Rancho Seco

Final Status Survey Summary Report

(Rev.1)

June 16, 2008

RC Drain Tank (V-600) Room (lowers)

Survey Unit F8130051

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130051, RC Drain Tank (V-600) Room (lowers)

Survey Unit Description:

Operating History: The Auxiliary Building was a reinforced concrete structure which contained the RadWaste processing and supporting systems. The building contained six main elevations. Residual radioactive material was known to be present on all levels of the interior of the building. Operating records and the HSA document several events with the potential for a release of radioactivity inside this structure.

Site Characterization: Direct measurements were made of each of the interior elevation surfaces as well as the exterior surfaces of the structure. These measurements confirmed the presence of plant-derived radionuclides. Direct measurements on the –47' elevation showed a mean gross activity level of 320,071 dpm/100 cm^2 and a maximum value of 5,720,000 dpm/100 cm^2. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the Reactor Coolant Drain Tank (V-600) room within the interior of the auxiliary building was determined to be a Class 1 survey unit.

HSA Events: HSA Report pg. 63.

Survey Unit Design Information:

The Survey Unit Design Parameters are presented in Table 1 below. The survey unit and measurement locations are depicted on the maps in Attachment 1. Direct measurement locations were determined using a random-start, fixed grid pattern and 141 m^2 were scanned for 100% coverage. Samples of removable contamination were collected at each direct measurement location. The instrumentation used for the survey along with the MDC values are listed in Tables 2-1 and 2-2 in Attachment 2.

Table 1. Survey Unit Design Parameters

Survey Design Parameter	Value	Comment
Survey Area:	F813	RC Drain Tank (V-600) Room (lowers)
Survey Unit:	0051	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m^2)**:**	141	
Evaluator:	D.A.Tallman	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	3.6	Class 1
Design DCGLemc (dpm/100 cm^2)**:**	156520	Class 1
LBGR (dpm/100 cm^2)**:**	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	9976	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	6.7	Class 1
Scan Area (m^2)**:**	141	
Scan Coverage (%):	100%	Class 1
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.97725	
Calculated Relative Shift:	2.1	
Relative Shift Used:	2.1	Uses 3.0 if Relative Shift is >3
N-Value:	12	
Design N-Value + 20%:	15	NUREG-1575 Table 5-5
Design Min Samples N:	21	Class 1
Grid Spacing L:	2.5	Class 1

Survey Results:

A total of 26 direct measurements were made in F8130051. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Multiple scan measurements indicated areas of elevated activity. Scan activity ranged from 1922 to 189618 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. Samples for removable surface activity were all less than 10% of the DCGL as shown in Table 3. Removable surface activity samples were counted for alpha activity and none was detected at the MDC shown in Table 2-1 of Attachment 2.

Table 2. Direct Measurement Results

Measurement ID	Gross Activity (dpm/100 cm²)
F8130051-C0001BD	2422
F8130051-C0002BD	2148
F8130051-C0003BD	1982
F8130051-C0004BD	1707
F8130051-C0005BD	1644
F8130051-C0006BD	1971
F8130051-C0007BD	27664
F8130051-C0008BD	2324
F8130051-C0009BD	1608
F8130051-C0010BD	1790
F8130051-C0011BD	1733
F8130051-C0012BD	1769
F8130051-C0013BD	1779
F8130051-C0014BD	1940
F8130051-C0015BD	7221
F8130051-C0016BD	2293
F8130051-C0017BD	2013
F8130051-C0018BD	4565
F8130051-C0019BD	2760
F8130051-C0020BD	5493
F8130051-C0021BD	3138
F8130051-C0022BD	2557
F8130051-C0023BD	2028
F8130051-C0024BD	2314
F8130051-C0025BD	2843
F8130051-C0026BD	2848
Mean:	3560
Median:	2220
Standard Deviation:	5084
Range:	1608 - 27664

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8130051C0001SM	11.97
F8130051C0002SM	4.22
F8130051C0003SM	1.64
F8130051C0004SM	9.38
F8130051C0005SM	4.22
F8130051C0006SM	2.93
F8130051C0007SM	-2.24
F8130051C0008SM	32.63
F8130051C0009SM	8.09
F8130051C0010SM	4.22
F8130051C0011SM	126.91
F8130051C0012SM	11.97
F8130051C0013SM	14.55
F8130051C0014SM	70.08
F8130051C0015SM	-0.95
F8130051C0016SM	4.22
F8130051C0017SM	-0.95
F8130051C0018SM	17.13
F8130051C0019SM	28.76
F8130051C0020SM	21.01
F8130051C0021SM	2.93
F8130051C0022SM	1.64
F8130051C0023SM	48.13
F8130051C0024SM	32.63
F8130051C0025SM	10.68
F8130051C0026SM	1.64
Mean:	17.98
Median:	8.74
Standard Deviation:	27.92
Range:	-2.24 to 126.91

Survey Unit Data Assessment:

The survey design required 26 direct measurements for the Sign Test. The critical value and the results of the Sign Test are presented in Table 4. The sample mean and median values were less than the DCGL. The sample standard deviation was less than the design standard deviation so no additional samples were required.

