

SAFETY EVALUATION BY OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

RELATED TO FINAL STATUS SURVEYS FOR

SIX SURVEY AREAS WITHIN SURVEY UNIT OOL10

FACILITY OPERATING LICENSE NO. DPR-7

PACIFIC GAS AND ELECTRIC COMPANY

HUMBOLDT BAY POWER PLANT UNIT 3

DOCKET NO. 50-133

1.0 INTRODUCTION

U.S. Nuclear Regulatory Commission (NRC) staff reviewed Final Status Survey Reports for six survey areas within Survey Units HBPP-FSS-OOL 10 as provided by letter dated October 17, 2019. These survey areas/survey units were designated HBPP-FSS-OOL10-05 (Circulating Water Intake Piping Excavation Area), HBPP-FSS-OOL10-06 (60kV Switchyard Excavation), HBPP-FSS-OOL10-14 (Remainder of Land Area [Parking Lot A]), HBPP-FSS-OOL10-15 (Buhne Slough), HBPP-FSS-OOL10-19 (Area East of Trailer City) and, HBPP-FSS-OOL10-23 (Humboldt Bay). The licensee's Final Status Survey (FSS) design criteria, implementation of the Data Quality Objectives (DQO) process, and survey approach/methods were reviewed, and final results were assessed against the licensee's approved release criteria. The NRC staff's analysis is provided below.

2.0 EVALUATION

HBPP-FSS-OOL10-05 (Circulating Water Intake Piping Excavation Area)

The survey unit designated as HBPP-FSS-OOL10-05 was classified by the licensee as a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Class 3 unit and is described as an approximately 453 m<sup>2</sup> area. The licensee describes the survey unit boundary as an excavation to remove circulating water piping under Survey Units OOL10-06, OOL1-18, and NOL01-06.

The licensee's License Termination Plan (LTP) requires 1-10% of Class 3 areas to receive gamma walkover scan coverage during FSS, and the scan survey completed for OOL10-05 was performed over approximately 100% of the area. This coverage is consistent with MARSSIM recommendations for judgmental scan coverage in Class 3 areas.

The licensee's DQO process determined that Cs-137 and Co-60 were the only nuclides that could potentially be present based on characterization data with Cs-137 being the primary contaminant of concern due to its longer half-life (30.17 years). A sum-of-fractions (SOF) value of unity was used as the criteria for survey planning purposes. The licensee determined the required number of soil samples using a Type 1 and Type 2 error of 0.05 and a sigma of 0.02 pCi/g, and the Lower Bound of the Gray Region (LBGR) was set to 0.95 pCi/g (such that  $\Delta = 0.05$ ) in order to achieve a relative shift in the range of 1 and 3 (i.e., using a relative shift of 2.2). The required number of samples was 15, and the licensee took 15 randomly selected soil samples, which is consistent with Table 5.5 of MARSSIM. Five (5) split samples were provided

to Oak Ridge Institute for Science and Education (ORISE) [NRC Contractor] for analysis by the ORISE laboratory (this was the only survey unit of the six which involved a split with ORISE). No plant derived radionuclides were identified in the 5 samples at either the on-site laboratory or the ORISE laboratory. A soil sampling investigation level was established at 50% of the Cs-137 Derived Concentration Guideline Limit (DCGL), or 3.97 pCi/g Cs-137, and a scan investigation was established for anything detectable above background. These investigation levels are consistent with investigation levels described in Table 5-5 of the licensee's LTP, and they are adequate per Table 5.8 of MARSSIM.

In addition to gamma measurements, the licensee performed analyses for Hard to Detect (HTD) radionuclides on two randomly selected samples from the survey unit, which included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. This frequency of HTD analyses is consistent with guidance from MARSSIM Section 4.3.2. Staff requested and reviewed the sample analysis for these samples and verified that no plant derived radionuclides were present greater than the applicable detection limits (LLD).

The licensee's survey results indicated that Cs-137 was not identified above the detection limit in any of the soil samples collected for non-parametric statistical testing. No soil samples triggered an investigation. Since no sample exceeded the DCGL, the statistical test (i.e., Sign Test) was not required. As such, the licensee acknowledged that the Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs, and that "performing the test is unnecessary as it is passed by inspection." NRC staff concludes that the licensee's survey and analyses for this survey unit provide reasonable assurance the licensee was able to demonstrate compliance with the unrestricted release criteria of 10 CFR 20.1402.

