

Rancho Seco
Final Status Survey Summary Report

April 1, 2008

Center Turbine Deck (+) 40' El.

Survey Unit F8260304

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8260304, Center Turbine Deck (+) 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 determined using a random-start, fixed grid pattern and 693 m² were scanned for approximately 73% 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	Center Turbine Deck (+) 40' El.
Survey Unit:	0304	Structure Surface
Class:	2	LTP Table 5-4
SU Area (m²):	953	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm²):	43,000	Gross Activity DCGL
Area Factor:	N/A	Class 2
Design DCGL_{mc} (dpm/100 cm²):	N/A	Class 2
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):	68.1	Class 2
Scan Area (m²):	693	
Scan Coverage (%):	73%	Class 2
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 2
Grid Spacing L:	8.2	Class 2

Survey Results:

A total of 16 direct measurements were made in F8260304. 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. All ISOCS gamma measurements were less than the Cs-137 and Co-60 MDAs. 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)
F8260304-M0001BD	2,302
F8260304-M0002BD	2,508
F8260304-M0003BD	2,413
F8260304-C0004BD	1,971
F8260304-C0005BD	2,049
F8260304-C0006BD	1,727
F8260304-C0007BD	1,276
F8260304-C0008BD	2,251
F8260304-C0009BD	2,049
F8260304-C0010BD	2,039
F8260304-C0011BD	2,044
F8260304-C0012BD	2,018
F8260304-C0013BD	1,950
F8260304-C0014BD	1,701
F8260304-C0015BD	2,646
F8260304-C0016BD	1,701
Mean:	2,040
Median:	2,041
Standard Deviation:	343
Range:	1,276 – 2,646

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8260304M0001SM	-3.53
F8260304M0002SM	1.64
F8260304M0003SM	-4.82
F8260304C0004SM	-0.95
F8260304C0005SM	-3.53
F8260304C0006SM	1.64
F8260304C0007SM	0.34
F8260304C0008SM	0.34
F8260304C0009SM	0.34
F8260304C0010SM	-0.95
F8260304C0011SM	-2.24
F8260304C0012SM	-3.53
F8260304C0013SM	-2.24
F8260304C0014SM	-2.24
F8260304C0015SM	8.09
F8260304C0016SM	-4.82
Mean:	-1.03
Median:	-1.59
Standard Deviation:	3.21
Range:	-4.82 to 8.09

Survey Unit Data Assessment:

The survey design required 16 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):	16	
Median (dpm/100 cm ²):	2,041	
Mean (dpm/100 cm ²):	2,040	
Direct Measurement Standard Deviation	343	Based on samples and backgrounds.
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	343	
Maximum (dpm/100 cm ²):	2,646	
Material Type:	N/A	
Sign Test Final N Value:	16	Background Subtract Not Applied
S+ Value:	16	
Critical Value:	11	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	Class 2
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{emc}:	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 2 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 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. 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.

