

Rancho Seco

Final Status Survey Summary Report

July 9, 2008

East and West Heat Removal Cooler Rooms 051 and 052 Excavation
Between Exterior Reactor Building Wall and Auxiliary Building Floor Slab

Survey Unit F8130732

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Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130732, East and West Heat Removal Cooler Rooms 051 and 052 Excavation
Between Exterior Reactor Building Wall and Auxiliary Building Floor Slab

Survey Unit Description:

Operating History: The East and West Heat Removal Cooler Rooms are located on the -20' elevation of the Auxiliary Building. The Auxiliary Building is a reinforced concrete structure that, during power operations, contained the Radwaste processing and supporting systems. The building has six main elevations. Residual levels of surface radioactivity were detected on all interior elevations 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 taken on each interior elevation of the Auxiliary Building. These measurements confirmed the presence of plant-derived radionuclides. Direct measurements taken 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. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the interior surfaces of the Auxiliary Building were determined primarily to be a Class 1 for the floors and lower walls (bottom 2 meters of the walls), and Class 2 for the upper walls and ceiling. Inside the East and West Heat Removal Cooler Rooms radioactive liquids leaked through the construction joints between the exterior surface of the Reactor Building wall and the -20' Auxiliary Building floor slab. There were a number of areas on the concrete structures exposed during excavation of the area where the gross surface activity levels were higher than the DCGL prior to remediation. Therefore, a Class 1 final status survey was performed on the East and West Heat Removal Cooler Rooms 051 and 052, excavation area between the exterior Reactor Building wall and Auxiliary Building floor slab.

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 93 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	East and West Heat Removal Cooler Rooms 051 and 052, Excavation Between Exterior Reactor Building Wall and Auxiliary Building Floor Slab
Survey Unit:	0732	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m ²):	93	
Evaluator:	Michael Stein	
DCGL (dpm/100 cm ²):	43000	Gross Activity DCGL
Area Factor:	4.1	Class 1
Design DCGL _{emc} (dpm/100 cm ²):	176300	Class 1
LBGR (dpm/100 cm ²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm ²):	12035	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m ²):	5.5	Class 1
Scan Area (m ²):	93	
Scan Coverage (%):	100%	Class 1
Z _{1-α} :	1.645	
Z _{1-β} :	1.645	
Sign P:	0.96407	
Calculated Relative Shift:	1.7	
Relative Shift Used:	1.7	Uses 3.0 if Relative Shift is >3
N-Value:	14	
Design N-Value + 20%:	17	NUREG-1575 Table 5-5
Design Min Samples N:	17	Class 1
Grid Spacing L:	2.3	Class 1

Survey Results:

A total of 25 direct measurements were made in F8130732. 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 3,196 to 48,982 dpm/100 cm², based on a surveyor efficiency of 0.5 and no background subtracted. None of the gamma scan measurements indicated areas of elevated activity. Gamma scan activity ranged from 290 to 1,399 dpm/100 cm² for Co-60 and 396 to 22,297 dpm/100 cm² for Cs-137. 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)
F8130732-C0001BD	1841
F8130732-C0002BD	3683
F8130732-C0003BD	2184
F8130732-C0004BD	7164
F8130732-C0005BD	3102
F8130732-C0006BD	1836
F8130732-C0007BD	1899
F8130732-C0008BD	2350
F8130732-C0009BD	1332
F8130732-C0010BD	1285
F8130732-C0011BD	1390
F8130732-C0012BD	1297
F8130732-C0013BD	1123
F8130732-C0014BD	1577
F8130732-C0015BD	1355
F8130732-C0016BD	15100
F8130732-C0017BD	2485
F8130732-C0018BD	1426
F8130732-C0019BD	1924
F8130732-C0020BD	3112
F8130732-C0021BD	1769
F8130732-C0022BD	2391
F8130732-C0023BD	1146
F8130732-C0024BD	1707
F8130732-C0025BD	1343
Mean:	2633
Median:	1836
Standard Deviation:	2879
Range:	1123 - 15100

