Rancho Seco

Final Status Survey Summary Report

June 3, 2008

Fuel Storage Building North Exterior Wall (+) 0' El. to (+) 69' 4" El. & Roof

Survey Unit F8120141

Prepared By: D. Anderson Date: 6/3/2008

FSS Engineer

Reviewed By: _____ Date: 6/3/08

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Approved By: _____ Date: 2-6-09

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8120141, Fuel Storage Building North Exterior Wall (+) 0' El. to (+) 69' 4" El. & Roof

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 randomly determined and 237.5 m^2 were scanned for approximately 28% 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	Fuel Storage Building North Exterior Wall (+) 0' El. to (+) 69' 4" El. & Roof Structure Surface
Survey Unit:	0141	
Class:	3	LTP Table 5-4
SU Area (m^2)**:**	854	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm^2)**:**	43,000	Gross Activity DCGL
Area Factor:	N/A	Class 3
Design DCGLemc (dpm/100 cm^2)**:**	N/A	Class 3
LBGR (dpm/100 cm^2)**:**	40,759	Adjusted
Design Sigma (dpm/100 cm^2)**:**	747	
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)**:**	237.5	
Scan Coverage (%):	28%	Class 3
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3	
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 F8120141. 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 highest average ISOCS gamma measurement was 4,441 dpm/100 cm² Cs-137; Co-60 was not identified above the MDA. 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)
F8120141-C0001BD	1,774
F8120141-C0002BD	1,805
F8120141-C0003BD	1,572
F8120141-C0004BD	1,681
F8120141-C0005BD	1,810
F8120141-M0006BD	809
F8120141-C0007BD	1,437
F8120141-C0008BD	1,857
F8120141-C0009BD	1,650
F8120141-C0010BD	1,696
F8120141-C0011BD	2,080
F8120141-C0012BD	2,303
F8120141-C0013BD	1,857
F8120141-C0014BD	1,707
Mean:	1,717
Median:	1,740
Standard Deviation:	336
Range:	809 – 2,303

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8120141C0001SM	-0.95
F8120141C0002SM	0.34
F8120141C0003SM	1.64
F8120141C0004SM	5.51
F8120141C0005SM	-0.95
F8120141M0006SM	1.64
F8120141C0007SM	-2.24
F8120141C0008SM	-2.24
F8120141C0009SM	0.34
F8120141C0010SM	-3.53
F8120141C0011SM	-4.82
F8120141C0012SM	4.22
F8120141C0013SM	-3.53
F8120141C0014SM	1.64
Mean:	-0.21
Median:	-0.3
Standard Deviation:	2.98
Range:	-4.82 to 5.51

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 cm²):	N/A	
Ambient Background Used (dpm/100 cm²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	14	
Median (dpm/100 cm²):	1,740	
Mean (dpm/100 cm²):	1,717	
Direct Measurement Standard Deviation (dpm/100 cm²):	336	
Total Standard Deviation (dpm/100 cm²):	336	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	2,303	
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 (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 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. No potential areas of elevated activity were detected.

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 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.

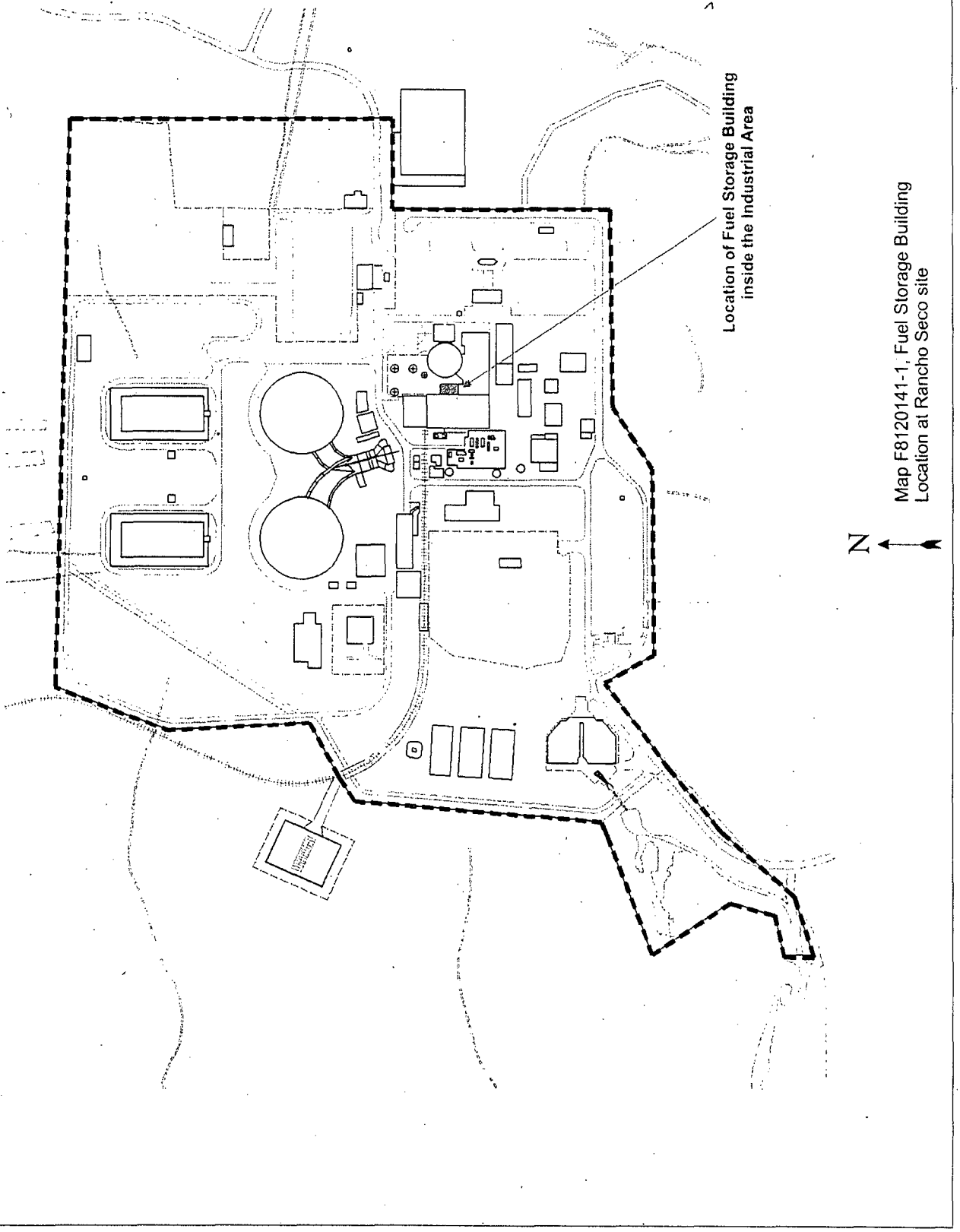
It is concluded that survey unit F8120141 meets the release criteria of 10CFR20.1402.

