Rancho Seco

Final Status Survey Summary Report

February 10, 2009

Containment Building Exterior Walls

Survey Unit F8113001

Prepared By: _____ Date: 2-10-2009

FSS Engineer

Reviewed By: _____ Date: 2/11/2009

Lead FSS Engineer

Approved By: _____ Date: 2-27-09

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8113001, Containment Building Exterior Walls

Survey Unit Description:

Operating History: The reinforced concrete structure contained the reactor and supporting systems. The building contained four 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. No events documenting exterior contamination were found.

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 –27' elevation showed a mean gross activity level of 1,535,383 dpm/100 cm^2 and a maximum value of 8,134,000 dpm/100 cm^2. Direct measurements on the grade elevation showed a mean gross activity level of 201,670 dpm/100 cm^2 and a maximum value of 370,000 dpm/100 cm^2. Direct measurements on the +40' elevation showed a mean gross activity level of 51,521 dpm/100 cm^2 and a maximum value of 99,150 dpm/100 cm^2. Direct measurements on the +60' elevation showed a mean gross activity level of 20,110 dpm/100 cm^2 and a maximum value of 46,660 dpm/100 cm^2. Direct measurements on the exterior roof showed a mean gross activity level of 1,364 dpm/100 cm^2 and a maximum value of 1,571 dpm/100 cm^2. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the reactor building was determined to be a Class 1 area and the exterior was a Class 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 randomly determined and 1158 m^2 were scanned for approximately 21% 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:	F811	Containment Building Exterior Walls
Survey Unit:	3001	Structure Surface
Class:	3	LTP Table 5-4
SU Area (m^2):	5516	
Evaluator:	Gary Frank	
DCGL (dpm/100 cm^2):	43000	Gross Activity DCGL
Area Factor:	N/A	Class 3
Design DCGLemc (dpm/100 cm^2):	N/A	Class 3
LBGR (dpm/100 cm^2):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2):	119	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2):	N/A	Class 3
Scan Area (m^2):	1158	
Scan Coverage (%):	21%	Class 3
$Z_{1-\alpha}$:	1.645	
$Z_{1-\beta}$:	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	180.6	
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 3
Grid Spacing L:	N/A	Class 3

Survey Results:

A total of 14 direct measurements were made in F8113001. 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 with 2350-1 w/ 43-68B ranged from 3807 to 7593 dpm/100 cm^2, based on a surveyor efficiency of 0.5 and no background subtracted. ISOCS scans ranged from 725 to 943 dpm/100cm^2 for Cs-137 and 443 to 783 dpm/100cm^2 for Co-60. 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 cm^2)
F8113001-C0001BD	1504
F8113001-C0002BD	1426
F8113001-C0003BD	1328
F8113001-C0004BD	1494
F8113001-C0005BD	1250
F8113001-C0006BD	1385
F8113001-C0007BD	1266
F8113001-C0008BD	1447
F8113001-C0009BD	1359
F8113001-C0010BD	1364
F8113001-C0011BD	1266
F8113001-C0012BD	1281
F8113001-C0013BD	1473
F8113001-C0014BD	1401
Mean:	1375
Median:	1375
Standard Deviation:	88
Range:	1250 - 1504

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8113001C0001SM	-0.29
F8113001C0002SM	-0.29
F8113001C0003SM	1
F8113001C0004SM	1
F8113001C0005SM	3.58
F8113001C0006SM	1
F8113001C0007SM	1
F8113001C0008SM	1
F8113001C0009SM	-0.29
F8113001C0010SM	-0.29
F8113001C0011SM	3.58
F8113001C0012SM	2.29
F8113001C0013SM	-0.29
F8113001C0014SM	1
Mean:	1
Median:	1
Standard Deviation:	1.34
Range:	-0.29 to 3.58

Survey Unit Data Assessment:

The survey design required 14 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):	14	
Median (dpm/100 cm^2):	1375	
Mean (dpm/100 cm^2):	1375	
Direct Measurement Standard Deviation (dpm/100 cm^2):	88	
Total Standard Deviation (dpm/100 cm^2):	88	Based on samples and backgrounds.
Maximum (dpm/100 cm^2):	1504	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	14	
S+ Value:	14	
Critical Value:	10	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	N/A	Class 3
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:

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 3 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.

