

Rancho Seco

Final Status Survey Summary Report

October 24, 2007

Aux. Bldg (-) 20' El., Rm 43, "B" HPI Pump Room, Upper Walls & Ceiling

Survey Unit F8130611

Prepared By: D. Anderson Date: 10/24/2007

FSS Engineer

Reviewed By: [Signature] Date: 10/24/07

Lead FSS Engineer

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Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130611, Aux. Bldg (-) 20' El., Rm 43, "B" HPI Pump Room, Upper Walls & Ceiling

Survey Unit Description:

Operating History: The reinforced concrete structure contained the RadWaste processing and supporting systems. The building contained six 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. One report documented contamination of the auxiliary building roof. The roof was later replaced.

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 on the -47' elevation showed a mean gross activity level of 320,071 dpm/100 cm² and a maximum value of 5,720,000 dpm/100 cm². Direct measurements on the -29' elevation showed a mean gross activity level of 544,756 dpm/100 cm² and a maximum value of 11,370,000 dpm/100 cm². Direct measurements on the -20' elevation showed a mean gross activity level of 247,831 dpm/100 cm² and a maximum value of 10,080,000 dpm/100 cm². Direct measurements on the grade elevation showed a mean gross activity level of 373,758 dpm/100 cm² and a maximum value of 5,800,000 dpm/100 cm². Direct measurements on the +20' elevation showed a mean gross activity level of 85,408 dpm/100 cm² and a maximum value of 1,900,000 dpm/100 cm². Direct measurements on the +40' elevation showed a mean gross activity level of 3,288 dpm/100 cm² and a maximum value of 24,781 dpm/100 cm². Direct measurements on the building exterior, including the mezzanine roof, showed a mean gross activity level of 1,897 dpm/100 cm² and a maximum value of 2,990 dpm/100 cm². (The roof had been replaced prior to the classification survey.) Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior of the auxiliary building was determined to be a Class 1, 2 area and the exterior was a Class 2,3.

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 76 m² were scanned for approximately 45% 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:	F813	Aux. Bldg (-) 20' El., Rm 43, "B" HPI Pump Room, Upper Walls & Ceiling
Survey Unit:	0611	Structure Surface
Class:	2	LTP Table 5-4
SU Area (m²):	167.15	
Evaluator:	D. Anderson	
DCGL (dpm/100 cm²):	43,000	Gross Activity DCGL
Area Factor:	N/A	Class 2
Design DCGL_{me} (dpm/100 cm²):	N/A	Class 2
LBGR (dpm/100 cm²):	30,277	Adjusted
Design Sigma (dpm/100 cm²):	4,241	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	11.94	Class 2
Scan Area (m²):	76	
Scan Coverage (%):	45%	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:	3.5	Class 2

Survey Results:

A total of 14 direct measurements were made in F8130611. 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 2,188 dpm/100 cm² to 17,489 dpm/100 cm² for ceiling, upper wall and juncture surfaces, based on a surveyor efficiency of 0.5 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)
F8130611-C0001BD	1,136
F8130611-C0002BD	1,162
F8130611-C0003BD	1,302
F8130611-C0004BD	1,120
F8130611-C0005BD	1,473
F8130611-C0006BD	1,188
F8130611-C0007BD	1,312
F8130611-C0008BD	3,118
F8130611-C0009BD	2,308
F8130611-C0010BD	1,297
F8130611-C0011BD	1,302
F8130611-C0012BD	1,255
F8130611-C0013BD	1,966
F8130611-C0014BD	1,354
Mean:	1,521
Median:	1,302
Standard Deviation:	569
Range:	1,120 – 3,118

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130611C0001SM	3.58
F8130611C0002SM	4.86
F8130611C0003SM	9.98
F8130611C0004SM	7.42
F8130611C0005SM	3.58
F8130611C0006SM	4.86
F8130611C0007SM	1.01
F8130611C0008SM	4.86
F8130611C0009SM	4.86
F8130611C0010SM	6.14
F8130611C0011SM	7.42
F8130611C0012SM	4.86
F8130611C0013SM	22.8
F8130611C0014SM	3.58
Mean:	6.41
Median:	4.86
Standard Deviation:	5.18
Range:	1.01 to 22.8

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):	1,302	
Mean (dpm/100 cm ²):	1,521	
Direct Measurement Standard Deviation	569	Based on samples and backgrounds.
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	569	
Maximum (dpm/100 cm ²):	3,118	
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 2
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{mc}:	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.

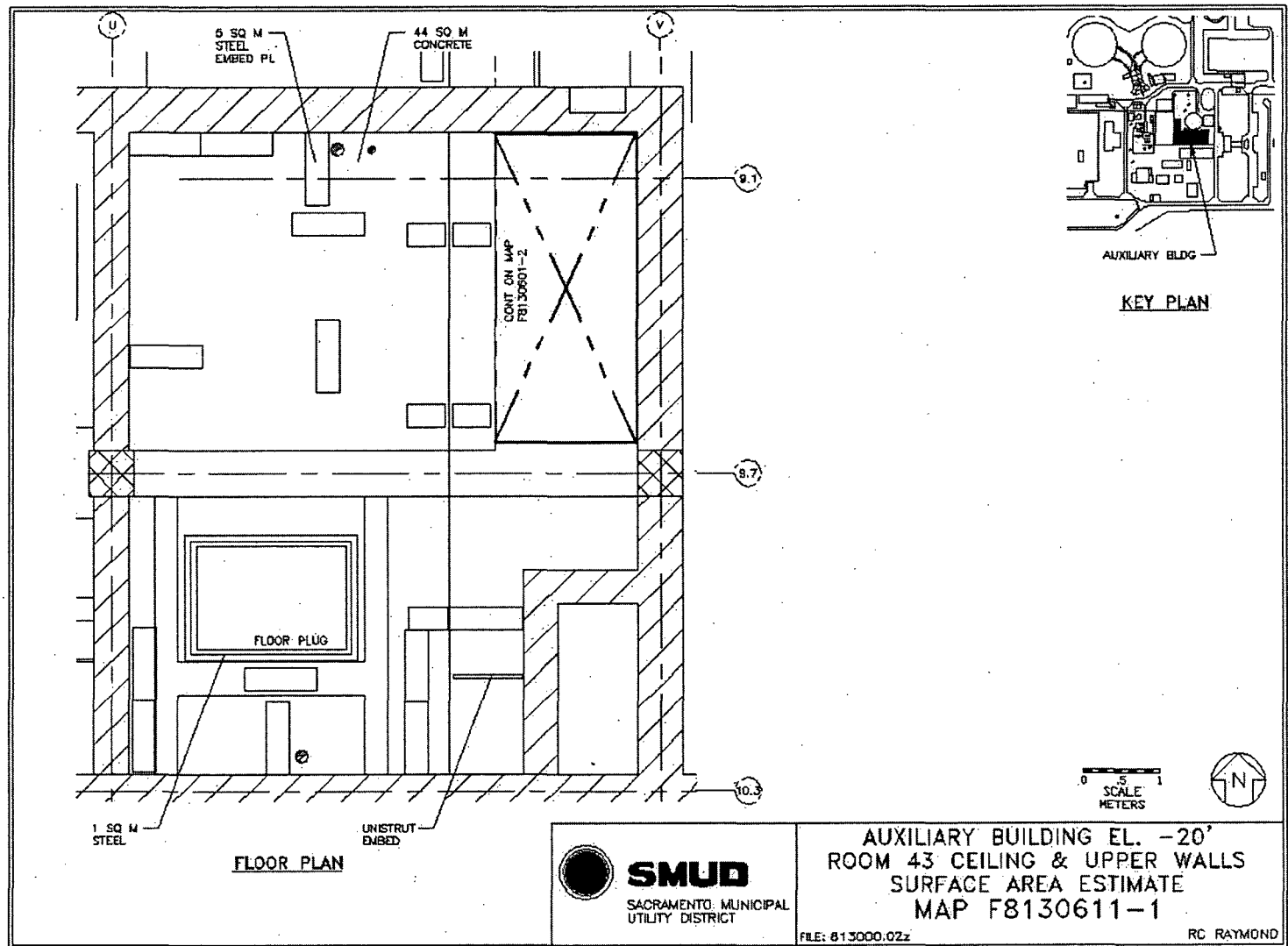
It is concluded that survey unit F8130611 meets the release criteria of 10CFR20.1402.