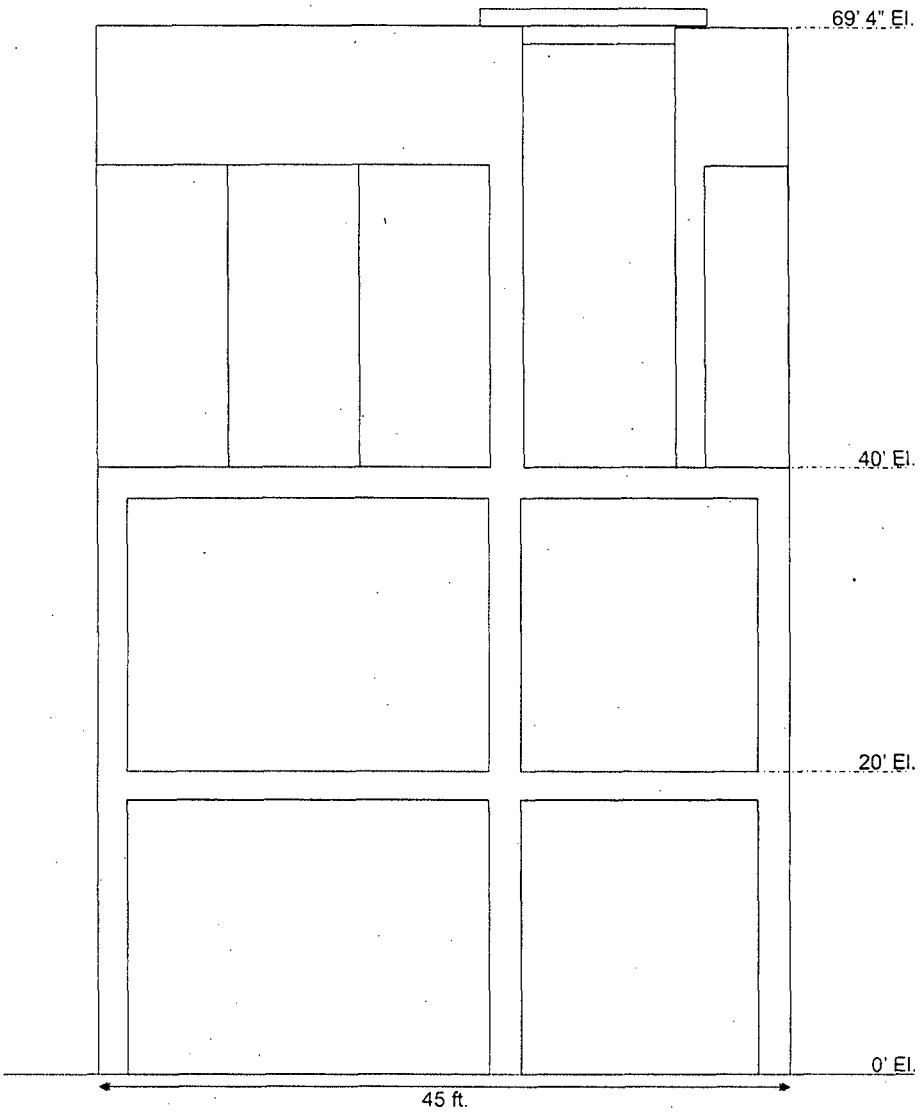
Attachment 1

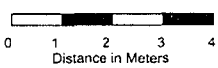
Maps

June 3, 2008

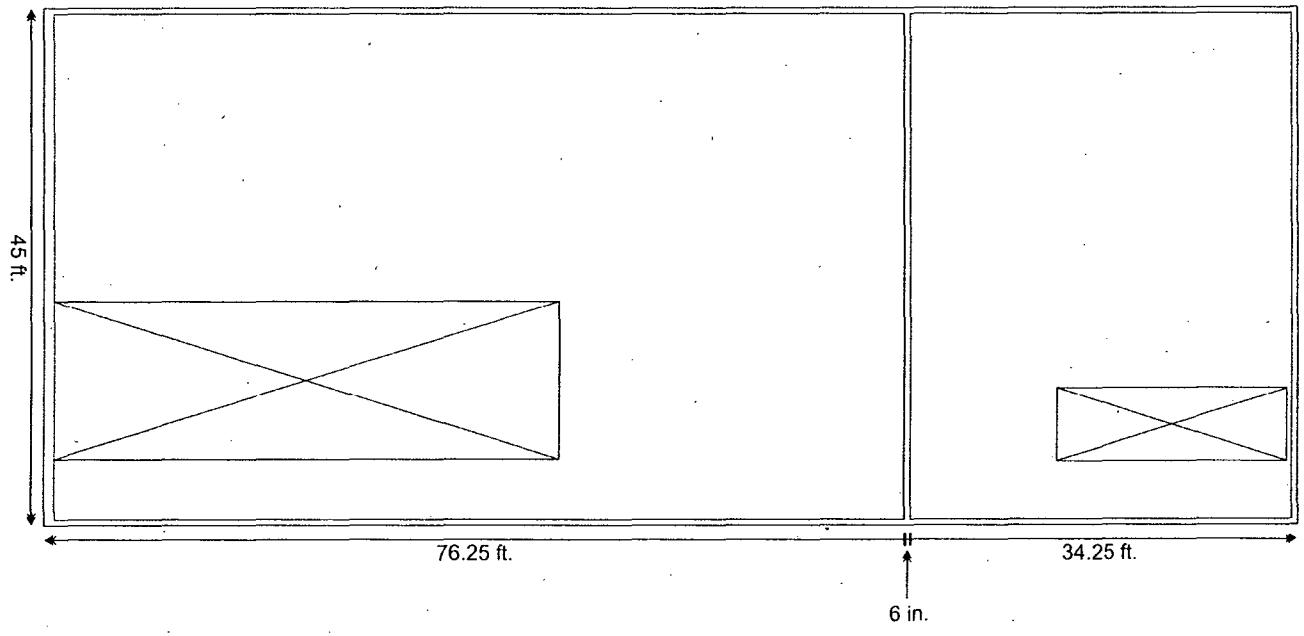
Survey Unit F8120141

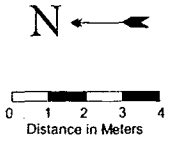

Location of Fuel Storage Building
