Rancho Seco

Final Status Survey Summary Report

February 22, 2009

Central Industrial Area Paved Roadways

Survey Unit F8000106

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Approved By: E.T. **Date:** 2-27-09

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8000106, Central Industrial Area Paved Roadways

Survey Unit Description:

Operating History: Paved areas within the Industrial Area included the access road, parking lots, foundation pads from demolished temporary structures, and on-site transportation corridors used to transport materials across the site, including radioactive material. Both operational surveys and the HSA document contaminated asphalt and concrete within the IA and potential contamination events outside the IA.

Site Characterization: Paved areas were surveyed using gas flow proportional detectors with more than 300 direct measurements taken. Mean levels of contamination reported were 2,630 dpm/100 cm^2 with a maximum value of 5,262 dpm/100 cm^2. Additionally, the access roads were gamma scanned using a multiple detector array with the east road showing <0.17 pCi/g Cs-137 and the west road showing <0.23 pCi/g Cs-137. Based on classification procedure (DSIP-0020) and the levels of activity found on asphalt and concrete surfaces, the general paved areas of the site were classified as Class 3. The classification for this survey area was increased from Class 3 to Class 2 not based on viable characterization data but as a conservative measure as the survey unit bounds a Class 1 land area.

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 782 m^2 were scanned for approximately 21% coverage. ISOCS gamma measurements 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:	F800	Central Industrial Area Paved Roadways
Survey Unit:	0106	Open Land Area
Class:	2	LTP Table 5-4
SU Area (m^2)**:**	3,680	
Evaluator:	D. Anderson	
DCGL Cs-137 surrogate (pCi/g)**:**	51.2	
Area Factor:	N/A	Class 2
Design DCGLemc (pCi/g)**:**	N/A	Class 2
LBGR (pCi/g)**:**	39.5	Adjusted
Design Sigma (pCi/g)**:**	3.90	DTBD-06-001, Table 5-4C
Type I Error:	0.05	
Type II Error:	0.05	
Nuclide:	Cs-137	
Sample Area (m^2)**:**	263	Class 2
Total Area Scanned (m^2)**:**	782	
Scan Coverage (%)**:**	21.3%	Class 2
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3.0	
Relative Shift Used:	3.0	Uses 3.0 if Rel Shift >3
N-Value:	11	
Design N-Value + 20%:	14	NUREG-1575 Table 5-5
Grid Spacing L:	16.2	Class 2

Survey Results:

A total of 14 direct measurements were made in F8000106. The results including mean, median, standard deviation and range are shown in Table 2. All of the direct measurements were less than the DCGL. None of the ISOCS gamma scan measurements on the asphalt roadway surfaces indicated areas of elevated activity. Co-60 was not identified above the MDC. The highest scan activity was 7.74E-01 pCi/g Cs-137.

Table 2. Direct Measurement Results
(all activity values in pCi/g)

Measurement ID	Cs137 MDA	Cs137 Activity	Uncertainty
Mean:		2.90E-01	
Median:		2.90E-01	
Standard Deviation:		1.39E-02	
Range:	2.67E-01 to 3.13E-01		
F8000106A0001GD	2.95E-01	< 2.95E-01	
F8000106A0002GD	2.84E-01	< 2.84E-01	
F8000106A0003GD	3.08E-01	< 3.08E-01	
F8000106A0004GD	2.67E-01	< 2.67E-01	
F8000106A0005GD	2.90E-01	< 2.90E-01	
F8000106A0006GD	2.92E-01	< 2.92E-01	
F8000106A0007GD	2.98E-01	< 2.98E-01	
F8000106A0008GD	2.73E-01	< 2.73E-01	
F8000106A0009GD	2.84E-01	< 2.84E-01	
F8000106A0010GD	2.82E-01	< 2.82E-01	
F8000106A0011GD	2.73E-01	< 2.73E-01	
F8000106A0012GD	2.90E-01	< 2.90E-01	
F8000106A0013GD	3.08E-01	< 3.08E-01	
F8000106A0014GD	3.13E-01	< 3.13E-01	

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 3. 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 3. Data Assessment Results

