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Ref. # Tech. Spec. 5.6.3

April 29, 2010

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT
DOCKET NOS. 50-445 AND 50-446
TRANSMITTAL OF YEAR 2009 RADIOACTIVE EFFLUENT RELEASE REPORT

Dear Sir or Madam:

In accordance with Comanche Peak Nuclear Power Plant Unit 1 and 2 Technical specifications (TS) 5.6.3 and Section 6.9.1.4 of the Comanche Peak Offsite Dose Calculation Manual (ODCM), enclosed is the Radioactive Effluent Release Report which covers the reporting period from January 1, 2009 through December 31, 2009.

The tabular summaries of radioactive liquid and gaseous releases are provided in the format defined in Appendix B of Regulatory Guide 1.21, Rev. 1, dated June, 1974.

During this reporting period there were two revisions to the ODCM. These revisions are discussed in the report and are denoted by change bars in the copy of the ODCM provided in Enclosure 2.

If there are any questions regarding this report, please contact Steve Dixon at (254) 897-5482 or Bill Moore at (254) 897-8222.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By: Fred W. Madden
Fred W. Madden
Director, Oversight & Regulatory Affairs

IE48
A009
NRR

Enclosures - 1. 2009 Radiological Effluent Release Report
2. Comanche Peak Nuclear Power Plant Offsite Dose Calculation Manual (ODCM) Unit 1 and 2, Revision 29 and Revision 30

c - E. E. Collins, Region IV
L. K. Gibson, NRR
Resident Inspectors, Comanche Peak (w/o Encl 2)

2009 RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 2009 - December 31, 2009

Prepared By: David Valentine Date: 3/25/2010

Reviewed By: Randy Walsh Date: 3/30/2010

Approved By: Bill Moore Date: 4/4/2010

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CPNPP	Comanche Peak Nuclear Power Plant
ECL	Effluent Concentration Limit
LDCR	Licensing Document Change Request
LHMT	Laundry Holdup and Monitor Tanks
LVW	Low Volume Waste
ODCM	Offsite Dose Calculation Manual
PET	Primary Effluent Tanks
pCi	Picocurie
REC	Radiological Effluent Control
SORC	Station Operations Review Committee
uCi	Microcurie
WMT	Waste Monitor Tanks
WWHT	Waste Water Holdup Tanks

1.0 Introduction

This Radioactive Effluent Release Report, for Comanche Peak Nuclear Power Plant Unit 1 and Unit 2, is submitted as required by Technical Specification 5.6.3 and Offsite Dose Calculation Manual (ODCM) Administrative Control 6.9.1.4 for the period January 1, 2009, through December 31, 2009.

1.1 Executive Summary

The radioactive effluent monitoring program for the year 2009 was conducted as described in the following report. The results of the monitoring program indicate the continued effort to maintain the release of radioactive effluents to the environment as low as reasonably achievable (ALARA).

Gaseous Effluents:

A summary of all the radioactive gaseous releases to the environment during 2009

Gaseous Waste	2009	2008	Comments
Tritium Activity	56.2 Ci	61.27 Ci	1
Total Fission and Activation Activity	5.08 Ci	996.9 Ci	2,5
Total Particulate Activity	0 Ci	8.44E-05 Ci	2,3,5
Gross Alpha Activity	0 Ci	0 Ci	3
Iodine Activity	0 Ci	1.41E-04 Ci	2,3,5
Calculated Gamma Air Dose	4.79e-4 mRad	3.93E-02 mRad	2,5
Calculated Beta Air Dose	1.10e-3 mRad	0.112 mRad	2,5
Total Whole body dose	0.0789 mRem	0.0868 mRem	4,5

Comments:

1. The major contributor to gaseous tritium activity is evaporation from the spent fuel pools. Factors contributing to the tritium activity in the pools is related to the type of fuel used (i.e., 18-month fuel) the core life and power output and number of core cycles.

2. Because CPNPP had no fuel defects during 2009 (whereas 2008 did), most of the total activities and dose decreased significantly in 2009.

3. No alpha, iodine or particulate activity was released.

4. Total whole body dose is very low (0.31% of Technical Specification).

5. There was only one refueling outage in 2009 versus two in 2008.

Overall the gaseous radioactivity releases from CPNPP are well controlled and maintained ALARA. CPNPP is well below all applicable limits for gaseous releases. Because neither unit had fuel defects during 2009, most of the released activity and associated dose was significantly lower than those during 2008.

Liquid Effluents:

A summary of all the radioactive liquid releases to the environment during 2009:

Liquid Waste	2009	2008	Comments
Total Activity (excluding tritium)	3.75mCi	15.2 mCi	1,2
Tritium Activity	1623 Ci	2426 Ci	1,2
Total Whole Body Dose	0.129 mRem	0.127 mRem	

Comments

1. There was only one refueling outage in 2009 versus two in 2008.

1. Because CPNPP had no fuel defects during 2009 (whereas 2008 did), most of the total activities and dose decreased significantly in 2009.

Meteorological Data

The CPNPP meteorological system achieved a greater than 90% recoverable data rate for the joint frequency parameters required by Regulatory Guide 1.23 for wind speed, wind direction and delta temperature. The individual percent recoveries are listed below:

Meteorological Data Recovery	
Channel	% Recovery
Wind Speed	97.6
Wind Direction	97.9
Delta Temperature A	99
Delta Temperature B	98.7

Monitors OOS > 30 Days

During 2009 there were no Technical Specification/ODCM effluent radiation monitors out of service for >30 days.

ODCM Changes

There were two revisions to the ODCM submitted in 2009.

Solid Waste

Summary of the solid waste production

Total Waste	2009	2008	% Error	Comments
Shipped (m3)	168	362	25%	
Shipped (Ci)	.175	383	25%	1
Buried (m3)	28.5	40.6	25%	
Buried (Ci)	2.34	559	25%	1

Comments

1. The large decrease in Ci shipped was due to clearing our backlog of B & C Class (high activity) waste last year prior to Barnwell closing.

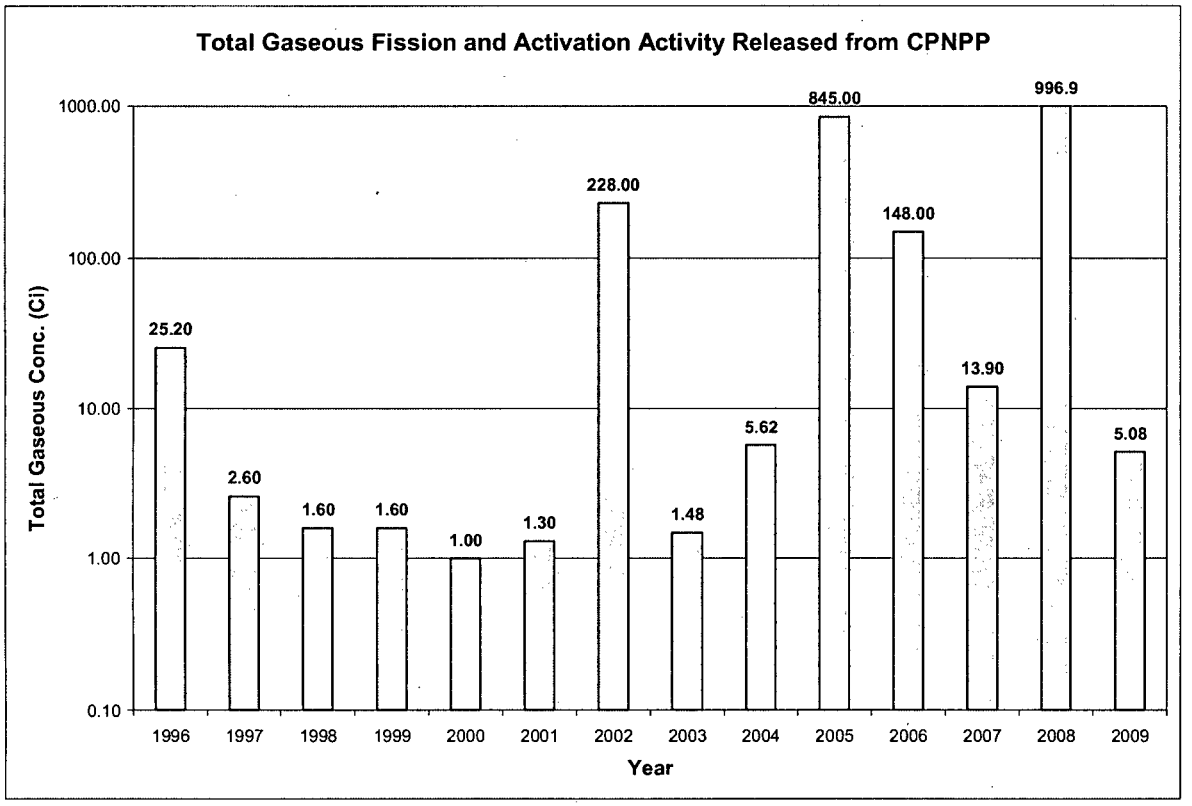
Overall, the radioactive effluent monitoring program has been conducted in an appropriate manner to ensure the activity released and associated dose to the public has been maintained as low as reasonably achievable (ALARA).

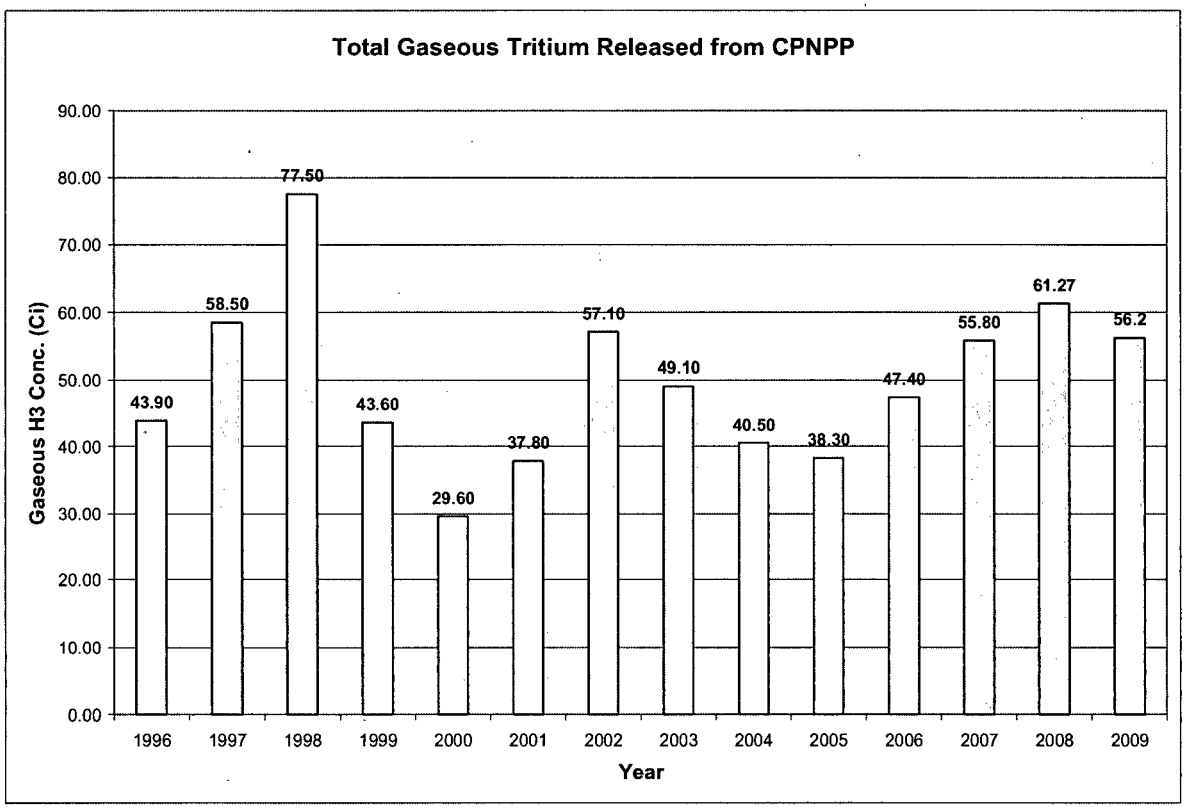
Groundwater Tritium

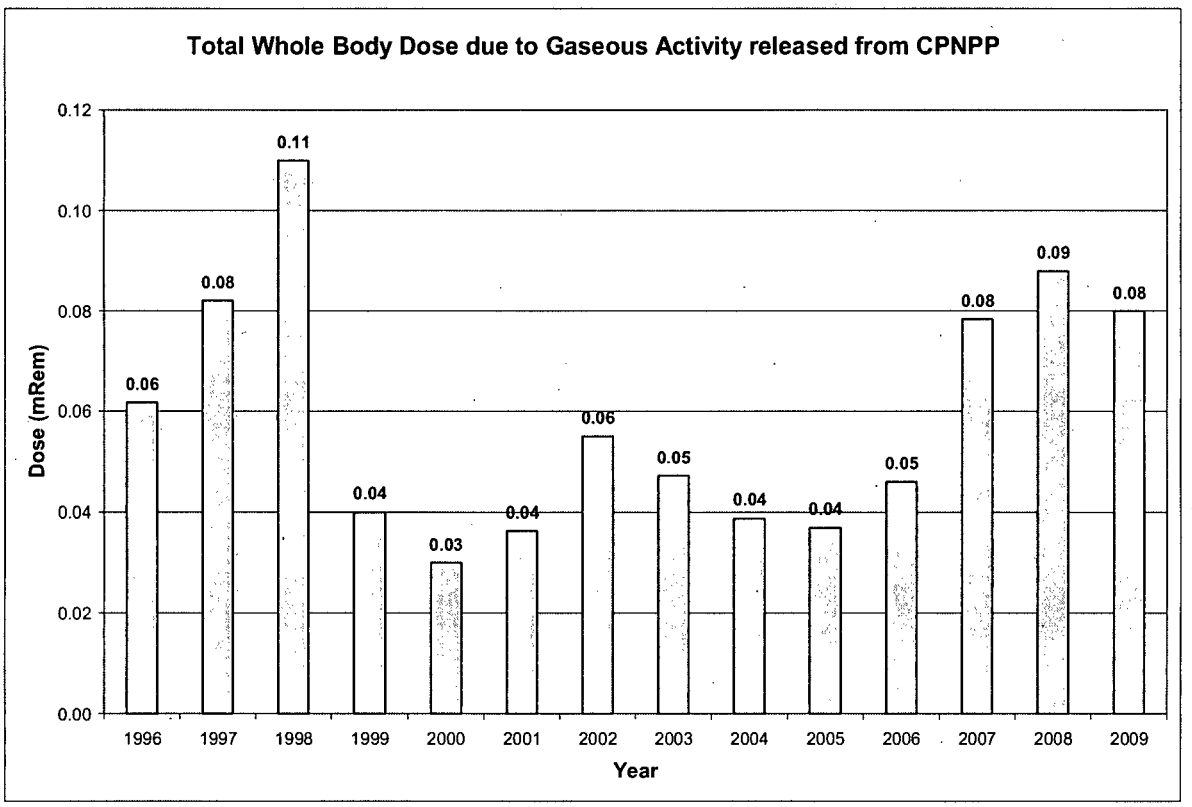
CR-2009-001351-00 documented some positive indications of tritium in the seepage sump near the water plant and in the A and C Waste Monitoring Basins. All of these samples were well below the state reportable criteria of 20,000 pCi/L. None of these positive tritium values were released to the environment.

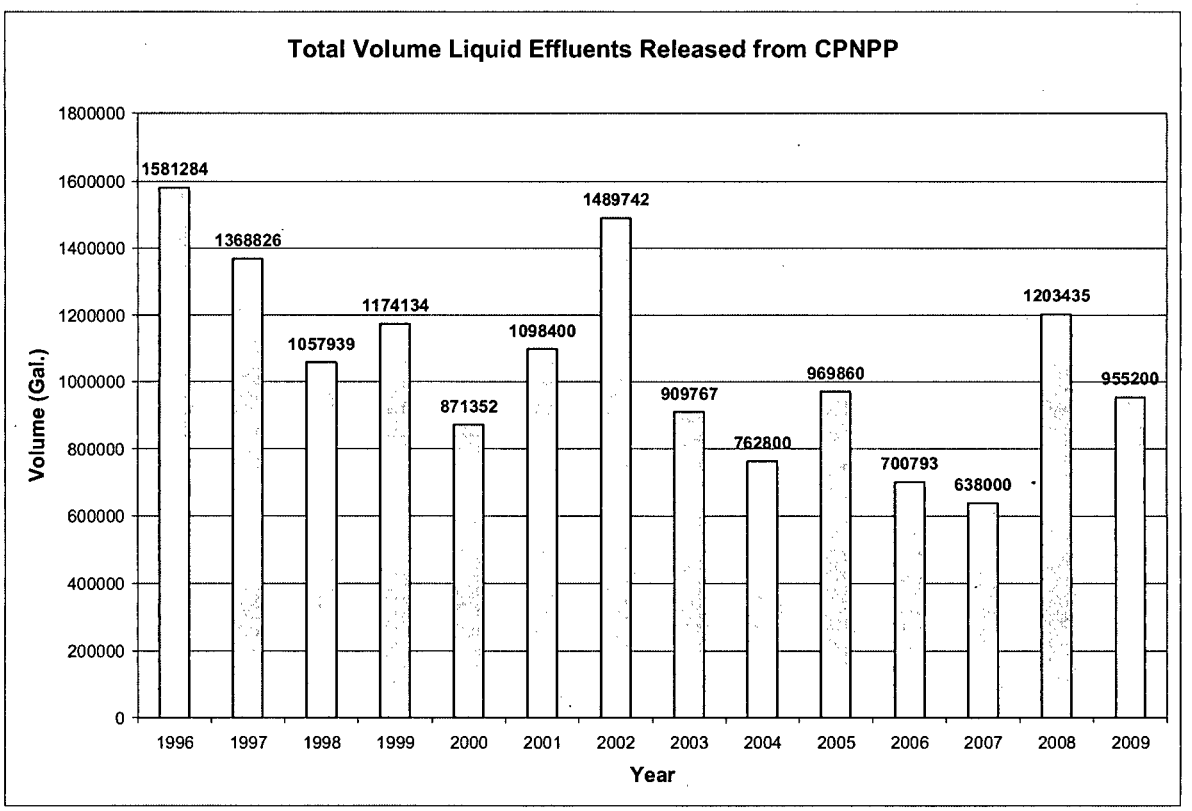
See section 8.8 for details.

