+04	0.00E+00	1.41E+07

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

Table 2.3-19

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Child

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	3.20E+03	3.20E+03	3.20E+03	3.20E+03	3.20E+03	3.20E+03
2 P-32	7.91E+10	3.70E+09	3.05E+09	0.00E+00	0.00E+00	0.00E+00	2.19E+09
3 Cr-51	0.00E+00	0.00E+00	1.02E+04	5.64E+03	1.54E+03	1.03E+04	5.39E+05
4 Mn-54	0.00E+00	1.78E+06	4.74E+05	0.00E+00	4.99E+05	0.00E+00	1.49E+06
5 Fe-59	1.26E+06	2.04E+06	1.02E+06	0.00E+00	0.00E+00	5.91E+05	2.12E+06
6 Co-57	0.00E+00	3.27E+05	6.63E+05	0.00E+00	0.00E+00	0.00E+00	2.68E+06
7 Co-58	0.00E+00	1.13E+06	3.46E+06	0.00E+00	0.00E+00	0.00E+00	6.60E+06
8 Co-60	0.00E+00	3.53E+06	1.04E+07	0.00E+00	0.00E+00	0.00E+00	1.95E+07
9 Zn-65	3.54E+08	9.44E+08	5.87E+08	0.00E+00	5.95E+08	0.00E+00	1.66E+08
10 Rb-86	0.00E+00	8.88E+08	5.46E+08	0.00E+00	0.00E+00	0.00E+00	5.71E+07
11 Sr-89	1.11E+10	0.00E+00	3.17E+08	0.00E+00	0.00E+00	0.00E+00	4.30E+08
12 Sr-90	1.59E+11	0.00E+00	4.02E+10	0.00E+00	0.00E+00	0.00E+00	2.14E+09
13 Y-91	3.70E+03	0.00E+00	9.89E+01	0.00E+00	0.00E+00	0.00E+00	4.93E+05
14 Zr-95	3.60E+02	7.92E+01	7.05E+01	0.00E+00	1.13E+02	0.00E+00	8.27E+04
15 Nb-95	3.13E+04	1.22E+04	8.71E+03	0.00E+00	1.14E+04	0.00E+00	2.25E+07
16 Nb-97	1.49E-12	2.70E-13	1.26E-13	0.00E+00	2.99E-13	0.00E+00	8.33E-08
17 Mo-99	0.00E+00	8.30E+06	2.05E+06	0.00E+00	1.77E+07	0.00E+00	6.87E+06
18 Tc-99m	1.35E+00	2.65E+00	4.39E+01	0.00E+00	3.84E+01	1.34E+00	1.51E+03
19 Ru-103	4.18E+02	0.00E+00	1.61E+02	0.00E+00	1.05E+03	0.00E+00	1.08E+04
20 Ru-106	7.79E+03	0.00E+00	9.72E+02	0.00E+00	1.05E+04	0.00E+00	1.21E+05
21 Ag-110m	1.79E+07	1.21E+07	9.65E+06	0.00E+00	2.25E+07	0.00E+00	1.44E+09
22 Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23 Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24 Te-127m	1.88E+07	5.05E+06	2.23E+06	4.48E+06	5.35E+07	0.00E+00	1.52E+07
25 Te-129m	2.68E+07	7.48E+06	4.16E+06	8.64E+06	7.87E+07	0.00E+00	3.27E+07
26 I-131	1.33E+09	1.34E+09	7.60E+08	4.42E+11	2.19E+09	0.00E+00	1.19E+08
27 I-133	1.75E+07	2.17E+07	8.20E+06	4.03E+09	3.61E+07	0.00E+00	8.73E+06
28 Cs-134	1.87E+09	3.07E+09	6.48E+08	0.00E+00	9.52E+08	3.42E+08	1.66E+07
29 Cs-136	2.58E+09	7.08E+09	4.58E+09	0.00E+00	3.77E+09	5.62E+08	2.49E+08
30 Cs-137	6.54E+10	6.26E+10	9.24E+09	0.00E+00	2.04E+10	7.34E+09	3.92E+08
31 Ba-140	1.19E+07	1.05E+06	6.96E+05	0.00E+00	3.40E+03	6.23E+03	6.04E+06
32 La-140	1.98E+00	6.92E-01	2.33E-01	0.00E+00	0.00E+00	0.00E+00	1.93E+04
33 Ce-141	2.16E+03	1.08E+03	1.60E+03	0.00E+00	4.73E+02	0.00E+00	1.35E+06
34 Ce-144	1.38E+05	4.33E+04	7.37E+03	0.00E+00	2.40E+04	0.00E+00	1.13E+07

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

Table 2.3-20

R VALUES FOR BEAVER VALLEY SITE

(sq meter-mrem/yr per uCi/sec)

Pathway = Goat Milk
Age Group = Infant

Nuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
1 H-3	0.00E+00	4.86E+03	4.86E+03	4.86E+03	4.86E+03	4.86E+03	4.86E+03
2 P-32	1.63E+11	9.59E+09	6.32E+09	0.00E+00	0.00E+00	0.00E+00	2.21E+09
3 Cr-51	0.00E+00	0.00E+00	1.61E+04	1.05E+04	2.29E+03	2.04E+04	4.69E+05
4 Mn-54	0.00E+00	3.31E+06	7.50E+05	0.00E+00	7.33E+05	0.00E+00	1.21E+06
5 Fe-59	2.35E+06	4.11E+06	1.62E+06	0.00E+00	0.00E+00	1.21E+06	1.96E+06
6 Co-57	0.00E+00	7.64E+05	1.24E+06	0.00E+00	0.00E+00	0.00E+00	2.60E+06
7 Co-58	0.00E+00	2.26E+06	5.64E+06	0.00E+00	0.00E+00	0.00E+00	5.64E+06
8 Co-60	0.00E+00	7.20E+06	1.70E+07	0.00E+00	0.00E+00	0.00E+00	1.71E+07
9 Zn-65	4.76E+08	1.63E+09	7.53E+08	0.00E+00	7.92E+08	0.00E+00	1.38E+09
10 Rb-86	0.00E+00	2.25E+09	1.11E+09	0.00E+00	0.00E+00	0.00E+00	5.77E+07
11 Sr-89	2.11E+10	0.00E+00	6.06E+08	0.00E+00	0.00E+00	0.00E+00	4.34E+08
12 Sr-90	1.73E+11	0.00E+00	4.39E+10	0.00E+00	0.00E+00	0.00E+00	2.16E+09
13 Y-91	6.94E+03	0.00E+00	1.85E+02	0.00E+00	0.00E+00	0.00E+00	4.98E+05
14 Zr-95	6.40E+02	1.56E+02	1.11E+02	0.00E+00	1.68E+02	0.00E+00	7.77E+04
15 Nb-95	5.84E+04	2.41E+04	1.39E+04	0.00E+00	1.72E+04	0.00E+00	2.03E+07
16 Nb-97	3.16E-12	6.74E-13	2.43E-13	0.00E+00	5.27E-13	0.00E+00	2.13E-07
17 Mo-99	0.00E+00	2.12E+07	4.14E+06	0.00E+00	3.17E+07	0.00E+00	6.99E+06
18 Tc-99m	2.81E+00	5.79E+00	7.46E+01	0.00E+00	6.23E+01	3.03E+00	1.68E+03
19 Ru-103	8.47E+02	0.00E+00	2.83E+02	0.00E+00	1.76E+03	0.00E+00	1.03E+04
20 Ru-106	1.60E+04	0.00E+00	2.00E+03	0.00E+00	1.90E+04	0.00E+00	1.22E+05
21 Ag-110m	3.30E+07	2.41E+07	1.60E+07	0.00E+00	3.45E+07	0.00E+00	1.25E+09
22 Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23 Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
24 Te-127m	3.80E+07	1.26E+07	4.59E+06	1.10E+07	9.35E+07	0.00E+00	1.53E+07
25 Te-129m	5.50E+07	1.89E+07	8.47E+06	2.11E+07	1.38E+08	0.00E+00	3.28E+07
26 I-131	2.77E+09	3.27E+09	1.44E+09	1.07E+12	3.82E+09	0.00E+00	1.17E+08
27 I-133	3.70E+07	5.39E+07	1.58E+07	9.80E+09	6.34E+07	0.00E+00	9.12E+06
28 Cs-134	3.02E+09	5.62E+09	5.68E+08	0.00E+00	1.45E+09	5.93E+08	1.53E+07
29 Cs-136	5.03E+09	1.48E+10	5.52E+09	0.00E+00	5.90E+09	1.21E+09	2.25E+08
30 Cs-137	1.04E+11	1.22E+11	8.66E+09	0.00E+00	3.28E+10	1.33E+10	3.82E+08
31 Ba-140	2.45E+07	2.45E+04	1.26E+06	0.00E+00	5.83E+03	1.51E+04	6.03E+06
32 La-140	4.14E+00	1.63E+00	4.19E-01	0.00E+00	0.00E+00	0.00E+00	1.92E+04
33 Ce-141	4.29E+03	2.62E+03	3.08E+02	0.00E+00	8.07E+02	0.00E+00	1.35E+06
34 Ce-144	1.98E+05	8.11E+04	1.11E+04	0.00E+00	3.28E+04	0.00E+00	1.14E+07

All nuclides (except H-3) calculated per ODCM equation 2.3-24
H-3 calculated per ODCM equation 2.3-28

TABLE 2.3-21

BV-1 AND 2 PROCESS VENT DISPERSION PARAMETERS ($\overline{D/Q}$)
FOR CONTINUOUS ELEVATED RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
SECTOR	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	6.00E-10	8.60E-09	3.14E-09	1.76E-09	8.12E-10	5.70E-10	4.24E-10	3.29E-10	2.63E-10	2.15E-10
NNE	6.66E-10	5.64E-09	1.98E-09	2.55E-09	1.33E-09	1.07E-09	6.75E-10	5.23E-10	4.56E-10	3.74E-10
NE	1.03E-09	1.57E-09	1.32E-09	3.62E-09	2.63E-09	1.64E-09	1.23E-09	6.13E-10	7.85E-10	6.42E-10
ENE	1.13E-09	1.55E-09	3.69E-09	3.27E-09	2.31E-09	1.29E-09	1.21E-09	6.78E-10	6.72E-10	3.89E-10
E	1.35E-09	1.28E-08	4.09E-09	3.12E-09	1.91E-09	1.36E-09	1.01E-09	7.83E-10	4.15E-10	5.10E-10
ESE	9.82E-10	7.85E-09	4.40E-09	2.46E-09	1.47E-09	1.03E-09	5.65E-10	5.05E-10	3.25E-10	3.00E-10
SE	2.76E-09	6.41E-09	3.52E-09	1.97E-09	1.18E-09	8.27E-10	5.68E-10	4.40E-10	2.93E-10	2.43E-10
SSE	2.22E-09	4.66E-09	3.01E-09	1.68E-09	1.02E-09	7.14E-10	4.25E-10	3.29E-10	2.19E-10	1.80E-10
S	3.00E-09	4.81E-09	3.76E-09	2.10E-09	1.36E-09	9.52E-10	5.12E-10	3.96E-10	2.68E-10	2.20E-10
SSW	1.44E-08	2.89E-09	7.83E-10	8.84E-10	5.70E-10	4.00E-10	2.55E-10	1.98E-10	1.84E-10	1.51E-10
SW	1.89E-08	5.55E-09	1.55E-09	8.71E-10	2.61E-10	3.94E-10	1.57E-10	2.50E-10	2.54E-10	2.08E-10
WSW	1.57E-09	6.63E-09	1.36E-09	1.04E-09	5.44E-10	2.39E-10	3.84E-10	2.98E-10	2.17E-10	1.78E-10
W	3.78E-10	2.95E-09	1.84E-09	1.03E-09	6.63E-10	4.66E-10	1.37E-10	2.68E-10	1.12E-10	1.75E-10
WNW	4.54E-10	4.13E-10	3.09E-10	4.71E-10	7.35E-10	5.16E-10	1.93E-10	1.10E-10	1.12E-10	1.80E-10
NW	4.52E-10	4.09E-10	2.86E-10	1.18E-09	7.04E-10	4.94E-10	3.37E-10	2.10E-10	2.09E-10	1.71E-10
NNW	3.40E-10	2.05E-09	1.63E-09	9.12E-10	5.86E-10	4.13E-10	2.79E-10	2.16E-10	1.73E-10	1.42E-10

TABLE 2.3-22

BV-1 AND 2 CONTAINMENT VENTS DISPERSION PARAMETERS ($\overline{D/Q}$)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

SECTOR	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	4.46E-08	7.73E-09	3.24E-09	1.81E-09	1.08E-09	7.57E-10	5.16E-10	4.00E-10	2.91E-10	2.38E-10
NNE	5.42E-08	9.39E-09	3.37E-09	1.89E-09	1.22E-09	8.54E-10	6.35E-10	4.92E-10	3.94E-10	3.22E-10
NE	7.32E-08	1.27E-08	6.21E-09	3.47E-09	2.24E-09	1.57E-09	1.00E-09	7.77E-10	5.69E-10	4.66E-10
ENE	7.77E-08	1.35E-08	6.51E-09	3.64E-09	2.50E-09	1.76E-09	1.31E-09	1.01E-09	6.58E-10	5.39E-10
E	6.08E-08	1.05E-08	3.79E-09	2.12E-09	1.37E-09	9.59E-10	6.54E-10	5.06E-10	4.05E-10	3.32E-10
ESE	3.23E-08	5.60E-09	2.54E-09	1.42E-09	8.46E-10	5.94E-10	4.05E-10	3.14E-10	2.28E-10	1.87E-10
SE	3.29E-08	5.70E-09	2.59E-09	1.45E-09	9.32E-10	6.55E-10	4.12E-10	3.19E-10	2.55E-10	2.09E-10
SSE	2.84E-08	4.92E-09	2.06E-09	1.15E-09	6.29E-10	4.42E-10	2.99E-10	2.32E-10	1.85E-10	1.52E-10
S	3.67E-08	6.37E-09	2.26E-09	1.26E-09	8.14E-10	5.71E-10	3.86E-10	2.99E-10	2.39E-10	1.96E-10
SSW	2.61E-08	4.52E-09	1.60E-09	8.97E-10	5.78E-10	4.06E-10	3.02E-10	2.34E-10	1.70E-10	1.39E-10
SW	3.06E-08	5.30E-09	2.62E-09	1.47E-09	8.01E-10	5.62E-10	4.18E-10	3.24E-10	2.35E-10	1.93E-10
WSW	4.60E-08	7.97E-09	3.34E-09	1.87E-09	1.20E-09	8.45E-10	5.87E-10	4.55E-10	3.38E-10	2.77E-10
W	6.49E-08	1.13E-08	4.72E-09	2.64E-09	1.19E-09	8.36E-10	6.22E-10	4.82E-10	3.85E-10	3.15E-10
WNW	9.25E-08	1.60E-08	6.43E-09	3.60E-09	2.21E-09	1.55E-09	1.16E-09	8.96E-10	5.79E-10	4.75E-10
NW	1.19E-07	2.07E-08	8.68E-09	4.86E-09	2.99E-09	2.10E-09	1.56E-09	1.21E-09	7.83E-10	6.41E-10
NNW	5.22E-08	9.04E-09	3.79E-09	2.12E-09	1.28E-09	9.00E-10	6.25E-10	4.84E-10	3.59E-10	2.94E-10

TABLE 2.3-23

BV-1 AND 2 SITE VENTILATION VENTS DISPERSION PARAMETERS ($\overline{D/Q}$)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

SECTOR	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	4.46E-08	7.73E-09	3.24E-09	1.81E-09	1.08E-09	7.57E-10	5.16E-10	4.00E-10	2.91E-10	2.38E-10
NNE	5.42E-08	9.39E-09	3.37E-09	1.89E-09	1.22E-09	8.54E-10	6.35E-10	4.92E-10	3.94E-10	3.22E-10
NE	7.32E-08	1.27E-08	6.21E-09	3.47E-09	2.24E-09	1.57E-09	1.00E-09	7.77E-10	5.69E-10	4.66E-10
ENE	7.77E-08	1.35E-08	6.51E-09	3.64E-09	2.50E-09	1.76E-09	1.31E-09	1.01E-09	6.58E-10	5.39E-10
E	6.08E-08	1.05E-08	3.79E-09	2.12E-09	1.37E-09	9.59E-10	6.54E-10	5.06E-10	4.05E-10	3.32E-10
ESE	3.23E-08	5.60E-09	2.54E-09	1.42E-09	8.46E-10	5.94E-10	4.05E-10	3.14E-10	2.28E-10	1.87E-10
SE	3.29E-08	5.70E-09	2.59E-09	1.45E-09	9.32E-10	6.55E-10	4.12E-10	3.19E-10	2.55E-10	2.09E-10
SSE	2.84E-08	4.92E-09	2.06E-09	1.15E-09	6.29E-10	4.42E-10	2.99E-10	2.32E-10	1.85E-10	1.52E-10
S	3.67E-08	6.37E-09	2.26E-09	1.26E-09	8.14E-10	5.71E-10	3.86E-10	2.99E-10	2.39E-10	1.96E-10
SSW	2.61E-08	4.52E-09	1.60E-09	8.97E-10	5.78E-10	4.06E-10	3.02E-10	2.34E-10	1.70E-10	1.39E-10
SW	3.06E-08	5.30E-09	2.62E-09	1.47E-09	8.01E-10	5.62E-00	4.18E-10	3.24E-10	2.35E-10	1.93E-10
WSW	4.60E-08	7.97E-09	3.34E-09	1.87E-09	1.20E-09	8.45E-10	5.87E-10	4.55E-10	3.38E-10	2.77E-10
W	6.49E-08	1.13E-08	4.72E-09	2.64E-09	1.19E-09	8.36E-10	6.22E-10	4.82E-10	3.85E-10	3.15E-10
WNW	9.25E-08	1.60E-08	6.43E-09	3.60E-09	2.21E-09	1.55E-09	1.16E-09	8.96E-10	5.79E-10	4.75E-10
NW	1.19E-07	2.07E-08	8.68E-09	4.86E-09	2.99E-09	2.19E-09	1.56E-09	1.21E-09	7.83E-10	6.41E-10
NNW	5.22E-08	9.04E-09	3.79E-09	2.12E-09	1.28E-09	9.00E-10	6.25E-10	4.84E-10	3.59E-10	2.94E-10

TABLE 2.3-24

BV-1 AND 2 TURBINE BUILDING VENTS DISPERSION PARAMETERS ($\overline{D/Q}$)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

SECTOR	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	4.46E-08	7.73E-09	3.24E-09	1.81E-09	1.08E-09	7.57E-10	5.16E-10	4.00E-10	2.91E-10	2.38E-10
NNE	5.42E-08	9.39E-09	3.37E-09	1.89E-09	1.22E-09	8.54E-10	6.35E-10	4.92E-10	3.94E-10	3.22E-10
NE	7.32E-08	1.27E-08	6.21E-09	3.47E-09	2.24E-09	1.57E-09	1.00E-09	7.77E-10	5.69E-10	4.66E-10
ENE	7.77E-08	1.35E-08	6.51E-09	3.64E-09	2.50E-09	1.76E-09	1.31E-09	1.01E-09	6.58E-10	5.39E-10
E	6.08E-08	1.05E-08	3.79E-09	2.12E-09	1.37E-09	9.59E-10	6.54E-10	5.06E-10	4.05E-10	3.32E-10
ESE	3.23E-08	5.60E-09	2.54E-09	1.42E-09	8.46E-10	5.94E-10	4.05E-10	3.14E-10	2.28E-10	1.87E-10
SE	3.29E-08	5.70E-09	2.59E-09	1.45E-09	9.32E-10	6.55E-10	4.12E-10	3.19E-10	2.55E-10	2.09E-10
SSE	2.84E-08	4.92E-09	2.06E-09	1.15E-09	6.29E-10	4.42E-10	2.99E-10	2.32E-10	1.85E-10	1.52E-10
S	3.67E-08	6.37E-09	2.26E-09	1.26E-09	8.14E-10	5.71E-10	3.86E-10	2.99E-10	2.39E-10	1.96E-10
SSW	2.61E-08	4.52E-09	1.60E-09	8.97E-10	5.78E-10	4.06E-10	3.02E-10	2.34E-10	1.70E-10	1.39E-10
SW	3.06E-08	5.30E-09	2.62E-09	1.47E-09	8.01E-10	5.62E-00	4.18E-10	3.24E-10	2.35E-10	1.98E-10
WSW	4.60E-08	7.97E-09	3.34E-09	1.87E-09	1.20E-09	8.45E-10	5.87E-10	4.55E-10	3.38E-10	2.77E-10
W	6.49E-08	1.13E-08	4.72E-09	2.64E-09	1.19E-09	8.36E-10	6.22E-10	4.82E-10	3.85E-10	3.15E-10
WNW	9.25E-08	1.60E-08	6.43E-09	3.60E-09	2.21E-09	1.55E-09	1.16E-09	8.96E-10	5.79E-10	4.75E-10
NW	1.19E-07	2.07E-08	8.68E-09	4.86E-09	2.99E-09	2.19E-09	1.56E-09	1.21E-09	7.83E-10	6.41E-10
NNW	5.22E-08	9.04E-09	3.79E-09	2.12E-09	1.28E-09	9.00E-10	6.25E-10	4.84E-10	3.59E-10	2.94E-10

TABLE 2.3-25
FOR INFORMATION ONLY

BV-2 CONDENSATE POLISHING BUILDING VENT DISPERSION PARAMETERS ($\overline{D/Q}$)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
SECTOR	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	4.46E-08	7.73E-09	3.24E-09	1.81E-09	1.08E-09	7.57E-10	5.16E-10	4.00E-10	2.91E-10	2.38E-10
NNE	5.42E-08	9.39E-09	3.37E-09	1.89E-09	1.22E-09	8.54E-10	6.35E-10	4.92E-10	3.94E-10	3.22E-10
NE	7.32E-08	1.27E-08	6.21E-09	3.47E-09	2.24E-09	1.57E-09	1.00E-09	7.77E-10	5.69E-10	4.60E-10
ENE	7.77E-08	1.35E-08	6.51E-09	3.64E-09	2.50E-09	1.76E-09	1.31E-09	1.01E-09	6.58E-10	5.39E-10
E	6.08E-08	1.05E-08	3.79E-09	2.12E-09	1.37E-09	9.59E-10	6.54E-10	5.06E-10	4.05E-10	3.32E-10
ESE	3.23E-08	5.60E-09	2.54E-09	1.42E-09	8.46E-10	5.94E-10	4.05E-10	3.14E-10	2.28E-10	1.87E-10
SE	3.29E-08	5.70E-09	2.59E-09	1.45E-09	9.32E-10	6.55E-10	4.12E-10	3.19E-10	2.55E-10	2.09E-10
SSE	2.84E-08	4.92E-09	2.06E-09	1.15E-09	6.29E-10	4.42E-10	2.99E-10	2.32E-10	1.85E-10	1.52E-10
S	3.67E-08	6.37E-09	2.26E-09	1.26E-09	8.14E-10	5.71E-10	3.86E-10	2.99E-10	2.39E-10	1.96E-10
SSW	2.61E-08	4.52E-09	1.60E-09	8.97E-10	5.78E-10	4.06E-10	3.02E-10	2.34E-10	1.70E-10	1.39E-10
SW	3.06E-08	5.30E-09	2.62E-09	1.47E-09	8.01E-10	5.62E-00	4.18E-10	3.24E-10	2.35E-10	1.93E-10
WSW	4.60E-08	7.97E-09	3.34E-09	1.87E-09	1.20E-09	8.45E-10	5.87E-10	4.55E-10	3.38E-10	2.77E-10
W	6.49E-08	1.13E-08	4.72E-09	2.64E-09	1.19E-09	8.36E-10	6.22E-10	4.82E-10	3.85E-10	3.15E-10
WNW	9.25E-08	1.60E-08	6.43E-09	3.60E-09	2.21E-09	1.55E-09	1.16E-09	8.96E-10	5.79E-10	4.75E-10
NW	1.19E-07	2.07E-08	8.68E-09	4.86E-09	2.99E-09	2.19E-09	1.56E-09	1.21E-09	7.83E-10	6.41E-10
NNW	5.22E-08	9.04E-09	3.79E-09	2.12E-09	1.28E-09	9.00E-10	6.25E-10	4.84E-10	3.59E-10	2.94E-10

TABLE 2.3-26
FOR INFORMATION ONLY

BV-2 DECONTAMINATION BUILDING VENT DISPERSION PARAMETERS ($\overline{D/Q}$)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
SECTOR	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	4.46E-08	7.73E-09	3.24E-09	1.81E-09	1.08E-09	7.57E-10	5.16E-10	4.00E-10	2.91E-10	2.38E-10
NNE	5.42E-08	9.39E-09	3.37E-09	1.89E-09	1.22E-09	8.54E-10	6.35E-10	4.92E-10	3.94E-10	3.22E-10
NE	7.32E-08	1.27E-08	6.21E-09	3.47E-09	2.24E-09	1.57E-09	1.00E-09	7.77E-10	5.69E-10	4.66E-10
ENE	7.77E-08	1.35E-08	6.51E-09	3.64E-09	2.50E-09	1.76E-09	1.31E-09	1.01E-09	6.58E-10	5.39E-10
E	6.08E-08	1.05E-08	3.79E-09	2.12E-09	1.37E-09	9.59E-10	6.54E-10	5.06E-10	4.05E-10	3.32E-10
ESE	3.23E-08	5.60E-09	2.54E-09	1.42E-09	8.46E-10	5.94E-10	4.05E-10	3.14E-10	2.28E-10	1.87E-10
SE	3.29E-08	5.70E-09	2.59E-09	1.45E-09	9.32E-10	6.55E-10	4.12E-10	3.19E-10	2.55E-10	2.09E-10
SSE	2.84E-08	4.92E-09	2.06E-09	1.15E-09	6.29E-10	4.42E-10	2.99E-10	2.32E-10	1.85E-10	1.52E-10
S	3.67E-08	6.37E-09	2.26E-09	1.26E-09	8.14E-10	5.71E-10	3.86E-10	2.99E-10	2.39E-10	1.96E-10
SSW	2.61E-08	4.52E-09	1.60E-09	8.97E-10	5.78E-10	4.06E-10	3.02E-10	2.34E-10	1.70E-10	1.39E-10
SW	3.06E-08	5.30E-09	2.62E-09	1.47E-09	8.01E-10	5.62E-00	4.18E-10	3.24E-10	2.35E-10	1.93E-10
WSW	4.60E-08	7.97E-09	3.34E-09	1.87E-09	1.20E-09	8.45E-10	5.87E-10	4.55E-10	3.38E-10	2.77E-10
W	6.49E-08	1.13E-08	4.72E-09	2.64E-09	1.19E-09	8.36E-10	6.22E-10	4.82E-10	3.85E-10	3.15E-10
WNW	9.25E-08	1.60E-08	6.43E-09	3.60E-09	2.21E-09	1.55E-09	1.16E-09	8.96E-10	5.79E-10	4.75E-10
NW	1.19E-07	2.07E-08	8.68E-09	4.86E-09	2.99E-09	2.19E-09	1.56E-09	1.21E-09	7.83E-10	6.41E-10
NNW	5.22E-08	9.04E-09	3.79E-09	2.12E-09	1.28E-09	9.00E-10	6.25E-10	4.84E-10	3.59E-10	2.94E-10