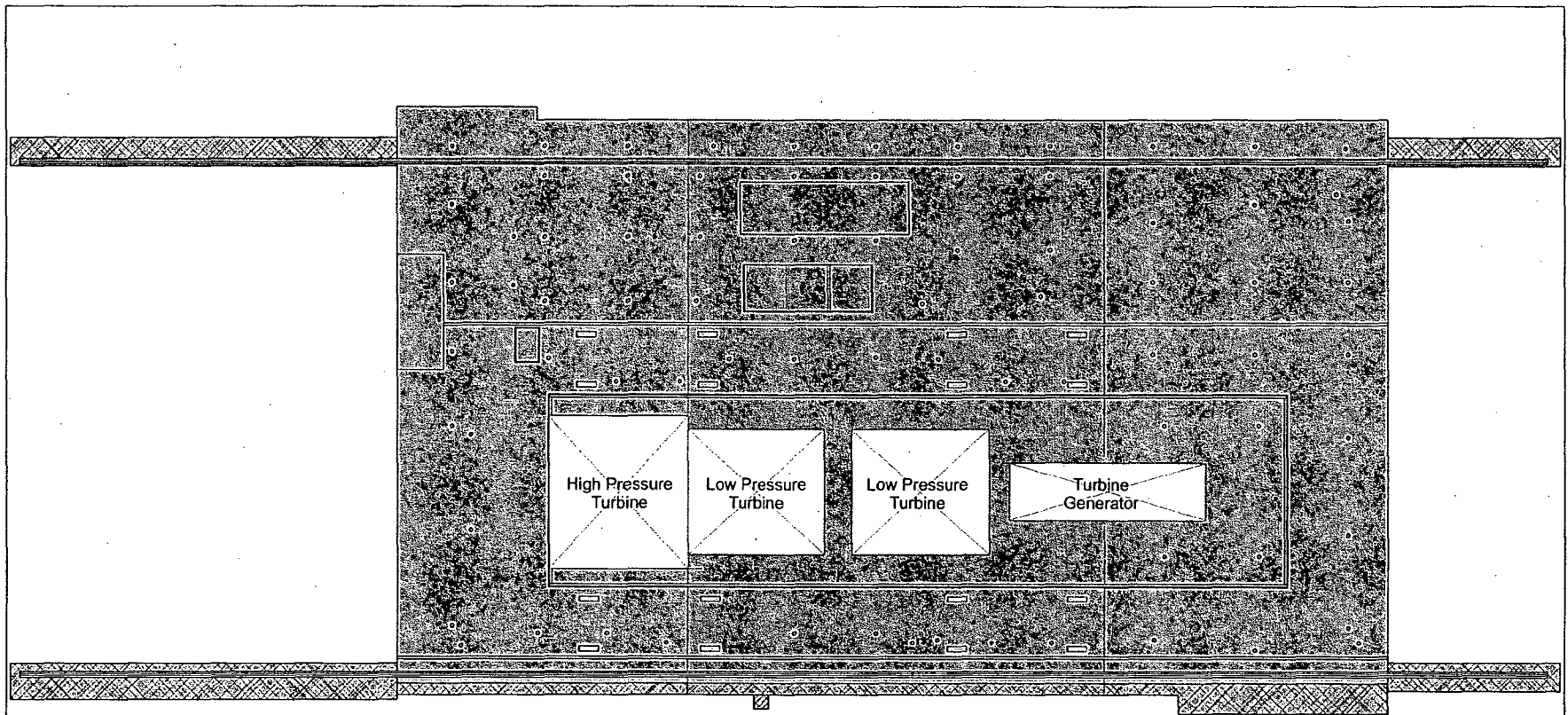
It is concluded that survey unit F8260304 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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Survey Unit F8260304

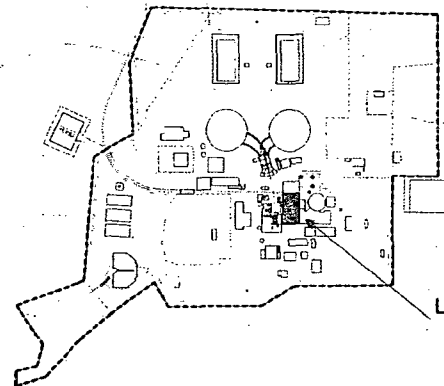
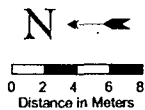


