

Rancho Seco
Final Status Survey Summary Report

September 8, 2008

Turbine Building Exterior Walls, (+) 0' El. to (+) 40' El.

Survey Unit F8260302

Prepared By: *D. Anderson* Date: 9/8/2008
FSS Engineer

Reviewed By: *R. J. Decker* Date: 11/20/08
Lead FSS Engineer

Approved By: *E. J. B.* Date: 2-27-09
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8260302, Turbine Building Exterior Walls, (+) 0' El. to (+) 40' El.

Survey Unit Description:

Operating History: The reinforced concrete and steel structure contained the turbine-generator and supporting systems. The building contained five 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.

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 in the condenser pit elevation showed a mean gross activity level of 3,077 dpm/100 cm² and a maximum value of 24,900 dpm/100 cm². Direct measurements on the grade elevation showed a mean gross activity level of 2,035 dpm/100 cm² and a maximum value of 6,980 dpm/100 cm². Direct measurements on the mezzanine elevation showed a mean gross activity level of 1,566 dpm/100 cm² and a maximum value of 2,626 dpm/100 cm². Direct measurements on the +40' elevation showed a mean gross activity level of 2,843 dpm/100 cm² and a maximum value of 3,615 dpm/100 cm². Direct measurements on the building exterior showed a mean gross activity level of 1,984 dpm/100 cm² and a maximum value of 10,312 dpm/100 cm². Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the turbine building was determined to be Class 1, 2, & 3 areas 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 903 m² were scanned for approximately 57% 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:	F826	Turbine Building Exterior Walls, (+) 0' El. to (+) 40' El.
Survey Unit:	0302	Structure Surface
Class:	3	LTP Table 5-4
SU Area (m²):	1,596	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm²):	43,000	Gross Activity DCGL
Area Factor:	N/A	Class 3
Design DCGL_{mc} (dpm/100 cm²):	N/A	Class 3
LBGR (dpm/100 cm²):	37,831	Adjusted
Design Sigma (dpm/100 cm²):	1,723	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	N/A	Class 3
Scan Area (m²):	903	
Scan Coverage (%):	57%	Class 3
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:	14	Class 3
Grid Spacing L:	N/A	Class 3

Survey Results:

A total of 14 direct measurements were made in F8260302. 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 < 974 dpm/100 cm² Co-60 and < 953 dpm/100 cm² to 971 dpm/100 cm² Cs-137. 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)
F8260302-M0001BD	1,015
F8260302-M0002BD	640
F8260302-M0003BD	655
F8260302-M0004BD	809
F8260302-M0005BD	621
F8260302-M0006BD	671
F8260302-M0007BD	769
F8260302-M0008BD	1,138
F8260302-M0009BD	1,504
F8260302-M0010BD	1,129
F8260302-M0011BD	1,477
F8260302-M0012BD	1,972
F8260302-M0013BD	1,935
F8260302-M0014BD	1,830
Mean:	1,155
Median:	1,072
Standard Deviation:	502
Range:	621 – 1,972

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm ²)
F8260302M0001SM	-0.95
F8260302M0002SM	-3.53
F8260302M0003SM	0.34
F8260302M0004SM	-0.95
F8260302M0005SM	2.93
F8260302M0006SM	-3.53
F8260302M0007SM	-3.53
F8260302M0008SM	-0.95
F8260302M0009SM	-2.24
F8260302M0010SM	-2.24
F8260302M0011SM	-3.53
F8260302M0012SM	-6.11
F8260302M0013SM	-2.24
F8260302M0014SM	-0.95
Mean:	-1.96
Median:	-2.24
Standard Deviation:	2.16
Range:	-6.11 to 2.93

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	Average Ambient BKG = 0
Ambient Background Used (dpm/100 cm ²):	N/A	
Actual Direct Measurements (N):	14	
Median (dpm/100 cm ²):	1,072	
Mean (dpm/100 cm ²):	1,155	
Direct Measurement Standard Deviation	502	Based on samples and backgrounds.
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	502	
Maximum (dpm/100 cm ²):	1,972	
Material Type:	N/A	
Sign Test Final N Value:	14	Background Subtract Not Applied
S+ Value:	14	
Critical Value:	10	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	Class 3
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{me}:	N/A	
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 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.

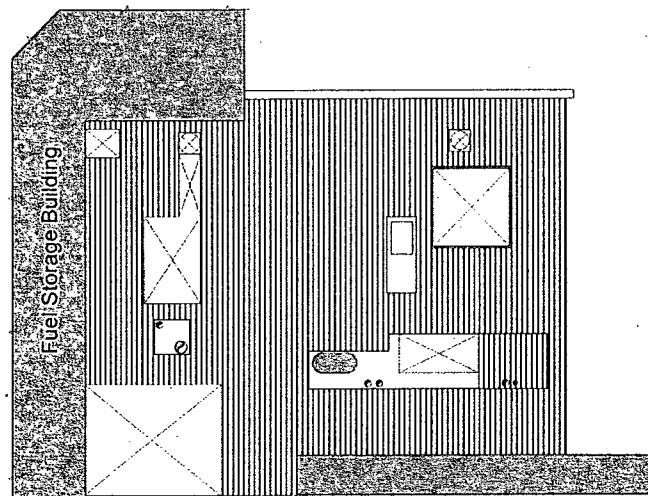
It is concluded that survey unit F8260302 meets the release criteria of 10CFR20.1402.

