

SAFETY EVALUATION BY OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

RELATED TO FINAL STATUS SURVEYS FOR THE OFFICE ANNEX,

SECURITY BUILDING, INTAKE STRUCTURE, COUNT ROOM BUILDING,

AND WASTE MANAGEMENT FACILITY

FACILITY OPERATING LICENSE NO. DPR-7

PACIFIC GAS AND ELECTRIC COMPANY

HUMBOLDT BAY POWER PLANT UNIT 3

DOCKET NO. 50-133

1.0 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed Final Status Survey Reports (FSSRs) for the Office Annex (survey units HBPP-FSSP-OFA01-01, 02, & Q01), Security Building (survey units HBPP-FSSP-SEC01 & 02), Intake Structure (survey units HBPP-CHAR-OOL02-02), Count Room Building (survey units HBPP-FSSP-CRB01-01, 02, & 03), and Waste Management Facility (survey units HBPP-FSSP-WMF01-01, 02, 03, 04, 05, & 06) as provided by letter on September 24, 2020 (Agencywide Documents Access and Management System [ADAMS] Accession Number ML20268B244). 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.

2.0 EVALUATION

Due to size of the submittal (592 pages) and being of different plant buildings, the NRC staff performed their evaluation of each of the buildings separately as discussed in the following sections.

2.1 Office Annex

The survey units designated as Office Annex (survey units OFA01-01, 02, & Q01) were classified by the licensee as Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Class 3 units. The licensee describes survey units OFA01-01 & 02 as "the interior and exterior surfaces respectively of the Office Annex Building (also known as Building 6) which is bounded by survey unit OOL10-17 to the North, South and West, and on the East by survey unit OOL08-01." The area of Survey Unit OFA01-01 is described as 745 m² and the area of OFA01-02 is 473 m². These areas are consistent with MARSSIM guidance on Class 3 structure survey areas (i.e., no size limit). Survey unit OFA01-Q01, is a quality replicate survey of Survey Unit OFA01-01.

The licensee stated that “due to safety constraints, the piping and vaults that were located under and/or exterior to the Annex Office Building were considered inaccessible for direct survey for entry using handheld proportional detector systems.” The two vaults exterior to the Annex Office Building were surveyed using In Situ Object Characterization System (ISOCs) measurements to determine the total surface activity component for easy-to-detect (ETD) radionuclides with a gamma signature. The two piping systems left in place, which were attached to the vaults, were approximately 43 feet of 4-inch piping from the oily water system (OWS), and approximately 35 feet of 12-inch drain line from the West yard drain system. These were characterized using NaI pipe detectors at 1-foot intervals through the pipe. The ends of both drain lines were grouted after being surveyed, as well as the OWS Vault (DI-11) and the West Yard Drain Line Vault (DI-13).

The licensee’s License Termination Plan (LTP) (Table 5-4) requires 1-10 percent of areal scan coverage for Class 3 survey units. For Survey Unit OFA01-01 the scan survey design criteria were as follows: 100 percent of accessible survey unit floors and interior walls to 8 feet, 100 percent scanning of accessible ventilation and proximity, and 1-2 percent scanning of the balance of the survey unit. For survey unit OFA01-02 the scan survey design criteria were as follows: 50 percent of accessible roof and 1-2 percent of the balance of the survey unit. This scan coverage is consistent with MARSSIM (Table 5.9) recommendations for judgmental scan coverage in Class 3 areas.

The piping under and adjacent to the Office Annex was characterized using a Ludlum 2350-1 Data Logger system with a 2” by 2” Model 44-157 or 3” by 3” 44-162 Sodium Iodide (NaI) Detector respectively. Measurements were taken approximately every foot of the pipe length. On average, the survey found residual radioactivity in the pipes of 39,400 dpm/100 cm² and 44,400 dpm/100 cm². Using the ratio of this activity level to the 100,000 dpm/100 cm² piping Derived Concentration Guideline Level (DCGL) (which corresponds to a dose of 9.67E-4 mrem/yr), the licensee was able to estimate hypothetical exposures from this material to be much less than 0.01 mrem/yr. Similarly, ISOCs measurements of the three vault systems were taken resulting with measured Cs-137 values of ~0, 192, and 218 dpm/100 cm² with only the highest being above the minimum detectable concentration (MDC). The dose calculated from the highest of these measurements, using the same method as used for the piping, was 2.11E-6 mrem/yr NRC staff verified these determinations.

