

Rancho Seco

Final Status Survey Summary Report

November 9, 2007

Turbine Bldg. (-) 9.5' to 40' EI, Low Pressure Turbine Exhaust Pedestals
and Crossbeams

Survey Unit F8261002

Prepared By: *S. Anderson* Date: 11/9/2007

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Reviewed By: *[Signature]* Date: 3/3/08

Lead FSS Engineer

Approved By: *[Signature]* Date: 3-17-08

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8261002, Turbine Bldg. (-) 9.5' to 40' El, Low Pressure Turbine Pedestals and Crossbeams

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 3077 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 108.4 m² were scanned for approximately 11% 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 Bldg. (-) 9.5' to 40' El, Low Pressure Turbine Exhaust Pedestals and Crossbeams
Survey Unit:	1002	Structure Surface
Class:	3	LTP Table 5-4
SU Area (m ²):	996.2	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm ²):	43,000	Gross Activity DCGL
Area Factor:	N/A	Class 3
Design DCGL _{emc} (dpm/100 cm ²):	N/A	Class 3
LBGR (dpm/100 cm ²):	33,610	Default = 50% DCGL
Design Sigma (dpm/100 cm ²):	3,130	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m ²):	N/A	Class 3
Scan Area (m ²):	108.4	
Scan Coverage (%):	11%	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 F8261002. 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. Average in situ scan activity ranged from 1,584 dpm/100 cm² to 3,545 dpm/100 cm², with no background subtracted. 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)
F8261002-C0001BD	1,670
F8261002-C0002BD	1,675
F8261002-C0003BD	1,836
F8261002-C0004BD	1,795
F8261002-C0005BD	1,841
F8261002-C0006BD	1,940
F8261002-C0007BD	1,790
F8261002-C0008BD	1,712
F8261002-C0009BD	1,416
F8261002-C0010BD	1,572
F8261002-C0011BD	1,940
F8261002-C0012BD	1,567
F8261002-C0013BD	1,681
F8261002-C0014BD	1,484
Mean:	1,708
Median:	1,696
Standard Deviation:	160
Range:	1,416 – 1,940

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm ²)
F8261002C0001SM	2.93
F8261002C0002SM	-3.53
F8261002C0003SM	0.34
F8261002C0004SM	-2.24
F8261002C0005SM	-3.53
F8261002C0006SM	-2.24
F8261002C0007SM	-4.82
F8261002C0008SM	-4.82
F8261002C0009SM	-2.24
F8261002C0010SM	-2.24
F8261002C0011SM	-8.7
F8261002C0012SM	1.64
F8261002C0013SM	-2.24
F8261002C0014SM	0.34
Mean:	-2.24
Median:	-2.24
Standard Deviation:	2.95
Range:	-8.7 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):	1,696		
Mean (dpm/100 cm ²):	1,708		
Direct Measurement Standard Deviation (dpm/100 cm ²):	160		
Total Standard Deviation (dpm/100 cm ²):	160		Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	1,940		Background Subtract Not Applied
Material Type:	N/A		
Sign Test Final N Value:	14		Class 3
S+ Value:	14		
Critical Value:	10		
Sufficient Samples Collected:	Yes		
Maximum Value < DCGL:	Yes		
Median Value < DCGL:	Yes		
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 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.

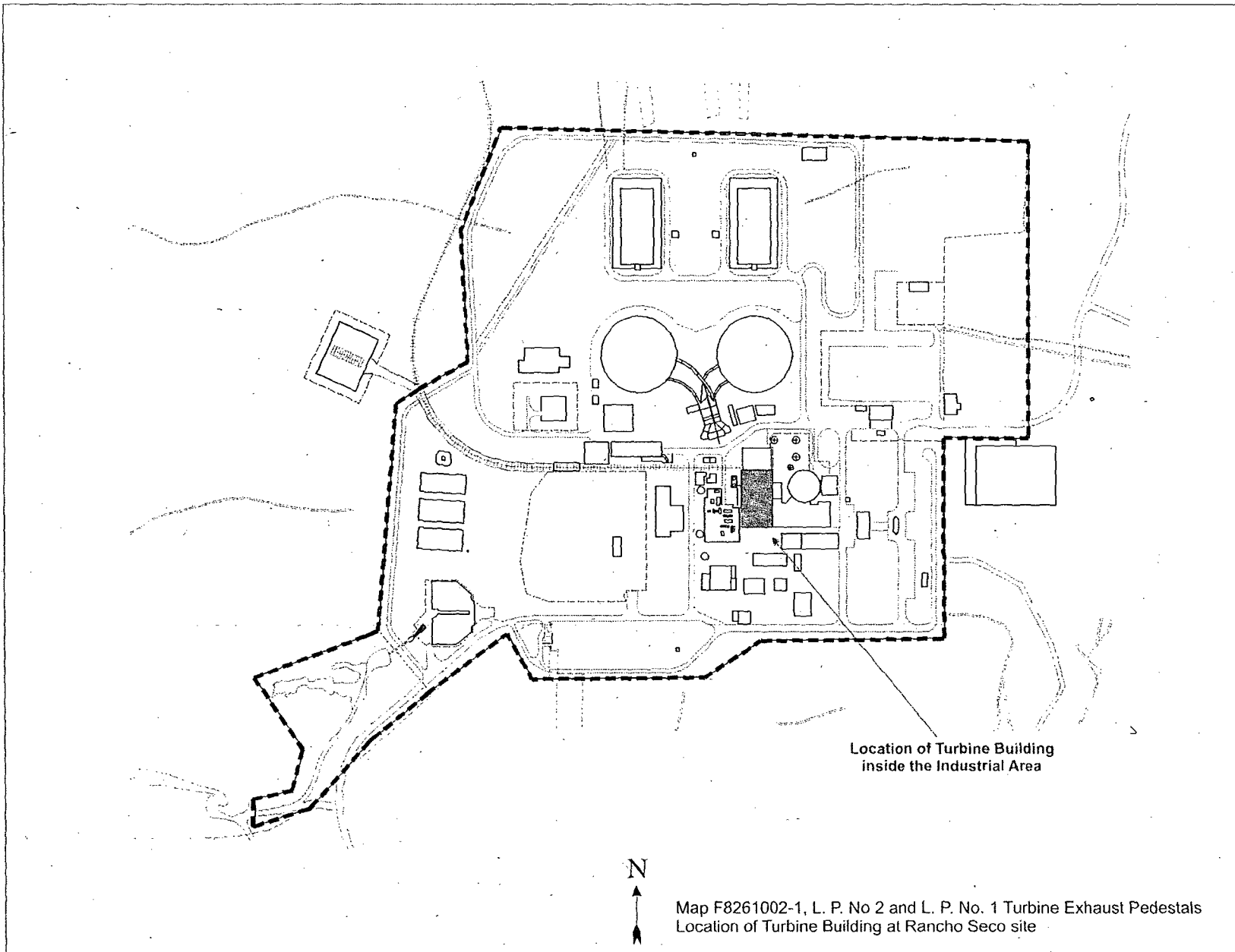
It is concluded that survey unit F8261002 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