TABLE 2.3-27
FOR INFORMATION ONLY

BV-2 WASTE GAS STORAGE VAULT VENT DISPERSION PARAMETERS ($\overline{D/Q}$)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
(meters^{-2})

SECTOR	DISTANCES TO THE CONTROL LOCATIONS, IN MILES									
	0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	4.46E-08	7.73E-09	3.24E-09	1.81E-09	1.08E-09	7.57E-10	5.16E-10	4.00E-10	2.91E-10	2.38E-10
NNE	5.42E-08	9.39E-09	3.37E-09	1.89E-09	1.22E-09	8.54E-10	6.35E-10	4.92E-10	3.94E-10	3.22E-10
NE	7.32E-08	1.27E-08	6.21E-09	3.47E-09	2.24E-09	1.57E-09	1.00E-09	7.77E-10	5.69E-10	4.66E-10
ENE	7.77E-08	1.35E-08	6.51E-09	3.64E-09	2.50E-09	1.76E-09	1.31E-09	1.01E-09	6.58E-10	5.39E-10
E	6.08E-08	1.05E-08	3.79E-09	2.12E-09	1.37E-09	9.59E-10	6.54E-10	5.06E-10	4.05E-10	3.32E-10
ESE	3.23E-08	5.60E-09	2.54E-09	1.42E-09	8.46E-10	5.94E-10	4.05E-10	3.14E-10	2.28E-10	1.87E-10
SE	3.29E-08	5.70E-09	2.59E-09	1.45E-09	9.32E-10	6.55E-10	4.12E-10	3.19E-10	2.55E-10	2.09E-10
SSE	2.84E-08	4.92E-09	2.06E-09	1.15E-09	6.29E-10	4.42E-10	2.99E-10	2.32E-10	1.85E-10	1.52E-10
S	3.67E-08	6.37E-09	2.26E-09	1.26E-09	8.14E-10	5.71E-10	3.86E-10	2.99E-10	2.39E-10	1.96E-10
SSW	2.61E-08	4.52E-09	1.60E-09	8.97E-10	5.78E-10	4.06E-10	3.02E-10	2.34E-10	1.70E-10	1.39E-10
SW	3.06E-08	5.30E-09	2.62E-09	1.47E-09	8.01E-10	5.62E-00	4.18E-10	3.24E-10	2.35E-10	1.93E-10
WSW	4.60E-08	7.97E-09	3.34E-09	1.87E-09	1.20E-09	8.45E-10	5.87E-10	4.55E-10	3.38E-10	2.77E-10
W	6.49E-08	1.13E-08	4.72E-09	2.64E-09	1.19E-09	8.36E-10	6.22E-10	4.82E-10	3.85E-10	3.15E-10
WNW	9.25E-08	1.60E-08	6.43E-09	3.60E-09	2.21E-09	1.55E-09	1.16E-09	8.96E-10	5.79E-10	4.75E-10
NW	1.19E-07	2.07E-08	8.68E-09	4.86E-09	2.99E-09	2.19E-09	1.56E-09	1.21E-09	7.83E-10	6.41E-10
NNW	5.22E-08	9.04E-09	3.79E-09	2.12E-09	1.28E-09	9.00E-10	6.25E-10	4.84E-10	3.59E-10	2.94E-10

TABLE 2.3-28

BV-1 AND 2 PROCESS VENT DISPERSION PARAMETERS (D/Q)
FOR CONTINUOUS ELEVATED LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)

(1E-9 $meters^{-2}$)

DOWNWIND SECTOR	SITE BOUNDARY	INDIVIDUAL RECEPTORS VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	.600	2.340	--	.572	.707	2.510
NNE	.673	3.220	--	.524	2.920	3.220
NE	.766	1.280	.660	.111	.660	1.200
ENE	1.010	5.080	--	.702	--	1.760
E	1.370	4.420	.401	1.290	1.290	4.420
ESE	.984	6.390	--	2.340	6.390	6.180
SE	11.000	3.680	.466	.466	1.300	3.680
SSE	7.060	3.220	.423	.105	3.140	4.320
S	5.780	1.540	1.410	--	2.610	2.730
SSW	2.040	1.040	.578	.208	1.040	1.460
SW	1.610	1.120	--	.693	.979	1.120
WSW	1.710	1.310	.370	--	1.190	1.310
W	.377	.659	.138	--	.518	.659
WNW	.424	.746	.497	.029	.746	.746
NW	.447	.425	--	.070	.488	.422
NNW	.340	1.840	--	.043	.545	1.92

TABLE 2.3-29

BV-1 AND 2 CONTAINMENT VENTS DISPERSION PARAMETERS (D/Q)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)

(1E-9 meters^{-2})

INDIVIDUAL RECEPTORS

DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	25.40	2.05	--	.693	.847	2.19
NNE	18.80	2.02	--	.459	1.850	2.11
NE	63.40	29.30	.455	.078	.455	30.40
ENE	65.90	8.92	--	.661	--	32.20
E	38.00	3.90	.382	1.020	1.020	22.70
ESE	17.10	3.56	--	1.380	3.560	3.56
SE	13.80	3.03	.350	.350	1.100	3.03
SSE	10.50	2.65	.317	.094	2.570	3.68
S	10.60	1.05	.934	--	1.860	1.95
SSW	5.59	1.26	.663	.266	1.260	4.42
SW	3.94	2.21	--	1.320	1.920	2.21
WSW	27.50	2.65	.596	--	2.380	2.65
W	31.60	1.23	.645	--	.960	1.23
WNW	39.10	2.23	1.490	.045	2.230	2.23
NW	70.60	15.00	--	.276	1.990	15.60
NNW	31.50	6.52	--	.068	1.090	9.91

TABLE 2.3-30

BV-1 AND 2 VENTILATION VENTS DISPERSION PARAMETERS (D/Q)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)

(1E-9 meters^{-2})

		INDIVIDUAL RECEPTORS				
DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	25.40	2.05	--	.693	.847	2.19
NNE	18.80	2.02	--	.459	1.850	2.11
NE	63.40	29.30	.455	.078	.455	30.40
ENE	65.90	8.92	--	.661	--	32.20
E	38.00	3.90	.382	1.020	1.020	22.70
ESE	17.10	3.56	--	1.380	3.560	3.56
SE	13.80	3.03	.350	.350	1.100	3.03
SSE	10.50	2.65	.317	.094	2.570	3.68
S	10.60	1.05	.934	--	1.860	1.95
SSW	5.59	1.26	.663	.266	1.260	4.42
SW	3.94	2.21	--	1.320	1.920	2.21
WSW	27.50	2.65	.596	--	2.380	2.65
W	31.60	1.23	.645	--	.960	1.23
WNW	39.10	2.23	1.490	.045	2.230	2.23
NW	70.60	15.00	--	.276	1.990	15.60
NNW	31.50	6.52	--	.068	1.090	9.91

TABLE 2.3-31

BV-1 AND 2 TURBINE BUILDING VENTS DISPERSION PARAMETERS (D/Q)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)

(1E-9 $meters^{-2}$)

			INDIVIDUAL RECEPTORS			
DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	20.20	2.05	--	.693	.847	2.190
NNE	34.90	2.02	--	.459	1.850	2.110
NE	54.20	29.30	.455	.078	.455	30.400
ENE	57.50	8.92	--	.661	--	32.200
E	38.10	3.90	.382	1.020	1.020	22.700
ESE	18.60	3.56	--	1.380	3.560	3.560
SE	19.00	3.03	.351	.351	1.100	3.030
SSE	13.30	2.65	.318	.094	2.570	3.690
S	11.30	10.40	.934	--	1.860	1.950
SSW	6.44	1.26	.664	.266	1.260	4.430
SW	3.95	2.21	--	1.320	1.920	2.210
WSW	25.10	2.65	.597	--	2.380	2.650
W	28.40	1.23	.646	--	.961	1.230
WNW	30.90	2.23	1.490	.045	2.230	2.230
NW	56.10	14.90	--	.276	1.980	15.500
NNW	25.10	6.53	--	.068	1.100	9.920

TABLE 2.3-32
FOR INFORMATION ONLY

BV-2 CONDENSATE POLISHING BUILDING VENT DISPERSION PARAMETERS (D/Q)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)

(1E-9 meters^{-2})

		INDIVIDUAL RECEPTORS				
DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	20.20	2.05	--	.693	.847	2.190
NNE	34.90	2.02	--	.459	1.850	2.110
NE	54.20	29.30	.455	.078	.455	30.400
ENE	57.50	8.92	--	.661	--	32.200
E	38.10	3.90	.382	1.020	1.020	22.700
ESE	18.60	3.56	--	1.380	3.560	3.560
SE	19.00	3.03	.351	.351	1.100	3.030
SSE	13.30	2.65	.318	.094	2.570	3.690
S	11.30	10.40	.934	--	1.860	1.950
SSW	6.44	1.26	.664	.266	1.260	4.430
SW	3.95	2.21	--	1.320	1.920	2.210
WSW	25.10	2.65	.597	--	2.380	2.650
W	28.40	1.23	.646	--	.961	1.230
WNW	30.90	2.23	1.490	.045	2.230	2.230
NW	56.10	14.90	--	.276	1.980	15.500
NNW	25.10	6.53	--	.068	1.100	9.920

TABLE 2.3-33
FOR INFORMATION ONLY

BV-2 DECONTAMINATION BUILDING VENT DISPERSION PARAMETERS (D/Q)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)
(1E-9 meters^{-2})

		INDIVIDUAL RECEPTORS				
DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	25.40	2.05	--	.693	.847	2.190
NNE	18.80	2.02	--	.459	1.850	2.110
NE	63.40	29.30	.455	.078	.455	30.400
ENE	65.90	8.92	--	.661	--	32.200
E	38.00	3.90	.382	1.020	1.020	22.700
ESE	17.10	3.56	--	1.380	3.560	3.560
SE	13.80	3.03	.350	.350	1.100	3.030
SSE	10.50	2.65	.317	.094	2.570	3.680
S	10.60	1.05	.934	--	1.860	1.950
SSW	5.59	1.26	.663	.266	1.260	4.420
SW	3.94	2.21	--	1.320	1.920	2.210
WSW	27.50	2.65	.596	--	2.380	2.650
W	31.60	1.23	.645	--	.960	1.230
WNW	39.10	2.23	1.490	.045	2.230	2.230
NW	70.60	15.00	--	.276	1.990	15.600
NNW	31.50	6.52	--	.068	1.090	9.910

TABLE 2.3-34
FOR INFORMATION ONLY

BV-2 WASTE GAS STORAGE VAULT VENT DISPERSION PARAMETERS (D/Q)
FOR CONTINUOUS GROUND LEVEL RELEASES >500 HRS/YR OR >150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)

($1E-9$ meters^{-2})

		INDIVIDUAL RECEPTORS				
DOWNWIND SECTOR	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	25.40	2.05	--	.693	.847	2.190
NNE	18.80	2.02	--	.459	1.850	2.110
NE	63.40	29.30	.455	.078	.455	30.400
ENE	65.90	8.92	--	.661	--	32.200
E	38.00	3.90	.382	1.020	1.020	22.700
ESE	17.10	3.56	--	1.380	3.560	3.560
SE	13.80	3.03	.350	.350	1.100	3.030
SSE	10.50	2.65	.317	.094	2.570	3.680
S	10.60	1.05	.934	--	1.860	1.950
SSW	5.59	1.26	.663	.266	1.260	4.420
SW	3.94	2.21	--	1.320	1.920	2.210
WSW	27.50	2.65	.596	--	2.380	2.650
W	31.60	1.23	.645	--	.960	1.230
WNW	39.10	2.23	1.490	.045	2.230	2.230
NW	70.60	15.00	--	.276	1.990	15.600
NNW	31.50	6.52	--	.068	1.090	9.910

TABLE 2.3-35

BV-1 AND 2 CONTAINMENT VENTS DISPERSION PARAMETERS (X/Q)
FOR BATCH GROUND LEVEL RELEASES ≤500 HRS/YR OR ≤150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)
(sec/m^3)

	INDIVIDUAL RECEPTORS					
DOWNWIND SECTOR*	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	8.21E-5	8.38E-6	--	3.72E-6	4.34E-6	8.82E-6
NNE	3.04E-5	4.71E-6	--	1.40E-6	4.38E-6	4.87E-6
NE	4.59E-5	2.21E-5	6.05E-7	1.38E-7	6.05E-7	2.28E-5
ENE	3.72E-5	5.25E-6	--	5.66E-7	--	1.88E-5
E	2.93E-5	3.79E-6	5.15E-7	1.17E-6	1.17E-6	1.78E-5
ESE	2.47E-5	5.61E-6	--	2.34E-6	5.61E-6	5.61E-6
SE	2.14E-5	5.00E-6	8.13E-7	8.13E-7	2.03E-6	5.00E-6
SSE	2.21E-5	6.31E-6	1.11E-6	3.92E-7	6.13E-6	8.49E-6
S	2.15E-5	3.03E-6	2.76E-6	--	4.93E-6	5.14E-6
SSW	2.18E-5	6.58E-6	3.81E-6	1.82E-6	6.58E-6	1.78E-5
SW	1.82E-5	1.03E-5	--	6.67E-6	9.12E-6	1.03E-5
WSW	1.09E-4	1.29E-5	4.10E-6	--	1.19E-5	1.29E-5
W	1.49E-4	1.05E-5	6.55E-6	--	8.77E-6	1.05E-5
WNW	1.91E-4	1.72E-5	1.28E-5	1.23E-6	1.72E-5	1.72E-5
NW	3.08E-4	6.13E-5	--	3.80E-6	1.36E-5	6.36E-5
NNW	1.80E-4	3.54E-5	--	1.35E-6	9.27E-6	5.29E-5

*Measured relevant to center point between BV-1 and BV-2 Containment Buildings

Period of Record: 1976 - 1980

TABLE 2.3-36

BV-1 AND 2 VENTILATION VENTS DISPERSION PARAMETERS (X/Q)
FOR BATCH GROUND LEVEL RELEASES ≤500 HRS/YR OR ≤150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)
(sec/m^3)

	INDIVIDUAL RECEPTORS					
DOWNWIND SECTOR*	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	9.75E-5	1.00E-5	--	4.21E-6	4.95E-6	1.06E-5
NNE	3.78E-5	5.11E-6	--	1.43E-6	4.72E-6	5.30E-6
NE	6.13E-5	2.70E-5	6.20E-7	1.40E-7	6.20E-7	2.81E-5
ENE	4.83E-5	5.58E-6	--	5.71E-7	--	2.24E-5
E	3.66E-5	3.99E-6	5.25E-7	1.19E-6	1.19E-6	2.10E-5
ESE	2.99E-5	6.13E-6	--	2.43E-6	6.13E-6	6.13E-6
SE	2.55E-5	5.29E-6	8.24E-7	8.24E-7	2.13E-6	5.29E-6
SSE	2.65E-5	6.72E-6	1.12E-6	3.95E-7	6.53E-6	9.22E-6
S	2.52E-5	3.14E-6	2.83E-6	--	5.29E-6	5.53E-6
SSW	2.60E-5	7.34E-6	4.15E-6	1.92E-6	7.34E-6	2.09E-5
SW	2.13E-5	1.18E-5	--	7.41E-6	1.04E-5	1.18E-5
WSW	1.34E-4	1.51E-5	4.46E-6	--	1.38E-5	1.51E-5
W	1.77E-4	1.25E-5	7.40E-6	--	1.02E-5	1.25E-5
WNW	2.33E-4	2.07E-5	1.49E-5	1.30E-6	2.07E-5	2.07E-5
NW	3.32E-4	8.57E-5	--	4.24E-6	1.64E-5	8.85E-5
NNW	1.90E-4	4.69E-5	--	1.45E-6	1.09E-5	6.75E-5

*Measured relevant to center point between BV-1 and BV-2 Containment Buildings

Period of Record: 1976 - 1980

TABLE 2.3-37

BV-1 AND 2 PROCESS VENT DISPERSION PARAMETERS (X/Q)
FOR BATCH ELEVATED RELEASES $\leq$500 HRS/YR OR $\leq$150 HRS/QTR
FOR SPECIAL DISTANCES (IDENTIFIED IN TABLE 2.2-3)
(sec/m^3)

	INDIVIDUAL RECEPTORS					
DOWNWIND SECTOR*	SITE BOUNDARY	VEGETABLE GARDEN	MILK COW	MILK GOAT	MEAT ANIMAL	RESIDENCE
N	3.09E-9	3.30E-6	--	1.13E-6	1.34E-6	3.36E-6
NNE	2.85E-9	2.68E-6	--	6.52E-7	2.47E-6	2.68E-6
NE	2.02E-10	7.42E-9	5.44E-7	1.24E-7	5.44E-7	5.51E-9
ENE	1.02E-9	3.21E-6	--	6.29E-7	--	1.67E-9
E	2.15E-9	2.91E-6	4.96E-7	1.14E-6	1.14E-6	2.91E-6
ESE	6.90E-9	4.97E-6	--	1.95E-6	4.97E-6	4.81E-6
SE	2.91E-6	3.52E-6	6.02E-7	6.02E-7	1.43E-6	3.52E-6
SSE	4.91E-6	3.56E-6	6.53E-7	2.18E-7	3.47E-6	4.71E-6
S	2.41E-6	1.78E-6	1.65E-6	--	2.84E-6	2.96E-6
SSW	4.83E-6	2.52E-6	1.50E-6	6.60E-7	2.52E-6	3.96E-6
SW	4.82E-6	2.75E-6	--	1.78E-6	2.44E-6	2.75E-6
WSW	5.77E-7	2.81E-6	8.79E-7	--	2.57E-6	2.81E-6
W	2.88E-9	1.68E-6	4.89E-7	--	1.37E-6	1.68E-6
WNW	3.40E-9	1.61E-6	1.13E-6	1.10E-7	1.61E-6	1.61E-6
NW	1.34E-9	3.31E-8	--	2.03E-7	1.07E-6	3.10E-8
NNW	1.52E-9	3.73E-6	--	1.73E-7	1.31E-6	3.81E-6

*Measured relevant to BV-1 natural draft cooling tower

Period of Record: 1976 - 1980

TABLE 2.3-38

BV-1 AND 2 PROCESS VENT DISPERSION PARAMETERS (X/Q)
FOR BATCH ELEVATED RELEASES ≤500 HRS/YR OR ≤150 HRS/QTR*
(sec/m^3)

SECTOR	DISTANCES TO THE CONTROL LOCATIONS, IN MILES 0.0 - 0.5	0.5 - 1.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	2.5 - 3.0	3.0 - 3.5	3.5 - 4.0	4.0 - 4.5	4.5 - 5.0
N	2.75E-15	1.07E-5	4.10E-6	2.61E-6	1.51E-6	1.13E-6	8.84E-7	7.13E-7	5.93E-7	5.06E-7
NNE	5.90E-17	5.39E-6	2.83E-6	2.19E-6	1.36E-6	1.13E-6	8.05E-7	6.51E-7	5.64E-7	4.81E-7
NE	4.45E-16	1.67E-8	7.39E-8	2.28E-6	1.72E-6	1.19E-6	9.28E-7	6.76E-7	6.34E-7	5.32E-7
ENE	1.92E-15	8.87E-8	2.60E-6	2.21E-6	1.66E-6	1.13E-6	9.25E-7	7.23E-7	6.06E-7	3.82E-7
E	1.84E-15	5.10E-6	2.77E-6	2.23E-6	1.44E-6	1.12E-6	8.74E-7	6.92E-7	5.11E-7	4.82E-7
ESE	2.96E-13	5.26E-6	3.48E-6	2.04E-6	1.34E-6	9.93E-7	6.70E-7	5.76E-7	4.37E-7	3.83E-7
SE	9.16E-8	3.13E-6	3.38E-6	1.99E-6	1.31E-6	9.58E-7	7.14E-7	5.74E-7	4.32E-7	3.68E-7
SSE	3.50E-8	4.86E-6	3.33E-6	1.95E-6	1.29E-6	9.42E-7	6.55E-7	5.24E-7	3.95E-7	3.32E-7
S	1.22E-7	4.12E-6	3.97E-6	2.34E-6	1.59E-6	1.17E-6	7.75E-7	6.24E-7	4.74E-7	4.00E-7
SSW	1.75E-5	6.22E-6	2.84E-6	2.18E-6	1.48E-6	1.08E-6	7.83E-7	6.31E-7	5.62E-7	4.77E-7
SW	2.08E-5	9.11E-6	3.47E-6	2.19E-6	1.25E-6	1.11E-6	8.19E-7	7.17E-7	6.89E-7	5.85E-7
WSW	8.56E-8	9.35E-6	3.16E-6	2.29E-6	1.46E-6	1.01E-6	9.06E-7	7.52E-7	5.99E-7	5.07E-7
W	5.44E-17	4.52E-6	4.21E-6	2.49E-6	1.69E-6	1.25E-6	4.86E-7	7.68E-7	5.80E-7	5.48E-7
WNW	9.25E-18	1.44E-8	5.66E-8	1.92E-6	1.59E-6	1.17E-6	7.75E-7	4.61E-7	5.28E-7	4.89E-7
NW	2.61E-16	1.98E-8	8.37E-8	2.24E-6	1.46E-6	1.08E-6	8.09E-7	6.12E-7	5.42E-7	4.60E-7
NNW	1.91E-15	3.91E-6	3.66E-6	2.15E-6	1.40E-6	1.08E-6	8.03E-7	6.48E-7	5.37E-7	4.56E-7

*Transmittal via Stone and Webster Engineering Corp. letter 2DLS-29981 under J.O. 12241 on January 30, 1987.

2.4 Gaseous Radwaste System

The gaseous radwaste system has the capability to control, collect, process, store, recycle, and dispose of gaseous radioactive waste generated as a result of plant operations, including anticipated operational occurrences.

A simplified flow diagram of the gaseous radwaste system for BV-1 and BV-2 is provided as Figure 2.4-1. A diagram showing the gaseous effluent release points is provided as Figure 2.4-2. Since the concept of a shared gaseous radwaste system is used, then gaseous waste generated can be stored, processed, and discharged from either BV-1 or BV-2.

2.4.1 BV-1 Gaseous Radwaste System Components

2.4.1.1 BR-EV-2A & 2B: Degasifiers

There are two Degasifiers. They are designed to continuously process reactor coolant letdown for reducing entrained noble gases in the liquid.

2.4.1.2 GW-E-1A & 1B: Waste Gas Chillers

There are two Chillers. Non-condensable gases from the degasifiers are directed by system pressure to the Waste Gas Chillers.

2.4.1.3 GW-TK-3A, 3B, 3C, & 3D: Gaseous Waste Charcoal Delay Beds

There are four Charcoal Beds. The dry effluent from the Chillers is directed to the Waste Gas Charcoal Delay Beds for holdup of xenon and krypton and adsorption of radioiodines. When four beds are operated in series, they provide a holdup of xenon isotopes for about 30 days.

2.4.1.4 GW-FL-5A & 5B: Overhead Gas Compressor Prefilters

There are two Prefilters. The gaseous effluent (primarily hydrogen) is directed from the Gaseous Waste Charcoal Delay Beds to one of the Overhead Gas Compressor Prefilters. The filters remove carbon solids from the gas stream.

2.4.1.5 GW-C-1A & 1B: Gas Compressors

There are two Compressors. The waste gas enters one of the compressors after passing through the Prefilters.

2.4.1.6 GW-TK-2: Gaseous Waste Surge Tank

There is one Surge Tank. It has a capacity of 52 cuft. After compression to about 65 psig, the waste gas is sent to the Surge Tank. This can be done automatically or manually.

2.4.1.7 GW-TK-1A, 1B, & 1C: Waste Gas Decay Tanks

There are three Decay Tanks. Each has a capacity of 132 cuft. The contents of the Surge Tank is transferred to the Decay Tanks for storage and decay. After 30 days of storage, all xenon and iodine should have decayed, and the resulting predominant nuclide should be krypton 85.

2.4.1.8 RM-GW-108 And RM-GW-109: Gaseous Effluent Radiation Monitors

There are redundant Radiation Monitors on the combined BV-1 and 2 gaseous waste release path. These Radiation Monitors continuously analyze gaseous waste as it is being discharged. Gaseous Monitor RM-GW-108B is an off-line gamma scintillator, while RM-GW-109 Channel 5 is an off-line beta scintillator. The upper activity alarm on the gaseous Channels of these Radiation Monitors have setpoints that would indicate we are approaching the Total Body Dose Rate or Skin Dose Rate limits for radioactive gas leaving the site. If an upper activity alarm on RM-GW-108 is received, it automatically terminates the discharge by closing an isolation valve downstream of the Decay Tanks.

2.4.2 BV-2 Gaseous Radwaste System Components

2.4.2.1 2BRS-EV21A & 21B: Degasifiers

There are four Degasifiers (two at Unit 1 and two at Unit 2). They are designed to continuously process reactor coolant letdown for reducing entrained noble gases in the liquid.

2.4.2.2 2GWS-E21A & 21B: Waste Gas Chillers

There are four Chillers (two at Unit 1 and two at Unit 2). Non-condensable gases from the degasifiers are directed by system pressure to the Waste Gas Chillers.

2.4.2.3 2GWS-TK22A, 22B, 22C, & 22D: Waste Gas Charcoal Delay Beds

There are four Charcoal Beds (four at Unit 1 and four at Unit 2). The dry effluent from the Chillers is directed to the Waste Gas Charcoal Delay Beds for holdup of xenon and krypton and adsorption of radioiodines. When four beds are operated in series, they provide a holdup of xenon isotopes for about 30 days.

2.4.2.4 2GWS-FLT24A & 24B: Overhead Gas Compressor Prefilters

There are two Prefilters. The gaseous effluent (primarily hydrogen) is directed from the Waste Gas Charcoal Delay Beds to one of the Overhead Gas Compressor Prefilters. The filters remove carbon solids from the gas stream.

2.4.2.5 2GWS-C21A & 21B: Gas Compressors

There are two Compressors. The waste gas enters one of the compressors after passing through the Prefilters.

2.4.2.6 2GWS-TK21: Gaseous Waste Surge Tank

There is one Surge Tank. It has a capacity of 52 cuft. After compression to about 65 psig, the waste gas is sent to the Surge Tank. This can be done automatically or manually.

2.4.2.7 2GWS-TK25A, 25B, 25C, 25D, 25E, 25F, & 25G: Gaseous Waste Storage Tanks

There are seven Decay Tanks. Each has a capacity of 132 cuft. The contents of the Surge Tank is transferred to the Decay Tanks for storage and decay. After 30 days of storage, all xenon and iodine should have decayed, and the resulting predominant nuclide should be krypton 85.

2.4.2.8 RM-GW-108 And RM-GW-109: Gaseous Effluent Radiation Monitors

Previously described in Section 2.4.1.

