

Rancho Seco

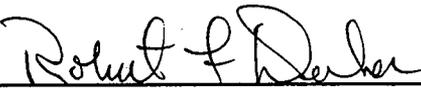
Final Status Survey Summary Report

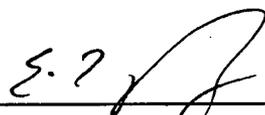
July 1, 2008

AB - Pump Alley column 11.7 south above -25'7" elevation

Survey Unit F8130471

Prepared By: Dan A. Tallman  Date: July 2, 2008
FSS Engineer

Reviewed By: Robert F. Decker  Date: 7/2/08
Lead FSS Engineer

Approved By: E. P. [Signature]  Date: 7-30-08
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130471, AB - Pump Alley column 11.7 south above -25'7" elevation

Survey Unit Description:

Operating History: The Auxiliary Building is a reinforced concrete structure that 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.

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 -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. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, Survey Unit 813047, within the interior of the auxiliary building was determined to be a Class 1 area.

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 280.9 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	AB - Pump Alley column 11.7 south above -25'7" elevation
Survey Unit:	0471	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	280.9	
Evaluator:	D.A.Tallman	
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	3.5	Class 1
Design DCGL_{mc} (dpm/100 cm²):	154370	Class 1
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	10204	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	6.85	Class 1
Scan Area (m²):	280.9	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.97725	
Calculated Relative Shift:	2.1	
Relative Shift Used:	2.0	Uses 3.0 if Relative Shift is >3
N-Value:	12	
Design N-Value + 20%:	15	NUREG-1575 Table 5-5
Design Min Samples N:	41	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 43 direct measurements were made in F8130471. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Two of the scan measurements indicated areas of elevated activity. Beta Scan activity ranged from 2409 to 12410 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. *In-vivo* gamma scans of two grids (13 and 49) exceeded the investigation level with observed activities of 71,800 dpm/100 cm², and 68,600 dpm/100 cm² respectively. 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)
F8130471-C0001BD	1888
F8130471-C0002BD	2039
F8130471-C0003BD	1561
F8130471-C0004BD	1764
F8130471-C0005BD	1364
F8130471-C0006BD	1302
F8130471-C0007BD	4648
F8130471-C0008BD	2563
F8130471-C0009BD	1836
F8130471-C0010BD	3128
F8130471-C0011BD	2277
F8130471-C0012BD	1841
F8130471-C0013BD	3185
F8130471-C0014BD	1940
F8130471-C0015BD	1867
F8130471-C0016BD	1914
F8130471-C0017BD	1826
F8130471-C0018BD	1758
F8130471-C0019BD	2199
F8130471-C0020BD	1727
F8130471-C0021BD	1582
F8130471-C0022BD	1847
F8130471-C0023BD	1862
F8130471-C0024BD	1385
F8130471-C0025BD	1561
F8130471-C0026BD	2075
F8130471-C0027BD	1608
F8130471-C0028BD	1769
F8130471-C0029BD	1722
F8130471-C0030BD	1484
F8130471-C0031BD	1930
F8130471-C0032BD	1826
F8130471-C0033BD	1644
F8130471-C0034BD	2552
F8130471-C0035BD	2153
F8130471-C0036BD	1743
F8130471-C0037BD	4274
F8130471-C0038BD	2557
F8130471-C0039BD	4082
F8130471-C0040BD	2910
F8130471-C0041BD	2324
F8130471-C0042BD	6795
F8130471-C0043BD	3377
Mean:	2272
Median:	1867
Standard Deviation:	1045
Range:	1302 - 6795

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm ²)
F8130471C0001SM	-2.24
F8130471C0002SM	-0.95
F8130471C0003SM	-3.53
F8130471C0004SM	-0.95
F8130471C0005SM	6.8
F8130471C0006SM	-2.24
F8130471C0007SM	301.25
F8130471C0008SM	42.96
F8130471C0009SM	10.68
F8130471C0010SM	6.8
F8130471C0011SM	14.55
F8130471C0012SM	4.22
F8130471C0013SM	37.8
F8130471C0014SM	21.01
F8130471C0015SM	11.97
F8130471C0016SM	72.67
F8130471C0017SM	128.2
F8130471C0018SM	27.46
F8130471C0019SM	94.62
F8130471C0020SM	26.17
F8130471C0021SM	5.51
F8130471C0022SM	45.55
F8130471C0023SM	11.97
F8130471C0024SM	-0.95
F8130471C0025SM	10.68
F8130471C0026SM	77.83
F8130471C0027SM	4.22
F8130471C0028SM	4.22
F8130471C0029SM	1.64
F8130471C0030SM	26.17
F8130471C0031SM	1.64
F8130471C0032SM	73.96
F8130471C0033SM	39.09
F8130471C0034SM	4.22
F8130471C0035SM	6.8
F8130471C0036SM	32.63
F8130471C0037SM	0.34
F8130471C0038SM	15.84
F8130471C0039SM	24.88
F8130471C0040SM	22.3
F8130471C0041SM	8.09
F8130471C0042SM	-0.95
F8130471C0043SM	9.38
Mean:	28.43
Median:	10.68
Standard Deviation:	51.46
Range:	-3.53 to 301.25