The licensee’s DQO process was utilized to design the FSS for typical structural surfaces and to develop a gross activity DCGL_{GA} for both beta/gamma and alpha contamination measurements. The beta/gamma-gross activity DCGL was based on Cs-137 and Co-60 weighted at 94 percent and 6 percent, respectively. The alpha-gross activity DCGL was conservatively based on Am-241, since Am-241 was determined to be the most limiting prevalent alpha emitter at Humboldt Bay Power Plant (HBPP) in the March 18, 2014 technical support document, “Gross Activity DCGL in Support of Final Status Survey at HBPP.” The licensee’s beta/gamma DCGL_{GA} was set at 40,600 dpm/100 cm², and the alpha DCGL_{GA} was set at 3,000 dpm/100 cm². Investigation levels for direct measurements were set at >50 percent of the DCGL_{GA} (i.e., >20,300 dpm/100 cm² beta/gamma and >1,500 dpm/100 cm² alpha). The investigation level for scan measurements was designated as a “discernable and reproducible audible indication of activity above background.”

The licensee calculated the required number of discrete measurements as 14, per Section 5.3.3 of the HBPP LTP and Table 5.5 of MARSSIM for Type 1 and Type 2 error rates of 0.05 and a relative shift of >3. The licensee's survey design included 15 direct measurements for beta/gamma and for alpha in the OFA01-01, 02, & Q01 survey units. A total of 14-15 smear measurements (one location in survey unit OFA01-01 was not accessible) were also taken in each Survey Unit at the location of the direct measurements in order to assess removable radioactivity.

In addition to the planned direct measurements, ETD gamma emitting radionuclides were measured as a part of the media sample analyses. Four media samples, from the OWS Vault and one of the North Yard Drain (DI-13) Vaults, were obtained but contained only relatively minor concentrations of Cs-137 (< 1 pCi/g which is significantly less than the 7.9 pCi/g DCGL for Cs-137). The licensee stated that the concentrations of Cs-137 were consistent with fallout levels and that no other plant-derived radionuclides were identified above the MDC. For the Office Annex Building, not enough sample media was collected for additional analysis of hard-to-detect (HTD) radionuclides. However, two media samples, from the OWS and DI-13 vaults, were analyzed for the HTD radionuclides.

ISOCs measurements were also obtained in the OWS, DI-11, and DI-13 Vaults (the vaults were not accessible for handheld instrument scanning) with the maximum result being 218 dpm/100 cm² Cs-137, which is far below the DCGL for beta/gamma emitters on surfaces. All of the media samples collected during the Relay Building FSS and Vault Characterization survey that positively identified either Cs-137 and/or Co-60 were at concentrations significantly less than investigation levels, with no other plant-derived nuclides identified.

The licensee's survey results indicated that direct measurements for all of the Office Annex survey units were at a small fraction of the DCGL (the highest measurement had a Sum of Fractions [SOF] of just 0.137 located in OFA01-02). No removable activity measurements (smears) were above the MDC for that measurement method. Scanning surveys did not identify any discernable elevations so no investigative measurements or samples were taken. ISOCs measurements indicated that Cs-137 was detected at a small fraction of the DCGL. Because no measurements exceeded the DCGL, the Sign Test was not required to be performed on the FSS data as the data passed by inspection.

The licensee calculated a number of statistical evaluations using the survey results, and also indicated that "since all result values were less than the alpha gross activity, beta/gamma gross activity, or Cs-137 DCGL, the Sign Test was passed by inspection." The licensee additionally notes that "the maximum hypothetical dose, from pathways from all sources residing within or on building surfaces, to a building occupant", was determined to be less than 0.67 mrem/yr for OFA01-01, 1.59 mrem/yr for OFA01-02, and 0.66 mrem/yr for OFA01-QA1 and that "the dose is compiled from the statistical data evaluated from the survey units." These Total Effective Dose Equivalent (TEDE) values are considerably less than the limit of 25 mrem/yr from Title 10 of the *Code of Federal Regulations* (10 CFR) 20.1402 and would indicate that the radiological criteria for unrestricted use have been met.

2.2 Security Building

The survey units designated for the Security Building (survey units SEC01-01 and SEC01-02) were classified by the licensee as MARSSIM Class 3 units. The licensee describes survey units SEC01-01 & 02 as “as the interior and exterior surfaces respectively of the Security Building (also known as Building 7) which is bounded by Survey Unit OOL10-17 to the North, South and West, and on the East by Survey Unit OOL08-01.” The area of survey unit SEC01-01 is described as 34 m² and the area of SEC01-02 is 77 m². These areas are consistent with MARSSIM guidance on Class 3 structure survey areas (i.e., no size limit).

