

Rancho Seco
Final Status Survey Summary Report
September 8, 2008
Turbine Building West H. P. Pit (-) 10' El.
Survey Unit F8260008

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8260008, Turbine Building West H. P. Pit (-) 10' 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 262.5 m² were scanned for approximately 76% 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 West H.
Survey Unit:	0008	P. Pit (-) 10' El.
Class:	2	Structure Surface
SU Area (m²):	346	LTP Table 5-4
Evaluator:	D. Anderson	
DCGL (dpm/100 cm²):	43,000	Gross Activity DCGL
Area Factor:	N/A	Class 2
Design DCGL_{emc} (dpm/100 cm²):	N/A	Class 2
LBGR (dpm/100 cm²):	25,030	Adjusted
Design Sigma (dpm/100 cm²):	5,990	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	24.71	Class 2
Scan Area (m²):	262.5	
Scan Coverage (%):	76%	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:	4.9	Class 2

Survey Results:

A total of 17 direct measurements were made in F8260008. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. One of the scan measurements indicated an area of elevated activity. Beta scan activity ranged from 3,631 to 46,275 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. A direct measurement taken at the location of elevated activity was evaluated as 37,758 dpm/100 cm², as shown in Table 3-1 of Attachment 3. The second highest beta scan measurement was determined to be 19,961 dpm/100 cm². 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)
F8260008-C0001BD	2,827
F8260008-C0002BD	2,173
F8260008-C0003BD	2,173
F8260008-C0004BD	2,298
F8260008-C0005BD	2,661
F8260008-C0006BD	2,661
F8260008-C0007BD	2,210
F8260008-C0008BD	2,438
F8260008-C0009BD	2,760
F8260008-C0010BD	2,246
F8260008-C0011BD	1,675
F8260008-C0012BD	1,816
F8260008-C0013BD	1,888
F8260008-C0014BD	1,826
F8260008-C0015BD	1,774
F8260008-C0016BD	1,774
F8260008-C0017BD	1,764
Mean:	2,174
Median:	2,173
Standard Deviation:	388
Range:	1,675 – 2,827

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8260008C0001SM	1.64
F8260008C0002SM	-4.82
F8260008C0003SM	1.64
F8260008C0004SM	4.22
F8260008C0005SM	-0.95
F8260008C0006SM	-0.95
F8260008C0007SM	-4.82
F8260008C0008SM	-3.53
F8260008C0009SM	-0.95
F8260008C0010SM	-2.24
F8260008C0011SM	0.34
F8260008C0012SM	-2.24
F8260008C0013SM	-3.53
F8260008C0014SM	-4.82
F8260008C0015SM	-2.24
F8260008C0016SM	-4.82
F8260008C0017SM	1.64
Mean:	-1.55
Median:	-2.24
Standard Deviation:	2.74
Range:	-4.82 to 4.22

Survey Unit Data Assessment:

The survey design required 17 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	
Ambient Background Used (dpm/100 cm ²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	17	
Median (dpm/100 cm ²):	2,173	
Mean (dpm/100 cm ²):	2,174	
Direct Measurement Standard Deviation	388	
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	388	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	2,827	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	17	
S+ Value:	17	
Critical Value:	12	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{emc}:	N/A	Class 2
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:

One investigation (scan grid 102) was required for the scan measurements and the results are reported in Attachment 3.

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. One potential area of elevated activity was detected and evaluated as shown in Attachment 3.

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. One investigation was 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.