Survey Results Parameter	Value	Comment
Actual Direct Measurements (N):	14	
Median (pCi/g)**:**	2.90E-01	
Mean (pCi/g)**:**	2.90E-01	
Direct Measurement Std Deviation (pCi/g)**:**	1.39E-02	
Maximum (pCi/g)**:**	3.13E-01	
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 2
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 2 land 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 2 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. All of the direct measurements were less than Unity. 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 F8000106 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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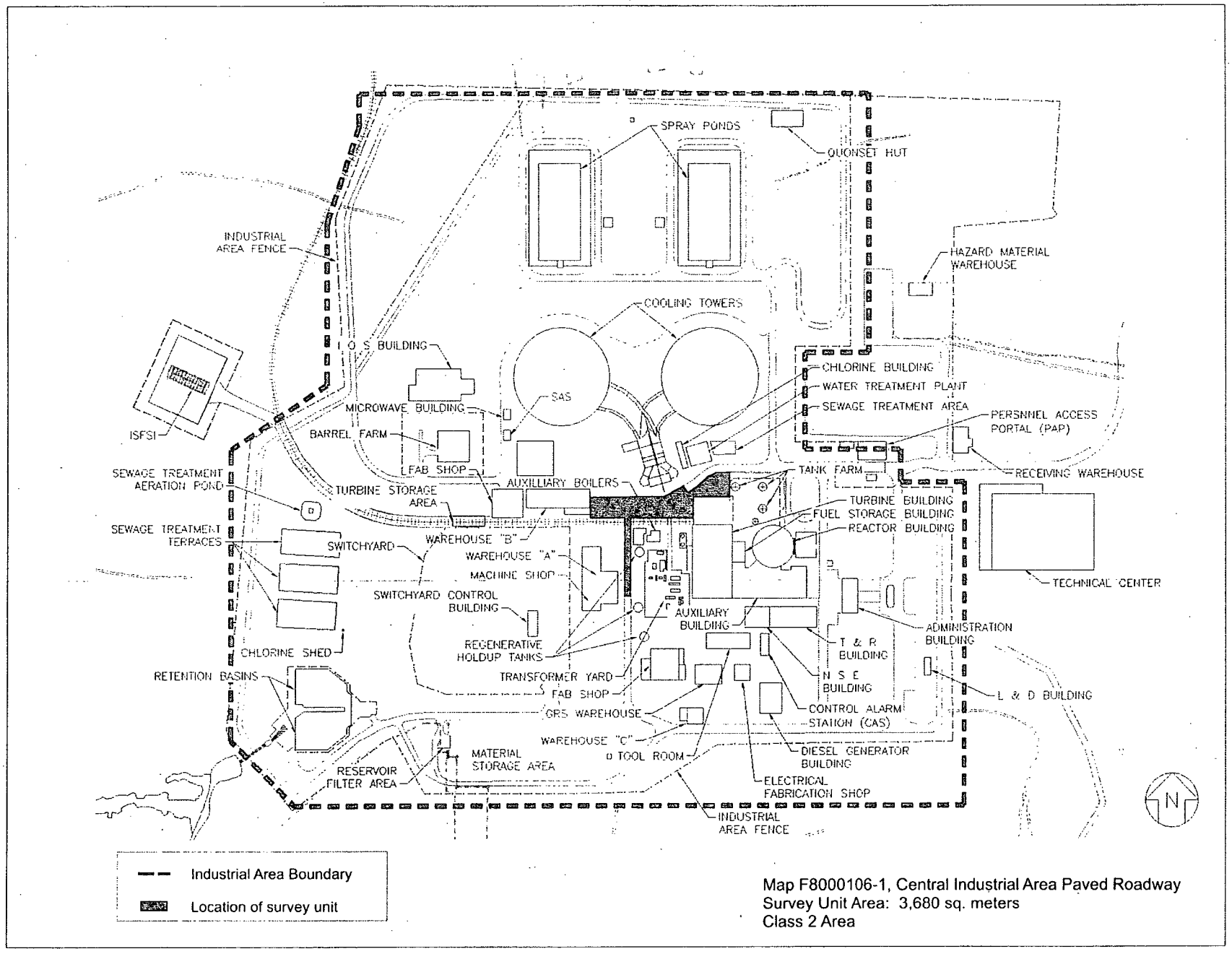
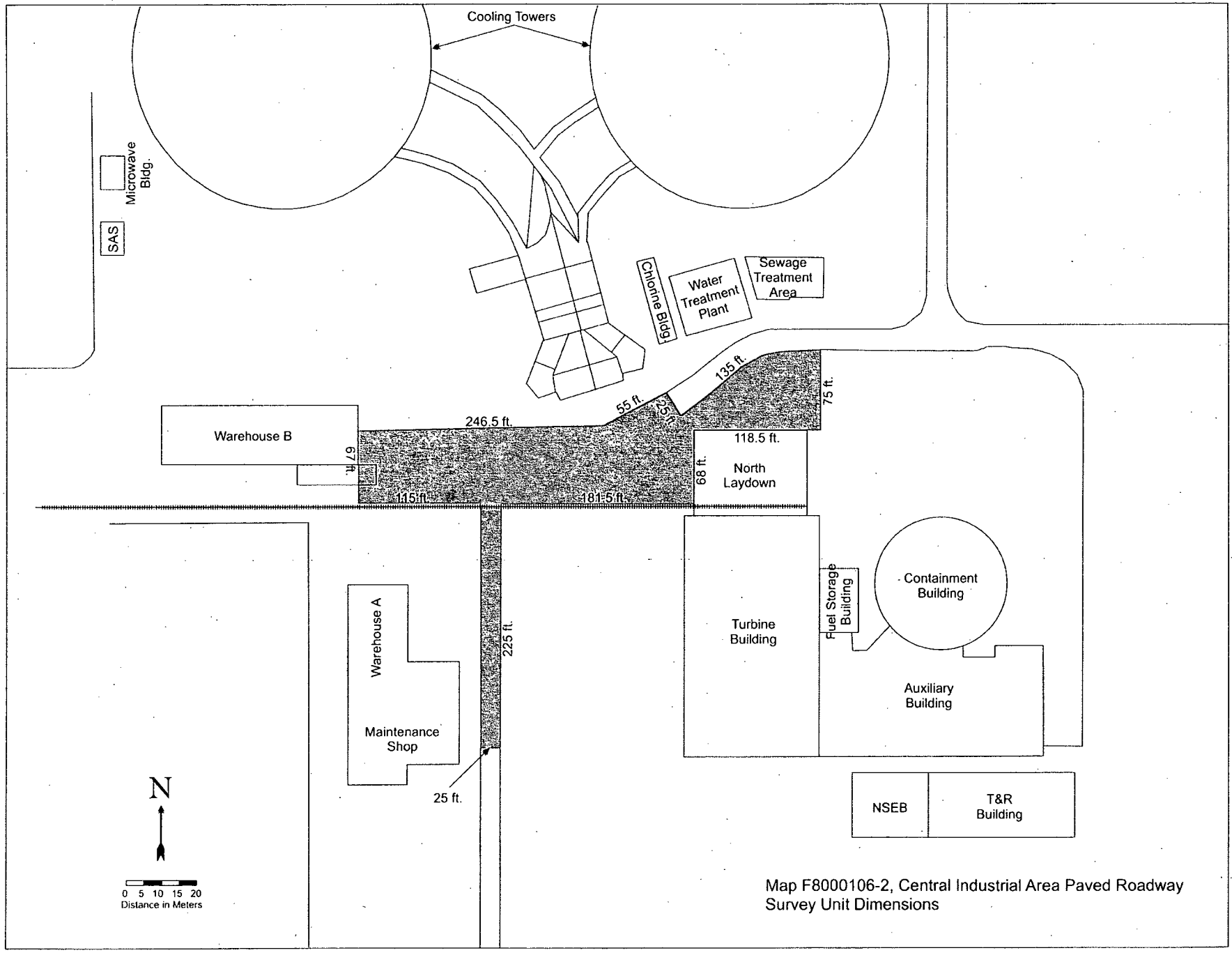
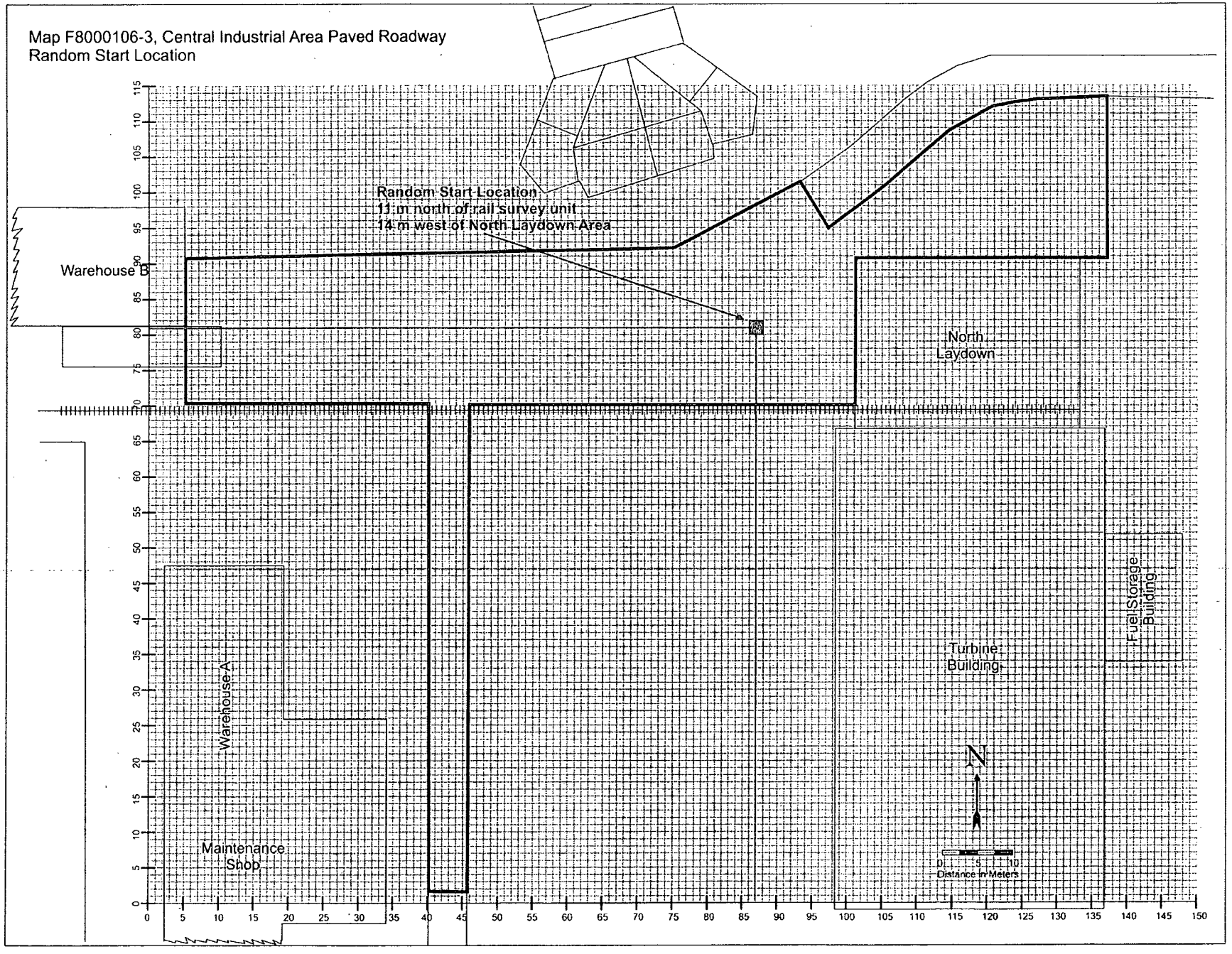
Survey Unit F8000106