inside the Industrial Area
N
Map F8120141-1, Fuel Storage Building
Location at Rancho Seco site



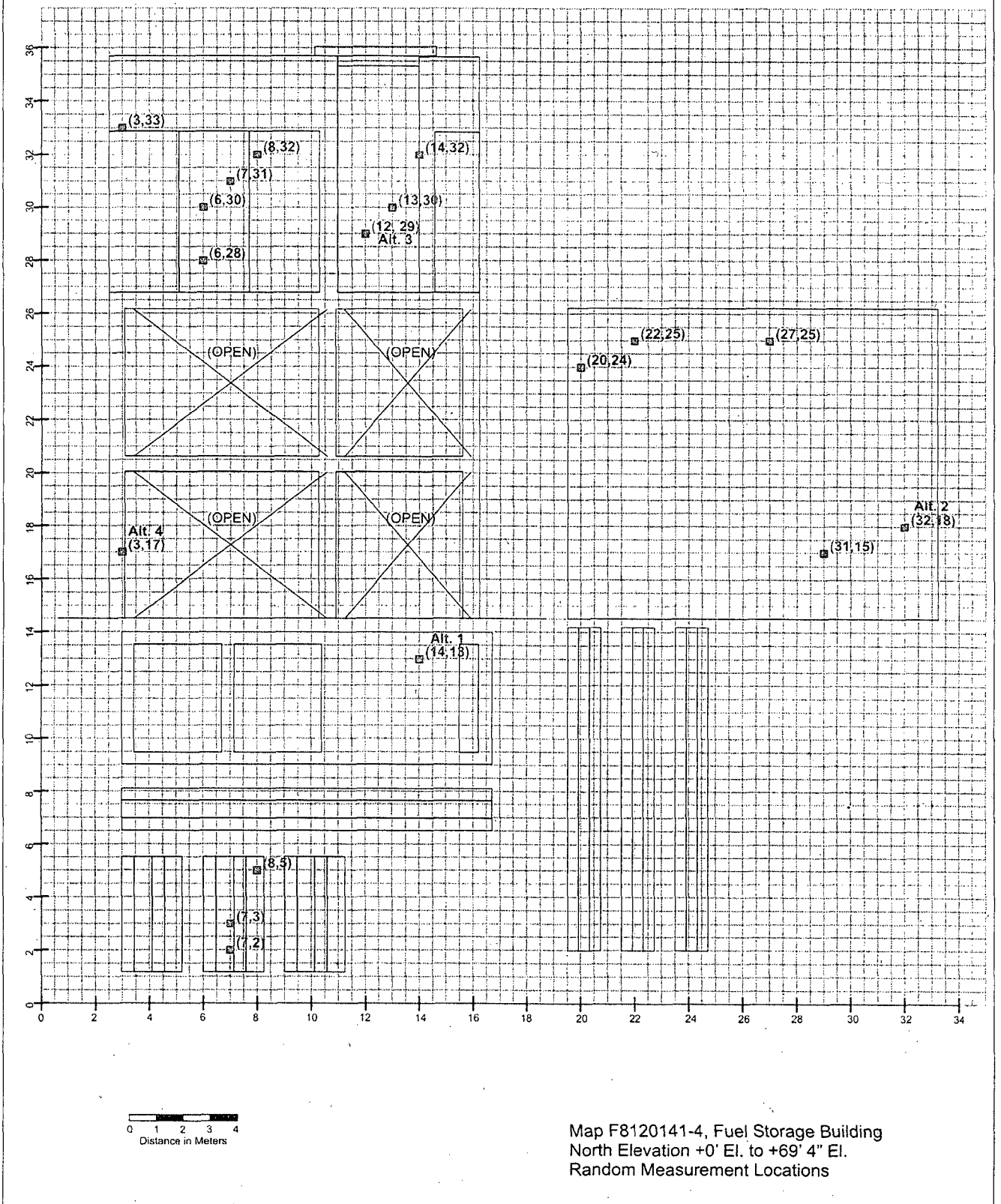


Map F8120141-2, Fuel Storage Building
North Elevation +0' El. to +69' 4" El.
Area Estimate: 325 sq. meters