#### HBPP-FSS-OOL10-06 (60 kV Switchyard Excavation)

The survey unit designated as HBPP-FSS-OOL10-06 was classified by the licensee as a MARSSIM Class 3 unit and is described as an approximately 4,345 m<sup>2</sup> area. The licensee describes the survey unit boundary as abutting Survey Units NGFA-West, MEPPS01-01/02, RLY01-01/02, OOL02-02, OOL10-04, OOL10-14, OOL10-15, and OOL10-18. The survey unit was an excavation that was made to upgrade the switchgear facility for the new Humboldt Bay Generating Station (HBGS) power plant that was built.

The licensee's LTP requires 1-10% of Class 3 areas to receive gamma walkover scan coverage during FSS, and the scan survey completed for OOL10-06 was performed over approximately 98% of the area. This coverage is consistent with MARSSIM recommendations for judgmental scan coverage in Class 3 areas.

The licensee's DQO process determined that Cs-137 and Co-60 were the only nuclides that could potentially be present based on characterization data with Cs-137 being the primary contaminant of concern due to its longer half-life (30.17 years). The licensee utilized a SOF value of unity as the criteria for survey planning purposes. The licensee determined the required number of soil samples using a Type 1 and Type 2 error of 0.05 and a sigma of 0.02 pCi/g, and the LBGR was set to 0.95 pCi/g (such that  $\Delta = 0.05$ ) in order to achieve a relative shift in the range of 1 and 3 (i.e., using a relative shift of 2.2). Consistent with Table 5.5 of MARSSIM, the required number of samples was 15, and the licensee obtained 20 randomly selected soil samples. A soil sampling investigation level was established at 50% of the Cs-137 DCGL, 3.97 pCi/g Cs-137, and a scan investigation was established for anything detectable

above background. These investigation levels are consistent with investigation levels described in Table 5-5 of the licensee's LTP, and they are adequate per Table 5.8 of MARSSIM.

In addition to gamma measurements, the licensee performed analyses for HTD radionuclides on two randomly selected samples from the survey unit, which included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. This frequency of HTD analyses is consistent with guidance from MARSSIM Section 4.3.2.

The licensee's survey results indicated that Cs-137 was only identified above the detection limit in two of the soil samples collected for non-parametric statistical testing with the maximum value being less than 5% of the Cs-137 DCGL, and neither of the two HTD samples tested positive for Cs-137 or other plant derived radionuclides. No soil samples triggered an investigation. Since no sample exceeded the DCGL, the statistical test (i.e., Sign Test) was not required. As such, the licensee acknowledged that the Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs, and that "performing the test is unnecessary as it is passed by inspection." NRC staff concludes that the licensee's survey and analyses for this survey unit provide reasonable assurance the licensee was able to demonstrate compliance with the unrestricted release criteria of 10 CFR 20.1402.

#### HBPP-FSS-OOL10-14 (Remainder of Land Area [Parking Lot A])

The survey unit designated as HBPP-FSS-OOL10-14 was classified by the licensee as a MARSSIM Class 3 unit and is described as an approximately 6,816 m<sup>2</sup> area. The licensee describes the survey unit boundary as abutting Survey Units OOL02-01, OOL02-02, OOL06-01, OOL11,01, OOL10-06, OOL10-15, and OOL10-17. The survey unit was previously a plant site parking lot.

The licensee's LTP requires 1-10% of Class 3 areas to receive gamma walkover scan coverage during FSS, and the scan survey completed for OOL10-14 was performed over approximately 59% of the area. This coverage is consistent with MARSSIM recommendations for judgmental scan coverage in Class 3 areas. Staff noted that the area was also scanned by ORISE for a confirmatory survey (ADAMS Accession No. ML18030B036) which similarly determined no elevations were present and that the area was not fully accessible.