FIGURE 2.4-1

BV-1 AND 2 GASEOUS RADWASTE SYSTEM

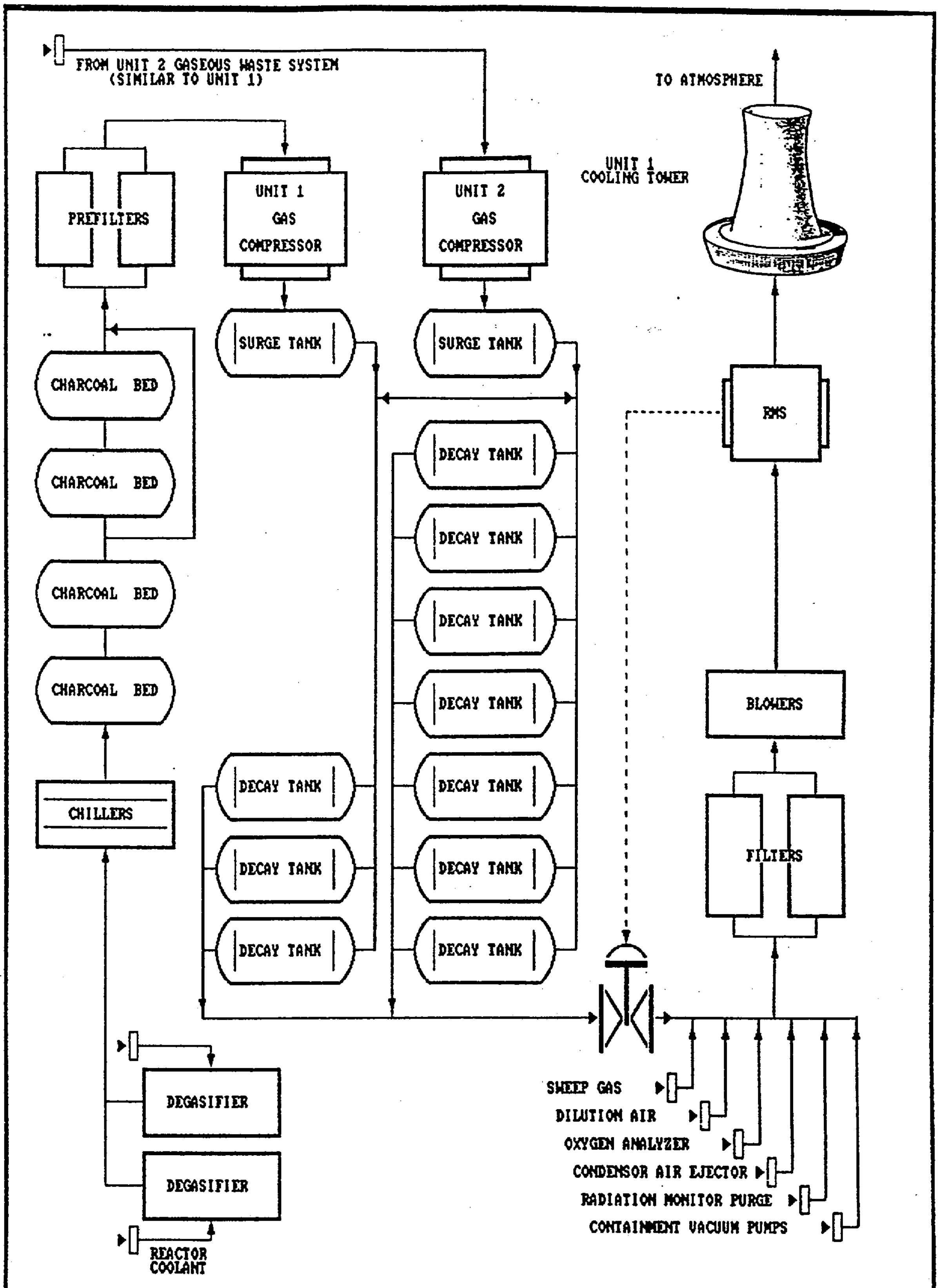
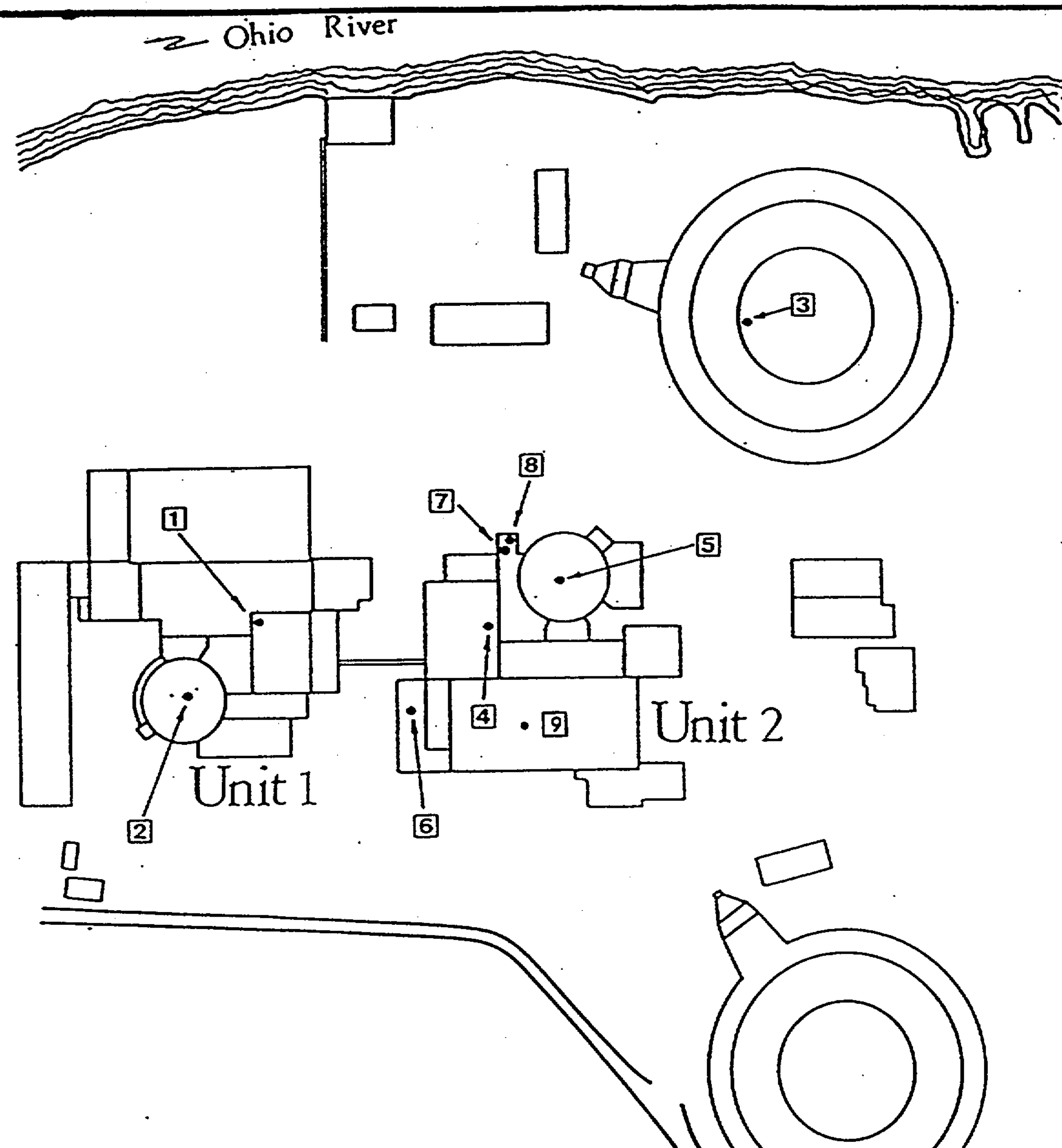


FIGURE 2.4-2

BV-1 AND 2 GASEOUS EFFLUENT RELEASE POINTS



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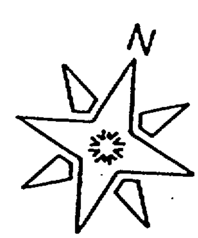
Release Point & Description			Elevation
1.	Unit 1:	Ventilation Vent	79 feet = 24 meters
2.	Unit 1:	Containment / SLCRS Vent	154 feet = 47 meters
3.	Unit 1&2:	Process Vent	475 feet = 145 meters
4.	Unit 2:	Ventilation Vent	85 feet = 26 meters
5.	Unit 2:	Containment / SLCRS Vent	154 feet = 47 meters
6.	Unit 2:	Condensate Polishing Building Vent	80 feet = 24 meters
7.	Unit 2:	Waste Gas Storage Vault Vent	80 feet = 24 meters
8.	Unit 2:	Decontamination Building Vent	80 feet = 24 meters
9.	Unit 2:	Turbine Building Vent	109 feet = 33 meters



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Note: The Release Point shown for the Unit 2 Turbine Building Vent is a representative exhaust point for the 10 roof exhaust outlets.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The following program requirements are excerpts from the Radiological Assessment Branch Technical Position, Revision 1, 1979.

Table 3.0-1 contains the DLC site number, sector, distance, sample point description, sampling and collection frequency, analysis, and analysis frequency for various exposure pathways in the vicinity of the Beaver Valley Power Station for the radiological environmental monitoring program. Figures 3.0-1 through 3.0-6 show the location of the various sampling points. 5/99

PROGRAM REQUIREMENTS

Environmental samples shall be collected and analyzed according to Table 3.0-1. Analytical techniques used shall be such that the detection capabilities in Appendix C, Table 4.12-1 are achieved.

The results of the radiological environmental monitoring are intended to supplement the results of the radiological effluent monitoring by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Thus, the specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of individuals resulting from the station operation. The initial radiological environmental monitoring program should be conducted for the first 3 years of commercial operation (or other period corresponding to a maximum burnup in the initial core cycle). Following this period, program changes may be proposed based on operational experience.

The specified detection capabilities are state-of-the-art for routine environmental measurements in industrial laboratories.

Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the annual report.

The laboratories of the licensee and licensee's contractors which perform analyses shall participate in the Environmental Protection Agency's (EPA's) Environmental Radioactivity Laboratory Intercomparisons Studies (Crosscheck) Program or equivalent program. This participation shall include all of the determinations (sample medium-radionuclide combination) that are offered by EPA and that also are included in the monitoring program. The results of analysis of these crosscheck samples shall be included in the annual report. The participants in the EPA crosscheck program may provide their EPA program code so that the NRC can review the EPA's participant data directly in lieu of submission in the annual report.

If the results of a determination in the EPA crosscheck program (or equivalent program) are outside the specified control limits, the laboratory shall investigate the cause of the problem and take steps to correct it. The results of this investigation and corrective action shall be included in the annual report.

The requirement for the participation in the EPA crosscheck program, or similar program, is based on the need for independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices as part of the quality assurance program for environmental monitoring in order to demonstrate the results are reasonably valid.

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A census shall be conducted annually during the growing season to determine the location of the nearest milk animal and nearest garden greater than 50 square meters (500 sq. ft.) producing broad leaf vegetation in each of the 16 meteorological sectors within a distance of 8 km (5 miles). For elevated releases as defined in Regulatory Guide 1.111, Rev. 1, the census shall also identify the locations of <u>all</u> milk animals, and gardens greater than 50 square meters producing broad leaf vegetation out to a distance of 5 km (3 miles) for each radial sector.

If it is learned from this census that the milk animals or gardens are present at a location which yields a calculated thyroid dose greater than those previously sampled, or if the census results in changes in the location used in ODCM dose calculations, a written report shall be submitted to the Director of Operating Reactors, NRR (with a copy to the Director of the NRC Regional Office) within 30 days identifying the new location (distance and direction). Milk animal or garden locations resulting in higher calculated doses shall be added to the surveillance program as soon as practicable.

The sampling location (excluding the control sample location) having the lowest calculated dose may then be dropped from the surveillance program at the end of the grazing or growing season during which the census was conducted. Any location from which milk can no longer be obtained may be dropped from the surveillance program after notifying the NRC in writing that they are no longer obtainable at that location. The results of the land-use census shall be reported in the annual report.

The census of milk animals and gardens producing broad leaf vegetation is based on the requirement in Appendix I of 10 CFR Part 50 to "Identify changes in the use of unrestricted areas (e.g., for agricultural purposes) to permit modifications in monitoring programs for evaluating doses to individuals from principal pathways of exposure." The consumption of milk from animals grazing on contaminated pasture and of leafy vegetation contaminated by airborne radioiodine is a major potential source of exposure. Samples from milk animals are considered a better indicator of radioiodine in the environment than vegetation. If the census reveals milk animals are not present or are unavailable for sampling, then vegetation must be sampled.

The 50 square meter garden, considering 20% used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and a vegetation yield of 2 kg/m^2, will produce the 26 kg/yr assumed in Regulatory Guide 1.109, Rev. 1, for child consumption of leafy vegetation. 5/97

The increase in the number of direct radiation stations is to better characterize the individual exposure (mrem) and population exposure (man-rem) in accordance with Criterion 64 - monitoring radioactivity releases, of 10 CFR Part 50, Appendix A. The NRC will place a similar amount of stations in the area between the two rings designated in Appendix C, Table 3.12-1.

TABLE 3.0-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	DLC SITE NO.	SECTOR[1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES
1. AIRBORNE Radioiodine and Particulates	13	11	1.4	Meyer's Farm	Continuous sampler operation w/ collection at least weekly.	Radioiodine Cartridge: I-131 analysis weekly. Particulate Sampler: Gross beta analysis following filter change[5]; Gamma isotopic analysis on composite (by location) quarterly.
	30	4	0.5	Shippingport (S.S.)		
	32	15	0.8	Midland (S.S.)		
	46.1	3	2.3	Industry, Midway Dr.		
	48	10	16.3	Weirton, W. Va. Weirton Water Tower, Collier Way[4]		
2. DIRECT RADIATION	10	3	1.0	Shippingport Boro	Continuous measurement with quarterly collection.	Gamma dose quarterly.
	13	11	1.4	Meyer's Farm		
	14	11	2.5	Hookstown		
	15	14	3.7	Georgetown Post Office		
	27	7	6.1	Brunton's Farm		
	28	1	8.6	Sherman's Farm		
	29B	3	8.0	Beaver Valley Geriatric Center		
	30	4	0.5	Shippingport (S.S.)		
	32	15	0.8	Midland (S.S.)		
	45	5	2.2	Rt. 18 & Anderson Street		
	45.1	6	1.9	Raccoon Twp., Kennedy's Corner		
	46	3	2.5	Industry, Midway Drive		
	46.1	3	2.3	Industry, Rt. 68 - Garage		
	47	14	4.9	East Liverpool, Oh. Water Treatment Plant		
	48	10	16.3	Weirton, W. Va. - Weirton Water Tower, Collier Way		
	51	5	8.0	Aliquippa (S.S.)		
	59	6	1.0	236 Green Hill Rd.		

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TABLE 3.0-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	DLC SITE NO.	SECTOR[1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES
DIRECT RADIATION (continued)	60	13	2.5	444 Hill Road	Continuous measurement with quarterly collection.	Gamma dose quarterly.
	70	1	3.4	N. of Wstrn. Beaver School-Engle Rd.		
	71	2	6.0	Brighton Twp., First Western Bank		
	72	3	3.3	Industry, Logan Park		
	73	4	2.5	618 Squirrel Run Road		
	74	4	7.0	CCBC, 137 Poplar Avenue		
	75	5	4.1	117 Holt Road		
	76	6	3.8	Raccoon Elementary School		
	77	6	5.6	3614 Green Garden Road		
	78	7	2.7	Raccoon Municipal Building		
	79	8	4.4	Rt. 151 & Pross Ln.		
	80	9	8.2	Raccoon Park Office, Rt. 18		
	81	9	3.6	Millcreek United Presb. Church		
	82	9	6.9	Hanover Municipal Building		
	83	10	4.2	735 Mill Creek Road		
	84	11	8.3	Hancock Parks & Recreation Complex		
	85	12	5.7	Rts. 8 and 30 Intersection		
	86	13	6.2	East Liverpool, Oh., 1090 Ohio Avenue		
	87	14	7.0	Calcutta, Oh.- Calcutta Smith's Ferry Rd & Valley Drive		
	88	15	2.8	Midland Heights, 110 Summit Road		
	89	15	4.8	Ohioville, 488 Smith's Ferry Road		
	90	16	5.2	Opposite Fairview School		
	91	2	3.9	Pine Grove & Doyle Roads		
	92	12	2.8	Georgetown Road (S.S.)		
	93	16	1.1	Midland - Sunrise Hills		
	94	8	2.2	McCleary Road & Pole Cat Hollow Road		
	95	10	2.3	832 McCleary Road		

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TABLE 3.0-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	DLC SITE NO.	SECTOR[1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES
5/99 3. WATERBORNE a) Surface (River)	49	3	5.0	Upstream side of Montgomery Dam[4]	Composite sample w/ sample collection at least monthly[6].	Gamma isotopic analysis monthly; tritium analysis on composite (by location) quarterly.
	2.1	14	1.5	Downstream, Midland - J&L		
b) Drinking Water	4	15	1.3	Midland Water Treatment Plant	Composite sample w/ sample collection at least bi-weekly[6].	I-131 analysis bi-weekly; gamma isotopic analysis on composite (by location) monthly; tritium analysis on composite (by location) quarterly.
	5	14	4.9	East Liverpool, Oh., Water Treatment Plant		
c) Ground Water				None required[7]		
d) Shoreline Sediment	2A	13	0.2	BVPS Outfall Discharge	Semi-annually.	Gamma isotopic analysis semi-annually.
4. INGESTION a) Milk	25	10	2.1	Searight's Farm	At least bi-weekly when animals are on pasture; at least monthly at other times.	Gamma isotopic and I-131 analysis on each sample.
	*[8]	--	--			
	*[8]	--	--			
	*[8]	--	--			
	96	10	10.4	Windsheimer's Farm[4]		
b) Fish	2A	13	0.2	BVPS Outfall Discharge	Semi-annually one sample of available species.	Gamma isotopic analysis. on edible portion.
	49	3	5.0	Upstream side of Montgomery Dam		

TABLE 3.0-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	DLC SITE NO.	SECTOR[1]	MILES[2]	SAMPLE POINT DESCRIPTION[3]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSES
4. INGESTION (continued)						
c) Food Products (Leafy Vegetables)	--	--	--	Three (3) locations within 5 miles of BVPS (Shippingport, Industry, and Georgetown)[9]	Annually at harvest time.	Gamma isotopic and I-131 analysis on edible portion.
	--	--	--			
	--	--	--			
	--	--	--	One (1) control location (Weirton, W. Va. area)[9]		

[1]Sector numbers 1-16 correspond to the 16 compass direction sectors N - NNW.

[2]Distance (in miles) is as measured from BVPS Unit 1 Containment Building.

[3]All Sample Points, unless otherwise noted, are in the Commonwealth of Pennsylvania. Maps showing the approximate locations of the Sample Points are provided as Figures 3.0-1 through 3.0-6.

[4]This is a Control Station and is presumed to be outside the influence of BVPS effluents.

[5]A gamma isotopic analysis is to be performed on each sample when the gross beta activity is found to be greater than 10 times the mean of the Control Station sample.

[6]Composite samples are obtained by collecting an aliquot at intervals not exceeding 2 hours. For the upstream surface water location site 49, a weekly grab sample, composited each month based on river flow at time of sampling is also acceptable. 11/98

[7]Collection of Ground Water samples is not required as the hydraulic gradient or recharge properties are directed toward the river because of the high terrain in the river valley at the BVPS; thus, station effluents do not affect local wells and ground water sources in the area.

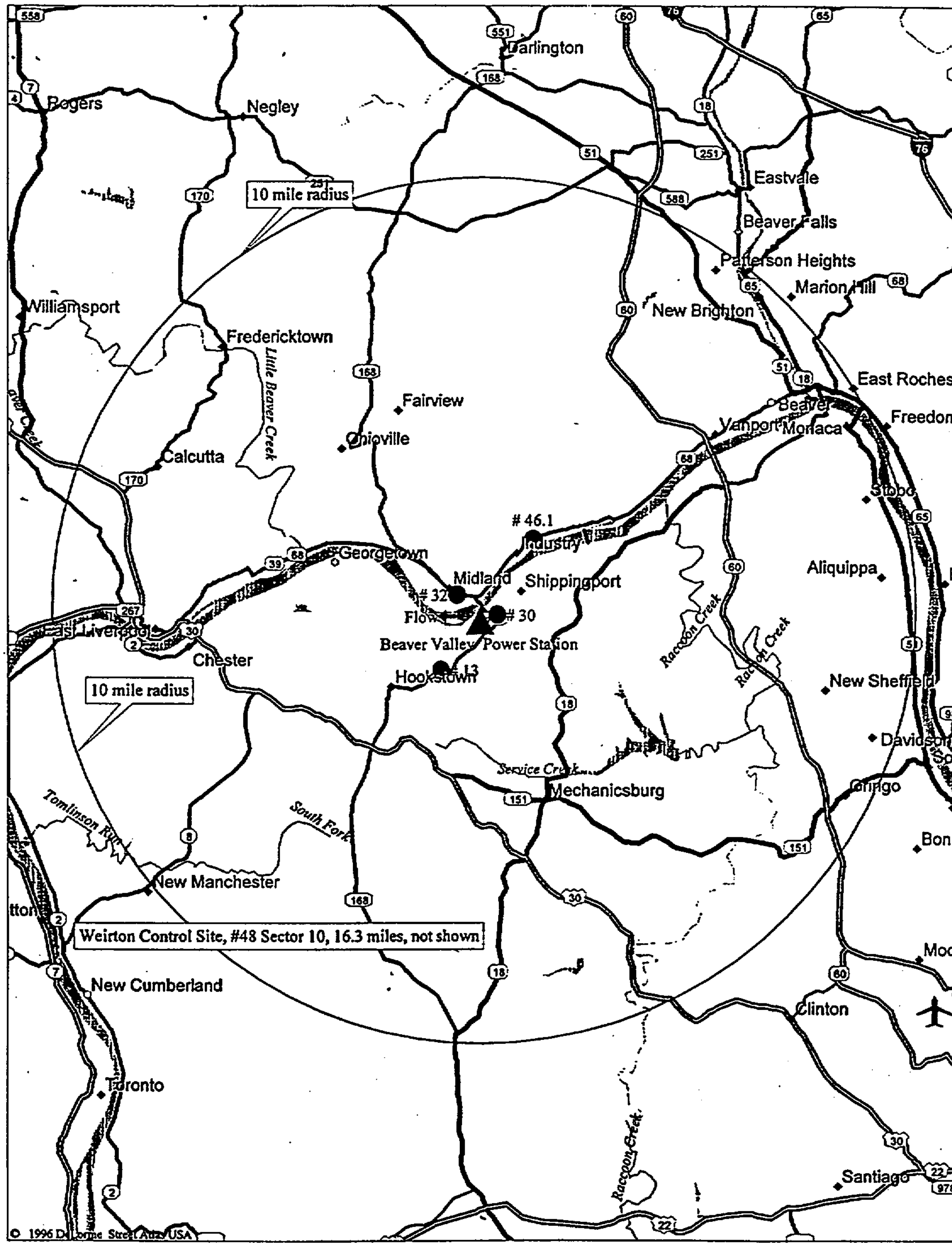
[8]These Sample Points will vary and are chosen based upon calculated annual deposition factors (highest).

[9]Exact location may vary due to availability of food products.

FIGURE 3.0-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

AIR SAMPLING LOCATIONS



Air Sampling Locations

Sector	Site #	Distance (miles)	Location
11	13	1.4	Meyer's Farm
4	30	0.5	Shippingport (S. S.)
15	32	0.8	Midland (S.S.)
3	46.1	2.3	Industry, Rt. 68 Garage
10	48	16.4	Weirton, W. Va.,-Weirton Water Tower, Collier Way

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FIGURE 3.0-2

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TLD LOCATIONS

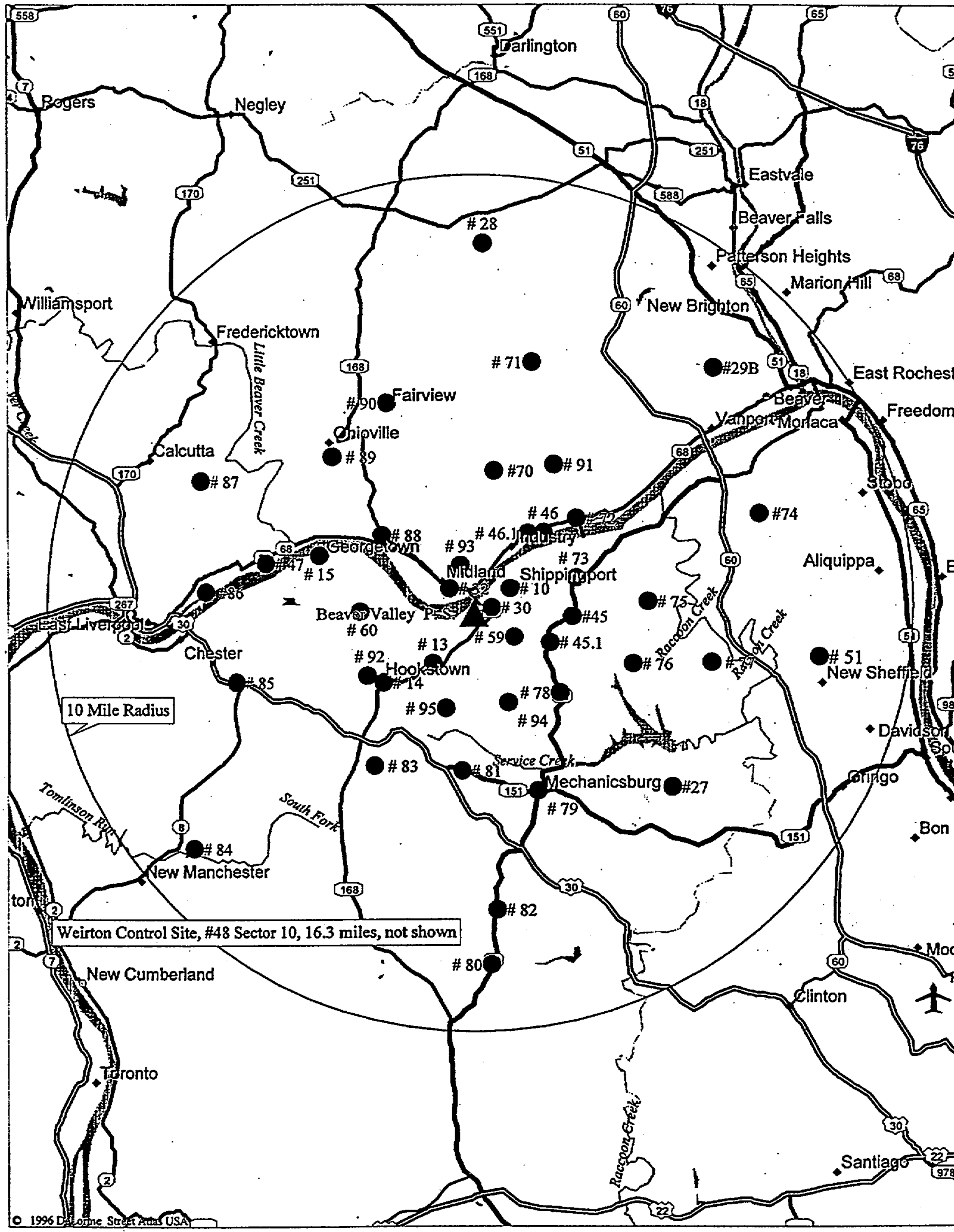

FIGURE 3.0-2 Continued

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TLD LOCATIONS

Southeast

Sector	Site #	Distance (miles)	Location	Sector	Site #	Distance (miles)	Location
7	27	6.1	Brunton's Farm	7	78	2.7	Raccoon Municipal Bldg.
6	45.1	1.9	Raccoon Twp., Kennedy Corners	8	79	4.4	Rt. 151 & Pross Ln.
5	51	8.0	Aliquippa (S.S.)	9	80	8.2	Raccoon Park Office–Rt. 18
6	59	1.0	236 Green Hill Road	9	82	6.9	Hanover Municipal Building
6	76	3.8	Raccoon Elementary School	8	94	2.2	McCleary Road & Pole Cat Hollow Road
6	77	5.6	3614 Green Garden Road				

Northwest

Sector	Site #	Distance (miles)	Location	Sector	Site #	Distance (miles)	Location
14	15	3.7	Georgetown Post Office	14	87	7.0	Calcutta, Oh. - Calcutta Smith's Ferry Rd & Valley Drive
15	32	0.8	Midland (S.S.)	15	88	2.8	Midland Heights – 110 Summit Road
14	47	4.9	E. Liverpool, Oh. (Water Company)	15	89	4.8	Ohioville – 488 Smith's Ferry Road
13	60	2.5	Haney's Farm	16	90	5.2	Opposite Fairview School
13	86	6.2	E. Liverpool, Oh., 1090 Ohio Avenue	16	93	1.1	Midland - Sunrise Hills

Northeast

Sector	Site #	Distance (miles)	Location	Sector	Site #	Distance (miles)	Location
4	10	1.0	Shippingport Boro	1	70	3.4	North of Western Beaver School – Engle Road
1	28	8.6	Sherman's Farm	2	71	6.0	Brighton Twp., First Western Bank
3	29B	8.0	Beaver Valley Geriatric Ctr.	3	72	3.3	Industry, Logan Park
4	30	0.5	Shippingport (S.S.)	4	73	2.5	618 Squirrel Run Road
5	45	2.2	Rt. 18 & Anderson Street	4	74	7.0	CCBC – 137 Poplar Avenue
3	46	2.5	Industry, Midway Drive	5	75	4.1	117 Holt Road
3	46.1	2.3	Industry, Rt. 68 - Garage	2	91	3.9	Pine Grove Rd. & Doyle Rd.

