

Rancho Seco

Final Status Survey Summary Report

July 7, 2008

Electrical Penetration Room 209, 20' Auxiliary Building, Floor and Lower Walls

Survey Unit F8131381

Prepared By: Michael Seem Date: 7/7/2008
FSS Engineer

Reviewed By: Robert F. Dasher Date: 7/10/08
Lead FSS Engineer

Approved By: E. J. [Signature] Date: 7-28-08
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8131381, Electrical Penetration Room 209, 20' Auxiliary Building, 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. The Electrical Penetration Room 209 floor and lower walls were determined to be a Class 1.

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 184 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	Electrical Penetration Room
Survey Unit:	1381	209, 20' Auxiliary Building,
Class:	1	Floor and Lower Walls
SU Area (m²):	184	Structure Surface
Evaluator:	Michael Stein	LTP Table 5-4
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	3.6	Class 1
Design DCGL_{me}	154800	Class 1
(dpm/100 cm²):		
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	5461	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	6.8	Class 1
Scan Area (m²):	184	
Scan Coverage (%):	100%	Class 1
Z_{1-α} :	1.645	
Z_{1-β} :	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	3.9	
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:	27	Class 1
Grid Spacing L:	2.6	Class 1

Survey Results:

A total of 34 direct measurements were made in F8131381. 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 beta scan measurements indicated areas of elevated activity. Beta scan activity ranged from 1,620 to 66,383 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. None of the gamma scan measurements detected activity due to plant operations. Scan measurement locations for both beta and gamma emissions are identified in Attachment 1 of this report. 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)
F8131381-C0001BD	2594
F8131381-C0002BD	2132
F8131381-C0003BD	1774
F8131381-C0004BD	2531
F8131381-C0005BD	4757
F8131381-C0006BD	1795
F8131381-C0007BD	2007
F8131381-C0008BD	1670
F8131381-C0009BD	2148
F8131381-C0010BD	1873
F8131381-C0011BD	1743
F8131381-C0012BD	1696
F8131381-C0013BD	1520
F8131381-C0014BD	1551
F8131381-C0015BD	1359
F8131381-C0016BD	1442
F8131381-C0017BD	1541
F8131381-C0018BD	1494
F8131381-C0019BD	1520
F8131381-C0020BD	1131
F8131381-C0021BD	1535
F8131381-C0022BD	1499
F8131381-C0023BD	1494
F8131381-C0024BD	1380
F8131381-C0025BD	908
F8131381-C0026BD	1037
F8131381-C0027BD	986
F8131381-C0028BD	1063
F8131381-C0029BD	1769
F8131381-C0030BD	2308
F8131381-C0031BD	1390
F8131381-C0032BD	846
F8131381-C0033BD	840
F8131381-C0034BD	716
Mean:	1648

Median:	1528
Standard Deviation:	719
Range:	716 - 4757

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8131381C0001SM	-2.24
F8131381C0002SM	8.09
F8131381C0003SM	0.34
F8131381C0004SM	6.8
F8131381C0005SM	9.38
F8131381C0006SM	2.93
F8131381C0007SM	4.22
F8131381C0008SM	-0.95
F8131381C0009SM	5.51
F8131381C0010SM	2.93
F8131381C0011SM	5.51
F8131381C0012SM	5.51
F8131381C0013SM	1.64
F8131381C0014SM	-0.95
F8131381C0015SM	2.93
F8131381C0016SM	0.34
F8131381C0017SM	2.93
F8131381C0018SM	0.34
F8131381C0019SM	2.93
F8131381C0020SM	-0.95
F8131381C0021SM	-0.95
F8131381C0022SM	-0.95
F8131381C0023SM	-2.24
F8131381C0024SM	4.22
F8131381C0025SM	-3.53
F8131381C0026SM	-2.24
F8131381C0027SM	1.64
F8131381C0028SM	2.93
F8131381C0029SM	4.22
F8131381C0030SM	5.51
F8131381C0031SM	0.34
F8131381C0032SM	5.51
F8131381C0033SM	-0.95
F8131381C0034SM	1.64
Mean:	2.13
Median:	2.28
Standard Deviation:	3.23
Range:	-3.53 to 9.38

Survey Unit Data Assessment:

The survey design required 27 direct measurements for the Sign Test. In actuality, 34 direct measurements were obtained. 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):	34	
Median (dpm/100 cm ²):	1528	
Mean (dpm/100 cm ²):	1648	
Direct Measurement Standard Deviation	719	Based on samples and backgrounds.
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	719	
Maximum (dpm/100 cm ²):	4757	Background Subtract Not Applied
Material Type:	N/A	
Sign Test Final N Value:	34	Class 1
S+ Value:	34	
Critical Value:	22	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{emc}:	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.

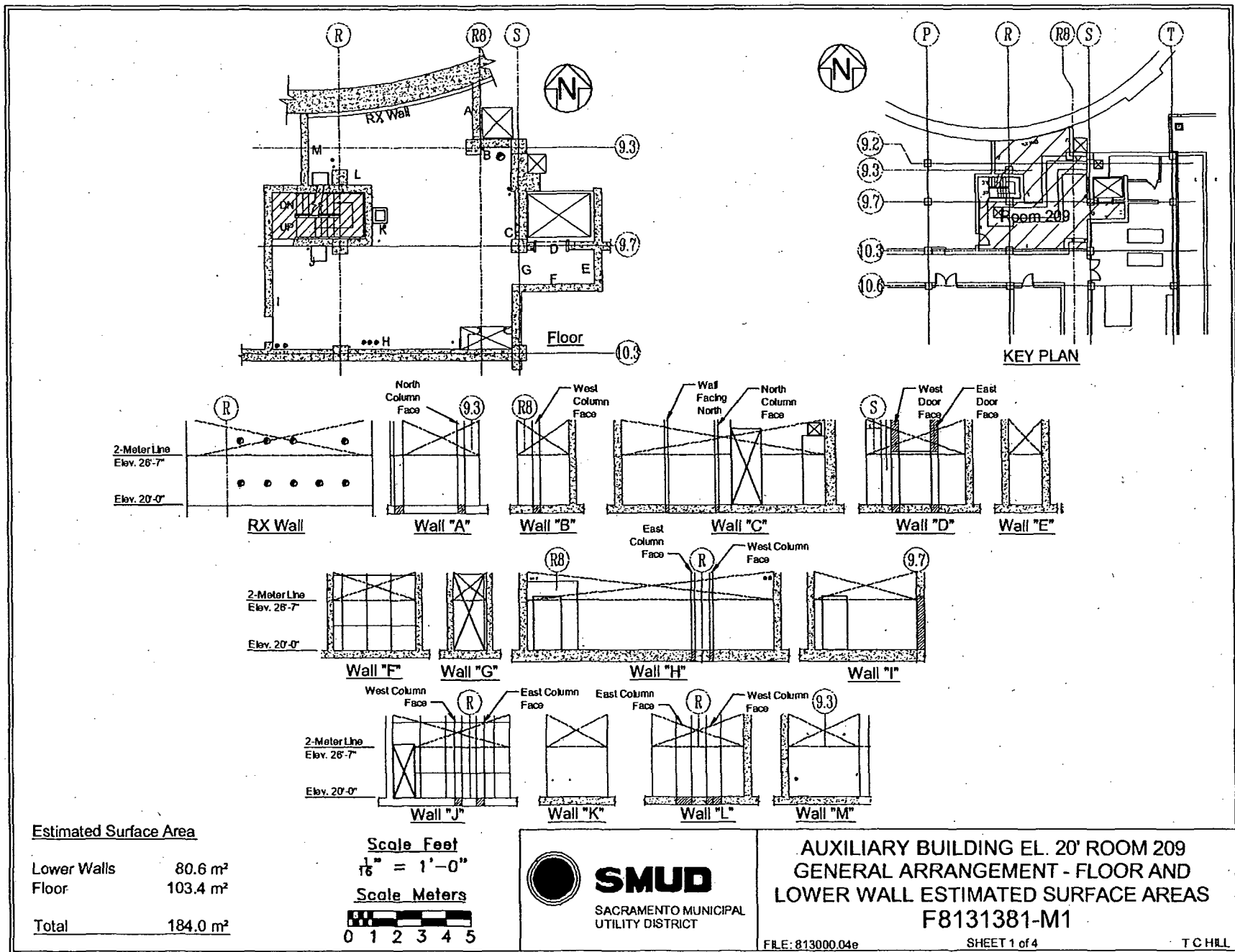
It is concluded that survey unit F8131381 meets the release criteria of 10CFR20.1402.