Conclusion:

The FSS of this survey unit was properly designed as a Class 3 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 F8113001 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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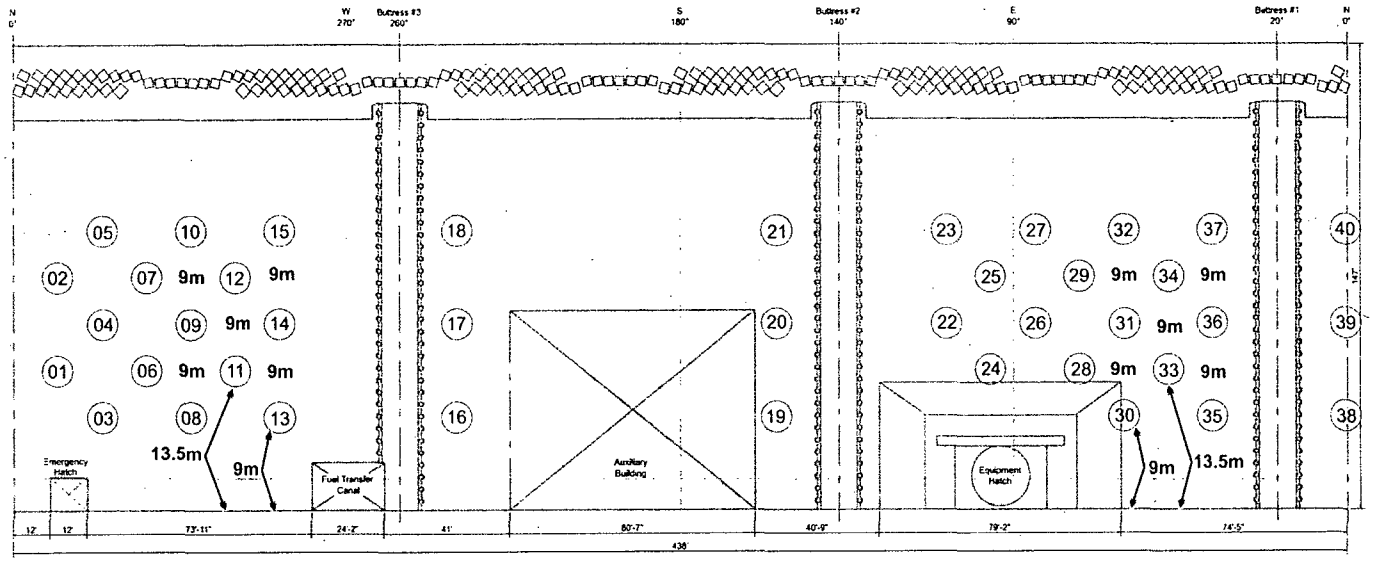
Survey Unit F8113001