Attachment 1

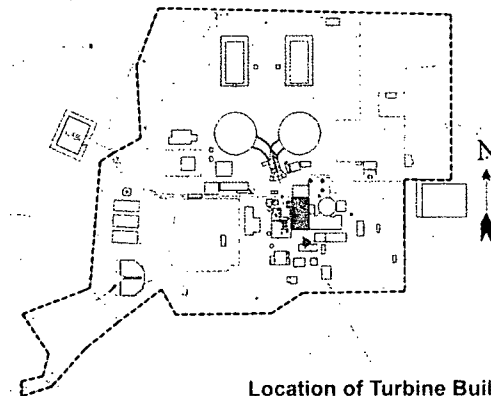
Maps

September 8, 2008

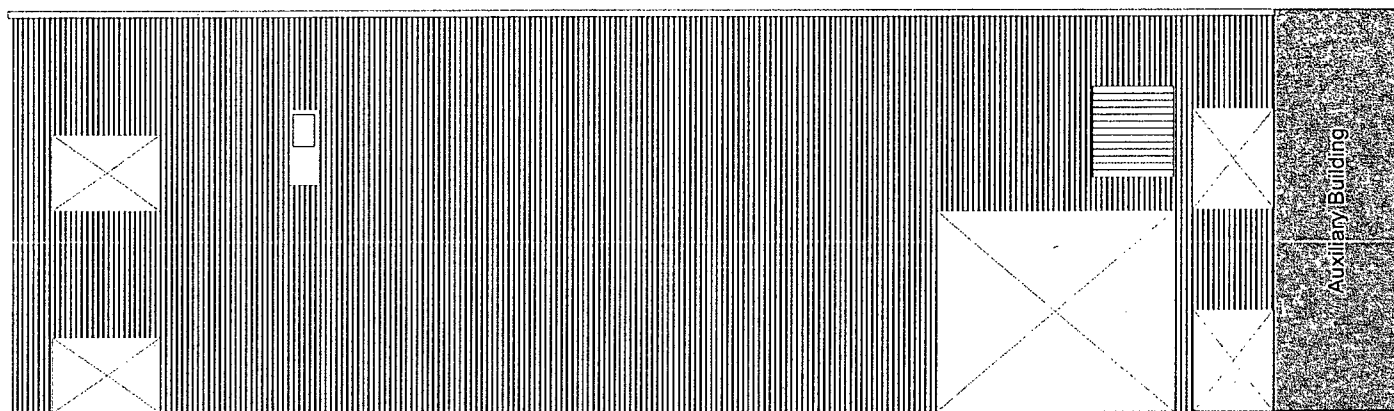
Survey Unit F8260302



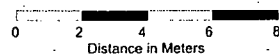
Turbine Building East Exterior Wall
Area Estimate: 154 sq. meters



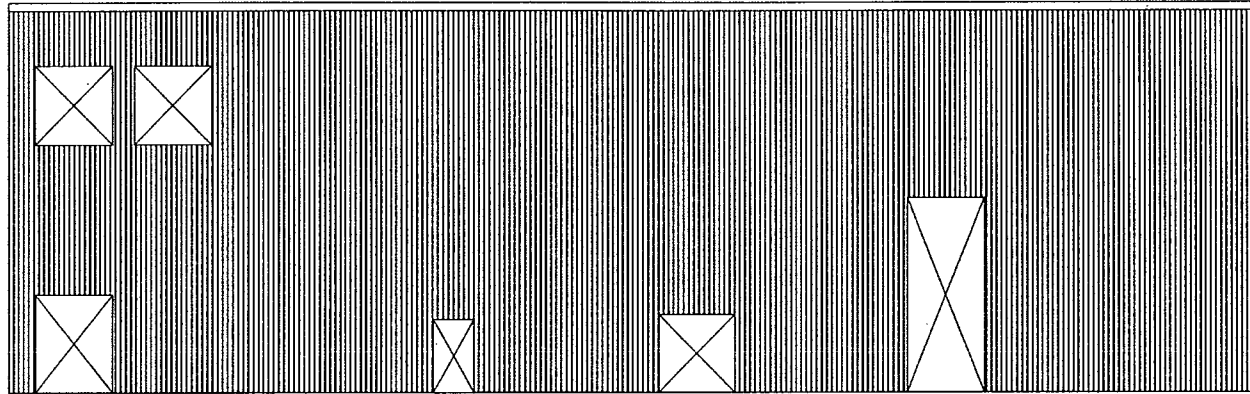
Location of Turbine Building
inside the Industrial Area



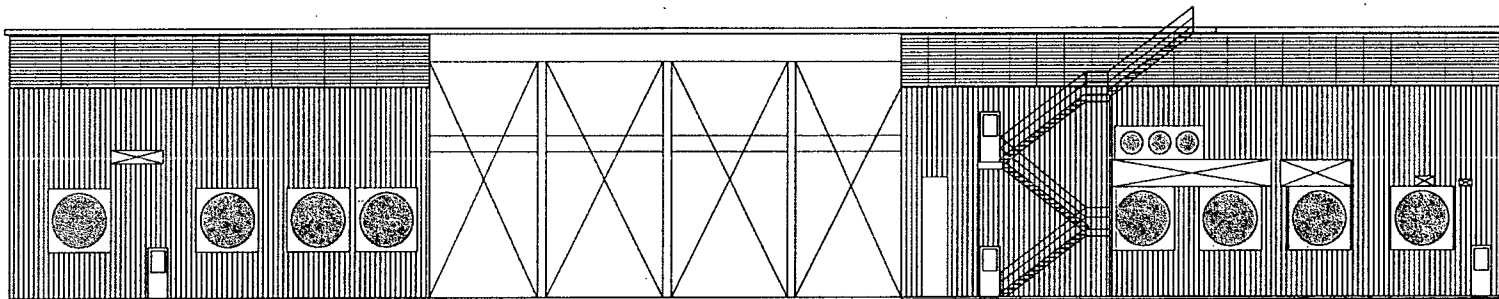
Turbine Building South Exterior Wall
Area Estimate: 398 sq. meters