Survey Unit Data Assessment:

The survey design required 43 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):	43		
Median (dpm/100 cm ²):	1867		
Mean (dpm/100 cm ²):	2272		
Direct Measurement Standard Deviation (dpm/100 cm ²):	1045		
Total Standard Deviation (dpm/100 cm ²):	1045		Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	6795		Background Subtract Not Applied
Material Type:	N/A		
Sign Test Final N Value:	43		
S+ Value:	43		
Critical Value:	27		
Sufficient Samples Collected:	Yes		
Maximum Value < DCGL:	Yes		
Median Value < DCGL:	Yes		
Mean Value < DCGL:	Yes		
Maximum Value < DCGL_{emc}:	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:

Two (2) investigations (scan grids GS13 and GS49) 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 (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. 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. The investigations required were performed and documented.

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.

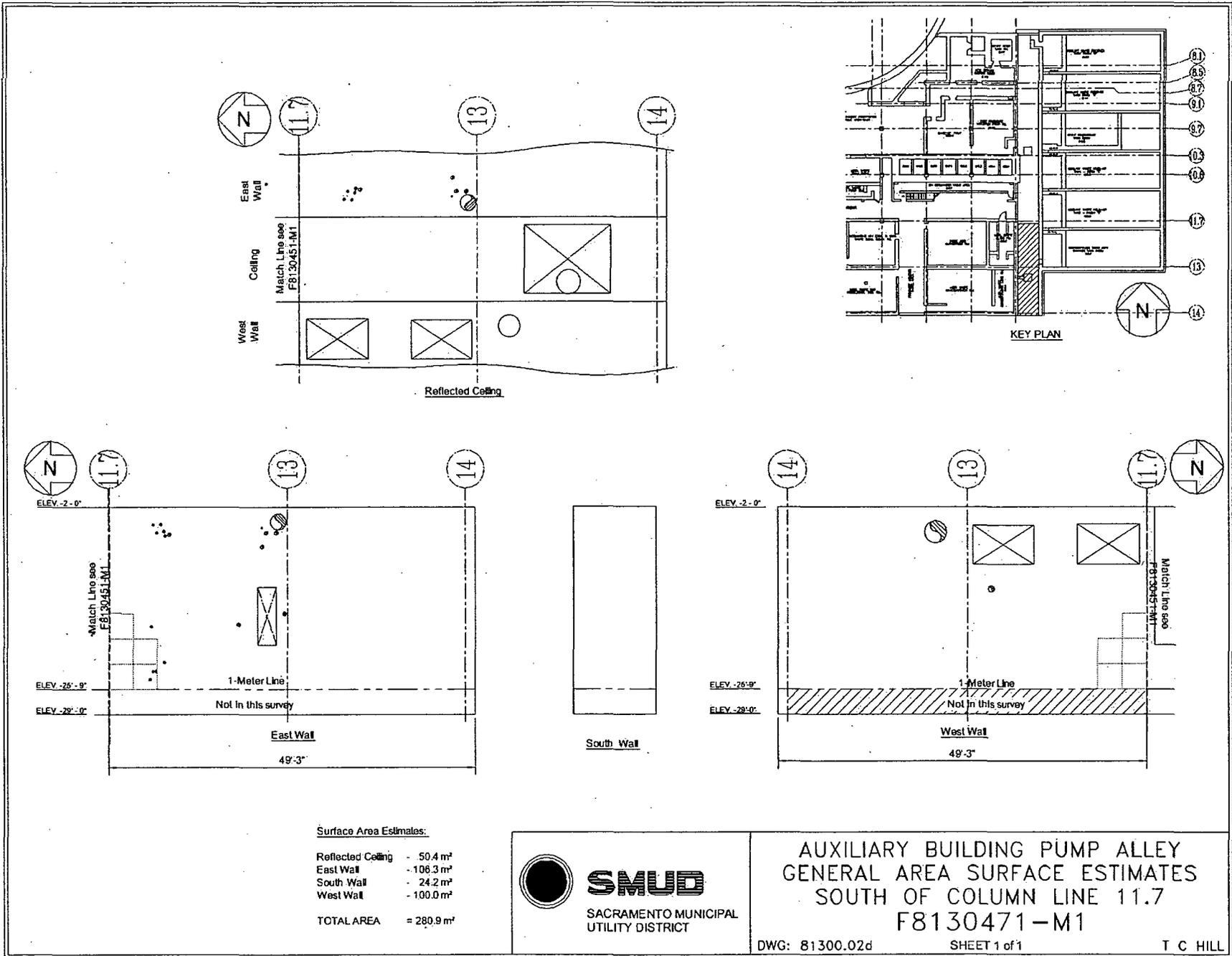
It is concluded that survey unit F8130471 meets the release criteria of 10CFR20.1402.

