Rancho Seco

Final Status Survey Summary Report

September 5, 2008

Spent Fuel Pool South Wall, (+) 0' El. to (+) 40' El.

Survey Unit F8120002

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Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8120002, Spent Fuel Pool South Wall, (+) 0' El. to (+) 40' El.

Survey Unit Description:

Operating History: The reinforced concrete structure contained the spent fuel pool and supporting systems. The building contained three main elevations including the pool. 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. Three documented instances of contamination through the common fuel building/turbine building wall were noted.

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 pool elevation showed a mean gross activity level of 16,900,000 dpm/100 cm^2 and a maximum value of 200,000,000 dpm/100 cm^2. Direct measurements on the +40' elevation showed a mean gross activity level of 5,942 dpm/100 cm^2 and a maximum value of 19,357 dpm/100 cm^2. Direct measurements on the building exterior showed a mean gross activity level of 1,408 dpm/100 cm^2 and a maximum value of 21,600 dpm/100 cm^2. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the spent fuel 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 137.68 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:	F812	Spent Fuel Pool South Wall
Survey Unit:	0002	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m^2)**:**	137.68	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm^2)**:**	43,000	Gross Activity DCGL
Area Factor:	3.6	Class 1
Design DCGLemc (dpm/100 cm^2)**:**	154,800	Class 1
LBGR (dpm/100 cm^2)**:**	21,500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	12,246	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	2.62	Class 1
Scan Area (m^2)**:**	137.68	
Scan Coverage (%):	100%	Class 1
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.955435	
Calculated Relative Shift:	1.7	
Relative Shift Used:	1.7	Uses 3.0 if Relative Shift is >3
N-Value:	14	
Design N-Value + 20%:	17	NUREG-1575 Table 5-5
Design Min Samples N:	20	Class 1
Grid Spacing L:	2.62	Class 1

Survey Results:

A total of 20 direct measurements were made in F8120002. 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. The gamma activity ranged from < 977 dpm/100 cm^2 Co-60 and < 1,130 dpm/100 cm^2 to 50,475 dpm/100 cm^2 Cs-137. Beta scan activity ranged from 2,399 to 40,311 dpm/100 cm^2, 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 cm^2)
F8120002-C0001BD	7,978
F8120002-C0002BD	2,614
F8120002-C0003BD	3,076
F8120002-C0004BD	3,066
F8120002-C0005BD	1,930
F8120002-C0006BD	1,795
F8120002-C0007BD	1,478
F8120002-C0008BD	1,463
F8120002-C0009BD	1,650
F8120002-C0010BD	1,629
F8120002-C0011BD	1,701
F8120002-C0012BD	1,867
F8120002-C0013BD	2,646
F8120002-C0014BD	2,635
F8120002-C0015BD	3,356
F8120002-C0016BD	1,727
F8120002-C0017BD	3,486
F8120002-C0018BD	2,371
F8120002-C0019BD	1,883
F8120002-C0020BD	2,381
Mean:	2,537
Median:	2,150
Standard Deviation:	1,430
Range:	1,463 – 7,978

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8120002C0001SM	8.09
F8120002C0002SM	9.38
F8120002C0003SM	5.51
F8120002C0004SM	21.01
F8120002C0005SM	2.93
F8120002C0006SM	0.34
F8120002C0007SM	-3.53
F8120002C0008SM	-2.24
F8120002C0009SM	1.64
F8120002C0010SM	-2.24
F8120002C0011SM	-2.24
F8120002C0012SM	-0.95
F8120002C0013SM	-4.82
F8120002C0014SM	-2.24
F8120002C0015SM	-2.24
F8120002C0016SM	0.34
F8120002C0017SM	0.34
F8120002C0018SM	-0.95
F8120002C0019SM	4.22
F8120002C0020SM	-0.95
Mean:	1.57
Median:	-0.3
Standard Deviation:	5.93
Range:	-4.82 to 21.01

Survey Unit Data Assessment:

The survey design required 20 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 cm²):	N/A	
Ambient Background Used (dpm/100 cm²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	20	
Median (dpm/100 cm²):	2,150	
Mean (dpm/100 cm²):	2,537	
Direct Measurement Standard Deviation (dpm/100 cm²):	1,430	
Total Standard Deviation (dpm/100 cm²):	1,430	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	7,978	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	20	
S+ Value:	20	
Critical Value:	14	
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:

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 (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. 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 43,000 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 F8120002 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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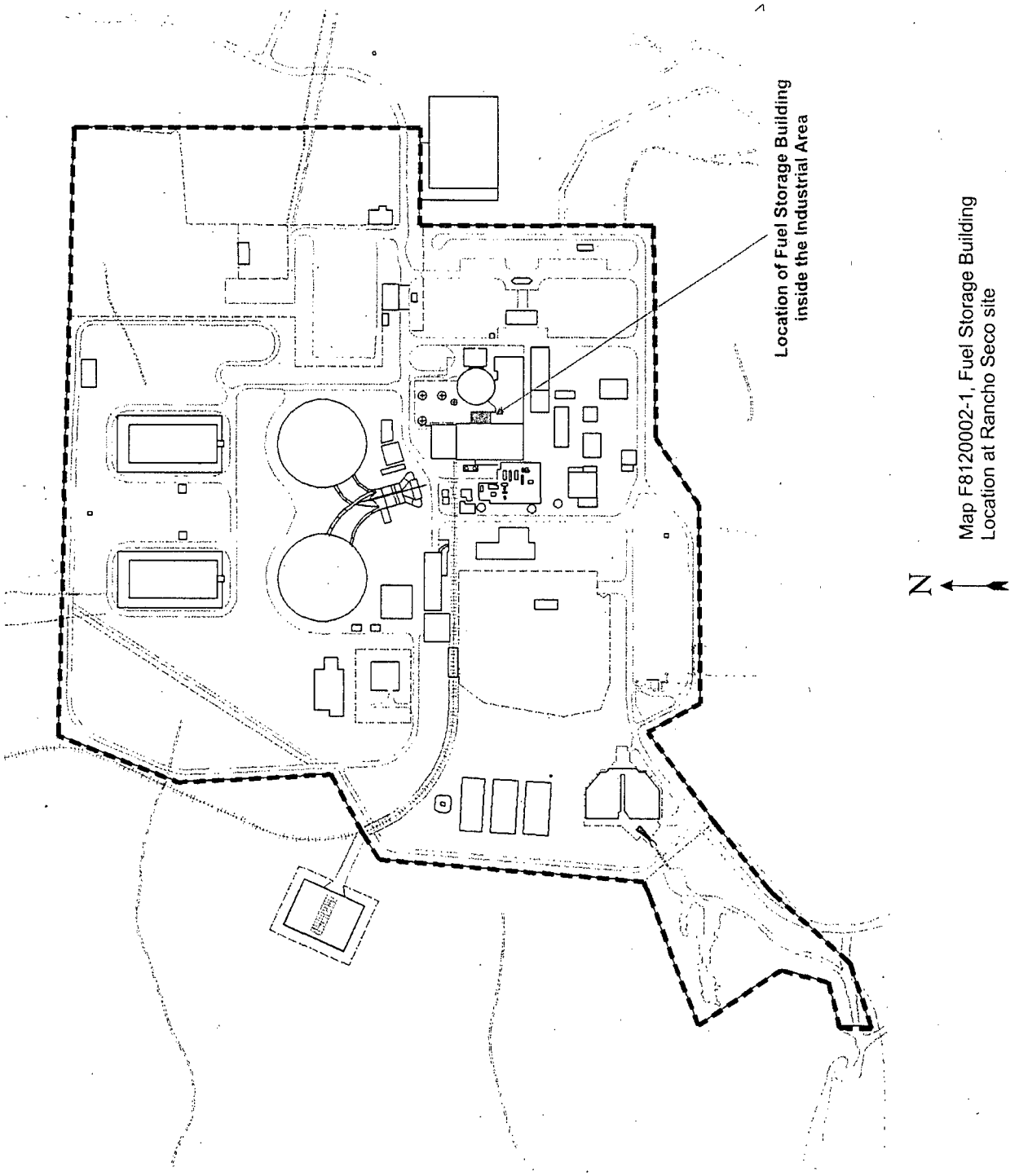
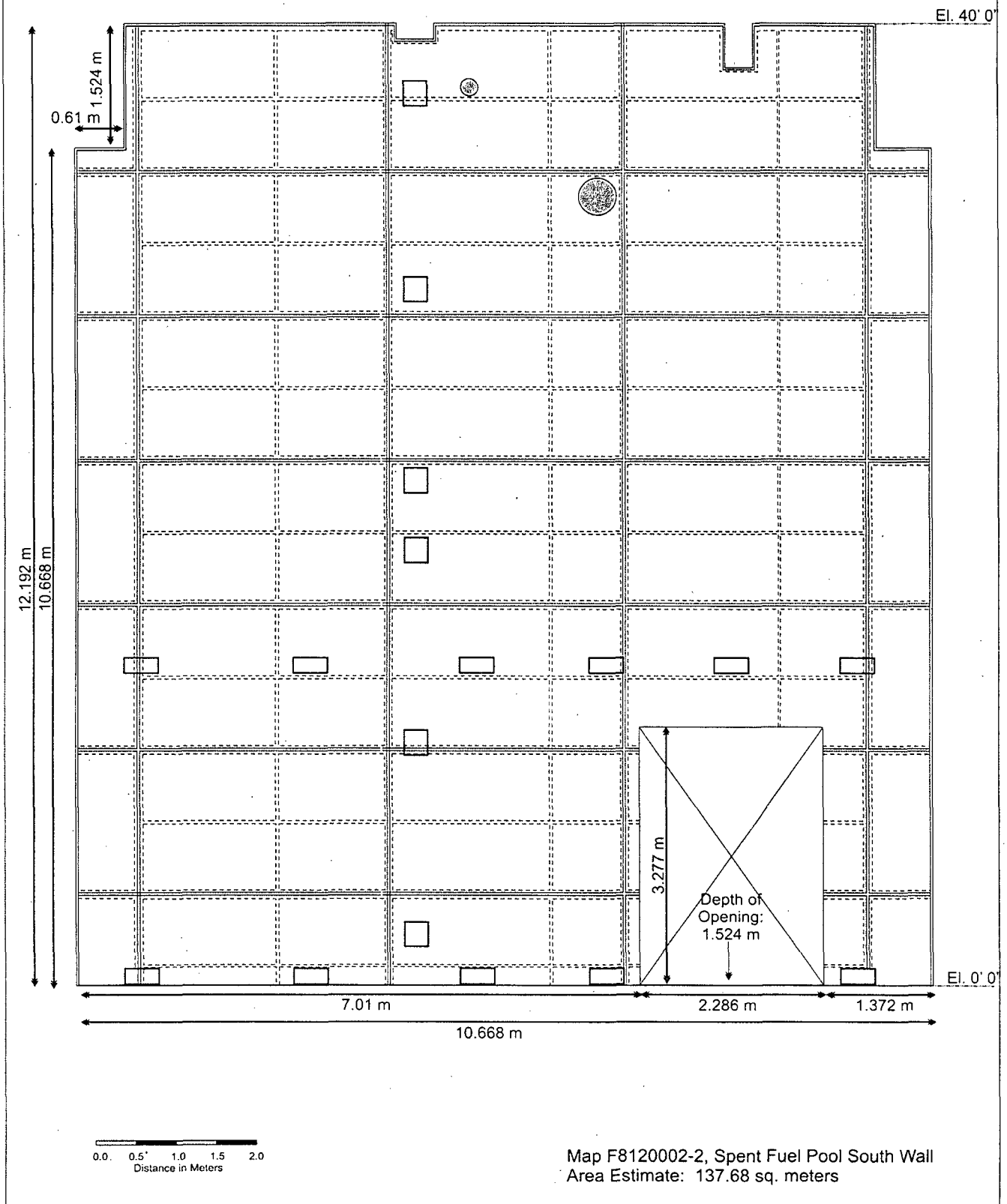
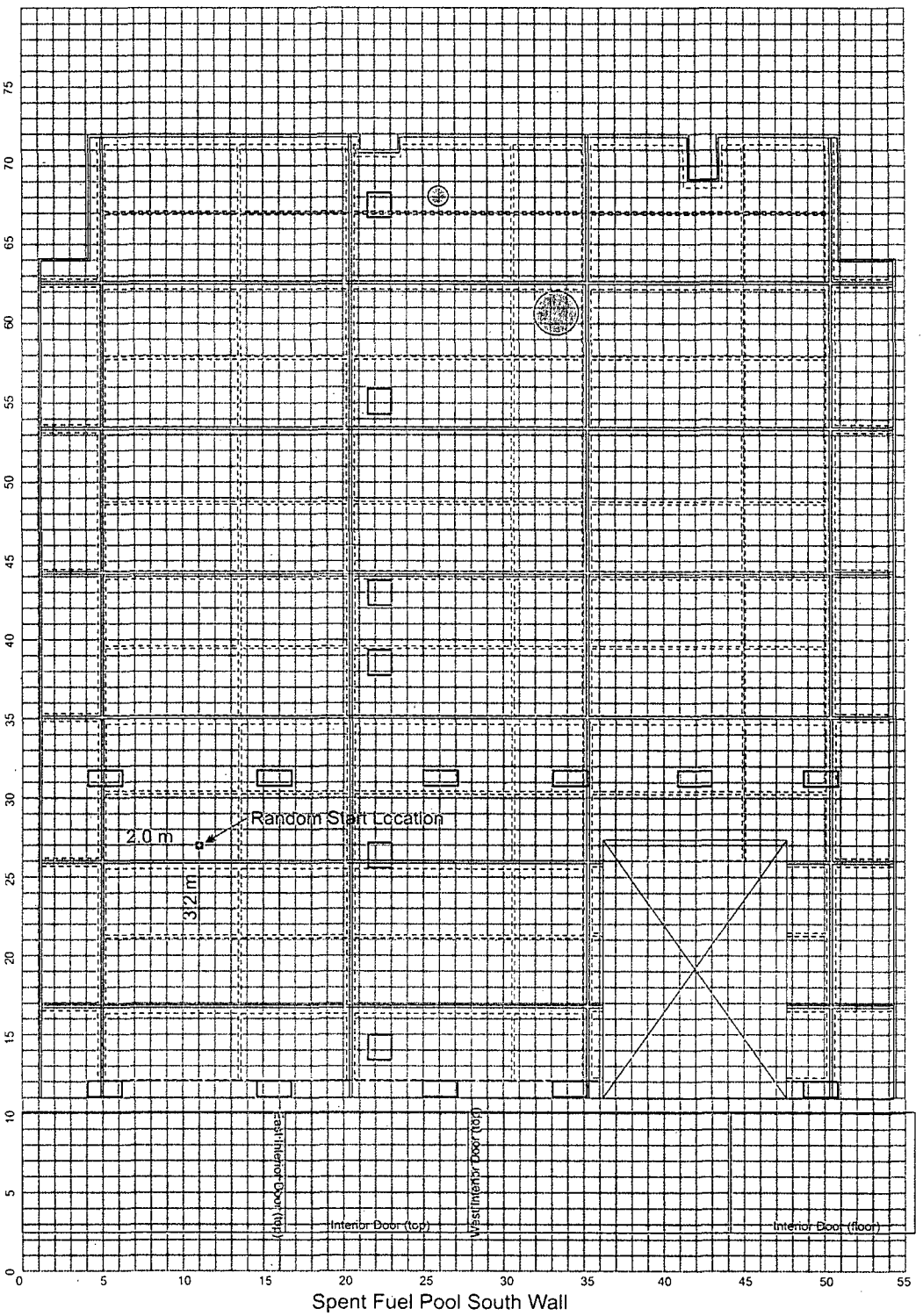
Survey Unit F8120002