Map F8260302-1, Turbine Building Exterior
East and South Exterior Walls
Area Estimate: 552 square meters

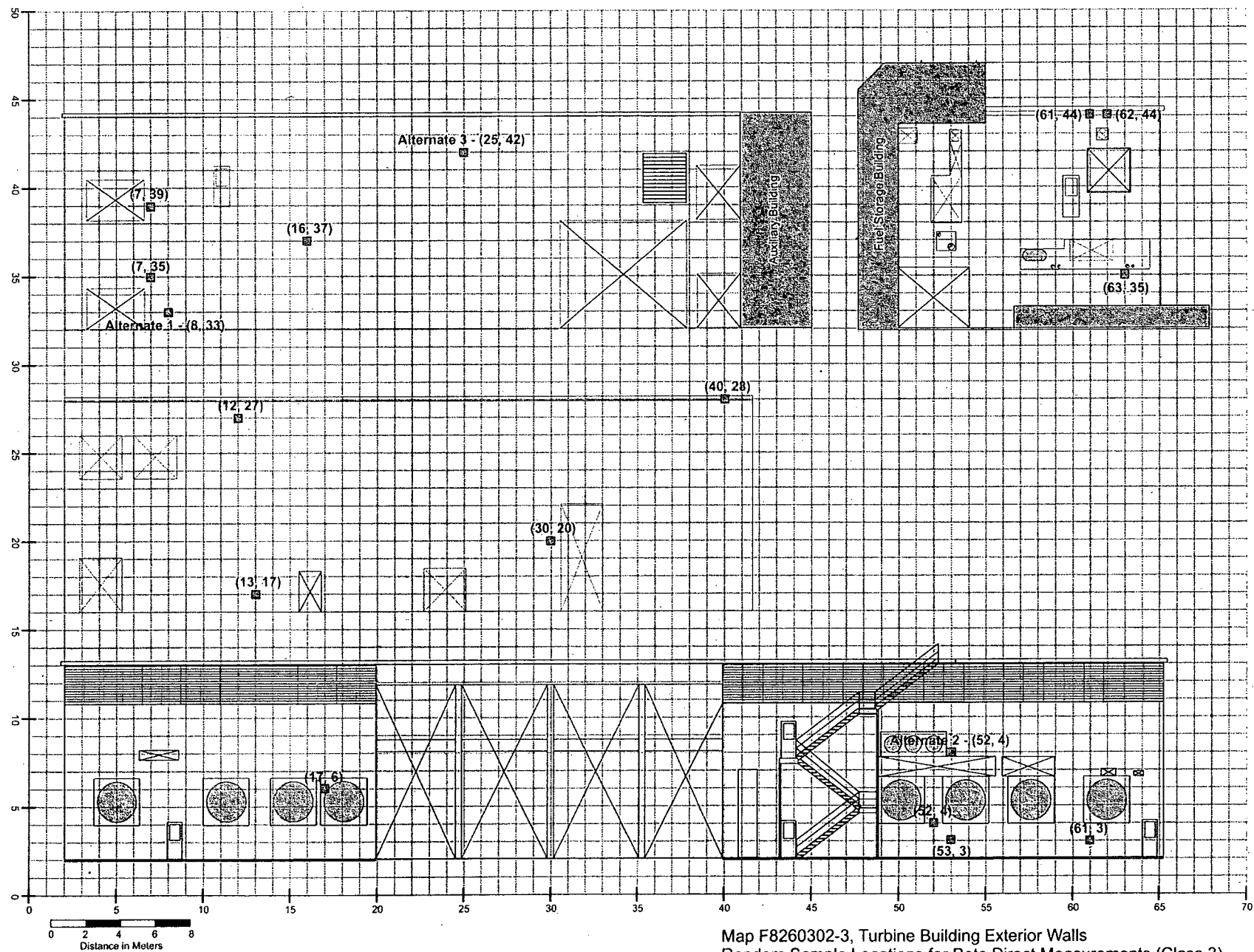


Turbine Building North Exterior Wall
Area Estimate: 454 sq. meters

