

Rancho Seco
Final Status Survey Summary Report
March 20, 2008
Flash Tank Room
Survey Unit F8130141

Prepared By: Dan Tallman at Secher Date: 3/20/2008
FSS Engineer

Reviewed By: [Signature] Date: 3/20/08
Lead FSS Engineer

Approved By: [Signature] Date: 5-12-08
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130141, Flash Tank Room

Survey Unit Description:

Operating History: The Auxiliary Building, a 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.

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 -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 of the auxiliary building -20' elevation 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 61.6 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	Flash Tank Room
Survey Unit:	0141	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	61.6	
Evaluator:	D.A.Tallman	
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	5.1	Class 1
Design DCGL_{emc} (dpm/100 cm²):	221058	Class 1
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	12035	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	3.85	Class 1
Scan Area (m²):	61.6	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.96407	
Calculated Relative Shift:	1.8	
Relative Shift Used:	1.8	Uses 3.0 if Relative Shift is >3
N-Value:	13	
Design N-Value + 20%:	16	NUREG-1575 Table 5-5
Design Min Samples N:	16	Class 1
Grid Spacing L:	1.9	Class 1

Survey Results:

A total of 16 direct measurements were made in F8130141. The results including mean, median, standard deviation and range are shown in Table 2. All direct measurements were less than the DCGL. Five scan measurements indicated areas of elevated activity. Scan activity ranged from 1356 to 114477 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)
F8130141-C0001BD	2915
F8130141-C0002BD	1841
F8130141-C0003BD	1556
F8130141-C0004BD	1930
F8130141-C0005BD	1608
F8130141-C0006BD	2754
F8130141-C0007BD	1836
F8130141-C0008BD	11365
F8130141-C0009BD	2210
F8130141-C0010BD	5068
F8130141-C0011BD	2090
F8130141-C0012BD	2319
F8130141-C0013BD	2215
F8130141-C0014BD	1551
F8130141-C0015BD	1323
F8130141-C0016BD	923
Mean:	2719
Median:	2010
Standard Deviation:	2486
Range:	923 - 11365

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm²)
F8130141C0001SM	13.26
F8130141C0002SM	-2.24
F8130141C0003SM	-3.53
F8130141C0004SM	-2.24
F8130141C0005SM	-3.53
F8130141C0006SM	2.93
F8130141C0007SM	0.34
F8130141C0008SM	8.09
F8130141C0009SM	-2.24
F8130141C0010SM	5.51
F8130141C0011SM	0.34
F8130141C0012SM	6.8
F8130141C0013SM	13.26
F8130141C0014SM	-0.95
F8130141C0015SM	-2.24
F8130141C0016SM	0.34
Mean:	2.12
Median:	0.34
Standard Deviation:	5.64
Range:	-3.53 to 13.26

Survey Unit Data Assessment:

The survey design required 16 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	
Ambient Background Used (dpm/100 cm ²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	16	
Median (dpm/100 cm ²):	2010	
Mean (dpm/100 cm ²):	2719	
Direct Measurement Standard Deviation	2486	
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	2486	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	11365	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	16	
S+ Value:	16	
Critical Value:	11	
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:

Five investigations (scan grids 03, 05, 20, 21, & penetration scan P07) were required based on an Investigation Level set conservatively at the DCGL_w in the survey design for the Beta 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. The potential areas of elevated activity were detected and evaluated as shown in Attachment 3 demonstrating that 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 evaluated as 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.

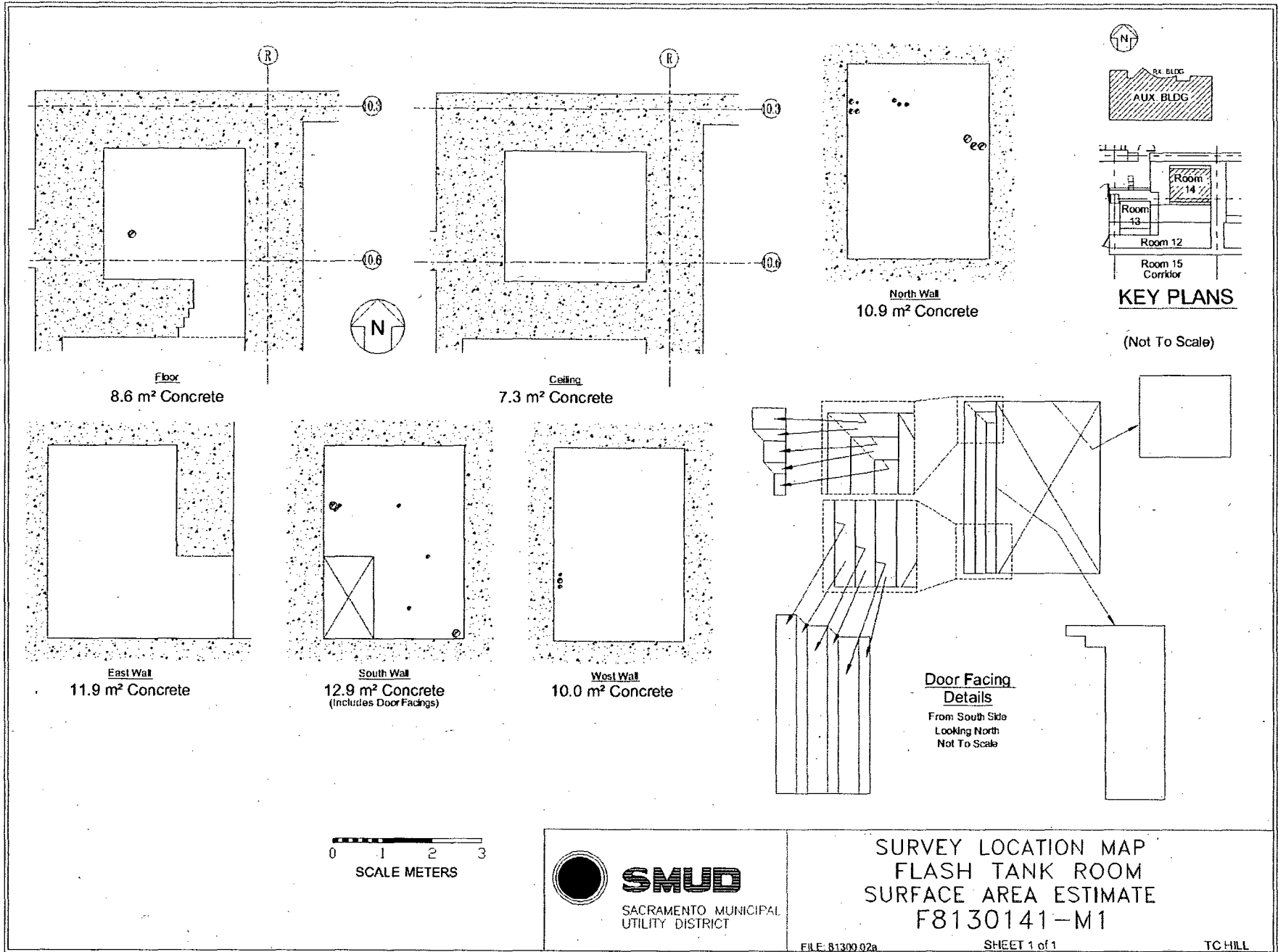
It is concluded that survey unit F8130141 meets the release criteria of 10CFR20.1402.