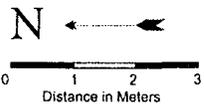
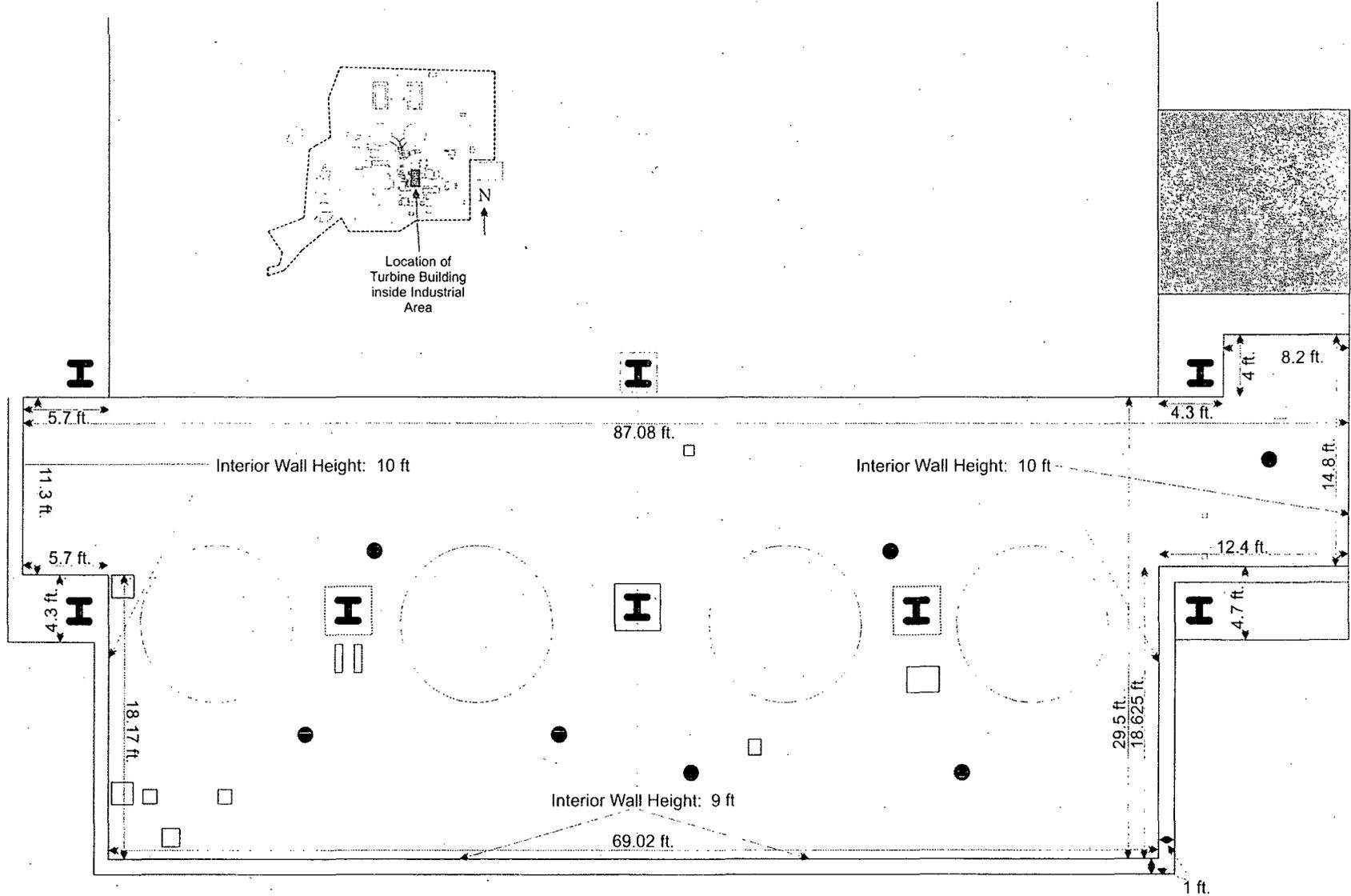
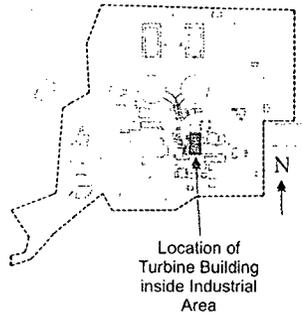
It is concluded that survey unit F8260008 meets the release criteria of 10CFR20.1402.