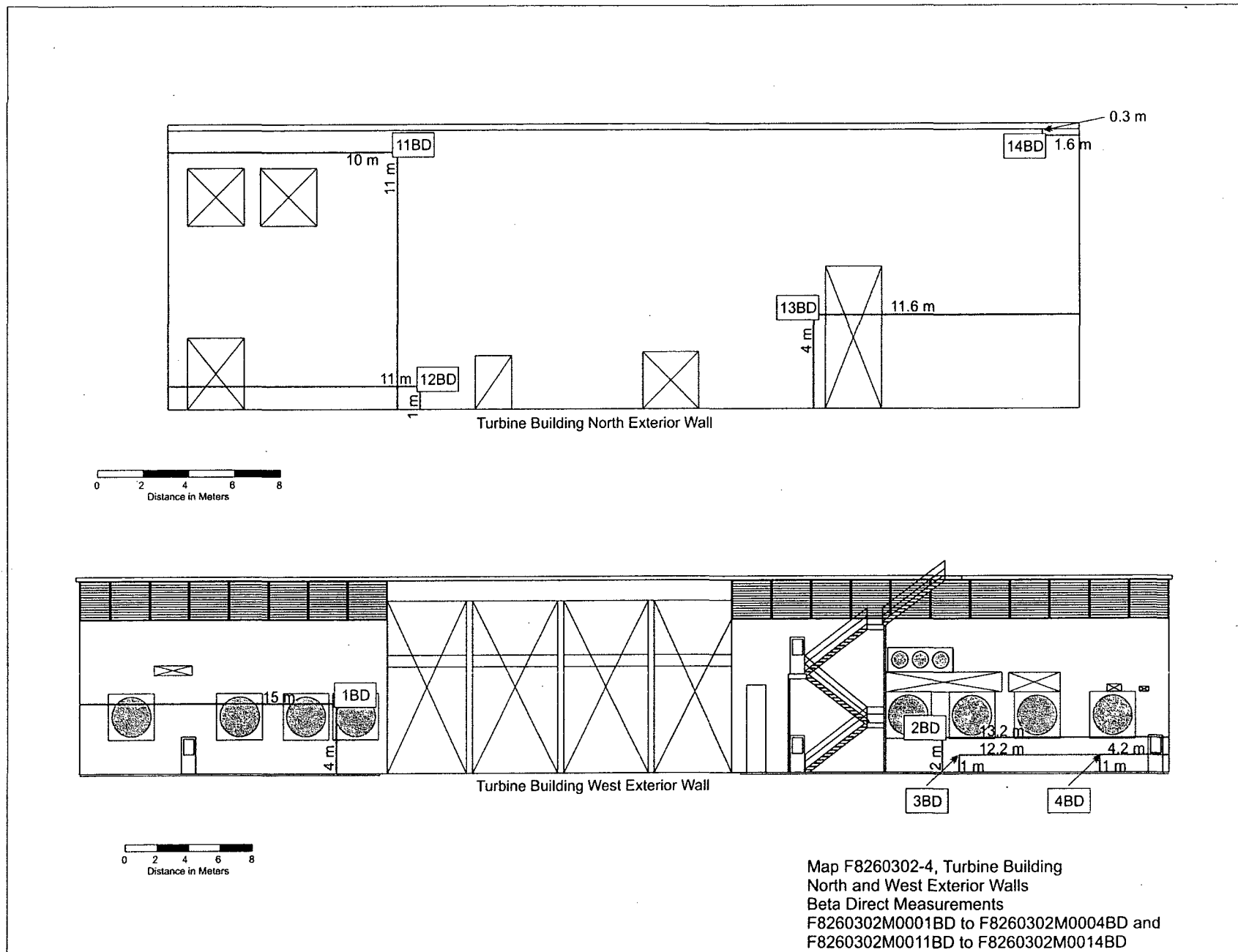


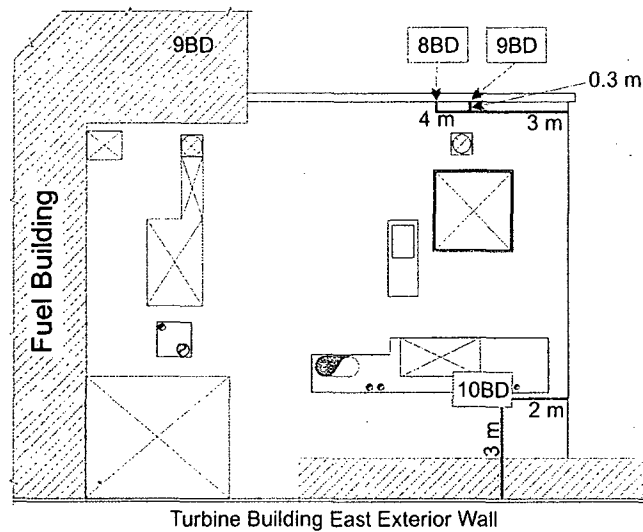
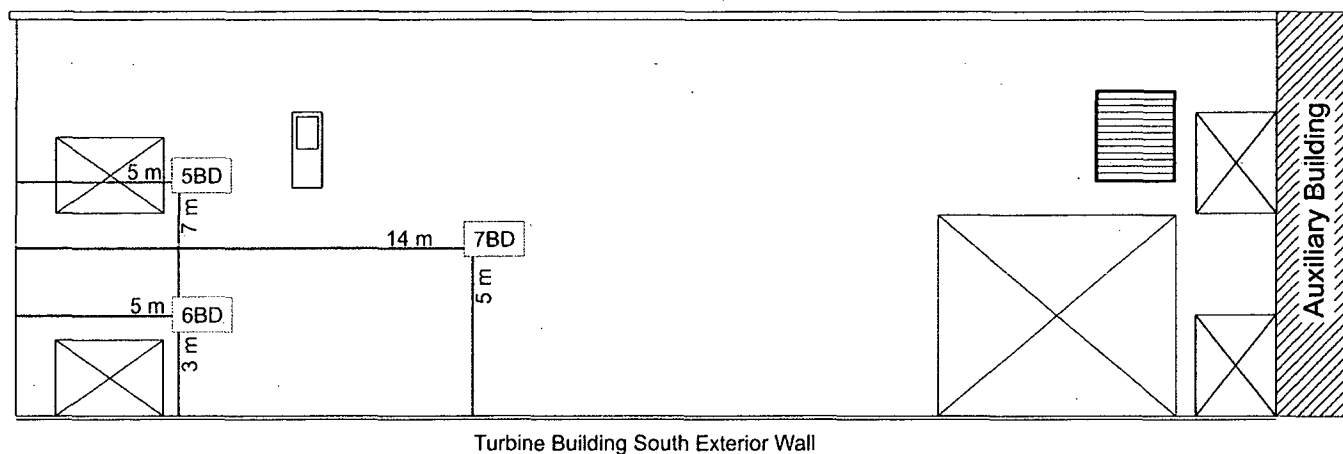
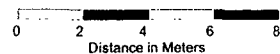
Turbine Building West Exterior Wall
Area Estimate: 590 sq. meters