The licensee's DQO process determined that Cs-137 and Co-60 were the only nuclides that could potentially be present based on characterization data with Cs-137 being the primary contaminant of concern due to its longer half-life (30.17 years). The licensee utilized a modified DCGL value for Cs-137 of 7.29 pCi/g (making allowance for insignificant radionuclides) as criteria for survey planning purposes. Staff requested and verified the derivation of the Cs-137 DCGL value which was modified from that in the LTP to account for insignificant radionuclides of concern. The licensee determined the required number of soil samples using a Type 1 and Type 2 error of 0.05 and a sigma of 0.18 pCi/g, and the LBGR was set to 6.91 pCi/g (such that  $\Delta = 0.38$ ) in order to achieve a relative shift in the range of 1 and 3 (i.e., using a relative shift of 2.1). The required number of samples was 15, consistent with Table 5.5 of MARSSIM, and the licensee obtained 15 randomly selected soil samples although one was inadvertently relocated and obtained outside of the survey unit and deemed ineligible for this survey unit evaluation. Because the number of required samples includes a 20% contingency for unusable data, 14 samples were considered adequate for the evaluation. A soil sampling investigation level was established at 50% of the Cs-137 DCGL (3.65 pCi/g Cs-137) and a scan investigation was established for anything detectable above background. These investigation levels are

consistent with investigation levels described in Table 5-5 of the licensee's LTP, and they are adequate per Table 5.8 of MARSSIM.

In addition to gamma measurements, the licensee performed analyses for HTD radionuclides on two randomly selected samples from the survey unit, which included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. This frequency of HTD analyses is consistent with guidance from MARSSIM Section 4.3.2.

The licensee's survey results indicated that Cs-137 was only identified above the detection limit in 4 of the soil samples collected for non-parametric statistical testing with the maximum value being less than 8% of the modified Cs-137 DCGL. No soil samples triggered an investigation. Since no sample exceeded the DCGL, the statistical test (i.e., Sign Test) was not required. As such, the licensee acknowledged that the Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs, and that "performing the test is unnecessary as it is passed by inspection." NRC staff concludes that the licensee's survey and analyses for this survey unit provide reasonable assurance the licensee was able to demonstrate compliance with the unrestricted release criteria of 10 CFR 20.1402.

#### HBPP-FSS-OOL10-15 (Buhne Slough)

The survey unit designated as HBPP-FSS-OOL10-15 was classified by the licensee as a MARSSIM Class 3 unit and is described as an approximately 70,367 m<sup>2</sup> area. The licensee describes the survey unit boundary as abutting Survey Units NGFA-East, NGFA-West, OOL02-02, OOL10-04, OOL10-06, OOL10-14, OOL10-17, OOL10-19, and other non-PG&E properties. The area is the Buhne Slough area.

The licensee's LTP requires 1-10% of Class 3 areas to receive gamma walkover scan coverage during FSS, and the scan survey completed for OOL10-15 was performed over approximately 5% of the area. This coverage is consistent with MARSSIM recommendations for judgmental scan coverage in Class 3 areas.

The licensee's DQO process determined that Cs-137 and Co-60 were the only nuclides that could potentially be present based on characterization data with Cs-137 being the primary contaminant of concern due to its longer half-life (30.17 years). The licensee utilized a modified DCGL value for Cs-137 of 7.6 pCi/g (making allowance for insignificant radionuclides) as criteria for survey planning purposes. The licensee determined the required number of soil samples using a Type 1 and Type 2 error of 0.05, a sigma of 0.18 pCi/g, and the LBGR was set to 7.24 pCi/g (such that  $\Delta = 0.36$ ) in order to achieve a relative shift in the range of 1 and 3 (i.e., using a relative shift of 2). The required number of samples was 15, consistent with Table 5.5 of MARSSIM, and the licensee obtained 15 randomly selected soil samples. A soil sampling investigation level was established at 50% of the Cs-137 DCGL, 3.8 pCi/g Cs-137, and a scan investigation was established for anything detectable above background. These investigation levels are consistent with investigation levels described in Table 5-5 of the licensee's LTP, and they are adequate per Table 5.8 of MARSSIM.

In addition to gamma measurements, the licensee performed analyses for HTD radionuclides on two randomly selected samples from the survey unit, which included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. This frequency of HTD analyses is consistent with guidance from

MARSSIM Section 4.3.2. Staff requested and reviewed these sample analysis results and verified no plant derived radionuclides were detected above the applicable LLD.

