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10 CFR 50, Appendix I
10 CFR 50.36a

PG&E Letter HBL-17-005

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-133, OL-DPR-7
Humboldt Bay Power Plant Unit 3
Annual Radioactive Effluent Release Report for 2016

Dear Commissioners and Staff:

Enclosure 1 contains the Humboldt Bay Power Plant Unit 3 "Annual Radioactive Effluent Release Report," covering the period January 1 through December 31, 2016. This report is required by Appendix B, Section 6.3 of the Humboldt Bay Quality Assurance Plan.

Enclosure 2 contains Revision 27 to the "SAFSTOR/Decommissioning Offsite Dose Calculation Manual," as required by Specification Section 4.2 of the "SAFSTOR/Decommissioning Offsite Dose Calculation Manual."

There are no new or revised regulatory commitments (as defined in NEI 99-04) made in this letter.

If you have any questions regarding this submittal, please contact Mr. Philippe Soenen at 805-595-6461.

Sincerely,

Loren D. Sharp

Enclosures
cc: HBPP Humboldt Distribution
cc/enc: John B. Hickman, NRC Project Manager
Kriss M. Kennedy, NRC Region IV Administrator

Enclosure 1
PG&E Letter HBL-17-005

PACIFIC GAS AND ELECTRIC COMPANY
HUMBOLDT BAY POWER PLANT
DOCKET NO. 50-133, LICENSE NO. DPR-7

HUMBOLDT BAY POWER PLANT UNIT 3 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1 through December 31, 2016

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INTRODUCTION

This report summarizes gaseous and liquid radioactive effluent releases from Humboldt Bay Power Plant (HBPP) Unit 3 for the four quarters of 2016. The report includes calculated potential radiation doses from these radioactive effluents and a comparison with the numerical guidelines of 10 CFR 50, Appendix I, as well as a summary of shipments of solid radioactive waste. The concentrations of plant effluent releases during the reporting period were well below Offsite Dose Calculation Manual (ODCM) limits.

The HBPP Main Plant Stack, a ground level release path, and Stack Particulate Airborne Monitoring Systems (SPAMS), the real time effluent monitor, were shut down on October 14, 2015, and permanently removed from service to facilitate partial demolition of the Reactor Building. Modular High Efficiency Particulate Air (HEPA) units continue to be monitored as potential gaseous effluent pathway.

The information is reported as required by Appendix B, Section 8.3 of the Humboldt Bay Quality Assurance Plan and Section 4.2 of the ODCM, and it is presented in the general format of Regulatory Guide (RG) 1.21, Appendix B (except for the topics identified below).

Meteorology

The meteorological data logging system was removed from service in 1967 so the information specified by RG 1.21 is not available. Previous HBPP Annual Radioactive Effluent Release Reports summarized the cumulative joint frequency distribution of wind speed, direction, and atmospheric stability for the period April 1962 through June 1967, when the meteorological data logging system was in service.

Short-lived Nuclides, Iodine and Noble Gasses

The Unit was last operated on July 2, 1976. Due to the long decay time since operation, short-lived radionuclides are neither expected nor reported. This includes Iodines and noble gases other than Kr-85. During 2008, all of the spent nuclear fuel was transferred from the spent fuel pool (SFP) to the independent spent fuel storage installation (ISFSI), so there is now no source term for Kr-85.

Air Particulate Filter Composites – Sr-90

Air particulate sample filters are composited quarterly and analyzed off-site for Sr-90.

Air Particulate Filter Composites – Am-241

Air particulate sample filters are composited quarterly and analyzed off-site for Am-241.

Air Particulate Filter Composites – Gross Alpha

Each weekly sample filter is individually counted for gross alpha activity, rather than analyzing a monthly composite of the filters, as described in RG 1.21.

Gaseous Effluents – Tritium

Tritium releases during plant operation were less than detection levels. Because the plant was permanently shut down in 1976, current tritium release levels are less than the release levels that occurred during plant operations. Therefore, no tritium samples were collected during this reporting period. Since the fuel has been relocated to the ISFSI and the SFP water is below the drinking water standard, no significant tritium can be released by the gaseous mode.

Liquid Effluents

The last batch discharge of radioactive liquid effluent occurred on December 11, 2013. Subsequent radioactive liquid effluent batches were transported to US Ecology for offsite disposal under the 10 CFR 20.2002 exemption. These shipments, volumes, and activity totals are included in Table 5 of this report.

Average Energy

Calculations for the average energy of gaseous releases of fission and activation gases are not required for HBPP.

I. SUPPLEMENTAL INFORMATION

A. Regulatory Limits

1. Gaseous Effluents

a. Noble Gas Release Rate Limit

Noble gases are no longer an issue since the spent nuclear fuel has been relocated to the ISFSI.

b. Iodine Release Rate Limit

Due to the long decay time since the Unit was shutdown, the license does not define an iodine release rate limit.

c. Particulate Release Rate Limit

The radioactive particulate release rate limit is based on concentration limits from 10 CFR 20, divided by an annual average dispersion factor for the sector with the least favorable atmospheric dispersion. If the total release for a period is determined to be a "less than" value, the limits are based on analytical results obtained in November, 2005, for which the mixture was determined to be 84 percent Cs-137, 11 percent Co-60 and 5 percent Sr-90.

The applicable annual average dispersion factor for incidental releases is 6.59E-3 seconds per cubic meter.

2. Liquid Effluents

a. Concentration Limit

Concentration limits for liquid effluent radioactivity released to Humboldt Bay are taken from 10 CFR 20.

B. Maximum Permissible Concentrations

1. Gaseous Effluents

Maximum Permissible Concentrations for gaseous effluents are taken from 10 CFR 20, Appendix B, Table 2, Column 1.

2. Liquid Effluents

Maximum Permissible Concentrations for liquid effluents are taken from 10 CFR 20, Appendix B, Table 2, Column 2.

C. Measurements and Approximations of Total Radioactivity

1. Gaseous Effluents – Elevated Release

Ventilation in 2016 was limited to modular HEPA ventilation units. Therefore, elevated releases did not occur at HBPP during 2016.

2. Gaseous Effluents – Ground-level Release

   a. Fission and Activation Gases

      Fission and activation gases are no longer an issue since the spent fuel has been relocated to the ISFSI.

   b. Iodines

      Due to the long decay time since operation (shutdown July 2, 1976), no detectable releases of radioactive Iodines can be expected. Therefore, neither the Technical Specifications nor the ODCM require that these radionuclides be monitored.

   c. Particulates

      Radioactive particulates released from modular HEPA ventilation units are monitored by continuous sample collection on particulate filters. Filter papers are removed from modular ventilation system weekly, and are analyzed for the concentration of gamma-emitting nuclides using an intrinsic germanium detector. All statistically significant gamma peaks are identified.

      After decaying at least seven days, the filters are analyzed for gross alpha radioactivity using a scintillation counter.

      Filters are composited and analyzed quarterly for Strontium-90 (the only radioactive Strontium present) and Americium-241 by alpha spectroscopy.

      The estimated error of the reported particulate release values is based on uncertainty in sample flow rate, modular HEPA unit flow rate, detector calibration, and typical sample counting statistics.

      The Minimum Detectable Activity (MDA) for all particulate filter samples was less than the applicable Lower Limit of Detection (LLD) presented in the ODCM.

      Individual sample release results are assigned to calendar quarters as of the termination of the sample period. Composite sample release results are assigned to the applicable calendar quarter. The release activity is sample concentration multiplied by sample duration and nominal release flow rate (2,000 cfm for modular HEPA units).