Map F8260302-2, Turbine Building Exterior
North and West Exterior Walls
Area Estimate: 1,044 square meters

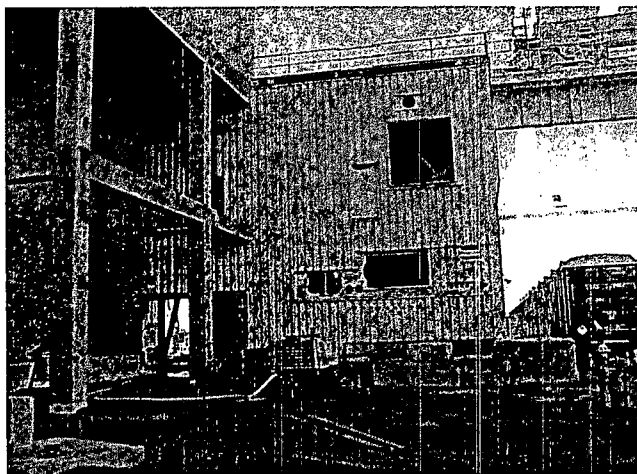
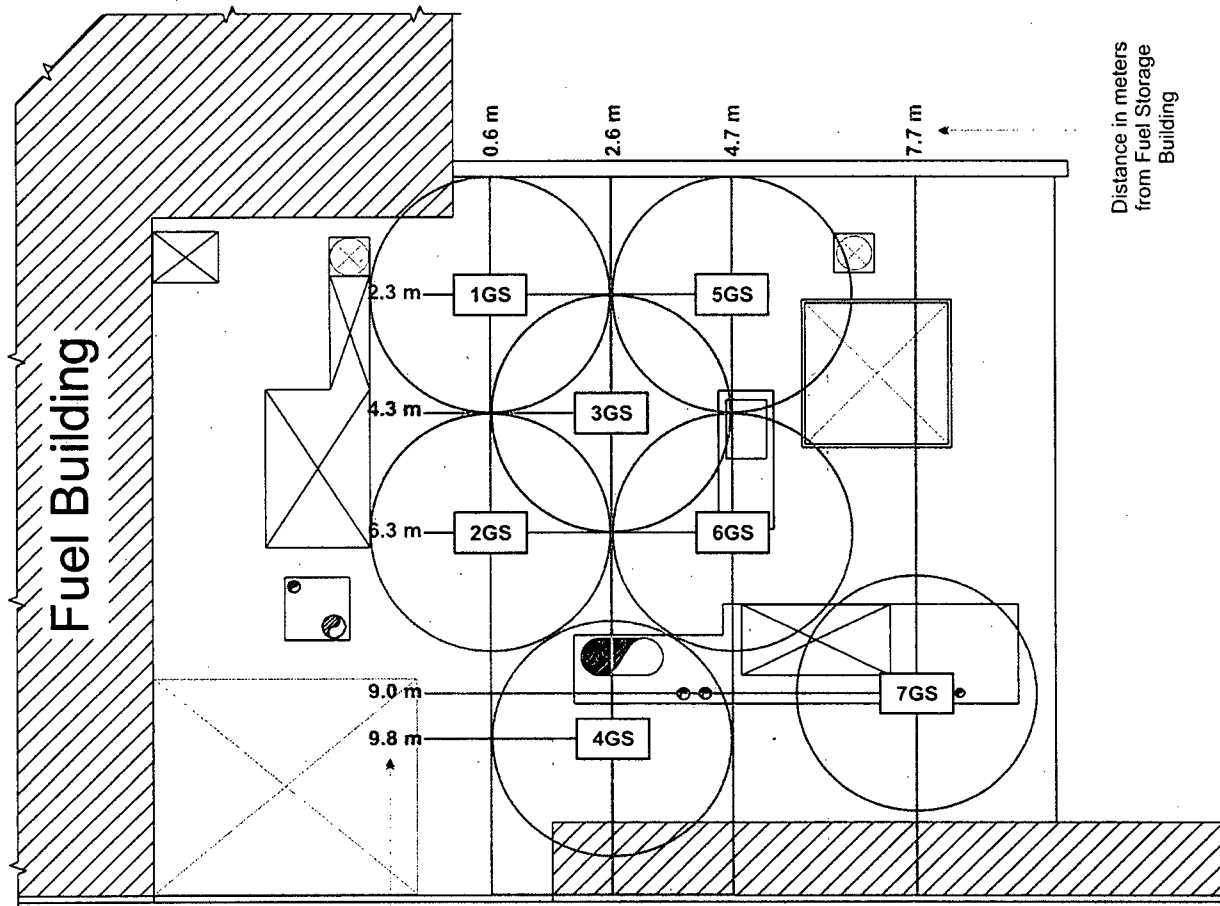


