

Rancho Seco

Final Status Survey Summary Report

October 1, 2008

Fuel Storage Building, West Exterior Wall, (+) 0' El. to (+) 20' El.

Survey Unit F8120121

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Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8120121, Fuel Storage Building, West Exterior Wall, (+) 0' El. to (+) 20' 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 cm² and a maximum value of 200,000,000 dpm/100 cm². Direct measurements on the +40' elevation showed a mean gross activity level of 5,942 dpm/100 cm² and a maximum value of 19,357 dpm/100 cm². Direct measurements on the building exterior showed a mean gross activity level of 1,408 dpm/100 cm² and a maximum value of 21,600 dpm/100 cm². 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 122.5 m² 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	Fuel Storage Building, West Exterior Wall, (+) 0' El. to (+) 20' El.
Survey Unit:	0121	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m ²):	122.5	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm ²):	43,000	Gross Activity DCGL
Area Factor:	3.6	Class 1
Design DCGL _{emc} (dpm/100 cm ²):	154,800	Class 1
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):	6.8	Class 1
Scan Area (m ²):	122.5	
Scan Coverage (%):	100%	Class 1
Z _{1-α} :	1.645	
Z _{1-β} :	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:	18	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 18 direct measurements were made in F8120121. 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 < 905 dpm/100 cm² Co-60 and <1,240 dpm/100 cm² to 40,994 dpm/100 cm² Cs-137. Beta scan activity ranged from 2,581 to 23,504 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. Soil samples collected from the trench adjacent to the structure identified the highest soil activity as 0.71 pCi/g Cs-137. Co-60 was not identified in soil 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)
F8120121-C0001BD	1,473
F8120121-C0002BD	2,106
F8120121-C0003BD	1,515
F8120121-X0004BD	3,020
F8120121-C0005BD	1,592
F8120121-X0006BD	2,833
F8120121-C0007BD	1,546
F8120121-X0008BD	2,877
F8120121-C0009BD	1,406
F8120121-X0010BD	2,789
F8120121-C0011BD	1,411
F8120121-X0012BD	2,866
F8120121-C0013BD	1,442
F8120121-X0014BD	2,921
F8120121-C0015BD	1,478
F8120121-X0016BD	4,012
F8120121-C0017BD	1,530
F8120121-X0018BD	2,800
Mean:	2,201
Median:	1,849
Standard Deviation:	808
Range:	1,406 – 4,012

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8120121C0001SM	-4.82
F8120121C0002SM	-4.82
F8120121C0003SM	-4.82
F8120121X0004SM	-3.53
F8120121C0005SM	-3.53
F8120121X0006SM	-0.95
F8120121C0007SM	-0.95
F8120121X0008SM	-3.53
F8120121C0009SM	-4.82
F8120121X0010SM	-0.95
F8120121C0011SM	-4.82
F8120121X0012SM	2.93
F8120121C0013SM	-3.53
F8120121X0014SM	-2.24
F8120121C0015SM	0.34
F8120121X0016SM	2.93
F8120121C0017SM	-4.82
F8120121X0018SM	-4.82
Mean:	-2.6
Median:	-3.53
Standard Deviation:	2.61
Range:	-4.82 to 2.93

Survey Unit Data Assessment:

The survey design required 18 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 cm ²):	N/A	Average Ambient BKG = 0	
Ambient Background Used (dpm/100 cm ²):	N/A		
Actual Direct Measurements (N):	18		
Median (dpm/100 cm ²):	1,849		
Mean (dpm/100 cm ²):	2,201		
Direct Measurement Standard Deviation (dpm/100 cm ²):	808		
Total Standard Deviation (dpm/100 cm ²):	808		Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	4,012		Background Subtract Not Applied
Material Type:	N/A		
Sign Test Final N Value:	18		Class 1 All samples < DCGL. SU passes.
S+ Value:	18		
Critical Value:	12		
Sufficient Samples Collected:	Yes		
Maximum Value < DCGL:	Yes		
Median Value < DCGL:	Yes		
Mean Value < DCGL:	Yes		
Maximum Value < DCGL_{emc}:	Yes		
Total Standard Deviation <= Sigma:	Investigate		
Pass the Sign Test?	Yes		
Reject the Null Hypothesis?	Yes	All samples < DCGL. SU passes.	
Does the Survey Unit Pass All Criteria?	Investigate		

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 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 43,000 dpm/100 cm² 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.

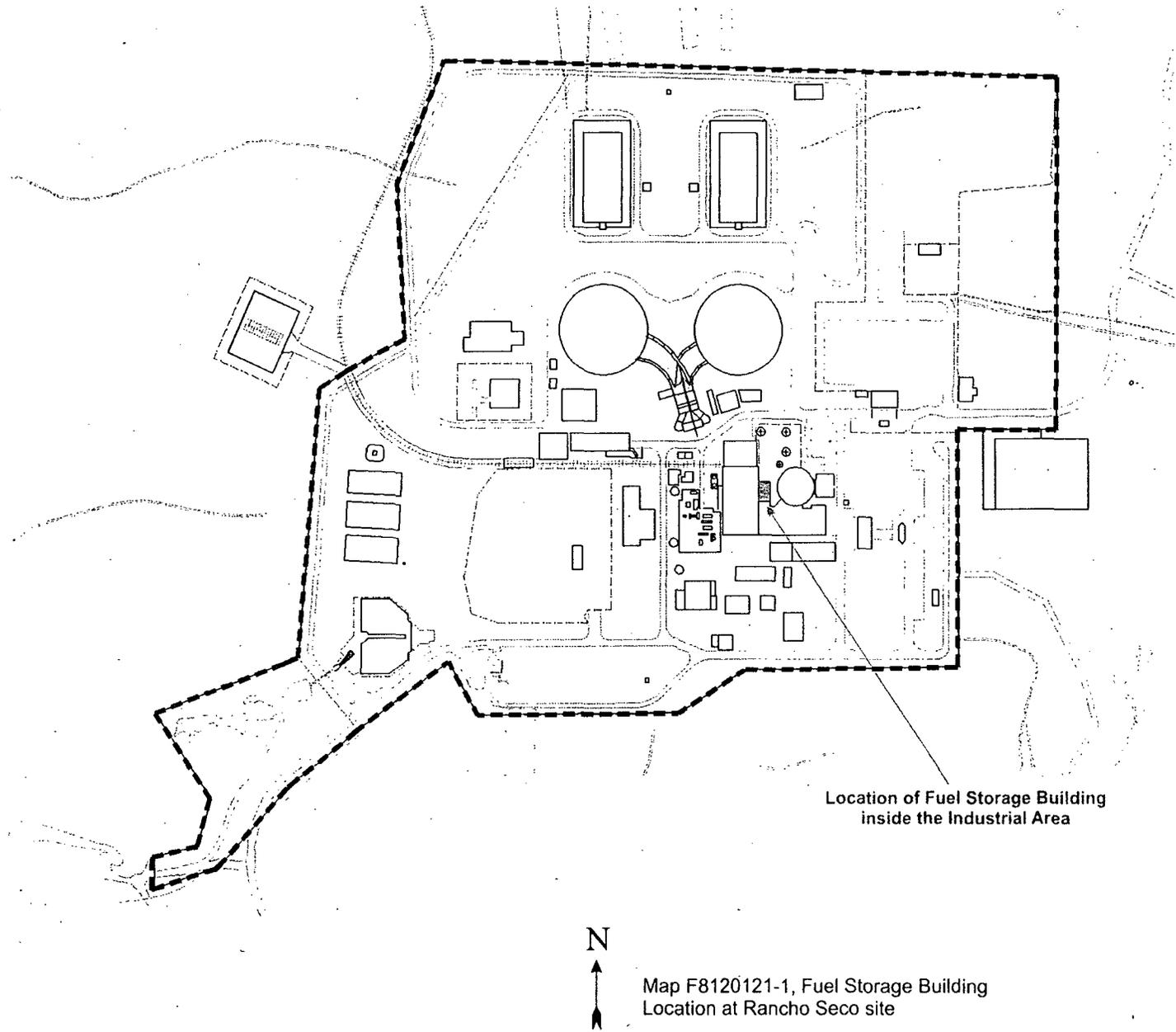
It is concluded that survey unit F8120121 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

