

Rancho Seco
Final Status Survey Summary Report

July 3, 2008

Chemical Storage Balcony Room 133 (Floor and Lower Walls)

Survey Unit F8131221

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131221, Chemical Storage Balcony Room 133 (Floor and Lower Walls)

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 271 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	Chemical Storage Balcony Room 133 (Floor and Lower Walls)
Survey Unit:	1221	Structure Surface
Class:	1	LTP Table 5-C
SU Area (m²):	271	
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	3.5	Class 1
Design DCGL_{me} (dpm/100 cm²):	154800	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):	6.9	Class 1
Scan Area (m²):	271	
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:	39	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 41 direct measurements were made in F8131221. 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 1419 to 124712 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)
F8131221-C0001BD	2921
F8131221-C0002BD	2546
F8131221-C0003BD	2668
F8131221-C0004BD	2326
F8131221-C0005BD	2590
F8131221-C0006BD	2943
F8131221-C0007BD	3560
F8131221-C0008BD	4652
F8131221-C0009BD	10097
F8131221-C0010BD	4475
F8131221-C0011BD	3230
F8131221-C0012BD	3020
F8131221-C0013BD	2888
F8131221-C0014BD	3274
F8131221-C0015BD	2976
F8131221-C0016BD	2601
F8131221-C0017BD	2965
F8131221-C0018BD	2701
F8131221-C0019BD	22608
F8131221-C0020BD	2734
F8131221-C0021BD	2822
F8131221-C0022BD	2800
F8131221-C0023BD	2623
F8131221-C0024BD	2888
F8131221-C0025BD	3241
F8131221-C0026BD	2227
F8131221-C0027BD	2557
F8131221-C0028BD	2690
F8131221-C0029BD	2403
F8131221-C0030BD	2546
F8131221-C0031BD	2469
F8131221-C0032BD	2491
F8131221-C0033BD	2745
F8131221-C0034BD	2745
F8131221-C0035BD	2921
F8131221-C0036BD	3086

F8131221-C0037BD	2668
F8131221-C0038BD	2778
F8131221-C0039BD	2590
F8131221-C0040BD	2634
F8131221-C0041BD	2579
Mean:	3519
Median:	2745
Standard Deviation:	3292
Range:	2227 - 22608

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8131221C0001SM	-3.53
F8131221C0002SM	-2.24
F8131221C0003SM	0.34
F8131221C0004SM	-2.24
F8131221C0005SM	4.22
F8131221C0006SM	-3.53
F8131221C0007SM	-0.95
F8131221C0008SM	1.64
F8131221C0009SM	4.22
F8131221C0010SM	2.93
F8131221C0011SM	0.34
F8131221C0012SM	1.64
F8131221C0013SM	0.34
F8131221C0014SM	-2.24
F8131221C0015SM	-0.95
F8131221C0016SM	-2.24
F8131221C0017SM	10.68
F8131221C0018SM	5.51
F8131221C0019SM	1.64
F8131221C0020SM	-4.82
F8131221C0021SM	-2.24
F8131221C0022SM	0.34
F8131221C0023SM	-2.24
F8131221C0024SM	-2.24
F8131221C0025SM	1.64
F8131221C0026SM	-3.53
F8131221C0027SM	-4.82
F8131221C0028SM	-2.24
F8131221C0029SM	-4.82
F8131221C0030SM	-0.95
F8131221C0031SM	-3.53
F8131221C0032SM	-0.95
F8131221C0033SM	-3.53
F8131221C0034SM	1.64
F8131221C0035SM	-3.53
F8131221C0036SM	-0.95
F8131221C0037SM	-3.53
F8131221C0038SM	-2.24
F8131221C0039SM	0.34
F8131221C0040SM	5.51
F8131221C0041SM	-3.53
Mean:	-0.6
Median:	-0.95
Standard Deviation:	3.31
Range:	-4.82 to 10.68

Survey Unit Data Assessment:

The survey design required 41 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):	41	
Median (dpm/100 cm ²):	2745	
Mean (dpm/100 cm ²):	3519	
Direct Measurement Standard Deviation (dpm/100 cm ²):	3292	Based on samples and backgrounds.
Total Standard Deviation (dpm/100 cm ²):	3292	
Maximum (dpm/100 cm ²):	22608	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	41	
S+ Value:	41	
Critical Value:	26	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	Class 1
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:

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.

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. 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.