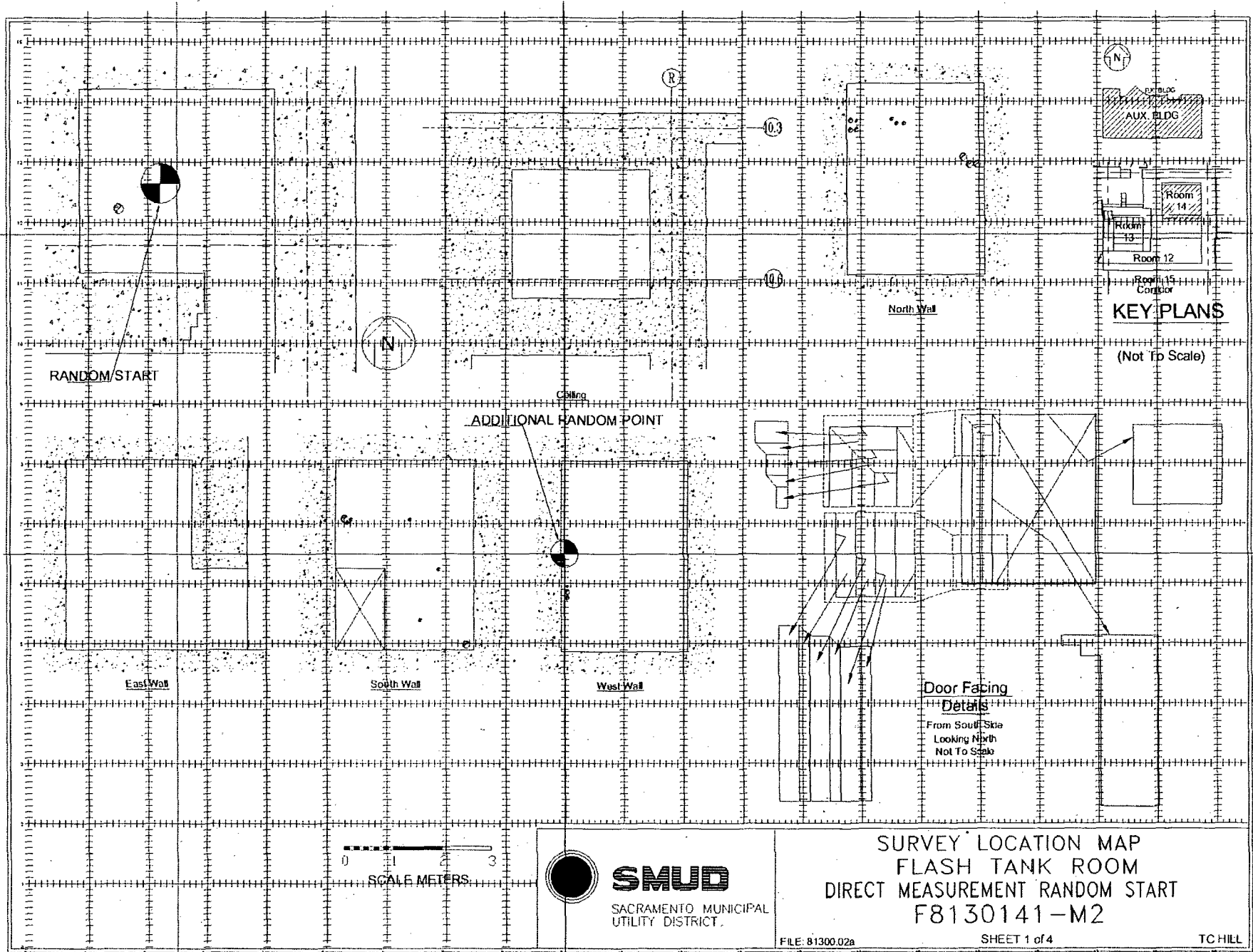
Attachment 1

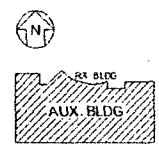
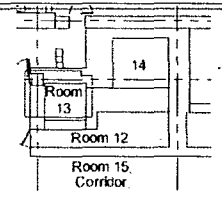
Maps