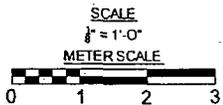
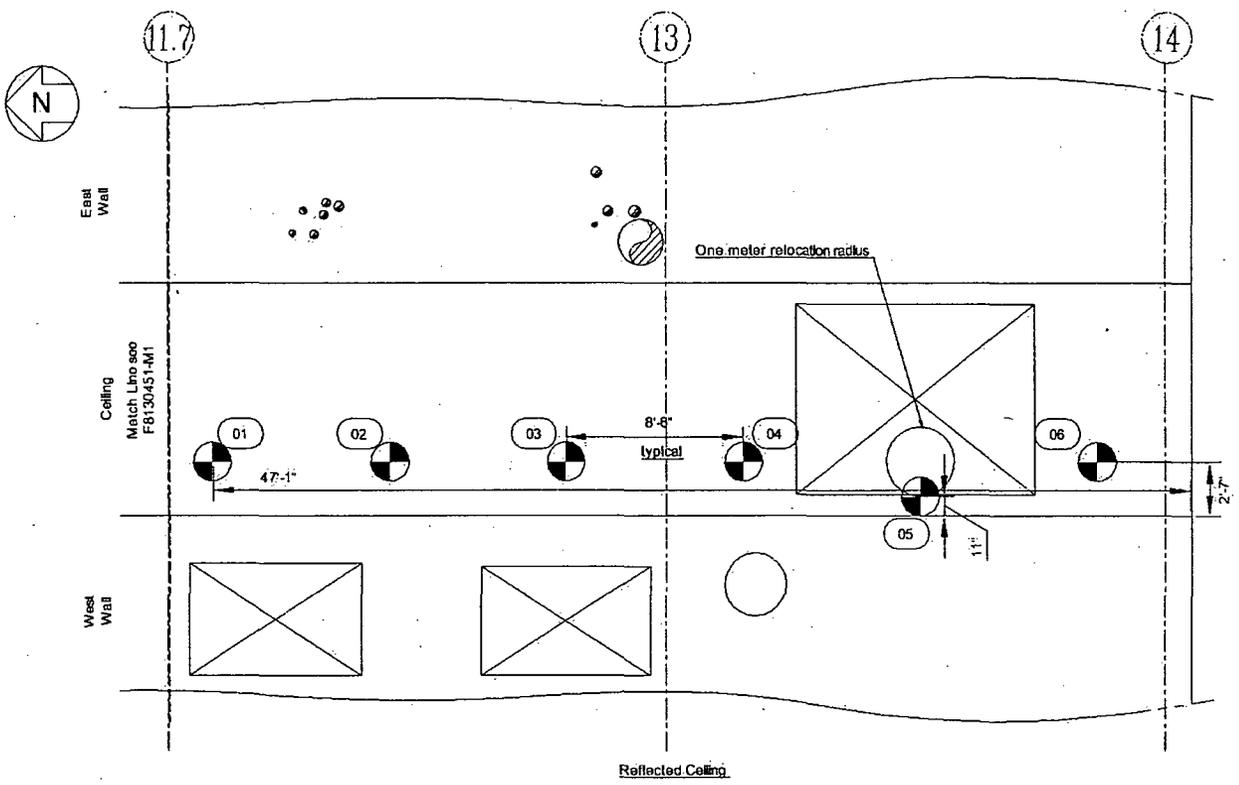
Attachment 1