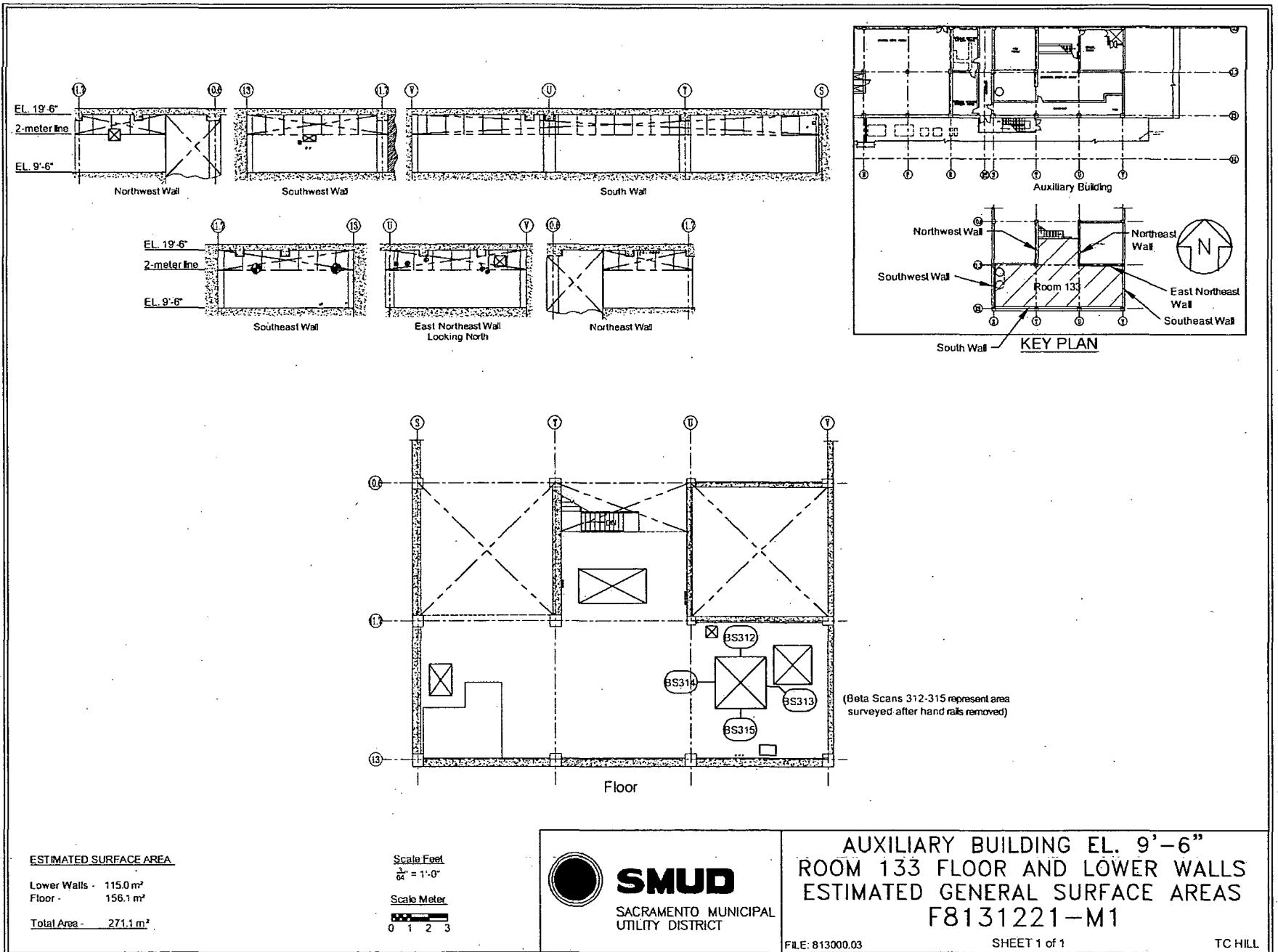
It is concluded that survey unit F8131221 meets the release criteria of 10CFR20.1402.