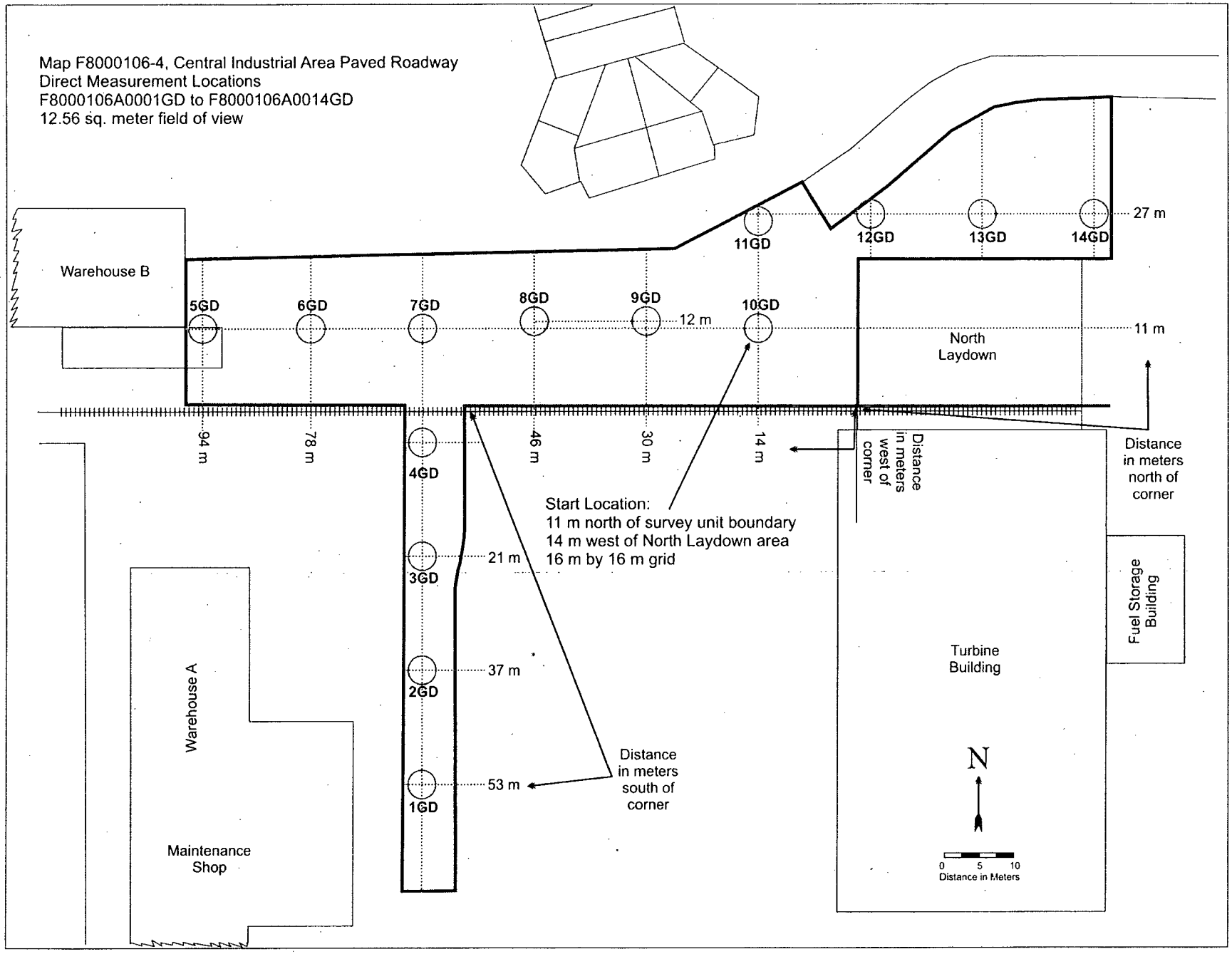


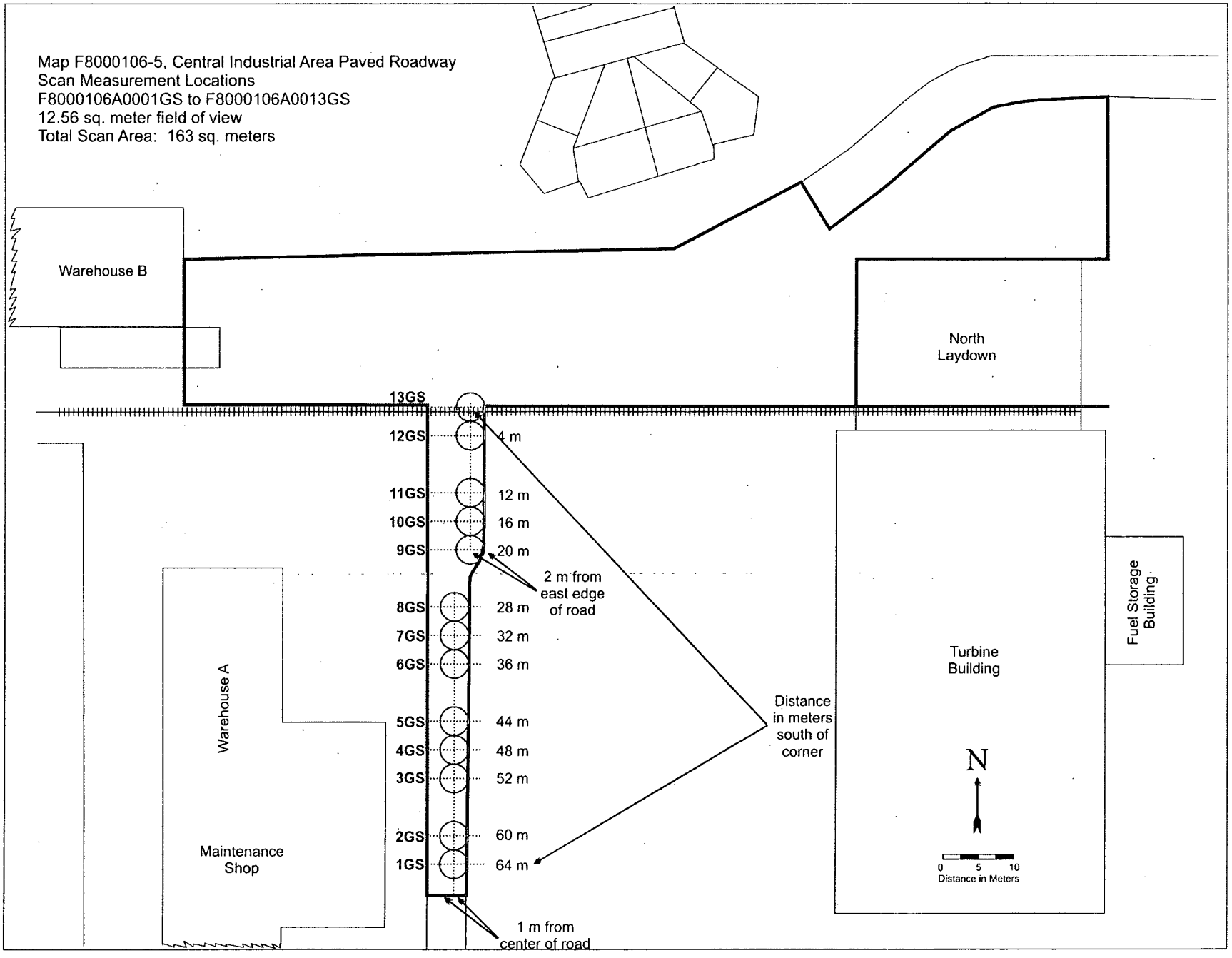
Map F8000106-1, Central Industrial Area Paved Roadway
Survey Unit Area: 3,680 sq. meters
Class 2 Area