3. Liquid Effluents

a. Batch Releases

There were no batch liquid effluent releases during this report period.

b. Continuous Releases

There were no continuous liquid effluent releases during this report period.

D. Batch Release Statistics

1. Liquid

a.	Number of batch releases	0
b.	Total time period for batch releases	N/A
c.	Maximum time period for a batch release	N/A
d.	Average time period for a batch release	N/A
e.	Minimum time period for a batch release	N/A

2. Gaseous

a.	Number of batch releases	0
b.	Total time period for batch releases	N/A
c.	Maximum time period for a batch release	N/A
d.	Average time period for a batch release	N/A
e.	Minimum time period for a batch release	N/A

E. Abnormal Release Statistics

1. Liquid

a. Number of abnormal releases 0
b. Total activity released ..... N/A

2. Gaseous

a. Number of abnormal releases 0
b. Total activity released ..... N/A

II. GASEOUS AND LIQUID EFFLUENTS

A. Gaseous Effluents

Table 1 summarizes the total quantities of radioactive gaseous effluents released. Section A of Table 1 has been omitted as Fission and Activation Gases are neither expected or measured. Table 2A is for reporting the quantities of each of these nuclides determined to be released from an elevated release point (there are none). Table 2B presents the quantities of each of the nuclides determined to be released by ground level release points. Section 1 of Tables 2A and 2B is omitted as Krypton-85 is neither expected nor measured.

There were no "Batch Mode" gaseous releases.

B. Liquid Effluents

Table 3 summarizes the total quantities of radioactive liquid effluents. Table 4 presents the quantities of each of the nuclides determined to be released.

There were no batch liquid effluent releases during this report period.

TABLE 1

GASEOUS EFFLUENTS – SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Est. Total Error, %
B. Particulates						
1. Total release	Ci	<1.60E-07	<2.55E-08	N/A	N/A	3.60E+1
2. Average release rate	μCi/sec	<4.11E-20	<4.15E-20	N/A	N/A	
3. Percent of applicable limit	%	<2.11E-03	<3.55E-04	N/A	N/A	
4. Applicable limit	μCi/cc	1.24E-10	1.24E-10	N/A	N/A	
5. Gross alpha radioactivity	Ci	<4.53E-09	<7.08E-10	N/A	N/A	

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the MDA for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected. The < symbol is applied if less than 50 percent of the combined value is made up of detected results. When combining detected and nondetected results for different nuclides (e.g., activity totals of multiple nuclides), values with the < symbol are ignored (i.e., treated as zero). When combining nondetected results for different nuclides (e.g., activity totals of multiple nuclides, when none were detected), all values with the < symbol are used.

If the total release for a period is determined to be a "less than" value, the limits are based on analytical results obtained in November, 2005, the mixture was determined to be 84 percent Cs-137, 11 percent Co-60 and 5 percent Sr-90.

The "percent of applicable limit" in Table 1 is the sum of the values for "percent of applicable limit" for each of the release paths identified below:
All Gaseous Effluent Releases in 2016 were from modular HEPA units.

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Stack Release Path	%	N/A	N/A	N/A	N/A
Incidental Release Path	%	100	100	N/A	N/A

No operating Modular HEPA units after June 7, 2016.

TABLE 2A

GASEOUS EFFLUENTS – ELEVATED RELEASE – PARTICULATES CONTINUOUS MODE - NUCLIDES RELEASED

Nuclides Released	Unit	Continuous Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Particulates					
Cobalt-60	Ci	N/A	N/A	N/A	N/A
Strontium-90	Ci	N/A	N/A	N/A	N/A
Cesium-137	Ci	N/A	N/A	N/A	N/A
Am-241	Ci	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A

Table Notes:

N/A – There were no elevated gaseous effluents during the report period.

TABLE 2B

GASEOUS EFFLUENTS – GROUND-LEVEL RELEASES
NUCLIDES RELEASED

Nuclides Released	Unit	Continuous Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2. Particulates					
Cobalt-60	Ci	<5.11E-08	<8.06E-09	N/A	N/A
Strontium-90	Ci	<7.37E-09	<1.15E-09	N/A	N/A
Cesium-137	Ci	<5.50E-08	<9.34E-09	N/A	N/A
Americium-241	Ci	<3.45E-08	<5.10E-09	N/A	N/A
Total for period	Ci	<1.60E-07	<2.55E-08	N/A	N/A

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the MDA for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected, but the < symbol is applied if less than 50 percent of the combined value is made up of detected results. When combining detected and nondetected results for different nuclides (e.g., activity totals of multiple nuclides), values with the < symbol are ignored (i.e., treated as zero). When combining nondetected results for different nuclides (e.g., activity totals of multiple nuclides, when none were detected), all values with the < symbol are used.

TABLE 3

LIQUID EFFLUENTS – SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Est. Total Error, %
A. Fission & Activation Products						
1. Total release (not including tritium, gases, alpha)	Ci	N/A	N/A	N/A	N/A	N/A
2. Average diluted concentration	μCi/ml	N/A	N/A	N/A	N/A	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	
4. Applicable limit	μCi/ml	N/A	N/A	N/A	N/A	
B. Tritium						
1. Total release	Ci	N/A	N/A	N/A	N/A	N/A
2. Average diluted concentration	μCi/ml	N/A	N/A	N/A	N/A	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	
4. Applicable limit	μCi/ml	N/A	N/A	N/A	N/A	
C. Gross Alpha Radioactivity						
1. Total release	Ci	N/A	N/A	N/A	N/A	N/A
D. Volume of waste released (prior to dilution)	Liters	N/A	N/A	N/A	N/A	N/A
E. Volume of dilution water	Liters	N/A	N/A	N/A	N/A	N/A

Table Notes:

There were no batch liquid effluent releases during this report period.

TABLE 4

LIQUID EFFLUENTS – NUCLIDES RELEASED

Nuclides Released	Unit	Batch Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Strontium-90	Ci	N/A	N/A	N/A	N/A
Cesium-137	Ci	N/A	N/A	N/A	N/A
Cobalt-60	Ci	N/A	N/A	N/A	N/A
Americium-241	Ci	N/A	N/A	N/A	N/A
Nickel-63	Ci	N/A	N/A	N/A	N/A
Tritium	Ci	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A

Table Notes:

There were no batch liquid effluent releases during this report period.

III. SOLID RADIOACTIVE WASTE

Table 5 summarizes the disposal of solid radioactive waste during the report period.

Note: Table reflects all waste shipped from HBPP in the reporting period.

TABLE 5

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite For Burial Or Disposal

1. Type of Waste	Unit	12 Month Period	Estimated Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	There were no Spent resins, filter sludges, evaporator bottoms, etc. shipments during this reporting period.		
b. Dry compressible waste, soils, contaminated equipment, etc.	Cubic Meter	1.32E+04	1.00E1
	Ci	1.28E+01	5.60E1
c. Irradiated components, control rods, etc.	There were no Irradiated components, control rods, etc. shipments during this reporting period.		
d. Other (Processed Waste from HBPP to Processor)	Cubic Meter	8.50E+00	1.00E1
	Ci	5.31E-04	5.60E1
e. Other (Processed Waste from processor to burial)	Cubic Meter	3.53E+01	1.00E1
	Ci	2.94E-01	5.60E1

