Pacific Gas and Electric Company
Humboldt Bay Power Plant
Paul J. Roller
Director and Plant Manager Humboldt Bay Nuclear

1000 King Salmon Avenue
Eureka, CA 95503
707/444-0700

April 29, 2011

PG&E Letter HBL-11-005

10 CFR Part 20
10 CFR Part 50
10 CFR Part 72.44

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

Docket No. 50-133
License No. DPR-7
Humboldt Bay Power Plant Unit 3
Annual Radiological Environmental Monitoring Report for 2010

Dear Commissioners and Staff:

Enclosed is the Humboldt Bay Power Plant Unit 3, "Annual Radiological Environmental Monitoring Report" for 2010. This report provides the information required by 10 CFR Part 20, 10 CFR Part 50, and 10 CFR Part 72.44(d), and by Section 4.1 of the SAFSTOR/Decommissioning Offsite Dose Calculation Manual (ODCM).

The report has three sections. Section A provides a summary description of the SAFSTOR Radiological Environmental Monitoring Program (REMP), including maps of sampling locations. Section A also provides the results of licensee laboratory participation in the Interlaboratory Comparison Program.

Section B provides summaries, interpretations, and analyses of trends of the results of the REMP for the reporting period. The material provided is consistent with the objectives outlined in the ODCM, and in 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C. Section B also includes a comparison with the baseline environmental conditions at the beginning of SAFSTOR.

Section C provides monitoring results for the reporting period, with summaries and tabulations. Radiological environmental samples and environmental radiation measurements were taken at the locations identified in ODCM Table 2-7 as quality-related locations. The summarized results are formatted for applicable reporting requirements of the NRC Radiological Assessment Branch's Branch Technical Position.

There are no regulatory commitments made in this letter.

A009
FSME20
IE25
FSME
NRC

If you wish to discuss the information in the enclosed report, please contact John Newey at (707) 441-2641, or David Sokolsky at (707) 444-0801.

Sincerely,

Paul J. Roller
Director and Plant Manager Humboldt Bay Nuclear

cc/enc: Elmo E. Collins, Jr., NRC Region IV
John B. Hickman, NRC Project Manager
HBPP Humboldt Distribution

Enclosure

Enclosure
PG&E Letter HBL-11-005

HUMBOLDT BAY POWER PLANT UNIT 3
ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

JANUARY 1 THROUGH DECEMBER 31, 2010

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ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT FOR HUMBOLDT BAY POWER PLANT UNIT 3, COVERING THE PERIOD JANUARY 1 THROUGH DECEMBER 31, 2010

This annual report is required by 10 CFR Part 20, 10 CFR Part 50, and 10 CFR Part 72.44(d), and by Section 4.1 of the SAFSTOR Offsite Dose Calculation Manual (ODCM). This report provides information about the Radiological Environmental Monitoring Program (REMP) for the period of January 1 through December 31, 2010, in a manner consistent with the objectives outlined in the ODCM, and in 10CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C.

The report has three sections. Section A provides a summary description of the REMP, including maps of sampling locations. Section A also provides the results of licensee laboratory participation in the Interlaboratory Comparison Program.

Section B provides summaries, interpretations, and analyses of trends of the results of the REMP for the reporting period. The material provided is consistent with the objectives outlined in the ODCM, and in 10CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C. Section B also includes a comparison with the baseline environmental conditions at the beginning of SAFSTOR.

Section C provides the results of analyses of radiological environmental samples and of environmental radiation measurements taken during the period pursuant to the quality related locations specified in the table and figures in the ODCM, presented as both summarized and tabulated results of these analyses and measurements. The summarized results are formatted for applicable reporting requirements of the NRC Radiological Assessment Branch's Branch Technical Position.

A. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1. Program Description

The NRC Radiological Assessment Branch issued a Branch Technical Position (BTP) on environmental monitoring in March 1978. Revision 1 of the BTP was issued as Generic Letter 79-65, "Radiological Environmental Monitoring Program Requirements – Enclosing Branch Technical Position," Revision 1, dated November 27, 1979, and sets forth an example of an acceptable minimum radiological monitoring program. The specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of individuals resulting from plant effluents.

As discussed below, many of the exposure pathway sample requirements specified in the BTP are not required for the HBPP REMP because of the baseline conditions established in the SAFSTOR Decommissioning Plan (now identified as the Defueled Safety Analysis Report (DSAR)) and the Environmental Report.

In addition, the nuclides specified for analysis by the BTP have been revised to reflect the available source term at a nuclear power plant that has been shut down since July 2, 1976.

The REMP consists of the collection and analysis of both onsite and offsite environmental samples. HBPP personnel perform sample collection and General Engineering Laboratories (GEL) personnel perform sample analysis. The Diablo Canyon Power Plant (DCPP) dosimetry group performs analysis of thermoluminescent dosimeters (TLDs) used for monitoring direct radiation. A summary of the REMP is provided as Table A-1, "HBPP Radiological Environmental Monitoring Program."

Prior to 2006, HBPP utilized an "in-house" environmental lab for sample analysis. That environmental lab was Technical and Ecological Services (TES) located in San Ramon, California. At the beginning of 2006, HBPP REMP changed its environmental lab to GEL located in Charleston, South Carolina.

Sample collection for the REMP is performed at the sampling stations defined by Table A-2, Distances and Directions to HBPP Offsite TLD Locations; Figure A-1, HBPP Onsite TLD Locations; Figure A-2, HBPP Onsite Monitoring Well Locations; and the discharge canal shown in Figure A-2, HBPP Onsite Monitoring Well Locations.

2. Monitoring Requirements

a. Offsite Environmental Monitoring - Direct Radiation

The SAFSTOR ODCM requires four offsite environmental monitoring stations equipped with TLDs to monitor gamma exposure. The TLDs are to be exchanged quarterly. The stations selected to satisfy this requirement are Stations 1, 2, 14 and 25 as described in Table A-2. These stations are considered to be the four control locations for the direct radiation dose pathway.

b. Onsite Environmental Monitoring

(1) Direct Radiation

The SAFSTOR ODCM requires sixteen onsite environmental monitoring stations, equipped with TLDs to monitor gamma exposure. The TLDs are to be exchanged quarterly. The stations selected to satisfy this requirement are Stations T1 through T16, shown on Figure A-1. Four additional TLDs were added around the ISFSI in the second quarter. These are Stations T18 through T21.

Each quarter the exposures from 20 stations are determined, which results in the 80 analyses for a full year. Each TLD station has three TLDs, each containing a number of phosphors (normally three).

The phosphor exposures for each TLD are averaged and then the three TLDs per station are averaged to provide the quarterly exposure for the station.

(2) Surface Water

The SAFSTOR ODCM requires that the discharge canal effluent be monitored by gamma isotopic analysis and by tritium analysis. Composite samples are normally collected weekly from a continuous sampler, with dip (grab) samples collected if the sampler is inoperable.

(3) Groundwater

The SAFSTOR ODCM requires that five groundwater wells be monitored by gamma isotopic analysis and by tritium analysis. Samples are to be collected quarterly. The monitoring wells selected to satisfy this requirement are identified as MW-1, MW-2, MW-4, MW-6, and MW-11, shown on Figure A-2.

c. Other Monitoring

Airborne, ingestion and terrestrial pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to the SAFSTOR license amendment request, established baseline conditions for these pathways. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR. The Environmental Report also contains a description of the demography and human activities within the environs surrounding the site.

As a matter of plant policy, groundwater leakage into the reactor caisson is routinely sampled, approximately monthly, and analyzed for tritium and gamma emitters, in order to develop a historical record of this parameter for the remainder of SAFSTOR. The results are included in this report, but are not considered part of the SAFSTOR REMP.

3. Interlaboratory Comparison Program

PG&E's contract laboratory, GEL, has analyzed evaluation samples provided by a commercial supplier to satisfy the requirement to participate in an Interlaboratory Cross-Check Program. This participation includes sufficient determinations (sample medium and radionuclide combination) to ensure independent checks on the precision and accuracy of the measurements of radioactive materials in the REMP samples. Table A-3 presents the participation in this Interlaboratory Cross-Check Program for samples analyzed in the report period that represent analyses performed for HBPP. The agreement criteria are consistent with the guidance for "Confirmatory Measurements" in NRC Inspection Procedure 83502.3, "Radiological Environment Monitoring Program and Radioactive Material Control Program."

GEL analyzed 3 samples for 30 parameters that are representative of analyses performed for HBPP during 2010. All results met the acceptance criteria. No adverse trends in quality were noted in the crosscheck program results.

GEL also participated in various proficiency testing programs for federal and state agencies, including the DOE Mixed Analyte Performance Evaluation Program (MAPEP). The data on appropriate media samples is also included. One "Disagreement" was noted.

4. NEI Groundwater Protection Initiative

Groundwater monitoring data is collected in accordance with the Nuclear Energy Institute (NEI) Groundwater Protection Initiative. The results show that there are detectable concentrations of radionuclides in the groundwater within the HBPP restricted area. These are believed to be the results of historical spills at the site.

The impact of these detectable concentrations is negligible, as the groundwater is saline and is not used now or likely to be used in the future for either direct consumption or for agricultural purposes.

To further characterize any groundwater issues, twelve additional wells are monitored as well as the five that are required to be monitored by the SAFSTOR REMP. The results of the analyses for the five required are in Table C-5. Additional wells are included in Table C-8, Additional Groundwater Monitoring Results.