October 1, 2008

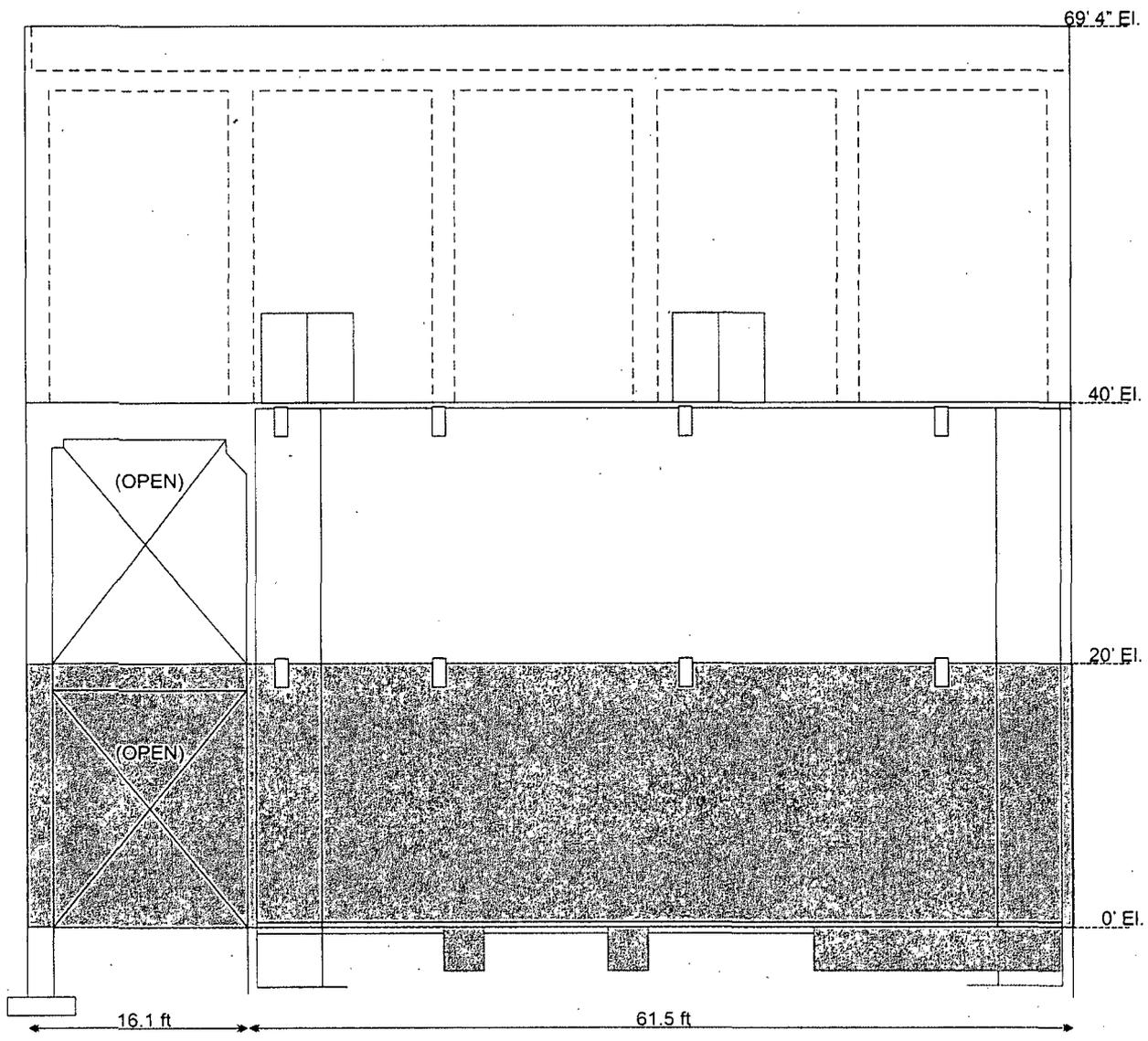
Survey Unit F8120121



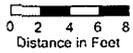
Location of Fuel Storage Building
inside the Industrial Area



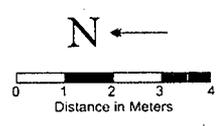
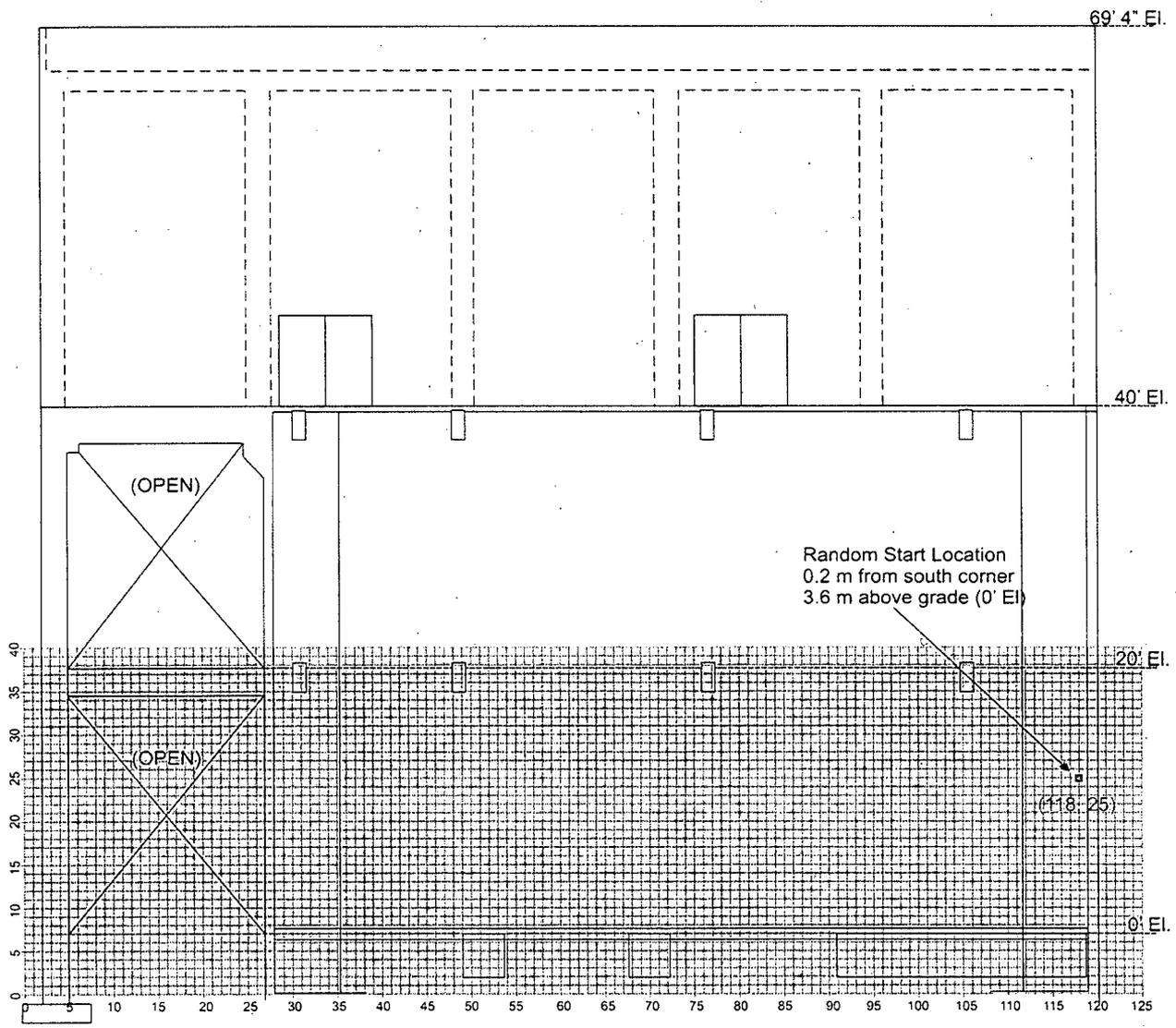
Map F8120121-1, Fuel Storage Building
Location at Rancho Seco site