March 20, 2008

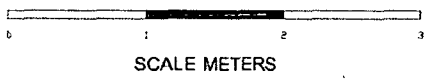
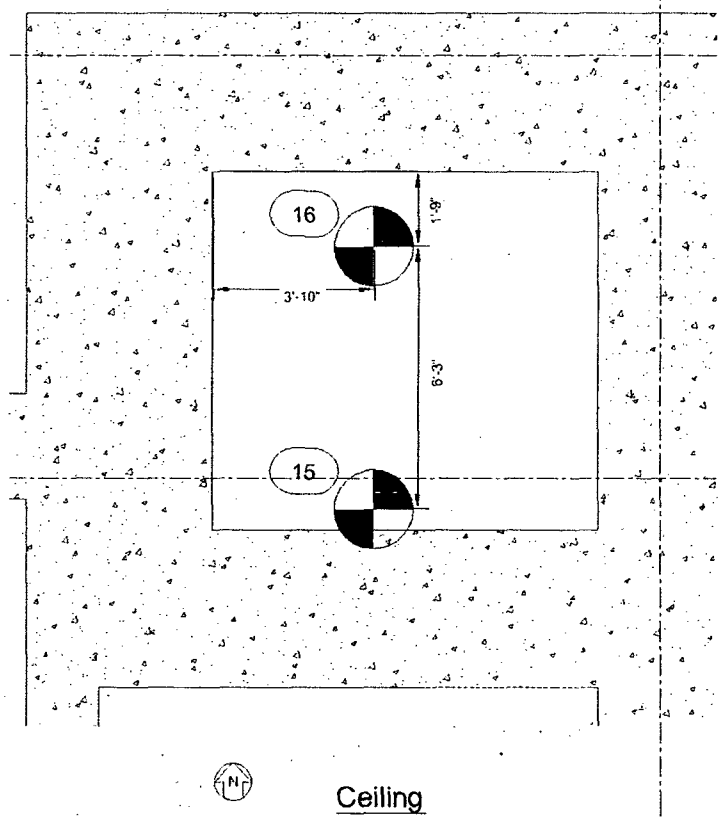
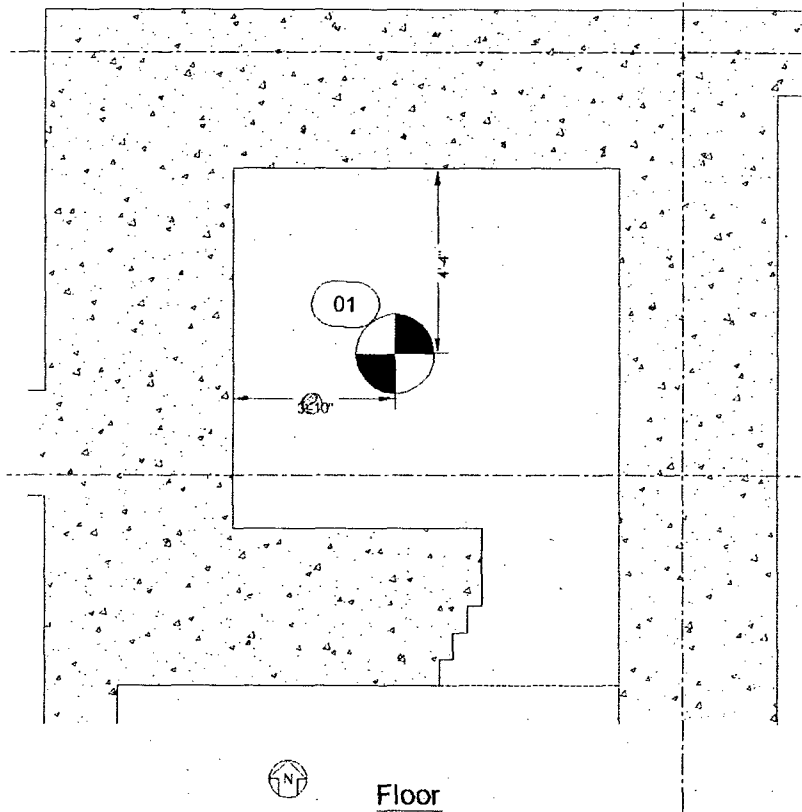
Survey Unit F8130141







KEY PLANS
(Not To Scale)

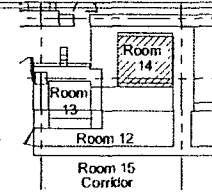
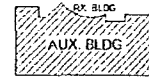


SURVEY LOCATION MAP
FLASH TANK ROOM
BETA DIRECT/REMOVABLE ACTIVITY
F8130141-M2

FILE: 81300.02a

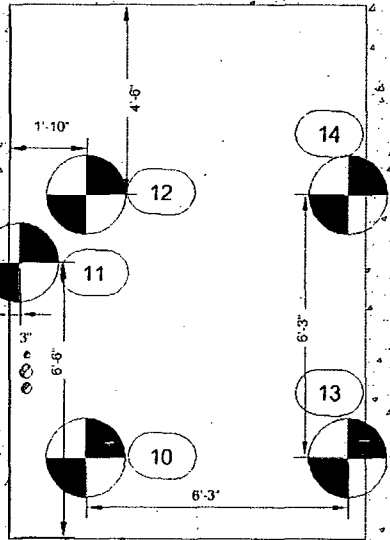
SHEET 2 of 4

TC HILL

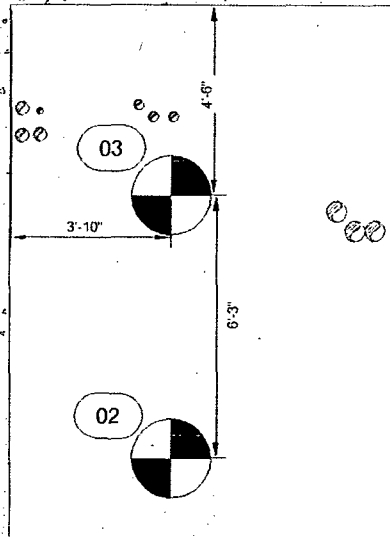


KEY PLANS

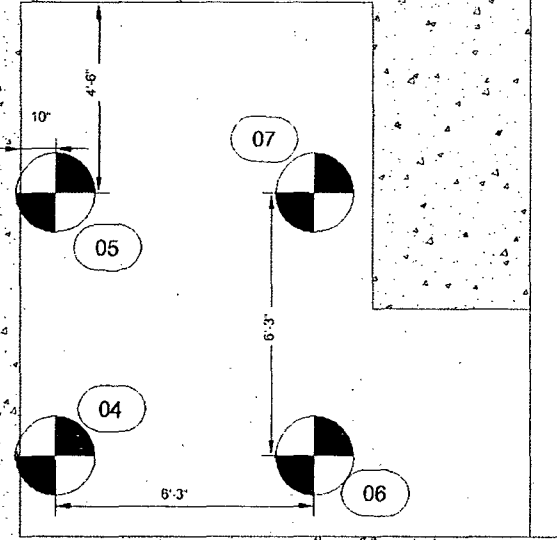
(Not To Scale)