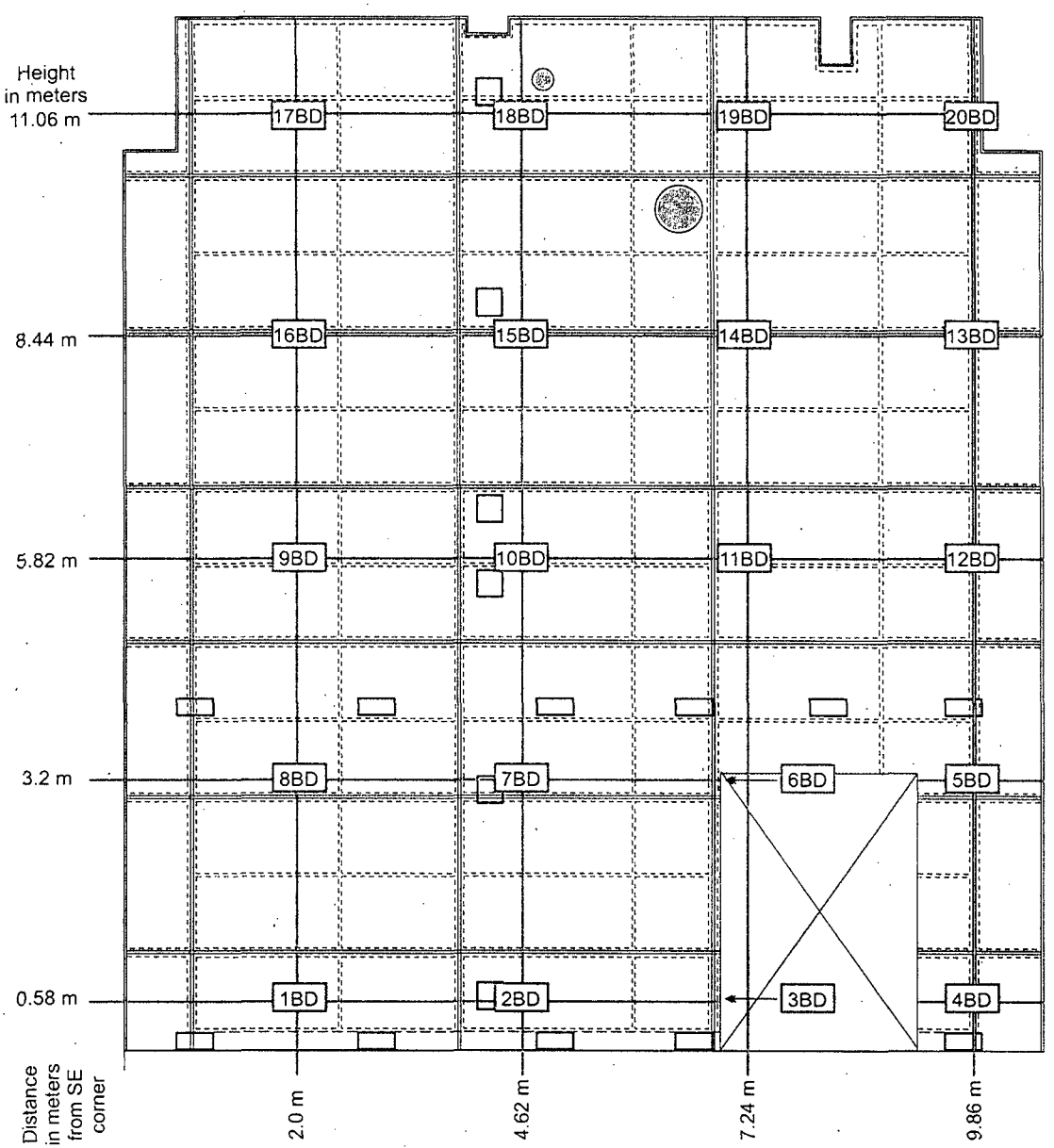

Location of Fuel Storage Building
inside the Industrial Area
N
Map F8120002-1, Fuel Storage Building
Location at Rancho Seco site



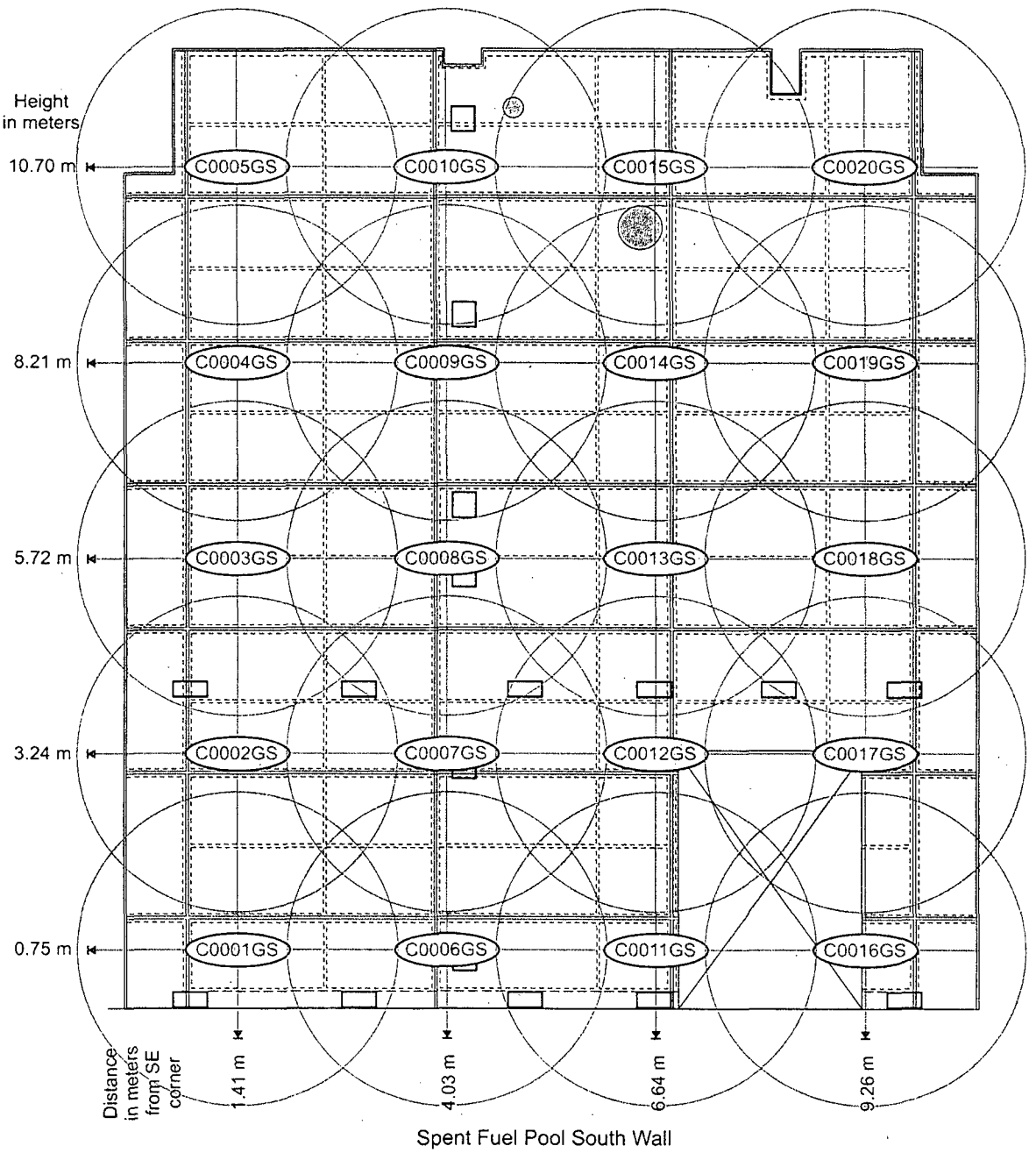
Map F8120002-2, Spent Fuel Pool South Wall
Area Estimate: 137.68 sq. meters