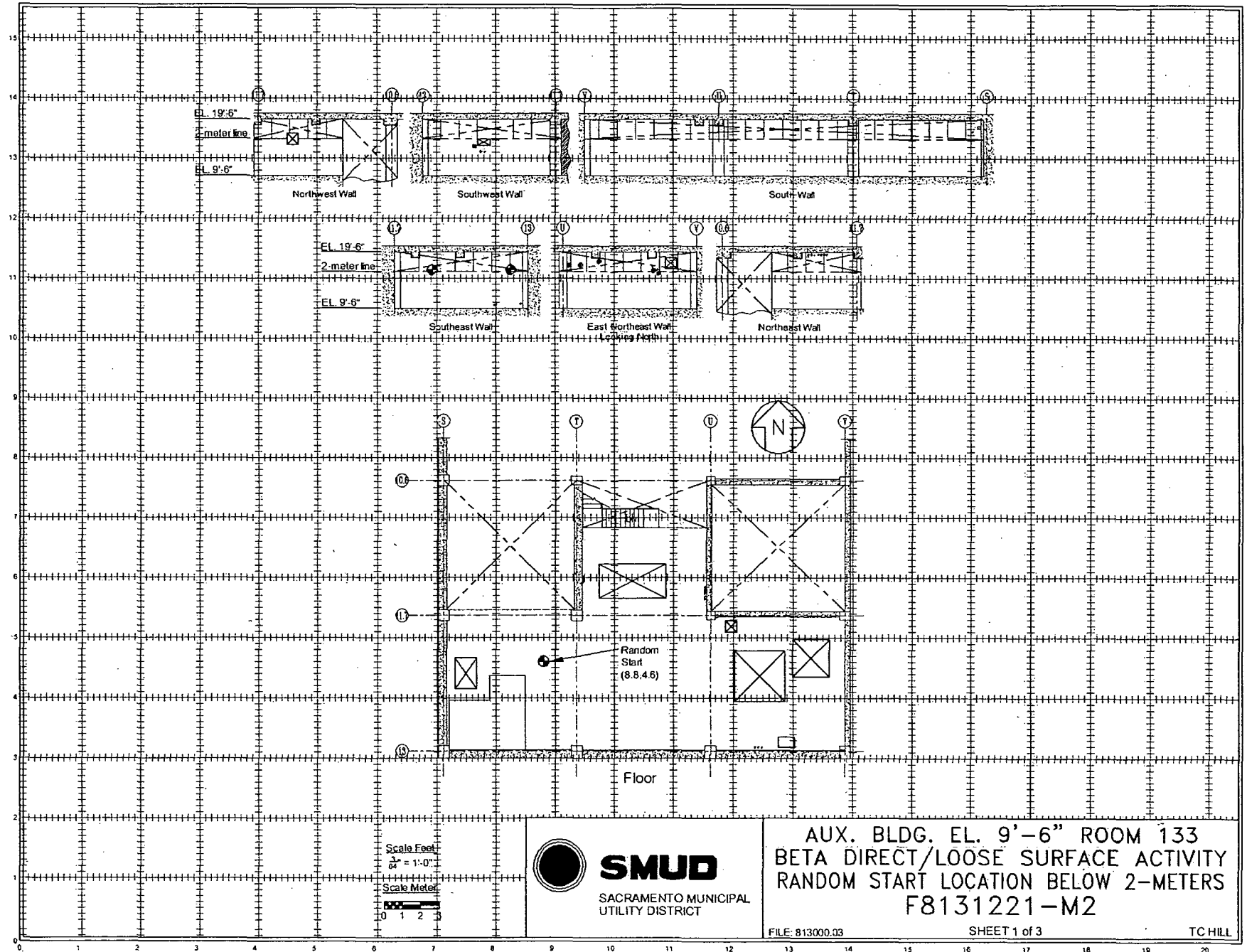
Attachment 1

Maps

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Survey Unit F8131221



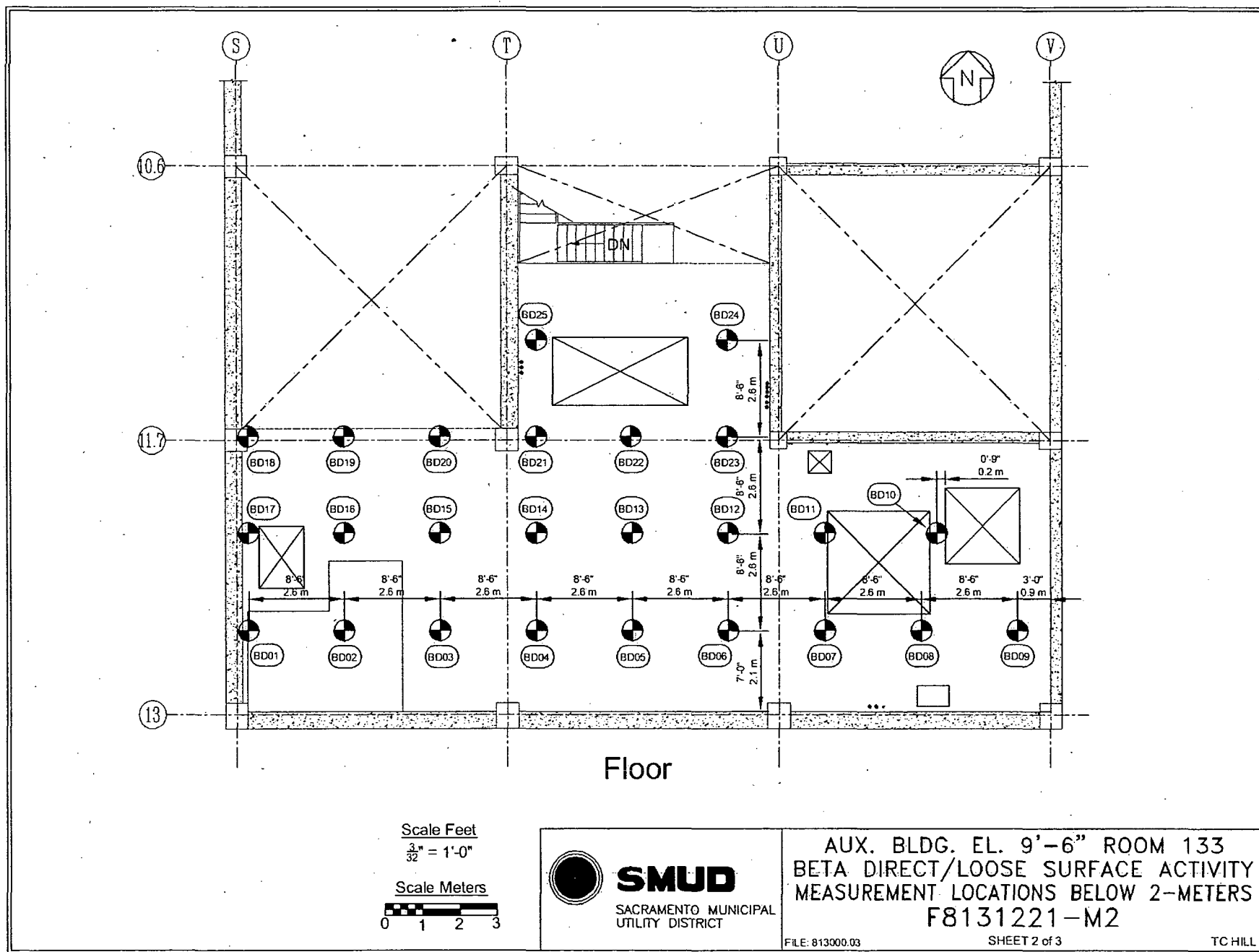


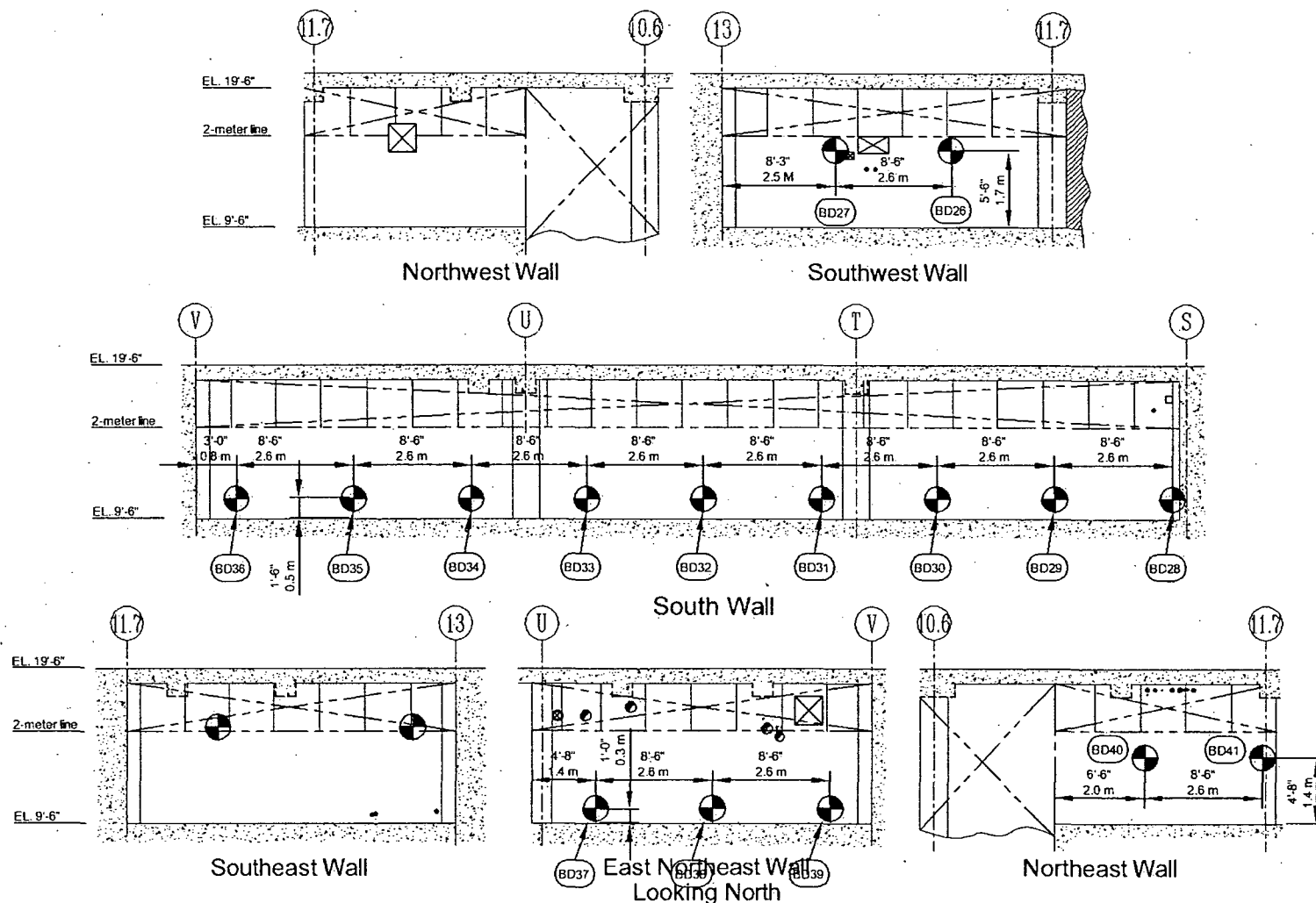
AUX. BLDG. EL. 9'-6" ROOM 133
BETA DIRECT/LOOSE SURFACE ACTIVITY
RANDOM START LOCATION BELOW 2-METERS