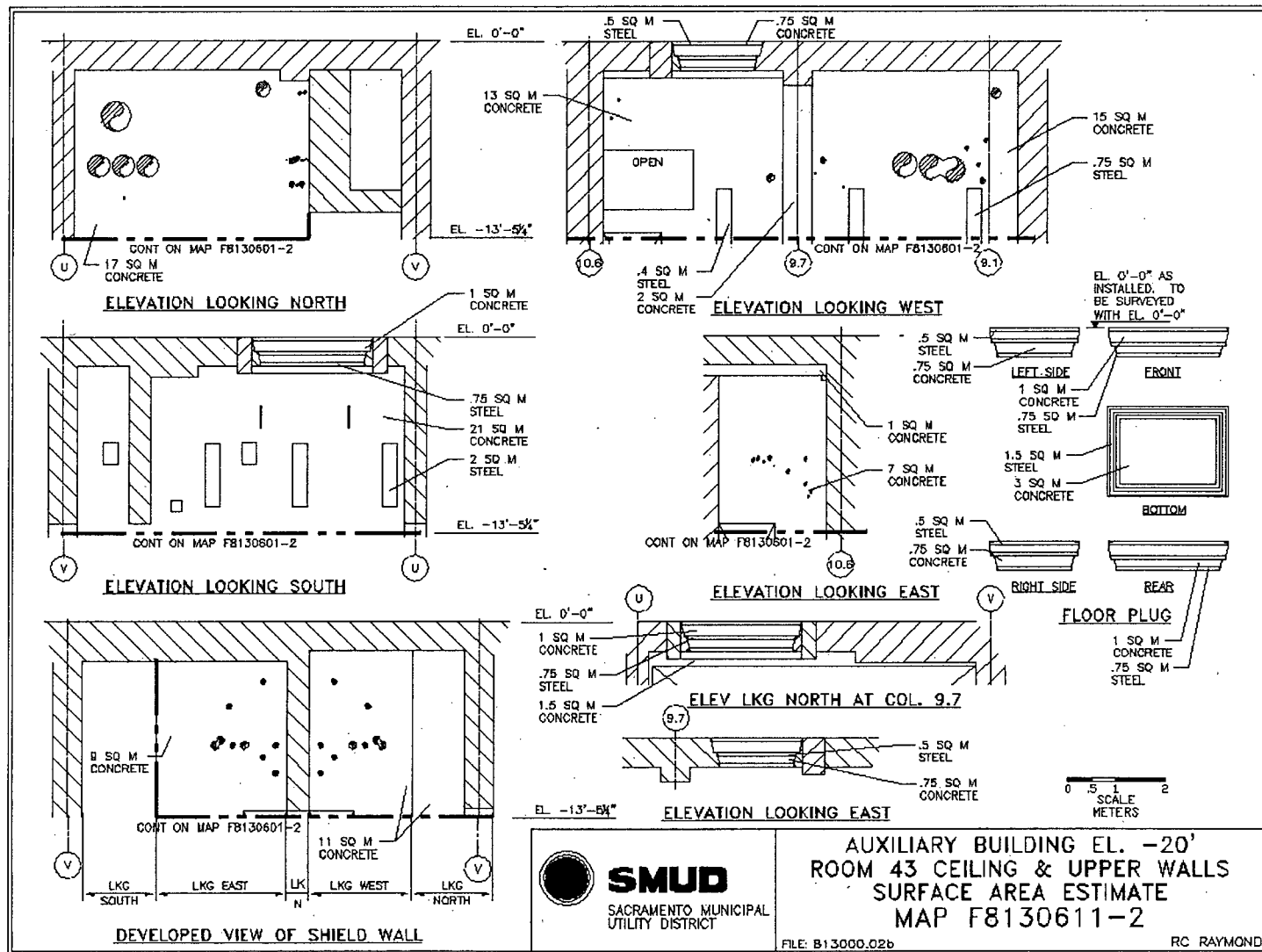
Attachment 1

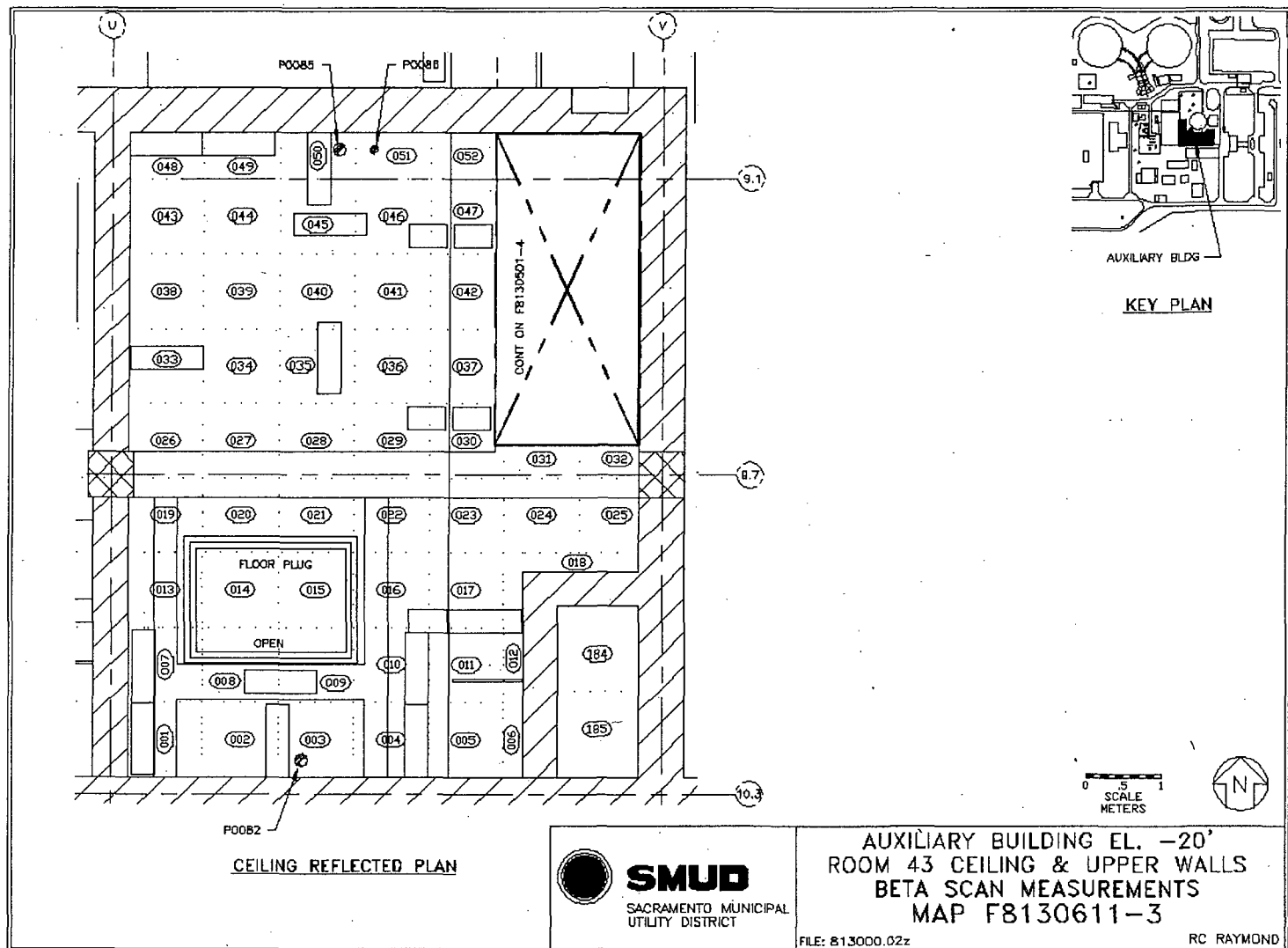
Maps

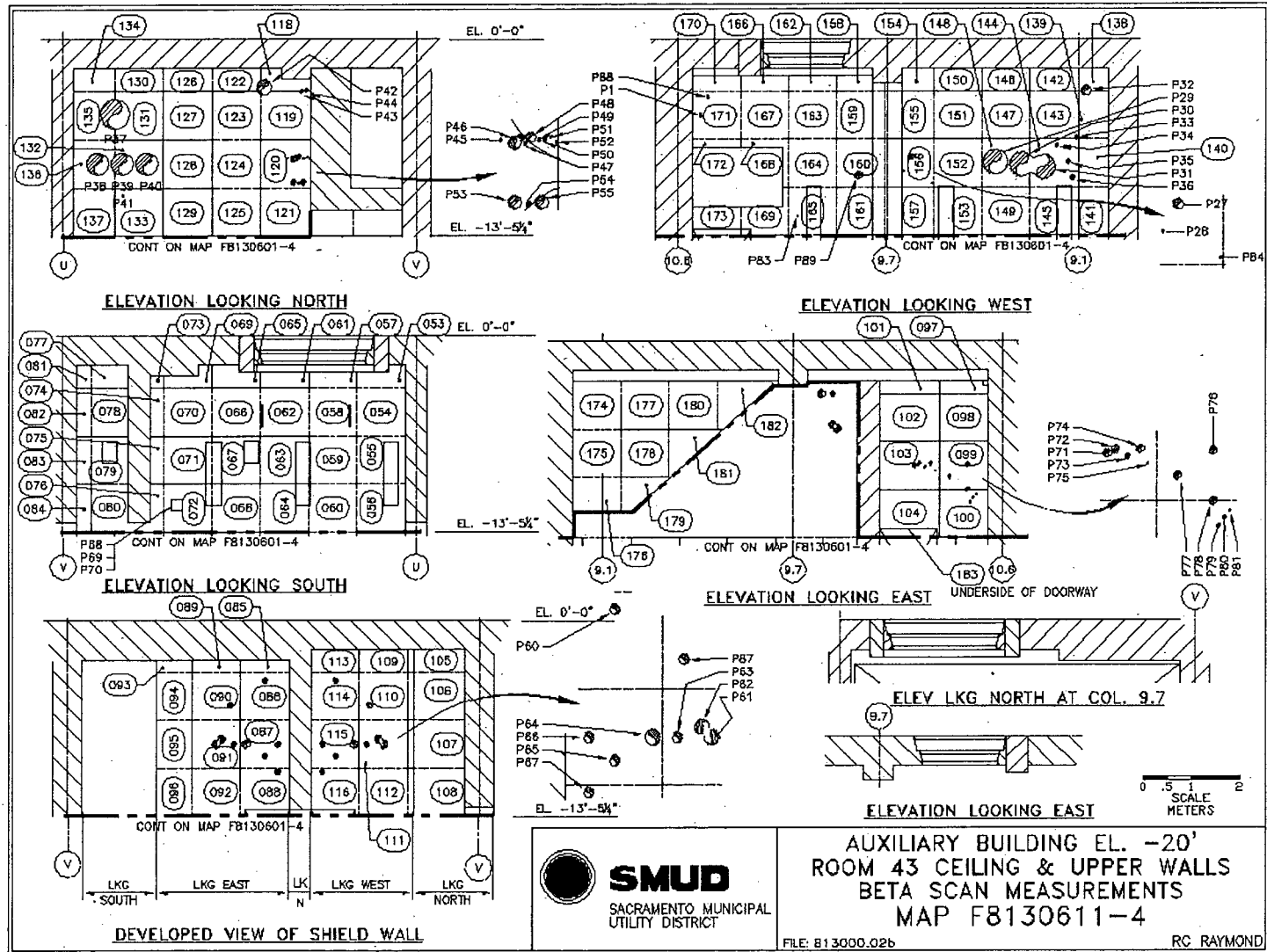
October 24, 2007

Survey Unit F8130611

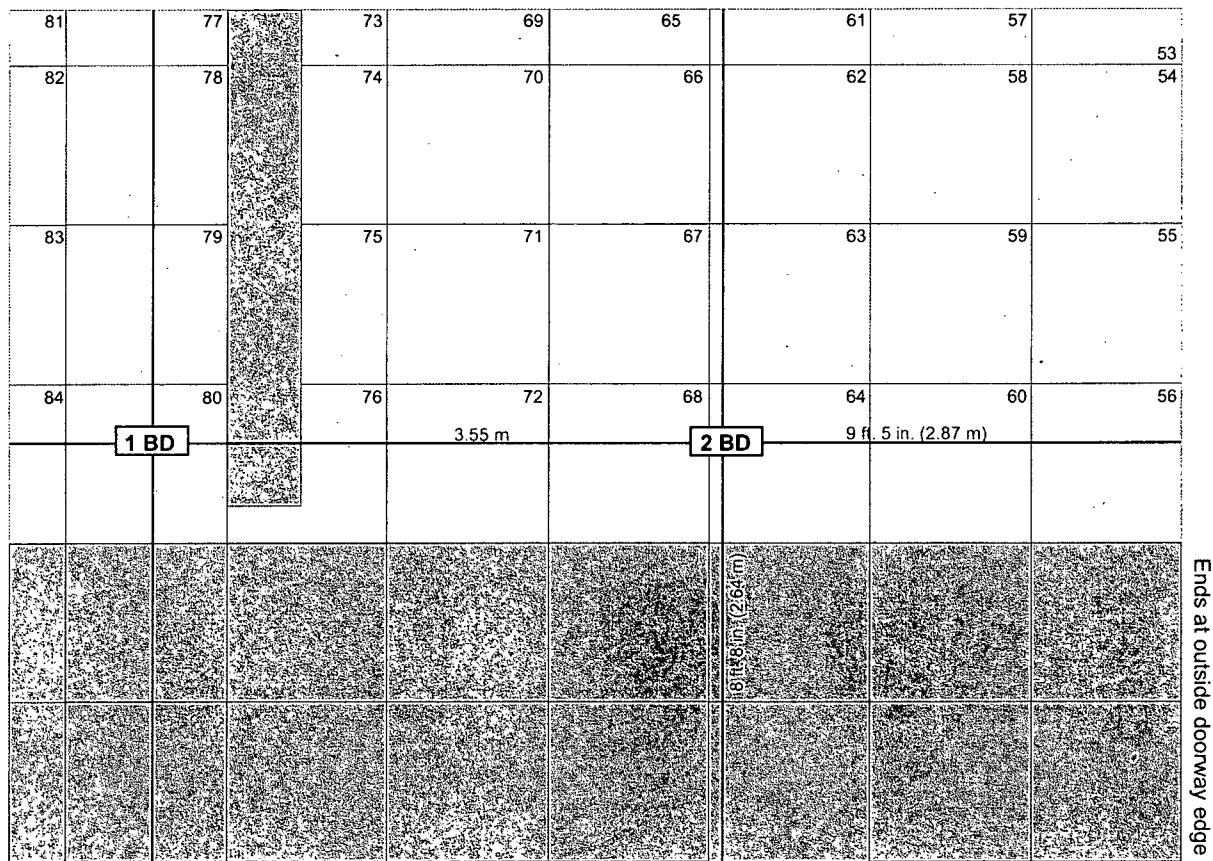






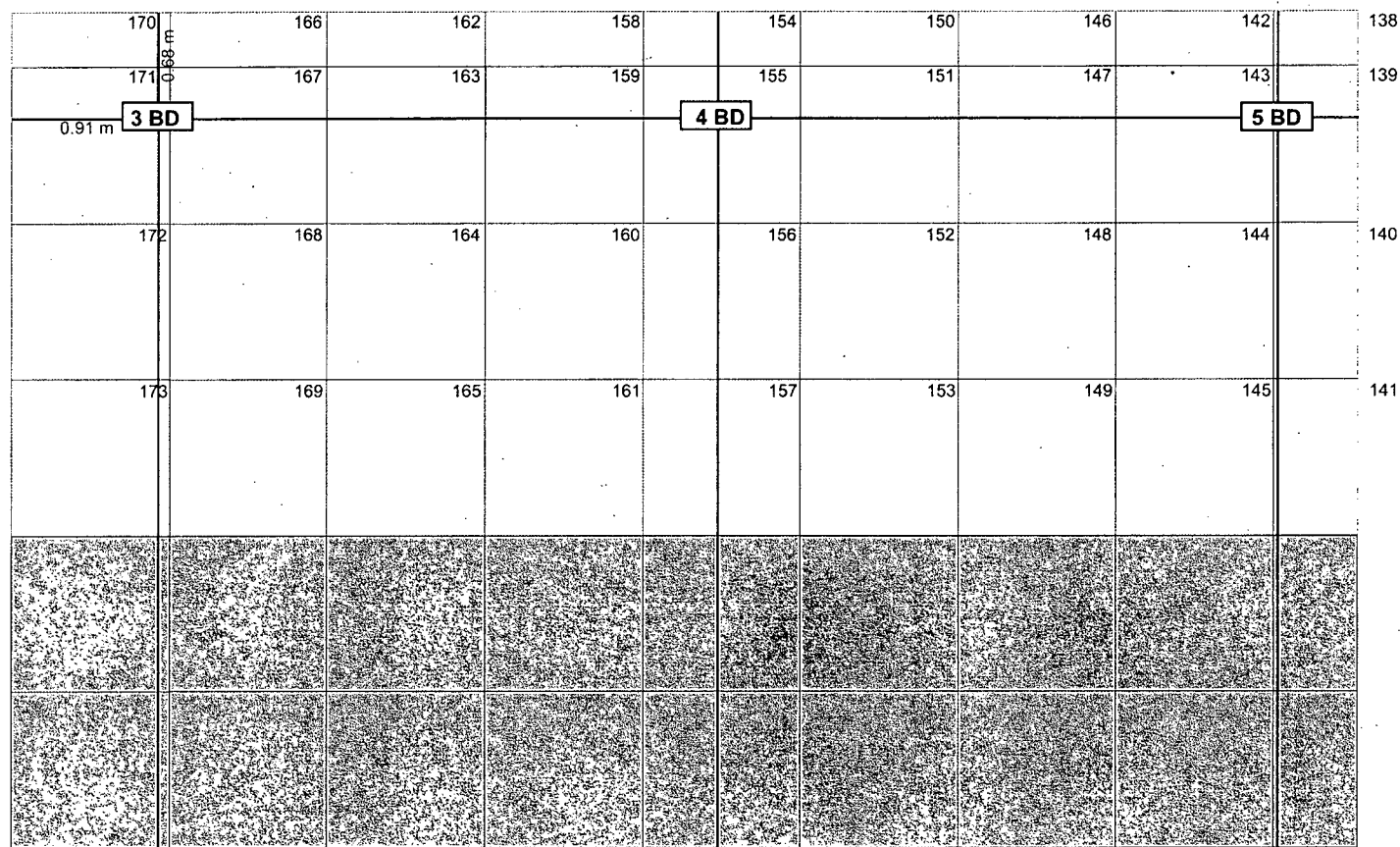






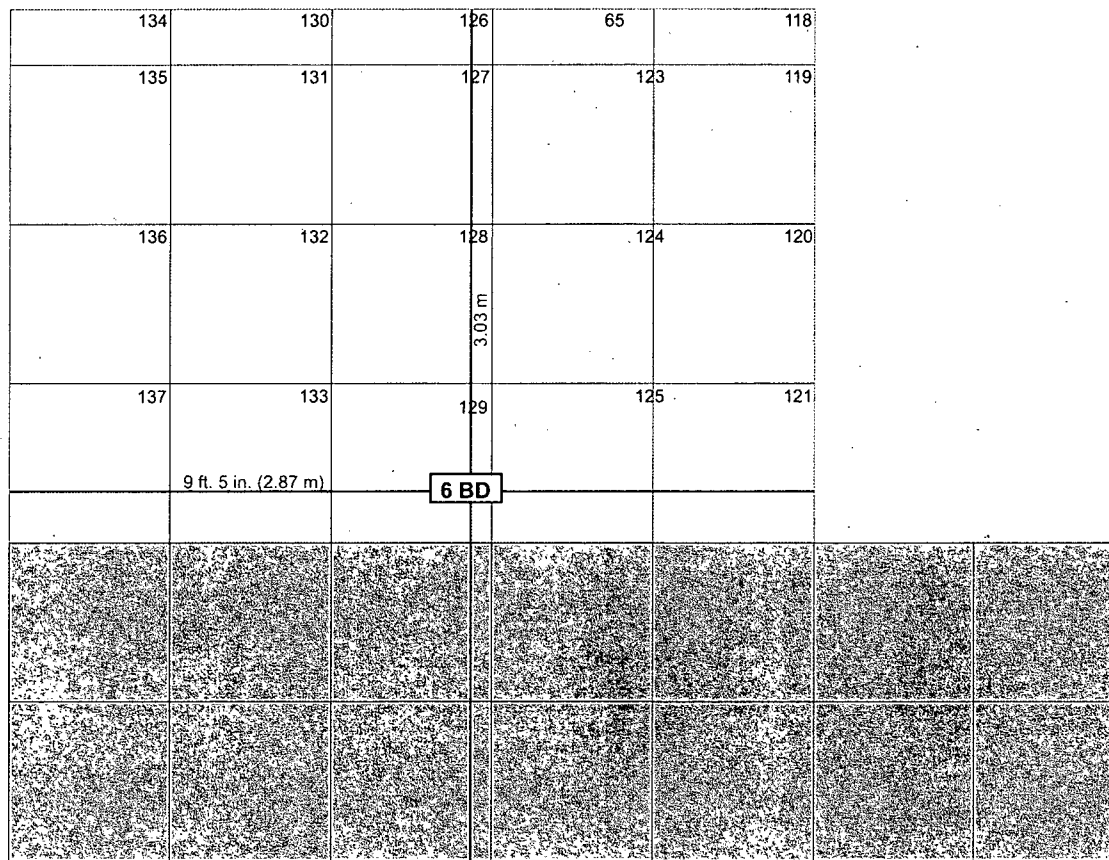
Rm 43, South Wall

Map F8130611-6, Auxiliary Building -20' EI
 Rm 43, "B" HPI Pump Room (3.55 m grid spacing)
 South Wall Beta Direct Measurements
 F8130601C0001BD to F8130601C0002BD



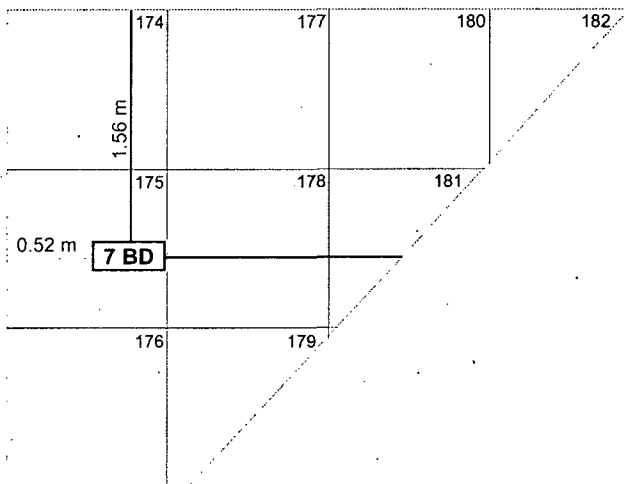
Rm 43, West Wall

Map F8130611-7, Auxiliary Building -20' EI
 Rm 43, "B" HPI Pump Room (3.55 m grid spacing)
 West Wall Beta Direct Measurements
 F8130601C0003BD to F8130601C0005BD



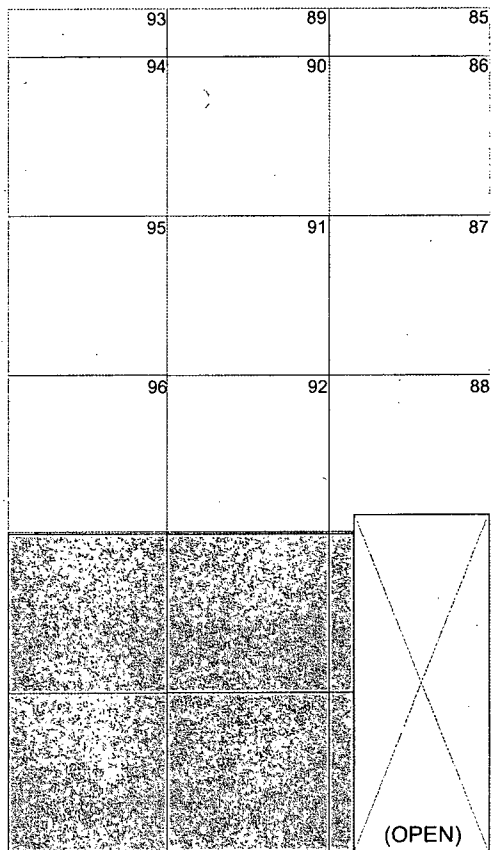
Rm 43, North Wall

Map F8130611-8, Auxiliary Building -20' EI
