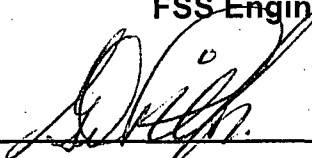
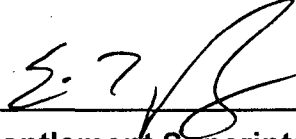


Rancho Seco
Final Status Survey Summary Report
February 5, 2008
Room 112, Compactor Room
Survey Unit F8130991

Prepared By:  Date: 3-14-2008
FSS Engineer

Reviewed By:  Date: 4/8/08
Lead FSS Engineer

Approved By:  Date: 4-9-08
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130991, Room 112

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 243 m² 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:	F813	Room 112
Survey Unit:	0991	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	243	
Evaluator:	Gary Frank	
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	3.5	Class 1
Design DCGL_{mc} (dpm/100 cm²):	150500	Class 1
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	6935	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	enter value	Class 1
Scan Area (m²):	243	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3.1	
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:	35	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 42 direct measurements were made in F8130991. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Two measurements indicated elevated activity above the investigation level resulting in an investigation documented in Attachment 3. Scan activity ranged from 1228 to 259555 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)
F8130991-C0001BD	3823
F8130991-C0002BD	2490
F8130991-C0003BD	2511
F8130991-C0004BD	3128
F8130991-C0005BD	2422
F8130991-C0006BD	2936
F8130991-C0007BD	2687
F8130991-C0008BD	2765
F8130991-C0009BD	2977
F8130991-C0010BD	2791
F8130991-C0011BD	2713
F8130991-C0012BD	4331
F8130991-C0013BD	2521
F8130991-C0014BD	2843
F8130991-C0015BD	4186
F8130991-C0016BD	2272
F8130991-C0017BD	2106
F8130991-C0018BD	2744
F8130991-C0019BD	3631
F8130991-C0020BD	4949
F8130991-C0021BD	2282
F8130991-C0022BD	2158
F8130991-C0023BD	2713
F8130991-C0024BD	2630
F8130991-C0025BD	2225
F8130991-C0026BD	2656
F8130991-C0027BD	2635
F8130991-C0028BD	3107
F8130991-C0029BD	2827
F8130991-C0030BD	3190
F8130991-C0031BD	2931
F8130991-C0032BD	2417
F8130991-C0033BD	2563
F8130991-C0034BD	2563
F8130991-C0035BD	3175

Measurement ID	Gross Activity (dpm/100 cm ²)
F8130991-C0036BD	3164
F8130991-C0037BD	3522
F8130991-C0038BD	8077
F8130991-C0039BD	3055
F8130991-C0040BD	3284
F8130991-C0041BD	2236
F8130991-C0042BD	2101
Mean:	3008
Median:	2754
Standard Deviation:	1006
Range:	2101 - 8077

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130991C0001SM	268.97
F8130991C0002SM	24.88
F8130991C0003SM	4.22
F8130991C0004SM	99.79
F8130991C0005SM	71.37
F8130991C0006SM	9.38
F8130991C0007SM	150.15
F8130991C0008SM	80.41
F8130991C0009SM	8.09
F8130991C0010SM	130.78
F8130991C0011SM	49.42
F8130991C0012SM	228.93
F8130991C0013SM	113.99
F8130991C0014SM	133.36
F8130991C0015SM	37.8
F8130991C0016SM	17.13
F8130991C0017SM	53.29
F8130991C0018SM	10.68
F8130991C0019SM	128.2
F8130991C0020SM	59.75
F8130991C0021SM	6.8
F8130991C0022SM	-0.95
F8130991C0023SM	214.72
F8130991C0024SM	151.44
F8130991C0025SM	0.34
F8130991C0026SM	139.82
F8130991C0027SM	53.29
F8130991C0028SM	8.09
F8130991C0029SM	46.84
F8130991C0030SM	138.53
F8130991C0031SM	41.67
F8130991C0032SM	2.93
F8130991C0033SM	23.59
F8130991C0034SM	11.97
F8130991C0035SM	27.46
F8130991C0036SM	21.01
F8130991C0037SM	10.68
F8130991C0038SM	59.75
F8130991C0039SM	21.01
F8130991C0040SM	33.92
F8130991C0041SM	5.51
F8130991C0042SM	5.51
Mean:	64.39
Median:	39.73
Standard Deviation:	68.5
Range:	-0.95 to 268.97

Survey Unit Data Assessment:

The survey design required 42 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):	42		
Median (dpm/100 cm ²):	2754		
Mean (dpm/100 cm ²):	3008		
Direct Measurement Standard Deviation (dpm/100 cm ²):	1006		
Total Standard Deviation (dpm/100 cm ²):	1006		Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	8077		Background Subtract Not Applied
Material Type:	N/A		
Sign Test Final N Value:	42		Class 1
S+ Value:	42		
Critical Value:	26		
Sufficient Samples Collected:	Yes		
Maximum Value < DCGL:	Yes		
Median Value < DCGL:	Yes		
Mean Value < DCGL:	Yes		
Maximum Value < DCGL_{mc}:	Yes		
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:

Two investigations (scan grids 27JS and penetration 15BS) were required for the scan measurements and the results are reported in Attachment 3. The EMC unity rule was not exceeded as shown in Table 3-1.

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, 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. Potential areas of elevated activity were detected and evaluated as shown in Attachment 3. 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 cm² and none of the removable surface activity measurements exceeded 10% of the DCGL. Two measurements indicated elevated activity above the investigation level resulting in an investigation documented in Attachment 3.

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.

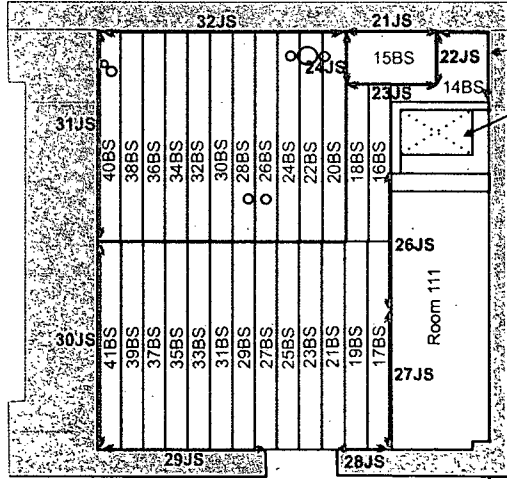
It is concluded that survey unit F8130991 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

