**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 30, 2009

PG&E Letter HBL-09-007

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 2008

Dear Commissioners and Staff:

Enclosed is the Humboldt Bay Power Plant Unit 3 "Annual Radiological Environmental Monitoring Report" for 2008. This report provides the information required by Section 3.7.2 of the SAFSTOR Quality Assurance Plan and by Section 4.1 of the SAFSTOR 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.

NMSS01
IE25

If you wish to discuss the information in the enclosed report, please contact Joe Davis at (707) 444-0851, or David Sokolsky at (707) 444-0801.

Sincerely,

Paul J. Roller
*Director and Plant Manager Humboldt Bay Nuclear*

cc/enc: Elmo E. Collins, Jr.
John B. Hickman
PG Fossil Gen HBPP Humboldt Distribution

Enclosure

Enclosure
PG&E Letter HBL-09-007

# HUMBOLDT BAY POWER PLANT UNIT 3
# ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

## JANUARY 1 THROUGH DECEMBER 31, 2008

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# PACIFIC GAS AND ELECTRIC COMPANY
# ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT FOR HUMBOLDT BAY POWER PLANT UNIT 3, COVERING THE PERIOD JANUARY 1 THROUGH DECEMBER 31, 2008

This annual report is required by Section 3.7.2 of the Humboldt Bay Power Plant (HBPP) SAFSTOR Quality Assurance Plan, 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, 2008, 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 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 General Engineering Labs (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 Environmental Monitoring Stations; Figure A-1, HBPP Onsite TLD Locations; Figure A-2, HBPP Onsite Monitoring Well Locations; and Figure A-3, HBPP Offsite TLD 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, shown on Figure A-3. 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.

Each quarter the exposures from 16 stations are determined, which results in the 64 analyses for the 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 Defueled Safety Analysis Report (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 Laboratories, 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 17 samples for 95 parameters during 2008. All results except six met the acceptance criteria; five were gamma emitters and one was Ni-63.

The root cause of the Gamma Emitter (Ba-133, Cs-134, Cs-137, Co-60, Zn-65) failures were attributed to an incorrect dilution. The samples are received as concentrates and must be diluted prior to preparation. Per the instruction the samples should have been diluted to a final volume of 2 liters but was diluted to 4 liters instead. All instructions are now scanned by the Quality Assurance Officer and emailed to the laboratory Group Leader when the samples are logged. The instructions are also stored in a location accessible to all laboratory personnel.

Two further Gamma Emitter samples were analyzed in November 2008 and both were acceptable.

The Ni-63 failure was attributed to an unusually low gravimetric yield.

No adverse trends in quality were noted in the crosscheck program results.

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.

Seven additional ground water monitoring wells were installed in 2008 to further characterize any groundwater issues. The results of the analyses for these wells are included in Table C-8.

## 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 (other than normal radioactive decay) 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.

With the exception of the direct radiation pathway (discussed below), there were no measurement results that could be directly compared to calculated doses to individuals.

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 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 completed in 2008, and the spent fuel was relocated from the Spent Fuel Pool to the ISFSI. 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 fenceline.

Based on the 2080 hour occupancy factor, the dose at the fenceline results in 0.17 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 flow of water circulating through 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 circulating water volume is rarely lower than 1.6E8 gallons, so the diluted activity for Tritium, Cs-137 and Co-60 would be 1.3, 0.044, and

0.0044, pico-Curies/liter, respectively. These concentrations are unlikely to be detected.

b. Groundwater

None of the ODCM required REMP samples indicated detectable levels of Tritium or gamma radioactivity. For gamma radioactivity, these sample results were typical of those observed since entering SAFSTOR. Tritium, which had previously been detected in wells MW-1 and MW-11, has decayed to a level that is rarely likely to be detected, and also as a result of removing the suspected source of the contamination in MW-11. Results for other parameters and samples were comparable to the ranges observed since entering SAFSTOR.

- This report also contains information on gamma and Sr-90 concentrations in the caisson sump and Spent Fuel Pool (SFP) French drain. The caisson sump and French drain Sr-90 results are significantly above background. The caisson sump Cs-137 concentration is near background. The French drain Cs-137 concentration is significantly greater than background.

Both of these sample points are believed to be the 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.

Seven additional ground water monitoring wells were installed in 2008 to further characterize any ground water issues.

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 airborne exposure 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.

None of the REMP analysis minimum detectable activities (MDAs) exceeded the lower limit of detection (LLD) criteria for radioactivity in environmental samples specified in HBPP ODCM Table 2-9.

2. Direct Radiation Pathway

Monitoring of the direct radiation pathway is performed at 16 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.

The Fourth Quarter TLD from location T-13 was lost and not analyzed. All other required sampling and analysis for direct radiation pathways were performed successfully during this reporting period.

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. One canal effluent sample result was above the MDA for Tritium. The MDA achieved by the laboratory was significantly lower than normal. The reported concentration of 155 pCi/l is equivalent to normal background levels of Tritium. None of the other REMP samples indicated detectable levels of Tritium or gamma radioactivity. 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.

Two of the samples for Tritium indicated detectable Tritium above the MDA. The MDA achieved by the laboratory was lower than normal and the uncertainty was approximately 50%. The reported concentrations of approximately 300 +/- 150 pCi/l are within the range of normal background levels of Tritium. None of the other REMP samples indicated detectable levels of 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 2008 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 2008 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 2008.
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** | 16 onsite stations with TLDs | TLDs exchanged quarterly | Gamma exposure |
| | 4 offsite stations with TLDs | TLDs exchanged quarterly | Gamma exposure |
| **WATERBORNE**<br>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 OFFSITE ENVIRONMENTAL MONITORING STATIONS

| 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 | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Gamma | I-131 | March | 7.73E+01 | 7.04E+01 | Agreement |
| | Ce-141 | March | 1.91E+02 | 1.98E+02 | Agreement |
| | Cr-51 | March | 2.79E+02 | 2.86E+02 | Agreement |
| | Cs-134 | March | 9.61E+01 | 9.97E+01 | Agreement |
| | Cs-137 | March | 1.15E+02 | 1.16E+02 | Agreement |
| | Co-58 | March | 5.89E+01 | 5.64E+01 | Agreement |
| | Mn-54 | March | 8.04E+01 | 7.50E+01 | Agreement |
| | Fe-59 | March | 8.61E+01 | 8.14E+01 | Agreement |
| | Zn-65 | March | 1.11E+02 | 1.09E+02 | Agreement |
| | Co-60 | March | 1.95E+02 | 1.88E+02 | Agreement |
| | | | | | |
| Water/Gamma | I-131 | June | 4.09E+01 | 4.53E+01 | Agreement |
| | Ce-141 | June | 2.22E+02 | 2.37E+02 | Agreement |
| | Cr-51 | June | 2.12E+02 | 1.88E+02 | Agreement |
| | Cs-134 | June | 1.00E+02 | 1.04E+02 | Agreement |
| | Cs-137 | June | 1.69E+02 | 1.58E+02 | Agreement |
| | Co-58 | June | 8.56E+01 | 8.42E+01 | Agreement |
| | Mn-54 | June | 1.93E+02 | 1.84E+02 | Agreement |
| | Fe-59 | June | 1.29E+02 | 1.25E+02 | Agreement |
| | Zn-65 | June | 1.94E+02 | 1.72E+02 | Agreement |
| | Co-60 | June | 1.55E+02 | 1.42E+02 | Agreement |
| | | | | | |
| Water/Gamma | I-131 | October | 1.15E+02 | 1.05E+02 | Agreement |
| | Ce-141 | October | 1.14E+02 | 1.07E+02 | Agreement |
| | Cr-51 | October | 3.17E+02 | 2.79E+02 | Agreement |
| | Cs-134 | October | 1.47E+01 | 1.54E+01 | Agreement |
| | Cs-137 | October | 1.16E+02 | 1.07E+02 | Agreement |
| | Co-58 | October | 1.19E+02 | 1.18E+02 | Agreement |
| | Mn-54 | October | 1.26E+02 | 1.10E+02 | Agreement |
| | Fe-59 | October | 1.09E+02 | 9.56E+01 | Agreement |
| | Zn-65 | October | 2.28E+02 | 2.11E+02 | Agreement |
| | Co-60 | October | 1.55E+02 | 1.55E+02 | Agreement |