 Rm 43, "B" HPI Pump Room (3.55 m grid spacing)
 North Wall Beta Direct Measurement
 F8130601C0006BD

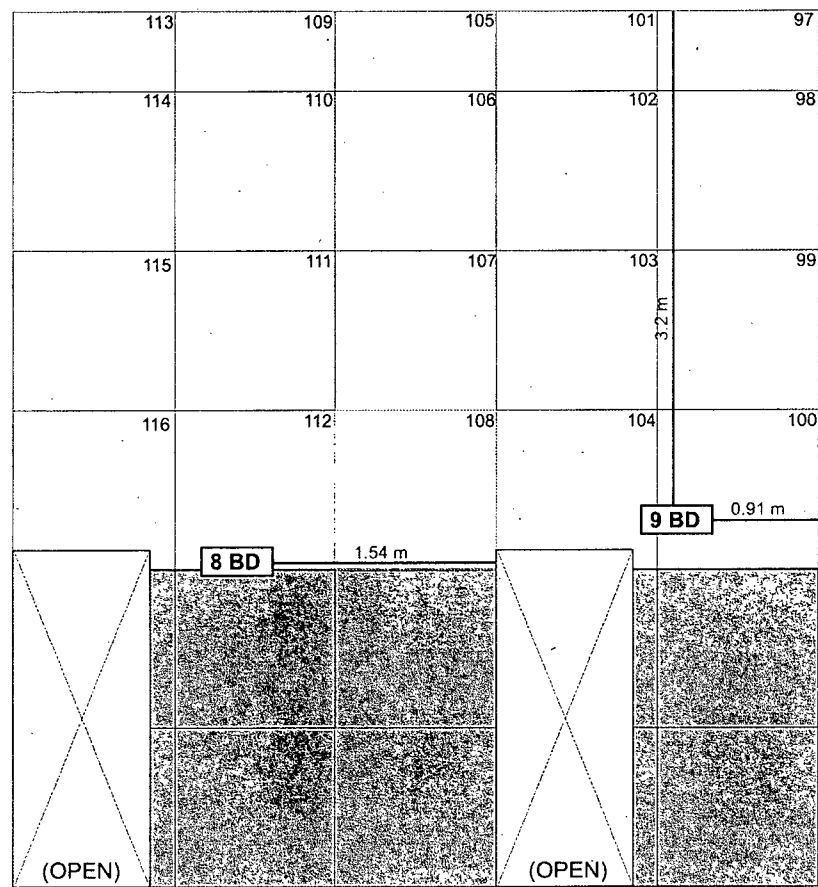


Rm 43, East Stairwell Wall

Map F8130611-9, Auxiliary Building -20' EI
 Rm 43, "B" HPI Pump Room (3.55 m grid spacing)
 East Stairwell Wall Beta Direct Measurement
 F8130601C0007BD



Rm 43, East Shield Wall (Exterior)

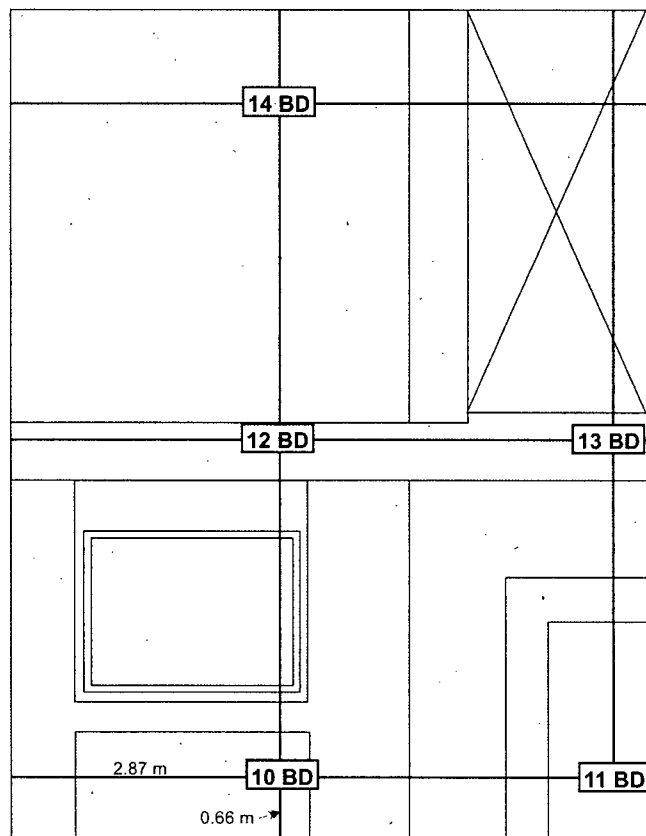


Rm 43, Interior Shield Wall, Looking West

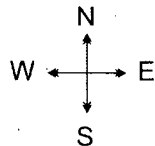
Rm 43, Interior Shield Wall, Looking North

Rm 43, Interior Shield Wall, Looking East

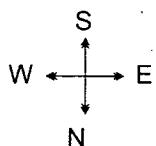
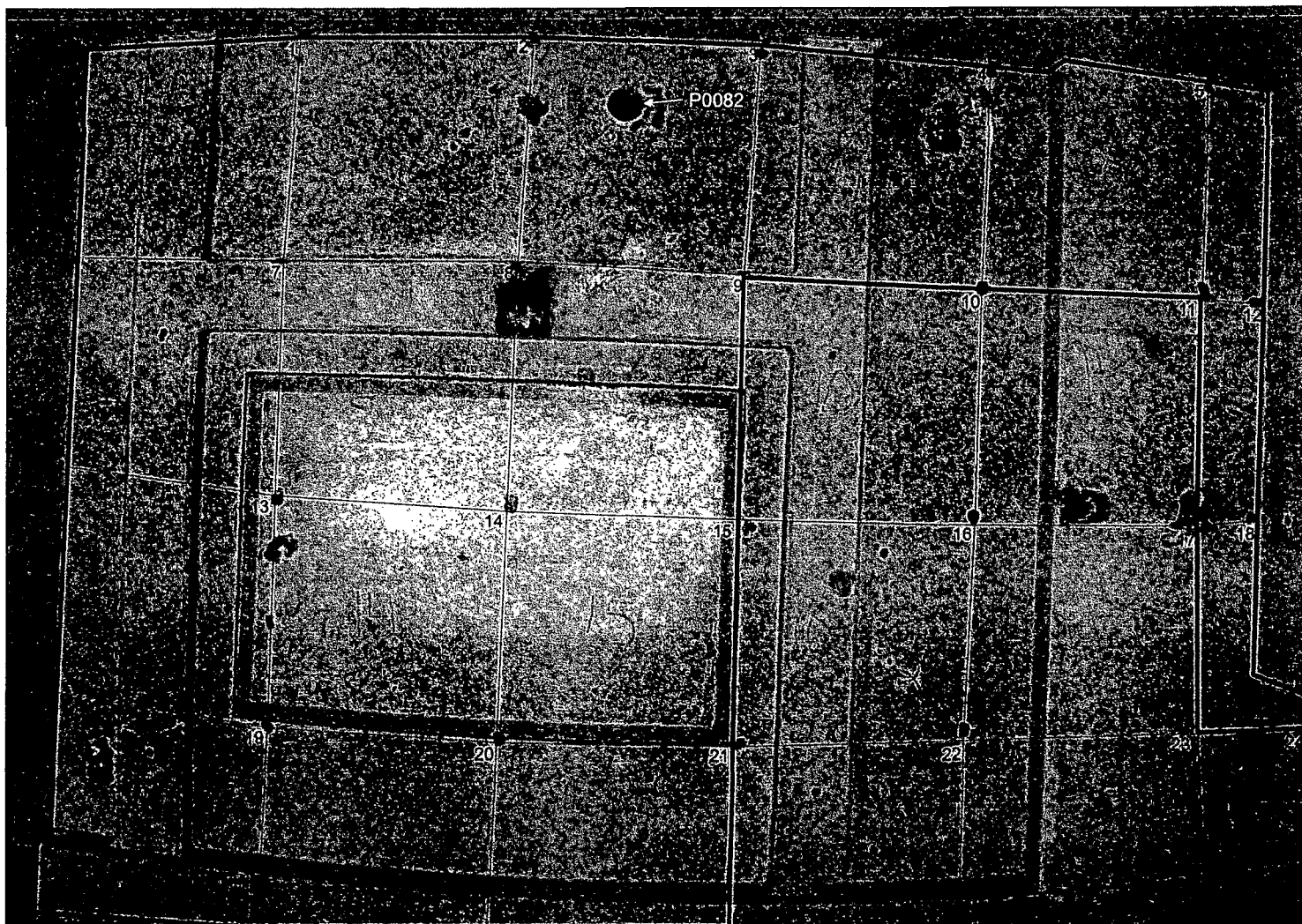
Map F8130611-10, Auxiliary Building -20' EI
Rm 43, "B" HPI Pump Room (3.55 m grid spacing)
Exterior and Interior Shield Wall Beta Direct Measurements
F8130601C0008BD to F8130601C0009BD