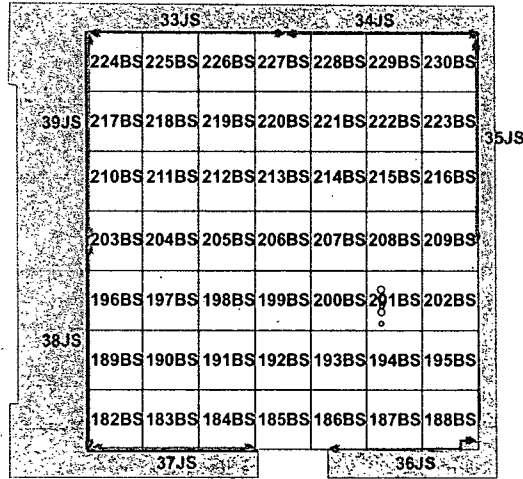
February 5, 2008

Survey Unit F8130991




FLOOR PLAN

25JS
 Hatch area
 on Map16



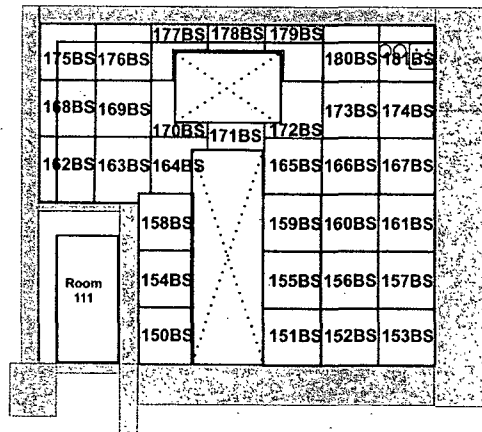
REFLECTED CEILING PLAN



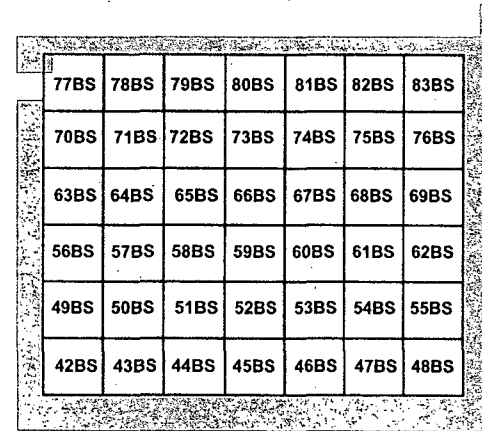
 SMUD	<p>Rooms 112 and 139 Floor and Ceiling Beta Scans F8130991 - M2</p>
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Grids on the south wall are 0.925m x 0.934m with the exception of the grids surrounding the openings which follow the boundary of the opening.

West wall is a 6 x 7 grid pattern.