F8260303: North Turbine Deck
Area Estimate: 815 sq. meters

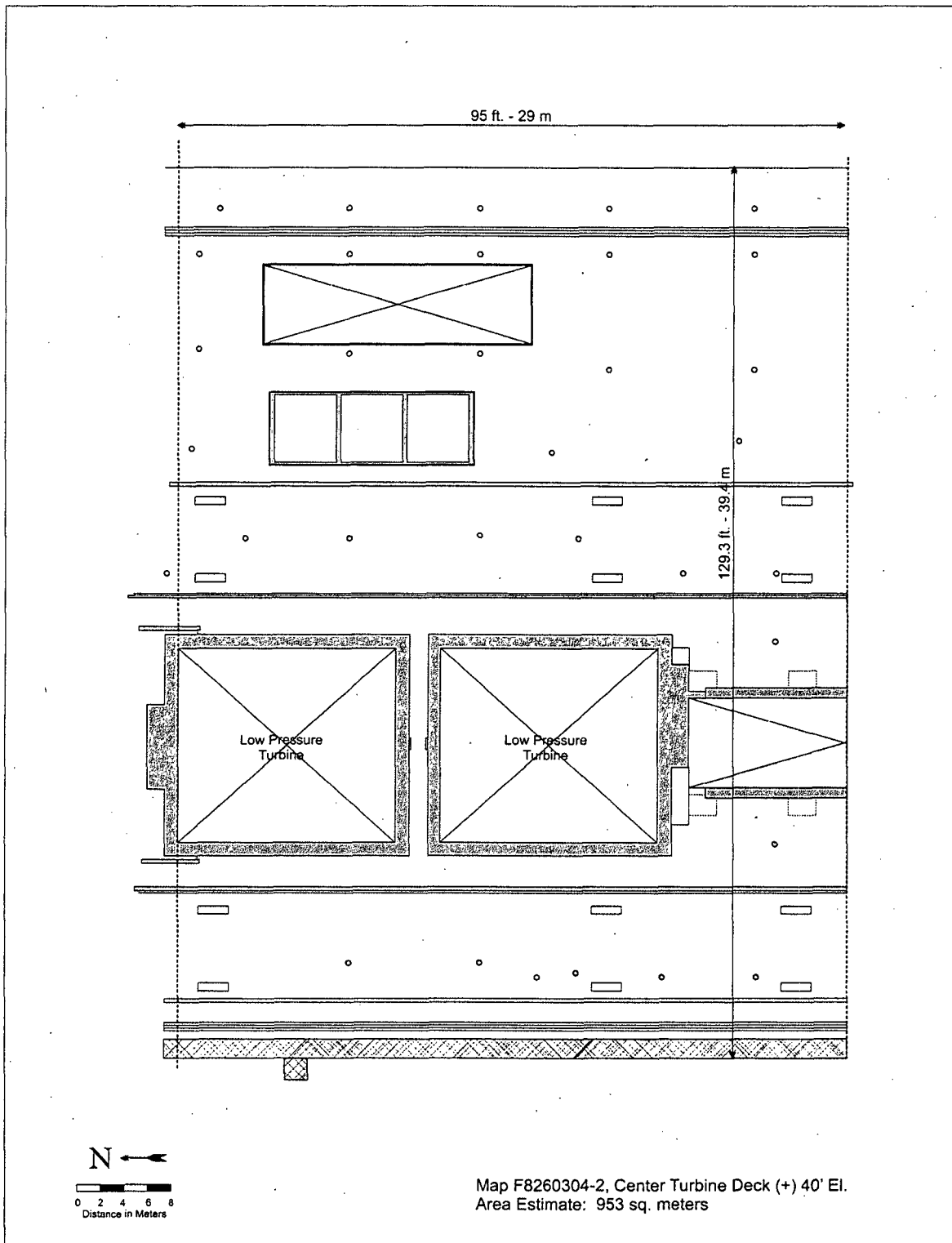
F8260304: Center Turbine Deck
Area Estimate: 953 sq. meters