Attachment 1

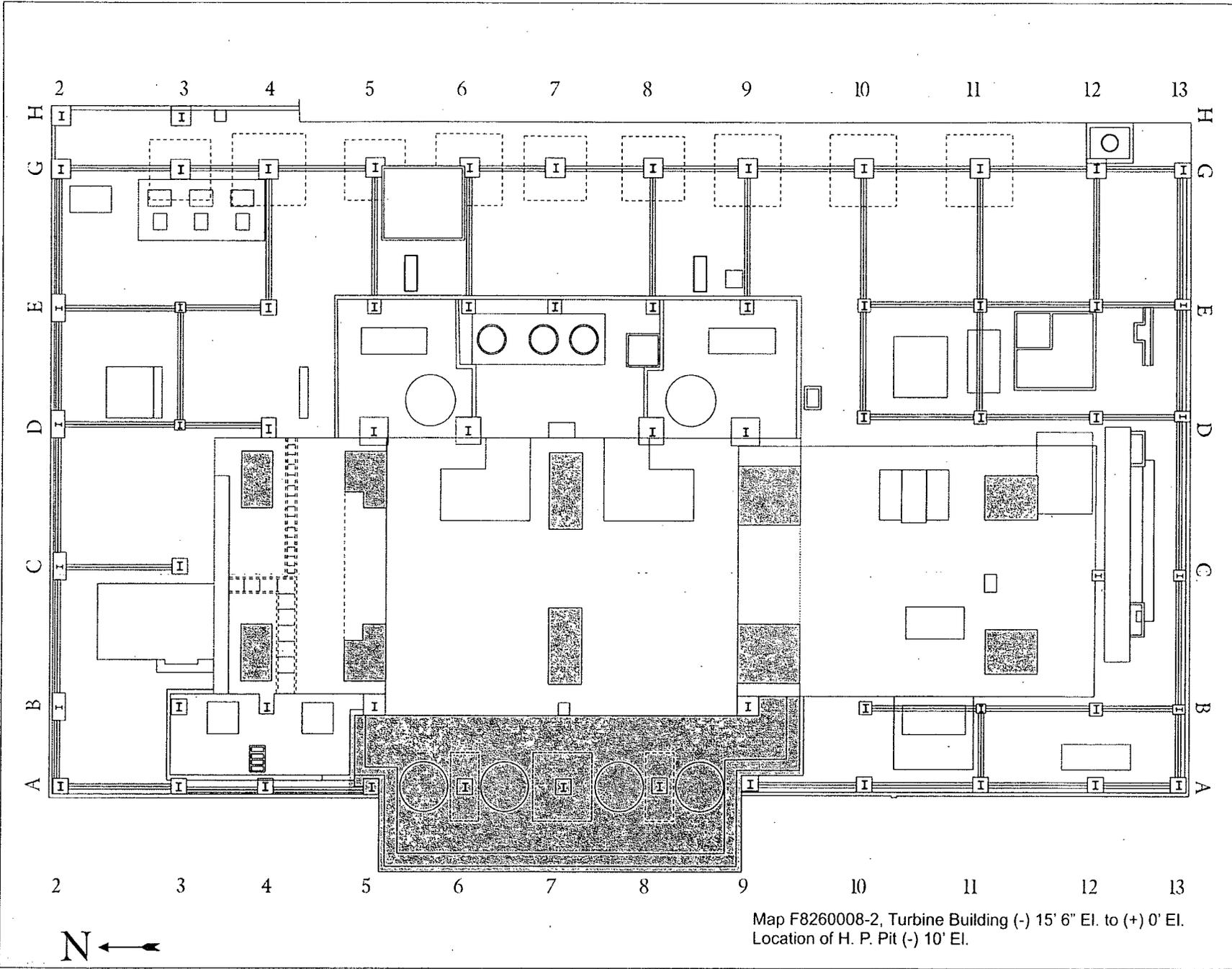
Maps

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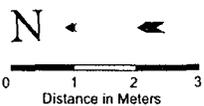
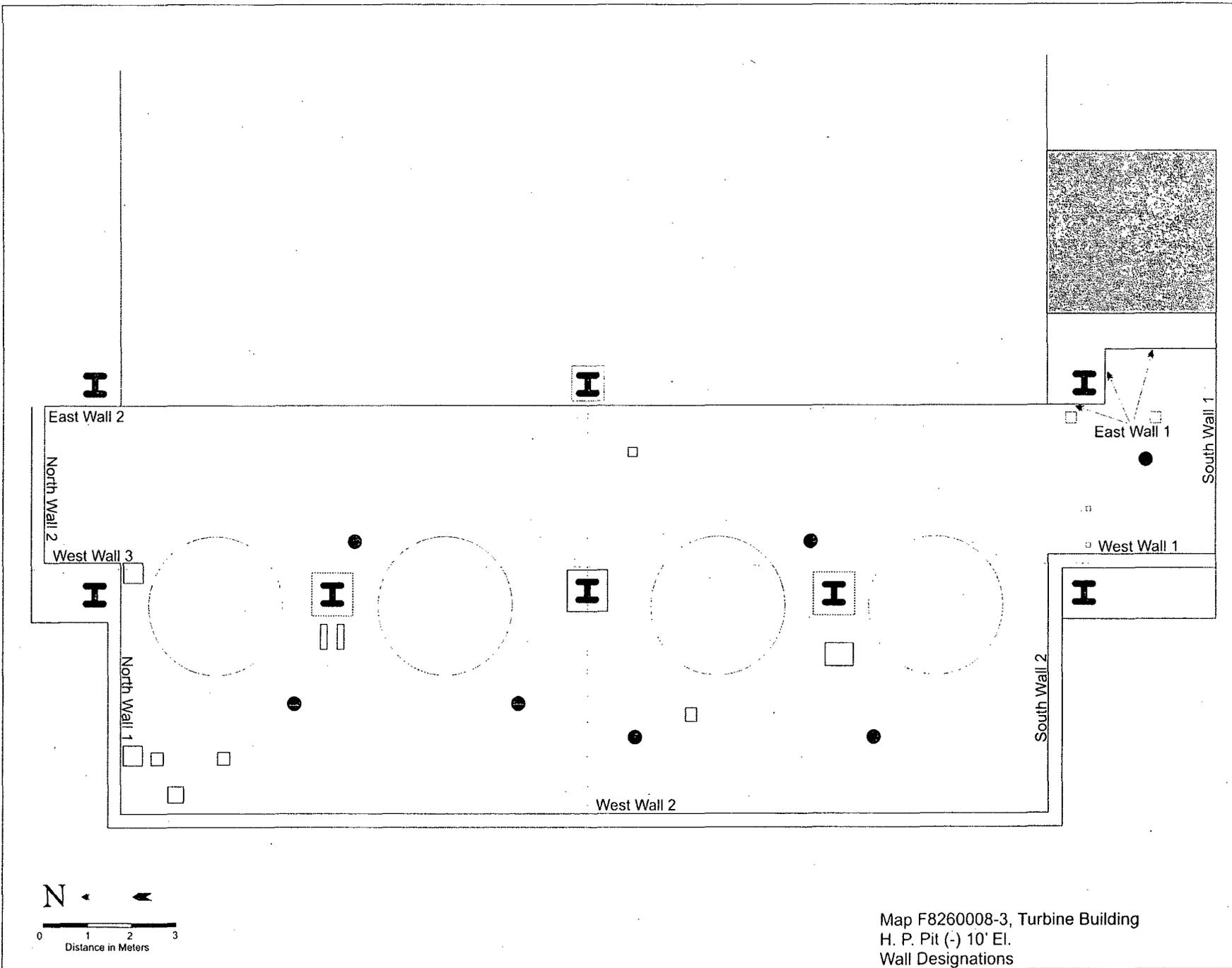
Survey Unit F8260008