The licensee's survey results indicated that Cs-137 was only identified above the detection limit in 5 of the soil samples collected for non-parametric statistical testing with the maximum value being less than 8% of the Cs-137 DCGL. No soil samples triggered an investigation. Since no sample exceeded the DCGL, the statistical test (i.e., Sign Test) was not required. As such, the licensee acknowledged that the Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs, and that "performing the test is unnecessary as it is passed by inspection." NRC staff concludes that the licensee's survey and analyses for this survey unit provide reasonable assurance the licensee was able to demonstrate compliance with the unrestricted release criteria of 10 CFR 20.1402.

#### HBPP-FSS-OOL10-19 (Area East of Trailer City)

The survey unit designated as HBPP-FSS-OOL10-15 was classified by the licensee as a MARSSIM Class 3 unit and is described as an approximately 24,546 m<sup>2</sup> area. The licensee describes the survey unit boundary as abutting Survey Units NGFA-East, OOL10-13, OOL10-15, OOL09-06, OOL09-09, OOL09-10, and other non-PG&E properties. The area is east of Trailer City, also known as the Duck Pond.

The licensee's LTP requires 1-10% of Class 3 areas to receive gamma walkover scan coverage during FSS, and the scan survey completed for OOL10-19 was performed over approximately 5% of the area. This coverage is consistent with MARSSIM recommendations for judgmental scan coverage in Class 3 areas.

The licensee's DQO process determined that Cs-137 and Co-60 were the only nuclides that could potentially be present based on characterization data with Cs-137 being the primary contaminant of concern due to its longer half-life (30.17 years). The licensee utilized a modified DCGL value for Cs-137 of 7.16 pCi/g (making allowance for insignificant radionuclides) as criteria for survey planning purposes. The licensee determined the required number of soil samples using a Type 1 and Type 2 error of 0.05, a sigma of 0.18 pCi/g, and the LBGR was set to 6.8 pCi/g (such that  $\Delta = 0.36$ ) in order to achieve a relative shift in the range of 1 and 3 (i.e., using a relative shift of 2). The required number of samples was 15, consistent with Table 5.5 of MARSSIM, and the licensee obtained 15 randomly selected soil samples. A soil sampling investigation level was established slightly above 50% of the Cs-137 DCGL, 3.8 pCi/g Cs-137, and a scan investigation was established for anything detectable above background. These investigation levels are generally consistent with investigation levels described in Table 5-5 of the licensee's LTP, and they are adequate per Table 5.8 of MARSSIM.

In addition to gamma measurements, the licensee performed analyses for HTD radionuclides on two randomly selected samples from the survey unit, which included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. This frequency of HTD analyses is consistent with guidance from MARSSIM Section 4.3.2.

The licensee's survey results indicated that Cs-137 was only identified above the detection limit in 3 of the soil samples collected for non-parametric statistical testing with the maximum value being less than 6% of the Cs-137 DCGL, and neither of the 2 HTD samples tested positive for Cs-137 or other plant derived radionuclides. No soil samples triggered an investigation. Since no sample exceeded the DCGL, the statistical test (i.e., Sign Test) was not required. As such,

the licensee acknowledged that the Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs, and that “performing the test is unnecessary as it is passed by inspection.” NRC staff concludes that the licensee’s survey and analyses for this survey unit provide reasonable assurance the licensee was able to demonstrate compliance with the unrestricted release criteria of 10 CFR 20.1402.

#### HBPP-FSS-OOL10-23 (Humboldt Bay)

The survey unit designated as HBPP-FSS-OOL10-15 was classified by the licensee as a MARSSIM Class 3 unit and is described as approximately 132,587 m<sup>2</sup> of ocean surface area. The licensee describes the survey unit boundary as abutting Survey Units OOL05-01, OOL10-13, the remainder of the Bay, and other non-PG&E properties.

The licensee’s LTP requires 1-10% of Class 3 areas to receive gamma walkover scan coverage during FSS; however, because the area is covered by ocean, this was not feasible. As partial compensation for the inability to scan, the licensee lowered its investigation level to 25% of the DCGL value (1.8 pCi/g). The staff finds not conducting the scanning survey in this circumstance to be reasonable.