Map F8260302-3, Turbine Building Exterior Walls
Random Sample Locations for Beta Direct Measurements (Class 3)

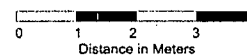


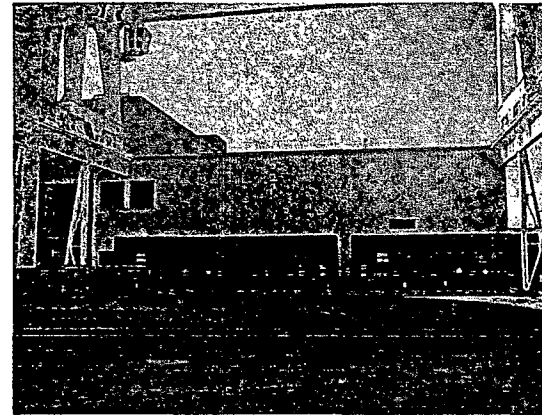
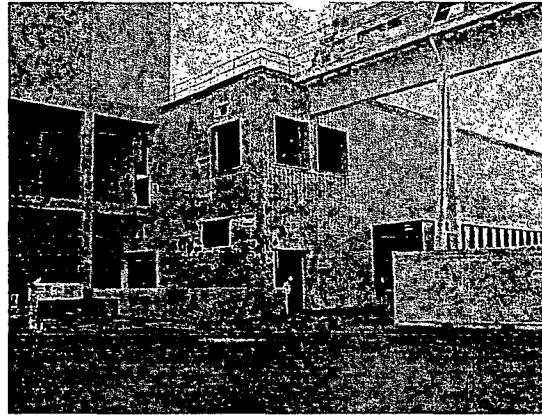


Map F8260302-5, Turbine Building
East and South Exterior Walls
Beta Direct Measurements
F8260302M0005BD to F8260302M0010BD