West Wall



North Wall



East Wall



SCALE METERS



SMUD

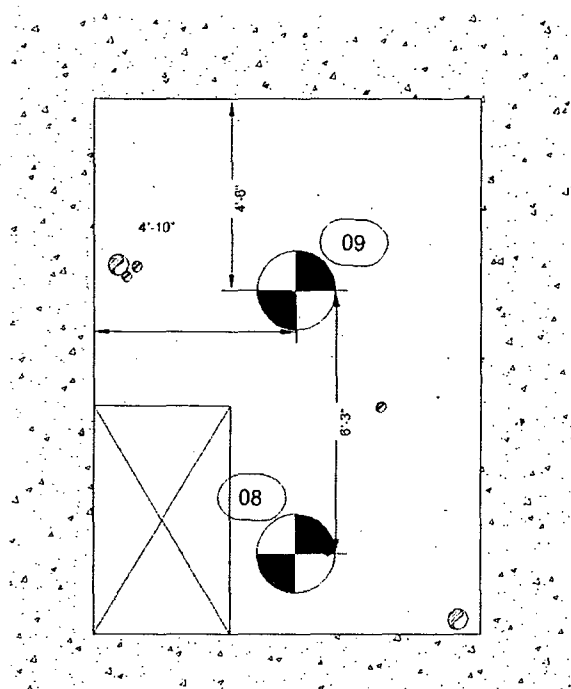
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

SURVEY LOCATION MAP
FLASH TANK ROOM
BETA DIRECT/REMOVABLE ACTIVITY
F8130141-M2

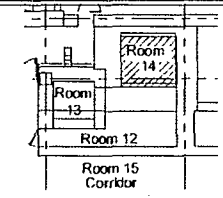
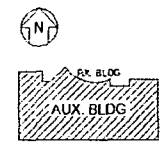
FILE: 81300.02a

SHEET 3 of 4

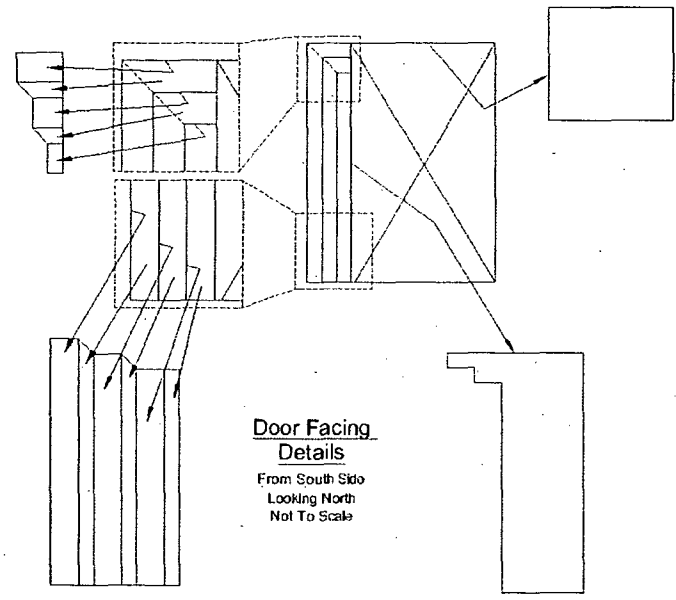
TC HILL



South Wall



KEY PLANS
(Not To Scale)



Door Facing
Details
From South Side
Looking North
Not To Scale



SCALE METERS

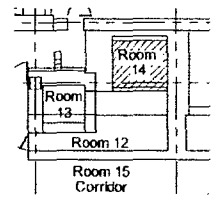
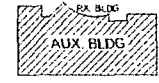