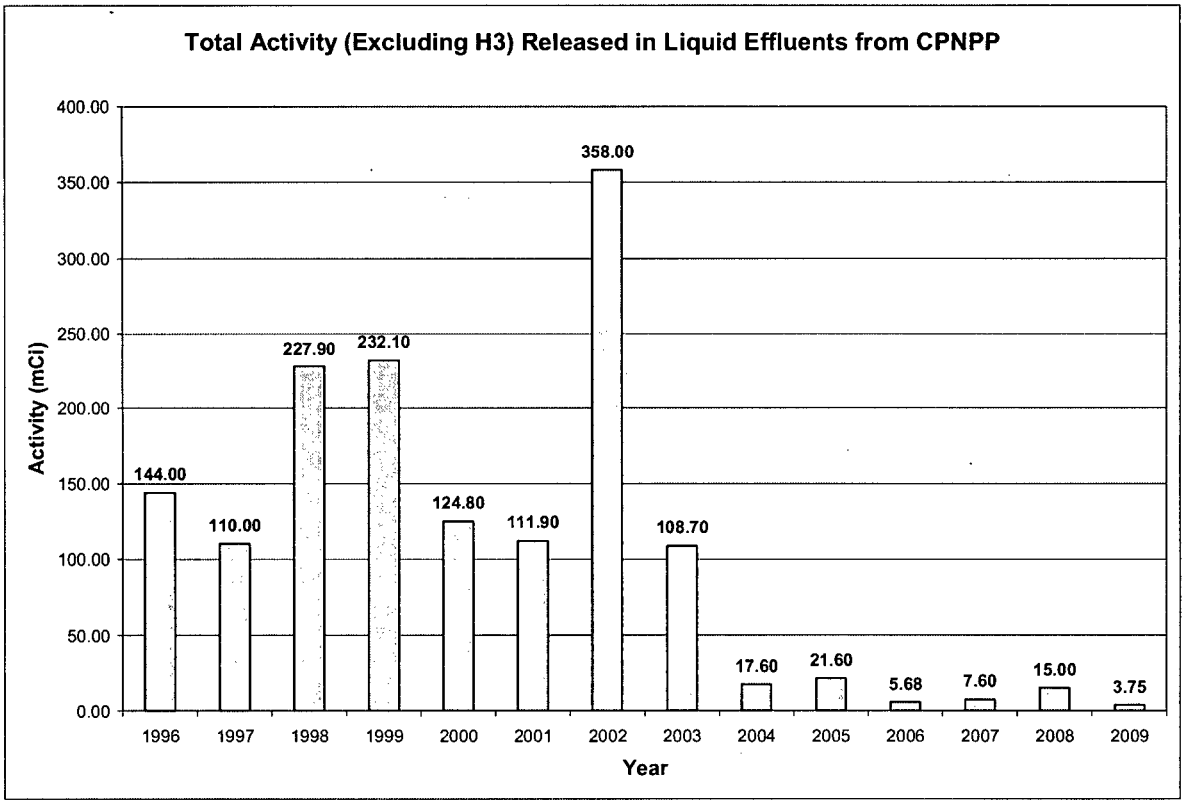
1.2 Historical Trend Graphs

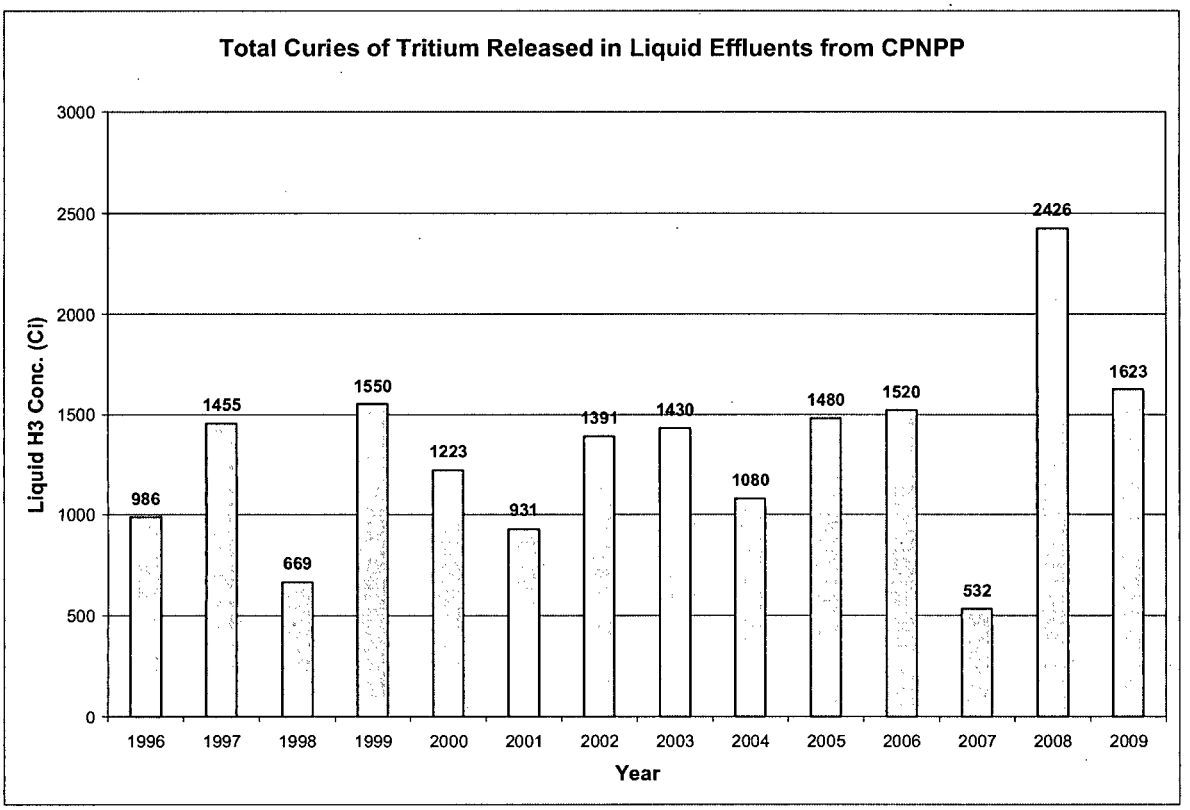


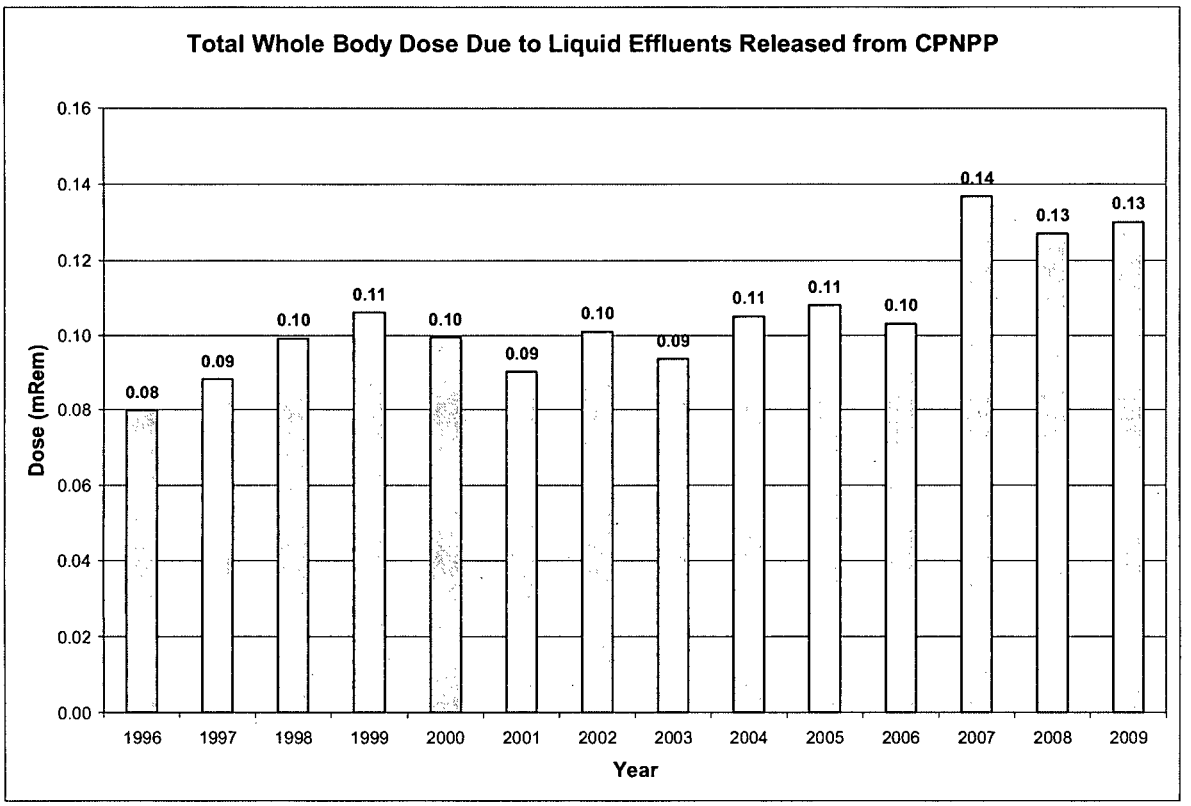


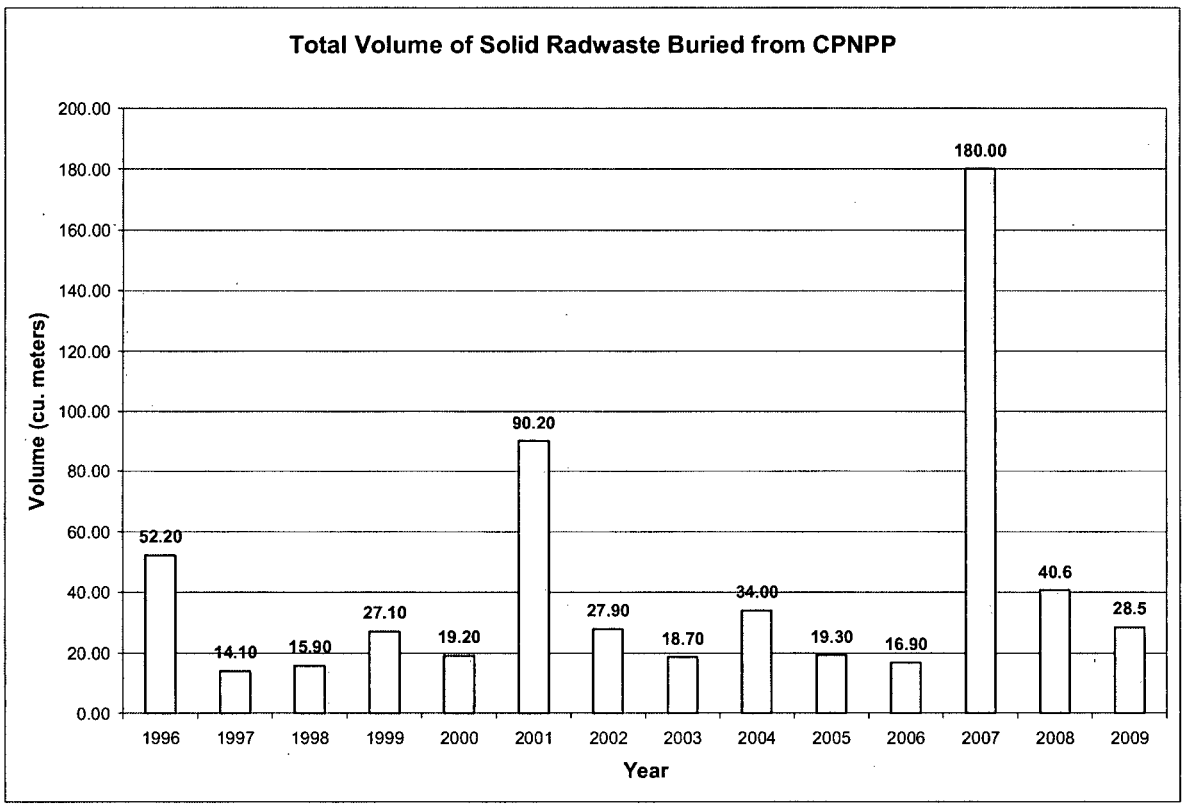

Total Whole Body Dose due to Gaseous Activity released from CPNPP
Dose (mRem)
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.06
0.08
0.11
0.04
0.03
0.04
0.06
0.05
0.04
0.04
0.05
0.08
0.09
0.08
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year

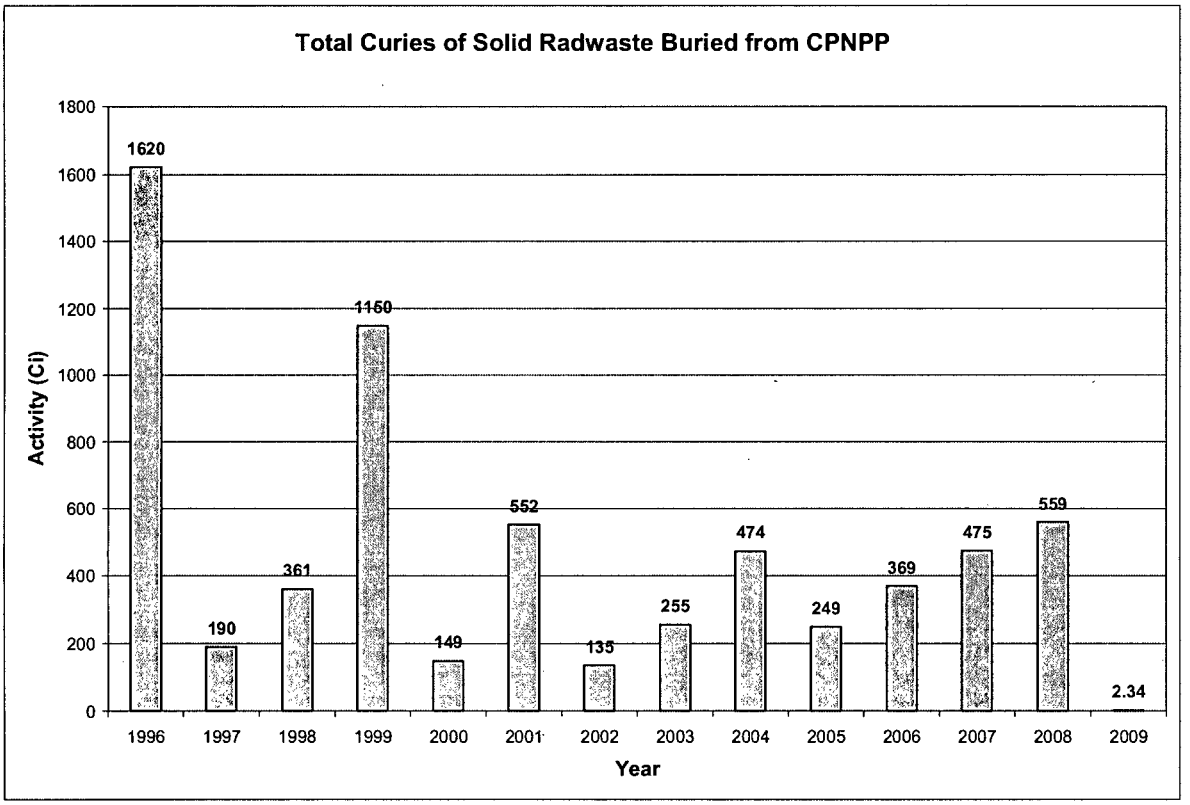

Total Volume Liquid Effluents Released from CPNPP
Volume (Gal.)
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
1581284
1368826
1057939
1174134
871352
1098400
1489742
909767
762800
969860
700793
638000
1203435
955200
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year


Total Activity (Excluding H3) Released in Liquid Effluents from CPNPP
Activity (mCi)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
144.00
110.00
227.90
232.10
124.80
111.90
358.00
108.70
17.60
21.60
5.68
7.60
15.00
3.75
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year


Total Curies of Tritium Released in Liquid Effluents from CPNPP
Liquid H3 Conc. (Ci)
3000
2500
2000
1500
1000
500
0
986
1455
669
1550
1223
931
1391
1430
1080
1480
1520
532
2426
1623
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year


Total Whole Body Dose Due to Liquid Effluents Released from CPNPP
Dose (mRem)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.08
0.09
0.10
0.11
0.10
0.09
0.10
0.09
0.11
0.11
0.10
0.14
0.13
0.13
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year


Total Volume of Solid Radwaste Buried from CPNPP
Volume (cu. meters)
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
52.20
14.10
15.90
27.10
19.20
90.20
27.90
18.70
34.00
19.30
16.90
180.00
40.6
28.5
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year


Total Curies of Solid Radwaste Buried from CPNPP
Activity (Ci)
1800
1600
1400
1200
1000
800
600
400
200
0
1620
190
361
1160
149
552
135
255
474
249
369
475
559
2.34
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The ODCM Radiological Effluent Control limits applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections.

2.1.1 Fission and Activation Gases (Noble Gases)

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to less than or equal to 500 mrems/yr to the whole body and less than or equal to 3000 mrems/yr to the skin.

The air dose due to noble gases released in gaseous effluents, from each unit, to areas at and beyond the site boundary shall be limited to the following:

a. During any calendar quarter: Less than or equal to 5 mrads for gamma radiation and less than or equal to 10 mrads for beta radiation, and

b. During any calendar year: Less than or equal to 10 mrads for gamma radiation and less than or equal to 20 mrads for beta radiation.

2.1.2 Iodine-131, Iodine-133, Tritium and Radioactive Material in Particulate Form

The dose rate due to iodine-131, iodine-133, tritium and all radionuclides in particulate form with half lives greater than 8 days, released in gaseous effluents from the site to areas at and beyond the site boundary, shall be limited to less than or equal to 1500 mrem/yr to any organ.

The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium and all radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents released, from each unit, to areas at and beyond the site boundary, shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrems to any organ, and

b. During any calendar year: Less than or equal to 15 mrems to any organ.

2.1.3 Liquid Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to 10 times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 μCi/ml total activity.

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each unit, to unrestricted areas shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrems to the whole body and to less than or equal to 5 mrems to any organ, and

b. During any calendar year to less than or equal to 3 mrems to the whole body and to less than or equal to 10 mrems to any organ.

2.1.4 LVW Pond Resin Inventory

The quantity of radioactive material contained in resins transferred to the LVW pond shall be limited by the following expression:

$$(264/V) \bullet \Sigma_j A_j/C_j < 1.0$$

excluding tritium, dissolved or entrained noble gases and radionuclides with less than an 8 day half life, where:

A_j = pond inventory limit for a single radionuclide j (Curies),

C_j = 10CFR20, Appendix B, Table 2 Column 2, concentration for a single radionuclide j (μCi/ml),

V = volume of resins in the pond (gallons), and

264 = conversion factor (μCi/Ci per ml/gal)

2.1.5 Total Dose

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 less than or equal to 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

2.2 Effluent Concentration Limits

2.2.1 Gaseous Effluents

For gaseous effluents, effluent concentration limits (ECL) values are not directly used in release rate calculations since the applicable limits are expressed in terms of dose rate at the site boundary.

2.2.2 Liquid Effluents

The values specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 are used as the ECL for liquid radioactive effluents released to unrestricted areas. A value of 2.0E-04 μCi/ml is used as the ECL for dissolved and entrained noble gases in liquid effluents.

2.3 Measurements and Approximations of Total Radioactivity

Measurements of total radioactivity in liquid and gaseous radioactive effluents were accomplished in accordance with the sampling and analysis requirements of Tables 4.11-1 and 4.11-2, respectively, of the CPNPP ODCM.

2.3.1 Liquid Radioactive Effluents

Each batch release was sampled and analyzed for gamma emitting radionuclides using gamma spectroscopy, prior to release. Composite samples were analyzed monthly and quarterly for the Primary Effluent Tanks (PET), Waste Monitor Tanks (WMT), Laundry Holdup and Monitor Tanks (LHMT) and Waste Water Holdup Tanks (WWHT). Composite samples were analyzed monthly for tritium and gross alpha radioactivity in the onsite laboratory using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by a contract laboratory. The results of the composite analyses from the previous month or quarter were used to estimate the quantities of these radionuclides in liquid effluents during the current month or quarter. The total radioactivity in liquid effluent releases was determined from the measured and estimated concentrations of each radionuclide present and the total volume of the effluent released during periods of discharge.

For batch releases of powdex resin to the LVW pond, samples were analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques, prior to release. Composite samples were analyzed quarterly, for Sr-89 and Sr-90, by a contract laboratory.

For continuous releases to the Circulating Water Discharge from the LVW pond, daily grab samples were obtained over the period of pond discharge. These samples were composited and analyzed for gamma emitting radionuclides, using gamma spectroscopy techniques. Composite samples were also analyzed for tritium and gross alpha radioactivity using liquid scintillation and gas flow proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by a contract laboratory.

2.3.2 Gaseous Radioactive Effluents

Each gaseous batch release was sampled and analyzed for radioactivity prior to release. For releases from Waste Gas Decay Tanks, noble gas grab samples were analyzed for gamma emitting radionuclides using gamma spectroscopy. For releases from the Containment Building, samples were taken using charcoal and particulate filters, in addition to noble gas and tritium grab samples, and analyzed for gamma emitting radionuclides prior to each release. The results of the analyses and the total volume of effluent released were used to determine the total amount of radioactivity released in the batch mode.

For continuous effluent release pathways, noble gas and tritium grab samples were collected and analyzed weekly for gamma emitting radionuclides by gamma spectroscopy and liquid scintillation counting techniques, respectively. Continuous release pathways were continuously sampled using radioiodine adsorbers and particulate filters. The radioiodine adsorbers and particulate filters were analyzed weekly for I-131 and gamma emitting radionuclides using gamma spectroscopy. Results of the noble gas and tritium grab samples, radioiodine adsorber and particulate filter analyses from the current week and the average effluent flow rate for the previous week were used to determine the total amount of radioactivity released in the continuous mode. Monthly composites of particulate filters were analyzed for gross alpha activity, in the onsite laboratory using the gas flow proportional counting technique. Quarterly composites of particulate filters were analyzed for Sr-89 and Sr-90 by a contract laboratory.

2.4 Batch Releases

A summary of information for gaseous and liquid batch releases is included in Table 9.1.

2.5 Abnormal or Unplanned Releases

Abnormal releases are defined as the unintended discharge of a volume of liquid or airborne radioactivity to the environment. No abnormal or unplanned liquid or gaseous effluent releases occurred during 2009. Table 9.2 summarizes the abnormal and unplanned releases.

3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 9.3 and 9.4. All releases of radioactive material in gaseous form are considered to be ground level releases.

4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables 9.5 and 9.6.

5.0 SOLID WASTES

The quantities of radioactive material released as solid effluents are summarized in Table 9.10.

6.0 RADIOLOGICAL IMPACT ON MAN

6.1 Dose Due to Liquid Effluents

The dose to an adult from the fish and cow-meat consumption pathways from Squaw Creek Reservoir were calculated in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in table 9.7.

6.2 Dose Due to Gaseous Effluents

The air dose due to gamma emissions and the air dose due to beta emissions were calculated using the highest annual average atmospheric dispersion factor at the Site Boundary location, in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Table 9.8.

6.3 Dose Due to Radioiodines, Tritium and Particulates

The dose to an adult, teen, child, and infant from radioiodines and particulates, for the pathways listed in Part II, Table 2.4 of the ODCM, were calculated using the highest dispersion and deposition factors, as appropriate, in accordance with the methodology and parameters in the ODCM. The results of the calculations are summarized on a quarterly and annual basis in Table 9.9.

6.4 40CFR190 Dose Evaluation

ODCM Radiological Effluent Control 3.11.4 requires dose evaluations to demonstrate compliance with 40 CFR Part 190 only if the calculated quarterly or yearly dose exceed two times the applicable quarterly or annual dose limits. At no time during 2009 were any of these limits exceeded, therefore no evaluations are required.

6.5 Dose to a MEMBER OF THE PUBLIC From Activities Inside the Site Boundary

Three activities are considered in this evaluation: fishing on Squaw Creek Reservoir, recreation activities at the CPNPP employee recreational area and site tours through the CPNPP Visitors Center.

The highest dose occurred in the evaluation for fishing, resulting in a dose of 1.27E-4 mRem/yr. The dose to a MEMBER OF THE PUBLIC (fisherman) on Squaw Creek Reservoir was calculated based on fishing twice a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation and submersion. Liquid pathways are not considered since all dose is calculated at the point of circ water discharge into the reservoir.

The dose to a MEMBER OF THE PUBLIC engaged in recreational activities at the CPNPP employee recreational park was calculated based on one visit a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation, submersion and ground plane.

The dose to a MEMBER OF THE PUBLIC during site tours through the CPNPP Visitors Center was calculated based on two visits per year, thirty minutes each visit. Pathways included in the calculation were gaseous inhalation and submersion.

Due to increased security, routine fishing on Squaw Creek Reservoir and visitation by the public on-site has been significantly restricted. The calculations are still valid and included in the event security access restrictions are ever returned to previous conditions and controls.

All calculations were performed in accordance with the methodology and parameters in the ODCM.

7.0 METEROLOGICAL DATA

7.1 Meteorological Monitoring Program

In accordance with ODCM Administrative Control 6.9.1.4, a summary of hourly meteorological data, collected during 2009, is retained onsite. This data is available for review by the NRC upon request. Joint Frequency Tables are included in Attachment 10. During 2009, the goal of >90% joint data recovery was met. The individual percent recoveries are listed below:

Meteorological Data Recovery	
Channel	**% Recovery**
Wind Speed	97.6
Wind Direction	97.9
Delta Temperature A	99
Delta Temperature B	98.7

8.0 RELATED INFORMATION

8.1 Operability of Liquid and Gaseous Monitoring Instrumentation

ODCM Radiological Effluent Controls 3.3.3.4 and 3.3.3.5 require an explanation of why designated inoperable liquid and gaseous monitoring instrumentation was not restored to operable status within thirty days.

During the period covered by this report, there were no instances where these instruments were inoperable for more than thirty days.

8.2 Changes to the Offsite Dose Calculation Manual

During the period covered by this report, there were two revisions to the ODCM approved and/or implemented.

REVISION 29
LDCR-OD-2007-2 (EVAL-2007-002019-01):
Table 3.3-8 action and associated statements were revised to clarify necessary actions in the event of a loss of heat tracing or sample lines to the WRGM sampling skid. These particulate and iodine channels are USNRC Regulatory Guide 1.97, Revision 2, Type/Category E3 variables that provide backup information to estimate magnitude of release of radioactive materials to identify pathways. This 7 day period for entry into the CPNPP Corrective Action Program is adequate to track the actions needed to restore the channel(s) to an operable status in a time commensurate with their safety significance.

REVISION 30
LDCR-OD-2009-1 (EVAL-2008-002039-03):
Note 2 of Table 3.12-1 and Note 2 of Table 4.12-1 were changed from thermo luminescent dosimeters (TLDs) to Optically Stimulated Luminescence (OSL) Badges. Also "thermoluminescent dosimeter" was replaced with "optically stimulated luminescence (OSL) badge" in section 2.5. This change acknowledges the recent switch from TLDs to OSLs.

8.3 New Locations for Dose Calculations or Environmental Monitoring

ODCM Administrative Control 6.9.1.4 requires any new locations for dose calculations and/or environmental monitoring, identified by the Land Use Census, to be included in the Radioactive Effluent Release Report. Based on the 2009 Land Use Census, no new receptor locations were identified which resulted in changes requiring a revision in current environmental sample locations. Values for the current nearest resident, milk animal, garden, X/Q and D/Q values in all sectors surrounding CPNPP were included in the 2009 Land Use Census.

8.4 Liquid Holdup and Gas Storage Tanks

ODCM Administrative Control 6.9.1.4 requires a description of the events leading to liquid holdup or gas storage tanks exceeding the limits required to be established by Technical Specification 5.5.12. Technical Requirements Manual 13.10.33 limits the quantity of radioactive material contained in each unprotected outdoor tank to less than or equal to ten curies, excluding tritium and dissolved or entrained noble gases. Technical Requirements Manual 13.10.32 limits the quantity of radioactive material contained in each gas storage tank to less than or equal to 200,000 curies of noble gases (considered as Xe-133 equivalent). These limits were not exceeded during the period covered by this report.

8.5 Noncompliance with Radiological Effluent Control Requirements

This section provides a listing and description of Abnormal Releases, issues that did not comply with the applicable requirements of the Radiological Effluents Controls given in Part I of the CPNPP ODCM and/or issues that did not comply with associated Administrative Controls and that failed to meet CPNPP expectations regarding Station Radioactive Effluent Controls. Detailed documentation concerning evaluations of these events and corrective actions is maintained onsite.

8.5.1 Normal, Unplanned Gaseous Release

No normal, unplanned gaseous effluent releases occurred during 2009.

8.5.2 Abnormal, Unplanned Gaseous Effluent Release

No abnormal, unplanned gaseous effluent releases occurred during 2009.

8.5.3 Abnormal, Unplanned Liquid Effluent Releases

No abnormal, unplanned liquid effluent releases occurred during 2009.

8.6 Resin Releases to the LVW Pond

A total of 158 ft^3 of powdex resin was transferred to the LVW pond during the period covered by this report. The cumulative activity deposited in the LVW pond since operations began through the end of 2009 is 1.15E-3 Curies, consisting of Co-58, Co-60, Cs-134, Cs-137, I-131 and Sb-125.

8.7 Changes to the Liquid, Gaseous, and Solid Waste Treatment Systems

In accordance with the CPNPP Process Control Program, Section 6.2.6.2, changes to the Radwaste Treatment Systems (liquid, gaseous and solid) should be summarized and reported to the Commission in the Radioactive Effluent Release Report if the changes implemented required a 10CFR50.59 safety evaluation.

For the reporting period of this report, no changes to the Radwaste Treatment Systems occurred that meet the reporting criteria of the Process Control Program.

8.8 Groundwater Tritium monitoring Program

Samples of perched groundwater are taken quarterly in accordance with the site groundwater tritium monitoring program. During the first quarter of 2009, a sample from the Water Production Plant seepage sump (storm drain) had positive values for tritium as listed in the table below. This value was well below state reportable limit of 20,000 pCi/L. The source of the tritium is from a small leak of reservoir water that feeds the water plant clarifier. Because CPNPP discharges its effluents into Squaw Creek Reservoir, there is always a low level background concentration of tritium in the reservoir water. Essentially the seepage sump is discharging diluted Squaw Creek Reservoir water back to Squaw Creek Reservoir.

The other positive samples were in waste monitoring basin A and C were from efforts made to repair the outer liner (CR 2008-3781). Water was intentionally transferred from the ponds to the space between the inner and outer liner in order to perform ultrasonic leak testing of the outer liner. Pond water was used because it had a lower concentration of tritium than the reservoir. Repairs to the liners were completed and the sample results of the Pond Leachate sample points are listed below.

	Tritium Results in pCi/L		
Date	Seepage Sump	Pond A Leachate	Pond C Leachate
Feb-09	6200	No Sample	1365
Apr-09	3500	607	337
Aug-09	3000	164	<mda
Nov-09	2760	<mda	<mda

6.11 Nonroutine planned release

There were no unplanned releases during 2009.

SECTION 9.0
TABLES

Table 9.1
Site Liquid and Gaseous Batch Release Summary (2009)

A. Liquid Releases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of batch releases	:	3	8	12	25	48
2. Total time period for Batch releases	(Minutes) :	9.950E+02	2.641E+03	3.750E+03	5.801E+03	1.319E+04
3. Maximum time period for a batch release	(Minutes) :	3.550E+02	3.540E+02	3.350E+02	3.640E+02	3.640E+02
4. Average time period for a batch release	(Minutes) :	3.317E+02	3.301E+02	3.125E+02	2.320E+02	2.747E+02
5. Minimum time period for a batch release	(Minutes) :	3.100E+02	3.030E+02	2.970E+02	6.700E+01	6.700E+01
6. Average stream flow during periods of release of liquid Effluent into a flowing stream	(GPM) :	1.194E+04	3.665E+04	5.230E+04	7.695E+04	1.778E+05

B. Gaseous Releases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of batch releases	:	36	36	36	32	140
2. Total time period for batch releases	(Minutes) :	1.369E+04	1.406E+04	1.292E+04	1.319E+04	5.386E+04
3. Maximum time period for a batch release	(Minutes) :	4.850E+02	1.840E+03	4.190E+02	1.200E+03	1.840E+03
4. Average time period for a batch release	(Minutes) :	3.803E+02	3.907E+02	3.588E+02	4.121E+02	3.847E+02
5. Minimum time period for a batch release	(Minutes) :	3.090E+02	1.760E+02	2.460E+02	2.120E+02	1.760E+02

Table 9.2
Site Abnormal Liquid and Gaseous Batch Release Summary (2009)

A. Liquid Releases	Units		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of batch releases		:	0	0	0	0	0
2. Total time period for Batch releases	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3. Maximum time period for a batch release	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4. Average time period for a batch release	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5. Minimum time period for a batch release	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6. Total Activity for all releases	(Curies)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

B. Gaseous Releases	Units		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Totals
1. Number of batch releases		:	0	0	0	0	0
2. Total time period for batch releases	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3. Maximum time period for a batch release	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4. Average time period for a batch release	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5. Minimum time period for a batch release	(Minutes)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6. Total Activity for all releases	(Curies)	:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Table 9.3
Site Gaseous Effluents - Summation of All Releases (2009)

Type of Effluent	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
A. Fission And Activation Gases						
1. Total Release	Curies:	2.224E+00	1.228E-01	2.388E+00	3.495E-01	5.084E+00
2. Average Release rate for period	uCi/sec:	2.821E-01	1.557E-02	3.028E-01	4.433E-02	6.449E-01
3. Percent of Applicable Limit	%	*	*	*	*	
B. Radioiodines						
1. Total Iodine-131	Curies:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2. Average Release rate for period	uCi/sec:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3. Percent of Applicable Limit	%	*	*	*	*	
C. Particulates						
1. Particulates (Half-Lives > 8 Days)	Curies:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2. Average Release rate for period	uCi/sec:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3. Percent of Applicable Limit	%	*	*	*	*	
D. Tritium						
1. Total Release	Curies:	1.370E+01	1.762E+01	1.535E+01	9.574E+00	5.624E+01
2. Average Release rate for period	uCi/sec:	1.738E+00	2.235E+00	1.947E+00	1.214E+00	7.134E+00
3. Percent of Applicable Limit	%	*	*	*	*	
E. Gross Alpha						
1. Total Release	Curies:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2. Average Release rate for period	uCi/sec:	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* Applicable limits are expressed in terms of dose. Estimated total error for all values is <1.0%

2009 Table 9.4
Site Gaseous Effluents - Ground Level Releases (2009)

Reactor Unit: Site

Continuous Mode Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Fission Gases						
No Nuclides Found		N/A	N/A	N/A	N/A	
Iodines						
No Nuclides Found		N/A	N/A	N/A	N/A	
Particulates						
No Nuclides Found		N/A	N/A	N/A	N/A	
Tritium						
H-3	Curies	1.366E+01	1.759E+01	1.533E+01	9.547E+00	5.613E+01
Gross Alpha						
No Nuclides Found		N/A	N/A	N/A	N/A	

2009 Table 9.4 (cont.)
Site Gaseous Effluents - Ground Level Releases (2009)

Batch Mode Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Fission Gases						
Ar-41	Curies	1.212E-01	1.209E-01	1.315E-01	1.005E-01	4.741E-01
Kr-85m	Curies	0.000E+00	0.000E+00	0.000E+00	6.847E-05	6.847E-05
Kr-85	Curies	2.102E+00	0.000E+00	2.244E+00	1.437E-01	4.490E+00
Kr-87	Curies	0.000E+00	0.000E+00	0.000E+00	6.242E-06	6.242E-06
Kr-88	Curies	0.000E+00	0.000E+00	0.000E+00	1.699E-07	1.699E-07
Xe-131m	Curies	0.000E+00	0.000E+00	0.000E+00	1.927E-05	1.927E-05
Xe-133m	Curies	0.000E+00	0.000E+00	0.000E+00	2.759E-03	2.759E-03
Xe-133	Curies	5.911E-04	1.894E-03	1.218E-02	7.420E-02	8.886E-02
Xe-135m	Curies	0.000E+00	0.000E+00	0.000E+00	2.098E-03	2.098E-03
Xe-135	Curies	0.000E+00	0.000E+00	0.000E+00	2.614E-02	2.614E-02
Total For Period	Curies	2.224E+00	1.228E-01	2.388E+00	3.495E-01	5.084E+00
Iodines						
No Nuclides Found		N/A	N/A	N/A	N/A	
Particulates						
No Nuclides Found		N/A	N/A	N/A	N/A	
Tritium						
H-3	Curies	3.665E-02	3.609E-02	1.813E-02	2.622E-02	1.17E-01
Gross Alpha						
No Nuclides Found		N/A	N/A	N/A	N/A	

* Zeroes or N/A in this table indicate that no radioactivity was present at detectable levels.