F8131221-M2

FILE: 813000.03

SHEET 1 of 3

TC HILL





Scale Feet
 $\frac{1}{8}'' = 1'-0''$
 Scale Meter
 0 1 2 3



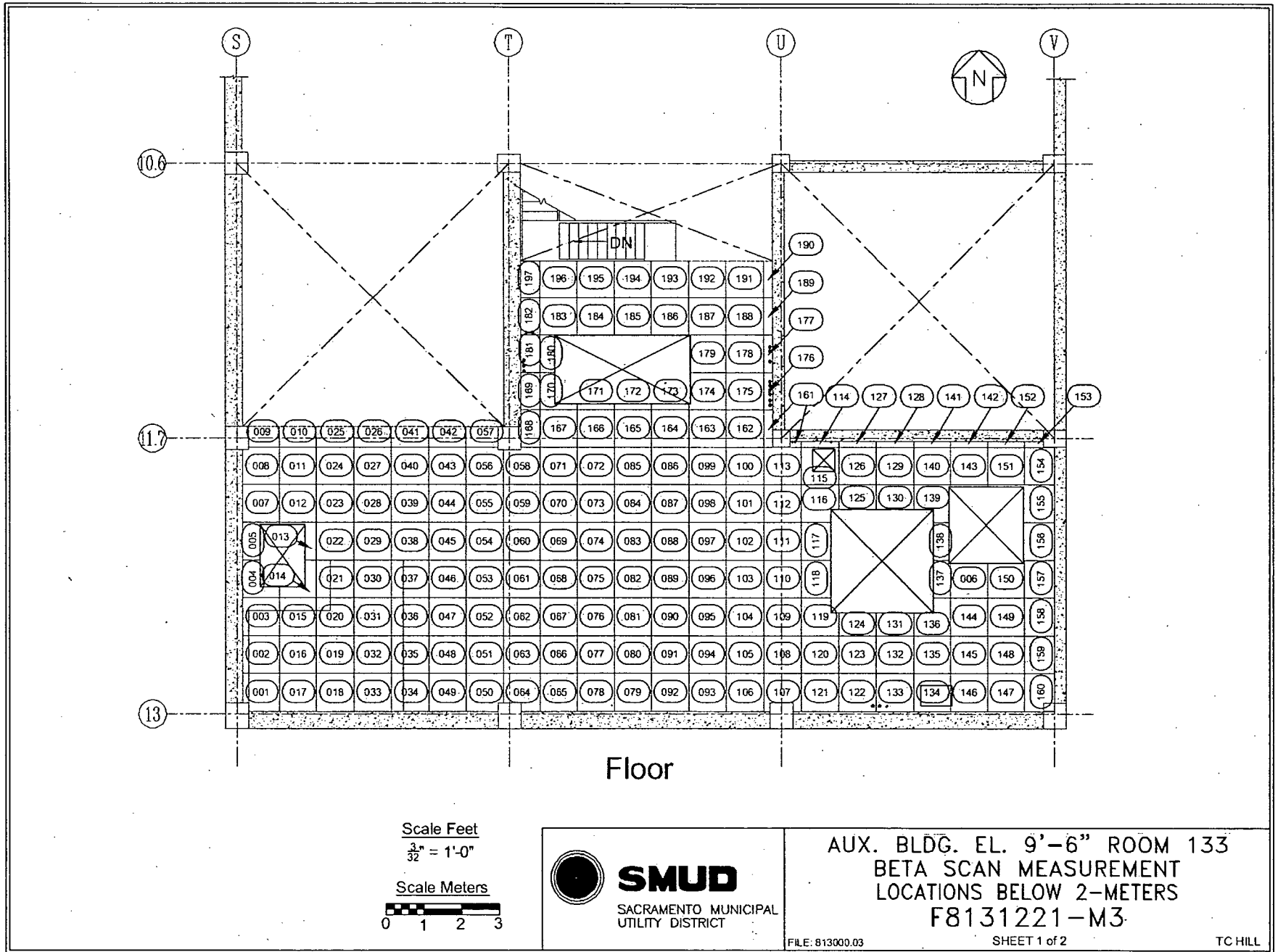
SMUD
 SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUX. BLDG. EL. 9'-6" ROOM 133
 BETA DIRECT/LOOSE SURFACE ACTIVITY
 MEASUREMENT LOCATIONS BELOW 2-METERS
 F8131221-M2

