Rancho Seco

Final Status Survey Summary Report

November 7, 2007

"A" High Pressure Injection Pump Room Floor and Lower Walls
(Room 053)

Survey Unit F8130781

Prepared By: _____ Date: 11/7/2007
FSS Engineer

Reviewed By: _____ Date: 11/7/07
Lead FSS Engineer

Approved By: _____ Date: 11-14-07
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8130781, "A" High Pressure Injection Pump Room Floor and Lower Walls (Room 053)

Survey Unit Description:

Operating History: The "A" High Pressure Injection Pump Room is 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 cm^2 and a maximum value of 10,080,000 dpm/100 cm^2. 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 "A" High Pressure Injection Pump Room there were a number of areas on the floor 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 floor and lower wall surfaces of the room.

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 84 m^2 were scanned for approximately 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	"A" High Pressure Injection Pump Room (Room 053)
Survey Unit:	0781	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m^2)**:**	84	
Evaluator:	Michael Stein	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	4	Class 1
Design DCGLemc (dpm/100 cm^2)**:**	172000	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)**:**	4.9	Class 1
Scan Area (m^2)**:**	84	
Scan Coverage (%):	100%	Class 1
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	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:	2.2	Class 1

Survey Results:

A total of 17 direct measurements were made in F8130781. 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 2,974 to 17,569 dpm/100 cm^2, 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)
F8130781-C0001BD	2189
F8130781-C0002BD	2236
F8130781-C0003BD	1940
F8130781-C0004BD	1608
F8130781-C0005BD	1924
F8130781-C0006BD	2853
F8130781-C0007BD	4103
F8130781-C0008BD	2189
F8130781-C0009BD	3740
F8130781-C0010BD	2007
F8130781-C0011BD	1712
F8130781-C0012BD	2065
F8130781-C0013BD	1899
F8130781-C0014BD	2127
F8130781-C0015BD	3631
F8130781-C0016BD	3112
F8130781-C0017BD	1644
Mean:	2411
Median:	2127
Standard Deviation:	780
Range:	1608 - 4103

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8130781C0001SM	8.7
F8130781C0002SM	7.42
F8130781C0003SM	2.29
F8130781C0004SM	6.14
F8130781C0005SM	8.7
F8130781C0006SM	2.29
F8130781C0007SM	7.42
F8130781C0008SM	8.7
F8130781C0009SM	9.98
F8130781C0010SM	3.58
F8130781C0011SM	7.42
F8130781C0012SM	4.86
F8130781C0013SM	8.7
F8130781C0014SM	3.58
F8130781C0015SM	7.42
F8130781C0016SM	8.7
F8130781C0017SM	4.86
Mean:	6.52
Median:	7.42
Standard Deviation:	2.47
Range:	2.29 to 9.98

Survey Unit Data Assessment:

The survey design required 17 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):	17	
Median (dpm/100 cm^2):	2127	
Mean (dpm/100 cm^2):	2411	
Direct Measurement Standard Deviation (dpm/100 cm^2):	780	
Total Standard Deviation (dpm/100 cm^2):	780	Based on samples and backgrounds.
Maximum (dpm/100 cm^2):	4103	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	17	
S+ Value:	17	
Critical Value:	12	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	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:

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. 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 cm^2 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.