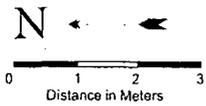
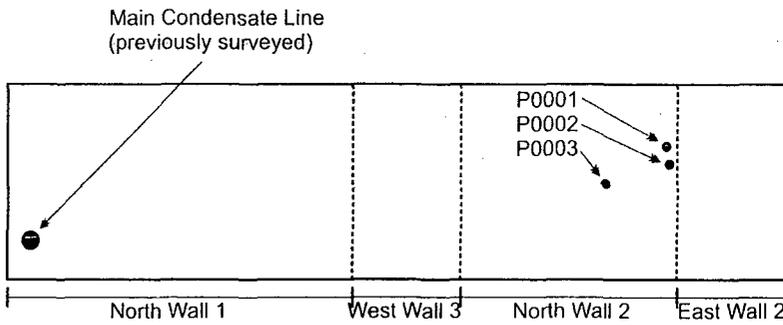
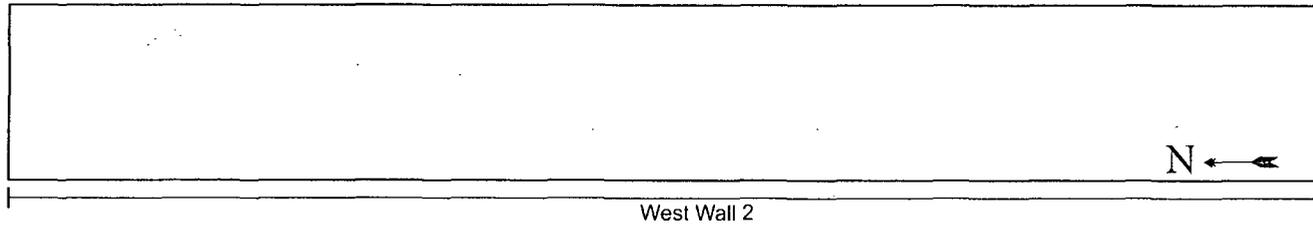
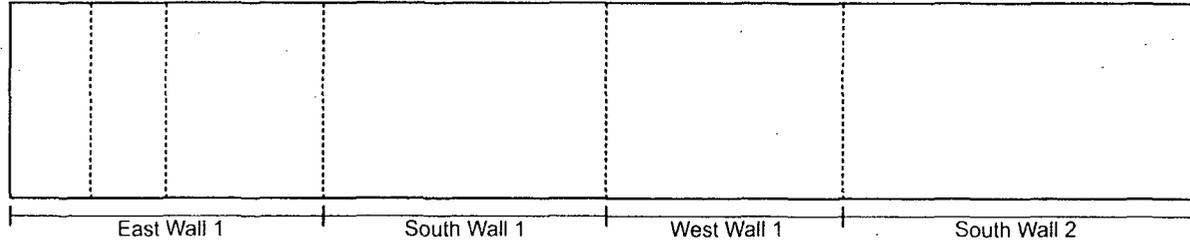
Map F8260008-1, Turbine Building
H. P. Pit (-) 10' El.
Area Estimate: 345.4 sq. meters



