Rancho Seco

Final Status Survey Summary Report

October 8, 2008

+20' Aux Steam Support

Survey Unit F8132134

Prepared By: _____ **Date:** 10-8-2008

FSS Engineer

Reviewed By: Robert F Decker **Date:** 11/12/08

Lead FSS Engineer

Approved By: _____ **Date:** 2-27-09

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8132134, +20' Aux Steam Support

Survey Unit Description:

Operating History: The reinforced concrete structure 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. One report documented contamination of the auxiliary building roof. The roof was later replaced.

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. Direct measurements on the –29' elevation showed a mean gross activity level of 544,756 dpm/100 cm^2 and a maximum value of 11,370,000 dpm/100 cm^2. Direct measurements on the –20' elevation showed a mean gross activity level of 247,831 dpm/100 cm^2 and a maximum value of 10,080,000 dpm/100 cm^2. Direct measurements on the grade elevation showed a mean gross activity level of 373,758 dpm/100 cm^2 and a maximum value of 5,800,000 dpm/100 cm^2. Direct measurements on the +20' elevation showed a mean gross activity level of 85,408 dpm/100 cm^2 and a maximum value of 1,900,000 dpm/100 cm^2. Direct measurements on the +40' elevation showed a mean gross activity level of 3,288 dpm/100 cm^2 and a maximum value of 24,781 dpm/100 cm^2. Direct measurements on the building exterior, including the mezzanine roof, showed a mean gross activity level of 1,897 dpm/100 cm^2 and a maximum value of 2,990 dpm/100 cm^2. (The roof had been replaced prior to the classification survey.) Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the auxiliary building was determined to be a Class 1, 2 area and the exterior was a Class 2,3.

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 2.25 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	+20' Aux Steam Support
Survey Unit:	2134	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m^2)**:**	2.25	
Evaluator:	Gary Frank	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	82.6	Class 1
Design DCGLemc (dpm/100 cm^2)**:**	3551800	Class 1
LBGR (dpm/100 cm^2)**:**	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	342	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	0.16	Class 1
Scan Area (m^2)**:**	2.25	
Scan Coverage (%):	100%	Class 1
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	62.9	
Relative Shift Used:	3	Uses 3.0 if Relative Shift is >3
N-Value:	11	
Design N-Value + 20%:	14	NUREG-1575 Table 5-5
Design Min Samples N:	14	Class 1
Grid Spacing L:	0.4	Class 1

Survey Results:

A total of 15 direct measurements were made in F8132134. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. None of the scan measurements indicated areas of elevated activity. Scan activity ranged from 19124 to 30796 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)
F8132134-C0001BD	3455
F8132134-C0002BD	18674
F8132134-C0003BD	22191
F8132134-C0004BD	6759
F8132134-C0005BD	8575
F8132134-C0006BD	7319
F8132134-C0007BD	4388
F8132134-C0008BD	3688
F8132134-C0009BD	4943
F8132134-C0010BD	2376
F8132134-C0011BD	2355
F8132134-C0012BD	2620
F8132134-C0013BD	2334
F8132134-C0014BD	2122
F8132134-C0015BD	2205
Mean:	6267
Median:	3688
Standard Deviation:	6135
Range:	2122 - 22191

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8132134C0001SM	1
F8132134C0002SM	30.7
F8132134C0003SM	41.03
F8132134C0004SM	4.87
F8132134C0005SM	4.87
F8132134C0006SM	7.46
F8132134C0007SM	3.58
F8132134C0008SM	2.29
F8132134C0009SM	10.04
F8132134C0010SM	1
F8132134C0011SM	3.58
F8132134C0012SM	8.75
F8132134C0013SM	3.58
F8132134C0014SM	1
F8132134C0015SM	11.33
Mean:	9.01
Median:	4.87
Standard Deviation:	11.54
Range:	1 to 41.03

Survey Unit Data Assessment:

The survey design required 15 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 greater than the design standard deviation. Since both values of sigma resulted in a relative shift greater than three (3), no additional samples were required.

Table 4. Data Assessment Results

Survey Results Parameter	Value	Comment
Material Background Used (dpm/100 cm²):	N/A	
Ambient Background Used (dpm/100 cm²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	15	
Median (dpm/100 cm²):	3688	
Mean (dpm/100 cm²):	6267	
Direct Measurement Standard Deviation (dpm/100 cm²):	6135	
Total Standard Deviation (dpm/100 cm²):	6135	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	22191	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	15	
S+ Value:	15	
Critical Value:	11	
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:	Investigate	All values <DCGLw
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
Does the Survey Unit Pass All Criteria?	Investigate	Survey Unit Passes

Survey Unit Investigations and Results:

No investigations were required for either direct or scan measurements and no investigation results are reported.