Table 9.5
Site Liquid Effluents - Summation Of All Releases (2009)

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
A. Fission And Activation Products						
1. Total Release (not including tritium, gases, alpha)	Curies	5.805E-05	1.127E-04	3.918E-04	3.188E-03	3.750E-03
2. Average diluted concentration during period	uCi/ml	1.869E-11	1.161E-11	2.787E-11	1.530E-10	2.112E-10
3. Percent of Applicable Limit	%	0.000006	0.000009	0.000002	0.000061	
B. Tritium						
1. Total Release	Curies	8.025E+01	3.278E+02	6.005E+02	6.143E+02	1.623E+03
2. Average diluted Concentration during period	uCi/ml	2.584E-05	3.378E-05	4.273E-05	2.948E-05	1.318E-04
3. Percent of Applicable Limit	%	2.584	3.378	4.273	2.948	
C. Dissolved and Entrained Gases						
1. Total Release	Curies	4.530E-04	2.793E-03	3.559E-03	1.705E-03	8.511E-03
2. Average diluted Concentration during period	uCi/ml	1.459E-10	2.879E-10	2.532E-10	8.184E-11	7.688E-10
3. Percent of Applicable Limit	%	0.000	0.000	0.000	0.000	
D: Gross Alpha Radioactivity						
1. Total Release	Curies	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
E: Waste Vol Release (Pre-Dilution)	Liters	2.332E+05	6.146E+05	8.838E+05	1.885E+06	3.616E+06
F. Volume of Dilution Water Used	Liters	3.106E+09	9.702E+09	1.405E+10	2.084E+10	4.770E+10

Applicable limits are expressed in terms of dose.
Estimated Total Error For All Values Reported Is < 1.0%

Table 9.6
Site Liquid Effluents (2009)

Continuous Mode

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Fission & Activation Products						
No Nuclides Found		N/A	N/A	N/A	N/A	
Tritium						
H-3	Curies	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Dissolved And Entrained Gases						
No Nuclides Found		N/A	N/A	N/A	N/A	
Gross Alpha Radioactivity	Curies	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Batch Mode

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Fission & Activation Products						
Cr-51	Curies	0.000E+00	0.000E+00	0.000E+00	7.777E-04	7.777E-04
Mn-54	Curies	0.000E+00	0.000E+00	0.000E+00	5.747E-05	5.747E-05
Fe-59	Curies	0.000E+00	0.000E+00	0.000E+00	1.725E-05	1.725E-05
Co-57	Curies	0.000E+00	0.000E+00	7.319E-06	0.000E+00	7.319E-06
Co-58	Curies	4.463E-05	6.738E-05	2.512E-04	1.846E-03	2.210E-03
Co-60	Curies	1.342E-05	4.531E-05	1.332E-04	2.230E-04	4.149E-04
Zr-95	Curies	0.000E+00	0.000E+00	0.000E+00	6.522E-05	6.522E-05
Nb-95	Curies	0.000E+00	0.000E+00	0.000E+00	1.051E-04	1.051E-04
Sb-125	Curies	0.000E+00	0.000E+00	0.000E+00	9.554E-05	9.554E-05
Total For Period	Curies	5.805E-05	1.127E-04	3.918E-04	3.188E-03	3.750E-03

Table 9.6 (cont.)
Site Liquid Effluents (2009)

Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Tritium						
H-3	Curies	8.025E+01	3.278E+02	6.005E+02	6.143E+02	1.623E+03
Dissolved And Entrained Gases						
Kr-85	Curies	4.530E-04	2.766E-03	3.279E-03	1.215E-03	7.713E-03
Xe-133	Curies	0.000E+00	2.740E-05	2.802E-04	4.647E-04	7.722E-04
Xe-135	Curies	0.000E+00	0.000E+00	0.000E+00	2.562E-05	2.562E-05
Total For Period	Curies	4.530E-04	2.793E-03	3.559E-03	1.705E-03	8.511E-03
Gross Alpha Radioactivity		0	0	0	0	0

* Zeroes or N/A in this table indicate that no radioactivity was present at detectable levels

Table 9.7
Dose to a member of the public due to Liquid Releases (2009)

Cumulative Dose Per Quarter

Organ	Tech Spec Limit	Units	Quarter 1	% of Tech Spec Limit	Quarter 2	% of Tech Spec Limit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Total Body	1.500E+00	mRem	3.306E-02	2.204E+00	3.211E-02	2.141E+00	3.094E-02	2.063E+00	3.281E-02	2.187E+00
Bone	5.000E+00	mRem	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.124E-07	6.249E-06
Thyroid	5.000E+00	mRem	3.306E-02	6.612E-01	3.211E-02	6.423E-01	3.094E-02	6.188E-01	3.280E-02	6.561E-01
Kidney	5.000E+00	mRem	3.306E-02	6.612E-01	3.211E-02	6.423E-01	3.094E-02	6.188E-01	3.280E-02	6.561E-01
Lung	5.000E+00	mRem	3.306E-02	6.612E-01	3.211E-02	6.423E-01	3.094E-02	6.188E-01	3.281E-02	6.561E-01
Liver	5.000E+00	mRem	3.306E-02	6.612E-01	3.211E-02	6.423E-01	3.094E-02	6.188E-01	3.281E-02	6.561E-01
GI-Lli	5.000E+00	mRem	3.306E-02	6.612E-01	3.212E-02	6.423E-01	3.094E-02	6.189E-01	3.354E-02	6.707E-01

Cumulative Dose per Year

Organ	Tech Spec Limit	Units	Year to Ending Date	% of Tech Spec Limit	Receptor	Limit
Total Body	2.500E+01	mRem	1.289E-01	5.157E-01	Liquid Receptor - Adult	40CFR190.10 (a) TB
Thyroid	7.500E+01	mRem	1.289E-01	1.719E-01	Liquid Receptor - Adult	40CFR190.10 (a) Thyroid
Bone	2.500E+01	mRem	3.124E-07	1.250E-06	Liquid Receptor - Adult	40CFR190.10 (a) Organ
Liver	2.500E+01	mRem	1.289E-01	5.157E-01	Liquid Receptor - Adult	40CFR190.10 (a) Organ
Kidney	2.500E+01	mRem	1.289E-01	5.157E-01	Liquid Receptor - Adult	40CFR190.10 (a) Organ
Lung	2.500E+01	mRem	1.289E-01	5.157E-01	Liquid Receptor - Adult	40CFR190.10 (a) Organ
GI-Lli	2.500E+01	mRem	1.297E-01	5.186E-01	Liquid Receptor - Adult	40CFR190.10 (a) Organ
Bone	1.000E+01	mRem	3.124E-07	3.124E-06	Liquid Receptor - Adult	Liq Annual Organ Dose
Liver	1.000E+01	mRem	1.289E-01	1.289E+00	Liquid Receptor - Adult	Liq Annual Organ Dose
Thyroid	1.000E+01	mRem	1.289E-01	1.289E+00	Liquid Receptor - Adult	Liq Annual Organ Dose
Kidney	1.000E+01	mRem	1.289E-01	1.289E+00	Liquid Receptor - Adult	Liq Annual Organ Dose
Lung	1.000E+01	mRem	1.289E-01	1.289E+00	Liquid Receptor - Adult	Liq Annual Organ Dose
GI-Lli	1.000E+01	mRem	1.297E-01	1.297E+00	Liquid Receptor - Adult	Liq Annual Organ Dose
Total Body	3.000E+00	mRem	1.289E-01	4.297E+00	Liquid Receptor - Adult	Liq Annual TB Dose

Total Dilution Volume for 1st Quarter: 3.106E+09
Total Dilution Volume for 2nd Quarter: 9.702E+09
Total Dilution Volume for 3rd Quarter: 1.405E+10
Total Dilution Volume for 4th Quarter: 2.084E+10

Table 9.8
Air Dose Due To Gaseous Releases – Site (2009)

Cumulative Dose Per Quarter

Type of Radiation	Tech Spec Limit	Units	Quarter 1	% Tech Spec Limit	Quarter 2	% Tech Spec Limit	Quarter 3	% Tech Spec Limit	Quarter 4	% Tech Spec Limit
Gamma	5.000E+00	mRad	1.218E-04	2.436E-03	1.177E-04	2.354E-03	1.324E-04	2.648E-03	1.069E-04	2.139E-03
Beta	1.000E+01	mRad	4.707E-04	4.707E-03	4.169E-05	4.169E-04	5.043E-04	5.043E-03	7.932E-05	7.932E-04

Cumulative Dose Per Year

Type of Radiation	Tech Spec Limit	Units	Year to End Date	% Tech Spec Limit	Receptor	Limit
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor SB - Adult	NG Annual Gamma Air Dose
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor SB - Teen	NG Annual Gamma Air Dose
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor SB - Child	NG Annual Gamma Air Dose
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor SB - Infant	NG Annual Gamma Air Dose
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor MI - Adult	NG Annual Gamma Air Dose
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor MI - Teen	NG Annual Gamma Air Dose
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor MI - Child	NG Annual Gamma Air Dose
Gamma	1.000E+01	mRad	4.789E-04	4.789E-03	Gas Receptor MI - Infant	NG Annual Gamma Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor SB - Adult	NG Annual Beta Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor SB - Teen	NG Annual Beta Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor SB - Child	NG Annual Beta Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor SB - Infant	NG Annual Beta Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor MI - Adult	NG Annual Beta Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor MI - Teen	NG Annual Beta Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor MI - Child	NG Annual Beta Air Dose
Beta	2.000E+01	mRad	1.096E-03	5.480E-03	Gas Receptor MI - Infant	NG Annual Beta Air Dose

Table 9.9
Dose to A Member Of The Public Due To Radioiodines, Tritium, and Particulates in Gaseous Releases (2009)

Cumulative Dose Per Quarter

Organ	Tech Spec Limit	Units	Quarter 1	% of Tech Spec Limit	Quarter 2	% of Tech Spec Limit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
GI-Lli	7.500E+00	mRem	1.921E-02	2.562E-01	2.471E-02	3.295E-01	2.152E-02	2.870E-01	1.343E-02	1.790E-01
Kidney	7.500E+00	mRem	1.921E-02	2.562E-01	2.471E-02	3.295E-01	2.152E-02	2.870E-01	1.343E-02	1.790E-01
Liver	7.500E+00	mRem	1.921E-02	2.562E-01	2.471E-02	3.295E-01	2.152E-02	2.870E-01	1.343E-02	1.790E-01
Lung	7.500E+00	mRem	1.921E-02	2.562E-01	2.471E-02	3.295E-01	2.152E-02	2.870E-01	1.343E-02	1.790E-01
Thyroid	7.500E+00	mRem	1.921E-02	2.562E-01	2.471E-02	3.295E-01	2.152E-02	2.870E-01	1.343E-02	1.790E-01
Total Body	7.500E+00	mRem	1.921E-02	2.562E-01	2.471E-02	3.295E-01	2.152E-02	2.870E-01	1.343E-02	1.790E-01

Cumulative Dose per Year

Organ	Tech Tech Spec Limit	Units	Year to Ending Date	% of Tech Spec Limit	Receptor	Limit
Total Body	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor SB - Child	40CFR190.10 (a) TB
Total Body	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor MI - Child	40CFR190.10 (a) TB
Thyroid	7.500E+01	mRem	7.888E-02	1.052E-01	Gas Receptor SB - Child	40CFR190.10 (a) Thyroid
Thyroid	7.500E+01	mRem	7.888E-02	1.052E-01	Gas Receptor MI - Child	40CFR190.10 (a) Thyroid
Liver	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor SB - Child	40CFR190.10 (a) Organ
Kidney	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor SB - Child	40CFR190.10 (a) Organ
Lung	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor SB - Child	40CFR190.10 (a) Organ
GI-Lli	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor SB - Child	40CFR190.10 (a) Organ
Liver	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor MI - Child	40CFR190.10 (a) Organ
Kidney	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor MI - Child	40CFR190.10 (a) Organ
Lung	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor MI - Child	40CFR190.10 (a) Organ
GI-Lli	2.500E+01	mRem	7.888E-02	3.155E-01	Gas Receptor MI - Child	40CFR190.10 (a) Organ

Table 9.9 (cont)

Dose to A Member Of The Public Due To Radioiodines, Tritium, and Particulates in Gaseous Releases (2009)

Cumulative Dose per Year (cont.)

Organ	Tech Tech Spec Limit	Units	Year to Ending Date	% of Tech Spec Limit	Receptor	Limit
Liver	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor SB - Child	Gas Annual Organ Dose
Total Body	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor SB - Child	Gas Annual Organ Dose
Thyroid	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor SB - Child	Gas Annual Organ Dose
Kidney	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor SB - Child	Gas Annual Organ Dose
Lung	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor SB - Child	Gas Annual Organ Dose
GI-Lli	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor SB - Child	Gas Annual Organ Dose
Liver	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor MI - Child	Gas Annual Organ Dose
Total Body	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor MI - Child	Gas Annual Organ Dose
Thyroid	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor MI - Child	Gas Annual Organ Dose
Kidney	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor MI - Child	Gas Annual Organ Dose
Lung	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor MI - Child	Gas Annual Organ Dose
GI-Lli	1.500E+01	mRem	7.888E-02	5.259E-01	Gas Receptor MI - Child	Gas Annual Organ Dose

TABLE 9.10
SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS -2009

A. Solid Waste Shipped Offsite for Burial or Disposal (Not Irradiated Fuel)

1. Type of Waste	Shipped M^3	Shipped Ci	Buried m^3	Buried Ci	Percent Error
a. Spent resins/filters	-0-	-0-	7.02E-01	2.08E+00	+/- 25%
b. Dry active waste	1.68E+02	1.75E-01	2.78E+01	2.57E+01	+/- 25%
c. Irradiated components	-0-	-0-	-0-	-0-	N/A
d. Other (oil/miscellaneous liquids sent to processor for volume reduction)	-0-	-0-	-0-	-0-	N/A
TOTAL	1.68E+02	1.75E-01	2.85E+01	2.34E+00	+/- 25%

Note:Shipped volumes and curies are not always equal to the buried volumes and curies since some disposal occurs outside the twelve month time period in which shipments occurred.

Dry active waste also includes some low-level radioactive resins tank sediments and filters that are handled and processed in a manner that is consistent with this waste stream.

2. Estimate of Major Nuclide Composition (by type of waste)	Nuclide	% Abund.	Activity (Ci)
a. Spent resins/filters	-0-	NA	-0-
b. Dry active waste	Fe-55	53.35	9.36E-02
	Ni-63	22.65	3.97E-02
	Co-60	16.70	2.93E-02
	Co-58	4.76	8.35E-03
	H-3	0.21	3.75E-04
	C-14	LLD	-0-
	Tc-99	LLD	-0-
	I-129	LLD	-0-
	Other*	2.33	4.08E-03
	Total	100.00	1.75E-01
d. Other (oil/miscellaneous liquids sent to processor for volume reduction) NA	-0-	-0-	-0-

Nuclides representing <1% of total shipped activity: Cr-51,Mn-54,Co-57,Nb-95,ZR-95,Sb-125,Cs-134,Cs-137,Ce-144,Pu-238,Pu-239/240,Am-241,Cm-242,Cm-243/244.

TABLE 9.10 (cont.)
SOLID RADWASTE AND IRRADIATED FUEL SHIPMENTS -2009

3. Solid Waste Disposition (Mode of Transportation: Truck)				
Waste Type	Waste Class	Container Type	Number of Shipments	Destination
a. Resin/filters	NA	NA	0	NA
b. Dry active waste	A	General Design	3	Energy Solutions Oak Ridge, TN

B. **Irradiated Fuel Shipments (Disposition)**

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

Attachment 10.1

2009 Meteorological Joint Frequency Table

R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION.

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: A
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	6	19	15	0	0	40
NNE	0	5	22	1	0	0	28
NE	3	27	12	0	0	0	42
ENE	1	14	5	0	0	0	20
E	0	11	4	0	0	0	15
ESE	1	17	10	1	0	0	29
SE	0	8	16	8	0	0	32
SSE	0	14	52	29	9	0	104
S	0	14	48	65	6	0	133
SSW	1	10	38	18	0	0	67
SW	1	3	14	4	0	0	22
WSW	0	1	1	0	0	0	2
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	2	2
NW	0	0	0	7	10	5	22
NNW	1	2	18	25	20	9	75
VARIABLE	4	5	1	0	0	0	10
Total	12	137	260	173	45	16	643

Periods of calm(hours): 0
Hours of missing data: 10

R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: B
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	7	17	8	0	0	32
NNE	1	8	11	8	0	0	28
NE	1	11	2	0	1	0	15
ENE	7	18	3	1	0	0	29
E	1	25	3	0	0	0	29
ESE	1	24	11	0	0	0	36
SE	0	13	14	4	0	0	31
SSE	0	7	38	17	4	0	66
S	1	11	59	46	17	1	135
SSW	0	11	17	15	0	0	43
SW	1	10	22	7	0	0	40
WSW	0	6	10	3	0	1	20
W	1	5	2	1	1	0	10
WNW	0	0	0	0	0	0	0
NW	1	2	5	15	8	1	32
NNW	0	12	12	22	8	2	56
VARIABLE	7	2	0	0	0	0	9
Total	22	172	226	147	39	5	611

Periods of calm(hours): 0
Hours of missing data: 5

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R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: C
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	10	13	10	0	0	35
NNE	3	3	14	4	0	0	24
NE	8	6	3	1	0	0	18
ENE	11	15	4	0	0	0	30
E	1	13	2	0	0	0	16
ESE	3	24	11	1	0	0	39
SE	4	13	13	5	0	0	35
SSE	3	14	21	23	8	1	70
S	4	8	28	58	24	0	122
SSW	0	10	15	11	0	1	37
SW	2	10	16	4	0	0	32
WSW	2	5	11	2	0	0	20
W	4	4	5	1	0	0	14
WNW	1	1	0	4	1	2	9
NW	0	11	6	14	6	2	39
NNW	1	11	17	21	17	4	71
VARIABLE	13	0	1	0	0	0	14
Total	62	158	180	159	56	10	625

Periods of calm(hours): 0
Hours of missing data: 7

R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: D
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	9	87	192	86	12	2	388
NNE	12	72	161	53	3	2	303
NE	19	49	118	18	2	0	206
ENE	10	72	51	4	0	0	137
E	27	92	38	4	0	0	161
ESE	35	143	43	7	0	0	228
SE	22	156	181	34	6	1	400
SSE	16	82	290	239	37	3	666
S	10	69	236	206	35	2	548
SSW	7	34	57	23	1	0	122
SW	10	26	27	5	2	0	70
WSW	8	20	10	4	0	0	42
W	7	7	5	8	0	1	28
WNW	8	24	36	28	12	11	119
NW	5	28	56	59	11	2	161
NNW	9	44	156	149	47	3	408
VARIABLE	63	38	8	0	0	0	109
Total	276	1033	1665	927	168	27	4096

Periods of calm(hours): 5
Hours of missing data: 137

R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: E
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	7	22	23	3	0	1	56
NNE	5	22	26	1	0	0	54
NE	4	8	4	0	0	0	16
ENE	5	6	0	0	0	1	12
E	9	31	3	0	0	0	43
ESE	20	89	10	0	0	0	119
SE	23	263	182	1	0	0	469
SSE	18	156	257	12	1	0	444
S	11	56	66	13	0	0	146
SSW	20	37	38	12	0	0	107
SW	16	18	15	7	0	0	56
WSW	14	17	12	6	0	0	49
W	10	12	8	0	0	0	30
WNW	6	26	23	2	0	0	57
NW	8	54	21	5	0	0	88
NNW	5	27	9	3	0	0	44
VARIABLE	56	13	5	1	0	0	75
Total	237	857	702	66	1	2	1865

Periods of calm(hours): 12
Hours of missing data: 37

R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: F
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	1	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	1	1	0	0	0	2
ESE	2	8	0	0	0	0	10
SE	3	46	12	0	0	0	61
SSE	6	19	7	1	0	0	33
S	19	19	5	0	0	0	43
SSW	17	13	9	0	0	0	39
SW	32	16	10	0	0	0	58
WSW	12	11	3	0	0	0	26
W	15	12	1	0	0	0	28
WNW	13	14	3	0	0	0	30
NW	8	34	0	1	0	0	43
NNW	1	4	0	0	0	0	5
VARIABLE	26	1	0	0	0	0	27
Total	154	198	52	2	0	0	406

Periods of calm(hours): 3
Hours of missing data: 0

R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: G
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	1	0	0	0	0	1
SE	0	4	2	0	0	0	6
SSE	3	2	0	1	0	0	6
S	3	4	1	0	0	0	8
SSW	18	16	3	0	0	0	37
SW	11	24	4	0	0	0	39
WSW	15	35	10	1	0	0	61
W	13	9	0	0	0	0	22
WNW	8	4	1	0	0	0	13
NW	8	17	1	0	0	0	26
NNW	0	1	0	0	0	0	1
VARIABLE	10	3	0	0	0	0	13
Total	89	120	22	2	0	0	233

Periods of calm(hours): 0
Hours of missing data: 0

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R.G. 1.21 JOINT FREQUENCY TABLE

T. U. ELECTRIC COMPANY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-09 00:00 TO 31-DEC-09 23:59

STABILITY CLASS: ALL
ELEVATION: 10 m.

Wind Direction	Wind Speed (mph) at 10 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	18	132	264	122	12	3	551
NNE	21	110	235	67	3	2	438
NE	35	101	139	19	3	0	297
ENE	34	125	63	5	0	1	228
E	38	173	51	4	0	0	266
ESE	62	306	85	9	0	0	462
SE	52	503	420	52	6	1	1034
SSE	45	294	665	322	59	4	1389
S	48	171	443	388	82	3	1135
SSW	63	131	177	79	1	1	452
SW	73	107	108	27	2	0	317
WSW	51	95	57	16	0	1	220
W	50	49	21	10	1	1	132
WNW	36	69	63	34	13	15	230
NW	30	146	89	101	35	10	411
NNW	17	101	212	220	92	18	660
VARIABLE	179	62	15	1	0	0	257
Total	852	2675	3107	1476	309	60	8479

Periods of calm(hours): 20
Hours of missing data: 261

SECTIONS 3.0 AND 4.0CONTROLS AND SURVEILLANCE REQUIREMENTS

3/4 CONTROLS AND SURVEILLANCE REQUIREMENTS

3/4.0 APPLICABILITY

The guidance provided for the use and application of LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY in Section 3.0, "LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY" of the Technical Specifications is applicable to the Controls contained in this manual, except as noted below.

The guidance provided for the use and application of SURVEILLANCE REQUIREMENT (SR) APPLICABILITY in Section 3.0, "SURVEILLANCE REQUIREMENT (SR) APPLICABILITY" of the Technical Specifications is applicable to the Surveillance Requirements contained in this manual.

For the purpose of the ODCM, the ODCM terms specified below should be considered synonymous with the listed Technical Specification term:

ODCM	Technical Specification
Control	LCO
ACTION	Required Action

A cross reference between Section 3/4.0 of the Offsite Dose Calculation Manual (ODCM) and the applicable Section 3.0 of the Technical Specifications is as follows:

ODCM Control:	Technical Specification Section
3.0.1	LCO 3.0.1
3.0.2	LCO 3.0.2
N/A (see Note 1)	LCO 3.0.3
N/A (see Note 1)	LCO 3.0.4
N/A (see Note 1)	LCO 3.0.5
N/A (see Note 1)	LCO 3.0.6
N/A (see Note 1)	LCO 3.0.7
ODCM Surveillance Requirement:	**Technical Specification Section**
4.0.1	SR 3.0.1
4.0.2	SR 3.0.2
4.0.3	SR 3.0.3
N/A (see Note 1)	SR 3.0.4

- NOTE 1 -

The provisions of the cross referenced Technical Specification LCO/SR are not pertinent for use in the ODCM; therefore, the Technical Specification LCO/SR is not applicable (N/A).

INSTRUMENTATION

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

CONTROLS

3.3.3.4 In accordance with CPSES TS 5.5.4.a, the radioactive liquid effluent monitoring instrumentation channels shown in Table 3.3-7 shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of Control 3.11.1.1 are not exceeded. The Alarm/Trip Setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Part II of the OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY: At all times.