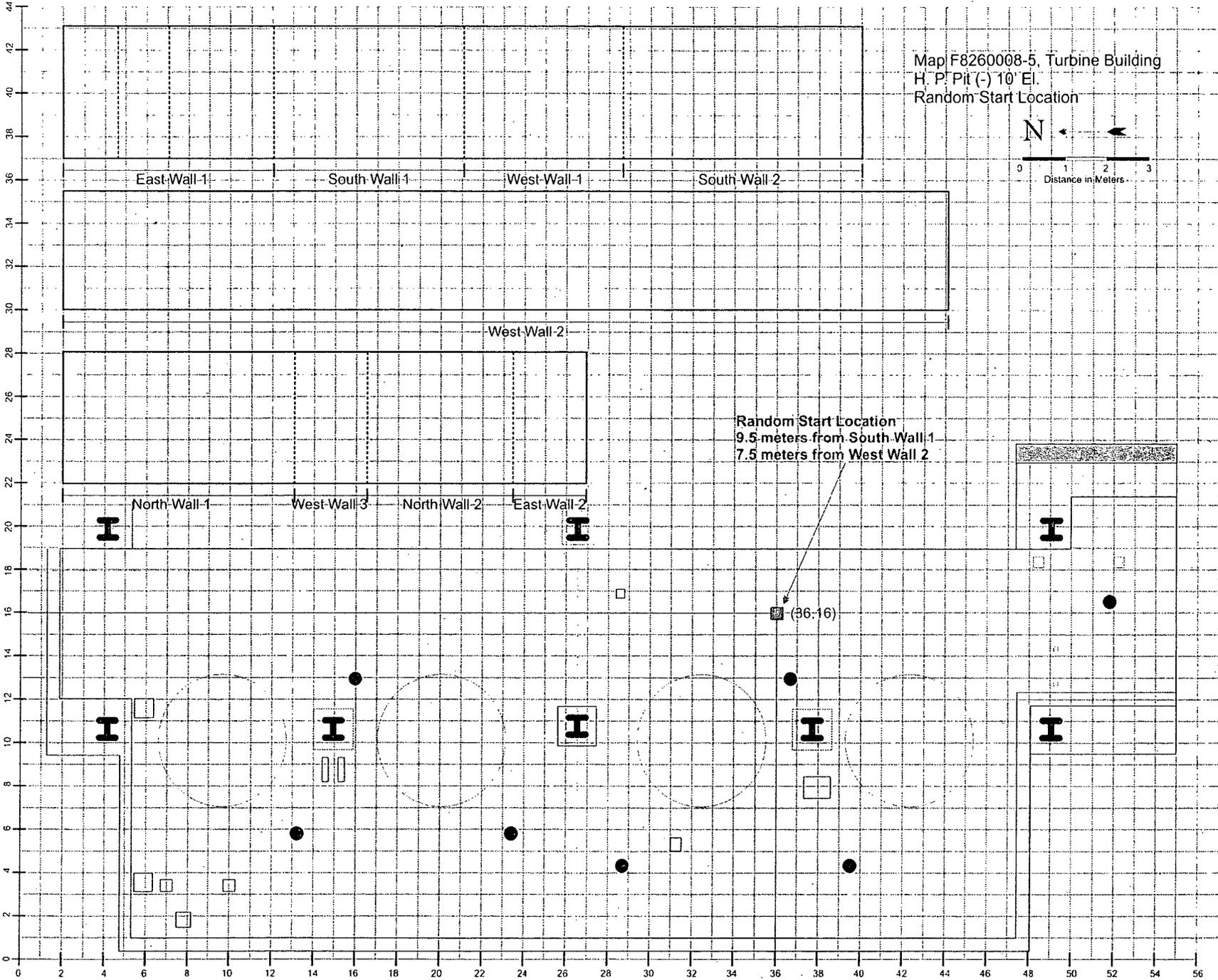
Map F8260008-2, Turbine Building (-) 15' 6" El. to (+) 0' El.
Location of H. P. Pit (-) 10' El.