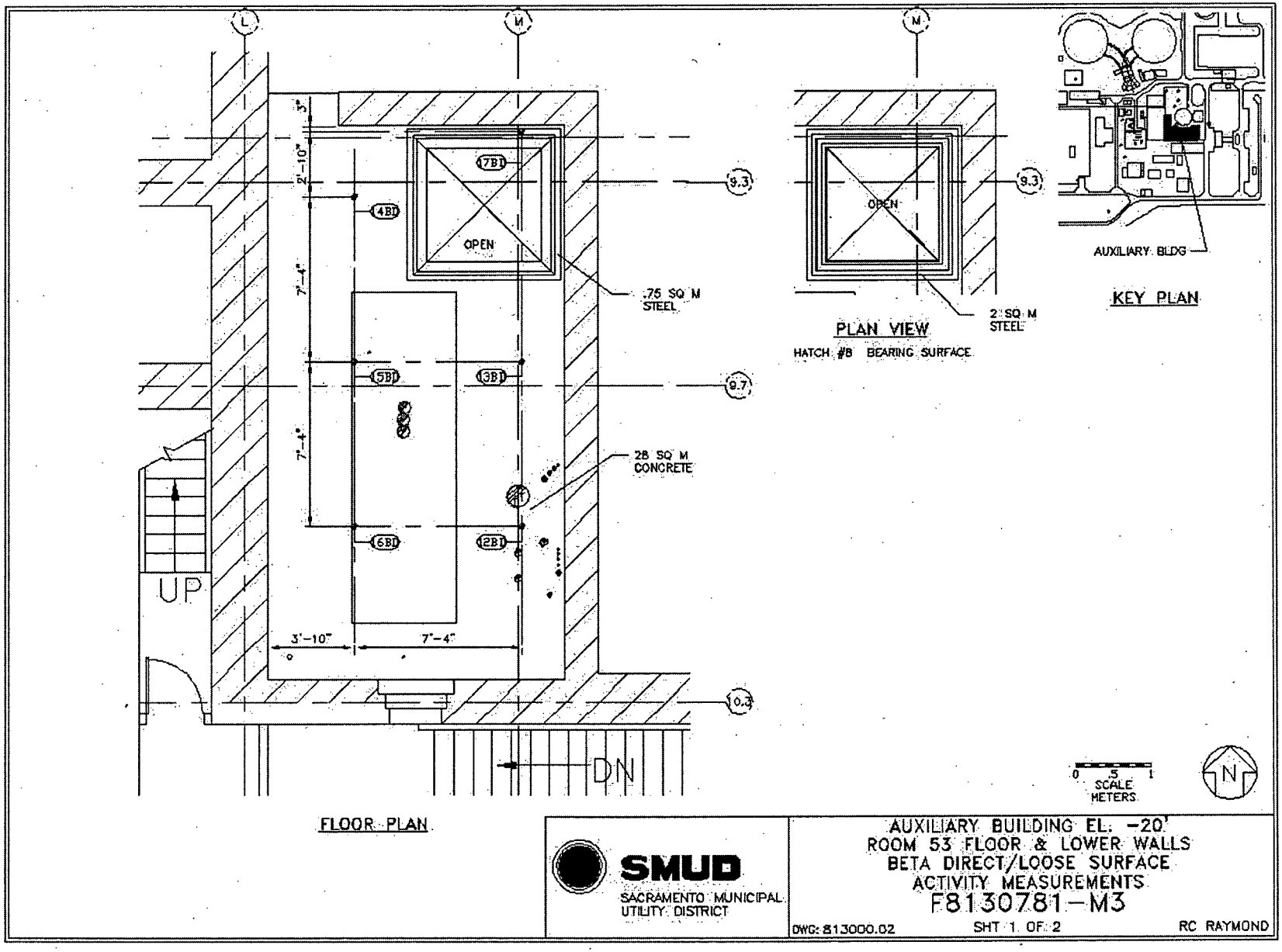
It is concluded that survey unit F8130781 meets the release criteria of 10CFR20.1402.