November 9, 2007

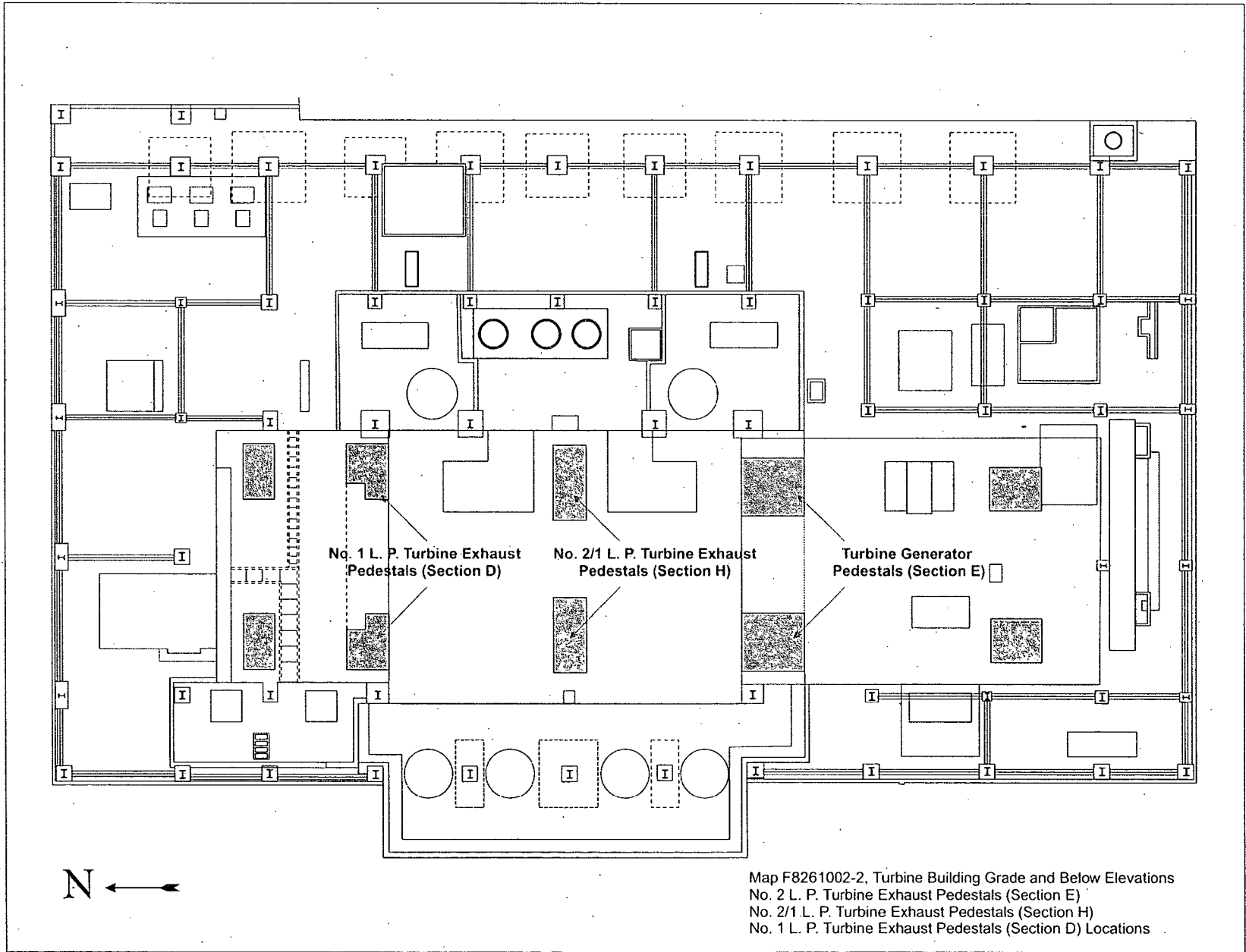
Survey Unit F8261002



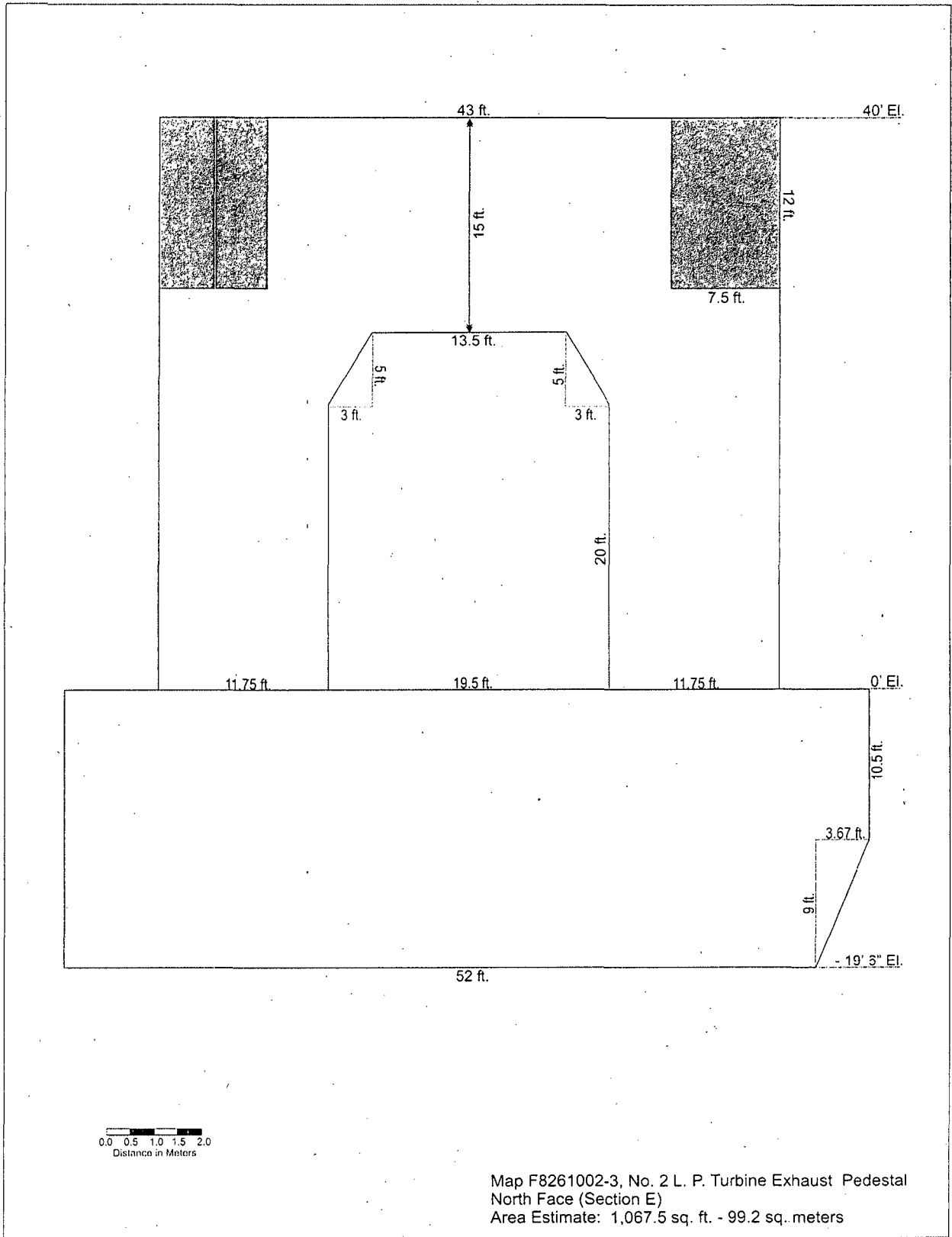
Location of Turbine Building
inside the Industrial Area

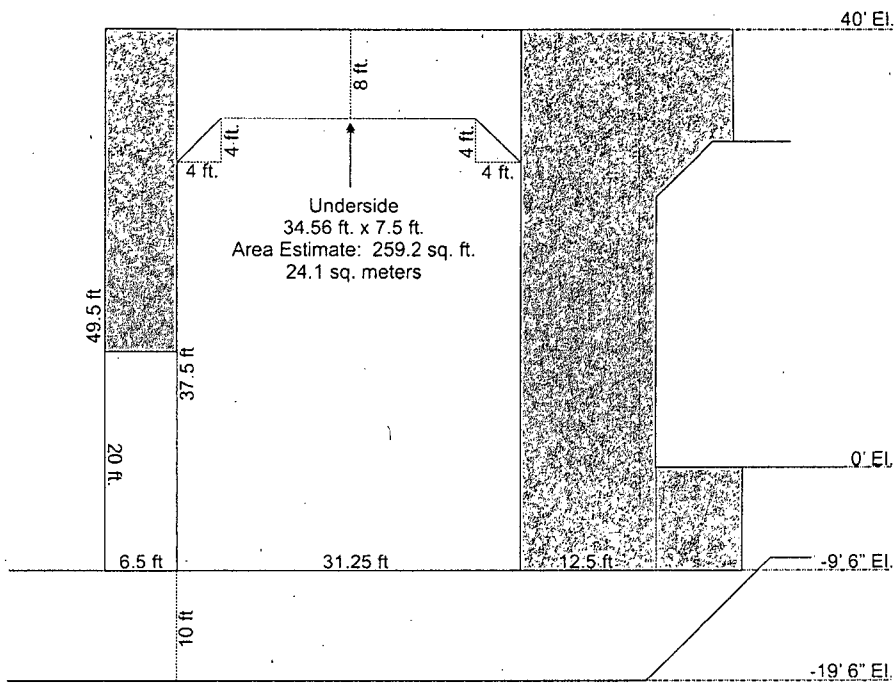


Map F8261002-1, L. P. No 2 and L. P. No. 1 Turbine Exhaust Pedestals
Location of Turbine Building at Rancho Seco site

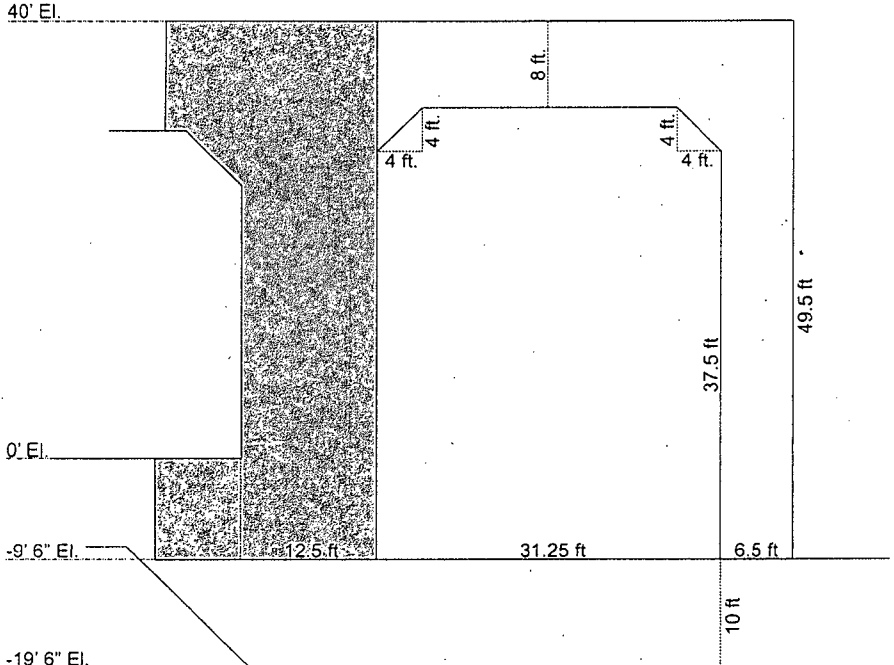


Map F8261002-2, Turbine Building Grade and Below Elevations
No. 2 L. P. Turbine Exhaust Pedestals (Section E)
No. 2/1 L. P. Turbine Exhaust Pedestals (Section H)
No. 1 L. P. Turbine Exhaust Pedestals (Section D) Locations

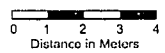




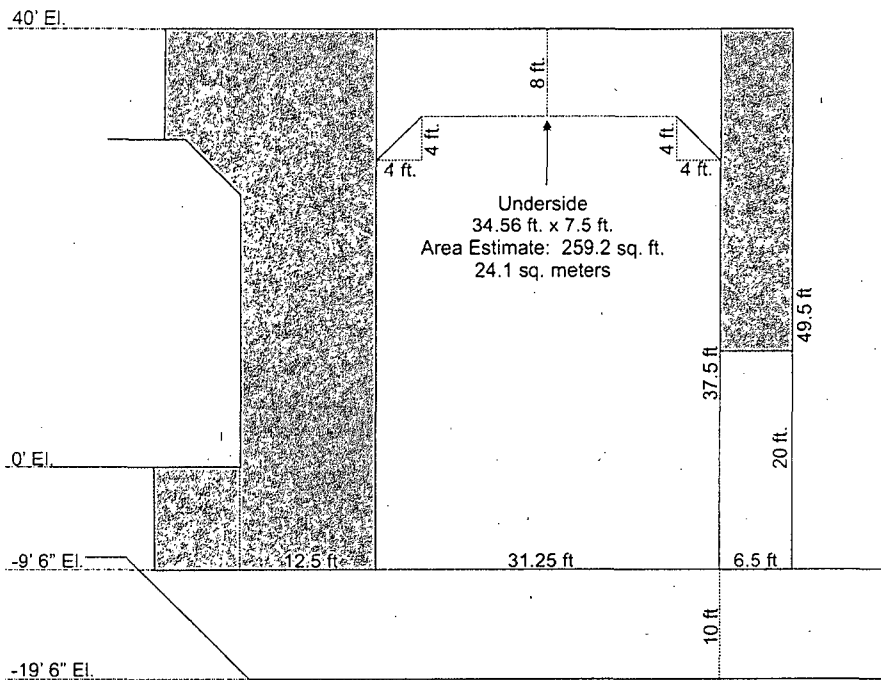
East No. 2 L. P. Exhaust Pedestals and Cross Beam, Interior Face,
Area Estimate: 396 sq. ft - 36.79 sq. meters