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, 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 greater than the characterization data used for survey design. However, no additional samples were required. No potential areas of elevated activity were detected. Therefore 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. No investigations were required.

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 F8132134 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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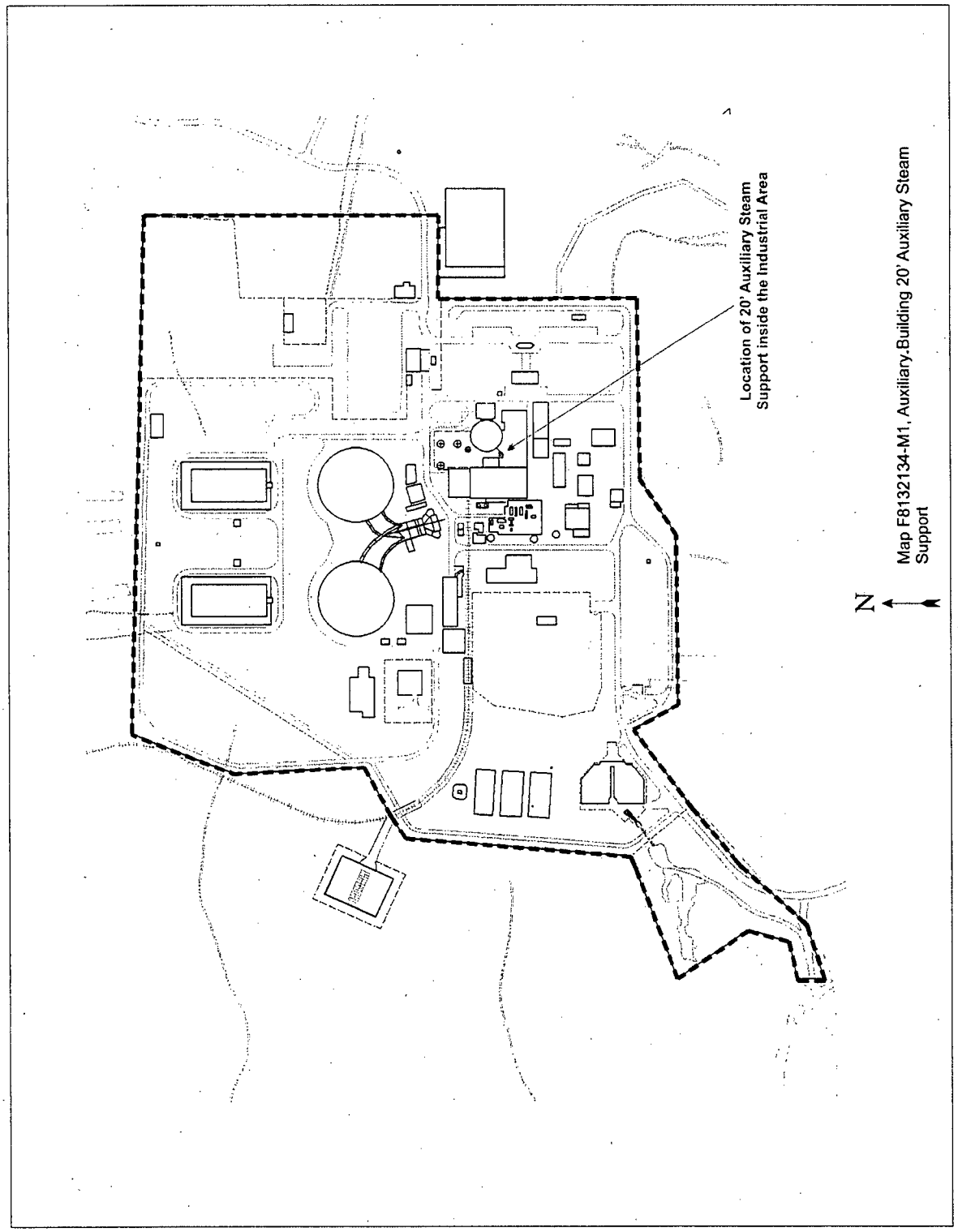
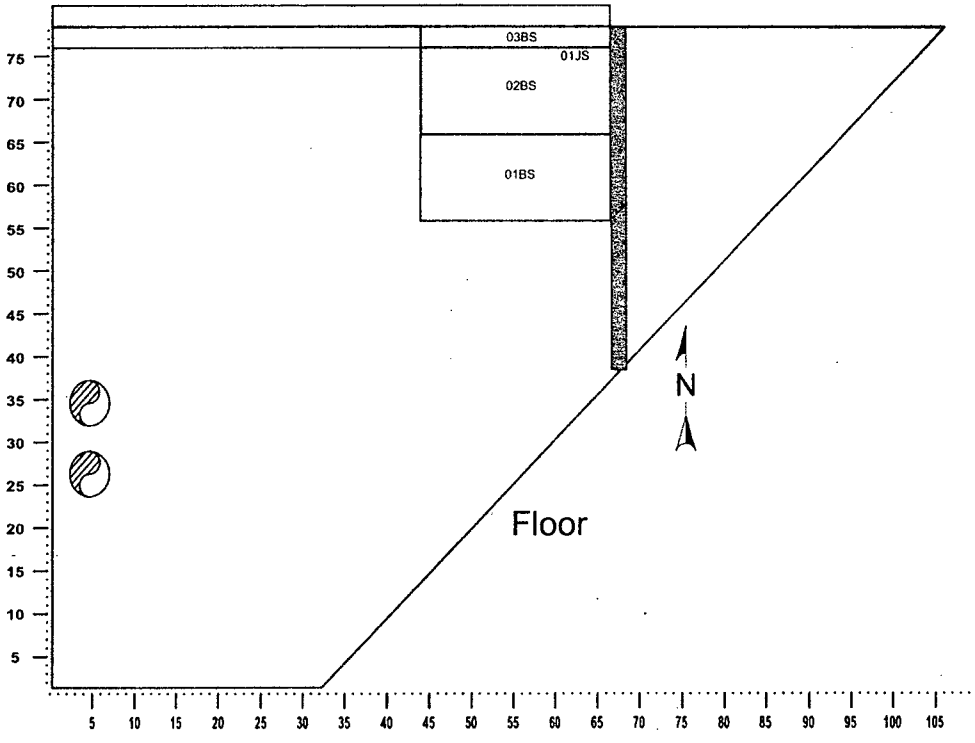
Survey Unit F8132134

