Rancho Seco

Final Status Survey Summary Report

September 6, 2008

Turbine Building -9'6" El. North Condensate Pit

Survey Unit F8260010

Prepared By: Erin L. Brown **Date:** 9/6/2008

FSS Engineer

Reviewed By: Robert Thaler **Date:** 11/20/08

Lead FSS Engineer

Approved By: [signature] **Date:** 2-27-09

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8260010, Turbine Building -9'6" El. North Condensate Pit

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 cm^2 and a maximum value of 24,900 dpm/100 cm^2. Direct measurements on the grade elevation showed a mean gross activity level of 2,035 dpm/100 cm^2 and a maximum value of 6,980 dpm/100 cm^2. Direct measurements on the mezzanine elevation showed a mean gross activity level of 1,566 dpm/100 cm^2 and a maximum value of 2,626 dpm/100 cm^2. Direct measurements on the +40' elevation showed a mean gross activity level of 2,843 dpm/100 cm^2 and a maximum value of 3,615 dpm/100 cm^2. Direct measurements on the building exterior showed a mean gross activity level of 1,984 dpm/100 cm^2 and a maximum value of 10,312 dpm/100 cm^2. 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.

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 319 m^2 were scanned for 100% 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 -9'6" El. North Condensate Pit
Survey Unit:	0010	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m^2)**:**	319	
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	3.6	Class 1
Design DCGLemc (dpm/100 cm^2)**:**	154800	Class 1
LBGR (dpm/100 cm^2)**:**	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	3130	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	6.9	Class 1
Scan Area (m^2)**:**	319	
Scan Coverage (%):	100%	Class 1
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	6.8	
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:	46	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 49 direct measurements were made in F8260010. 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. Scan activity ranged from 1614 to 34413 dpm/100 cm², based on a surveyor efficiency of 0.5 and 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)
F8260010-C0001BD	1048
F8260010-C0002BD	1146
F8260010-C0003BD	1235
F8260010-C0004BD	1157
F8260010-C0005BD	1131
F8260010-C0006BD	1416
F8260010-C0007BD	1172
F8260010-C0008BD	1344
F8260010-C0009BD	1380
F8260010-C0010BD	1484
F8260010-C0011BD	1551
F8260010-C0012BD	1292
F8260010-C0013BD	1577
F8260010-C0014BD	1458
F8260010-C0015BD	1520
F8260010-C0016BD	1629
F8260010-C0017BD	1473
F8260010-C0018BD	1344
F8260010-C0019BD	1484
F8260010-C0020BD	1261
F8260010-C0021BD	1535
F8260010-C0022BD	3631
F8260010-C0023BD	1302
F8260010-C0024BD	1665
F8260010-C0025BD	1385
F8260010-C0026BD	1691
F8260010-C0027BD	1426
F8260010-C0028BD	1344
F8260010-C0029BD	1318
F8260010-C0030BD	1276
F8260010-C0031BD	1644
F8260010-C0032BD	1603
F8260010-C0033BD	1598
F8260010-C0034BD	1816
F8260010-C0035BD	1987
F8260010-C0036BD	1707

F8260010-C0037BD	1395
F8260010-C0038BD	1297
F8260010-C0039BD	1494
F8260010-C0040BD	1509
F8260010-C0041BD	1307
F8260010-C0042BD	1183
F8260010-C0043BD	3429
F8260010-C0044BD	1442
F8260010-C0045BD	1525
F8260010-C0046BD	1401
F8260010-C0047BD	1338
F8260010-C0048BD	1810
F8260010-C0049BD	1318
Mean:	1520
Median:	1426
Standard Deviation:	461
Range:	1048 - 3631

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8260010C0001SM	-3.53
F8260010C0002SM	-2.24
F8260010C0003SM	-3.53
F8260010C0004SM	-3.53
F8260010C0005SM	-0.95
F8260010C0006SM	-2.24
F8260010C0007SM	-0.95
F8260010C0008SM	0.34
F8260010C0009SM	-2.24
F8260010C0010SM	0.34
F8260010C0011SM	-2.24
F8260010C0012SM	-2.24
F8260010C0013SM	-0.95
F8260010C0014SM	-0.95
F8260010C0015SM	-4.82
F8260010C0016SM	-4.82
F8260010C0017SM	-3.53
F8260010C0018SM	-4.82
F8260010C0019SM	-2.24
F8260010C0020SM	-4.82
F8260010C0021SM	-2.24
F8260010C0022SM	-6.11
F8260010C0023SM	-2.24
F8260010C0024SM	-3.53
F8260010C0025SM	-4.82
F8260010C0026SM	-6.11
F8260010C0027SM	-2.24
F8260010C0028SM	-3.53
F8260010C0029SM	-0.95
F8260010C0030SM	1.64
F8260010C0031SM	-3.53
F8260010C0032SM	-0.95
F8260010C0033SM	-4.82
F8260010C0034SM	-0.95
F8260010C0035SM	-3.53
F8260010C0036SM	-2.24
F8260010C0037SM	-0.95
F8260010C0038SM	-3.53
F8260010C0039SM	-4.82
F8260010C0040SM	-2.24
F8260010C0041SM	-2.24
F8260010C0042SM	-0.95
F8260010C0043SM	0.34
F8260010C0044SM	-4.82
F8260010C0045SM	-3.53
F8260010C0046SM	-3.53
F8260010C0047SM	-4.82
F8260010C0048SM	0.34

F8260010C0049SM	-2.24
Mean:	-2.63
Median:	-2.24
Standard Deviation:	1.81
Range:	-6.11 to 1.64

Survey Unit Data Assessment:

The survey design required 49 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):	49	
Median (dpm/100 cm^2):	1426	
Mean (dpm/100 cm^2):	1520	
Direct Measurement Standard Deviation (dpm/100 cm^2):	461	
Total Standard Deviation (dpm/100 cm^2):	461	Based on samples and backgrounds.
Maximum (dpm/100 cm^2):	3631	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	49	
S+ Value:	49	
Critical Value:	30	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	Yes	Class 1
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 1 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. Therefore the EMC criterion was met.

Conclusion:

The FSS of this survey unit was properly designed as a Class 1 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 43000 dpm/100 cm^2 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.

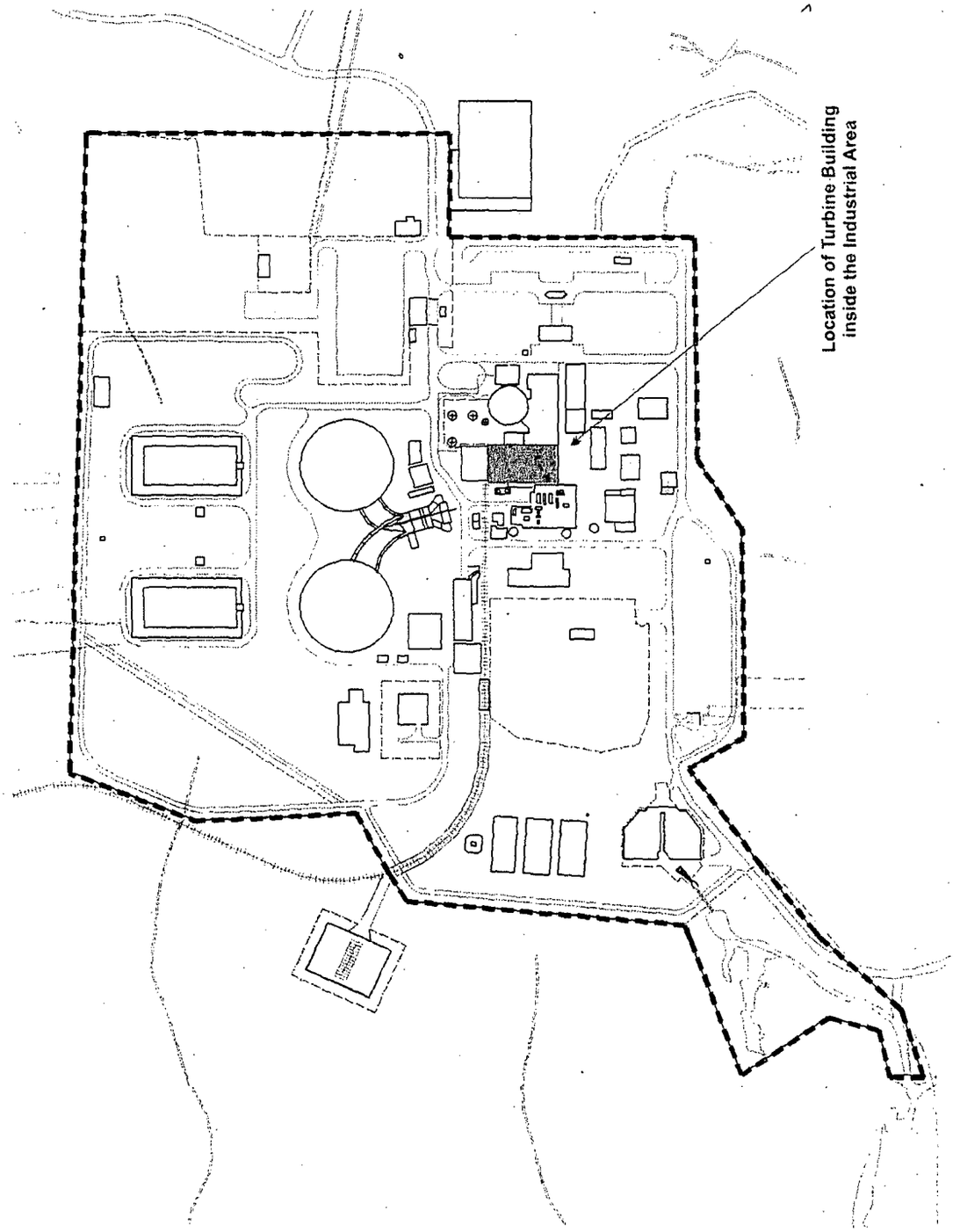
It is concluded that survey unit F8260010 meets the release criteria of 10CFR20.1402.