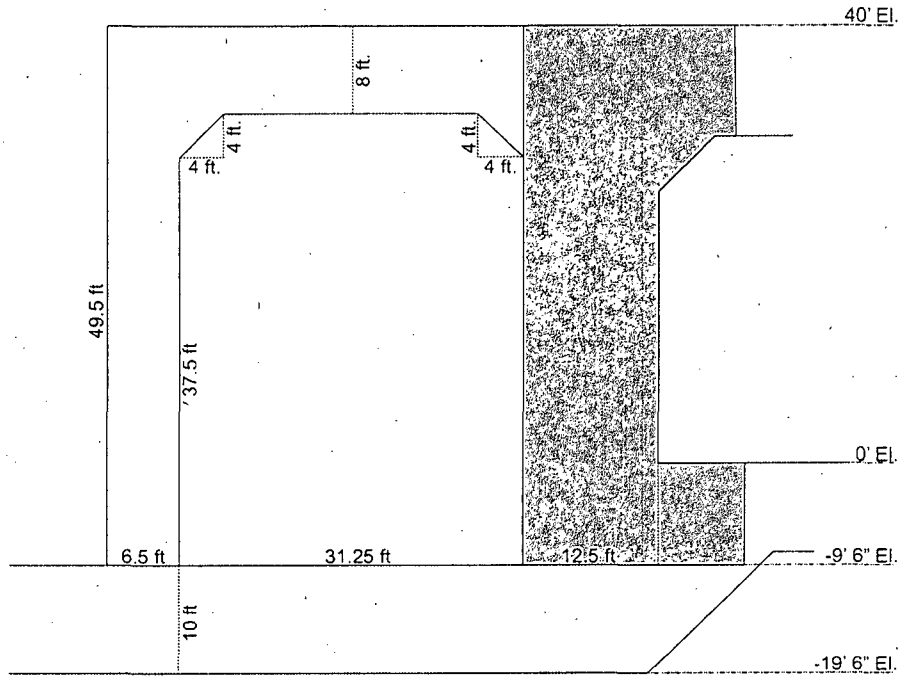
East No. 2 L. P. Exhaust Pedestals and Cross Beam, Exterior Face,
Area Estimate: 587.75 sq. ft. - 54.6 sq. meters



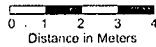
Map F8261002-4, East No. 2 L. P. Exhaust Pedestals and Cross Beam
Area Estimate: 115.5 sq. meters



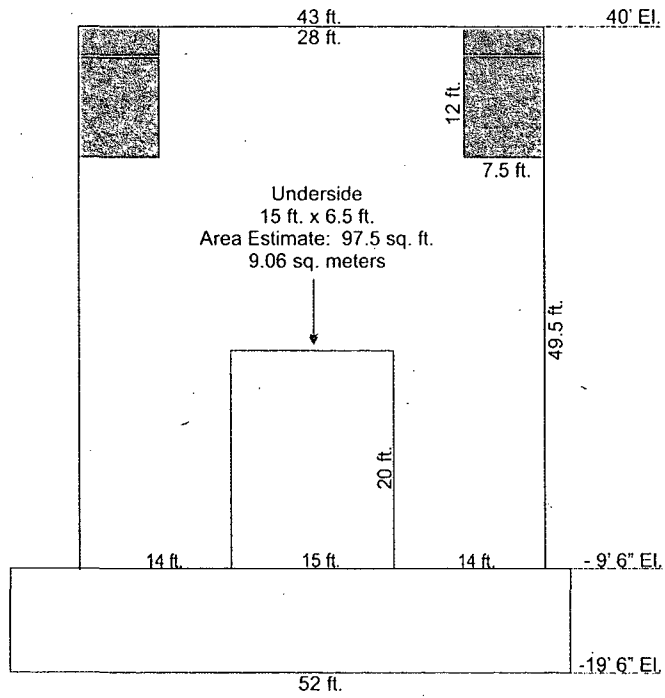
West No. 2 L. P. Exhaust Pedestals and Cross Beam, Interior Face,
Area Estimate: 396 sq. ft. - 36.79 sq. meters



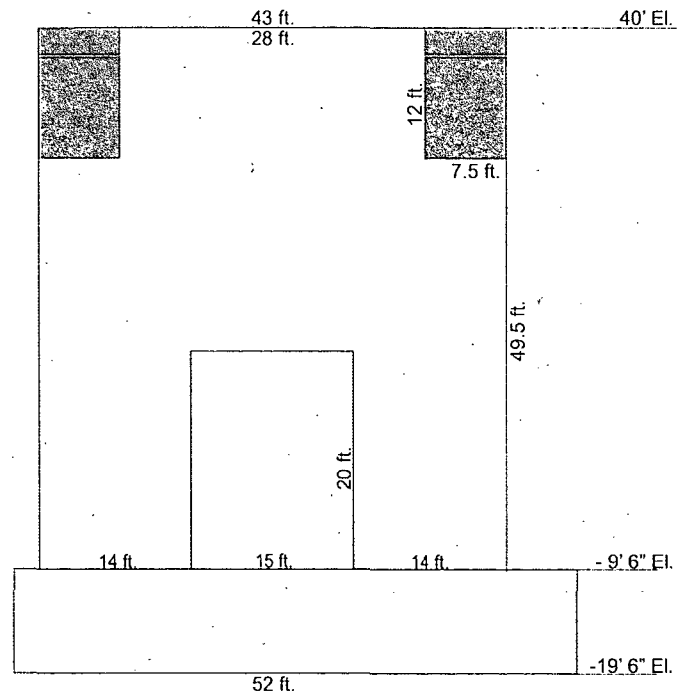
West No. 2 L. P. Exhaust Pedestals and Cross Beam, Exterior Face,
Area Estimate: 587.75 sq. ft. - 54.6 sq. meters



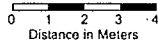
Map F8261002-5, West No. 2 L. P. Exhaust Pedestals and Cross Beam
Area Estimate: 115.5 sq. meters



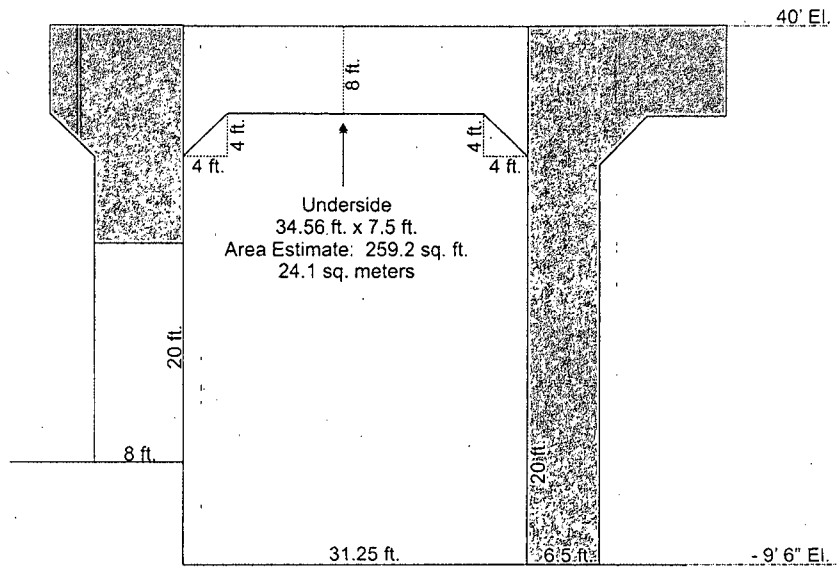
No. 1 L. P. Turbine Exhaust Pedestal South Face (Section H)
Area Estimate: 1,648.5 sq. ft. - 153.15 sq. meters



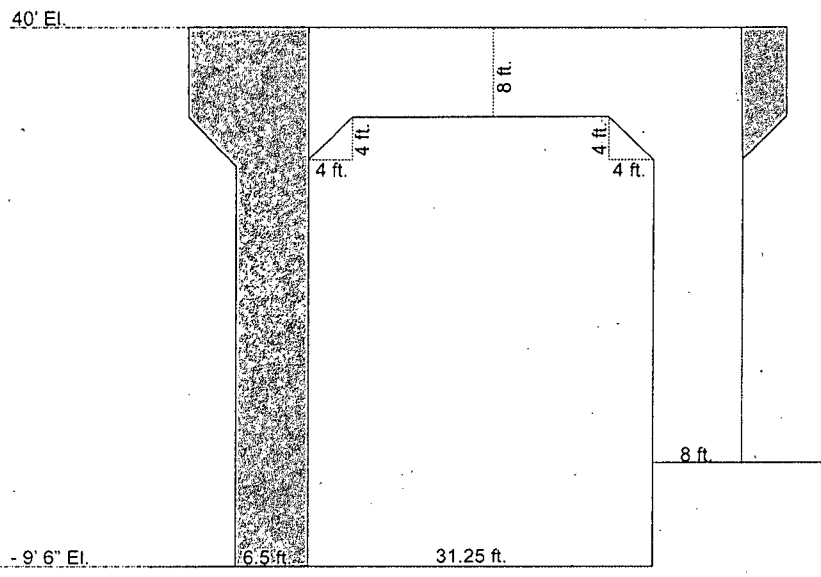
No. 2 L. P. Turbine Exhaust Pedestal North Face (Section H)
Area Estimate: 1,648.5 sq. ft. - 153.15 sq. meters



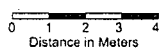
Map F8261002-6; No. 1 L. P. Turbine Exhaust Pedestal South Face (Section H)
No. 2 L. P. Turbine Exhaust Pedestal North Face (Section H)
Area Estimate: 315.4 sq. meters