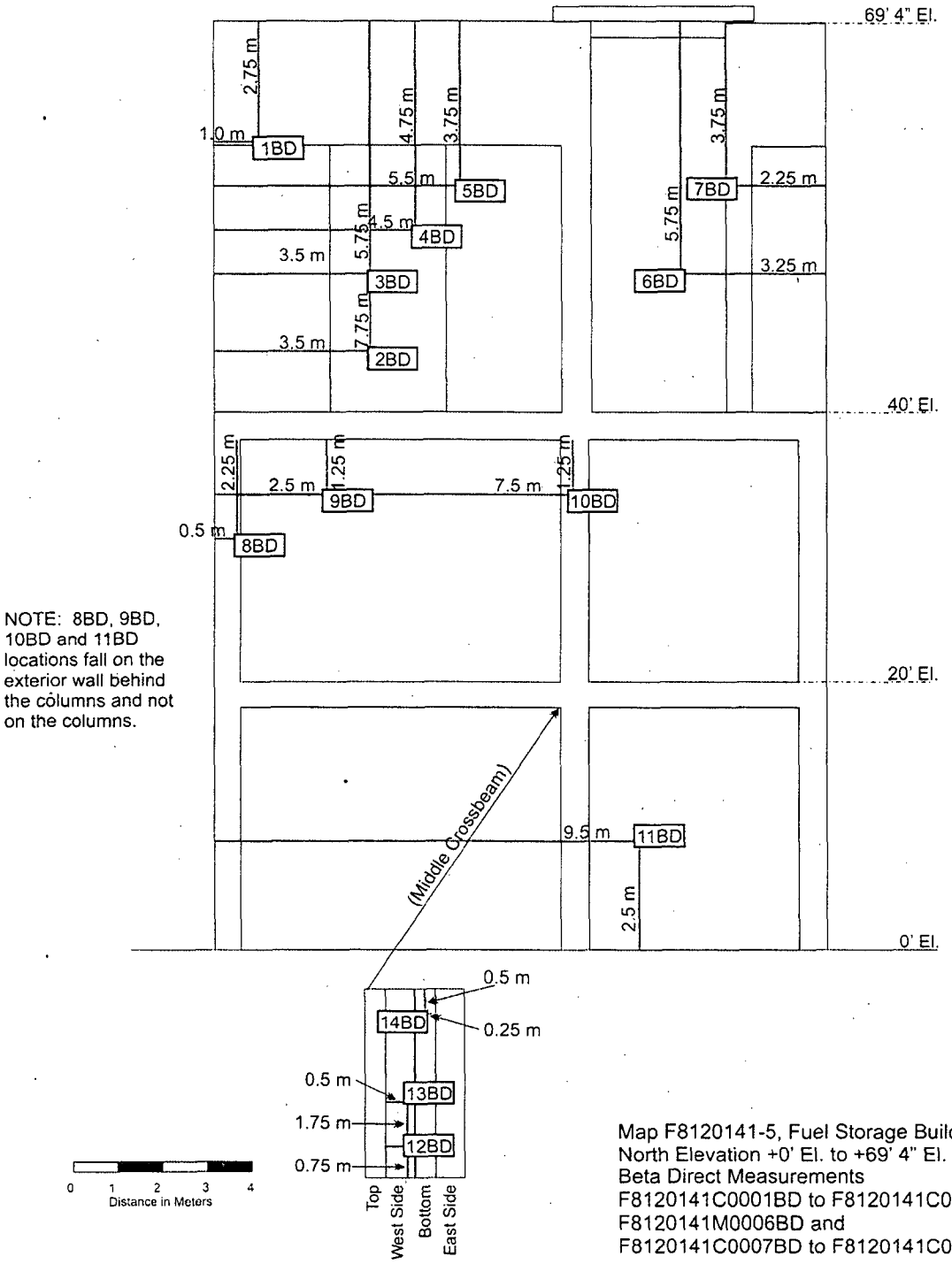




Map F8120141-3, Fuel Storage Building +69' 4" El.
Auxiliary Building +69' 4" El.
Exterior Roof Area Estimate: 529 sq. meters