Attachment 1

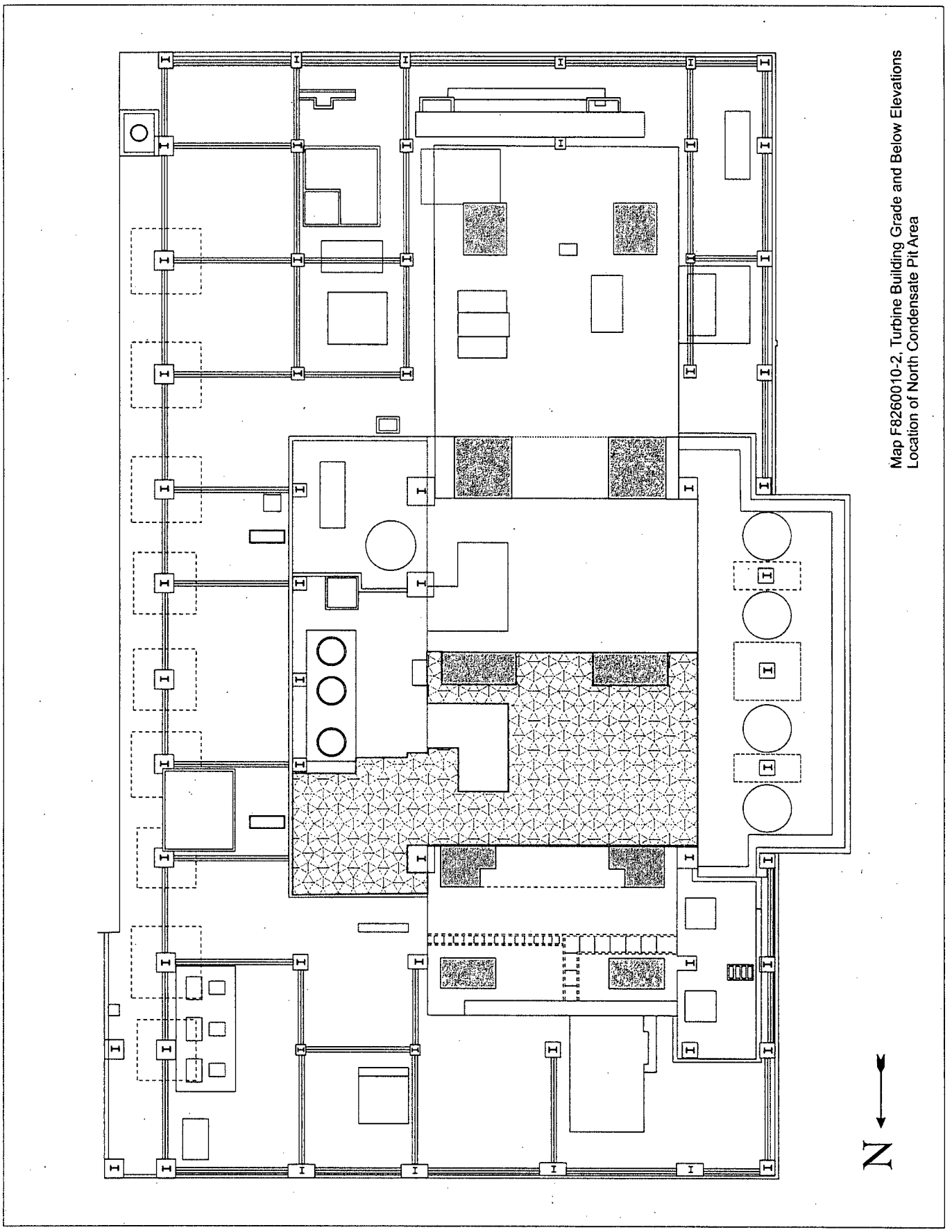
Maps

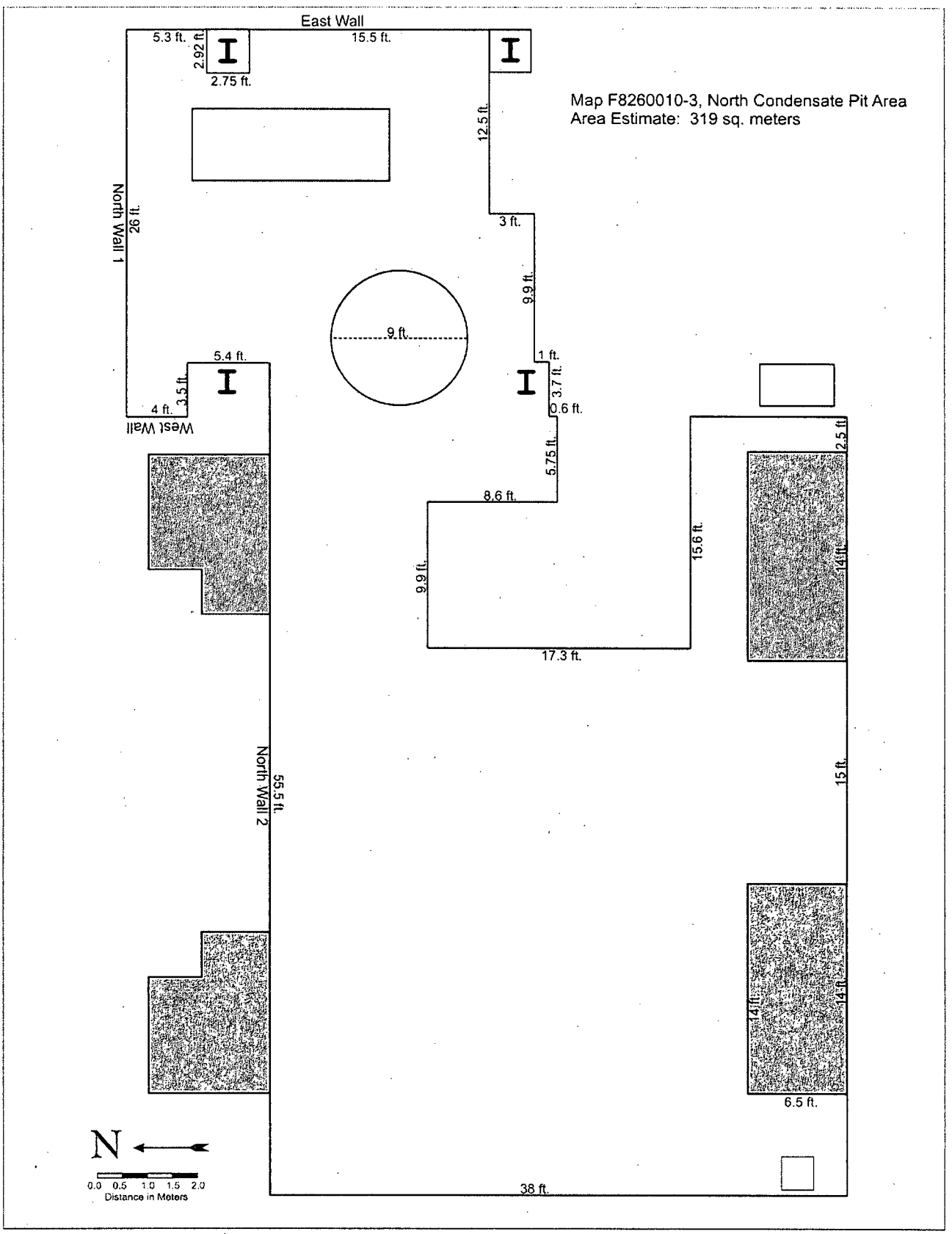
September 6, 2008

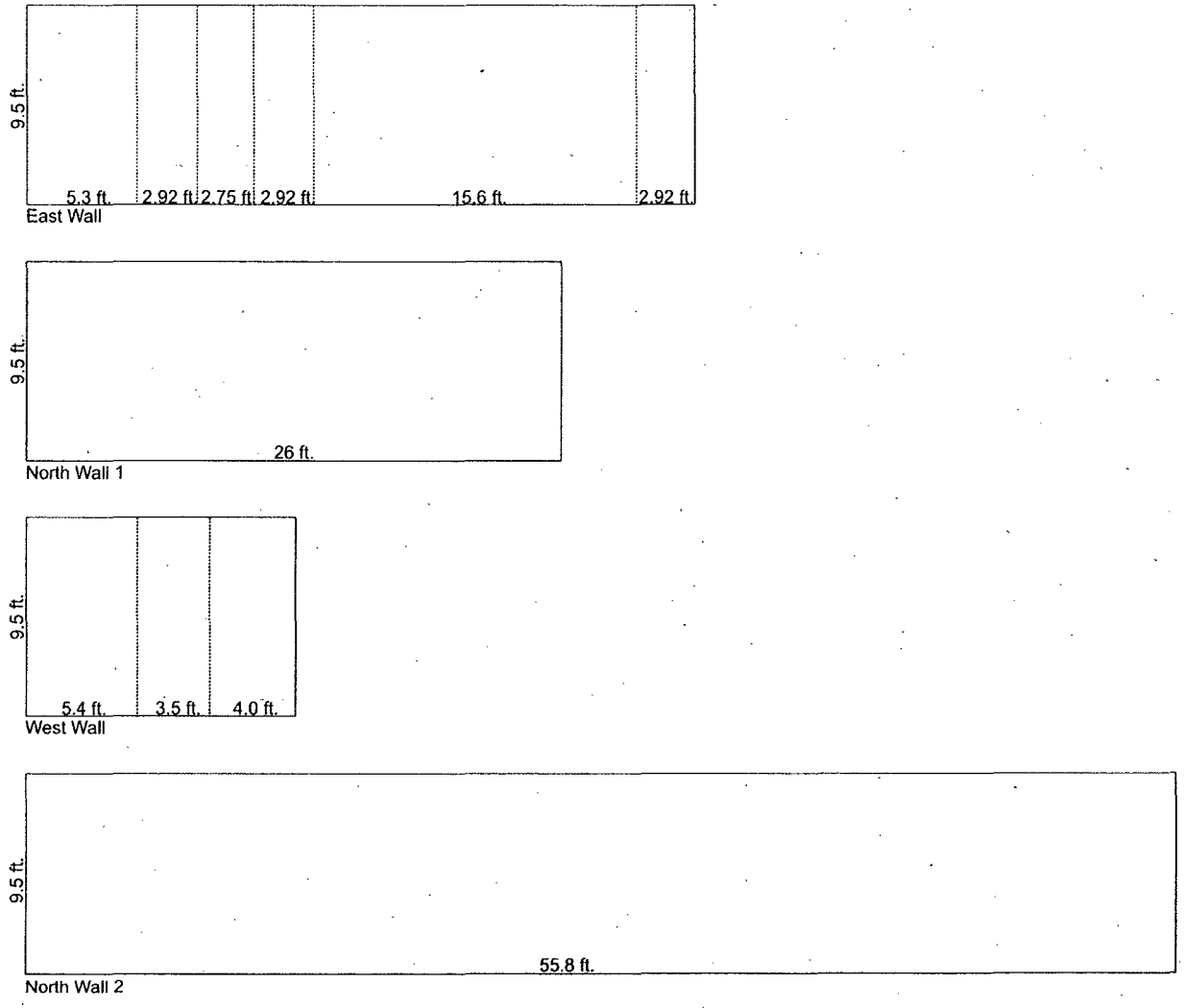
Survey Unit F8260010



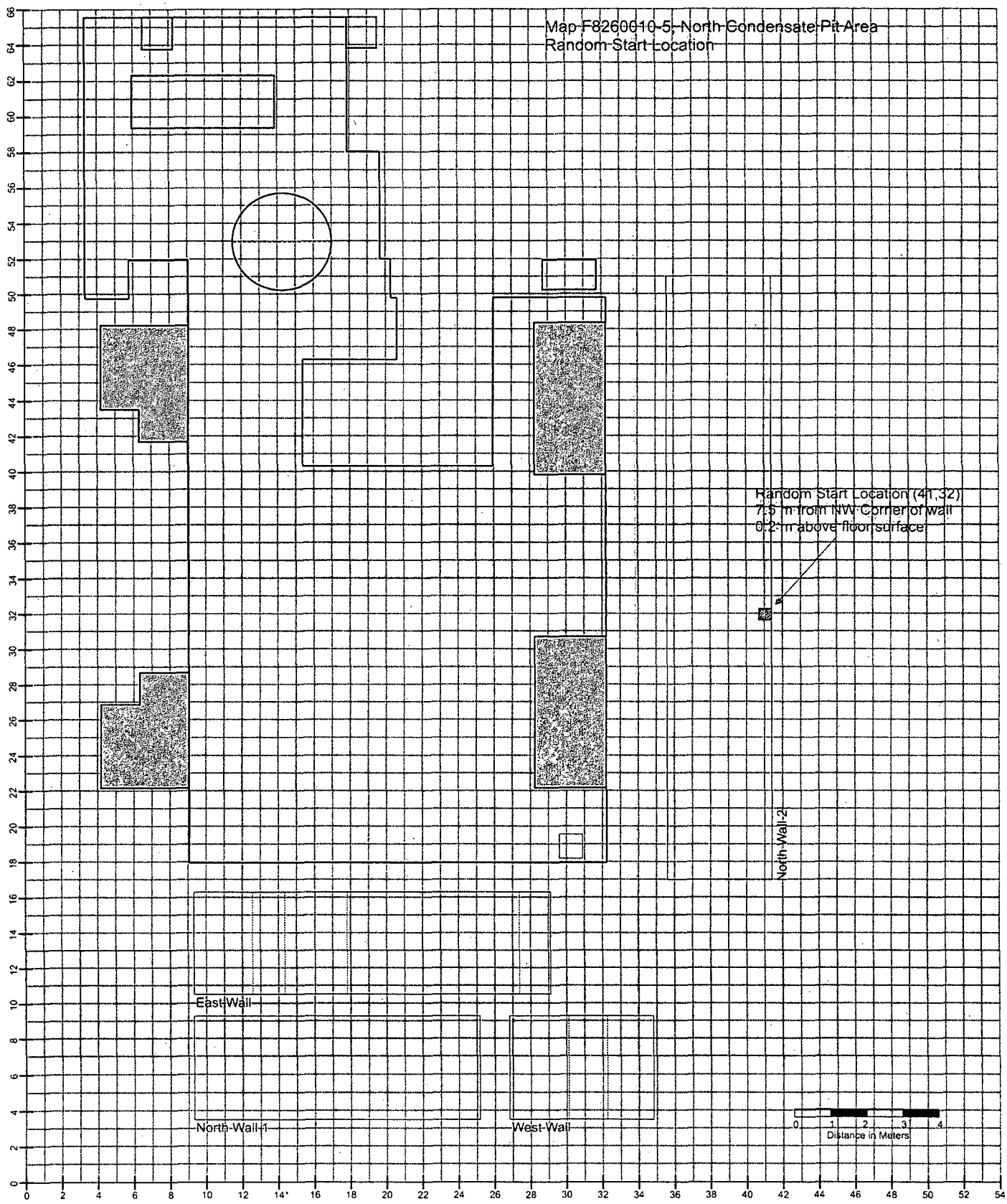
Map F8260010-1, Location of Turbine Building at Rancho Seco site

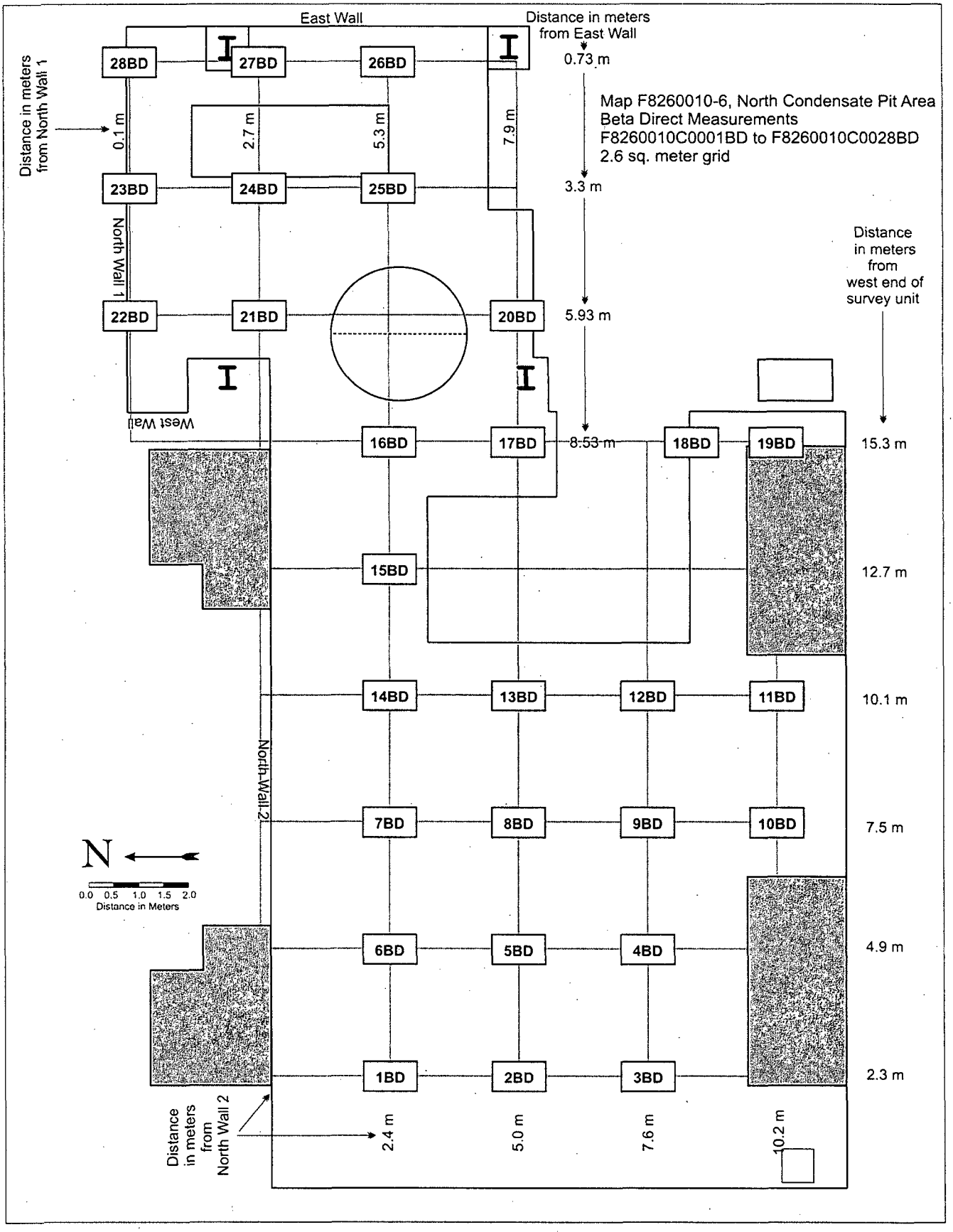

Map F8260010-2, Turbine Building Grade and Below Elevations
Location of North Condensate Pit Area
N


East Wall
5.3 ft.
2.92 ft.
2.75 ft.
15.5 ft.
Map F8260010-3, North Condensate Pit Area
Area Estimate: 319 sq. meters
12.5 ft.
3 ft.
North Wall 1
26 ft.
9.9 ft.
9 ft.
5.4 ft.
3.5 ft.
4 ft.
West Wall
1 ft.
3.7 ft.
0.6 ft.
5.75 ft.
8.6 ft.
9.9 ft.
15.6 ft.
2.5 ft.
14 ft.
17.3 ft.
North Wall 2
55.5 ft.
15 ft.
14 ft.
6.5 ft.
38 ft.
N
0.0 0.5 1.0 1.5 2.0
Distance in Meters