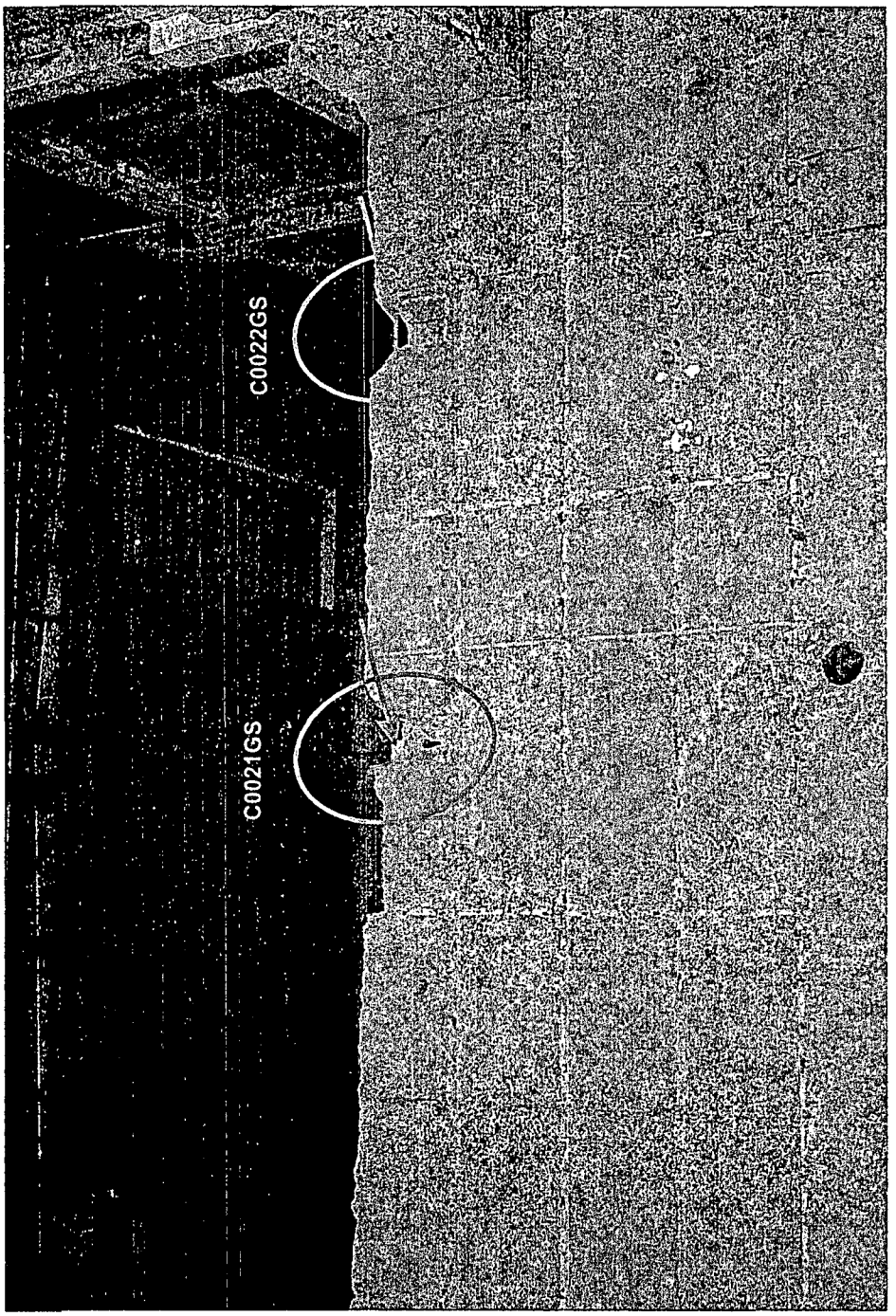
Map F8120002-3, Spent Fuel Pool South Wall
Random Start Location



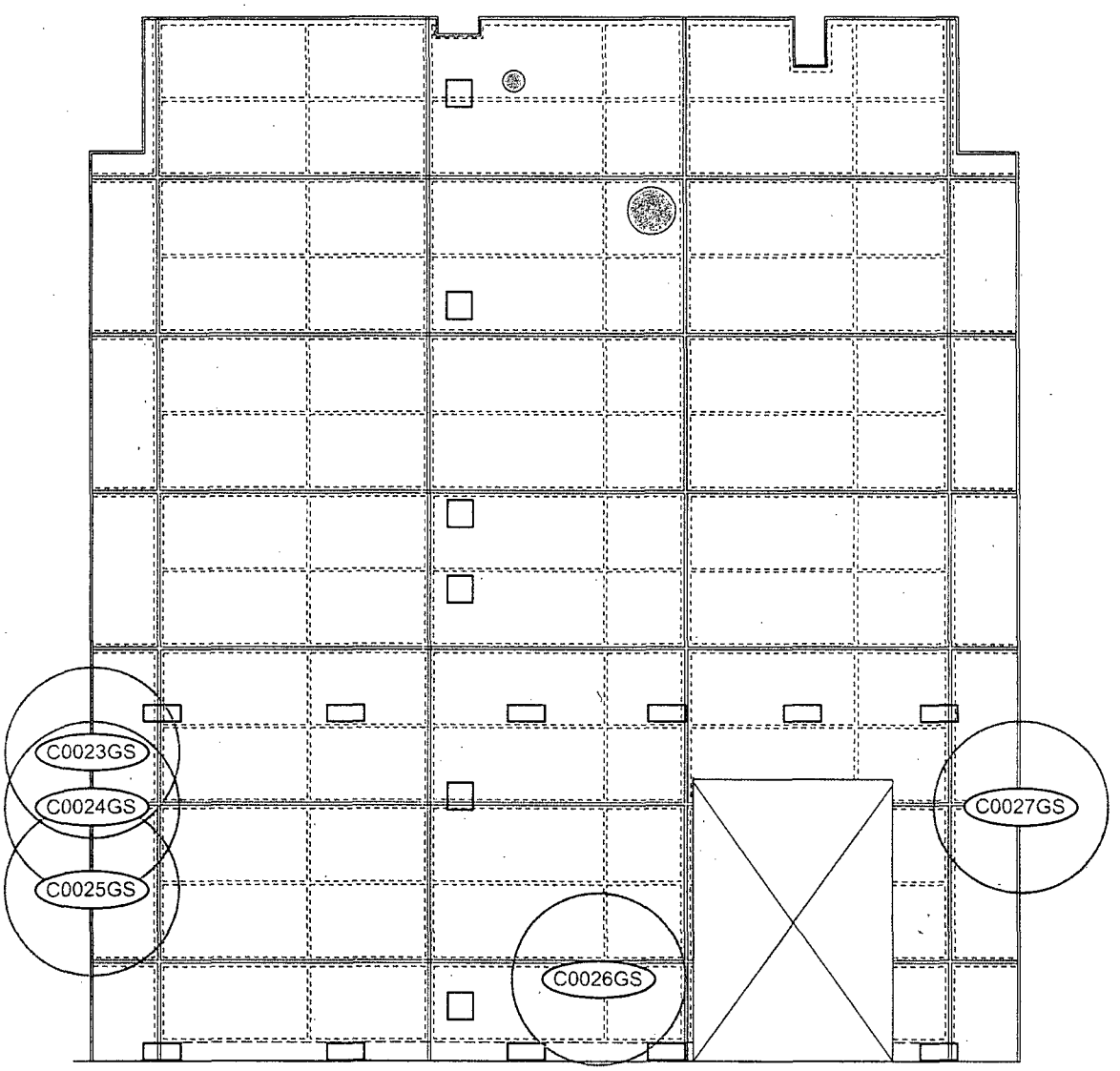
Map F8120002-4, Spent Fuel Pool South Wall
Beta Direct Measurements
F8120002C0001BD to F8120002C0020BD
2.62 sq. meter grid spacing