FILE: 813000.03

SHEET 3 of 3

TC HILL



Scale Feet
 $\frac{3}{32}'' = 1'-0''$
 Scale Meters
 0 1 2 3



SMUD

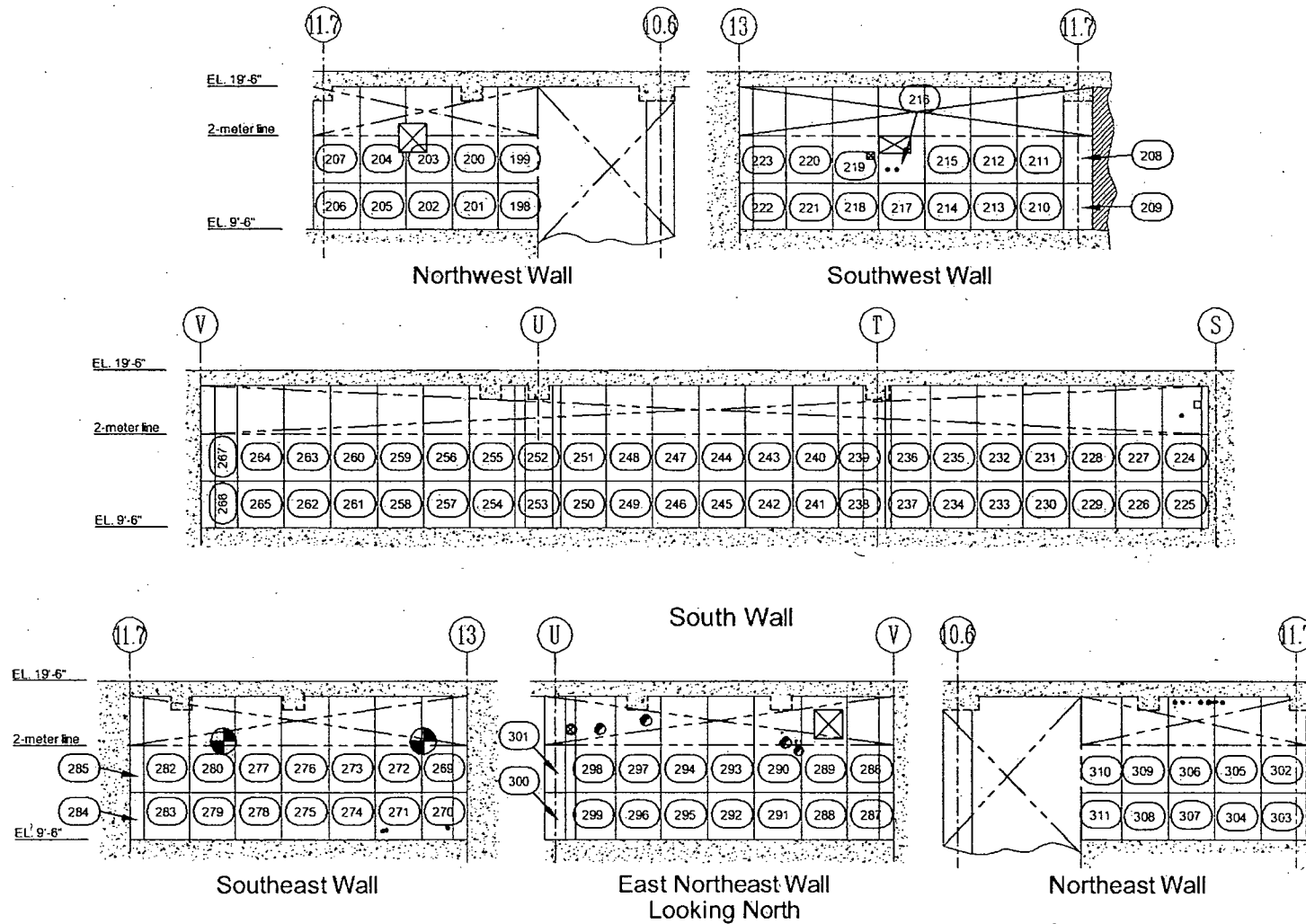
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUX. BLDG. EL. 9'-6" ROOM 133
 BETA SCAN MEASUREMENT
 LOCATIONS BELOW 2-METERS
 F8131221-M3