Rm 43, Ceiling

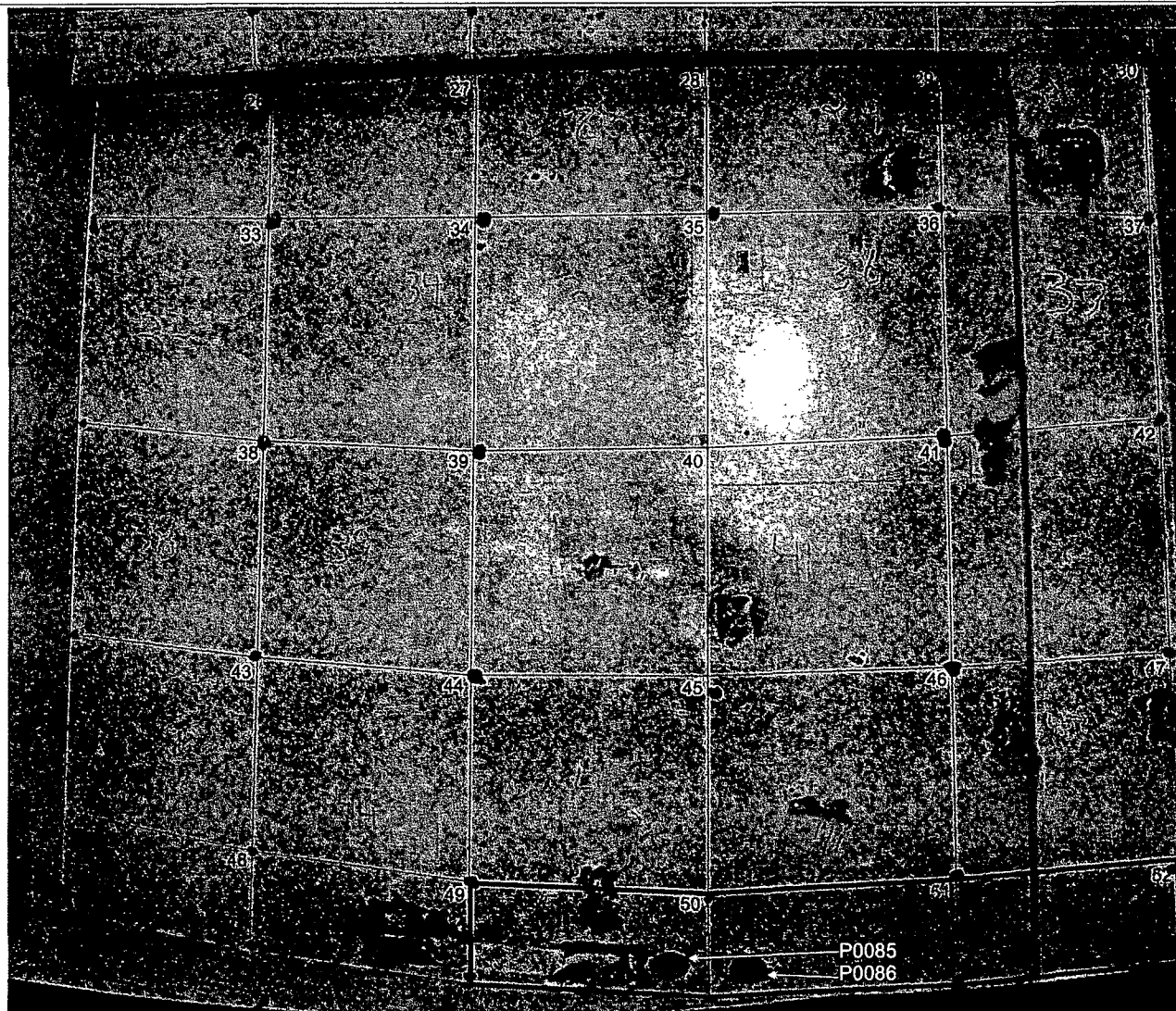


Map F8130611-11, Auxiliary Building -20' EI
 Rm 43, "B" HPI Pump Room (3.55 m grid spacing)
 Ceiling Beta Direct Measurements
 F8130601C0010BD to F8130601C0014BD



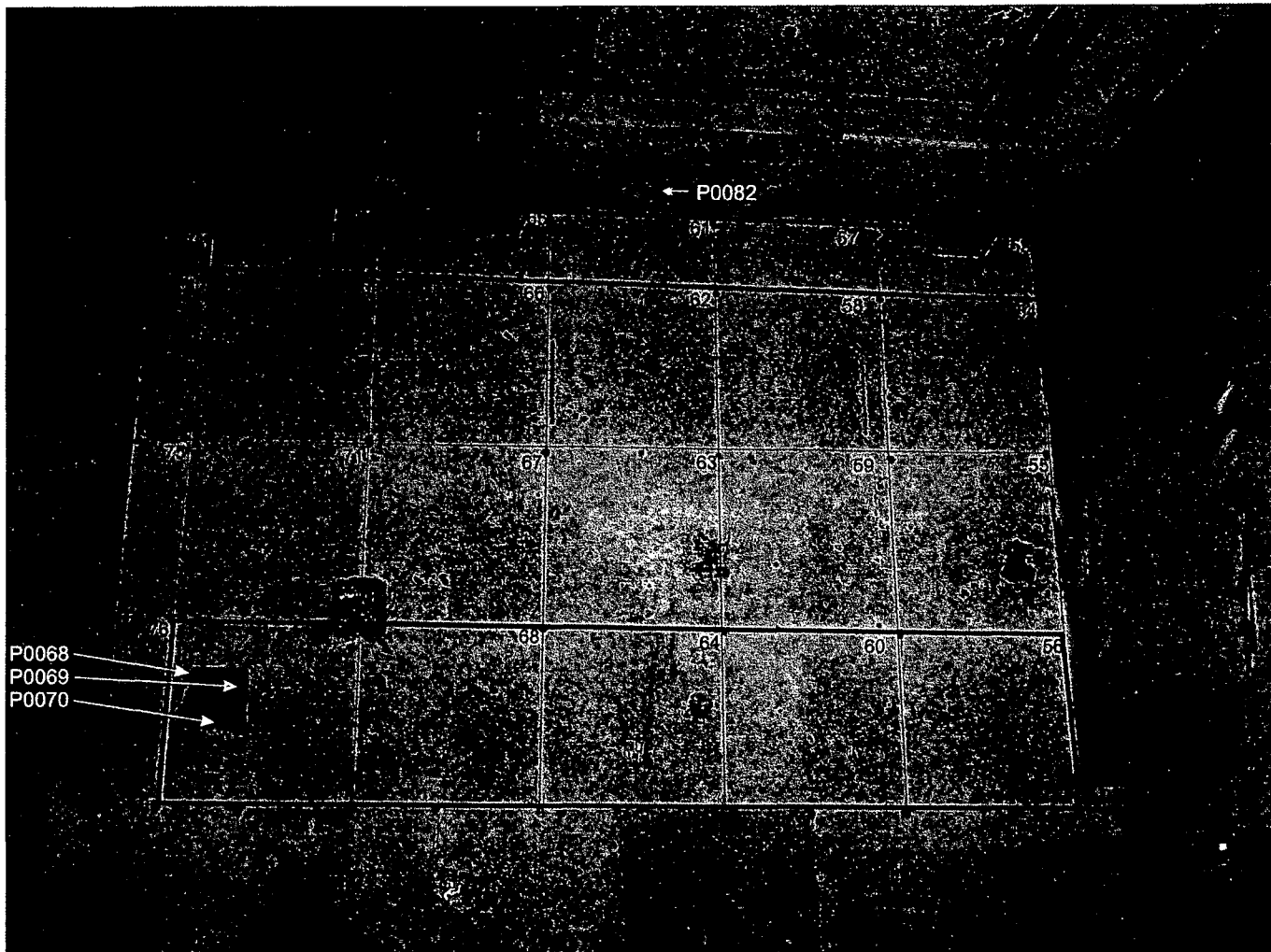
Map F8130611-12, Aux Bldg. -20' El.,
Rm 43, "B" HPI Pump Room
Upper Walls and Ceiling, Class 2
South Ceiling Beta Scan Measurements

F8130611C0012BS to F8130611C0015BS,
F8130611C0018BS to F8130611C0021BS
Penetration Scan F8130611P0082BS
Total Scan Area: ~14.5 sq. meters



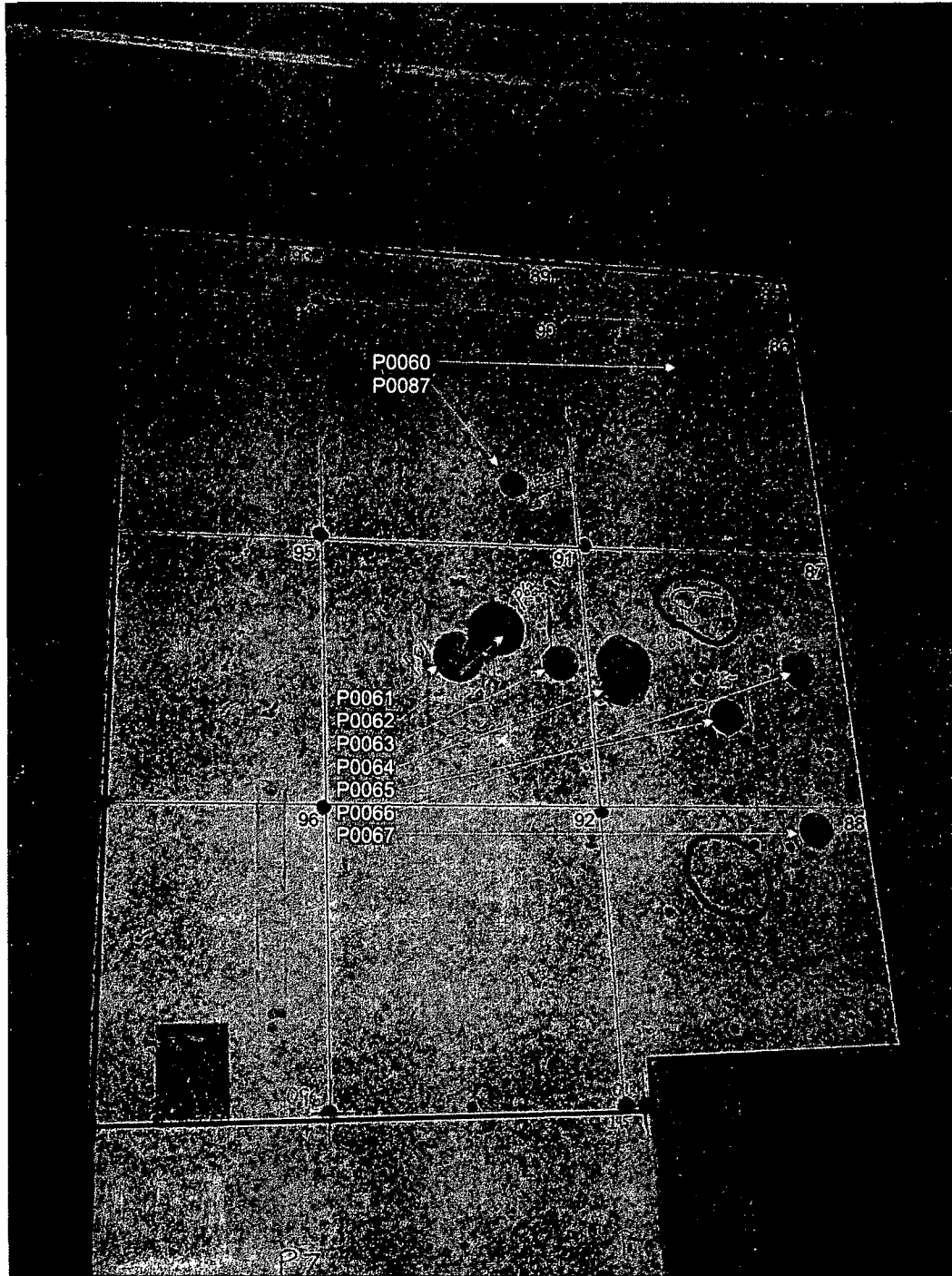
Map F8130611-13, Aux Bldg. -20' El.,
Rm 43, "B" HPI Pump Room
Upper Walls and Ceiling, Class 2