ACTION:

a. With a radioactive liquid effluent monitoring instrumentation channel Alarm/Trip Setpoint less conservative than required by the above Control, immediately suspend the release of radioactive liquid effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 3.3-7. Restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report pursuant to Control 6.9.1.4 why this inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

4.3.3.4 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and DIGITAL CHANNEL OPERATIONAL TEST or ANALOG CHANNEL OPERATIONAL TEST at the frequencies shown in Table 4.3-3.

TABLE 3.3-7 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1.	Radioactivity Monitors Providing Alarm and Automatic Termination of Release		
	a. Liquid Radwaste Effluent Line (XRE-5253)	1	30
	b. Turbine Building (Floor Drains) Sumps Effluent Lines (1RE-5100 & 2RE-5100)	1/sump	31
	c. Auxiliary Building to LVW Pond Liquid Effluent Line (XRE-5251A)	1	31A
2.	Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination of Release		
	a. Service Water System Effluent Lines (1RE-4269, 1RE-4270, 2RE-4269 & 2RE-4270)	1/train	32
3.	Flow Rate Measurement Devices		
	a. Liquid Radwaste Effluent Line (XFT-5288)	1	33

TABLE 3.3-7 (Continued)

ACTIONS STATEMENTS

ACTION 30- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with Control 4.11.1.1.1; and

b. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge line valving.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 31- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for principal gamma emitters at a lower limit of detection of no more than 5×10^{-7} microCurie/ml:

a. At least once per 12 hours when the specific activity of the secondary coolant is greater than 0.01 microCurie/gram DOSE EQUIVALENT I-131; or

b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 microCurie/gram DOSE EQUIVALENT I-131. (Refer to Notation 3 of Table 4.11-1 for the applicability of the LLD requirement.)

ACTION 31A- With number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for principal gamma emitters at a lower-limit of detection of no more than 5×10^{-7} microCurie/ml at least once per 12 hours.

ACTION 32- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, operations may continue provided that:

a. With the component cooling water monitors (uRE-4509, uRE-4510, &uRE-4511)* OPERABLE and indicating an activity of less than $1X10^{-4}$ micro Curie/ml, a grab sample is collected and analyzed for principal gamma emitters at a lower limit of detection of no more than 5×10^{-7} microCurie/ml at least every 31 days; or

---

* "u" designates monitor for the applicable unit, e.g., 1 or 2.

TABLE 3.3-7 (Continued)

ACTIONS STATEMENTS (Continued)

b. At least once per 12 hours, grab samples are collected and analyzed for principal gamma emitters at a lower limit of detection of no more than 5×10^{-7} microCurie/ml. (Refer to Notation 3 of Table 4.11-1 for the applicability of the LLD requirement.)

NOTE: Collection of grab samples is not required when there is no process flow at the monitor.

ACTION 33- 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 during actual releases. Pump performance curves generated in place may be used to estimate flow.

TABLE 4.3-3 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	ANALOG CHANNEL OPERATIONAL TEST	DIGITAL CHANNEL OPERATIONAL TEST
1.	Radioactivity Monitors Providing Alarm and Automatic Termination of Release					
	a. Liquid Radwaste Effluent Line (XRE-5253)	D	P	R(4)	N.A.	Q(1)
	b. Turbine Building (Floor Drains) Sumps Effluent Lines (1RE-5100 & 2RE-5100)	D	M	R(4)	N.A.	Q(2)
	c. Auxiliary Building to LVW Pond Liquid Effluent Line (XRE-5251A)	D	M	R(4)	N.A.	Q(2)
2.	Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination of Release					
	a. Service Water System Effluent Lines (1RE-4269, 1RE-4270, 2RE-4269 & 2RE-4270)	D	M	R(4)	N.A.	Q(3)
3.	Flow Rate Measurement Devices					
	a. Liquid Radwaste Effluent Line (XFT-5288)	D(5)	N.A.	R	Q	N.A.

TABLE 4.3-3 (Continued)

TABLE NOTATIONS

(1) The DIGITAL CHANNEL OPERATIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room alarm annunciation occur if any of the following conditions exist:

a. Instrument indicates measured levels above the Alarm/Trip Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(2) The DIGITAL CHANNEL OPERATIONAL TEST shall also demonstrate that automatic flow diversion of this pathway (from the Low Volume Waste Treatment System to the Co-Current Waste Treatment System) and Control Room alarm annunciation occur if any of the following conditions exist:

a. Instrument indicates measured levels above the Alarm/Trip Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, or Check Source Failure).

(3) The DIGITAL CHANNEL OPERATIONAL 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 Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(4) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology (NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration, reference standards certified by NIST, or standards that have been obtained from suppliers that participate in measurement assurance activities with NIST shall be used.

(5) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once per 24 hours on days on which continuous, periodic, or batch releases are made.

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

CONTROLS

3.3.3.5 In accordance with CPSES TS 5.5.4.a, the radioactive gaseous effluent monitoring instrumentation channels shown in Table 3.3-8 shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of Control 3.11.2.1 are not exceeded. The Alarm/Trip Setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Part II of the ODCM.

APPLICABILITY: As shown in Table 3.3-8.

ACTION:

a. With a radioactive gaseous effluent monitoring instrumentation channel Alarm/ Trip Setpoint less conservative than required by the above Control, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 3.3-8. Restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report pursuant to Control 6.9.1.4 why this inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

4.3.3.5 Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and DIGITAL CHANNEL OPERATIONAL TEST or ANALOG CHANNEL OPERATIONAL TEST at the frequencies shown in Table 4.3-4.

TABLE 3.3-8 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1.	WASTE GAS HOLDUP SYSTEM			
	a. Noble Gas Release Rate Monitor - Providing Alarm and Automatic Termination of Release [XRE-5570A & XRE-5570B (effluent release rate channel)]	1/stack	**	34
2.	PRIMARY PLANT VENTILATION			
	a. Noble Gas Release Rate Monitor [XRE-5570A & XRE-5570B (effluent release rate channel)]	1/stack	*	36
	b. Iodine Sampler (WRGM sample skid)	1/stack	*	37
	c. Particulate Sampler (WRGM sample skid)	1/stack	*	37
	d. Sampler Flow Rate Monitor SMPL Flow 1 (X-RFT-5570A-1, X-RFT-5570B-1)	1/stack	*	35

TABLE 3.3-8 (Continued)

TABLE NOTATIONS

* At all times.

** During Batch Radioactive Releases via this pathway.

ACTION 34- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:

a. The auxiliary building vent duct monitor (XRE-5701) is confirmed OPERABLE; or

b. At least two independent samples of the tank's contents are analyzed; and

c. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 35- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the sample flow rate is estimated at least once per 4 hours.

ACTION 36- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that:

a. A Plant Vent Noble Gas Activity Monitor (XRE-5570A, XRE-5570B (low range activity) or XRE-5567A, XRE-5567B) is OPERABLE, and the plant vent flow rate is estimated at least once per 4 hours; or

b. The Plant Vent Flow Monitor, PROC FLOW N (X-FT-5570A-1, X-FT-5570B-1), is OPERABLE, and an alternate Plant Vent Noble Gas Activity Monitor is OPERABLE (XRE-5567A, XRE-5567B) or grab samples are taken at least once per 12 hours and these samples are analyzed for radioactivity within 24 hours; or

c. The plant vent flow rate is estimated at least once per 4 hours, and grab samples are taken at least once per 12 hours and these samples are analyzed for radioactivity within 24 hours; or

d. if the number of channels OPERABLE is less than required by the "Minimum Channels OPERABLE" requirement due to loss of sample line, effluent releases via this pathway may continue for no more than 7 days, provided monitors on the other stack are OPERABLE and actions are initiated in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical.

TABLE 3.3-8 (Continued)

TABLE NOTATIONS

ACTION 37- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue provided that:

a. samples are continuously collected with auxiliary sampling equipment as required in Table 4.11-2, or

b. if the number of channels OPERABLE is less than required by the "minimum Channels OPERABLE" requirement due to loss of heat tracing, then declare the Iodine & Particulate samplers INOPERABLE. Restore the heat tracing within 7 days and declare the samplers OPERABLE or initiate action in accordance with the Corrective Action Program to restore the channel(s) to OPERABLE status as soon as practical; or

c. if the number of channels OPERABLE is less than required by the "Minimum Channels OPERABLE" requirement due to loss of sample line, effluent releases via the affected pathway may continue for no more than 7 days, provided monitors on the other stack are OPERABLE and actions are initiated in accordance with the Corrective Action Program to restore the channel(s) to OPERABLE status as soon as practical.

TABLE 4.3-4 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	ANALOG CHANNEL OPERATIONAL TEST	DIGITAL CHANNEL OPERATIONAL TEST
1.	WASTE GAS HOLDUP SYSTEM					
	a. Noble Gas Release Rate Monitor - Providing Alarm and Automatic Termination of Release [XRE-5570A, XRE-5570B (effluent release rate channel)]	P	P	R(3)	N.A.	Q(1)
2.	PRIMARY PLANT VENTILATION					
	a. Noble Gas Release Rate Monitor [XRE-5570A, XRE-5570B (effluent release rate channel)]	D	#	R(3)	N.A.	Q(2)
	b. Iodine Sampler (WRGM sample skid)	W(4)	N.A.	N.A.	N.A.	N.A.
	c. Particulate Sampler (WRGM Sample Skid)	W(4)	N.A.	N.A.	N.A.	N.A.
	d. Sampler Flow Rate Monitor SMPL Flow 1 (X-RFT-5570A-1, X-RFT-5570B-1)	D	N.A.	R	Q	N.A.

TABLE 4.3-4 (Continued)

TABLE NOTATIONS

Prior to any release from the WASTE GAS HOLDUP SYSTEM or containment PURGING or VENTING, not to exceed 31 days.

(1) The DIGITAL CHANNEL OPERATIONAL 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; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(2) The DIGITAL CHANNEL OPERATIONAL 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 Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(3) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology (NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration, reference standards certified by NIST, or standards that have been obtained from suppliers that participate in measurement assurance activities with NIST shall be used.

(4) The CHANNEL CHECK shall consist of visually verifying that the collection element (i.e., filter or cartridge. etc.) is in place for sampling.

INSTRUMENTATION

METEOROLOGICAL MONITORING INSTRUMENTATION

CONTROLS

3.3.3.6 The meteorological monitoring instrumentation channels shown in Table 3.3-9 shall be OPERABLE.

APPLICABILITY: At all times.

ACTION:

a. With less than the minimum number of meteorological monitoring instrumentation channels OPERABLE for more than 7 days, initiate action in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical.

SURVEILLANCE REQUIREMENTS

4.3.3.6 Each of the above meteorological monitoring instrumentation channels shall be demonstrated OPERABLE:

a. At least once per 24 hours by performance of a CHANNEL CHECK; and

b. At least once per 184 days by performance of a CHANNEL CALIBRATION except the wind speed and wind direction sensors which are replaced with calibrated sensors at least once per 12 months.

TABLE 3.3-9 METEOROLOGICAL MONITORING INSTRUMENTATION

INSTRUMENT CHANNEL		LOCATION	MINIMUM OPERABLE
1.	WIND SPEED		1 of 3
	a. X-S-4117	Nominal Elev. 60 m.	
	b. X-S-4118	Nominal Elev. 10 m.	
	c. X-S-4128*	Nominal Elev. 10 m.	
2.	WIND DIRECTION		1 of 3
	a. X-Z-4115	Nominal Elev. 60 m	
	b. X-Z-4116	Nominal Elev. 10 m.	
	c. X-Z-4126*	Nominal Elev. 10 m.	
3.	AIR TEMPERATURE - ΔT		1 of 2
	a. X-T-4119	Nominal Elev. 60 m. and Nominal Elev. 10 m.	
	b. X-T-4120	Nominal Elev. 60 m. and Nominal Elev. 10 m.	

* Mounted on backup tower.

SEALED SOURCE CONTAMINATION

CONTROLS

3.7.15 Each sealed source containing radioactive material either in excess of 100 microCuries of beta and/or gamma emitting material or 5 microCuries of alpha emitting material shall be free of greater than or equal to 0.005 microCurie of removable contamination.

APPLICABILITY: At all times.

ACTION:

With a sealed source having removable contamination in excess of the above limits, immediately withdraw the sealed source from use and either:

1. Decontaminate and repair the sealed source; or

2. Dispose of the sealed source in accordance with Commission Regulations.

SURVEILLANCE REQUIREMENTS

4.7.15.1 Test Requirements - Each sealed source shall be tested for leakage and/or contamination by:

a. The licensee; or

b. Other persons specifically authorized by the Commission or an Agreement State.

The test method shall have a detection sensitivity of at least 0.005 microCurie per test sample.

4.7.15.2 Test Frequencies - Each category of sealed sources (excluding startup sources and fission detectors previously subjected to core flux) shall be tested at the frequency described below.

a. Sources in use - At least once per 6 months for all sealed sources containing radioactive materials:

1) With a half-life greater than 30 days (excluding Hydrogen 3), and

2) In any form other than gas.

b. Stored sources not in use - Each sealed source and fission detector shall be tested prior to use or transfer to another licensee unless tested within the previous 6 months. Sealed sources and fission detectors transferred without a certificate indicating the last test date shall be tested prior to being placed into use; and

c. Startup sources and fission detectors - Each sealed startup source and fission detector shall be tested prior to installation or within 31 days prior to being subjected to core flux and following repair or maintenance to the source.

4.7.15.3 Reports - A report shall be prepared and submitted to the Commission on an annual basis if sealed source or fission detector leakage tests reveal the presence of greater than or equal to 0.005 microCurie of removable contamination.

3/4.11 RADIOACTIVE EFFLUENTS

3/4.11.1 LIQUID EFFLUENTS

CONCENTRATION CONTROLS

3.11.1.1 In accordance with CPSES TS 5.5.4.b and 5.5.4.c the concentration of radioactive material released in liquid effluents from the site to CONTROLLED AREAS and UNRESTRICTED AREAS (see Figure 5.1-3) shall be limited to 10 times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} microCurie/ml total activity.

APPLICABILITY: At all times.

ACTION:

a. With the concentration of radioactive material released in liquid effluents to CONTROLLED AREAS and UNRESTRICTED AREAS exceeding the above limits, immediately restore the concentration to within the above limits.

SURVEILLANCE REQUIREMENTS

4.11.1.1.1 Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 4.11-1.

4.11.1.1.2 The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in Part II of the ODCM to assure that the concentrations at the point of release are maintained within the limits of Control 3.11.1.1.

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[1] (μCi/ml)
1A.	Batch Waste Release [2] Tanks to the Circulating Water Discharge a. Waste Monitor Tanks b. Laundry Holdup & Monitor Tanks c. Waste Water Holdup Tanks [8] d. Plant Effluent Tanks	P Each Batch	P Each Batch	Principal Gamma Emitters [3]	5.0E-07
				I-131	1.0E-06
				Dissolved & Entrained[3] Gases (Gamma Emitters)	1.0E-05
			M Composite [4]	H-3	1.0E-05
				Gross Alpha	1.0E-07
			Q Composite [4]	Sr-89, Sr-90	5.0E-08
				Fe-55	1.0E-06
1B.	Batch Waste Release [2] Tanks to the Waste Water Management System a. Condensate Polisher Backwash Recovery Tanks [6,7] b. Waste Water Holdup Tanks [6,8] c. Temporary holdup tanks [10]	P Each Batch	P Each Batch	Principal Gamma Emitters [3]	5.0E-07
				1-131	1.0E-06
				H-3	1.0E-05
2A.	Continuous Release[5] to the Circulating Water Discharge a. Low Volume Waste Pond Effluents	Monthly Grab [11]	Monthly Grab [11]	Dissolved & Entrained [3] Gases (Gamma Emitters)	(11)
		Daily Grab Sample [9]	Composite over pond discharge period [4]	Principal Gamma Emitters [3]	5.0E-07[11]
				I-131	1.0E-06
				H-3	1.0E-05
				Gross Alpha	1.0E-07
			Q Composite [4]	Sr-89, Sr-90	5.0E-08
				Fe-55	1.0E-06
2B.	Continuous Releases [5] to the Waste Water Management System a. Turbine Bldg. Sump No. 2 Effluents [6,7] b. Turbine Bldg. Sump No. 4 Effluents [6,7] c. Auxiliary Bldg. Secondary Effluents [6,7]	W Grab Sample	W	Principal Gamma Emitters [3]	5.0E-07
				I-131	1.0E-.06
				H-3	1.0E-05

TABLE 4.11-1 (Continued)

TABLE NOTATIONS

(1) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \bullet V \bullet 2.22 \times 10^6 \bullet Y \bullet \exp(-\lambda \Delta t)}$$

Where:

LLD = "A priori" lower limit of detection (microCurie per unit mass or volume),

s_b = Standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = Counting efficiency (counts per disintegration),

V = Sample size (units of mass or volume),

2.22×10^6 = Number of disintegrations per minute per microCurie,

Y = Fractional radiochemical yield, when applicable,

λ = Radioactive decay constant for the particular radionuclide (sec^{-1}), and

Δt = Elapsed time between the midpoint of sample collection and the time of counting(s).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

(2) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed by a method described in Part II of the ODCM to assure representative sampling.

(3) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, and Ce-141 for fission and corrosion products, and Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for dissolved or entrained gases. Ce-144 shall also be measured, but with an LLD of 5×10^{-6}. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall

TABLE NOTATIONS (Continued)

also be analyzed and reported in the Radioactive Effluent Release Report pursuant to Control 6.9.1.4 in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.

(4) 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 that is representative of the liquids released.

(5) A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

(6) These waste streams shall be sampled and analyzed, in accordance with this table, if radioactive material is detected in the LVW Pond composite samples in concentrations that exceed 10% of the limits of 10 CFR 20, Appendix B, Table 2, Column 2. This sampling shall continue until 2 consecutive samples from the waste stream show that the concentration of radioactive materials in the waste stream is less than or equal to 10% of the limits of 10 CFR 20, Appendix B, Table 2, Column 2.

(7) All flow from these waste streams shall be diverted to the Waste Water Holdup Tanks if activity is present in the waste stream in concentrations that exceed 10 times the limits of 10 CFR 20, Appendix B, Table 2, Column 2. Sampling and analysis of the respective Tanks or sumps are not required when flow is diverted to the Waste Water Holdup Tanks.

(8) Waste Water Holdup Tanks (WWHT) shall be discharged directly to the Circulating Water Discharge Tunnel when results of sample analyses indicate activity in concentrations that exceed 10 times the limits of 10 CFR 20, Appendix B, Table 2, Column 2. Otherwise, WWHTs may be discharged to the Low Volume Waste Pond. WWHT discharges to the Circulating Water Discharge Tunnel shall be sampled and analyzed per Item 1A.c of this table. WWHT discharges to the LVW Pond shall be sampled and analyzed per Item 1B.b of this table.

(9) Samples shall be taken at least once per 24 hours while the release is occurring. To be representative of the liquid effluent, the sample volume shall be proportioned to the effluent stream discharge volume. The ratio of sample volume to effluent discharge volume shall be maintained constant for all samples taken for the composite sample.

(10) Temporary holdup tanks used to support special plant activities (e.g., Steam Generator Secondary Cleaning) involving potentially radioactive systems may be transferred to the Waste Water Management System when sampled in accordance with this table and the special plant activity has been evaluated in accordance with the 50.59 process. This waste stream shall not be discharged to the Waste Water Management System if activity is present in the waste stream in concentrations that exceed 10 times the limits of 10CFR20, Appendix B, Table 2, Column 2.

(11) Dissolved and entrained gases should be included in the analysis (including Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138). There are no LLD requirements for these gases in the LVW samples since the half life of the isotopes are relatively short with respect to the sample counting frequency. Gases are also not expected to be found in the LVW due

TABLE 4.11-1 (Continued)

TABLE NOTATIONS (Continued)

to delay times associated with water being transported to the LVW and the open exposure of the ponds which would aid in the degasification of the liquids. One sample should be obtained monthly from the Low Volume Waste in addition to the composite sample to analyze for these noble gases. The count time for the sample should be equal to the time required to establish LLD values for the noble gas isotopes (e.g., 2000 seconds or the same count time used for effluent liquid batch releases).

RADIOACTIVE EFFLUENTS

DOSE

CONTROLS

3.11.1.2 In accordance with CPSES TS 5.5.4.d and 5.5.4.e the dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each unit, to CONTROLLED AREAS and UNRESTRICTED AREAS (see Figure 5.1-3) shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrems to the whole body and to less than or equal to 5 mrems to any organ; and

b. During any calendar year to less than or equal to 3 mrems to the whole body and to less than or equal to 10 mrems 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 a report to the Commission within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits. This 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 Part 141, Safe Drinking Water Act.

SURVEILLANCE REQUIREMENTS

4.11.1.2 Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodology and parameters in Part II of the ODCM at least once per 31 days.

RADIOACTIVE EFFLUENTS

LIQUID RADWASTE TREATMENT SYSTEM

CONTROLS

3.11.1.3 In accordance with CPSES TS 5.5.4.f, the Liquid Radwaste Treatment System shall be OPERABLE and appropriate portions of the system shall be used to reduce releases of radioactivity when the projected doses due to the liquid effluent, from each unit, to CONTROLLED AREAS and UNRESTRICTED AREAS (see Figure 5.1-3) would exceed 0.06 mrem to the whole body or 0.2 mrem to any organ in a 31-day period.

APPLICABILITY: At all times.

ACTION:

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits and any portion of the Liquid Radwaste Treatment System not in operation, prepare and submit a report to the Commission within 30 days, pursuant to 10 CFR 50, Appendix I, that includes the following information:

1) Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,

2) Action(s) taken to restore the inoperable equipment to OPERABLE status, and

3) Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS

4.11.1.3.1 Doses due to liquid releases from each unit to CONTROLLED AREAS and UNRESTRICTED AREAS shall be projected at least once per 31 days in accordance with the methodology and parameters in Part II of the ODCM when Liquid Radwaste Treatment Systems are not being fully utilized.

4.11.1.3.2 The installed Liquid Radwaste Treatment System shall be considered OPERABLE by meeting Controls 3.11.1.1 and 3.11.1.2.

CONTROLS

3.11.1.4 The quantity of radioactive material contained in resins transferred to the LVW Pond shall be limited by the following expression:

$$\frac{264}{V} \cdot \sum_j \frac{A_j}{C_j} < 1.0$$

excluding tritium, dissolved or entrained noble gases, and radionuclides with less than an 8-day half-life,

where:

A_j = Pond inventory limit for single radionuclide "j" (Curies),

C_j = 10 CFR 20, Appendix B, Table 2, Column 2, concentration for single radionuclide "j" (microCuries/ml),

V = Volume of resins in the pond (gallons), and

264 = Unit conversion factor (microCuries/Curie per milliliter/gallon).

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material contained in resins in the LVW Pond exceeding the above limit, immediately suspend all additions of resins to the pond.

SURVEILLANCE REQUIREMENTS

4.11.1.4 Prior to transferring any batch of used powdex resin to the pond, the total inventory of radioactive materials in resins contained in the pond, including the batch to be transferred, shall be determined to be within the above limit. The inventory shall be determined based on analysis of a representative sample of the resin batch. Decay of radionuclides in previously discharged resins may be taken into account in determining inventory levels.

SURVEILLANCE REQUIREMENTS (Continued)

Additionally, each batch of resins transferred to the pond shall be limited by the expression:

$$\sum_{j} \frac{Q_j}{C_j} \leq 0.1$$

where:

Q_j = Concentration of radioactive materials (microCuries/ml) in wet, drained slurry (used powdex resin) for radionuclide "j", excluding tritium, dissolved or entrained noble gases, and radionuclides with less than an 8-day half-life. The analysis shall include at least Ce-144, Cs-134, Cs-137, Co-58 and Co-60. Estimates of the Sr-89 and Sr-90 batch concentration shall be included based on the most recent quarterly composite analysis,

C_j = 10 CFR 20, Appendix B, Table 2, Column 2, concentration for single radionuclide "j" (microCuries/milliliter).

3/4.11 RADIOACTIVE EFFLUENTS

3/4.11.2 GASEOUS EFFLUENTS

DOSE RATE

3.11.2.1 In accordance with CPSES TS 5.5.4.c and 5.5.4.g, the dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. For noble gases: Less than or equal to a dose rate of 500 mrems/yr to the total body and less than or equal to 3000 mrems/yr to the skin; and

b. For Iodine-131, for Iodine-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to a dose rate of 1500 mrem/yr to any organ.

APPLICABILITY: At all times.

ACTION:

a. With the dose rate(s) exceeding the above limits, immediately restore the release rate to within the above limits(s).

SURVEILLANCE REQUIREMENTS

4.11.2.1.1 Radioactive gaseous wastes shall be sampled and analyzed according to the sampling and analysis program of Table 4.11-2.

4.11.2.1.2 The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in Part II of the ODCM to assure that the dose rates at or beyond the SITE BOUNDARY are maintained within the limits of Control 3.11.2.1.

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) (1) (μCi/ml)
1. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters(2)	$1x10^{-4}$
2. Containment Purge or Vent	P Each Release(3) Grab Sample	P Each Release(3)	Principal Gamma Emitters(2)	$1x10^{-4}$
		M	H-3 (oxide)	$1x10^{-6}$
3. Plant Vent	M(3), (4), (5) Grab Sample	M(3)	Principal Gamma Emitters(2)	$1x10^{-4}$
			H-3 (oxide)	$1x10^{-6}$
	Continuous(6)	W(7) Radioiodine Adsorber	I-131	$1x10^{-12}$
	Continuous(6)	W(7) Particulate Sample	Principal Gamma Emitters(2)	$1x10^{-11}$
	Continuous(6)	M Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
	Continuous(6)	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$
	Continuous(6)	Noble Gas ** Beta or Gamma	Noble Gas	$1x10^{-6}$
4. Outside Buildings	Grab sample	W(8)	Principle Gamma Emitters(2)	$1x10^{-11}$

* Table notations next page
**This sample is continuously analyzed by a radiation monitor

TABLE 4.11-2 (Continued)

TABLE NOTATIONS

(1) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \bullet V \bullet 2.22 \times 10^6 \bullet Y \bullet \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (microCurie per unit mass or volume),

s_b = Standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = Counting efficiency (counts per disintegration),

V = Sample size (units of mass or volume),

2.22×10^6 = Number of disintegrations per minute per microCurie,

Y = Fractional radiochemical yield, when applicable,

λ = Radioactive decay constant for the particular radionuclide (sec^{-1}), and

Δt = Elapsed time between the midpoint of sample collection and the time of counting(s).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

(2) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 in noble gas releases and Mn-54, Fe-59, Co-58, Co-60, Zn-65, I-131, Cs-134, Cs-137, Ce-141 and Ce-144 in iodine and particulate releases. This list does not mean that only these nuclides are to be considered. In the case of release type 4, Outside Buildings, noble gases and iodine may not be sampled based on an evaluation of the source term. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report, pursuant to Control 6.9.1.4, in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.