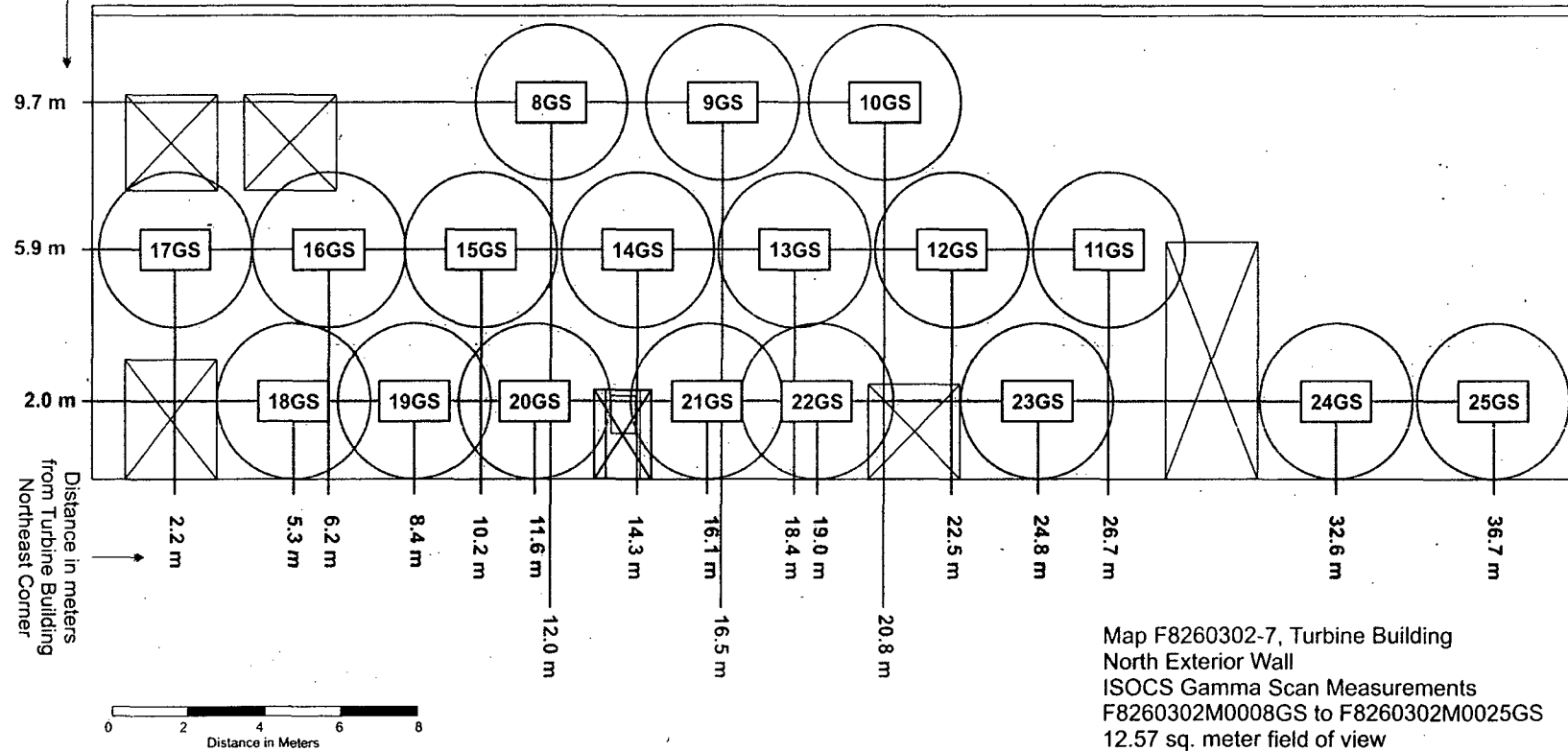


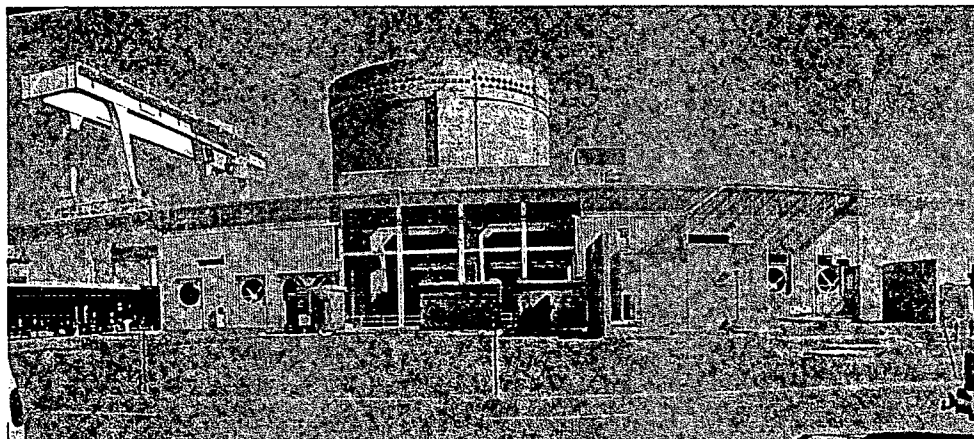
Map F8260302-6, Turbine Building
 East Exterior Wall
 ISOCS Gamma Scan Measurements
 F8260302M0001GS to F8260302M0007GS
 12.57 sq. meter field of view
 Total Scan Area: 79 sq. meters





Distance in meters
from Turbine
Building
(+) 0' El.





Map F8260302-8, Turbine Building

West Exterior Wall

ISOCS Gamma Scan Measurements

F8260302M0026GS to F8260302M0029GS,

F8260302M0033GS, and

F8260302M0039GS to F8260302M0045GS

12.57 sq. meter field of view

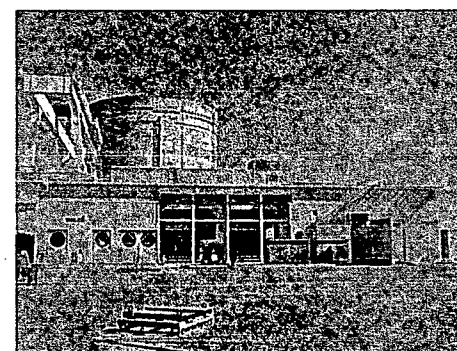
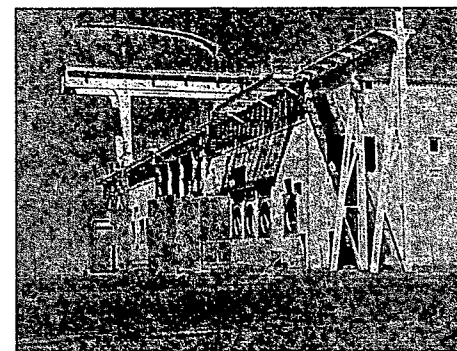
F8260302M0030GS to F8260302M0032GS