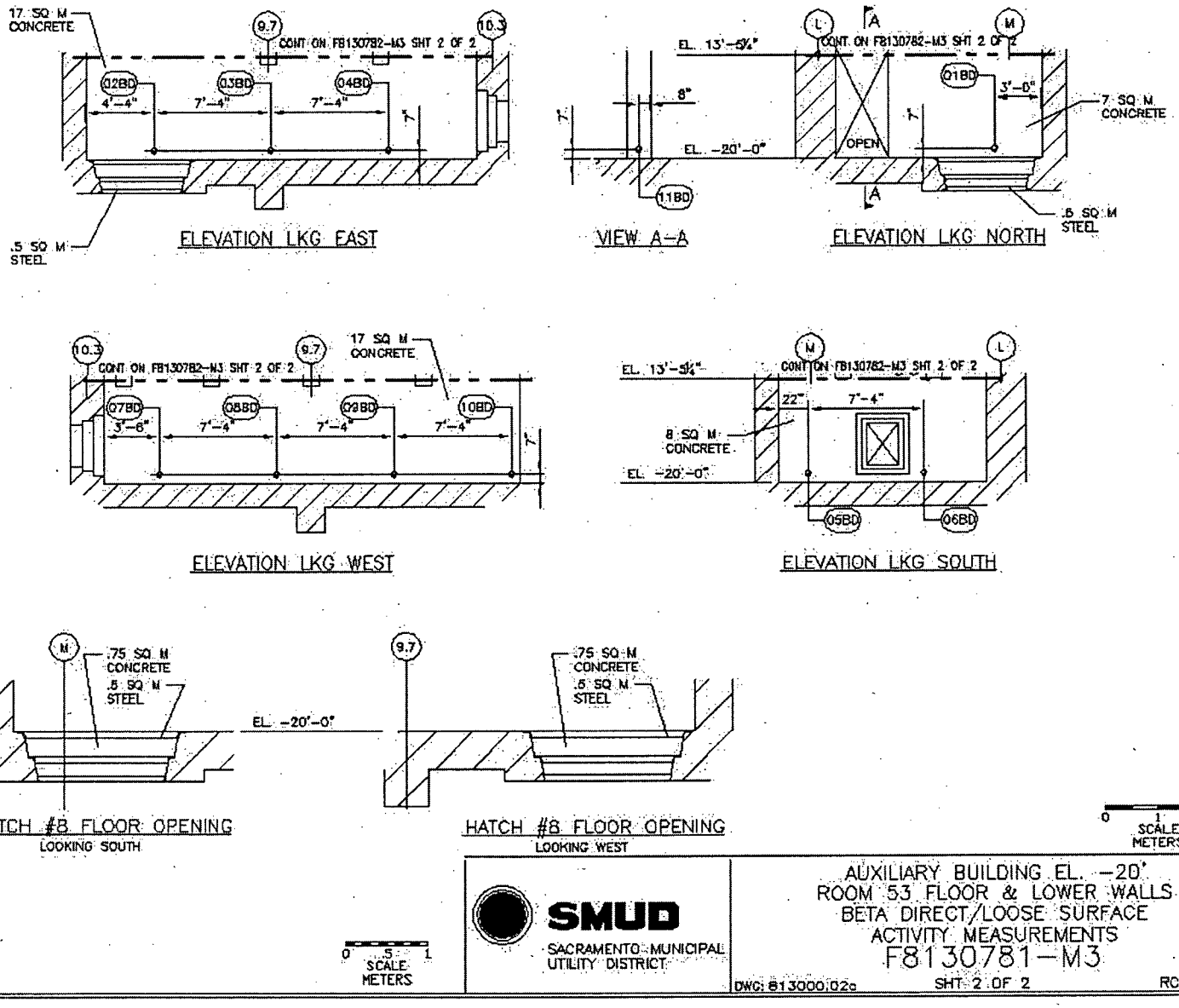
Attachment 1

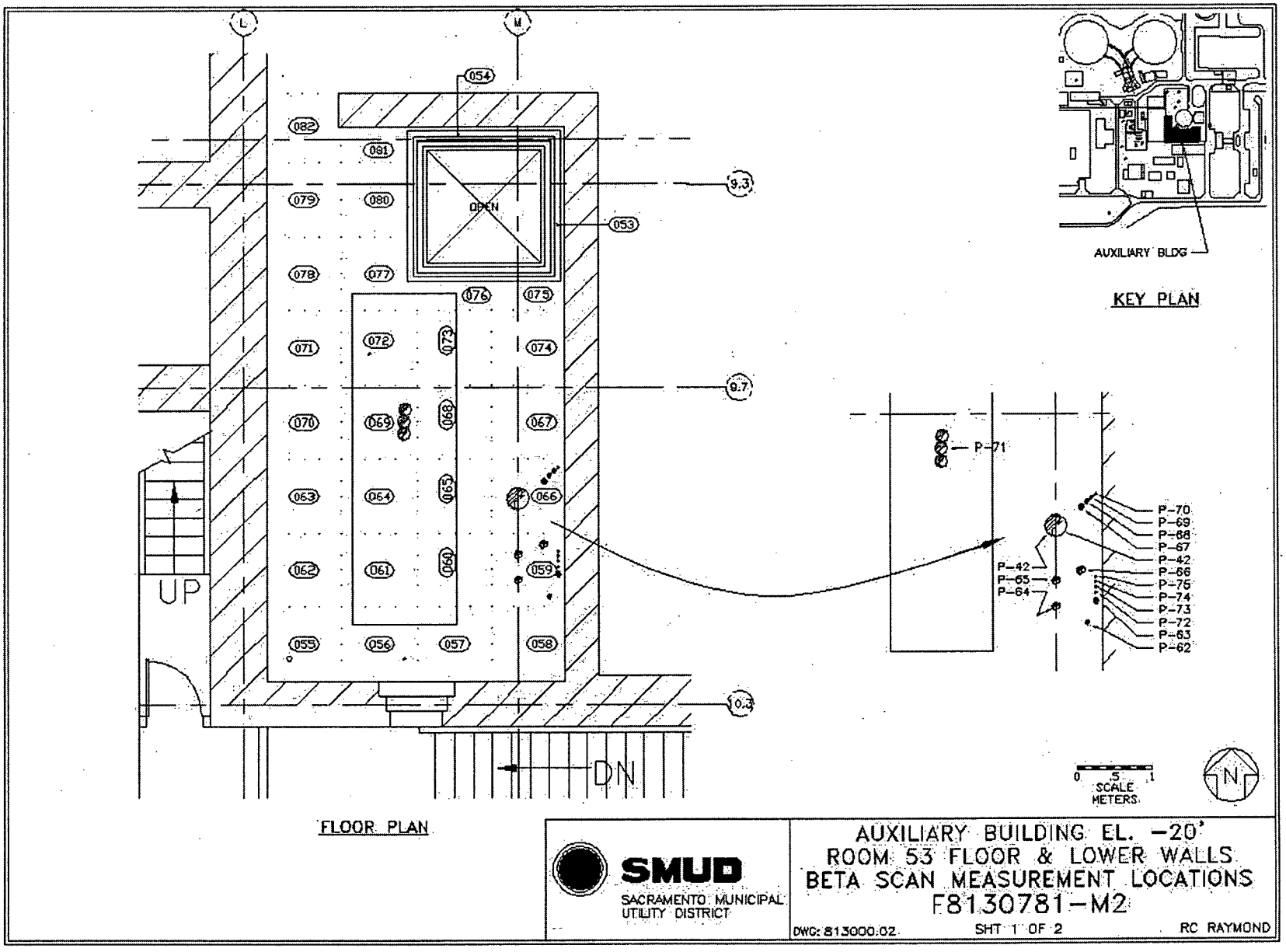
Maps

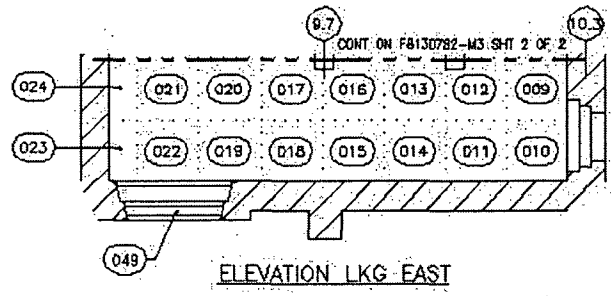
November 7, 2007

Survey Unit F8130781

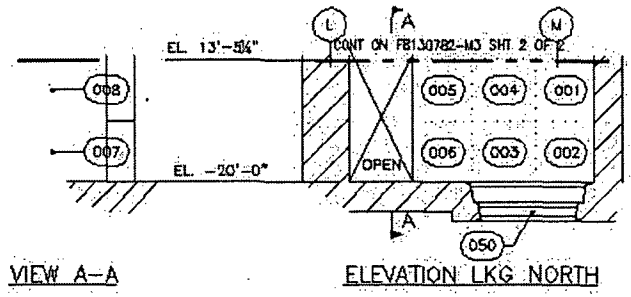

L
M
9.3
9.7
10.3
3"
2'-10"
7'-4"
7'-4"
7BD
4BD
5BD
3BD
6BD
2BD
OPEN
.75 SQ M
STEEL
28 SQ M
CONCRETE
UP
DN
3'-10"
7'-4"
FLOOR PLAN
M
9.3
OPEN
2 SQ M
STEEL
PLAN VIEW
HATCH #8 BEARING SURFACE
AUXILIARY BLDG
KEY PLAN
0 .5 1
SCALE
METERS
N
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
AUXILIARY BUILDING EL. -20'
ROOM 53 FLOOR & LOWER WALLS
BETA DIRECT/LOOSE SURFACE
ACTIVITY MEASUREMENTS
F8130781-M3
DWG: 813000.02
SHT 1 OF 2
RC RAYMOND


17 SQ M CONCRETE
9.7
CONT ON F8130782-M3 SHT 2 OF 2
10.3
02BD
03BD
04BD
4'-4"
7'-4"
7'-4"
7"
.5 SQ M STEEL
ELEVATION LKG EAST
EL. 13'-5¾"
L
A
M
CONT ON F8130782-M3 SHT 2 OF 2
01BD
3'-0"
7 SQ M CONCRETE
8"
7"
EL. -20'-0"
OPEN
11BD
A
.5 SQ M STEEL
VIEW A-A
ELEVATION LKG NORTH
10.3
CONT ON F8130782-M3 SHT 2 OF 2
9.7
17 SQ M CONCRETE
07BD
08BD
09BD
10BD
3'-6"
