Rancho Seco

Final Status Survey Summary Report

October 29, 2007

Exterior Surfaces of Warehouse "B"

Survey Unit F8330002

Prepared By: _____ Date: 10/29/2007

FSS Engineer

Reviewed By: _____ Date: 10/29/07

Lead FSS Engineer

Approved By: _____ Date: 11-13-07

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8330002, Exterior Surfaces of Warehouse "B"

Survey Unit Description:

Operating History: This structure was used as a warehouse. This area was reported to have been used for the storage of radioactive material. Operating records and the HSA document two occurrences of radioactive material with the potential for a release of radioactivity associated with this survey area.

Site Characterization: Direct measurements were made of the interior and exterior surfaces of the structure which confirmed the absence of plant-derived radionuclides. Direct measurements interior showed a mean gross activity level of 635 dpm/100 cm^2 and a maximum value of 3,751 dpm/100 cm^2. Direct measurements exterior showed a mean gross activity level of 3,749 dpm/100 cm^2 and a maximum value of 34,785 dpm/100 cm^2. Survey results were adjusted for background levels caused by the handling and temporary storage of radioactive components nearby. Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the area was determined to be a Class 3 interior and Class 2 exterior area.

HSA Events: PDQ-840010, 980017.

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 260 m^2 were scanned for approximately 10% 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:	F833	Exterior Surfaces of Warehouse "B"
Survey Unit:	0002	Structure Surface
Class:	2	LTP Table 5-4
SU Area (m^2)**:**	2574	
Evaluator:	Michael Stein	
DCGL (dpm/100 cm^2)**:**	43000	Gross Activity DCGL
Area Factor:	N/A	Class 2
Design DCGLemc (dpm/100 cm^2)**:**	N/A	Class 2
LBGR (dpm/100 cm^2)**:**	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm^2)**:**	10064	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m^2)**:**	171.6	Class 2
Scan Area (m^2)**:**	260	
Scan Coverage (%):	10%	Class 2
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.97725	
Calculated Relative Shift:	2.1	
Relative Shift Used:	2.1	Rounded ↓ to 2.0, NUREG-1575 Table 5.5
N-Value:	12	
Design N-Value + 20%:	15	NUREG-1575 Table 5-5
Design Min Samples N:	15	Class 2
Grid Spacing L:	13.0	Class 2

Survey Results:

A total of 19 direct measurements were made in F8330002. 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 2,744 dpm/100 cm^2 to 8,128 dpm/100 cm^2, based on a surveyor efficiency of 0.5 with 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)
F8330002-C0001BD	2179
F8330002-C0002BD	1743
F8330002-C0003BD	2153
F8330002-C0004BD	2267
F8330002-C0005BD	2132
F8330002-C0006BD	1136
F8330002-C0007BD	1167
F8330002-C0008BD	1375
F8330002-C0009BD	1203
F8330002-C0010BD	1281
F8330002-C0011BD	1805
F8330002-C0012BD	1790
F8330002-C0013BD	2070
F8330002-C0014BD	1914
F8330002-C0015BD	2054
F8330002-C0016BD	1515
F8330002-C0017BD	1504
F8330002-C0018BD	1577
F8330002-C0019BD	1504
Mean:	1704
Median:	1743
Standard Deviation:	375
Range:	1136 - 2267

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm^2)
F8330002C0001SM	3.58
F8330002C0002SM	4.86
F8330002C0003SM	2.29
F8330002C0004SM	15.11
F8330002C0005SM	6.14
F8330002C0006SM	4.86
F8330002C0007SM	6.14
F8330002C0008SM	-0.27
F8330002C0009SM	-0.27
F8330002C0010SM	7.42
F8330002C0011SM	3.58
F8330002C0012SM	1.01
F8330002C0013SM	1.01
F8330002C0014SM	7.42
F8330002C0015SM	2.29
F8330002C0016SM	4.86
F8330002C0017SM	4.86
F8330002C0018SM	2.29
F8330002C0019SM	3.58
Mean:	4.25
Median:	3.58
Standard Deviation:	3.51
Range:	-0.27 to 15.11

Survey Unit Data Assessment:

The survey design required 19 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 cm²):	N/A	
Ambient Background Used (dpm/100 cm²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	19	
Median (dpm/100 cm²):	1743	
Mean (dpm/100 cm²):	1704	
Direct Measurement Standard Deviation (dpm/100 cm²):	375	
Total Standard Deviation (dpm/100 cm²):	375	Based on samples and backgrounds.
Maximum (dpm/100 cm²):	2267	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	19	
S+ Value:	19	
Critical Value:	13	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	N/A	Class 2
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 2 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 2 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.