Maps

July 1, 2008

Survey Unit F8130471



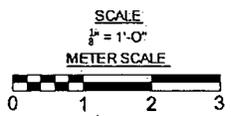
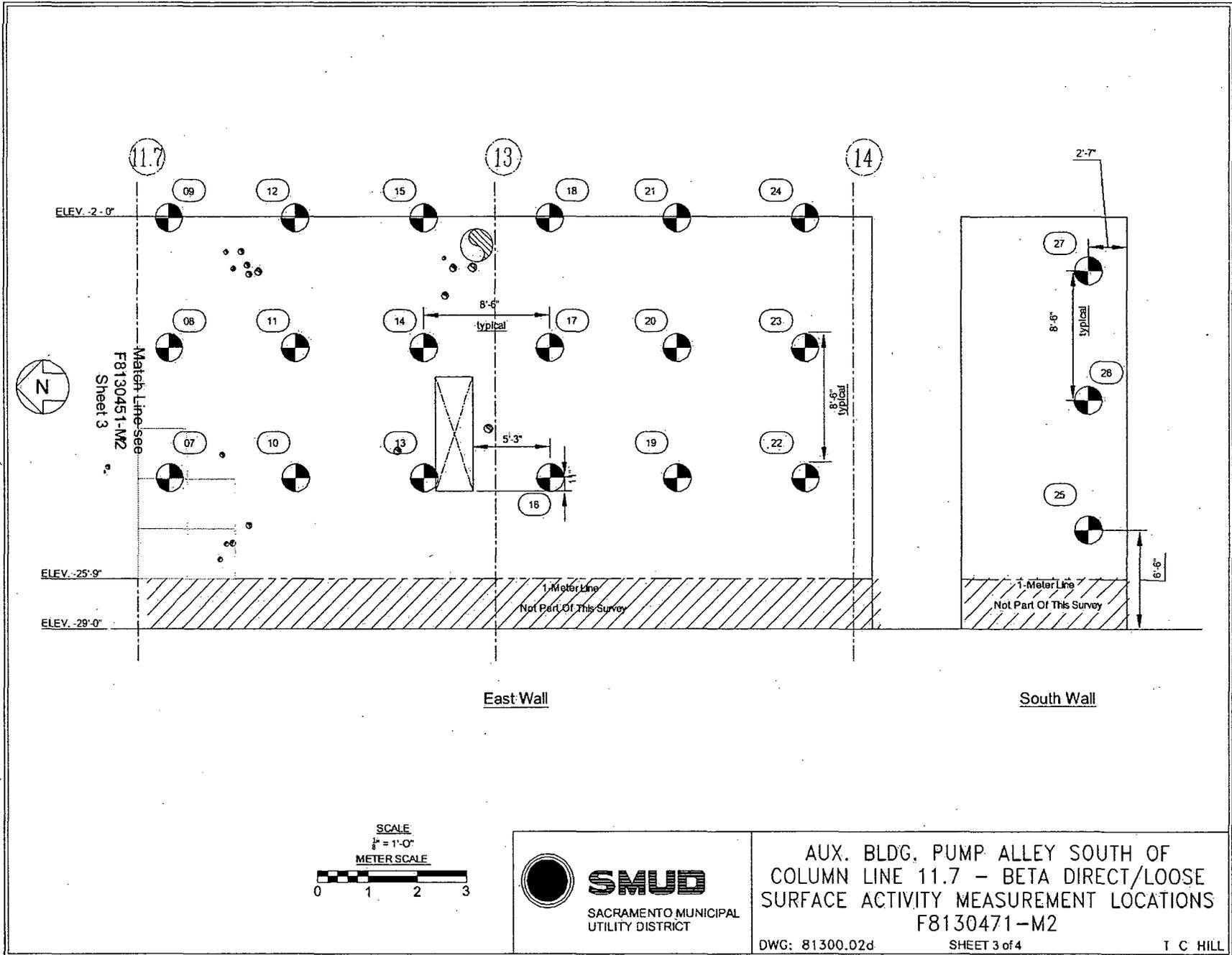