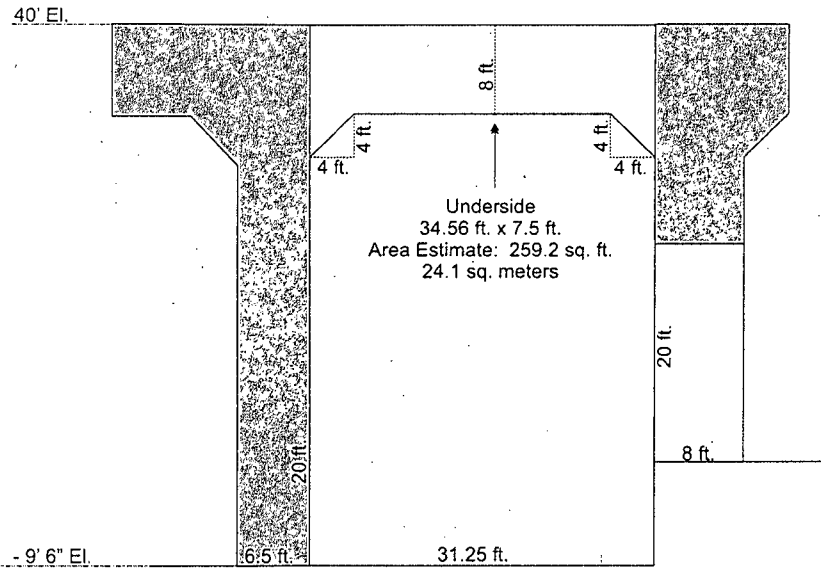
East No. 1 L.P. Exhaust Pedestals and Cross Beam, Interior Face
 Area Estimate: 426 sq. feet - 39.6 sq. meters



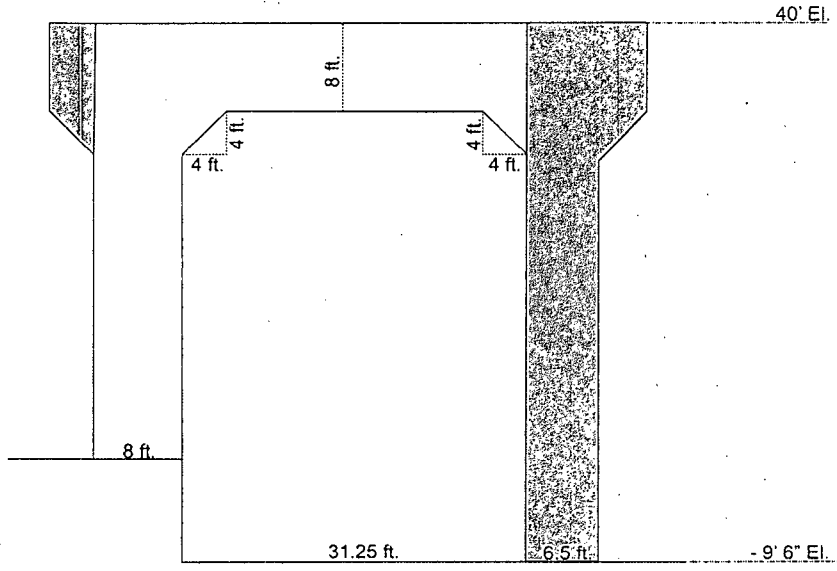
East No. 1 L.P. Exhaust Pedestals and Cross Beam, Exterior Face
 Area Estimate: 586 sq.ft. - 54.44 sq. meters



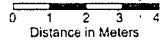
Map F8261002-7, East No. 1 L. P. Turbine Exhaust Pedestals and Cross Beam
 Area Estimate: 118.1 sq. meters



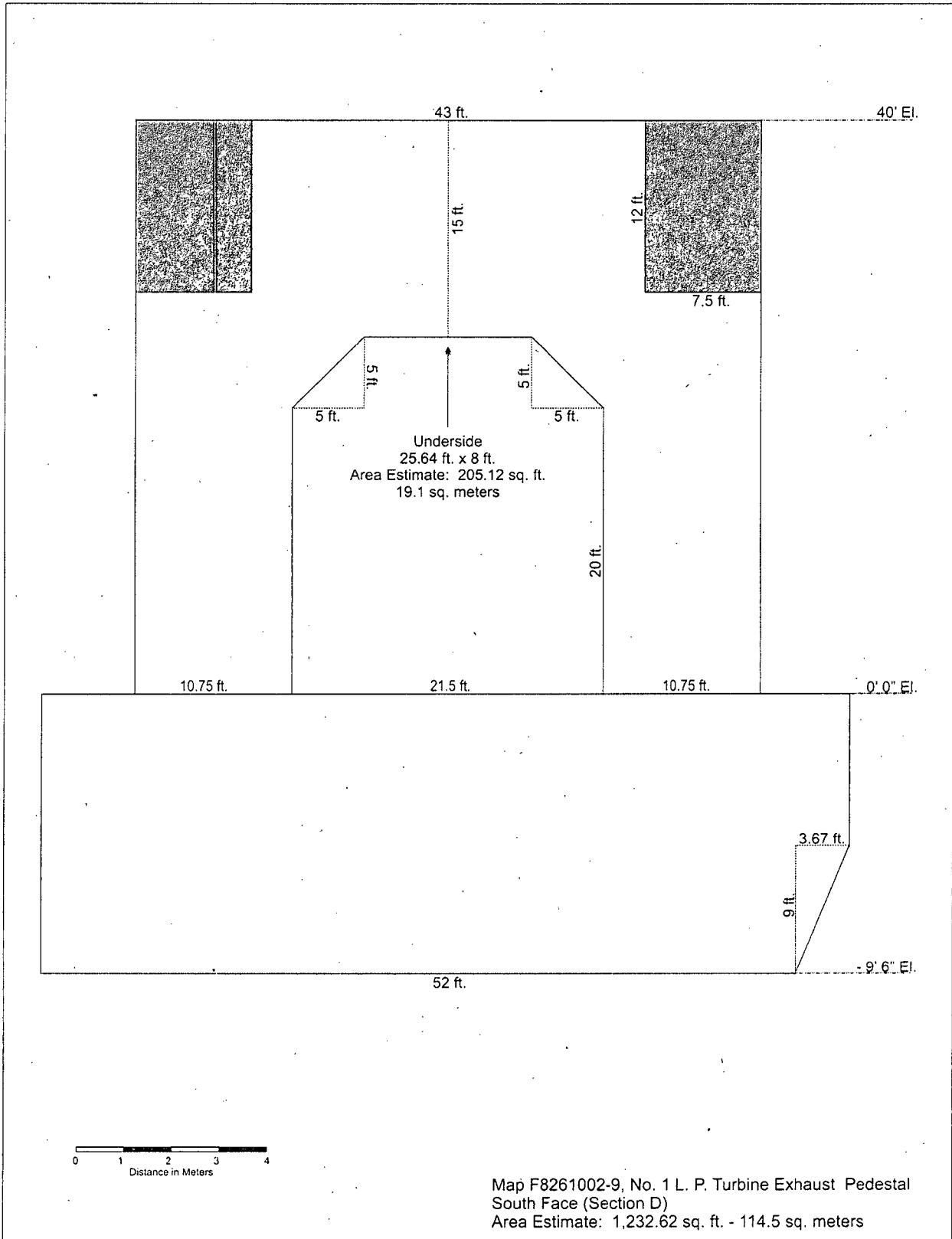
West No. 1 L. P. Exhaust Pedestals and Cross Beam, Interior Face
Area Estimate: 426 sq. feet - 39.6 sq. meters