The licensee’s LTP (Table 5-4) requires 1-10 percent of areal scan coverage for Class 3 survey units. For both survey units, the scan survey design criteria were as follows: 100 percent of accessible survey unit floors and walls to 8 feet. This scan coverage is consistent with MARSSIM (Table 5.9) recommendations for judgmental scan coverage in Class 3 areas.

The licensee’s DQO process was utilized to design the FSS and to develop a gross activity DCGL_{GA} for both beta/gamma and alpha contamination measurements. The beta/gamma-gross activity DCGL was based on Cs-137 and Co-60 weighted at 94 percent and 6 percent, respectively. The alpha-gross activity DCGL was conservatively based on Am-241, since Am-241 was determined to be the most limiting prevalent alpha emitter at HBPP in the March 18, 2014 technical support document, “Gross Activity DCGL in Support of Final Status Survey at HBPP.” The licensee’s beta/gamma DCGL_{GA} was set at 40,600 dpm/100 cm², and the alpha DCGL_{GA} was set at 3,000 dpm/100 cm². Investigation levels for direct measurements were set at >50 percent of the DCGL_{GA} (i.e., >20,300 dpm/100 cm² beta/gamma and >1,500 dpm/100 cm² alpha). The investigation level for scan measurements was designated as a “discernable and reproducible audible indication of activity above background.”

The licensee calculated the required number of discrete measurements as 14, per Section 5.3.3 of the HBPP LTP and Table 5.5 of MARSSIM for Type 1 and Type 2 error rates of 0.05 and a relative shift of >3. The licensee’s survey design included 15 direct measurements for beta/gamma and for alpha in both survey units. A total of 15 smear measurements were also taken in each Survey Unit at the location of the direct measurements in order to assess removable radioactivity.

Media samples from the Security Building roof sediment were obtained and analyzed for plant derived radionuclides. Small amounts of Cs-137 was detected that was consistent with fall out levels. The licensee noted some discrepancies with Tc-99 and Cm-245/246 in on sample, however, a TC-99 result of 3.44 pCi/g was reproducible when the sample was reanalyzed, and the licensee considered it to primarily be an anomalous result. The cm-245/246 result was qualified as likely biased to tailing from the Am-243 ROI, so the licensee considered it “insignificant and likely a false positive result.” No other elevations above the MDC were noted in the media analysis.

The licensee’s survey results indicated that direct measurements for all of the Security Building survey units were at a small fraction of the DCGL (the highest measurement had a SOF of just 0.085 located in SEC01-02). No removable activity measurements (smears) were above the MDC for that measurement method. Scanning surveys did not identify any discernable elevations so no investigative measurements or samples were taken. Because no measurements exceeded the DCGL, the Sign Test was not required to be performed on the FSS data as the data passed by inspection.

The licensee calculated a number of statistical valuations using the survey results, and also indicated that “since all result values were less than the alpha gross activity, beta/gamma gross activity, or Cs-137 DCGL, the Sign Test was passed by inspection.” The licensee additionally notes that “the maximum hypothetical dose, from pathways from all sources residing within or on building surfaces, to a building occupant” was determined to be less than 0.72 mrem/yr for SEC01-01 and 1.15 mrem/yr for SEC01-02 and that “the dose is compiled from the statistical data evaluated from the survey units.” These TEDE values are considerably less than the limit of 25 mrem/yr from 10 CFR 20.1402, and would indicate that the radiological criteria for unrestricted use have been met.

2.3 Intake Structure

The survey unit designated as Intake Structure (survey unit OOL02-02) was classified by the licensee as a MARSSIM Class 3 unit. The licensee describes the survey unit as consisting “of the Unit 1 and Unit 2 Intake Structures, trash racks, screens, pumps, and supporting equipment, with a footprint of approximately 106 m². The survey unit borders the intake canal (Survey Unit OOL02-01) on the south and west, and survey unit OOL10-18 on the north and east, with survey units OOL10-05 and OOL10-06 on a small portion of the southeast portion of the structure.” This area is consistent with MARSSIM guidance on Class 3 structure survey units (i.e., no size limit).