AUX. BLDG. PUMP ALLEY SOUTH OF
COLUMN LINE 11.7 - BETA DIRECT/LOOSE
SURFACE ACTIVITY MEASUREMENT LOCATIONS
F8130471-M2

DWG: 81300.02d

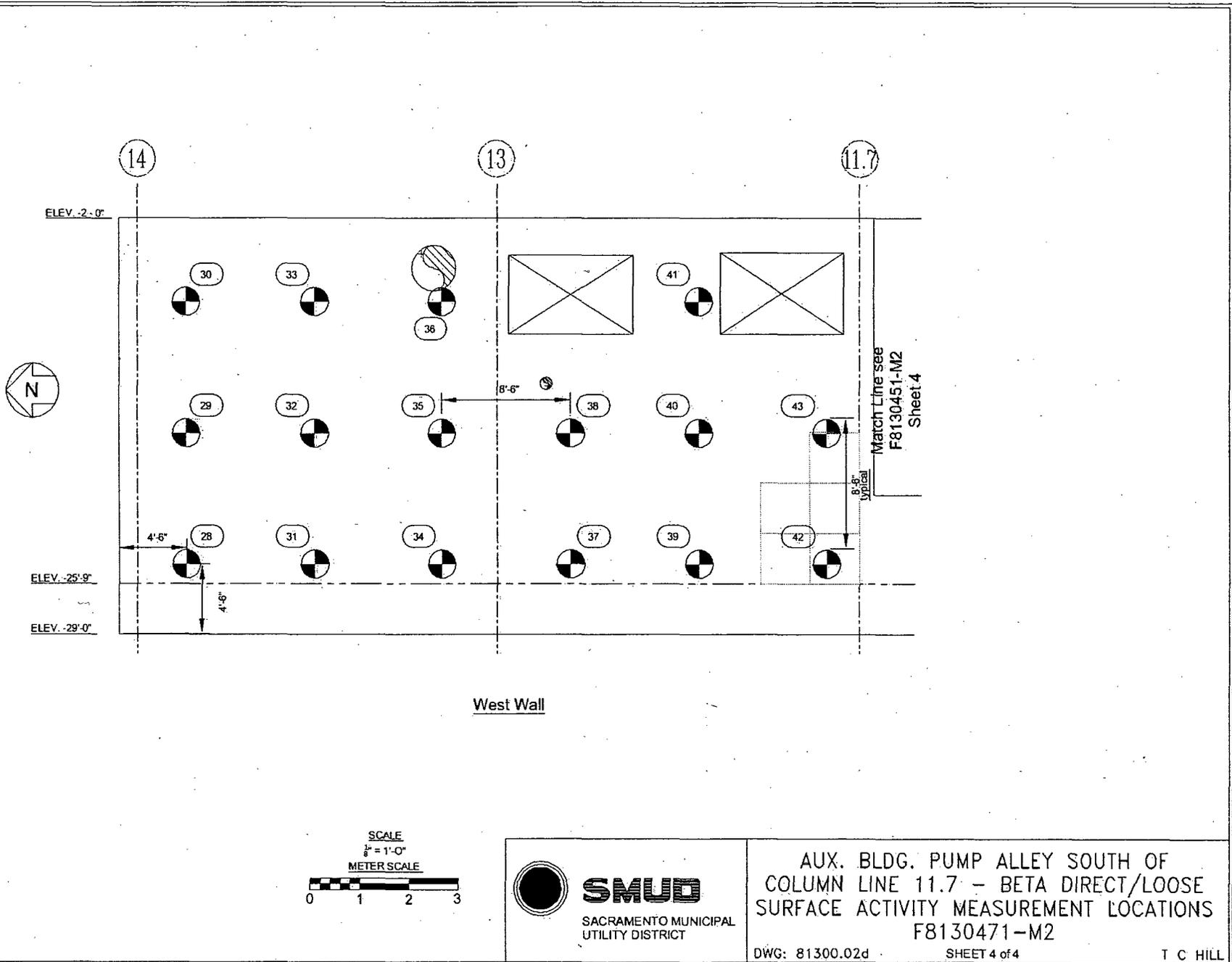
SHEET 2 of 4

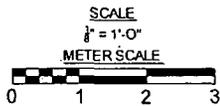
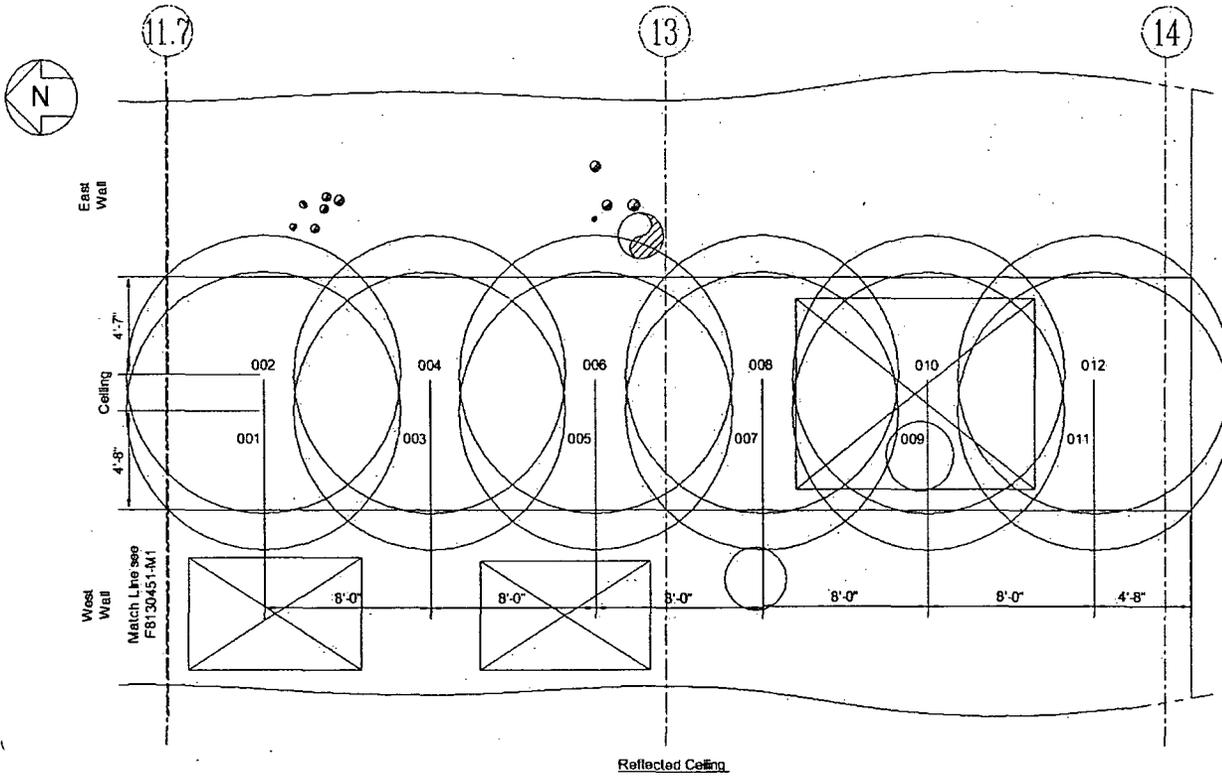
T C HILL



SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUX. BLDG. PUMP ALLEY SOUTH OF
COLUMN LINE 11.7 - BETA DIRECT/LOOSE
SURFACE ACTIVITY MEASUREMENT LOCATIONS
F8130471-M2
DWG: 81300.02d SHEET 3 of 4 T C HILL