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

| *Sample/Analysis* | *Radionuclide* | *Month* | *GEL* | *Ref Value* | *Evaluation* |
|---|---|---|---|---|---|
| Water/Gamma | I-131 | December | 6.37E+01 | 6.41E+01 | Agreement |
| | Ce-141 | December | 2.24E+02 | 2.24E+02 | Agreement |
| | Cr-51 | December | 2.78E+02 | 2.88E+02 | Agreement |
| | Cs-134 | December | 1.59E+02 | 1.57E+02 | Agreement |
| | Cs-137 | December | 1.48E+02 | 1.40E+02 | Agreement |
| | Co-58 | December | 1.26E+02 | 1.22E+02 | Agreement |
| | Mn-54 | December | 1.92E+02 | 1.78E+02 | Agreement |
| | Fe-59 | December | 1.28E+02 | 1.17E+02 | Agreement |
| | Zn-65 | December | 2.38E+02 | 2.14E+02 | Agreement |
| | Co-60 | December | 1.68E+02 | 1.56E+02 | Agreement |

| **Sample/Analysis** | **Radionuclide** | **Month** | **GEL** | **Ref Value** | **Evaluation** |
|---|---|---|---|---|---|
| Water/Gamma | Barium-133 | May | 17.2 | 58.3 | Fail |
| | Cs-134 | May | 11.2 | 46.6 | Fail |
| | Cs-137 | May | 24.8 | 102 | Fail |
| | Co-60 | May | 20.6 | 76.6 | Fail |
| | Zn-65 | May | 31.8 | 106 | Fail |

| **Sample/Analysis** | **Radionuclide** | **Month** | **GEL** | **Ref Value** | **Evaluation** |
|---|---|---|---|---|---|
| Water/Gamma | Barium-133 | November | 60.7 | 63.5 | Pass |
| | Cs-134 | November | 28.1 | 25.6 | Pass |
| | Cs-137 | November | 31.5 | 25.6 | Pass |
| | Co-60 | November | 46.7 | 49.1 | Pass |
| | Zn-65 | November | 77.2 | 68.6 | Pass |

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

| Sample/Analysis | Radionuclide | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Gamma | Barium-133 | November | 72.6 | 73.1 | Pass |
| | Cs-134 | November | 72.8 | 64.9 | Pass |
| | Cs-137 | November | 184.0 | 176 | Pass |
| | Co-60 | November | 87.3 | 84.4 | Pass |
| | Zn-65 | November | 354.0 | 327 | Pass |

| Sample/Analysis | Radionuclide | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Various | Am-241 | March | 1.27 | 1.23 | Pass |
| | Cs-134 | March | 0.108 | 0 | Pass |
| | Cs-137 | March | 0.0648 | 0 | Pass |
| | Co-57 | March | 23.2 | 22.8 | Pass |
| | Co-60 | March | 8.41 | 8.40 | Pass |
| | Mn-54 | March | 483 | 472 | Pass |
| | Zn-65 | March | 17.4 | 16.3 | Pass |
| | Fe-55 | March | 46.9 | 36.5 | Pass |
| | Ni-63 | March | 40.3 | 30.7 | Fail |
| | Sr-90 | March | 12.0 | 11.4 | Pass |

| Sample/Analysis | Radionuclide | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Various | Am-241 | October | -0.0003 | 0 | Pass |
| | Cs-134 | October | 18.9 | 19.5 | Pass |
| | Cs-137 | October | 23.0 | 23.6 | Pass |
| | Co-57 | October | 0.01 | 0 | Pass |
| | Co-60 | October | 11.4 | 11.7 | Pass |
| | Mn-54 | October | 13.4 | 13.7 | Pass |
| | Zn-65 | October | 17.0 | 17.1 | Pass |
| | Fe-55 | October | 44.8 | 46.2 | Pass |
| | Ni-63 | October | -0.2 | 0 | Pass |
| | Sr-90 | October | 6.40 | 6.45 | Pass |

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

| Sample/Analysis | Radionuclide | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Various | Am-241 | May | 95 | 90.9 | Pass |
| | Cs-134 | May | 693 | 751.0 | Pass |
| | Cs-137 | May | 1970 | 1990 | Pass |
| | Co-60 | May | 1480 | 1420 | Pass |
| | Mn-54 | May | <9.32 | 0 | Pass |
| | Zn-65 | May | 800 | 694 | Pass |
| | Sr-90 | May | 517 | 512 | Pass |

| Sample/Analysis | Radionuclide | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Various | Am-241 | November | 174 | 161 | Pass |
| | Cs-134 | November | 1250 | 1240.0 | Pass |
| | Cs-137 | November | 1270 | 1270 | Pass |
| | Co-60 | November | 1160 | 1130 | Pass |
| | Mn-54 | November | <9.12 | 0 | Pass |
| | Zn-65 | November | 1070 | 987 | Pass |
| | Sr-90 | November | 678 | 655 | Pass |

| Sample/Analysis | Radionuclide | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Various | Tritium | May | 12500 | 12000 | Pass |
| | Tritium | June | 25800 | 25800 | Pass |
| | Tritium | November | 2100 | 2220 | Pass |
| | Tritium | November | 27600 | 28800 | Pass |

| Sample/Analysis | Radionuclide | Month | GEL | Ref Value | Evaluation |
|---|---|---|---|---|---|
| Water/Various | Sr-90 | May | 30.7 | 39.2 | Pass |
| | Sr-90 | November | 32.2 | 33.6 | Pass |