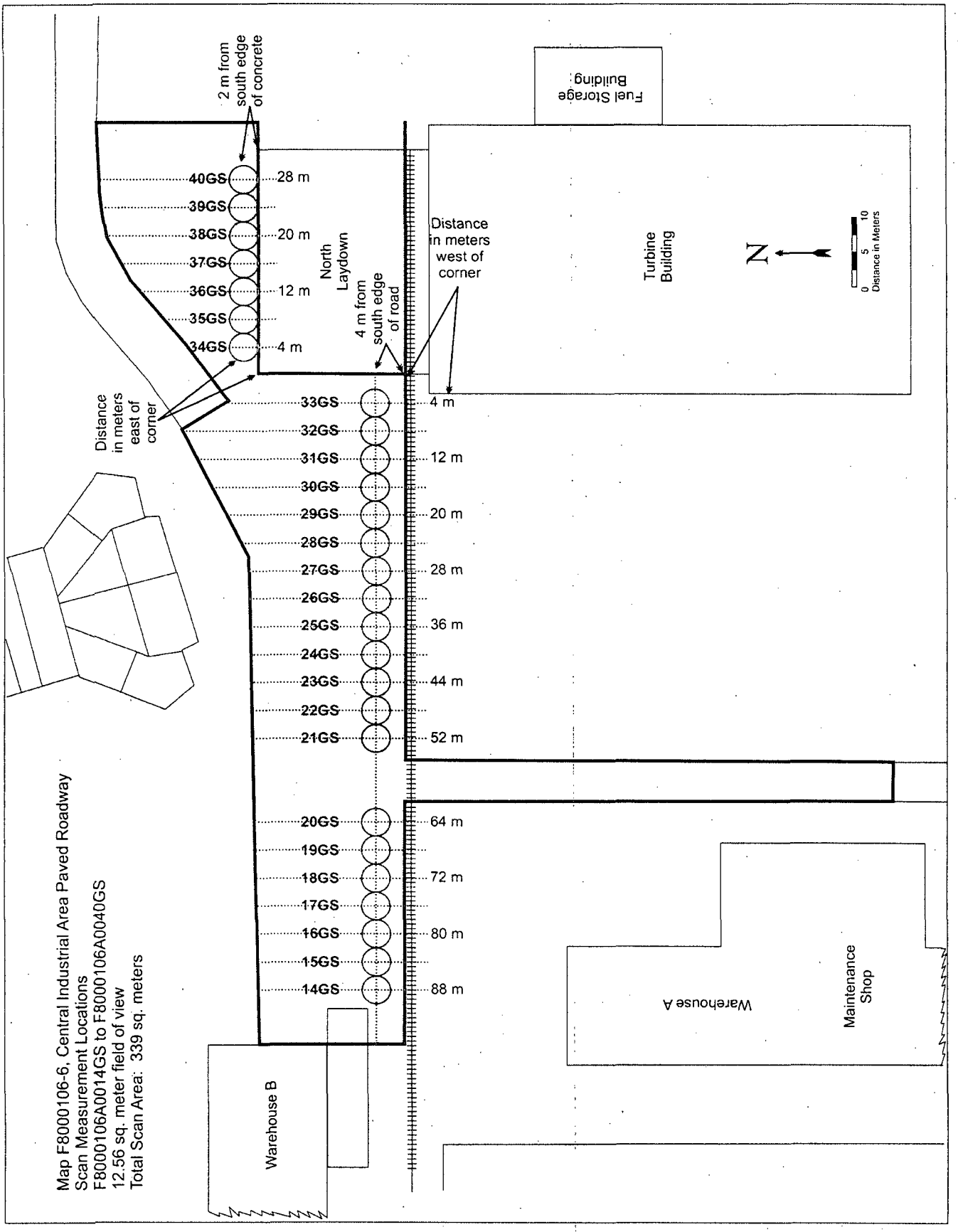


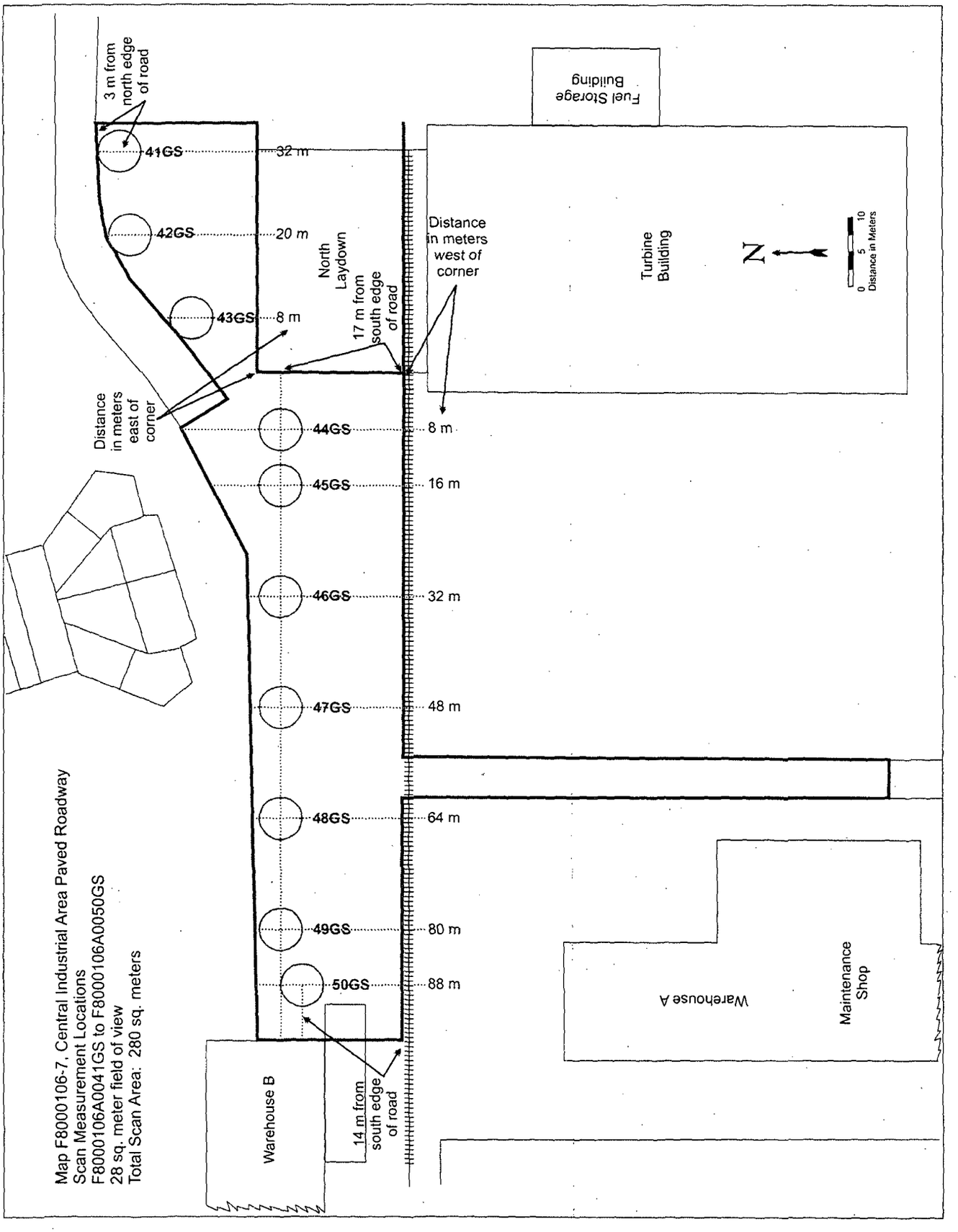
Map F8000106-2, Central Industrial Area Paved Roadway Survey Unit Dimensions