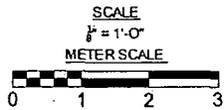
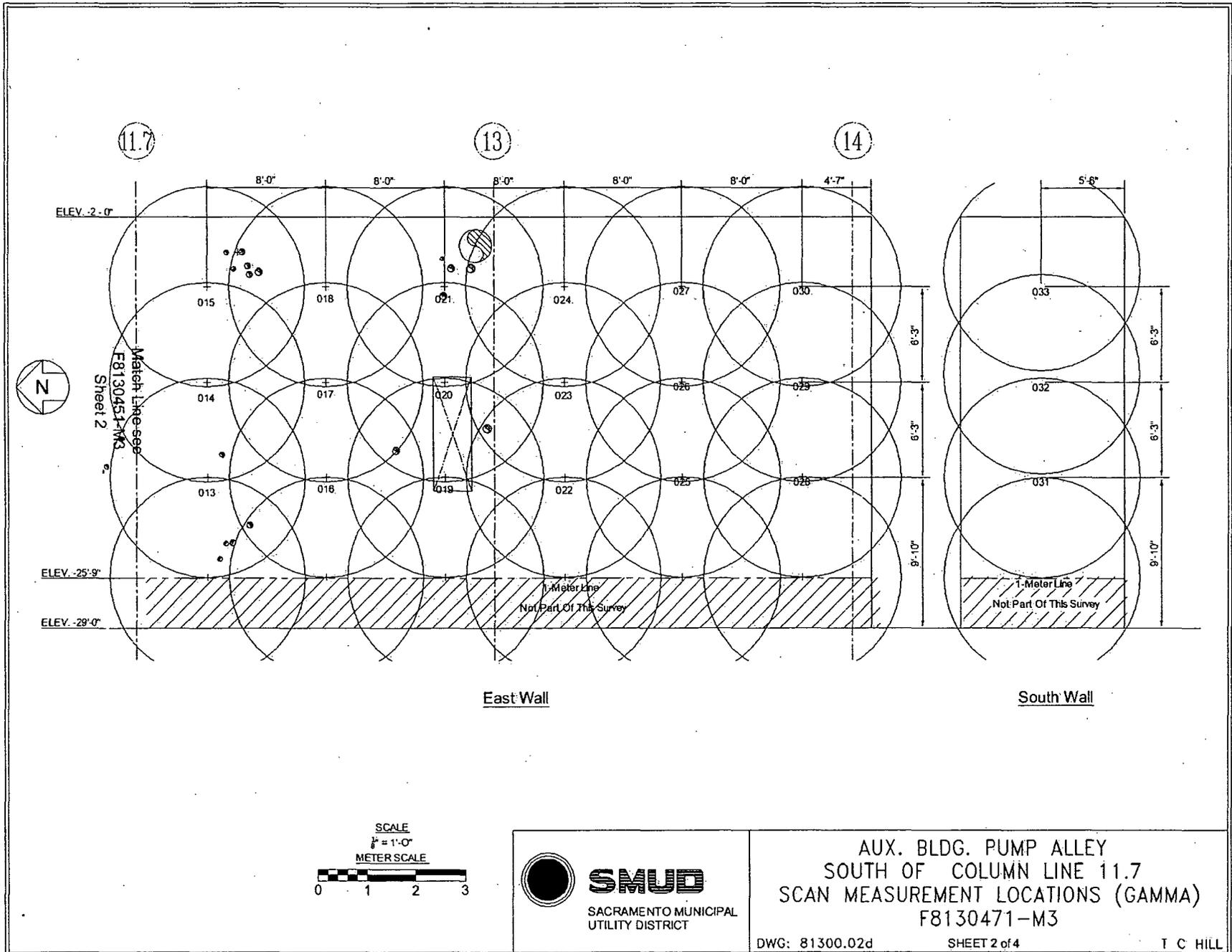