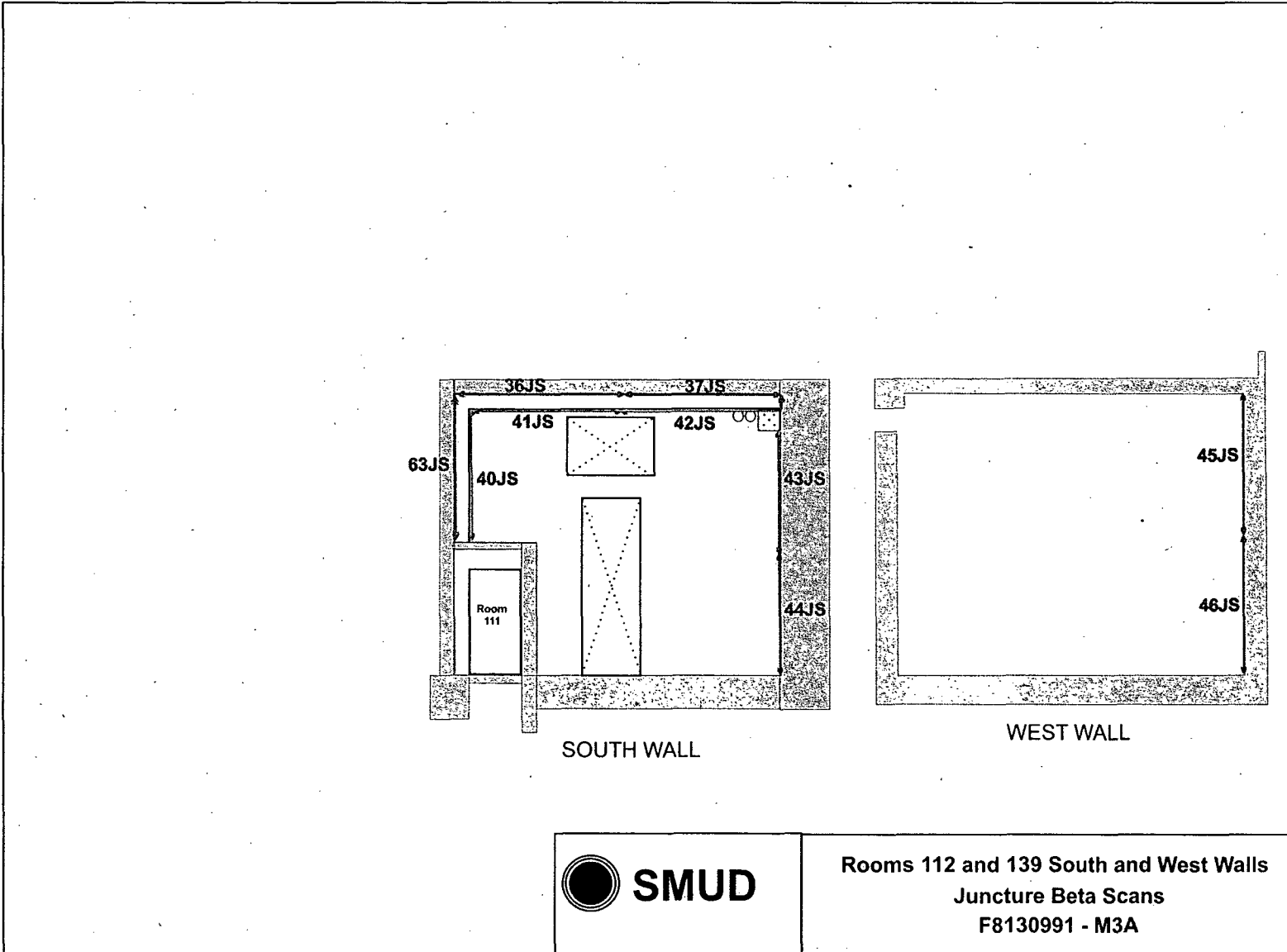
SOUTH WALL




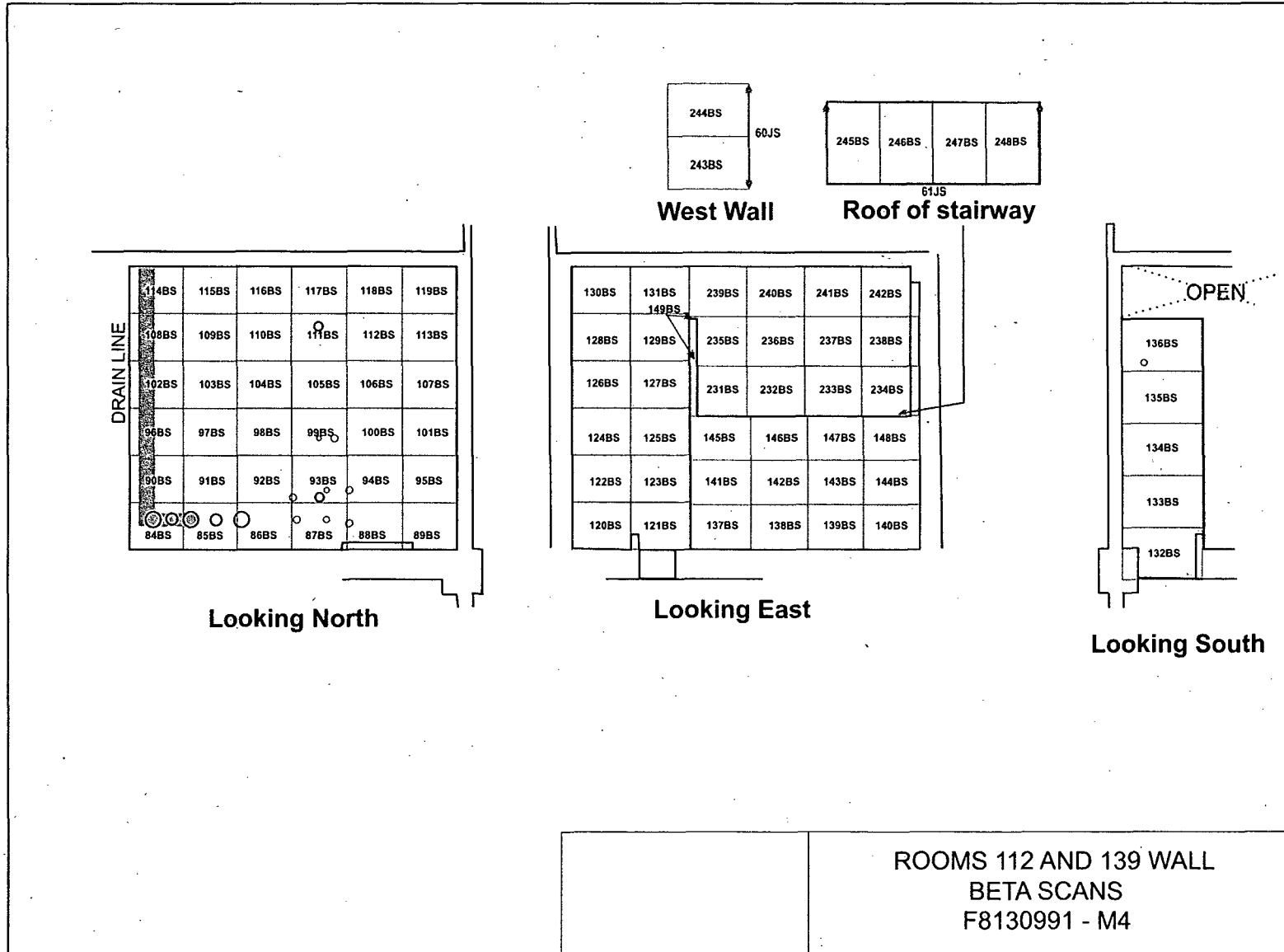
WEST WALL



Rooms 112 and 139 South and West Walls
Beta Scans
F8130991 - M3



 SMUD	Rooms 112 and 139 South and West Walls Juncture Beta Scans F8130991 - M3A
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Room 112 Northwest Lower