B. TRENDS, BASELINE COMPARISONS AND INTERPRETATIONS

Section B provides interpretations of results, and analyses of trends of the results. The material provided is consistent with the objectives outlined in the ODCM, and in 10CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C. Section B also includes a comparison with the baseline environmental conditions at the beginning of SAFSTOR.

1. General Comments

The Environmental Report, submitted to the NRC as Attachment 6 to the SAFSTOR license amendment request, established baseline conditions for soil, biota and sediments. In accordance with the NRC approved SAFSTOR Decommissioning Plan (now identified as the DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR. The results to date indicate no significant change from the baseline environmental conditions established in the Environmental Report.

The results, interpretations, and analysis of trends of the results, indicate that SAFSTOR activities have had no measurable radiological effect on the

environment. Facility surveys for radiation and radioactive surface contamination are performed on both a scheduled basis and on an as-required basis. These surveys indicate that the radioactivity control barriers established for SAFSTOR continue to be effective.

As discussed below, the ODCM calculation model conservatively assumes that exposure pathways begin at the unrestricted area boundary. Since there have not been any changes in the location of the boundary, no survey for changes to the use of unrestricted areas was necessary.

2. Direct Radiation Pathway

A plot of the radiation level trends for the four control locations is shown in Figure B-1, Offsite Environmental Radiation Level Trends. A plot of the radiation level trends for onsite stations is shown in Figure B-2, Onsite Environmental Radiation Level Trends. This plot includes the average dose for two groups of onsite stations, selected by their potential to be affected by radioactive waste handling activities.

The plots show that the offsite annual doses continue to be within the ranges that have been observed over the last ten years.

Figure B-2 also shows that dose measurement variations can be attributed to in-plant sources and low-level waste packaging and shipping activities. However, allowing for the background change in the general environs, all measurements were comparable to the ranges observed at these locations since entering SAFSTOR, with the onsite station dose levels approximately within the range of dose levels shown by the offsite stations.

The ODCM calculation model for the direct radiation exposure pathway assumes an occupancy factor for the portion of the unrestricted area boundary that is closest to the radioactive waste handling area of the plant, which is the location of the highest potential exposure. The occupancy factor is 67 hours per year, based on regulatory guidance for shoreline recreation, even though the actual shoreline is farther from the boundary. Since there have been no significant changes of the locations of the radioactive waste handling activities, boundary, or shoreline, no further survey for changes to the use of unrestricted areas is necessary.

The Independent Spent Fuel Storage Facility (ISFSI) was constructed in 2008 and spent fuel transfer from the spent fuel pool was completed in December 2008. As a result of this the dose rates at the fence line increased slightly. The ISFSI Final Safety Analysis Report (FSAR) assumes an occupancy factor of 2,080 hours per year at the fence line. Based on the 2080 hour occupancy factor the dose at the fence line would have been less than 0.1 mrem per year.

3. Airborne Pathway

Airborne pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to the SAFSTOR license amendment request, established baseline conditions for the airborne pathway. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR. The ODCM calculation model for the airborne pathway assumes that the airborne exposure pathway (inhalation exposure) is at the unrestricted area boundary, which is the location of the highest potential exposure.

4. Waterborne Pathway

a. Surface Water

None of the REMP samples indicated detectable levels of Tritium or gamma radioactivity. These sample results were typical of those observed since entering SAFSTOR.

The ODCM calculation model for the surface water waterborne pathway assumes that the waterborne exposure pathway (vertebrate and invertebrate food consumption) begins at the unrestricted area boundary, which is the location of the highest potential exposure.

The ODCM calculation model is based on the average concentration of the radioactivity released and diluted by the tidal flow of water in the outfall canal. For the purposes of comparing the sampling results with effluents, consider a conservatively estimated liquid waste batch of 7,000 gallons containing Tritium at 30,000 pico-Curies/liter, Cs-137 at 1,000 pico-Curies/liter, and Co-60 at 100 pico-Curies/liter. For a single batch release during a week-long canal composite sample, the tidal flow volume is approximately 7E6 gallons, so the diluted activity for Tritium, Cs-137 and Co-60 would be 30, 1.0, and 0.1 pico-Curies/liter, respectively. These concentrations are unlikely to be detected.

b. Groundwater

None of the samples of the 5 SAFSTOR REMP required monitoring wells indicated detectable levels of tritium. For gamma radioactivity, these sample results were typical of those observed since entering SAFSTOR. Results for other parameters and samples were comparable to the ranges observed since entering SAFSTOR.

This report also contains information on gamma emitting radionuclides and tritium concentrations in the caisson sump and gamma emitting radionuclide concentrations for the Spent Fuel Pool (SFP) French drain. There is detectable radioactivity, due to plant operations, at these sample points. Both of these locations are believed to be

contaminated as a result of groundwater intrusion into historically contaminated areas of concrete and fill material.

The ODCM does not provide a model for the groundwater waterborne pathway, as the groundwater is saline and is not used for either direct consumption or for agricultural purposes.

5. Ingestion Pathway

Ingestion pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to the SAFSTOR license amendment request, established baseline conditions for the ingestion pathway. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR.

The ODCM calculation model for the airborne pathway assumes that the ingestion pathways (milk, meat and vegetable consumption) begin at the unrestricted area boundary, which is the location of the highest potential exposure, whether any dairy, farm, etc. is actually present.

6. Terrestrial Pathway

Terrestrial pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to the SAFSTOR license amendment request, established baseline conditions for the terrestrial pathway. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR.

The ODCM calculation model for the terrestrial pathway conservatively assumes that the terrestrial exposure (direct radiation from airborne radioactivity deposition) is at the unrestricted area boundary, which is the location of the highest potential exposure.

C. MONITORING RESULTS

1. Annual Summary

Results of the REMP sampling and analysis are summarized in Table C-1 in the format of the BTP Table 3. None of the REMP samples results exceeded the reporting levels for radioactivity concentration in environmental samples specified in HBPP ODCM Table 2-8.

All of the minimum detectable activities (MDAs) for analyses required by the SAFSTOR REMP were less than or equal to the lower limit of detection (LLD) criteria for radioactivity in environmental samples specified in Table C-1 of this report. Because alpha and beta radioactivity analyses of the saline ground water are less effective than Tritium and Gamma radioactivity analyses for monitoring potential spent fuel pool leakage, the ODCM does not currently require alpha and beta radioactivity analyses to be part of the SAFSTOR REMP.

2. Direct Radiation Pathway

   Monitoring of the direct radiation pathway is performed at 20 onsite locations near the facility fence line, and at 4 offsite (control) locations in the vicinity of the facility. Monitoring is performed with TLDs with multiple crystal elements. Three TLDs are installed at each station, and the set is exchanged quarterly. The reported result and its standard error are calculated from the measurements of multiple elements in the TLD triplet. Results of the onsite and offsite monitoring are provided in Tables C-2 and C-3, respectively.

3. Airborne Pathway

   Airborne pathway monitoring is not required by the ODCM.

4. Waterborne Pathway

   a. Surface Water

      Surface water sampling of the waterborne pathway is performed by sampling the discharge canal effluent. Sampling is normally performed by collecting a weekly sample from a discharge canal continuous composite sampler. If the composite sampler is found to be inoperable, dip samples from the discharge canal are taken. All samples during the reporting period were obtained from the continuous composite sampler.

      Detailed results of the discharge canal monitoring are provided in Table C-4. None of the REMP samples indicated detectable levels of Tritium or gamma radioactivity at or above the MDA. The MDA for these analyses was at or below the LLD stated in Table C-1 of this report. These sample results were typical of those observed since entering SAFSTOR. Since no activity was detected, a comparison with the baseline levels was not performed.

b. Groundwater

Groundwater sampling of the waterborne pathway is performed by sampling five monitoring wells located to monitor for leakage from the spent fuel pool. Sampling of these monitoring wells is performed quarterly. Detailed results of groundwater monitoring are provided in Table C-5.

The tritium concentration for all of the wells listed in Tables C-5 and C-8 during 2010 was less than the MDA of approximately 300 pCi/liter. The addition of the several more groundwater monitoring wells in the last couple of years will help to further characterize groundwater issues. All of the monitoring wells are inside the owner controlled area boundary and the groundwater is saline and is not used for direct consumption or for agricultural purposes. Therefore, there is no groundwater waterborne pathway for a member of the public. None of the other ODCM required REMP samples indicated detectable levels of tritium or gamma radioactivity.

Because alpha and beta radioactivity analyses of the saline ground water are less effective than tritium and gamma radioactivity analyses for monitoring potential spent fuel pool leakage, the ODCM does not currently require alpha and beta radioactivity analyses to be part of the SAFSTOR REMP. Nevertheless, alpha and beta radioactivity analyses are performed as a matter of plant policy, in order to maintain a historical record of this parameter for the remainder of SAFSTOR. These results are included in Table C-5, but are not considered part of the SAFSTOR REMP.

All required sampling and analysis for the five monitoring wells of the waterborne pathway required during this reporting period was performed successfully.

Groundwater leakage into the reactor caisson is also routinely sampled, approximately monthly, and analyzed for gamma emitters and Tritium as a matter of plant policy, in order to develop a historical record of this parameter for the remainder of SAFSTOR. These results are included in Table C-6, but are not considered part of the SAFSTOR REMP.