North Ceiling Beta Scan Measurements
F8130611C0050BS to F8130611C0052BS
Penetration Scans F8130611P0085BS to F8130611P0086BS
Total Scan Area: ~1.0 sq. meter

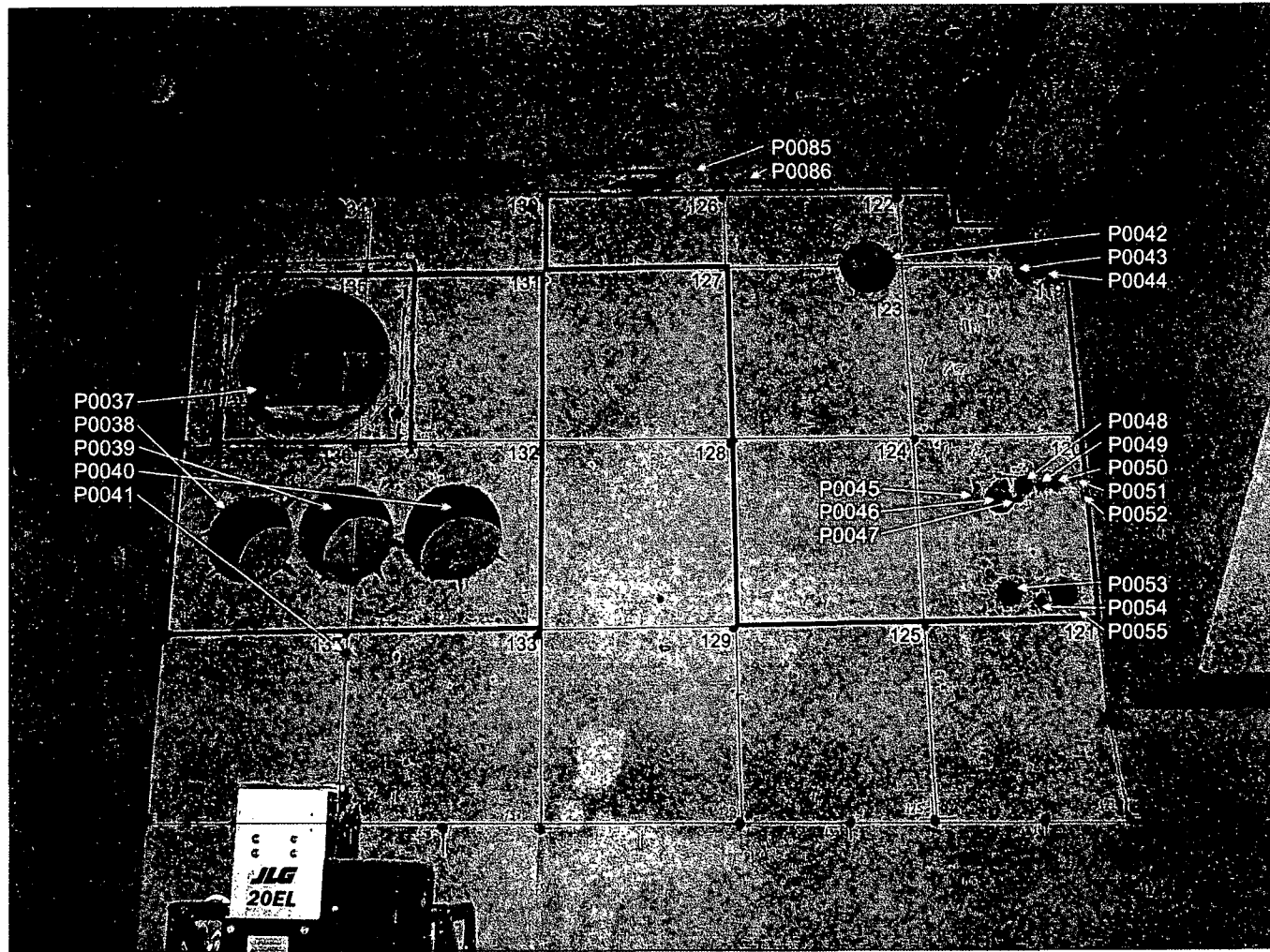


Map F8130611-14, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 South Wall Beta Scan Measurements
 F8130611C0053BS,
 F8130611C0056BS to F8130611C0057BS,
 F8130611C0060BS to F8130611C0061BS,

F8130611C0064BS to F8130611C0065BS,
 F8130611C0068BS to F8130611C0069BS,
 and F8130611C0072BS
 Penetration Scans F8130611P0068BS to F8130611P0070BS
 and F8130611P0082BS
 Total Scan Area: ~6 sq. meters

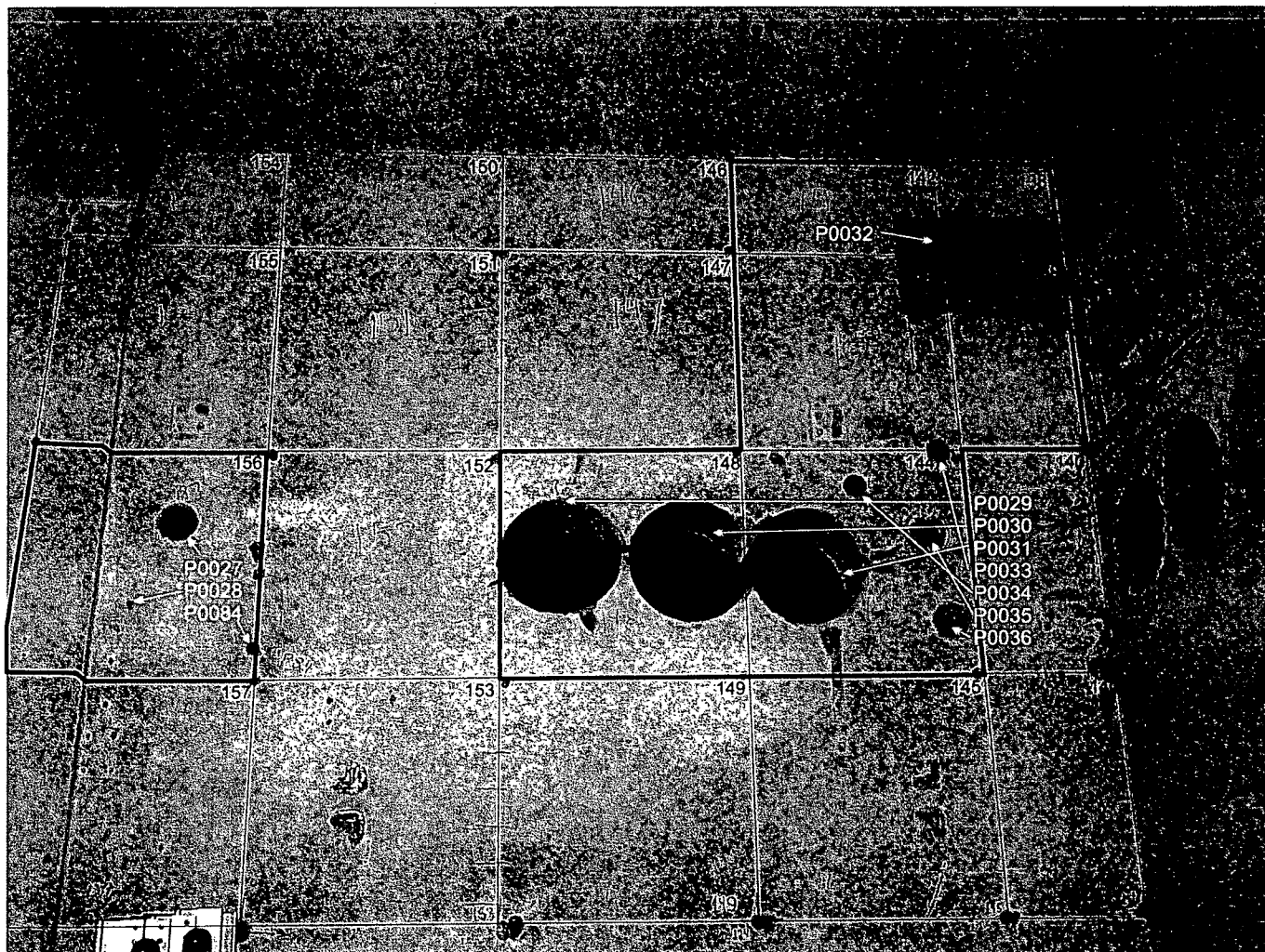


Map F8130611-15, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 East Wall Beta Scan Measurements
 F8130611C0085BS to F8130611C0096BS
 Penetration Scans F8130611P0060BS to F8130611P0067BS
 and F8130611P0087BS
 Total Scan Area: ~8 sq. meters



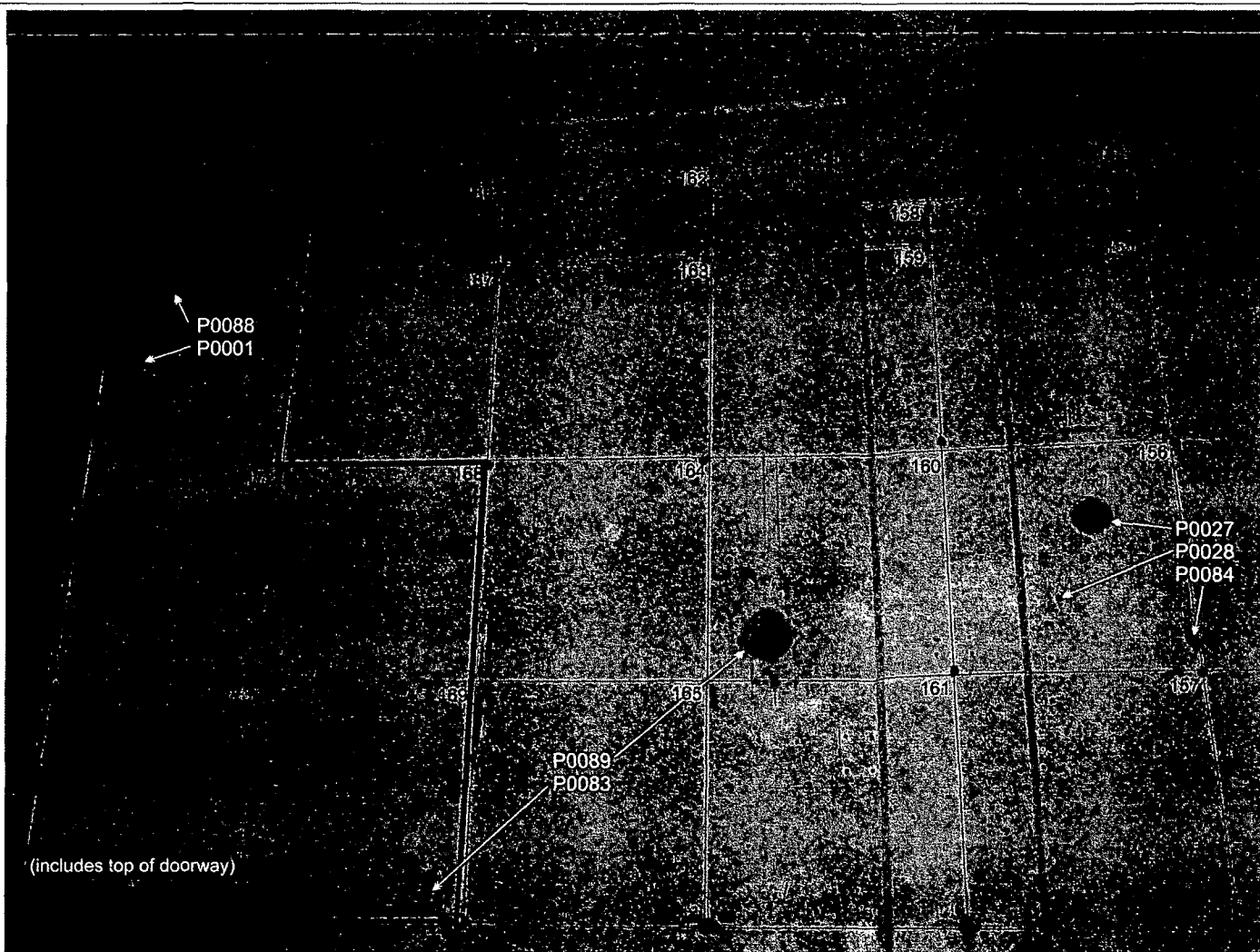
Map F8130611-16, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
Upper Walls and Ceiling, Class 2
North Wall Beta Scan Measurements
F8130611C0118BS to F8130611C0120BS,
F8130611C0122BS to F8130611C0124BS,

F8130611C0126BS,
F8130611C0131BS to F8130611C0132BS, and
F8130611C0135BS to F8130611C0136BS
Penetration Scans F8130611P0037BS to F8130611P0055BS
and F8130611P0085BS to F8130611P0086BS
Total Scan Area: ~8.5 sq. meters