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130732C0001SM	1.64
F8130732C0002SM	-2.24
F8130732C0003SM	-3.53
F8130732C0004SM	2.93
F8130732C0005SM	-2.24
F8130732C0006SM	-3.53
F8130732C0007SM	-0.95
F8130732C0008SM	4.22
F8130732C0009SM	-3.53
F8130732C0010SM	-3.53
F8130732C0011SM	-3.53
F8130732C0012SM	0.34
F8130732C0013SM	-0.95
F8130732C0014SM	-3.53
F8130732C0015SM	0.34
F8130732C0016SM	39.09
F8130732C0017SM	1.64
F8130732C0018SM	1.64
F8130732C0019SM	0.34
F8130732C0020SM	18.42
F8130732C0021SM	1.64
F8130732C0022SM	26.17
F8130732C0023SM	-2.24
F8130732C0024SM	-3.53
F8130732C0025SM	0.34
Mean:	2.62
Median:	0.34
Standard Deviation:	10.25
Range:	-3.53 to 39.09

Survey Unit Data Assessment:

The survey design required 17 direct measurements for the Sign Test. In actuality, 25 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):	25	
Median (dpm/100 cm ²):	1836	
Mean (dpm/100 cm ²):	2633	
Direct Measurement Standard Deviation (dpm/100 cm ²):	2879	Based on samples and backgrounds.
Total Standard Deviation (dpm/100 cm ²):	2879	
Maximum (dpm/100 cm ²):	15100	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	25	Class 1
S+ Value:	25	
Critical Value:	17	
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:

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.

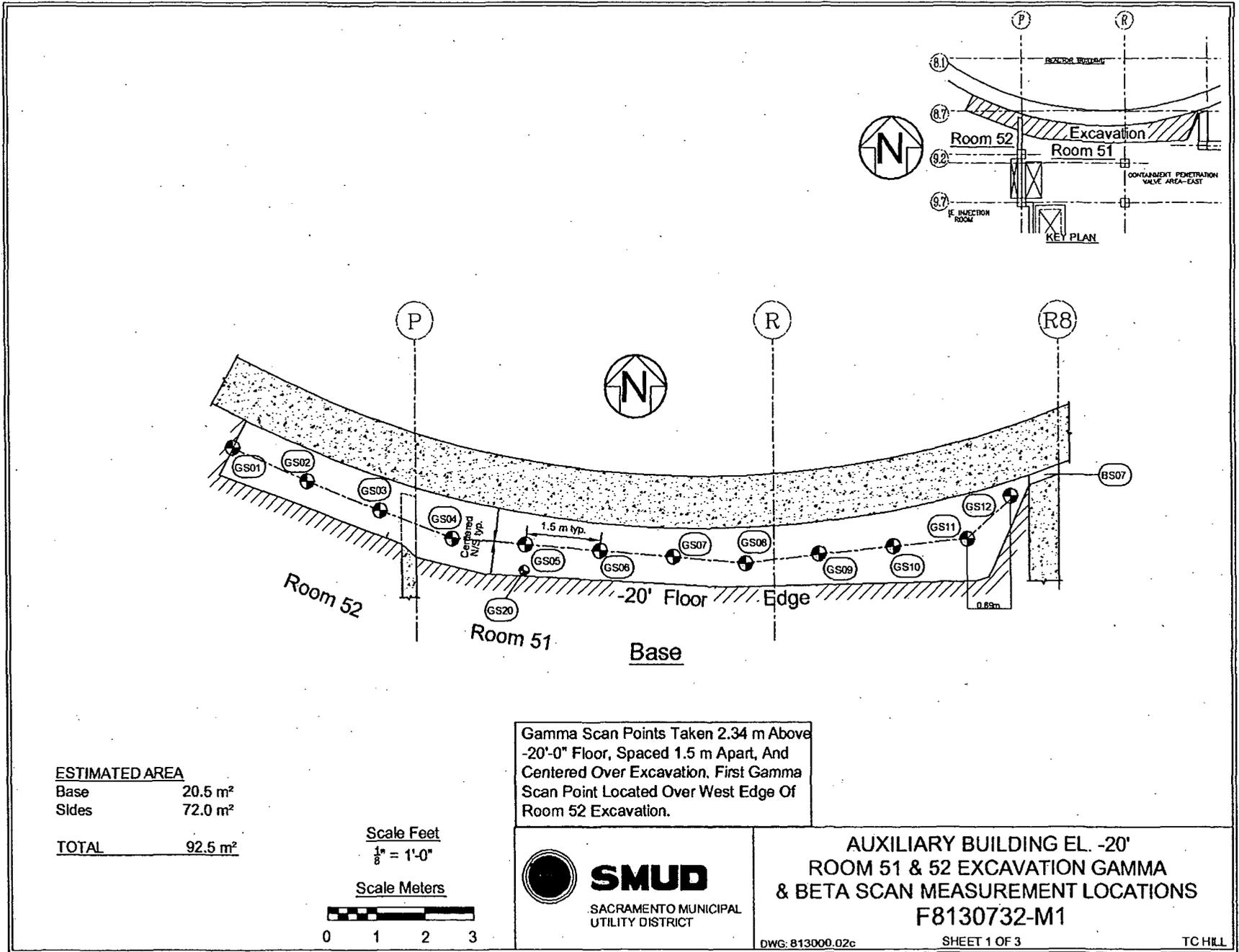
It is concluded that survey unit F8130732 meets the release criteria of 10CFR20.1402.