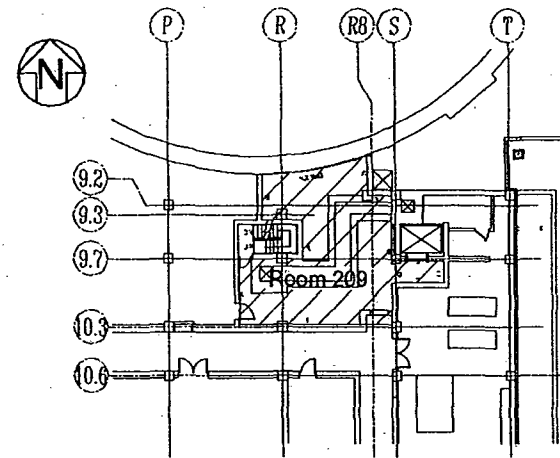
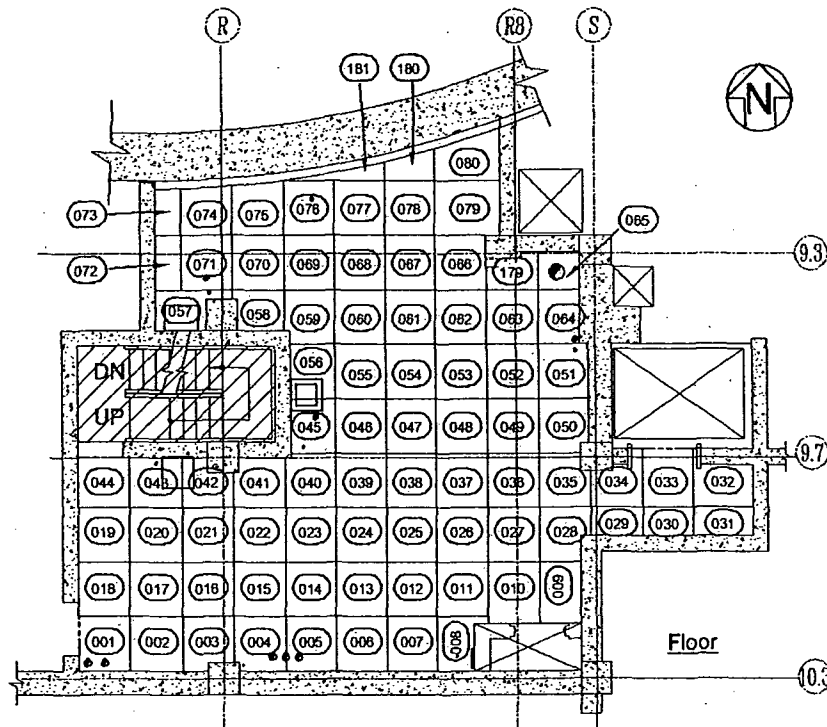
Attachment 1

Maps

July 7, 2008

Survey Unit F8131381





KEY PLAN

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

 0 1 2 3



SMUD

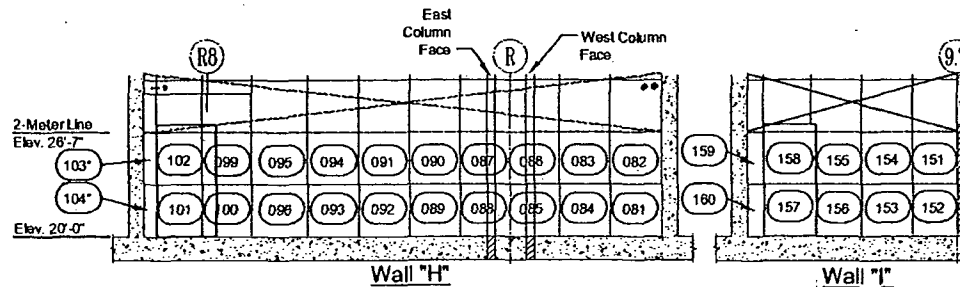
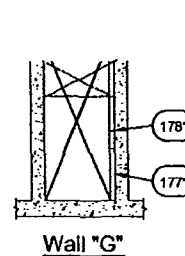
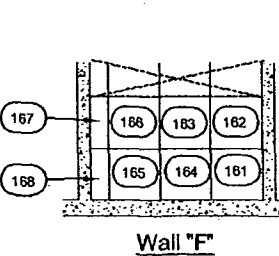
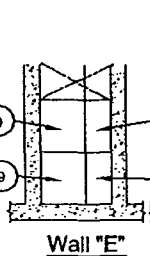
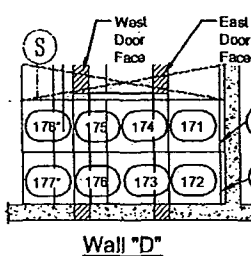
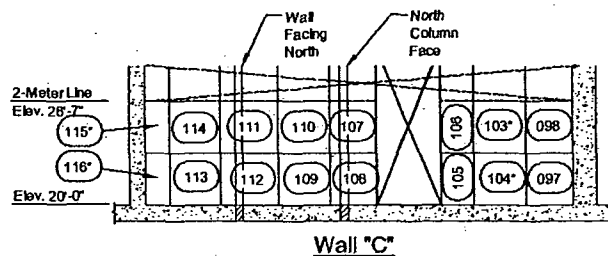
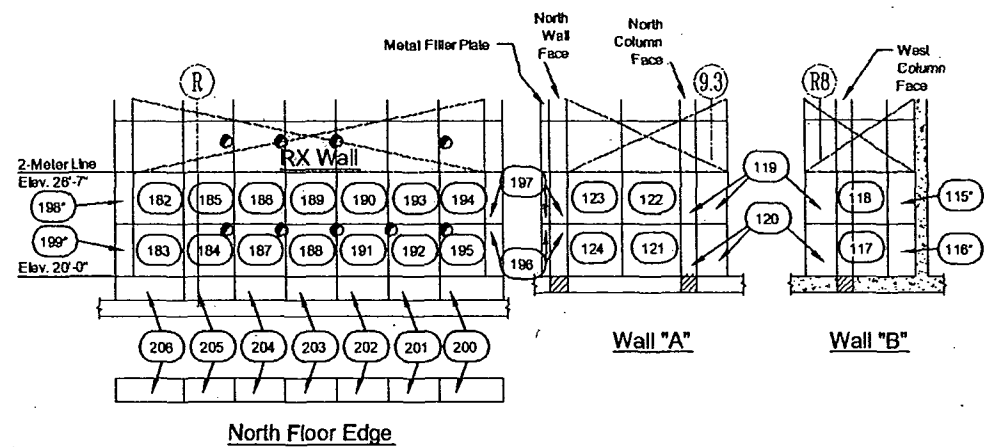
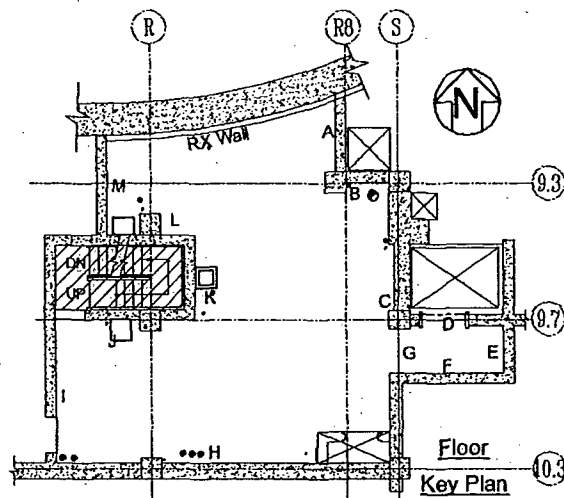
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUXILIARY BUILDING EL. 20' ROOM 209
 FLOOR AND LOWER WALL
 BETA SCAN MEASUREMENT LOCATIONS
 F8131381-M1