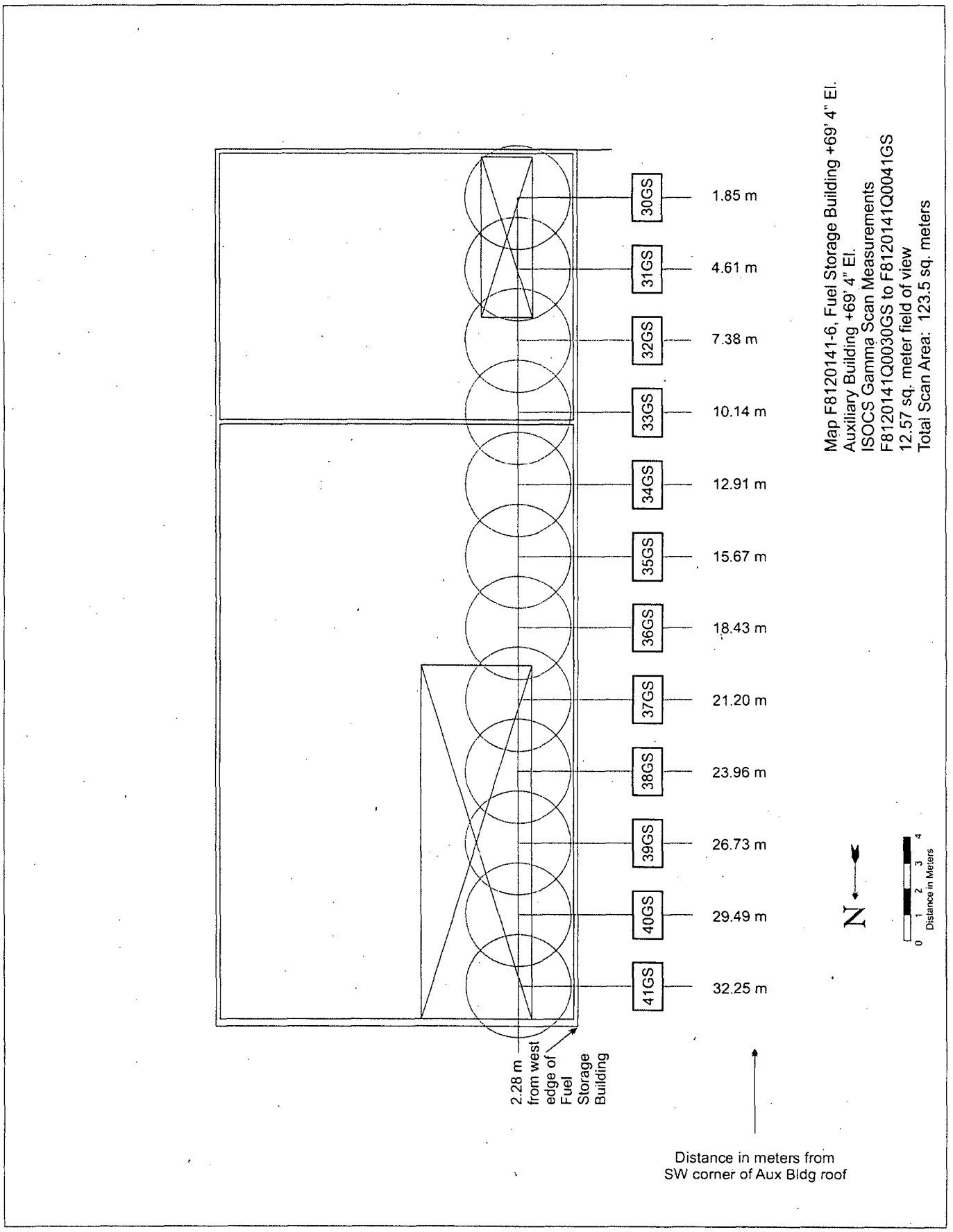


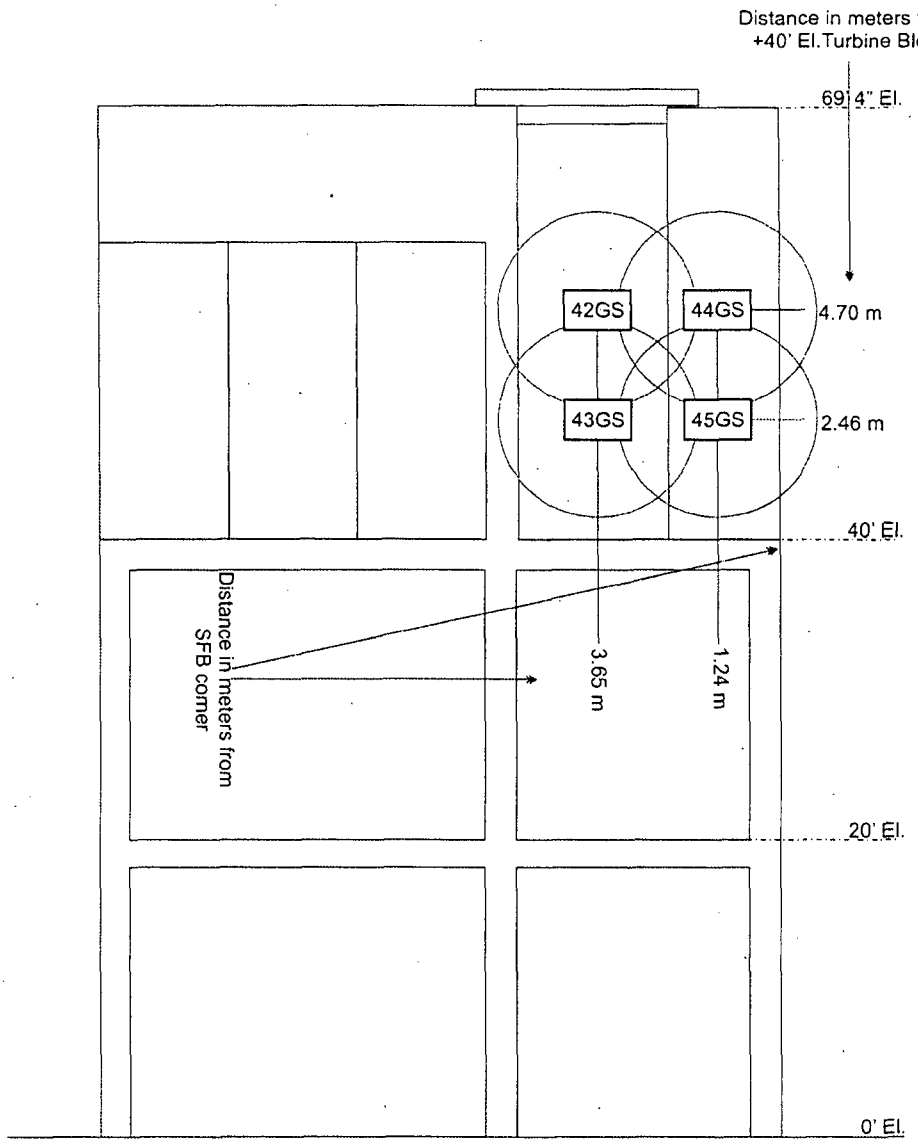
Map F8120141-4, Fuel Storage Building
North Elevation +0' El. to +69' 4" El.
Random Measurement Locations



NOTE: 8BD, 9BD, 10BD and 11BD locations fall on the exterior wall behind the columns and not on the columns.