## 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, 2008

| Medium or Pathway Sampled [Unit of Measurement] | Type and Total Number of Analyses Performed | Lower Limit of Detection[a] (LLD) | All Indicator Locations | Location with Highest Annual Mean | | Control Locations | Number of Nonroutine Reported Measurements |
|---|---|---|---|---|---|---|---|
| | | | Mean, (Fraction) & [Range][b] | Name, Distance and Direction | Mean, (Fraction) & [Range][b] | Mean, (Fraction) & [Range][b] | |
| AIRBORNE<br>Radioiodine and Particulates | Not Required | N/A | N/A | N/A | N/A | Not Required | N/A |
| DIRECT RADIATION<br>[mR/quarter] | Direct radiation (63) | 3 | 13.2 ± 0.2<br>(63/64)<br>[9.6 – 14.4] | Station T1, Figure B-1 | 14.4 ± 0.2<br>(4/4)<br>[9.6– 14.4] | 12.6 ± 0.3<br>(16/16)<br>[11.6– 14.1] | 0 |
| WATERBORNE<br>Surface Water (Discharge canal effluent)<br>[pCi/l] | Gamma isotopic (52) | Co-60: 15<br>Cs-137: 18 | <MDA<br>(0/52)<br>[N/A] | N/A | N/A | Not Required | 0 |
| | Tritium (52) | ODCM: 3000<br>Plant Policy: 400 | <MDA<br>(0/52)<br>[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 | Location with Highest Annual Mean | | Control Locations | | Number of Nonroutine Reported Measurements |
|---|---|---|---|---|---|---|---|---|
| | | | Mean, (Fraction) & [Range][b] | Name, Distance and Direction | Mean, (Fraction) & [Range][b] | Mean, (Fraction) & [Range][b] | | |
| WATERBORNE (continued) | | | Co-60 Cs-137 | Co-60 Cs-137 | Co-60 Cs-137 | Co-60 Cs-137 | | |
| Groundwater (Monitoring wells) [pCi/l] | Gamma isotopic (20) | Co-60: 15 Cs-137: 18 | <MDA <MDA (0/20) (0/20) [N/A] [N/A] | N/A N/A | <MDA <MDA (0/4) (0/4) [N/A] [N/A] | <MDA <MDA (0/4) (0/4) [N/A] [N/A] | | 0 |
| | Tritium (20) | ODCM:2000 Plant Policy: 400 | 353 (1/20) [353] | MW-1 | 353 (1/4) [N/A] | 306 (1/4) [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 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 | 14.3 ± 0.3 | 14.0 ± 0.5 | 14.2 ± 0.4 | 14.9 ± 0.6 |
| T2 | 12.9 ± 0.3 | 12.5 ± 0.5 | 13.8 ± 0.2 | 13.4 ± 0.3 |
| T3 | 12.5 ± 0.2 | 11.6 ± 0.4 | 13.2 ± 1.0 | 13.0 ± 0.5 |
| T4 | 12.6 ± 0.3 | 12.3 ± 0.2 | 13.2 ± 0.4 | 12.8 ± 0.2 |
| T5 | 13.0 ± 0.4 | 12.4 ± 0.4 | 13.4 ± 0.4 | 13.3 ± 0.2 |
| T6 | 12.3 ± 0.3 | 12.1 ± 0.5 | 12.9 ± 0.4 | 13.0 ± 0.4 |
| T7 | 12.5 ± 0.4 | 11.8 ± 0.4 | 13.4 ± 0.4 | 15.1 ± 0.4 |
| T8 | 12.5 ± 0.3 | 12.4 ± 0.4 | 13.0 ± 0.3 | 13.3 ± 0.4 |
| T9 | 12.9 ± 0.3 | 12.3 ± 0.2 | 13.3 ± 0.5 | 13.4 ± 0.5 |
| T10 | 11.9 ± 0.3 | 11.7 ± 0.2 | 12.4 ± 0.4 | 12.7 ± 0.3 |
| T11 | 12.7 ± 0.4 | 12.4 ± 0.3 | 13.0 ± 0.3 | 13.7 ± 0.2 |
| T12 | 13.8 ± 0.3 | 13.3 ± 0.3 | 14.0 ± 0.3 | 15.1 ± 0.6 |
| T13 | 12.3 ± 0.5 | 12.2 ± 0.2 | 13.9 ± 0.6 | 0.0 ± 0.0 |
| T14 | 13.9 ± 0.4 | 13.9 ± 0.3 | 14.4 ± 0.4 | 14.4 ± 0.2 |
| T15 | 13.3 ± 0.4 | 12.5 ± 0.4 | 14.3 ± 0.3 | 13.9 ± 0.4 |
| T16 | 13.5 ± 0.5 | 13.5 ± 0.5 | 14.5 ± 0.3 | 13.7 ± 0.2 |

| Parameter | Calculated Parameters (mR) | | | |
|---|---|---|---|---|
| | First Quarter | Second Quarter | Third Quarter | Fourth Quarter |
| Average | 12.9 ± 0.1 | 12.6 ± 0.1 | 13.6 ± 0.1 | 13.7 ± 0.1 |
| Maximum | 14.3 ± 0.5 | 14.0 ± 0.5 | 14.5 ± 0.5 | 15.1 ± 0.4 |

Notes:

1. These exposures are reported for a standardized period of 90 days.
2. The Fourth Quarter TLD for location T13 was lost.

## TABLE C-3
## OFFSITE ENVIRONMENTAL TLD STATIONS

| Station Number | TLD Exposure Measurements (mR) | | | |
|---|---|---|---|---|
| | First Quarter | Second Quarter | Third Quarter | Fourth Quarter |
| 1 | 13.1 ± 0.2 | 12.9 ± 0.4 | 13.0 ± 0.5 | 12.9 ± 0.4 |
| 2 | 13.9 ± 0.5 | 13.6 ± 0.5 | 14.0 ± 0.2 | 14.9 ± 0.4 |
| 14 | 11.5 ± 0.2 | 11.3 ± 0.4 | 11.5 ± 0.3 | 12.2 ± 0.3 |
| 25 | 11.7 ± 0.2 | 11.4 ± 0.5 | 11.6 ± 0.3 | 12.2 ± 0.3 |

| Parameter | Calculated Parameters (mR) | | | |
|---|---|---|---|---|
| | First Quarter | Second Quarter | Third Quarter | Fourth Quarter |
| Average | 12.6 ± 0.2 | 12.3 ± 0.2 | 12.5 ± 0.2 | 13.1 ± 0.2 |
| Maximum | 13.9 ± 0.5 | 13.6 ± 1.0 | 14.0 ± 0.4 | 14.9 ± 0.4 |