7'-4"
7'-4"
7'-4"
7"
ELEVATION LKG WEST
M
L
EL. 13'-5¾"
CONT ON F8130782-M3 SHT 2 OF 2
22"
7'-4"
8 SQ M CONCRETE
EL. -20'-0"
05BD
06BD
ELEVATION LKG SOUTH
M
.75 SQ M CONCRETE
.5 SQ M STEEL
EL. -20'-0"
HATCH #8 FLOOR OPENING
LOOKING SOUTH
9.7
.75 SQ M CONCRETE
.5 SQ M STEEL
HATCH #8 FLOOR OPENING
LOOKING WEST
0 1 2
SCALE METERS
0 .5 1
SCALE METERS
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BUILDING EL. -20'
ROOM 53 FLOOR & LOWER WALLS
BETA DIRECT/LOOSE SURFACE
ACTIVITY MEASUREMENTS
F8130781-M3
DWG: 813000.02c
SHT 2 OF 2
RC RAYMOND


L
M
054
082
081
9.3
079
080
OPEN
053
078
077
076
075
071
072
073
074
9.7
070
069
068
067
063
064
065
066
062
061
060
059
UP
055
056
057
058
0.3
DN
AUXILIARY BLDG
KEY PLAN
P-71
P-70
P-69
P-68
P-67
P-42
P-66
P-75
P-74
P-73
P-72
P-63
P-62
P-42
P-65
P-64
0
.5
1
SCALE
METERS
N
FLOOR PLAN
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
AUXILIARY BUILDING EL. -20'
ROOM 53 FLOOR & LOWER WALLS
BETA SCAN MEASUREMENT LOCATIONS
F8130781-M2
DWG: 813000.02
SHT 1 OF 2
RC RAYMOND