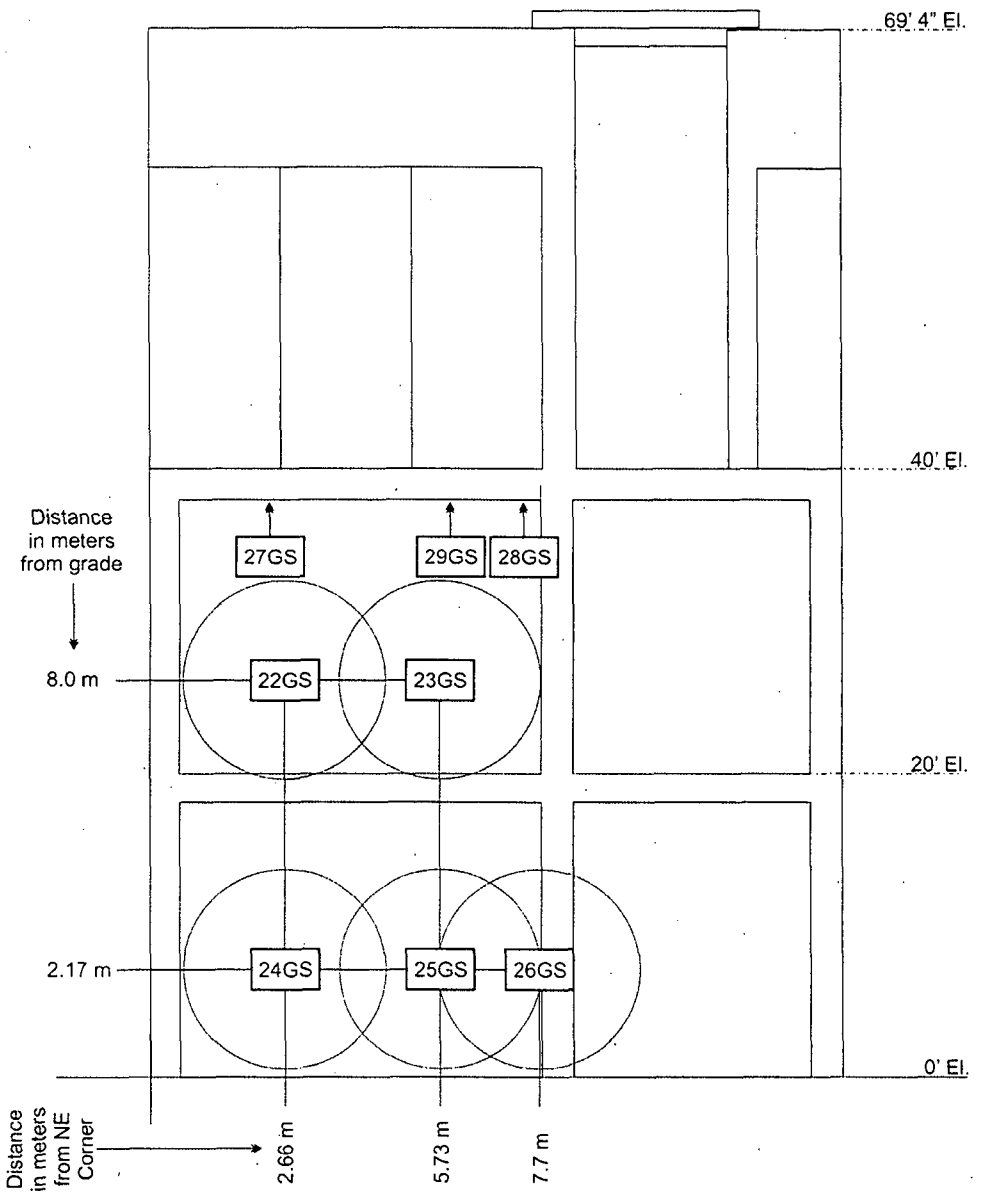
Map F8120141-5, Fuel Storage Building
North Elevation +0' El. to +69' 4" El.
Beta Direct Measurements
F8120141C0001BD to F8120141C0005BD,
F8120141M0006BD and
F8120141C0007BD to F8120141C0014BD


Map F8120141-6, Fuel Storage Building +69' 4" El.
Auxiliary Building +69' 4" El.
ISOCS Gamma Scan Measurements
F8120141Q0030GS to F8120141Q0041GS
12.57 sq. meter field of view
Total Scan Area: 123.5 sq. meters
30GS
1.85 m
31GS
4.61 m
32GS
7.38 m
33GS
10.14 m
34GS
12.91 m
35GS
15.67 m
36GS
18.43 m
37GS
21.20 m
38GS
23.96 m
39GS
26.73 m
40GS
29.49 m
41GS
32.25 m
2.28 m from west edge of Fuel Storage Building
Distance in meters from SW corner of Aux Bldg roof
N
0 1 2 3 4
Distance in Meters



0 1 2 3 4
Distance in Meters

Map F8120141-7, Fuel Storage Building
North Elevation +0' El. to +69' 4" El.
ISOCS Gamma Scan Measurements
F8120141M0042GS to F8120141M0043GS and
F8120141C0044GS to F8120141C0045GS
12.57 sq. meter field of view
Total Scan Area: 35 sq. meters



Map F8120141-8, Fuel Storage Building
North Elevation +0' El. to +69' 4" El.
ISOCS Gamma Scan Measurements
F8120141C0022GS to F8120141C0029GS
12.57 sq. meter field of view
Total Scan Area: 79 sq. meters

Attachment 2

Instrumentation

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Survey Unit F8120141

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; 175834	43-68B; 190482	433	1,033
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 – 1,800 dpm/100 cm^2 Cs-137, Concrete – 1,280 dpm/100 cm^2 Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm^2)
Investigation Criteria - Direct	21,500
Investigation Criteria – Scan (ISOCS average activity)	4,300
$DCGL_W$	43,000
$DCGL_{EMC}$	N/A