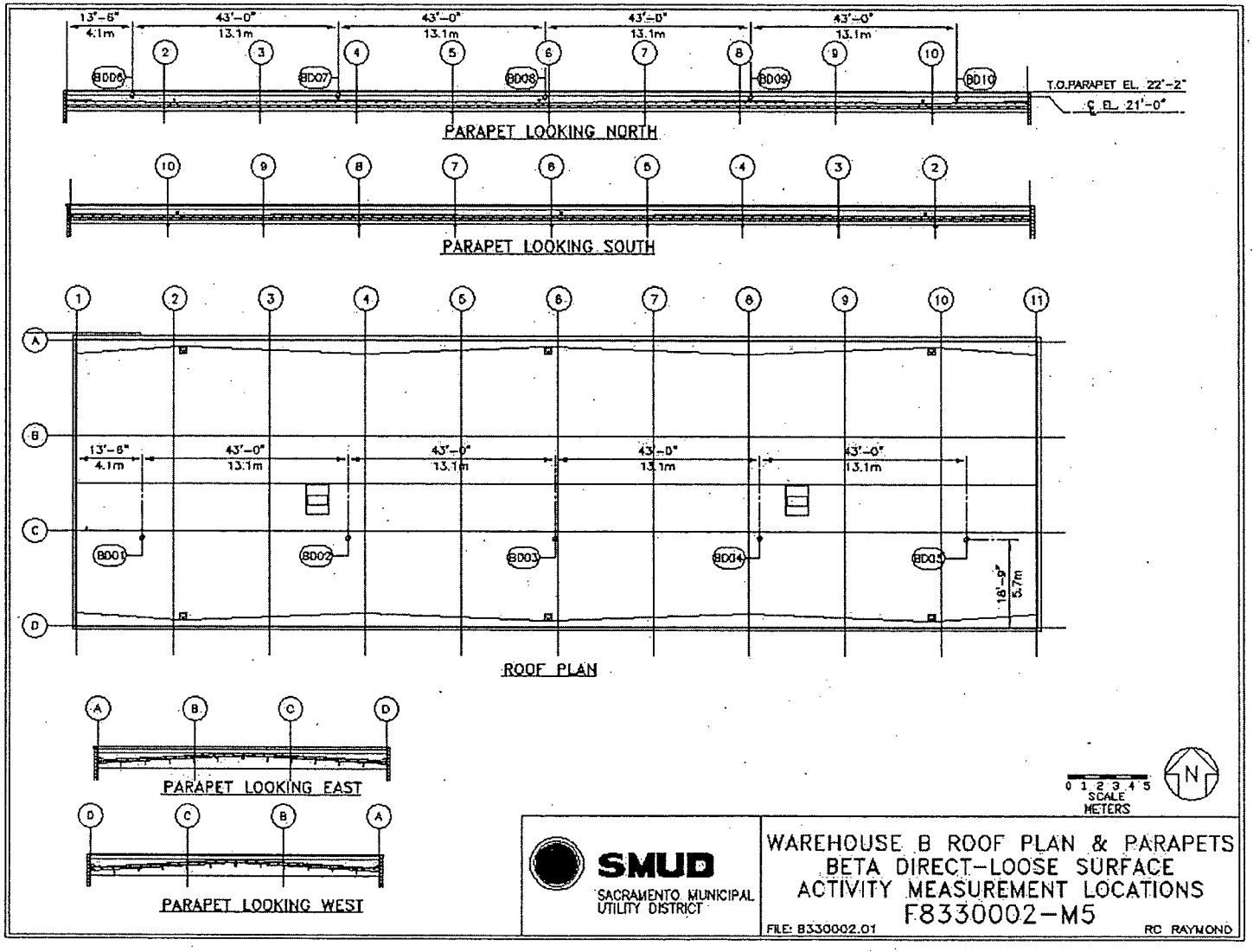
It is concluded that survey unit F8330002 meets the release criteria of 10CFR20.1402.