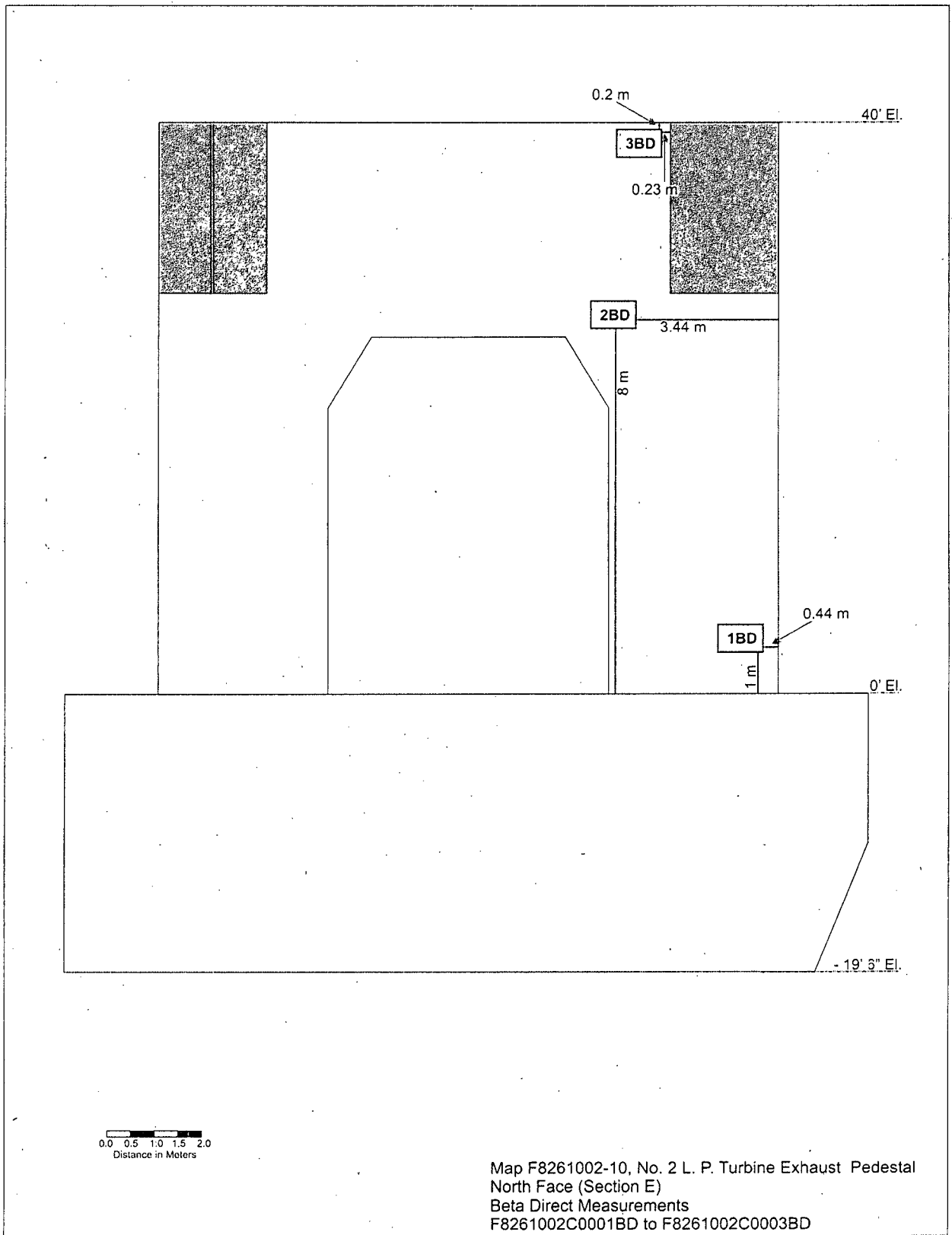


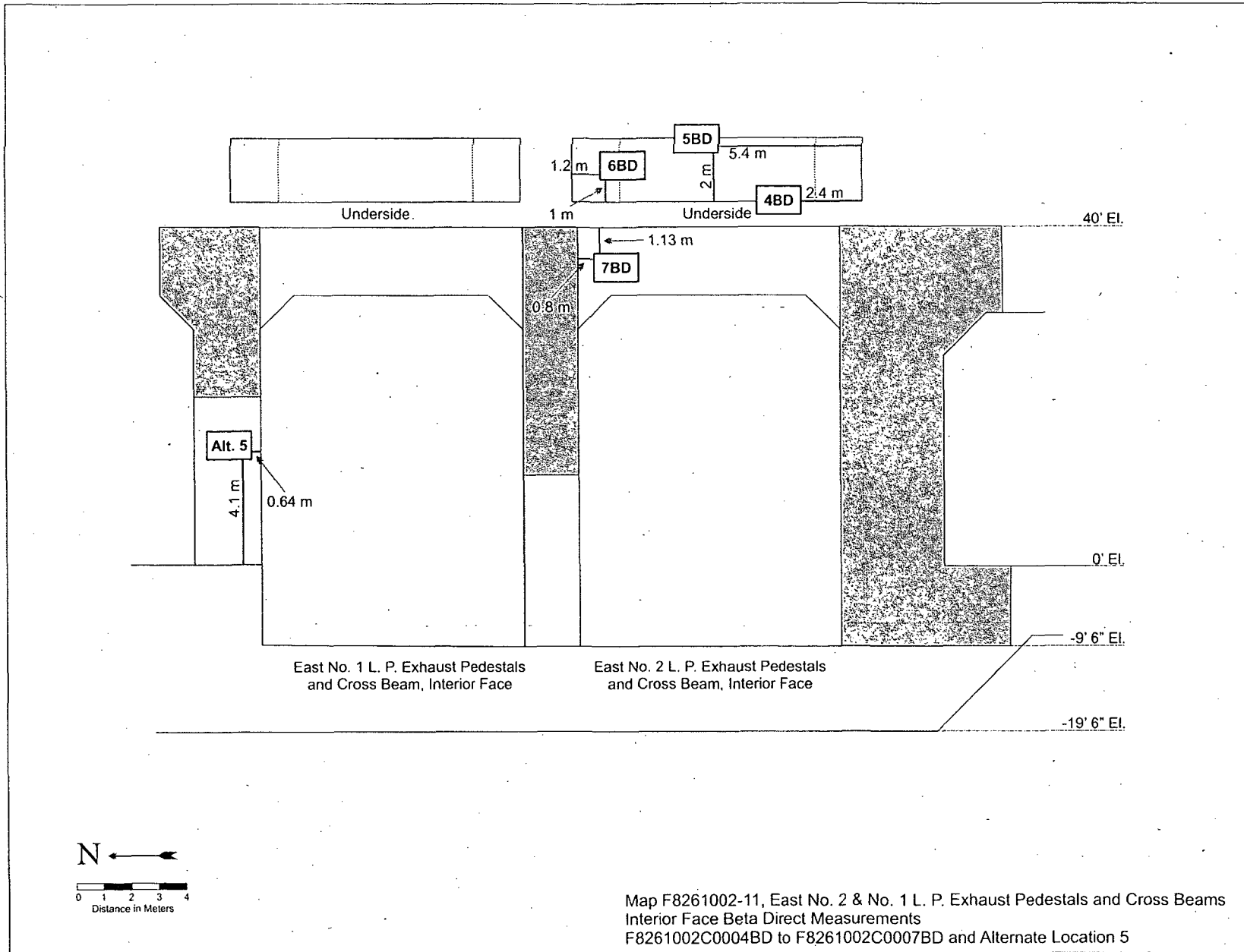
West No. 1 L. P. Exhaust Pedestals and Cross Beam, Exterior Face
Area Estimate: 586 sq.ft. - 54.44 sq. meters



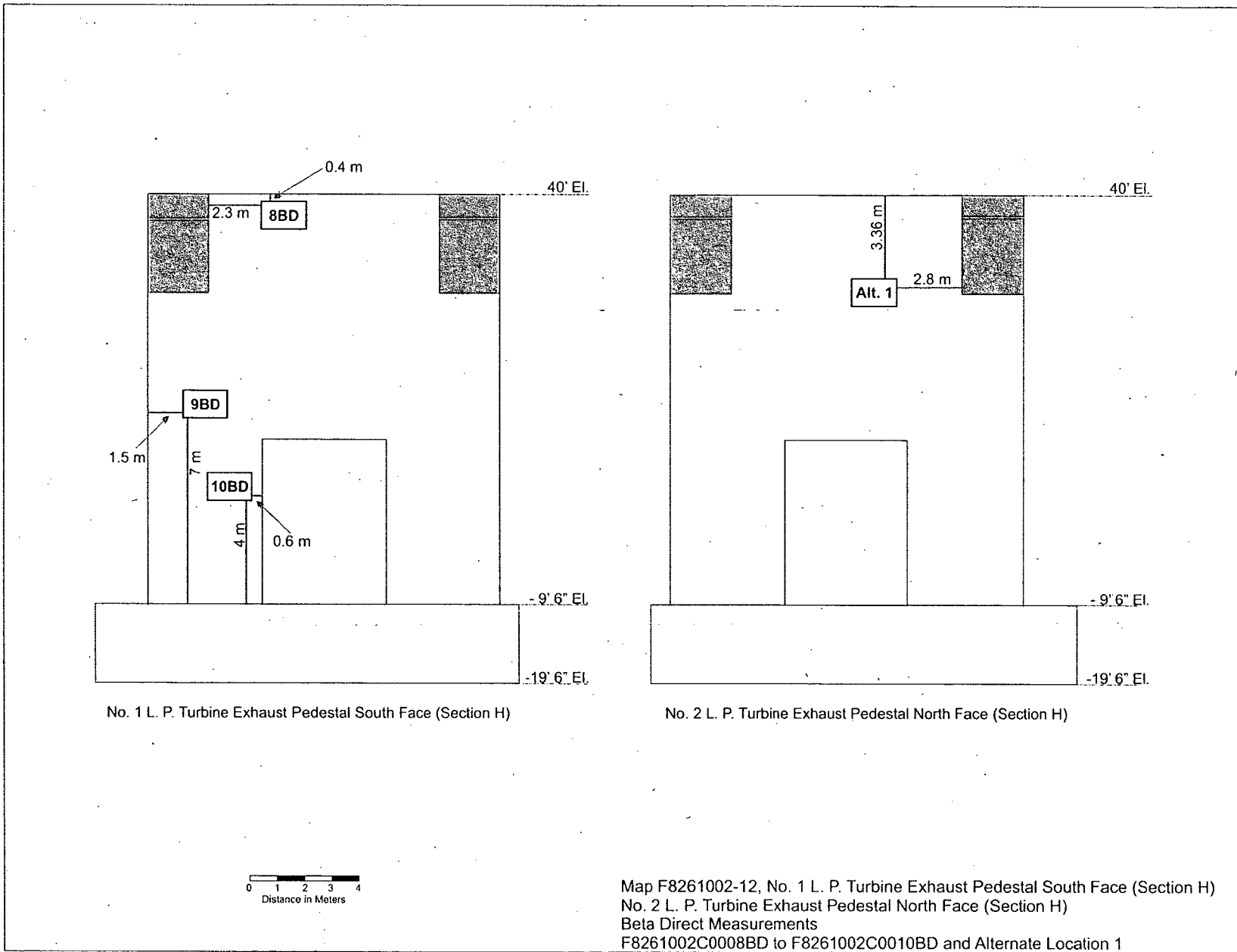
Map F8261002-8, West No. 1 L. P. Turbine Exhaust Pedestals and Cross Beam
Area Estimate: 118.1 sq. meters