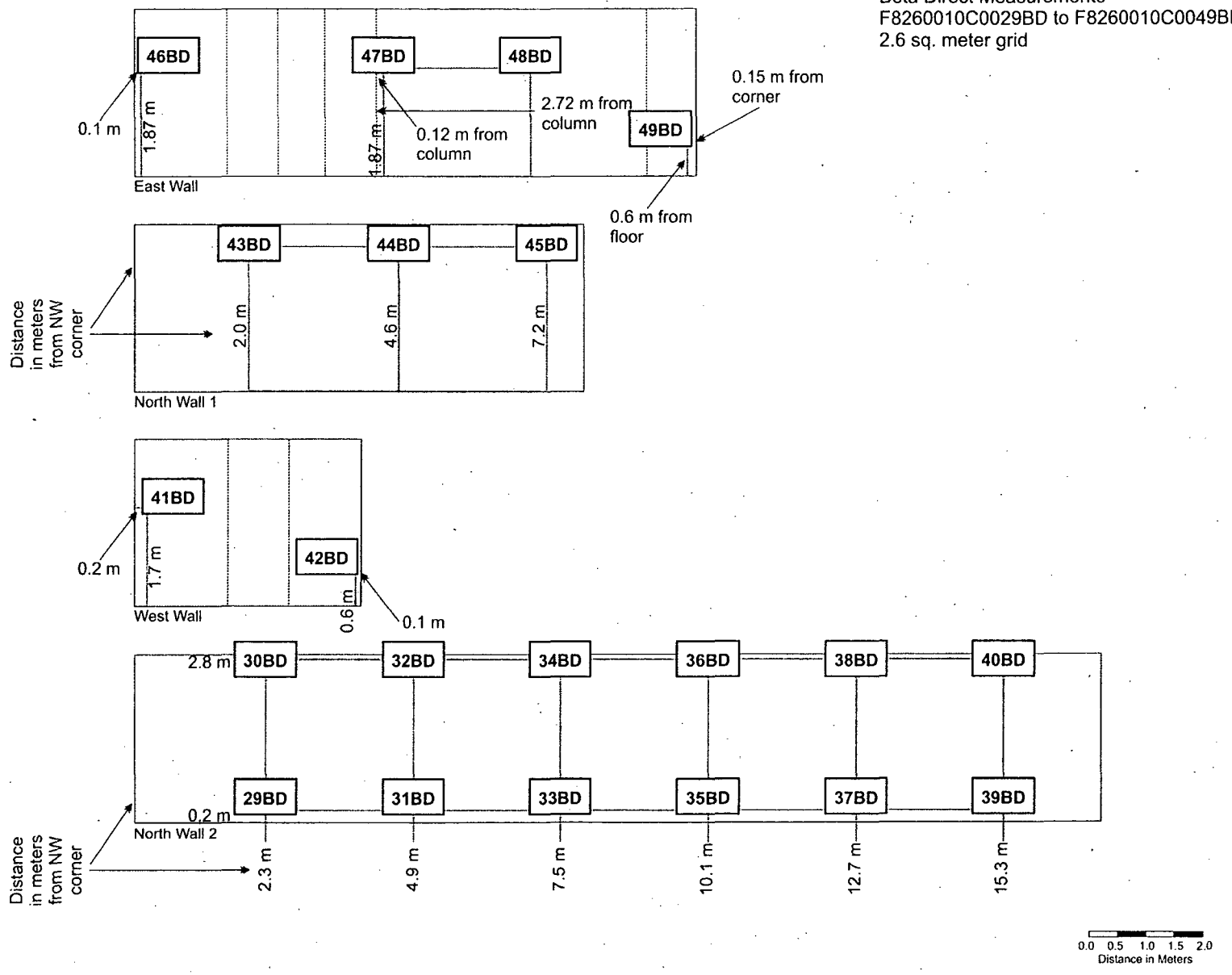


Map F8260010-4, North Condensate Pit Area
Wall Dimensions


Map F8260010-5, North Condensate Pit Area
Random Start Location
Random Start Location (41,32)
7.5 m from NW Corner of wall
0.2 m above floor surface
North-Wall-2
East-Wall
North-Wall-1
West-Wall
0 1 2 3 4
Distance in Meters


East Wall
Distance in meters from East Wall
0.73 m
Map F8260010-6, North Condensate Pit Area
Beta Direct Measurements
F8260010C0001BD to F8260010C0028BD
2.6 sq. meter grid
3.3 m
5.93 m
8.53 m
Distance in meters from west end of survey unit
15.3 m
12.7 m
10.1 m
7.5 m
4.9 m
2.3 m
Distance in meters from North Wall 1
0.1 m
2.7 m
5.3 m
7.9 m
North Wall 1
West Wall
North Wall 2
28BD
27BD
26BD
23BD
24BD
25BD
22BD
21BD
20BD
16BD
17BD
18BD
19BD
15BD
14BD
13BD
12BD
11BD
7BD
8BD
9BD
10BD
6BD
5BD
4BD
1BD
2BD
3BD
N
0.0 0.5 1.0 1.5 2.0
Distance in Meters
Distance in meters from North Wall 2
2.4 m
5.0 m
7.6 m
10.2 m

Map F8260010-7, North Condensate Pit Area
Beta Direct Measurements
F8260010C0029BD to F8260010C0049BD
2.6 sq. meter grid



(Include horizontal and vertical surfaces
of penetration in 62BS and 63BS scan surveys)

57BS	58BS	59BS	60BS	61BS	62BS	63BS	64BS	65BS	66BS
56BS	55BS	54BS	53BS	52BS	51BS	50BS	49BS	48BS	47BS
37BS	38BS	39BS	40BS	41BS	42BS	43BS	44BS	45BS	46BS

East Wall

(Include horizontal ledge surfaces
in scan surveys of Grids 60 to 65)

29BS	30BS	31BS	32BS	33BS	34BS	35BS	36BS
20BS	19BS	18BS	17BS	16BS	15BS	14BS	13BS
5BS	6BS	7BS	8BS	9BS	10BS	11BS	12BS

North Wall 1

25BS	26BS	27BS	28BS	← 29BS
24BS	23BS	22BS	21BS	← 20BS
1BS	2BS	3BS	4BS	← 5BS

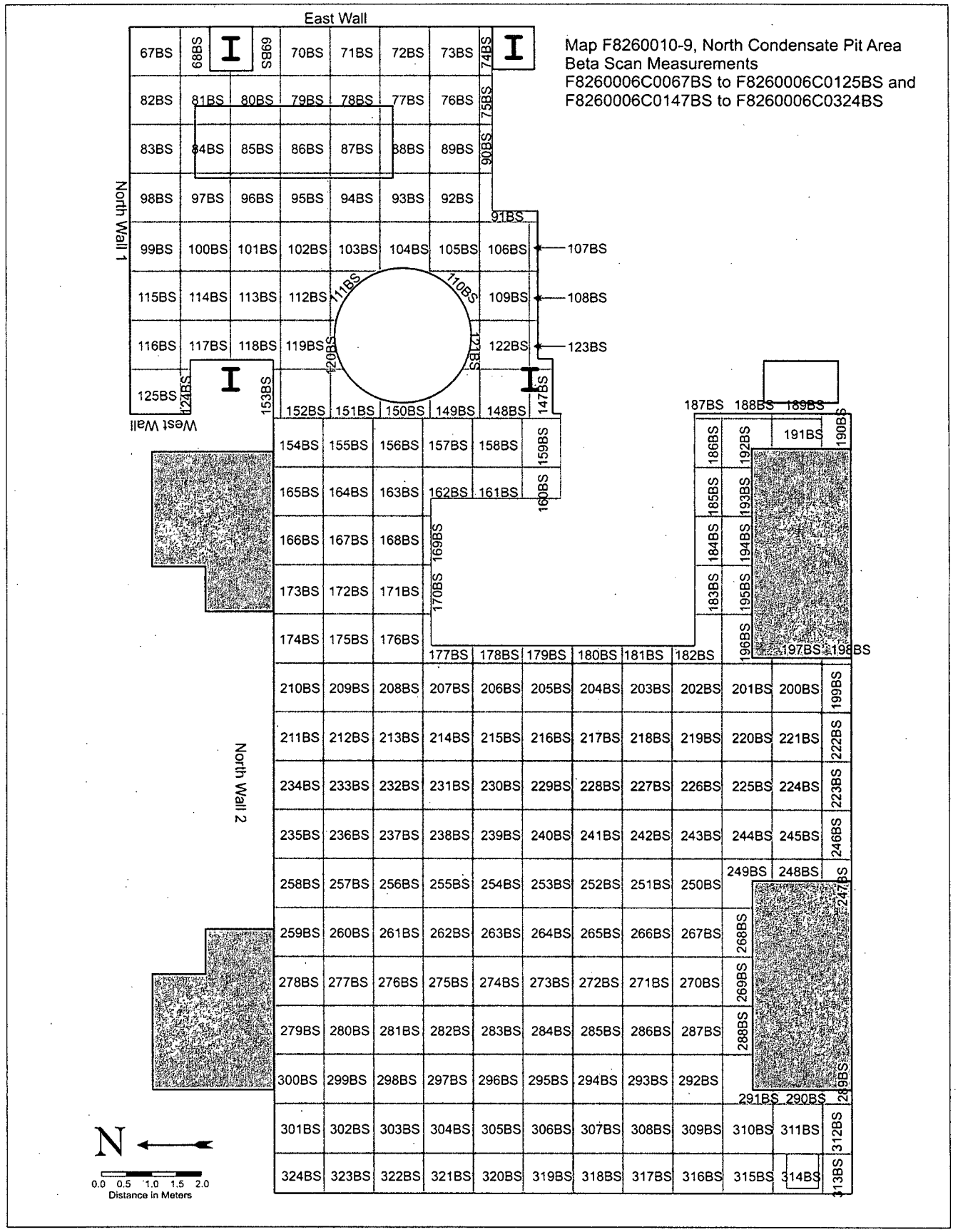
West Wall

375BS	374BS	373BS	372BS	371BS	370BS	369BS	368BS	367BS	366BS	365BS	364BS	363BS	362BS	361BS	360BS	359BS
342BS	343BS	344BS	345BS	346BS	347BS	348BS	349BS	350BS	351BS	352BS	353BS	354BS	355BS	356BS	357BS	358BS
341BS	340BS	339BS	338BS	337BS	336BS	335BS	334BS	333BS	332BS	331BS	330BS	329BS	328BS	327BS	326BS	325BS