Containment Exterior

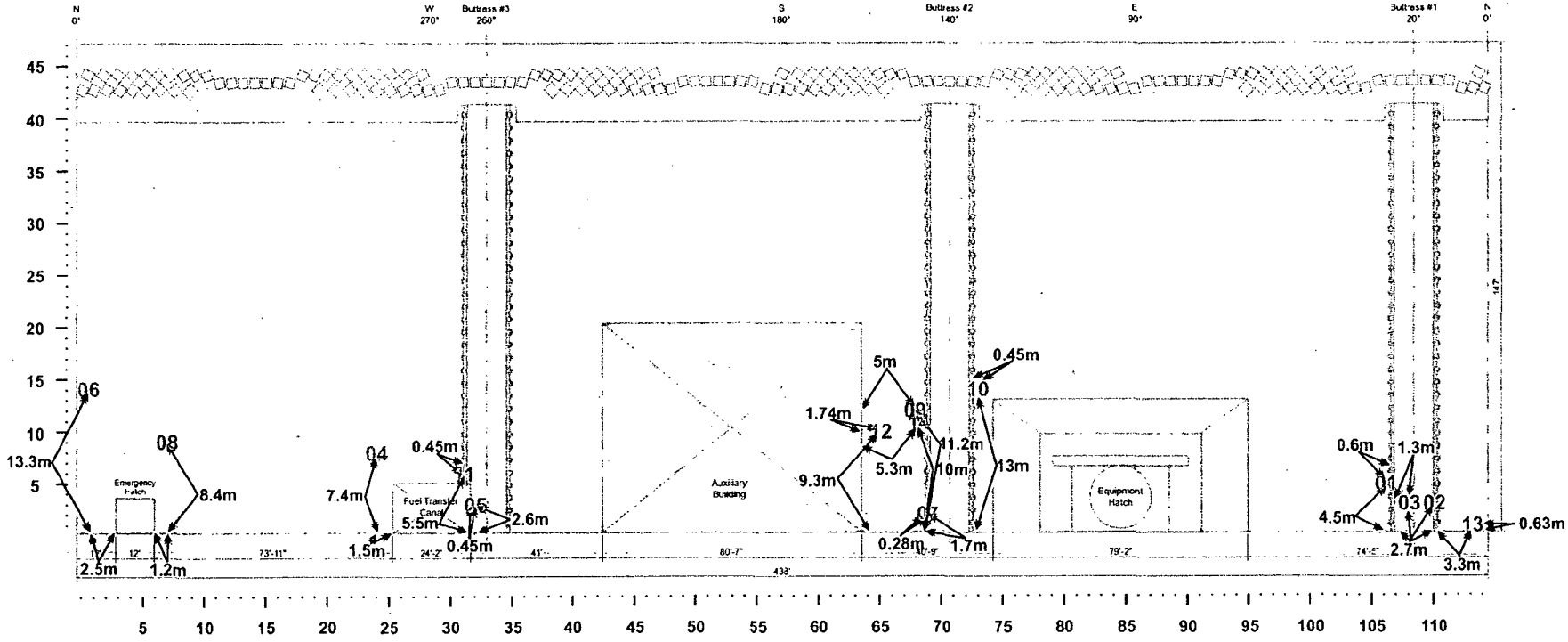


Containment Building Exterior Elevation

Estimated Surface Area:
58,537 ft²
5438.3 m²

WMF saved in: /Exterior Maps/8113001 -Reactor Building/WMFs

F8113001 - M1



Containment Building Exterior
Elevation

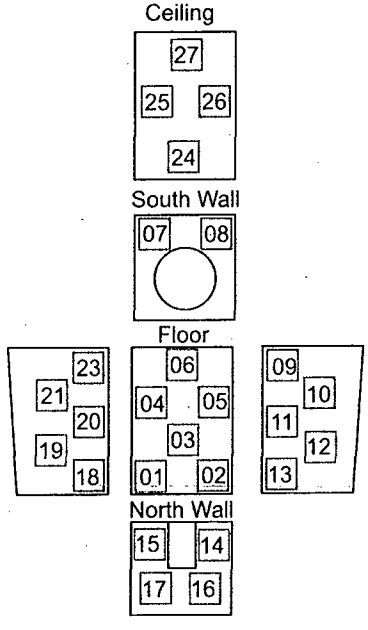
Estimated Surface Area:
58,537 ft²
5438.3 m²

E →

WMF saved in: /Exterior Maps/8113001 -Reactor Building\WMFs

F8113001-M2

Reactor Building Emergency Hatch Interior
Beta Scans



F8113001-M3

Attachment 2

Instrumentation

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Survey Unit F8113001

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; 149789	43-68B; 161415	433	1033
M2350; 175834	43-68B; 148634	433	1033
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	21500
Investigation Criteria – Scan	43000
$DCGL_W$	43000
$DCGL_{EMC}$	N/A