TABLE 4.11-2 (Continued)

TABLE NOTATIONS (Continued)

(3) Sampling and analysis shall also be performed following shutdown, startup, or a THERMAL POWER change ≥ 15% of RATED THERMAL POWER within a 1-hour period. This requirement does not apply if: (1) analysis of primary coolant activity performed pursuant to Technical Specification 3.4.16 shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3, and (2) noble gas monitoring shows that effluent activity has not increased more than a factor of 3.

(4) Tritium grab samples shall be taken at least once per 24 hours when the refueling canal is flooded.

(5) Tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

(6) The 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 Controls 3.11.2.1, 3.11.2.2, and 3.11.2.3.

(7) Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing, or after removal from the 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 ≥ 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) noble gas monitoring shows that effluent activity has not increased more than a factor of 3.

(8) Samples shall be changed at least once per seven (7) days and analysis shall be completed within 48 hours after changing, or after removal from the sampler. This requirement does not apply, if no activities are being conducted in the Outside Building that would generate radioactive effluent.

RADIOACTIVE EFFLUENTS

DOSE - NOBLE GASES

CONTROLS

3.11.2.2 In accordance with CPSES TS 5.5.4.e and 5.5.4.h, the air dose due to noble gases released in gaseous effluents, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 5 mrads for gamma radiation and less than or equal to 10 mrads for beta radiation; and

b. During any calendar year: Less than or equal to 10 mrads for gamma radiation and less than or equal to 20 mrads 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 a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS

4.11.2.2 Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology and parameters in Part II of the ODCM at least once per 31 days.

DOSE - IODINE-131, IODINE-133, TRITIUM, AND RADIOACTIVE MATERIAL IN PARTICULATE FORM

CONTROLS

3.11.2.3 In accordance with CPSES TS 5.5.4.e and 5.5.4.i, the dose to a MEMBER OF THE PUBLIC from Iodine-131, Iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrems to any organ; and

b. During any calendar year: Less than or equal to 15 mrems to any organ.

APPLICABILITY: At all times.

ACTION:

a. With the calculated dose from the release of Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding any of the above limits, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit and defines the corrective actions that have to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS

4.11.2.3 Cumulative dose contributions for the current calendar quarter and current calendar year for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodology and parameters in Part II of the ODCM at least once per 31 days.

CONTROLS

3.11.2.4 In accordance with CPSES TS 5.5.4.f, the PRIMARY PLANT VENTILATION SYSTEM and the WASTE GAS HOLDUP SYSTEM shall be OPERABLE and appropriate portions of these systems shall be used to reduce releases of radioactivity when the projected doses in 31 days due to gaseous effluent releases, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) would exceed:

a. 0.2 mrad to air from gamma radiation, or

b. 0.4 mrad to air from beta radiation, or

c. 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

APPLICABILITY: At all times.

ACTION:

a. With radioactive gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that includes the following information:

   1) Identification of any inoperable equipment or subsystems, and the reason for the inoperability,

   2) Action(s) taken to restore the inoperable equipment to OPERABLE status, and

   3) Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS

4.11.2.4.1 Doses due to gaseous releases from each unit to areas at and beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodology and parameters in Part II of the ODCM when Gaseous Radwaste Treatment Systems are not being fully utilized.

4.11.2.4.2 The installed PRIMARY PLANT VENTILATION SYSTEM and WASTE GAS HOLDUP SYSTEM shall be considered OPERABLE by meeting Controls 3.11.2.1 and 3.11.2.2 or 3.11.2.3.

3/4.11.4 TOTAL DOSE

CONTROLS

3.11.4 In accordance with CPSES TS 5.5.4.j, 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 less than or equal to 25 mrems to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

APPLICABILITY: At all times.

ACTION:

a. With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Controls 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 and from outside storage tanks to determine whether the above limits of Control 3.11.4 have been exceeded. If such is the case, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 20.1301(d) and 10 CFR 20.2203(a)(4) 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 report, as defined in 10 CFR 20.2203(b), 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 concentration 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 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.

SURVEILLANCE REQUIREMENTS

4.11.4.1 Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Controls 4.11.1.2, 4.11.2.2, and 4.11.2.3, and in accordance with the methodology and parameters in Part II of the ODCM.

4.11.4.2 Cumulative dose contributions from direct radiation from the units and from radwaste storage tanks shall be determined in accordance with the methodology and parameters in Part II of the ODCM. This requirement is applicable only under conditions set forth in ACTION a. of Control 3.11.4.

3/4.12 RADIOLOGICAL ENVIRONMENTAL MONITORING

3/4.12.1 MONITORING PROGRAM

CONTROLS

3.12.1 The Radiological Environmental Monitoring Program shall be conducted as specified in Table 3.12-1.

APPLICABILITY: At all times.

ACTION:

a. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 3.12-1, prepare and submit to the NRC, in the Annual Radiological Environmental Operating Report required by Control 6.9.1.3, a description of the reason(s) for not conducting the program as required and the plan for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 3.12-2 when averaged over any calendar quarter, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit(s) and defines the corrective action to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of Control 3.11.1.2, 3.11.2.2, or 3.11.2.3. When more than one of the radionuclides in Table 3.12-2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 3.12-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to A MEMBER OF THE PUBLIC from all radionuclides is equal to or greater than the calendar year limits of Control 3.11.1.2, 3.11.2.2, or 3.11.2.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report required by Control 6.9.1.3.

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* The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

CONTROLS (Continued)

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 3.12-1, identify locations for obtaining replacement samples and add them within 30 days to the Radiological Environmental Monitoring Program. The specific locations from which samples were unavailable may then be deleted from the monitoring program. New sampling locations shall be listed in the results of the annual Land Use Census.

SURVEILLANCE REQUIREMENTS

4.12.1 The radiological environmental monitoring samples shall be collected pursuant to Table 3.12-1 and shall be analyzed pursuant to the requirements of Table 3.12-1 and the detection capabilities required by Table 4.12-1. The specific sample locations for the Radiological Environmental Monitoring Program shall be listed and maintained current in the results of the annual Land Use Census.

TABLE 3.12-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

	EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1.	Direct Radiation[2]	Forty routine monitoring stations either with two or more dosimeters or with one instrument for measuring and recording dose rate continuously, placed as follows: An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY; An outer ring of stations, one in each meteorological sector in the 6- to 8-km range from the site; and The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and in one or two areas to serve as control stations.	Quarterly	Gamma dose quarterly
2.	Airborne Radioiodine and Particulates	Samples from five locations: Three samples from close to the three SITE BOUNDARY locations, in different sectors, of the highest calculated annual average ground-level D/Q;	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Canister: I-131 analysis weekly Particulate Sampler: Gross beta radioactivity analysis following filter change;[4] and gamma isotopic analysis[5] of composite (by location quarterly).

TABLE 3.12-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
	One sample from the vicinity of a community having the highest calculated annual average ground-level D/Q; and One sample from a control location, as for example 15 to 30 km distant and in the least prevalent wind direction.[3]		
3. Waterborne			
a. Surface	Squaw Creek Reservoir[6]	Monthly composite of weekly grab samples.	Gamma isotopic analysis[5] monthly. Composite for tritium analysis quarterly.
	Lake Granbury	Monthly composite of weekly grab samples when Lake Granbury is receiving letdown from SCR. Otherwise, monthly grab sample.[7]	Gamma isotopic analysis[5] monthly. Composite for tritium analysis quarterly.
	Control-Brazos River upstream of Lake Granbury	Monthly	Gamma isotopic analysis[5] monthly. Composite for tritium analysis quarterly.
b. Ground	Samples from two sources if likely to be affected.[8]	Quarterly	Gamma isotopic[5] and tritium analysis quarterly.

TABLE 3.12-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. Waterborne (Continued)			
c. Drinking	One sample from Squaw Creek Reservoir.	Composite of weekly grab samples over 2-week period when I-131 analysis is performed; monthly composite of weekly grab samples otherwise.	I-131 analysis of each composite sample when the dose calculated for the consumption of the water is greater than 1 mrem per year[9]. Gross beta and gamma isotopic analyses[5] monthly. Composite for tritium analysis quarterly.
d. Sediment from Shoreline	One sample from downstream area with existing or potential recreational value.	Semiannually.	Gamma isotopic analysis[5] semiannually.
4. Ingestion			
a. Milk	Samples from milking animals in three locations within 5 km distance having the highest dose potential. If there are none, sample from milking animals in each of three areas between 5 to 8 km distant where doses are calculated to be greater than 1 mrem per yr.[9] One sample from milking animals at a control location, 15 to 30 km distant and in the least prevalent wind direction.[3]	Semimonthly when animals are on pasture; monthly at other times.	Gamma isotopic[5] and I-131 analysis semimonthly when animals are on pasture; monthly at other times.

TABLE 3.12-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE		NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4.	Ingestion (Continued)			
b.	Fish and Invertebrates	One sample of at least two recreationally important species in vicinity of plant discharge area.	Sample semiannually.	Gamma isotopic analysis[5] on edible portions semiannually
		One sample of same species in areas not influenced by plant discharge.		
c.	Food Products*	One sample of each principal class of food products from any area that is irrigated by water in which liquid plant wastes have been discharged.	At time of harvest[10]	Gamma isotopic analysis[5] on edible portion following sample collection.
		A sample of broad leaf vegetation grown nearest each of two different offsite locations of highest predicted annual average ground level D/Q if milk sampling is not performed at all required locations.	Monthly, when available.	Gamma isotopic[5] and I-131 analyses, monthly, when samples are collected
		One sample of each of the similar broad leaf vegetation grown 15 to 30 km distant in the least prevalent wind direction[3] if milk sampling is not performed at all required locations.	Monthly, when available.	Gamma isotopic[5] and I-131 analyses, monthly, when samples are collected

* Reports from 3 additional airborne radioiodine sample locations may be supplemented for broad leaf vegetation samples.

TABLE 3.12-1 (Continued)

TABLE NOTATIONS

(1) For each sample location required by Table 3.12-1, specific parameters of distance and direction sector from the centerline of one reactor, and additional description where pertinent, are provided in information maintained current in the results of the annual Land Use Census. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, and malfunction of automatic sampling equipment. If specimens are unobtainable due to sampling equipment malfunction, 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 Radiological Environmental Operating Report pursuant to Control 6.9.1.3. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable specific alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Program. New sampling locations shall be listed in the results of the annual Land Use Census.

(2) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation.

(3) The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted. The control sample location at 12.3 miles in the southwest sector has been evaluated and found to be an acceptable substitute sampling location.

(4) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than 10 times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(5) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

(6) The Reservoir shall be sampled in an area at or beyond but near the mixing zone. Also, the Reservoir shall be sampled at a distance beyond significant influence of the discharge.

(7) Lake Granbury shall be sampled near the letdown discharge and at a distance beyond significant influence of the discharge.

(8) Groundwater samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

TABLE 3.12-1 (Continued)

TABLE NOTATIONS (Continued)

(9) The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in Part II of the ODCM.

(10) If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be monthly. Attention shall be paid to including samples of tuberous and root food products.

TABLE 3.12-2 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

ANALYSIS	WATER (pCi/1)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)
H-3	20,000*				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2**	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

(*) For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.
(**) If no drinking water pathway exists, a value of 20 pCi/l may be used.

TABLE 4.12-1 DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

Lower Limit of Detection (LLD)[3]

ANALYSIS	WATER (pCi/1)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	2000*					
Mn-54	15		130			
Fe-59	30		260			
Co -58, 60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1**	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

* If no drinking water pathway exists, a value of 3000 pCi/l may be used.
** If no drinking water pathway exists, a value of 15 pCi/l may be used.

TABLE 4.12-1 (Continued)

TABLE NOTATIONS

(1) The list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

(2) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.

(3) The LLD is defined, for purposes of these specifications, as the smallest concentrations of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only a 5% probability of falsely concluding that a blank observation represents a "real" signal.

$$LLD = \frac{4.66 s_b}{E \bullet V \bullet Y \bullet \exp(-\lambda \Delta t) \; 2.22}$$

Where:

LLD	=	the "a priori" lower limit of detection (picoCurie per unit mass or volume),
s_b	=	Standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),
E	=	Counting efficiency (counts per disintegration),
V	=	Sample size (units of mass or volume),
2.22	=	Number of disintegrations per minute per picoCurie,
Y	=	Fractional radiochemical yield, when applicable,
λ	=	Radioactive decay constant for the particular radionuclide (sec^{-1}), and
Δt	=	Elapsed time between the midpoint of sample collection and the time of counting(s).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs 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 Operating Report pursuant to Control 6.9.1.3.

3/4.12.2 LAND USE CENSUS

CONTROLS

3.12.2 A Land Use Census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence, and the nearest garden* of greater than $50m^2$ (500 ft^2) producing broad leaf vegetation.

APPLICABILITY: At all times.

ACTION:

a. With a Land Use Census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Control 4.11.2.3, pursuant to Control 6.9.1.4, identify the new location(s) in the next Radioactive Effluent Release Report.

b. With a Land Use Census identifying a location(s) that 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 Control 3.12.1, add the new location(s) within 30 days, to the Radiological Environmental Monitoring Program. The sampling locations having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. New sampling locations shall be listed in the results of the annual Land Use Census.

SURVEILLANCE REQUIREMENTS

4.12.2 The Land Use Census shall be conducted during the growing season at least once per 12 months using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

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* Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 3.12-1, Item 4.c. shall be followed, including analysis of control samples.

3/4.12 RADIOLOGICAL ENVIRONMENTAL MONITORING

3/4.12.3 INTERLABORATORY COMPARISON PROGRAM

CONTROLS

3.12.3 Analyses shall be performed on all radioactive materials, supplied as part of an Interlaboratory Comparison Program, that correspond to samples required by Table 3.12-1.

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 NRC in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

SURVEILLANCE REQUIREMENTS

4.12.3 The Interlaboratory Comparison Program shall be described in Part II of the ODCM. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

COMANCHE PEAK STEAM ELECTRIC STATION
OFFSITE DOSE CALCULATION MANUAL (ODCM)
EFFECTIVE LISTING FOR SECTIONS, TABLES, AND FIGURES

BELOW IS A LEGEND FOR THE EFFECTIVE LISTING OF SECTIONS, TABLES, AND FIGURES:

Revision 0 (TXX-89118)	Submitted to the NRC March 2, 1989
Revision 1 (TXX-89595)	Submitted to the NRC August 25, 1989
Revision 2 (TXX-89711)	Submitted to the NRC November 27, 1989
Revision 3	April 10, 1990
Revision 4	October 9, 1990
Revision 5	December 20, 1990
Revision 6	July 3, 1991
Revision 7	December 4, 1991
Revision 7A	August 6, 1992
Revision 8 (Unit 2 Operations)	January 1, 1993
Revision 9	September 28, 1994
Revision 10	April 22, 1994
Revision 11	November 7, 1994
Revision 12	December 8, 1995
Revision 13	February 14, 1996
Revision 14	October 1, 1996
Revision 15	March 3, 1999
Revision 16	July 27, 1999
Revision 17	October 7, 1999
Revision 18	December 20, 1999
Revision 19	October 16, 2001
Revision 20	July 8, 2002
Revision 21	March 23, 2004
Revision 22	December 8, 2004
Revision 23	January 31, 2006
Revision 24	March 13, 2006
Revision 25	June 1, 2006
Revision 26	December 12, 2006
Revision 27	July 24, 2007
Revision 28	September 11, 2008
Revision 29	February 26, 2009

PART I

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Table 1.2	Revision 23
Figure 1.1	Revision 23
Figure 1.2	Revision 23
Figure 1.3	Revision 23
Section 2	Revision 26
Table 2.1	Revision 26
Table 2.2	Revision 23
Table 2.3	Revision 23
Table 2.4	Revision 23
Table 2.5	Revision 23
Figure 2.1	Revision 23
Figure 2.2	Revision 23
Figure 2.3	Revision 23
Figure 2.4	Revision 23
Figure 2.5	Revision 23
Section 3	Revision 23
Table 3.1	Revision 23
Figure 3.1	Revision 23
Appendix A	Revision 23
Appendix B	Revision 23
Appendix C	Revision 23
Appendix D	Revision 23
Appendix E	Revision 23
Appendix F	Revision 23
Appendix G	Revision 23

EL-1	Revision 29
EL-2	Revision 29
EL-3	Revision 29

REVISION 23

LDCR-OD-2006-2 (CPSES-200600206) (RJK):

Revision 23 updates the entire ODCM to reflect the following changes:

- The electronic files have been converted from Microsoft Word to Adobe Framemaker and published in Adobe Portable Document Format (PDF).

  The type of changes include changes such as:
  - Correction of spelling errors
  - Correction of inadvertent word processing errors from previous changes
  - Style guide changes (e.g., changing from a numbered bullet list to an alphabetized bullet list and vice versa, change numbering of footnote naming scheme)
  - Administrative change only and contain no technical changes.

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

- The entire ODCM will be reissued as Revision 23. For the text and tables there will be no change bars in the page margins for editorial changes. The list of effective pages is being replaced with a list of effective section, tables, and figure

Sections Revised: All

Tables Revised: All

Figures Revised: All

REVISION 24

LDCR-OD-2005-1 (EVAL-2005-003863-02) (GLM):

Revision 24 updates ODCM Section 3/4 to reflect the following changes:

- Delete the requirement to submit a special report outlining the cause of the malfunction and the plans for restoring the channel(s) to operable status.

- Adds the requirement to initiate actions in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical.

REVISION 24 (continued)

LDCR-OD-2005-1 (EVAL-2005-003863-02) (GLM) (continued):

- The CPSES Corrective Action Program is adequate to track the actions needed to restore the channel(s) to an operable status in a time commensurate with their safety significance. The minimum set of conditions required by law to be reported to the NRC are contained in the Code Of Federal Regulations (10CFR50.73, 10CFR50.72, 10CFR73, etc.). This ODCM special report is not required by the CFRs, and there is no regulatory basis for this special report. There is no Technical Specification action, regulation, license condition, order, or commitment that requires this ODCM special report. The meteorological monitoring system is governed by Regulatory Guide 1.23, "Onsite Meteorological Programs", and this Regulatory Guide contains no requirement for a special report to the NRC. Based on the above, this ODCM special report is only an administrative requirement and therefore it can be deleted.

Sections Revised: 3/4

Tables Revised: None

Figures Revised: None

REVISION 25

LDCR-OD-2006-3 (EVAL-2006-000932-01) (RJK):

Revision 25 updates ODCM Section 3/4 to reflect the following changes:

- The 7 day allowance for planned and/or scheduled channel maintenance (similar to the TS COMPLETION TIME) was removed in error by Revision 24 of the ODCM (LDCR-OD-2005-01). That revision intended only to remove the requirement to issue a Special Report to the NRC if the 7 days allowance was exceeded.

- This LDCR restores an acceptable outage duration for planned and/or scheduled work commensurate with the safety significance of this item. This change also maintains the levels of radioactive effluent control required by 10 CFR 20.1302, 40 CFR 190, 10 CFR 50.36a, and 10 CFR 50, Appendix I, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

Sections Revised: 3/4

Tables Revised: None

Figures Revised: None

REVISION 26

LDCR-OD-2006-5 (EVAL-2006-002463-01) (RJK):

Engineering evaluation ME-CA-0000-5326 assessed the potential gaseous effluent release from a planned decontamination facility on site. The evaluation also provides for operational controls on any similar facility to limit the source term and assess the effluents. The proposed changes to the ODCM provide the framework to identify, control, and monitor any gaseous effluent pathway. The results of the monitoring are reported in the Radioactive Effluent Release Report, pursuant to ODCM Control 6.9.1.4.

LDCR-OD-2006-6 (EVAL-2006-001766-01) (RJK):

Revise Action Statement 37 (applicable to WRGM skid iodine and particulate channels) to add "If the number of channels OPERABLE is less than required by the "minimum Channels OPERABLE" requirement due to loss of heat tracing, then declare the Iodine & Particulate samplers INOPERABLE. Restore the heat tracing within 7 days and declare the samplers OPERABLE or initiate action in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical."

These particulate and iodine channels are USNRC Regulatory Guide 1.97, Revision 2, Type/Category E3 variables that provide backup information to estimate magnitude of release of radioactive materials to identify pathways. This 7 day period for entry into the CPSES Corrective Action Program is adequate to track the actions needed to restore the channel(s) to an operable status in a time commensurate with their safety significance.

REVISION 27

LDCR-OD-2006-1 (EVAL-2005-001822-07) (GLM):

Revise definition of DOSE EQUIVALENT IODINE 131 and add new definition for DOSE EQUIVALENT XENON 133.

LAR 06-001 revises TS 3.4.16 to eliminate E-bar and adopt DOSE EQUIVALENT XE-133 for monitoring RCS gross specific activity. This change makes the ODCM definition consistent with the revised TS definition.

REVISION 28

LDCR-OD-2007-1 (EVAL-2006-003080-05) (JDS):

Revise Definition of Rated Thermal Power to reflect 4.5% increase on Units 1 and 2 as issued by the NRC in Amendment 146 to the Operating Licenses and Technical Specifications.

REVISION 29

LDCR-OD-2007-2 (EVAL-2007-002019-01) (SCD):

Revise Table 3.3-8 ACTION and associated statements to clarify necessary actions in the event of a loss of heat tracing or sample lines to the WRGM sampling skid. These particulate and iodine channels are USNRC Regulatory Guide 1.97, Revision 2, Type/ Category E3 variables that provide backup information to estimate magnitude of release of radioactive materials to identify pathways. This 7 day period for entry into the CPNPP Corrective Action Program is adequate to track the actions needed to restore the channel(s) to an operable status in a time commensurate with their safety significance.

SECTIONS 3.0 AND 4.0 CONTROLS AND SURVEILLANCE REQUIREMENTS

3/4.0 APPLICABILITY

The guidance provided for the use and application of LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY in Section 3.0, "LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY" of the Technical Specifications is applicable to the Controls contained in this manual, except as noted below.

The guidance provided for the use and application of SURVEILLANCE REQUIREMENT (SR) APPLICABILITY in Section 3.0, "SURVEILLANCE REQUIREMENT (SR) APPLICABILITY" of the Technical Specifications is applicable to the Surveillance Requirements contained in this manual.

For the purpose of the ODCM, the ODCM terms specified below should be considered synonymous with the listed Technical Specification term:

ODCM	Technical Specification
Control	LCO
ACTION	Required Action

A cross reference between Section 3/4.0 of the Offsite Dose Calculation Manual (ODCM) and the applicable Section 3.0 of the Technical Specifications is as follows:

ODCM Control:	Technical Specification Section
3.0.1	LCO 3.0.1
3.0.2	LCO 3.0.2
N/A (see Note 1)	LCO 3.0.3
N/A (see Note 1)	LCO 3.0.4
N/A (see Note 1)	LCO 3.0.5
N/A (see Note 1)	LCO 3.0.6
N/A (see Note 1)	LCO 3.0.7
ODCM Surveillance Requirement:	**Technical Specification Section**
4.0.1	SR 3.0.1
4.0.2	SR 3.0.2
4.0.3	SR 3.0.3
N/A (see Note 1)	SR 3.0.4

- NOTE 1 -

The provisions of the cross referenced Technical Specification LCO/SR are not pertinent for use in the ODCM; therefore, the Technical Specification LCO/SR is not applicable (N/A).

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

CONTROLS

3.3.3.4 In accordance with CPSES TS 5.5.4.a, the radioactive liquid effluent monitoring instrumentation channels shown in Table 3.3-7 shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of Control 3.11.1.1 are not exceeded. The Alarm/Trip Setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Part II of the OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY: At all times.

ACTION:

a. With a radioactive liquid effluent monitoring instrumentation channel Alarm/Trip Setpoint less conservative than required by the above Control, immediately suspend the release of radioactive liquid effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 3.3-7. Restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report pursuant to Control 6.9.1.4 why this inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

4.3.3.4 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and DIGITAL CHANNEL OPERATIONAL TEST or ANALOG CHANNEL OPERATIONAL TEST at the frequencies shown in Table 4.3-3.

TABLE 3.3-7 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1.	Radioactivity Monitors Providing Alarm and Automatic Termination of Release		
	a. Liquid Radwaste Effluent Line (XRE-5253)	1	30
	b. Turbine Building (Floor Drains) Sumps Effluent Lines (1RE-5100 & 2RE-5100)	1/sump	31
	c. Auxiliary Building to LVW Pond Liquid Effluent Line (XRE-5251A)	1	31A
2.	Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination of Release		
	a. Service Water System Effluent Lines (1RE-4269, 1RE-4270, 2RE-4269 & 2RE-4270)	1/train	32
3.	Flow Rate Measurement Devices		
	a. Liquid Radwaste Effluent Line (XFT-5288)	1	33

TABLE 3.3-7 (Continued)

ACTIONS STATEMENTS

ACTION 30- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with Control 4.11.1.1.1; and

b. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge line valving.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 31- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for principal gamma emitters at a lower limit of detection of no more than 5×10^{-7} microCurie/ml:

a. At least once per 12 hours when the specific activity of the secondary coolant is greater than 0.01 microCurie/gram DOSE EQUIVALENT I-131; or

b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 microCurie/gram DOSE EQUIVALENT I-131. (Refer to Notation 3 of Table 4.11-1 for the applicability of the LLD requirement.)

ACTION 31A- With number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for principal gamma emitters at a lower-limit of detection of no more than 5×10^{-7} microCurie/ml at least once per 12 hours.

ACTION 32- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, operations may continue provided that:

a. With the component cooling water monitors (uRE-4509, uRE-4510, &uRE-4511)* OPERABLE and indicating an activity of less than $1X10^{-4}$ micro Curie/ml, a grab sample is collected and analyzed for principal gamma emitters at a lower limit of detection of no more than 5×10^{-7} microCurie/ml at least every 31 days; or

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* "u" designates monitor for the applicable unit, e.g., 1 or 2.

TABLE 3.3-7 (Continued)

ACTIONS STATEMENTS (Continued)

b. At least once per 12 hours, grab samples are collected and analyzed for principal gamma emitters at a lower limit of detection of no more than 5×10^{-7} microCurie/ml. (Refer to Notation 3 of Table 4.11-1 for the applicability of the LLD requirement.)

NOTE: Collection of grab samples is not required when there is no process flow at the monitor.

ACTION 33- 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 during actual releases. Pump performance curves generated in place may be used to estimate flow.