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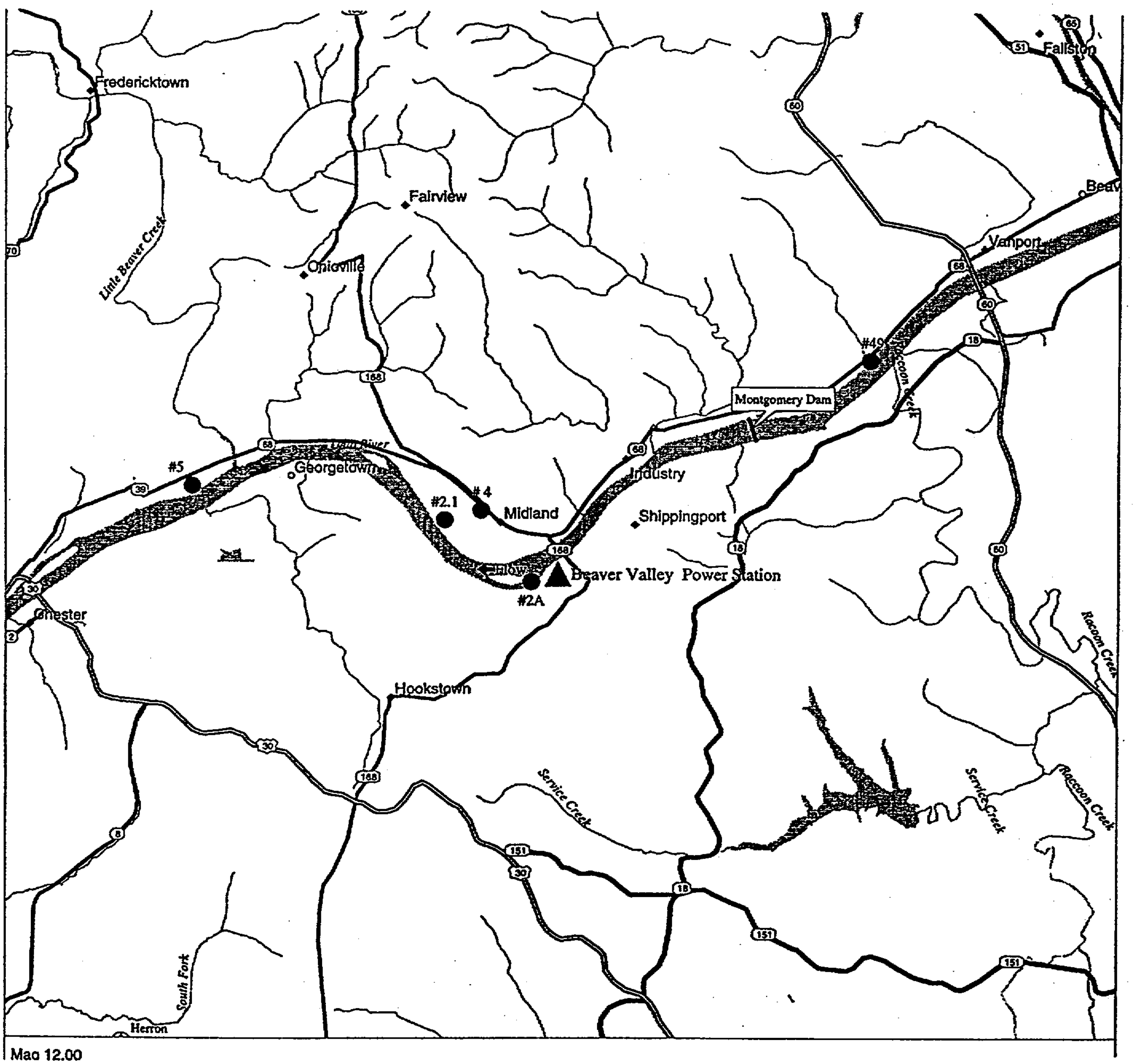
Southwest

Sector	Site #	Distance (miles)	Location	Sector	Site #	Distance (miles)	Location
11	13	1.4	Meyer's Farm	11	84	8.3	Hancock Co. Parks & Recreation Complex
11	14	2.5	Hookstown	12	85	5.7	Rts. 8 & 30 Intersection
10	48	16.3	Weirton, W. Va., - Weirton Water Tower, Collier Way	12	92	2.8	Georgetown Road
9	81	3.6	Millcreek United Presb. Church	10	95	2.3	832 McCleary Road
10	83	4.2	735 Mill Creek Road				

FIGURE 3.0-3

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SHORLINE, SEDIMENT, SURFACE WATER, AND DRINKING WATER SAMPLING LOCATIONS



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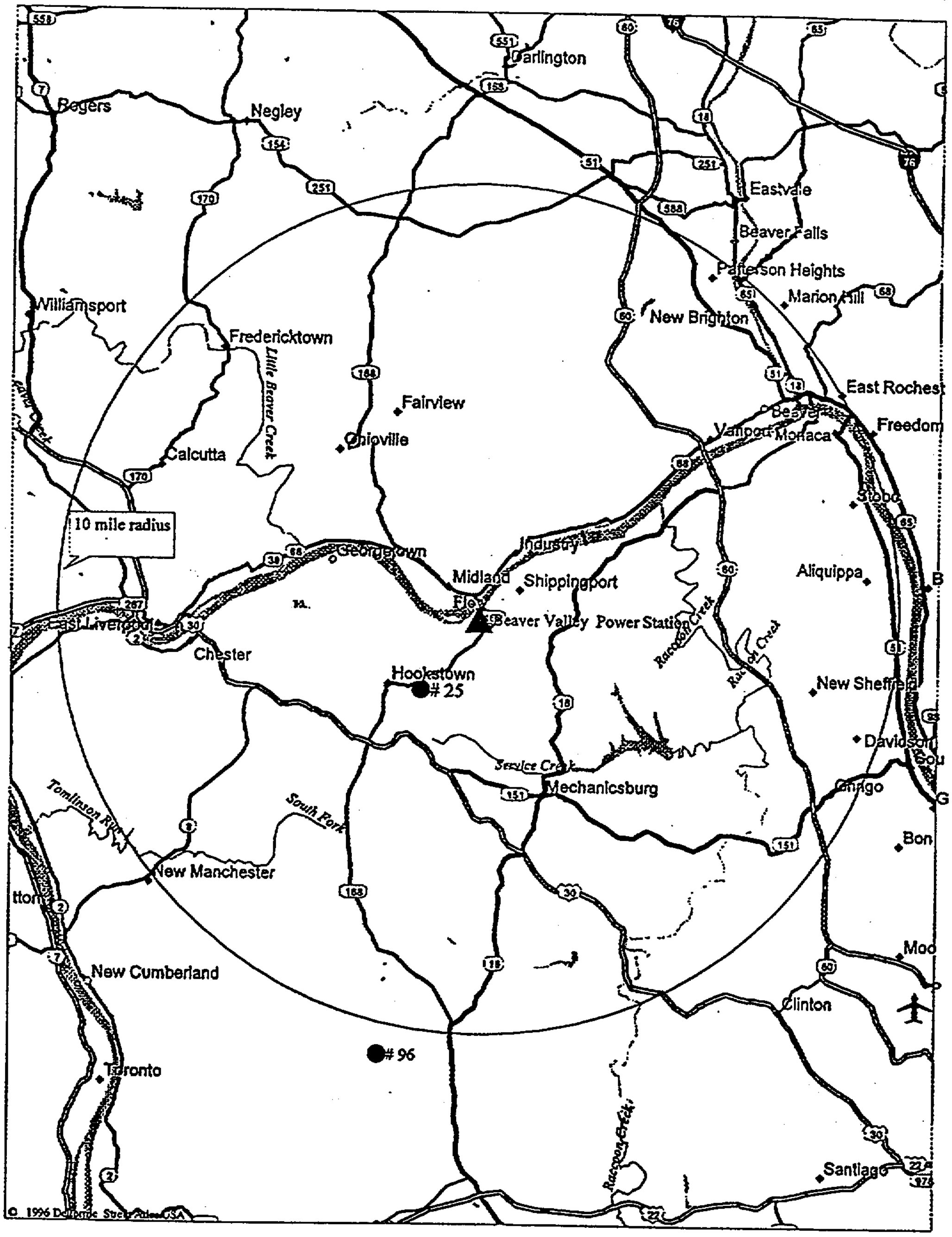
Water/Shoreline Sediment Sampling Locations

Sample Type	Sector	Site #	Distance (miles)	Location
Surface Water	14	2.1	1.5	Downstream, Midland - J&L
Surface Water	3	49	5.0	Upstream side of Montomery Dam
Sediment	13	2A	0.2	BVPS Outfall Discharge
Drinking Water	15	4	1.3	Midland Water Treatment Plant
Drinking Water	14	5	4.9	E. Liverpool, Oh. Water Treatment Plant

FIGURE 3.0-4

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

MILK SAMPLING LOCATIONS



Milk Sampling Locations

Sector	Site #	Distance (miles)	Location
10	25*	2.1	Searight's Farm
10	96	10.4	Windsheimer Farm
	*		
	*		
	*		

*Three dairies based on highest deposition factors.

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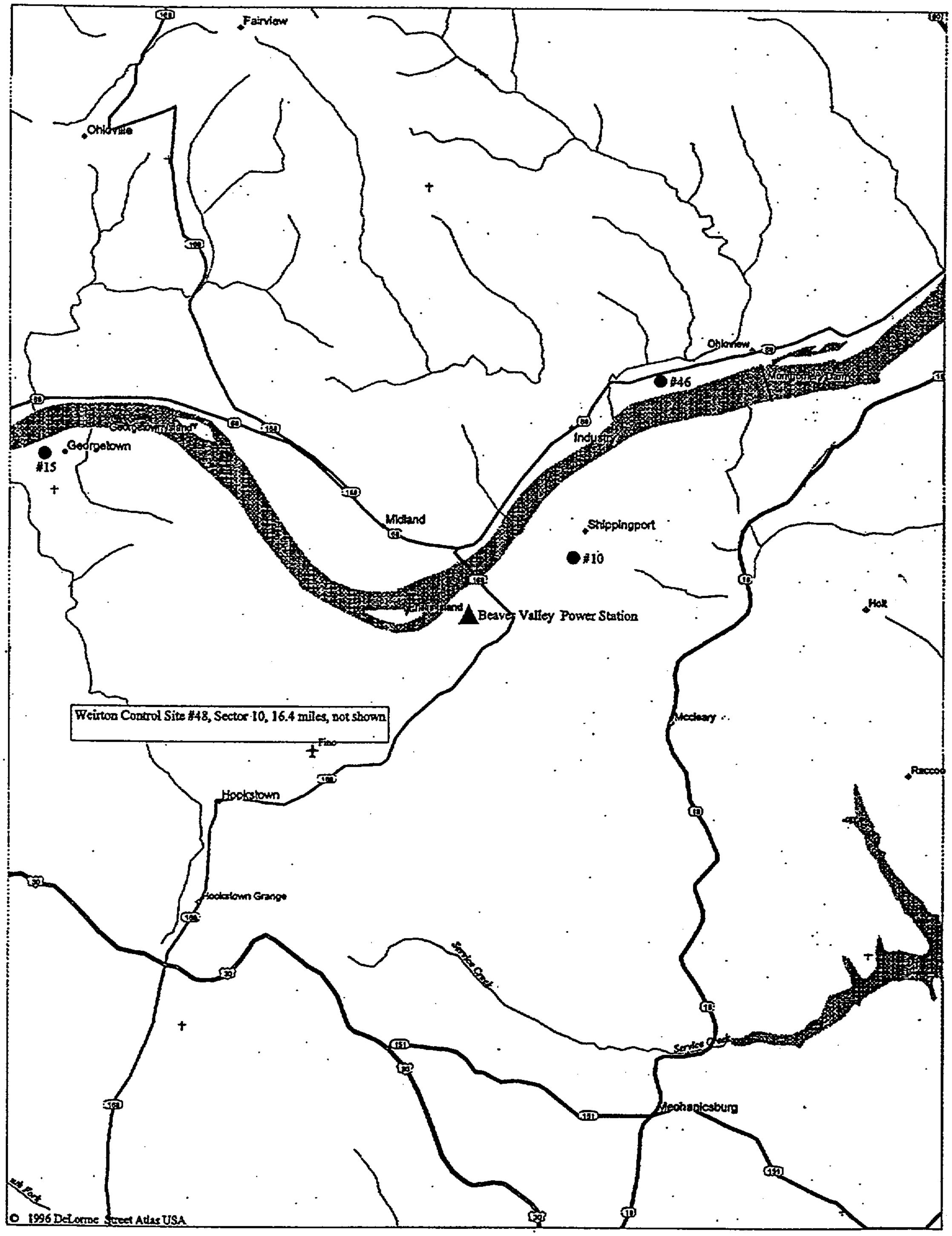
FIGURE 3.0-5

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

FOODCROP SAMPLING LOCATIONS



Food Sampling Locations

Site #	Description
10	Shippingport Boro
15	Georgetown Post Office
46	Industry, Midway Dr.
48	Weirton, W. Va., - Weirton Water Tower, Collier Way

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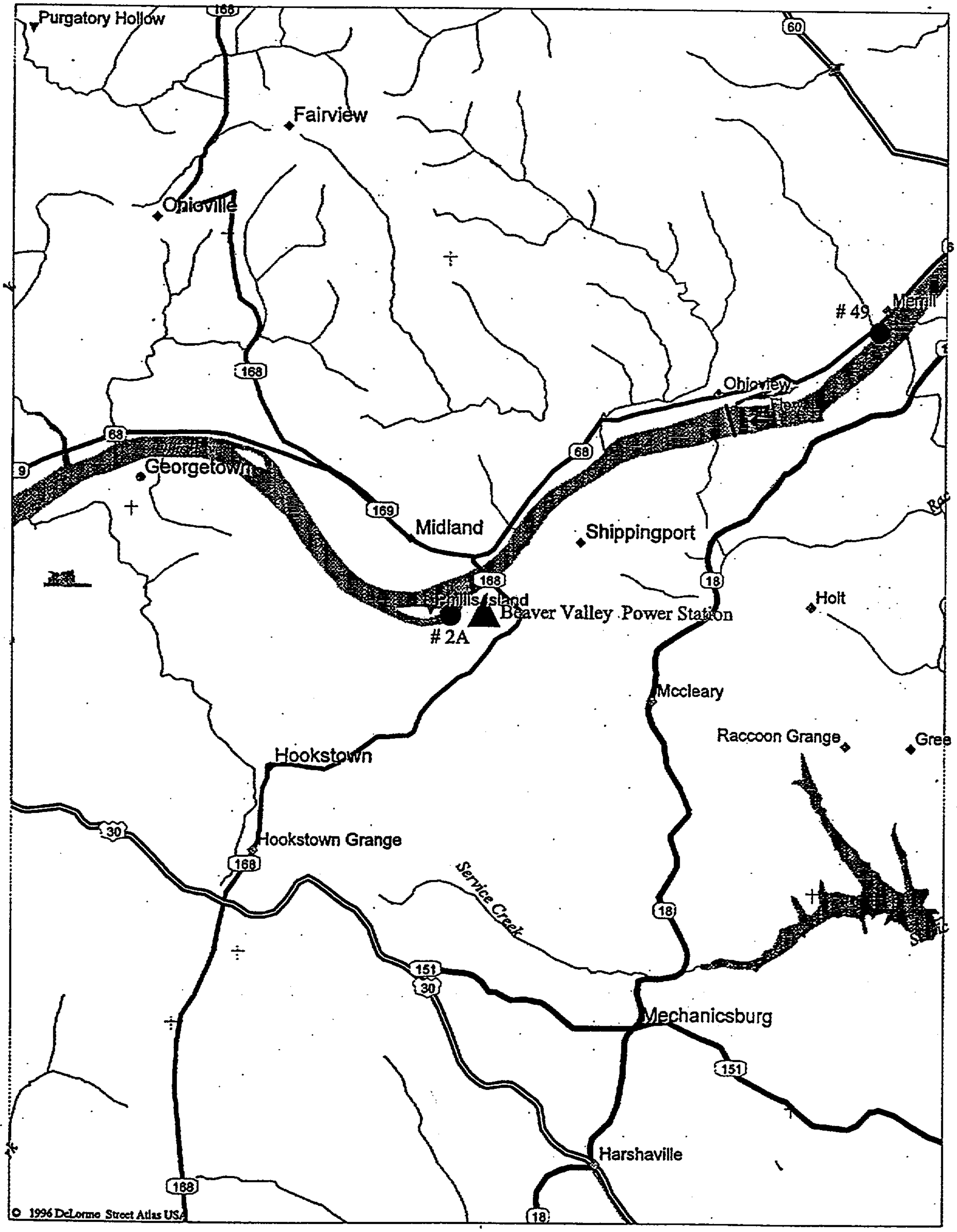
FIGURE 3.0-6

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

FISH SAMPLING LOCATIONS



Fish Sampling Locations

Sector	Site #	Distance (miles)	Location
13	2A	0.2	BVPS Outfall Discharge
3	49	5.0	Upstream side of Montgomery Dam

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4.0 INFORMATION RELATED TO 40 CFR 190

Appendix C CONTROL 3.11.4.1 requires that when the calculated doses associated with the effluent releases exceed twice the limits of Appendix C CONTROL 3.11.1.2.a, 3.11.1.2.b, 3.11.2.2.a, 3.11.2.2.b, 3.11.2.3.a, or 3.11.2.3.b, calculations shall be made including direct radiation contributions from the units (including outside storage tanks, etc.) to determine whether the dose or dose commitment to any MEMBER OF THE PUBLIC from all facility releases of radioactivity and to radiation from uranium fuel cycle sources exceeds the limits of ≤ 25 mrem to the total body or any organ, except the thyroid, which is limited to ≤ 75 mrem for a calendar year. If any of these limits are exceeded, prepare and submit to the Commission within 30 days a Special Report puruant to Technical Specification 6.9.2f. The following shall be included in the Special Report:

- Define the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the limits of Appendix C CONTROL 3.11.4.1.

- Include the schedule for achieving conformance within the limits of Appendix C CONTROL 3.11.4.1.

- Include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report.

- Describe levels of radiation and concentrations of radioactive material involved, and the cause of exposure levels or concentrations.

- If the estimated dose(s) exceeds the limits of Appendix C CONTROL 3.11.4.1, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

4.1 INSIDE THE SITE BOUNDARY RADIATION DOSES

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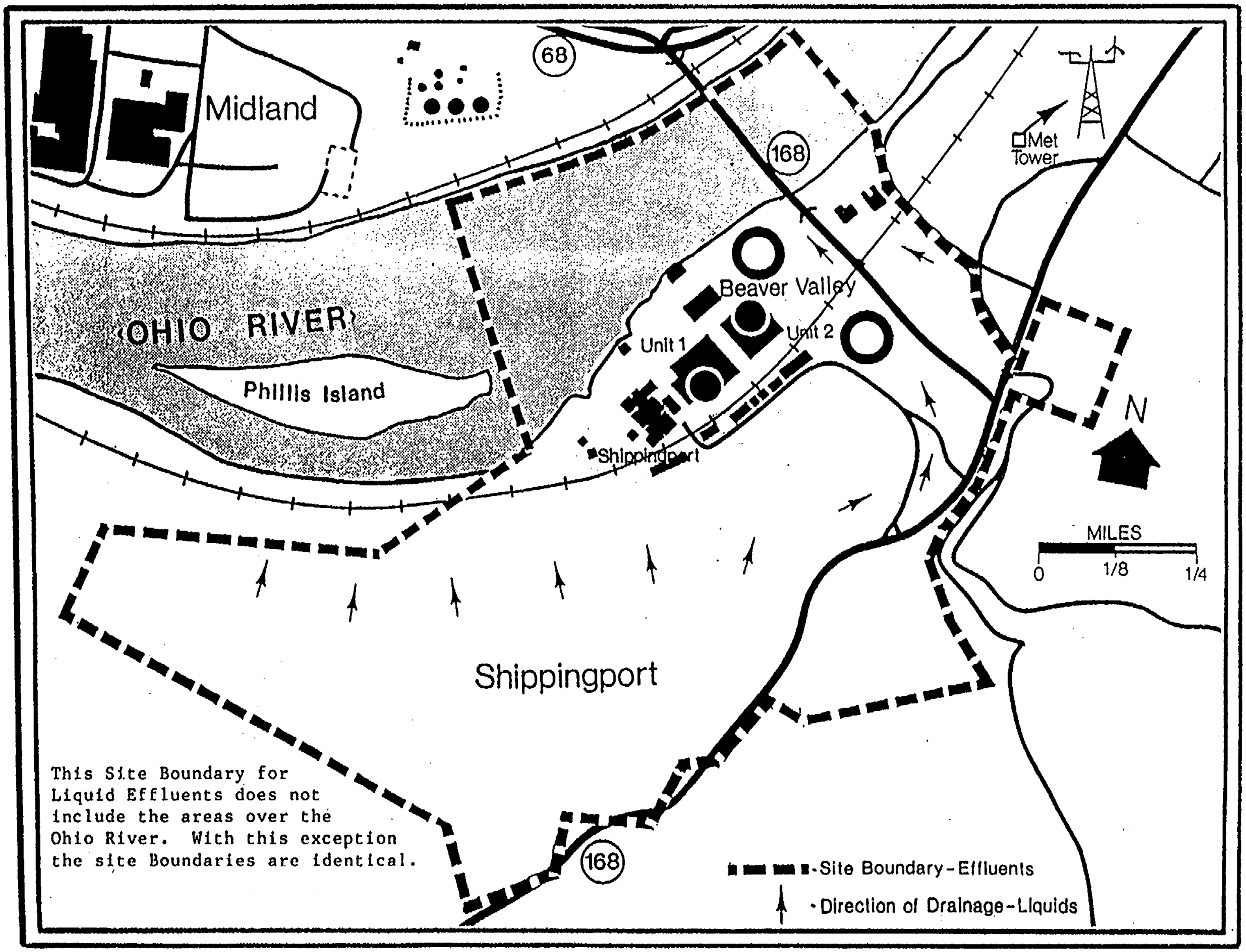
A separate assessment of radiation doses from radioactive effluents to MEMBERS OF THE PUBLIC due to their activities inside the site boundary is generally not necessary because the exposure time for individuals not occupationally associated with the plant site is minimal in comparison to the exposure time considered for the dose calculation at or beyond the site boundary.

For reporting purposes, separate guidance for calculating radiation doses to a MEMBER OF THE PUBLIC inside the site boundary is not needed because the dose assessments for an offsite MEMBER OF THE PUBLIC is also assumed to be for a MEMBER OF THE PUBLIC conducting activities onsite. This is verified by showing that the ground release χ/Q dispersion parameter used for dose calculation at the site boundary (0.352 miles NW) are greater than the χ/Q dispersion parameter at the location where a MEMBER OF THE PUBLIC would most likely have the maximum exposure time (0-0.5 miles N and NNW). A comparison of these χ/Q dispersion parameters is as follows:

	Site Boundary χ/Q (0.352 miles NW)	Inside Site Boundary χ/Q (0-0.5 miles N)	Inside Site Boundary χ/Q (0-0.5 miles NNW)	χ/Q References
•	9.24E-5 sec/m^3	2.33E-5 sec/m^3	5.47E-5 sec/m^3	ODCM Table 2.2-4
•	1.03E-4 sec/m^3	2.76E-5 sec/m^3	6.01E-5 sec/m^3	ODCM Table 2.2-5
•	7.35E-5 sec/m^3	2.44E-5 sec/m^3	5.57E-5 sec/m^3	ODCM Table 2.2-7
•	9.24E-5 sec/m^3	2.33E-5 sec/m^3	5.47E-5 sec/m^3	ODCM Table 2.2-8
•	9.24E-5 sec/m^3	2.33E-5 sec/m^3	5.47E-5 sec/m^3	ODCM Table 2.2-9
•	7.35E-5 sec/m^3	2.44E-5 sec/m^3	5.57E-5 sec/m^3	ODCM Table 2.2-10

FIGURE 5-1

SITE BOUNDARY FOR GASEOUS AND LIQUID EFFLUENTS



This Site Boundary for Liquid Effluents does not include the areas over the Ohio River. With this exception the site Boundaries are identical.

APPENDIX A

SUMMARY OF DISPERSION CALCULATIONAL PROCEDURES

Annual average and grazing season average values of relative concentration (X/Q) and deposition (D/Q) were calculated for continuous and intermittent gaseous releases of activity from the site according to the straight-line airflow (Gaussian) model described in NRC Regulatory Guide 1.111, Revision 1. Undecayed and undepleted sector average X/Q and D/Q values were obtained for each of sixteen 22.5-degree sectors at the site boundary and maximum individual receptors. For an elevated release, defined as occurring at a height that is twice the height or more of a nearby structure, credit was taken for the effective release height which is comprised of the physical release height plus momentum plume rise minus the terrain height at a given receptor. A building wake correction factor was used to adjust calculations for ground-level releases. Airflow reversals were also accounted for by applying site-specific terrain recirculation factors for both ground and elevated releases at the site (Albersheim, 1978). The methodology employed in the calculation of intermittent release X/Q and D/Q values is that described in NUREG/CR-2919 (Sagendorf, et. al. 1982).