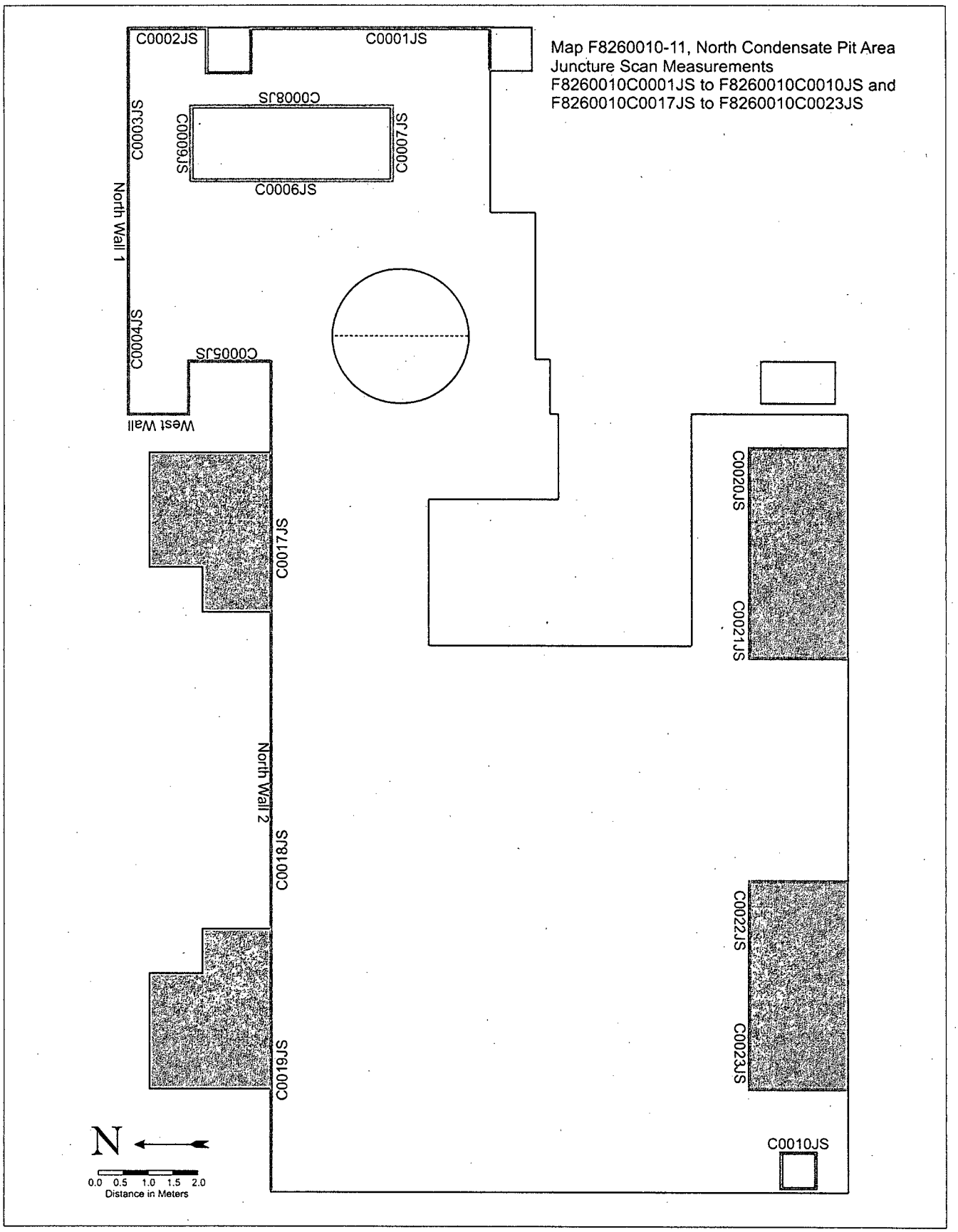
North Wall 2

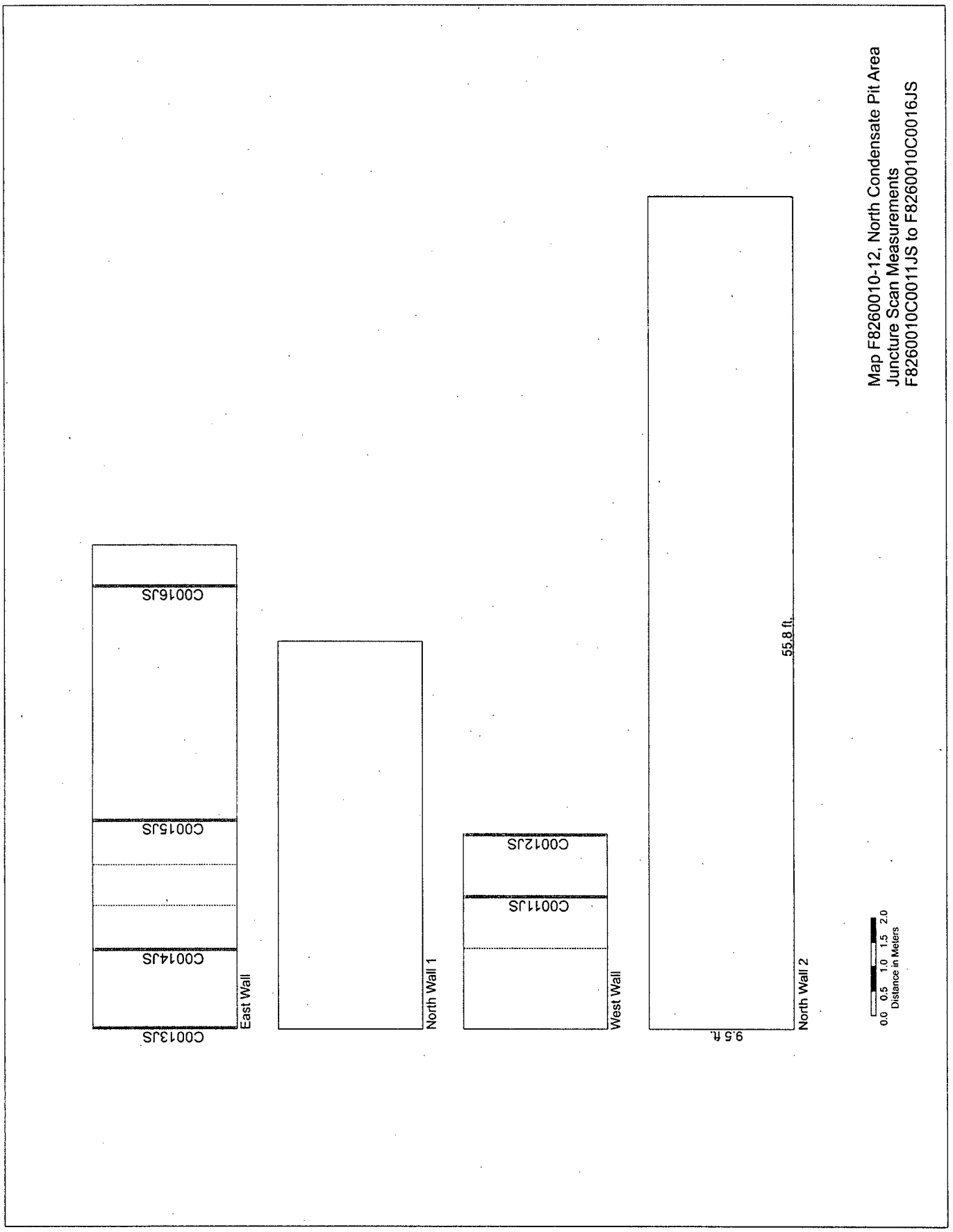
0.0 0.5 1.0 1.5 2.0
Distance in Meters

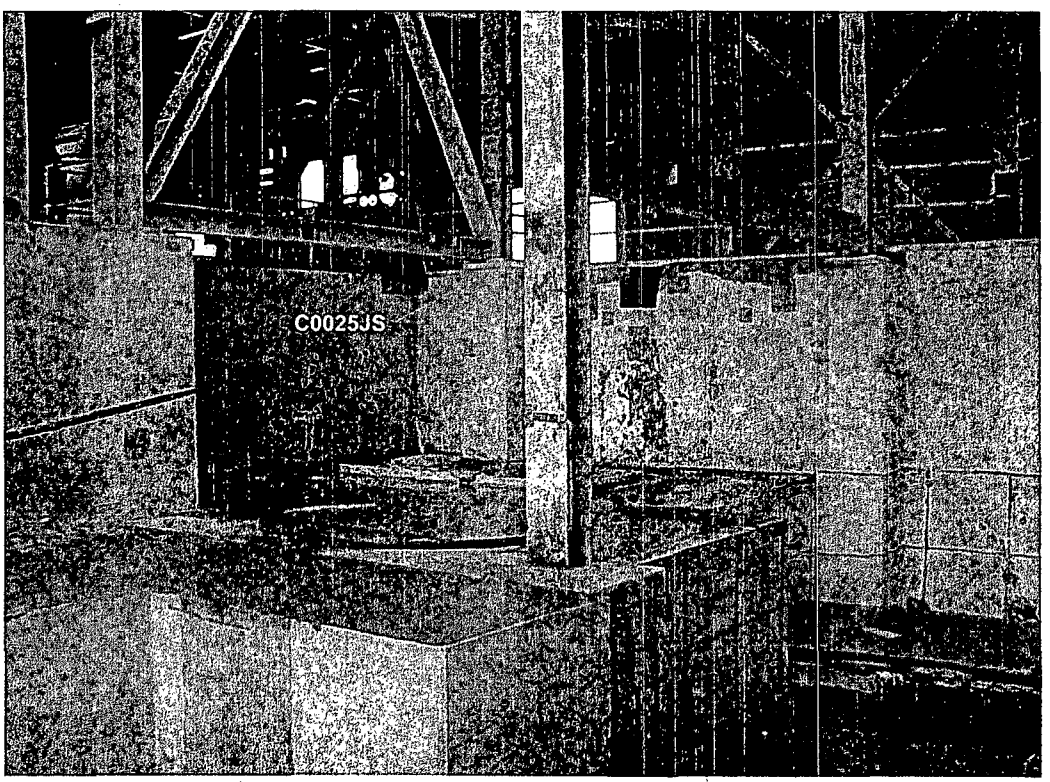
Map F8260010-8, North Condensate Pit Area
Beta Scan Measurements
F8260006C0001BS to F8260006C0066BS and
F8260028C0325BS to F8260006C0375BS

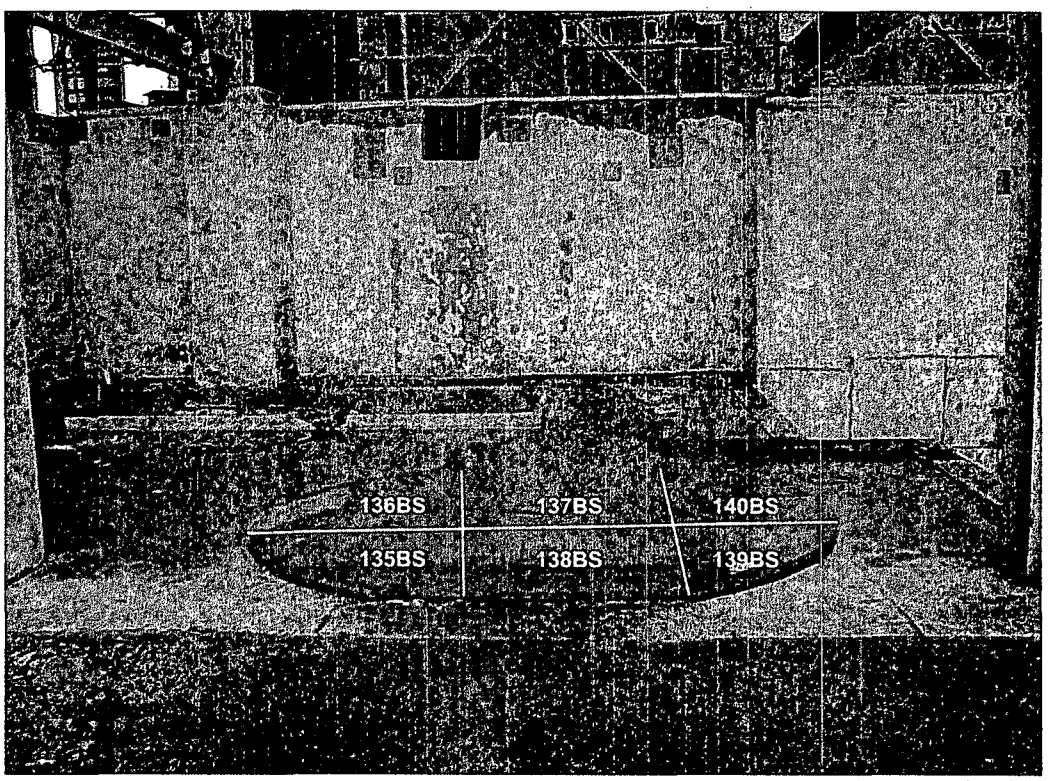

East Wall
North Wall 1
West Wall
North Wall 2
Map F8260010-9, North Condensate Pit Area
Beta Scan Measurements
F8260006C0067BS to F8260006C0125BS and
F8260006C0147BS to F8260006C0324BS
N
0.0 0.5 1.0 1.5 2.0
Distance in Meters