FILE: 813000.04e

SHEET 2 of 4

T C HILL

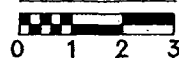


Note: Grid numbers 157 and 158 were not used because door was removed.

Scale Feet

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

Scale Meters



*Beta Scan Continued On Adjacent Surface



SMUD

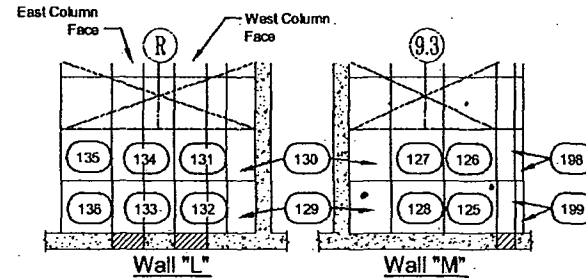
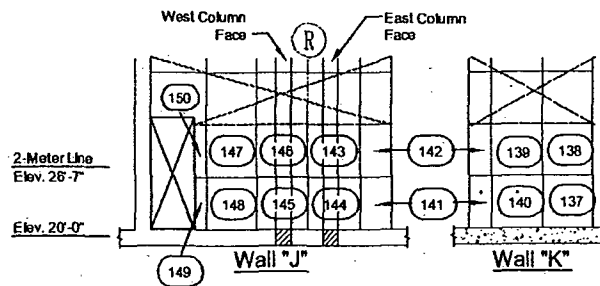
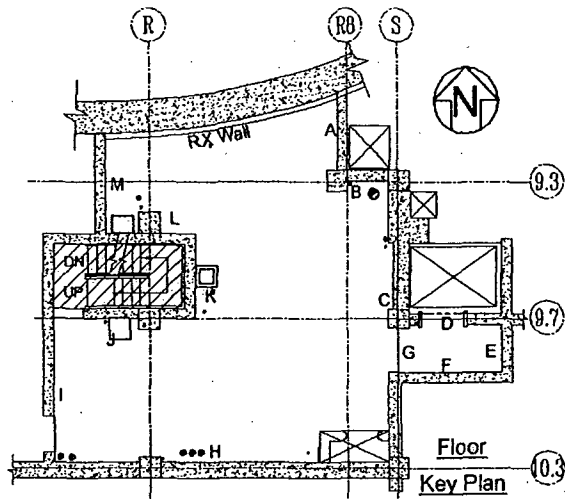
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UTILITY DISTRICT

AUXILIARY BUILDING EL. 20' ROOM 209
FLOOR AND LOWER WALL
BETA SCAN MEASUREMENT LOCATIONS
F8131381-M1

FILE: 813000.04e

SHEET 3 of 4

T C HILL



Scale Feet
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 Scale Meters
 0 1 2 3