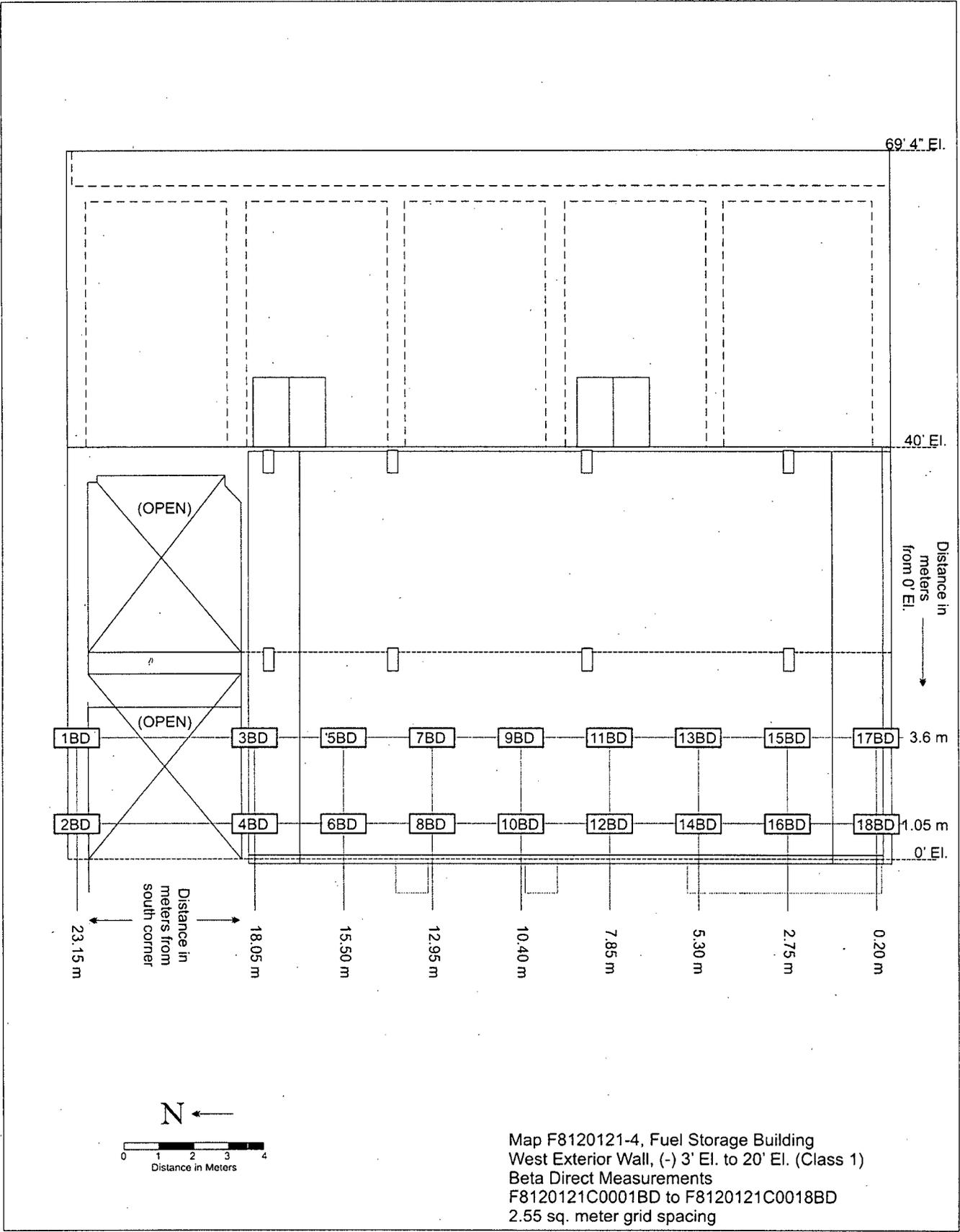
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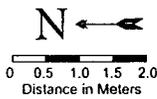
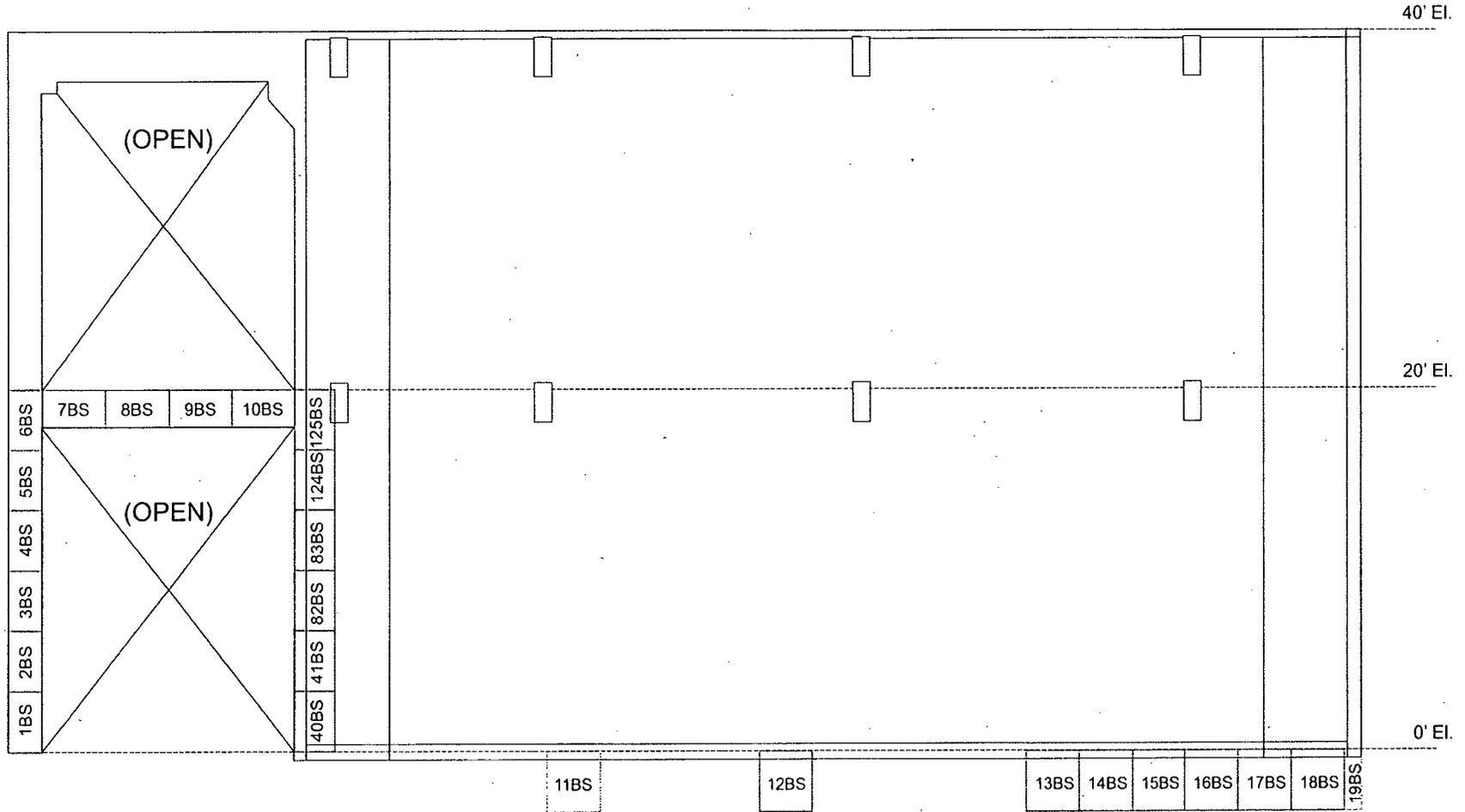


Map F8120121-2, Fuel Storage Building
 West Exterior Wall, (-3)' El. to 20' El. (Class 1)
 Area Estimate: 122.5 sq. meters