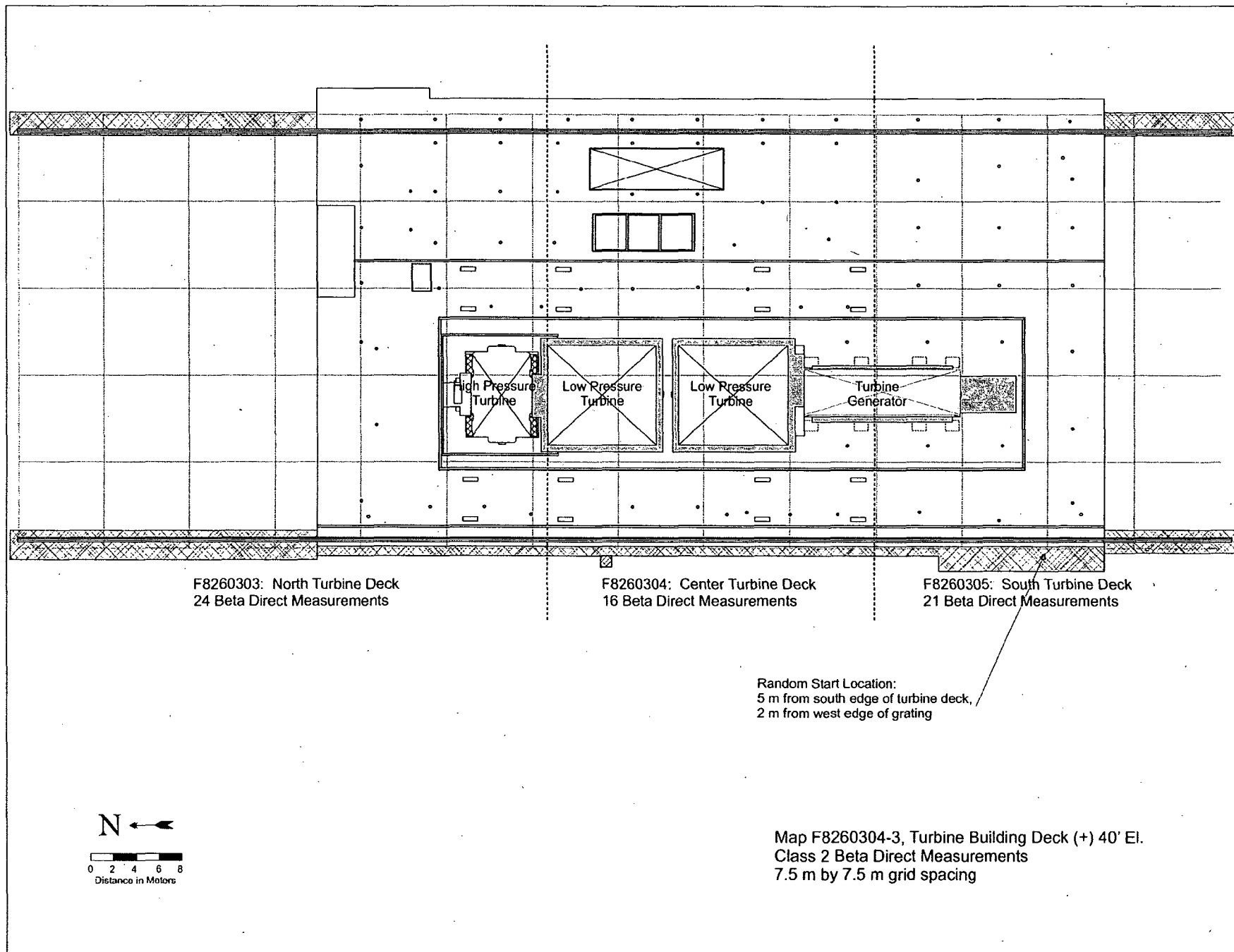
F8260305: South Turbine Deck
Area Estimate: 847 sq. meters

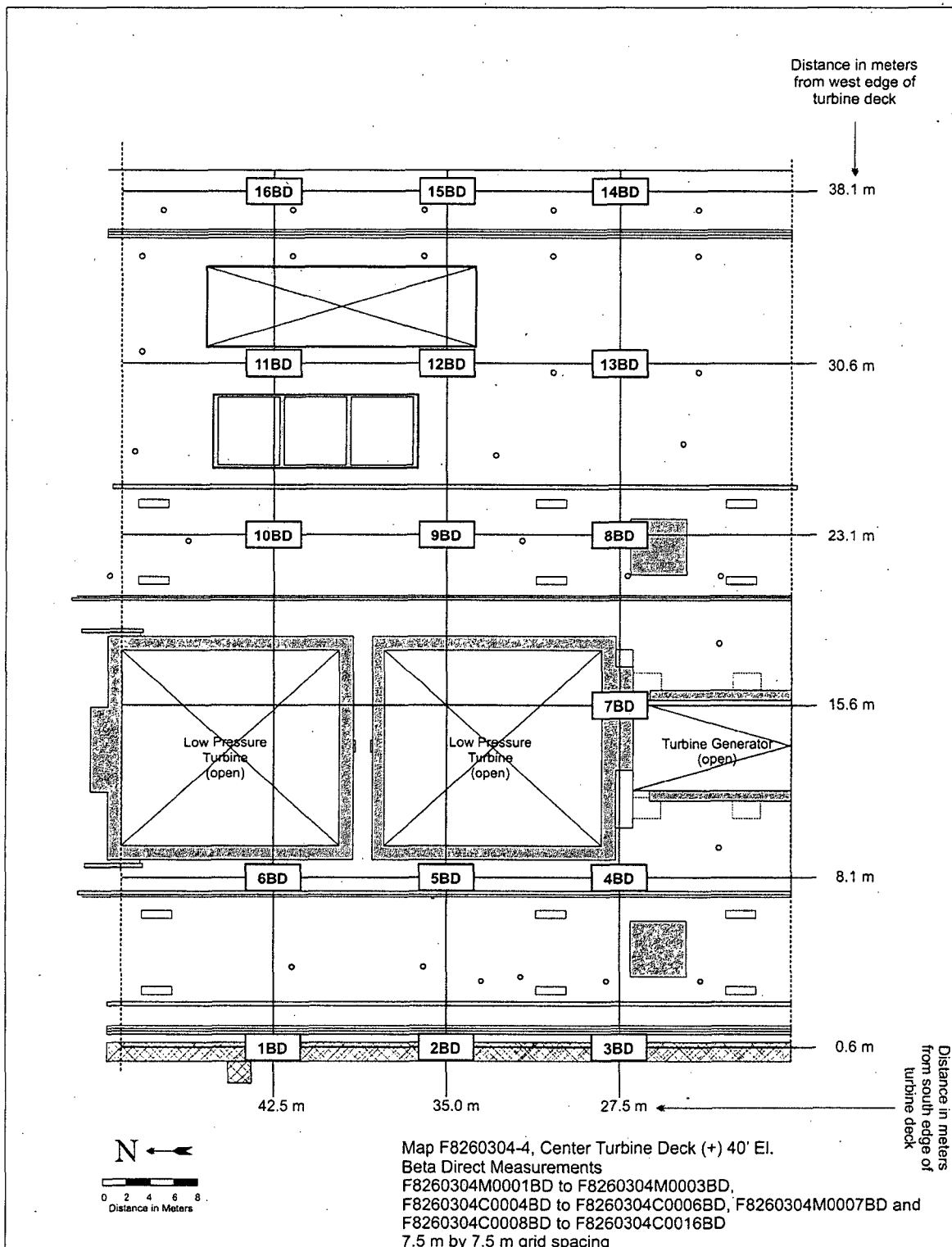
Map F8260304-1, Turbine Building Deck (+) 40' El.
Area Estimate: 2,615 sq. meters
(3 survey units – Class 2)