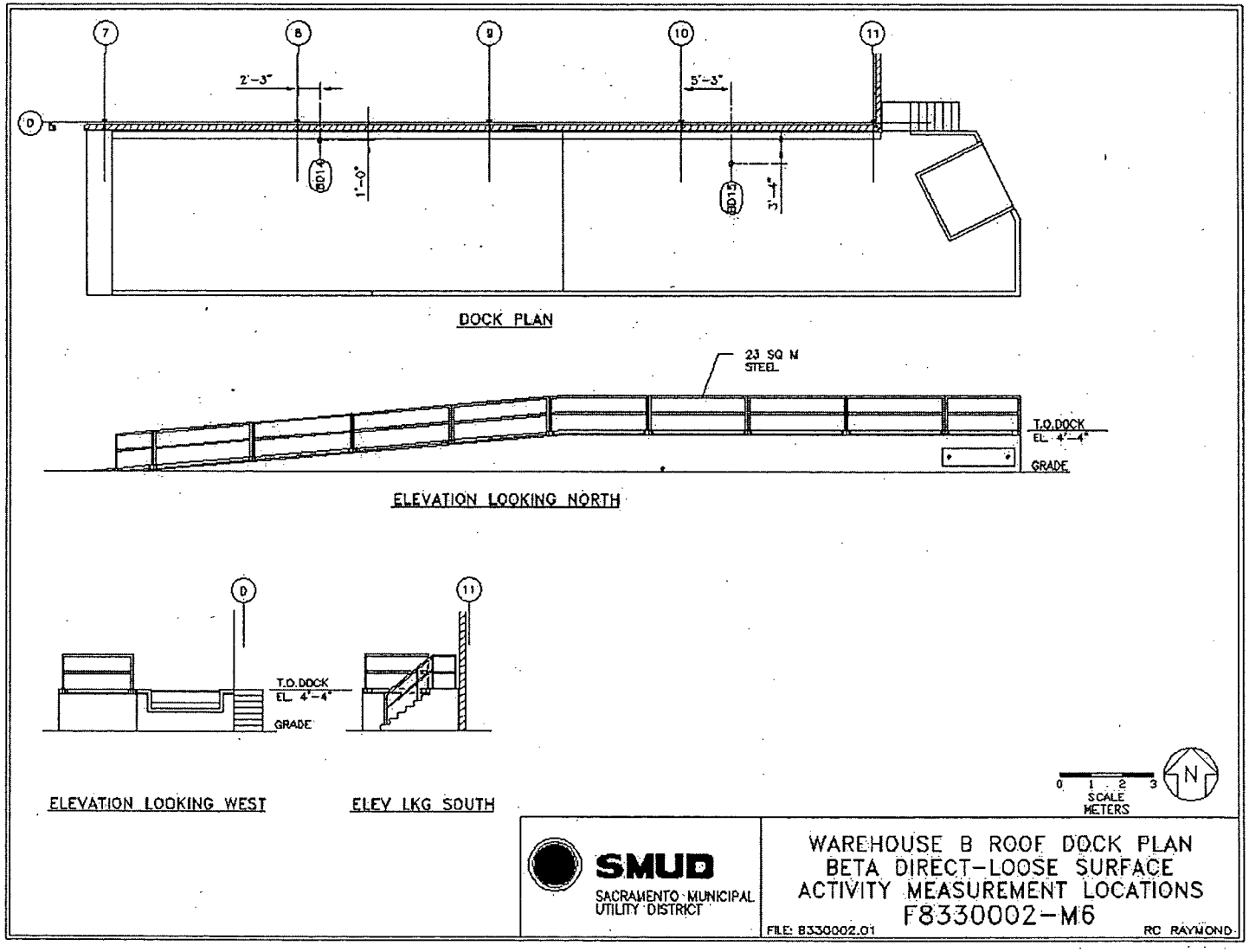
Attachment 1