TABLE 4.3-3 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	ANALOG CHANNEL OPERATIONAL TEST	DIGITAL CHANNEL OPERATIONAL TEST
1.	Radioactivity Monitors Providing Alarm and Automatic Termination of Release					
	a. Liquid Radwaste Effluent Line (XRE-5253)	D	P	R(4)	N.A.	Q(1)
	b. Turbine Building (Floor Drains) Sumps Effluent Lines (1RE-5100 & 2RE-5100)	D	M	R(4)	N.A.	Q(2)
	c. Auxiliary Building to LVW Pond Liquid Effluent Line (XRE-5251A)	D	M	R(4)	N.A.	Q(2)
2.	Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination of Release					
	a. Service Water System Effluent Lines (1RE-4269, 1RE-4270, 2RE-4269 & 2RE-4270)	D	M	R(4)	N.A.	Q(3)
3.	Flow Rate Measurement Devices					
	a. Liquid Radwaste Effluent Line (XFT-5288)	D(5)	N.A.	R	Q	N.A.

TABLE 4.3-3 (Continued)

TABLE NOTATIONS

(1) The DIGITAL CHANNEL OPERATIONAL TEST shall also demonstrate that automatic isolation of this pathway and Control Room alarm annunciation occur if any of the following conditions exist:

a. Instrument indicates measured levels above the Alarm/Trip Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(2) The DIGITAL CHANNEL OPERATIONAL TEST shall also demonstrate that automatic flow diversion of this pathway (from the Low Volume Waste Treatment System to the Co-Current Waste Treatment System) and Control Room alarm annunciation occur if any of the following conditions exist:

a. Instrument indicates measured levels above the Alarm/Trip Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, or Check Source Failure).

(3) The DIGITAL CHANNEL OPERATIONAL 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 Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(4) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology (NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration, reference standards certified by NIST, or standards that have been obtained from suppliers that participate in measurement assurance activities with NIST shall be used.

(5) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once per 24 hours on days on which continuous, periodic, or batch releases are made.

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

CONTROLS

3.3.3.5 In accordance with CPSES TS 5.5.4.a, the radioactive gaseous effluent monitoring instrumentation channels shown in Table 3.3-8 shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of Control 3.11.2.1 are not exceeded. The Alarm/Trip Setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Part II of the ODCM.

APPLICABILITY: As shown in Table 3.3-8.

ACTION:

a. With a radioactive gaseous effluent monitoring instrumentation channel Alarm/ Trip Setpoint less conservative than required by the above Control, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 3.3-8. Restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report pursuant to Control 6.9.1.4 why this inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

4.3.3.5 Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and DIGITAL CHANNEL OPERATIONAL TEST or ANALOG CHANNEL OPERATIONAL TEST at the frequencies shown in Table 4.3-4.

TABLE 3.3-8 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1.	WASTE GAS HOLDUP SYSTEM			
	a. Noble Gas Release Rate Monitor - Providing Alarm and Automatic Termination of Release [XRE-5570A & XRE-5570B (effluent release rate channel)]	1/stack	**	34
2.	PRIMARY PLANT VENTILATION			
	a. Noble Gas Release Rate Monitor [XRE-5570A & XRE-5570B (effluent release rate channel)]	1/stack	*	36
	b. Iodine Sampler (WRGM sample skid)	1/stack	*	37
	c. Particulate Sampler (WRGM sample skid)	1/stack	*	37
	d. Sampler Flow Rate Monitor SMPL Flow 1 (X-RFT-5570A-1, X-RFT-5570B-1)	1/stack	*	35

TABLE 3.3-8 (Continued)

TABLE NOTATIONS

* At all times.

** During Batch Radioactive Releases via this pathway.

ACTION 34- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:

a. The auxiliary building vent duct monitor (XRE-5701) is confirmed OPERABLE; or

b. At least two independent samples of the tank's contents are analyzed; and

c. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 35- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the sample flow rate is estimated at least once per 4 hours.

ACTION 36- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that:

a. A Plant Vent Noble Gas Activity Monitor (XRE-5570A, XRE-5570B (low range activity) or XRE-5567A, XRE-5567B) is OPERABLE, and the plant vent flow rate is estimated at least once per 4 hours; or

b. The Plant Vent Flow Monitor, PROC FLOW N (X-FT-5570A-1, X-FT-5570B-1), is OPERABLE, and an alternate Plant Vent Noble Gas Activity Monitor is OPERABLE (XRE-5567A, XRE-5567B) or grab samples are taken at least once per 12 hours and these samples are analyzed for radioactivity within 24 hours; or

c. The plant vent flow rate is estimated at least once per 4 hours, and grab samples are taken at least once per 12 hours and these samples are analyzed for radioactivity within 24 hours; or

d. if the number of channels OPERABLE is less than required by the "Minimum Channels OPERABLE" requirement due to loss of sample line, effluent releases via this pathway may continue for no more than 7 days, provided monitors on the other stack are OPERABLE and actions are initiated in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical.

TABLE 3.3-8 (Continued)

TABLE NOTATIONS

ACTION 37- With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue provided that:

a. samples are continuously collected with auxiliary sampling equipment as required in Table 4.11-2, or

b. if the number of channels OPERABLE is less than required by the "minimum Channels OPERABLE" requirement due to loss of heat tracing, then declare the Iodine & Particulate samplers INOPERABLE. Restore the heat tracing within 7 days and declare the samplers OPERABLE or initiate action in accordance with the Corrective Action Program to restore the channel(s) to OPERABLE status as soon as practical; or

c. if the number of channels OPERABLE is less than required by the "Minimum Channels OPERABLE" requirement due to loss of sample line, effluent releases via the affected pathway may continue for no more than 7 days, provided monitors on the other stack are OPERABLE and actions are initiated in accordance with the Corrective Action Program to restore the channel(s) to OPERABLE status as soon as practical.

TABLE 4.3-4 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	ANALOG CHANNEL OPERATIONAL TEST	DIGITAL CHANNEL OPERATIONAL TEST
1.	WASTE GAS HOLDUP SYSTEM					
a.	Noble Gas Release Rate Monitor - Providing Alarm and Automatic Termination of Release [XRE-5570A, XRE-5570B (effluent release rate channel)]	P	P	R(3)	N.A.	Q(1)
2.	PRIMARY PLANT VENTILATION					
a.	Noble Gas Release Rate Monitor [XRE-5570A, XRE-5570B (effluent release rate channel)]	D	#	R(3)	N.A.	Q(2)
b.	Iodine Sampler (WRGM sample skid)	W(4)	N.A.	N.A.	N.A.	N.A.
c.	Particulate Sampler (WRGM Sample Skid)	W(4)	N.A.	N.A.	N.A.	N.A.
d.	Sampler Flow Rate Monitor SMPL Flow 1 (X-RFT-5570A-1, X-RFT-5570B-1)	D	N.A.	R	Q	N.A.

TABLE 4.3-4 (Continued)

TABLE NOTATIONS

Prior to any release from the WASTE GAS HOLDUP SYSTEM or containment PURGING or VENTING, not to exceed 31 days.

(1) The DIGITAL CHANNEL OPERATIONAL 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; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(2) The DIGITAL CHANNEL OPERATIONAL 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 Setpoint; or

b. Circuit failure (Channel Out of Service - Loss of Power, Loss of Counts, Loss of Sample Flow, or Check Source Failure).

(3) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology (NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration, reference standards certified by NIST, or standards that have been obtained from suppliers that participate in measurement assurance activities with NIST shall be used.

(4) The CHANNEL CHECK shall consist of visually verifying that the collection element (i.e., filter or cartridge. etc.) is in place for sampling.

CONTROLS

3.3.3.6 The meteorological monitoring instrumentation channels shown in Table 3.3-9 shall be OPERABLE.

APPLICABILITY: At all times.

ACTION:

a. With less than the minimum number of meteorological monitoring instrumentation channels OPERABLE for more than 7 days, initiate action in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical.

SURVEILLANCE REQUIREMENTS

4.3.3.6 Each of the above meteorological monitoring instrumentation channels shall be demonstrated OPERABLE:

a. At least once per 24 hours by performance of a CHANNEL CHECK; and

b. At least once per 184 days by performance of a CHANNEL CALIBRATION except the wind speed and wind direction sensors which are replaced with calibrated sensors at least once per 12 months.

TABLE 3.3-9 METEOROLOGICAL MONITORING INSTRUMENTATION

INSTRUMENT CHANNEL		LOCATION	MINIMUM OPERABLE
1.	WIND SPEED		1 of 3
	a. X-S-4117	Nominal Elev. 60 m.	
	b. X-S-4118	Nominal Elev. 10 m.	
	c. X-S-4128*	Nominal Elev. 10 m.	
2.	WIND DIRECTION		1 of 3
	a. X-Z-4115	Nominal Elev. 60 m	
	b. X-Z-4116	Nominal Elev. 10 m.	
	c. X-Z-4126*	Nominal Elev. 10 m.	
3.	AIR TEMPERATURE - ΔT		1 of 2
	a. X-T-4119	Nominal Elev. 60 m. and Nominal Elev. 10 m.	
	b. X-T-4120	Nominal Elev. 60 m. and Nominal Elev. 10 m.	

* Mounted on backup tower.

CONTROLS

3.7.15 Each sealed source containing radioactive material either in excess of 100 microCuries of beta and/or gamma emitting material or 5 microCuries of alpha emitting material shall be free of greater than or equal to 0.005 microCurie of removable contamination.

APPLICABILITY: At all times.

ACTION:

With a sealed source having removable contamination in excess of the above limits, immediately withdraw the sealed source from use and either:

1. Decontaminate and repair the sealed source; or

2. Dispose of the sealed source in accordance with Commission Regulations.

SURVEILLANCE REQUIREMENTS

4.7.15.1 Test Requirements - Each sealed source shall be tested for leakage and/or contamination by:

a. The licensee; or

b. Other persons specifically authorized by the Commission or an Agreement State.

The test method shall have a detection sensitivity of at least 0.005 microCurie per test sample.

4.7.15.2 Test Frequencies - Each category of sealed sources (excluding startup sources and fission detectors previously subjected to core flux) shall be tested at the frequency described below.

a. Sources in use - At least once per 6 months for all sealed sources containing radioactive materials:

1) With a half-life greater than 30 days (excluding Hydrogen 3), and

2) In any form other than gas.

b. Stored sources not in use - Each sealed source and fission detector shall be tested prior to use or transfer to another licensee unless tested within the previous 6 months. Sealed sources and fission detectors transferred without a certificate indicating the last test date shall be tested prior to being placed into use; and

c. Startup sources and fission detectors - Each sealed startup source and fission detector shall be tested prior to installation or within 31 days prior to being subjected to core flux and following repair or maintenance to the source.

4.7.15.3 Reports - A report shall be prepared and submitted to the Commission on an annual basis if sealed source or fission detector leakage tests reveal the presence of greater than or equal to 0.005 microCurie of removable contamination.

3/4.11 RADIOACTIVE EFFLUENTS

3/4.11.1 LIQUID EFFLUENTS

CONCENTRATION CONTROLS

3.11.1.1 In accordance with CPSES TS 5.5.4.b and 5.5.4.c the concentration of radioactive material released in liquid effluents from the site to CONTROLLED AREAS and UNRESTRICTED AREAS (see Figure 5.1-3) shall be limited to 10 times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} microCurie/ml total activity.

APPLICABILITY: At all times.

ACTION:

a. With the concentration of radioactive material released in liquid effluents to CONTROLLED AREAS and UNRESTRICTED AREAS exceeding the above limits, immediately restore the concentration to within the above limits.

SURVEILLANCE REQUIREMENTS

4.11.1.1.1 Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 4.11-1.

4.11.1.1.2 The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in Part II of the ODCM to assure that the concentrations at the point of release are maintained within the limits of Control 3.11.1.1.

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[1] (μCi/ml)
1A.	Batch Waste Release [2] Tanks to the Circulating Water Discharge a. Waste Monitor Tanks b. Laundry Holdup & Monitor Tanks c. Waste Water Holdup Tanks [8] d. Plant Effluent Tanks	P Each Batch	P Each Batch	Principal Gamma Emitters [3]	5.0E-07
				I-131	1.0E-06
				Dissolved & Entrained[3] Gases (Gamma Emitters)	1.0E-05
			M Composite [4]	H-3	1.0E-05
				Gross Alpha	1.0E-07
			Q Composite [4]	Sr-89, Sr-90	5.0E-08
				Fe-55	1.0E-06
1B.	Batch Waste Release [2] Tanks to the Waste Water Management System a. Condensate Polisher Backwash Recovery Tanks [6,7] b. Waste Water Holdup Tanks [6,8] c. Temporary holdup tanks [10]	P Each Batch	P Each Batch	Principal Gamma Emitters [3]	5.0E-07
				1-131	1.0E-06
				H-3	1.0E-05
2A.	Continuous Release[5] to the Circulating Water Discharge a. Low Volume Waste Pond Effluents	Monthly Grab [11]	Monthly Grab [11]	Dissolved & Entrained [3] Gases (Gamma Emitters)	[11]
		Daily Grab Sample [9]	Composite over pond discharge period [4]	Principal Gamma Emitters [3]	5.0E-07[11]
				I-131	1.0E-06
				H-3	1.0E-05
				Gross Alpha	1.0E-07
			Q Composite [4]	Sr-89, Sr-90	5.0E-08
				Fe-55	1.0E-06
2B.	Continuous Releases [5] to the Waste Water Management System a. Turbine Bldg. Sump No. 2 Effluents [6,7] b. Turbine Bldg. Sump No. 4 Effluents [6,7] c. Auxiliary Bldg. Secondary Effluents [6,7]	W Grab Sample	W	Principal Gamma Emitters [3]	5.0E-07
				I-131	1.0E-.06
				H-3	1.0E-05

TABLE NOTATIONS

(1) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \bullet V \bullet 2.22 \times 10^6 \bullet Y \bullet \exp(-\lambda \Delta t)}$$

Where:

LLD = "A priori" lower limit of detection (microCurie per unit mass or volume),

s_b = Standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = Counting efficiency (counts per disintegration),

V = Sample size (units of mass or volume),

2.22×10^6 = Number of disintegrations per minute per microCurie,

Y = Fractional radiochemical yield, when applicable,

λ = Radioactive decay constant for the particular radionuclide (sec^{-1}), and

Δt = Elapsed time between the midpoint of sample collection and the time of counting(s).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

(2) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed by a method described in Part II of the ODCM to assure representative sampling.

(3) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, and Ce-141 for fission and corrosion products, and Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for dissolved or entrained gases. Ce-144 shall also be measured, but with an LLD of 5×10^{-6}. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall

TABLE NOTATIONS (Continued)

also be analyzed and reported in the Radioactive Effluent Release Report pursuant to Control 6.9.1.4 in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.

(4) 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 that is representative of the liquids released.

(5) A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

(6) These waste streams shall be sampled and analyzed, in accordance with this table, if radioactive material is detected in the LVW Pond composite samples in concentrations that exceed 10% of the limits of 10 CFR 20, Appendix B, Table 2, Column 2. This sampling shall continue until 2 consecutive samples from the waste stream show that the concentration of radioactive materials in the waste stream is less than or equal to 10% of the limits of 10 CFR 20, Appendix B, Table 2, Column 2.

(7) All flow from these waste streams shall be diverted to the Waste Water Holdup Tanks if activity is present in the waste stream in concentrations that exceed 10 times the limits of 10 CFR 20, Appendix B, Table 2, Column 2. Sampling and analysis of the respective Tanks or sumps are not required when flow is diverted to the Waste Water Holdup Tanks.

(8) Waste Water Holdup Tanks (WWHT) shall be discharged directly to the Circulating Water Discharge Tunnel when results of sample analyses indicate activity in concentrations that exceed 10 times the limits of 10 CFR 20, Appendix B, Table 2, Column 2. Otherwise, WWHTs may be discharged to the Low Volume Waste Pond. WWHT discharges to the Circulating Water Discharge Tunnel shall be sampled and analyzed per Item 1A.c of this table. WWHT discharges to the LVW Pond shall be sampled and analyzed per Item 1B.b of this table.

(9) Samples shall be taken at least once per 24 hours while the release is occurring. To be representative of the liquid effluent, the sample volume shall be proportioned to the effluent stream discharge volume. The ratio of sample volume to effluent discharge volume shall be maintained constant for all samples taken for the composite sample.

(10) Temporary holdup tanks used to support special plant activities (e.g., Steam Generator Secondary Cleaning) involving potentially radioactive systems may be transferred to the Waste Water Management System when sampled in accordance with this table and the special plant activity has been evaluated in accordance with the 50.59 process. This waste stream shall not be discharged to the Waste Water Management System if activity is present in the waste stream in concentrations that exceed 10 times the limits of 10CFR20, Appendix B, Table 2, Column 2.

(11) Dissolved and entrained gases should be included in the analysis (including Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138). There are no LLD requirements for these gases in the LVW samples since the half life of the isotopes are relatively short with respect to the sample counting frequency. Gases are also not expected to be found in the LVW due

TABLE NOTATIONS (Continued)

to delay times associated with water being transported to the LVW and the open exposure of the ponds which would aid in the degasification of the liquids. One sample should be obtained monthly from the Low Volume Waste in addition to the composite sample to analyze for these noble gases. The count time for the sample should be equal to the time required to establish LLD values for the noble gas isotopes (e.g., 2000 seconds or the same count time used for effluent liquid batch releases).

CONTROLS

3.11.1.2 In accordance with CPSES TS 5.5.4.d and 5.5.4.e the dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each unit, to CONTROLLED AREAS and UNRESTRICTED AREAS (see Figure 5.1-3) shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrems to the whole body and to less than or equal to 5 mrems to any organ; and

b. During any calendar year to less than or equal to 3 mrems to the whole body and to less than or equal to 10 mrems 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 a report to the Commission within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits. This 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 Part 141, Safe Drinking Water Act.

SURVEILLANCE REQUIREMENTS

4.11.1.2 Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodology and parameters in Part II of the ODCM at least once per 31 days.

CONTROLS

3.11.1.3 In accordance with CPSES TS 5.5.4.f, the Liquid Radwaste Treatment System shall be OPERABLE and appropriate portions of the system shall be used to reduce releases of radioactivity when the projected doses due to the liquid effluent, from each unit, to CONTROLLED AREAS and UNRESTRICTED AREAS (see Figure 5.1-3) would exceed 0.06 mrem to the whole body or 0.2 mrem to any organ in a 31-day period.

APPLICABILITY: At all times.

ACTION:

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits and any portion of the Liquid Radwaste Treatment System not in operation, prepare and submit a report to the Commission within 30 days, pursuant to 10 CFR 50, Appendix I, that includes the following information:

   1) Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,

   2) Action(s) taken to restore the inoperable equipment to OPERABLE status, and

   3) Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS

4.11.1.3.1 Doses due to liquid releases from each unit to CONTROLLED AREAS and UNRESTRICTED AREAS shall be projected at least once per 31 days in accordance with the methodology and parameters in Part II of the ODCM when Liquid Radwaste Treatment Systems are not being fully utilized.

4.11.1.3.2 The installed Liquid Radwaste Treatment System shall be considered OPERABLE by meeting Controls 3.11.1.1 and 3.11.1.2.

CONTROLS

3.11.1.4 The quantity of radioactive material contained in resins transferred to the LVW Pond shall be limited by the following expression:

$$\frac{264}{V} \cdot \sum_j \frac{A_j}{C_j} < 1.0$$

excluding tritium, dissolved or entrained noble gases, and radionuclides with less than an 8-day half-life,

where:

A_j = Pond inventory limit for single radionuclide "j" (Curies),

C_j = 10 CFR 20, Appendix B, Table 2, Column 2, concentration for single radionuclide "j" (microCuries/ml),

V = Volume of resins in the pond (gallons), and

264 = Unit conversion factor (microCuries/Curie per milliliter/gallon).

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material contained in resins in the LVW Pond exceeding the above limit, immediately suspend all additions of resins to the pond.

SURVEILLANCE REQUIREMENTS

4.11.1.4 Prior to transferring any batch of used powdex resin to the pond, the total inventory of radioactive materials in resins contained in the pond, including the batch to be transferred, shall be determined to be within the above limit. The inventory shall be determined based on analysis of a representative sample of the resin batch. Decay of radionuclides in previously discharged resins may be taken into account in determining inventory levels.

SURVEILLANCE REQUIREMENTS (Continued)

Additionally, each batch of resins transferred to the pond shall be limited by the expression:

$$\sum_{j} \frac{Q_j}{C_j} \leq 0.1$$

where:

Q_j = Concentration of radioactive materials (microCuries/ml) in wet, drained slurry (used powdex resin) for radionuclide "j", excluding tritium, dissolved or entrained noble gases, and radionuclides with less than an 8-day half-life. The analysis shall include at least Ce-144, Cs-134, Cs-137, Co-58 and Co-60. Estimates of the Sr-89 and Sr-90 batch concentration shall be included based on the most recent quarterly composite analysis,

C_j = 10 CFR 20, Appendix B, Table 2, Column 2, concentration for single radionuclide "j" (microCuries/milliliter).

DOSE RATE

3.11.2.1 In accordance with CPSES TS 5.5.4.c and 5.5.4.g, the dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. For noble gases: Less than or equal to a dose rate of 500 mrems/yr to the total body and less than or equal to 3000 mrems/yr to the skin; and

b. For Iodine-131, for Iodine-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to a dose rate of 1500 mrem/yr to any organ.

APPLICABILITY: At all times.

ACTION:

a. With the dose rate(s) exceeding the above limits, immediately restore the release rate to within the above limits(s).

SURVEILLANCE REQUIREMENTS

4.11.2.1.1 Radioactive gaseous wastes shall be sampled and analyzed according to the sampling and analysis program of Table 4.11-2.

4.11.2.1.2 The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in Part II of the ODCM to assure that the dose rates at or beyond the SITE BOUNDARY are maintained within the limits of Control 3.11.2.1.

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) (1) (μCi/ml)
1. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters(2)	$1x10^{-4}$
2. Containment Purge or Vent	P Each Release(3) Grab Sample	P Each Release(3)	Principal Gamma Emitters(2)	$1x10^{-4}$
		M	H-3 (oxide)	$1x10^{-6}$
3. Plant Vent	M(3), (4), (5) Grab Sample	M(3)	Principal Gamma Emitters(2)	$1x10^{-4}$
			H-3 (oxide)	$1x10^{-6}$
	Continuous(6)	W(7) Radioiodine Adsorber	I-131	$1x10^{-12}$
	Continuous(6)	W(7) Particulate Sample	Principal Gamma Emitters(2)	$1x10^{-11}$
	Continuous(6)	M Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
	Continuous(6)	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$
	Continuous(6)	Noble Gas ** Beta or Gamma	Noble Gas	$1x10^{-6}$
4. Outside Buildings	Grab sample	W(8)	Principle Gamma Emitters(2)	$1x10^{-11}$

* Table notations next page
**This sample is continuously analyzed by a radiation monitor

TABLE 4.11-2 (Continued)

TABLE NOTATIONS

(1) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \bullet V \bullet 2.22 \times 10^6 \bullet Y \bullet \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (microCurie per unit mass or volume),

s_b = Standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = Counting efficiency (counts per disintegration),

V = Sample size (units of mass or volume),

2.22×10^6 = Number of disintegrations per minute per microCurie,

Y = Fractional radiochemical yield, when applicable,

λ = Radioactive decay constant for the particular radionuclide (sec^{-1}), and

Δt = Elapsed time between the midpoint of sample collection and the time of counting(s).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

(2) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 in noble gas releases and Mn-54, Fe-59, Co-58, Co-60, Zn-65, I-131, Cs-134, Cs-137, Ce-141 and Ce-144 in iodine and particulate releases. This list does not mean that only these nuclides are to be considered. In the case of release type 4, Outside Buildings, noble gases and iodine may not be sampled based on an evaluation of the source term. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report, pursuant to Control 6.9.1.4, in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.

TABLE NOTATIONS (Continued)

(3) Sampling and analysis shall also be performed following shutdown, startup, or a THERMAL POWER change ≥ 15% of RATED THERMAL POWER within a 1-hour period. This requirement does not apply if: (1) analysis of primary coolant activity performed pursuant to Technical Specification 3.4.16 shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3, and (2) noble gas monitoring shows that effluent activity has not increased more than a factor of 3.

(4) Tritium grab samples shall be taken at least once per 24 hours when the refueling canal is flooded.

(5) Tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

(6) The 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 Controls 3.11.2.1, 3.11.2.2, and 3.11.2.3.

(7) Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing, or after removal from the 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 ≥ 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) noble gas monitoring shows that effluent activity has not increased more than a factor of 3.

(8) Samples shall be changed at least once per seven (7) days and analysis shall be completed within 48 hours after changing, or after removal from the sampler. This requirement does not apply, if no activities are being conducted in the Outside Building that would generate radioactive effluent.

DOSE - NOBLE GASES

CONTROLS

3.11.2.2 In accordance with CPSES TS 5.5.4.e and 5.5.4.h, the air dose due to noble gases released in gaseous effluents, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 5 mrads for gamma radiation and less than or equal to 10 mrads for beta radiation; and

b. During any calendar year: Less than or equal to 10 mrads for gamma radiation and less than or equal to 20 mrads 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 a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS

4.11.2.2 Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology and parameters in Part II of the ODCM at least once per 31 days.

DOSE - IODINE-131, IODINE-133, TRITIUM, AND RADIOACTIVE MATERIAL IN PARTICULATE FORM

CONTROLS

3.11.2.3 In accordance with CPSES TS 5.5.4.e and 5.5.4.i, the dose to a MEMBER OF THE PUBLIC from Iodine-131, Iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrems to any organ; and

b. During any calendar year: Less than or equal to 15 mrems to any organ.

APPLICABILITY: At all times.

ACTION:

a. With the calculated dose from the release of Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding any of the above limits, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit and defines the corrective actions that have to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS

4.11.2.3 Cumulative dose contributions for the current calendar quarter and current calendar year for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodology and parameters in Part II of the ODCM at least once per 31 days.

CONTROLS

3.11.2.4 In accordance with CPSES TS 5.5.4.f, the PRIMARY PLANT VENTILATION SYSTEM and the WASTE GAS HOLDUP SYSTEM shall be OPERABLE and appropriate portions of these systems shall be used to reduce releases of radioactivity when the projected doses in 31 days due to gaseous effluent releases, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) would exceed:

a. 0.2 mrad to air from gamma radiation, or

b. 0.4 mrad to air from beta radiation, or

c. 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

APPLICABILITY: At all times.

ACTION:

a. With radioactive gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that includes the following information:

1) Identification of any inoperable equipment or subsystems, and the reason for the inoperability,

2) Action(s) taken to restore the inoperable equipment to OPERABLE status, and

3) Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS

4.11.2.4.1 Doses due to gaseous releases from each unit to areas at and beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodology and parameters in Part II of the ODCM when Gaseous Radwaste Treatment Systems are not being fully utilized.