FILE: 813000.03

SHEET 1 of 2

TC HILL



Scale Feet
 $\frac{3}{32}" = 1'-0"$

Scale Meters
 0 1 2 3



SMUD

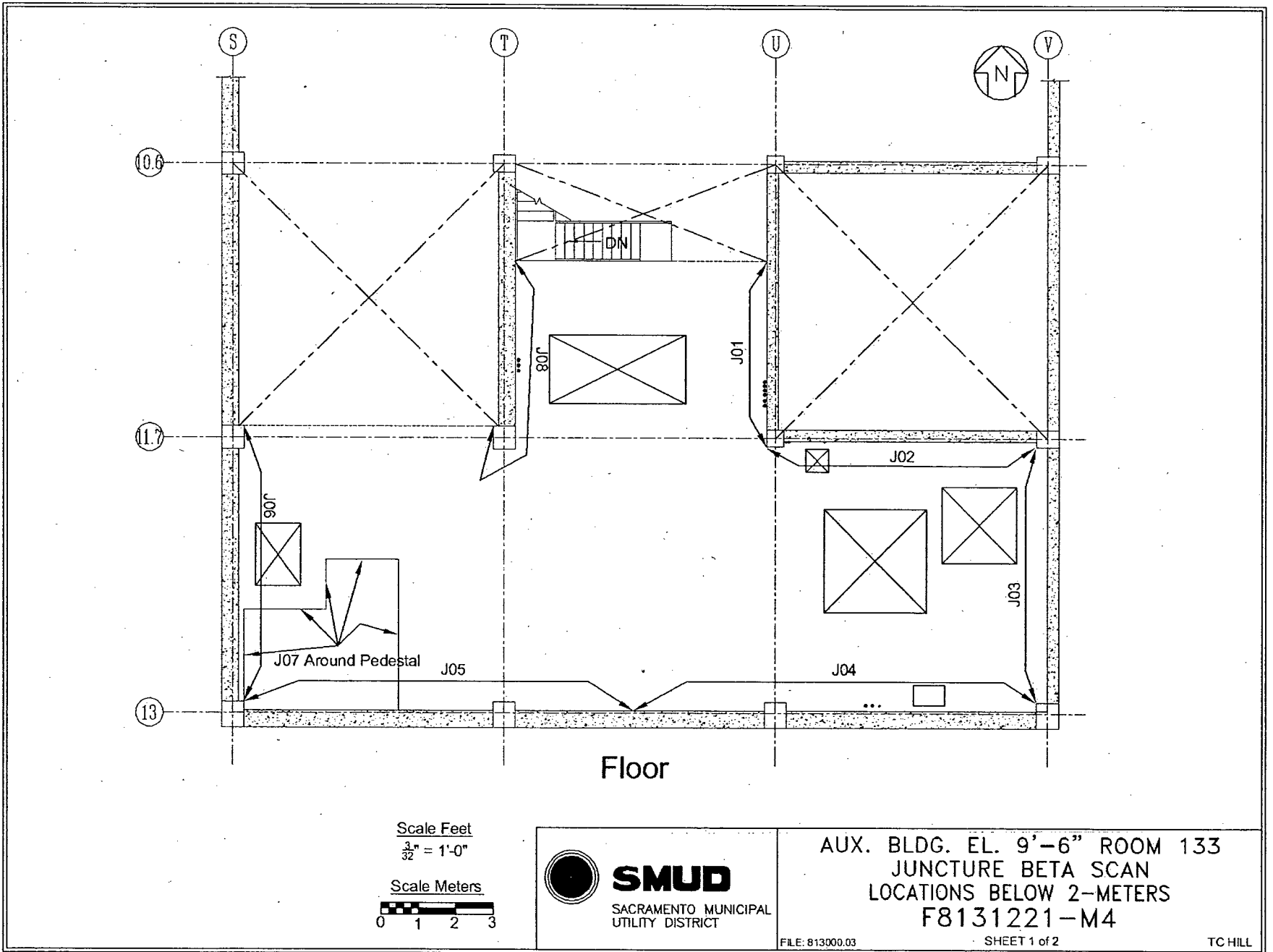
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