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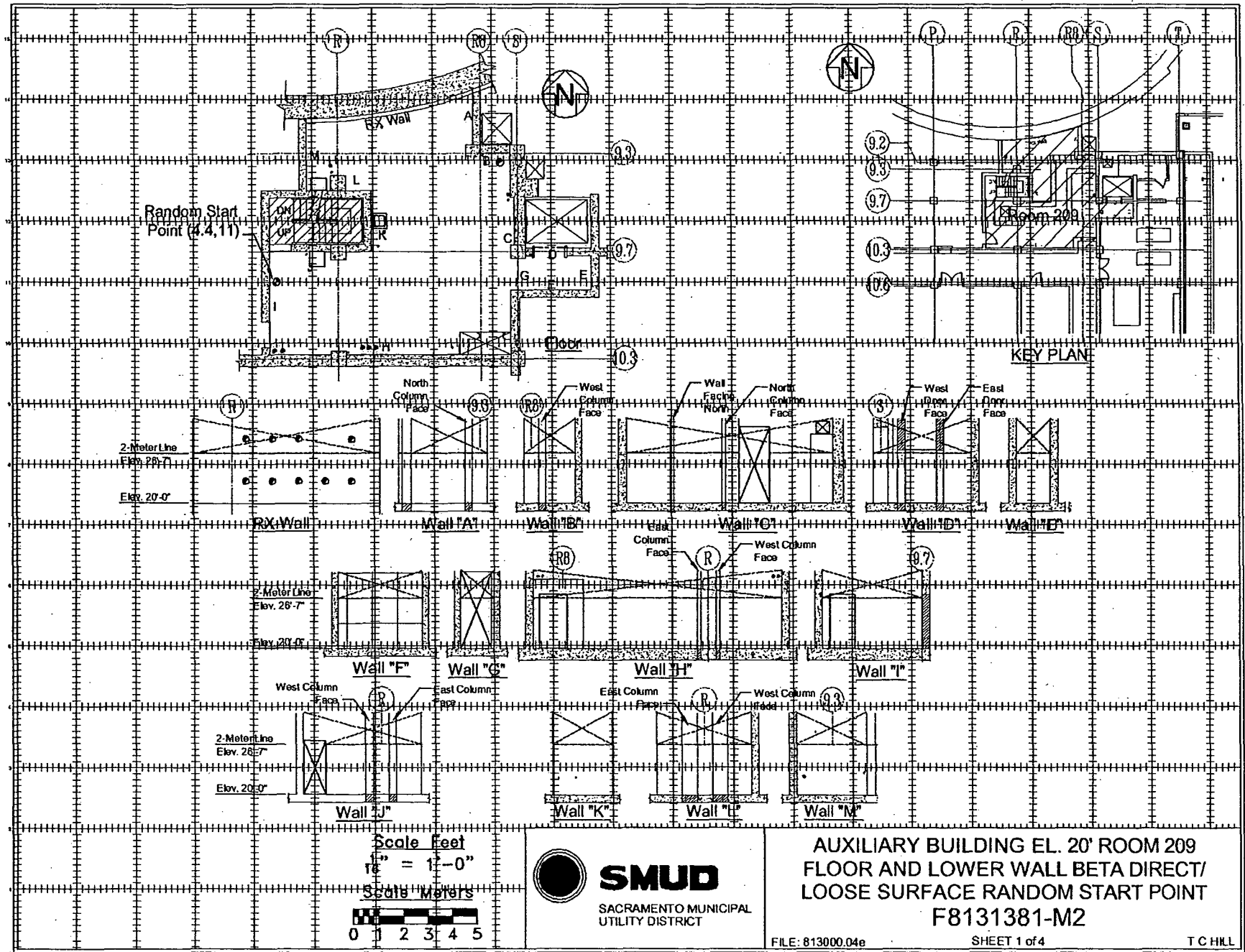
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 UTILITY DISTRICT

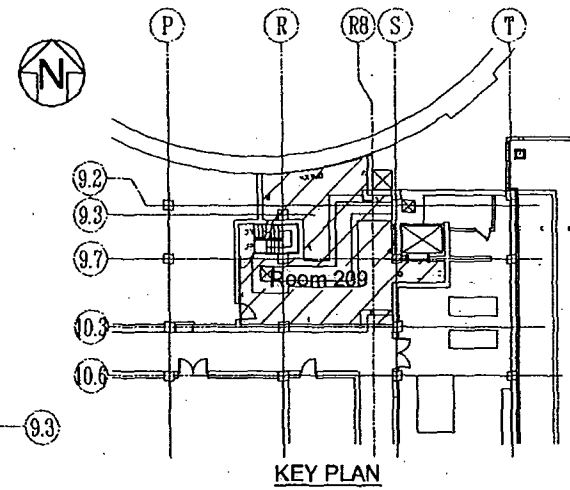
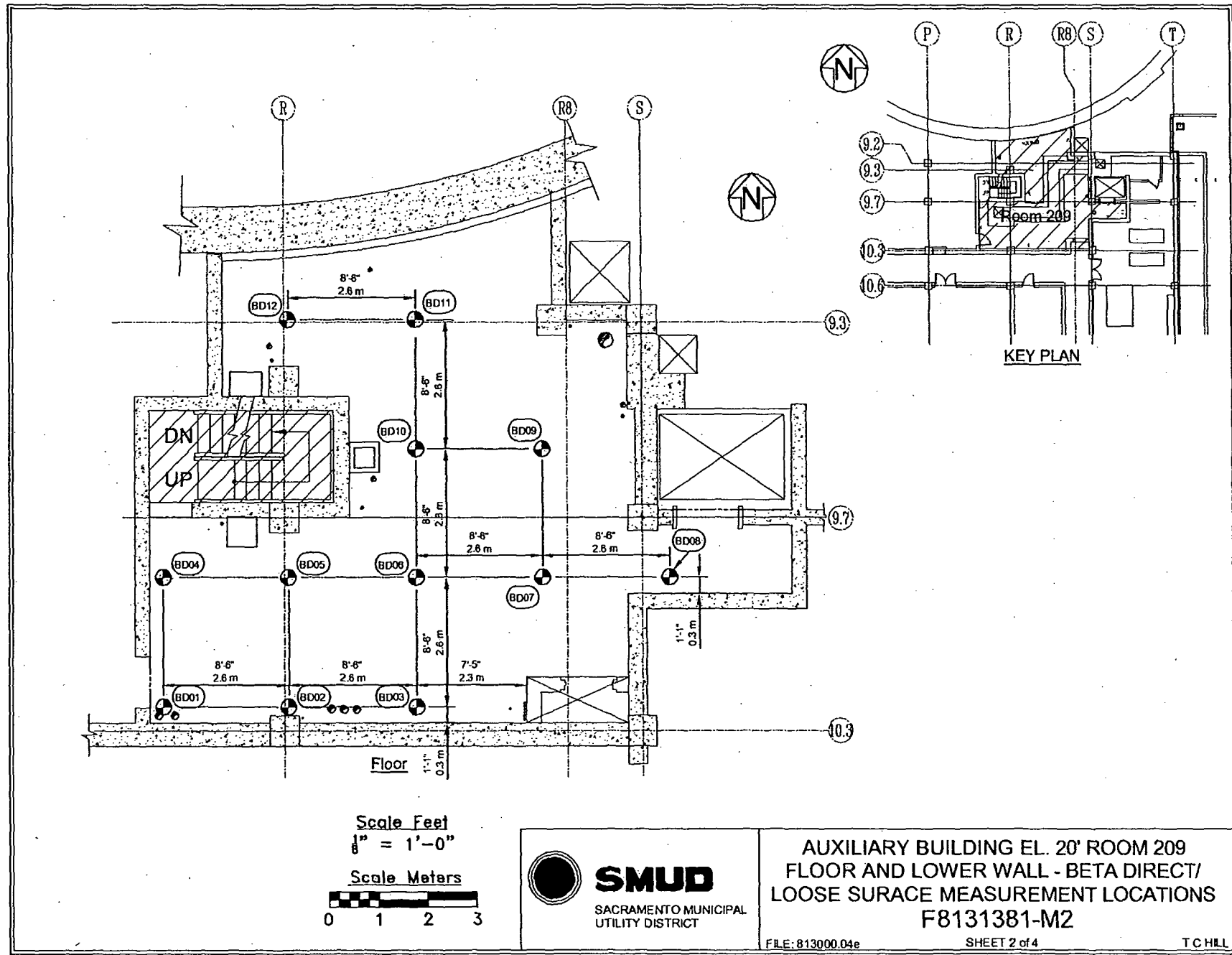
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 FLOOR AND LOWER WALL
 BETA SCAN MEASUREMENT LOCATIONS
 F8131381-M1