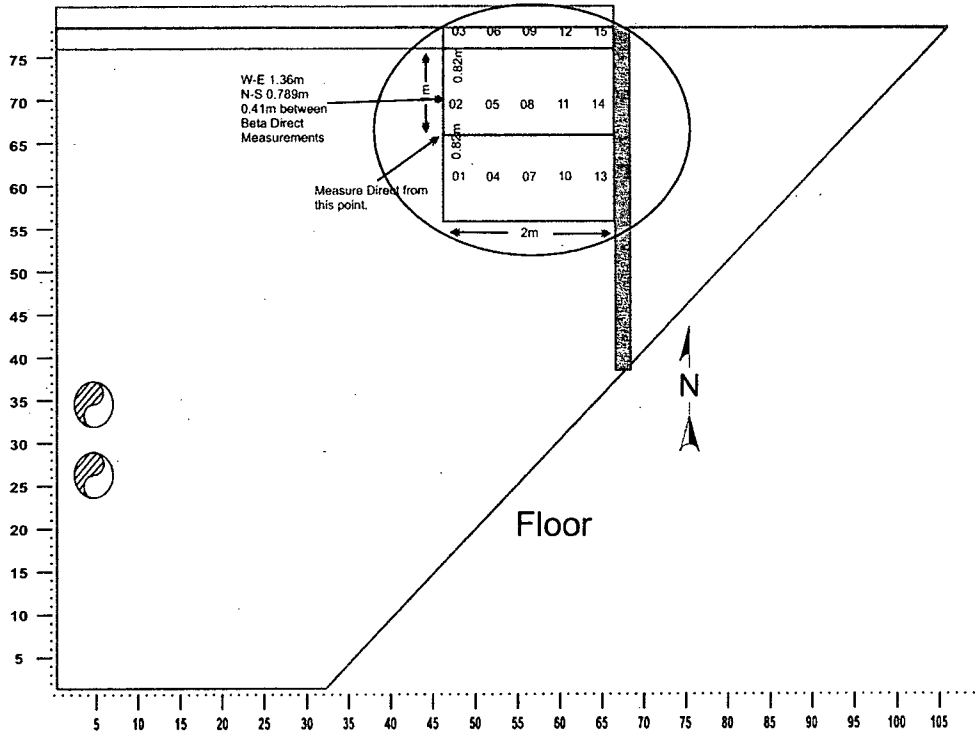

Location of 20' Auxiliary Steam Support inside the Industrial Area
N
Map F8132134-M1, Auxiliary.Building 20' Auxiliary Steam Support