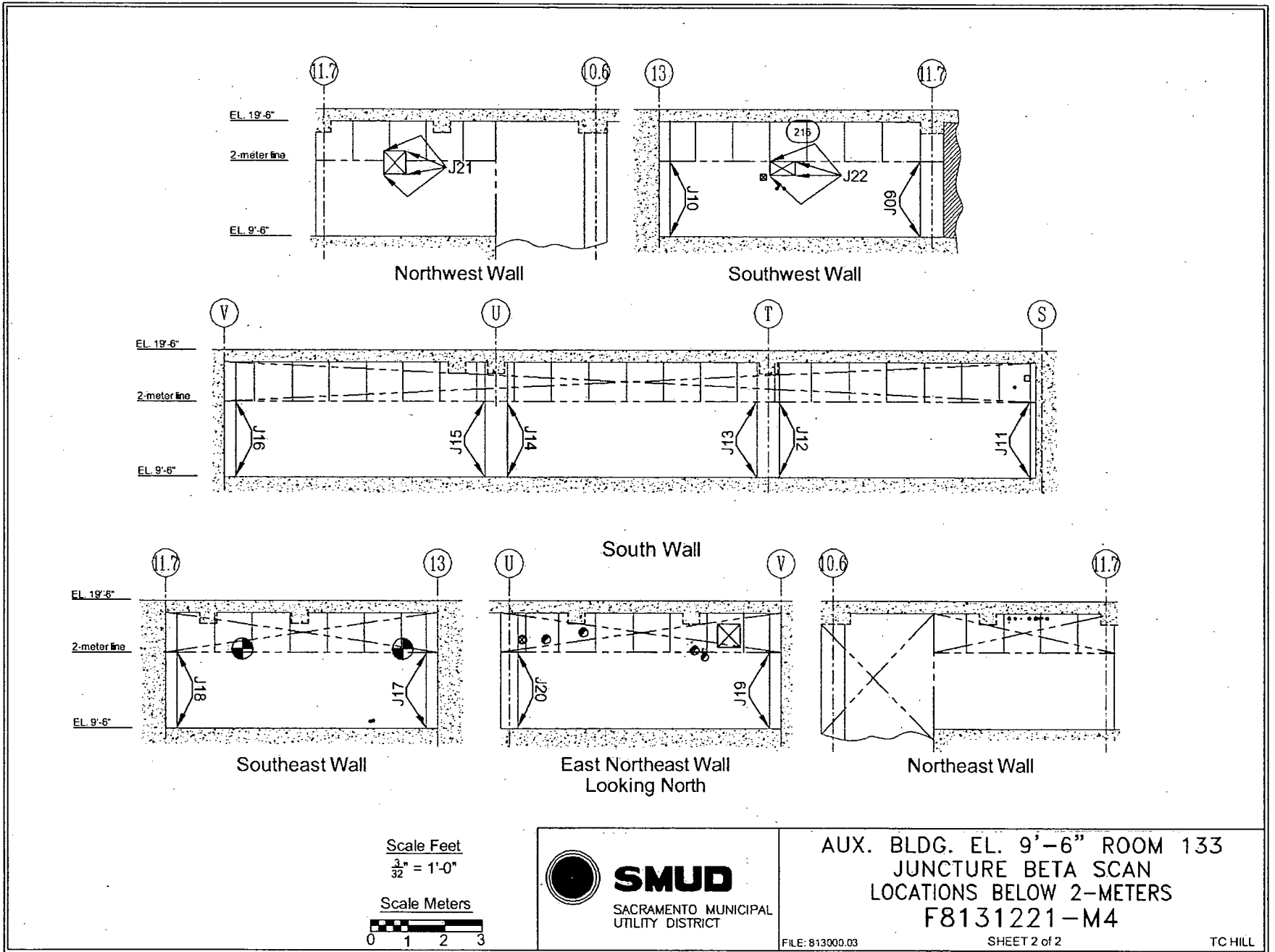
AUX. BLDG. EL. 9'-6" ROOM 133
 BETA SCAN MEASUREMENT
 LOCATIONS BELOW 2-METERS
 F8131221-M3