The licensee’s LTP (Table 5-4) requires 1-10 percent of areal scan coverage for Class 3 survey units. For survey unit OOL02-02 the scan survey design criteria was to scan 100 percent of accessible survey unit floors and walls to 8 feet. This scan coverage is consistent with MARSSIM (Table 5.9) recommendations for judgmental scan coverage in Class 3 areas. In addition, the licensee noted that ISOCS measurements taken in an adjoining survey unit (survey unit OOL10-18) had three measurements that overlapped into the OOL02-02 survey unit. No indications of plant-derived radionuclides were noted from the ISOCS measurements and neither were any elevations from the scanning survey identified.

The licensee’s DQO process was utilized to design the FSS and to develop a DCGL_{GA} for both beta/gamma and alpha contamination measurements. The beta/gamma-gross activity DCGL was based on Cs-137 and Co-60 weighted at 94 percent and 6 percent, respectively. The alpha-gross activity DCGL was conservatively based on Am-241, since Am-241 was determined to be the most limiting prevalent alpha emitter at HBPP in the March 18, 2014 technical support document, “Gross Activity DCGL in Support of Final Status Survey at HBPP.” The licensee’s beta/gamma DCGL_{GA} was set at 40,600 dpm/100 cm², and the alpha DCGL_{GA} was set at 3,000 dpm/100 cm². Investigation levels for direct measurements were set at >50 percent of the DCGL_{GA} (i.e., >20,300 dpm/100 cm² beta/gamma and >1,500 dpm/100 cm² alpha). The investigation level for scan measurements was designated as a “discernable and reproducible audible indication of activity above background.”

The licensee calculated the required number of discrete measurements as 14, per Section 5.3.3 of the HBPP LTP and Table 5.5 of MARSSIM for Type 1 and Type 2 error rates of 0.05 and a relative shift of >3. The licensee's survey design included 15 direct measurements for beta/gamma and for alpha in the OOL02-02 survey unit. A total of 15 smear measurements were also taken at the location of the direct measurements in order to assess removable radioactivity. The NRC staff noted that the measurement locations for this survey were judgmentally selected as opposed to randomly selected. This is inconsistent with MARSSIM; however, it is also understandable given the relatively small size of the structure being surveyed. Because the entirety of the survey unit did not have any indications of significant residual radioactivity, the NRC staff consider this adequate, in this case.

The licensee's survey results indicated that direct measurements for the Intake Structure survey unit was at a small fraction of the DCGL (the highest measurement had a SOF of just 0.031). No removable activity measurements (smears) were above the MDC for that measurement method. Scanning surveys did not identify any discernable elevations so no investigative measurements or samples were taken.

In addition, the licensee obtained 5 media samples of scrapings from the Intake Structure. The samples were analyzed for the ETD radionuclides and the licensee noted that neither Co-60 nor Cs-137 were detected above the MDC. The licensee presumes that, because the predominant site ROCs were not present, no other site ROCs will be present.

The licensee calculated a number of statistical parameters using the survey results, and also indicated that "since all result values were less than the alpha gross activity, beta/gamma gross activity, and SOF, the Sign Test was passed by inspection." The licensee additionally notes that "the maximum hypothetical dose, from pathways from all sources, to a building occupant was determined to be less than 0.59 mrem/yr for OOL02-02, and that "the dose is compiled from the statistical data evaluated from the survey units." These TEDE values are considerably less than the limit of 25 mrem/yr from 10 CFR 20.1402, and would indicate that the radiological criteria for unrestricted use have been met. Staff further note that the licensee backfilled the voids in the Intake Structure using soil reclaimed from Class 1 survey units that was screened through the Gamma Radiation Detection and In-Container Analysis (GARDIAN) system, essentially making the structure uninhabitable and also lessening it as a hazard (confined space).

2.4 Count Room Building

The survey units designated for the Count Room Building (survey units CRB01-01, 02, & 03) were designated by the licensee as MARSSIM Class 3 units except for CRB01-03 which was a MARSSIM Class 2 survey unit. The licensee describes the Count Room Building as a Class 3 structure consisting of exterior walls and roof and interior walls and ceiling. The licensee notes that accessible floors of the Laboratory Rooms are where samples were processed and designated as Class 2 areas. The structure sits inside open land Survey Unit OOL10-25. The surface areas of these survey units are listed by the licensee as 3,645 m², 733 m², and 219 m² with the last one being that of the Class 2 survey unit. These areas are consistent with MARSSIM guidance on Class 3 and Class 2 structure survey units (i.e., Class 3 has no size limit and Class 2 should be less than 1,000 m²).