The site continuous gaseous release points that have been evaluated include the process vent attached to the BVPS-1 natural draft cooling tower, the Containment Vents, Ventilation Vents, Turbine Building Vents, the BVPS-2 Condensate Polishing Building Vent, Decontamination Building Vent, and Gaseous Waste Storage Tank Vault Vent. The intermittent releases are from the Process Vent, Containment Vents, and Ventilation Vents. Only the process vent was considered to be an elevated release with all other release points being treated as ground level releases. A summary of the release characteristics and their locations is given in Appendix A, Table 1.1.

Onsite meteorological data for the period January 1, 1976 through December 31, 1980 were used as input for the annual-average calculations. The grazing season was represented by a six-month period from May 1 through October 31 for each year of the 5-year meteorological data base. This grazing season corresponds reasonably well with the growing season. The data were collected according to guidance in NRC Regulatory Guide 1.23 as described in Section 2.3 of the BVPS-2 FSAR. The parameters used in the X/Q-D/Q calculations consist of wind speed, wind direction, and ΔT as an indicator of atmospheric stability. The lower level winds (35 ft) and ΔT (150-35 ft) were used for all release points except the process vent which required the use of 500 ft winds and ΔT (500-35 ft) which are representative of the release height (510 ft).

The annual average and grazing season X/Q and D/Q values for the continuous and intermittent radioactive releases were calculated at the site boundary, nearest resident, nearest vegetable garden, nearest milk cow, nearest milk goat, and nearest meat animal. In the case of the process vent releases, several of each receptor type were evaluated in each downwind sector to determine the maximum X/Q-D/Q values. The distances of the limiting maximum individual receptors from the radioactive release points are given in Table 2.2-3. The continuous release annual average X/Q values at the special locations for the Containment Vents, Ventilation Vents, Process Vent, Turbine Building Vents, Decontamination Building Vent, Waste Gas Storage Vault Vent, and Condensate Polishing Building Vent are given in Tables 2.2-4 through 2.2-10 respectively. Continuous release annual average X/Q's for these same release points are also given at ten

APPENDIX A

SUMMARY OF DISPERSION CALCULATIONAL PROCEDURES (continued)

incremental downwind distances. Continuous release D/Q values for these same release points are given in Tables 2.3-21 through 2.3-27 for the incremental distances and in Tables 2.3-28 through 2.3-34 for the special locations. Due to their location adjacent to the containment building, the BVPS-2 Decontamination Building and Gaseous Waste Storage Tank Vault X/Q's and D/Q's are the same as the containment vent X/Q's and D/Q's. Likewise, the Turbine Building Vent X/Q's and D/Q's apply to the BVPS-2 Condensate Polishing Building as well due to its location adjacent to the Turbine Building.

Tables 2.3-35 through 2.3-38 contain short term X/Q values for batch releases originating from the Containment Vent, Ventilation Vent, and Process Vent releases respectively. The values in these tables are based on 32 hours per year of Containment and Ventilation Vent purges and 74 hours per year of Process Vent purges.

Albersheim, S. R., Development Of Terrain Adjustment Factors For Use At the Beaver Valley Power Station For the Straight-Line Atmospheric Dispersion Model, NUS-2173, NUS Corporation, June 1978

Sagendorf, J. F., Goll, J. T. and Sandusky, W. F., XOQDOQ: Computer Program For The Meteorological Evaluation Of Routine Effluent Releases At Nuclear Power Stations, NUREG/CR-2919, U. S. Nuclear Regulatory Commission, September, 1982.

APPENDIX A

TABLE A:1

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BV-1 AND 2 RELEASE CONDITIONS

	VENTILATION VENT	CONTAINMENT VENT	PROCESS VENT	TURBINE BUILDING VENT
TYPE OF RELEASE	GROUND LEVEL	GROUND LEVEL	ELEVATED	GROUND LEVEL
	Long Term And Short Term	Long Term And Short Term	Long Term And Short Term	
Release Point Height (m)	26	47	155	33
Adjacent Building Height (m)	19	44	155 -	33
Relative Location To Adjacent Structures	E. Side Of Primary Auxiliary Bldg	Top Center Of Containment Dome	Atop Cooling Tower	Turbine Building
Exit Velocity (m/sec)	NA	NA	9.4	NA
Internal Stack Diameter (m)	NA	NA	0.25	NA
Building Cross-Sectional Area (m^2)	1600	1600	NA	NA
Purge Frequency* (hours/year)	32	32	74	NA
Purge Duration (hrs/release)	8	8	NA	NA

*Applied to Short Term calculations only

APPENDIX B

INPUTS TO COMPUTER CODES FOR GENERATION OF SOURCE TERMS

This Appendix contains the input parameters to the various computer codes used by Duquesne Light Company and its subcontractors for determination of the Liquid and Gaseous source term mixes. The inputs are contained in the following Tables of this Appendix:

Table B:1a	Inputs To Gale Code For Generation Of BV-1 Liquid Source Term Mixes
Table B:1b	Inputs To SWEC LIQ1BB Code For Generation Of BV-2 Liquid Source Term Mixes
Table B:2a	Inputs To SWEC GAS1BB Code For Generation Of BV-1 Gaseous Source Term Mixes
Table B:2b	Inputs To SWEC GAS1BB Code For Generation Of BV-2 Gaseous Source Term Mixes

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APPENDIX B

TABLE B:1a

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INPUTS TO GALE CODE FOR GENERATION OF BV-1 LIQUID SOURCE TERM MIXES

BV-1 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	345.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	60.000
Letdown Cation Demineralizer Flow	6.000
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.620
Mass Of Steam In Each Steam Generator (thousand lbs)	6.772
Mass Of Liquid In Each Steam Generator (thousand lbs)	97.000
Total Mass Of Secondary Coolant (thousand lbs)	1296.000
Mass Of Water In Steam Generator (thousand lbs)	291.000
Blowdown Rate (thousand lbs/hr)	33.900
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	0.000
Radwaste Dilution Flow (thousand gpm)	22.500

BV-1 LIQUID WASTE INPUTS

STREAM	FLOW RATE (gal/day)	FRACTION OF PCA	FRACTION DISCHARGE	COLLECTION TIME (days)	DELAY TIME (days)	DECONTAMINATION FACTORS I	Cs	OTHERS
Shim Bleed Rate	1.32E4	1.000	0.000	11.260	7.220	1E7	1E7	1E7
Equipment Drains	6.00E2	1.000	0.000	11.260	7.220	1E7	1E7	1E7
Clean Waste Input	7.50E1	1.000	1.000	0.071	0.648	1E5	2E4	1E5
Dirty Waste Input	1.35E3	0.035	1.000	0.071	0.648	1E5	2E4	1E5
Blowdown	9.75E4	--	1.000	0.071	0.648	1E5	2E4	1E5
Untreated Blowdown	0.0	--	--	--	--	--	--	--

APPENDIX B

TABLE B:1b

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INPUTS TO SWEC LIQ1BB CODE FOR GENERATION OF BV-2 LIQUID SOURCE TERM MIXES

BV-2 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	385.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	57.000
Letdown Cation Demineralizer Flow	5.700
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.600
Mass Of Steam In Each Steam Generator (thousand lbs)	8.700
Mass Of Liquid In Each Steam Generator (thousand lbs)	100.000
Total Mass Of Secondary Coolant (thousand lbs)	2000.000
Mass Of Water In Steam Generator (thousand lbs)	298.000
Blowdown Rate (thousand lbs/hr)	22.300
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	.700
Radwaste Dilution Flow (thousand gpm)	7.800

BV-2 LIQUID WASTE INPUTS

STREAM	FLOW RATE (gal/day)	FRACTION OF PCA	FRACTION DISCHARGE	COLLECTION TIME (hrs)	DELAY TIME (hrs)	DECONTAMINATION FACTORS I	DECONTAMINATION FACTORS CsRb	DECONTAMINATION FACTORS OTHERS
Containment Sump	40	1.000	1.0	35.5	6.2	1E3	1E4	1E4
Auxiliary Building Sump	200	0.100	1.0	35.5	6.2	1E3	1E4	1E4
Miscellaneous Sources	700	0.010	1.0	35.5	6.2	1E3	1E4	1E4
Rx Plant Samples	35	1.000	1.0	35.5	6.2	1E3	1E4	1E4
Lab Drains	400	0.002	1.0	35.5	6.2	1E3	1E4	1E4
Cond. Demin. Rinse Water	2685	1.1E-4	1.0	35.5	6.2	1E3	1E4	1E4
CVCS	60	--	1.0	1300	173	1E4	4E3	1E5
Turbine Bldg. Drains	7200	--	1.0	--	--	--	--	--

APPENDIX B

TABLE B:2a

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INPUTS TO SWEC GAS1BB CODE FOR GENERATION OF BV-1 GASEOUS SOURCE TERM MIXES

BV-1 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	385.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	57.000
Letdown Cation Demineralizer Flow	5.700
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.600
Mass Of Steam In Each Steam Generator (thousand lbs)	8.700
Mass Of Liquid In Each Steam Generator (thousand lbs)	100.000
Total Mass Of Secondary Coolant (thousand lbs)	2000.000
Mass Of Water In Steam Generator (thousand lbs)	298.000
Blowdown Rate (thousand lbs/hr)	52.000
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	0.000
Radwaste Dilution Flow (thousand gpm)	15.000

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BV-1 GASEOUS WASTE INPUTS	VALUE
There Is Not Continuous Stripping Of Full Letdown Flow	
Hold Up Time For Xenon (days)	39.000
Hold Up Time For Krypton (days)	2.000
Primary Coolant Leak To Auxiliary Building (lb/day)	160.000
Auxiliary Building Leak Iodine Partition Factor	7.5E-3
Gas Waste System Particulate Release Fraction	0.000
Auxiliary Building Charcoiodine Release Fraction	1.000
Particulate Release Fraction	1.000
Containment Volume (million cu-ft)	1.800
Frequency Of Primary Coolant Degassing (times/yr)	2.000
Primary To Secondary Leak Rate (lb/day)	100.000
There Is A Kidney Filter	
Containment Atmosphere Cleanup Rate (thousand cfm)	2.000
Purge Time Of Containment (hours)	8.000
There Is Not A Condensate Demineralizer	
Iodine Partition Factor (gas/liq) In Steam Generator	0.010
Frequency Of Containment Building High Vol Purge (times/yr)*	4.000
Containment Volume Purge Iodine Release Fraction	1.000
Particulate Release Fraction	1.000
Steam Leak To Turbine Building (lbs/hr)	1700.000
Fraction Iodine Released From Blowdown Tank Vent	0.000
Fraction Iodine Released From Main Condensate Air Ejector	0.440
There Is Not A Cryogenic Off Gas System	

*2 cold and 2 hot purges

APPENDIX B

TABLE B:2b

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INPUTS TO SWEC GAS1BB CODE FOR GENERATION OF BV-2 GASEOUS SOURCE TERM MIXES

BV-2 PWR INPUTS	VALUE
Thermal Power Level (megawatts)	2766.000
Plant Capacity Factor	.800
Mass Of Primary Coolant (thousand lbs)	385.000
Percent Fuel With Cladding Defects	.120
Primary System Letdown Rate (gpm)	57.000
Letdown Cation Demineralizer Flow	5.700
Number Of Steam Generators	3.000
Total Steam Flow (million lbs/hr)	11.600
Mass Of Steam In Each Steam Generator (thousand lbs)	8.700
Mass Of Liquid In Each Steam Generator (thousand lbs)	100.000
Total Mass Of Secondary Coolant (thousand lbs)	2000.000
Mass Of Water In Steam Generator (thousand lbs)	298.000
Blowdown Rate (thousand lbs/hr)	22.300
Primary To Secondary Leak Rate (lbs/day)	100.000
Fission Product Carry-Over Fraction	.001
Halogen Carry-Over Fraction	.010
Condensate Demineralizer Flow Fraction	.700
Radwaste Dilution Flow (thousand gpm)	7.800

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BV-2 GASEOUS WASTE INPUTS	VALUE
There Is Not Continuous Stripping Of Full Letdown Flow	
Hold Up Time For Xenon (days)	45.800
Hold Up Time For Krypton (days)	2.570
Primary Coolant Leak To Auxiliary Building (lb/day)	160.000
Auxiliary Building Leak Iodine Partition Factor	7.5E-3
Gas Waste System Particulate Release Fraction	0.000
Auxiliary Building Charcoiodine Release Fraction	0.100
Particulate Release Fraction	0.010
Containment Volume (million cu-ft)	1.800
Frequency Of Primary Coolant Degassing (times/yr)	2.000
Primary To Secondary Leak Rate (lb/day)	100.000
There Is A Kidney Filter	
Containment Atmosphere Cleanup Rate (thousand cfm)	20.000
Purge Time Of Containment (hours)	8.000
There Is Not A Condensate Demineralizer	
Iodine Partition Factor (gas/liq) In Steam Generator	0.010
Frequency Of Containment Building High Vol Purge (times/yr)*	4.000
Containment Volume Purge Iodine Release Fraction	1.000
Particulate Release Fraction	1.000
Steam Leak To Turbine Building (lbs/hr)	1700.000
Fraction Iodine Released From Blowdown Tank Vent	0.000
Fraction Iodine Released From Main Condensate Air Ejector	0.270
There Is Not A Cryogenic Off Gas System	

*2 cold and 2 hot purges

APPENDIX C
ODCM CONTROLS

This appendix contains procedural details for the Radiological Effluent Technical Specification (RETS) that were transferred from the Technical Specifications per Unit 1/2 Amendments 188/70, and in accordance with Generic Letter 89-01 and Generic Letter 89-01, Supplement No. 1 (NUREG 1301). 10/95

This appendix also includes selected Definitions and Tables as delineated in Section 1 of the Technical Specifications and selected applicability and surveillance requirement statements as delineated in Section 3/40 of the Technical Specifications. These were added to Appendix C for reference purposes, even though they are currently described in the Technical Specification.

The numbering of each specific Control, Surveillance Requirement and Table contained in the appendix does not appear to be sequential. This is intentional, as all Control, Surveillance Requirement and Table numbers remained the same when they were transferred from the Technical Specifications. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

APPENDIX C
ODCM CONTROLS

The defined terms of this section appear in capitalized type and are applicable throughout these CONTROLS.

1.5 ACTION shall be those additional requirements specified as corollary statements to each principal CONTROL and shall be part of the CONTROLS.

1.9 A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds with the necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel including the sensor and alarm and/or trip functions, and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.

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1.10 A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

1.11 A CHANNEL FUNCTIONAL TEST shall be the injection of a simulated signal into the channel as close to the primary sensor as practicable to verify OPERABILITY including alarm and/or trip functions.

1.19 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (uCi/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table E-7 of Regulatory Guide 1.109, Revision 1, 1977 or Table III of TID 14844.

1.21 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.2.

1.31 A GASEOUS RADWASTE TREATMENT SYSTEM is any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

1.36 MEMBER(S) OF THE PUBLIC means any individual except when that individual is receiving an occupational dose. This definition is used to show compliance to an ODCM Appendix C CONTROL that is based on 10 CFR Part 20.

APPENDIX C
ODCM CONTROLS

1.36 MEMBER(S) OF THE PUBLIC means any individual that can receive a radiation dose in the general environment, whether he may or may not also be exposed to radiation in an occupation associated with a nuclear fuel cycle. However, an individual is not considered a MEMBER OF THE PUBLIC during any period in which he is engaged in carrying out any operation which is part of the nuclear fuel cycle. **This definition is used to show compliance to an ODCM Appendix C CONTROL that is based on 40 CFR Part 190.**

1.30 The OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Section 6.8.6 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports required by Specifications in the Administrative Controls Section of the TS 5/99

1.6 A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electric power sources, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related safety function(s).

1.4 An OPERATIONAL MODE shall correspond to any one inclusive combination of core reactivity condition, power level, and average reactor coolant temperature specified in Table 1.1.

1.33 PURGE or PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating conditions, in such a manner that replacement air or gas is required to purify the confinement.

1.3 RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant of 2652 MWt.

1.7 A REPORTABLE EVENT shall be any of those conditions specified in Section 50.73 to 10 CFR Part 50.

1.40 SHUTDOWN means reactor power change to 0% power. 5/99

1.38 The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee. (See Figure 5-1)

APPENDIX C
ODCM CONTROLS

5/99

1.41 STARTUP means reactor power change from 0% power.

1.27 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

1.2 THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

1.39 An UNRESTRICTED AREA means any area access to which is neither limited nor controlled by the licensee.

1.32 VENTILATION EXHAUST TREATMENT SYSTEM is any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal absorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment (such a system is not considered to have any effect on noble gas effluents). Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

1.34 VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating conditions, in such a manner that replacement air or gas is not provided or required during VENTING. Vent, used in system names, does not imply a VENTING process.

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ODCM CONTROLS

TABLE 1.1

OPERATIONAL MODES

MODE	REACTIVITY CONDITION, K_{eff}	% RATED THERMAL POWER*	AVERAGE COOLANT TEMPERATURE
1. Power Operation	≥0.99	>5%	≥350°F
2. Startup	≥0.99	≤5%	≥350°F
3. Hot Standby	<0.99	0	≥350°F
4. Hot Shutdown	<0.99	0	350°F $>T_{avg}$ >200°F
5. Cold Shutdown	<0.99	0	≤200°F
6. Refueling**	≤0.95	0	≤140°F

*Excluding decay heat.
**Reactor vessel head unbolted or removed and fuel in the vessel.

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ODCM CONTROLS

TABLE 1.2

FREQUENCY NOTATION

NOTATION	FREQUENCY
S	At least once per 12 hours
D	At least once per 24 hours
W	At least once per 7 days
M	At least once per 31 days
Q	At least once per 92 days
SA	At least once per 184 days
R	At least once per 18 months
S/U	Prior to each reactor startup
P	Completed prior to each release
N.A.	Not applicable

APPENDIX C
ODCM CONTROLS

CONTROLS: APPLICABILITY

3.0.1 Compliance with the CONTROLS in the succeeding CONTROLS is required during the OPERATIONAL MODES or other conditions specified therein; except that upon failure to meet the CONTROL, the associated ACTION requirements shall be met.

3.0.2 Non-compliance with a CONTROL shall exist when the requirements of the CONTROL and associated ACTION requirements are not met within the specified time intervals. If the CONTROL is restored prior to expiration of the specified time intervals, completion of the ACTION requirements is not required.

3.0.3 When a CONTROL is not met except as provided in the associated ACTION requirements, within one hour action shall be initiated to place the unit in a MODE in which the CONTROL does not apply by placing it, as applicable, in:

1. At least HOT STANDBY within the next 6 hours,
2. At least HOT SHUTDOWN within the following 6 hours, and
3. At least COLD SHUTDOWN within the subsequent 24 hours.

Where corrective measures are completed that permit operation under the ACTION requirements, the ACTION may be taken in accordance with the specified time limits as measured from the time of failure to meet the CONTROL. Exceptions to these requirements are stated in the individual CONTROLS.

3.0.4 Entry into an OPERATIONAL MODE or other specified condition shall not be made when the conditions for the CONTROL are not met and the associated ACTION requires a shutdown if they are not met within a specified time interval. Entry into an OPERATIONAL MODE or specified condition may be made in accordance with ACTION requirements when conformance to them permits continued operation of the facility for an unlimited period of time. This provision shall not prevent passage through or to OPERATIONAL MODES as required to comply with ACTION requirements. Exceptions to these requirements are stated in the individual CONTROLS.

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ODCM CONTROLS

CONTROLS: SURVEILLANCE REQUIREMENTS

4.0.1 Surveillance Requirements shall be met during the OPERATIONAL MODES or other conditions specified for individual CONTROLS unless otherwise stated in an individual Surveillance Requirement.

4.0.2 Each Surveillance Requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval.

4.0.3 Failure to perform a Surveillance Requirement within the allowed surveillance interval, defined by CONTROL 4.0.2, shall constitute non-compliance with the OPERABILITY requirements for a CONTROL. The time limits of the ACTION requirements are applicable at the time it is identified that a Surveillance Requirement has not been performed. The ACTION requirements may be delayed for up to 24 hours to permit the completion of the surveillance when the allowable outage time limits of the ACTION requirements are less than 24 hours. Surveillance Requirements do not have to be performed on inoperable equipment.

4.0.4 Entry into an OPERATIONAL MODE or other specified condition shall not be made unless the Surveillance Requirement(s) associated with the CONTROL has been performed within the stated surveillance interval or as otherwise specified. This provision shall not prevent passage through or to OPERATIONAL MODES as required to comply with ACTION requirements.

APPENDIX C
ODCM CONTROLS

CONTROLS: RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

3.3.3.9 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Item 1, the radioactive liquid effluent monitoring instrumentation channels shown in Appendix C, Table 3.3-12 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Appendix C CONTROL 3.11.1.1 are not exceeded. The alarm/trip setpoints of the radiation monitoring channels shall be determined in accordance with Section 1.1.1 and 1.1.2 of this manual.

Applicability:

During releases through the flow path.

Action:

a. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above specification, immediately suspend the release of radioactive liquid effluents monitored by the affected channel or correct the alarm/trip setpoint.

b. With one or more radioactive liquid effluent monitoring instrumentation channels inoperable, take the ACTION shown in Appendix C, Table 3.3-12 or conservatively reduce the alarm setpoint. Exert a best effort to return the channel to operable status within 30 days, and if unsuccessful, explain in the next Annual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. 8/95

c. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.9 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated operable by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Appendix C, Table 4.3-12.

APPENDIX C
ODCM CONTROLS

TABLE 3.3-12

BV-1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments, Alt = Alternate Instruments

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1.	Gross Activity Monitors Providing Automatic Termination Of Release		
	a. Liquid Waste Effluents Monitor Pri: (RM-LW-104)	(1)	23
	b. Liquid Waste Contaminated Drain Monitor Pri: (RM-LW-116)	(1)	23
	c. Auxiliary Feed Pump Bay Drain Monitor Pri: (RM-DA-100)	(1)	24
2.	Gross Activity Monitors Not Providing Termination Of Release		
	a. Component Cooling-Recirculation Spray Heat Exchangers River Water Monitor Pri: (RM-RW-100)	(1)	24
3.	Flow Rate Measurement Devices		
	a. Liquid Radwaste Effluent Line Pri: (FR-LW-104) for (RM-LW-104)	(1)	25
	b. Liquid Waste Contaminated Drain Line Pri: (FR-LW-103) for (RM-LW-116)		
	c. Cooling Tower Blowdown Line Pri: (FT-CW-101-1) or Alt: (FT-CW-101)and (2CWS-FT-101)	(1)	25
4.	Tank Level Indicating Devices (for tanks outside plant building)		
	a. Primary Water Storage Tank Pri: (LI-PG-115A) for (BR-TK-6A)	(1)	26
	b. Primary Water Storage Tank Pri: (LI-PG-115B) for (BR-TK-6B)	(1)	26
	c. Steam Generator Drain Tank Pri: (LI-LW-110) for (LW-TK-7A)	(1)	26
	d. Steam Generator Drain Tank Pri: (LI-LW-111) for (LW-TK-7B)	(1)	26

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APPENDIX C
ODCM CONTROLS

TABLE 3.3-12 (continued)

BV-2 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments, Alt = Alternate Instruments

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	INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1.	Gross Radioactivity Monitor Providing Alarm And Automatic Termination Of Release		
	a. Liquid Waste Process Effluent Monitor Pri: (2SGC-RQ100)	(1)	23
2.	Gross Radioactivity Monitors Providing Alarm But Not Providing Termination Of Release		
	a. None Required		
3.	Flow Rate Measurement Devices		
	a. Liquid Radwaste Effluent Pri: (2SGC-FS100)	(1)	25
	b. Cooling Tower Blowdown Line Pri: (FT-CW-101) or Alt: (FT-CW-101) and (2CWS-FT101)	(1)	25
4.	Tank Level Indicating Devices (for tanks outside plant buildings)		
	a. None Required		

APPENDIX C
ODCM CONTROLS

TABLE 3.3-12 (continued)

ACTION STATEMENTS

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Action 23 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may be initiated or resumed provided that prior to release:

1. At least two independent samples are analyzed in accordance with Appendix C SURVEILLANCE REQUIREMENT 4.11.1.1.1, and at least two technically qualified members of the Facility Staff independently verify the release rate calculations* and discharge valving, or

2. Initiate monitoring with the comparable alternate monitoring channel. Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

Otherwise, suspend release of radioactive effluents via this pathway.

Action 24 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

1. That at least once per 8 hours grab samples are analyzed for gross radioactivity (beta or gamma) at a Lower Limit of Detection (LLD) of at least 1E-7 uCi/ml, or

2. Initiate monitoring with the comparable alternate monitoring channel. Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

* Since the computer software used for discharge permit generation automatically performs the release rate calculations, then the independent signatures on the discharge permit for preparer and reviewer satisfy the requirement for "...two technically qualified members of the Facility Staff independently verify the release rate calculations..."

APPENDIX C
ODCM CONTROLS

Action 25 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

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1. The flow rate is estimated at least once per 4 hours during actual releases. (Pump curves may be used to estimate flow), or

2. Initiate monitoring with the comparable alternate monitoring channel. Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

Action 26 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, liquid additions to this tank may continue provided:

1. The tank liquid level is estimated during all liquid additions to the tank, or

2. Initiate monitoring with the comparable alternate monitoring channel. Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

APPENDIX C
ODCM CONTROLS

TABLE 4.3-12

BV-1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1.	Gross Beta Or Gamma Radioactivity Monitors Providing Alarm And Automatic Termination Of Release				
	a. Liquid Radwaste Effluent Line Pri: (RM-LW-104)	D	P(5)	R(3)	Q(1)
	b. Liquid Waste Contaminated Drain Line Pri: (RM-LW-116)	D	P(5)	R(3)	Q(1)
	c. Auxiliary Feed Pump Bay Drain Monitor Pri: (RM-DA-100)	D	D	R(3)	Q(6)
2.	Gross Beta Or Gamma Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination Of Release				
	a. Component Cooling - Recirculation Spray Heat Exchangers River Water Monitor Pri: (RM-RW-100)	D	M(5)	R(3)	Q(2)
3.	Flow Rate Monitors				
	a. Liquid Radwaste Effluent Lines Pri: (FR-LW-104) for (RM-LW-104)	D(4)	NA	R	Q
	b. Liquid Waste Contaminated Drain Line Pri: (FR-LW-103) for (RM-LW-116)				
	c. Cooling Tower Blowdown Line Pri: (FT-CW-101-1) or Alt: (FT-CW-101) and (2CWS-FT-101)	D(4)	NA	R	Q

APPENDIX C
ODCM CONTROLS

TABLE 4.3-12 (continued)

BV-1 RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
4.	Tank Level Indicating Devices (for tanks outside plant buildings)				
a.	Primary Water Storage Tank Pri: (LI-PG-115A) for (BR-TK-6A)	D*	NA	R	Q
b.	Primary Water Storage Tank Pri: (LI-PG-115B) for (BR-TK-6B)	D*	NA	R	Q
c.	Steam Generator Drain Tank Pri: (LI-LW-110) for (LW-TK-7A)	D*	NA	R	Q
d.	Steam Generator Drain Tank Pri: (LI-LW-111) for (LW-TK-7B)	D*	NA	R	Q

*During liquid additions to the tank.