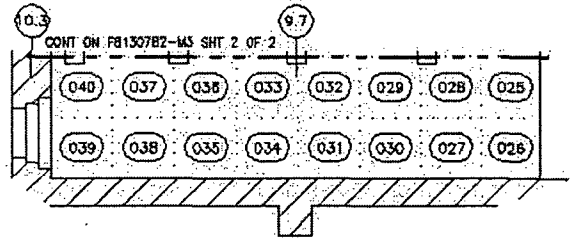


ELEVATION LKG EAST

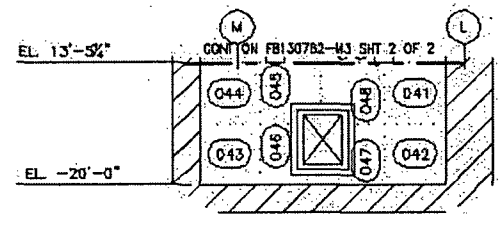


VIEW A-A

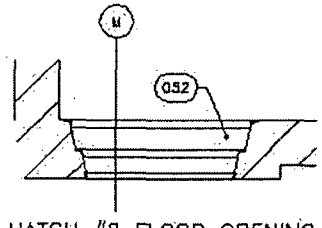
ELEVATION LKG NORTH



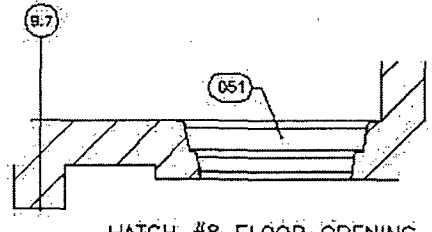
ELEVATION LKG WEST



ELEVATION LKG SOUTH



HATCH #8 FLOOR OPENING
LOOKING SOUTH

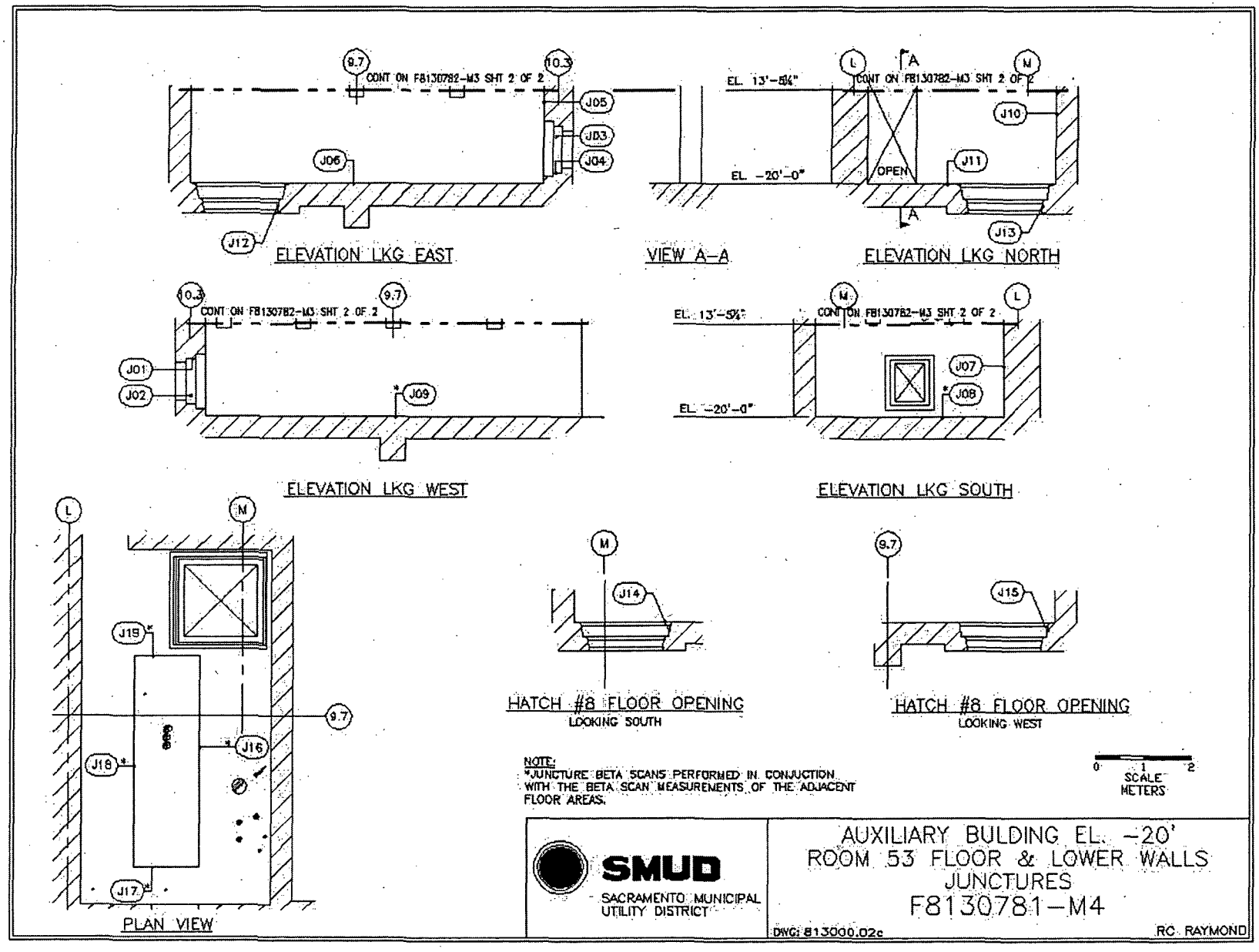


HATCH #8 FLOOR OPENING
LOOKING WEST

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

AUXILIARY BULDING EL. -20'
ROOM 53 FLOOR & LOWER WALLS
BETA SCAN MEASUREMENT LOCATIONS
F8130781-M2

DWG: 813000.02c SHT 2 OF 2 RC RAYMOND


9.7
CONT ON F8130782-M3 SHT 2 OF 2
10.3
J05
JD3
J04
J06
J12
ELEVATION LKG EAST
EL. 13'-5¼"
L
A
M
CONT ON F8130782-M3 SHT 2 OF 2
J10
EL. -20'-0"
OPEN
J11
A
J13
VIEW A-A
ELEVATION LKG NORTH
10.3
CONT ON F8130782-M3 SHT 2 OF 2
9.7
J01
J02
J09
ELEVATION LKG WEST
EL. 13'-5¼"
M
CONT ON F8130782-M3 SHT 2 OF 2
L
J07
J08
EL. -20'-0"
ELEVATION LKG SOUTH
L
M
J19
9.7
J18
J16
J17
PLAN VIEW
M
J14
HATCH #8 FLOOR OPENING
LOOKING SOUTH
9.7
J15
HATCH #8 FLOOR OPENING