The licensee's LTP (Table 5-4) requires 1-10 percent of areal scan coverage for Class 3 survey units and 10-100 percent for Class 2 survey units. For survey unit CRB01-01, the scan survey design criteria was a 5 percent judgmental scan of the roof, exterior walls, and overhead ceilings. For CRB01-02, the scan survey design criteria was to perform a 100 percent scan of accessible floors, 5 percent scan of interior walls to 6 feet of the Main Office and support areas, and an 80 percent scan of the walls of the Laboratory Room up to 6 feet. For survey unit CRB01-03, the scan survey design criteria was a 100 percent scan of the Laboratory Room floor. This scan coverage is consistent with MARSSIM (Table 5.9) recommendations for judgmental scan coverage in Class 3 and Class 2 areas, as appropriate. The licensee reported it achieved the required scan coverages and no audible indications of elevations were noted during the scanning.

The licensee's DQO process was utilized to design the FSS and to develop a gross activity $DCGL_{GA}$ for both beta/gamma and alpha contamination measurements. The beta/gamma-gross activity DCGL was based on Cs-137 and Co-60 weighted at 94 percent and 6 percent, respectively. The alpha-gross activity DCGL was conservatively based on Am-241, since Am-241 was determined to be the most limiting prevalent alpha emitter at HBPP in the March 18, 2014 technical support document, "Gross Activity DCGL in Support of Final Status Survey at HBPP." The licensee's beta/gamma $DCGL_{GA}$ was set at 40,600 dpm/100 cm², and the alpha $DCGL_{GA}$ was set at 3,000 dpm/100 cm². Investigation levels for direct measurements were set at >50 percent of the $DCGL_{GA}$ (i.e., >20,300 dpm/100 cm² beta/gamma and >1,500 dpm/100 cm² alpha). The investigation level for scan measurements was designated as a "discernable and reproducible audible indication of activity above background."

The licensee calculated the required number of discrete measurements as 14, per Section 5.3.3 of the HBPP LTP and Table 5.5 of MARSSIM for Type 1 and Type 2 error rates of 0.05 and a relative shift of >3. The licensee's survey design included 15 direct measurements for beta/gamma and for alpha in the OFA01-01, 02, & Q01 survey units. A total of 15 smear measurements were also taken in each survey unit at the location of the direct measurements in order to assess removable radioactivity.

The licensee's survey results indicated that direct measurements for all of the Count Room Building survey units were at a small fraction of the DCGL (the highest measurement had a SOF of just 0.141 located in CRB01-01). Only four removable activity measurements (smears) exceeded the MDC for that measurement method and were taken at locations in CRB01-01. The smear activities for those measurements did not exceed 10 percent of the total activity measurements at those locations so were considered consistent with the DCGL basis. Scanning surveys did not identify any discernable elevations so no investigative measurements or samples were taken.

The licensee calculated a number of statistical parameters using the survey results, and also indicated that "since all result values were less than the alpha gross activity, beta/gamma gross activity, Cs-137 DCGL, or SOF, the Sign Test was passed by inspection." The licensee additionally notes that "the maximum hypothetical dose, from pathways from all sources residing within or on building surfaces, to a building occupant" was determined to be less than 1.18 mrem/yr for CRB01-01, 0.41 mrem/yr for CRB01-02, and 0.56 mrem/yr for CRB01-03 and that "the dose is compiled from the statistical data evaluated from the survey units." These TEDE values are considerably less than the limit of 25 mrem/yr from 10 CFR 20.1402, and would indicate that the radiological criteria for unrestricted use have been met.

2.5 Waste Management Facility

The Waste Management Facility was the largest of the structures being surveyed in this report submittal. The survey units designated for the Waste Management Facility (survey units WFM01-01, 02, & 03) were classified by the licensee as MARSSIM Class 3 units while survey units WFM01-04, 05, & 06 were classified as MARSSIM Class 2. The licensee describes survey units per the table below. These areas are consistent with MARSSIM guidance (i.e., Class 3 has no size limit and Class 2 should be less than 1,000 m²).