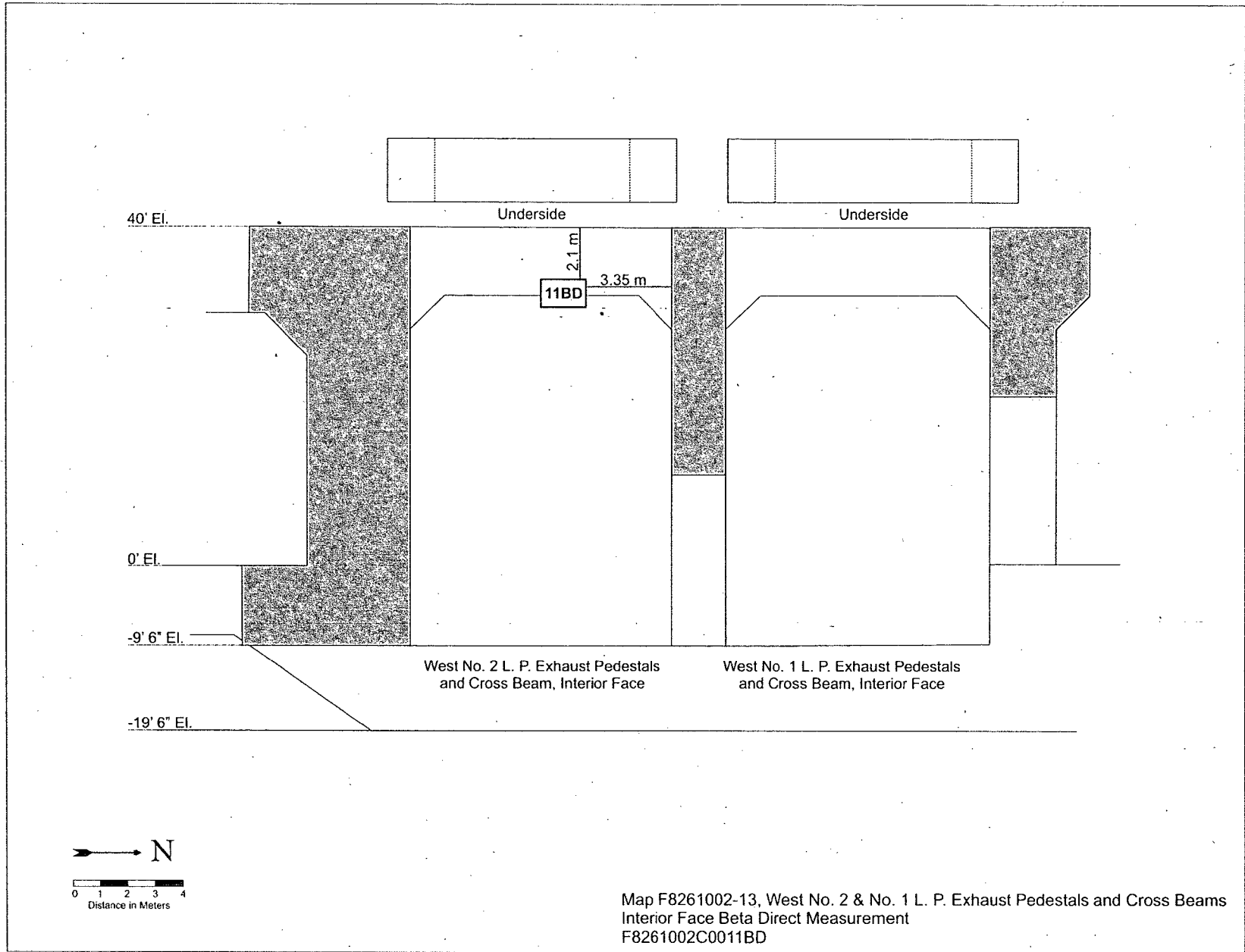


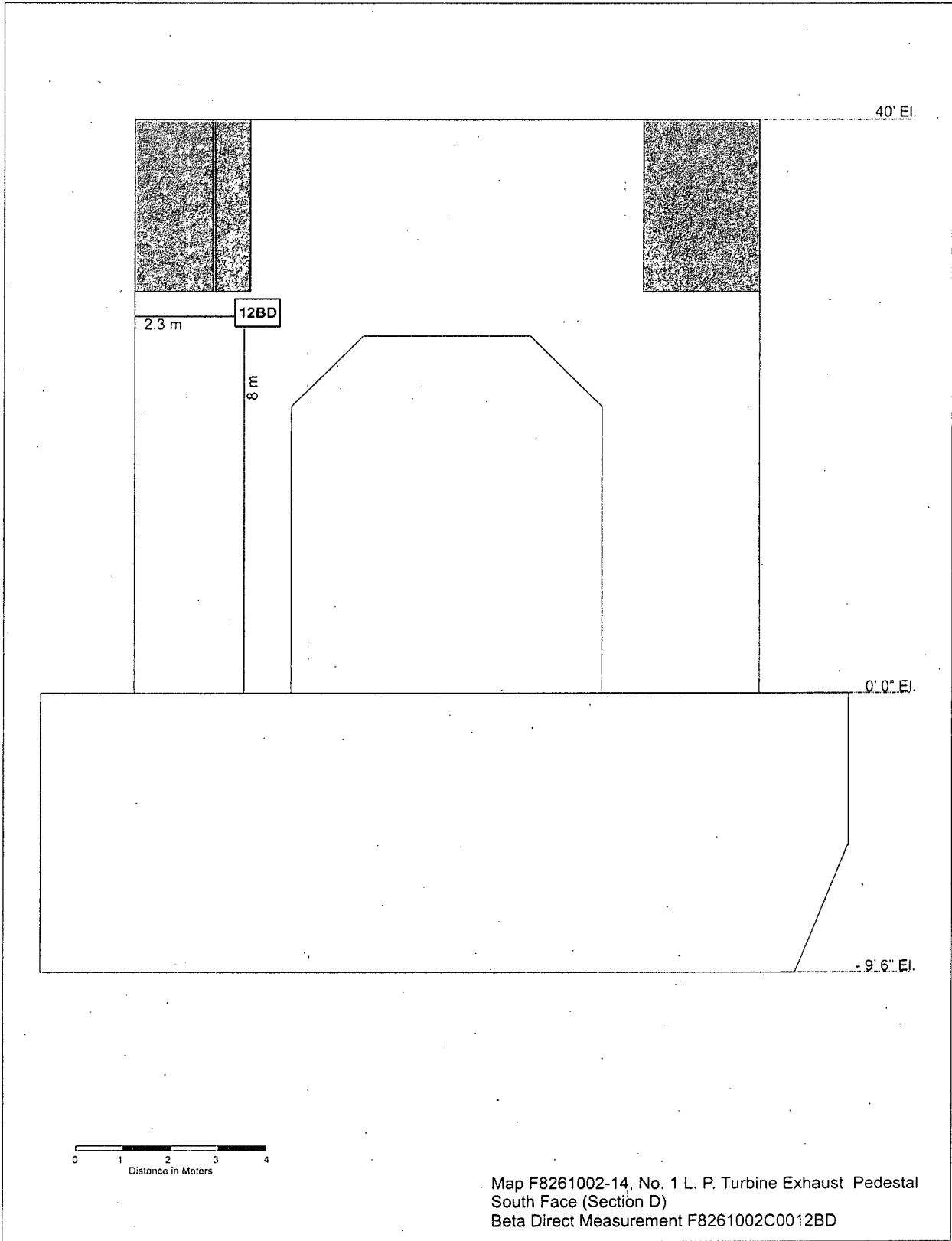


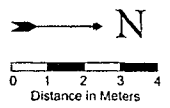
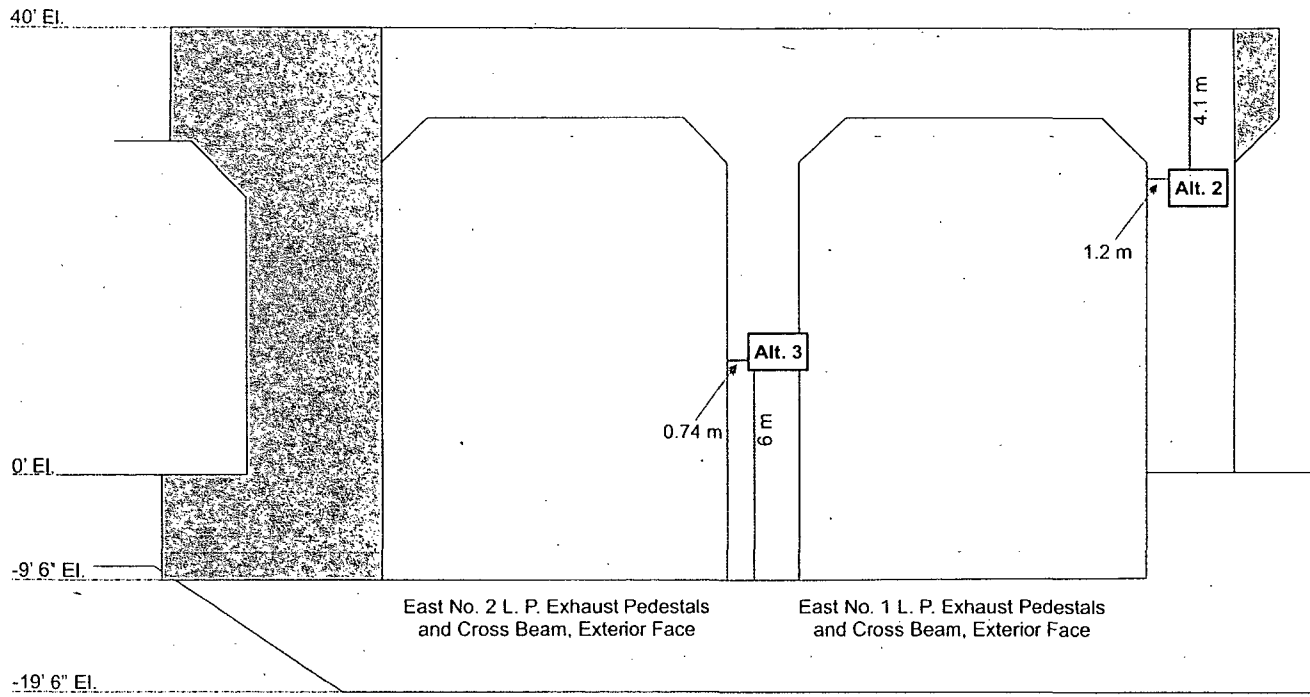


Map F8261002-11, East No. 2 & No. 1 L. P. Exhaust Pedestals and Cross Beams Interior Face Beta Direct Measurements F8261002C0004BD to F8261002C0007BD and Alternate Location 5