F8260302M0034GS to F8260302M0038GS, and

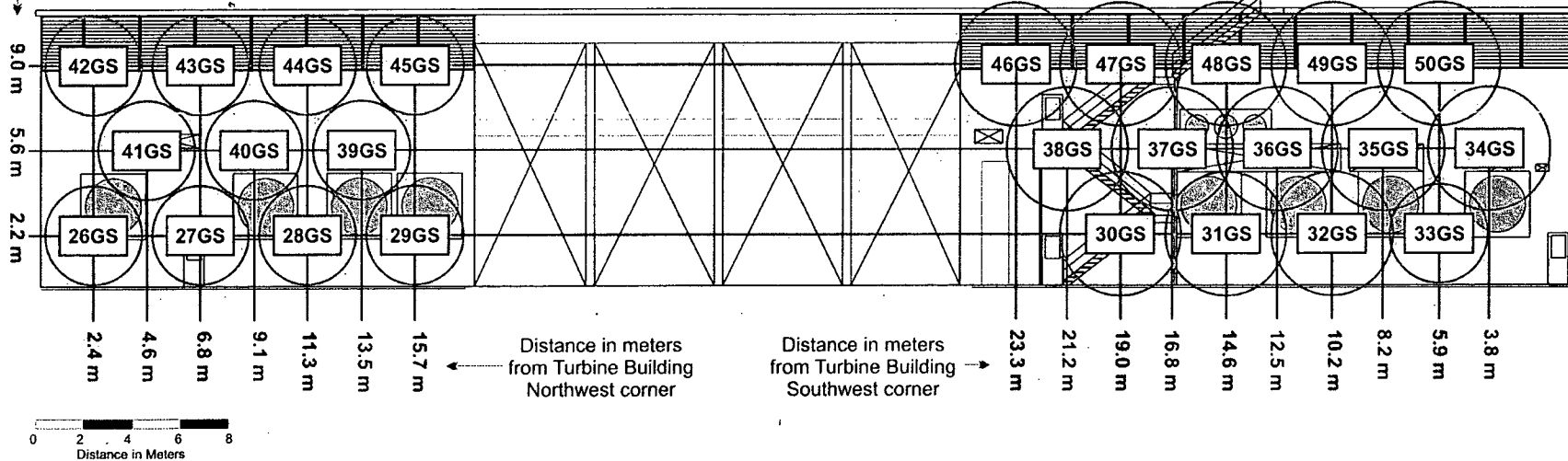
F8260302M0046GS to F8260302M0050GS

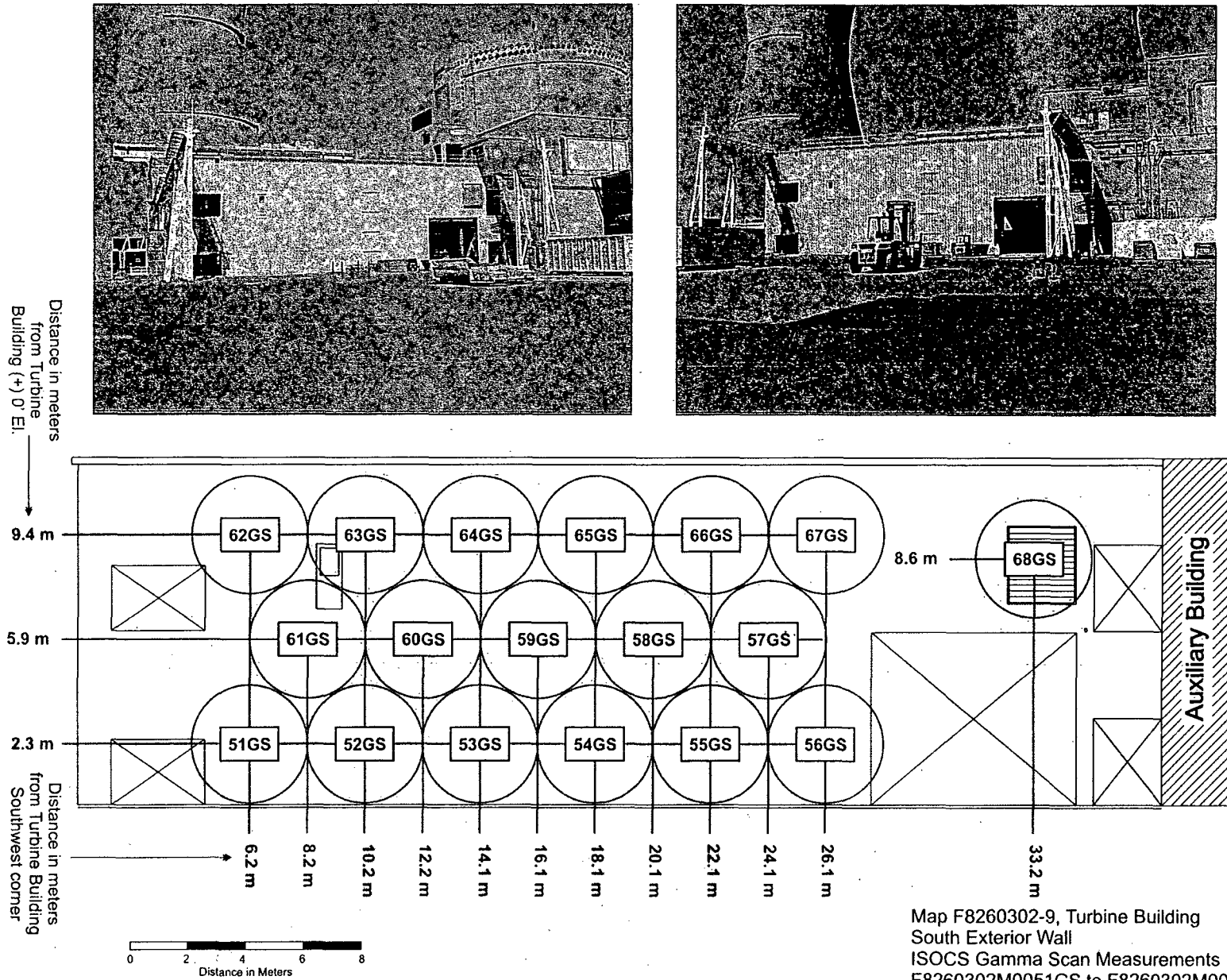
19.6 sq. meter field of view

Total Scan Area: 377 sq. meters



Distance in meters
from Turbine
Building (+) 0' El.





Attachment 2

Instrumentation

September 8, 2008

Survey Unit F8260302

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	257	612
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	2983947	Concrete – 974 dpm/100 cm ² Cs-137, Concrete – 953 dpm/100 cm ² Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	21,500
Investigation Criteria – Scan (ISOCS average Cs-137 activity for 12.5 m ² field of view)	2,300
DCGL _w	43,000
DCGL _{EMC}	N/A

Attachment 3

Investigation

September 8, 2008

Survey Unit F8260302

(none required)

Attachment 4
Data Assessment
September 8, 2008
Survey Unit F8260302