The licensee’s DQO process determined that Cs-137 and Co-60 were the only nuclides that could potentially be present based on characterization data with Cs-137 being the primary contaminant of concern due to its longer half-life (30.17 years). The licensee utilized a modified DCGL value for Cs-137 of 7.22 pCi/g (making allowance for insignificant radionuclides) as criteria for survey planning purposes. The licensee determined the required number of soil samples using a Type 1 and Type 2 error of 0.05, a sigma of 0.01 pCi/g, and the LBGR was set to 7.19 pCi/g (such that  $\Delta = 0.03$ ) in order to achieve a relative shift in the range of 1 and 3 (i.e., using a relative shift of 2.17). The required number of samples was 15, consistent with Table 5.5 of MARSSIM, and the licensee obtained 15 randomly selected soil samples. A soil sampling investigation level was established at 25% of the Cs-137 DCGL (1.8 pCi/g Cs-137). This investigation level is generally consistent with investigation levels described in Table 5-5 of the licensee’s LTP and is adequate per Table 5.8 of MARSSIM.

In addition to gamma measurements, the licensee performed analyses for HTD radionuclides on two randomly selected samples from the survey unit, which included alpha spectroscopy, gas proportional counting, and liquid scintillation depending on the radionuclide and the measurement method. This frequency of HTD analyses is consistent with guidance from MARSSIM Section 4.3.2.

The licensee’s survey results indicated that Cs-137 was only identified above the detection limit in 1 of the soil samples collected for non-parametric statistical testing with the maximum value being less than 1% of the Cs-137 DCGL, and neither of the 2 HTD samples tested positive for Cs-137 or other plant derived radionuclides. No soil samples triggered an investigation. Since no sample exceeded the DCGL, the statistical test (i.e., Sign Test) was not required. As such, the licensee acknowledged that the Sign Test was performed (by inspection) on the data and compared to the original assumptions of the DQOs, and that “performing the test is unnecessary as it is passed by inspection.” NRC staff concludes that the licensee’s survey and analyses for this survey unit provide reasonable assurance the licensee was able to demonstrate compliance with the unrestricted release criteria of 10 CFR 20.1402.

### 3.0 CONCLUSION

NRC staff concludes that the survey results presented in the Final Status Survey Reports for survey units HBPP-FSS-OOL10-05 (Circulating Water Intake Piping Excavation Area), HBPP-FSS-OOL10-06 (60kV Switchyard Excavation), HBPP-FSS-OOL10-14 (Remainder of Land Area [Parking Lot A]), HBPP-FSS-OOL10-15 (Buhne Slough), HBPP-FSS-OOL10-19 (Area East of Trailer City) and, HBPP-FSS-OOL10-23 (Humboldt Bay) provide reasonable assurance that the licensee demonstrated compliance with the unrestricted release criteria of 10 CFR 20.1402. However, the staff's review resulted in three comments for the licensee to consider as additional final status surveys are completed. These comments are presented below.

#### 4.0 COMMENTS

1. The Cs-137 DCGL varied between the survey units because the licensee considered insignificant radionuclides and scaled down the DCGL to make allowance for radionuclides not analyzed for in the collected samples. In response to a request for additional information, this determination was provided (it was present in the survey planning documents but not in the FSSR). It would be helpful if this information is provided in future FSSRs (the staff notes that the licensee also has made this determination).
2. While some of the site's radionuclides of concern were deemed "insignificant," there were several that remained including Cs-137. However, the only data presented in the FSSRs was for Cs-137 analytical results. As no data was provided for the other "significant" radionuclides, it was unclear to the staff how the remaining "significant" radionuclides were dispositioned or addressed. In response to staff's questions, the licensee confirmed that only Cs-137 was detected and confirmed in any of the samples obtained so all other "significant" radionuclides were considered to be at "0" contaminant concentrations and therefore were not reported. Staff requested and reviewed select HTD analysis performed within two of the survey units and verified this statement. It may be useful going forward to include a statement in the FSSR regarding dismissal of "significant" radionuclides when similar determinations are made in this manner.
3. Similar to the above comment, the FSSR neglected to discuss the analytical results of radionuclides in the two split samples taken from each survey unit and analyzed for all radionuclides of concern. This information would be valuable, in staff's opinion, for verifying appropriate consideration of all radionuclides was performed.