TABLE 5 – Continued

2. Estimate of major nuclide composition (by type of waste)	Unit	Nuclide	12 Month Period
a. Spent resins, filter sludges, evaporator bottoms, etc.	There were no spent resins, filter sludges, evaporator bottoms, etc. shipments during this reporting period.		
b. Dry compressible waste, soils, contaminated equipment, etc.	%	H-3	8.60E-01
	%	C-14	2.16E-01
	%	Fe-55	1.32E-01
	%	Co-60	3.43E-01
	%	Ni-59	9.69E-03
	%	Ni-63	2.24E+00
	%	Sr-90	5.66E-01
	%	Tc-99	8.44E-02
	%	I-129	4.72E-01
	%	Cs-137	9.33E+01
	%	Eu-152	1.65E-05
	%	Eu-154	1.16E-05
	%	U-233	1.74E-01
	%	U-234	1.75E-01
	%	U-235	1.27E-07
	%	U-238	3.71E-01
	%	Pu-238	5.78E-02
	%	Pu-239	3.67E-02
	%	Pu-240	3.67E-02
	%	Pu-241	8.51E-01
	%	Pu-242	9.92E-10
	%	Am-241	2.96E-01
	%	Cm-243	1.30E-02
	%	Cm-244	1.21E-02

TABLE 5 – Continued

c. Irradiated components, control rods, etc.	There were no irradiated components, control rods, etc. shipments during this reporting period.

d. Other (processed waste),	%	H-3	1.26E+01
	%	C-14	8.54E-02
	%	Fe-55	1.03E-01
	%	Co-60	2.60E-01
	%	Ni-59	7.33E-03
	%	Ni-63	1.62E+00
	%	Sr-90	5.03E-01
	%	Nb-94	0.00E+00
	%	Tc-99	7.54E-02
	%	I-129	4.22E-01
	%	Cs-137	8.26E+01
	%	U-233	1.56E-01
	%	U-234	1.56E-01
	%	U-238	3.02E-01
	%	Pu-238	5.18E-02
	%	Pu-239	3.28E-02
	%	Pu-240	3.28E-02
	%	Pu-241	7.65E-01
	%	Am-241	2.56E-01
	%	Cm-243	1.16E-02
	%	Cm-244	1.08E-02

TABLE 5 - Continued

3.a. Solid Waste Disposition from HBPP	Number of Shipments	Mode of Transportation	Destination
	682	Truck - NCF/Savage	US Ecology
	109	Truck - Hittman, MP Environmental	WCS
	57	Truck - Hittman, MP Environmental, Interstate Ventures	Clive
	1	Truck- Hittman	To processor: Perma-Fix
3.b. Solid Waste Disposition from processor to disposal	14	Truck - Interstate Ventures	From processor to Clive

TABLE 5 - Continued

B. Irradiated Fuel Shipments

1. Irradiated Fuel Disposition	**Number of Shipments**	**Mode of Transportation**	**Destination**
	None	N/A	N/A
3.a. Solid Waste Disposition from HBPP	**Number of Shipments**	**Mode of Transportation**	**Destination**
	682	Truck - NCF/Savage	US Ecology
	109	Truck - Hittman, MP Environmental	WCS
	57	Truck - Hittman, MP Environmental, Interstate Ventures	Clive
	1	Truck- Hittman	To processor: Perma-Fix

Table Notes:

There were no "Irradiated components, control rods, etc." shipments during this reporting period.

Processed waste shipped in 2016 was disposed of in 2016.

HBPP no longer performs batch liquid effluent discharges. Shipments, volumes and activity totals for liquid shipments are included in Table 5.

682 shipments (including 5 liquid shipments) were made to US Ecology under a 10 CFR 20.2002 exemption. These shipments included 7.51E+01 Curies of Cs-137 and 1.09E+00 Curies of Co-60 (to which 5 liquid shipments contributed 1.46E-05 Curies of Cs-137 and 3.96E-06 Curies of Co-60).

IV. RADIOLOGICAL IMPACT ON MAN

A comparison of calculated doses from various paths has shown that the offsite doses are primarily due to direct radiation. Maximum doses to individuals (for the maximally exposed organs and age groups) are summarized in Table 6. Doses from Noble Gases are not reported, as noble gas releases were neither expected nor measured. There are no airborne or liquid dose pathways from the adjacent ISFSI, and the direct radiation measurement locations for Humboldt Bay Power Plant include the contribution from the ISFSI. Therefore, these doses comply with 40 CFR 190 as there are no other uranium fuel cycle facilities within 8 km of the HBPP and ISFSI.

A. Doses to the average individual in the population, based on the guidance of RG 1.109, from all receiving-water-related pathways were not calculated for 2016, because there were no batch liquid effluent releases during this report period. The last batch liquid effluent discharge occurred on December 11, 2013.

   With no batch liquid effluent discharge, doses continue to be well below the 10 CFR 50, Appendix I numerical guidelines for limiting effluents as low as is reasonably achievable (ALARA) (3 mrem/yr to the total body and 10 mrem/yr to any organ).

B. Total body doses to the average individual in the population from gaseous effluents to a distance of 50 miles from the site are not calculated, but this dose is less than the total body dose to an average individual present at the maximally exposed location. For an average individual at the maximally exposed location, the total body dose (determined with the same dispersion and deposition parameters as used to calculate maximum exposure) was not explicitly calculated as there were no significant detected releases. Performing the calculation with the observed "less than" values for releases produced a result less than 0.02 mrem/yr.

   This maximum calculated dose is well below the 10 CFR 50, Appendix I numerical ALARA guidelines (10 mrem/yr for gamma radiation and 20 mrad/yr for beta radiation from noble gases and 15 mrem/yr to any organ from tritium and radionuclides in particulate form).

C. Total body doses (to the average individual in unrestricted areas from direct radiation from the facility) are based on thermal luminescent dosimetry (TLD) results of stations at the site boundary, using the shoreline occupancy factors given in RG 1.109 for the highest average potential individual (Teen age group). For this group, direct radiation would result in an exposure of less than 0.02mrem/yr.

   This maximum potential dose is well below the 10 CFR 20.1302(b)(2)(ii) limit of 50 mrem/yr from external sources necessary to demonstrate compliance with the 10 CFR 20.1301 dose limit for individual members of the public.

TABLE 6

RADIATION DOSE FOR MAXIMALLY EXPOSED INDIVIDUALS

	Dose, milli-rem				
Dose Source	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Liquid Effluents					
Water-related Pathways (1)	-	-	-	-	-
	-	-	-	-	-
Airborne Effluents					
Particulates	-	-	-	-	-
	-	-	-	-	-
Direct Radiation (2)	<0.01	<0.01	<0.01	<0.01	<0.02

Notes

1. Maximum total body and organ doses to individuals in unrestricted areas from receiving-water-related exposure pathways were not calculated as there were no batch liquid effluent releases during this report period. The last batch liquid effluent discharge occurred on December 11, 2013.
2. Total body doses (to the maximum individual in the population) are based on TLD results of stations at the site boundary, using the shoreline occupancy factors of RG 1.109 for the maximum potential individual (Teen age group).

V. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)

As decommissioning proceeds at HBPP, system changes or removal may require changes to the ODCM. During 2016 there was one ODCM revision: Revision 27.

The specific changes are as follows:

ODCM Revision 27 (Effective 02/10/2016)

Editorial - Updated page number in table of Content.

Editorial – Changed Plant Manager to HB Director to be consistent with HBAP A-1 (HBPP Organization)

Section I Table 1-1 Updated site photo.

Deleted references to ISFSI TLDs and Part 72.44(d) Radiological Environmental Monitoring Program (REMP) reporting requirements for ISFSI. Effective November 20, 2015, the responsibility for the ISFSI Radiation protection Program transferred from HBPP to the DCPP Radiation Protection (RP) Organization.

Introduction

Deleted reference to setpoint calculations. The ODCM no longer contains instrumentation setpoints.