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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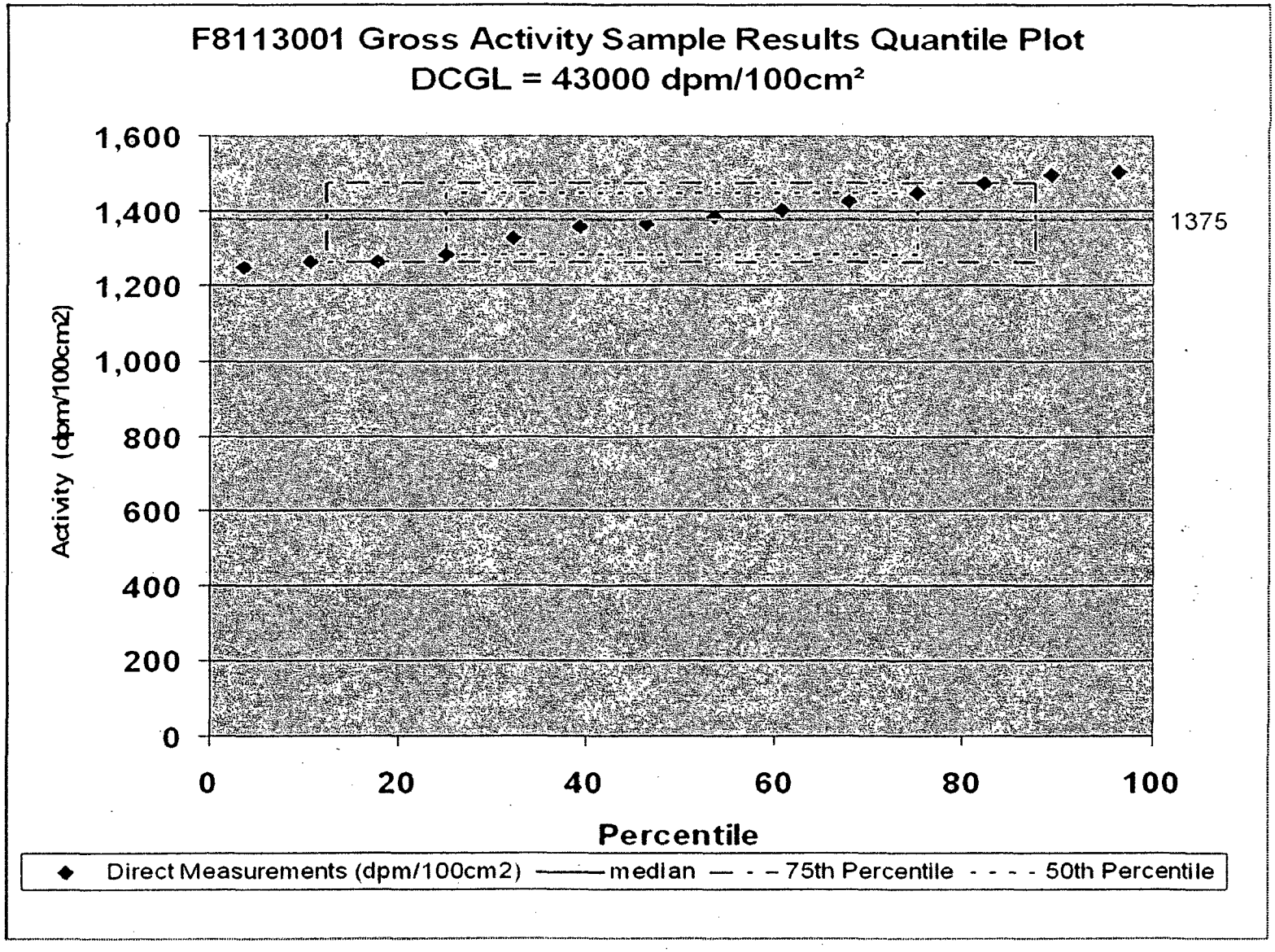
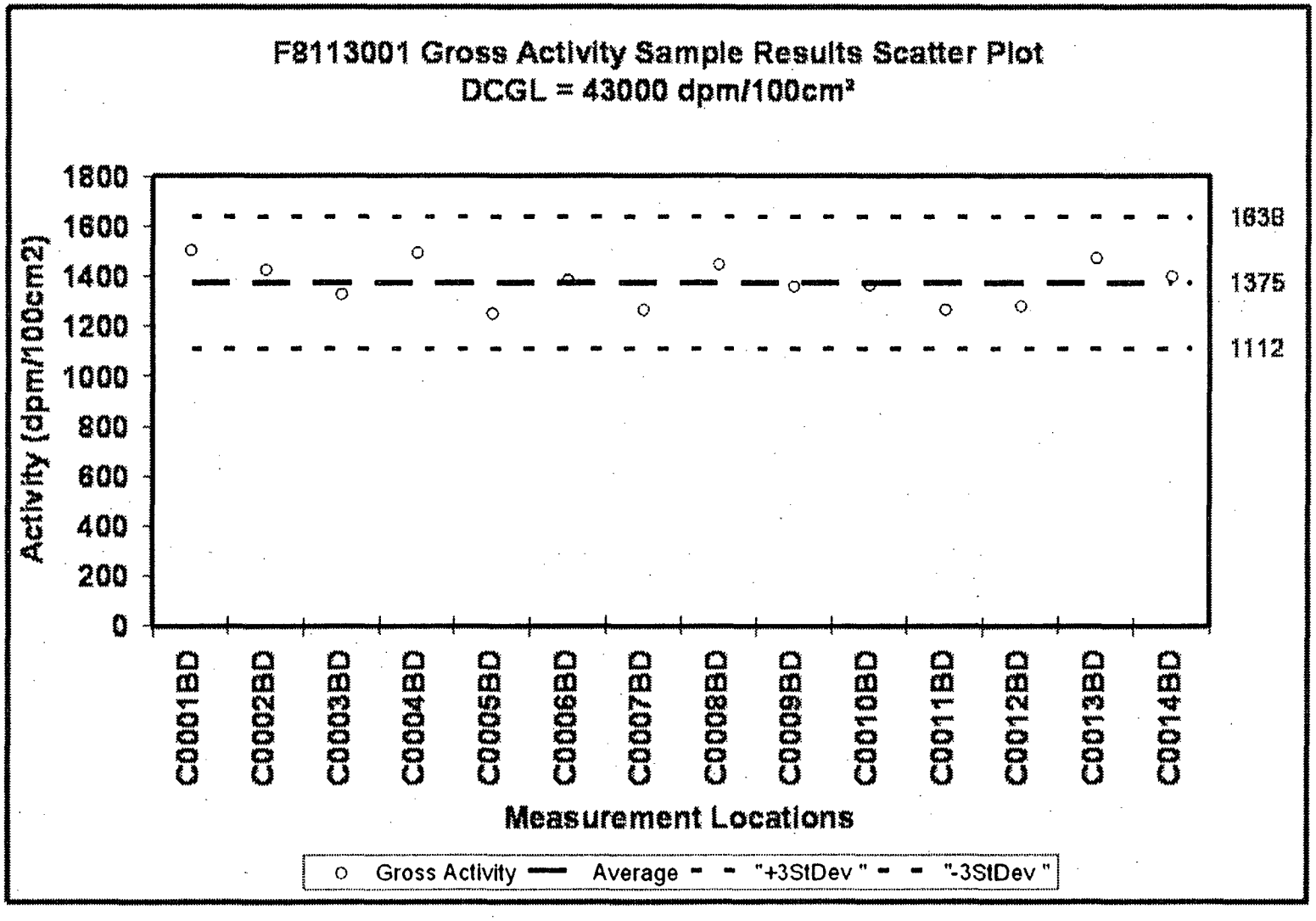
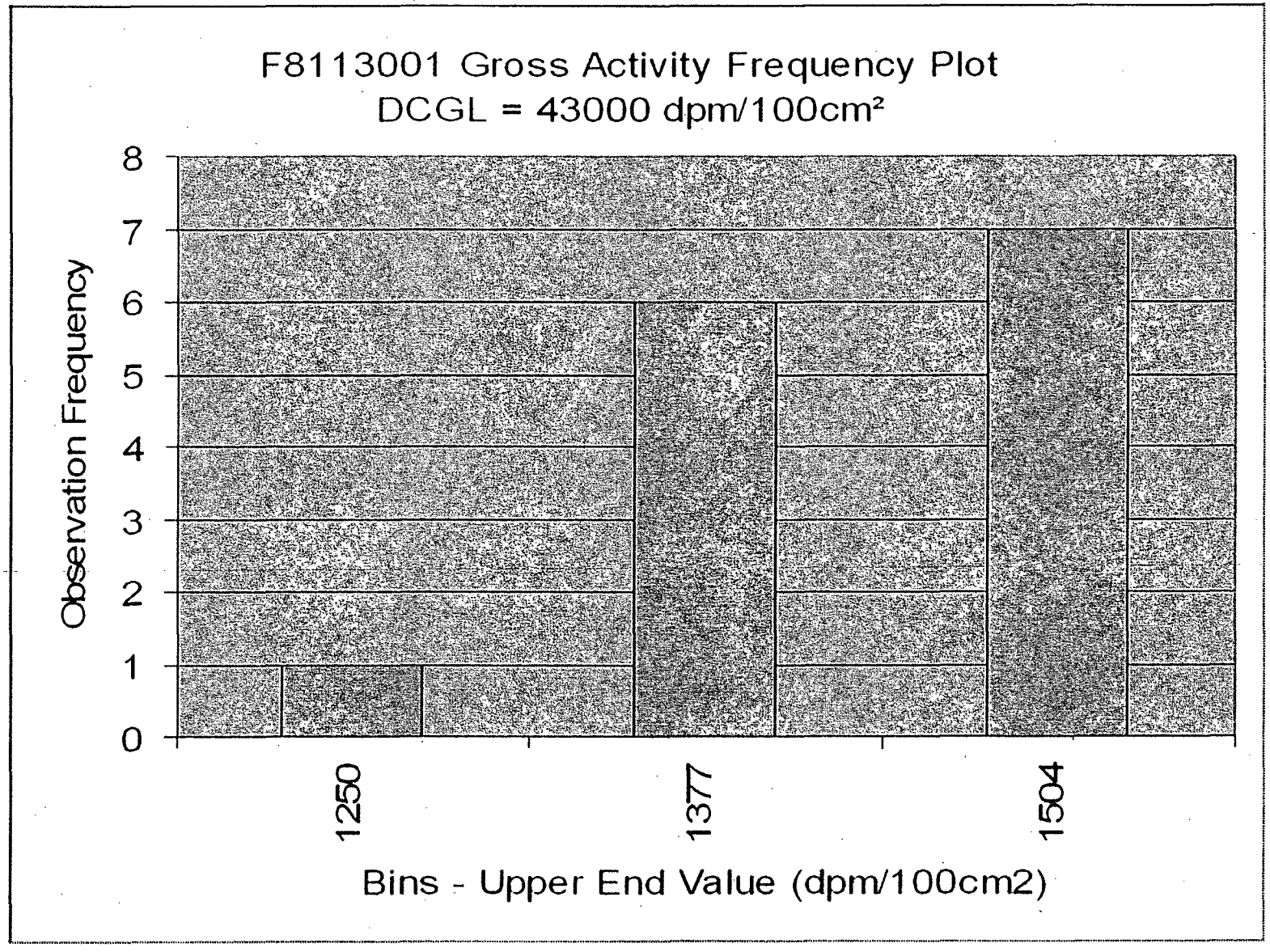

F8113001 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
1,600
1,400
1,200
1,000
800
600
400
200
0
Activity (dpm/100cm2)
1375
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8113001 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
1800
1600
1400
1200
1000
800
600
400
200
0
1638
1375
1112
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8113001 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
7
8
1250
1377
1504
Bins - Upper End Value (dpm/100cm2)