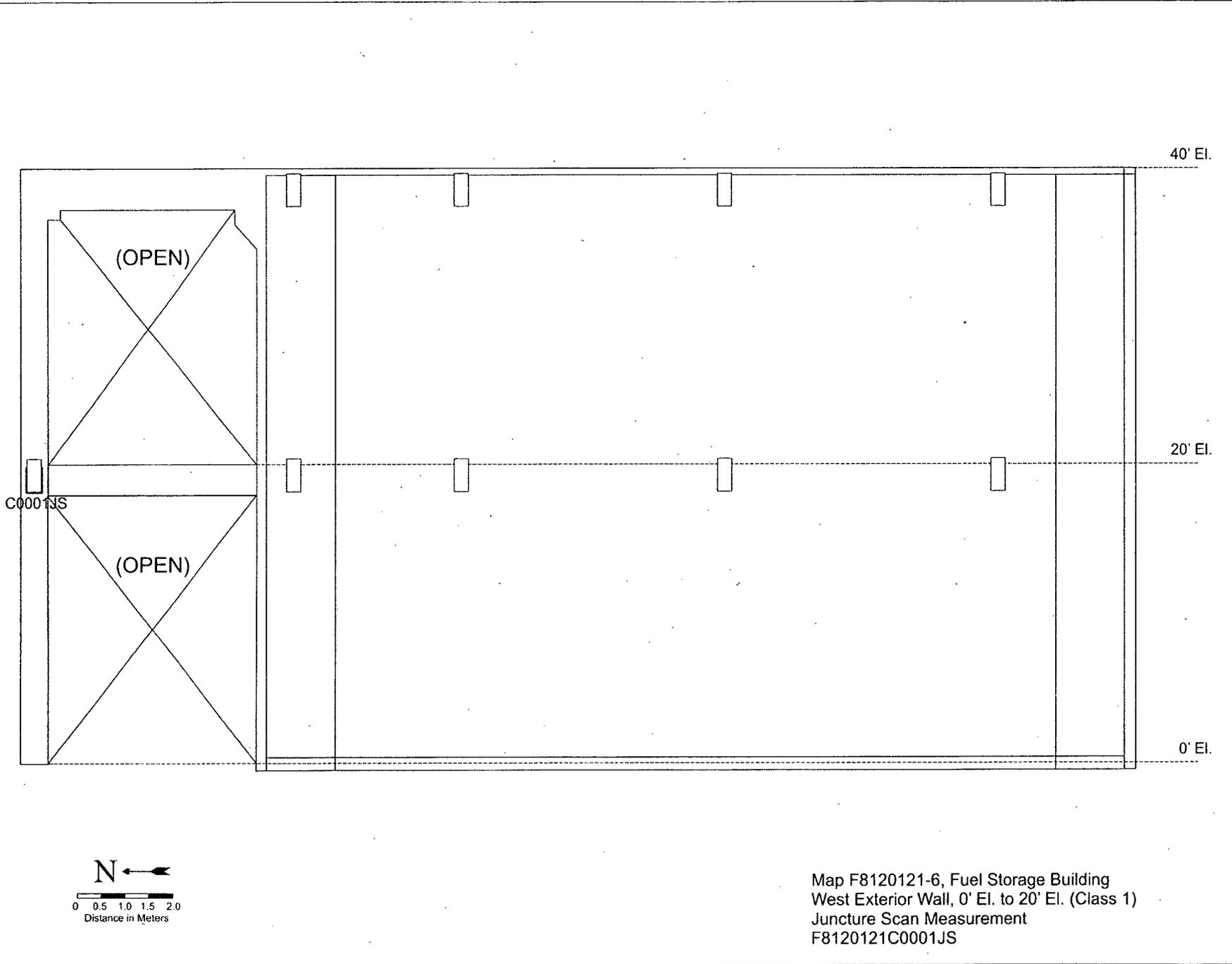


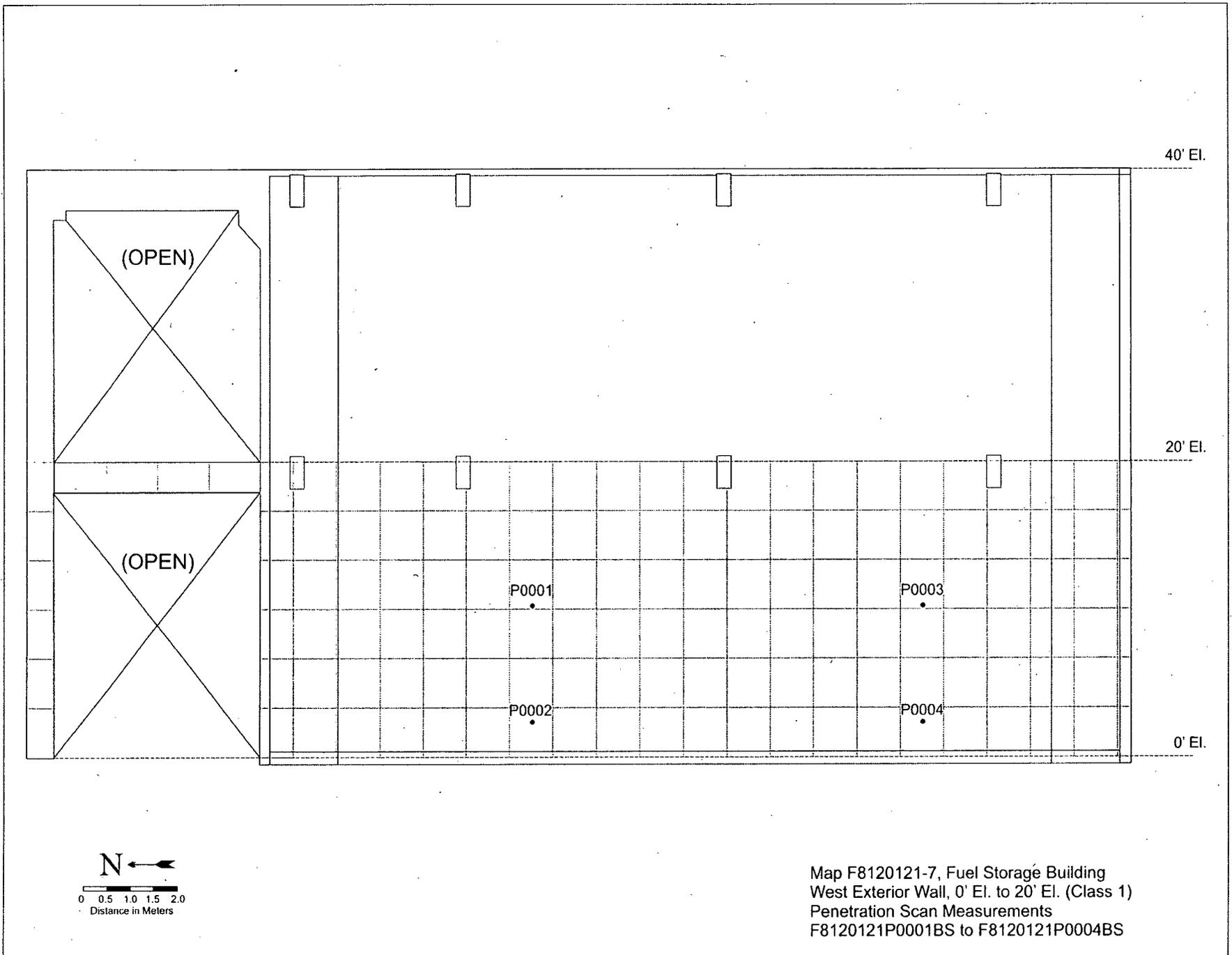
Map F8120121-3, Fuel Storage Building
 West Exterior Wall, (-) 3' El. to 20' El. (Class 1)
 Random Start Location



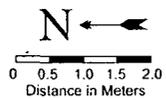
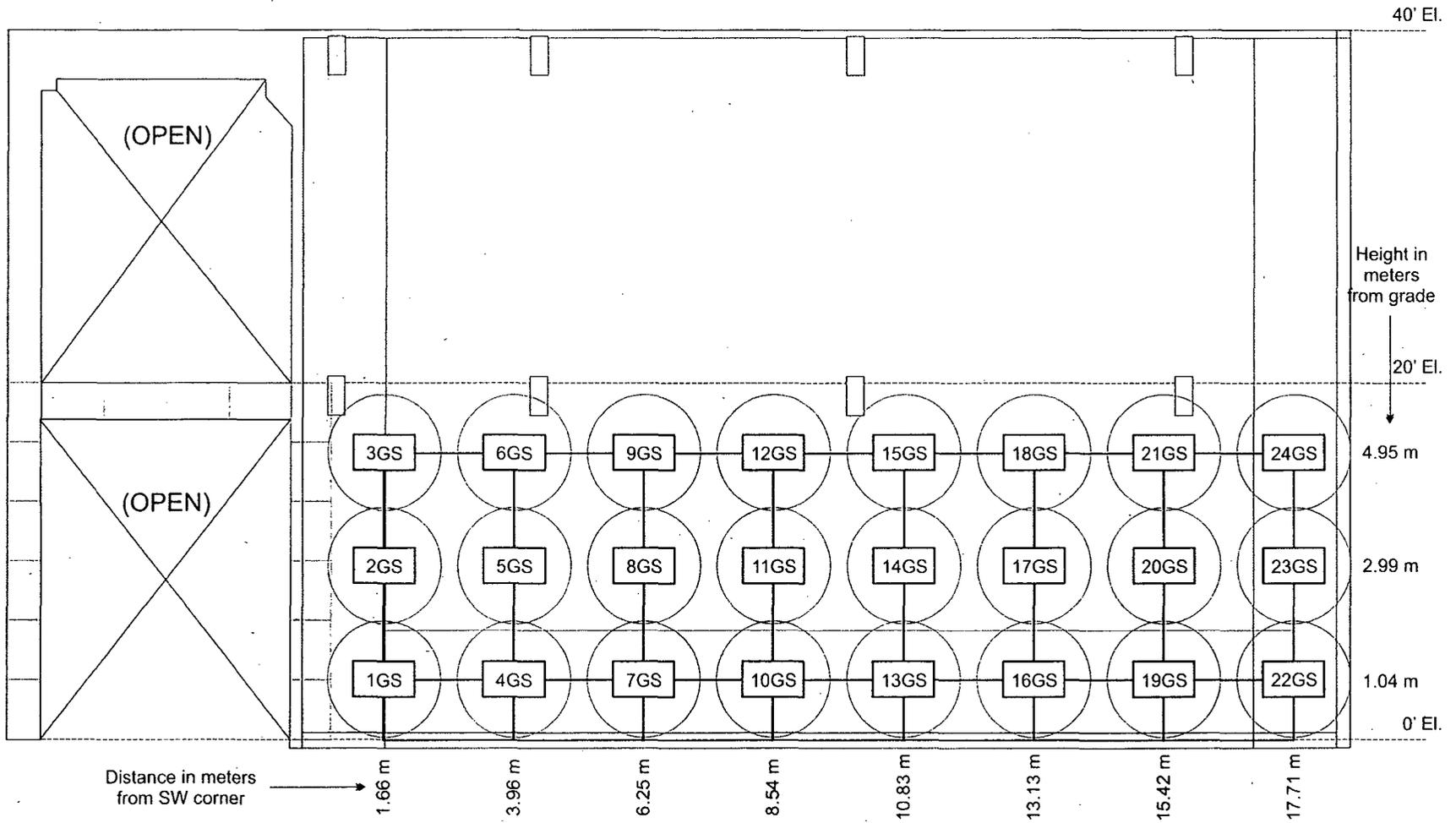


Map F8120121-5, Fuel Storage Building
West Exterior Wall, (-) 3' El. to 20' El. (Class 1)
Beta Scan Measurements
F8120121C0001BS to F8120121C0019BS,
F8120121C0040BS to F8120121C0041BS,
F8120121C0082BS to F8120121C0083BS and
F8120121C0124BS to F8120121C0125BS