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 | |
| 1/2/2008 | <MDA | <MDA | <MDA |
| 1/9/2008 | <MDA | <MDA | <MDA |
| 1/16/2008 | <MDA | <MDA | <MDA |
| 1/23/2008 | <MDA | <MDA | <MDA |
| 1/30/2008 | <MDA | <MDA | <MDA |
| 2/6/2008 | <MDA | <MDA | <MDA |
| 2/13/2008 | <MDA | <MDA | <MDA |
| 2/20/2008 | <MDA | <MDA | <MDA |
| 2/27/2008 | <MDA | <MDA | <MDA |
| 3/6/2008 | <MDA | <MDA | <MDA |
| 3/12/2008 | <MDA | <MDA | <MDA |
| 3/19/2008 | <MDA | <MDA | <MDA |
| 3/26/2008 | <MDA | <MDA | <MDA |
| 4/2/2008 | <MDA | <MDA | <MDA |
| 4/9/2008 | <MDA | <MDA | <MDA |
| 4/16/2008 | <MDA | <MDA | <MDA |
| 4/23/2008 | <MDA | <MDA | <MDA |
| 4/30/2008 | <MDA | <MDA | <MDA |
| 5/7/2008 | <MDA | <MDA | <MDA |
| 5/14/2008 | <MDA | <MDA | <MDA |
| 5/21/2008 | <MDA | <MDA | <MDA |
| 5/28/2008 | <MDA | <MDA | <MDA |
| 6/4/2008 | <MDA | <MDA | <MDA |
| 6/11/2008 | <MDA | <MDA | <MDA |
| 6/18/2008 | <MDA | <MDA | <MDA |
| 6/25/2008 | <MDA | <MDA | <MDA |
| 7/2/2008 | <MDA | <MDA | <MDA |
| 7/9/2008 | <MDA | <MDA | <MDA |
| 7/16/2008 | <MDA | <MDA | <MDA |
| 7/23/2008 | <MDA | <MDA | <MDA |
| 7/30/2008 | <MDA | <MDA | <MDA |
| 8/6/2008 | <MDA | <MDA | <MDA |
| 8/13/2008 | <MDA | <MDA | <MDA |
| 8/20/2008 | <MDA | <MDA | <MDA |
| 8/27/2008 | <MDA | <MDA | <MDA |
| 9/3/2008 | <MDA | <MDA | <MDA |
| 9/10/2008 | <MDA | <MDA | <MDA |
| 9/17/2008 | <MDA | <MDA | <MDA |
| 9/24/2008 | <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 | |
| 10/1/2008 | <MDA | <MDA | <MDA |
| 10/8/2008 | <MDA | <MDA | <MDA |
| 10/15/2008 | <MDA | <MDA | <MDA |
| 10/22/2008 | <MDA | <MDA | <MDA |
| 10/29/2008 | <MDA | <MDA | <MDA |
| 11/5/2008 | <MDA | <MDA | <MDA |
| 11/12/2008 | <MDA | <MDA | <MDA |
| 11/19/2008 | <MDA | <MDA | <MDA |
| 11/26/2008 | <MDA | <MDA | <MDA |
| 12/3/2008 | <MDA | <MDA | <MDA |
| 12/10/2008 | <MDA | <MDA | <MDA |
| 12/17/2008 | <MDA | <MDA | <MDA |
| 12/24/2008 | <MDA | <MDA | <MDA |
| 12/31/2008 | <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 | 2/04/08 | <2.03 (MDA) | 2.87 ± 1.11 | <4.28 (MDA) | <2.59 (MDA) | <301 (MDA) |
| MW-1 | 2/04/08 | <4.28 (MDA) | <4.18 (MDA) | <5.25 (MDA) | <4.71 (MDA) | 353 ± 197 |
| MW-4 | 2/04/08 | <2.63 (MDA) | 2.72 ± 1.38 | <4.69 (MDA) | <4.57 (MDA) | <299 (MDA) |
| MW-6 | 2/04/08 | <2.33 (MDA) | 1.90 ± 1.20 | <4.54 (MDA) | <4.53 (MDA) | <298 (MDA) |
| MW-2 | 2/04/08 | <3.02 (MDA) | <2.53 (MDA) | <4.90 (MDA) | <4.19 (MDA) | <296 (MDA) |
| | | | | | | |
| MW-11 | 5/01/08 | <0.85 (MDA) | <2.15 (MDA) | <6.90 (MDA) | <6.81 (MDA) | <302 (MDA) |
| MW-1 | 5/01/08 | <6.26 (MDA) | <7.40 (MDA) | <5.86 (MDA) | <5.07 (MDA) | <299 (MDA) |
| MW-4 | 5/01/08 | <3.39 (MDA) | <6.56 (MDA) | <5.32 (MDA) | <5.45 (MDA) | <298 (MDA) |
| MW-6 | 5/01/08 | <0.91 (MDA) | 2.22 ± 1.10 | <4.86 (MDA) | <3.26 (MDA) | <302 (MDA) |
| MW-2 | 5/01/08 | <1.61 (MDA) | 4.89 ± 1.15 | <5.31 (MDA) | <5.53 (MDA) | <295 (MDA) |
| | | | | | | |
| MW-11 | 7/29/08 | <4.14 (MDA) | 19.8 ± 5.46 | <5.41 (MDA) | <5.91 (MDA) | 306 ± 139 |
| MW-1 | 7/29/08 | <2.82 (MDA) | 8.00 ± 2.38 | <5.79 (MDA) | <5.39 (MDA) | <213 (MDA) |
| MW-4 | 7/29/08 | <2.35 (MDA) | 2.83 ± 1.61 | <3.76 (MDA) | <3.99 (MDA) | <214 (MDA) |
| MW-6 | 7/29/08 | <0.62 (MDA) | 2.90 ± 0.66 | <3.96 (MDA) | <4.48 (MDA) | <213 (MDA) |
| MW-2 | 7/29/08 | 1.00 ± 0.54 | 1.94 ± 0.59 | <4.85 (MDA) | <4.75 (MDA) | <209 (MDA) |
| | | | | | | |
| MW-11 | 11/07/08 | <2.70 (MDA) | 7.37 ± 2.38 | <3.39 (MDA) | <3.09 (MDA) | <167 (MDA) |
| MW-1 | 11/05/08 | <2.16 (MDA) | 11.4 ± 3.50 | <2.86 (MDA) | <3.77 (MDA) | <163 (MDA) |
| MW-4 | 11/06/08 | <2.45 (MDA) | <4.09 (MDA) | <3.00 (MDA) | <3.88(MDA) | <165 (MDA) |
| MW-6 | 11/06/08 | <1.43 (MDA) | <4.07 (MDA) | <2.83 (MDA) | <2.89(MDA) | <166 (MDA) |
| MW-2 | 11/06/08 | <2.04 (MDA) | 3.19 ± 1.91 | <3.83 (MDA) | <4.02 (MDA) | <165 (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 | 9.7 ± 2.94 | Note 4 | Note 4 | 353 ± 197 |
| Average: MW-2 | 1.00 ± -.54 | 3.34 ± 1.22 | Note 4 | Note 4 | Note 4 |
| Average: MW-4 | Note 4 | 2.78 ± 1.50 | Note 4 | Note 4 | Note 4 |
| Average: MW-6 | Note 4 | 2.34 ± 0.99 | Note 4 | Note 4 | Note 4 |
| Average: MW-11 | Note 4 | 10.0 ± 2.98 | Note 4 | Note 4 | 306 ± 139 |
| | | | | | |
| Maximum: MW-1 | Note 4 | 11.4 ± 3.50 | Note 4 | Note 4 | 353 ± 197 |
| Maximum: MW-2 | 1.00 ± -.54 | 4.89 ± 1.15 | Note 4 | Note 4 | Note 4 |
| Maximum: MW-4 | Note 4 | 2.83 ± 2.46 | Note 4 | Note 4 | Note 4 |
| Maximum: MW-6 | Note 4 | 2.90 ± 0.66 | Note 4 | Note 4 | Note 4 |
| Maximum: MW-11 | Note 4 | 19.8 ± 5.46 | Note 4 | Note 4 | 306 ± 139 |

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) |
|---|---|---|---|
| 1/2/2008 | 5.72 | <MDA | 948 ± 237 |
| 1/30/2008 | 6.23 | <MDA | 593 ± 223 |
| 2/27/2008 | 677 | <MDA | 857 ± 233 |
| 2/29/2008 | 449 | 9.56 | NA |
| 3/26/2008 | 1070 | 403 | 4490 ± 348 |
| 4/23/2008 | 1150 | <MDA | 5950 ± 279 |
| 5/21/2008 | 302 | <MDA | 4140 ± 627 |
| 5/30/2008 | 121 | <MDA | NA |
| 6/2/2008 | 264 | <MDA | NA |
| 6/19/2008 | 113 | <MDA | 782 ± 155 |
| 7/16/2008 | 76.1 | <MDA | 1210 ± 233 |
| 8/13/2008 | 39.9 | <MDA | 686 ± 259 |
| 9/10/2008 | 43.4 | <MDA | 855 ± 266 |
| 10/8/2008 | 40.5 | <MDA | 2280 ± 335 |
| 11/5/2008 | 13.6 | <MDA | 1050 ± 425 |
| 12/3/2008 | 28.9 | <MDA | 898 ± 320 |
| 12/31/2008 | 19.1 | <MDA | NA |

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".

## TABLE C-7
## FRENCH DRAIN MONITORING RESULTS

| Sample Date | Cs-137 Activity (pCi/L) | Co-60 Activity (pCi/L) |
|---|---|---|
| 1/2/2008 | 379 | 8.05 |
| 1/30/2008 | 370 | 4.74 |
| 2/27/2008 | 326 | 8.55 |
| 3/26/2008 | 434 | 8.50 |
| 4/23/2008 | 425 | 7.25 |
| 5/21/2008 | 452 | 7.88 |
| 6/19/2008 | 366 | 7.33 |
| 7/16/2008 | 422 | 3.34 |
| 8/13/2008 | 432 | 9.05 |
| 9/10/2008 | 446 | 9.33 |
| 10/8/2008 | 469 | 7.14 |
| 11/5/2008 | 185 | 4.34 |
| 12/3/2008 | 328 | 8.62 |
| 12/31/2008 | 287 | 9.03 |

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.