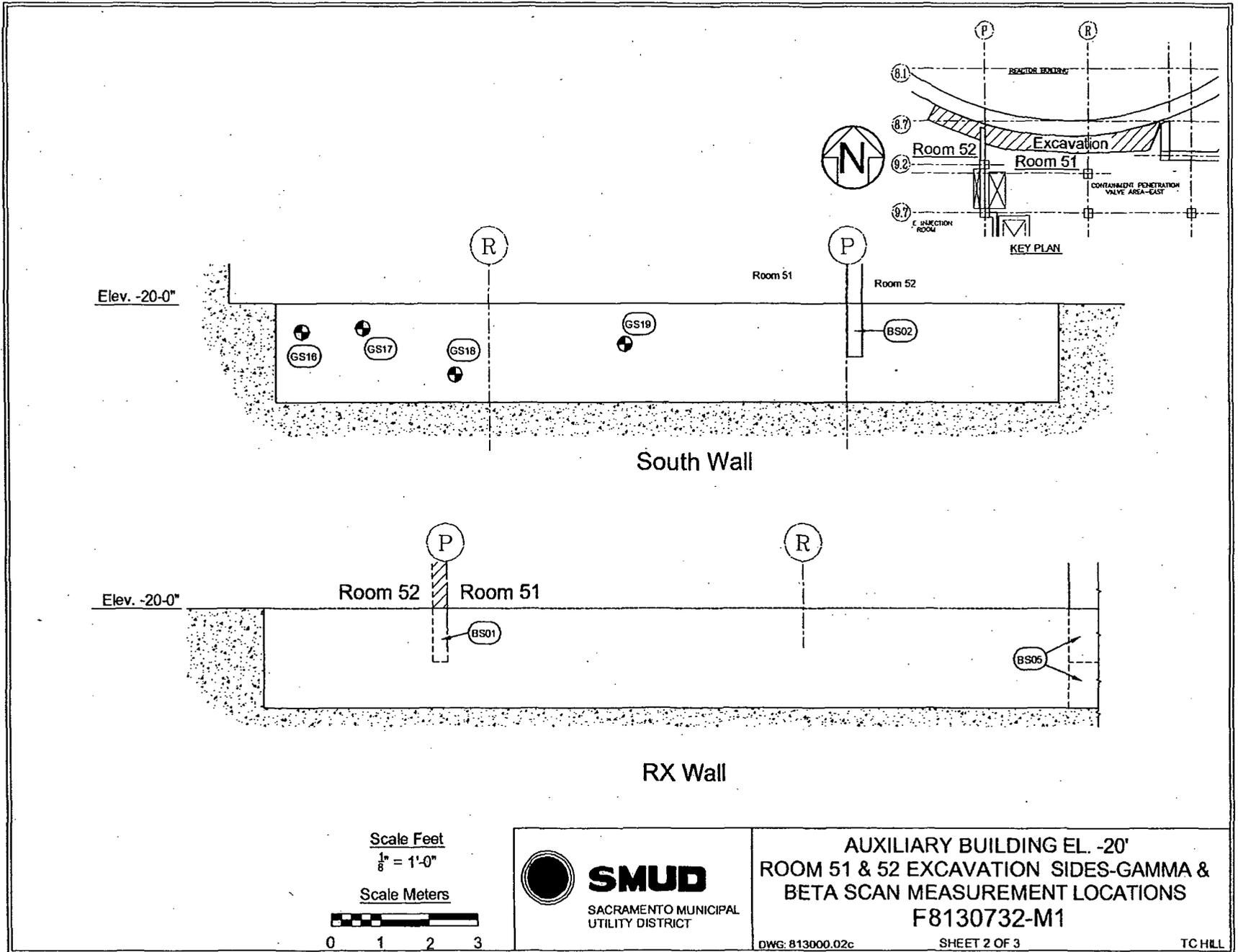
Attachment 1

Maps

July 9, 2008

Survey Unit F8130732





Scale Feet

1/8" = 1'-0"