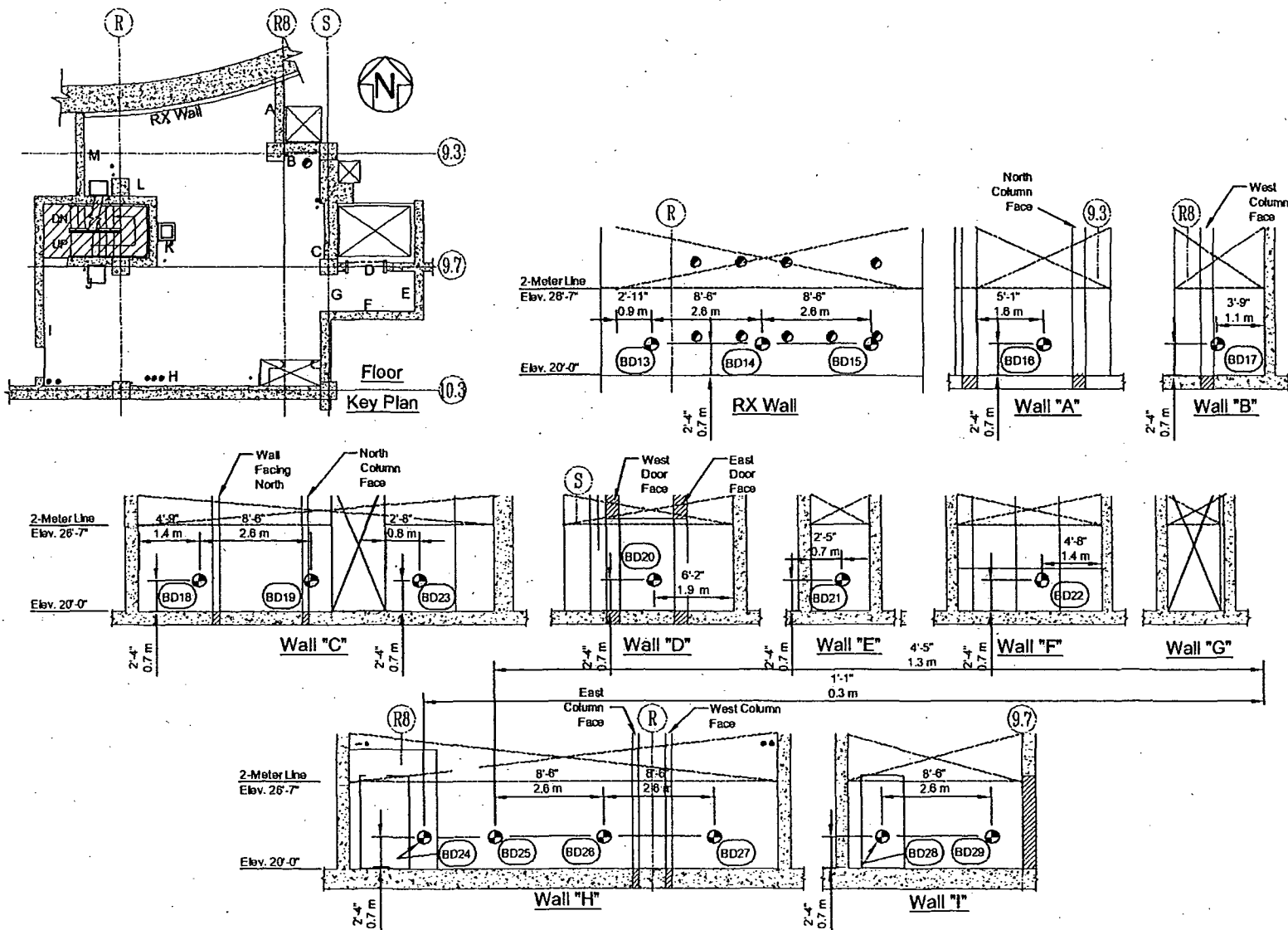
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SHEET 4 of 4

T.C.HILL







Scale Feet
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 Scale Meters
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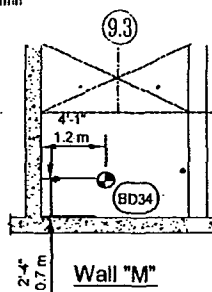
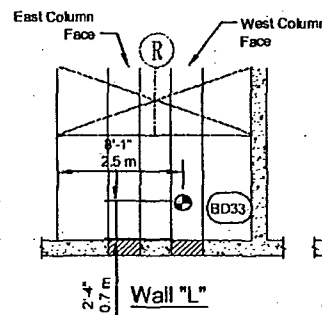
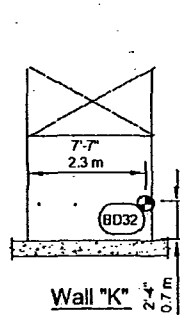
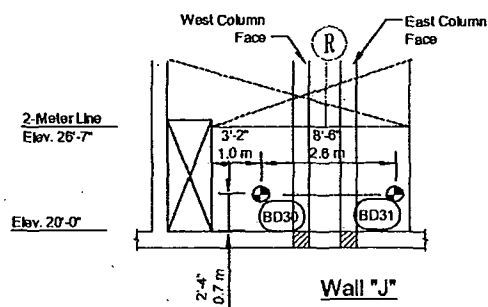
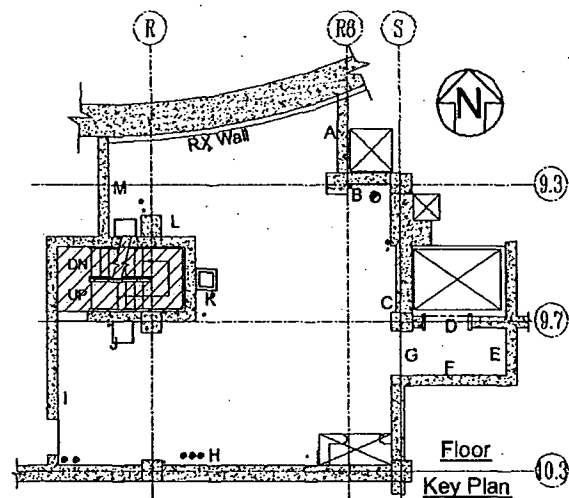
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUXILIARY BUILDING EL. 20' ROOM 209
 FLOOR AND LOWER WALL - BETA DIRECT/
 LOOSE SURFACE MEASUREMENT LOCATIONS
 F8131381-M2