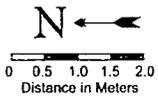
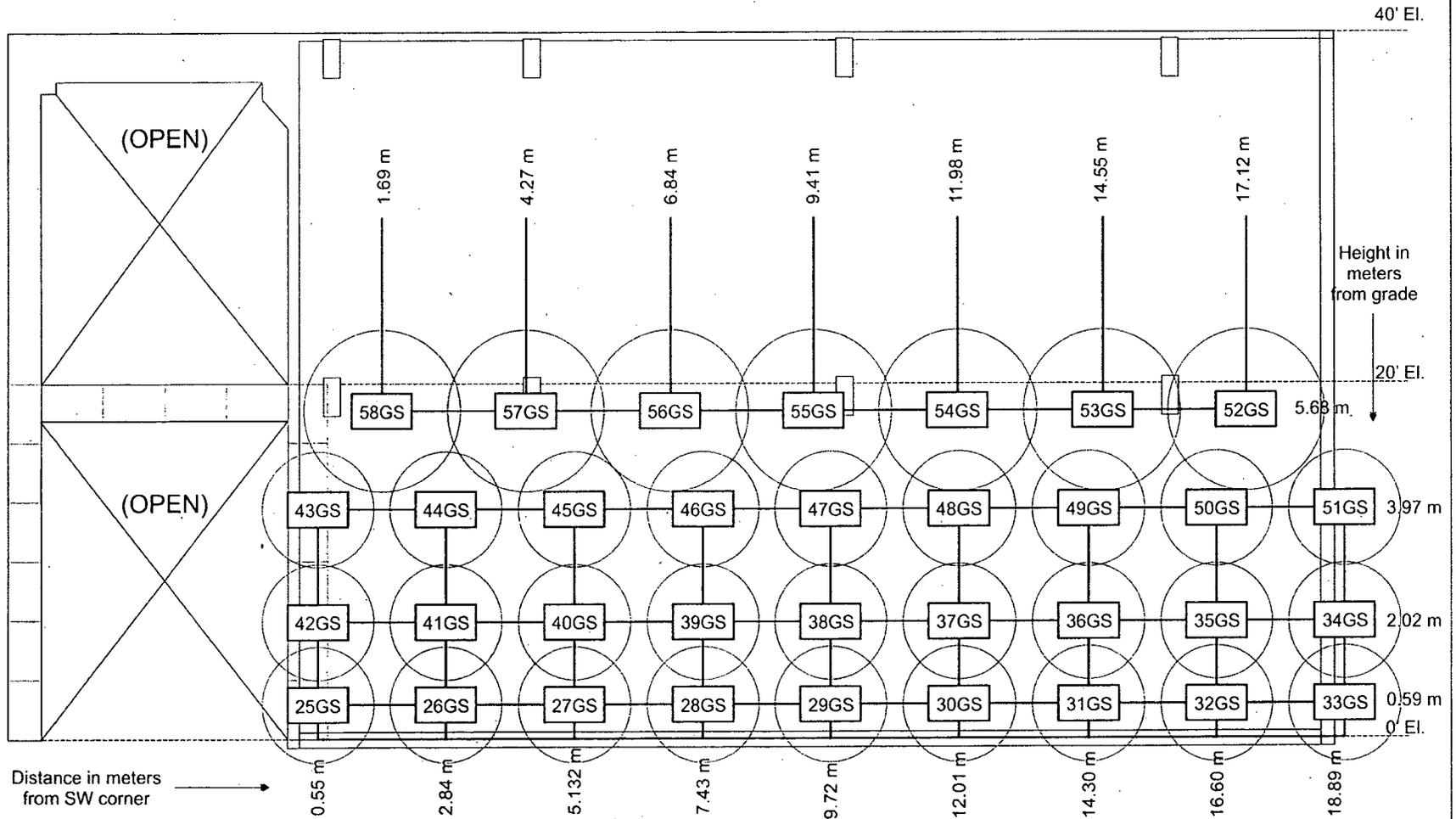




Map F8120121-7, Fuel Storage Building
West Exterior Wall, 0' El. to 20' El. (Class 1)
Penetration Scan Measurements
F8120121P0001BS to F8120121P0004BS

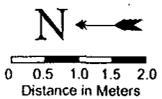
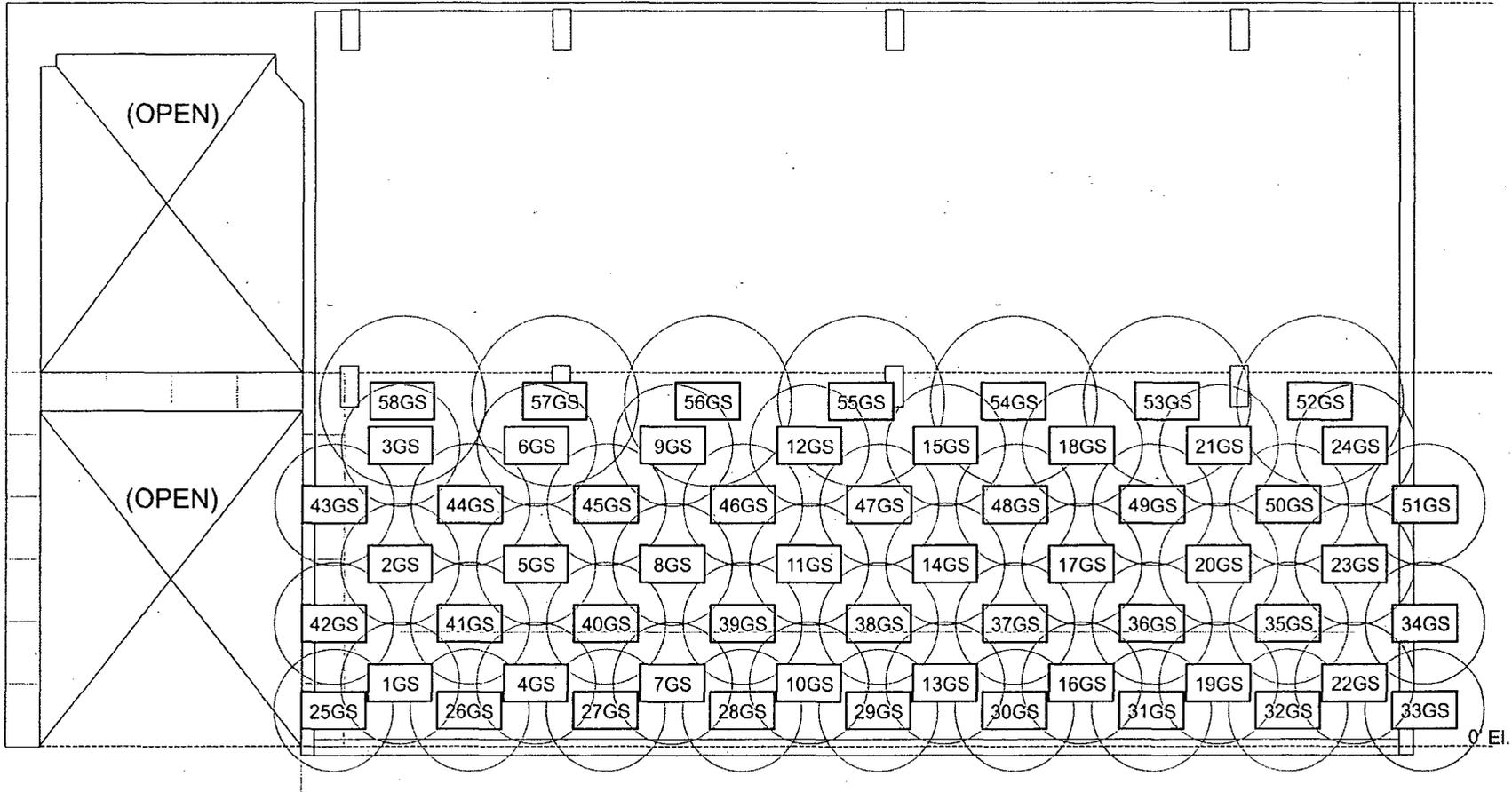


Map F8120121-8, Fuel Storage Building
West Exterior Wall, 0' El. to 20' El. (Class 1)
ISOCS Gamma Scan Measurements
F8120121C0001GS to F8120121C0024GS
3.14 sq. meter field of view