AUX. BLDG. PUMP ALLEY
 SOUTH OF COLUMN LINE 11.7
 SCAN MEASUREMENT LOCATIONS (GAMMA)
 F8130471-M3

DWG: 81300.02d

SHEET 1 of 4

T C HILL



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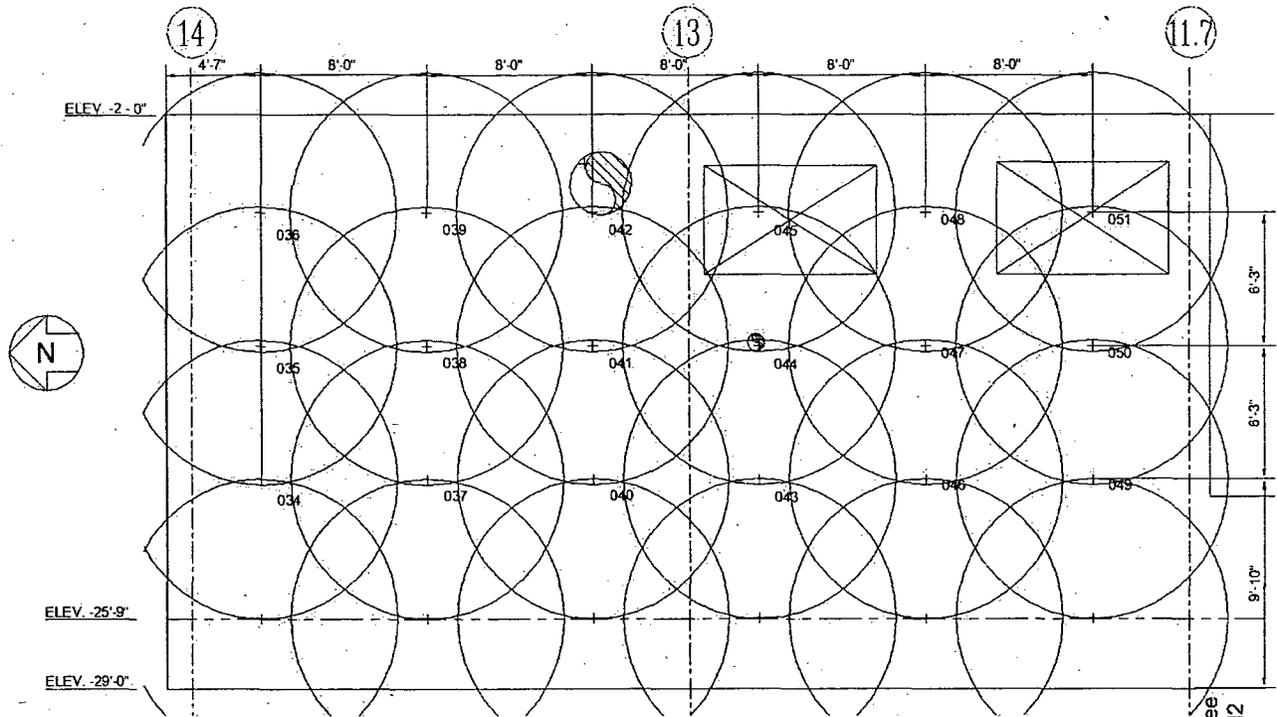
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUX. BLDG. PUMP ALLEY
SOUTH OF COLUMN LINE 11.7
SCAN MEASUREMENT LOCATIONS (GAMMA)
F8130471-M3

DWG: 81300.02d

SHEET 2 of 4

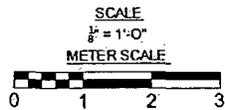
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West Wall

Gamma Scan Centered
at One Meter will be
Evaluated in
F8130461

Match Line see
F8130451-M2
Sheet 3



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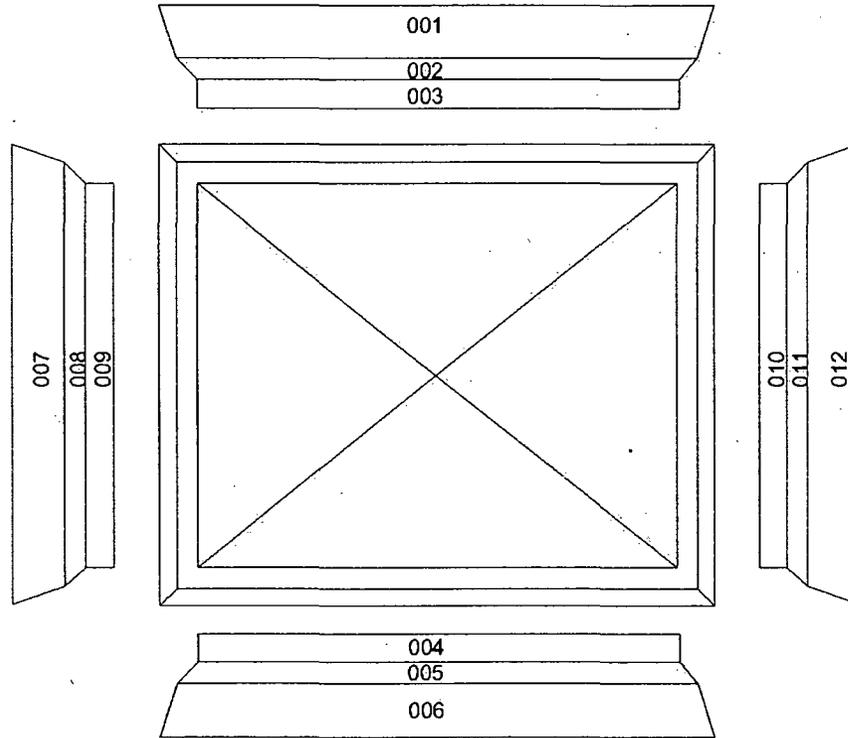
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UTILITY DISTRICT