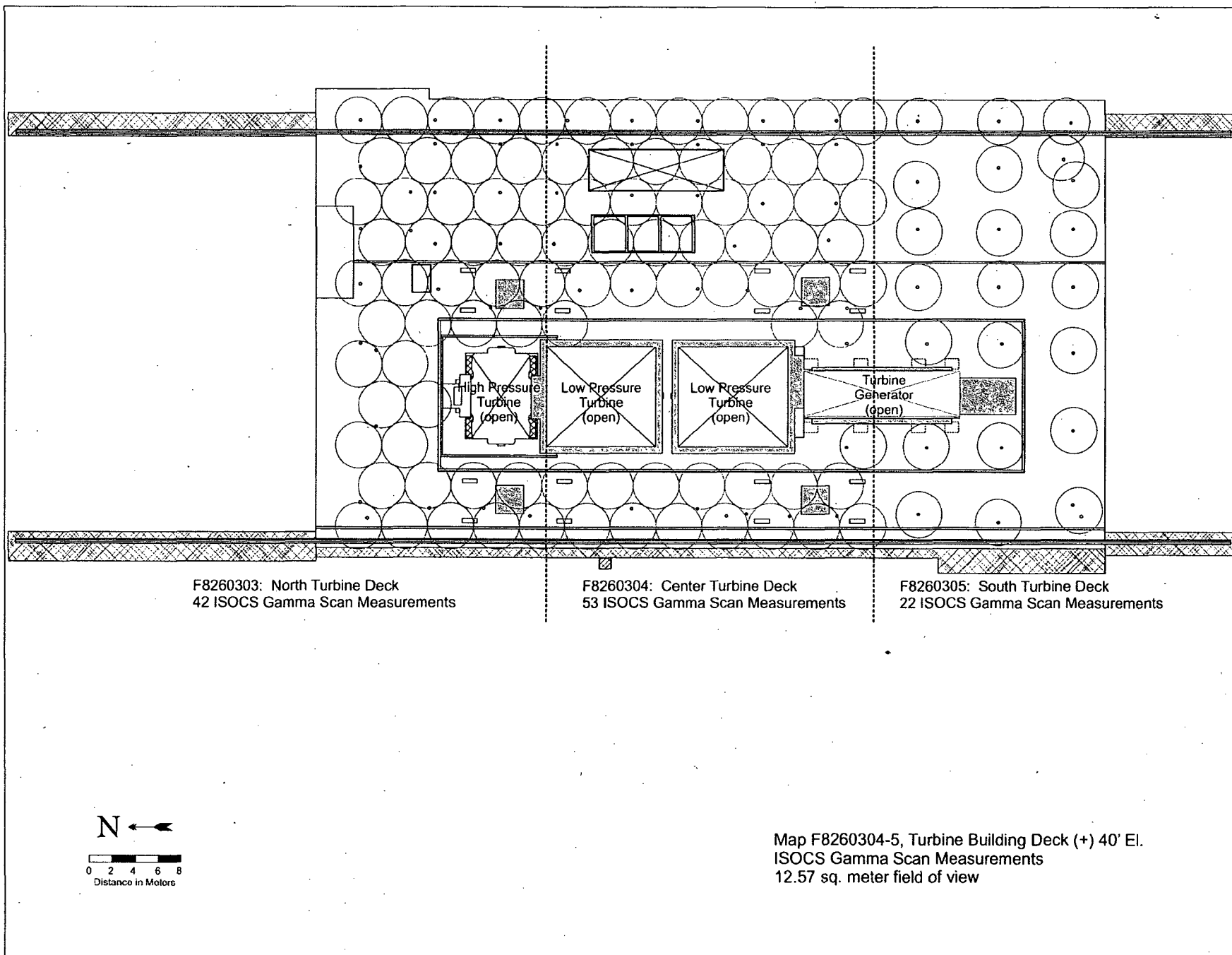


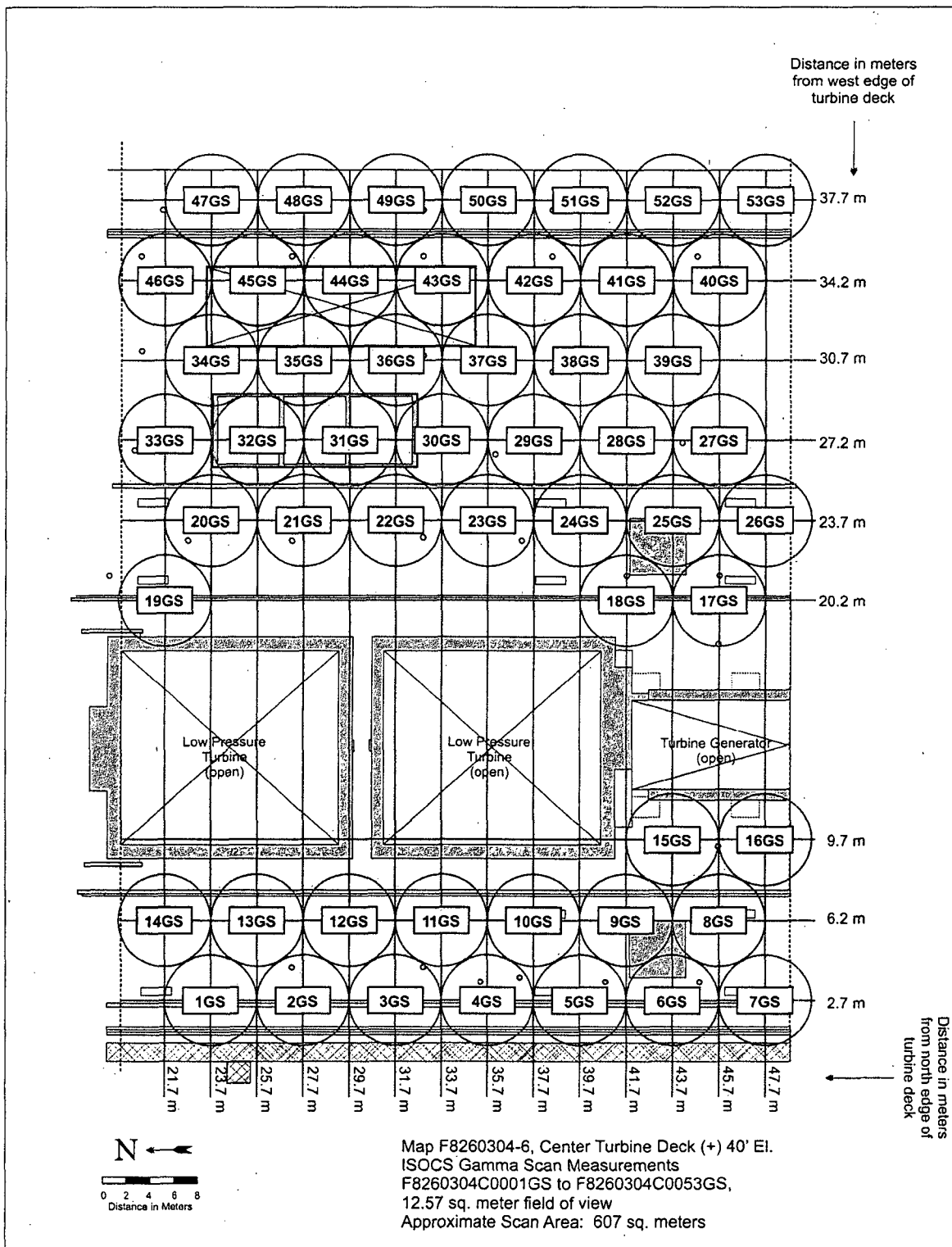
Location of Turbine Building
inside the Industrial Area