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SHEET 3 of 4

T.C.HILL



Scale Feet
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 Scale Meters
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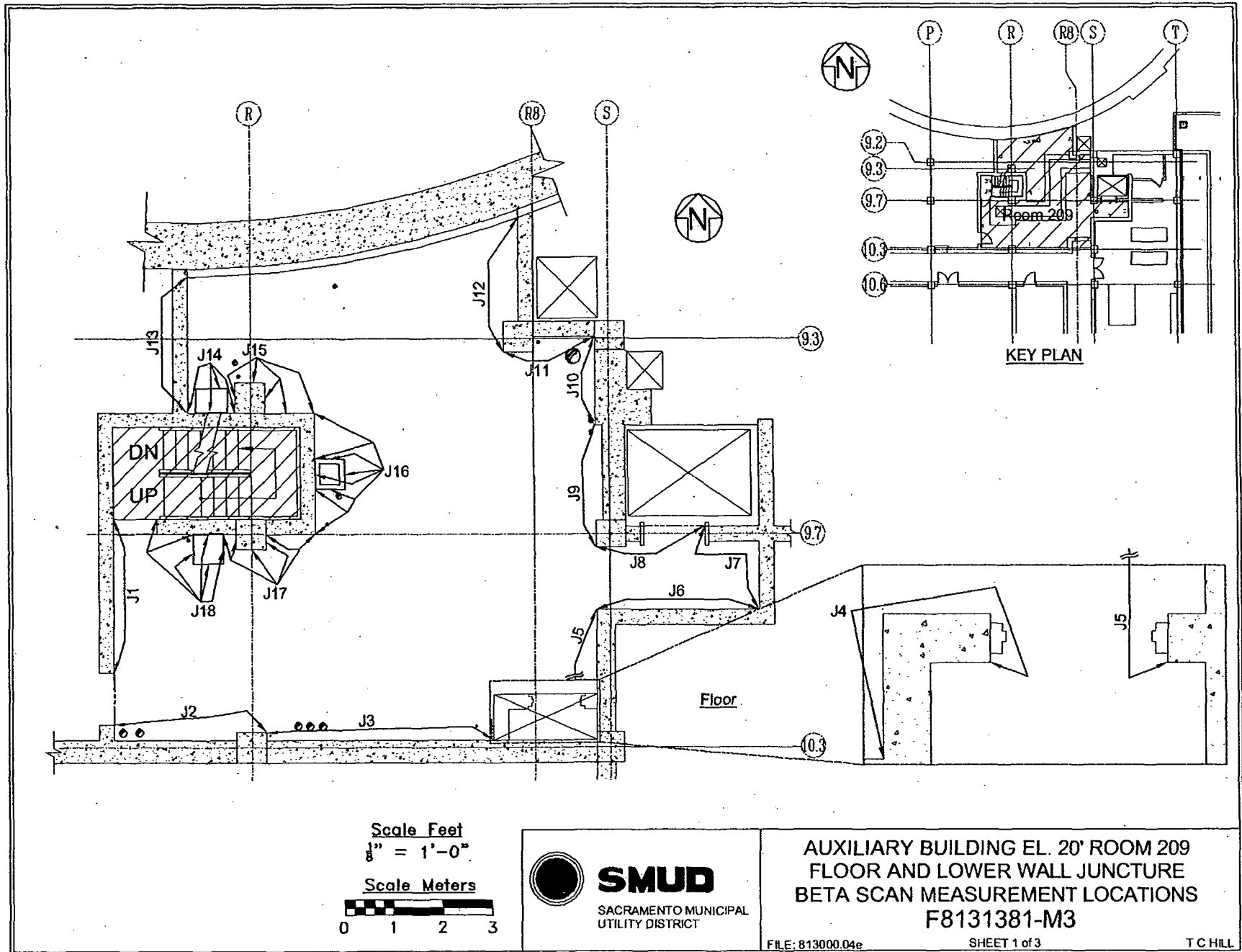
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 UTILITY DISTRICT

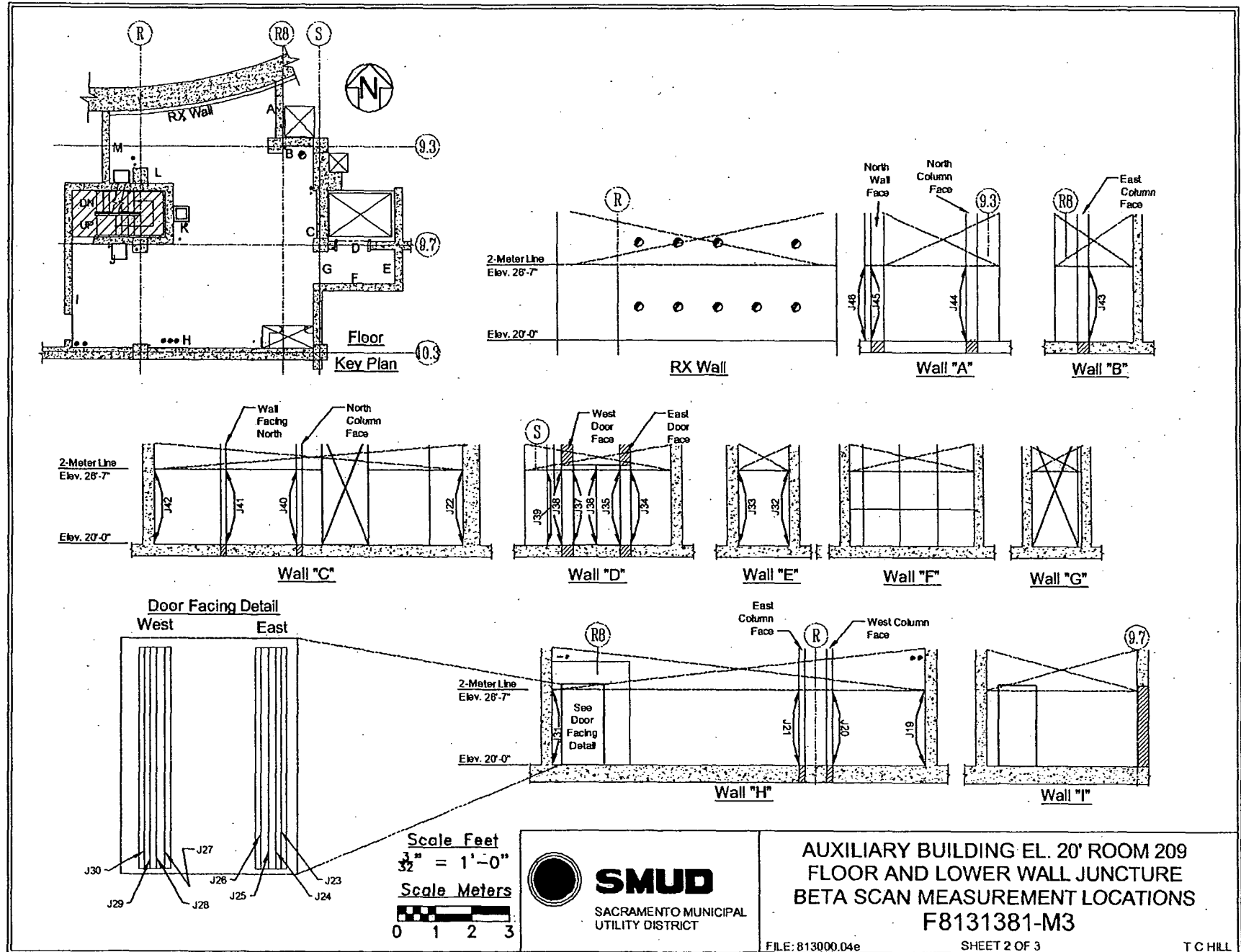
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 FLOOR AND LOWER WALL - BETA DIRECT/
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 F8131381-M2