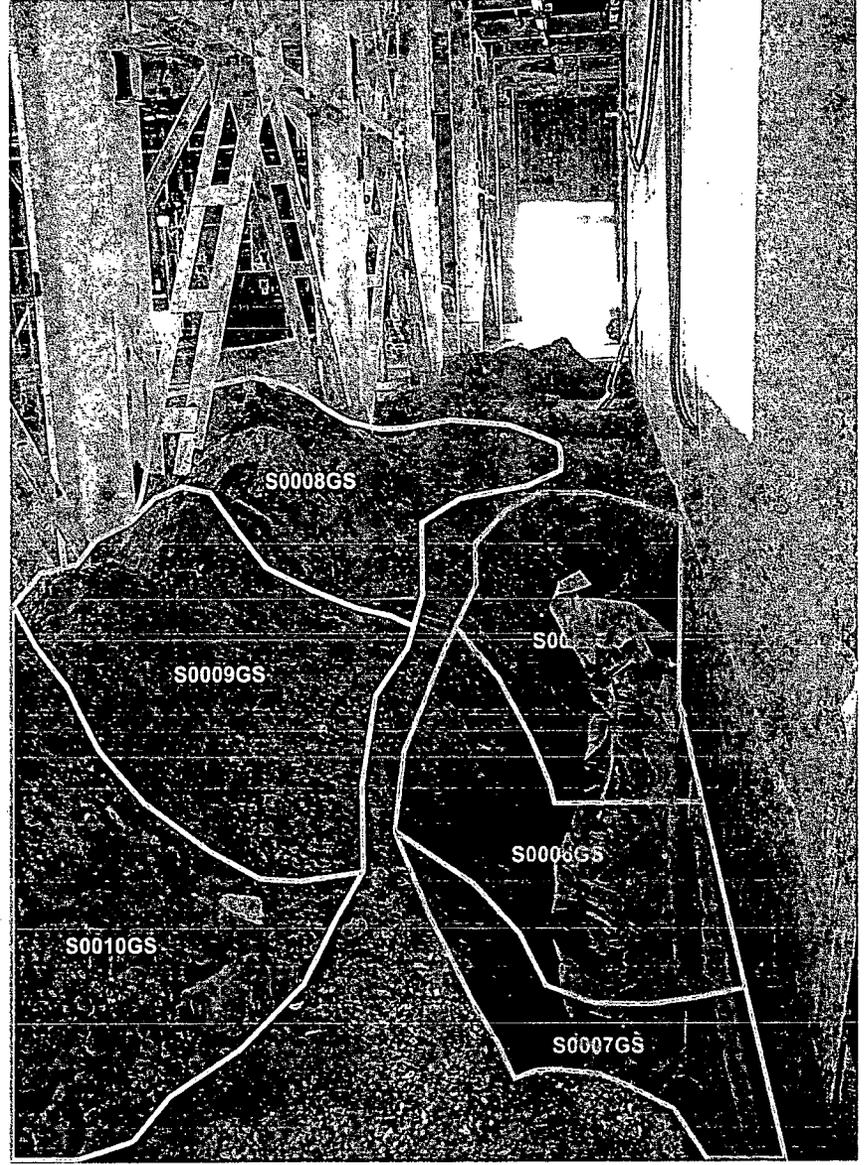
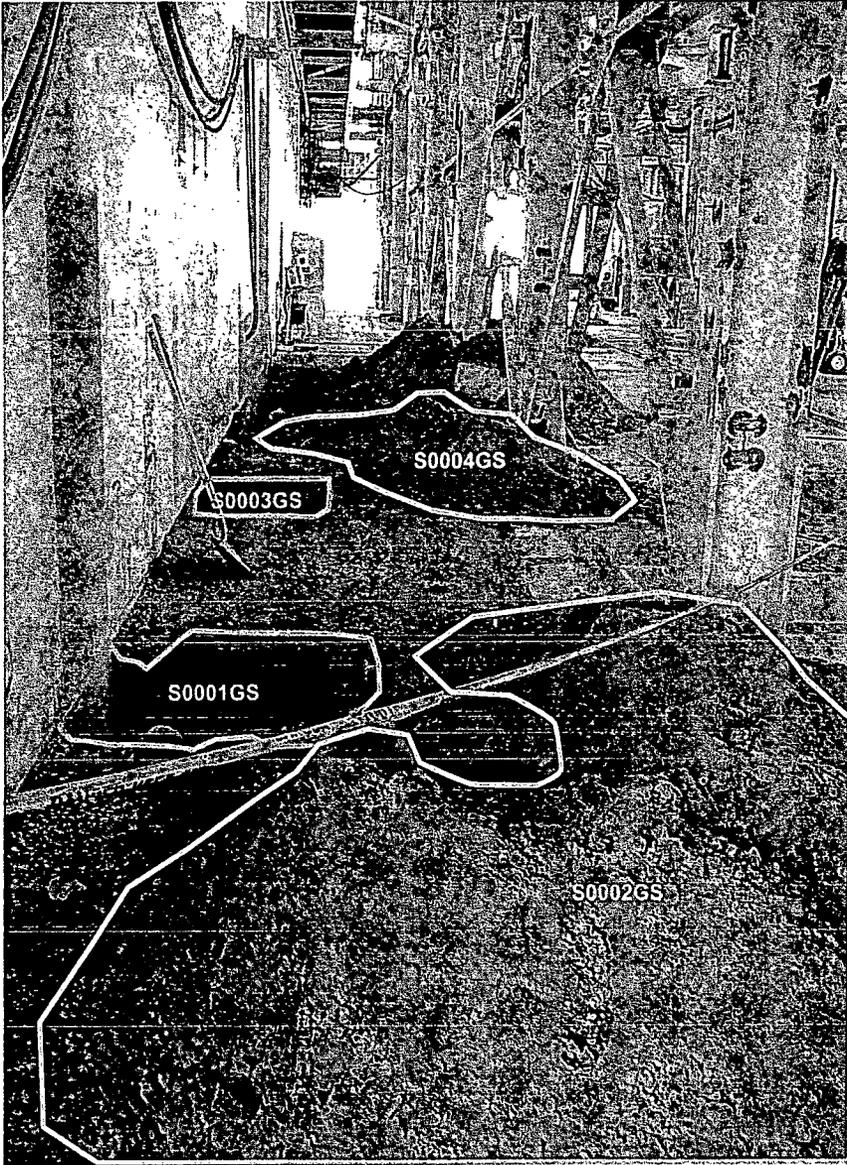


Map F8120121-9, Fuel Storage Building
West Exterior Wall, 0' El. to 20' El. (Class 1)
ISOCS Gamma Scan Measurements
F8120121C0025GS to F8120121C0053GS
3.14 sq. meter field of view
F8120121C0052GS to F8120121C0058GS
6.2 sq. meter field of view

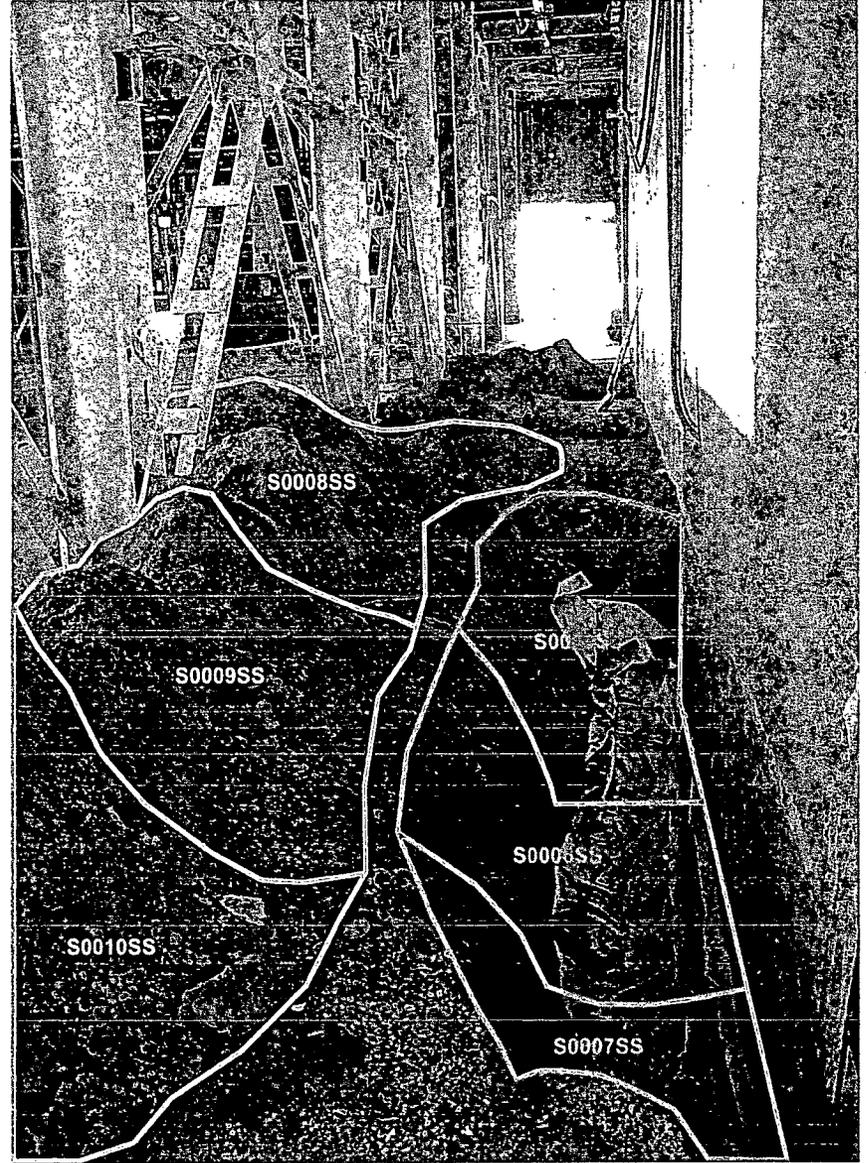
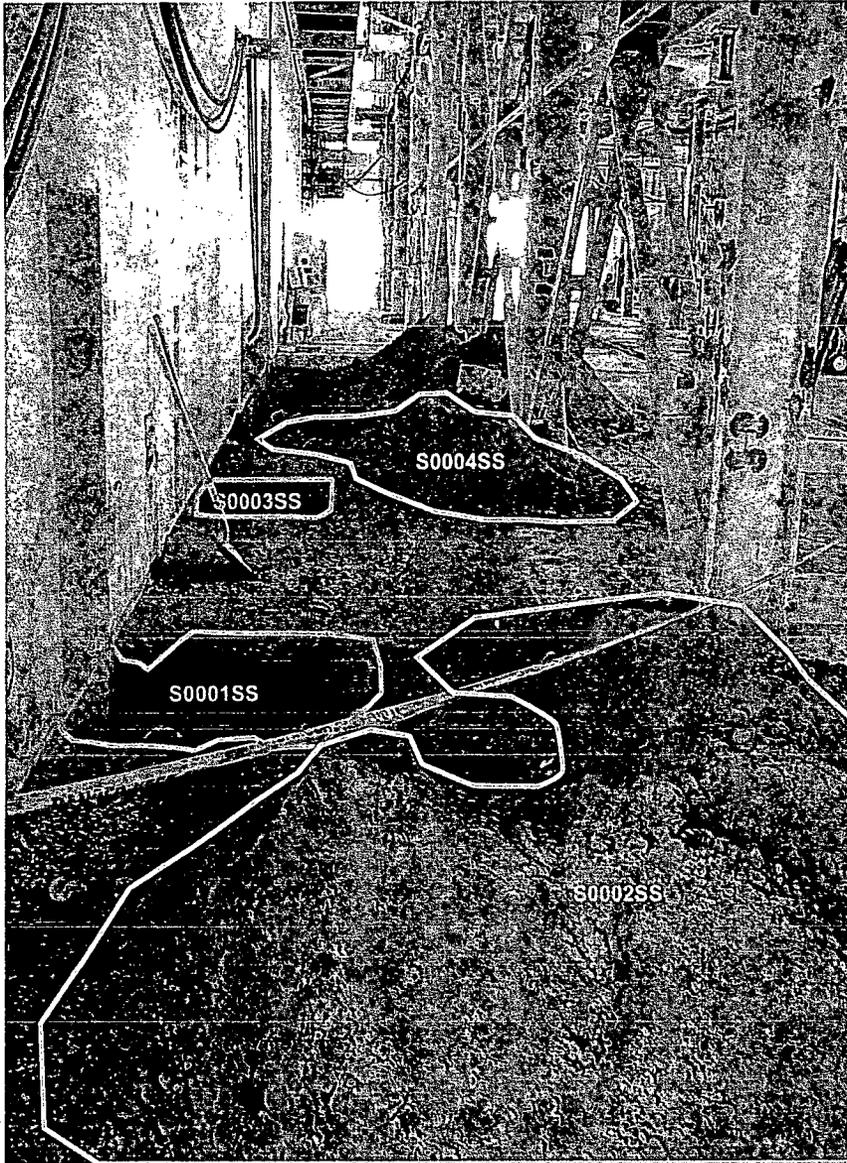
40' El.