4.11.2.4.2 The installed PRIMARY PLANT VENTILATION SYSTEM and WASTE GAS HOLDUP SYSTEM shall be considered OPERABLE by meeting Controls 3.11.2.1 and 3.11.2.2 or 3.11.2.3.

3/4.11.4 TOTAL DOSE

CONTROLS

3.11.4 In accordance with CPSES TS 5.5.4.j, 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 less than or equal to 25 mrems to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

APPLICABILITY: At all times.

ACTION:

a. With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Controls 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 and from outside storage tanks to determine whether the above limits of Control 3.11.4 have been exceeded. If such is the case, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 20.1301(d) and 10 CFR 20.2203(a)(4) 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 report, as defined in 10 CFR 20.2203(b), 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 concentration 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 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.

SURVEILLANCE REQUIREMENTS

4.11.4.1 Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Controls 4.11.1.2, 4.11.2.2, and 4.11.2.3, and in accordance with the methodology and parameters in Part II of the ODCM.

4.11.4.2 Cumulative dose contributions from direct radiation from the units and from radwaste storage tanks shall be determined in accordance with the methodology and parameters in Part II of the ODCM. This requirement is applicable only under conditions set forth in ACTION a. of Control 3.11.4.

CONTROLS

3.12.1 The Radiological Environmental Monitoring Program shall be conducted as specified in Table 3.12-1.

APPLICABILITY: At all times.

ACTION:

a. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 3.12-1, prepare and submit to the NRC, in the Annual Radiological Environmental Operating Report required by Control 6.9.1.3, a description of the reason(s) for not conducting the program as required and the plan for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 3.12-2 when averaged over any calendar quarter, prepare and submit a report to the NRC within 30 days, pursuant to 10 CFR 50, Appendix I, that identifies the cause(s) for exceeding the limit(s) and defines the corrective action to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of Control 3.11.1.2, 3.11.2.2, or 3.11.2.3. When more than one of the radionuclides in Table 3.12-2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 3.12-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to A MEMBER OF THE PUBLIC from all radionuclides is equal to or greater than the calendar year limits of Control 3.11.1.2, 3.11.2.2, or 3.11.2.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report required by Control 6.9.1.3.

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* The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

CONTROLS (Continued)

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 3.12-1, identify locations for obtaining replacement samples and add them within 30 days to the Radiological Environmental Monitoring Program. The specific locations from which samples were unavailable may then be deleted from the monitoring program. New sampling locations shall be listed in the results of the annual Land Use Census.

SURVEILLANCE REQUIREMENTS

4.12.1 The radiological environmental monitoring samples shall be collected pursuant to Table 3.12-1 and shall be analyzed pursuant to the requirements of Table 3.12-1 and the detection capabilities required by Table 4.12-1. The specific sample locations for the Radiological Environmental Monitoring Program shall be listed and maintained current in the results of the annual Land Use Census.

TABLE 3.12-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

	EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1.	Direct Radiation[2]	Forty routine monitoring stations either with two or more dosimeters or with one instrument for measuring and recording dose rate continuously, placed as follows: An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY; An outer ring of stations, one in each meteorological sector in the 6- to 8-km range from the site; and The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and in one or two areas to serve as control stations.	Quarterly	Gamma dose quarterly
2.	Airborne Radioiodine and Particulates	Samples from five locations: Three samples from close to the three SITE BOUNDARY locations, in different sectors, of the highest calculated annual average ground-level D/Q;	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Canister: I-131 analysis weekly Particulate Sampler: Gross beta radioactivity analysis following filter change;[4] and gamma isotopic analysis[5] of composite (by location quarterly).

TABLE 3.12-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
	One sample from the vicinity of a community having the highest calculated annual average ground-level D/Q; and One sample from a control location, as for example 15 to 30 km distant and in the least prevalent wind direction.[3]		
3. Waterborne			
a. Surface	Squaw Creek Reservoir[6]	Monthly composite of weekly grab samples.	Gamma isotopic analysis[5] monthly. Composite for tritium analysis quarterly.
	Lake Granbury	Monthly composite of weekly grab samples when Lake Granbury is receiving letdown from SCR. Otherwise, monthly grab sample.[7]	Gamma isotopic analysis[5] monthly. Composite for tritium analysis quarterly.
	Control-Brazos River upstream of Lake Granbury	Monthly	Gamma isotopic analysis[5] monthly. Composite for tritium analysis quarterly.
b. Ground	Samples from two sources if likely to be affected.[8]	Quarterly	Gamma isotopic[5] and tritium analysis quarterly.

TABLE 3.12-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. Waterborne (Continued)			
c. Drinking	One sample from Squaw Creek Reservoir.	Composite of weekly grab samples over 2-week period when I-131 analysis is performed; monthly composite of weekly grab samples otherwise.	I-131 analysis of each composite sample when the dose calculated for the consumption of the water is greater than 1 mrem per year[9]. Gross beta and gamma isotopic analyses[5] monthly. Composite for tritium analysis quarterly.
d. Sediment from Shoreline	One sample from downstream area with existing or potential recreational value.	Semiannually.	Gamma isotopic analysis[5] semiannually.
4. Ingestion			
a. Milk	Samples from milking animals in three locations within 5 km distance having the highest dose potential. If there are none, sample from milking animals in each of three areas between 5 to 8 km distant where doses are calculated to be greater than 1 mrem per yr.[9] One sample from milking animals at a control location, 15 to 30 km distant and in the least prevalent wind direction.[3]	Semimonthly when animals are on pasture; monthly at other times.	Gamma isotopic[5] and I-131 analysis semimonthly when animals are on pasture; monthly at other times.

TABLE 3.12-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE		NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4.	Ingestion (Continued)			
b.	Fish and Invertebrates	One sample of at least two recreationally important species in vicinity of plant discharge area.	Sample semiannually.	Gamma isotopic analysis[5] on edible portions semiannually
		One sample of same species in areas not influenced by plant discharge.		
c.	Food Products*	One sample of each principal class of food products from any area that is irrigated by water in which liquid plant wastes have been discharged.	At time of harvest[10]	Gamma isotopic analysis[5] on edible portion following sample collection.
		A sample of broad leaf vegetation grown nearest each of two different offsite locations of highest predicted annual average ground level D/Q if milk sampling is not performed at all required locations.	Monthly, when available.	Gamma isotopic[5] and I-131 analyses, monthly, when samples are collected
		One sample of each of the similar broad leaf vegetation grown 15 to 30 km distant in the least prevalent wind direction[3] if milk sampling is not performed at all required locations.	Monthly, when available.	Gamma isotopic[5] and I-131 analyses, monthly, when samples are collected

* Reports from 3 additional airborne radioiodine sample locations may be supplemented for broad leaf vegetation samples.

TABLE 3.12-1 (Continued)

TABLE NOTATIONS

(1) For each sample location required by Table 3.12-1, specific parameters of distance and direction sector from the centerline of one reactor, and additional description where pertinent, are provided in information maintained current in the results of the annual Land Use Census. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, and malfunction of automatic sampling equipment. If specimens are unobtainable due to sampling equipment malfunction, 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 Radiological Environmental Operating Report pursuant to Control 6.9.1.3., It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable specific alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Program. New sampling locations shall be listed in the results of the annual Land Use Census.

(2) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a dosimeter is considered to be one phosphor or aluminum oxide chip (detector) or; two or more phosphors or aluminum oxide chips (detectors) in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation.

(3) The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted. The control sample location at 12.3 miles in the southwest sector has been evaluated and found to be an acceptable substitute sampling location.

(4) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than 10 times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

(5) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

(6) The Reservoir shall be sampled in an area at or beyond but near the mixing zone. Also, the Reservoir shall be sampled at a distance beyond significant influence of the discharge.

(7) Lake Granbury shall be sampled near the letdown discharge and at a distance beyond significant influence of the discharge.

(8) Groundwater samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

TABLE NOTATIONS (Continued)

(9) The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in Part II of the ODCM.

(10) If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be monthly. Attention shall be paid to including samples of tuberous and root food products.

TABLE 3.12-2 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

ANALYSIS	WATER (pCi/1)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)
H-3	20,000*				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2**	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

(*) For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.
(**) If no drinking water pathway exists, a value of 20 pCi/l may be used.

TABLE 4.12-1 DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

Lower Limit of Detection (LLD)[3]

ANALYSIS	WATER (pCi/1)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	2000*					
Mn-54	15		130			
Fe-59	30		260			
Co -58, 60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1**	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

* If no drinking water pathway exists, a value of 3000 pCi/l may be used.
** If no drinking water pathway exists, a value of 15 pCi/l may be used.

TABLE 4.12-1 (Continued)

TABLE NOTATIONS

(1) The list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

(2) Required detection capabilities for OSL (Optically Stimulated Luminescence) Badge used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.

(3) The LLD is defined, for purposes of these specifications, as the smallest concentrations of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only a 5% probability of falsely concluding that a blank observation represents a "real" signal.

$$LLD = \frac{4.66 s_b}{E \bullet V \bullet Y \bullet \exp(-\lambda \Delta t) \; 2.22}$$

Where:

LLD	=	the "a priori" lower limit of detection (picoCurie per unit mass or volume),
s_b	=	Standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),
E	=	Counting efficiency (counts per disintegration),
V	=	Sample size (units of mass or volume),
2.22	=	Number of disintegrations per minute per picoCurie,
Y	=	Fractional radiochemical yield, when applicable,
λ	=	Radioactive decay constant for the particular radionuclide (sec^{-1}), and
Δt	=	Elapsed time between the midpoint of sample collection and the time of counting(s).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs 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 Operating Report pursuant to Control 6.9.1.3.

3/4.12.2 LAND USE CENSUS

CONTROLS

3.12.2 A Land Use Census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence, and the nearest garden* of greater than $50m^2$ ($500 ft^2$) producing broad leaf vegetation.

APPLICABILITY: At all times.

ACTION:

a. With a Land Use Census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Control 4.11.2.3, pursuant to Control 6.9.1.4, identify the new location(s) in the next Radioactive Effluent Release Report.

b. With a Land Use Census identifying a location(s) that 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 Control 3.12.1, add the new location(s) within 30 days, to the Radiological Environmental Monitoring Program. The sampling locations having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. New sampling locations shall be listed in the results of the annual Land Use Census.

SURVEILLANCE REQUIREMENTS

4.12.2 The Land Use Census shall be conducted during the growing season at least once per 12 months using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

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* Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 3.12-1, Item 4.c. shall be followed, including analysis of control samples.

3/4.12.3 INTERLABORATORY COMPARISON PROGRAM

CONTROLS

3.12.3 Analyses shall be performed on all radioactive materials, supplied as part of an Interlaboratory Comparison Program, that correspond to samples required by Table 3.12-1.

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 NRC in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

SURVEILLANCE REQUIREMENTS

4.12.3 The Interlaboratory Comparison Program shall be described in Part II of the ODCM. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report pursuant to Control 6.9.1.3.

At CPSES, normal radioactive gaseous effluents are collected in a common exhaust air intake plenum, processed through charcoal and HEPA filters, and discharged to the atmosphere through the two common Plant Vent Stacks designated as Stack A and Stack B. Due to the fact that these release points are below the height of the nearest adjacent structure (i.e., containment building), all gaseous releases from these stacks are conservatively assumed to be entrained into the building wake and cavity regions, which results in a conservative ground-level release.

Routine gaseous effluent releases may occur from the Unit 1 and Unit 2 Containment Buildings (purges and vents), Waste Gas Decay Tanks (WGDT), and the plant vent stacks (continuous ventilation). The normal ventilation exhaust via the plant vent stacks is considered a continuous release. Containment Building vents for pressure relief and WGDT discharges are treated as batch releases. Because Containment Building purges are only allowed during MODES 5 and 6 and because radioactivity is discharged rapidly from the containment atmosphere during purges, the first portion (i.e., the release period during which most containment atmospheric radioactivity is discharged) of a Containment Building purge is considered a batch release. The remainder of a purge is treated as a contribution to the continuous release already occurring through the plant vent stacks.

Operating experience has shown that occasional releases may be required from Pressurizer Relief Tank (PRT) vents for depressurizing the RCS during outages, from Volume Control Tank (VCT) vents during maintenance on the Waste Gas Processing System, from the Containment Buildings during Integrated Leak Rate Tests (ILRT), and from secondary steam releases (potentially radioactive during periods of primary-to-secondary leaks). These releases occur infrequently and are treated as batch releases.

Occasional operational requirements involve handling radioactive materials in buildings outside the permanent structures that may contribute to gaseous effluents. Since these buildings are not connected to the PRIMARY PLANT VENTILATION SYSTEM, portable air sampling equipment may be used to determine effluent airborne radioactivity concentrations. Offsite dose estimates will be based on the analysis of samples collected, estimated effluent flow rates and treated as a planned continuous or batch release. The effluent discharge point is not the plant stack and the distance to the site boundary may be adjusted, if the proximity to the site boundary would significantly affect the offsite dose estimates. No automated monitoring or isolation equipment is provided, however, due to a limited source term, this pathway is expected to contribute a small fraction of the dose limits from gaseous effluents.

A summary of all gaseous effluent release points, release sources, flow rates (if applicable) and associated radiation monitors is shown in Table 2.1. A flow diagram of all Gaseous Waste Processing System discharge pathways is shown in Figure 2.1.

Each Plant Vent Stack is equipped with a Wide Range Gas Monitor (WRGM) and a Noble Gas Monitor. These monitors are part of the plant Digital Radiation Monitoring System (DRMS) supplied by Sorrento Electronics (formerly General Atomics). Since all DRMS monitors provide a digital output, they may be calibrated to read out in the appropriate engineering units (i.e., uCi/ml). The conversion factor for detector output from counts per minute to uCi/ml is determined during the calibration of each individual monitor, and is input into the data base for the monitor microprocessor.

The WRGMs are designated as monitors XRE-5570A and XRE-5570B for Stacks A and B, respectively. Each WRGM consists of a low range (10^{-7} to 10^{-1} uCi/cc), mid range (10^{-4} to

10^2 uCi/cc), and high range (10^{-1} to 10^5 uCi/cc) noble gas activity detector. The WRGMs also have an effluent release rate channel which uses inputs from the appropriate WRGM noble gas activity detectors and the plant vent stack flow rate detectors (X-FT-5570A-1/B-1) to provide an indication of noble gas release rate in uCi/sec. Alarm setpoints are established for the WRGM effluent release rate channel to fulfill the requirements of Radiological Effluent Control 3/4.3.3.5. Exceeding the WRGM effluent release rate channel high alarm setpoint also initiates automatic termination of Waste Gas Decay Tank releases.

The stack Noble Gas Monitors are designated as noble gas channels XRE-5567A and XRE-5567B for Stacks A and B, respectively. The stack noble gas channels may be used as a back-up to the WRGM when no automatic control functions are required. Therefore, a methodology is provided for calculating the noble gas monitor setpoints.

Other monitors that may be used for effluent monitoring and control are the Auxiliary Building Ventilation Duct Monitor, XRE-5701, and the Containment PIG Noble Gas Monitors, 1RE-5503 and 2RE-5503. XRE-5701 may be used to monitor Waste Gas Decay Tank releases by monitoring the Auxiliary Building Ventilation Duct. XRE-5701 also provides the automatic control function for termination of Waste Gas Decay Tank releases. 1RE-5503 and 2RE-5503 monitor the Unit 1 and Unit 2 Containment atmospheres, respectively, and provide the only automatic control function for termination of Containment vents or purges.

2.1 RADIOLOGICAL EFFLUENT CONTROL 3/4.11.2.1 COMPLIANCE

2.1.1 Dose Rates Due to Noble Gases

For implementation of Radiological Effluent Control 3/4.11.2.1.a, the dose rate to the total body and skin of an individual at the SITE BOUNDARY due to noble gases released from the site shall be calculated as follows:

a. Total Body Dose Rate Due to Noble Gases

$$D_t = \sum_v D_{tv} = \sum_v (\overline{X/Q}) \sum K_i Q_{iv} \quad \text{[Eq. 2-1]}$$

(noble gases)

Where: D_t = Total body dose rate at the SITE BOUNDARY due to noble gases from all release sources (mRem/yr)

D_{tv} = Total body dose rate at the SITE BOUNDARY due to noble gases from release source v (mRem/yr).

$(\overline{X/Q})$ = Highest annual average relative concentration at the SITE BOUNDARY (3.3×10^{-6} sec/m^3 in the NNW sector at a distance of 1.29 miles from the plant*)

NOTE: The annual average X/Q is also used in determining setpoints for containment purge or vent as required by Technical Specification 3.3.6.

K_i = Total body dose factor due to gamma emissions from noble gas radionuclide i from Table 2.2 (mRem/yr per uCi/m^3)

Q_{iv} = Total release rate of noble gas radionuclide i from the release source v (uCi/sec) (See C below for calculation of Q_{iv})

v = Index over all release sources

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* Reference 4, Section 2.3.5.2.

b. Skin Dose Rate Due To Noble Gases

$$D_s = \sum_v D_{sv} = \sum_v (\overline{X/Q}) \sum (L_i + 1.1M_1)Q_{iv}$$

(noble gases) [Eq. 2-2]

Where: D_s = Skin dose rate at the SITE BOUNDARY due to noble gases from all release sources. (mRem/yr)

D_{sv} = Skin dose rate at the SITE BOUNDARY due to noble gases from release source v. (mRem/yr)

L_i = Skin dose factor due to beta emissions from noble gas radionuclide i from Table 2.2 (mRem/yr per uCi/m^3)

1.1 = Conversion factor of mRem skin dose per mRad air dose

M_i = Air dose factor due to gamma emissions from noble gas radionuclide i from Table 2.2 (mRad/yr per uCi/m^3)

All other terms are as previously defined.

c. Release Rate

Q_i is defined as the total release rate (uCi/sec) of radionuclide i from all release sources. Q_i is given by:

$$Q_i = \sum_v Q_{iv} = \sum_v X_{iv}F_v \quad \text{[Eq. 2-3]}$$

Where: X_{iv} = Measured concentration of radionuclide i present in each release source v (uCi/cm^3)

F_v = Flow rate from each release source v (cm^3/sec)

Q_{iv} = Release rate of radionuclide i from release source v (uCi/sec)

v = Index over all release sources

2.1.2 Dose Rates Due to Radioiodines, Tritium, and Particulates

Organ dose rates due to iodine-131 and iodine-133, tritium, and all radioactive materials in particulate form with half-lives greater than eight days released from the site will be calculated to implement the requirements of Radiological Effluent Control 3/4.11.2.1.b as follows:

$$D_o = \sum_v D_{ov} = \sum_v (\overline{X/Q}) \sum_{IP\&T} P_i Q_i \qquad \text{[Eq. 2-4]}$$

Where: D_o = Total organ dose rate due to iodine-131, iodine-133, particulates with half-lives greater than eight days, and tritium from all release sources. (mrem/yr)

D_{ov} = Organ dose rate due to iodine-131, iodine-133, particulates with half-lives greater than eight days, and tritium from release source v. (mrem/yr)

P_i = Pathway dose rate parameter factor for radionuclide, i, (for radioiodines, particulates, and tritium) for the inhalation pathway in mRem/yr per uCi/m^3 (Table 2.3). The methodology used for determining values of P_i is given in Appendix A.

IP&T = Iodine-131, iodine-133, particulates with half-lives greater than eight days, and tritium. These are the isotopes over which the summation function is to be performed.

All other variables are previously defined.

2.2 GASEOUS EFFLUENT MONITOR SETPOINTS

The gaseous monitor setpoint values, as determined using the methodology in the following sections, will be regarded as upper bounds for the actual setpoint adjustments. Setpoints may be established at values lower than the calculated values if desired. Further, if the calculated value should exceed the maximum range of the monitor, the setpoint shall be adjusted to a value that falls within the normal operating range of the monitor.

If a calculated setpoint is less than the measured concentration associated with the particular release pathway, no release may be made. Under such circumstances, contributing source terms shall be reduced and the setpoint recalculated.

2.2.1 Plant Vent Effluent Release Rate Monitors XRE-5570A and XRE-5570B Effluent Release Rate Channels

The WRGM effluent release rate channels monitor the release rate of radioactive materials from each plant vent stack by combining inputs from the WRGM low range noble gas activity channel (uCi/cm^3) indication and a stack flow rate (cm^3/sec) indication (X-FT-5570A-1/B-1) to yield an effluent release rate (uCi/sec). By establishing an alarm setpoint for this monitor, an increase in either the noble gas activity or stack flow rate will cause an alarm trip. The WRGM effluent channel also provides an automatic control function for termination of Waste Gas Decay Tank Releases. The setpoint for each plant vent effluent release rate monitor will be calculated using the following methodology:

Q_{SITE} = the lessor of:

$$Q_{NG} = \frac{500}{D_t} \times SF = 125\frac{Q_{NG}}{D_t} \qquad \text{[Eq. 2-7]}$$

OR

$$Q_{NG} = \frac{3000}{D_s} \times SF = 750\frac{Q_{NG}}{D_s} \qquad \text{[Eq. 2-6]}$$

Where: Q_{site} = Total site noble gas release rate limit corresponding to a dose rate at or beyond the SITE BOUNDARY of 500 mrem/yr to the total body or 3000 mrem/yr to the skin. (uCi/sec)

Q_{NG} = $\sum$ (noble gases) Q_i

= Actual release rate of noble gases from all release sources as calculated from the radionuclide concentrations determined from the analysis of the appropriate samples taken in accordance with Radiological Effluent Control 3/4.11.2.1, Table 4.11-2.

500 = Dose rate limit to the total body of an individual at or beyond the SITE BOUNDARY due to noble gases from all release sources. (mRem/yr)

3000 = Dose rate limit to the skin of the body of an individual at or beyond the SITE BOUNDARY due to noble gases from all release sources. (mRem/yr)

SF = Safety Factor of 0.5 applied to compensate for statistical fluctuations, errors of measurement, and non-uniform distribution of release activity between the stacks (unitless)

Then the release rate setpoint for each stack monitor, C_f, in uCi/sec is determined as follows:

$$C_f = Q_{site} \cdot AF \qquad \text{[Eq. 2-7]}$$

Where: AF = Allocation Factor of 0.5 applied to account for releases from both plant stacks simultaneously (unitless). This factor will limit the release rate contribution from each stack to 1/2 the limit for the site.

2.2.2 Plant Vent Stack Noble Gas Activity Monitors XRE-5570A/XRE-5570B (WRGM low range noble gas activity channel) and XRE-5567A/XRE-5567B (noble gas channel)

The WRGM low range noble gas activity channels provide noble gas concentration data to the effluent release rate channels, as discussed in Section 2.2.1 above. The monitor design does not include an alarm setpoint for this channel that provides an audible alarm if the setpoint is exceeded. Therefore, setpoint adjustments are not performed for these channels. Radiological Effluent Control 3/4.3.3.5, Table 3.3-8, ACTION 36 allows for use of the stack noble gas monitors (XRE-5567A and XRE-5567B) as a backup for an inoperable WRGM effluent release rate channel when no automatic control function is required. The alarm setpoint for these channels, C_G, in uCi/cm^3 is determined using the following methodology:

$$C_G = \frac{C_f}{F_{PVS}} \qquad \text{[Eq. 2-8]}$$

Where: F_{PVS} = Maximum stack flow rate (cc/sec) corresponding to 115,000 cfm during normal operations and 130,000 cfm during containment purges.

2.2.3 Sampler Flow Rate Monitors (X-RFT-5570A-1/B-1)

The WRGMs are designed to sample isokinetically from the plant vent stacks. Isokinetic sample flow is maintained automatically by the monitor microprocessor. The sampler flow rate monitors are designed such that if there is a loss of sample flow, the stack monitor automatic control functions are initiated. The loss of sample flow alarm setpoints are established permanently in accordance with vendor specifications.

2.2.4 Auxiliary Building Ventilation Exhaust Monitor (XRE-5701)

Radiological Effluent Control 3/4.3.3.5, Table 3.3-8, ACTION 34, allows for the Auxiliary Building Ventilation (ABV) Duct Monitor (XRE-5701) to be used as a backup for an inoperable WRGM for monitoring Waste Gas Decay Tank (WGDT) releases. XRE-5701 monitors WGDT releases by measuring activity in the Auxiliary Building Vent Duct and providing an automatic control function for termination of WGDT releases. If required, the alarm setpoint for XRE-5701 will be calculated using the following methodology. The alarm setpoint calculation is based on the following assumption:

(1) a waste gas decay tank release is the only batch release occurring (i.e., a containment purge or vent is not occurring at the same time).

Based on assumption (1) above, there are a maximum of three release sources that may contribute to the total release rate from the site during a WGDT release. These are the WGDT batch release, the continuous release from Stack A, and the continuous release from Stack B. Therefore, a release factor of 1/3 will be used for the ABV monitor setpoint determination. The total release rate from the site at the alarm setpoint release rate from each stack would correspond to a value of $2C_f$ uCi/sec. To determine the ABV monitor setpoint, the release rate contribution from the ABV will be limited to 1/3 of the limiting site release rate:

$$Q_{aux} = 1/3 \cdot 2C_f = 2/3\ C_f \qquad \text{[Eq. 2-9]}$$

Where: Q_{aux} = Limiting release rate contribution from the Auxiliary Building Vent during WGDT releases (uCi/sec)

Other terms have been previously defined.

To determine the setpoint, C_{aux}, for the ABV monitor in uCi/cc, the limiting ABV release rate is divided by the Maximum ABV flow rate:

$$C_{aux} = \frac{Q_{aux}}{F_{aux}} = \frac{2C_f}{3F_{aux}} \qquad \text{[Eq. 2-10]}$$

Where: F_{aux} = Maximum ABV flow rate (cc/sec) corresponding to 106,400 cfm.

2.2.5 Containment Atmosphere Gaseous Monitors (1RE-5503 and 2RE-5503)

For implementation of Technical Specification 3.3.6, the alarm setpoint for the Containment Atmosphere Gaseous Monitor for Containment Ventilation Isolation will be calculated using the following methodology. The alarm setpoint calculation is based on the following assumption:

(1) a purge or vent from each containment may occur simultaneously and no other batch release is occurring (i.e., a waste gas decay tank release is not occurring at the same time as a containment release).