Scale Meters



SMUD

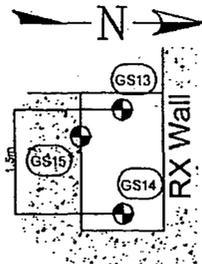
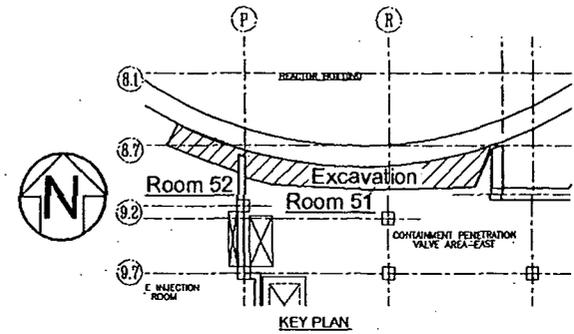
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

AUXILIARY BUILDING EL. -20'
 ROOM 51 & 52 EXCAVATION SIDES-GAMMA &
 BETA SCAN MEASUREMENT LOCATIONS
 F8130732-M1

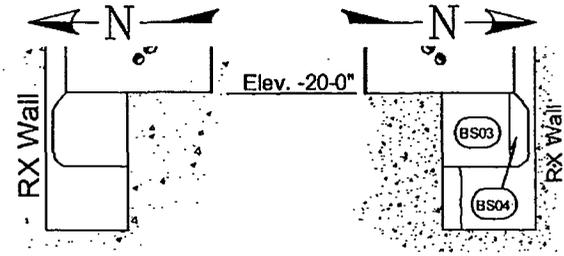
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SHEET 2 OF 3

TC HILL

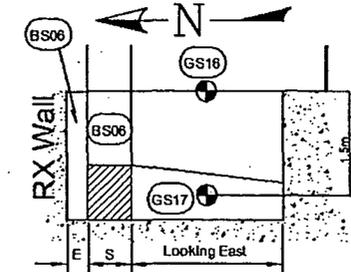


West Side Room 52



East Side Room 52

West Side Room 51



East Side Room 51

Scale Feet

1/8" = 1'-0"