Map F8260010-10, North Condensate Pit Area
Beta Scan Measurements
F8260010C0126BS to F8260010C0134BS
Juncture Scan Measurement
F8260010C0024JS

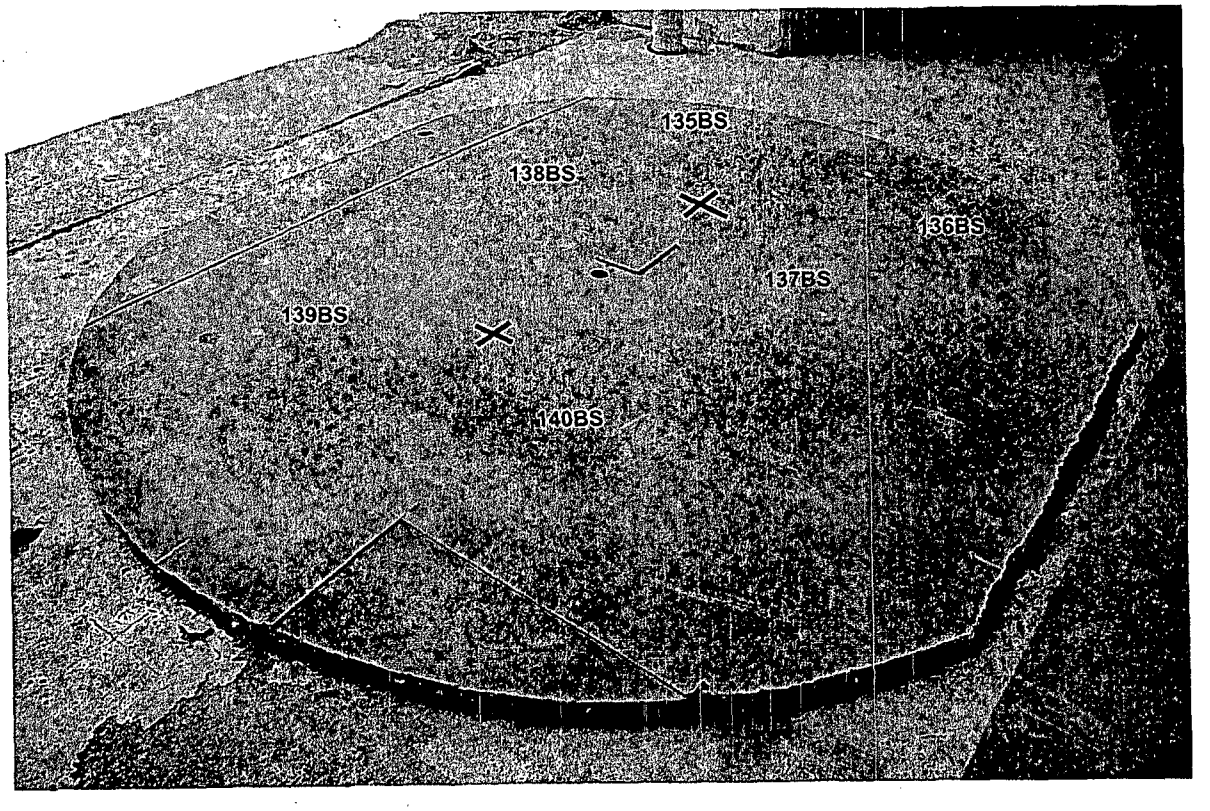

Map F8260010-11, North Condensate Pit Area
Juncture Scan Measurements
F8260010C0001JS to F8260010C0010JS and
F8260010C0017JS to F8260010C0023JS
C0002JS
C0001JS
C0008JS
C0003JS
C0009JS
C0007JS
C0006JS
North Wall 1
C0004JS
C0005JS
West Wall
C0017JS
C0020JS
C0021JS
North Wall 2
C0018JS
C0022JS
C0023JS
C0019JS
C0010JS
N
0.0 0.5 1.0 1.5 2.0
Distance in Meters

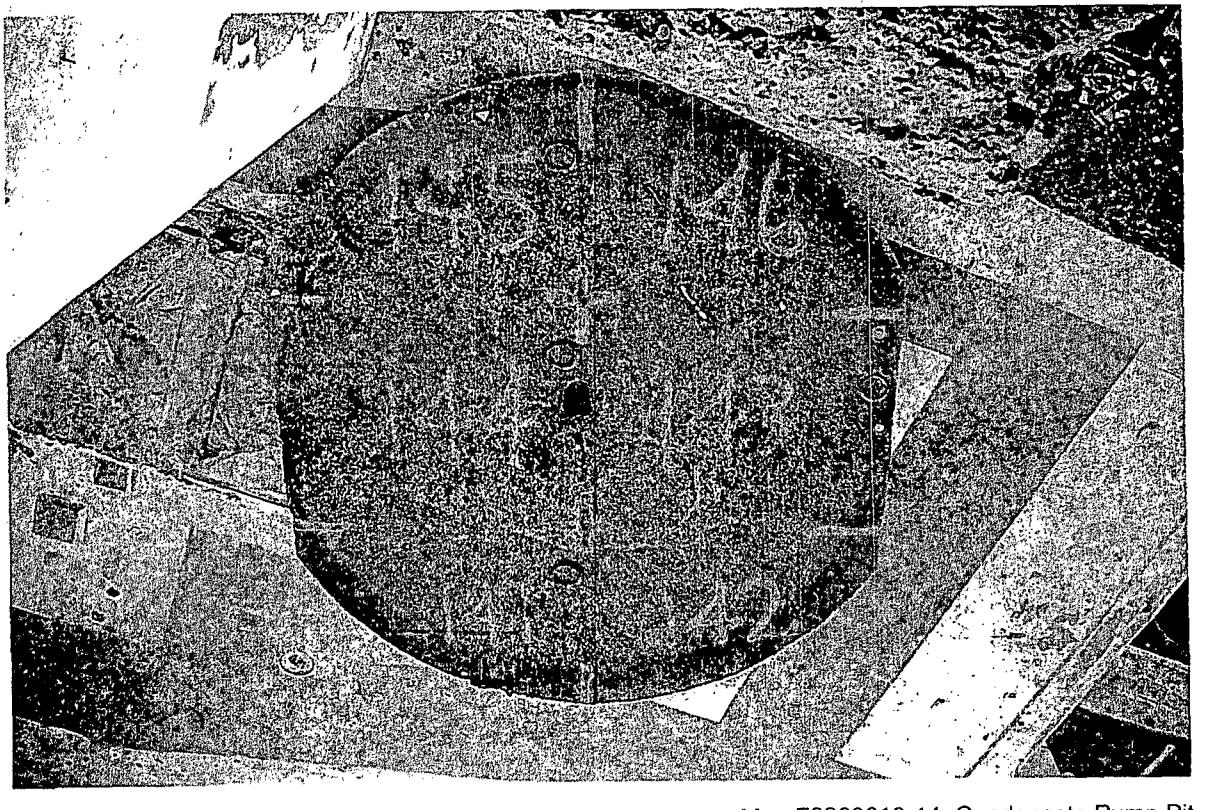

Map F8260010-12, North Condensate Pit Area
Juncture Scan Measurements
F8260010C0011JS to F8260010C0016JS
C00163S
C00153S
C00143S
C00133S
East Wall
North Wall 1
C00123S
C00113S
West Wall
55.8 ft.
9.5 ft.
North Wall 2
0.0 0.5 1.0 1.5 2.0
Distance in Meters



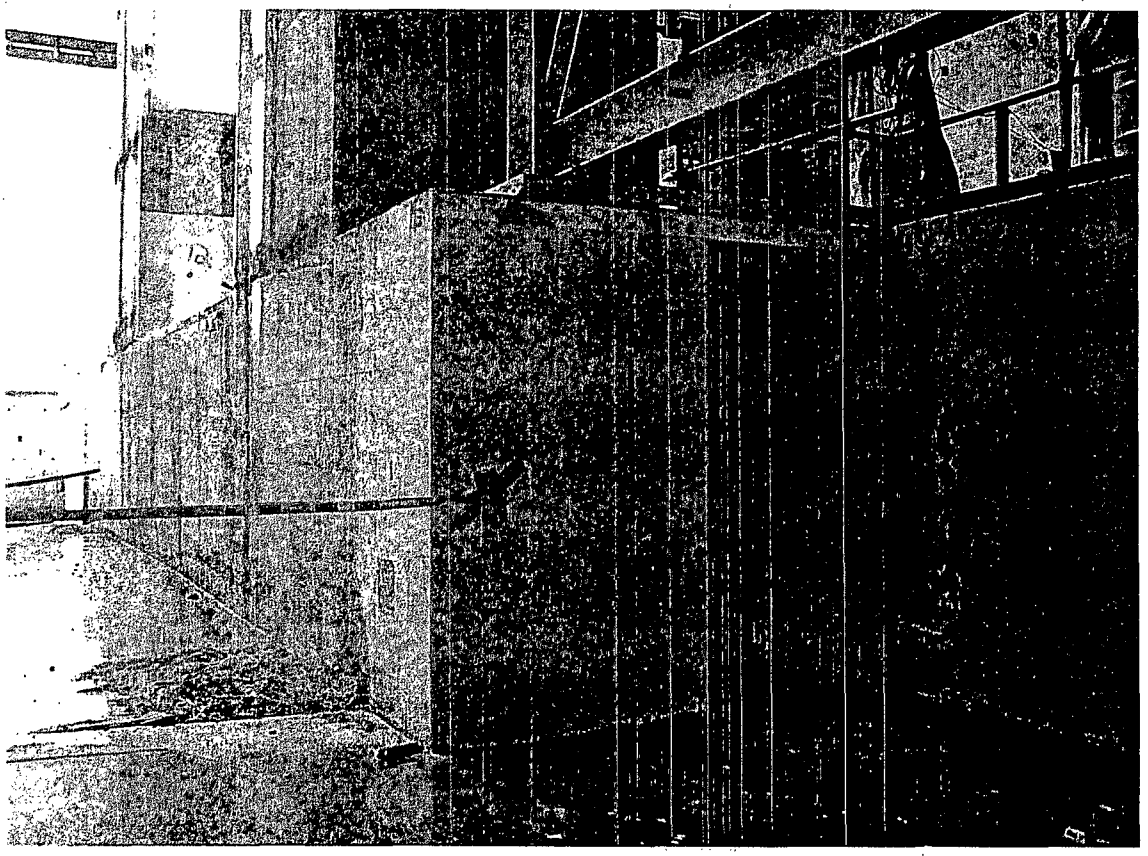


Map F8260010-13, Condensate Pump Pit
Juncture Scan Measurement F8260010C0025JS,
Beta Scan Measurements on Metal Plate
F8260010M0135BS to F8260010M0140BS