The French Drain beneath the Spent Fuel Pool is also routinely sampled, approximately monthly, and analyzed for gamma emitters as a matter of plant policy, in order to develop a historical record of this parameter for the remainder of SAFSTOR. These results are included in Table C-7, but are not considered part of the SAFSTOR REMP.

As a response to the NEI groundwater initiative, additional analyses were performed on some groundwater samples. The results of these analyses are provided in Table C-8.

5. Ingestion Pathway

Ingestion pathway monitoring is not required by the ODCM.

6. Terrestrial Pathway

Terrestrial pathway monitoring is not required by the ODCM.

7. NEI Groundwater Protection Initiative Voluntary Reporting Results

The NEI Groundwater Protection Initiative contains the following requirements:

OBJECTIVE 2.2 VOLUNTARY COMMUNICATION

Make informal notification as soon as practicable to appropriate State/Local officials, with follow up notification to the NRC, as appropriate, regarding significant onsite leaks/spills into groundwater and onsite or offsite water sample results exceeding the criteria in the REMP as described in the ODCM/ODAM.

HBPP Response to 2.2:

There were no reports or notifications required to be generated in 2010 for groundwater results exceeding reporting/notification levels or significant onsite leaks/spills.

OBJECTIVE 2.3 THIRTY-DAY REPORTS

Submit a 30-day report to the NRC for any water sample result for onsite groundwater that is or may be used as a source of drinking water that exceeds the criteria in the licensee's existing REMP for 30-day reporting of offsite water sample results. Copies of 30-day reports for both onsite and offsite water samples will also be provided to the appropriate State agency, and:

HBPP Response to 2.3:

There were no reports or notifications required to be generated in 2010 for groundwater results exceeding reporting/notification levels or significant onsite leaks/spills.

OBJECTIVE 2.4 ANNUAL REPORTING

Document all on-site ground water sample results and a description of any significant on-site leaks/spills into groundwater for each calendar year in the AREOR for REMP or the ARERR for the RETS as contained in the appropriate reporting procedure, beginning with Calendar year 2006. .

HBPP Response to 2.4:

Onsite groundwater monitoring points are described and reported in this report as follows:

MW-01 (Monitoring Well 01), MW-02 (Monitoring Well 02), MW-04 (Monitoring Well 04), MW-06 (Monitoring Well 06), MW-11 (Monitoring Well 11), the Caisson Sump and the French Drain. A summary of the sample results are provided in Section C.

There were no significant onsite leaks/spills into groundwater in 2010.

Note: the term "significant" is defined by the NEI Initiative as greater than 100 gallons.

8. Errata for Previous Report

There are no errata for previous reports.

TABLE A-1
HBPP RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway And/Or Sample	Number of Samples And Locations	Sampling and Collection Frequency	Type of Analysis
DIRECT RADIATION	20 onsite stations with TLDs	TLDs exchanged quarterly	Gamma exposure
	4 offsite stations with TLDs	TLDs exchanged quarterly	Gamma exposure
WATERBORNE Surface Water	Discharge canal effluent	Continuous sampler operation with sample collection weekly. Dip samples if sampler inoperable	Gamma isotopic[(a)] and Tritium analysis of weekly sample
Groundwater	5 groundwater monitoring wells	Quarterly	Tritium and gamma isotopic[(a)] analysis

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

TABLE A-2
DISTANCES AND DIRECTIONS TO HBPP OFFSITE TLD LOCATIONS

Station Number	Station Name	Radial Direction		Radial Distance From Plant (Miles)
		Sector	By Degrees	
1	King Salmon Picnic Area	W	270	0.3
2	City of Fortuna Water Pollution Control Plant, 180 Dinsmore Drive, Fortuna	SSE	158	9.4
14	South Bay School Parking Lot	S	180	0.4
25	Irving Drive, Humboldt Hill	SSE	175	1.3

TABLE A-3
GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA

Table Notation: (a) All of the values shown are relative. Therefore, the units for total activity or concentration levels are not shown.

Sample/Analysis	Radionuclide	Quarter 2010	GEL	Ref Value	Evaluation
Water/Gamma	Ce-141	2nd	2.04E+02	2.04E+02	Agreement
	Co-58	2nd	2.19E+02	2.13E+02	Agreement
	Co-60	2nd	2.67E+02	2.58E+02	Agreement
	Cr-51	2nd	5.78E+02	5.54E+02	Agreement
	Cs-134	2nd	2.56E+02	2.55E+02	Agreement
	Cs-137	2nd	1.81E+02	1.81E+02	Agreement
	Fe-59	2nd	1.94E+02	1.79E+02	Agreement
	I-131	2nd	1.00E+02	9.61E+01	Agreement
	Mn-54	2nd	1.90E+02	1.79E+02	Agreement
	Zn-65	2nd	3.72E+02	3.48E+02	Agreement
Water/Gamma	Ce-141	2nd	2.78E+02	2.63E+02	Agreement
	Co-58	2nd	1.51E+02	1.44E+02	Agreement
	Co-60	2nd	1.94E+02	1.85E+02	Agreement
	Cr-51	2nd	3.86E+02	3.64E+02	Agreement
	Cs-134	2nd	1.85E+02	1.79E+02	Agreement
	Cs-137	2nd	1.71E+02	1.59E+02	Agreement
	Fe-59	2nd	1.60E+02	1.38E+02	Agreement
	I-131	2nd	8.12E+01	7.22E+01	Agreement
	Mn-54	2nd	2.30E+02	2.09E+02	Agreement
	Zn-65	2nd	2.97E+02	2.56E+02	Agreement
Water/Gamma	Ce-141	4th	1.74E+02	1.65E+02	Agreement
	Co-58	4th	9.63E+01	9.35E+01	Agreement
	Co-60	4th	2.34E+02	2.17E+02	Agreement
	Cr-51	4th	3.12E+02	2.97E+02	Agreement
	Cs-134	4th	1.22E+02	1.18E+02	Agreement
	Cs-137	4th	1.24E+02	1.20E+02	Agreement
	Fe-59	4th	1.48E+02	1.41E+02	Agreement
	I-131	4th	7.24E+01	6.44E+01	Agreement
	Mn-54	4th	1.70E+02	1.52E+02	Agreement
	Zn-65	4th	2.97E+02	2.59E+02	Agreement

TABLE A-3 (Continued)
GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA

Sample/Analysis	Radionuclide	Quarter 2010	GEL	MAPEP	Evaluation
Water/Various	Am-241	3rd	1.0323	1.30	Agreement
	Cs-137	3rd	63.1	60.6	Agreement
	Mn-54	3rd	28.83	26.9	Agreement
	Co-57	3rd	29.2	28.3	Agreement
	Ni-63	3rd	57.7	59.9	Agreement
	Pu-238	3rd	1.213	1.93	Disagreement
	Pu-239/240	3rd	0.026	0.009	Agreement
	U-234/233	3rd	1.163	1.22	Agreement
	U-238	3rd	1.223	1.25	Agreement
	Zn-65	3rd	45.9	40.7	Agreement
Water/Gross Alpha		3rd	0.559	0.676	Agreement
Water/Gross Beta		3rd	3.110	3.09	Agreement

TABLE C-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL REPORT SUMMARY

Name of Facility: Humboldt Bay Power Plant Unit 3 — Docket No.: 50-133; License No. DPR-7

Location of Facility: Humboldt County, California (County, State) — Reporting Period: January 1 – December 31, 2010

Medium or Pathway Sampled [Unit of Measurement]	Type and Total Number of Analyses Performed	Lower Limit of Detection[a] (LLD)	All Indicator Locations Mean, (Fraction) & [Range][b]	Location with Highest Annual Mean: Name, Distance and Direction	Location with Highest Annual Mean: Mean, (Fraction) & [Range][b]	Control Locations Mean, (Fraction) & [Range][b]	Number of Nonroutine Reported Measurements
AIRBORNE Radioiodine and Particulates	Not Required	N/A	N/A	N/A	N/A	Not Required	N/A
DIRECT RADIATION [mR/quarter]	Direct radiation (76)	3	12.9 ± 0.1 (76/76) [11.0 – 15.0]	Station T19, Figure B-1	14.5 ± 0.3 (3/3) [14.4– 14.6]	12.3 ± 0.1 (16/16) [11.0 – 14.4]	0
WATERBORNE Surface Water (Discharge canal effluent) [pCi/l]	Gamma isotopic (52)	Co-60: 15 Cs-137: 18	<MDA (0/52) [N/A]	N/A	N/A	Not Required	0
	Tritium (52)	ODCM: 3000 Plant Policy: 400	<MDA (0/52) [N/A]	N/A	N/A	Not Required	0

TABLE C-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL REPORT SUMMARY

Medium or Pathway Sampled [Unit of Measurement]	Type and Total Number of Analyses Performed	Lower Limit of Detection[a] (LLD)	All Indicator Locations Mean, (Fraction) & [Range][b]		Location with Highest Annual Mean: Name, Distance and Direction		Location with Highest Annual Mean: Mean, (Fraction) & [Range][b]		Control Locations Mean, (Fraction) & [Range][b]		Number of Nonroutine Reported Measurements
			Co-60	Cs-137	Co-60	Cs-137	Co-60	Cs-137	Co-60	Cs-137	
WATERBORNE (continued) Groundwater (Monitoring wells) [pCi/l]	Gamma isotopic (20)	Co-60: 15 Cs-137: 18	<MDA (0/20) [N/A]	<MDA (0/20) [N/A]	N/A	N/A	<MDA (0/4) [N/A]	<MDA (0/4) [N/A]	N/A	N/A	0
	Tritium (20)	ODCM:2000 Plant Policy: 400	<MDA (0/20) [N/A]		N/A		<MDA (0/4) [N/A]		N/A		0
Drinking Water	Not Required	N/A	N/A		N/A		N/A		Not Required		N/A
Sediment	Not Required	N/A	N/A		N/A		N/A		Not Required		N/A
Algae	Not Required	N/A	N/A		N/A		N/A		Not Required		N/A
INGESTION Milk	Not Required	N/A	N/A		N/A		N/A		Not Required		N/A
Fish and invertebrates	Not Required	N/A	N/A		N/A		N/A		Not Required		N/A
TERRESTRIAL Soil	Not Required	N/A	N/A		N/A		N/A		Not Required		N/A

[a] The LLD is defined 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.
LLD is defined as the a priori (before the fact) lower limit of detection (as pCi per unit mass or volume) representing the capability of a measurement system and not as the a posteriori (after the fact) limit for a particular measurement. (Current literature defines the LLD as the detection capability for the instrumentation only, and the MDA, minimum detectable concentration, as the detection capability for a given instrument, procedure and type of sample.) The actual MDA for these analyses was at or below the LLD.