Table 4. Data Assessment Results

Survey Results Parameter	Value	Comment
Material Background Used (dpm/100 cm^2):	N/A	
Ambient Background Used (dpm/100 cm^2):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	26	
Median (dpm/100 cm^2):	2220	
Mean (dpm/100 cm^2):	3560	
Direct Measurement Standard Deviation (dpm/100 cm^2):	5084	
Total Standard Deviation (dpm/100 cm^2):	5084	Based on samples and backgrounds.
Maximum (dpm/100 cm^2):	27664	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	26	
S+ Value:	26	
Critical Value:	17	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	Yes	Class 1
Total Standard Deviation <= Sigma:	Yes	
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
Does the Survey Unit Pass All Criteria?	Yes	

Survey Unit Investigations and Results:

Six (6) investigations (scan grids 019, 143, 145, Junctures 02, & 42, and Penetration 02) were required for the scan measurements and the results are reported in Attachment 3. The EMC unity rule was not exceeded as shown in Table 3-1.

During routine surveillance surveys utilizing the 44-10 NaI detector, discovery was made in grids 14, 33, 36, 51, 61, and 71. The results of this discovery are detailed in Revision 1 to Attachment 3. The EMC unity rule was not exceeded as shown in Revision 1 to Table 3-1.

ALARA Statement:

As stated in Chapter 4 of the LTP, as long as the residual activity within the survey unit is less than the DCGL (i.e. the survey unit average activity is less than the DCGL and the EMC criterion has been met), the ALARA criterion has been met.

Changes in Initial Survey Unit Assumptions:

The survey unit was designed as a Class 1 structure survey and the sample results are consistent with that classification. The variability of the survey results was less than the characterization data used for survey design. Potential areas of elevated activity were detected and evaluated as shown in Attachment 3 demonstrating that the EMC criterion was met.

Conclusion:

The FSS of this survey unit was properly designed as a Class 1 survey based on Table 5-4 of the LTP. The required number of direct measurements was made and the scan coverage met the requirement of Table 5-6 of the LTP. No direct measurements exceeded the DCGL of 43000 dpm/100 cm^2 and none of the removable surface activity measurements exceeded 10% of the DCGL. The required investigations were performed.

The direct measurement data support rejection of the null hypothesis, providing high confidence that the survey unit satisfied the release criteria and that the data quality objectives were met.

It is concluded that survey unit F8130051 meets the release criteria of 10CFR20.1402.

Attachment 2

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Instrumentation

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Table 2-1. Survey Unit Instrumentation

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static (dpm/100 cm²)	MDC Scan (dpm/100 cm²)
M2350; 203481	43-68B; 161405	433	1033
M2350; 142507	43-68B; 160781		
M2350; 193715	43-68B; 160703		
M2350; 149789 M2350; 193715	43-116-1B; 256006 43-116-1B; 190643	796	3258
M2350; 149789 M2350; 193715	43-116-1B; 256006 43-116-1B; 190643	491[1]	1060[1]
M2350; 203482 M2350; 203486	44-10; 211672 44-10; 171995	NA	18720
Tennelec; 0401171	N/A	6 dpm α, 12 dpm β	N/A

[1] 43-116-1B – Juncture Scan - concrete

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	156520
Investigation Criteria – Scan	43000 [1, 2]
$DCGL_W$	43000
$DCGL_{EMC}$	156520

[1] Scan Investigation Level set at $DCGL_w$
[2] Scan Investigation Level for routine 44-10 surveillance scan set at 20,000 cpm

Attachment 3

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Investigation

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Table 3-1 Survey Unit Investigation

Grid	*Investigation Level (cpm)*	*Initial Value (cpm)*	*Investigation Result (cpm)*	*Elevated Area (m²)*	*Area Factor*	*$DCGL_{emc}$*	*Investigation Result (dpm/100cm²)*	*$DCGL_{emc}$ Unity Fraction*
Grid 19	1990*	2154	1723	NA	NA	NA	NA	0
Grid 145	5840	25848	13262	0.22	60.95	2,620,881	153,584	0.056
Grid 143	5840	13468	5919	0.04	326	14,022,374	68547	0.005
J-42	4260	4529	5515	0.02	649	27,913,730	63868	0.002
J-02	1990*	3031	2498	NA	NA	NA	NA	0
P-02	1990*	2013	2013	0.4	34.65	1,489,303	43380	0.025
G14	20000	44000	44000	0.02	559.7	24,067,100	1,707,808	0.071
G33	20000	37000	37000	0.05	280.9	12,079,990	1,436,111	0.119
G36	20000	35000	35000	0.01	1294.1	55,646,300	1,358,483	0.024
G51	20000	30000	30000	0.01	1294.1	55,646,300	1,164,414	0.021
G61	20000	48000	48000	0.01	1294.1	55,646,300	1,863,063	0.034
G71	20000	37000	37000	0.01	1294.1	55,646,300	1,436,111	0.026
Investigation Level as documented within the survey instructions = 1100 cpm above background. Subsequent to survey performance, the IL was revised to the 1990 value based on the scan speed coefficient modification (0.42 vs. 0.76) During routine surveillance surveys using the 44-10 (NaI), discovery was made within grids 14, 33, 36, 51, 61, &71.								
Survey Unit Remainder						DCGL = 43,000	SU Mean = 6194	0.144
							EMC Unity Sum	0.526