## TABLE C-8
## ADDITIONAL 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 | |
| RCW-SFP-1 | 11/06/08 | <2.36 (MDA) | <3.75 (MDA) | <3.31 (MDA) | <3.39 (MDA) | <161 (MDA) |
| RCW-SFP-2 | 11/5/08 | <2.07 (MDA) | 8.64 ± 3.23 | <3.29 (MDA) | <3.87 (MDA) | <164 (MDA) |
| RCW-CS-1 | 11/5/08 | <43.0 (MDA) | 84.1 ± 32.3 | <2.99 (MDA) | <3.24 (MDA) | <164 (MDA) |
| RCW-CS-2 | 11/06/08 | <7.23 (MDA) | 13.5 ± 6.95 | <2.75 (MDA) | <2.64 (MDA) | <165 (MDA) |
| RCW-CS-3 | 11/06/08 | <2.00 (MDA) | <4.14 (MDA) | <2.70 (MDA) | <2.60 (MDA) | <164 (MDA) |
| RCW-CS-4 | 11/5/08 | <1.60 (MDA) | 8.57 ± 2.17 | <3.81 (MDA) | <3.14 (MDA) | <161 (MDA) |
| RCW-CS-5 | 11/7/08 | <2.08 (MDA) | 4.99 ± 2.56 | <2.56 (MDA) | <2.85 (MDA) | <167 (MDA) |

## TABLE C-8 (Continued)
## ADDITIONAL MONITORING RESULTS

| Location | Sample Date | Sr-90 Activity (pCi/l) | Ni-63 Activity (pCi/l) | Fe-55 Activity (pCi/l) | C-14 Activity (pCi/l) |
|---|---|---|---|---|---|
| MW-1 | 11/5/08 | <0.42 (MDA) | <18.3 (MDA) | <35.2 (MDA) | <15.2 (MDA) |
| MW-2 | 11/06/08 | <0.58 (MDA) | <19.6 (MDA) | <35.7 (MDA) | <15.2 (MDA) |
| MW-4 | 11/06/08 | <0.82 (MDA) | <15.5 (MDA) | <38.0 (MDA) | <15.2 (MDA) |
| MW-6 | 11/06/08 | <0.72 (MDA) | <18.6 (MDA) | <37.2 (MDA) | <15.2 (MDA) |
| MW-11 | 11/07/08 | <0. 63 (MDA) | <15.1 (MDA) | <34.7 (MDA) | <15.2 (MDA) |
| RCW-SFP-1 | 11/06/08 | <0.907 (MDA) | <17.1 (MDA) | <32.5 (MDA) | <15.2 (MDA) |
| RCW-SFP-2 | 11/5/08 | <0.794 (MDA) | <16.4 (MDA) | <36.9 (MDA) | <15.2 (MDA) |
| RCW-CS-1 | 11/5/08 | <0.869 (MDA) | <16.2 (MDA) | <35.7 (MDA) | <18.4 (MDA) |
| RCW-CS-2 | 11/06/08 | <0.815 (MDA) | <17.7 (MDA) | <35.8 (MDA) | <15.2 (MDA) |
| RCW-CS-3 | 11/06/08 | <0.635 (MDA) | <16.9 (MDA) | <36.7 (MDA) | <15.2 (MDA) |
| RCW-CS-4 | 11/5/08 | <0.788 (MDA) | <17.1 (MDA) | <36.8 (MDA) | <15.2 (MDA) |
| RCW-CS-5 | 11/7/08 | <0.801 (MDA) | <15.5 (MDA) | <36.9 (MDA) | <15.2 (MDA) |

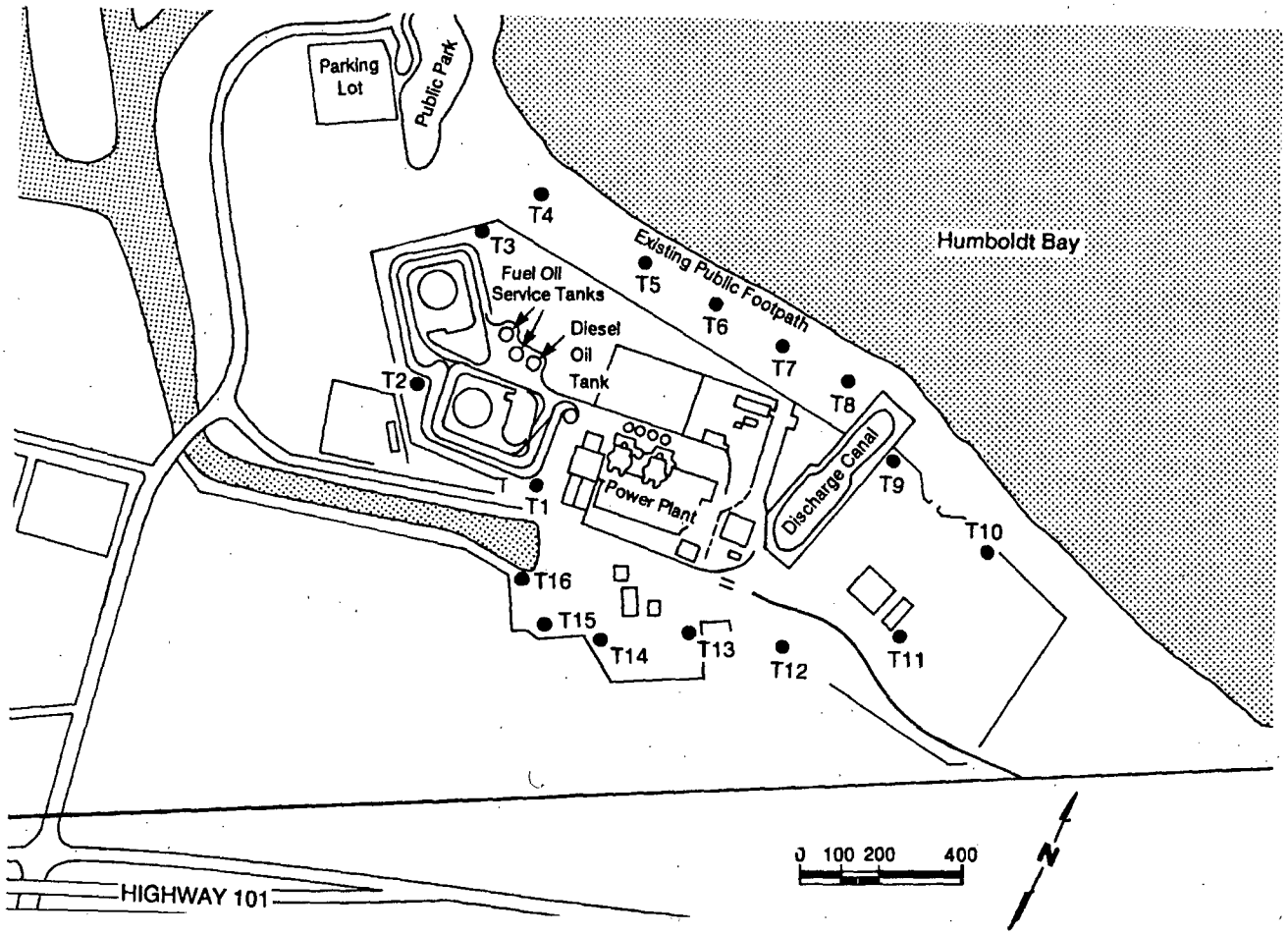
## TABLE C-8 (Continued)
## ADDITIONAL MONITORING RESULTS