LOOKING WEST
NOTE:
*JUNCTURE BETA SCANS PERFORMED IN CONJUCTION WITH THE BETA SCAN MEASUREMENTS OF THE ADJACENT FLOOR AREAS.
0
1
2
SCALE
METERS
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
AUXILIARY BULDING EL. -20'
ROOM 53 FLOOR & LOWER WALLS
JUNCTURES
F8130781-M4
DWG: 813000.02c
RC RAYMOND

Attachment 2

Instrumentation

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Survey Unit F8130781

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	43-94; 148620	350	610
M2350; 193700	43-68B; 190294	433	1033
M2350; 203486	43-68B; 161400	433	1033
M2350; 193715	43-68B; 148630	433	1033
M2350; 149794	43-116-1B; 216072	796	5895
M2350; 149794	43-116-1B; 216072	491 (β Juncture)	739 (β Juncture)
Tennelec; 0401171	N/A	5 dpm α, 11 dpm β	N/A

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	172000
Investigation Criteria – Scan	172000
$DCGL_W$	43000
$DCGL_{EMC}$	172000

Attachment 3

Investigation

November 7, 2007

Survey Unit F8130781

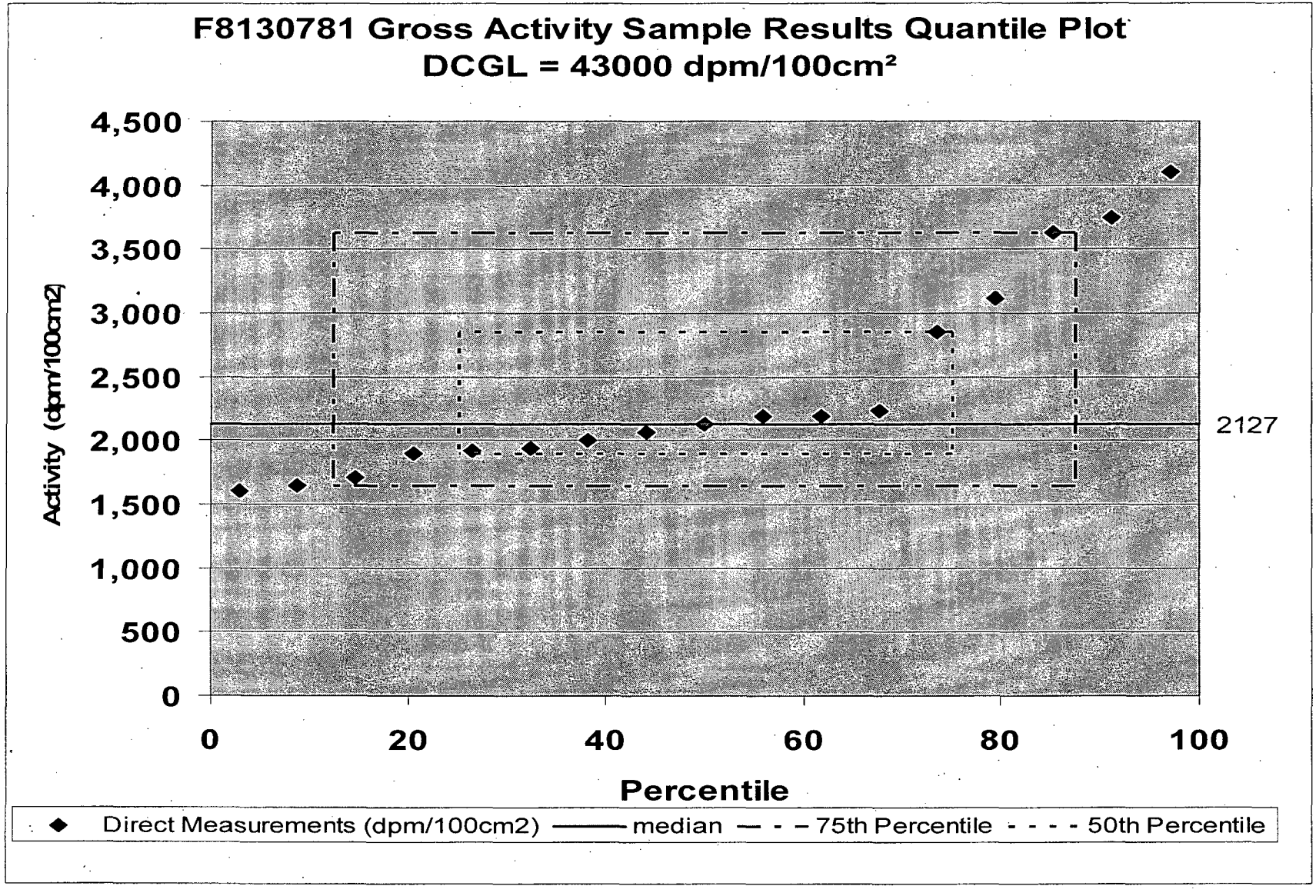
(none required)