Map F8000106-3, Central Industrial Area Paved Roadway
Random Start Location
Random Start Location
11 m north of rail survey unit
14 m west of North Laydown Area
Warehouse B
North Laydown
Fuel Storage Building
Turbine Building
Warehouse A
Maintenance Shop
N
0 5 10
Distance in Meters


Map F8000106-4, Central Industrial Area Paved Roadway
Direct Measurement Locations
F8000106A0001GD to F8000106A0014GD
12.56 sq. meter field of view
Warehouse B
5GD
6GD
7GD
8GD
9GD
10GD
11GD
12GD
13GD
14GD
27 m
12 m
11 m
North Laydown
94 m
78 m
46 m
30 m
14 m
4GD
3GD
2GD
1GD
21 m
37 m
53 m
Start Location:
11 m north of survey unit boundary
14 m west of North Laydown area
16 m by 16 m grid
Distance in meters south of corner
Distance in meters west of corner
Distance in meters north of corner
Fuel Storage Building
Turbine Building
Warehouse A
Maintenance Shop
N
0 5 10
Distance in Meters


Map F8000106-5, Central Industrial Area Paved Roadway
Scan Measurement Locations
F8000106A0001GS to F8000106A0013GS
12.56 sq. meter field of view
Total Scan Area: 163 sq. meters
Warehouse B
North Laydown
13GS
12GS
4 m
11GS
12 m
10GS
16 m
9GS
20 m
2 m from east edge of road
8GS
28 m
7GS
32 m
6GS
36 m
5GS
44 m
4GS
48 m
3GS
52 m
2GS
60 m
1GS
64 m
Distance in meters south of corner
1 m from center of road
Warehouse A
Maintenance Shop
Turbine Building
Fuel Storage Building
N
0 5 10
Distance in Meters


Map F8000106-6, Central Industrial Area Paved Roadway
Scan Measurement Locations
F8000106A0014GS to F8000106A0040GS
12.56 sq. meter field of view
Total Scan Area: 339 sq. meters
2 m from south edge of concrete
40GS
39GS
38GS
37GS
36GS
35GS
34GS
28 m
20 m
12 m
4 m
North Laydown
4 m from south edge of road
Distance in meters west of corner
Distance in meters east of corner
33GS
32GS
31GS
30GS
29GS
28GS
27GS
26GS
25GS
24GS
23GS
22GS
21GS
4 m
12 m
20 m
28 m
36 m
44 m
52 m
20GS
19GS
18GS
17GS
16GS
15GS
14GS
64 m
72 m
80 m
88 m
Fuel Storage Building
Turbine Building
N
0 5 10
Distance in Meters
Warehouse A
Maintenance Shop
Warehouse B


Map F8000106-7, Central Industrial Area Paved Roadway
Scan Measurement Locations
F8000106A0041GS to F8000106A0050GS
28 sq. meter field of view
Total Scan Area: 280 sq. meters
3 m from north edge of road
41GS
32 m
42GS
20 m
43GS
8 m
North Laydown
17 m from south edge of road
Distance in meters west of corner
Distance in meters east of corner
44GS
8 m
45GS
16 m
46GS
32 m
47GS
48 m
48GS
64 m
49GS
80 m
50GS
88 m
14 m from south edge of road
Fuel Storage Building
Turbine Building
N
0 5 10
Distance in Meters
Warehouse A
Maintenance Shop
Warehouse B

Attachment 2

Instrumentation

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Survey Unit F8000106

Table 2-1. Survey Unit Instrumentation

Instrument	Detector Model No.	Detector Serial No.	MDC
ISOCS	N/A	1983920	Asphalt – 3.37E-01 pCi/g Cs-137 Asphalt – 2.68E-01 pCi/g Co-60
ISOCS	N/A	1983920	Concrete – 995 dpm/100 cm^2 Cs-137 Concrete – 701 dpm/100 cm^2 Co-60

Table 2-2. Investigation Criteria and DCGL

Instrument	Parameter	Value
ISOCS	Investigation Criteria - Scan	Asphalt – 20 pCi/g Cs-137
ISOCS	Investigation Criteria - Scan	Concrete – 4,300 dpm/100 cm^2 Cs-137
All	$DCGL_W$	51.2 Cs-137 12.6 Co-60
All	$DCGL_W$	43,000 dpm/100 cm^2
All	$DCGL_{EMC}$	N/A

Attachment 3

Investigation

February 22, 2009

Survey Unit F8000106

(none required)