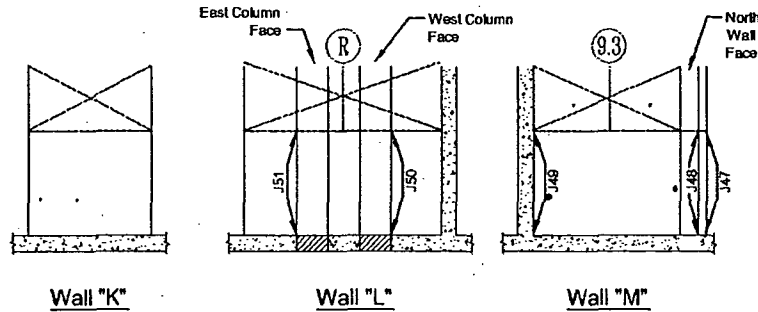
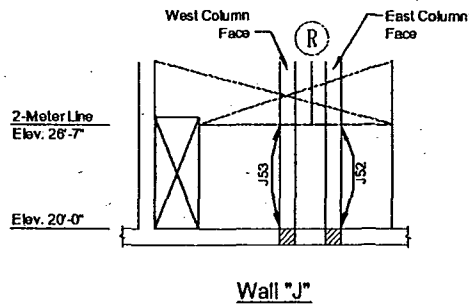
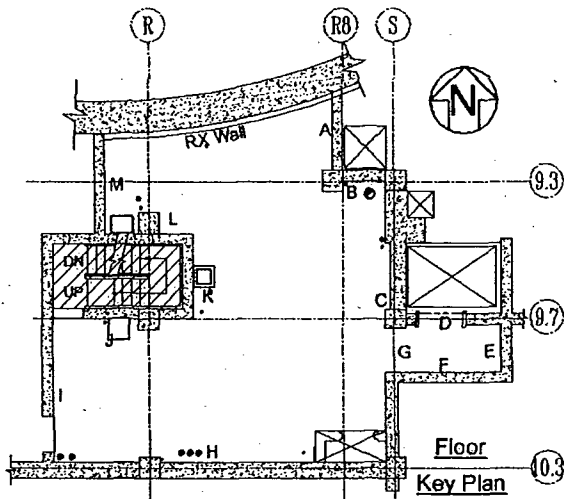
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SHEET 4 of 4

T.C. HILL







Scale Feet
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 Scale Meters
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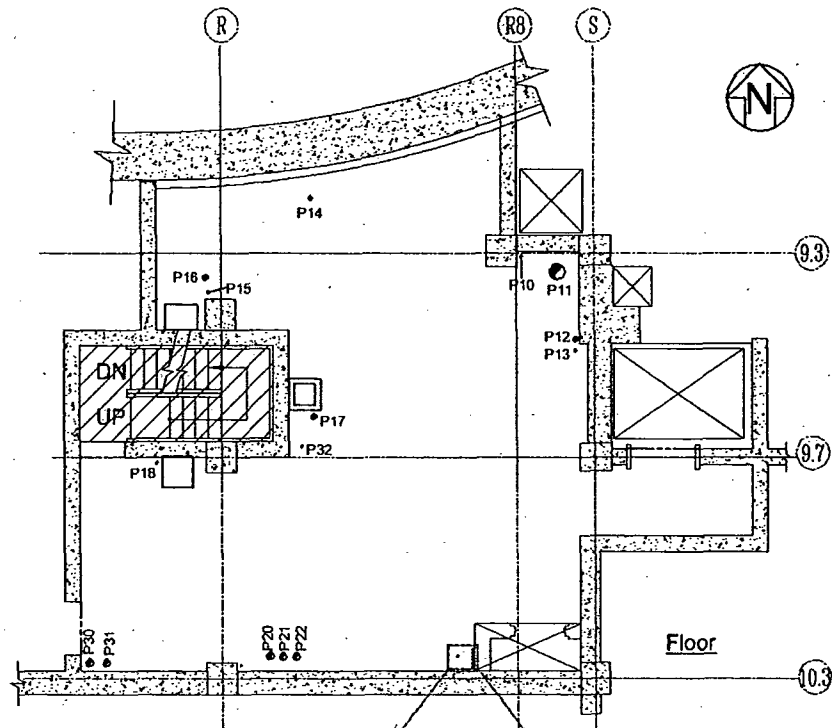
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUXILIARY BUILDING EL. 20' ROOM 209
 FLOOR AND LOWER WALL JUNCTURE
 BETA SCAN MEASUREMENT LOCATIONS
 F8131381-M3

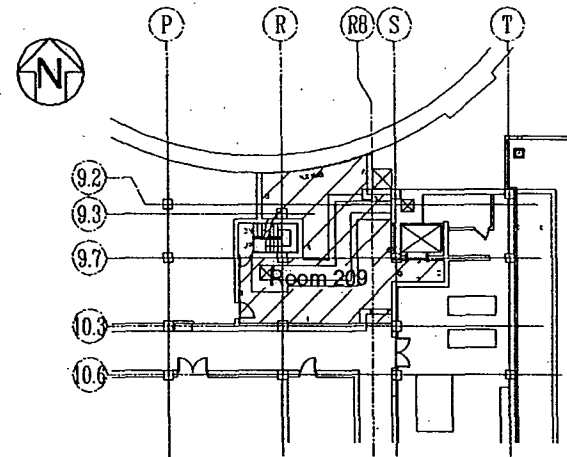
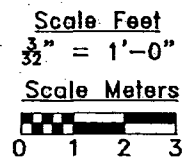
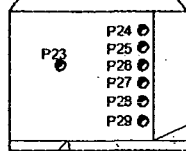
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SHEET 3 OF 3