Scale Meters



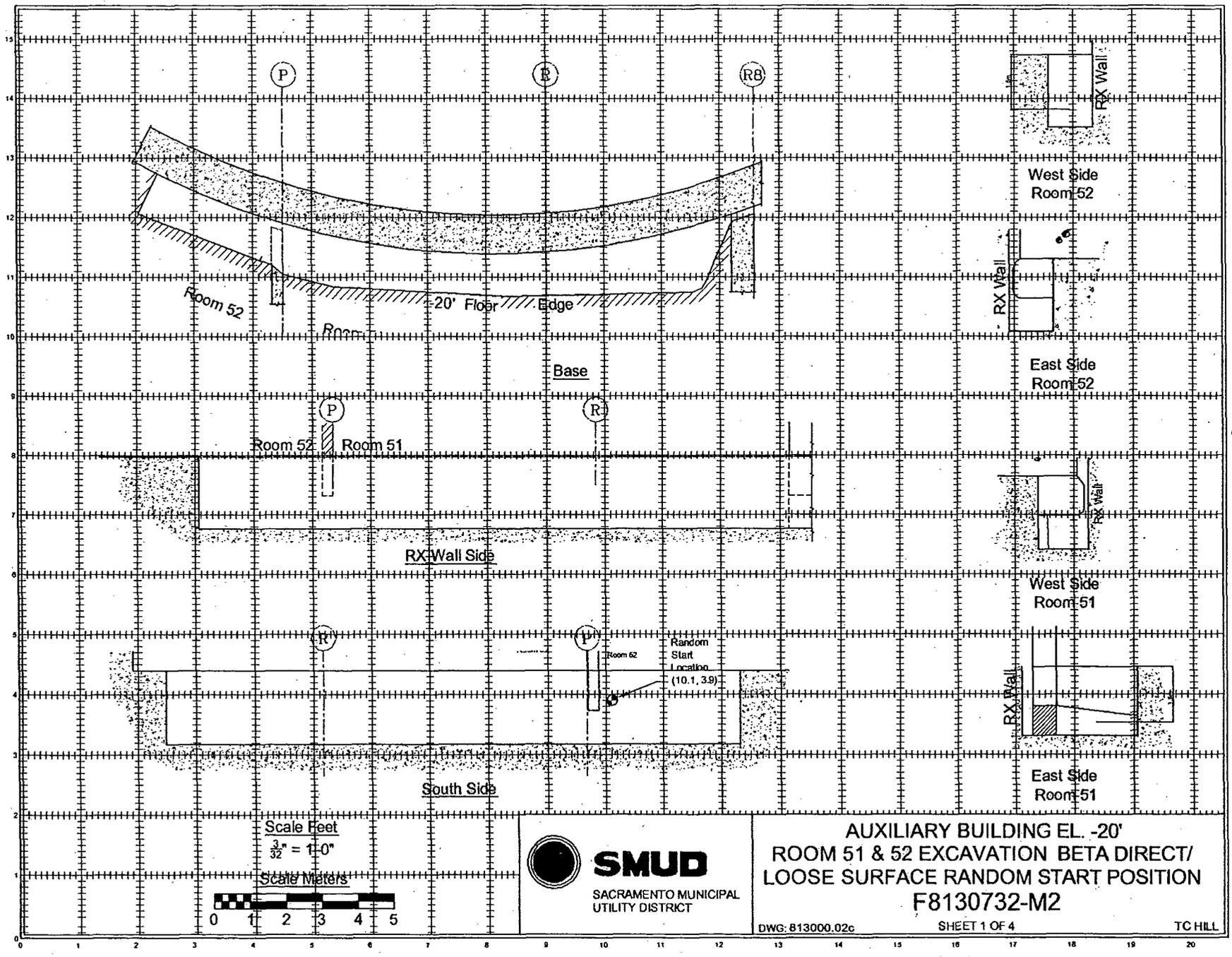
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BUILDING EL. -20'
 ROOM 51 & 52 EXCAVATION SIDES-GAMMA &
 BETA SCAN MEASUREMENT LOCATIONS
 F8130732-M1