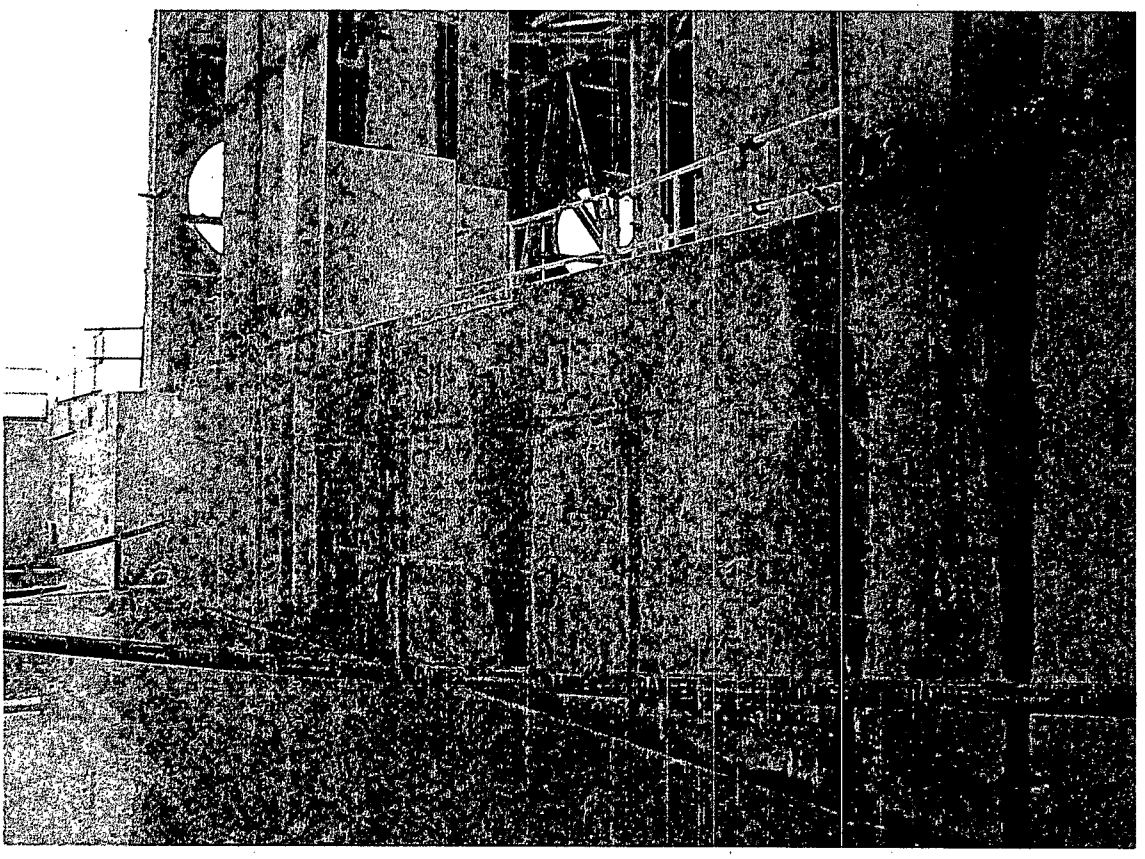


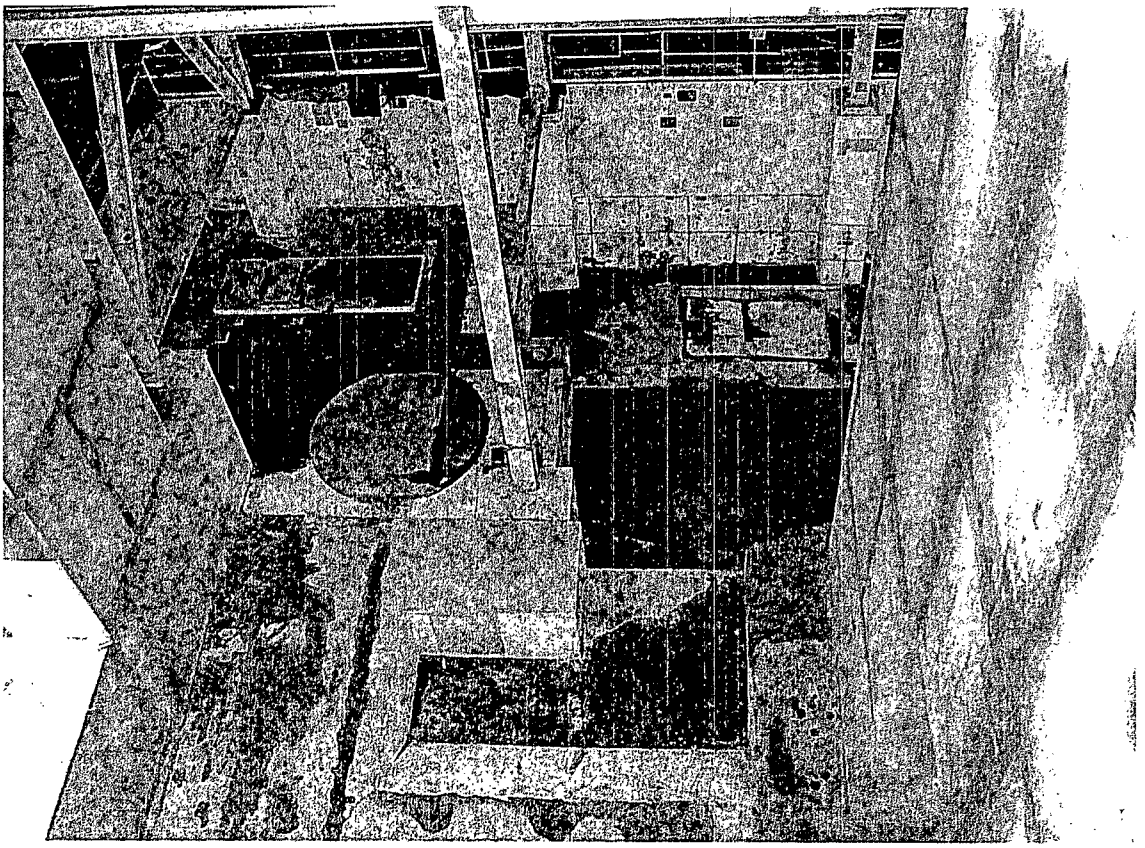


Map F8260010-14, Condensate Pump Pit
Beta Scan Measurements on Metal Plate
F8260004M0135BS to F8260004M0146BS



Photos -1





Photos -2

Attachment 2

Instrumentation

September 6, 2008

Survey Unit F8260010

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; 149789	43-68B; 161415	433	1033
M2350; 175834	43-68B; 148634	433	1033
M2350; 193715	43-68B; 148630	433	1033
M2350; 193700	43-116-1B; 216072	N/A	739
M2350; 193715	43-116-1B; 190643	N/A	739
M2350; 175834	43-116-1B; 190642	N/A	739
Tennelec; 0401171	N/A	5.9 dpm α, 11.7 dpm β	N/A

The MDC's noted are the most conservative for the actual survey performed.

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	154800
Investigation Criteria – Scan	154800
$DCGL_W$	43000
$DCGL_{EMC}$	154800

Attachment 3

Investigation

September 6, 2008

Survey Unit F8260010

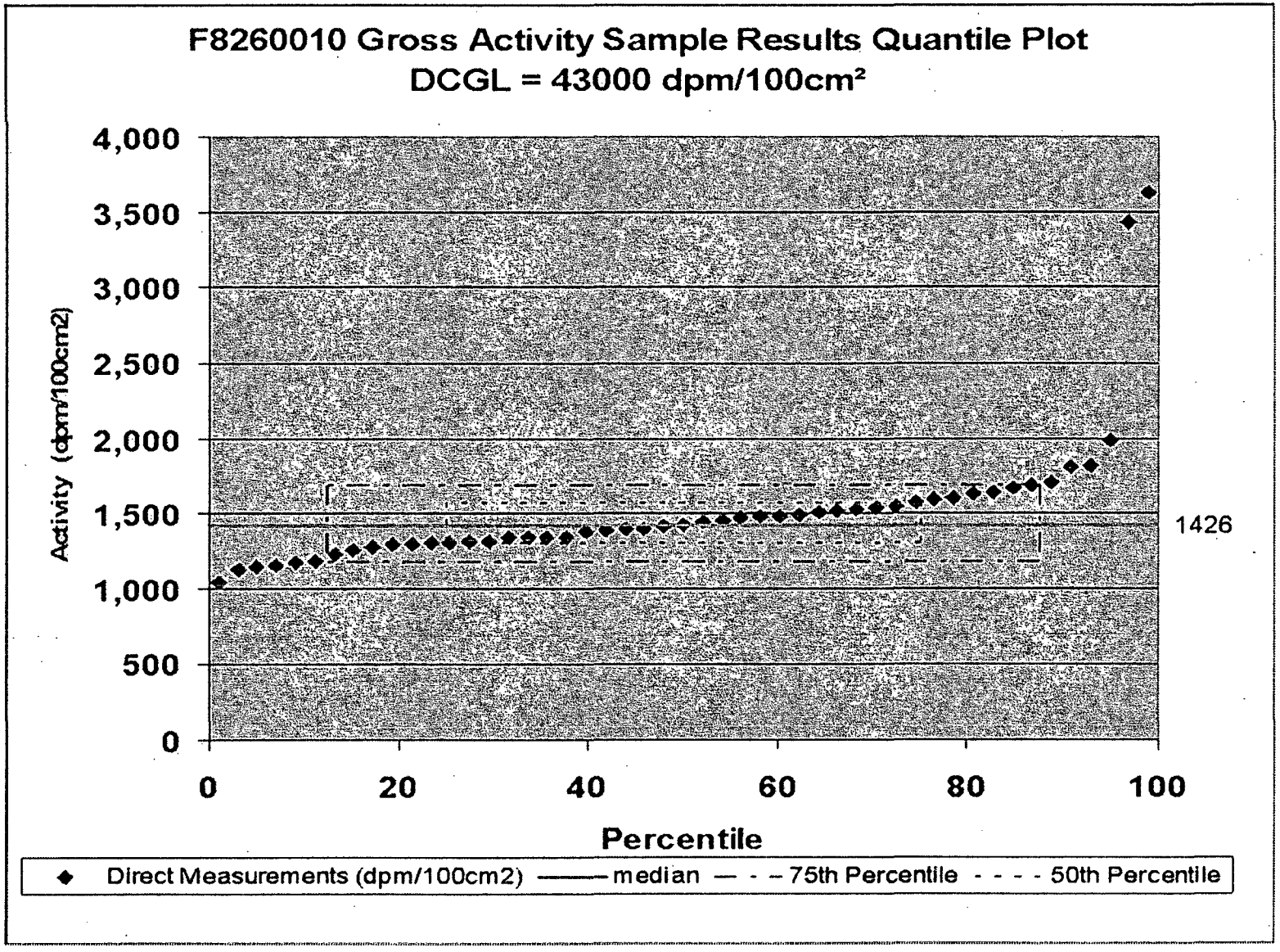
(none required)