| Location | Sample Date | U233/234 Activity (pCi/l) | U-235/236 Activity (pCi/l) | U-238 Activity (pCi/l) |
|---|---|---|---|---|
| MW-1 | 11/5/08 | 0.17 ± 0.09 | <0.09 (MDA) | 0.12 ± 0.06 |
| MW-2 | 11/06/08 | <0.21 (MDA) | <0.16 (MDA) | <0.16 (MDA) |
| MW-4 | 11/06/08 | <0.23 (MDA) | <0.06 (MDA) | <0.17 (MDA) |
| MW-6 | 11/06/08 | <0.10 (MDA) | <0.10 (MDA) | <0.10 (MDA) |
| MW-11 | 11/07/08 | <0.39 (MDA) | <0.48 (MDA) | <0.39 (MDA) |
| RCW-SFP-1 | 11/06/08 | <0.33 (MDA) | <0.20 (MDA) | <0.30 (MDA) |
| RCW-SFP-2 | 11/5/08 | 0.11 ± 0.06 | <0.10 (MDA) | <0.11 (MDA) |
| RCW-CS-1 | 11/5/08 | 0.67 ± 0.17 | <0.10 (MDA) | 0.23 ± 0.10 |
| RCW-CS-2 | 11/06/08 | 0.52 ± 0.20 | <0.06 (MDA) | <0.26 (MDA) |
| RCW-CS-3 | 11/06/08 | <0.36 (MDA) | <0.30 (MDA) | <0.24 (MDA) |
| RCW-CS-4 | 11/5/08 | 0.11 ± 0.07 | <0.08 (MDA) | <0.10 (MDA) |
| RCW-CS-5 | 11/7/08 | <0.24 (MDA) | <0.17 (MDA) | <0.22 (MDA) |

## TABLE C-8 (Continued)
## ADDITIONAL MONITORING RESULTS

| Location | Sample Date | Pu-238 Activity (pCi/l) | Pu-239/240 Activity (pCi/l) | Am-241 Activity (pCi/l) | Cm-242 Activity (pCi/l) | Cm-243/244 Activity (pCi/l) |
|---|---|---|---|---|---|---|
| MW-1 | 11/5/08 | <0.11 (MDA) | <0.08 (MDA) | <0.08 (MDA) | <0.03 (MDA) | <0.02 (MDA) |
| MW-2 | 11/06/08 | <0.02 (MDA) | <0.06 (MDA) | <0.08 (MDA) | <0.07 (MDA) | <0.09 (MDA) |
| MW-4 | 11/06/08 | <0.02 (MDA) | <0.07 (MDA) | <0.02 (MDA) | <0.02 (MDA) | <0.12 (MDA) |
| MW-6 | 11/06/08 | <0.08 (MDA) | <0.07 (MDA) | <0.05 (MDA) | <0.02 (MDA) | <0.05 (MDA) |
| MW-11 | 11/07/08 | <0.07 (MDA) | <0.08 (MDA) | <0.05 (MDA) | <0.02 (MDA) | <0.13 (MDA) |
| RCW-SFP-1 | 11/06/08 | <0.08 (MDA) | <0.08 (MDA) | <0.06 (MDA) | <0.03 (MDA) | <0.02 (MDA) |
| RCW-SFP-2 | 11/5/08 | <0.08 (MDA) | <0.07 (MDA) | <0.08 (MDA) | <0.03 (MDA) | <0.09 (MDA) |
| RCW-CS-1 | 11/5/08 | <0.13 (MDA) | <0.09 (MDA) | <0.11 (MDA) | <0.04 (MDA) | <0.12 (MDA) |
| RCW-CS-2 | 11/06/08 | <0.14 (MDA) | <0.09 (MDA) | <0.16 (MDA) | <0.07 (MDA) | <0.16 (MDA) |
| RCW-CS-3 | 11/06/08 | <0.06 (MDA) | <0.06 (MDA) | <0.08 (MDA) | <0.02 (MDA) | <0.10 (MDA) |
| RCW-CS-4 | 11/5/08 | <0.09 (MDA) | <0.12 (MDA) | <0.12 (MDA) | <0.11(MDA) | <0.24 (MDA) |
| RCW-CS-5 | 11/7/08 | <0.17 (MDA) | <0.11 (MDA) | <0.07 (MDA) | <0.07 (MDA) | <0.11 (MDA) |