Survey Unit	Class	Description	Area (m ²)
WFM01-01	3	Building exterior walls and roof	1,851
WFM01-02	3	Building interior ceiling surfaces	1,133
WFM01-03	3	Building interior wall surfaces	688
WFM01-04	2	Concrete push wall and limited accessible/inaccessible floor surfaces behind the push wall	537
WFM01-05	2	Building south floor surfaces	533
WFM01-06	2	Building north floor surfaces	542

The licensee's LTP (Table 5-4) requires 1-10 percent of areal scan coverage for Class 3 survey units and 10-100 percent for Class 2 survey units. This is consistent with MARSSIM (Table 5.9) recommendations for scan coverage in Class 3 and Class 2 areas. For the Waste Management Facility survey units, the scan survey design criteria and accomplishments were as shown in the table below.

Survey Unit	Description of Scan Survey Requirements	Percentage Completed
WFM01-01	10 percent of roof and exterior walls	42 percent of roof (using ISOCS), 5.6 percent of exterior walls
WFM01-02	100 percent of accessible horizontal surfaces	100 percent of accessible horizontal surfaces
WFM01-03	10 percent of accessible interior walls	100 percent scan of the horizontal surfaces of the beam at 7' level and wall surfaces below 7'
WFM01-04	100 percent scan of accessible interior push wall surfaces, 5 percent on backside of inaccessible West wall and floor surfaces, 100 percent of accessible surfaces behind the North and South push walls and floors	100 percent of the accessible interior push wall surfaces, 5 percent of backside of inaccessible West wall and floor surfaces, 100 percent of accessible surfaces behind the North and South push walls and floors
WFM01-05	100 percent accessible south floors	100 percent accessible south floors
WFM01-06	100 percent accessible north floors	100 percent accessible north floors

The licensee noted that it used ISOCS measurements in lieu of traditional scanning for the Waste Management Facility roof due to safety reasons. It is the NRC staff's opinion that ISOCS measurements are not generally adequate substitutes for scanning (ISOCS measurements are essentially large area weighted average measurements vs traditional scanning which uses much smaller detectors in close contact with the surface and which would identify smaller discrete areas of elevated residual radioactivity). Regardless, the measurements do provide information that no detectable large area contamination was found using this method. When combined with the fact that the remainder of the scanning surveys of the Waste Management Facility surfaces, performed using traditional methods, did not find any elevations above background and a media sample of the roof/gutter sediment only identified fallout levels of Cs-137 at much lower concentrations than the DCGL, the NRC staff find the ISOCS measurement substitution adequate, in this case, to demonstrate that no significant elevations were apparent. Because no discernable elevations were identified, no biased measurements or investigations were performed in any of the survey units (note: the licensee did still take the appropriate number of direct measurements from the survey unit that includes the roof).

The licensee's DQO process was utilized to design the FSS and to develop a gross activity DCGL_{GA} for both beta/gamma and alpha contamination measurements. The beta/gamma-gross activity DCGL was based on Cs-137 and Co-60 weighted at 94 percent and 6 percent, respectively. The alpha-gross activity DCGL was conservatively based on Am-241, since Am-241 was determined to be the most limiting prevalent alpha emitter at HBPP in the March 18, 2014 technical support document, "Gross Activity DCGL in Support of Final Status Survey at HBPP." The licensee's beta/gamma DCGL_{GA} was set at 40,600 dpm/100 cm², and the alpha DCGL_{GA} was set at 3,000 dpm/100 cm². Investigation levels for direct measurements were set at >50 percent of the DCGL_{GA} (i.e., >20,300 dpm/100 cm² beta/gamma and >1,500 dpm/100 cm² alpha). The investigation level for scan measurements was designated as a "discernable and reproducible audible indication of activity above background."

The licensee calculated the required number of discrete measurements as 14, per Section 5.3.3 of the HBPP LTP and Table 5.5 of MARSSIM for Type 1 and Type 2 error rates of 0.05 and a relative shift of >3. The licensee's survey design included 15 direct measurements for beta/gamma and for alpha in each survey unit. A total of 15 smear measurements were also taken in each survey unit at the location of the direct measurements in order to assess removable radioactivity.

In addition to the planned direct measurements, ETD gamma emitting radionuclides were measured as a part of the media sample analyses. One media sample, of the roof gutter sediment/debris contained only relatively minor concentrations of Cs-137 (< 0.3 pCi/g which is significantly less than the 7.9 pCi/g DCGL for Cs-137). The licensee stated that the concentrations of Cs-137 were consistent with fallout levels and that no other plant-derived radionuclides were identified.