Auxiliary Building Exterior Class 1
20' Auxiliary Steam Support Beta Scans



F8132134-M2

Auxiliary Building Exterior Class 1
20' Auxiliary Steam Support Beta Directs



F8132134-M3

Attachment 2

Instrumentation

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Survey Unit F8132134

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; 193715	43-68B; 148630	433	1033
M2350; 193715	43-116-1B; 256007	796	3258
Tennelec; 0401171	N/A	5 dpm α, 10 dpm β	N/A

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm^2)
Investigation Criteria - Direct	3551800
Investigation Criteria – Scan	3551800
$DCGL_W$	43000
$DCGL_{EMC}$	3551800

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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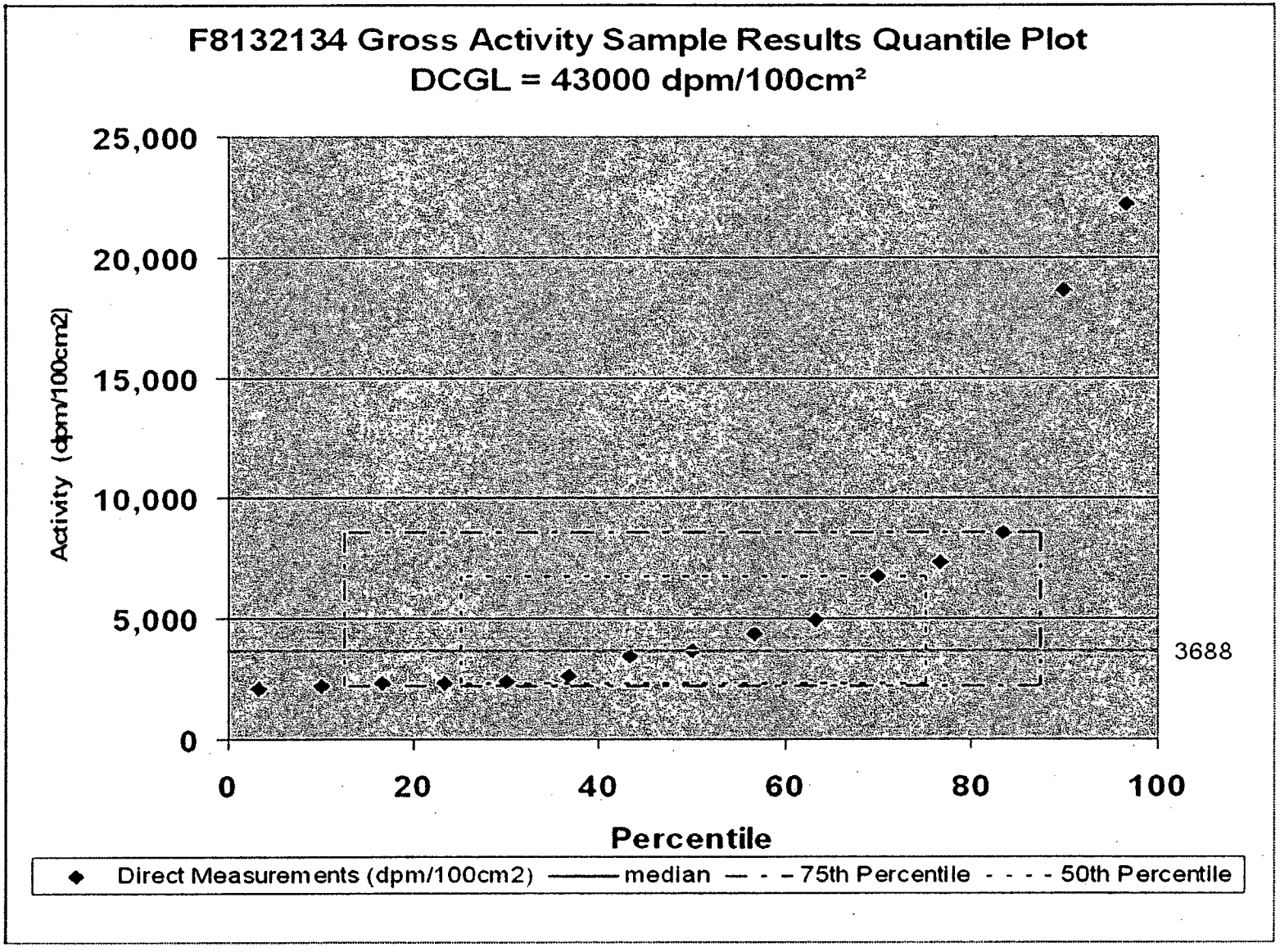
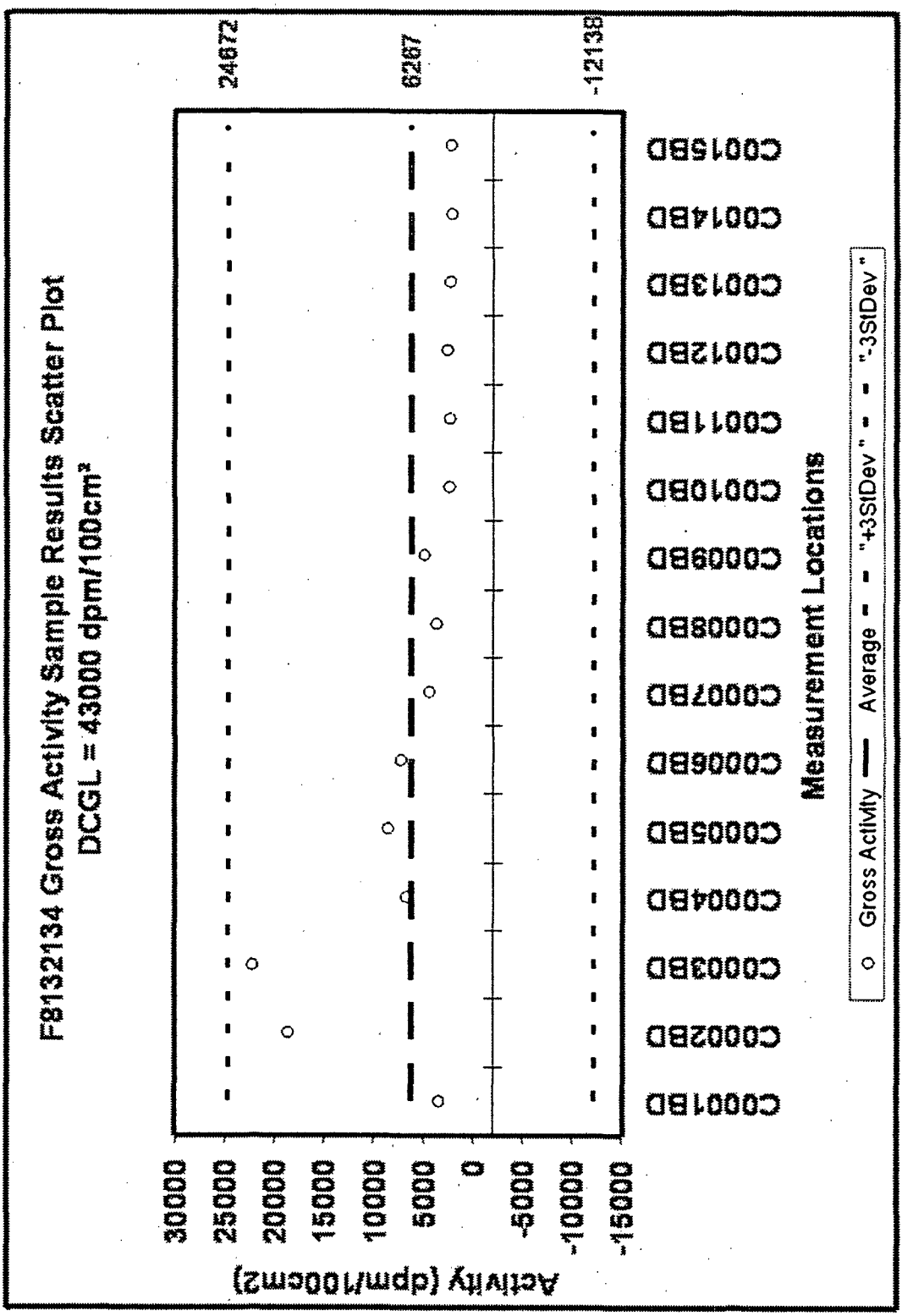
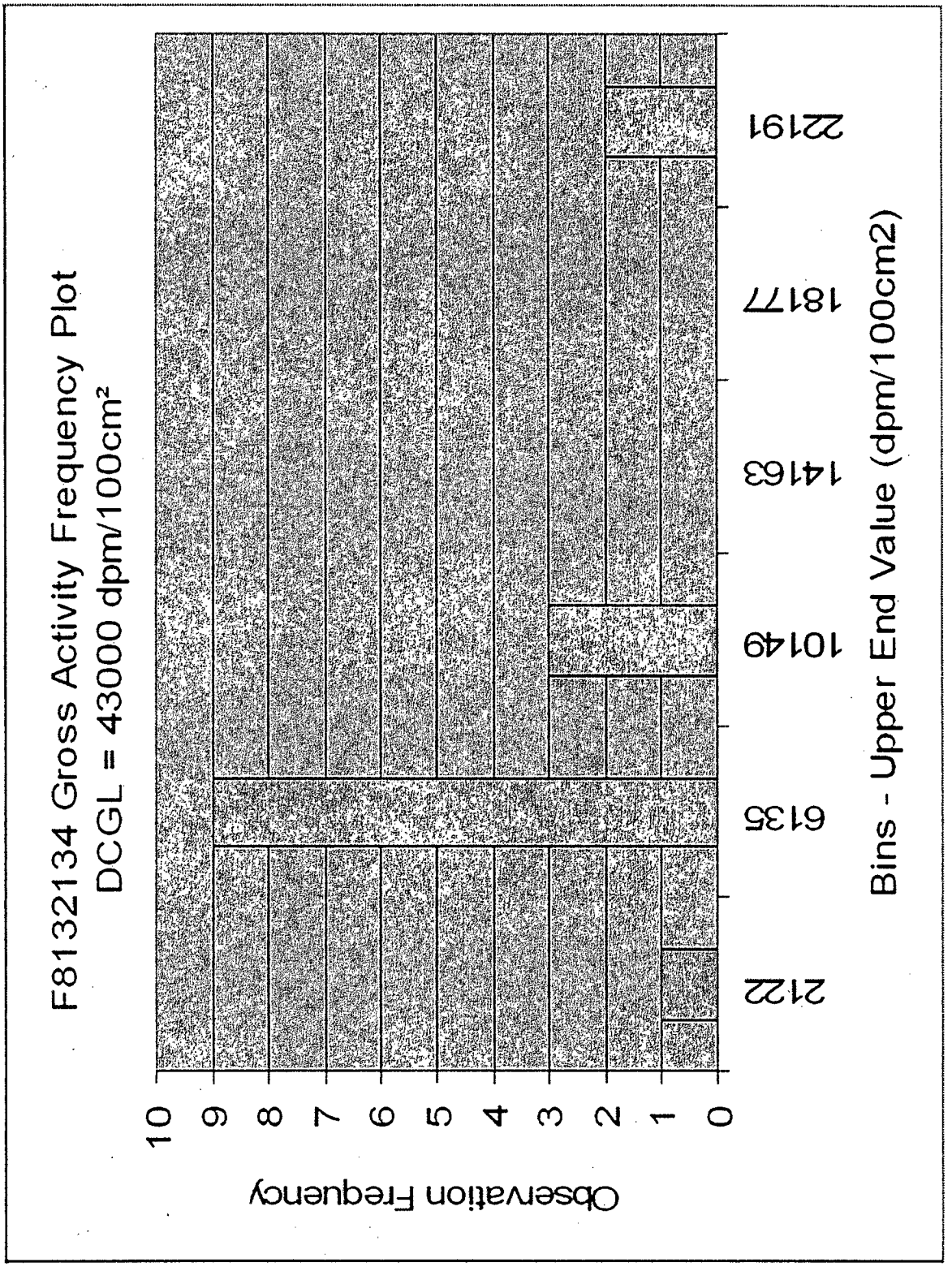

F8132134 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
25,000
20,000
15,000
10,000
5,000
0
3688
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8132134 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
24672
6267
-12138
30000
25000
20000
15000
10000
5000
0
-5000
-10000
-15000
Activity (dpm/100cm2)
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
C0015BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8132134 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
7
8
9
10
212
6135
10149
14163
18177
22191
Bins - Upper End Value (dpm/100cm2)