Section I Table 2-6

Editorial superscript note (a)

Section I Table 2-7

Deleted Note (b) and (d) associated with sampling and ISFSI TLDs. As of December 31, 2013, HBPP ceased liquid radioactive effluent discharges via the discharge canal to Humboldt bay.

Section I Table 2-10

Deleted reference to ISFSI TLDs.

Section I Figure 2-1

Updated figure, deleted reference to ISFSI TLDs. Effective November 20, 2015, the responsibility for the ISFSI Radiation protection Program transferred from HBPP to the DCPP RP Organization.

Section I Table 4-1

Editorial – Deleted Note (d) since it is no longer applicable. Note was previously associated with waterborne pathways that were previously deleted from Table 4-1.

Section II.7

Editorial- For consistency with Section II.6 and the Table of Contents, added "Deleted" to reflect that the Section is no longer applicable.

Section II.9.3 & II.10

Editorial- The Commitment Tracking System is no longer being maintained. Thus, commitment 10.1(formerly CTS291) was added to the ODCM to be consistent with the formatting requirements for commitments in HBAP E-4, Procedure Controls, Revision 80.

Section II 12.0

Deleted reference to Outfall Canal Effluent Dilution Factors. HBPP no longer discharges liquid effluents.

VI. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)

There were no changes to the Process Control Program during the report period.

VII. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

HBPP no longer performs batch liquid effluent discharges.

VIII. INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

Liquid Effluent Monitoring

Effective December 23, 2013, HBPP no longer uses outfall canal dilution for liquid effluents. There were no batch liquid effluent releases during this report period.

Airborne Effluent Monitoring Instrumentation

Modular HEPA air sample units are used to monitor air effluents SPAMS was removed from service on October 14, 2015.

A 12 kV site wide outage affected power to the Hot Shop Modular HEPA unit on February 16, 2016. See SAPN 1415706

Hot Shop Modular HEPA totalizer was turned off for 11 minutes for calibration purposes. Totalizer run times are used to calculate effluent particulate activity of the air filter. It was determined that the 11 minute span only contributed to 0.055 percent of the total volume used in the calculation. Therefore, the totalizer reading as well as the effluent calculation was not adjusted to account for the 11-minute span of down time. See SAPN 1415706, Task detail 0002.

The 12 kV outage originally scheduled for 2/19/2016 was cancelled late in the afternoon of 2/18/2016. The Modular HEPA in Building 26 had already been turned off and filter removed. Because there was no scheduled ongoing work in the building, the HEPA was not returned to service until the morning of February 23, 2016. SAPN 1415705 was written to track the effects of the February 19, 2016 12 kV site wide outage on the Hot Shop Modular HEPA unit. See SAPN 1415705.

During week of February 23 to February 26, 2016, the HBPP site experienced a power outage at night. As a result the HEPA in Building 26 lost power and was not

discovered until after the 4-day weekend on March 1, 2016. There was no ongoing work in the building following the power outage. The used filter was discarded and the HEPA was not returned to service. The HEPA will not be routinely operated unless contamination work in the Hot Shop is performed, and then it will be ran to meet the desired MDAs. See SAPN 1415705

IX. ERRATA

2015 Annual Radioactive Effluent Release Report Errata:

At the time of submitting the 2015 report, the waste processor had not completed processing the waste to be sent for disposal. The following update to Table 5 now includes the 2015 shipped waste and corrected processed waste volume and isotopic percentages for the year. Table 5 part 3 reflects shipments from processor to disposal not reported in prior report.

TABLE 5
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite For Burial Or Disposal

1. Type of Waste	Unit	12 Month Period	Estimated Total Error, %
d. Other (Processed Waste)	Cubic Meter	1.97E+02	1.00E+01
	Ci	2.13E+00	5.60E+01

TABLE 5 - Continued

2. Estimate of major nuclide composition (by type of waste)	Unit	Nuclide	12 Month Period
d. Other (processed waste),	%	H-3	3.74E+00
	%	C-14	1.40E-01
	%	Fe-55	8.08E-01
	%	Co-60	1.21E+01
	%	Ni-59	4.45E-01
	%	Ni-63	6.98E+01
	%	Sr-90	2.51E+00
	%	Nb-94	7.91E-04
	%	Tc-99	3.90E-02
	%	I-129	1.69E-02
	%	Cs-137	6.39E+00
	%	Eu-154	3.34E-02
	%	U-233	5.85E-03
	%	U-234	5.89E-03
	%	U-235	1.85E-05
	%	U-238	9.84E-03
	%	Pu-238	2.24E-01
	%	Pu-239	1.67E-01
	%	Pu-240	1.78E-01
	%	Pu-241	2.88E+00
	%	Pu-242	9.22E-04
	%	Am-241	9.09E-01
	%	Cm-242	5.63E-06
	%	Cm-243	6.38E-02
	%	Cm-244	6.17E-02

3. Solid Waste Disposition	Number of Shipments	Mode of Transportation	Destination
	14	Truck - Interstate Ventures	From processor to Clive

HUMBOLDT BAY POWER PLANT UNIT 3

SAFSTOR/DECOMMISSIONING OFFSITE DOSE CALCULATION MANUAL

REVISION 27

INCLUDING CHANGES MADE DURING 2016

PG&E	**Nuclear Power Generation** **Humboldt Bay Power Plant**	SECTION **ODCM** VOLUME **4** REVISION **27** EFFEC DATE **2-10-16** PAGE **i**
	TITLE **SAFSTOR/DECOMMISSIONING OFFSITE DOSE CALCULATION MANUAL**	APPROVED BY **ORIGINAL SIGNED 2-4-16** DIRECTOR/PLANT MANAGER / DATE HB NUCLEAR

(Procedure Classification - Quality Related)

INTRODUCTION

The SAFSTOR/DECOMMISSIONING Off-site Dose Calculation Manual (ODCM) is provided to support implementation of the Humboldt Bay Power Plant (HBPP) Unit 3 radiological effluent controls and radiological environmental monitoring. The ODCM is divided into two parts, Part I - Specifications and Part II - Calculational Methods and Parameters.

Part I contains the specifications for liquid and gaseous radiological effluents (RETS) developed in accordance with NUREG-0473, *Draft Radiological Effluent Technical Specifications - BWR*, by License Amendment Request (LAR) 96-02 and the radiological environmental monitoring program (REMP). Both the RETS and the REMP were relocated from the Technical Specifications by LAR 96-02 in accordance with the provisions of Generic Letter 89-01, *Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Offsite Dose Calculation Manual or to the Process Control Program*, issued by the NRC in January, 1989.

Implementation of the LAR revised the instantaneous liquid concentration limits based on "old" 10 CFR 20 maximum permissible concentrations (MPCs) to 10 times the "new" 10 CFR 20, Appendix B, Table 2, Column 2 effluent concentration limits (ECLs) and replaced the gaseous effluent instantaneous concentration limits at the site boundary with annual dose rate limits equating to the doses associated with the annual average concentrations of "old" 10 CFR 20, Appendix B, Table II, Column 1. The LAR also established limits for doses to members of the public from radiological effluents based on the as low as reasonably achievable (ALARA) design objectives of 10 CFR 50, Appendix I as applicable to a nuclear power plant which has been shut down in excess of 20 years and is in Decommissioning. These dose limits were established following the guidance of NUREG-0133, *Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants*, and NUREG-0473. This guidance was modified, as appropriate, to reflect the decommissioning licensing basis contained in the HBPP SAFSTOR Decommissioning Plan, the Environmental Report submitted as Attachment 6 to the HBPP SAFSTOR licensing amendment request and NUREG-1166, *HBPP Final Environmental Statement*.