Map F8120002-5, Spent Fuel Pool South Wall
ISOCS Gamma Scan Measurements
F8120002C0001GS to F8120002C0020GS
12.57 sq. meter field of view



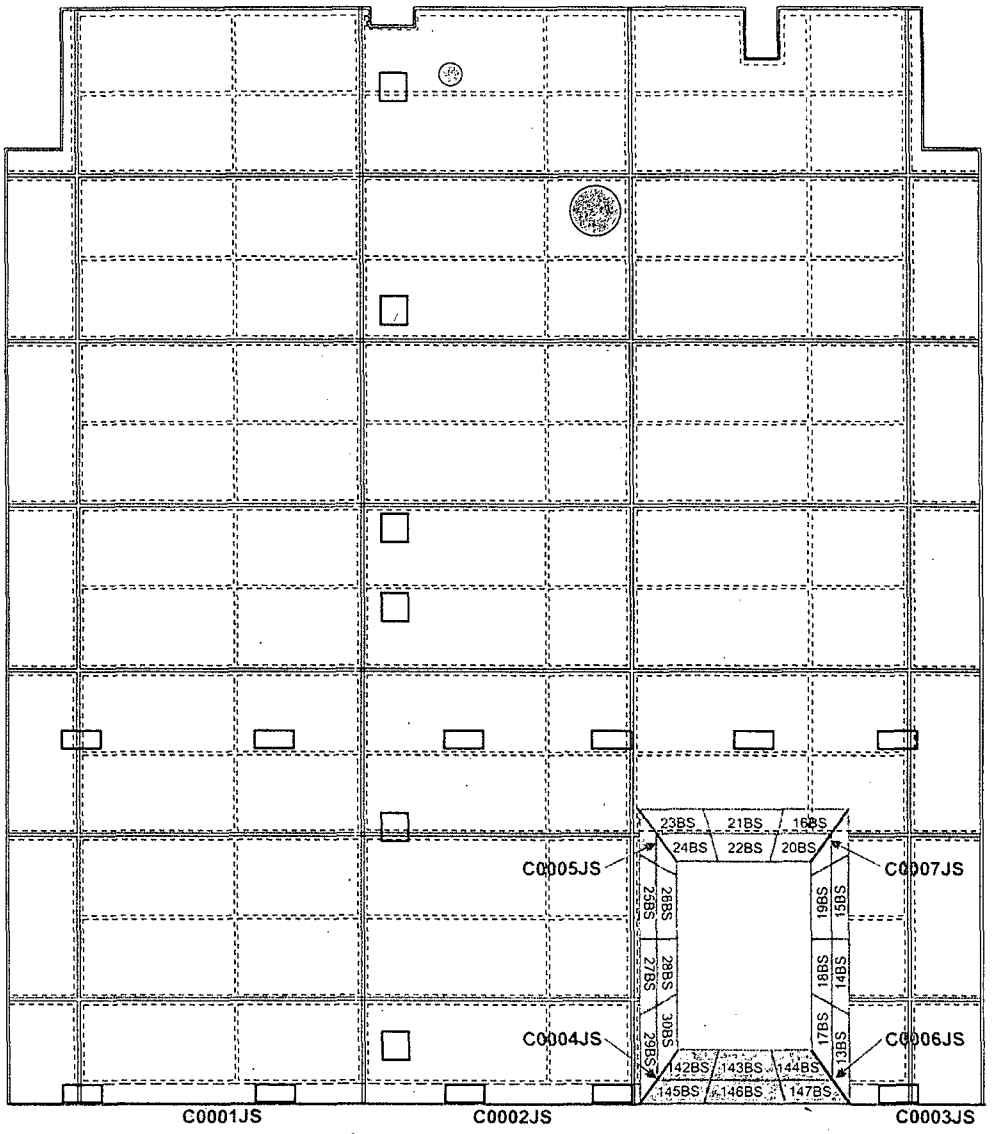
Map F8120002-6, Spent Fuel Pool South Wall
ISOCS Gamma Scan Measurements
F8120002C0021GS to F8120002C0022JS
3.14 sq. meter field of view



Spent Fuel Pool South Wall

0.0 0.5 1.0 1.5 2.0
Distance in Meters

Map F8120002-7, Spent Fuel Pool South Wall
ISOCS Gamma Scan Measurements
F8120002C0023GS to F8120002C0027GS
3.14 sq. meter field of view



Spent Fuel Pool South Wall

0.0 0.5 1.0 1.5 2.0
Distance in Meters

Map F8120002-8, Spent Fuel Pool South Wall
Beta Scan Measurements
F8120002C0013BS to F8120002C0030BS and
F8120002C0142BS to F8120002C0147BS
Juncture Scan Measurements
F8120002C0001JS to F8120002C0007JS

Attachment 2

Instrumentation

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Survey Unit F8120002

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; 203486	43-68B; 161400	433	1,033
M2350; 175834	43-116-1B; 190642	491	739
Tennelec; 0401171	N/A	5.88 dpm α, 11.71 dpm β	N/A

Instrument	Detector Model No.	Detector Serial No.	MDC
ISOCS	N/A	1983920	Concrete – 1,130 dpm/100 cm^2 Cs-137, Concrete – 977 dpm/100 cm^2 Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm^2)
Investigation Criteria - Direct	154,800
Investigation Criteria – Scan (ISOCS average activity – 12.6 sq. meter field of view)	63,300 Cs-137 20,000 Co-60
Investigation Criteria – Scan (ISOCS average activity – 3.1 sq. meter field of view)	180,000 Cs-137 60,000 Co-60
$DCGL_W$	43,000
$DCGL_{EMC}$	154,800