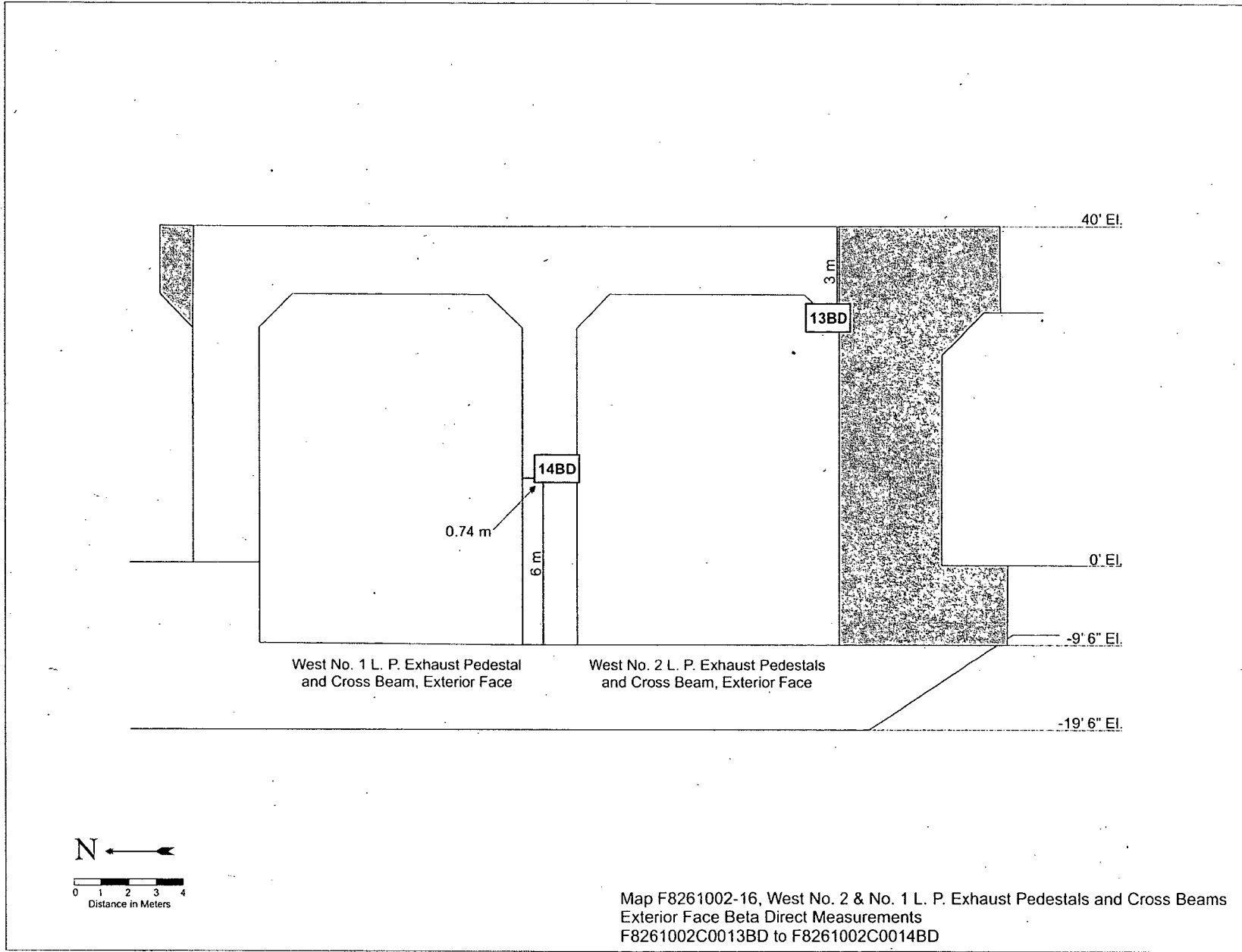


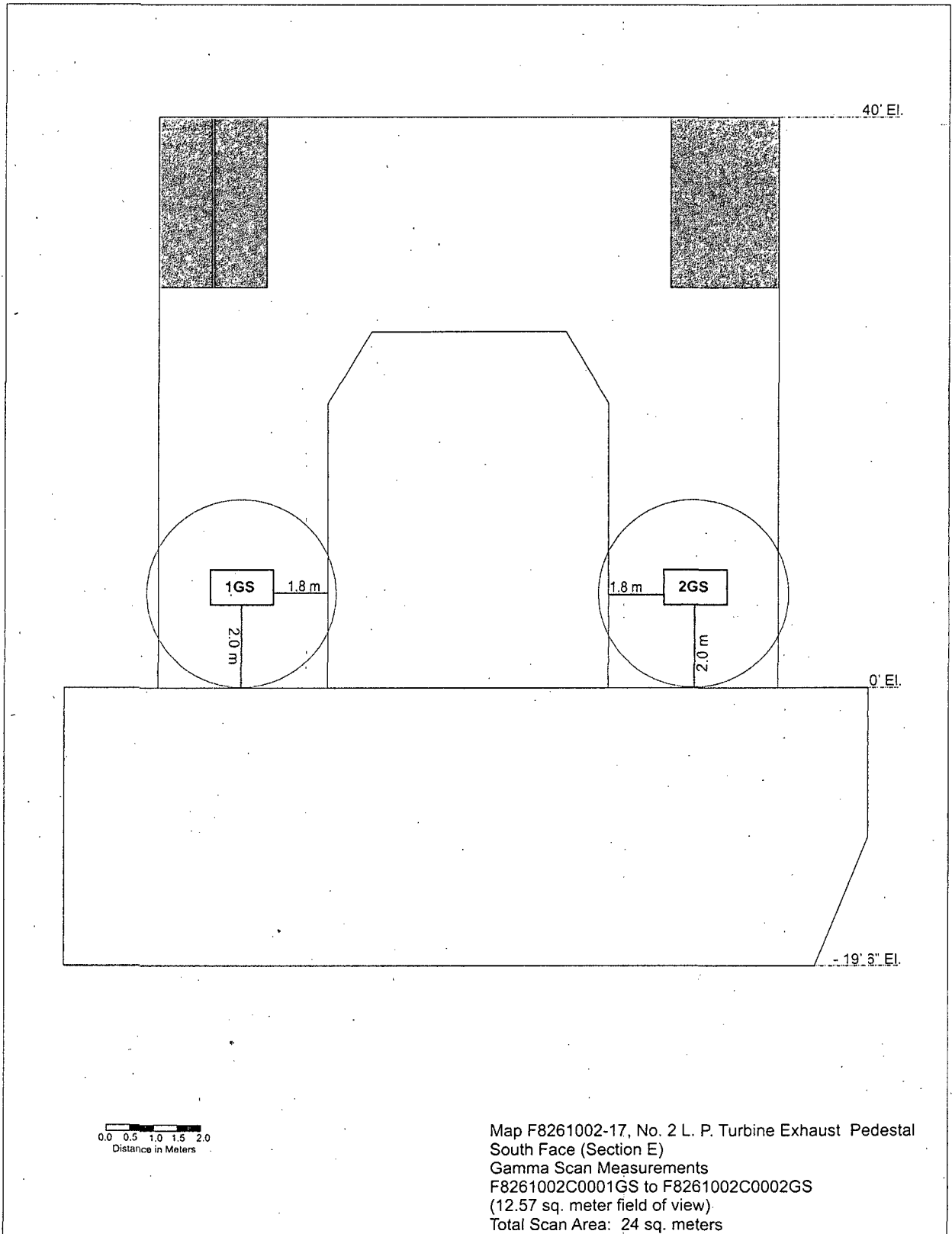


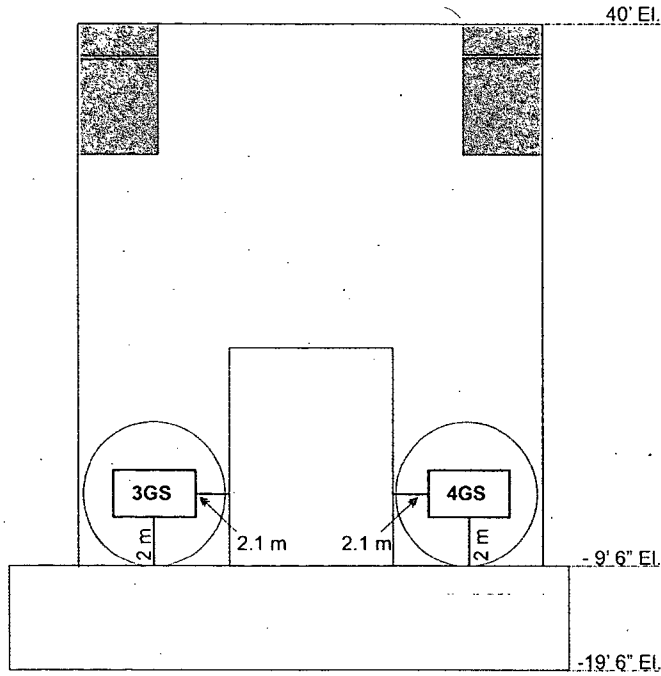




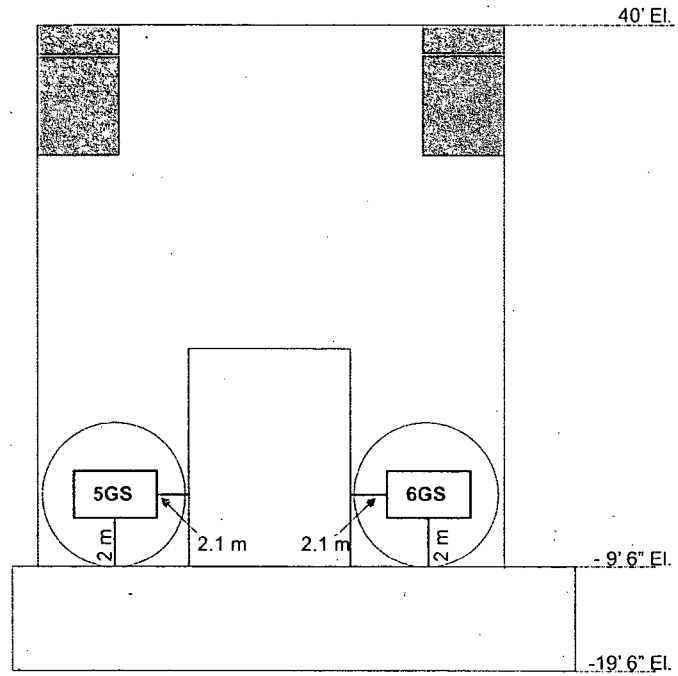
Map F8261002-15, East No. 2 & No. 1 L. P. Exhaust Pedestals and Cross Beams Exterior Face Beta Direct Measurements Alternate Locations 2 and 3