The ODCM contains the requirements for the REMP. This program consists of monitoring stations and sampling programs based on the SAFSTOR Decommissioning Plan and the Environmental Report which established baseline conditions for soil, biota and sediments. The REMP also includes requirements to participate in an interlaboratory comparison program. As of December 31, 2013, HBPP ceased liquid radioactive effluent discharges via the discharge canal to Humboldt Bay. The scope of the REMP and interlaboratory comparison program are the dosimeters and air samples required to evaluate the direct radiation and gaseous effluents from HBPP.

Part II of the ODCM contains the calculational methods developed, following the above guidance, to be used in determining the dose to members of the public resulting from routine radioactive effluents released from HBPP during the decommissioning period. Part II of the ODCM contains the calculational methods for gaseous and liquid effluents to preserve site specific data although the gaseous effluent pathway is limited to Modular HEPA Units on a selected basis and the liquid discharge pathway has been terminated.

The ODCM also contains the Process Control Program (PCP) for solid radioactive wastes, administrative controls regarding the content of the Annual Radiological Environmental Monitoring Program Report, administrative controls regarding the content of the Annual Radioactive Effluent Release Report, and administrative controls regarding major changes to radioactive waste treatment systems.

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The ODCM shall become effective after approval by the HB Director. Changes to the ODCM shall be documented and records of reviews performed shall be retained. This documentation shall contain sufficient information to support the change (including analyses or evaluations), and a determination that the change will maintain the required level of radioactive effluent control and not adversely impact the accuracy or reliability of effluent or dose calculations.

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Changes shall be submitted to the NRC in the form of a complete and legible copy of the entire ODCM as part of, or concurrent with, the Annual Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed.

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PART I - SPECIFICATIONS

1.0 DEFINITIONS

1.1 ACTION

ACTION shall be that part of a control that prescribes remedial measures required under designated conditions.

1.2 BASELINE COMPARISON

A BASELINE COMPARISON shall be a comparison of cumulative radioactivity releases for a stated period with the baseline radioactivity release conditions established by the ENVIRONMENTAL REPORT.

1.3 Deleted

1.4 Deleted

1.5 Deleted

1.6 ENVIRONMENTAL REPORT

Submitted as Attachment 6 to the SAFSTOR license amendment request, the ENVIRONMENTAL REPORT established baseline radiological environmental conditions for soil, biota and sediments.

1.7 Deleted

1.8 FREQUENCY NOTATION

The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1-1.

1.9 Deleted

1.10 INDEPENDENT VERIFICATION

INDEPENDENT VERIFICATION is a separate act of confirming or substantiating that an activity or condition has been completed or implemented, in accordance with specified requirements, by an individual not associated with the original determination that the activity or condition was completed or implemented in accordance with specified requirements.

1.11 INSTANTANEOUS CONCENTRATION

INSTANTANEOUS CONCENTRATION is the concentration averaged over one hour of radioactive materials in effluents.

1.12 MEMBER OF THE PUBLIC

MEMBER OF THE PUBLIC means an individual in any area located beyond the boundary of the restricted area controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials and within, at, or beyond the SITE BOUNDARY. However, an individual is not a member of the public during any period in which the individual receives an onsite occupational dose.

1.13 MODULAR HEPA VENTILATION UNIT

MODULAR HEPA VENTILATION UNIT consists of HEPA filter trains discharged to the environment and sampled in accordance with ANSI/HPS N13.1-1999.

1.14 OFFSITE DOSE CALCULATION MANUAL

The OFFSITE DOSE CALCULATION MANUAL contains the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM also contains the Radioactive Effluent Controls and Radiological Environmental Monitoring Program and descriptions of the information that should be included in the Annual Radiological Environmental Monitoring Report and the Annual Radioactive Effluent Release Report. The ODCM also contains the Process Control Program (PCP) for solid radioactive wastes.

1.15 OPERABLE - OPERABILITY

A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s). Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment, that are required for the system, subsystem, train, component or device to perform its function(s), are also capable of performing their related support function(s).

1.16 PROCESS CONTROL PROGRAM

The PROCESS CONTROL PROGRAM (PCP) shall contain the current formulas, sampling, analyses, tests, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, State regulations, disposal site(s) requirements, and other requirements governing the disposal of solid radioactive waste.

1.17 Deleted

1.18 RESTRICTED AREA

The RESTRICTED AREA is defined by 10CFR20.1003. The physical location(s) of the RESTRICTED AREA shall be defined in plant procedures.

1.19 SITE BOUNDARY

The SITE BOUNDARY shall be the boundary of the UNRESTRICTED AREA used in the offsite dose calculations for gaseous and liquid effluents. The SITE BOUNDARY is shown in Figure 1-1. Ingress and egress through the SITE BOUNDARY are controlled by the Company.

1.20 Deleted

1.21 Deleted

1.22 UNRESTRICTED AREA

An UNRESTRICTED AREA shall be any area located beyond the boundary of the restricted area controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials and within, at, or beyond the SITE BOUNDARY.

1.23 URANIUM FUEL CYCLE

As defined in 40 CFR Part 190.02(b), "URANIUM FUEL CYCLE means the operations of milling of uranium ore, chemical conversion of uranium, isotopic enrichment of uranium, fabrication of uranium fuel, generation of electricity by a light-water-cooled nuclear power plant using uranium fuel, and reprocessing of spent uranium fuel, to the extent that these directly support the production of electrical power for public use utilizing nuclear energy, but excludes mining operations, operations at waste disposal sites, transportation of any radioactive material in support of these operations, and the reuse of recovered non-uranium special nuclear and by-product materials from the cycle."

1.24 VENTILATION EXHAUST TREATMENT SYSTEM

A VENTILATION EXHAUST TREATMENT SYSTEM is any system designed and installed to reduce radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal absorbers and/or HEPA filters for the purpose of removing particulates from the gaseous exhaust stream prior to release to the environment.

1.25 Deleted

Table 1-1
FREQUENCY NOTATION

Notation	Frequency	[1]Extension Period
D	At least once per 24 hours.	None
W	At least once per 7 days.	42 hours
M	At least once per 31 days.	7 days
Q	At least once per 92 days.	22 days
SA	At least once per 184 days.	45 days
A	At least once per 365 days.	91 days
P	Completed prior to each release.	
N.A.	Not applicable.	

[1]The extension period for a frequency of a week or longer is 25% with a maximum tolerance of 325% for three consecutive periods.

Figure 1-1
SITE BOUNDARY

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2.0 SPECIFICATIONS

2.1 **Deleted; Table 2-1 - Deleted; Table 2.2 - Deleted**

2.2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION[1]

LIMITING CONDITIONS

2.2.1 Deleted - plant stack is no longer in operation.

SURVEILLANCE REQUIREMENTS

2.2.2 Deleted

Table 2-3 - Deleted
Table 2-4 - Deleted

2.3 LIQUID EFFLUENT - CONCENTRATION

LIMITING CONDITIONS

2.3.1 The instantaneous concentration of radioactive material released beyond the SITE BOUNDARY shall be less than or equal to 10 times the concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2.

APPLICABILITY: At all times.

ACTION:

With the instantaneous concentration of radioactive materials released beyond the SITE BOUNDARY exceeding the above limits, without delay restore the concentration of radioactive materials being released beyond the SITE BOUNDARY to within the above limits.