[b] The mean and the range are based on detectable measurements only. The fraction of detectable measurements at specified locations is indicated in parentheses; e.g., (10/12) means that 10 out of 12 samples contained detectable activity. The range of detected results is indicated in brackets; e.g., [23-34].

Not Required: Not required by the HBPP Unit 3 Technical Specifications or the SAFSTOR Offsite Dose Calculation Manual. Baseline environmental conditions for this parameter were established in the Environmental Report as referenced by the SAFSTOR Decommissioning Plan (now identified as the Defueled Safety Analysis Report).
N/A – Not applicable

TABLE C-2
ONSITE ENVIRONMENTAL TLD STATIONS

Station Number	TLD Exposure Measurements (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
T1	14.1 ± 0.8	14.3 ± 0.5	14.5 ± 0.6	13.8 ± 0.5
T2	12.8 ± 0.4	12.1 ± 0.4	13.6 ± 0.4	13.0 ± 0.6
T3	12.5 ± 0.8	12.4 ± 0.6	12.9 ± 0.5	13.1 ± 0.7
T4	13.4 ± 0.5	12.6 ± 0.6	13.1 ± 0.3	13.4 ± 0.2
T5	12.4 ± 0.4	12.3 ± 0.5	12.4 ± 0.7	13.1 ± 0.8
T6	11.3 ± 0.5	11.5 ± 0.5	11.2 ± 0.4	12.2 ± 0.7
T7	12.9 ± 0.6	12.1 ± 0.5	12.3 ± 0.6	13.4 ± 0.4
T8	11.0 ± 0.5	11.5 ± 0.5	11.4 ± 0.4	11.9 ± 0.4
T9	12.1 ± 0.6	12.1 ± 0.4	12.8 ± 0.8	13.4 ± 0.5
T10	12.1 ± 0.9	11.7 ± 0.4	12.0 ± 0.4	11.6 ± 0.5
T11	12.8 ± 0.5	12.1 ± 0.6	12.7 ± 0.6	12.7 ± 0.5
T12	12.4 ± 0.6	12.6 ± 0.3	13.0 ± 0.7	13.1 ± 0.7
T13	12.6 ± 0.3	13.0 ± 0.8	13.5 ± 0.4	13.0 ± 0.6
T14	12.7 ± 0.5	12.8 ± 0.4	13.6 ± 0.6	13.7 ± 0.6
T15	13.1 ± 0.6	14.5 ± 0.9	13.1 ± 0.7	13.6 ± 0.4
T16	12.8 ± 0.8	14.6 ± 0.6	12.6 ± 0.6	13.5 ± 0.6
T18	Note 2	13.5 ± 0.7	13.5 ± 0.7	14.6 ± 0.6
T19	Note 2	14.6 ± 0.6	14.4 ± 0.6	14.6 ± 0.5
T20	Note 2	15.0 ± 0.2	13.7 ± 0.6	13.9 ± 0.2
T21	Note 2	13.3 ± 0.4	13.6 ± 0.3	13.6 ± 0.6

Parameter	Calculated Parameters (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Average	12.6 ± 0.2	12.9 ± 0.1	13.0 ± 0.1	13.3 ± 0.1
Maximum	14.1 ± 0.8	15.0 ± 0.2	14.5 ± 0.6	14.6 ± 0.6

Notes:

1. These exposures are reported for a standardized period of 90 days.
2. Additional TLDs were added in the second quarter around the ISFSI.

TABLE C-3
OFFSITE ENVIRONMENTAL TLD STATIONS

Station Number	TLD Exposure Measurements (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1	12.4 ± 0.4	12.6 ± 0.5	12.3 ± 0.6	12.4 ± 0.4
2	14.0 ± 0.9	13.6 ± 0.7	13.7 ± 0.4	14.4 ± 0.6
14	11.1 ± 0.4	11.1 ± 0.4	11.0 ± 0.5	11.3 ± 0.6
25	12.4 ± 0.8	11.1 ± 0.2	11.3 ± 0.8	11.4 ± 0.6

Parameter	Calculated Parameters (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Average	12.5 ± 0.3	12.1 ± 0.2	12.1 ± 0.3	12.4 ± 0.3
Maximum	14.0 ± 0.9	13.6 ± 0.7	13.7 ± 0.4	14.4 ± 0.6

Note:

1. These exposures are reported for a standardized period of 90 days.

TABLE C-4
DISCHARGE CANAL SAMPLE RESULTS

Sample Date	Gamma Activity (pCi/l)		Tritium Activity (pCi/l)
	Cs-137	Co-60	
1/6/2010	<MDA	<MDA	<MDA
1/13/2010	<MDA	<MDA	<MDA
1/20/2010	<MDA	<MDA	<MDA
1/27/2010	<MDA	<MDA	<MDA
2/3/2010	<MDA	<MDA	<MDA
2/10/2010	<MDA	<MDA	<MDA
2/17/2010	<MDA	<MDA	<MDA
2/24/2010	<MDA	<MDA	<MDA
3/3/2010	<MDA	<MDA	<MDA
3/10/2010	<MDA	<MDA	<MDA
3/17/2010	<MDA	<MDA	<MDA
3/24/2010	<MDA	<MDA	<MDA
3/31/2010	<MDA	<MDA	<MDA
4/7/2010	<MDA	<MDA	<MDA
4/14/2010	<MDA	<MDA	<MDA
4/21/2010	<MDA	<MDA	<MDA
4/28/2010	<MDA	<MDA	<MDA
5/5/2010	<MDA	<MDA	<MDA
5/12/2010	<MDA	<MDA	<MDA
5/19/2010	<MDA	<MDA	<MDA
5/26/2010	<MDA	<MDA	<MDA
6/2/2010	<MDA	<MDA	<MDA
6/9/2010	<MDA	<MDA	<MDA
6/16/2010	<MDA	<MDA	<MDA
6/23/2010	<MDA	<MDA	<MDA
6/30/2010	<MDA	<MDA	<MDA
7/7/2010	<MDA	<MDA	<MDA
7/14/2010	<MDA	<MDA	<MDA
7/21/2010	<MDA	<MDA	<MDA
7/28/2010	<MDA	<MDA	<MDA
8/4/2010	<MDA	<MDA	<MDA
8/11/2010	<MDA	<MDA	<MDA
8/18/2010	<MDA	<MDA	<MDA
8/25/2010	<MDA	<MDA	<MDA
9/1/2010	<MDA	<MDA	<MDA
9/8/2010	<MDA	<MDA	<MDA
9/15/2010	<MDA	<MDA	<MDA
9/22/2010	<MDA	<MDA	<MDA
9/29/2010	<MDA	<MDA	<MDA

TABLE C-4 (CONTINUED)
DISCHARGE CANAL SAMPLE RESULTS

Sample Date	Gamma Activity (pCi/l)		Tritium Activity (pCi/l)
	Cs-137	Co-60	
10/6/2010	<MDA	<MDA	<MDA
10/13/2010	<MDA	<MDA	<MDA
10/20/2010	<MDA	<MDA	<MDA
10/27/2010	<MDA	<MDA	<MDA
11/3/2010	<MDA	<MDA	<MDA
11/10/2010	<MDA	<MDA	<MDA
11/17/2010	<MDA	<MDA	<MDA
11/24/2010	<MDA	<MDA	<MDA
12/1/2010	<MDA	<MDA	<MDA
12/8/2010	<MDA	<MDA	<MDA
12/15/2010	<MDA	<MDA	<MDA
12/22/2010	<MDA	<MDA	<MDA
12/29/2010	<MDA	<MDA	<MDA

Calculated Parameters	Gamma Activity (pCi/l)		Tritium Activity (pCi/l)
	Cs-137	Co-60	
Average	Note 4	Note 4	Note 4
Maximum	Note 4	Note 4	Note 4

Notes:

1. Gamma measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/l, respectively. The MDA for these analyses was at or below the LLD and are reported as "<MDA".

2. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.

3. Tritium analysis is performed on a measured aliquot of distilled sample. The reported values are net measurements above instrument background. The normal MDA for the analyses for tritium was less than 400 pCi/l. Results that are at or below the normal MDA are reported as "<MDA".