APPENDIX C
ODCM CONTROLS

TABLE 4.3-12 (continued)

BV-2 RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1.	Gross Radioactivity Monitor Providing Alarm And Automatic Termination Of Release				
	a. Liquid Waste Process Effluent Pri: (2SGC-RQ100)	D	P(5)	R(8)(3)	Q(7)
2.	Flow Rate Measurement Devices				
	a. Liquid Radwaste Effluent Pri: (2SGC-FS100)	D(4)	NA	R	Q
	b. Cooling Tower Blowdown Line Pri: (FT-CW-101-1) or Alt: (FT-CW-101) and (2CWS-FT101)	D(4)	NA	R	Q
3.	Tank Level Indicating Devices (for tanks outside plant buildings)				
	a. None Required				

TABLE 4.3-12 (continued)

TABLE NOTATION

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room Alarm Annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm/trip setpoint.

2. Downscale failure.

3. Instrument controls not set in operate mode.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that Control Room Alarm Annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm/trip setpoint.

2. Downscale failure.

3. Instrument controls are not set in operate mode.

(3) The initial CHANNEL CALIBRATION for radioactivity measurement instrumentation shall be performed using one or more of the reference standards certified by the National Bureau of Standards or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS. These standards should permit calibrating the system over its intended range of energy and rate capabilities. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration should be used, at intervals of at least once per 18 months. This can normally be accomplished during refueling outages. (Existing plants may substitute previously established calibration procedures for this requirement).

(4) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which continuous, periodic, or batch releases are made.

(5) A SOURCE CHECK may be performed utilizing the installed means or flashing the detector with a portable source to obtain an upscale increase in the existing count rate to verify channel response.

APPENDIX C
ODCM CONTROLS

TABLE 4.3-12 (continued)

TABLE NOTATION

(6) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room Alarm Annunciation occurs when the instrument indicates measured levels above the Alarm/Trip Setpoint.

The CHANNEL FUNCTIONAL TEST shall also demonstrate that Control Alarm Annunciation occurs if any of the following conditions exists:

1. Downscale failure.

2. Instrument controls are not set in operate mode.

(7) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room Alarm Annunciation occurs if the instrument indicates measured levels above the alarm/trip setpoint.

(8) The CHANNEL CALIBRATION shall also demonstrate that Control Room Alarm Annunciation occurs if either of the following conditions exist:

1. Downscale failure.

2. Instrument controls are not set in operate mode.

APPENDIX C
ODCM CONTROLS

CONTROLS: RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

3.3.3.10 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Item 1, the radioactive gaseous effluent monitoring instrumentation channels shown in Appendix C, Table 3.3-13 shall be operable with their alarm/trip setpoints set to ensure that the limits of Appendix C CONTROL 3.11.2.1 are not exceeded. The alarm/trip setpoints of the radiation monitoring channels shall be determined in accordance with Section 2.1 of this manual.

Applicability:

During releases through the flow path.

Action:

a. With a radioactive gaseous process or effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits of Appendix C CONTROL 3.11.2.1 are met, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel or correct the alarm/trip setpoint.

b. With one or more radioactive gaseous effluent monitoring instrumentation channels inoperable, take the ACTION shown in Appendix C, Table 3.3-13 or conservatively reduce the alarm setpoint. Exert a best effort to return the channel to operable status within 30 days, and if unsuccessful, explain in the next Annual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. 8/95

c. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.3.10 Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated operable by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Appendix C, Table 4.3-13.

APPENDIX C
ODCM CONTROLS

TABLE 3.3-13

BV-1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. Gaseous Waste/Process Vent System(PV-1,2)			
a. Noble Gas Activity Monitor Pri: (RM-GW-108B)	(1)	*	27,29,30***
b. Particulate Activity Monitor Pri: (RM-GW-108A) or Alt: (RM-GW-109 Ch 1)	(1)	*	32
c. System Effluent Flow Rate Measuring Device Pri: (FR-GW-108) or Alt: (RM-GW-109 Ch 10)	(1)	*	28
d. Sampler Flow Rate Measuring Device Pri: (Rotometer)	(1)	*	28
2. Auxiliary Building Ventilation System (VV-1; Also called Ventilation Vent)			
a. Noble Gas Activity Monitor Pri: (RM-VS-101B) or Alt: (RM-VS-109 Ch 5)	(1)	*	29,30***
b. Particulate Activity Monitor Pri: (RM-VS-101A) or Alt: (RM-VS-109 Ch 1)	(1)	*	32
c. System Effluent Flow Rate Measuring Device Pri: (FR-VS-101) or Alt: (RM-VS-109 Ch 10)	(1)	*	28
d. Sampler Flow Rate Measuring Device Pri: (Rotometer)	(1)	*	28

*During Releases via this pathway.

***During purging of Reactor Containment via this pathway.

APPENDIX C
ODCM CONTROLS

TABLE 3.3-13 (continued)

BV-1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
3. Reactor Building/SLCRS (CV-1; Also called Elevated Release)			
a. Noble Gas Activity Monitor Pri: (RM-VS-107B) or Alt: (RM-VS-110 Ch 5)	(1)	*	29,30***
b. Particulate Activity Monitor Pri: (RM-VS-107A) or Alt: (RM-VS-110 Ch 1)	(1)	*	32
c. System Effluent Flow Rate Measuring Device Pri: (FR-VS-112) or Alt: (RM-VS-110 Ch 10)	(1)	*	28
d. Sampler Flow Rate Measuring Device Pri: (Rotometer)	(1)	*	28

*During Releases via this pathway.

***During purging of Reactor Containment via this pathway.

APPENDIX C
ODCM CONTROLS

TABLE 3.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. SLCRS Unfiltered Pathway (VV-2; Also called Ventilation Vent)			
a. Noble Gas Activity Monitor Pri: (2HVS-RQ101B)	1	*	29,30***
b. Particulate Activity Monitor Pri: (2HVS-RQ101A)	1	*	32
c. Process Flow Rate Monitor Pri: (Monitor Item 29)	1	*	28
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	1	*	28
2. SLCRS Filtered Pathway (CV-2; Also called Elevated Release)			
a. Noble Gas Activity Monitor Pri: (2HVS-RQ109B)	1	*	29,30***
b. Particulate Activity Monitor Pri: (2HVS-RQ109A)	1	*	32
c. Process Flow Rate Monitor Pri: (Monitor Item 29)	1	*	28
d. Sampler Flow Rate Monitor Pri: (Monitor Items 28 and 72)	1	*	28
3. Decontamination Building Vent (DV-2)			
a. Noble Gas Activity Monitor Pri: (2RMQ-RQ301B)	1	*	29
b. Particulate Activity Monitor Pri: (2RMQ-RQ301A)	1	*	32
c. Process Flow Rate Monitor Pri: None Required	None	None	None
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	1	*	28

*During Releases via this pathway.

***During purging of Reactor Containment via this pathway.

APPENDIX C
ODCM CONTROLS

TABLE 3.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
4. Condensate Polishing Building Vent (CB-2)			
a. Noble Gas Activity Monitor Pri: (2HVL-RQ112B)	1	*	29
b. Particulate Activity Monitor Pri: (2HVL-RQ112A)	1	*	32
c. Process Flow Rate Monitor Pri: None Required	None	None	None
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	1	*	28
5. Waste Gas Storage Vault Vent (WV-2)			
a. Noble Gas Activity Monitor Pri: (2RMQ-RQ303B)	1	*	29
b. Particulate Activity Monitor Pri: (2RMQ-RQ303A)	1	*	32
c. Process Flow Rate Monitor Pri: None Required	None	None	None
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	1	*	28

APPENDIX C
ODCM CONTROLS

TABLE 3.3-13 (continued)

ACTION STATEMENTS

Action 27 APPLICABLE FOR RELEASES OF THE BV-1 OR BV-2 GAS WASTE TANKS

With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the Unit 1 Gaseous Waste Decay Tanks or the Unit 2 Gsseous Waste Storage Tanks may be released to the environment provided that prior to initiating the release:

1. At least two independent samples of the tank's content are analyzed and at least two technically qualified members of the Facility Staff independently verify the release rate calculations and discharge valve lineup, or

2. Initiate continuous monitoring with the comparable alternate monitoring channel. Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this technical specification requirement.

Otherwise, suspend releases of radioactive effluents via this pathway.

Action 28 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours. For BV-2, this action should be applied with the following guidance:

5/99

1. Action 28 is applicable when the Sample Flow Rate monitor (by itself) is INOPERABLE.

2. Action 28 is not applicable when already performing the required Actions for INOPERABLE Particulate Activity Monitor and Noble Gas Activity Monitor (i.e.; both of these channels need to be INOPERABLE to exempt Action 28 requirements). In this situation, the detector flow path is INOPERABLE.

Action 29 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided:

1. Grab samples are taken at least once per 8 hours and these samples are analyzed for gross activity within 24 hours, or

2. Initiate continuous monitoring with the comparable alternate monitoring channel. Surveillance requirements applicable to the inoperable channel shall apply to the comparable alternate monitoring channel when used to satisfy this ODCM CONTROL requirement.

APPENDIX C
ODCM CONTROLS

TABLE 3.3-13 (continued)

ACTION STATEMENTS

Action 30 APPLICABLE FOR BATCH PURGES OF THE BV-1 REACTOR CONTAINMENT 5/99

With the number of channels OPERABLE less than required by minimum Channels OPERABLE requirement, immediately suspend PURGING of Reactor Containment via this pathway if both RM-VS-104A and B are not OPERABLE with the purge/exhaust system in service.

Action 30 APPLICABLE FOR BATCH PURGES OF THE BV-2 REACTOR CONTAINMENT 5/99

With the number of channels OPERABLE less than required by Minimum Channels OPERABLE requirement, immediately suspend purging of Reactor Containment via this pathway.

Action 32 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in Appendix C, Table 4.11-2 or sampled and analyzed once every 8 hours.

APPENDIX C
ODCM CONTROLS

TABLE 4.3-13

BV-1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1.	Gaseous Waste/Process Vent System (PV-1,2)				
a.	Noble Gas Activity Monitor Pri: (RM-GW-108B)	P	P(4)	R(3)	Q(1)
b.	Particulate Activity Monitor Pri: (RM-GW-108A) or Alt: (RM-GW-109 Ch 1)	W	NA	NA	NA
c.	System Effluent Flow Rate Measuring Device Pri: (FR-GW-108) or Alt: (RM-GW-109 Ch 10)	P	NA	R	Q
d.	Sampler Flow Rate Measuring Device Pri: (Rotometer)	D*	NA	R	Q
2.	Auxiliary Building Ventilation System (VV-1; Also called Ventilation Vent)				
a.	Noble Gas Activity Monitor Pri: (RM-VS-101B) or Alt: (RM-VS-109 Ch 5)	D	M(4), P(4)***	R(3)	Q(2)
b.	Particulate Activity Monitor Pri: (RM-VS-101A) or Alt: (RM-VS-109 Ch 1)	W	NA	NA	NA
c.	System Effluent Flow Rate Measurement Device Pri: (FR-VS-101) or Alt: (RM-VS-109 Ch 10)	D	NA	R	Q
d.	Sampler Flow Rate Measuring Device Pri: (Rotometer)	D	NA	R	Q
3.	Reactor Building/SLCRS (CV-1; Also called Elevated Release)				
a.	Noble Gas Activity Monitor Pri: (RM-VS-107B) or Alt: (RM-VS-110 Ch 5)	D	M(4), P(4)***	R(3)	Q(2)
b.	Particulate Activity Monitor Pri: (RM-VS-107A) or Alt: (RM-VS-110 Ch 1)	W	NA	NA	NA
c.	System Effluent Flow Rate Measuring Device Pri: (FR-VS-112) or Alt: (RM-VS-110 Ch 10)	D	NA	R	Q
d.	Sampler Flow Rate Measuring Device Pri: (Rotometer)	D	NA	R	Q

*During releases via this pathway.
***During purging of Reactor Containment via this pathway.

APPENDIX C
ODCM CONTROLS

TABLE 4.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1. SLCRS Unfiltered Pathway (VV-2; Also called Ventilation Vent)				
a. Noble Gas Activity Monitor Pri: (2HVS-RQ101B)	D	M(4), P(4)***	R(3)(6)	Q(5)
b. Particulate Activity Monitor Pri: (2HVS-RQ101A)	W	NA	NA	NA
c. Process Flow Rate Monitor Pri: (Monitor Item 29)	D	NA	R	Q
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	D	NA	R	Q
2. SLCRS Filtered Pathway (CV-2; Also called Elevated Release)				
a. Noble Gas Activity Monitor Pri: (2HVS-RQ109B)	D	M(4), P(4)***	R(3)(6)	Q(5)
b. Particulate Activity Monitor Pri: (2HVS-RQ109A)	W	NA	NA	NA
c. Process Flow Rate Monitor Pri: (Monitor Item 29)	D	NA	R	Q
d. Sampler Flow Rate Monitor Pri: (Monitor Items 28 and 72)	D	NA	R	Q
3. Decontamination Building Vent (DV-2)				
a. Noble Gas Activity Monitor Pri: (2RMQ-RQ301B)	D	M(4)	R(3)(6)	Q(5)
b. Particulate Activity Monitor Pri: (2RMQ-RQ301A)	W	NA	NA	NA
c. Process Flow Rate Monitor Pri: None Required	NA	NA	NA	NA
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	D	NA	R	Q
4. Condensate Polishing Building Vent (CB-2)				
a. Noble Gas Activity Monitor Pri: (2HVL-RQ112B)	D	M(4)	R(3)(6)	Q(5)
b. Particulate Activity Monitor Pri: (2HVL-RQ112A)	W	NA	NA	NA
c. Process Flow Rate Monitor Pri: None Required	NA	NA	NA	NA
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	D	NA	R	Q

APPENDIX C
ODCM CONTROLS

TABLE 4.3-13 (continued)

BV-2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Pri = Primary Instruments, Alt = Alternate Instruments

5/99

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
5. Waste Gas Storage Vault Vent (WV-2)				
a. Noble Gas Activity Monitor Pri: (2RMQ-RQ303B)	D	M(4)	R(3)(6)	Q(5)
b. Particulate Activity Monitor Pri: (2RMQ-RQ303A)	W	NA	NA	NA
c. Process Flow Rate Monitor Pri: None Required	NA	NA	NA	NA
d. Sampler Flow Rate Monitor Pri: (Monitor Item 28)	D	NA	R	Q

APPENDIX C
ODCM CONTROLS

TABLE 4.3-13 (continued)

TABLE NOTATION

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room Alarm Annunciation occurs if any of the following conditions exist:

a. Instrument indicates measured levels above the alarm/trip setpoint.

b. Downscale failure.

c. Instrument controls not set in operate mode.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that Control Room Alarm Annunciation occurs if any of the following conditions exist:

a. Instrument indicates measured levels above the alarm/trip setpoint.

b. Downscale failure.

c. Instrument controls not set in operate mode.

(3) The initial CHANNEL CALIBRATION for radioactivity measurement instrumentation shall be performed using one or more of the reference standards certified be National Bureau of Standards or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS. These standards should permit calibrating the system over its intended range of energy and rate capabilities. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration should be used, at intervals of at least once per 18 months. This can normally be accomplished during refueling outages.

(4) A SOURCE CHECK may be performed utilizing the installed means or flashing the detector with a portable source to obtain an upscale increase in the existing count rate to verify channel response.

(5) The CHANNEL FUNCTIONAL TEST shall also demonstrate that Control Room Alarm Annunciation occurs if the instrument indicates measured levels above the alarm/trip setpoint.

(6) The CHANNEL CALIBRATION shall also demonstrate that Control Room Alarm Annunciation occurs if either of the following conditions exist:

1. Downscale failure.

2. Instrument controls are not set in operate mode.

APPENDIX C
ODCM CONTROLS

CONTROLS: LIQUID EFFLUENT CONCENTRATION

3.11.1.1 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Items 2 and 3, the concentration of radioactive material released at any time from the site (see Figure 5-1) shall be limited to 10 times the EC's specified in 10 CFR Part 20, Appendix B (20.1001-20.2401), Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. This is referred to as the ODCM Effluent Concentration Limit (OEC). For dissolved or entrained noble gases, the concentration shall be limited to 2E-4 uCi/ml total activity.

Applicability:

At all times.

Action:

a. With the concentration of radioactive material released from the site to unrestricted areas exceeding the above limits; immediately restore the concentration within the above limits, and

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b. Submit a Special Report to the Commission within 30 days in accordance with 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1).

c. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.1.1.1 Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Appendix C, Table 4.11-1*.

4.11.1.1.2 The results of radioactive analysis shall be used in accordance with the methods of Section 1.2 of this manual to assure that the concentration at the point of release are maintained within the limits of Appendix C CONTROL 3.11.1.1.

4.11.1.1.3 When BV-1 primary to secondary leakage exceeds 0.1 gpm (142 gpd), samples of the Turbine Building Sump shall be obtained every 8 hours to ensure that the Turbine Building Sump concentration does not exceed 1 OEC. Once it is determined that an OEC is reached, the Turbine Building Sump shall be routed to the Chemical Waste Sump.

SURVEILLANCE REQUIREMENTS (continued)

4.11.1.1.4 When BV-2 primary to secondary leakage exceeds 0.1 gpm (142 gpd), samples of the Turbine Building Sump shall be obtained every 8 hours to ensure that the Turbine Building Sump concentration does not exceed 1 OEC. Once it is determined that an OEC is reached, the Turbine Building Sump shall be routed to Steam Generator blowdown hold tank (2SGC-TK21A or 2SGC-TK21B). 10/95

4.11.1.1.5 Prior to the BV-2 Recirculation Drain Pump(s) (2DAS-P215A/B) discharging to catch basin 16, a grap sample will be taken. The samples will be analyzed for gross activity at a sensitivity of at least 1E-7 uCi/ml. Water volume discharged shall be estimated from the number of pump operations unless alternate flow or volume instrumentation is provided.

*Radioactive liquid discharges are normally via batch modes. BV-1 and BV-2 Turbine Building Drains shall be monitored as specified in Appendix C SURVEILLANCE REQUIREMENT 4.11.1.1.3 and 4.11.1.1.4. The BV-2 Recirculation drain pump discharge shall be monitored as specified in Appendix C SURVEILLANCE REQUIREMENT 4.11.1.1.5 respectively.

APPENDIX C
ODCM CONTROLS

TABLE 4.11-1

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uCi/ml)[a]
A. Batch Waste Release Tanks[d]	P Each Batch[h]	P Each Batch[h]	Principal Gamma Emitters[f]	5E-7
			I-131	1E-6
	P One Batch/M[h]	M	Dissolved And Entrained Gases (Gamma Emitters)	1E-5
	P Each Batch[h]	M Composite[b]	H-3	1E-5
			Gross Alpha	1E-7
	P Each Batch[h]	M Composite[b]	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
B. Continuous Releases[e, g]	Grab Sample[g]	W Composite[c]	Principal Gamma Emitters[f]	5E-7
			I-131	1E-6
	Grab Sample[g]	M	Dissolved And Entrained Gases (Gamma Emitters)	1E-5
	Grab Sample[g]	M Composite[c]	H-3	1E-5
			Gross Alpha	1E-7
	Grab Sample[g]	Q Composite[b]	Sr-89, Sr-90	5E-8
			Fe-55	1E-6

APPENDIX C
ODCM CONTROLS

TABLE 4.11-1 (continued)

TABLE NOTATION

[a] The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ S_b}{(E)(V)(2.22)(Y)\ \exp(-\lambda\Delta T)}$$

where:

LLD is the lower limit of detection as defined above (as pCi per unit mass or volume);

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute);

E is the counting efficiency (as counts per transformation);

V is the sample size (in units of mass or volume);

2.22 is the number of transformations per minute per picocurie;

Y is the fractional radiochemical yield (when applicable);

λ is the radioactive decay constant for the particular radionuclide;

ΔT is the elapsed time between sample collection (or end of the sample collection period) and time of counting (for environmental samples, not plant effluent samples).

The value of S_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. Typical values of E, V, Y and ΔT should be used in the calculations. 8/95

The LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement.

TABLE 4.11-1 (continued)

TABLE NOTATION

[b] A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

[c] To be representative of the quantities and concentrations of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

[d] A batch release exists when the discharge of liquid wastes is from a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

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[e] A continuous release exists when the discharge of liquid wastes is from a non-discrete volume; e.g., from a volume of a system having an input flow during the continuous release. Releases from the Turbine Building Drains and the AFW Pump Bay Drain System and Chemical Waste Sump are considered continuous when the primary to secondary leak rate exceeds 0.1 gpm (142 gpd).

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[f] The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should be reported as "less than" the nuclide's LLD, and should not be reported as being present at the LLD level for that nuclide. The "less than" values should not be used in the required dose calculations. When unusual circumstances result in LLD's higher than required, the reasons shall be documented in the Annual Radioactive Effluent Release Report.

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[g] When radioactivity is identified in the secondary system, a RWDA-L should be prepared on a monthly basis to account for the radioactivity that will eventually be discharged to the Ohio River.

[h] Whenever the BV-2 Recirculation Drain Pump(s) are discharging to catch basin 16, sampling will be performed by means of a grab sample taken every 4 hours during pump operation.

APPENDIX C
ODCM CONTROLS

CONTROLS: LIQUID EFFLUENT DOSE

3.11.1.2 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Items 4 and 5, the dose or dose commitment to MEMBER(S) OF THE PUBLIC from radioactive materials in liquid effluents released from the reactor unit (see Figure 5-1) shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and

b. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

Applicability:

At all times.

Action:

a. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce the releases, and the proposed corrective actions to be taken to assure the subsequent releases will be within the above limits. (This Special Report shall also include (1) the results of radiological analyses of the drinking water source and (2) the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act).* 5/99

b. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.1.2.1 Dose Calculations. Cumulative dose contributions from liquid effluents shall be determined in accordance with Section 1.3 of this manual at least once per 31 days.

*Applicable only if drinking water supply is taken from the receiving water body within three miles of the plant discharge (three miles downstream only).

APPENDIX C
ODCM CONTROLS

CONTROLS: LIQUID RADWASTE TREATMENT SYSTEM

3.11.1.3 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Item 6, the Liquid Radwaste Treatment System shall be used to reduce the radioactive materials in each liquid waste batch prior to its discharge when the projected doses due to liquid effluent releases from the reactor unit (see Figure 5-1) when averaged over 31 days would exceed 0.06 mrem to the total body or 0.2 mrem to any organ.

Applicability:

At all times.

Action:

5/99

a. With liquid waste being discharged without treatment and exceeding the limits specified, prepare and submit to the Commission within 30 days pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1) a Special Report which includes the following information:

   1. Identification of the inoperable equipment or subsystems and the reason for inoperability.

   2. Action(s) taken to restore the inoperable equipment to operational status, and

   3. Summary description of action(s) taken to prevent a recurrence.

b. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.1.3.1 Doses due to liquid releases shall be projected at least once per 31 days, in accordance with Section 1.3 of this manual.

APPENDIX C
ODCM CONTROLS

CONTROLS: GASEOUS EFFLUENT DOSE RATE

3.11.2.1 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Items 3 and 7, the dose rate in the unrestricted areas (see Figure 5-1) due to radioactive materials released in gaseous effluents from the site shall be limited to the following values:

a. The dose rate limit for noble gases shall be ≤ 500 mrem/yr to the total body and ≤ 3000 mrem/yr to the skin*, and

b. The dose rate limit, inhalation pathway only, for I-131, tritium and all radionuclides in particulate form (excluding C-14) with half-lives greater than eight days shall be ≤ 1500 mrem/yr to any organ.

Applicability:

At all times.

Action:

a. With the dose rate(s) exceeding the above limits, immediately decrease the release rate to comply with the above limits(s), and

b. Submit a Special Report to the Commission within 30 days pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1). 5/99

c. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.1.1 The dose rate due to noble gaseous effluents shall be determined to be within the above limits in accordance with Section 2.2 of this manual.

4.11.2.1.2 The dose rate, inhalation pathway only, for I-131, tritium and all radionuclides in particulate form (excluding C-14) with half-lives greater than eight days in gaseous effluents, shall be determined to be within the above limits in accordance with the methods and procedures of the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Appendix C Table 4.11-2.

*During containment purge the dose rate may be averaged over 960 minutes.

APPENDIX C
ODCM CONTROLS

TABLE 4.11-2

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uCi/ml)[a]
A. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[g]	1E-4
	Each Tank* Grab Sample	Each Tank*	H-3*	1E-6
B. Containment Purge	P Each Purge[b] Grab Sample	P Each Purge[b]	Principal Gamma Emitters[g]	1E-4
			H-3	1E-6
C. Ventilation Systems[h] 1. Unit 1 Ventilation Vent 2. Unit 1 Containment/SLCRS Vent 3. Unit 1/2 Process Vent 4. Unit 2 Ventilation Vent 5. Unit 2 Containment/SLCRS Vent 6. Unit 2 Decon. Bldg. Vent 7. Unit 2 Waste Gas Storage Vault Vent 8. Unit 2 Condensate Polishing Bldg. Vent	M[b,c,e,] Grab Sample	M[b]	Principal Gamma Emitters[g]	1E-4
			H-3	1E-6

* The H-3 concentration shall be estimated prior to release and followed up with an H-3 grab sample from the Ventilation System during release.

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APPENDIX C
ODCM CONTROLS

TABLE 4.11-2 (continued)

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (uCi/ml)[a]
D. All Systems Listed Above Which Produce Continuous Release	Continuous[f]	W[d] Charcoal Sample	I-131	1E-12
			I-133	1E-10
	Continuous[f]	W[d] Particulate Sample	Principal Gamma Emitters[g] (I-131, Others)	1E-11
	Continuous[f]	M Composite Particulate Sample	Gross Alpha	1E-11
	Continuous[f]	Q Composite Particulate Sample	Sr-89, Sr-90	1E-11
	Continuous[f]	Noble Gas Monitor	Noble Gases Gross Beta And Gamma	1E-6

APPENDIX C
ODCM CONTROLS

TABLE 4.11-2 (continued)

TABLE NOTATION

[a] The Lower Limit of Detection (LLD) is defined in Table Notation (a) of Appendix C, Table 4.11-1 of Appendix C CONTROL 4.11.1.1.

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[b] Sampling and analysis shall also be performed following SHUTDOWN, STARTUP, or a THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1 hour period. This requirement does not apply if (1) analysis shows that the Dose Equivalent I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.

All samples or surveillances used to satisfy note[b] above shall be obtained within 24 hours of reaching the intended steady state power level, and analyzed within 48 hours of reaching the intended steady state power level.

[c] Tritium grab samples shall be taken at least once per 24 hours (from the appropriate ventilation release path) when the refueling canal is flooded.

[d] Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing, or after removal from sampler. Sampling shall also be performed at least once per 24 hours for at least 7 days following each SHUTDOWN, STARTUP, or THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1 hour period and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. This requirement does not apply if: (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the reactor coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3.

[e] Tritium grab samples shall be taken at least once per 7 days (from the appropriate ventilation release path of the spent fuel pool area) whenever spent fuel is in the spent fuel pool.

[f] The average ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Appendix C CONTROLS 3.11.2.1, 3.11.2.2, and 3.11.2.3.

[g] The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measureable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses should not be reported as being present at the LLD level for that nuclide. When unusual circumstances result in LLD's higher than required, the reasons shall be documented in the Annual Radioactive Effluent Release Report.