SURVEILLANCE REQUIREMENTS

Deleted (See BASES Section 3.2 and Appendix A)

Table 2-5 (Deleted)

2.4 LIQUID EFFLUENT – DOSE Deleted - No longer applicable

2.5 Deleted - No longer applicable

2.6 GASEOUS EFFLUENTS - DOSE RATE

LIMITING CONDITIONS

2.6.1 The dose rate at or beyond the SITE BOUNDARY, due to radioactive materials released in gaseous effluents, shall be limited as follows:

a. Radioactive particulates with half-lives of greater than 8 days: less than or equal to 1500 mrem/year to any organ.

APPLICABILITY: At all times.

ACTION:

With dose rate(s) exceeding the above limit, without delay decrease the dose rate to within the above limit(s).

SURVEILLANCE REQUIREMENTS

2.6.2 Deleted (see BASES section 3.5)

2.6.3 Deleted (see BASES section 3.5)

2.6.4 Radioactive particulates, with half-lives of greater than 8 days, in gaseous effluents released to the environment shall be sampled and analyzed in accordance with the sampling and analysis program of Table 2-6, and their concentrations shall be compared with the limits of 10CFR20, Appendix B, Table 2, Column 1. IF their concentrations exceed those limits, the calculational methods in Part II of the ODCM shall be used to determine whether or not the limits of Specification 2.6.1 have been exceeded. The actual sample period shall be used to determine the dose rate during the sample period.

Table 2-6
RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type 2/16	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (μCi/ml)[a]
Modular HEPA Ventilation Discharge				
	Continuous[b,d]	W[b] Mixing Box Particulate Sample	Principal Gamma Emitters[e]	1×10^{-11}
	Continuous[b,d]	W[b] Mixing Box Particulate Sample	Gross Alpha	1×10^{-12}
	Continuous[b,d]	W[b] Mixing Box Particulate Sample	Gross Beta	6.7×10^{-12}
	Continuous[b,d]	Q Composite of Mixing Box Particulate Samples	Sr-90[g]	1×10^{-11}
	Continuous[b,d,h]	Q Composite of Mixing Box Particulate Samples	Am-241	1×10^{-12}
	Continuous[b,d,i]	Q Composite of Mixing Box Particulate Samples	Am-241	1×10^{-14}

Table 2-6 (Continued)

Table Notation

[a] The LLD* is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

* For a particular measurement system (which may include radiochemical separation):

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

Where:

LLD is the lower limit of detection as defined above (as microcurie per unit mass or volume), s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per disintegration),

V is the sample size (in units of mass or volume),

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

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

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. NOTE: The LLDs are achievable with a reasonable count time assuming adequate effluent volume and sample volume. If the LLD is not achieved, initiate a condition report to document that the LLD was not achieved and indicate a probable cause (short runtime, equipment malfunction, etc.). RP Supervision will determine if additional calculations should be performed per Surveillance 2.6.4.

Table 2-6 (Continued)

Table Notation (Continued)

[b] Samples shall be changed at least once per 7 days (3 day extension permitted), assuming effluent pathway is in continuous use (typically > 40 hrs per week). Samples may be collected more frequently for short duration use of a Modular HEPA Ventilation Unit.

[c] Deleted

[d] 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 the Specifications 2.6, and 2.8.

[e] The principal gamma emitters for which the LLD specification applies exclusively are Co-60 and Cs-137 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are not detected for the analyses shall be reported as "less than" the nuclide's LLD, and shall not be reported as being present at the LLD level for that nuclide. The "less than" values shall not be used in the required dose calculations.

[f] Deleted based on SPAMS no longer in service.

[g] Analysis specific to Sr-90 may be replaced by analysis for total radioactive Strontium.

[h] When release volume is less than or equal to 3.26×10^{11} ml (e.g., 1.15E+7 cubic feet).

[i] When release volume exceeds 3.26×10^{11} ml (e.g., 1.15E+7 cubic feet).

2.7 Deleted

2.8 GASEOUS EFFLUENTS: DOSE - RADIONUCLIDES IN PARTICULATE FORM

LIMITING CONDITIONS

2.8.1 The dose to a MEMBER OF THE PUBLIC from the release of radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents released beyond the SITE BOUNDARY shall be limited as follows:

a. During any calendar quarter: less than or equal to 7.5 mrem to any organ, and

b. During any calendar year: less than or equal to 15 mrem to any organ.

APPLICABILITY: At all times.

ACTION:

With the calculated dose from the release of radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission, within 30 days, a Special Report, pursuant to Administrative Control 4.3, which includes:

a. Identification of the cause for exceeding the limit(s).

b. Corrective action taken to reduce the release of radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents during the remainder of the current calendar quarter and during the remainder of the current calendar year so that the average dose to any organ is less than or equal to 15 mrem.

SURVEILLANCE REQUIREMENTS

2.8.2 At least once per 31 days, perform a dose calculation for the current calendar quarter and the current calendar year, for the release of radioactive materials in particulate form with half-lives greater than 8 days,
OR

Perform a BASELINE COMPARISON for gaseous effluent radioactivity (particulate form) released to date for the current calendar quarter and current calendar year. IF the comparison indicates that the activity released to date exceeds the Environmental Report baseline annual release, THEN a dose calculation shall be performed for the current calendar quarter and the current calendar year.
OR

Perform a dose assessment, if weekly sampling indicates the effluent from modular HEPA units exceed 0.1 uCi of alpha emitters or Sr-90. The assessment of alpha and beta may be performed with appropriate compensation for naturally occurring nuclides.

As explained in Specification Bases section 3.8, neither routine surveillance nor dose calculations are required for Tritium in gaseous effluents.

2.9 SOLID RADIOACTIVE WASTE

LIMITING CONDITIONS

2.9.1 The solid radwaste system shall be used in accordance with a PROCESS CONTROL PROGRAM to process wet radioactive wastes to meet shipping and disposal site(s) requirements.

APPLICABILITY: At all times.

ACTION:

With the provisions of the PROCESS CONTROL PROGRAM not satisfied, suspend shipments of defectively processed or defectively packaged solid radioactive wastes from the site.

SURVEILLANCE REQUIREMENTS

2.9.2 The PROCESS CONTROL PROGRAM, as defined in Section 1.0, shall be used to verify that processed wet radioactive wastes (e.g., filter sludges, spent resins) meet the shipping, disposal site(s) requirements with regard to dewatering and off site vendor processes.

2.10 TOTAL DOSE

LIMITING CONDITIONS

2.10.1 The calendar year dose or dose commitment to any MEMBER OF THE PUBLIC, due to releases of radioactivity and radiation, from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which shall be limited to less than or equal to 75 mrem).

APPLICABILITY: At all times.

ACTION:

With the calculated doses from the release of radioactive materials in gaseous effluents exceeding twice the limits of Specification 2.8.1.a, or 2.8.1.b, calculations should be made, which include direct radiation contributions from Unit No. 3, to determine whether the above limits of Specification 2.10 have been exceeded. If such is the case, prepare and submit to the Commission within 30 days, pursuant to Administrative Control 4.3, a Special Report that defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in 10 CFR Part 20.2203, shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is considered granted until staff action on the request is complete.

SURVEILLANCE REQUIREMENTS

2.10.2 DOSE CALCULATIONS - Annual dose contributions from gaseous effluents shall be calculated in accordance with dose calculation methodology provided for Specification 2.8.1.

2.11 REMP MONITORING PROGRAM

LIMITING CONDITIONS

2.11.1 A radiological environmental monitoring program shall be provided to monitor the radiation and radionuclides in the environs of the facility. The program shall be conducted as specified in Table 2-7.

APPLICABILITY: At all times.