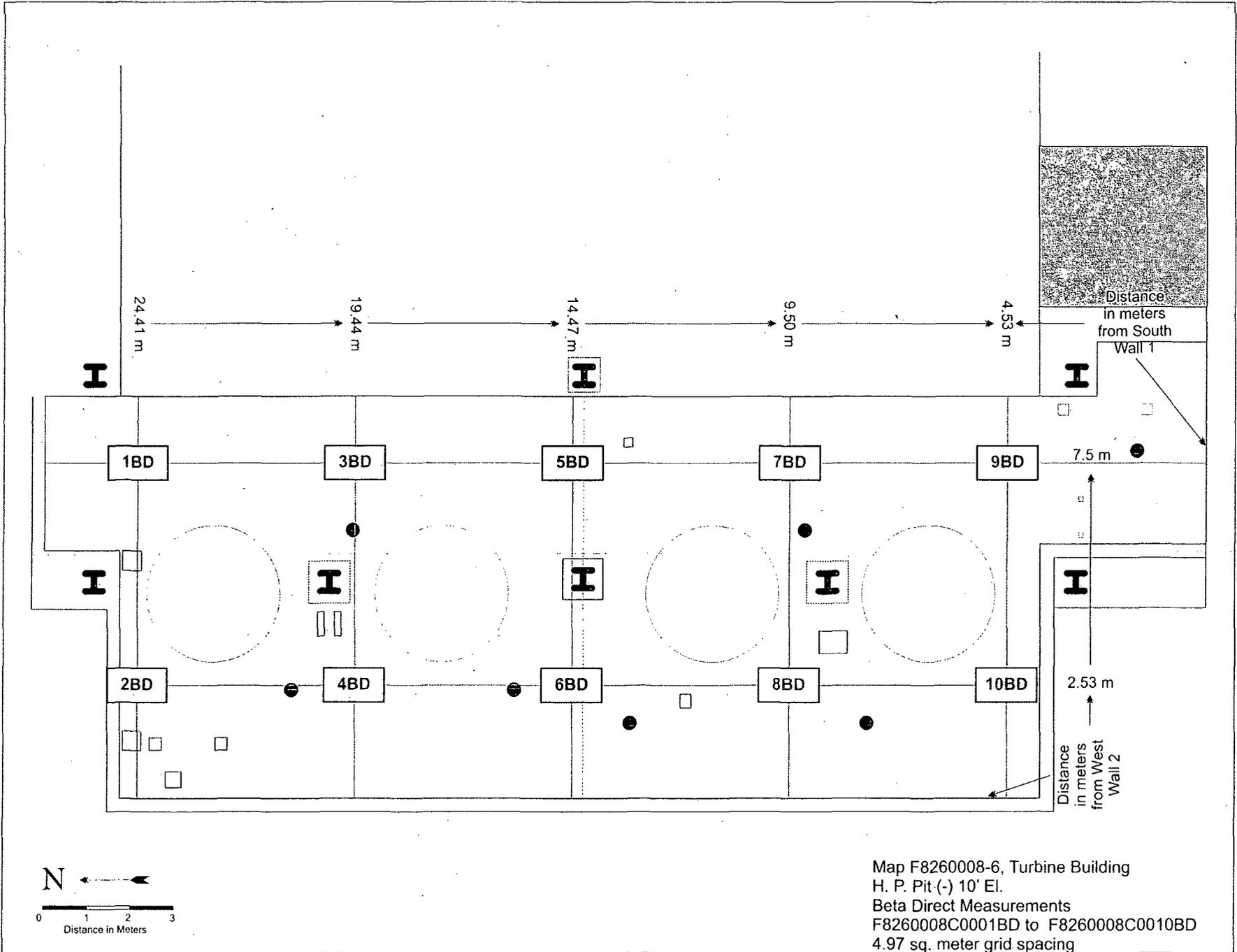


Map F8260008-3, Turbine Building
H. P. Pit (-) 10' El.
Wall Designations

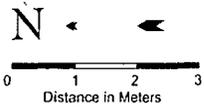
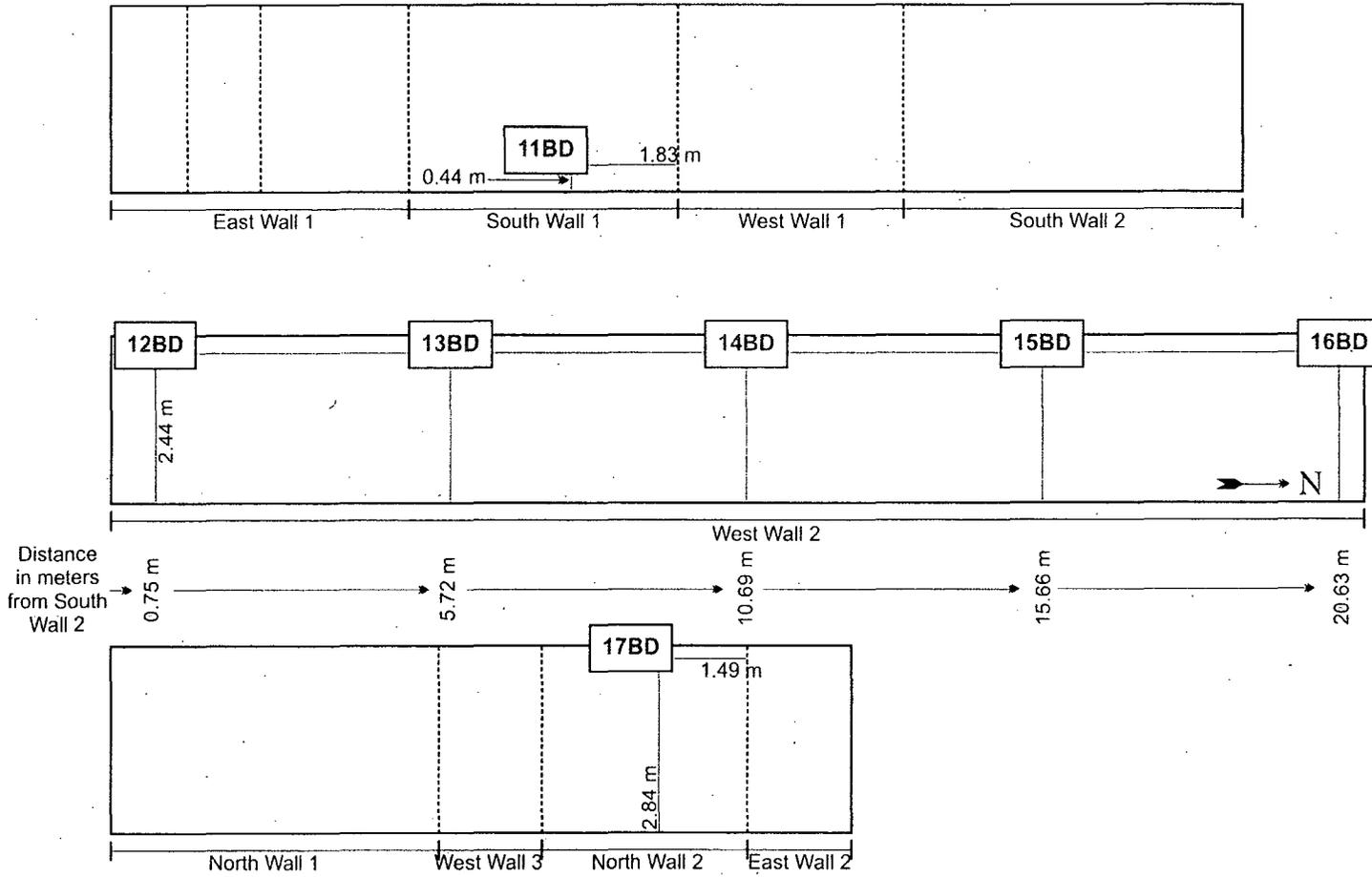