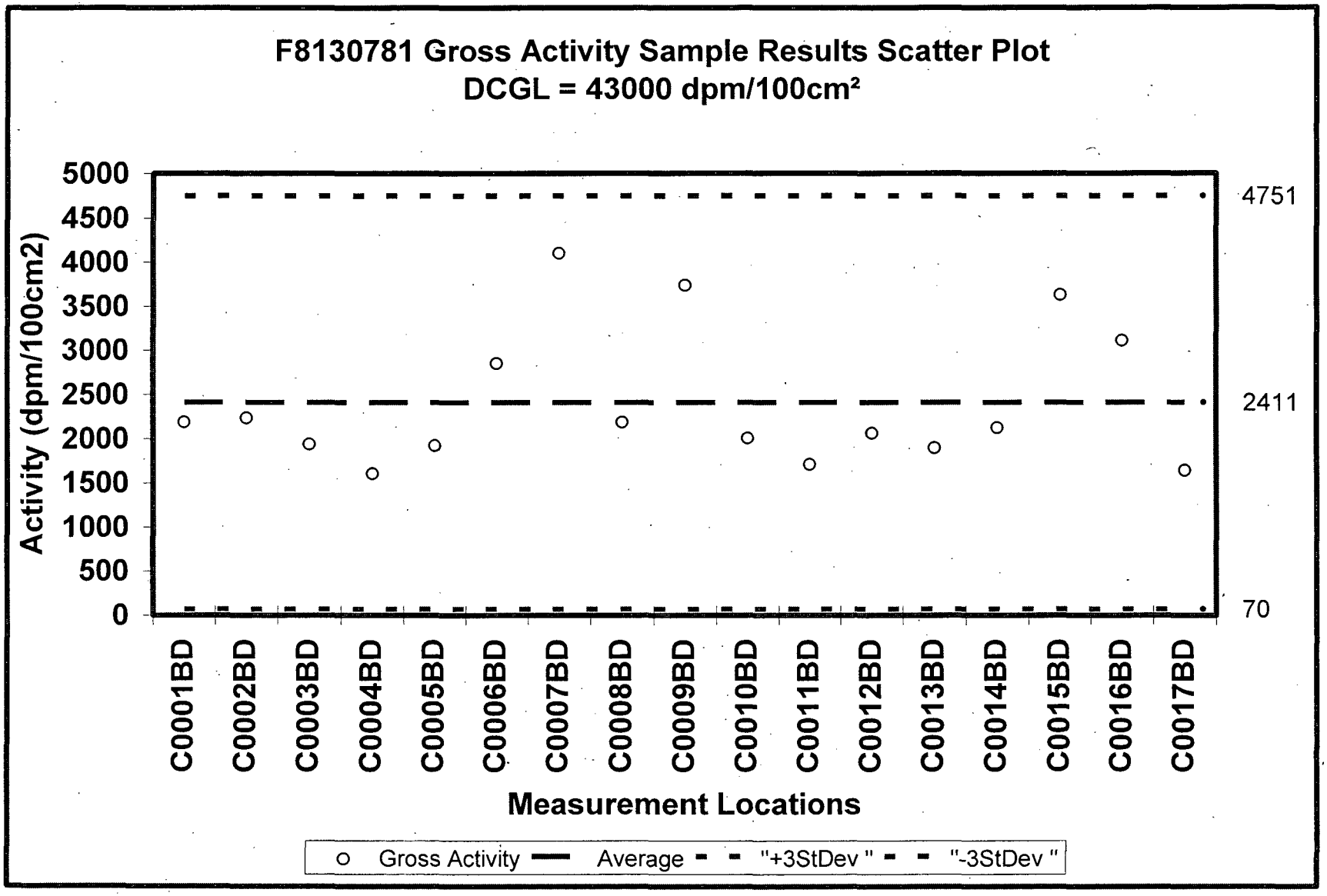
Attachment 4

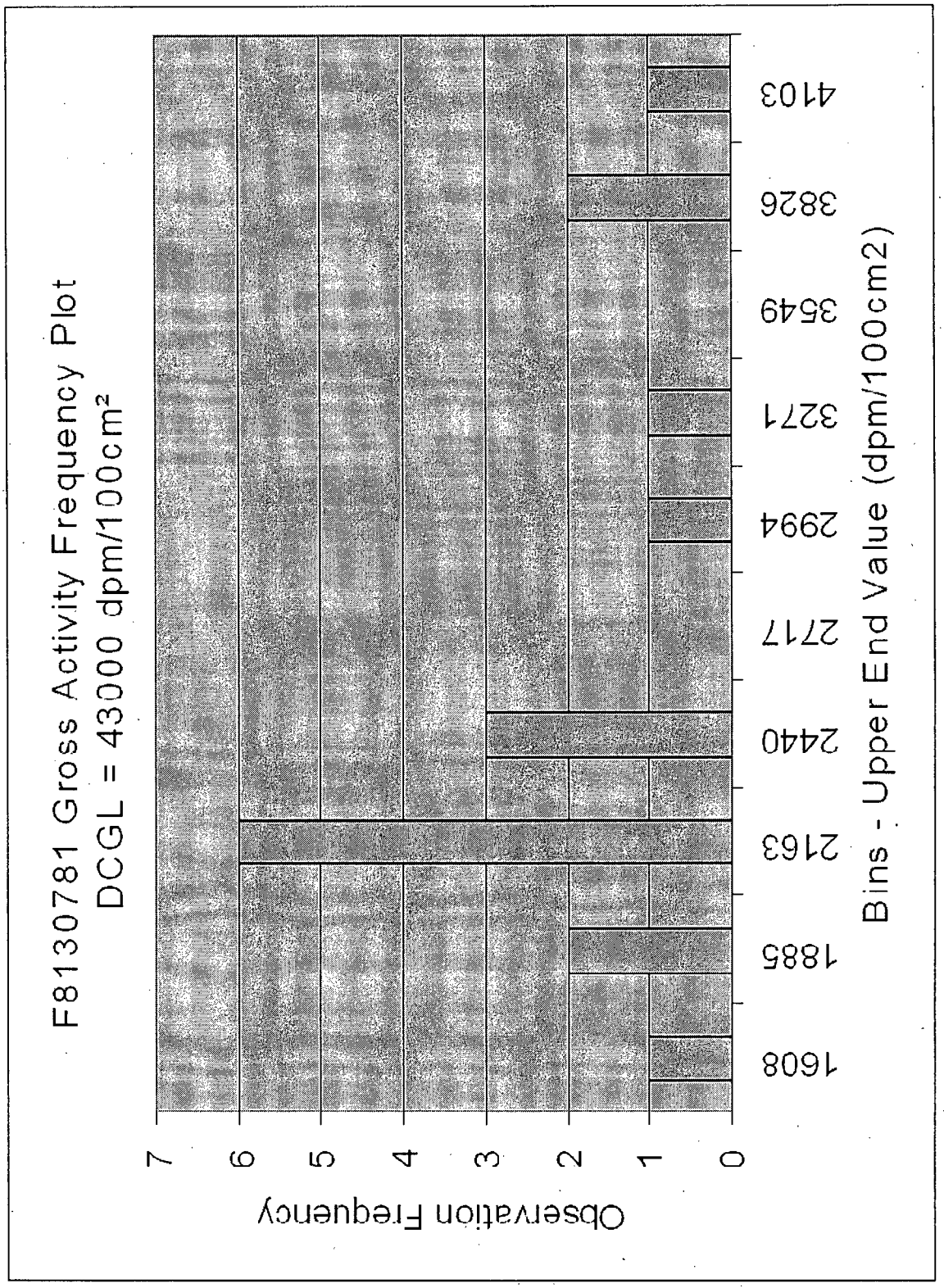
Data Assessment

November 7, 2007

Survey Unit F8130781


F8130781 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2127
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8130781 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
4751
2411
70
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
C0015BD
C0016BD
C0017BD
Measurement Locations
Gross Activity
Average
"+3StDev "
"-3StDev "


F8130781 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
6
7
1608
1885
2163
2440
2717
2994
3271
3549
3826
4103
Bins - Upper End Value (dpm/100cm2)