01PS

02PS

03PS

04PS

05PS

06PS

09PS

08PS

07PS

10PS

11PS

12PS

13PS

14PS

15PS

31JS

32JS

F8130991 - M5

Room 112 Northeast Upper

17PS

34JS

35JS

20PS

18PS

47JS

48JS

56PS

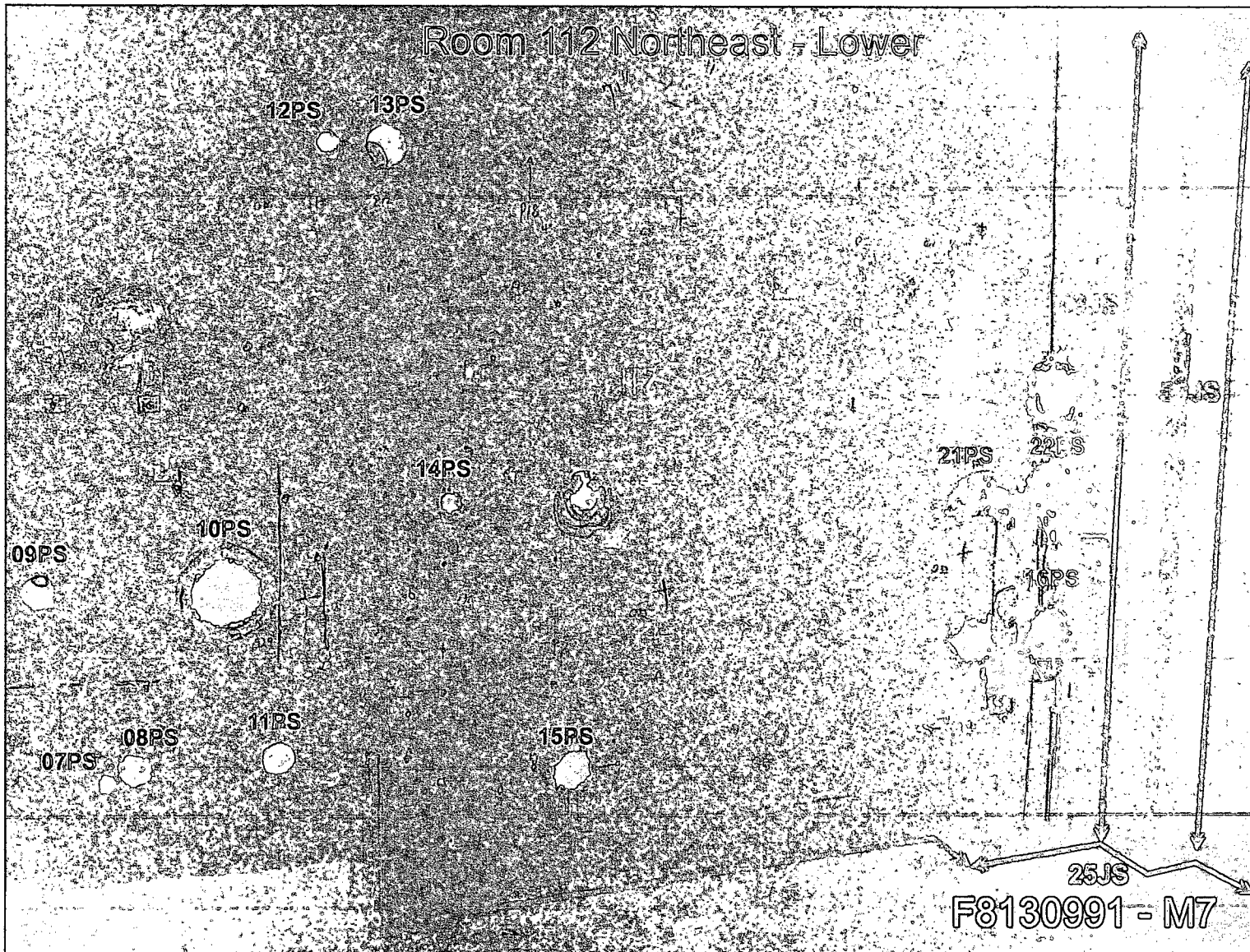
20PS

49JS

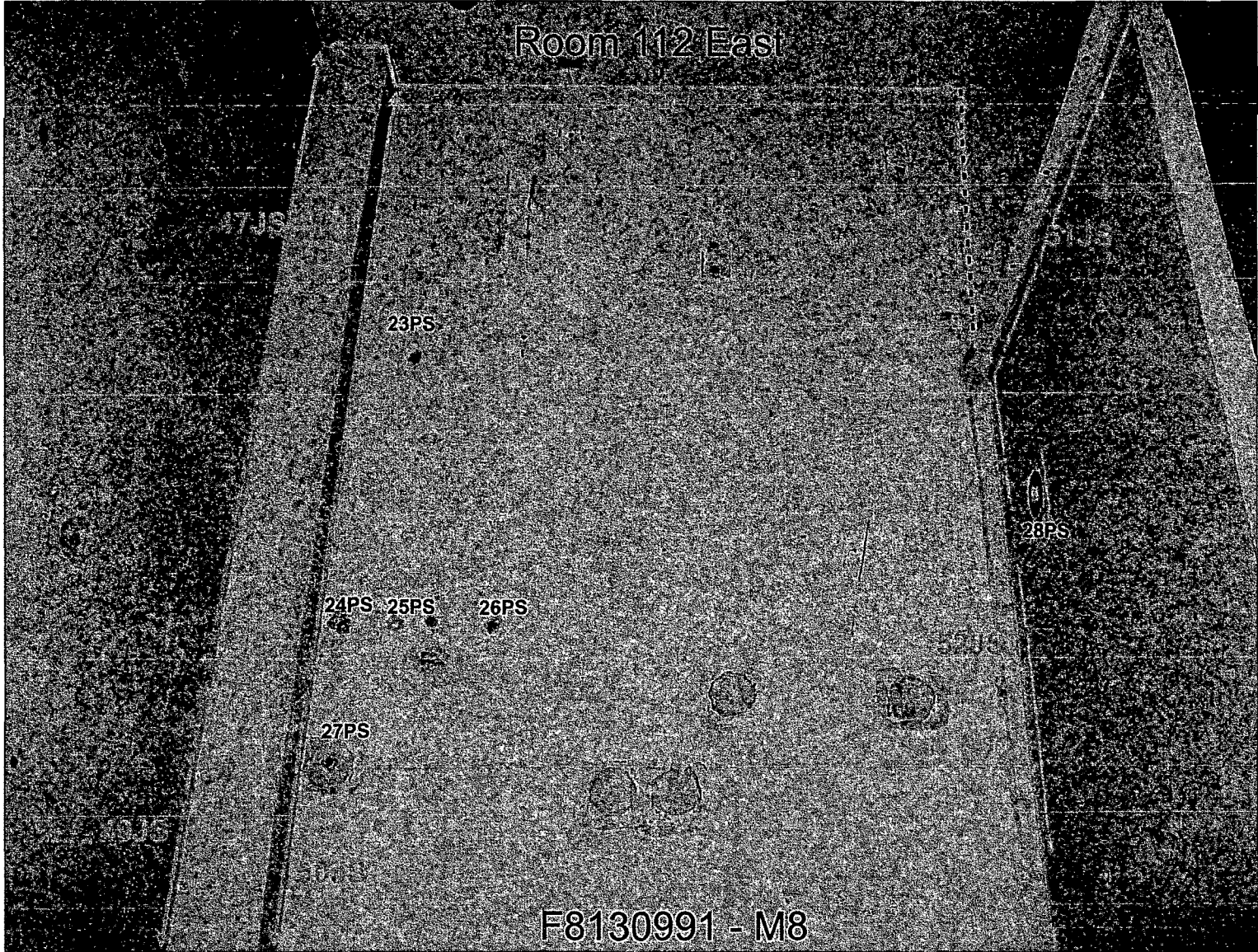
50JS

F8130991

Room 112 Northeast - Lower



F8130991 - M7



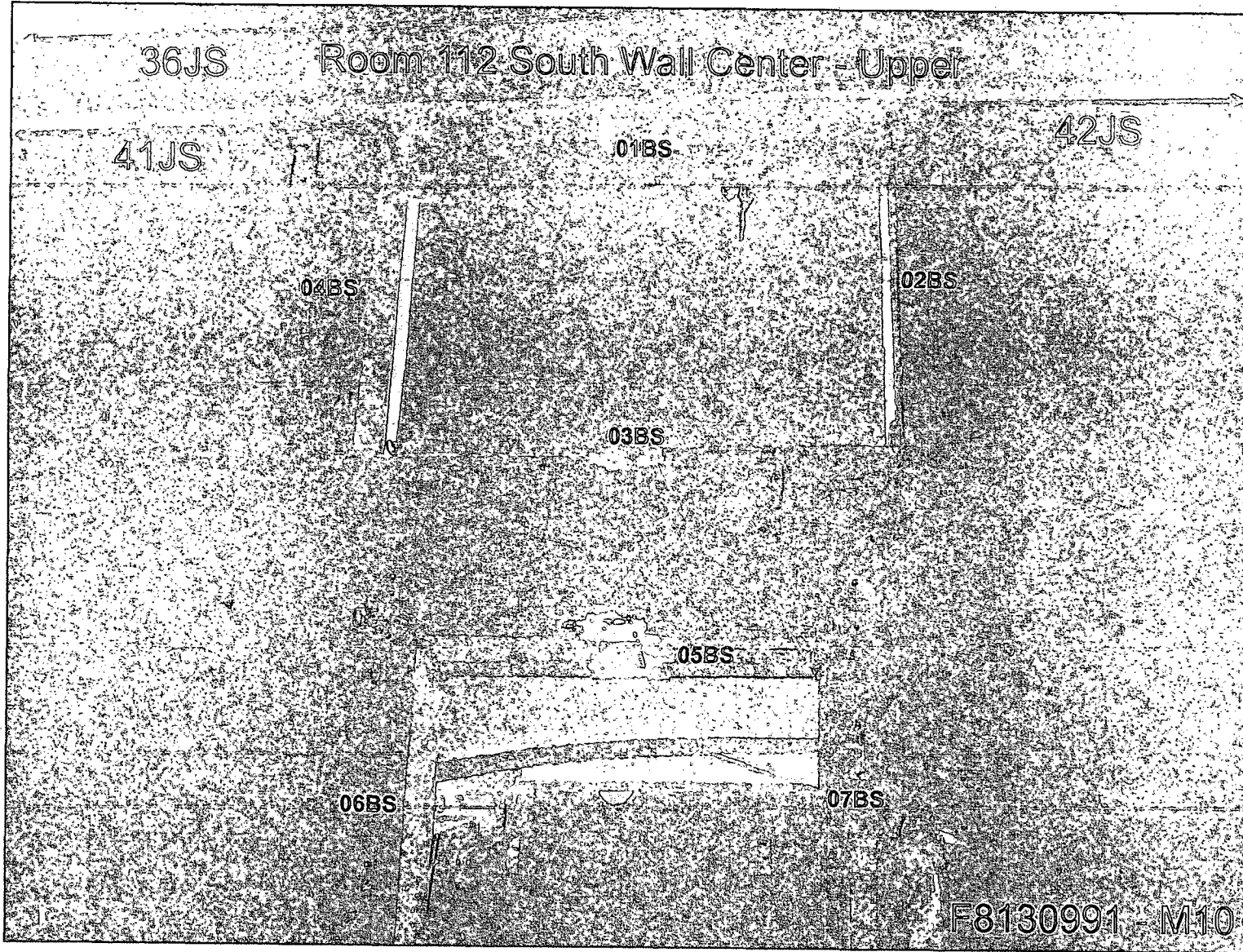
F8130991 - M8

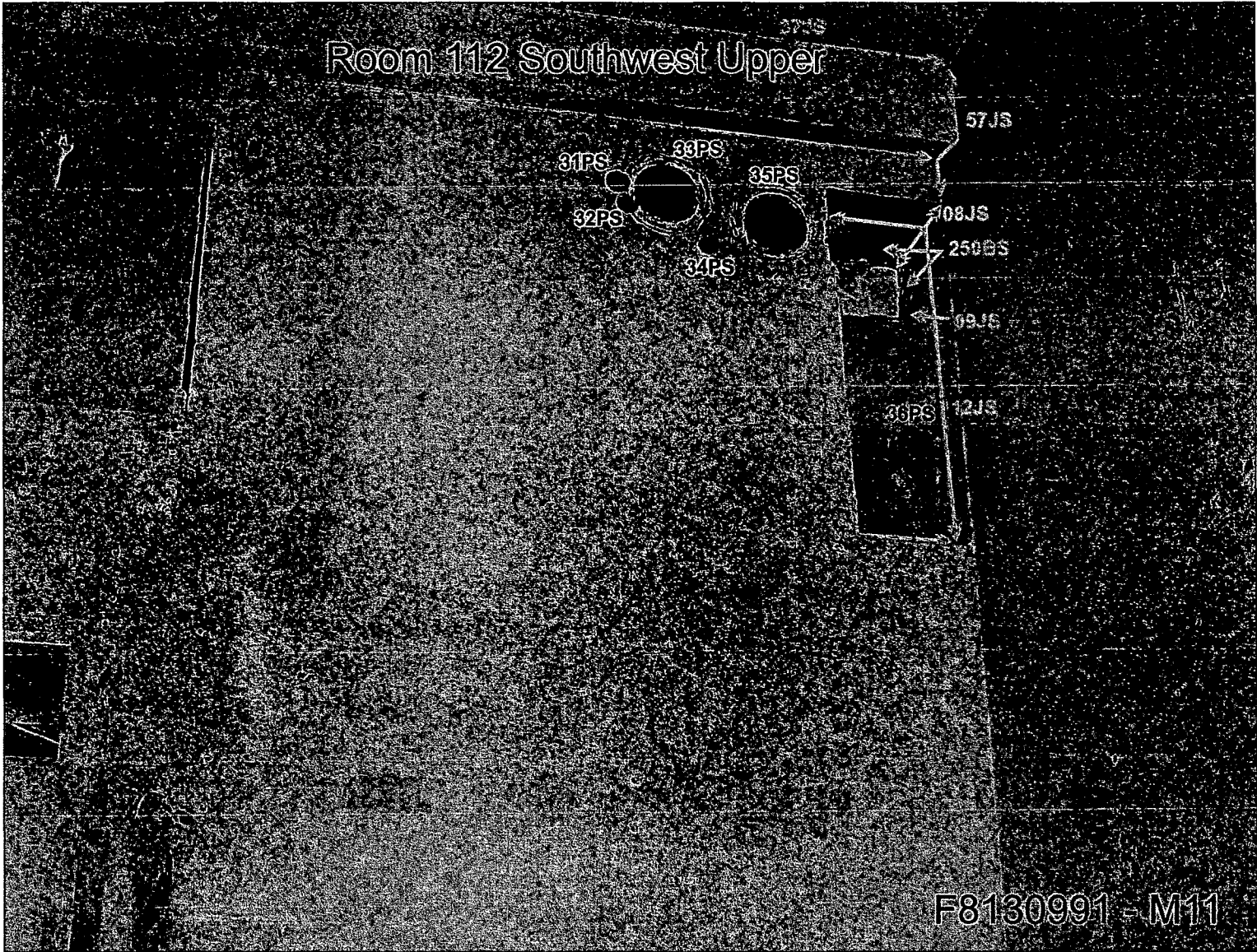
Room 112 Southeast

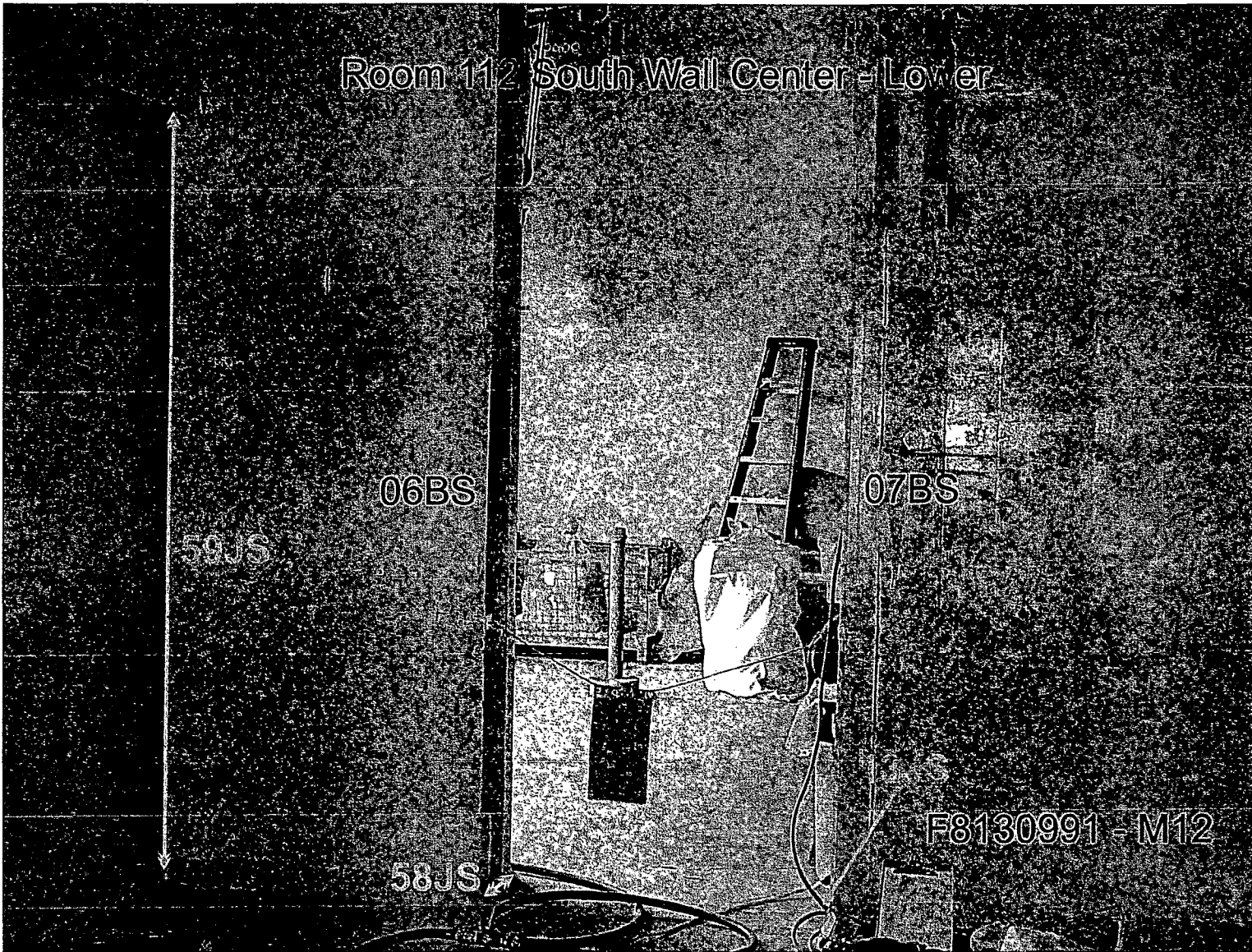
29PS

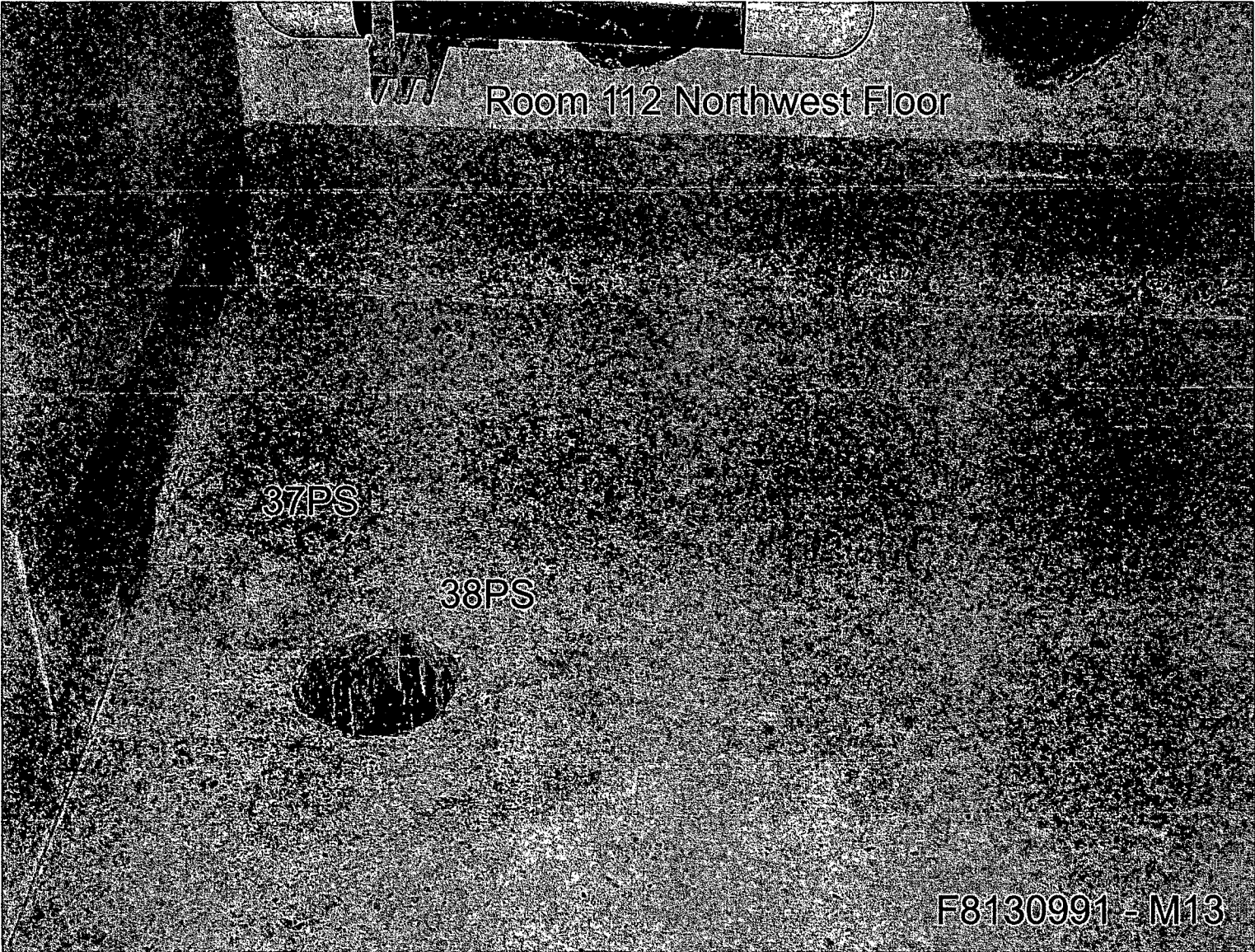
30PS

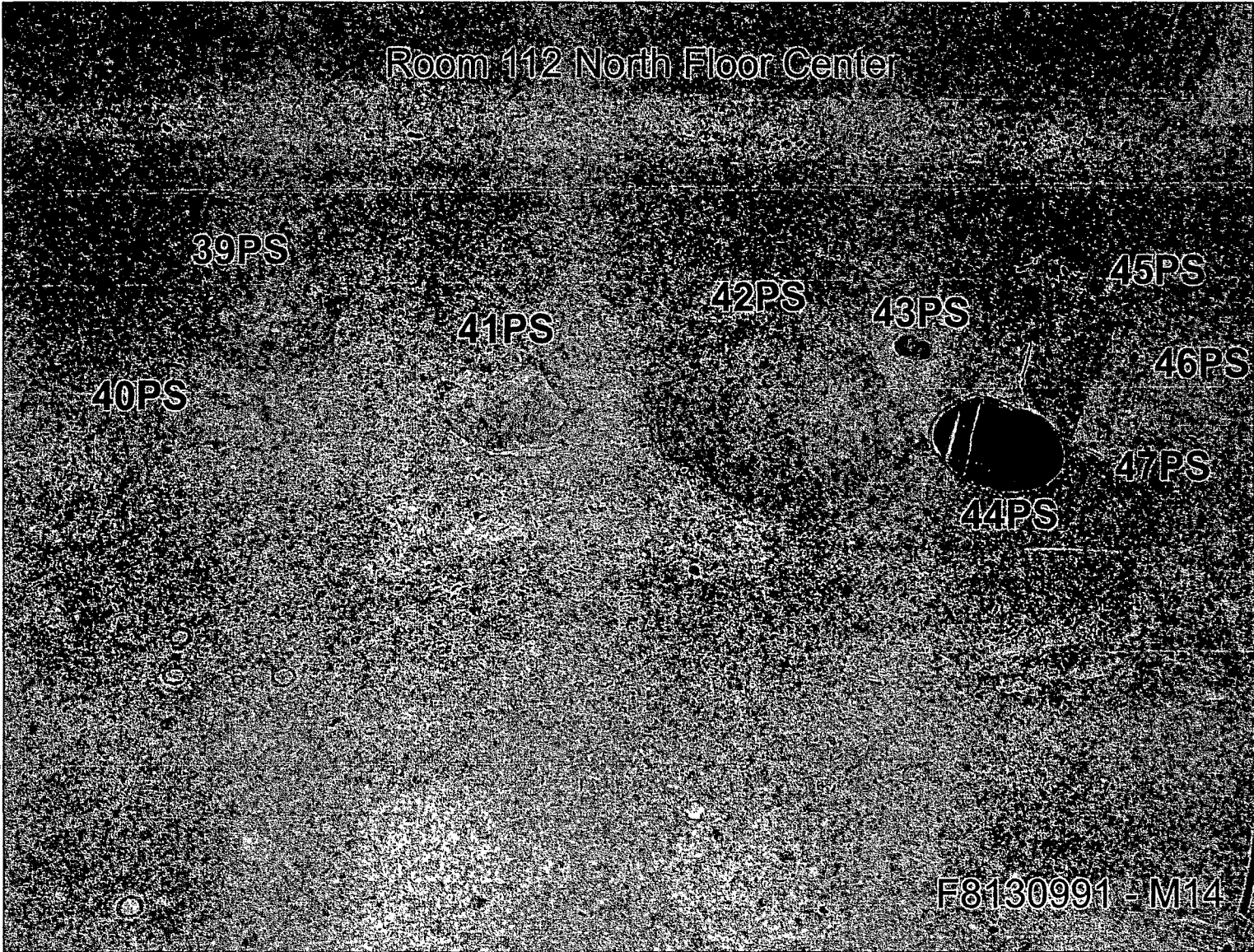
F8130991 - M9

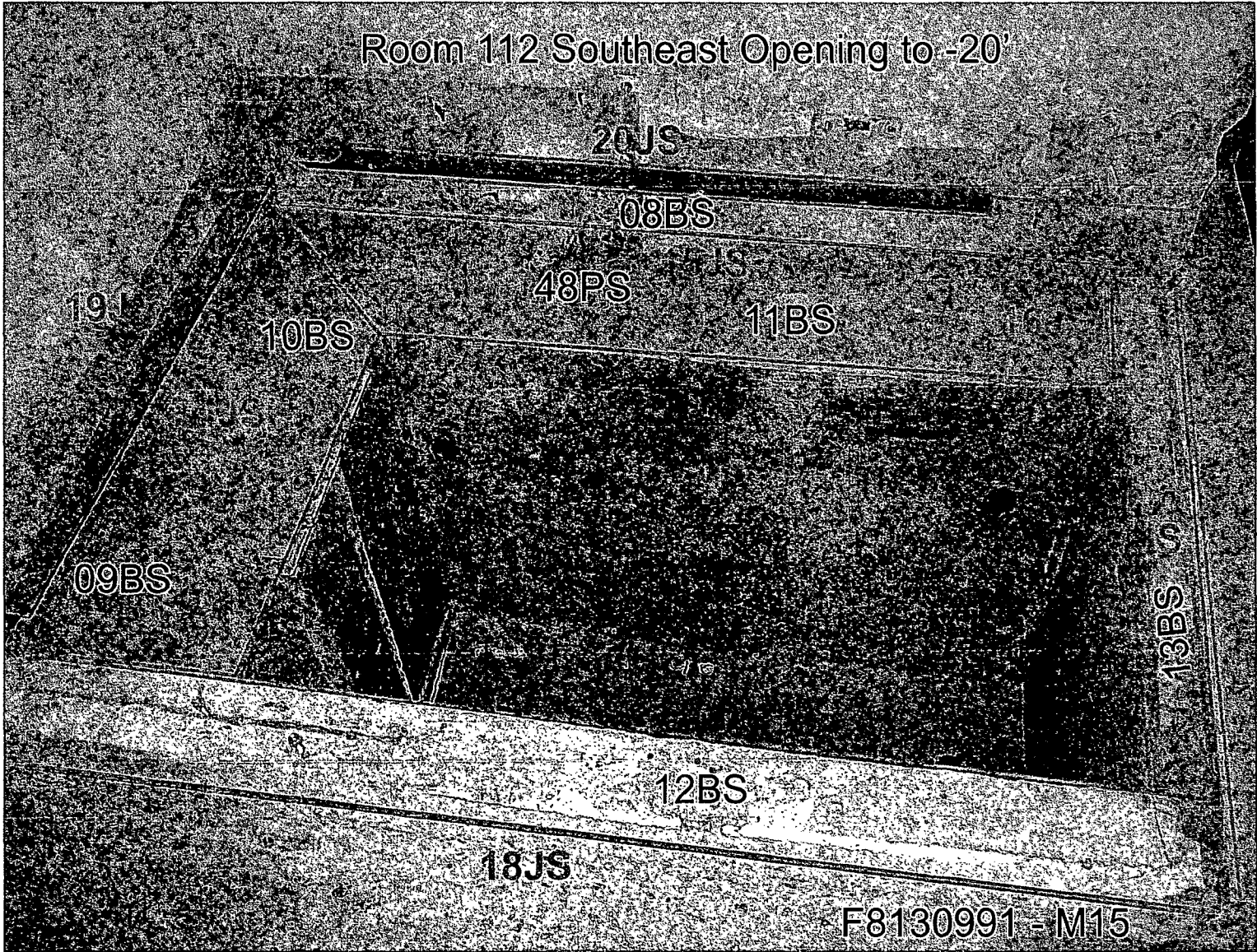