The licensee's survey results indicated that direct measurements for all of the Waste Management Facility survey units were at a small fraction of the DCGL (the highest measurement had a SOF of just 0.065 located in WFM01-01). No removable activity measurements (smears) were above the MDC for that measurement method. Scanning surveys and ISOCS measurements did not identify any discernable elevations so no investigative measurements or samples were taken. Because no measurements exceeded the DCGL, the Sign Test was not required to be performed on the FSS data as the data passed by inspection.

The licensee calculated a number of statistical parameters using the survey results, and also indicated that “since all result values were less than the alpha gross activity, beta/gamma gross activity, or Cs-137 DCGL, the Sign Test was passed by inspection.” The maximum “hypothetical dose, from pathways from all sources residing within or on building surfaces, to a building occupant” was determined to be less than 1.07 mrem/yr for WFM01-01, 0.55 mrem/yr for WFM01-02, 0.38 mrem/yr for WFM01-03, 0.51 mrem/yr for WFM01-04, 0.70 mrem/yr for WFM01-05, and 0.65 mrem/yr for WFM01-06. The licensee notes that “the dose is compiled from the statistical data evaluated from the survey units.” These TEDE values are considerably less than the limit of 25 mrem/yr from 10 CFR 20.1402, and would indicate that the radiological criteria for unrestricted use have been met.

3.0 CONCLUSION

The NRC staff find the data in the licensee report dated September 24, 2020 (ADAMS Accession No. ML20268B244) adequate to provide reasonable assurance that the survey units designated for the Office Annex (survey units HBPP-FSSP-OFA01-01, 02, & Q01), Security Building (survey units HBPP-FSSP-SEC01 & 02), Intake Structure (survey units HBPP-CHAR-OOL02-02), Count Room Building (survey units HBPP-FSSP-CRB01-01, 02, & 03), and Waste Management Facility (survey units HBPP-FSSP-WMF01-01, 02, 03, 04, 05, & 06) meet the unrestricted use criteria found in 10 CFR 20.1402.

The NRC staff’s findings are supported by confirmatory surveys conducted by Oak Ridge Institute for Science and Education (ORISE) (an independent NRC contractor, see ADAMS Accession No. ML16250A433) in which scanning surveys and direct measurements were performed in the Office Annex Building. The beta scanning surveys performed did not identify any elevations. ORISE obtained 29 direct measurements from these survey units and noted that the gross activity results were all less than 50 percent of the applicable DCGL confirming the licensee’s classification of the survey units. ORISE again visited the site and performed confirmatory surveys in 2019 (see ADAMS Accession No. ML20021A128) with the Waste Management Facility and Security building being included as part of the surveys performed. ORISE’s survey found that residual radioactivity in the structures was less than 10 percent of the DCGLs and confirmed the licensee’s survey unit classification.

The NRC staff concludes that 1) the FSSs were effectively conducted in accordance with the LTP, as amended, even though one scanning survey (the Waste Management Facility roof) was deficient due to safety concerns with accessibility. The NRC staff independently evaluated data in the FSSRs and found the data adequate; (2) the FSSR contains the information identified in NUREG-1757, “Consolidated NMSS Decommissioning Guidance,” Section 4.5; and (3) the FSS results demonstrate that the residual radioactivity in five structures assessed meet the radiological criteria for unrestricted release identified in the LTP. The NRC staff’s conclusion is based on its review of the licensee’s FSSRs, survey release records, and the results of a confirmatory survey conducted by ORISE.

While the NRC staff do not believe the survey evaluations included in this submittal are all inclusive with regards to hypothetical exposure (i.e., these are only structural surveys and do not consider additional exposure considerations due to residual radioactivity in nearby soil or in groundwater), it is apparent to the NRC staff that the residual radioactivity in these other media would not significantly contribute to dose of a building occupant. For example, soil from Class 1 land areas that was screened through the GARDIAN system was used to fill voids in the Intake Structure making it uninhabitable. Also, based on staff reviews of land area survey unit FSSs, the NRC staff do not expect that soil would contribute more than 10 mrem/yr for a resident farmer (see ADAMS Accession No. ML21225A776) such that the hypothetical dose for building occupants with these additional considerations would still be expected to meet the criteria in 10 CFR 20.1402. The NRC staff concludes that the licensee's survey and analyses for these survey units provide reasonable assurance of compliance with the unrestricted release criteria of 10 CFR 20.1402.