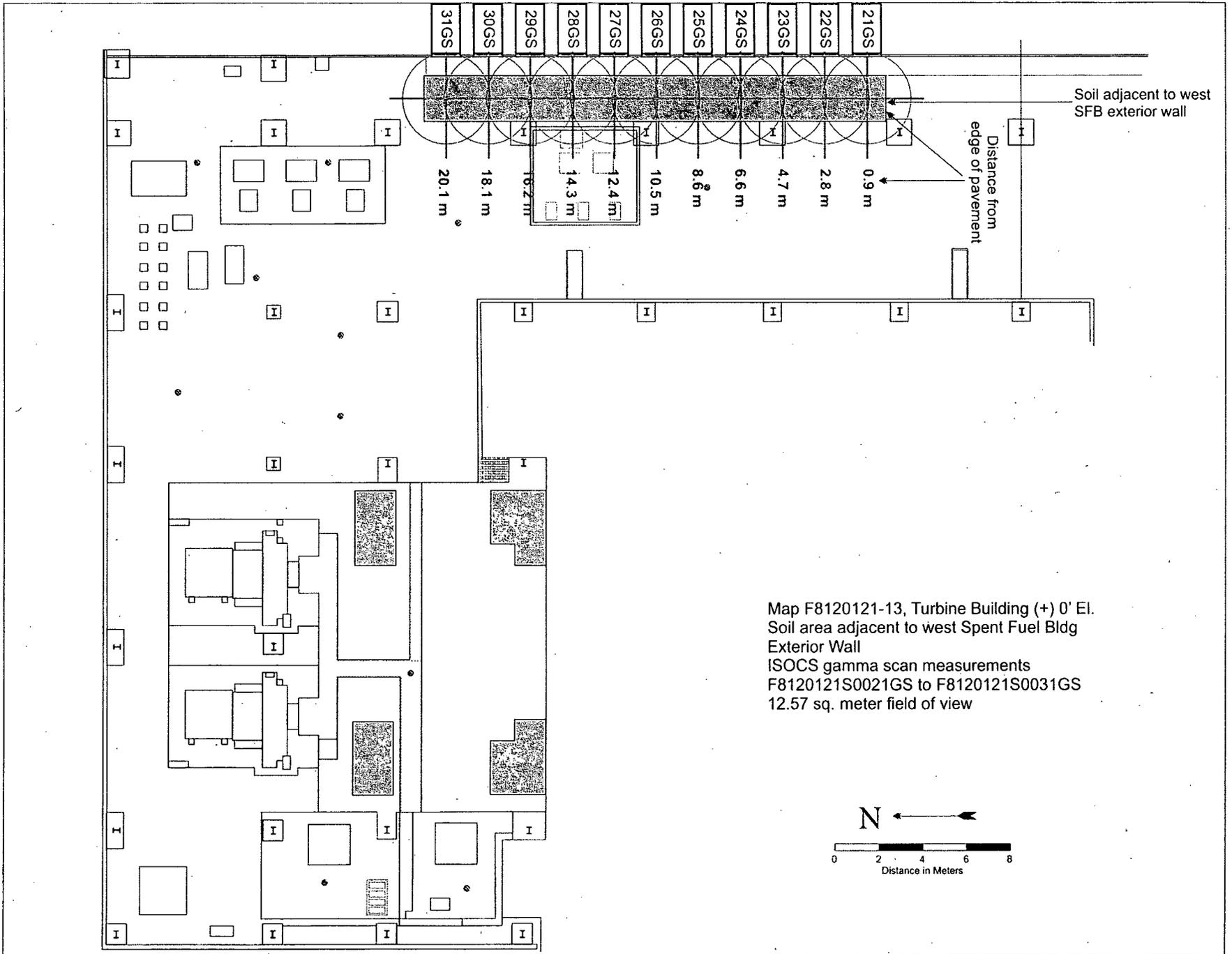
Map F8120121-10, Fuel Storage Building
West Exterior Wall, 0' El. to 20' El. (Class 1)
ISOCS Gamma Scan Measurements
F8120121C0001GS to F8120121C0058GS

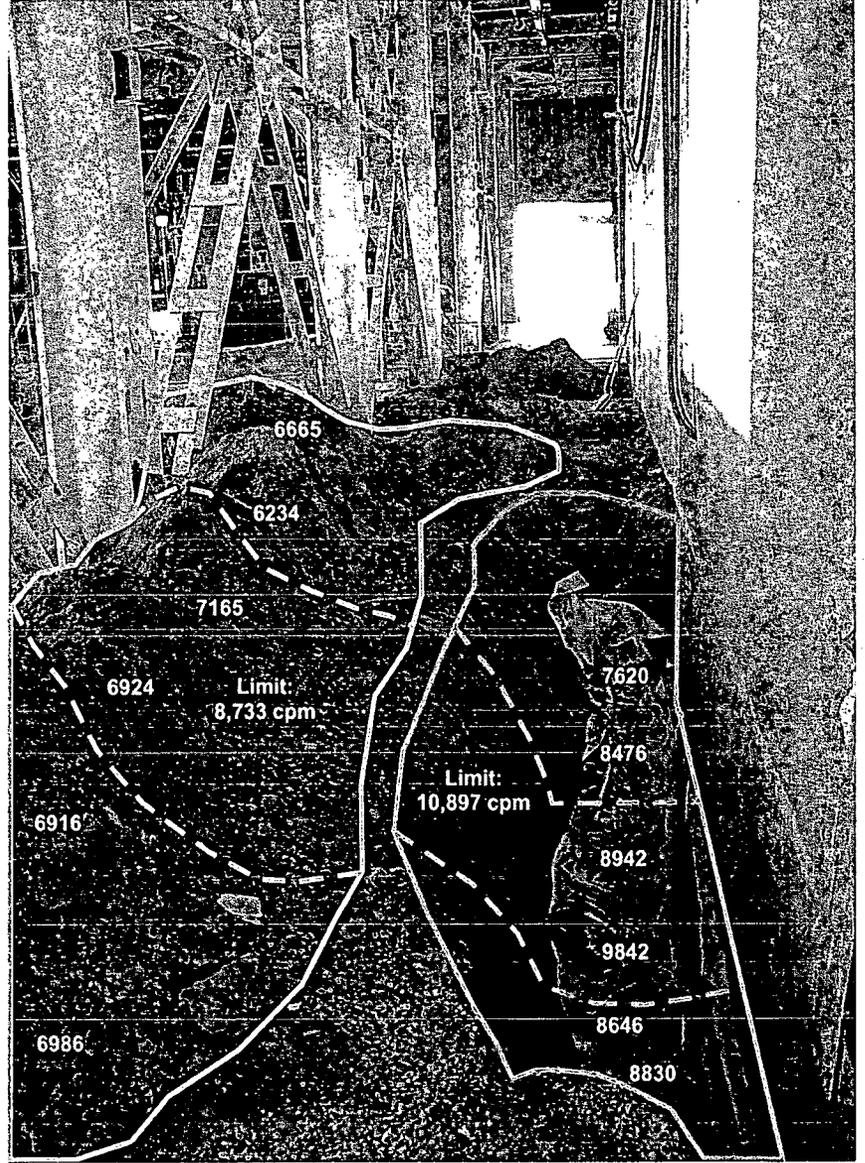
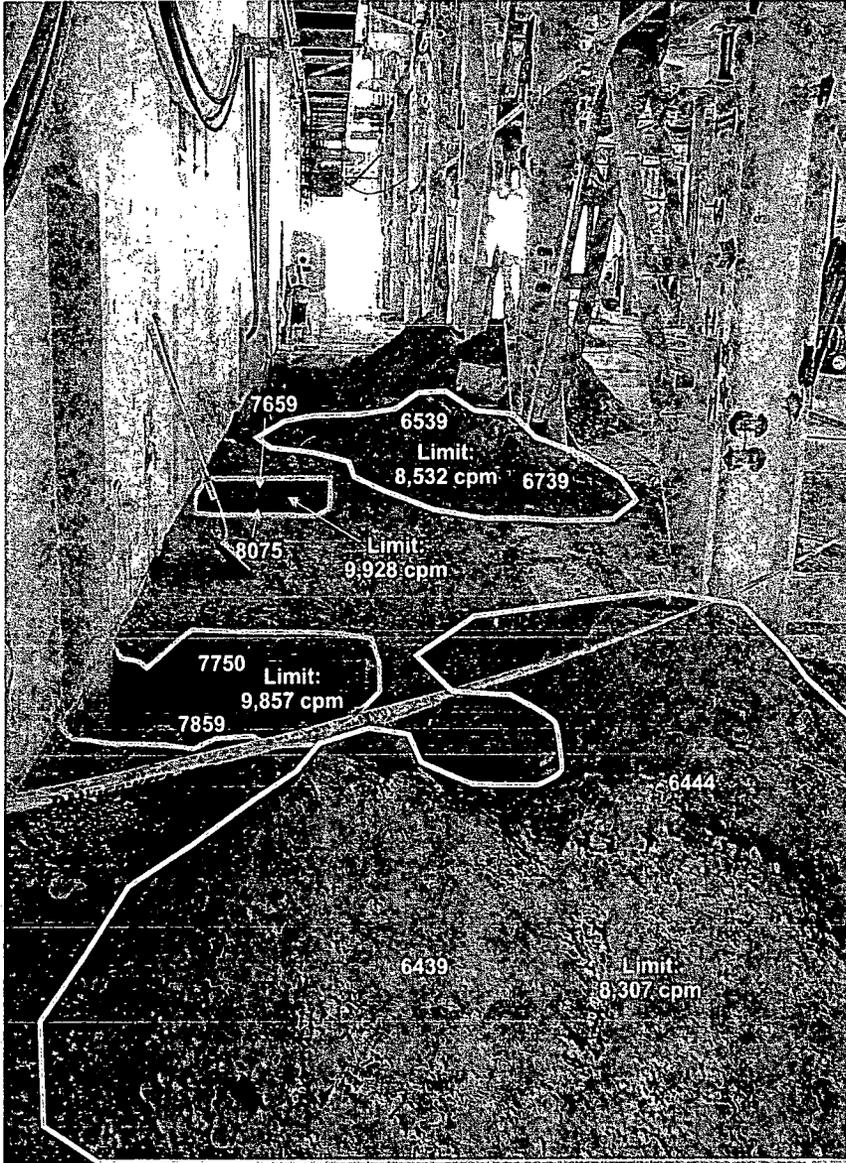