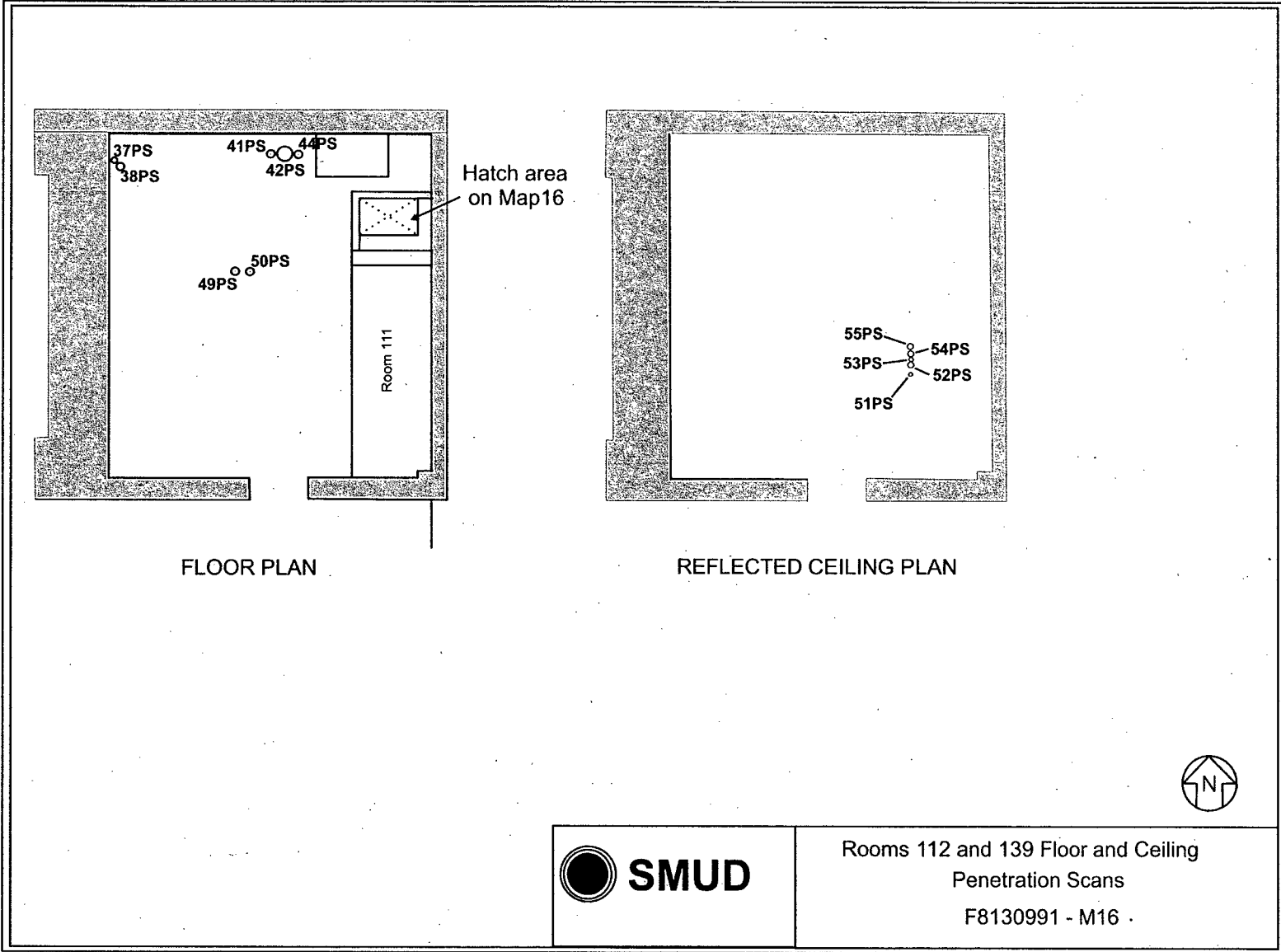













 SMUD	Rooms 112 and 139 Floor and Ceiling Penetration Scans F8130991 - M16
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Attachment 2

Instrumentation

February 5, 2008

Survey Unit F8130991

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; 180733	43-98B; 148638 ¹¹	350	630
M2350; 180733	43-98B; 148638 ¹²	550	990
M2350; 180733	43-98B; 148638 ¹³	820	1490
M2350; 180733	43-98B; 148638 ¹⁴	930	1680
M2350; 180733	43-98B; 148638 ¹⁵	1400	2520
M2350; 180733	43-98B; 148638 ¹⁶	1400	2520
M2350; 180733	43-94B; 148620 ⁷	950	1660
M2350; 180733	43-94B; 148620 ⁸	1550	2710