Attachment 3

Investigation

June 3, 2008

Survey Unit F8120141

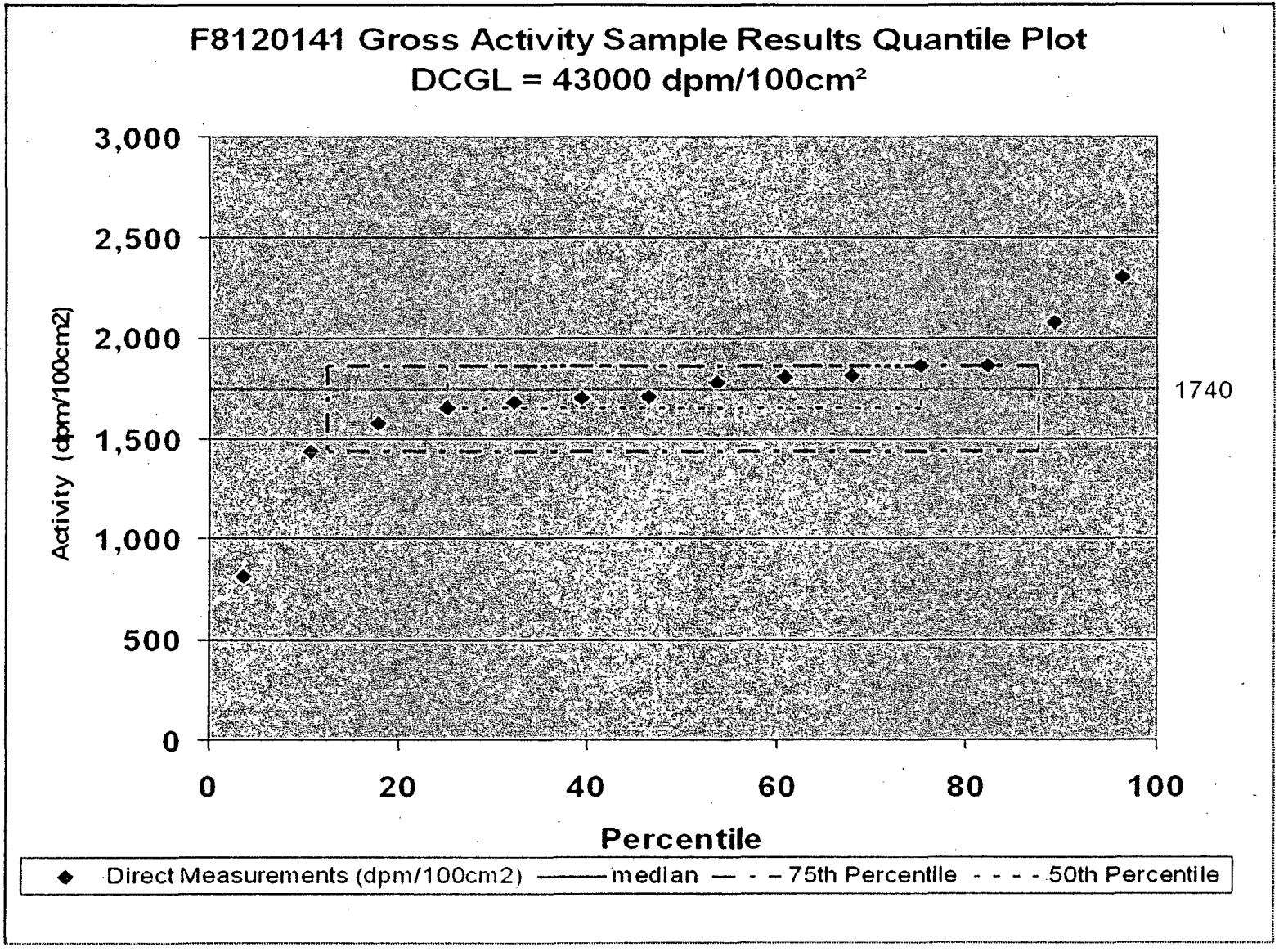
(none required)