DWG: 813000.02c

SHEET 3 OF 3

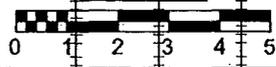
TC HILL



Scale Feet

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

Scale Meters



SMUD

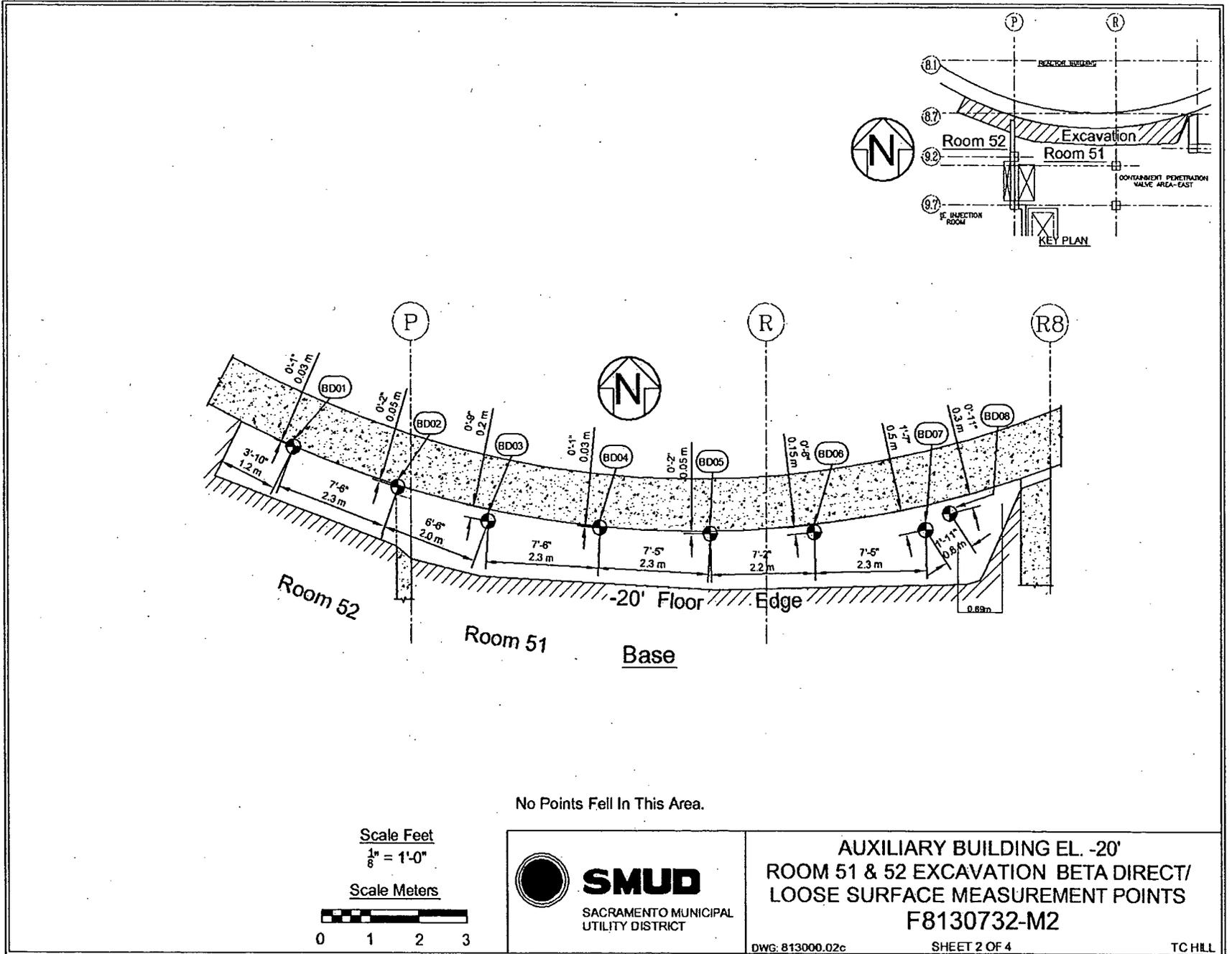
SACRAMENTO MUNICIPAL
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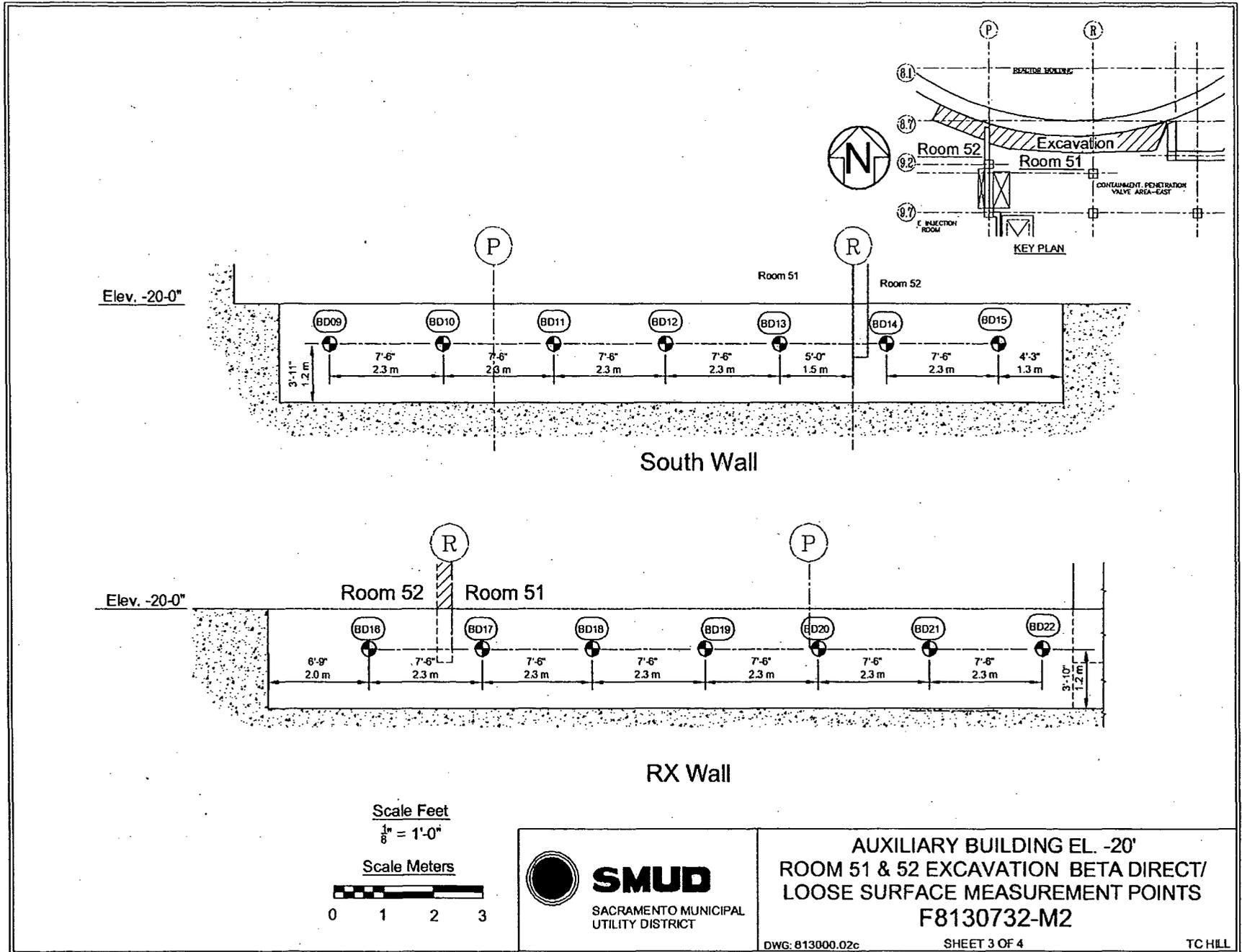
AUXILIARY BUILDING EL. -20'
ROOM 51 & 52 EXCAVATION BETA DIRECT/
LOOSE SURFACE RANDOM START POSITION
F8130732-M2