Map F8260008-4, Turbine Building
H. P. Pit (-) 10' El.
Walls



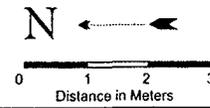
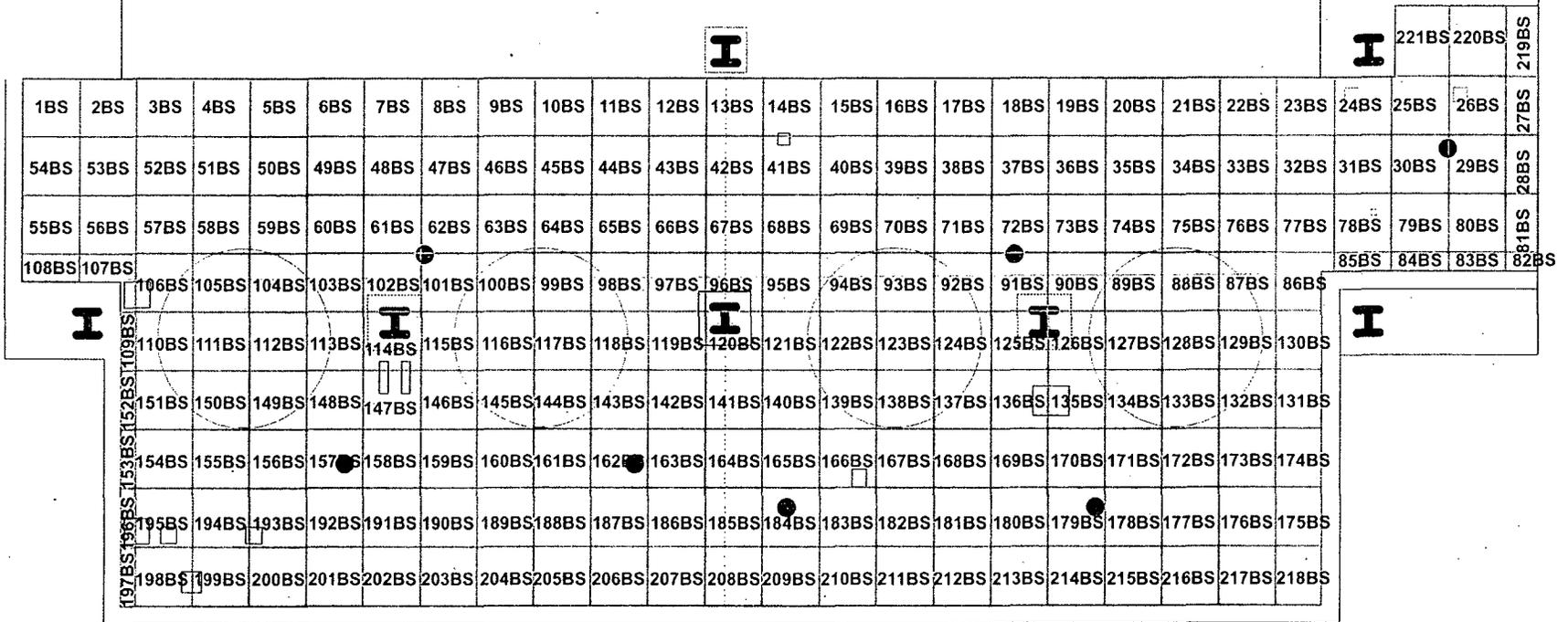
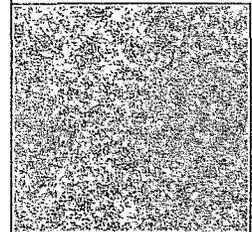