SURVEY LOCATION MAP
FLASH TANK ROOM
BETA DIRECT/REMOVABLE ACTIVITY
F8130141-M2

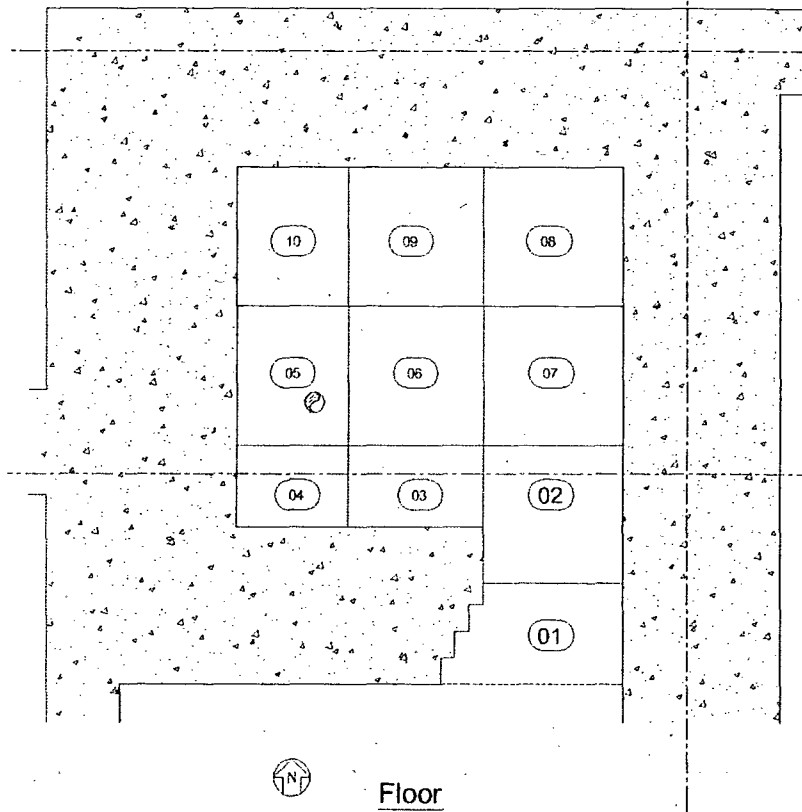
FILE: 81300.02a

SHEET 4 of 4

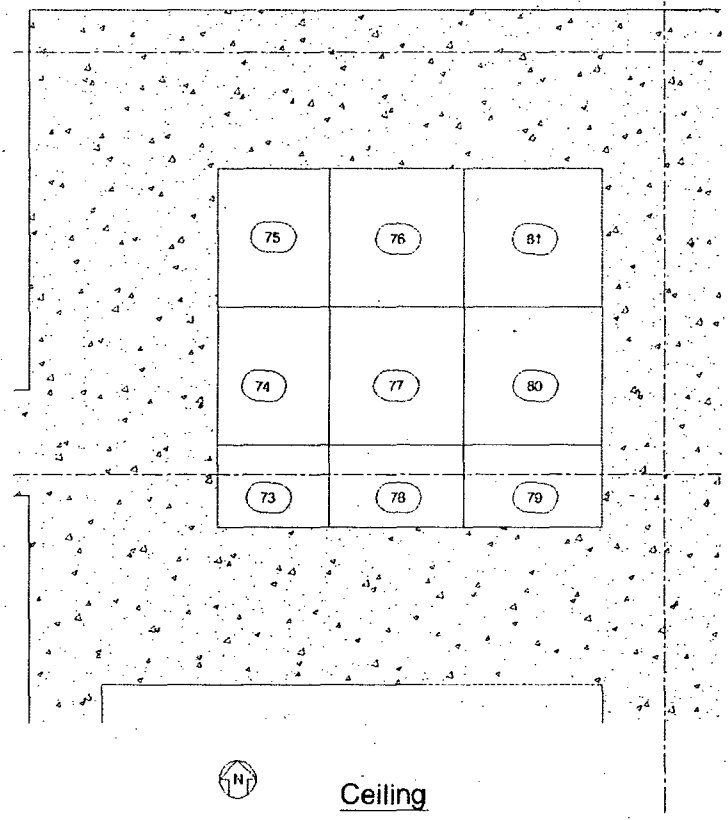
TC HILL



KEY PLANS
(Not To Scale)



Floor



Ceiling



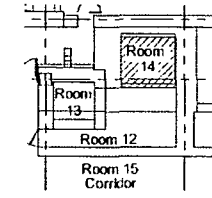
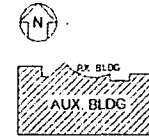
SCALE METERS



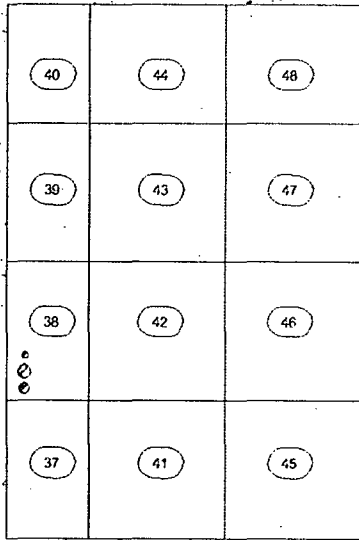
SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

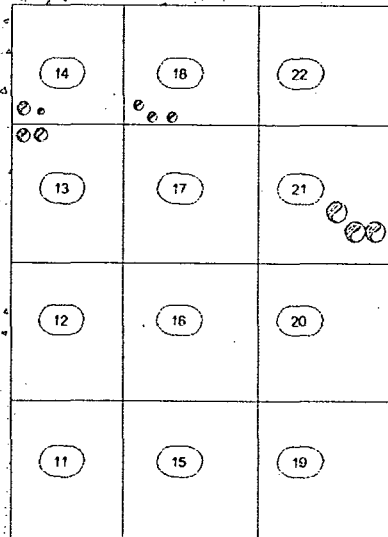
SURVEY LOCATION MAP
FLASH TANK ROOM
BETA SCAN
F8130141-M3



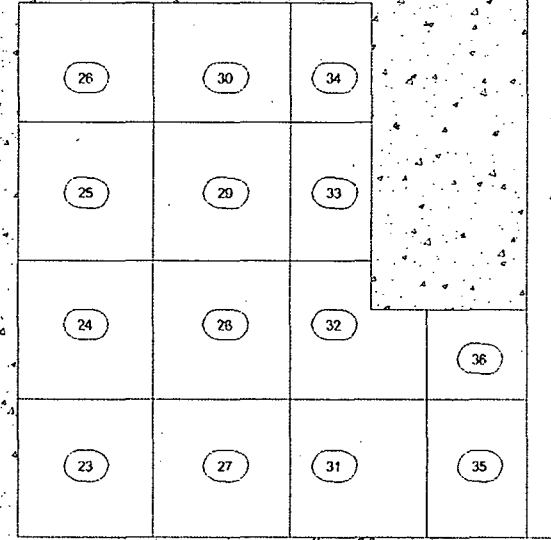
KEY PLANS
(Not To Scale)