4. Results identified as "<MDA" are not included in the calculation of average and maximum values.

TABLE C-5
GROUNDWATER MONITORING WELL RESULTS

Monitor Well Number	Sample Date	Alpha Activity (pCi/l)	Beta Activity (pCi/l)	Gamma Activity (pCi/l)		Tritium Activity (pCi/l)
				Cs-137	Co-60	
MW-11	2/18/10	<4.23 (MDA)	<5.56 (MDA)	<5.01 (MDA)	<4.26 (MDA)	<211 (MDA)
MW-1	2/18/10	<4.77 (MDA)	<5.52 (MDA)	<5.57 (MDA)	<5.03 (MDA)	<211 (MDA)
MW-4	2/18/10	8.35 ± 3.75	13.2 ± 3.20	<3.53 (MDA)	<4.17 (MDA)	<211 (MDA)
MW-6	2/18/10	<3.19 (MDA)	<2.85 (MDA)	<6.84 (MDA)	<6.19 (MDA)	<242 (MDA)
MW-2	2/18/10	<3.34 (MDA)	7.64 ± 2.31	<5.07 (MDA)	<4.52 (MDA)	<212 (MDA)
MW-11	5/19/10	<8.67 (MDA)	<11.9 (MDA)	<4.64 (MDA)	<5.60 (MDA)	<127 (MDA)
MW-1	5/18/09	<8.27 (MDA)	<10.9 (MDA)	<5.88 (MDA)	<4.09 (MDA)	<335 (MDA)
MW-4	5/18/10	9.19 ± 3.13	12.6 ± 3.40	<5.23 (MDA)	<3.64 (MDA)	<125 (MDA)
MW-6	5/18/10	<1.49 (MDA)	<3.17 (MDA)	<3.96 (MDA)	<4.28 (MDA)	<338 (MDA)
MW-2	5/18/10	<1.28 (MDA)	3.85 ± 1.68	<5.04 (MDA)	<5.14 (MDA)	<129 (MDA)
MW-11	8/25/10	<6.67 (MDA)	<6.76 (MDA)	<4.36 (MDA)	<4.63 (MDA)	<317 (MDA)
MW-1	8/25/10	<5.67 (MDA)	<6.84 (MDA)	<3.47 (MDA)	<4.36 (MDA)	<319 (MDA)
MW-4	8/25/10	<3.12 (MDA)	6.41 ± 2.53	<3.97 (MDA)	<4.26 (MDA)	<318 (MDA)
MW-6	8/25/10	<1.95 (MDA)	<3.65 (MDA)	<7.74 (MDA)	<5.29 (MDA)	<318 (MDA)
MW-2	8/25/10	<2.96 (MDA)	<2.57 (MDA)	<3.73 (MDA)	<4.78 (MDA)	<363 (MDA)
MW-11	11/17/10	<4.04 (MDA)	<6.37 (MDA)	<2.19 (MDA)	<2.11 (MDA)	<272 (MDA)
MW-1	11/17/09	<4.10 (MDA)	<4.95 (MDA)	<2.26 (MDA)	<2.08 (MDA)	<273 (MDA)
MW-4	11/17/10	<3.22 (MDA)	3.92 ± 2.19	<2.14 (MDA)	<2.28 (MDA)	<272 (MDA)
MW-6	11/17/10	<2.97 (MDA)	<3.68 (MDA)	<2.35 (MDA)	<2.39 (MDA)	<272 (MDA)
MW-2	11/17/10	<2.95 (MDA)	<2.39 (MDA)	<2.52 (MDA)	<2.30 (MDA)	<271 (MDA)

TABLE C-5 (CONTINUED)
GROUNDWATER MONITORING WELL RESULTS

Calculated Parameters (By Monitor Well Number)	Alpha Activity (pCi/l)	Beta Activity (pCi/l)	Gamma Activity (pCi/l)		Tritium Activity (pCi/l)
			Cs-137	Co-60	
Average: MW-1	Note 4	Note 4	Note 4	Note 4	Note 4
Average: MW-2	Note 4	5.75 ± 1.43	Note 4	Note 4	Note 4
Average: MW-4	8.77 ± 2.44	9.03 ± 1.44	Note 4	Note 4	Note 4
Average: MW-6	Note 4	Note 4	Note 4	Note 4	Note 4
Average: MW-11	Note 4	Note 4	Note 4	Note 4	Note 4
Maximum: MW-1	Note 4	Note 4	Note 4	Note 4	Note 4
Maximum: MW-2	Note 4	7.64 ± 2.31	Note 4	Note 4	Note 4
Maximum: MW-4	9.19 ± 3.13	13.2 ± 3.20	Note 4	Note 4	Note 4
Maximum: MW-6	Note 4	Note 4	Note 4	Note 4	Note 4
Maximum: MW-11	Note 4	Note 4	Note 4	Note 4	Note 4

Notes:

1. Reported values are net measurements (above instrument background). The normal minimum detectable activities (MDAs) for the analyses for gross alpha, gross beta and tritium are approximately 4, 4 and 400 pCi/l, respectively. Results that are at or below the normal MDA are reported as "<MDA".

2. Gamma activity measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/l, respectively. The actual MDAs for these analyses were at or below the LLD.

3. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.

4. Results identified as "<" are not included in the calculation of average and maximum values.

TABLE C-6
CAISSON SUMP MONITORING RESULTS

Sample Date	Cs-137 Activity (pCi/L)	Co-60 Activity (pCi/L)	Tritium Activity (pCi/l)
01/14/10	60.1	<MDA	440 ± 227
02/17/10	91.9	<MDA	768 ± 236
03/17/10	31.4	<MDA	462 ± 197
04/16/10	118	<MDA	559 ± 151
05/13/10	79.5	<MDA	548 ± 201
06/10/10	9.17	<MDA	601 ± 225
07/12/10	111	<MDA	670 ± 280
08/11/10	172	<MDA	1140 ± 262
09/08/10	147	<MDA	770 ± 197
10/15/10	11.3	<MDA	762 ± 205
11/15/10	19.3	<MDA	961 ± 217
12/15/10	13.2	<MDA	538 ± 307

Notes:

1. Gamma measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/l, respectively. The MDA for these analyses was at or below the LLD and are reported as "<MDA".

2. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.

3. Tritium analysis is performed on a measured aliquot of distilled sample. The reported values are net measurements above instrument background. The normal MDA for the analyses for tritium was 400 pCi/l. Results that are at or below the normal MDA are reported as "<MDA".

TABLE C-7
FRENCH DRAIN MONITORING RESULTS

Sample Date	Cs-137 Activity (pCi/L)	Co-60 Activity (pCi/L)
1/14/2010	324	<MDA
2/17/2010	282	<MDA
3/17/2010	259	<MDA
4/16/2010	322	<MDA
5/13/2010	397	<MDA
6/10/2010	369	<MDA
7/12/2010	396	<MDA
8/11/2010	363	<MDA
9/08/2010	311	<MDA
10/15/2010	320	<MDA
11/2010	Note 3	Note 3
12/15/2010	236	<MDA

Notes:

1. Gamma measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/l, respectively. The MDA for these analyses was at or below the LLD and reported as "<MDA".
2. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.