ACTION:

a. With the radiological environmental monitoring program not being conducted as specified in Table 2-7, prepare and submit to the Commission, in the Annual Radiological Environmental Monitoring Program Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. A Special Report pursuant to Administrative Control 4.3, shall be submitted if the potential annual dose to a MEMBER OF THE PUBLIC is greater than or equal to the calendar year limits of Specification 2.8. Prepare and submit to the Commission within 30 days of obtaining analytical results from the affected sampling period which includes an evaluation of release conditions, environmental factors or other aspects which caused the dose limits to be exceeded. 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 Monitoring Program Report.

SURVEILLANCE REQUIREMENTS

2.11.2 The radiological environmental monitoring samples shall be collected pursuant to Table 2-7 from the "Quality Related" locations given in Tables 2-7 and 2-10 and Figures, 2-3, 2-4 and 2-5 and shall be analyzed pursuant to the requirements of Tables 2-7 and 2-9.

Table 2-7
HBPP RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Locations[a]	PROGRAM DESCRIPTION Sampling and Collection Frequency	Type of Analysis	PROGRAM BASIS ODCM Specs (QR)
AIRBORNE	5 onsite locations, 1 offsite location	Continuous sampler operation with sample collection at least once per 7 days[1]	Gross alpha and gross beta radioactivity following filter change Gamma isotopic[b] analysis on quarterly composite (by station)	X
DIRECT RADIATION	Minimum of 8 onsite stations, at or within the SITE BOUNDARY fence line, with TLDs	TLDs exchanged quarterly[1]	Gamma exposure[3]	X
	1 offsite control station with TLD	TLDs exchanged quarterly[1]	Gamma exposure[3]	X
	4 offsite stations with TLDs	TLDs exchanged quarterly[1]	Gamma exposure[3]	X
WATERBORNE	None	N/A	N/A	
INGESTION	None	N/A	N/A	
TERRESTRIAL	None	N/A	N/A	

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Table Notations
QR - Quality Related [1]Performed by HBPP [3]Performed by a NVLAP accredited processor

[a] Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. 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 quality-related sampling schedule shall be documented in the Annual Radiological Environmental Monitoring Program Report. 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 REMP, and submitted in the next Annual Radioactive Effluent Release Report, including a revised figure(s) and table for the REMP reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples for that pathway and justifying the section of the new location(s) for obtaining samples. Note: This reporting requirement applies only to the quality-related portion of the REMP.

[b] Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the facility.

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Table 2-8 (Deleted)

Table 2-9
DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS[a] [b]
LOWER LIMITS OF DETECTION (LLD)[c]

Analysis	Airborne Particulate (pCi/m^3)
Gross Beta	0.01
H-3	
Co-60	
Cs-137	0.06

Table Notations

[a] This 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 Monitoring Program Report.

[b] Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13, Revision 1, July 1977.

[c] 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 percent probability with only 5 percent probability of falsely concluding that a blank observation represents a "real" signal.

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

$$LLD = \frac{4.66 S_b}{E \times V \times 2.22 \times Y \times \exp(-\lambda t)}$$

Where:

LLD = the "a priori" lower limit of detection as defined above (as pCi per unit mass or volume)

S_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute)

Table 2-9 (Continued)

Table Notations (Continued)

E = the counting efficiency (as counts per transformation)

V = the sample size (in units of mass or volume)

2.22 = the number of transformations per minute per pico-Curie

Y = the fractional radiochemical yield (when applicable)

λ = the radioactive decay constant for the particular radionuclide

Δt = the elapsed time between sample collection (or end of the sample collection period) and time of counting

The value of S_b used in the calculation of the LLD for a detection system will be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma ray spectrometry, the background will include the typical contributions of other radionuclides normally present in the samples.

Analyses will be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors will be identified and described in the Annual Radiological Environmental Monitoring Program Report.

Typical values of E, V, Y and t should be used in the calculation. It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement.

Table 2-10
DISTANCES AND DIRECTIONS TO ENVIRONMENTAL MONITORING STATIONS

Station No.	Code	Station Name	Radial Direction Sector	Radial Direction By Degrees	Radial Distance from Plant (Miles)
1	**Δ**	**King Salmon Picnic Area**	**W**	**270**	**0.3**
2	**Δ**	**180 Dinsmore Drive, Fortuna**	**SSE**	**158**	**9.4**
3	□	Humboldt Hill Road at Bret Harte Lane	SSE	158	0.9
14	**Δ**	**South Bay School Parking Lot**	**S**	**180**	**0.4**
17	Δ	**Control Set at Humboldt Substation, Eureka**	**NEE**	**61**	**5.8**
25	**Δ**	**Irving Drive, Humboldt Hill**	**SSE**	**175**	**1.3**

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Table Notations

Code: Δ Dosimetry Station □ Air Particulate Station

Figure 2-1
HBPP Onsite TLD Locations

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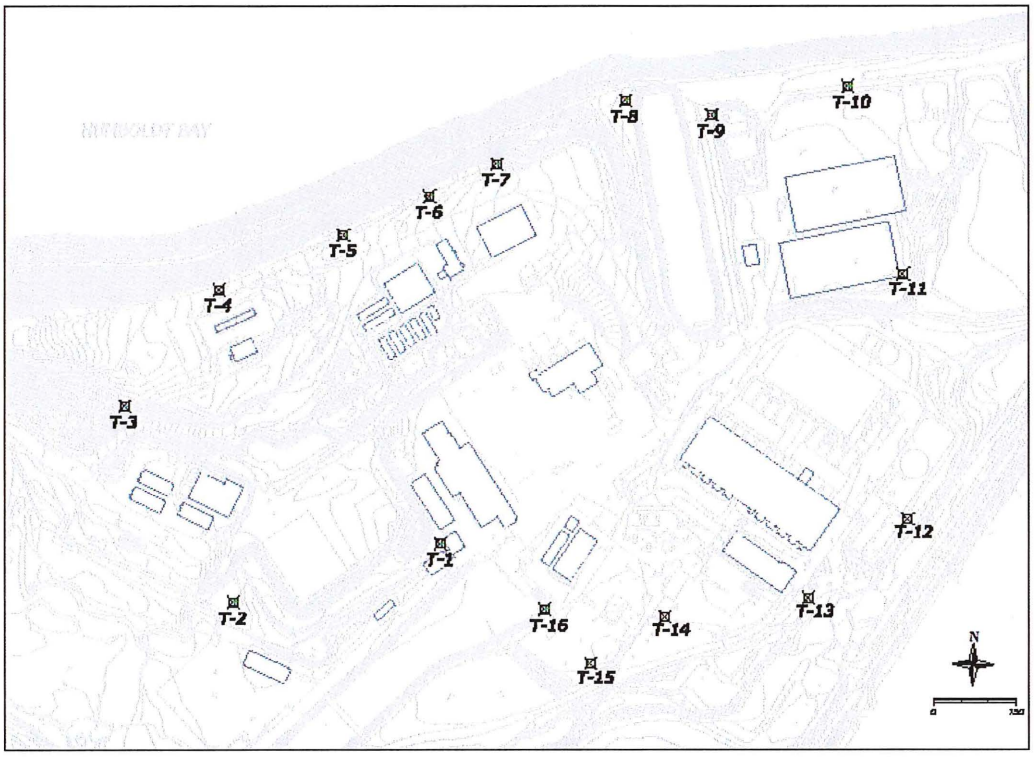