Attachment 3

Investigation

September 5, 2008

Survey Unit F8120002

(none required)

Attachment 4

Data Assessment

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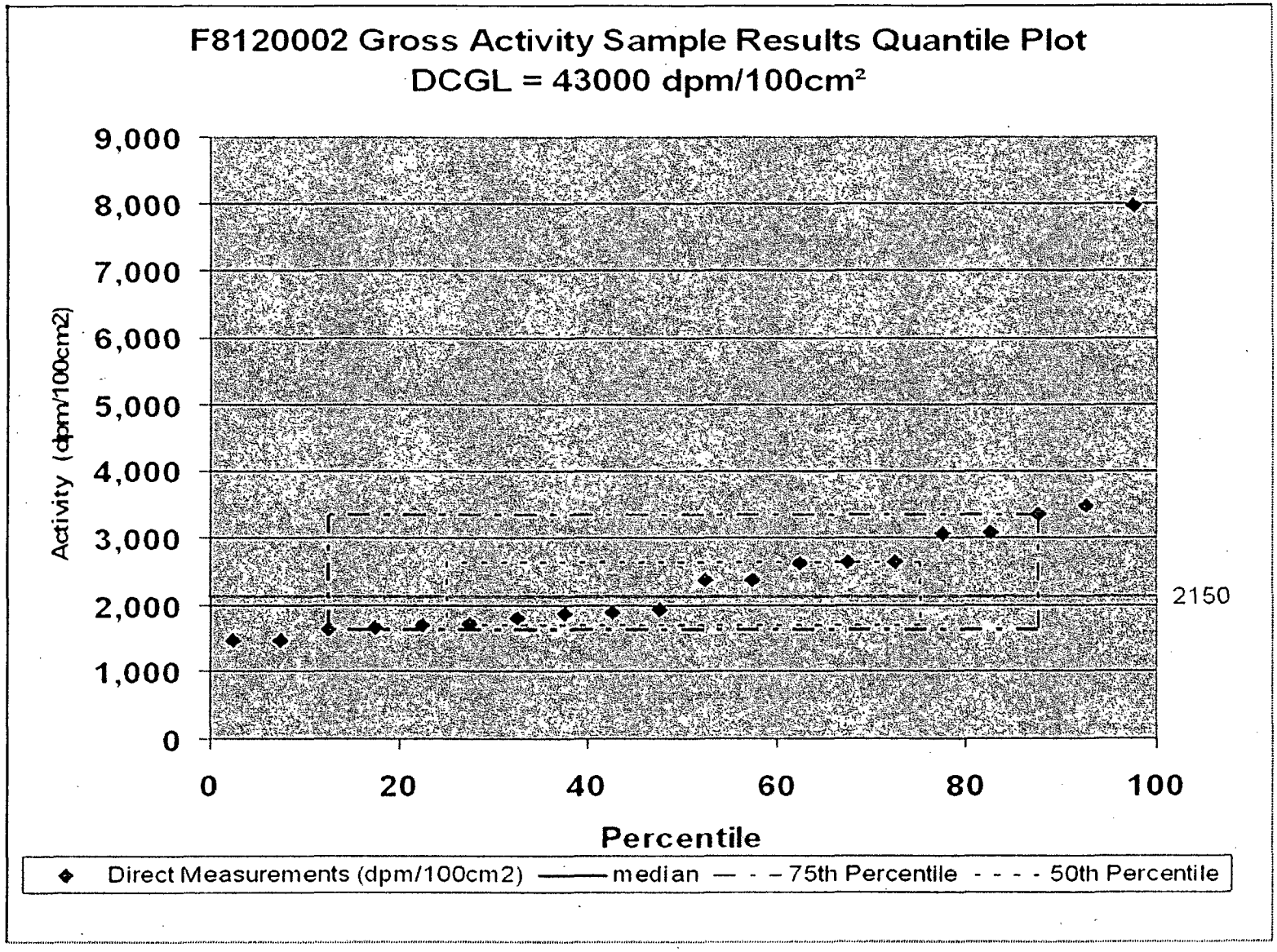
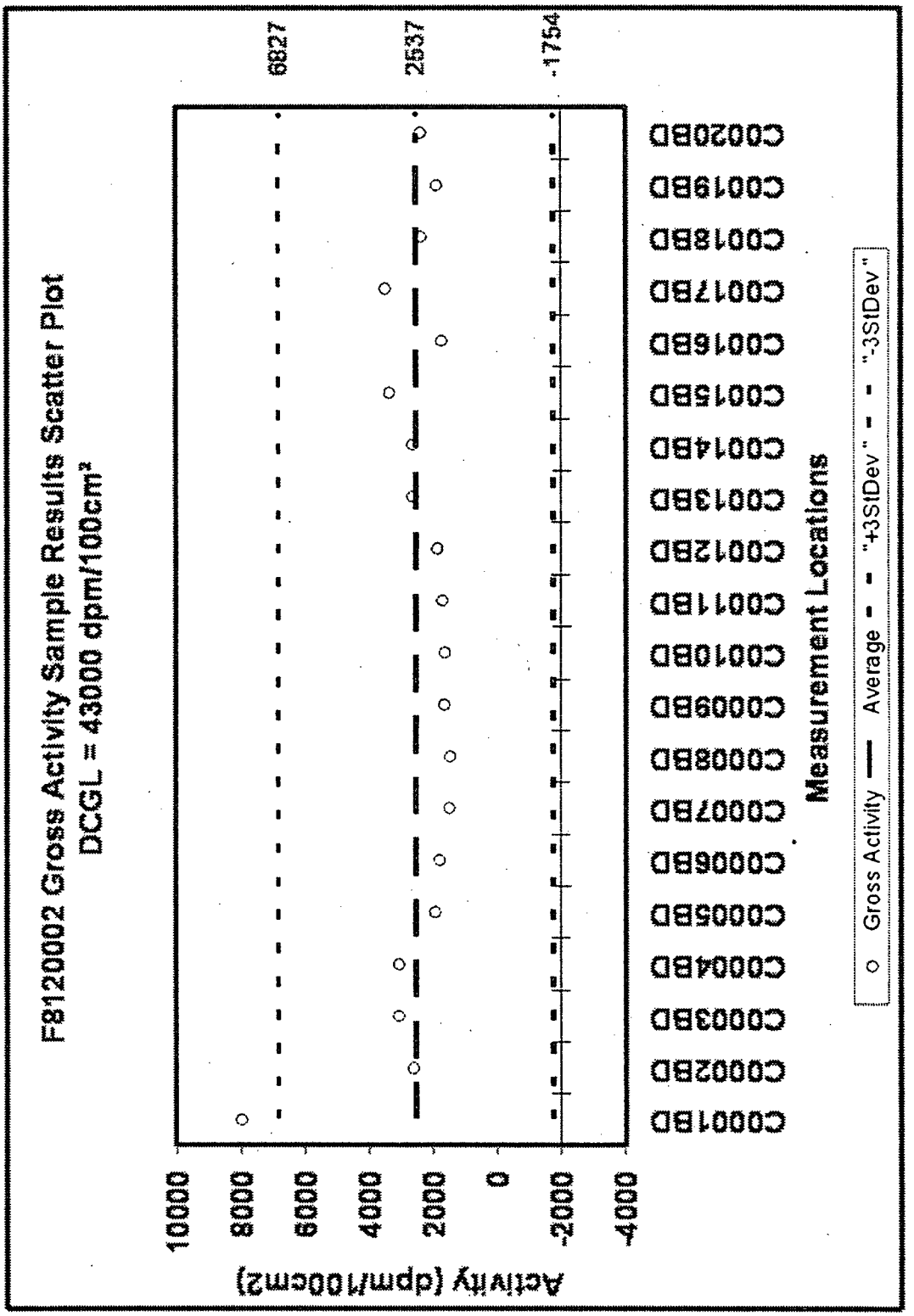
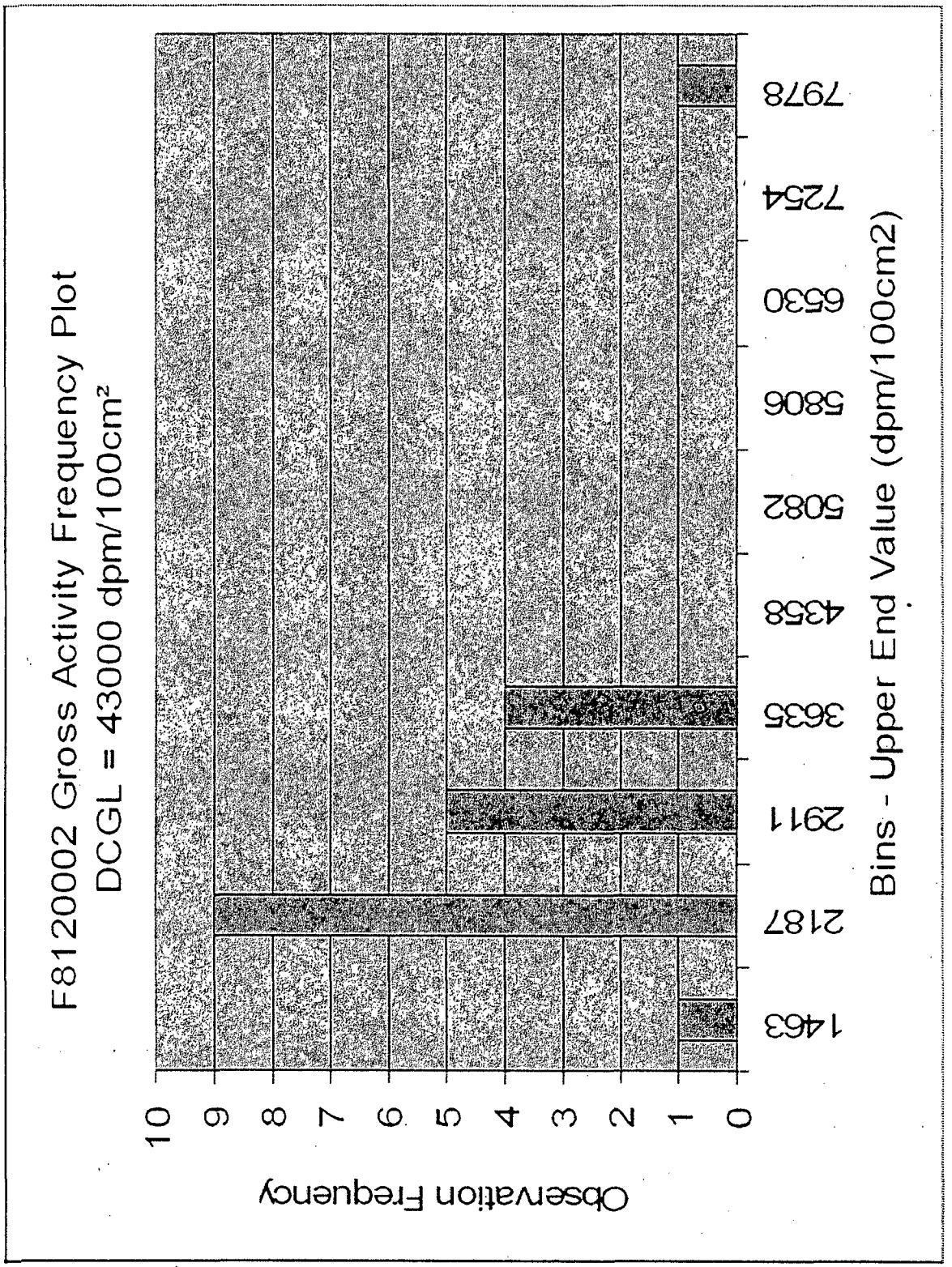
Survey Unit F8120002


F8120002 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0
20
40
60
80
100
Percentile
2150
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8120002 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
6827
2537
-1754
10000
8000
6000
4000
2000
0
-2000
-4000
Activity (dpm/100cm2)
C00020BD
C00019BD
C00018BD
C00017BD
C00016BD
C00015BD
C00014BD
C00013BD
C00012BD
C00011BD
C00010BD
C00009BD
C00008BD
C00007BD
C00006BD
C00005BD
C00004BD
C00003BD
C00002BD
C00001BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8120002 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
7
8
9
10
1463
2187
2911
3635
4358
5082
5806
6530
7254
7978
Bins - Upper End Value (dpm/100cm2)