3. Unable to obtain a sample in November.

TABLE C-8
ADDITIONAL GROUNDWATER MONITORING RESULTS

Monitor Well Number	Sample Date	Alpha Activity (pCi/l)	Beta Activity (pCi/l)	Gamma Activity (pCi/l)		Tritium Activity (pCi/l)
				Cs-137	Co-60	
5G-MW-03	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4
1C-MW-07	2/18/10	<2.70 (MDA)	<3.61 (MDA)	<4.32 (MDA)	<4.65 (MDA)	<242 (MDA)
1C-MW-08	2/18/10	<2.97 (MDA)	2.82 ± 1.88	<5.01 (MDA)	<5.41 (MDA)	<213 (MDA)
1E-MW-12	2/18/10	<7.93 (MDA)	<10.3 (MDA)	<5.28 (MDA)	<3.87 (MDA)	<242 (MDA)
1E-MW-13	2/18/10	<2.88 (MDA)	<2.99 (MDA)	<4.54 (MDA)	<5.12 (MDA)	<212 (MDA)
RCW-SFP-1	2/18/10	<3.16 (MDA)	<3.64 (MDA)	<4.48 (MDA)	<3.63 (MDA)	<242 (MDA)
RCW-SFP-2	2/18/10	4.77 ± 2.79	<3.45 (MDA)	<4.85 (MDA)	<4.68 (MDA)	<242 (MDA)
RCW-CS-1	2/18/10	29.7 ± 17.6	<23.4 (MDA)	<7.61 (MDA)	<5.43 (MDA)	<211 (MDA)
RCW-CS-2	2/18/10	<11.30 (MDA)	<12.3 (MDA)	<6.38 (MDA)	<6.99 (MDA)	<211 (MDA)
RCW-CS-3	2/18/10	<2.16 (MDA)	<3.83 (MDA)	<6.73 (MDA)	<6.36 (MDA)	<242 (MDA)
RCW-CS-4	2/18/10	<3.07 (MDA)	<2.88 (MDA)	<3.64 (MDA)	<4.82 (MDA)	<241 (MDA)
RCW-CS-5	2/18/10	<3.07 (MDA)	<2.81 (MDA)	<4.99 (MDA)	<5.37 (MDA)	<242 (MDA)
5G-MW-03	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4
1C-MW-07	5/19/10	<1.72 (MDA)	2.97 ± 1.08	<4.62 (MDA)	<5.25 (MDA)	<336 (MDA)
1C-MW-08	5/18/10	<3.20 (MDA)	2.87 ± 1.79	<4.22 (MDA)	<4.24 (MDA)	<337 (MDA)
1E-MW-12	5/19/10	<23.3 (MDA)	<21.4 (MDA)	<6.47 (MDA)	<4.91 (MDA)	<337 (MDA)
1E-MW-13	5/19/10	<3.89 (MDA)	2.98 ± 1.90	<4.83 (MDA)	<5.22 (MDA)	<330 (MDA)
RCW-SFP-1	5/18/10	<1.99 (MDA)	<3.13 (MDA)	<4.15 (MDA)	<5.16 (MDA)	<333 (MDA)
RCW-SFP-2	5/19/10	<3.12 (MDA)	<4.84 (MDA)	<5.61 (MDA)	<4.94 (MDA)	<282 (MDA)
RCW-CS-1	5/19/10	<48.0 (MDA)	<50.8 (MDA)	<4.85 (MDA)	<5.60 (MDA)	<332 (MDA)
RCW-CS-2	5/18/10	27.4 ± 16.4	31.4 ± 19.5	<7.87 (MDA)	<4.50 (MDA)	<127 (MDA)
RCW-CS-3	5/18/10	<2.03 (MDA)	<2.99 (MDA)	<5.69 (MDA)	<5.52 (MDA)	<326 (MDA)
RCW-CS-4	5/19/10	<6.12 (MDA)	5.19 ± 3.11	<5.29 (MDA)	<5.11 (MDA)	<337 (MDA)
RCW-CS-5	5/19/10	<1.73 (MDA)	<3.12 (MDA)	<4.15 (MDA)	<5.77 (MDA)	<333 (MDA)
5G-MW-03	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4
1C-MW-07	8/25/10	<2.92 (MDA)	7.32 ± 2.17	<6.22 (MDA)	<6.21 (MDA)	<317 (MDA)
1C-MW-08	8/25/10	<4.65 (MDA)	8.65 ± 3.22	<6.08 (MDA)	<5.23 (MDA)	<314 (MDA)
1E-MW-12	8/25/10	103 ± 27.5	86.0 ± 21.2	<3.99 (MDA)	<3.79 (MDA)	<312 (MDA)
1E-MW-13	8/25/10	<2.83 (MDA)	<2.28 (MDA)	<4.62 (MDA)	<5.36 (MDA)	<318 (MDA)
RCW-SFP-1	8/25/10	<2.91 (MDA)	<3.63 (MDA)	<3.79 (MDA)	<5.06 (MDA)	<321 (MDA)
RCW-SFP-2	8/25/10	<5.26 (MDA)	<6.97 (MDA)	<4.29 (MDA)	<3.08 (MDA)	<319 (MDA)
RCW-CS-1	8/25/10	<84.7 (MDA)	<122 (MDA)	<5.27 (MDA)	<3.66 (MDA)	<315 (MDA)
RCW-CS-2	8/25/10	<21.1 (MDA)	<18.7 (MDA)	<5.00 (MDA)	<4.96 (MDA)	<320 (MDA)
RCW-CS-3	8/25/10	<3.20 (MDA)	<2.92 (MDA)	<3.83 (MDA)	<3.93 (MDA)	<316 (MDA)
RCW-CS-4	8/25/10	<4.50 (MDA)	10.8 ± 2.46	<4.44 (MDA)	<5.50 (MDA)	<316 (MDA)
RCW-CS-5	8/25/10	<2.79 (MDA)	<2.54 (MDA)	<4.35 (MDA)	<5.04 (MDA)	<319 (MDA)
5G-MW-03	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4
1C-MW-07	11/17/10	<2.88 (MDA)	3.28 ± 2.13	<4.83 (MDA)	<4.62 (MDA)	<245 (MDA)
1C-MW-08	11/17/10	8.71 ± 3.22	11.5 ± 2.32	<6.74 (MDA)	<7.18 (MDA)	<271 (MDA)
1E-MW-12	11/17/10	<11.5 (MDA)	<10.9 (MDA)	<5.43 (MDA)	<4.27 (MDA)	<270 (MDA)

TABLE C-8 (CONTINUED)
ADDITIONAL GROUNDWATER MONITORING RESULTS

Monitor Well Number	Sample Date	Alpha Activity (pCi/l)	Beta Activity (pCi/l)	Gamma Activity (pCi/l)		Tritium Activity (pCi/l)
				Cs-137	Co-60	
1E-MW-13	11/17/10	<3.02 (MDA)	<5.31 (MDA)	<7.60 (MDA)	<5.33 (MDA)	<271 (MDA)
RCW-SFP-1	11/17/10	<1.46 (MDA)	<3.66 (MDA)	<4.55 (MDA)	<3.62 (MDA)	<265 (MDA)
RCW-SFP-2	11/17/10	<4.86 (MDA)	6.33 ± 3.62	<5.03 (MDA)	<3.92 (MDA)	<272 (MDA)
RCW-CS-1	11/17/10	<30.2 (MDA)	<32.5 (MDA)	<1.98 (MDA)	<2.37 (MDA)	<272 (MDA)
RCW-CS-2	11/17/10	<14.9 (MDA)	<29.2 (MDA)	<2.80 (MDA)	<2.82 (MDA)	<269 (MDA)
RCW-CS-3	11/17/10	<2.45 (MDA)	5.13 ± 2.57	<1.89 (MDA)	<1.79 (MDA)	<273 (MDA)
RCW-CS-4	11/17/10	<3.13 (MDA)	<3.06 (MDA)	<4.85 (MDA)	<5.86 (MDA)	<272 (MDA)
RCW-CS-5	11/17/10	<2.52 (MDA)	<3.48 (MDA)	<4.63 (MDA)	<5.30 (MDA)	<273 (MDA)

Notes:

1. Reported values are net measurements (above instrument background). The normal minimum detectable activities (MDAs) for the analyses for gross alpha, gross beta and tritium are approximately 4, 4 and 400 pCi/l, respectively. Results that are at or below the normal MDA are reported as "<MDA".

2. Gamma activity measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/l, respectively. The actual MDAs for these analyses were at or below the LLD.

3. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.

4. The technicians were unable to obtain a water sample from the well suitable for radiological analyses. At the time of sampling, the well did not provide a sample size large enough for analyses or the degree of sample turbidity was unacceptable.