## FIGURE A-1
## HBPP ONSITE TLD LOCATIONS



# FIGURE A-2
# HBPP ONSITE MONITORING WELL LOCATIONS

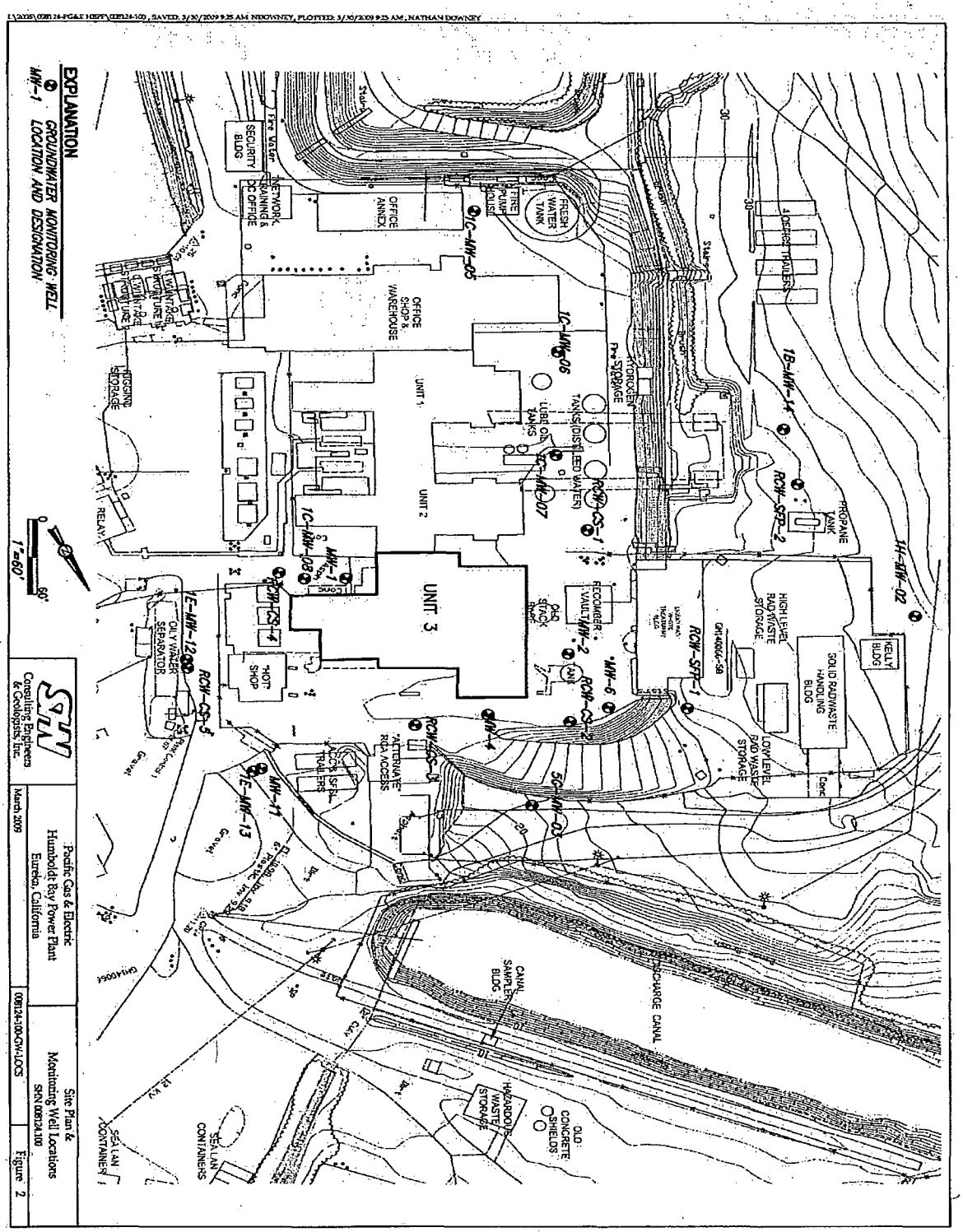


FIGURE A-3

## HBPP OFFSITE TLD LOCATIONS

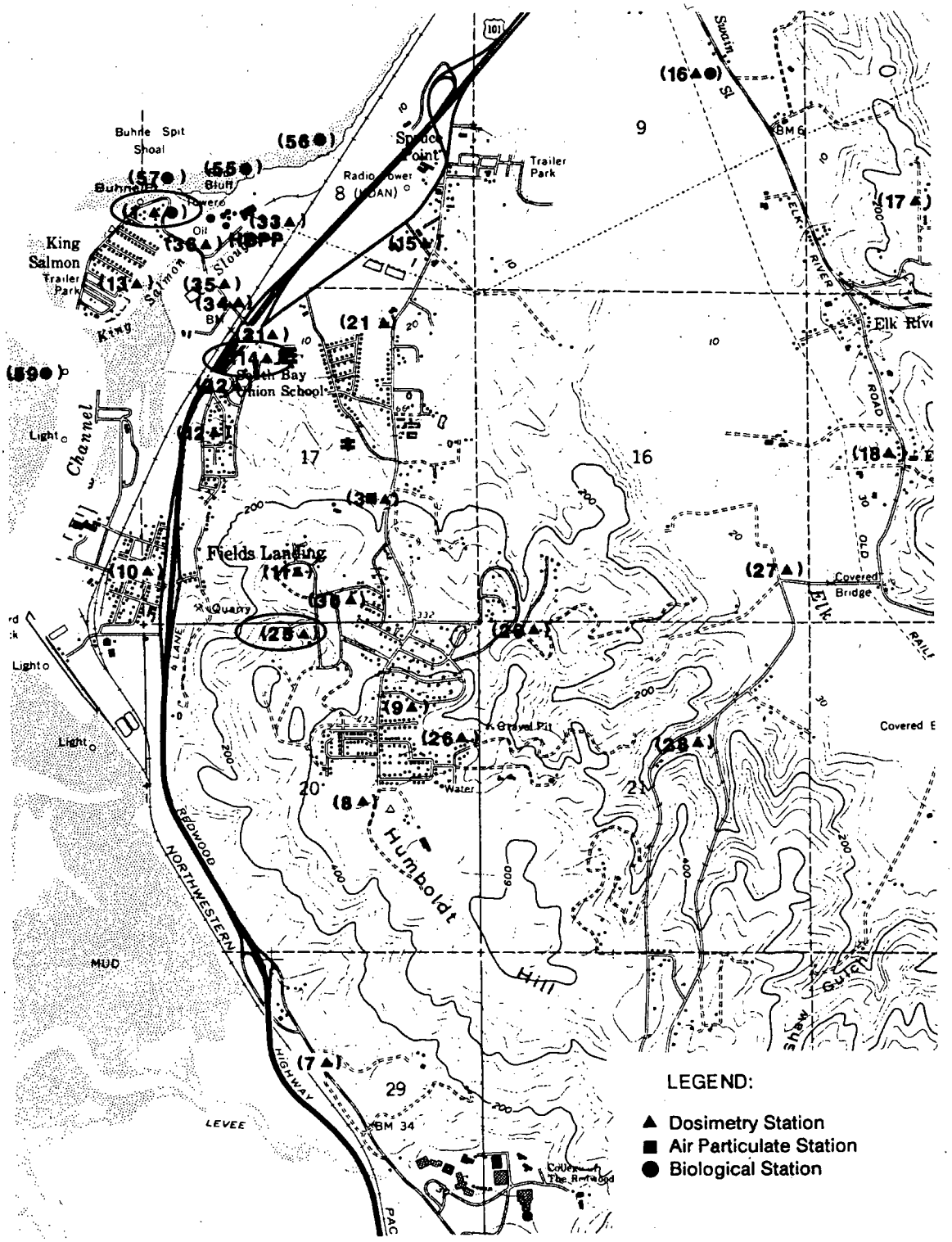
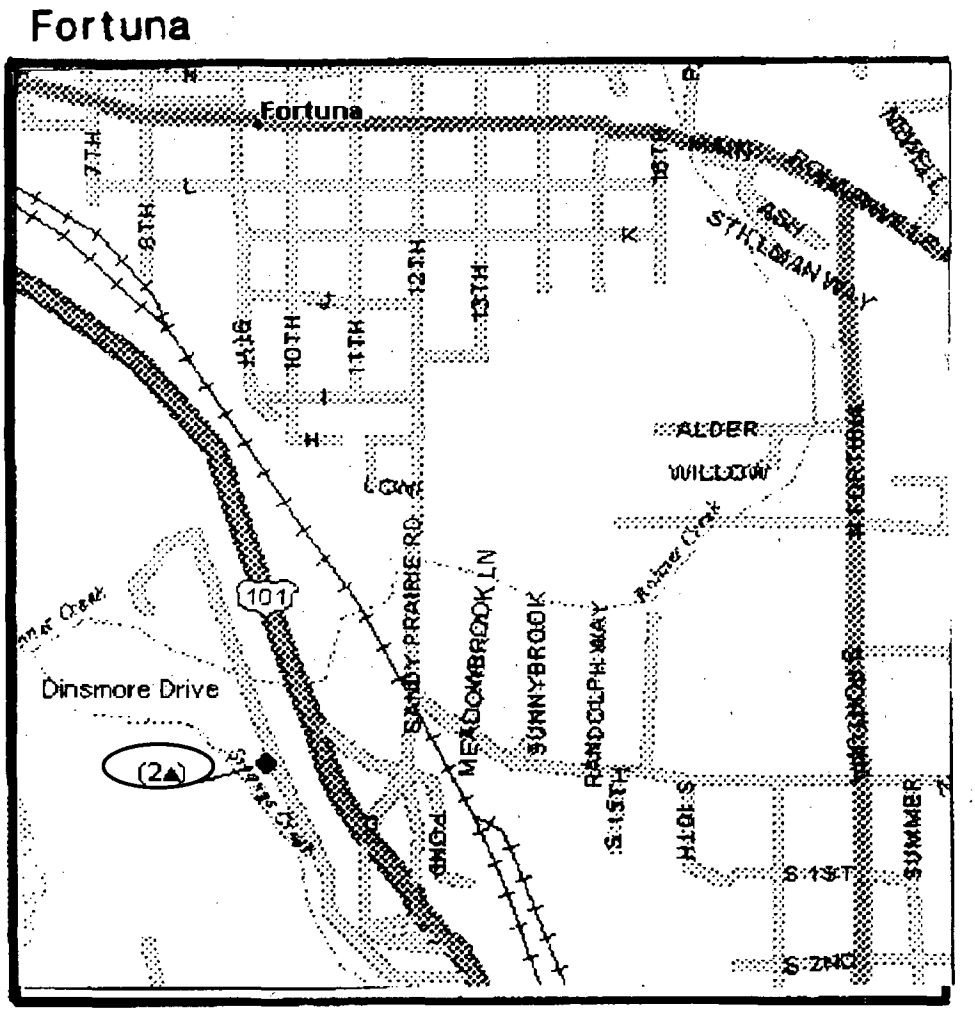
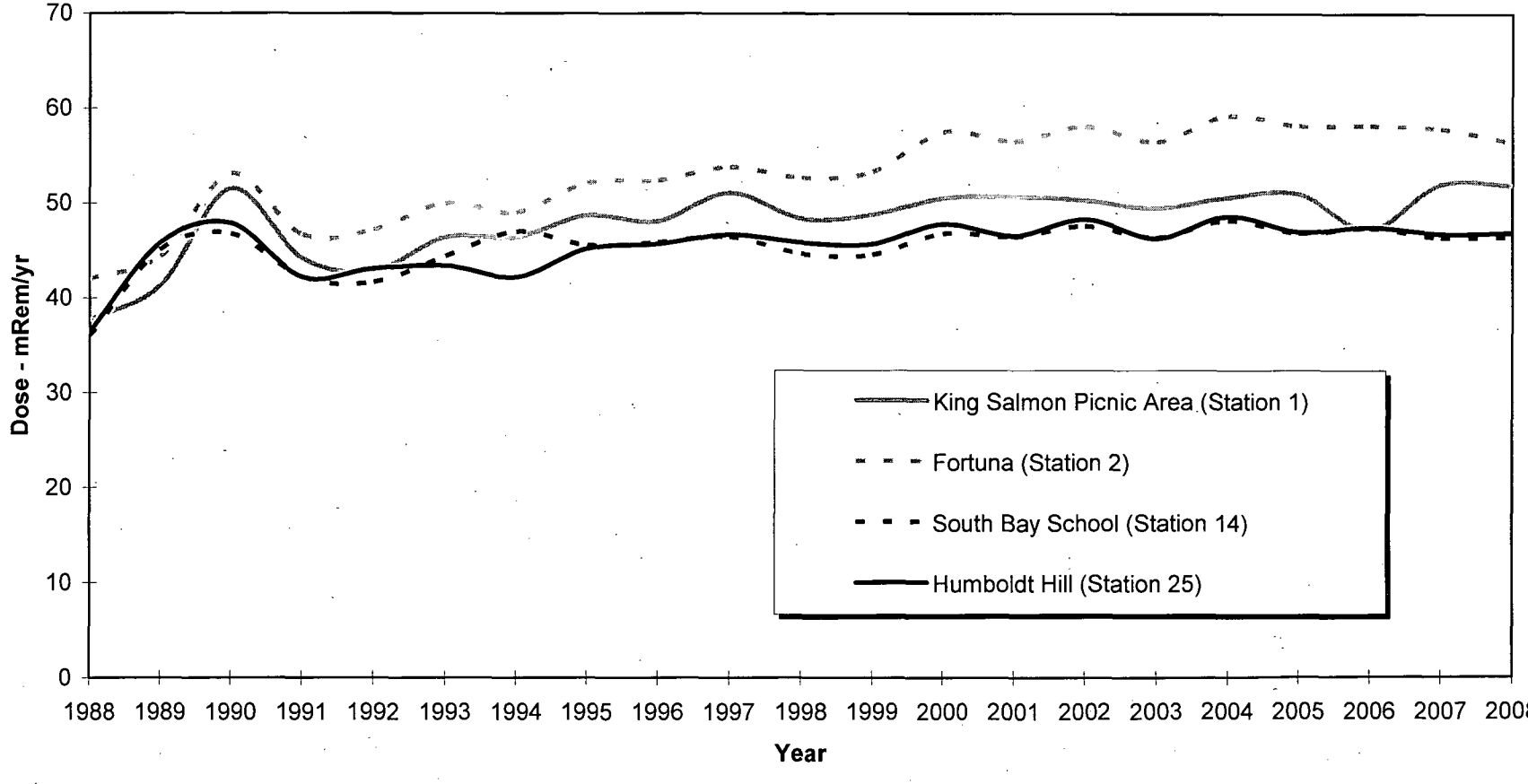