Attachment 4

Data Assessment

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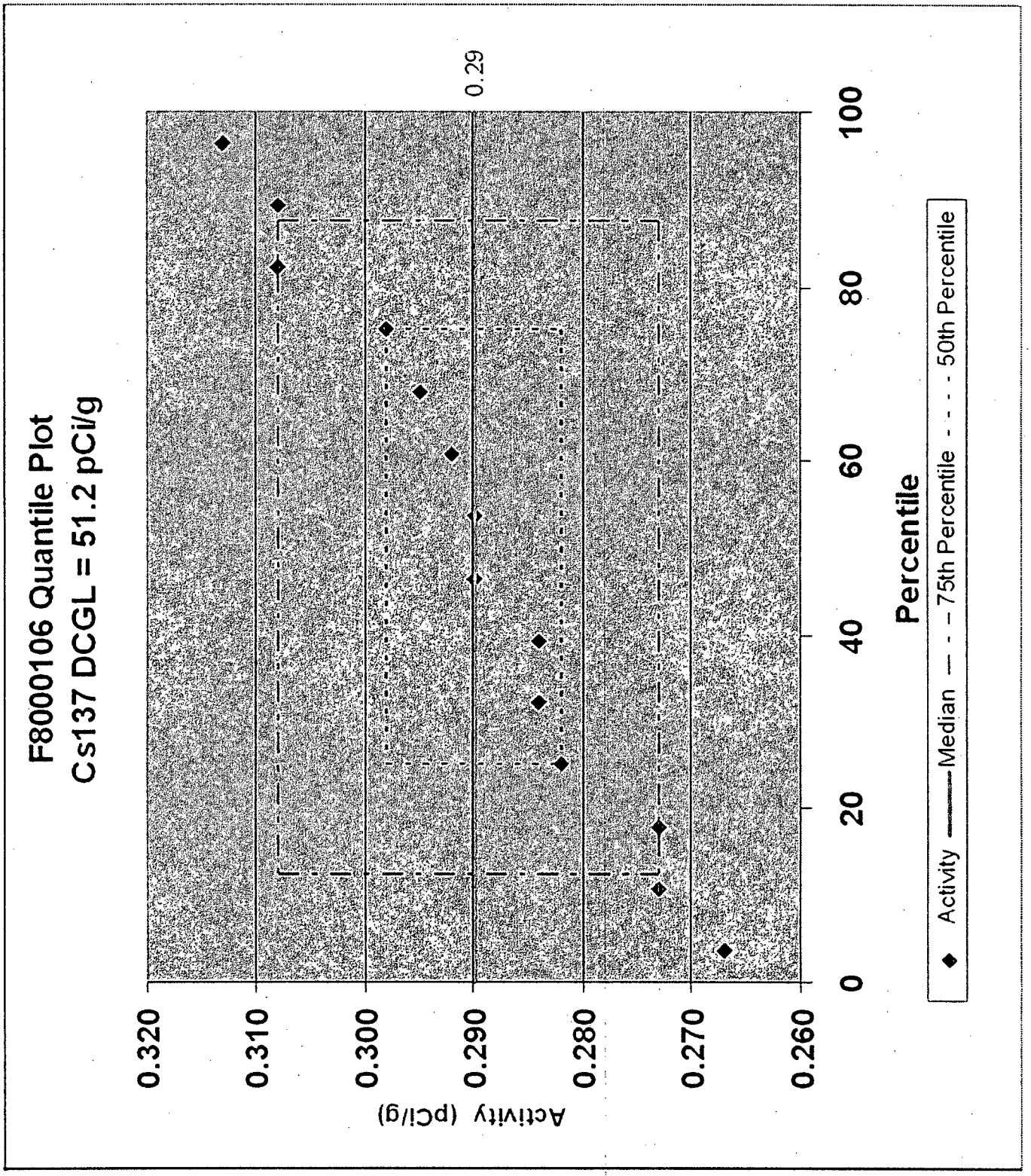
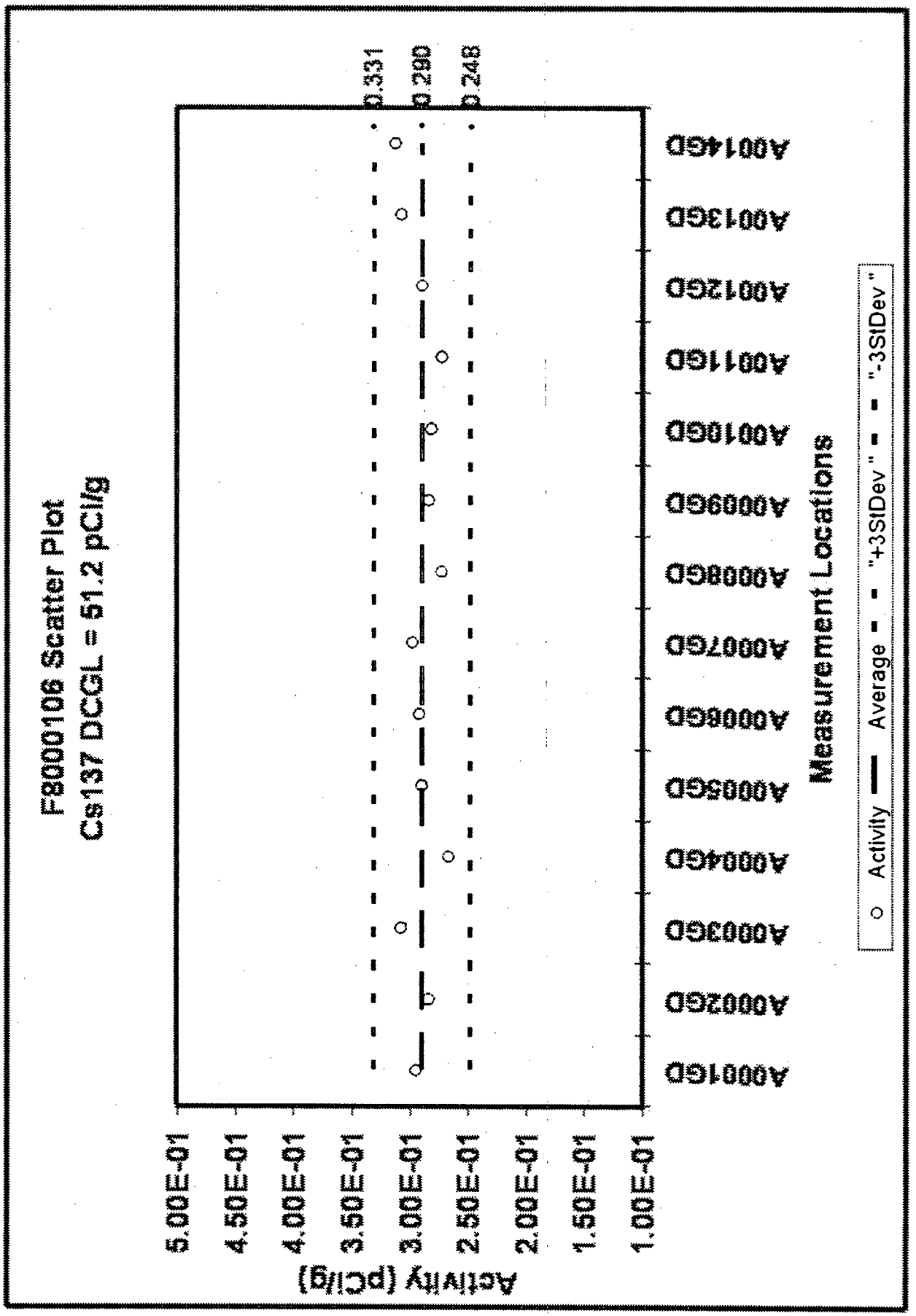
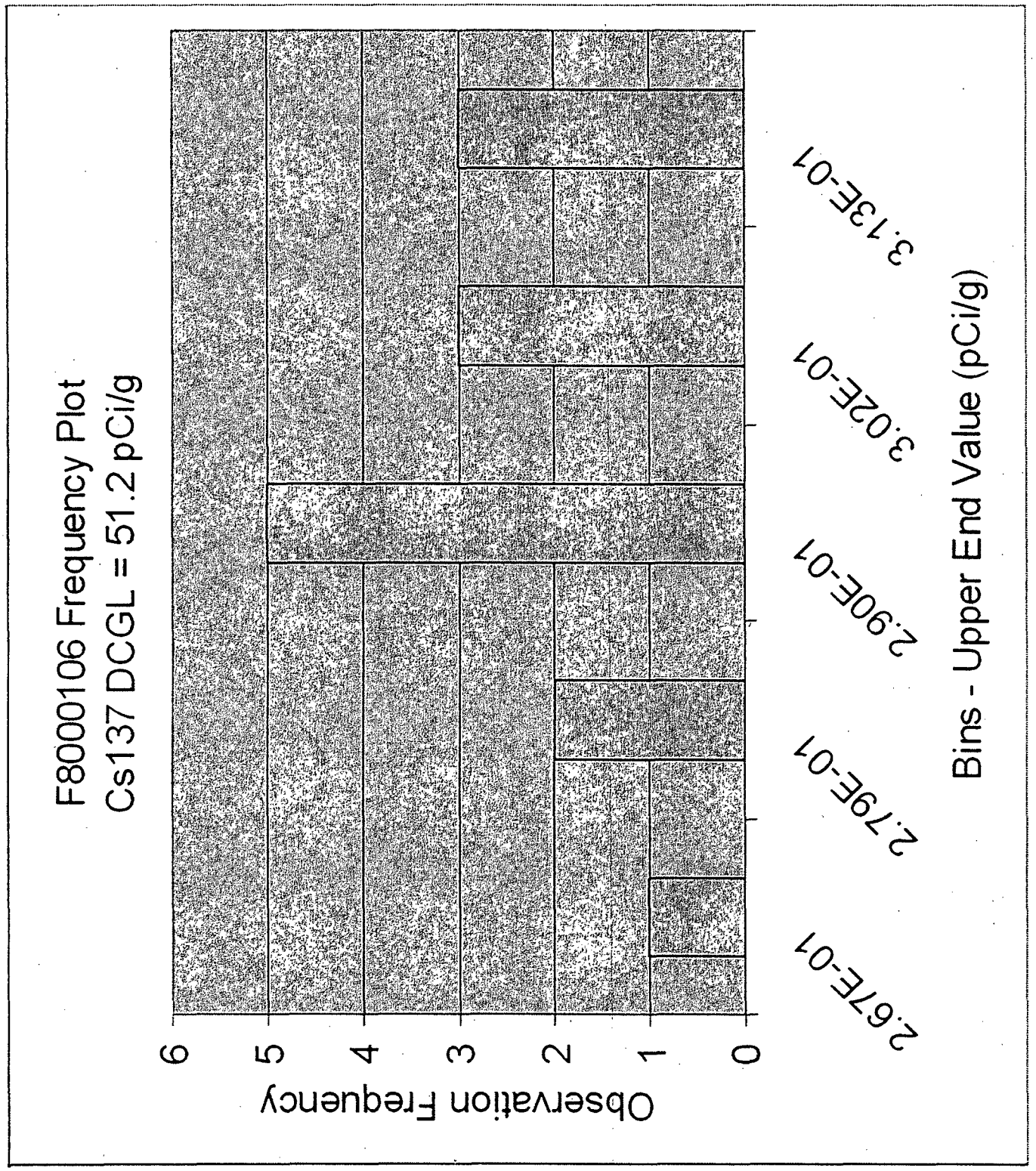
Survey Unit F8000106


F8000106 Quantile Plot
Cs137 DCGL = 51.2 pCi/g
0.29
0.320
0.310
0.300
0.290
0.280
0.270
0.260
Activity (pCi/g)
0
20
40
60
80
100
Percentile
Activity
Median
75th Percentile
50th Percentile


F8000106 Scatter Plot
Cs137 DCGL = 51.2 pCi/g
0.331
0.290
0.248
A00014GD
A00013GD
A00012GD
A00011GD
A00010GD
A00009GD
A00008GD
A00007GD
A00006GD
A00005GD
A00004GD
A00003GD
A00002GD
A00001GD
Measurement Locations
Activity (pCi/g)
5.00E-01
4.50E-01
4.00E-01
3.50E-01
3.00E-01
2.50E-01
2.00E-01
1.50E-01
1.00E-01
Activity
Average
"+3StDev"
"-3StDev"


F8000106 Frequency Plot
Cs137 DCGL = 51.2 pCi/g
Observation Frequency
0
1
2
3
4
5
6
2.67E-01
2.79E-01
2.90E-01
3.02E-01
3.13E-01
Bins - Upper End Value (pCi/g)