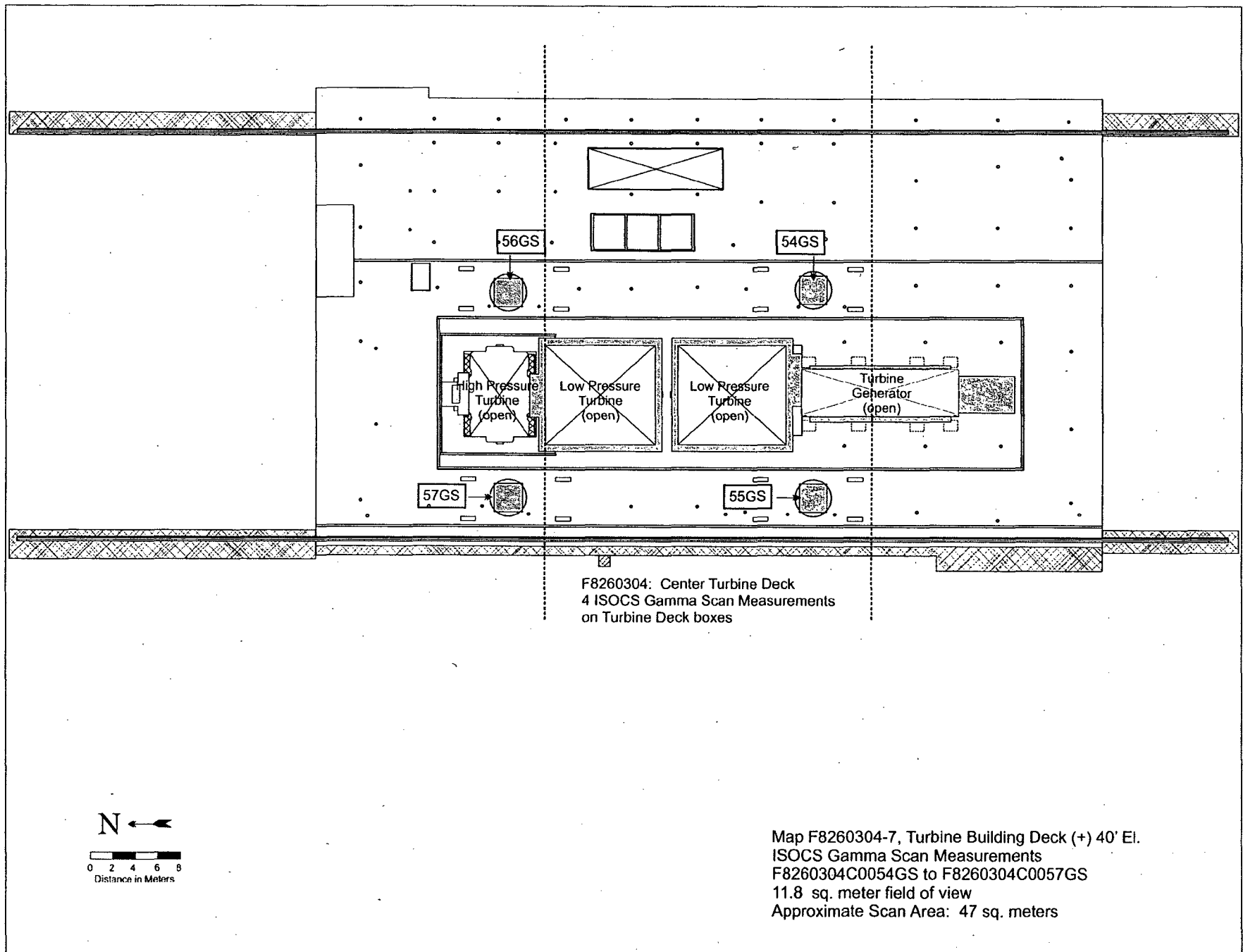


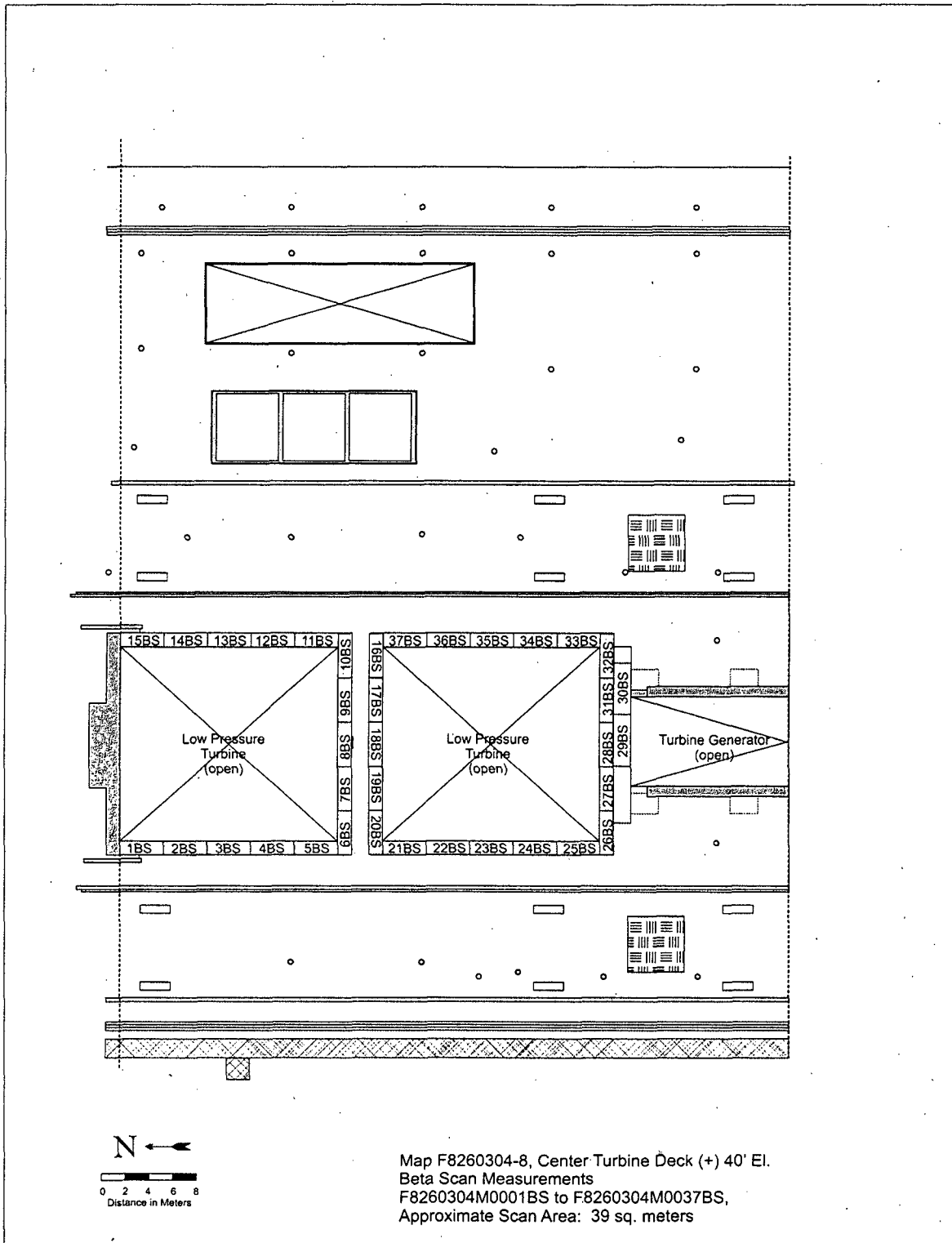












Attachment 2

Instrumentation

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Survey Unit F8260304

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
M2350; 175834	43-68B; 148634	433	1,033
M2350; 193715	43-68B; 148630	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	2983947	Concrete – 1,420 dpm/100 cm ² Cs-137, Concrete – 740 dpm/100 cm ² Co-60

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	43,000
Investigation Criteria – Scan (ISOCS average activity)	4,300
DCGL _w	43,000
DCGL _{EMC}	N/A

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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