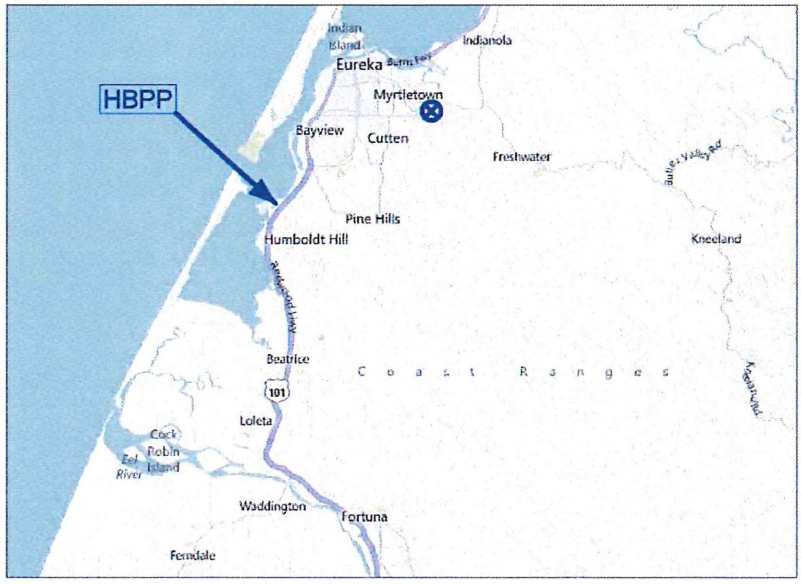
Monitoring locations T7, T10, T11, T13, T16, T2, T3, and T5 generally represent REMP Site Boundary direct exposure monitoring locations in the 8 primary compass points beginning with
2/16 T-7 to representing north and moving clockwise.

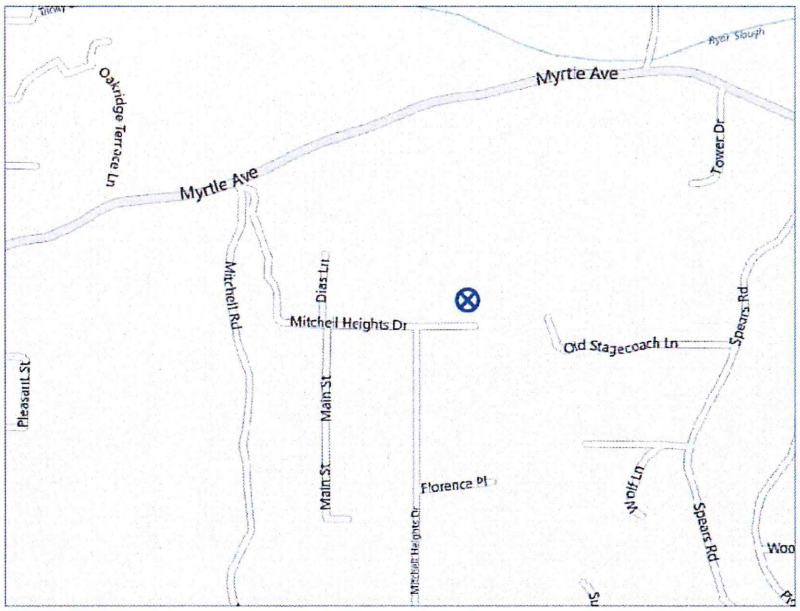
Figure 2-2 - Deleted

Figure 2-3
HBPP OFFSITE SAMPLING LOCATIONS - HUMBOLDT HILL

Station	GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			Decimal Degrees	
	Easting	Northing	el.	Latitude	Longitude
1	5948026.52	2161183.79	11.38	40.74156	-124.21903
3	5951260.28	2155706.11	234.94	40.72676	-124.20274
14	5949876.83	2158864.39	18.65	40.73533	-124.20802
25	5950247.30	2154214.18	229.22	40.72260	-124.20626

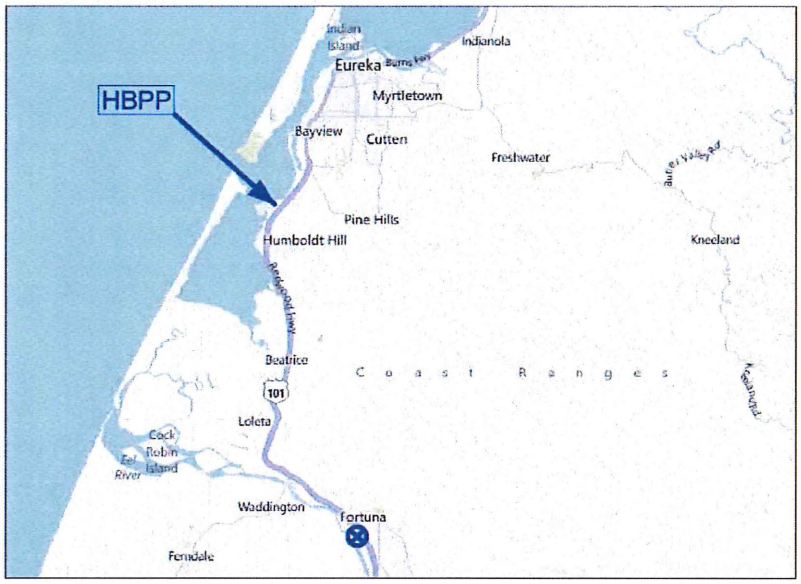
Figure 2-4
HBPP OFFSITE SAMPLING LOCATIONS - EUREKA

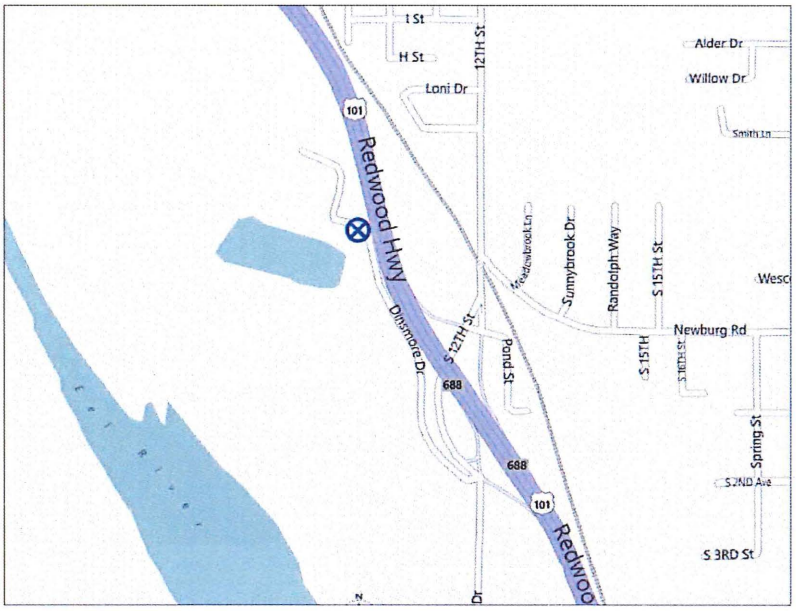




Station	GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			Decimal Degrees	
	Easting	Northing	el.	Latitude	Longitude
17	5976549.55	2175490.19	164.85	40.78276	-124.11324

Figure 2-5
HBPP OFFSITE SAMPLING LOCATIONS - FORTUNA





Station	GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			Decimal Degrees	
	Easting	Northing	el.	Latitude	Longitude
2	5962583.86	2105797.82	35.53	40.59057	-124.15746

2.12 REMP INTERLABORATORY COMPARISON PROGRAM

LIMITING CONDITIONS

2.12.1 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program.

APPLICABILITY: At all times.

ACTION:

With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Monitoring Program Report.

SURVEILLANCE REQUIREMENTS

2.12.2 A summary of the results obtained from this program shall be included in the Annual Radiological Environmental Monitoring Program Report pursuant to Administrative Control 4.1.