Map F8130611-17, Aux Bldg. -20' El.,
Rm 43, "B" HPI Pump Room
Upper Walls and Ceiling, Class 2
West Wall Beta Scan Measurements
F8130611C0138BS to F8130611C0139BS,

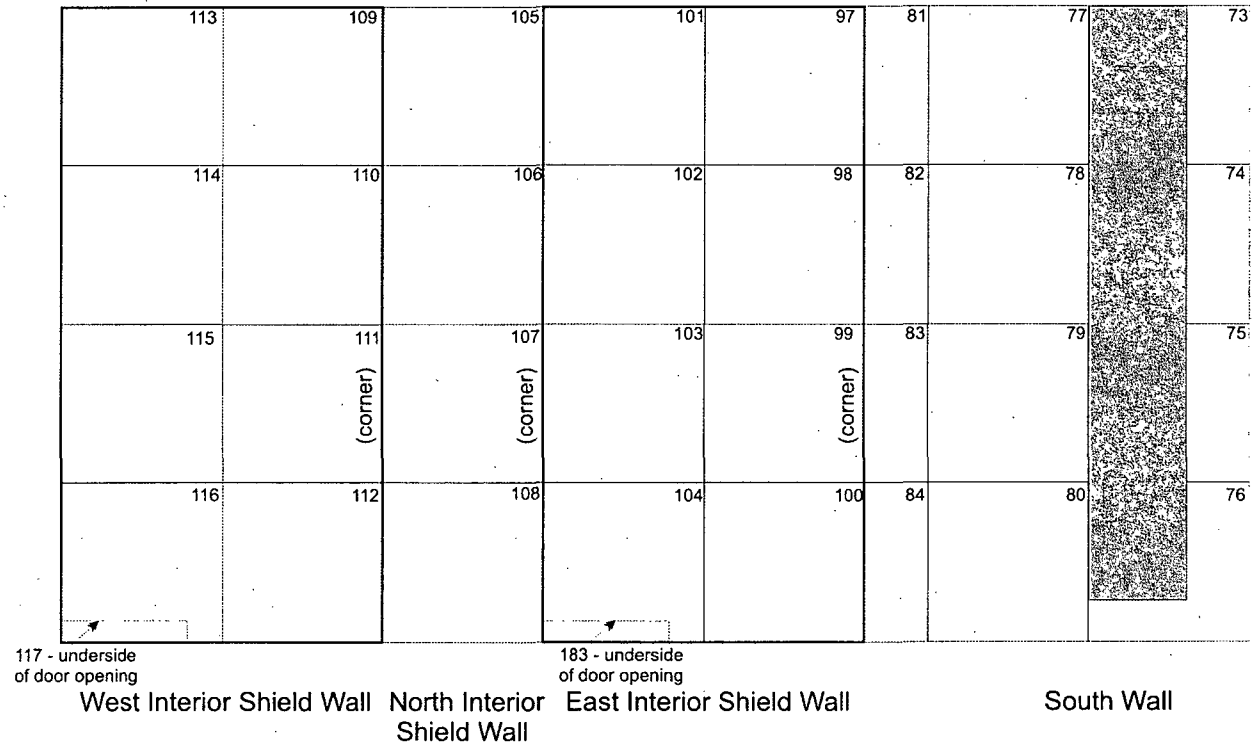
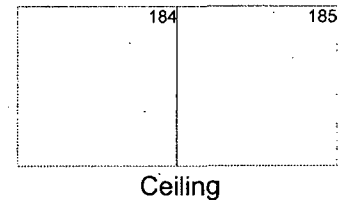
F8130611C0142BS to F8130611C0144BS,
F8130611C0148BS and F8130611C0156BS,
Penetration Scans F8130611P0027BS to F8130611P0036BS
and F8130611P0084BS
Total Scan Area: ~ 4.5 sq. meters

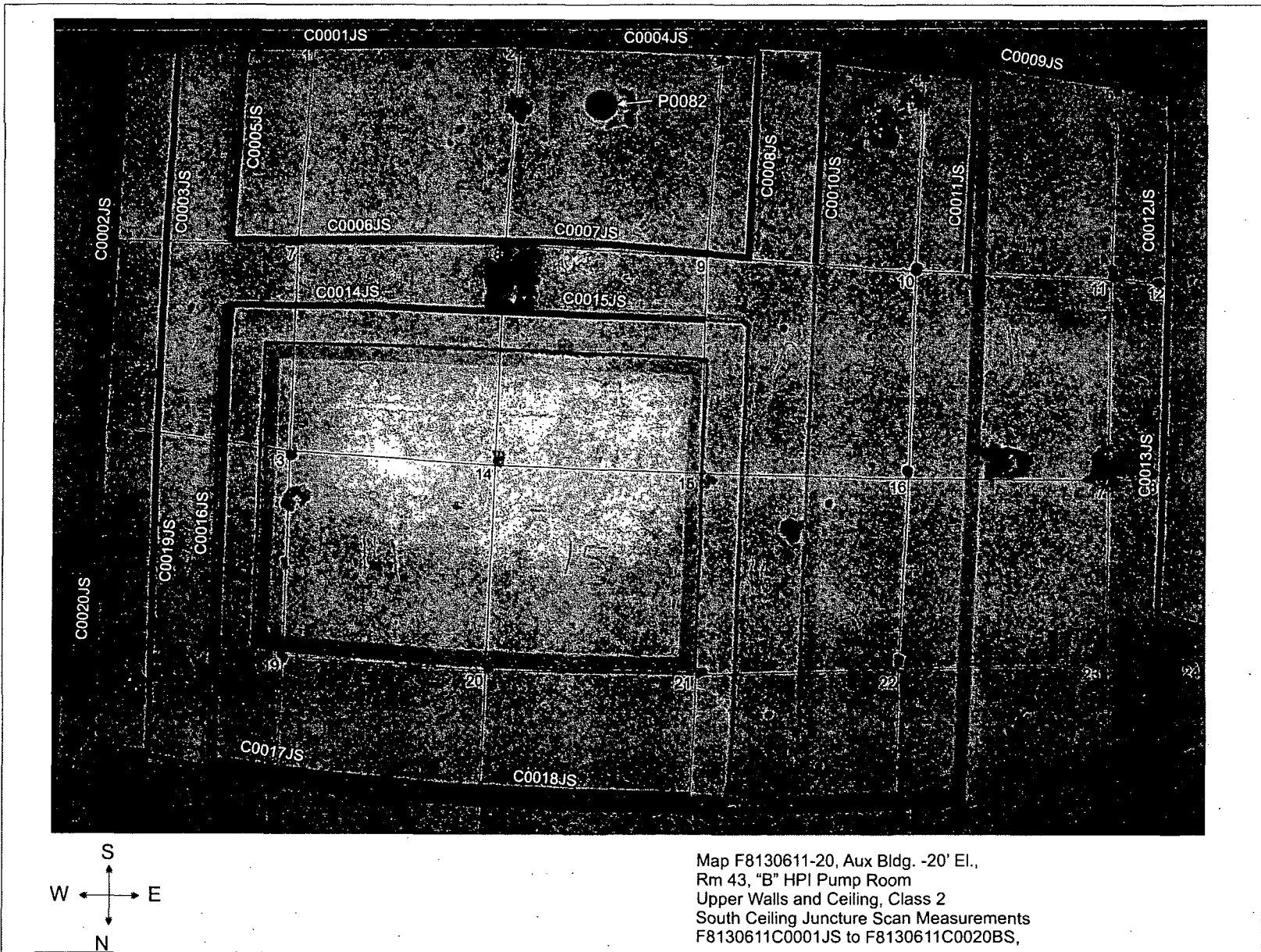


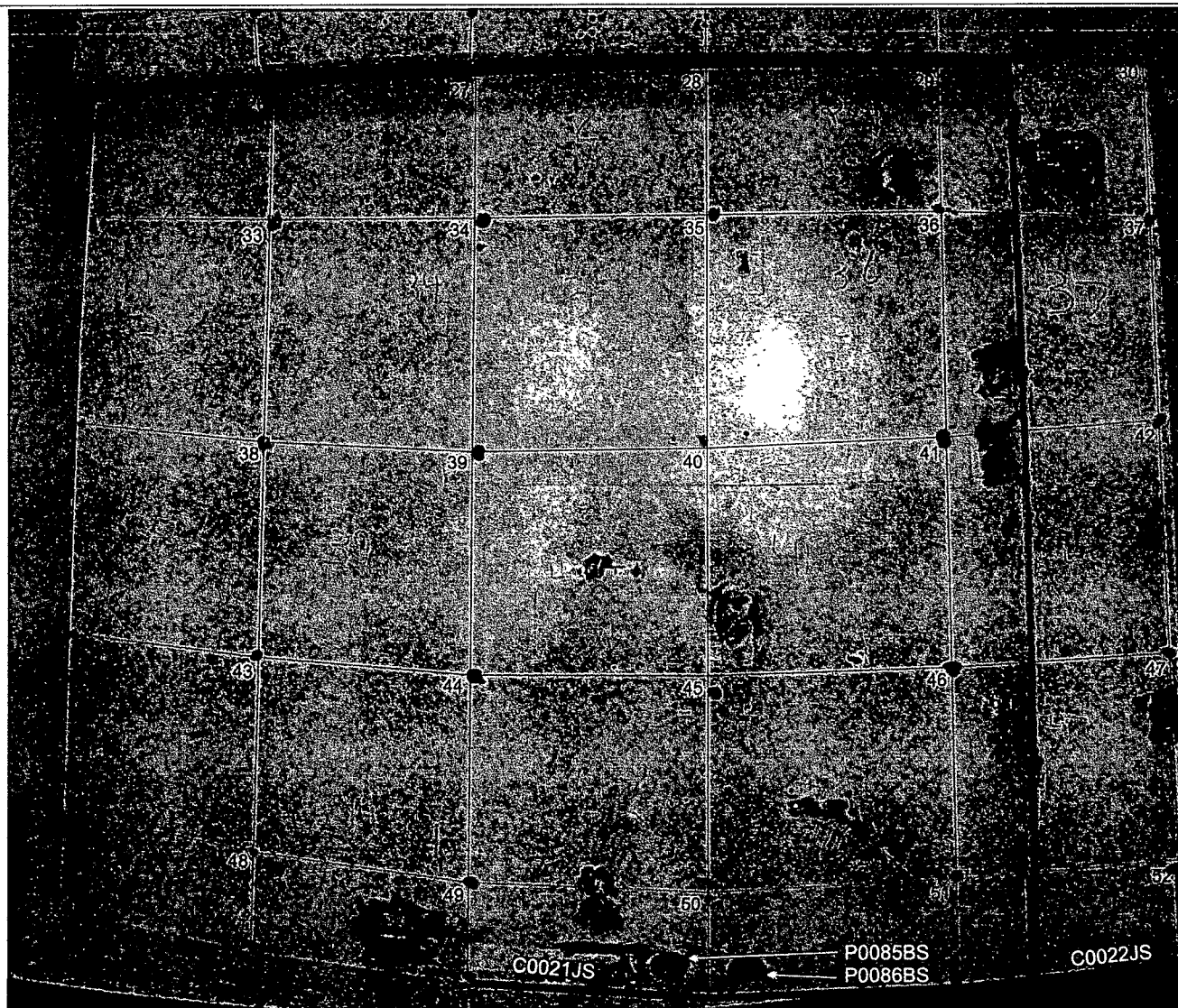
Map F8130611-18, Aux Bldg. -20' El.,
Rm 43, "B" HPI Pump Room
Upper Walls and Ceiling, Class 2
West Wall Beta Scan Measurements

Penetration Scans F8130611P0001BS, F8130611P0027BS
F8130611P0083BS to F8130611P0083BS,
and F8130611P0088BS to F8130611P0089BS
Total Scan Area: ~5.5 sq. meters