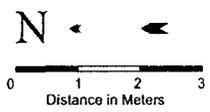
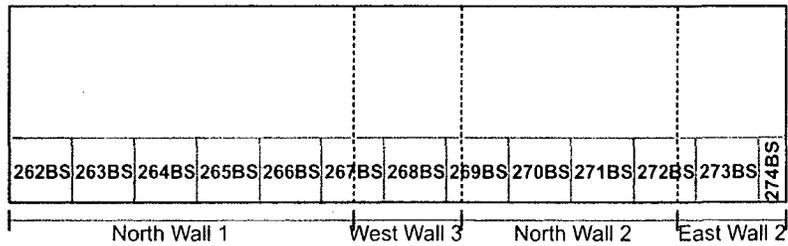
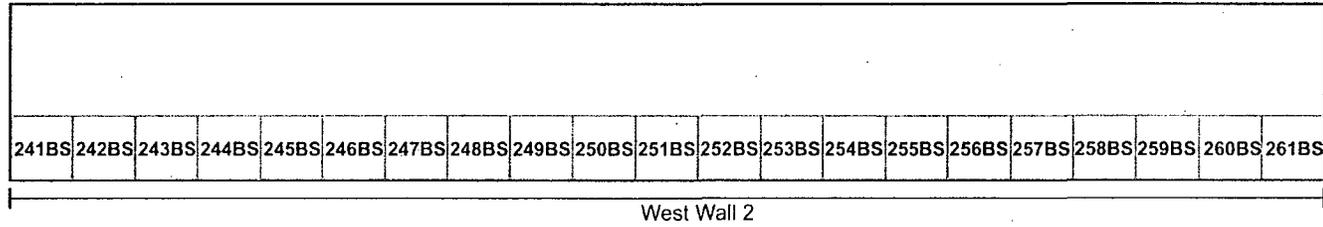
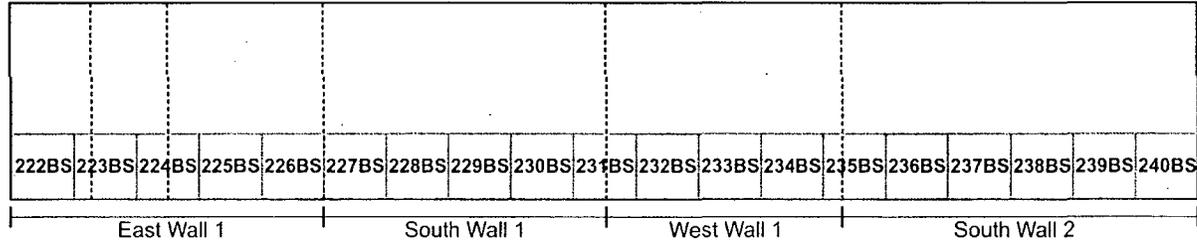
Map F8260008-6, Turbine Building
H. P. Pit (-) 10' El.
Beta Direct Measurements
F8260008C0001BD to F8260008C0010BD
4.97 sq. meter grid spacing



Map F8260008-7, Turbine Building
H. P. Pit (-) 10' EI.
Beta Direct Measurements
F8260008C0011BD to F8260008C0017BD
4.97 sq. meter grid spacing

Map F8260008-8, Turbine Building
H. P. Pit (-) 10' El.
Beta Scan Measurements
F8260001C0001BS to F8260001C0221BS
Total Scan Area: 210 sq. meters





Map F8260008-9, Turbine Building
H. P. Pit (-) 10' El.
Beta Scan Measurements
F8260001C0222BS to F8260001C0274BS
Total Scan Area: 52.5 sq. meters

Attachment 2

Instrumentation

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Survey Unit F8260008

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; 193700	43-68B; 190294	433	1,033
M2350; 193700	43-68B; 160691	433	1,033
M2350; 193715	43-116-1B; 256007	796	3,258
Tennelec; 0401171	N/A	5.88 dpm α , 11.71 dpm β	N/A

Table 2-2. Investigation Criteria and DCGL

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

Attachment 3

Investigation

September 8, 2008

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Table 3-1 Survey Unit Investigation

<i>Grid</i>	<i>Investigation Level (cpm)</i>	<i>Initial Value (cpm)</i>	<i>Investigation Result (cpm)</i>	<i>Elevated Area (m²)</i>	<i>Area Factor</i>	<i>DCGL_{emc}</i>	<i>Investigation Result (dpm/100cm²)</i>	<i>DCGL_{emc} Unity Fraction</i>
102	5,840	6,308	7,269	0.093	N/A	43,000	37,706	0.0
Survey Unit Remainder						DCGL = 43,000	SU Mean = 2,174	0.051
EMC Unity Sum								0.051

Attachment 4
Data Assessment
September 8, 2008
Survey Unit F8260008