[h] Only when this release path is in use.

APPENDIX C
ODCM CONTROLS

CONTROLS: DOSE-NOBLE GASES

3.11.2.2 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Items 5 and 8, the air dose from the reactor unit in unrestricted areas (see Figure 5-1) due to noble gases released in gaseous effluents shall be limited to the following:

a. During any calendar quarter, to ≤ 5 mrad for gamma radiation and ≤ 10 mrad for beta radiation.

b. During any calendar year, to ≤ 10 mrad for gamma radiation and ≤ 20 mrad for beta radiation.

Applicability:

At all times.

Action:

a. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission with in 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions taken to reduce the releases and the proposed corrective actions to be taken to assure the subsequent releases will be within the above limits. 5/99

b. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.2.1 Dose Calculations. Cumulative dose contributions shall be determined in accordance with Section 2.3 of this manual at least once every 31 days.

APPENDIX C
ODCM CONTROLS

CONTROLS: DOSE-RADIOIODINES, RADIOACTIVE MATERIAL IN PARTICULATE FORM, AND RADIONUCLIDES OTHER THAN NOBLE GASES

3.11.2.3 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Items 5 and 9, the dose to MEMBER(S) OF THE PUBLIC from radioiodines and radioactive materials in particular form (excluding C-14), and radionuclides (other than noble gases) with half-lives greater than eight days in gaseous effluents releases from the reactor unit (see Figure 5-1) shall be limited to the following:

a. During any calendar quarter to ≤ 7.5 mrem to any organ, and

b. During any calendar year to ≤ 15 mrem to any organ.

Applicability:

At all times.

Action:

5/99

a. With the calculated dose from the release of radioiodines, radioactive materials in particulate form, (excluding C-14), and radionuclides (other than noble gases) with half-lives greater than eight days, in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report, which identifies the cause(s) for exceeding the limit and defines the corrective actions taken to reduce the releases and the proposed corrective actions to be taken to assure the subsequent releases will be within the above limits.

b. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.3.1 Dose Calculations. Cumulative dose contributions shall be determined in accordance with Section 2.3 of this manual at least once every 31 days.

CONTROLS: GASEOUS RADWASTE TREATMENT SYSTEM

3.11.2.4 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Item 6, the Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases from the reactor unit (see Figure 5-1), when averaged over 31 days, would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. The appropriate portions of the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases from the reactor unit (see Figure 5-1) when averaged over 31 days would exceed 0.3 mrem to any organ.

Applicability:

At all times.

Action:

a. With gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report which includes the following information. 5/99

   1. Identification of the inoperable equipment or subsystems and the reason for inoperability,

   2. Action(s) taken to restore the inoperable equipment to operational status, and

   3. Summary description of action(s) taken to prevent a recurrence.

b. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS (continued)

4.11.2.4.1 Doses due to gaseous releases from the site shall be projected at least once per 31 days, in accordance with Section 2.3 of this manual.

APPENDIX C
ODCM CONTROLS

CONTROLS: TOTAL DOSE

3.11.4.1 In accordance with BV-1 and BV-2 Technical Specification 6.8.6a, Item 10, the annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to ≤ 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to ≤ 75 mrems.

Applicability:

At all times.

Action:

5/99

a. With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Appendix C CONTROL 3.11.1.2a, 3.11.1.2b, 3.11.2.2a, 3.11.2.2b, 3.11.2.3a, or 3.11.2.3b, calculations shall be made including direct radiation contributions from the units (including outside storage tanks, etc.) to determine whether the above limits of Appendix C CONTROL 3.11.4.1 have been exceeded. If such is the case, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report that defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in 10 CFR 20.405(c), shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

b. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS (continued)

4.11.4.1.1 Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Appendix C SURVEILLANCE REQUIREMENTS 4.11.1.2.1, 4.11.2.2.1, and 4.11.2.3.1. 5/97

4.11.4.1.2 Cumulative dose contributions from direct radiation from the units (including outside storage tanks, etc.) shall be determined in accordance with Section 4 of this manual. This requirement is applicable only under conditions set forth in Action a. of Appendix C CONTROL 3.11.4.1.

APPENDIX C
ODCM CONTROLS

CONTROLS: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

3.12.1 In accordance with BV-1 and BV-2 Technical Specification 6.8.6b, Item 1, the radiological environmental monitoring program shall be conducted as specified in Appendix C, Table 3.12-1.

Applicability:

At all times.

Action:

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a. With the radiological environmental monitoring program not being conducted as specified in Appendix C, Table 3.12-1, prepare and submit to the Commission, in the Annual Radiological Environmental Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period.

b. With the level of radioactivity in an environmental sampling medium at one or more of the locations specified in Appendix C, Table 3.12-1 exceeding the limits of Appendix C, Table 3.12-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days from the end of affected calendar quarter a Special Report pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1) which includes an evaluation of any release conditions, environmental factors or other aspects which caused the limits of Appendix C, Table 3.12-2 to be exceeded. This report is not required if the measured level of radioactive was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Report.

When more than one of the radionuclides in Table 3.12-2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{Concentration (1)}}{\text{Limit Level (1)}} + \frac{\text{Concentration (2)}}{\text{Limit Level (2)}} + \ldots \geq 1.0$$

c. With milk or fresh leafy vegetable samples unavailable from the required number of locations selected in accordance with Appendix C CONTROL 3.12.2 and listed in the ODCM, obtain replacement samples. The locations from which samples were unavailable may then be deleted from those required by Appendix C, Table 3.12-1 and the ODCM provided the locations from which the replacement samples were obtained are added to the environmental monitoring program as replacement locations, if available.

d. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS (continued)

4.12.1.1 The radiological environmental monitoring samples shall be collected pursuant to Appendix C, Table 3.12-1 from the locations given in the ODCM and shall be analyzed pursuant to be requirements of Appendix C, Tables 3.12-1 and 4.12-1.

TABLE 3.12-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY[a] OF ANALYSIS
1. AIRBORNE a. Radioiodine And Particulates	5 locations 1. One sample from a control location 10-20 miles distant and in the least prevalent wind direction 2. One sample from vicinity of community having the highest calculated annual average ground level D/Q.	Continuous operation of sampler with sample collection at least weekly.	Each radioiodine canister. Analyze for I-131; Particulate sampler. Analyze for gross beta weekly[b]; Perform gamma isotopic analysis on composite (by location) sample at least quarterly.
2. DIRECT RADIATION	40 locations ≥ 2 TLDs or a pressurized ion chamber at each location.	Continuous measurement with collection at least quarterly.	Gamma dose, quarterly.

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[a] Analysis frequency same as sampling frequency unless otherwise specified.
[b] Particulate samples are not counted for ≥ 24 hours after filter change. Perform gamma isotopic analysis on each sample when gross beta is >10 times the yearly mean of control samples.

**Sample locations are given on figures and tables in Section 3 of this manual.

APPENDIX C
ODCM CONTROLS

TABLE 3.12-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND LOCATIONS**	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY[(a)] OF ANALYSIS
3. WATERBORNE a. Surface	2 locations. 1. One sample upstream. 2. One sample downstream.	Composite* sample collected over a period not to exceed 1 month.	Gamma isotopic analysis of composite sample by location) monthly; Tritium analysis of composite sample at least quarterly.
b. Drinking	2 locations.	Composite* sample collected over a period not to exceed 2 weeks.	I-131 analysis of each composite sample; Gamma isotopic analysis of composite sample (by location) monthly; Tritium analysis of composite sample quarterly.
c. Groundwater	N/A - No wells in lower elevations between plant and river		
d. Sediment From Shoreline	1 location.	Semi-annually.	Gamma isotopic analysis semi-annually.

11/98

(a) Analysis frequency same as sampling frequency unless otherwise specified.

*Composite samples shall be collected by collecting an aliquot at intervals not exceeding two hours. For the upstream surface water location, a weekly grab sample, composited each month based on river flow at time of sampling, is also acceptable.

**Sample locations are given on figures and tables in Section 3 of this manual.

APPENDIX C
ODCM CONTROLS

TABLE 3.12-1 (continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF SAMPLES AND LOCATIONS**	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY[a] OF ANALYSIS
4. INGESTION a. Milk	4 locations.[c] 1. Three samples selected on basis of highest potential thyroid dose using milch census data. 2. One local large dairy.	At least bi-weekly when animals are on pasture; at least monthly at other times.	Gamma isotopic and I-131 analysis of each sample.
b. Fish	2 locations.	Semi-annual. One sample of available species.	Gamma isotopic analysis on edible portions.
c. Food Products (Leafy Vegetables)	4 locations. 1. Three locations within 5 miles. 2. One control location.	Annually at time of harvest.	Gamma isotopic analysis and I-131 analysis on edible portion.

[a] Analysis frequency same as sampling frequency unless otherwise specified.
[c] Other dairies may be included as control station or for historical continuity. These would not be modified on basis of milch animal census.

**Sample locations are given on figures and tables in Section 3 of this manual.

APPENDIX C
ODCM CONTROLS

TABLE 3.12-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

ANALYSIS	WATER (pCi/l)	REPORTING LEVELS AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, WET)	MILK (pCi/l	BROAD LEAF VEGETABLES (pCi/kg, WET)
H-3	2E+4[a]				
Mn-54	1E+3		3E+4		
Fe-59	4E+2		1E+4		
Co-58	1E+3		3E+4		
Co-60	3E+2		1E+4		
Zn-65	3E+2		2E+4		
Zr/Nb-95	4E+2				
I-131	2[b]	0.9		3	1E+2
Cs-134	30	10	1E+3	60	1E+3
Cs-137	50	20	2E+3	70	2E+3
Ba/La-140	2E+2			3E+2	

a For drinking water samples. This is a 40 CFR Part 141 value. If no drinking water pathway exists, a value of 3E+4 pCi/l may be used.

b If no drinking water pathway exists, a value of 20 pCi/l may be used.

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APPENDIX C
ODCM CONTROLS

TABLE 4.12-1

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)[a,e]

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GAS (pCi/m^3)	FISH (pCi/kg, WET)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, WET)	SEDIMENT (pCi/kg, DRY)
Gross Beta	4	1E-2				
H-3	2000[d]					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr-95	30[c]					
Nb-95	15[c]					
I-131	1[b]	7E-2		1	60	
Cs-134	15	5E-2	130	15	60	150
Cs-137	18	6E-2	150	18	80	180
Ba-140	60[c]			60		
La-140	15[c]			15		

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APPENDIX C
ODCM CONTROLS

TABLE 4.12-1 (continued)

TABLE NOTATION

[a] The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ S_b}{(E)(V)(2.22)(Y)\ \exp(-\lambda\Delta T)}$$

where:

LLD is the lower limit of detection as defined above (as pCi per unit mass or volume);

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute);

E is the counting efficiency (as counts per transformation);

V is the sample size (in units of mass or volume);

2.22 is the number of transformations per minute per picocurie;

Y is the fractional radiochemical yield (when applicable);

λ is the radioactive decay constant for the particular radionuclide;

ΔT is the elapsed time between sample collection (or end of the sample collection period) and time of counting (for environmental samples, not plant effluent samples).

The value of S_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., potassium-40 in milk samples). Typical values of E, V, Y and ΔT should be used in the calculations.

APPENDIX C
ODCM CONTROLS

TABLE 4.12-1 (continued)

TABLE NOTATION

5/97

The LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLD's will be achieved under routine conditions. Occasionally, background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLD's unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Report.

[b] If no drinking water pathway exists, a value of 15 pCi/l may be used.

[c] If parent and daughter are totaled, the most restrictive LLD should be applied.

[d] If no drinking water pathway exists, a value of 3000 pCi/l may be used.

[e] This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall be identified in the Annual Radiological Environmental Report.

APPENDIX C
ODCM CONTROLS

CONTROLS: RADIOLOGICAL ENVIRONMENTAL MONITORING - LAND USE CENSUS

3.12.2 In accordance with BV-1 and BV-2 Technical Specification 6.8.6b, Item 2, a land use census shall be conducted and shall identify the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 square feet producing broad leaf vegetation in each of the 16 meteorological sectors within a distance of five miles. For elevated releases as defined in Regulatory Guide 1.111, (Rev. 1), July, 1977, the land use census shall also identify the locations of all milk animals and all gardens of greater than 500 square feet producing fresh leafy vegetables in each of the 16 meteorological sectors within a distance of three miles. 5/99

Applicability:

At all times.

Action:

a. With a land use census identifying a location(s) which yields a calculated dose or dose commitment greater than the values currently being calculated in Appendix C SURVEILLANCE REQUIREMENT 4.11.2.3.1, prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report, which identifies the new location(s).

b. With a land use census identifying a milk animal location(s) which yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with Appendix C CONTROL 3.12.1 prepare and submit to the Commission within 30 days, pursuant to 10 CFR 20.2203(a)(2)(v) and 10 CFR 50.4(b)(1), a Special Report, which identifies the new location. The new location shall be added to the radiological environmental monitoring program within 30 days, if possible. The milk sampling program shall include samples from the three active milk animal locations, having the highest calculated dose or dose commitment. Any replaced location may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted. 5/99

c. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.12.2.1 The land use census shall be conducted at least once per 12 months between the dates of June 1 and October 1 using that information which will provide the best results, such as by a door-to-door survey*, aerial survey, or by consulting local agriculture authorities.

* Confirmation by telephone is equivalent to door-to-door.

APPENDIX C
ODCM CONTROLS

CONTROLS: RADIOLOGICAL ENVIRONMENTAL MONITORING - INTERLABORATORY COMPARISON PROGRAM

3.12.3 In accordance with BV-1 and BV-2 Technical Specification 6.8.6b, Item 3, analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program.

Applicability:

At all times.

Action:

a. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Report.

b. The provisions of Appendix C CONTROL 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.12.3.1 The results of analyses performed as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Report.

APPENDIX D
BASES FOR ODCM CONTROLS

This appendix contains the Bases for the ODCM Controls that were transferred from the Bases Section of the Technical Specification per Unit 1/2 Amendments 188/70, and in accordance with Generic Letter 89-01 and Generic Letter 89-01, Supplement No. 1 (NUREG-1301).

10/95

The numbering of each specific Bases contained in this appendix does not appear to be sequential. This is intentional, as all Bases numbers remained the same when they were transferred from the Technical Specifications. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

APPENDIX D
BASES FOR ODCM CONTROLS

BASES: INSTRUMENTATION

3/4.3.3.9 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with Section 1 of this manual to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

3/4.3.3.10 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with Section 2 of this manual to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also includes provisions for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the waste gas holdup system. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

APPENDIX D
BASES FOR ODCM CONTROLS

BASES: LIQUID EFFLUENTS

3/4.11.1.1 LIQUID EFFLUENT CONCENTRATION

This CONTROL is provided to ensure that the concentration of radioactive materials released in Liquid waste effluents from the site to unrestricted areas will be less than 10 times the EC's specified in 10 CFR Part 20, Appendix B (20.1001-20-2401), Table 2, Column 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will result in exposure within (1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to an individual and (2) the limits of 10 CFR Part 20.1302 to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2. 8/95

3/4.11.1.2 LIQUID EFFLUENT DOSE

This CONTROL is provided to implement the requirements of Sections II.A, III.A, and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies which can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR 141. The dose calculations in the Section 1.3 of this manual implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in Section 1.3 of this manual for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in 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, October, 1977, and Regulatory Guide 1.113, "Estimating Aquatic Dispersion Of Effluents From Accidental And Routine Reactor Releases For The Purpose Of Implementing Appendix I," April, 1977. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.113.

BASES: LIQUID EFFLUENTS (continued)

This CONTROL applies to the release of liquid effluents for Beaver Valley Power Station, Unit No. 1 or Unit No. 2. These units have shared radwaste treatment systems, the liquid effluents from the shared system are proportioned among the units sharing that system.

3/4.11.1.3 LIQUID WASTE TREATMENT SYSTEM

The CONTROL that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and design objective given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the liquid radwaste treatment system were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents. This specification applies to Beaver Valley Power Station, Unit No. 1 or Unit No. 2.

APPENDIX D
BASES FOR ODCM CONTROLS

BASES: GASEOUS EFFLUENTS

3/4.11.2.1 GASEOUS EFFLUENT DOSE RATE

This CONTROL is provided to ensure that the dose at anytime at the site boundary from gaseous effluents from all units on the site will be within the annual dose limits of 10 CFR Part 20 for unrestricted areas. The annual dose limits are the doses associated with the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 1. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area, either within or outside the site boundary, to annual average concentrations exceeding the limits specified in Appendix B, Table II of 10 CFR Part 20 (10 CFR Part 20.106(b)). For individuals who may at times be within the site boundary, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the site boundary to $\leq$ 500 mrem/year to the total body or to $\leq$ 3,000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to $\leq$ 1,500 mrem/year.

3/4.11.2.2 DOSE, NOBLE GASES

This CONTROL is provided to implement the requirements of Sections II.B, III.A, and IV.A of Appendix I, 10 CFR Part 50. The CONTROL implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the release of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated. The dose calculations established in Section 2.3 of this manual for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in 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, October, 1977 and Regulatory Guide 1.111, "Methods For Estimating Atmospheric Transport And Dispersion of Gaseous Effluents In Routine Releases From Light-Water-Cooled Reactors," Revision 1, July, 1977. The equations in Section 2.3 of this manual are provided for determining the air doses at the exclusion area boundary, and are based upon the historical average

BASES: GASEOUS EFFLUENTS (continued)

atmospheric conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111. This specifications applies to the release of gaseous effluents from Beaver Valley Power Station, Unit No. 1 or Unit No. 2.

3/4.11.2.3 DOSE, RADIOIODINES, RADIOACTIVE MATERIAL IN PARTICULATE FORM AND RADIONUCLIDES OTHER THAN NOBLE GASES

This CONTROL is provided to implement the requirements of Sections II.C, III.A, and IV.A of Appendix I, 10 CFR Part 50. The CONTROLS are the guides set forth in Section II.C of Appendix I.

The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." The calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The calculational methods in Section 2.3 of this manaual are for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation Of Annual Doses To Man From Routing Releases Of Reactor Effluents For The Purpose Of Evaluating Compliance With 10 CFR Part 50, Appendix I," Revision 1, October, 1977 and Regulatory Guide 1.111, "Methods For Estimating Atmospheric Transport And Dispersion Of Gaseous Effluents In Routine Releases From Light-Water-Cooled Reactors," Revision 1, July, 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for radioiodines, radioactive material in particulate form, and radionuclides other than noble gases are dependent on the existing radionuclide pathways to man, in the unrestricted area. The pathways which are examined in the development of these calculations are: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and 4) deposition on the ground with subsequent exposure of man. This CONTROL applies to radioactive material in particulate form and radionuclides other than noble gases released from Beaver Valley Power Station, Unit No. 1 or Unit No.2.

APPENDIX D
BASES FOR ODCM CONTROLS

BASES: GASEOUS EFFLUENTS (continued)

3/4.11.2.4 GASEOUS RADWASTE TREATMENT SYSTEM

The CONTROL that the appropriate portions of these systems be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and design objective Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents. This specification applies to gaseous radwaste from Beaver Valley Power Station, Unit No. 1 or Unit No. 2.

BASES: TOTAL DOSE

3/4.11.4 TOTAL DOSE

This CONTROL is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR Part 20 by 46 FR 18525. The CONTROL requires the preparation and submittal of a Special Report whenever the calculated doses due to releases of radioactivity and to radiation from uranium fuel cycle sources exceed 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems. For sites containing up to 4 reactors, it is highly unlikley that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within twice the dose design objectives of Appendix I, and if direct radiation doses from the units (including outside storages tanks, etc.) are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 5 miles must be considered. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR 190.11 and 10 CFR 20.405c, is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in CONTROLS 3.11.1.1 and 3.11.2.1. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

APPENDIX D
BASES FOR ODCM CONTROLS

BASES: RADIOLOGICAL ENVIRONMENTAL MONITORING

3/4.12.1 MONITORING PROGRAM

The radiological monitoring program required by this CONTROL provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of MEMBER(S) OF THE PUBLIC resulting from the station operation. This monitoring program thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. The initially specified monitoring program will be effective for at least the first 3 years of commercial operation. Following this period, program changes may be initiated based on operational experience.

The detection capabilities required by Appendix C, Table 4.12-1 are state-of-the-art for routine environmental measurements in industrial laboratories. The LLD's for drinking water meet the requirements of 40 CFR 141.

3/4.12.2 LAND USE CENSUS

This CONTROL is provided to ensure that changes in the use of unrestricted areas are identified and that modifications to the monitoring programs are made if required by the results of this census. The best survey information from the door-to-door survey, aerial survey, or by consulting with local agriculture authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were used: 1) that 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and 2) a vegetation yield of 2 kg/square meter.

3/4.12.3 INTERLABORATORY COMPARISON PROGRAM

The CONTROL for participation in an Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of a quality assurance program for environmental monitoring in order to demonstrate that the results are reasonably valid.

APPENDIX E
ANNUAL REPORTS

This appendix contains the reporting requirements for the Annual Radioactive Effluent Release Report and the Annual Radiological Environmental Report that were transferred from the Technical Specification per Unit 1/2 Amendments 188/70 and in accordance with Generic Letter 89-01 and Generic Letter 89-01, Supplement No. 1 (NUREG 1301). 10/95

The numbering of each specific Report contained in this appendix does not appear to be sequential. This is intentional, as all Report numbers remained the same when they were transferred from the Technical Specifications. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

APPENDIX E
ANNUAL REPORTS

ANNUAL REPORT

ANNUAL RADIOLOGICAL ENVIRONMENTAL REPORT[3]

5/99

6.9.1.10 Routine radiological environmental operating reports covering the operation of the unit during the previous calendar year shall be submitted prior to May 15 of each year and will include reporting any deviations not reported under 10 CFR 20.2203(a)(2)(v) or 10 CFR 50.4(b)(1) with respect to any Appendix C CONTROL.

The annual radiological environmental reports shall include:

- Summaries, interpretations, and statistical evaluation of the results of the radiological environmental surveillance activities for the report period, including a comparison with pre-operational studies, operational controls (as appropriate), and previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment.
- The results of the land use censuses required by Appendix C CONTROL 3.12.2.
- If harmful effects or evidence of irreversible damage are detected by the monitoring, the report shall provide an analysis of the problem and a planned course of action to alleviate the problem.
- Summarized and tabulated results in the format of Appendix E, Table 6.9-1 of all radiological environmental samples taken during the report period. In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.
- A summary description of the radiological environmental monitoring program.
- A map of all sampling locations keyed to a table giving distances and directions from one reactor.
- The results of licensee participation in the Interlaboratory Comparison Program required by Appendix C CONTROL 3.12.3.

[3] A single submittal may be made for a multiple unit site. The submittal should combine those sections that are common to both units.

APPENDIX E
ANNUAL REPORTS

TABLE E:6.9-1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name Of Facility________________________ Docket No.__________

Location Of Facility________________________ Reporting Period__________
(County, State)

5/99

MEDIUM OF PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPE AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMITS OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS	LOCATIONS WITH HIGHEST ANNUAL MEAN		CONTROL LOCATIONS	NONROUTINE REPORTED MEASUREMENTS
			MEAN (F)[b] RANGE[b]	NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	MEAN (F)[b] RANGE[b]	

[a]Nominal Lower Limits Of Detection (LLD) as defined in Table Notation [a] of Table 4.12-1 of Appendix C CONTROL 3.11.1.1.
[b]Mean and range based upon detectable measurement only. Fraction of detectable measurement at specified locations is indicated in parenthesis (f).

APPENDIX E
ANNUAL REPORTS

ANNUAL REPORT

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT[4]

5/99

6.9.1.11 Routine radioactive effluent release reports covering the operation of the unit during the previous calendar year shall be submitted prior to April 1 of each year in accordance with 10 CFR 50.36a. This report is prepared and submitted with the guidance presented in BVPS-HPM Appendix 5, and at a minimum, shall contain the following:

- A summary of the quantities of radioactive liquid and gaseous effluent and solid waste released from the unit as outlined in Regulatory Guide 1.21, Revision 1, June, 1974, "Measuring, Evaluating, And Reporting Radioactivity In Solid Wastes And Releases Of Radioactive Materials In Liquid And Gaseous Effluents From Light-Water-Cooled Nuclear Power Plants," with data summarized on a quarterly basis following the format of Appendix B thereof.

- An assessment of radiation doses from the radioactive liquid and gaseous effluents released from the unit during each calendar quarter as outlined in Regulatory Guide 1.21. In addition, the unrestricted area boundary maximum noble gas gamma air and beta air doses shall be evaluated. The assessment of radiation doses shall be performed in accordance with this manual.

- Any licensee initiated changes to the ODCM made during the 12 month period.

- Any radioactive liquid or gaseous effluent monitoring instrumentation channels not returned to OPERABLE status within 30 days, and why the inoperability was not corrected in a timely manner. This applies to the liquid or gaseous effluent monitoring instrumentation channels required to be OPERABLE per Appendix C CONTROLS 3.3.3.9 and 3.3.3.10.

- Any ODCM Appendix C SURVEILLANCE REQUIREMENT deficiencies. This applies to monitoring, sampling and analysis and dose projection.

- The reasons when unusual circumstances result in LLD's higher than required by Appendix C, Table 4.11-1 and 4.11-2.

[4] A single submittal may be made for a multiple unit site. The submittal should combine those sections that are common to all units at the site; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

APPENDIX E
ANNUAL REPORTS

ANNUAL REPORT (continued)

° The following information for each type of solid waste shipped offsite during the report period:

- container volume
- total curie quantity (determined by measurement or estimate)
- principal radionuclides (determined by measurement or estimate)
- type of waste (e.g., spent resin, compacted dry waste, evaporator bottoms)
- type of container (e.g., LSA, Type A, Type B, Large Quantity)
- solidification agent (e.g., cement)
- classification and other requirements specified by 10 CFR Part 61

° An annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing of wind speed, wind direction, atmospheric stability, and precipitation (if measured) on magnetic tape, or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability.

° An assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the previous calendar year.

° An assessment of the radiation doses from radioactive effluents to MEMBER(S) OF THE PUBLIC due to their activities inside the site boundary (Figure 5-1) during the report period. All assumptions used in making these assessments (e.g., specific activity, exposure time, and location) shall be included in these reports. The assessment of radiation doses shall be performed in accordance with Section 4 of this manual.

° An assessment of radiation doses to the likely most exposed real individual from reactor releases for the previous calendar year to show conformance with 40 CFR 190, Environmental Radiation Protection Standards For Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Revision 1. The SKYSHINE Code (available from Radiation Shielding Information Center, (ORNL)) is acceptable for calculating the dose contribution from direct radiation due to N-16.

° If quantities of radioactive materials released during the reporting period are significantly above design objectives, the report must cover this specifically.

Appendix F
ODCM Controls Procedure Matrix

This appendix contains plant procedure references for Radiological Effluent Technical Specifications (RETS) that were transferred from the Technical Specification Procedure Matrix.

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The numbering of each specific Control, Surveillance Requirement and Table contained in this Appendix does not appear to be sequential. This is intentional, as all Control, Surveillance Requirement and Table numbers remained the same when they were transferred from the Technical Specifications Procedure Matrix. This was done in an effort to minimize the amount of plant procedure changes and to eliminate any confusion associated with numbering changes.

APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:1a
BV-1 LIQUID EFFLUENT MONITOR SURVEILLANCES

<u>ODCM Appendix C Control 3.3.3.9</u>: Liquid Effluent Monitors In Appendix C Table 3.3-12 OPERABLE
<u>APPLICABILITY</u>: During Releases Through The Flow Path

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ODCM SR	DESCRIPTION	PROCEDURE	
4.3.3.9	Test Monitors at Table 4.3-12 Frequency		
4.3.3.9.1	Monitors Providing Alarm and Automatic Termination		
4.3.3.9.1.a	Liquid Radwaste Effluent Line (RM-LW-104)	MSP 1-43.18 1OM-54.3 1/2OM-17.4A.D OST 1.43.9	Channel Calibration (Log L5) Channel Check Source Check Functional Test
4.3.3.9.1.b	Liquid Waste Contaminated Drain Line (RM-LW-116)	MSP 1-43.23 1OM-54.3 1/2OM-17.4A.D OST 1.43.9	Channel Calibration (Log L5) Channel Check Source Check Functional Test
4.3.3.9.1.c	Auxiliary Feed Pump Bay Drain Monitor (RM-DA-100)	MSP 1-43.70 1OM-54.3 1OM-54.3 OST 1.43.9	Channel Calibration (Log L5) Channel Check (Log L5) Source Check Functional Test
4.3.3.9.2	Monitors Providing Alarm, but Not Prividing Auto Termination		
4.3.3.9.2.a	Component Cooling - Recirculation Spray Hx River Water Monitor (RM-RW-100)	MSP 1-43.10 1OM-54.3 OST 1.43.9 OST 1.43.9A	Channel Calibration (Log L5) Channel Check Functional Test Source Check
4.3.3.9.3	Flow Rate Measurement Devices		
4.3.3.9.3a	Liquid Radwaste Effluent Lines (FR-LW-103 for RM-LW-116) (FR-LW-104 for RM-LW-104)	MSP 1-17.5 MSP 1-17.6 MSP 1-17.7 MSP 1-17.8 MSP 1-17.9 MSP 1-17.10 1OM-54.3 1OM-54.3 1OM-54.3	Channel Calibration F-LW-104-1 Channel Calibration F-LW-104-2 Channel Calibration F-LW-104-1 Functional Test F-LW-104-2 Functional Test F-LW-103 Functional Test (Log L5) FR-LW-103 Channel Check (Log L5) FR-LW-104-1 Channel Check (Log L5) FR-LW-104-2 Channel Check
4.3.3.9.3.b	Cooling Tower Blowdown Line (FT-CW-101) (FT-CW-101-1)	MSP 1-31.4 MSP 1-31.5 MSP 1-31.6 MSP 1-31.7 1OM-54.3 1OM-54.3	F-CW-101 Channel Calibration F-CW-101 Functional Test F-CW-101-1 Channel Calibration F-CW-101-1 Functional Test (Log L5) FT-CW-101 Channel Check (Log L5) FT-CW-101-1 Channel Check
4.3.3.9.4	Tank Level Indicating Devices		
4.3.3.9.4.a	Primary Water Storage Tank (LI-PG-115A for BR-TK-6A)	MSP 1-8.1 MSP 1-8.3 1OM-54.3	L-PG115A Functional Test L-PG115A Channel Calibration (Log L5) When Adding to Tank
4.3.3.9.4.b	Primary Water Storage Tank (LI-PG-115B for BR-TK-6B)	MSP 1-8.2 MSP 1-8.4 1OM-54.3	L-PG-115B Functional Test L-PG-115B Channel Calibration (Log L5) When Adding to Tank
4.3.3.9.4.c	Steam Generator Drain Tank (LI-LW-110 for LW-TK-7A)	MSP 1-17.1 MSP 1-17.3 1OM-54.3	L-LW110 Functional Test L-LW110 Channel Calibration (Log L5) When Adding to Tank
4.3.3.9.4.d	Steam Generator Drain Tank (LI-LW-111 for LW-TK-7B)	MSP 1-17.2 MSP 1-17.4 1OM-54.3	L-LW111 Functional Test L-LW111 Channel Calibration (Log L5) When Adding to Tank

APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:1b
BV-2 LIQUID EFFLUENT MONITOR SURVEILLANCES

ODCM Appendix C Control 3.3.3.9: Liquid Effluent Monitors In Appendix C Table 3.3-12 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

ODCM SR	DESCRIPTION	PROCEDURE	
4.3.3.9	Test Monitors at Table 4.3-12 Frequency		
4.3.3.9.1	Monitors Providing Alarm and Automatic Termination		
4.3.3.9.1.a	Liquid Waste Process Effluent Monitor (2SGC-RQ100)	HPM-RP 6.5 HPM-RP 6.5A MSP 2-43.39 1/2OM-17.4A.C 2OM-54.3 2OM-25.4.L 2OM-25.4.N OST 2.43.3	Source Check Source Check Channel Calibration Source Check (Log L5) Channel Check Source Check Source Check Functional Test
4.3.3.9.2	Flow Rate Measurement Devices		
4.3.3.9.2.a	Liquid Radwaste Effluent (2SGC-FIS100)	MSP 2-25.1 MSP 2-43.39 2OM-54.3	2SGC-P26A,B Calibration / Functional Test Channel Calibration (Log L5) Channel Check
4.3.3.9.2.b	Cooling Tower Blowdown Line (2CWS-FT101)	MSP 2-31.4 MSP 2-31.5 2OM-54.3	Channel Calibration Functional Test (Log L5) Channel Check

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:2a
BV-1 GASEOUS EFFLUENT MONITOR SURVEILLANCES

ODCM Appendix C Control 3.3.3.10: Gaseous Effluent Monitors In Appendix C Table 3.3-13 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

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ODCM SR	DESCRIPTION	PROCEDURE	
4.3.3.10	Test Monitors at Table 4.3-13 Frequency		
4.3.3.10.1	Gaseous Waste / Process Vent		
4.3.3.10.1.a	Noble Gas Activity Monitor Pri: (RM-GW-108B)	MSP 1-43.22 1OM-19.4.E 1OM-19.4.E 1OM-54.3 1OM-54.3 OST 1.43.9	Channel Calibration Channel Check Source Check (Log L5) RM-GW-108B Channel Check (Log L5) RM-GW-109 Channel Check Functional Test
4.3.3.10.1.b	Particulate Activity Monitor Pri: (RM-GW-108A)	1OM-54.3	(Log L5) Channel Check
4.3.3.10.1.c	System Effluent Flow Rate Measuring Device Pri: (FR-GW-108) Alt: (RM-GW-109 Ch 10)	MSP 1-19.5 MSP 1-19.6 1OM-54.3	Functional Test Channel Calibration (Log L5) Channel Check
4.3.3.10.1.d	Sampler Flow Rate Measuring Device Pri: (Rotometer)	MSP 1-43.21 MSP 1-43.71	Channel Calibration Rotometer Functional Test
4.3.3.10.2	Auxiliary Building Vent		
4.3.3.10.2.a	Noble Gas Activity Monitor Pri: (RM-VS-101B) Alt: (RM-VS-109 Ch 5)	MSP 1-43.13 1OM-54.3 1OM-54.3 OST 1.43.7A OST 1.43.9 OST 1.43.9A	Channel Calibration (Log L5) RM-VS-101B Channel Check (Log L5) RM-VS-109 Channel Check Alternate Noble Gas Monitor Functional Test Functional Test Source Check
4.3.3.10.2.b	Particulate Activity Monitor Pri: (RM-VS-101A) Alt: (RM-VS-109 Ch 1)	1OM-54.3	(Log L5) Channel Check
4.3.3.10.2.c	System Effluent Flow Rate Measuring Device Pri: (FR-VS-101) Alt: (RM-VS-109 Ch 10)	MSP 1-44.7 MSP 1-44.8 1OM-54.3	Functional Test Channel Calibration (Log L5) Channel Check
4.3.3.10.2.d	Sampler Flow Rate Measuring Device Pri: (Rotometer)	MSP 1-44.7 MSP 1-44.8 1OM-54.3	Functional Test Channel Calibration (Log L5) Channel Check
4.3.3.10.3	Rx Containment / SLCRS Vent		
4.3.3.10.3.a	Noble Gas Activity Monitor Pri: (RM-VS-107B) Alt: (RM-VS-110 Ch 5)	MSP 1-43.20 1OM-54.3 1OM-54.3 OST 1.43.7A OST 1.43.9 OST 1.43.9A	Channel Calibration (Log L5) RM-VS-107B Channel Check (Log L5) RM-VS-110 Channel Check Alternate Noble Gas Monitor Functional Test Functional Test Source Check
4.3.3.10.3.b	Particulate Activity Monitor Pri: (RM-VS-107A) Alt: (RM-VS-110 Ch 1)	1OM-54.3	(Log L5) Channel Check
4.3.3.10.3.c	System Effluent Flow Rate Measuring Device Pri: (FR-VS-112) Alt: (RM-VS-110 Ch 10)	MSP 1-44.9 MSP 1-44.10 1OM-54.3	Channel Calibration Functional Test (Log L5) Channel Check
4.3.3.10.3.d	Sampler Flow Rate Measuring Device Pri: (Rotometer)	MSP 1-43.19 MSP 1-43.72 Radcon Log	Channel Calibration Rotometer Functional Test Channel Check

APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:2b
BV-2 GASEOUS EFFLUENT MONITOR SURVEILLANCES

ODCM Appendix C Control 3.3.3.10: Gaseous Effluent Monitors In Appendix C Table 3.3-13 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

ODCM SR	DESCRIPTION	PROCEDURE	
4.3.3.10	Test Monitors at Table 4.3-13 Frequency		
4.3.3.10.1	SLCRS - Unfiltered Pathway		
4.3.3.10.1.a	Noble Gas Activity Monitor Pri: (2HVS-RQ101B)	MSP 2-43.36 2OM-54.3 OST 2-43.9 HPM-RIP 2.18	Channel Calibration (Log L5) Channel Check Functional Test Source Check (DRMS Auto Function)
4.3.3.10.1.b	Particulate Activity Monitor Pri: (2HVS-RQ101A)	2OM-54.3	(Log L5) Channel Check
4.3.3.10.1.c	Process Flow Rate Monitor Pri: (Monitor Item 29)	MSP 2-43.36 MSP 2-43.36A MWR 2OM-54.3	Channel Calibration Functional Test Velocity Probe Calibration (Log L5) Channel Check
4.3.3.10.1.d	Sampler Flow Rate Monitor Pri: (Monitor Item 28)	MSP 2-43.36 MSP 2-43.36A 2OM-54.3	Channel Calibration Functional Test (Log L5) Channel Check
4.3.3.10.2	SLCRS - Filtered Pathway		
4.3.3.10.2.a	Noble Gas Activity Monitor Pri: (2HVS-RQ109B)	MSP 2-43.32 MSP 2-43.33 2OM-54.3 OST 2.43.8 HPM-RIP 2.18	2HVS-RQ109A Channel Calibration 2HVS-RQ109B,C,D Channel Calibration (Log L5) Channel Check Functional Test Source Check (DRMS Auto Function)
4.3.3.10.2.b	Particulate Activity Monitor Pri: (2HVS-RQ109A)	MSP 2-43.32 2OM-54.8	Channel Calibration (Log L5) Channel Check
4.3.3.10.2.c	Process Flow Rate Monitor Pri: (Monitor Item 29)	MSP 2-43.32a MSP 2-43.33 2OM-54.3	Functional Test 2HVS-RQ109B,C,D, Channel Calibration (Log L5) Channel Check
4.3.3.10.2.d	Sampler Flow Rate Monitor Pri: (Monitor Items 28 & 72)	MSP 2-43.32 MSP 2-43.32A MSP 2-43.33 2OM-54.3	2HVS-RQ109A Channel Calibration Functional Test 2HVS-RQ109B,C,D, Channel Calibration (Log L5) Channel Check
4.3.3.10.3	Decontamination Building Vent		
4.3.3.10.3.a	Noble Gas Activity Monitor Pri: (2RMQ-RQ301B)	MSP 2-43.35 2OM-54.3 OST 2.43.9 HPM-RIP 2.18	Channel Calibration (Log L5) Channel Check Functional Test Source Check (DRMS Auto Function)
4.3.3.10.3.b	Particulate Activity Monitor Pri: (2RMQ-RQ301A)	2OM-54.3	(Log L5) Channel Check

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:2b
BV-2 GASEOUS EFFLUENT MONITOR SURVEILLANCES

ODCM Appendix C Control 3.3.3.10: Gaseous Effluent Monitors In Appendix C Table 3.3-13 OPERABLE
APPLICABILITY: During Releases Through The Flow Paths

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ODCM SR	DESCRIPTION	PROCEDURE	
4.3.3.10.3.d	Sampler Flow Rate Monitor Pri: (Monitor Item 28)	MSP 2-43.35 MSP 2-43.35A 2OM-54.3	Channel Calibration Functional Test (Log L5) Channel Check
4.3.3.10.4	Condensate Polishing Building Vent		
4.3.3.10.4.a	Noble Gas Activity Monitor Pri: (2HVL-RQ112B)	MSP 2-43.38 2OM-54.3 OST 2.43.9 HPM-RIP 2.18	Channel Calibration (Log L5) Channel Check Functional Test Source Check (DRMS Auto Function)
4.3.3.10.4.b	Particulate Activity Monitor Pri: (2HVL-RQ112A)	2OM-54.3	(Log L5) Channel Check
4.3.3.10.4.d	Sampler Flow Rate Monitor Pri: (Monitor Item 28)	MSP 2-43.38 2OM-54.3	Channel Calibration (Log L5) Channel Check
4.3.3.10.5	Waste Gas Storage Vault Vent		
4.3.3.10.5.a	Noble Gas Activity Monitor Pri: (2RMQ-RQ303B)	MSP 2-43.37 2OM-54.3 OST 2.43.9 HPM-RIP 2.18	Channel Calibration (Log L5) Channel Check Functional Test Source Check (DRMS Auto Function)
4.3.3.10.5.b	Particulate Activity Monitor Pri: (2RMQ-RQ303A)	2OM-54.3	(Log L5) Channel Check
4.3.3.10.5.d	Sampler Flow Rate Monitor Pri: (Monitor Item 28)	MSP 2-43.37 MSP 2-43.37A 2OM-54.3	Channel Calibration Functional Test (Log L5) Channel Check

APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:3
BV-1 AND 2 LIQUID EFFLUENT CONCENTRATION SURVEILLANCES

ODCM Appendix C Control 3.11.1.1: Effluent Concentration Within 10 Times 10CFR20 EC's
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.11.1.1.1	Sample and Analyze Radioactive Liquid Wastes per Table 4.11-1	HPM-CP 1	Liquid Radwaste Discharges
4.11.1.1.1.A	Batch Waste Release Tanks	CHM CP 3	Sampling and Testing
		CHM CP 5	Radiochemical Procedures
		CHM CP 8	Logs and Forms (Analysis)
		CHM CP 9	Conduct of Operation
		HPM-RP 6.1	Liquid Waste Tank Sampling
		HPM-RIP2.2	Effluent Monitors
		HPM-RIP2.21	DRMS Effluent Monitors
		HPM-RIP5.17	ND-9900 Counting System
4.11.1.1.1.B	Continuous Releases	CHM CP 3	Sampling and Testing
		CHM CP 5	Radiochemical Procedures
		CHM CP 8	Logs and Forms (Analysis)
		CHM CP 9	Conduct of Operation
		HPM-RIP 2.2	Effluent Monitors
		HPM-RIP 2.21	DRMS Effluent Monitors
		HPM-RIP 5.17	ND-9900 Counting System
4.11.1.1.2	Use ODCM Methodology to Assure Compliance	HPM-RP 6.5	Liquid Waste Discharge Authorization
		HPM-RP 6.5A	Liquid Waste Discharge Authorization
		1/2OM-17.4A.D	Liquid Waste Discharge (with RP 6.5 or 6.5A)
4.11.1.1.3	Take Turbine Building Grab Sample When BV-1 Primary to Secondary Leakage Exceeds 0.1 gpm (142 gpd)	CHM CP 3	Sampling and Testing
		CHM CP 5	Leak Rate Calculations
		CHM CP 8	Logs and Forms (Analysis)
		HPM-RP 6.5	Liquid Waste Discharge Authorization
		HPM-RP 6.5A	Liquid Waste Discharge Authorization
		HPM-RIP 2.2	Effluent Monitors
4.11.1.1.4	Take Turbine Building Grab Sample When BV-2 Primary to Secondary Leakage Exceeds 0.1 gpm (142 gpd)	CHM CP 3	Sampling and Testing
		CHM CP 5	Leak Rate Calculations
		CHM CP 8	Logs and Forms (Analysis)
		HPM-RP 6.5	Liquid Waste Discharge Authorization
		HPM-RP 6.5A	Liquid Waste Discharge Authorization
		HPM-RIP 2.21	DRMS Effluent Monitors
4.11.1.1.5	Take Grab Samples Prior to BV-2 Recirculation Drain Pump Discharge to Catch Basin No. 16	HPM-RP 6.1	Liquid Waste Tank Sampling
		2OM-9.2	Rx Plant Vents and Drains (CB-16)
		2OM-9.4F	Drain RSS Pump Casing / Pit
		OM 51-86	OM Clearance 51-86 (2DAS-P215A/B)

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:4
BV-1 AND 2 LIQUID EFFLUENT DOSE SURVEILLANCES

ODCM Appendix C Control 3.11.1.2: Liquid Effluent Dose
APPLICABILITY: At All Times

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ODCM SR	DESCRIPTION	PROCEDURE	
4.11.1.2.1	Using the ODCM - Determine Cumulative Dose From Liquid Effluents Every 31 Days	HPM-RP 6.5	Liquid Waste Discharge Authorization
		HPM-RP 6.5A	Liquid Waste Discharge Authorization
		HP Letter	Monthly Dose Projection (with RP 6.5 or 6.5A)
		1/2OM-17.4A.D	Liquid Waste Discharge (with RP 6.5 or 6.5A)

APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:5
BV-1 AND 2 LIQUID EFFLUENT TREATMENT SURVEILLANCES

ODCM Appendix C Control 3.11.1.3: Liquid Effluent Treatment System
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.11.1.3.1	Using the ODCM - Project the Liquid Release Dose Every 31 Days	HPM-RP 6.5	Liquid Waste Discharge Authorization
		HPM-RP 6.5A	Liquid Waste Discharge Authorization
		HP Letter	Monthly Dose Projection (with RP 6.5 or 6.5A)
		1/2OM-17.4A.D	Liquid Waste Discharge (with RP 6.5 or 6.5A)

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:6
BV-1 AND 2 GASEOUS EFFLUENT DOSE SURVEILLANCES

ODCM Appendix C Control 3.11.2.1: Gaseous Effluent Dose Rates
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.11.2.1.1	Using the ODCM - Determine the Noble Gas Effluent Dose Rate	HPM-RP 6.6 HPM-RP 6.6A HPM-RP 6.10 HPM-RP 6.12 HPM-RP 6.12A 1OM-19.4E 1/2OM-19.4A.B	Gaseous Waste Discharge Authorization Gaseous Waste Discharge Authorization Continuous Ventilation Path Releases Abnormal Gaseous Releases Abnormal Gaseous Releases BV-1 Decay Tank Discharge (with RP 6.6 or 6.6A) BV-2 Decay Tank Discharge (with RP 6.6 or 6.6A)
4.11.2.1.2	Sample and Analyze per Table 4.11-2 to Determine Inhalation Pathway Dose	HPM-CP 1	Radwaste Disposal
4.11.2.1.2.A	Waste Gas Storage Tank - Grag Sample Each Tank	CHM CP 3 CHM CP 5 CHM CP 8 CHM CP 9 HPM-RP 6.3 HPM-RP 6.4 HPM-RP 6.6 HPM-RP 6.6A HPM-RIP 2.2 HPM-RIP 2.20 HPM-RIP 2.21	Sampling and Testing Radiochemical Procedures Logs and Forms (Analysis) Conduct of Operation BV-1 Gas Tank Sampling BV-2 Gas Tank Sampling Gaseous Waste Discharge Authorization Gaseous Waste Discharge Authorization Effluent Monitors DRMS Process Monitors DRMS Effluent Monitors
4.11.2.1.2.B	Containment Purge - Grag Sample Each Purge	CHM CP 3 CHM CP 5 CHM CP 8 CHM CP 9 HPM-RP 6.6 HPM-RP 6.6A HPM-RP 7.3 HPM-RIP 2.2 HPM-RIP 2.20 HPM-RIP 2.21	Sampling and Testing Radiochemical Procedures Logs and Forms (Analysis) Conduct of Operation Gaseous Waste Discharge Authorization Gaseous Waste Discharge Authorization Air Sampling Effluent Monitors DRMS Process Monitors DRMS Effluent Monitors
4.11.2.1.2.C	Ventilation Systems		
4.11.2.1.2.C.1 thru 4.11.2.1.C.3 and 4.11.2.1.2.D.1 thru 4.11.2.1.2.D.3	BV-1 Grab and Continuous Samples	CHM CP 3 CHM CP 5 CHM CP 8 CHM CP 9 HPM-RP 6.10 HPM-RIP 2.2 HPM-RIP 2.8 HPM-RIP 2.10 HPM-RIP 2.32 HPM-RIP 2.33 HPM-REOP 1.1 HPM-REOP 1.2	Sampling and Testing Radiochemical Procedures Logs and Forms (Analysis) Conduct of Operation Continuous Ventilation Path Releases Effluent Monitors SA-9/10 Noble Gas Monitor SPING-4 Monitor RMS Sample Flow Valve Line-Up (normal) RMS Sample Flow Valve Line-Up (after sampling) SA-9/10 Emergency Operation SPING-4 Emergency Operation
4.11.2.1.2.C.4 thru 4.11.2.1.2.C.8 and 4.11.2.1.2.D.4 thru 4.11.2.1.2.D.8	BV-2 Grab and Continuous Samples	CHM CP 3 CHM CP 5 CHM CP 8 CHM CP 9 HPM-RP 6.10 HPM-RIP 2.21 HPM-REOP 4.1	Sampling and Testing Radiochemical Procedures Logs and Forms (Analysis) Conduct of Operation Continuous Ventilation Path Releases DRMS Effluent Monitors Emergency Operation of WRGM Assembly

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:7
BV-1 AND 2 GASEOUS EFFLUENT AIR DOSE SURVEILLANCES

ODCM Appendix C Control 3.11.2.2: Gaseous Effluent Air Doses
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.11.2.2.1	Using the ODCM - Determine the Noble Gas Cumulative Dose Contributions Every 31 Days	HPM-RP 6.6	Gaseous Waste Discharge Authorization
		HPM-RP 6.6A	Gaseous Waste Discharge Authorization
		HPM-RP 6.10	Continuous Ventilation Path Releases
		HPM-RP 6.12	Abnormal Gaseous Releases
		HPM-RP 6.12A	Abnormal Gaseous Releases
		HPM-RIP 2.2	Effluent Monitors
		HPM-RIP 2.21	DRMS Effluent Monitors
		1OM-19.4E	BV-1 Decay Tank Discharge (with RP 6.6 or 6.6A)
		1/2OM-19.4A.B	BV-2 Decay Tank Discharge (with RP 6.6 or 6.6A)
		HP Letter	Monthly Dose Projection (with RP 6.6 or 6.6A)

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:8
BV-1 AND 2 GASEOUS EFFLUENT PARTICULATE AND IODINE DOSE SURVEILLANCES

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ODCM Appendix C Control 3.11.2.3: Gaseous Effluent Particulate And Iodine Doses
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.11.2.3.1	Using the ODCM - Determine the Particulate & Radioiodine Cumulative Dose Contributions Every 31 Days	HPM-RP 6.6	Gaseous Waste Discharge Authorization
		HPM-RP 6.6A	Gaseous Waste Discharge Authorization
		HPM-RP 6.10	Continuous Ventilation Path Releases
		HPM-RP 6.12	Abnormal Gaseous Releases
		HPM-RP 6.12A	Abnormal Gaseous Releases
		HPM-RIP 2.2	Effluent Monitors
		HPM-RIP 2.21	DRMS Effluent Monitors
		1OM-19.4E	BV-1 Decay Tank Discharge (with RP 6.6 or 6.6A)
		1/2OM-19.4A.B	BV-2 Decay Tank Discharge (with RP 6.6 or 6.6A)
		HP Letter	Monthly Dose Projection (with RP 6.6 or 6.6A)

APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:9
BV-1 AND 2 GASEOUS EFFLUENT TREATMENT SURVEILLANCES

ODCM Appendix C Control 3.11.2.4: Gaseous Effluent Treatment System
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.11.2.4.1	Using the ODCM - Project the Gas Release Dose from the Site Every 31 Days	HPM-RP 6.6	Gaseous Waste Discharge Authorization
		HPM-RP 6.6A	Gaseous Waste Discharge Authorization
		HPM-RP 6.10	Continuous Ventilation Path Releases
		HPM-RP 6.12	Abnormal Gaseous Releases
		HPM-RP 6.12A	Abnormal Gaseous Releases
		HP Letter	Monthly Dose Projection (with RP 6.6 or 6.6A)
		1OM-19.4E	BV-1 Decay Tank Discharge (with RP 6.6 or 6.6A)
		1/2OM-19.4A.B	BV-2 Decay Tank Discharge (with RP 6.6 or 6.6A)

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:10
BV-1 AND 2 TOTAL DOSE SURVEILLANCES

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ODCM Appendix C Control 3.11.4.1: Liquid And Gaseous Doses
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.11.4.1.1	Using the ODCM - Determine Cumulative Gas & Liquid Dose per Appendix C Control 3.11.1.2, 3.11.2.2, 3.11.2.3	HPM-APP 5	Compliance with RG 1.21 & T.S. (40CFR190)
		HPM-RP 6.5	Liquid Waste Discharge Authorization
		HPM-RP 6.5A	Liquid Waste Discharge Authorization
		HPM-RP 6.6	Gaseous Waste Discharge Authorization
		HPM-RP 6.6A	Gaseous Waste Discharge Authorization
		HPM-RP 6.10	Continuous Ventilation Path Releases
		HPM-RP 6.12	Abnormal Gaseous Releases
		HPM-RP 6.12A	Abnormal Gaseous Releases
		REAM-REAP 6.105	Effluent Data Processing (40CFR190)

APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:11
BV-1 AND 2 REMP SURVEILLANCES

ODCM Appendix C Control 3.12.1: Radiological Environmental Monitoring Program (REMP)
APPLICABILITY: At All Times

ODCM SR	DESCRIPTION	PROCEDURE	
4.12.1.1	Using Locations in the ODCM - Collect and Analyze Samples per Tables 3.12-1, 3.12-2 & 4.12-1:	EPMP 2.01 EPMP 3.01	Description of REMP Environmental Sampling

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APPENDIX F
ODCM CONTROLS PROCEDURE MATRIX

TABLE F:12
BV-1 AND 2 LAND USE CENSUS SURVEILLANCES

ODCM Appendix Control 3.12.2: Land Use Census
APPLICABILITY: At All Times

3/98

ODCM SR	DESCRIPTION	PROCEDURE	
4.12.2.1	Using the Best Available Method - Conduct a Land Use Census Yearly Between 6/1 & 10/1	EPMP 2.01	Description of REMP