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SHEET 1 OF 4

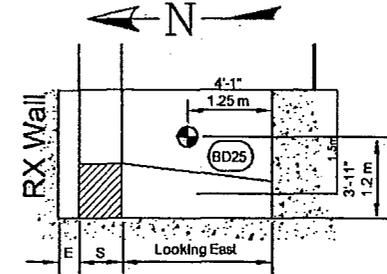
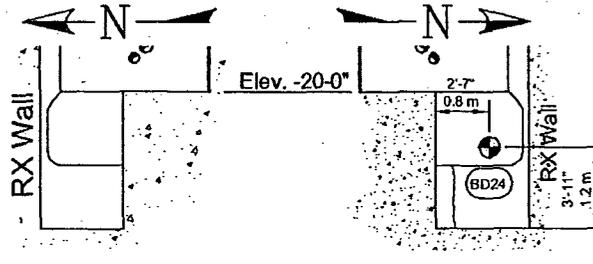
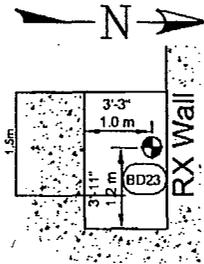
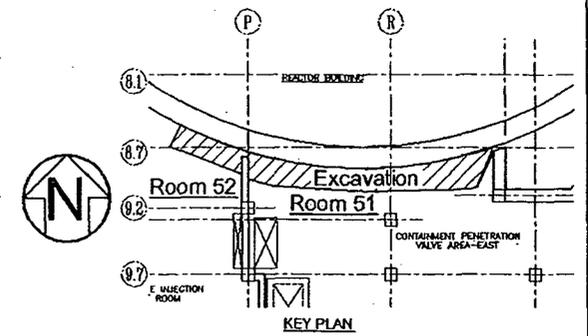
TC HILL





SMUD
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UTILITY DISTRICT

AUXILIARY BUILDING EL. -20'
ROOM 51 & 52 EXCAVATION BETA DIRECT/
LOOSE SURFACE MEASUREMENT POINTS
F8130732-M2
DWG: 813000.02c SHEET 3 OF 4 TC HILL