AUX. BLDG. PUMP ALLEY
SOUTH OF COLUMN LINE 11.7
SCAN MEASUREMENT LOCATIONS (GAMMA)
F8130471-M3

DWG: 81300.02d

SHEET 3 of 4

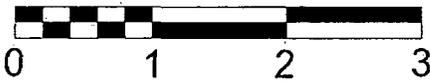
T C HILL



Sides of Ceiling Opening

CEILING PLUG CAVITY
DETAIL

SCALE
1/4" = 1'-0"
METER SCALE



SMUD

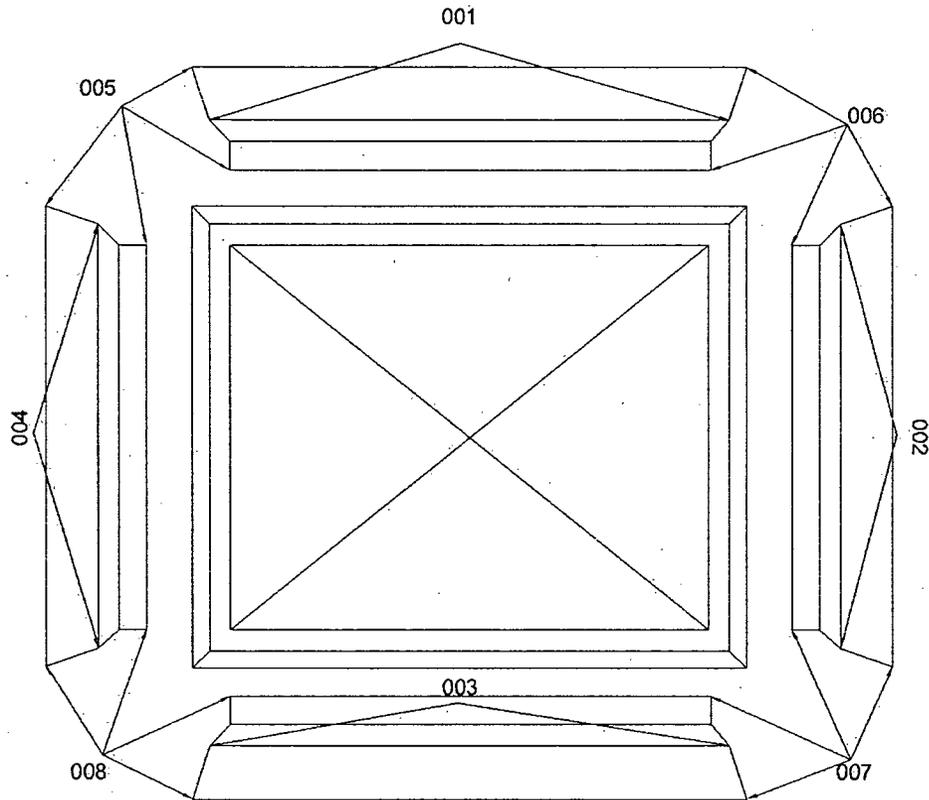
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UTILITY DISTRICT

AUX. BLDG. PUMP ALLEY
SOUTH OF COLUMN LINE 11.7
SCAN MEASUREMENT LOCATIONS (BETA)
F8130471-M3

DWG: 81300.02d

SHEET 4 of 4

T C HILL



Sides of Ceiling Opening

CEILING PLUG CAVITY
DETAIL

SCALE
1/4" = 1'-0"
METER SCALE



SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUX. BLDG. PUMP ALLEY
SOUTH OF COLUMN LINE 11.7
JUNCTURE SCAN LOCATIONS
F8130471-M4

DWG: 81300.02d

SHEET 1 of 1

T C HILL

Attachment 2

Instrumentation

July 1, 2008

Survey Unit F8130471

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; 161397	433	1033
M2350; 149789	43-116-1B; 256006 ^A	437	739
Tennelec; 0401171	N/A	6 dpm α , 12 dpm β	N/A

^A Juncture

Instrument Model; Serial No.	Detector Model; Serial No.	MDC ¹ (dpm/100 cm²)
ISOCS	1983920	1580 (Co60) 1400 (Cs137)

¹ 3920_2m_concrete geometry 12.5 m² FOV

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	154370
Investigation Criteria – Scan	154370
DCGL _W	43000
DCGL _{EMC}	154370

Instrument	Parameter	Value (dpm/100 cm²) To detect a 1 m² hot spot at the EMC Criterion within the detector field of view
ISOCS	Investigation Criteria - Concrete Scan ^{1,2}	63,300 dpm/100 cm ² Cs-137 21,275 dpm/100 cm ² Co-60

¹ 3920_2m_concrete geometry 12.5 m² FOV

² Investigation Level set at 43,000 dpm/100cm² Cs-137, ND Co-60 for investigation within survey instructions, revised during data evaluation based on LFSSE recommendation.

Attachment 3

Investigation

July 1, 2008

Survey Unit F8130471

Table 3-1 Survey Unit Investigation

<i>Grid</i>	<i>Investigation Level (dpm/100 cm²)</i>	<i>Initial Value (dpm/100 cm²)</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>
GS13	63,300 dpm/100 cm ² Cs-137	75,800 ³	1,555 ²	NA	NA	NA	11,406 ¹	NA
GS49	21,275 dpm/100 cm ² Co-60	71,800 ³	1,557 ³	NA	NA	NA	11,419 ²	NA
Comments:								
¹ Average of BS01-05 taken within boundaries of elevated measurement.								
² Average of BS06-10 taken within boundaries of elevated measurement.								
³ Total activity as calculated on F8130471 - Scan Sample Results worksheet (Co60/Cs137 summation)								
Survey Unit Remainder						DCGL = 43,000	SU Mean = 2,272	0.053
EMC Unity Sum								0.053

Attachment 4

Data Assessment

July 1, 2008

Survey Unit F8130471