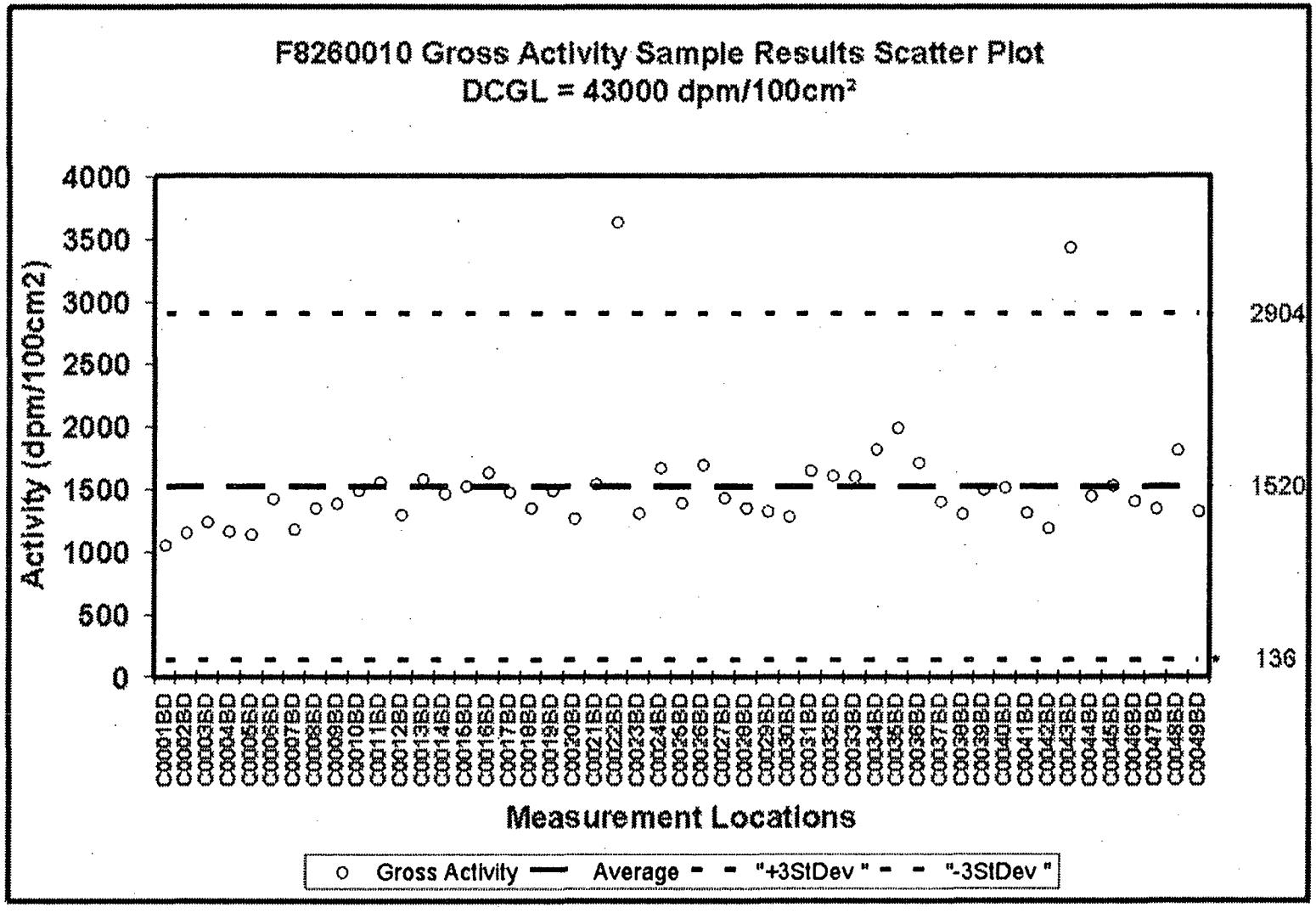
Attachment 4

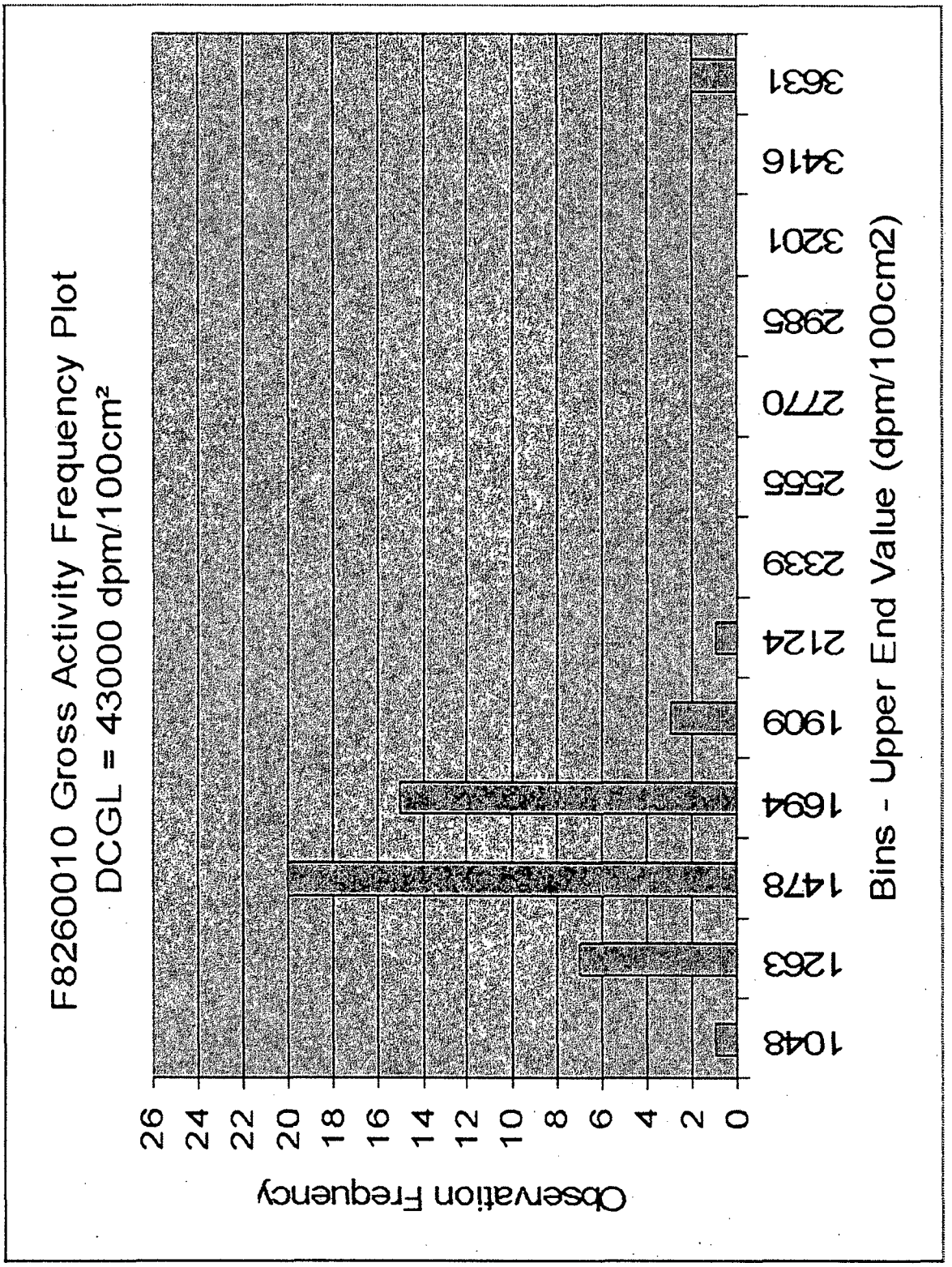
Data Assessment

September 6, 2008

Survey Unit F8260010


F8260010 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
20
40
60
80
100
Percentile
1426
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8260010 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
4000
3500
3000
2500
2000
1500
1000
500
0
2904
1520
136
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
C0016BD
C0016BD
C0017BD
C0018BD
C0019BD
C0020BD
C0021BD
C0022BD
C0023BD
C0024BD
C0026BD
C0026BD
C0027BD
C0028BD
C0029BD
C0030BD
C0031BD
C0032BD
C0033BD
C0034BD
C0035BD
C0036BD
C0037BD
C0038BD
C0039BD
C0040BD
C0041BD
C0042BD
C0043BD
C0044BD
C0045BD
C0046BD
C0047BD
C0048BD
C0049BD
Measurement Locations
Gross Activity
Average
"+3StDev"
"-3StDev"


F8260010 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
2
4
6
8
10
12
14
16
18
20
22
24
26
1048
1263
1478
1694
1909
2124
2339
2555
2770
2985
3201
3416
3631
Bins - Upper End Value (dpm/100cm2)