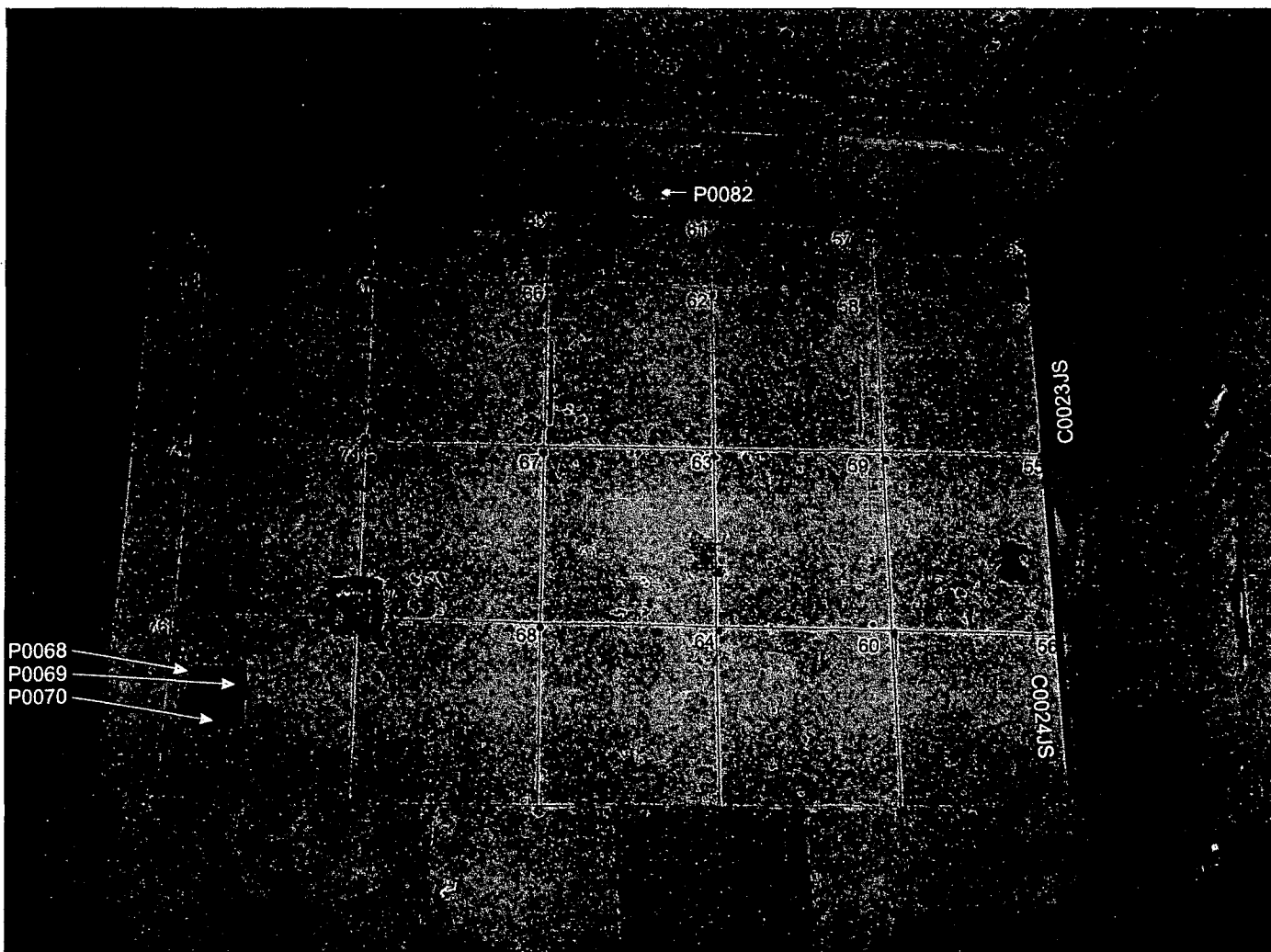
Map F8130611-19, Auxiliary Building -20' EI
 Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 Inside Shield Wall Beta Scan Measurements
 F8130611C0097BS to F8130611C0104BS,
 F8130611C0109BS to F8130611C0117BS,
 and F8130611C0183BS
 Penetration Scans F8130611P0071BS to F8130611P0081BS
 Total Scan Area: ~16 sq. meters



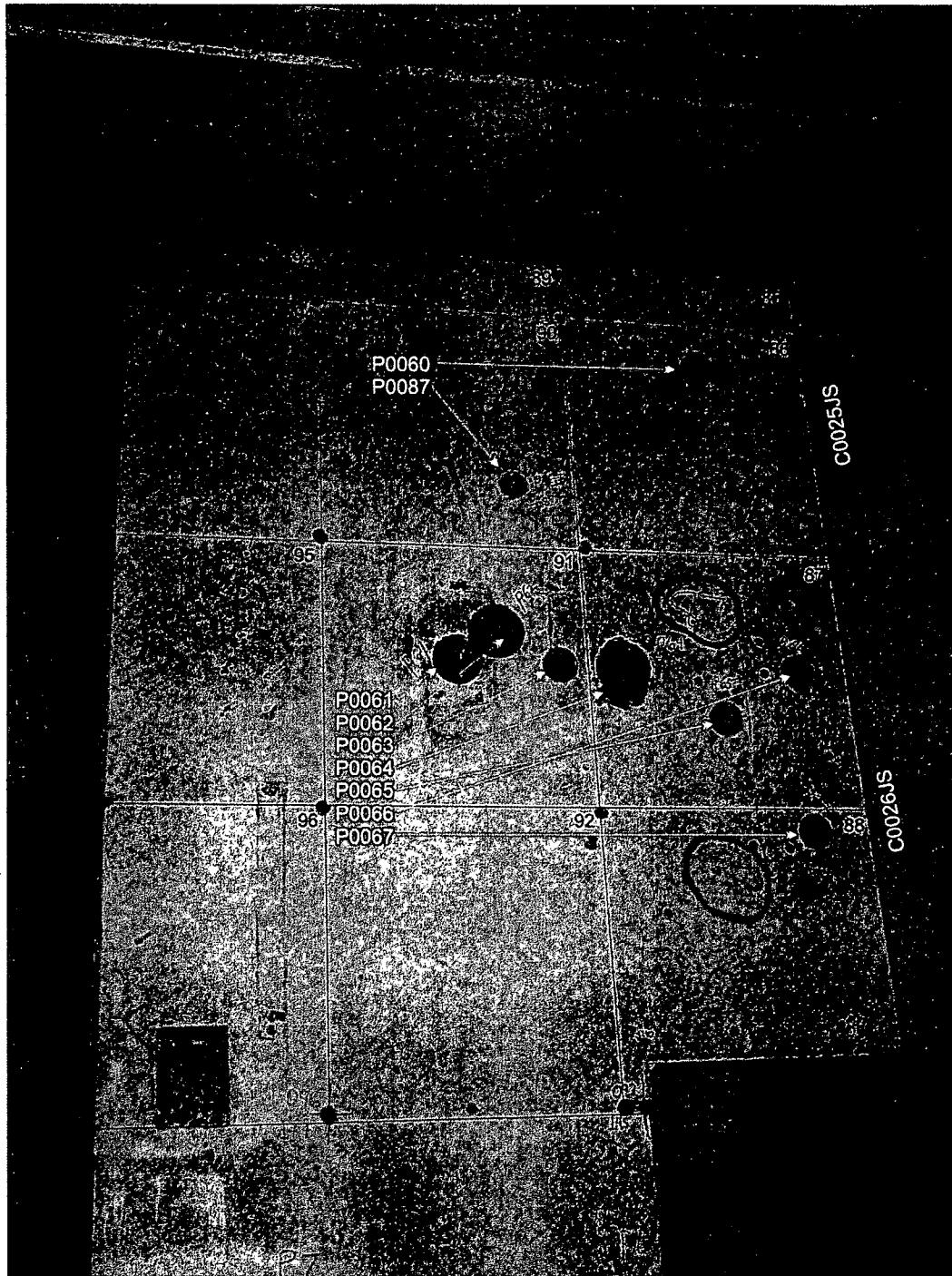




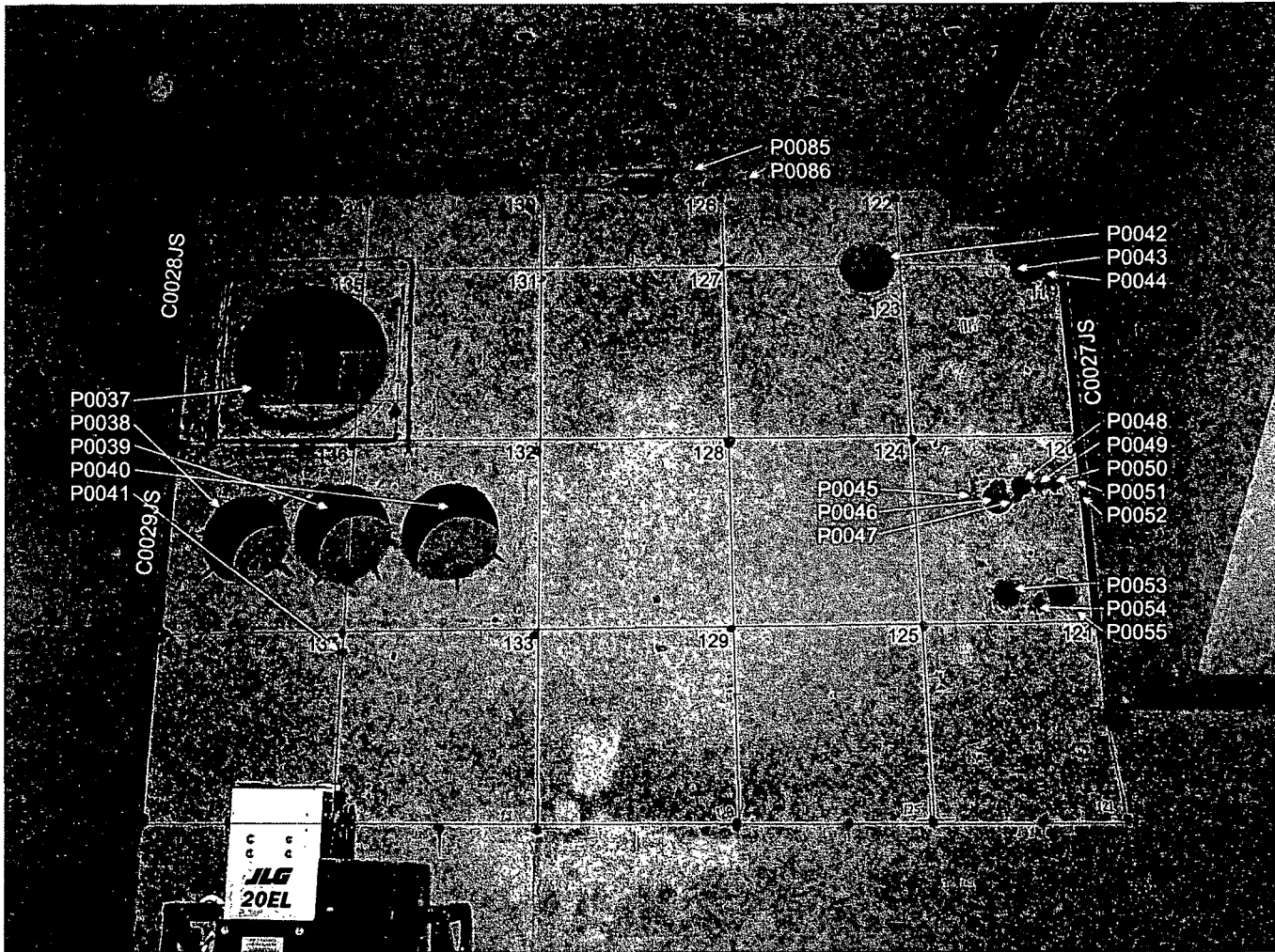
Map F8130611-21, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 North Ceiling Juncture Scan Measurements
 F8130611C0021JS to F8130611C0022JS



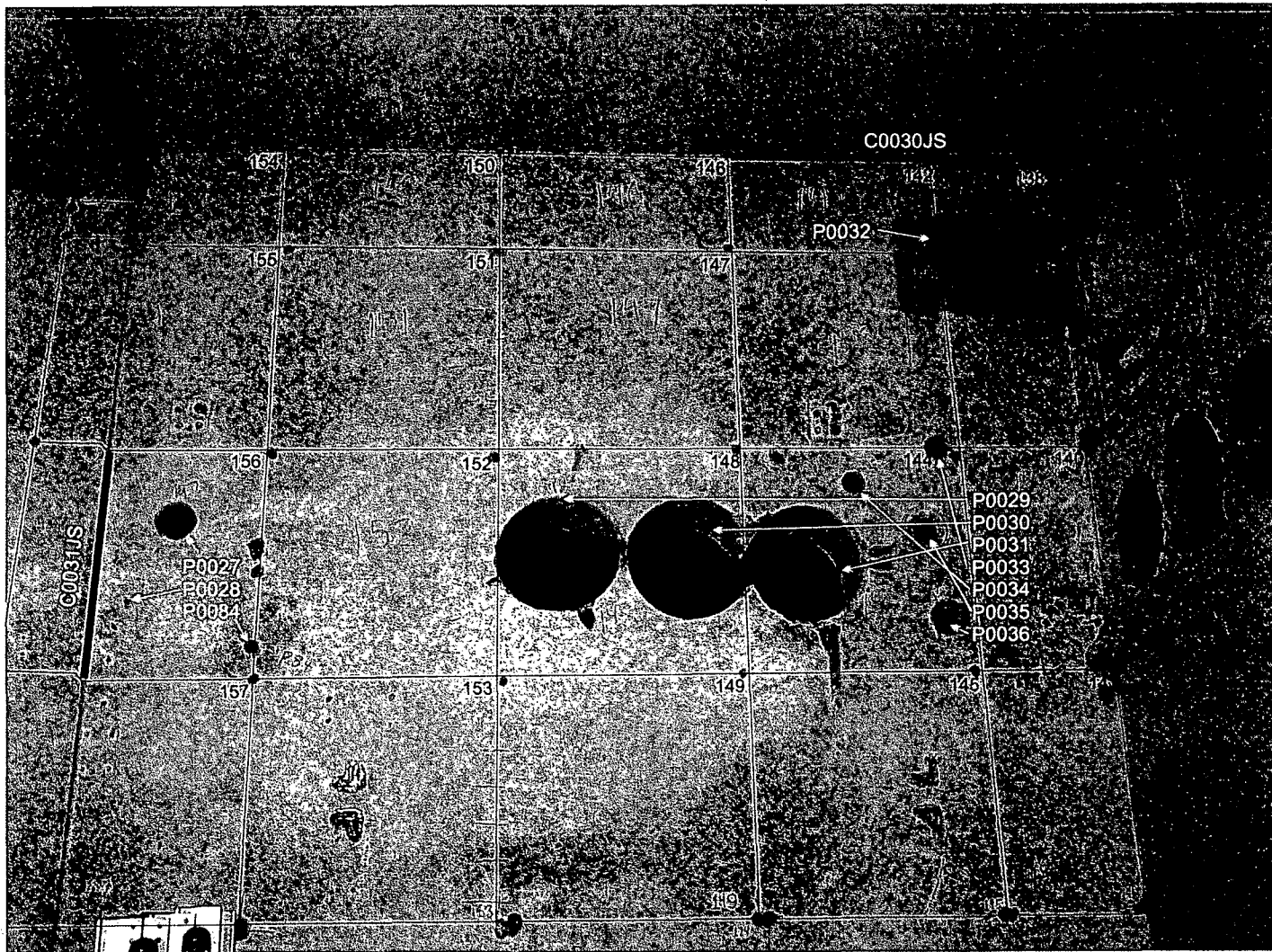
Map F8130611-22, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 South Wall Junction Scan Measurements
 F8130611C0023JS to F8130611C0024JS