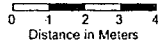




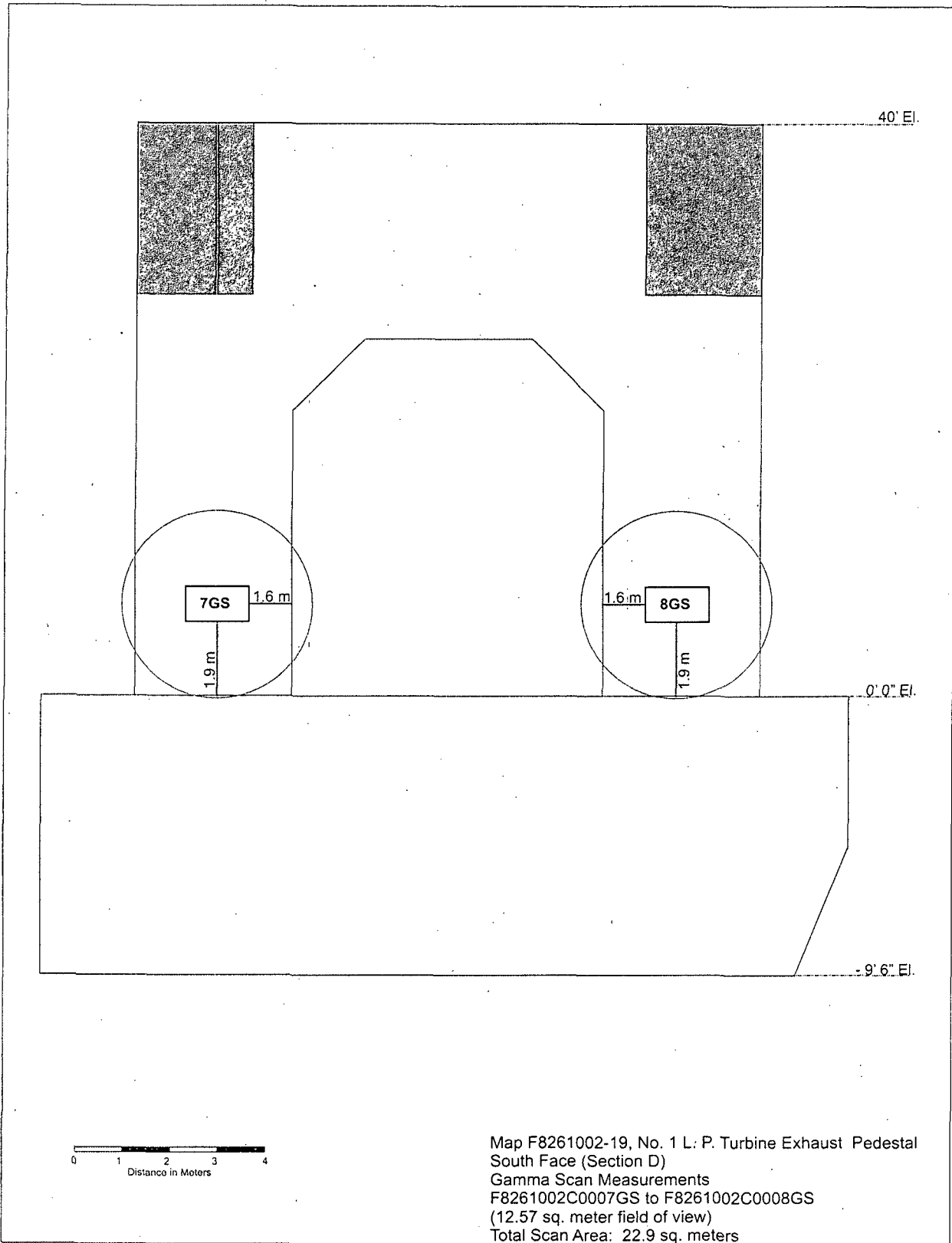
No. 1 L. P. Turbine Exhaust Pedestal South Face (Section H)

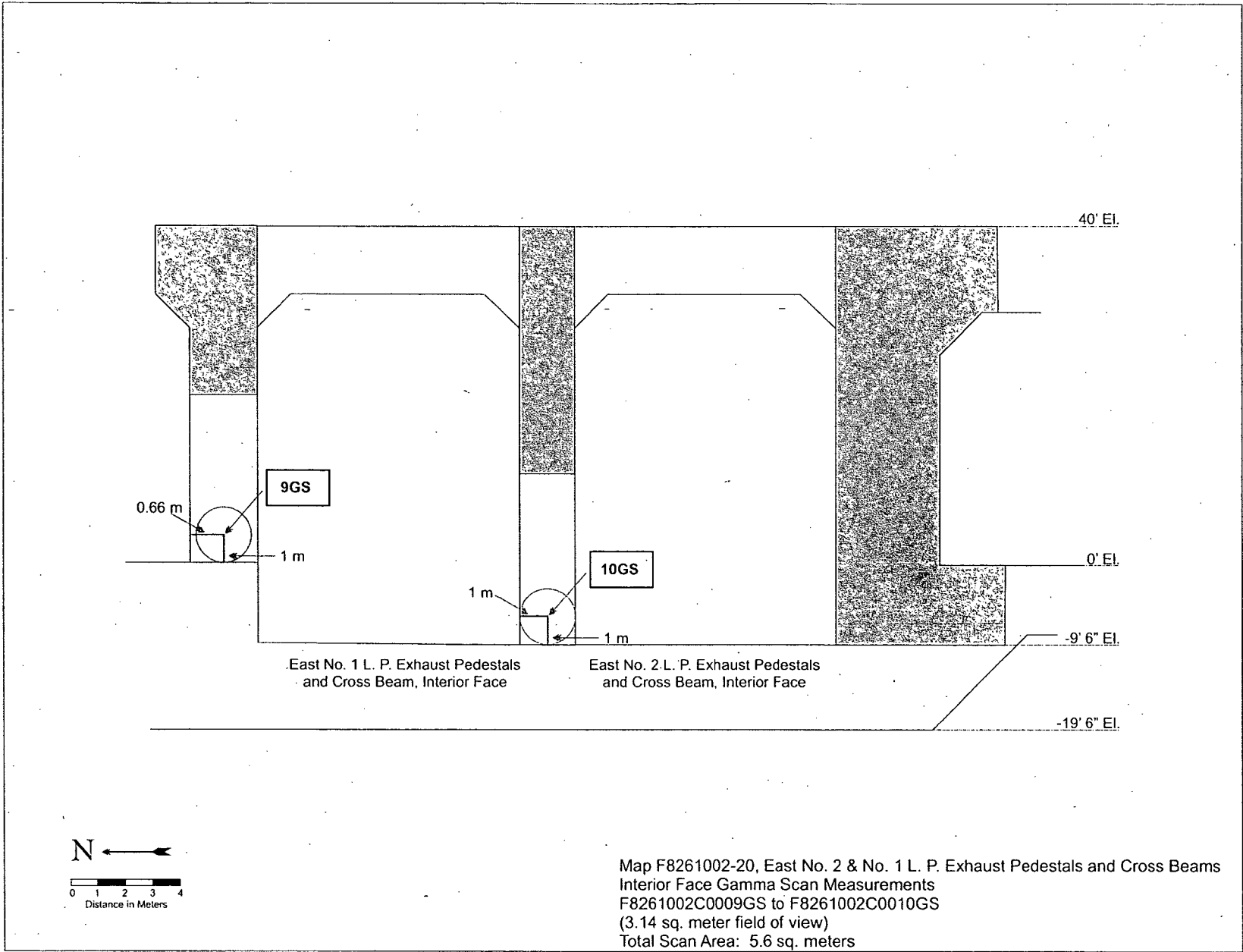


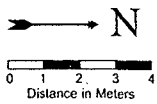
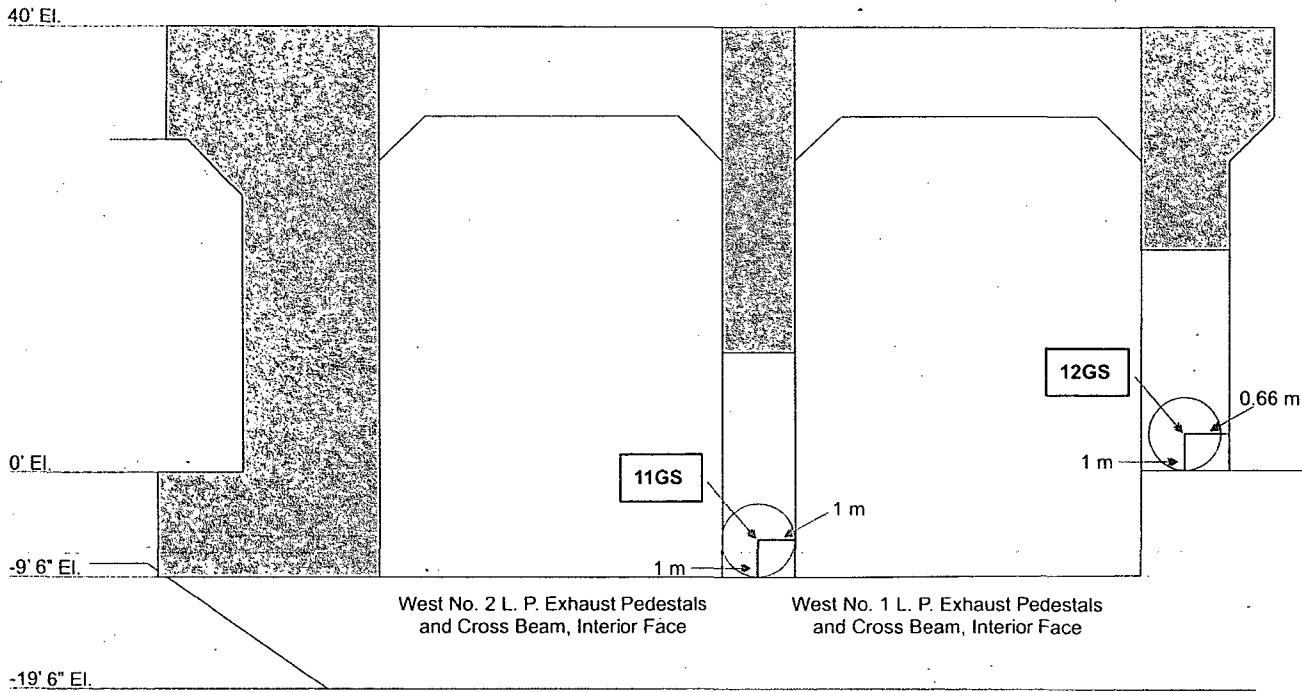
No. 2 L. P. Turbine Exhaust Pedestal North Face (Section H)



Map F8261002-18, No. 1 L. P. Turbine Exhaust Pedestal South Face (Section H)
Gamma Scan Measurements F8261002C0003GS to F8261002C0004GS
(12.57 sq. meter field of view)
No. 2 L. P. Turbine Exhaust Pedestal North Face (Section H)
Gamma Scan Measurements F8261002C0005GS to F8261002C0006GS
(12.57 sq. meter field of view)
Total Scan Area: 50.3 sq. meters







Map F8261002-21, West No. 2 & No. 1 L. P. Exhaust Pedestals and Cross Beams
Interior Face Gamma Scan Measurements
F8261002C0011GS to F8261002C0012GS
(3.14 sq. meter field of view)
Total Scan Area: 5.6 sq. meters

Attachment 2

Instrumentation

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Survey Unit F8261002

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; 193715	43-68B; 160703	433	1,033
Tennelec; 0401171	N/A	5 dpm α , 11 dpm β	N/A

Instrument	Detector Serial No.	MDC (dpm/100 cm²)
ISOCS	1983920	1,140 dpm/100 cm ² Cs-137 842 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	43,000
DCGL _w	43,000
DCGL _{EMC}	N/A

Instrument	Parameter	Value (dpm/100 cm²)
ISOCS	Investigation Criteria - Scan	Concrete - 43,000 dpm/100 cm ² Cs-137

Attachment 3

Investigation

November 9, 2007

Survey Unit F8261002

(none required)

Attachment 4
Data Assessment
November 9, 2007
Survey Unit F8261002