T C HILL



Note: P19 not used to number a penetration



KEY PLAN



SMUD

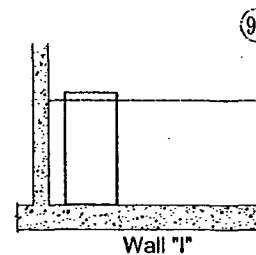
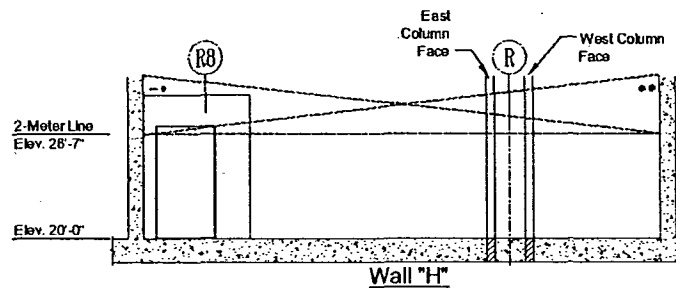
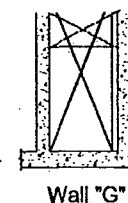
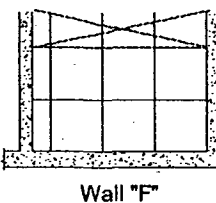
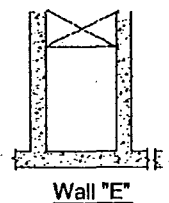
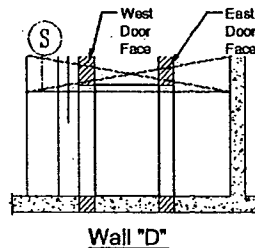
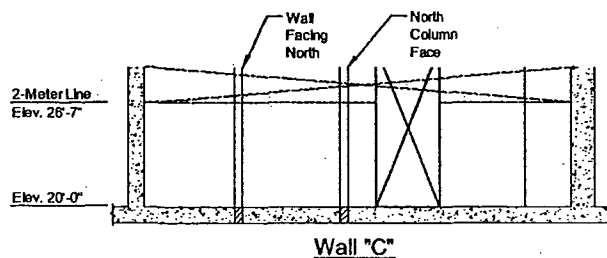
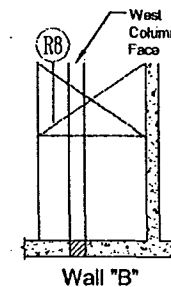
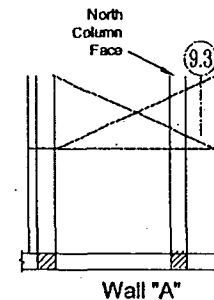
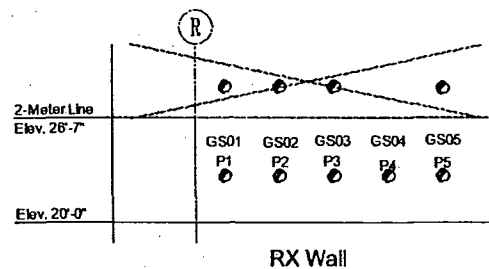
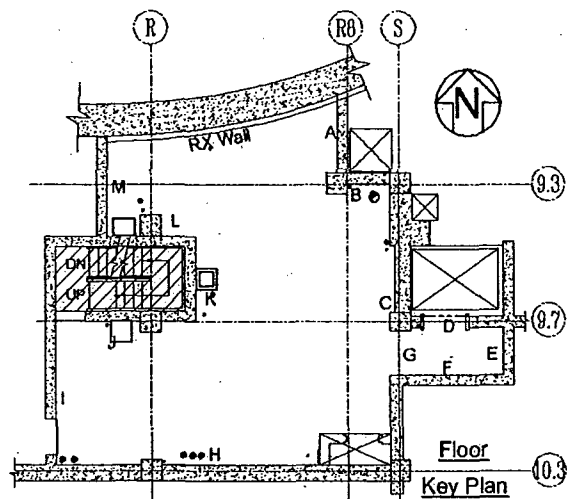
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUXILIARY BUILDING EL. 20' ROOM 209
 FLOOR AND LOWER WALL- PENETRATION
 BETA SCAN MEASUREMENT LOCATIONS
F8131381-M4

FILE: 813000.04e

SHEET 1 of 3

T C HLL



Note: P1, P2 and P3 covered or filled additional beta scans will be performed for inside Reactor Building

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



SMUD

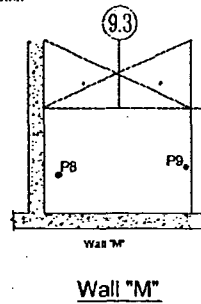
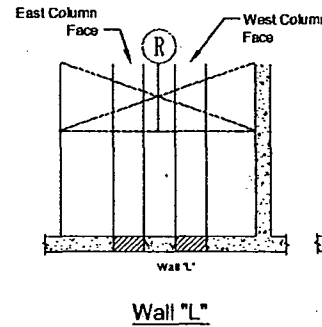
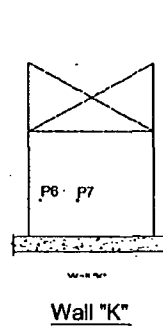
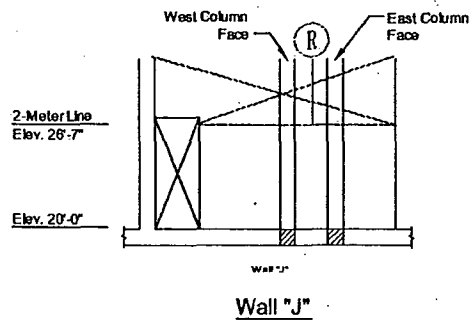
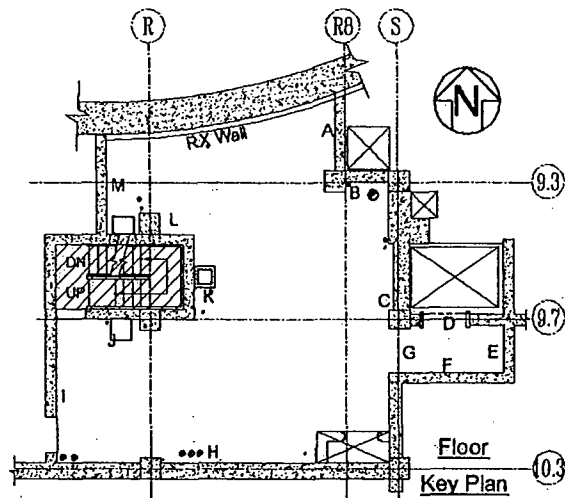
SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUXILIARY BUILDING EL. 20' ROOM 209
 FLOOR AND LOWER WALL- PENETRATION
 BETA/GAMMA SCAN MEASUREMENT LOCATIONS
 F8131381-M4

FILE: 813000.04e

SHEET 2 of 3

T.C. HILL



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



SMUD

SACRAMENTO MUNICIPAL
 UTILITY DISTRICT

AUXILIARY BUILDING EL. 20' ROOM 209
 FLOOR AND LOWER WALL- PENETRATION
 BETA SCAN MEASUREMENT LOCATIONS
 F8131381-M4

FILE: 813000.04e

SHEET 3 of 3

T C HILL

Attachment 2

Instrumentation

July 7, 2008

Survey Unit F8131381

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	930	1680
M2350; 180733	43-94B; 148620	350	610
M2350; 193715	43-68B; 160703	433	1033
M2350; 193715	43-68B; 148630	433	1033
M2350; 193700	43-116-1B; 216072	796	3258
M2350; 193715	43-116-1B; 190643	491 β Juncture	739 β Juncture
M2350; 180733	43-111B; 148641	1230	2230
Tennelec; 0401171	N/A	5.9 dpm α , 11.7 dpm β	N/A
InSpector 1000	10054579	N/A	462 Cs-137 470 Co-60

The scan and static MDC's provided represent the most conservative MDC values for the survey conducted.

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

July 7, 2008

Survey Unit F8131381

(none required)

Attachment 4

Data Assessment

July 7, 2008

Survey Unit F8131381