FIGURE A-1
HBPP ONSITE TLD LOCATIONS

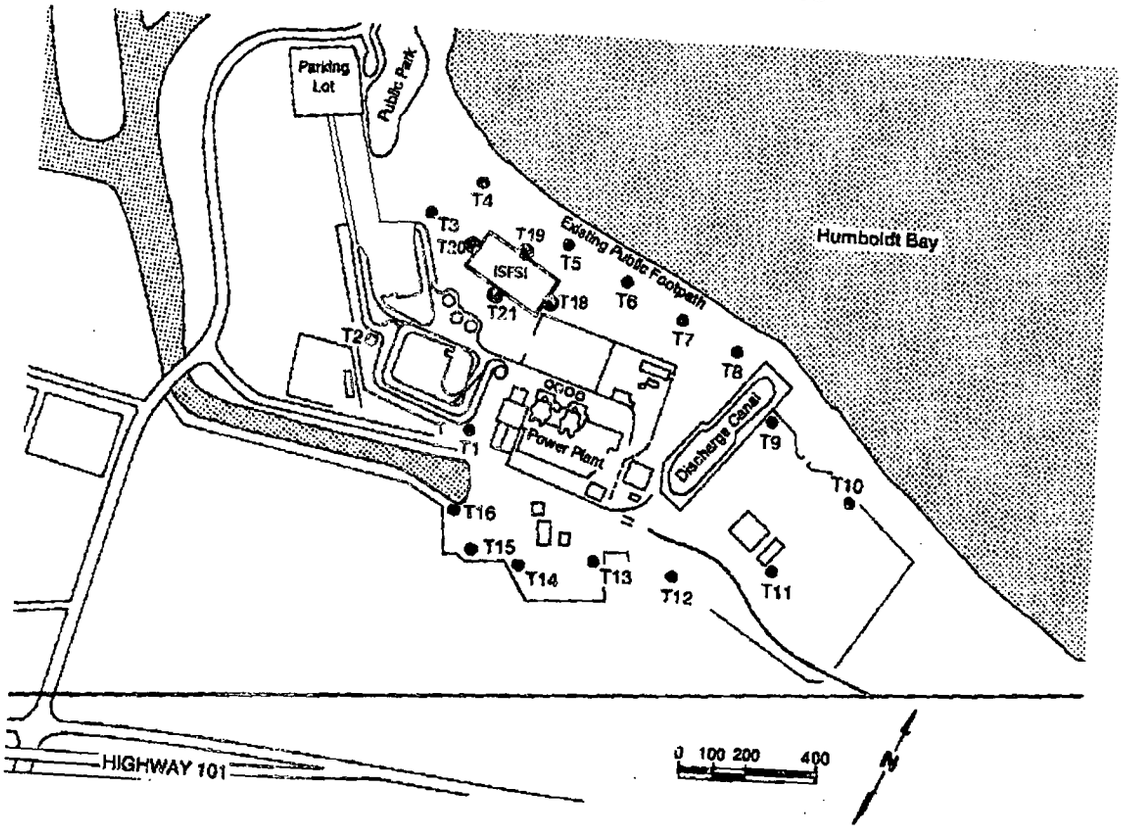


FIGURE A-2

HBPP ONSITE MONITORING WELL LOCATIONS

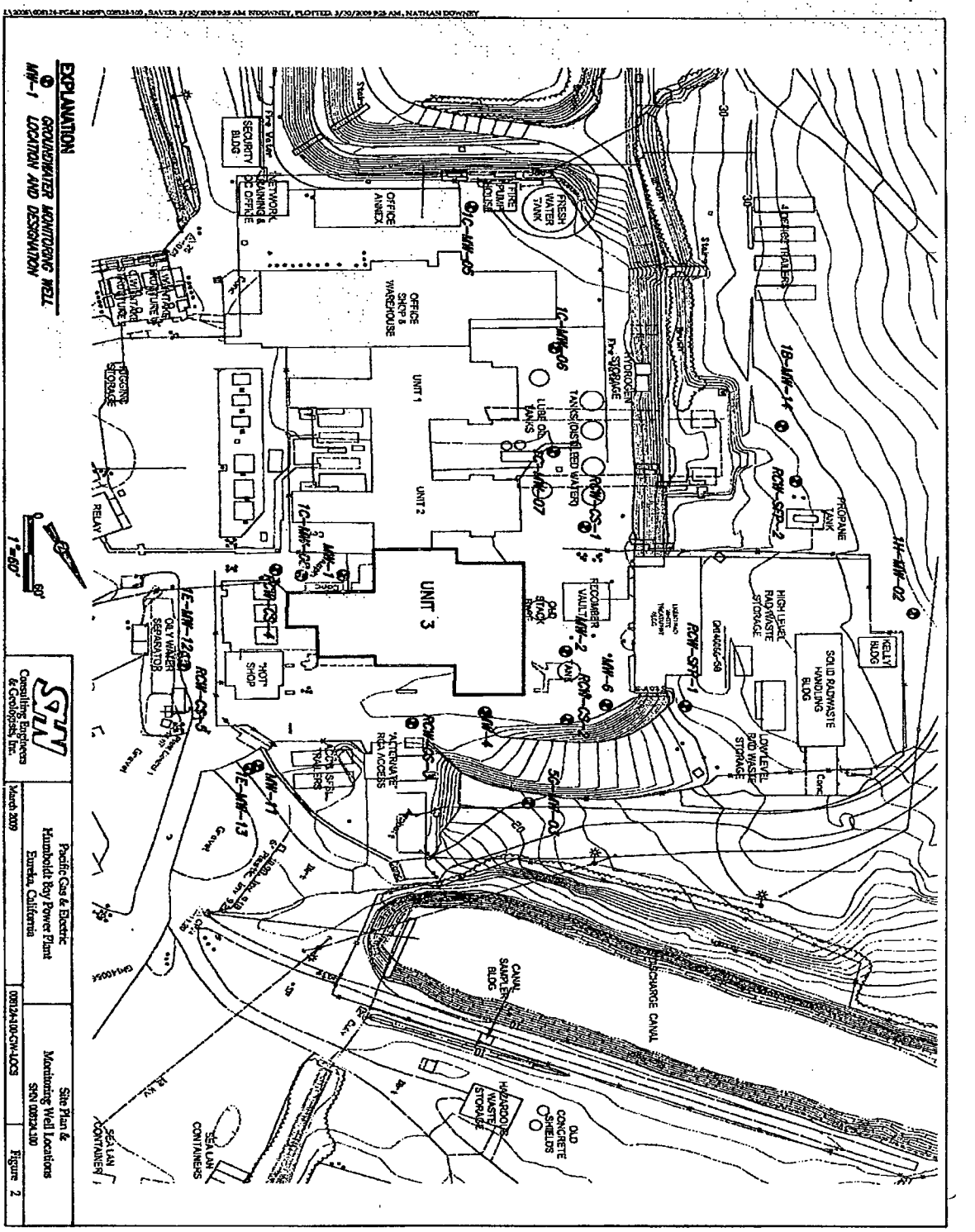


FIGURE A-3
HBPP OFFSITE TLD
LOCATIONS

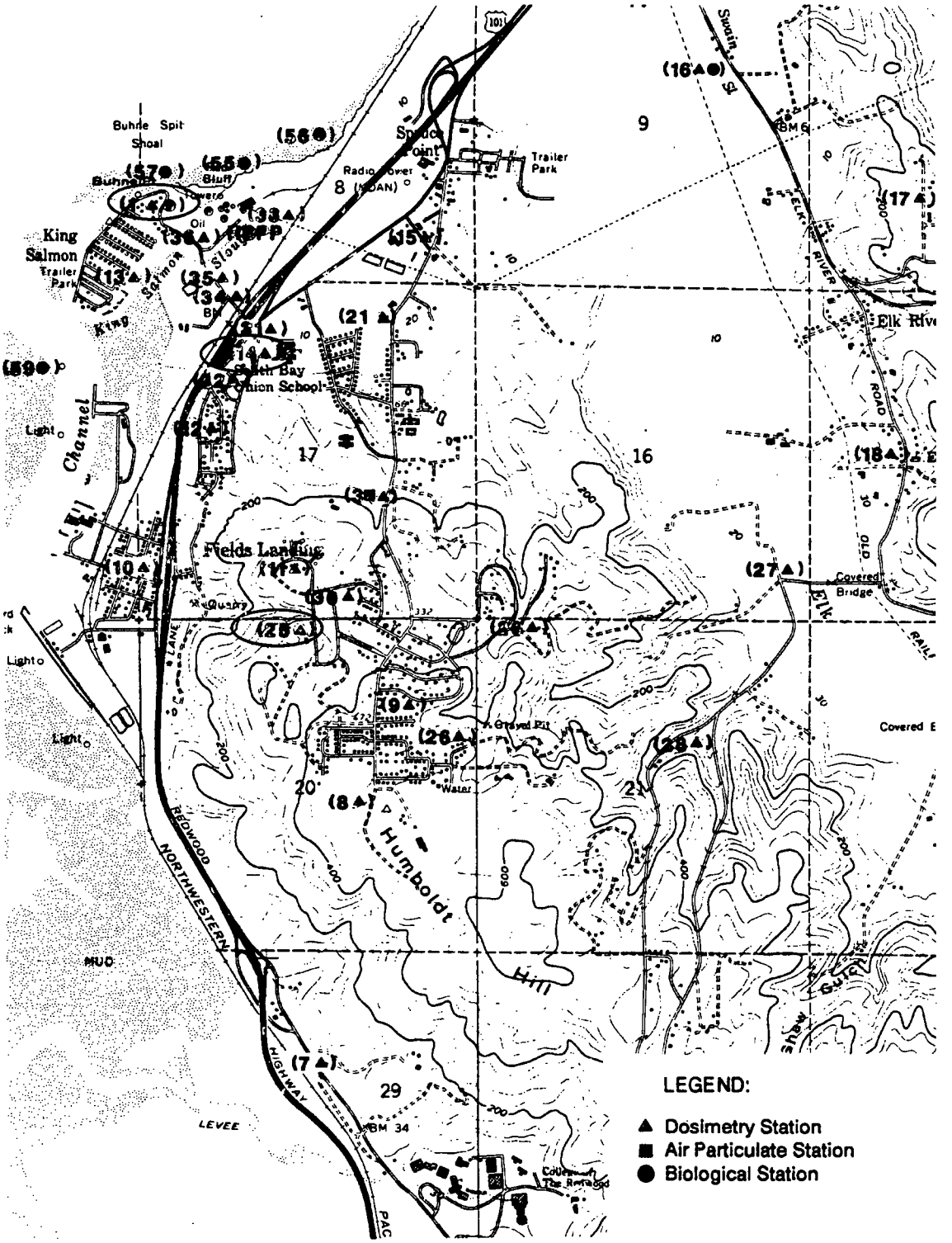


FIGURE A-3 (CONTINUED)
HBPP OFFSITE TLD LOCATIONS

Fortuna

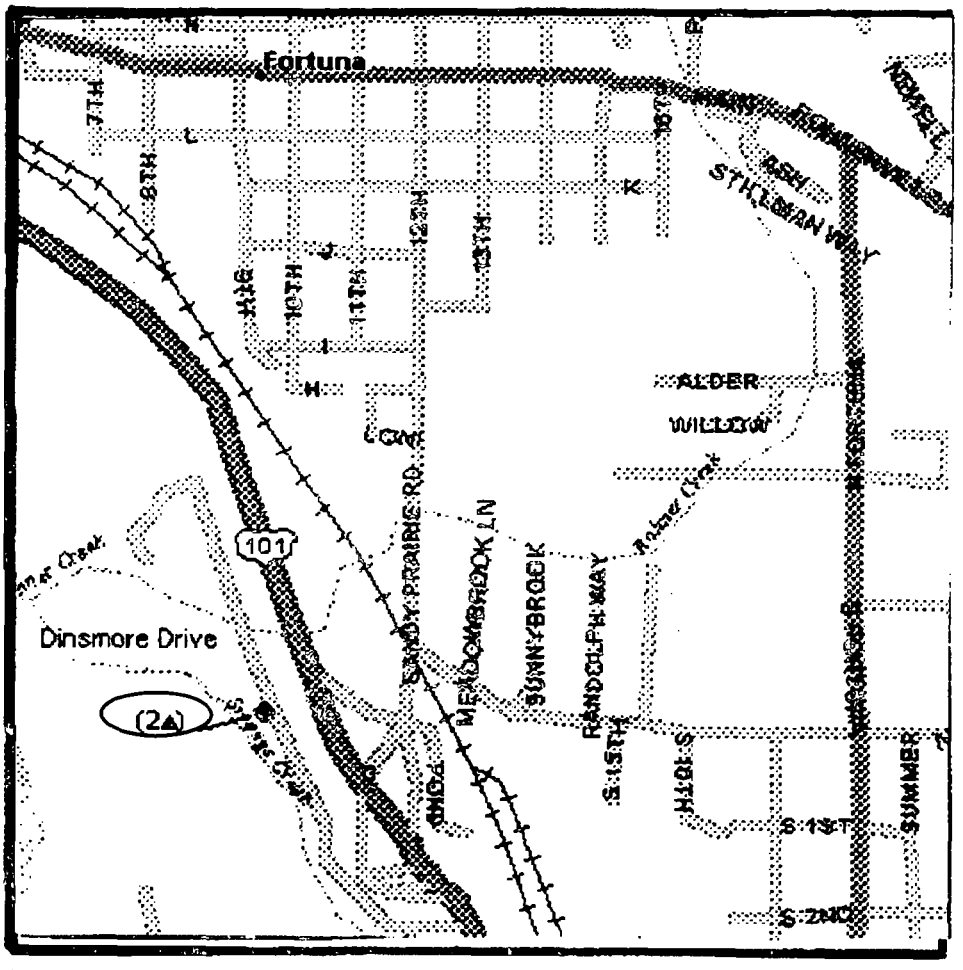
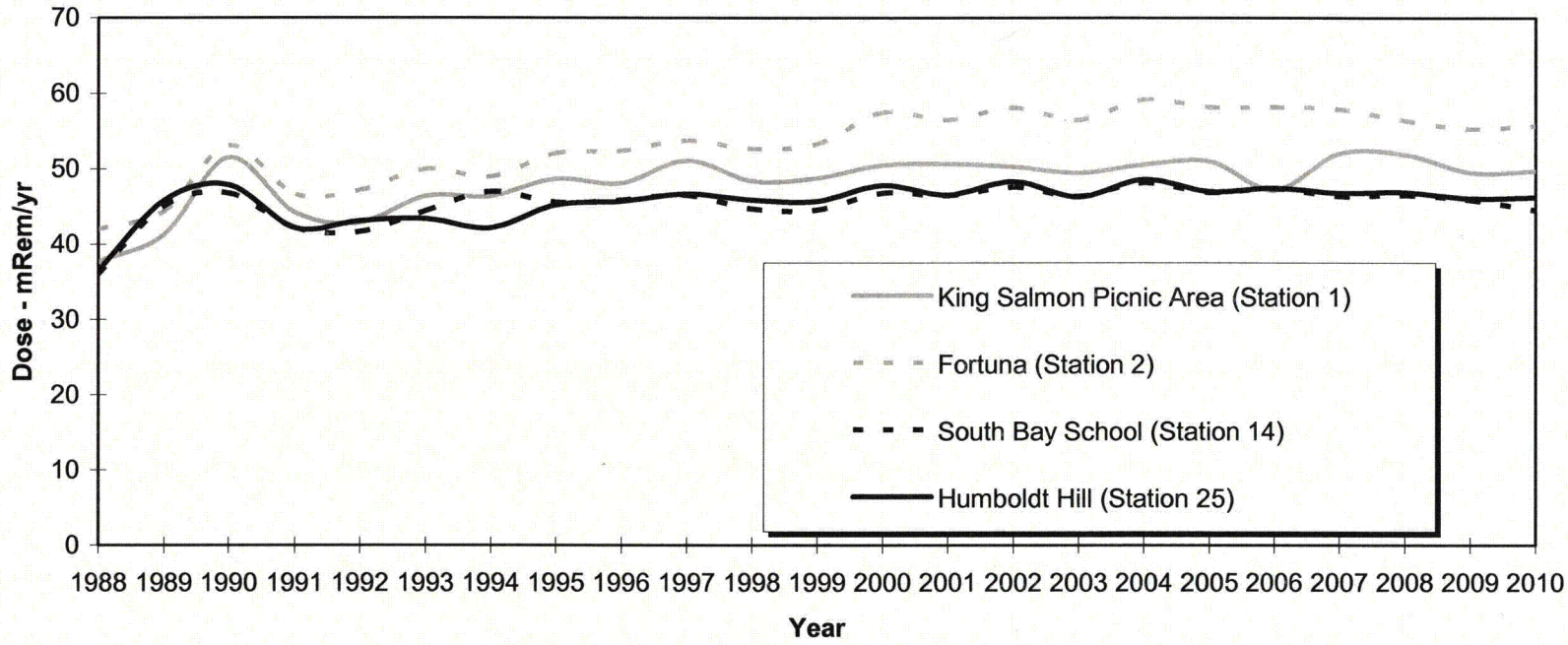
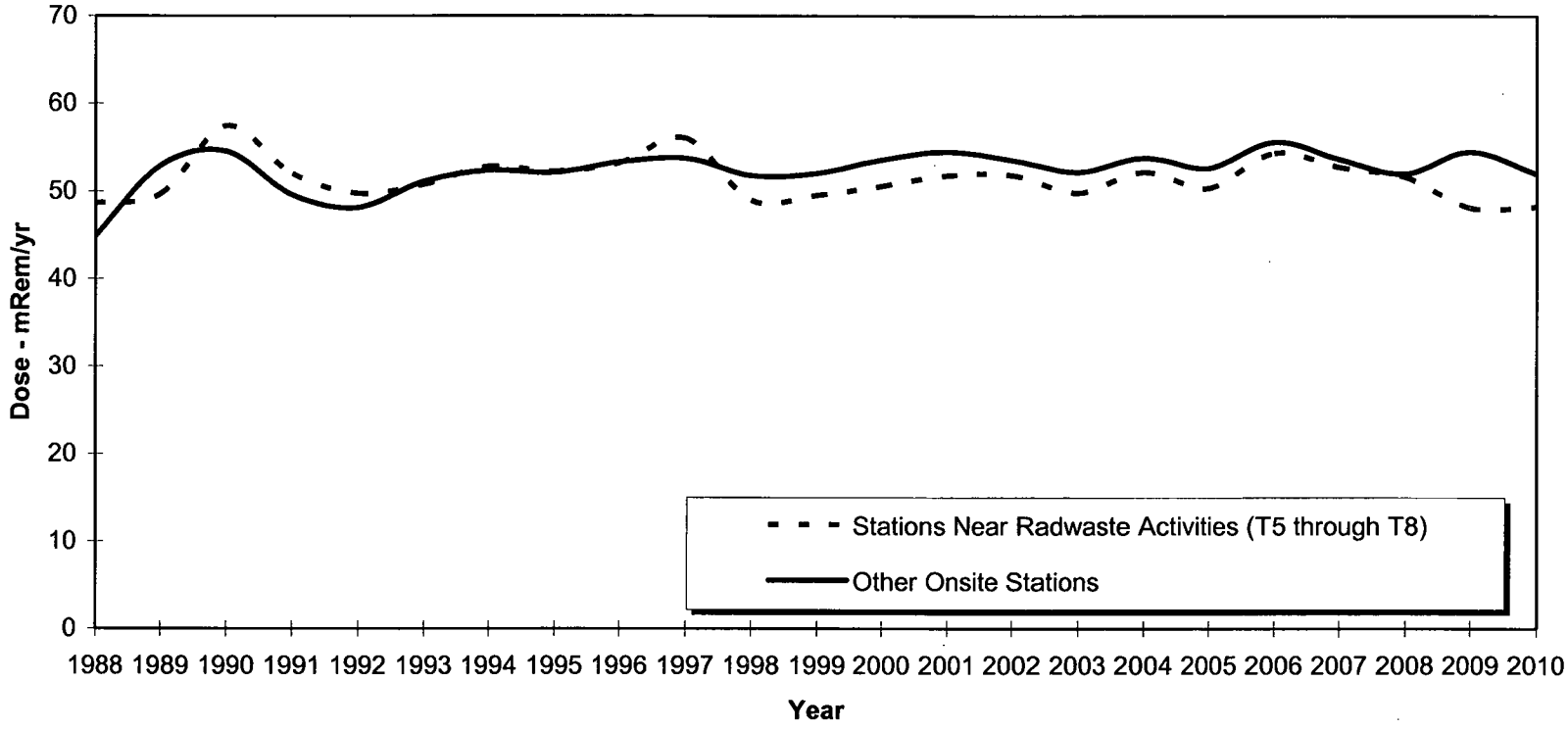


Figure B-1
Offsite Environmental Radiation Level Trends



The baseline values for each location were obtained by averaging the readings at each location from 1977 through 1983. These values, however, were obtained using ion chambers instead of TLDs. The average values from 1977 through 1983 were Station 1 – 83.0 mrem, Station 2 – 79.8 mrem, Station 14 – 80.2 mrem, and Station 25 – 73.7 mrem

Figure B-2
Onsite Environmental Radiation Level Trends



The baseline values for the two areas were obtained by averaging the readings for each area from 1977 through 1983. These values, however, were obtained using ion chambers instead of TLDs. The average value from 1977 through 1983 for the stations near the Radwaste Activities was 78.6 mrem and the average for Other Onsite stations was 79.4 mrem.