West Wall



North Wall

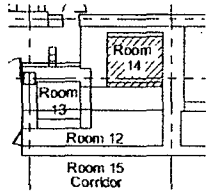


East Wall

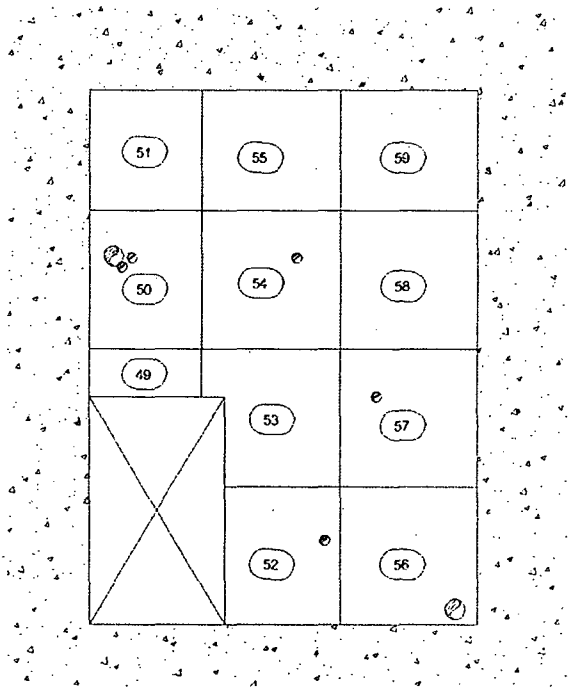


SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

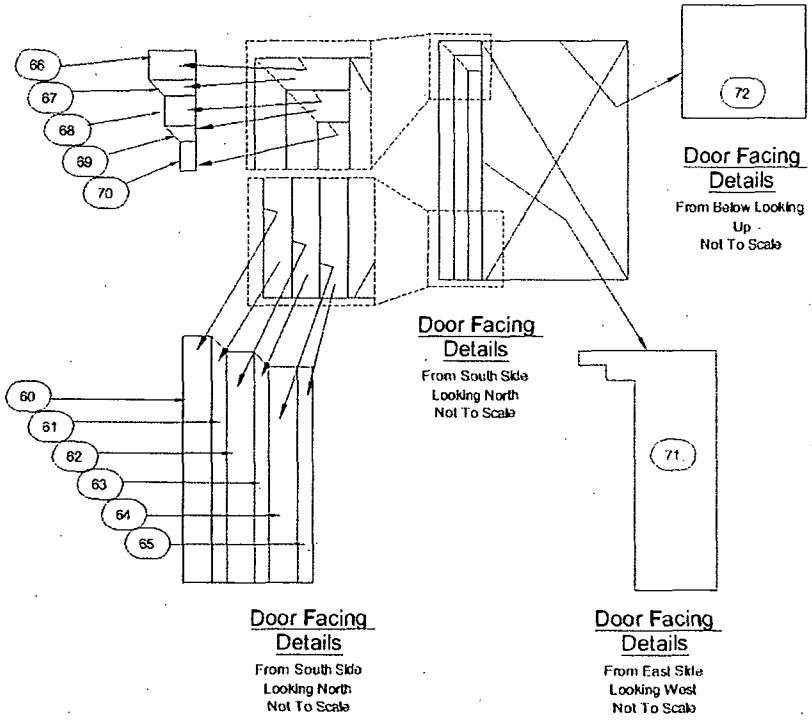
SURVEY LOCATION MAP
FLASH TANK ROOM
BETA SCAN
F8130141-M3



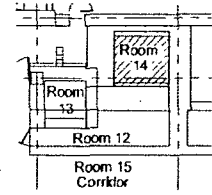
KEY PLANS
(Not To Scale)



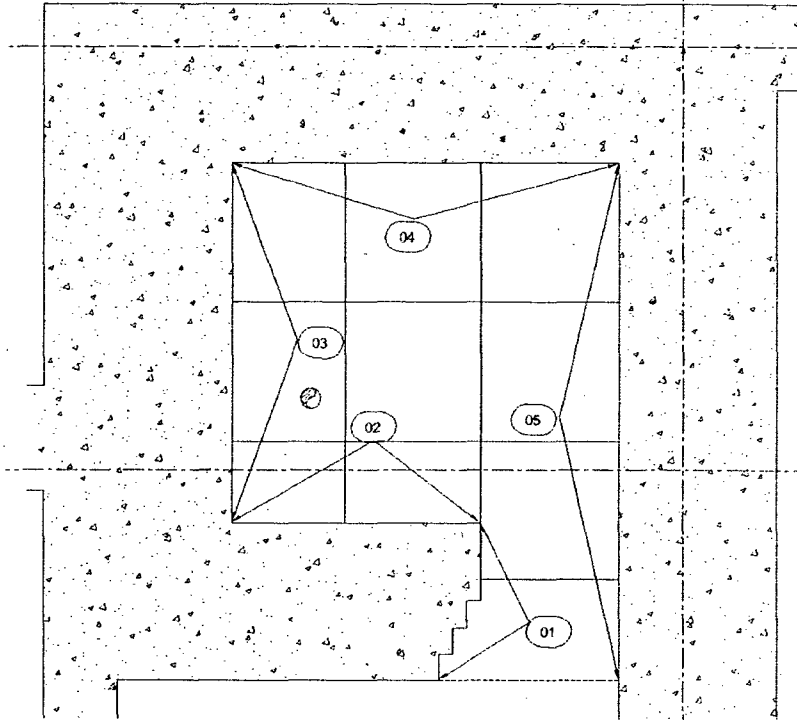
South Wall



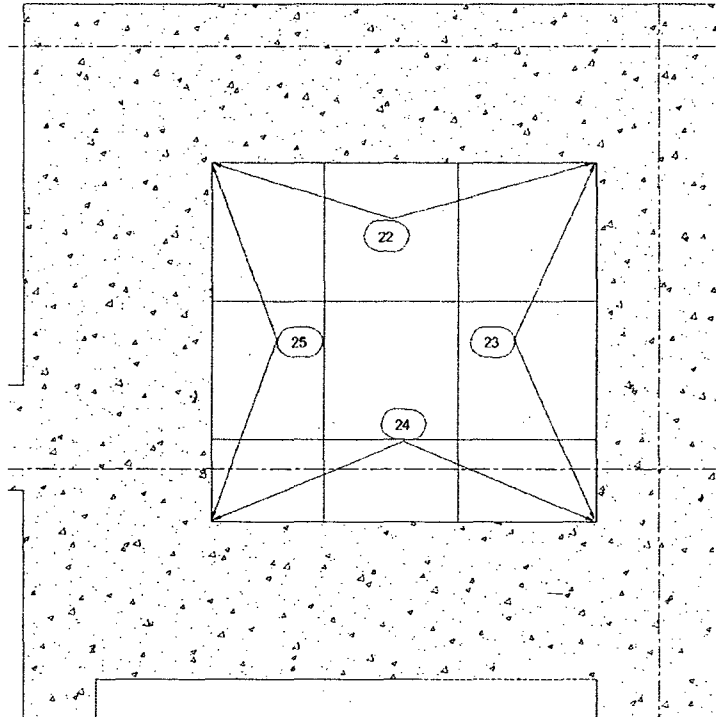
SURVEY LOCATION MAP
FLASH TANK ROOM
BETA SCAN
F8130141-M3



KEY PLANS
(Not To Scale)