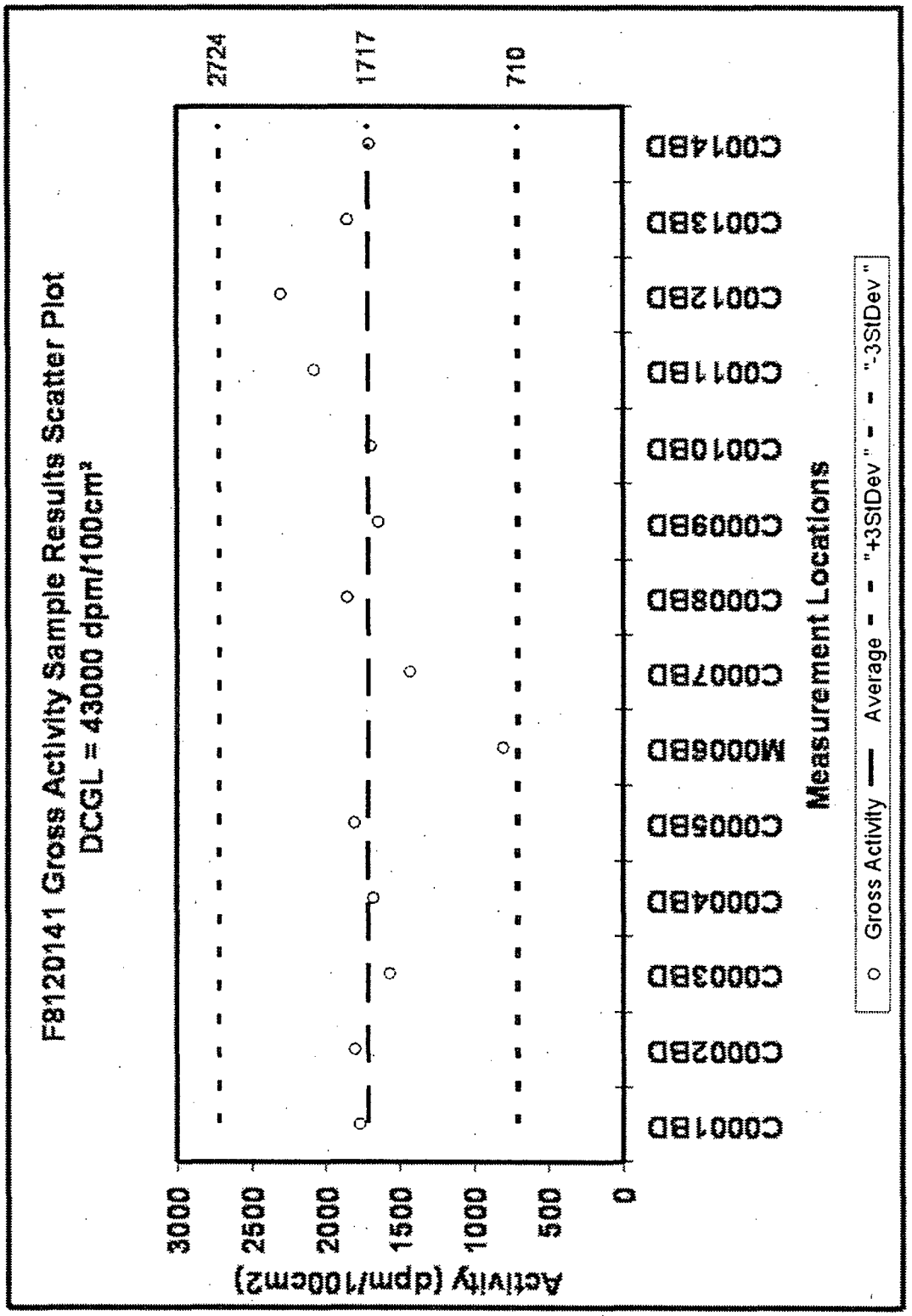
Attachment 4

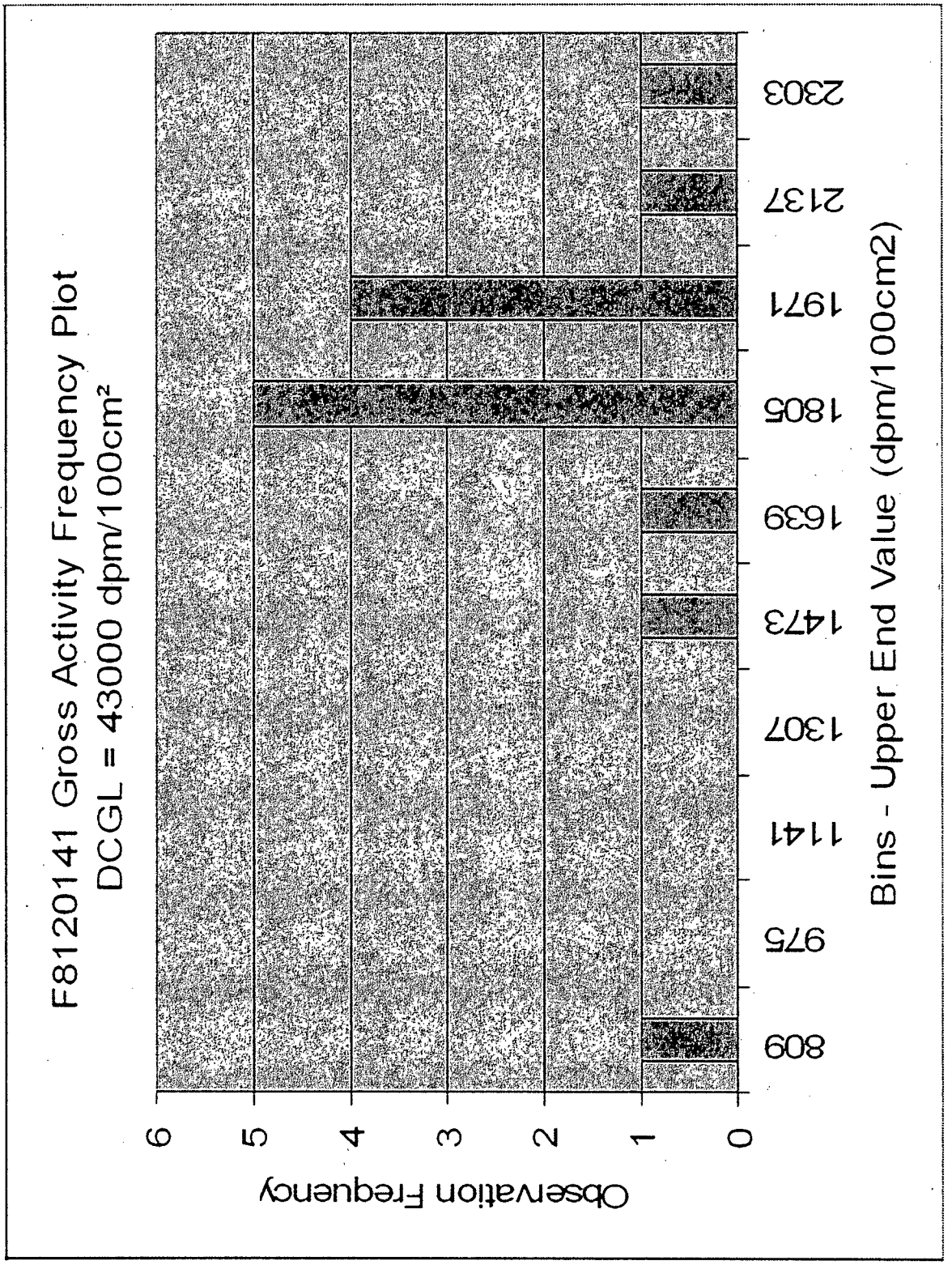
Data Assessment

June 3, 2008

Survey Unit F8120141


F8120141 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
3,000
2,500
2,000
1,500
1,000
500
0
1740
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8120141 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
2724
1717
710
3000
2500
2000
1500
1000
500
0
Activity (dpm/100cm2)
C00014BD
C00013BD
C00012BD
C00011BD
C00010BD
C00009BD
C00008BD
C00007BD
M00006BD
C00005BD
C00004BD
C00003BD
C00002BD
C00001BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8120141 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
809
975
1141
1307
1473
1639
1805
1971
2137
2303
Bins - Upper End Value (dpm/100cm2)