M2350; 180733	43-94B; 148620 ⁹	1610	2800
M2350; 180733	43-94B; 148620 ¹⁰	2630	4580
M2350; 142515	43-68B; 148453 ¹	433	1033
M2350; 142515	43-68B; 148453 ⁵	257	612
M2350; 180738	43-68/5B; 148942 ¹	433	1033
M2350; 142499	43-37B; 148502 ⁴	198	616
M2350; 142515	43-116-1B; 256007 ²	491	739
M2350; 180738	43-116-1B; 216007 ³	796	5895
M2350; 180738	43-116-1B; 216073 ²	491	739
Tennelec; 0401171	N/A	5 dpm α, 11 dpm β	N/A

¹43-68B Concrete Surface

³43-116-1B Concrete Surface

⁵43-68B Metal Surfaces

⁷43-94B 2" Metal Scan

⁹43-94B 2" Concrete Scan

¹¹43-98B 2" Metal Scan

¹³43-98B 4" Metal Scan

¹⁵43-98B 4" Concrete Scan

²43-116-1B Concrete Junctures

⁴43-37B Concrete Surface

⁶43-94B 1" Metal Scan

⁸43-94B 3" Metal Scan

¹⁰43-94B 3" Concrete Scan

¹²43-98B 3" Metal Scan

¹⁴43-98B 3" Concrete Scan

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	150500
Investigation Criteria – Scan	150500
DCGL _w	43000
DCGL _{EMC}	150500

Attachment 3

Investigation

February 5, 2008

Survey Unit F8130991

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>
15BS	4700	21204	960	1	15.8	679400	11949	<DCGL
27JS	14900	25746	574	1	15.8	679400	5787	<DCGL
Survey Unit Remainder						DCGL =	SU Mean =	N/A
EMC Unity Sum								N/A

Investigations were performed on the following grids.

Grid P0015BS is a penetration that exceeded the DCGL_{emc} investigation level of 4700 cpm with a count rate of 21204 cpm. The penetration was core bored to remove the activity and resurveyed with a resulting count rate of 960 cpm resulting in a final value for the survey of 11949 dpm/100cm² below the DCGL_w.

Grid C0027BS is a juncture that exceeded the DCGL_{emc} investigation level of 14900 cpm with a count rate of 25746 cpm. The juncture was remediated to remove the activity and resurveyed with a resulting count rate of 574 cpm resulting in a final value for the survey of 5787 dpm/100cm² below the DCGL_w.

Attachment 4

Data Assessment

February 5, 2008

Survey Unit F8130991