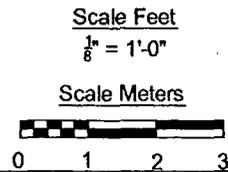


West Side Room 52

East Side Room 52

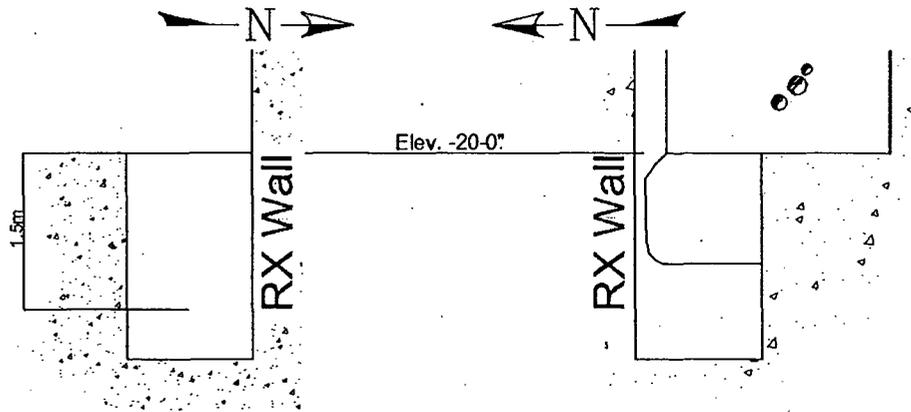
West Side Room 51

East Side Room 51



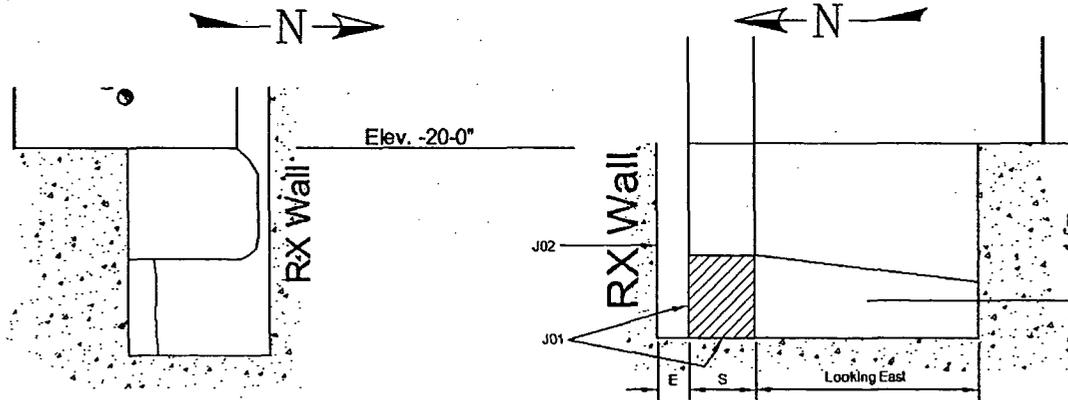
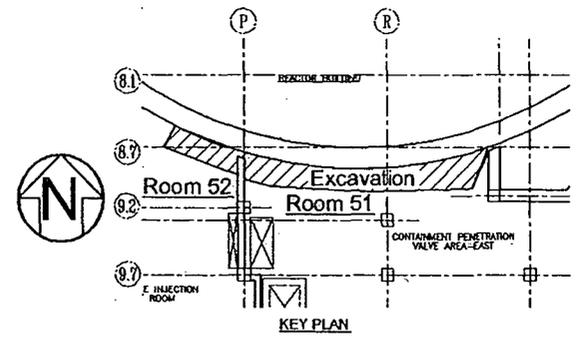
AUXILIARY BUILDING EL. -20'
ROOM 51 & 52 EXCAVATION BETA DIRECT/
LOOSE SURFACE MEASUREMENT POINTS
F8130732-M2

DWG: 813000.02c SHEET 4 OF 4 TC HILL



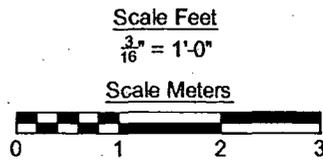
West Side Room 52

East Side Room 52



West Side Room 51

East Side Room 51



AUXILIARY BUILDING EL. -20'
ROOM 51 & 52 EXCAVATION - JUNCTURE
BETA SCAN MEASUREMENT LOCATIONS
F8130732-M3

DWG: 813000.02c

SHEET 1 OF 1

TC HILL

Attachment 2

Instrumentation

July 9, 2008

Survey Unit F8130732

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; 175834	43-68B; 190482	433	1033
M2350; 149794	43-68/5B; 149103	433	1033
M2350; 149794	43-116-1B; 256005	796	3258
M2350; 175834	43-116-1B; 190642	796	3258
Tennelec; 0401171	N/A	5.9 dpm α , 11.7 dpm β	N/A
InSpector 1000	10054579	N/A	4890 Cs-137 2160 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	176300
Investigation Criteria - Scan	176300
DCGL _w	43000
DCGL _{EMC}	176300

Attachment 3

Investigation

July 9, 2008

Survey Unit F8130732

(none required)

Attachment 4

Data Assessment

July 9, 2008

Survey Unit F8130732