Floor



Ceiling



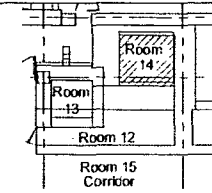
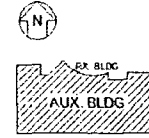
SCALE METERS



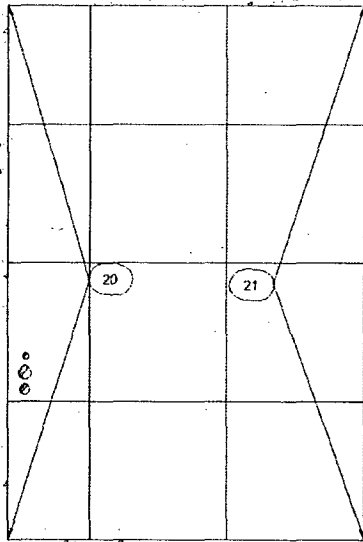
SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

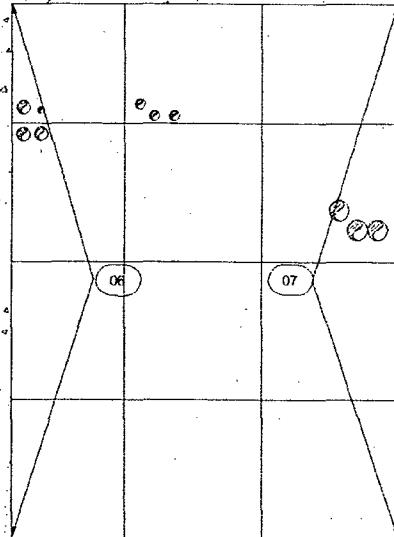
SURVEY LOCATION MAP
FLASH TANK ROOM
JUNCTURE SCANS
F8130141-M4



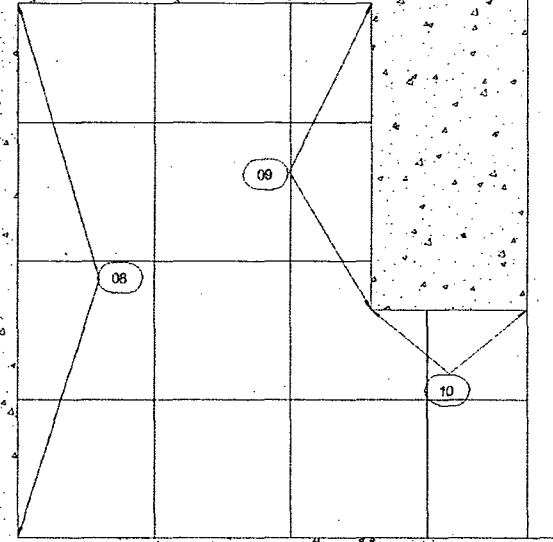
KEY PLANS
(Not To Scale)



West Wall



North Wall



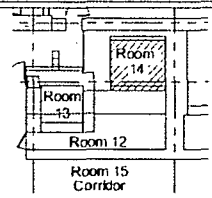
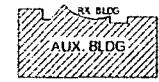
East Wall



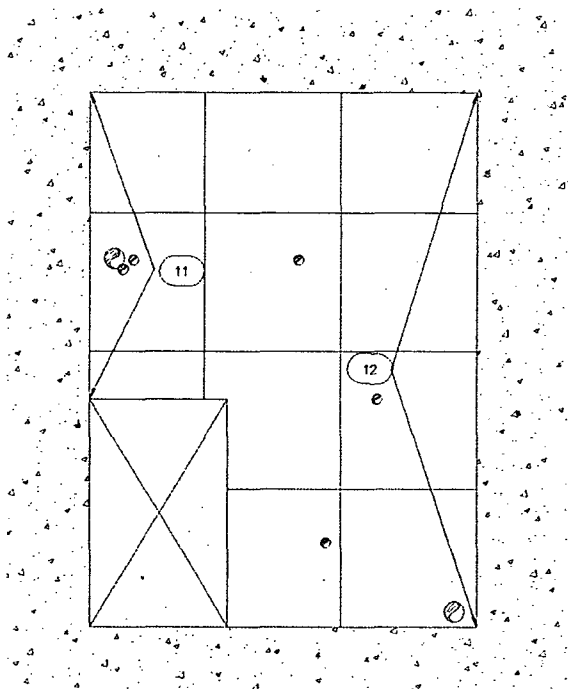
SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

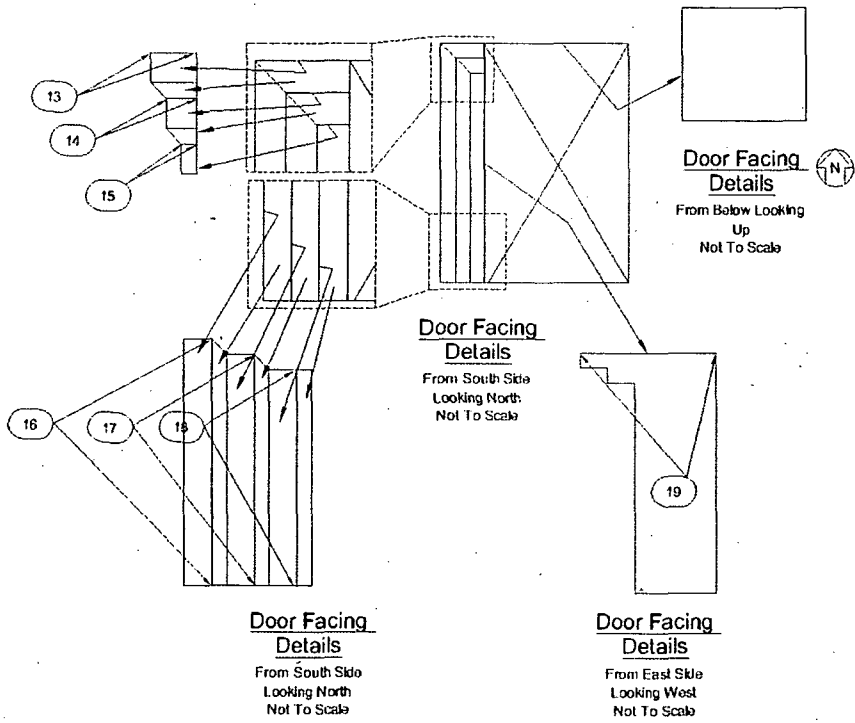
SURVEY LOCATION MAP
FLASH TANK ROOM
JUNCTURE SCANS
F8130141-M4



KEY PLANS
(Not To Scale)