Map F8120121-11, Fuel Storage Building
West Exterior Wall, (-) 3' El. to 20' El. (Class 1)
Nal Gamma Scan Measurements
F8120121S0001GS to F8120121S0010GS

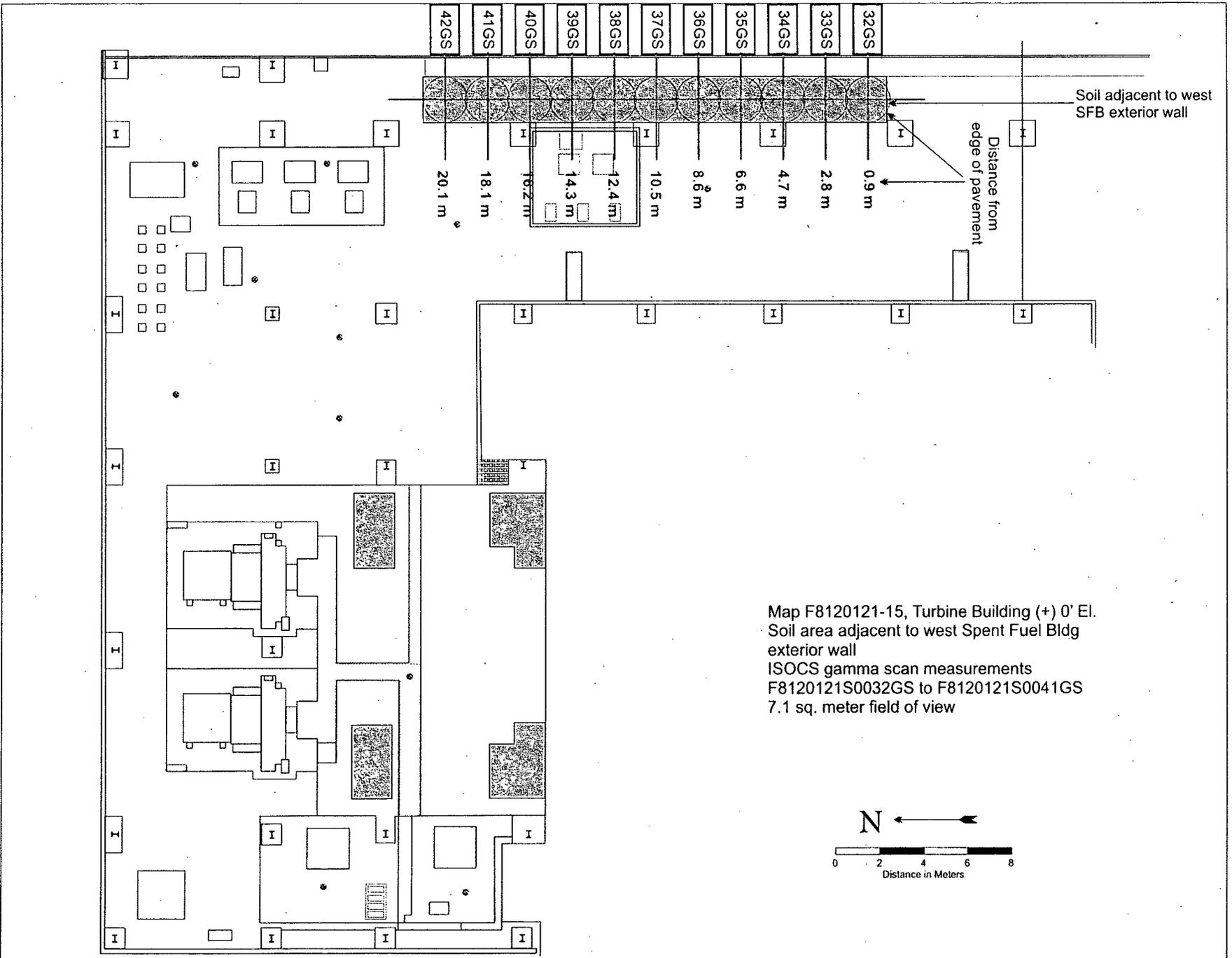


Map F8120121-12, Fuel Storage Building
West Exterior Wall, (-) 3' El. to 20' El. (Class 1)
Soil Sample Locations
F8120121S0001SS to F8120121S0010SS





Map F8120121-14, Fuel Storage Building West Exterior Wall, (-) 3' El. to 20' El. (Class 1) Nal Background Locations F8120121S0001GS to F8120121S0020GS



Attachment 2
Instrumentation
October 1, 2008
Survey Unit F8120121

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; 142514	43-98B; 148639	1,400	2,520
M2350; 193700	43-68B; 190294 ¹	433	1,033
M2350; 193700	43-68B; 190294 ²	909	2,169
M2350; 142509	43-68B; 160699 ¹	433	1,033
M2350; 142509	43-68B; 160699 ²	909	2,169
M2350; 193700	43-116-1B; 216072	491	739
Tennelec; 0401171	N/A	5.88 dpm α , 11.71 dpm β	N/A

¹Concrete surfaces

²Concrete surfaces with 1 layer of paint

Instrument	Detector Model No.	Detector Serial No.	MDC
ISOCS	N/A	1983920	Concrete – 1,220 dpm/100 cm ² Cs-137, Concrete – 905 dpm/100 cm ² Co-60
ISOCS	N/A	2983947	Concrete – 1,240 dpm/100 cm ² Cs-137, Concrete – 856 dpm/100 cm ² Co-60

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static (pCi/g)	MDC Scan (pCi/g)
M2350; 193700	44-10; 256101	N/A	5.2
M2350; 193715	44-10; 171374	N/A	5.2

Instrument	Detector Model No.	Detector Serial No.	MDC
ISOCS	N/A	1983920	Soil – 0.34 pCi/g Cs-137, Soil – 0.23 pCi/g Co-60
ISOCS	N/A	2983947	Soil – 0.23 pCi/g Cs-137, Soil – 0.26 pCi/g Co-60
HPGe	N/A	05069128	Soil – 0.06 pCi/g Cs-137, Soil – 0.07 pCi/g Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	154,800
Investigation Criteria – Scan	154,800
Investigation Criteria – Scan (ISOCS average activity – 3.14 sq. meter field of view)	186,000 Cs-137 64,000 Co-60
Investigation Criteria – Scan (ISOCS average activity – 6.2 sq. meter field of view)	63,000 Cs-137 21,000 Co-60
DCGL _w	43,000
DCGL _{EMC}	154,800

Attachment 3
Investigation
October 1, 2008
Survey Unit F8120121

(none required)

Attachment 4
Data Assessment
October 1, 2008
Survey Unit F8120121