Based on assumption (1) above, there are a maximum of four release sources that may contribute to the total release rate from the site during a containment release. These are a Unit 1 Containment release, a Unit 2 Containment release, the continuous release from Stack A, and the continuous release from Stack B. Therefore, a release factor of 1/4 will be used for the the containment monitor setpoint determination. The total release rate from the site at the alarm setpoint release rate from each stack would correspond to a value of $2C_f$ uCi/sec. To determine the containment monitor setpoint, the release rate

contribution from a containment release will be limited to 1/4 of the limiting site release rate:

$$Q_{cont} = \frac{1}{4} \bullet 2\ C_f = \frac{1}{2}\ C_f \qquad \text{[Eq. 2-11]}$$

Where: Q_{cont} = Limiting release rate contribution from a containment release (uCi/sec)

Other terms have been previously defined.

To determine the setpoint, C_{cont}, for the containment monitor in uCi/cc, the limiting containment release rate is divided by the maximum containment release flow rate:

$$C_{cont} = \frac{Q_{cont}}{F_{cont}} = \frac{C_f}{2\ F_{cont}} \qquad \text{[Eq. 2-12]}$$

Where: F_{cont} = Maximum containment release flow rate (cc/sec) corresponding to 750 cfm for containment vents and 30,000 cfm for containment purges.

2.3 DOSE CALCULATIONS FOR GASEOUS EFFLUENTS

The methodologies for calculating doses from gaseous effluents are given in Sections 2.3.1 and 2.3.2 below. For purposes of demonstrating compliance with the dose limits of Radiological Effluent Controls 3.11.2.2 and 3.11.2.3, the calculated cumulative doses (i.e., the total dose for both units) will be compared to two times the dose limits for a unit. In other words, the doses assigned to each unit will be one-half of the total doses from all releases from the site.

2.3.1 Dose Due to Noble Gases

For implementation of Radiological Effluent Control 3/4.11.2.2, the cumulative air dose due to noble gases to areas at and beyond the SITE BOUNDARY will be calculated at least once per 31 days and a cumulative summation of the air doses will be maintained for each calendar quarter and each calendar year. The air dose over the desired time period will be calculated as follows:

a. Air Dose Due to Gamma Emissions

D_γ = Air dose due to gamma emissions from noble gas radionuclides from all release sources. (mrad)

$$D_\gamma = 3.17\times10^{-8}\ (\overline{X/Q}) \sum_{\text{(noble gases)}} M_i Q'_i \qquad \text{[Eq. 2-13]}$$

Where: 3.17×10^{-8} = Fraction of a year represented by one second.

Q'_i = Cumulative release of radionuclide i during the period of interest from all release sources. (uCi)
($Q'_i = Q_i$ (uCi/sec) x release duration (sec))

Q'_i is based on the noble gas activities in each plant vent stack and WGDT or Containment Samples required by Radiological Effluent Control 3/4.11.2.1, Table 4.11-2.

All other variables are previously defined.

b. Air Dose Due to Beta Emissions

D_β = Air dose due to beta emissions from noble gas radionuclides. (mrad)

$$D_\beta = 3.17 \times 10^{-8} (\overline{X/Q}) \sum_{\text{(noble gases)}} N_i Q_i' \qquad \text{[Eq. 2-14]}$$

Where: N_i = Air dose factor due to beta emissions from noble gas radionuclide i from Table 2.2.
(mRad/yr per uCi/m^3).

All other variables are previously defined.

NOTE: If the methodology in this section is used in determining dose to an individual rather than air dose due to noble gases, substitute K_i for M_i, (L_i + 1.1 M_i) for N_i, and the Annual Average X/Q values from information listed and maintained current in the results of the annual Land Use Census for the highest annual average relative concentration (X/Q) at the SITE BOUNDARY.

2.3.2 Dose Due to Radiodines, Tritium, and Particulates

For implementation of Radiological Effluent Control 3/4.11.2.3, the cumulative dose to each organ of an individual due to iodine-131, iodine-133, tritium, and particulates with half-lives greater than 8 days will be calculated at least once per 31 days and a cumulative summation of these doses will be maintained for each calendar quarter and each calendar year. The dose over the desired period will be calculated as follows:

$$D_\rho = \sum_{\text{Paths}} 3.17 \times 10^{-8} W' \sum_{\text{I\&PT}} R^p_{i,a,o} Q_i' \qquad \text{[Eq. 2-15]}$$

Where: D_P = Dose due to all real pathways to organ, o, of an individual in age group, a, from iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than eight days from all release sources (mRem).

W′ = Dispersion parameter for estimating the dose to an individual at the location where the combination of existing pathways and receptor age groups indicates the maximum potential exposures. Locations of interest are listed in the results of the annual Land Use Census,

W′ = X/Q for the inhalation pathway in sec/m^3. X/Q is the annual average relative concentration at the location of interest. Values for X/Q are listed in the results of the annual Land Use Census. If desired, the highest individual receptor X/Q or X/Q value may be used, or

W′ = D/Q for the food and ground plane pathways in m^{-2}. D/Q is the annual average deposition at the location of interest. Values for D/Q are listed in the results of the annual Land Use Census. If desired, the highest individual receptor D/Q or D/Q value may be used.

NOTE: For tritium, the dispersion parameter, W' is taken as the annual average X/Q values from information listed and maintained current in the results of the annual Land Use Census for inhalation, food and ground plane pathways.

$R^p_{i,a,o}$ = Dose factor for radionuclide i, pathway p, age group a and organ o, in mRem/yr per uCi/m^3 for the inhalation pathway and m^2 (mRem/yr) per uCi/sec for food and ground plane pathways, except for tritium which is in mRem/yr per uCi/m^3 for all pathways. The values for $R^p_{i,a,o}$ for each pathway, radionuclide, age group and organ are listed in Table 2.4.

The methodioogies used for determining values of $R^P_{i,a,o}$ for each pathway are given in Appendices B through F.

Q'_i = Cumulative release of radionuclide, i, during the period of interest (uCi). Q'_i is based on the activities measured in each plant vent stack from the analyses of the particulate and iodine samples required by Radiological Effluent Control 3/4.11.2.1, Table 4.11-2.

I&PT = Iodines, particulates with half-lives greater than eight days, and tritium. These are the isotopes over which the summation function is to be performed.

PATHS = The real pathways of exposure to individuals at the locations of interest.

2.4 DOSE PROJECTIONS FOR GASEOUS EFFLUENTS

Radiological Effluent Control 3/4.11.2.4 requires that appropriate portions of the PRIMARY PLANT VENTILATION SYSTEM and WASTE GAS HOLDUP SYSTEM be used to reduce releases of radioactivity when the projected doses due to the gaseous effluent from a unit to areas at or beyond the SITE BOUNDARY would exceed, in a 31-day period, either:

0.2 mrad to air from gamma radiation; or

0.4 mrad to air from beta radiation; or

0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

The following calculational method is provided for performing this dose projection:

At least once every 31 days the gamma air dose, beta air dose and the maximum organ dose for each unit for the previous three months will be divided by the number of days in the three month period and multiplied by 31. Also, this dose projection may include the estimated dose due to any anticipated unusual releases during the period for which the projection is made, such as Waste Gas Decay Tank release. If the projected doses for a unit exceed any of the values listed above, appropriate portions of the PRIMARY PLANT VENTILATION SYSTEM and WASTE GAS HOLDUP SYSTEM shall be used to reduce radioactivity levels prior to release.

2.5 DOSE CALCULATIONS TO SUPPORT OTHER REQUIREMENTS

For the purpose of implementing the requirements of Radiological Effluent Control 6.9.1.4, the Annual Radioactive Effluent Release Report shall include an assessment of the radiation doses due to radioactive liquid and gaseous effluents from the station during the previous year of operation. This assessment shall be a summary of the doses determined in accordance with Section 1.3 for doses due to liquid effluents, Section 2.3.1 for air doses due to noble gases, and Section 2.3.2 for doses due to iodines, tritium, and particulates. This same report shall also include an assessment of the radiation doses from radioactive liquid and gaseous effluents to members of the public due to their activities inside the SITE BOUNDARY. This assessment shall be performed in accordance with the methodologies in Section 1.3, 2.3.1, and 2.3.2, using either historical average or concurrent dispersion and deposition parameters for the locations of interest, and taking into account occupancy factors. All assumptions and factors used in the determination shall be included in the report.

For the purpose of implementing Radiological Effluent Control 3/4.12.2 dose calculations for the new locations identified in the land use census shall be performed using the methodology in Section 2.3.2, substituting the appropriate pathway receptor dose factors and dispersion parameters for the location(s) of interest. Annual average dispersion parameters may be used for these calculations. If the land use census changes, the critical location (i.e., the location where an individual would be exposed to the highest dose) must be reevaluated for the nearest residence, the nearest milk animal, and the nearest vegetable garden. Additionally, when a location is identified that yields a calculated dose 20% greater than at a location where environmental samples are currently being obtained, add the new location within 30 days to the Radiological Environmental Monitoring locations described in Section 3.1 of this manual.

For the purpose of implementing Radiological Effluent Control 3/4.11.4, the total annual dose to any member of the public due to releases of radioactivity and to radiation from uranium fuel cycle sources may be determined by summing the annual doses determined for a member of the public in accordance with the methodology of Sections 1.3, 2.3.1, and 2.3.2 and the direct radiation dose contributions from the units and from outside storage tanks to the particular member of the public. This assessment must be performed in the event calculated doses from the effluent releases exceed twice the limits of Controls 3/4.11.1.2, 3/4.11.2.2, or 3/4.11.2.3. This assessment will be included in the Annual Radioactive Effluent Release Report to be submitted the year after the assessment was required. Otherwise, no assessments are required.

For the evaluation of doses to real individuals from liquid releases, the same calculation methods as employed in Section 1.3 will be used. However, more encompassing and realistic assumptions will be made concerning the dilution and ingestion of radionuclides. The results of the Radiological Environmental Monitoring Program will be used in determining the realistic dose based on actual measured radionuclide concentrations. For the evaluation of doses to real individuals from gaseous releases, the same calculational methods as employed in Sections 2.3.1 and 2.3.2 will be used. In Sections 2.3.1, the total body dose factor should be substituted for the gamma air dose factor (M_i) to determine the total body dose. Otherwise, the same calculational sequence applies. More realistic assumptions will be made concerning the actual location of real individuals, the meteorological conditions, and the consumption of food. Data obtained from the latest land use census should be used to determine locations for evaluating doses. The results of the Radiological Environmental Monitoring Program will be included in determining more realistic doses based on actual measured radionuclide concentrations.

The dose component due to direct radiation may be determined by calculation or actual measurement (e.g., OSL (Optically Stimulated Luminescence) Badge, micro-R meter). The calculation or actual measurement of direct radiation shall be documented in the Special Report that must be submitted if this determination is required.

2.6 METEOROLOGICAL MODEL

2.6.1 Dispersion Calculations

Atmospheric dispersion for gaseous releases is calculated using a straight line flow Gaussian model similar to the Constant Mean Wind Direction model given in Regulatory Guide 1.111, Section C.1.c. The method given here is modified by including factors to account for plume depletion and effects of the open terrain. The average relative concentration is given by the following equation:

$$\frac{X}{Q} = 2.032\delta\, K \sum_{j,k} \left(\frac{n_{jk}}{N\, r\, \bar{u}_{jk}\, \Sigma\, j(r)} \right) \qquad \text{[Eq. 2-16]}$$

Where: X/Q = Average concentration normalized by source strength. (sec/m^3)

2.032 = $(2/\pi)^{1/2} \cdot (2\pi/16)^{-1}$.

δ = Plume depletion factor at distance r for the applicable stability class (Figure 2.2). Normally, a value of 1.0 is assumed when undepleted X/Q values are to be used in dose calculations.

K = Terrain correction factor (Figure 2.5).

n_{jk} = Number of hours meteorological conditions are observed to be in a given wind direction, wind speed class, k, and atmospheric stability class, j.

N = Total hours of valid meteorological data throughout the period of release.

NOTE: If hourly meteorological data are used, all variable subscripts are dropped, n_{jk} and N are set equal to 1, and the hourly averaged meteorological variables are used in the model.

r = Downwind distance from the release point to the location of interest. (meters)

$\bar{u}jk$ = Average windspeed (midpoint of windspeed class, k) measured at the 10 meter level during stability class j. (meters/sec)

$\Sigma_j(r)$ = Vertical plume spread with a volumetric correction for a release within the building wake cavity, at a distance, r, for stability class, j, expressed in meters.

NOTE: All parameters are considered dimensionless unless otherwise indicated.

The equation for calculating $\Sigma_j(r)$ is:

$$\Sigma_j(r) = \text{the lesser of} \begin{cases} (\sigma_j^2 + 0.5\ b^2/\pi)^{\frac{1}{2}} & \text{[Eq. 2-17]} \\ \sqrt{3}\sigma_j & \text{[Eq. 2-18]} \end{cases}$$

Where: σ_j = Vertical standard deviation of materials in the plume at distance, r, for atmospheric stability class, j, expressed in meters (Figure 2.3).

0.5 = Building shape factor.

b = Vertical height of the reactor containment structure (79.4 meters).

2.6.2 Deposition Calculations

The relative deposition per unit area is calculated as follows:

$$\frac{D}{Q} = \frac{K\ D_g z}{0.3927\ r} \qquad \text{[Eq. 2-19]}$$

Where: D/Q = Deposition per unit area normalized by source strength (m^{-2})

D_g = Relative deposition rate for a ground level release (m^{-1}) (Figure 2.4)

z = Fraction of time the wind blows to the sector of interest.

NOTE: If hourly meteorological data are used, z is set equal to one.

0.3927 = Width in radians of a 22.5° sector.

Other variables are as previously defined.

NOTE: All parameters are considered dimensionless unless otherwise indicated.

2.7 DEFINITIONS OF GASEOUS EFFLUENTS PARAMETERS

TERM	DEFINITION
AF	Allocation Factor of 0.5 applied to account for releases from both stacks simultaneously. This factor will limit the release rate contribution from each stack to 1/2 the limit for the site.
B	vertical height of the reactor containment structure.
C_G	the alarm setpoint for each plant vent stack noble gas activity monitor. (uCi/cm^3)
C_f	the alarm setpoint for each plant vent stack effluent release rate monitor. (uCi/sec)
c_{aux}	the Auxiliary Building Ventilation Exhaust monitor alarm setpoint. (uCi/cm^3)
c_{cont}	the Containment Atmosphere Gaseous monitor alarm setpoint. (uCi/cm^3)
D_g	relative deposition rate for a ground-level release. (m^{-1})
D_o	the total organ dose rate due to tritium, iodines, and particulates with half-lives greater than eight days from all gaseous release sources. (mRem/yr)
D_{ov}	the organ dose rate due to tritium, iodines, and particulates with half-lives greater than eight days from gaseous release source v. (mRem/yr)

TERM	DEFINITION
D_p	dose to any organ of an individual from radioiodines, tritium and radionuclides in particulate form with half-lives greater than eight days from all release sources. (mRem)
D_s	Skin dose rate at the SITE BOUNDARY due to noble gases from all release sources. (mRem/yr)
D_{sv}	Skin dose rate at the SITE BOUNDARY due to noble gases from release source v. (mRem/yr)
D_t	Total body dose rate at the SITE BOUNDARY due to noble gases from all release sources. (mRem/yr)
D_{tv}	Total body dose rate at the SITE BOUNDARY due to noble gases from release source v. (mRem/yr)
D_β	Air dose due to beta emissions from noble gases from all release sources. (mRad)
D_γ	Air dose due to gamma emissions from noble gases from all release sources. (mRad)
D/Q	Annual average relative deposition at the location of interest. (m^{-2})
δ	Plume depletion factor at distance r for the appropriate stability class (radioiodines and particulates).
F_v	Flow rate from each release source v. (cm^3/sec)
F_{aux}	Maximum Auxiliary Building Ventilation flow rate (cm^3/sec) corresponding to 106,400 cfm.
F_{cont}	Maximum containment release flow rate (cm^3/sec) corresponding to 750 cfm for containment vents and 30,000 cfm for containment purges.
F_{PVS}	Maximum stack flow rate (cc/sec) corresponding to 115,000 cfm during normal operations and 130,000 cfm during containment purges.
K	terrain correction factor. (unitless)
K_i	total body dose factor due to gamma emissions from noble gas radionuclide i. (mRem/yr per uCi/m^3)
L_i	skin dose factor due to beta emissions from noble gas radionuclide i. (mRem/yr per uCi/m^3)
M_i	air dose factor due to gamma emissions from noble gas radionuclide i. (mrad/yr per uCi/m^3)
N_i	air dose factor due to beta emissions from noble gas radionuclide i. (mrad/yr per uCi/m^3)
n_{jk}	number of hours meteorological conditions are observed to be in a given wind direction, wind speed class k, and atmospheric stability class j.
N	total hours of valid meteorological data.
P_i	pathway dose rate parameter for radionuclide i, (other than noble gases) for the inhalation pathway. (mRem/yr per uCi/cm^3)

TERM	DEFINITION
Q_{aux}	the limiting release rate contribution from the Auxiliary Building Vent during WGDT releases. (uCi/sec)
Q_{cont}	the limiting release rate contribution from a containment release. (uCi/sec)
Q_i	total release rate of radionuclide i from all release sources. (uCi/sec)
Q_{iv}	Total release rate of radionuclide i from release source v. (uCi/sec)
Q'_i	Cumulative release of radionuclide i during the period of interest from all release sources. (uCi)
Q_{NG}	Actual release rate of noble gases from all release sources as calculated from the radionuclide concentrations determined from analyses of samples taken in accordance with Control 3/4.11.2.1, Table 4.11-2.
Q_{SITE}	Total site noble gas release rate limit corresponding to a dose rate at or beyond the SITE BOUNDARY of 500 mRem/yr to the total body or 3000 mRem/yr to the skin. (uCi/sec)
$R^p_{i,a,o}$	Dose factor for radionuclide i, pathway p, and age group a, and organ o (mRem/yr per uCi/m^3) or(m^2-mRem/yr per uCi/sec).
r	Distance from the point of release to the location of interest for dispersion calculations. (meters)
SF	Safety Factor of 0.5 applied to compensate for statistical fluctuations, errors of measurement, and non-uniform distribution of release activity between the stacks.
$\Sigma_j(r)$	Vertical plume spread with a volumetric correction for a release within the building wake cavity, at a distance, r, for stability class, j, expressed in meters.
σ_j	Vertical standard deviation of the plume concentration (in meters), at distance, r, for stability category j.
$\bar{u}_{jk}$	Wind speed (midpoint of windspeed class k) at ground level (m/sec) during atmosphere stability class j.
W'	Dispersion parameter for estimating the dose to an individual at the location where the combination of existing pathways and receptor age groups indicates the maximum exposures.
X/Q	Annual average relative concentration at the location of interest. (sec/m^3)
$\overline{X/Q}$	Highest annual average relative concentration at the SITE BOUNDARY. (sec/m^3) (3.3×10^{-6} sec/m^3 in the NNW sector)
X_{iv}	Measured concentration of radionuclide i present in each release source v. (uCi/cm^3).
z	Fraction of time the wind blows to the sector of interest.
1.1	Conversion factor of mRem skin dose per mRad air dose.
500	Dose rate limit to the total body of an individual at or beyond the SITE BOUNDARY due to noble gases from all release sources. (mRem/yr)

TERM	DEFINITION
3000	Dose rate limit to the skin of the body of the individual at or beyond the SITE BOUNDARY due to noble gases from all release sources. (mRem/yr)

COMANCHE PEAK STEAM ELECTRIC STATION
OFFSITE DOSE CALCULATION MANUAL (ODCM)
EFFECTIVE LISTING FOR SECTIONS, TABLES, AND FIGURES

BELOW IS A LEGEND FOR THE EFFECTIVE LISTING OF SECTIONS, TABLES, AND FIGURES:

Revision 0 (TXX-89118)	Submitted to the NRC March 2, 1989
Revision 1 (TXX-89595)	Submitted to the NRC August 25, 1989
Revision 2 (TXX-89711)	Submitted to the NRC November 27, 1989
Revision 3	April 10, 1990
Revision 4	October 9, 1990
Revision 5	December 20, 1990
Revision 6	July 3, 1991
Revision 7	December 4, 1991
Revision 7A	August 6, 1992
Revision 8 (Unit 2 Operations)	January 1, 1993
Revision 9	September 28, 1994
Revision 10	April 22, 1994
Revision 11	November 7, 1994
Revision 12	December 8, 1995
Revision 13	February 14, 1996
Revision 14	October 1, 1996
Revision 15	March 3, 1999
Revision 16	July 27, 1999
Revision 17	October 7, 1999
Revision 18	December 20, 1999
Revision 19	October 16, 2001
Revision 20	July 8, 2002
Revision 21	March 23, 2004
Revision 22	December 8, 2004
Revision 23	January 31, 2006
Revision 24	March 13, 2006
Revision 25	June 1, 2006
Revision 26	December 12, 2006
Revision 27	July 24, 2007
Revision 28	September 11, 2008
Revision 29	February 26, 2009
Revision 30	September 1, 2009

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REVISION 23

LDCR-OD-2006-2 (CPSES-200600206) (RJK):

Revision 23 updates the entire ODCM to reflect the following changes:

- The electronic files have been converted from Microsoft Word to Adobe Framemaker and published in Adobe Portable Document Format (PDF).

  The type of changes include changes such as:
  - Correction of spelling errors
  - Correction of inadvertent word processing errors from previous changes
  - Style guide changes (e.g., changing from a numbered bullet list to an alphabetized bullet list and vice versa, change numbering of footnote naming scheme)
  - Administrative change only and contain no technical changes.

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

- The entire ODCM will be reissued as Revision 23. For the text and tables there will be no change bars in the page margins for editorial changes. The list of effective pages is being replaced with a list of effective section, tables, and figure

Sections Revised: All

Tables Revised: All

Figures Revised: All

REVISION 24

LDCR-OD-2005-1 (EVAL-2005-003863-02) (GLM):

Revision 24 updates ODCM Section 3/4 to reflect the following changes:

- Delete the requirement to submit a special report outlining the cause of the malfunction and the plans for restoring the channel(s) to operable status.

- Adds the requirement to initiate actions in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical.

REVISION 24 (continued)

LDCR-OD-2005-1 (EVAL-2005-003863-02) (GLM) (continued):

- The CPSES Corrective Action Program is adequate to track the actions needed to restore the channel(s) to an operable status in a time commensurate with their safety significance. The minimum set of conditions required by law to be reported to the NRC are contained in the Code Of Federal Regulations (10CFR50.73, 10CFR50.72, 10CFR73, etc.). This ODCM special report is not required by the CFRs, and there is no regulatory basis for this special report. There is no Technical Specification action, regulation, license condition, order, or commitment that requires this ODCM special report. The meteorological monitoring system is governed by Regulatory Guide 1.23, "Onsite Meteorological Programs", and this Regulatory Guide contains no requirement for a special report to the NRC. Based on the above, this ODCM special report is only an administrative requirement and therefore it can be deleted.

Sections Revised: 3/4

Tables Revised: None

Figures Revised: None

REVISION 25

LDCR-OD-2006-3 (EVAL-2006-000932-01) (RJK):

Revision 25 updates ODCM Section 3/4 to reflect the following changes:

- The 7 day allowance for planned and/or scheduled channel maintenance (similar to the TS COMPLETION TIME) was removed in error by Revision 24 of the ODCM (LDCR-OD-2005-01). That revision intended only to remove the requirement to issue a Special Report to the NRC if the 7 days allowance was exceeded.

- This LDCR restores an acceptable outage duration for planned and/or scheduled work commensurate with the safety significance of this item. This change also maintains the levels of radioactive effluent control required by 10 CFR 20.1302, 40 CFR 190, 10 CFR 50.36a, and 10 CFR 50, Appendix I, and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

Sections Revised: 3/4

Tables Revised: None

Figures Revised: None

REVISION 26

LDCR-OD-2006-5 (EVAL-2006-002463-01) (RJK):

Engineering evaluation ME-CA-0000-5326 assessed the potential gaseous effluent release from a planned decontamination facility on site. The evaluation also provides for operational controls on any similar facility to limit the source term and assess the effluents. The proposed changes to the ODCM provide the framework to identify, control, and monitor any gaseous effluent pathway. The results of the monitoring are reported in the Radioactive Effluent Release Report, pursuant to ODCM Control 6.9.1.4.

LDCR-OD-2006-6 (EVAL-2006-001766-01) (RJK):

Revise Action Statement 37 (applicable to WRGM skid iodine and particulate channels) to add "If the number of channels OPERABLE is less than required by the "minimum Channels OPERABLE" requirement due to loss of heat tracing, then declare the Iodine & Particulate samplers INOPERABLE. Restore the heat tracing within 7 days and declare the samplers OPERABLE or initiate action in accordance with the Corrective Action Program to restore the channel(s) to operable status as soon as practical."

These particulate and iodine channels are USNRC Regulatory Guide 1.97, Revision 2, Type/Category E3 variables that provide backup information to estimate magnitude of release of radioactive materials to identify pathways. This 7 day period for entry into the CPSES Corrective Action Program is adequate to track the actions needed to restore the channel(s) to an operable status in a time commensurate with their safety significance.

REVISION 27

LDCR-OD-2006-1 (EVAL-2005-001822-07) (GLM):

Revise definition of DOSE EQUIVALENT IODINE 131 and add new definition for DOSE EQUIVALENT XENON 133.

LAR 06-001 revises TS 3.4.16 to eliminate E-bar and adopt DOSE EQUIVALENT XE-133 for monitoring RCS gross specific activity. This change makes the ODCM definition consistent with the revised TS definition.

REVISION 28

LDCR-OD-2007-1 (EVAL-2006-003080-05) (JDS):

Revise Definition of Rated Thermal Power to reflect 4.5% increase on Units 1 and 2 as issued by the NRC in Amendment 146 to the Operating Licenses and Technical Specifications.

REVISION 29

LDCR-OD-2007-2 (EVAL-2007-002019-01) (SCD):

Revise Table 3.3-8 ACTION and associated statements to clarify necessary actions in the event of a loss of heat tracing or sample lines to the WRGM sampling skid. These particulate and iodine channels are USNRC Regulatory Guide 1.97, Revision 2, Type/ Category E3 variables that provide backup information to estimate magnitude of release of radioactive materials to identify pathways. This 7 day period for entry into the CPNPP Corrective Action Program is adequate to track the actions needed to restore the channel(s) to an operable status in a time commensurate with their safety significance.

REVISION 30

LDCR-OD-2009-1 (EVAL-2008-002039-03) (SCD):

LDCR OD-2009-001 (tracked by SMF EVAL-2008-002039-03) changes Note 2 of Table 3.12-1 and Note 2 of Table 4.12-1 from thermo luminescent dosimeters (TLDs) to Optically Stimulated Luminescence (OSL) Badges. Also replace "thermoluminescent dosimeter" with "optically stimulated luminescence (OSL) badge" in section 2.5. This change acknowledges the recent switch from TLDs to OSLs.