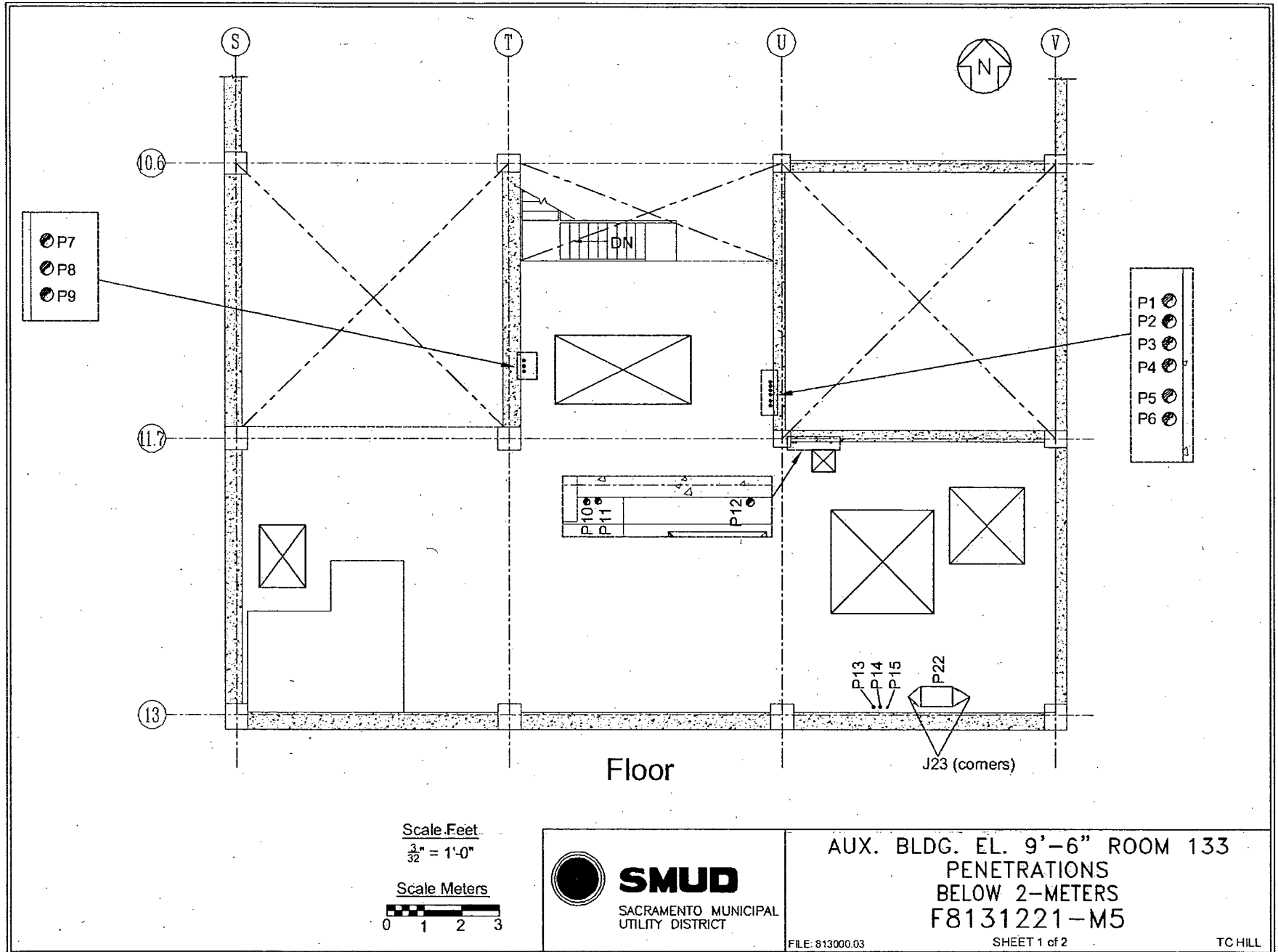
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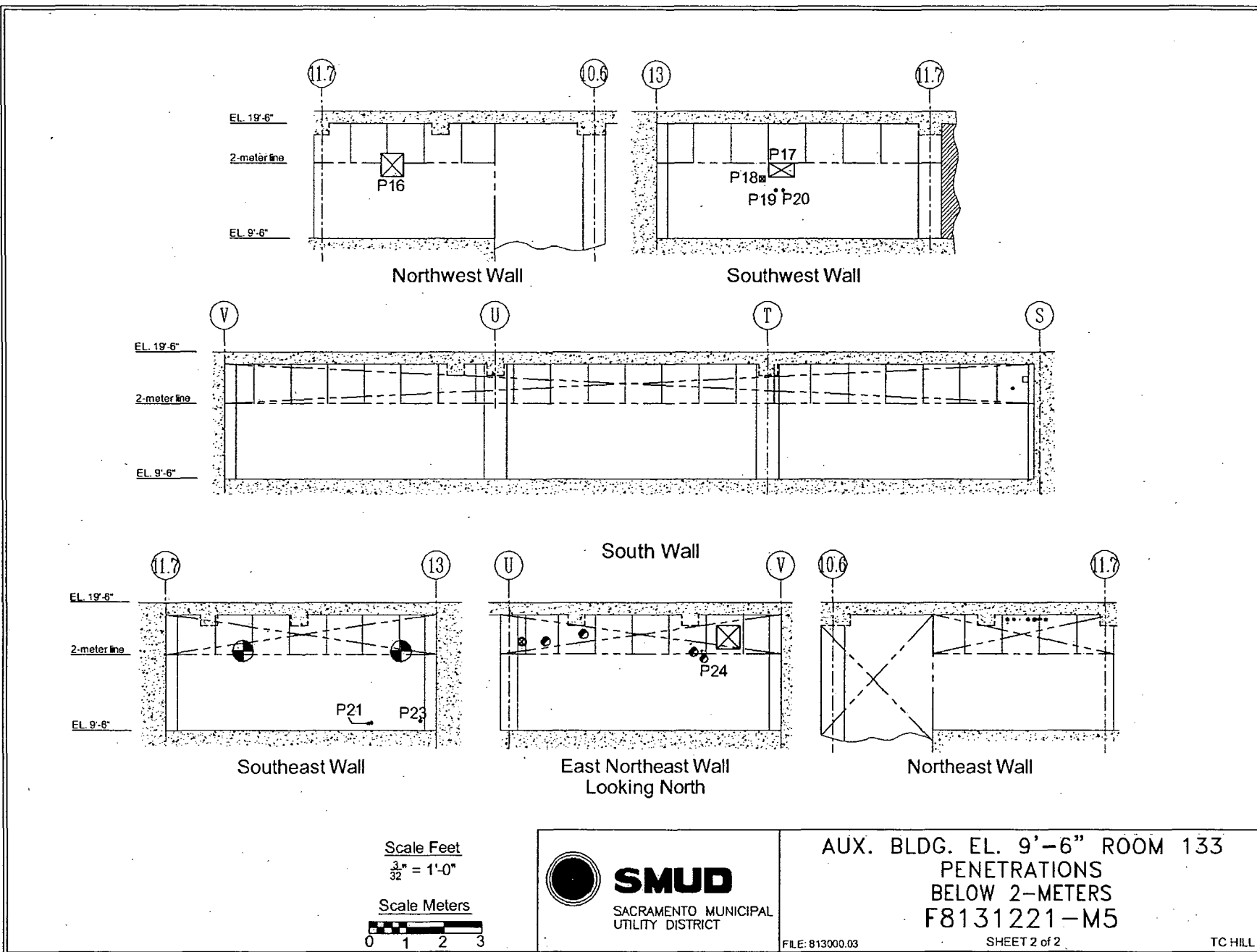
SHEET 2 of 2

TC HILL









Attachment 2

Instrumentation

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Survey Unit F8131221

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	N/A	1680 3
M2350; 180733	43-94; 148620	N/A	2800 2
M2350; 203486	43-68B; 190476	909	2169
M2350; 203486	43-68B; 161400	909	2169
M2350; 203486	43-116-1B; 190173	796	3258
M2350; 180733	43-111B; 148641	N/A	6854
Tennelec; 0401171	N/A	5.9 dpm α , 11.7 dpm β	N/A

The MDC noted for the detector model 43-98B is for the 3" diameter piping and for detector model 43-94 is for the 2" piping which is the most conservative.

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

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(none required)

Attachment 4

Data Assessment

July 3, 2008

Survey Unit F8131221