South Wall



SCALE METERS

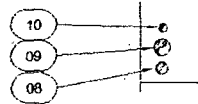
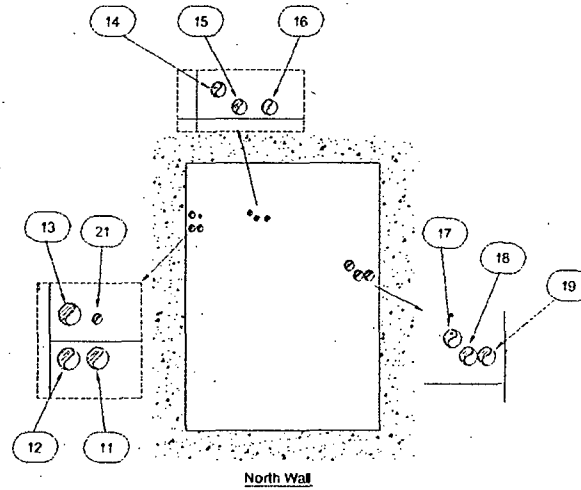
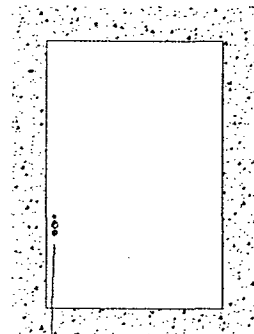
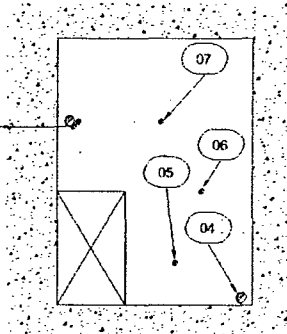
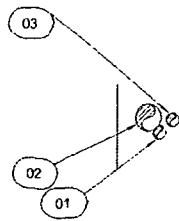
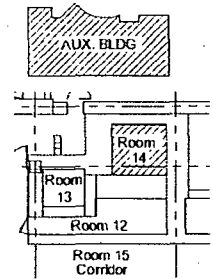
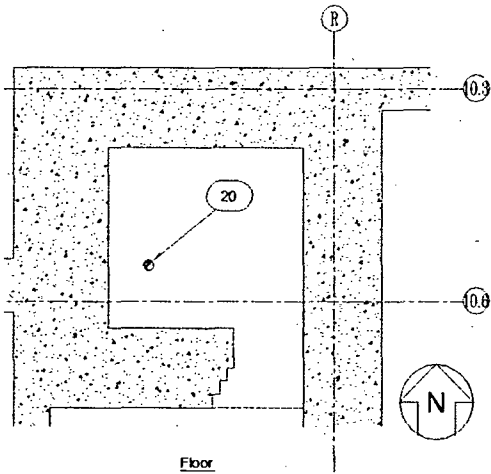


SURVEY LOCATION MAP
FLASH TANK ROOM
JUNCTURE SCANS
F8130141-M4

FILE: 81300.02a

SHEET 3 of 3

TC HILL



SMUD

SACRAMENTO MUNICIPAL
UTILITY DISTRICT

SURVEY LOCATION MAP
FLASH TANK ROOM
PENETRATIONS
F8130141-M5

FILE: 81300.02a

SHEET 1 of 1

TC HILL

Attachment 2

Instrumentation

March 20, 2008

Survey Unit F8130141

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 ¹	930	1680
M2350; 180733	43-98B; 148638 ²	350	630
M2350; 180733	43-98B; 148638 ³	550	990
M2350; 180733	43-98B; 148638 ⁴	820	1490
M2350; 180733	43-94; 148620 ⁵	590	1030
M2350; 149789	43-68B; 161397	433	1033
M2350; 149789	43-116-1B; 256006 ⁶	491	739
M2350; 149789	43-116-1B; 256006 ⁷	472	1930
M2350; 149789	43-116-1B; 256006 ⁸	796	3258
Tennelec; 0401171	N/A	5.88 dpm α , 11.71 dpm β .	N/A

¹ Penetration – 3” - concrete

² Penetration – 2” - metal

³ Penetration – 3” - metal

⁴ Penetration – 4” - metal

⁵ Penetration – 1” - concrete

⁶ Juncture – concrete

⁷ Structure/Penetration – 4”-14” - metal

⁸ Structure /Penetration – 4”-14” - concrete

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	222282
Investigation Criteria – Scan	43000 ^A
DCGL _w	43000
DCGL _{EMC}	222282

^A Investigation Level set at DCGL_w within the survey instruction.

Attachment 3

Investigation

March 20, 2008

Survey Unit F8130141

Table 3-1 Survey Unit Investigation

<i>Grid</i>	<i>Investigation Level (cpm)</i>	<i>Initial Value (cpm)</i>	<i>Investigation Result (cpm)¹</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>
Grid 03	5840	7111	5422	NA	NA	NA	< DCGL _w	0
Grid 05	5840	11202	7172	NA	NA	NA	< DCGL _w	0
Grid 20	5840	8665	3954	NA	NA	NA	< DCGL _w	0
Grid 21	5840	15605	13322	0.06	218.25	9384924	69105	0.007
P07	1350	4430	1088 ²	NA	NA	NA	< DCGL _w	0
¹ Beta Direct measurement								
² 43-98B								
Survey Unit Remainder						DCGL = 43,000	SU Mean = 2718	0.063
EMC Unity Sum								0.07

Attachment 4

Data Assessment

March 20, 2008

Survey Unit F8130141