Map F8130611-23, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 East Wall Juncture Scan Measurements
 F8130611C0025JS to F8130611C0026JS

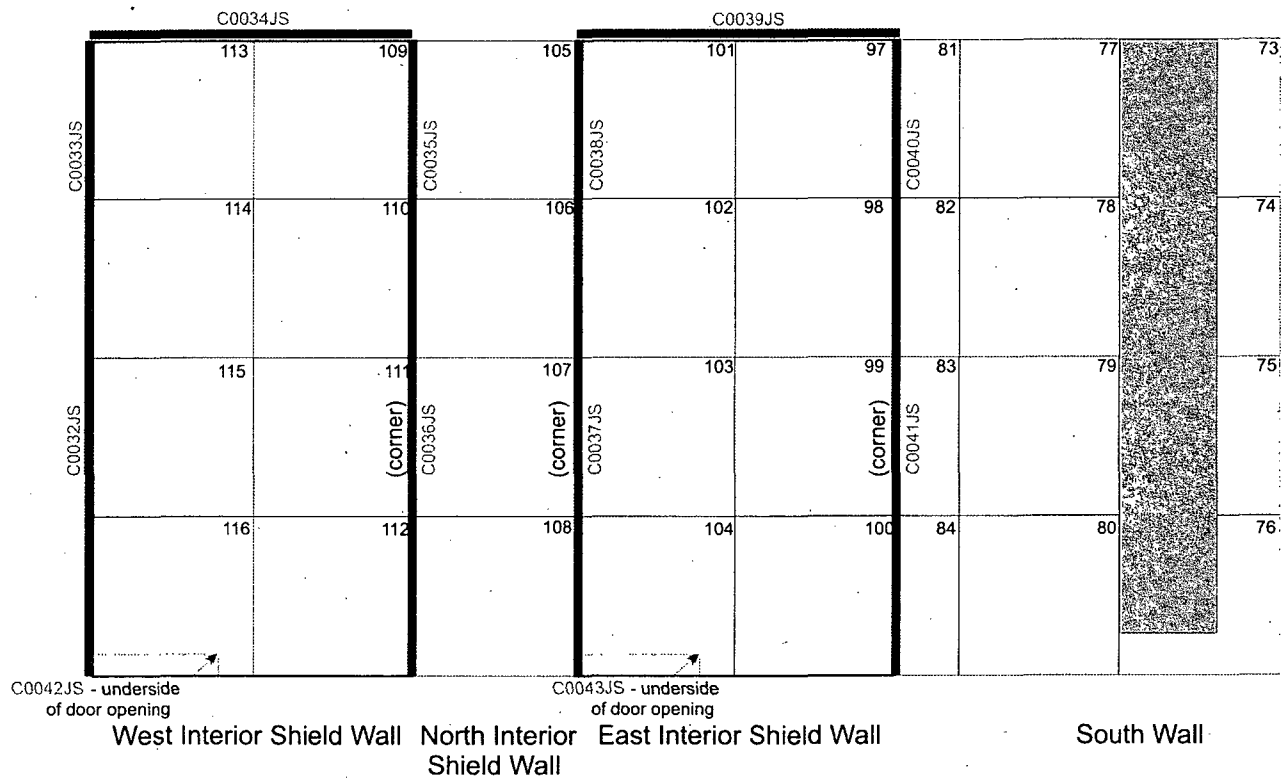


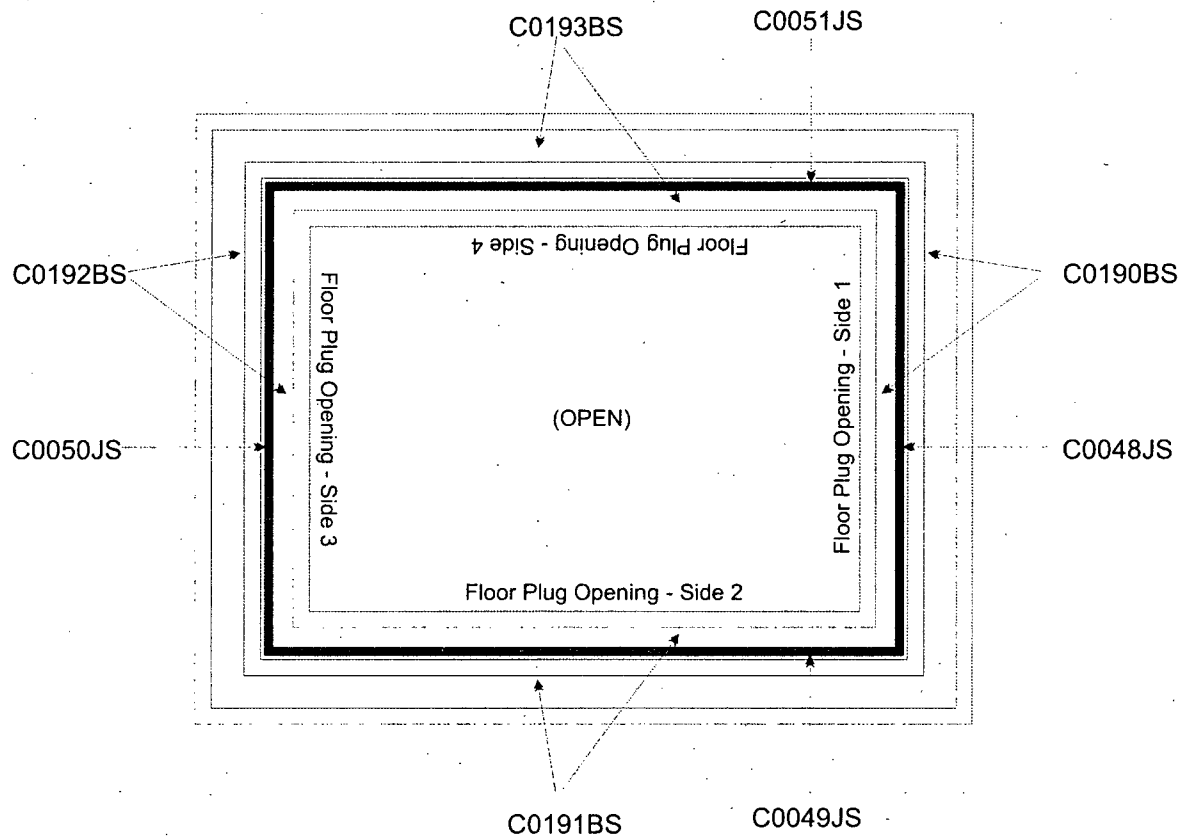
Map F8130611-24, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 North Wall Juncture Scan Measurements
 F8130611C0027JS to F8130611C0029JS



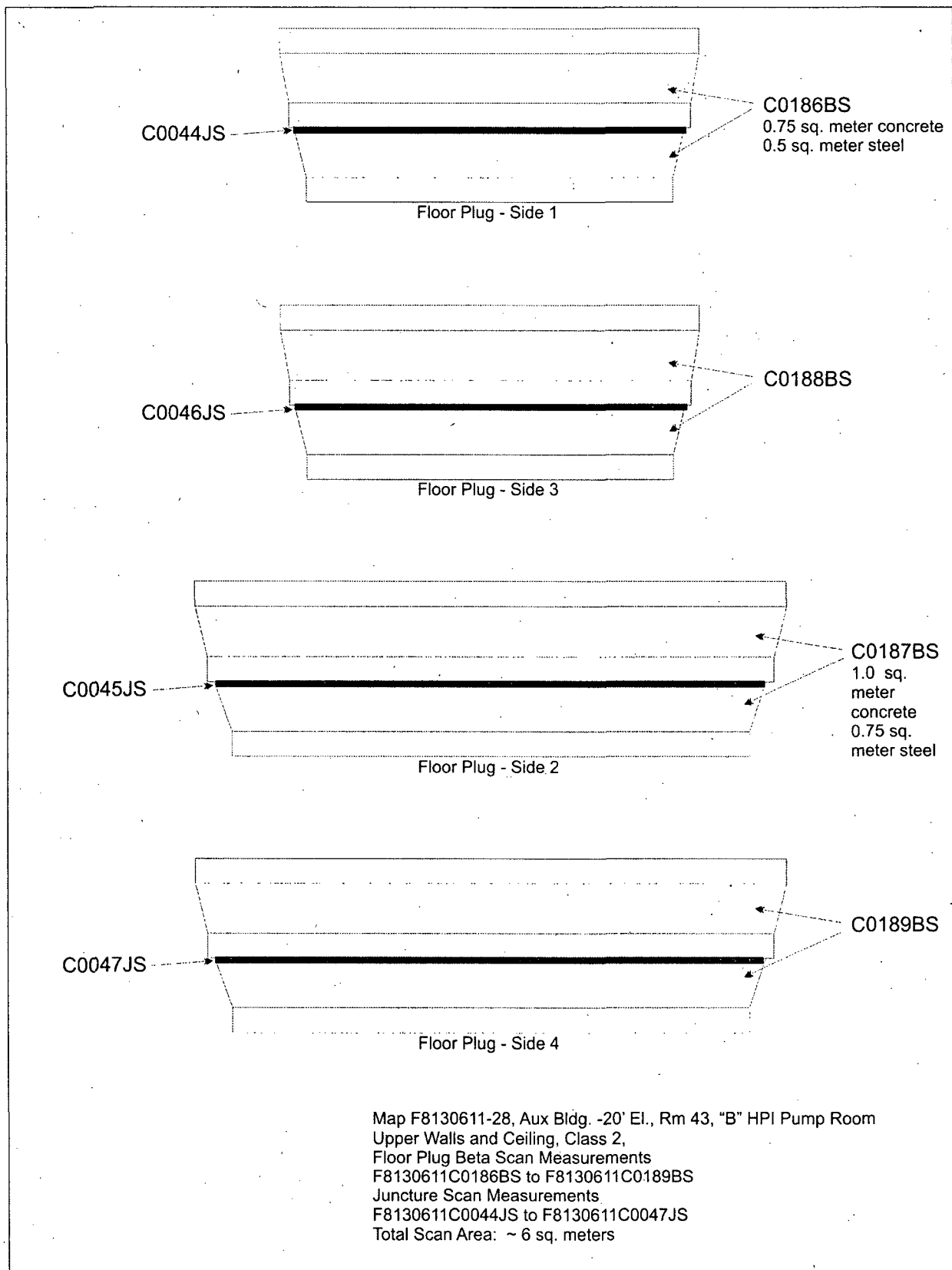
Map F8130611-25, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
Upper Walls and Ceiling, Class 2
West Wall Juncture Scan Measurements
F8130611C0030JS to F8130611C0031JS

Map F8130611-26, Auxiliary Building -20' EI
 Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 Inside Shield Wall Juncture Scan Measurements
 F8130611C0032JS to F8130611C0043J





Map F8130611-27, Aux Bldg. -20' El., Rm 43, "B" HPI Pump Room
 Upper Walls and Ceiling, Class 2
 Floor Plug Opening Beta Scan Measurements
 F8130611C0190BS to F8130611C0193BS
 Juncture Scan Measurements
 F8130611C0048JS to F8130611C0051JS
 Total Scan Area: ~6 sq. meters



Attachment 2

Instrumentation

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Survey Unit F8130611

Table 2-1. Survey Unit Instrumentation

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static	MDC Scan
M2350; 180733	43-98B; 148638	1,400	2,520
M2350; 180733	43-94; 148620	2,630	4,580
M2350; 149794	43-68/5B; 149103 ¹	433	1,033
M2350; 149794	43-68/5B; 149103 ²	433	1,084
M2350; 149794	43-116-1B; 216072 ³	796	5,895
M2350; 149802	43-116-1B; 190173 ³		
M2350; 149802	43-116-1B; 190173 ⁴	472	3,492
M2350; 180733	43-111; 148641	3,880	7,020
Tennelec; 0401171	N/A	5 dpm α , 11 dpm β	N/A

¹43-68B Concrete surfaces

²43-68B Concrete penetrations

³43-116-1B Concrete junctures and penetrations

⁴43-116-1B Metal penetrations

Instrument	Detector Serial No.	MDC (dpm/100 cm²)
InSpector	08051294	2,570 dpm/100 cm ² Cs-137 2,510 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	43,000
DCGL _W	43,000
DCGL _{EMC}	N/A

Attachment 3

Investigation

October 24, 2007

Survey Unit F8130611

(none required)

Attachment 4

Data Assessment

October 24, 2007

Survey Unit F8130611