**FIGURE A-3 (CONTINUED)**
**HBPP OFFSITE TLD LOCATIONS**

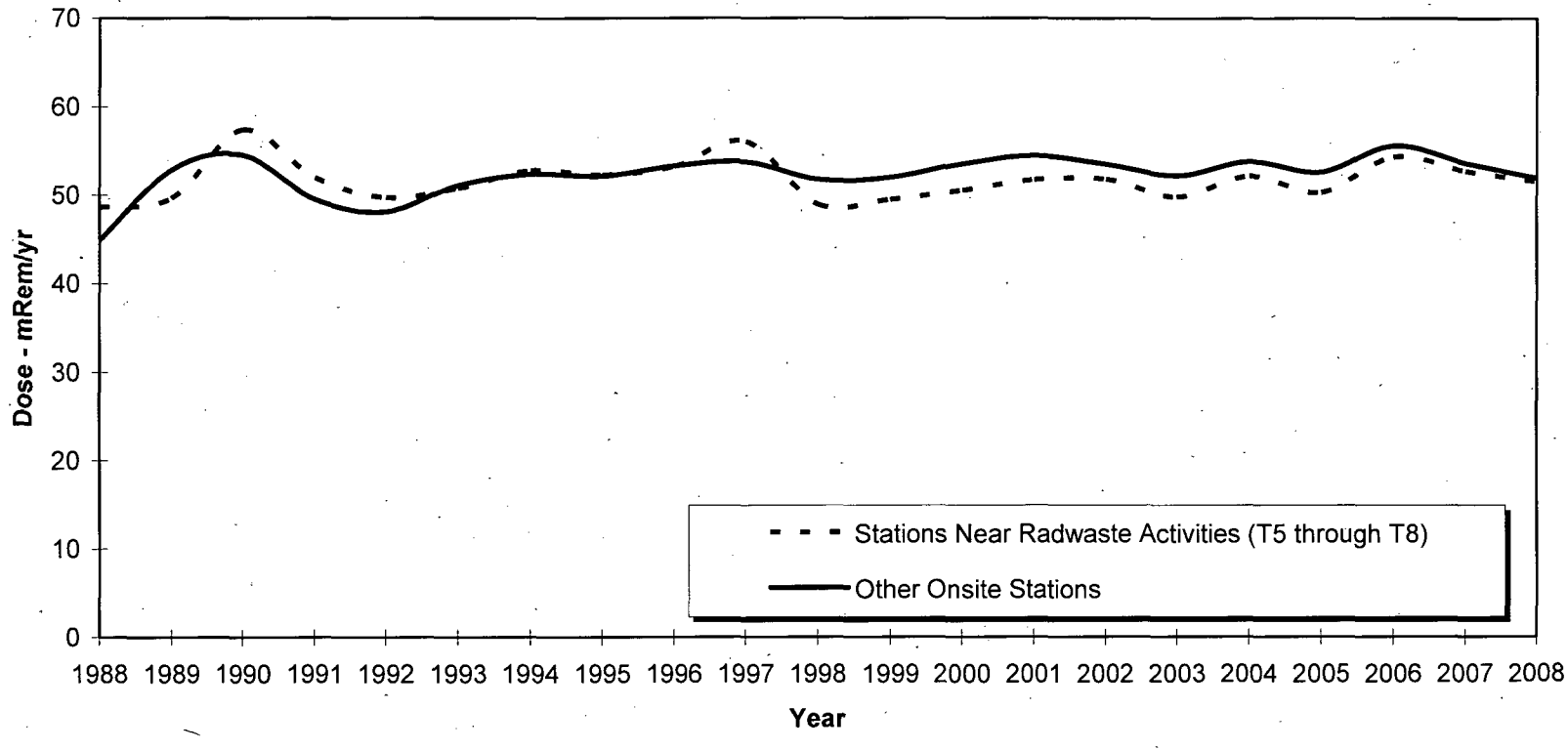


## Figure B-1
## Offsite Environmental Radiation Level Trends




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 for the stations near the Radwaste Activities was 78.6 mrem and the average for Other Onsite stations was 79.4 mrem.

## Figure B-2
## Onsite 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 are Station 1 – 83.0 mrem, Station 2 – 79.8 mrem, Station 14 – 80.2 mrem, and Station 25 – 73.7 mrem.