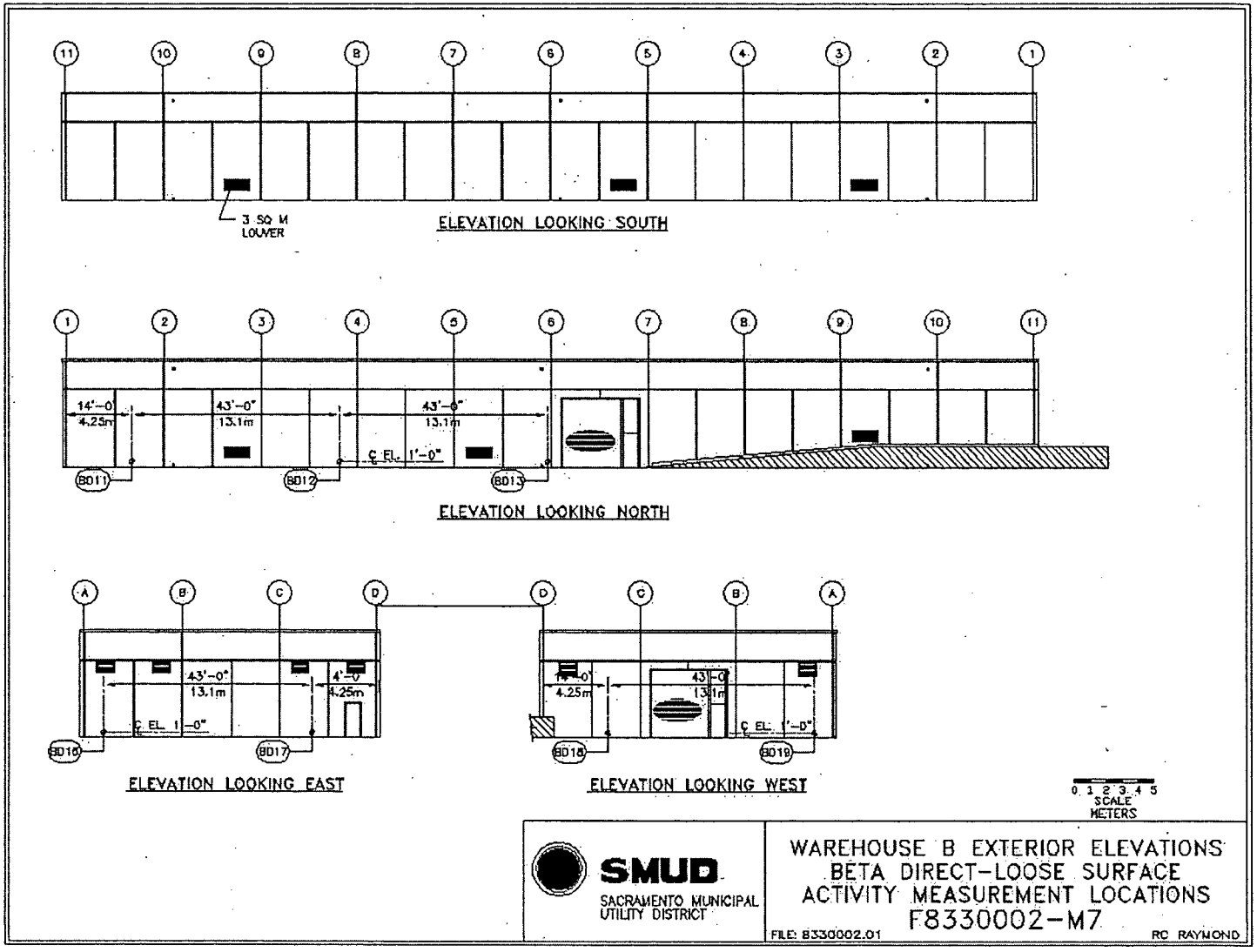
Maps

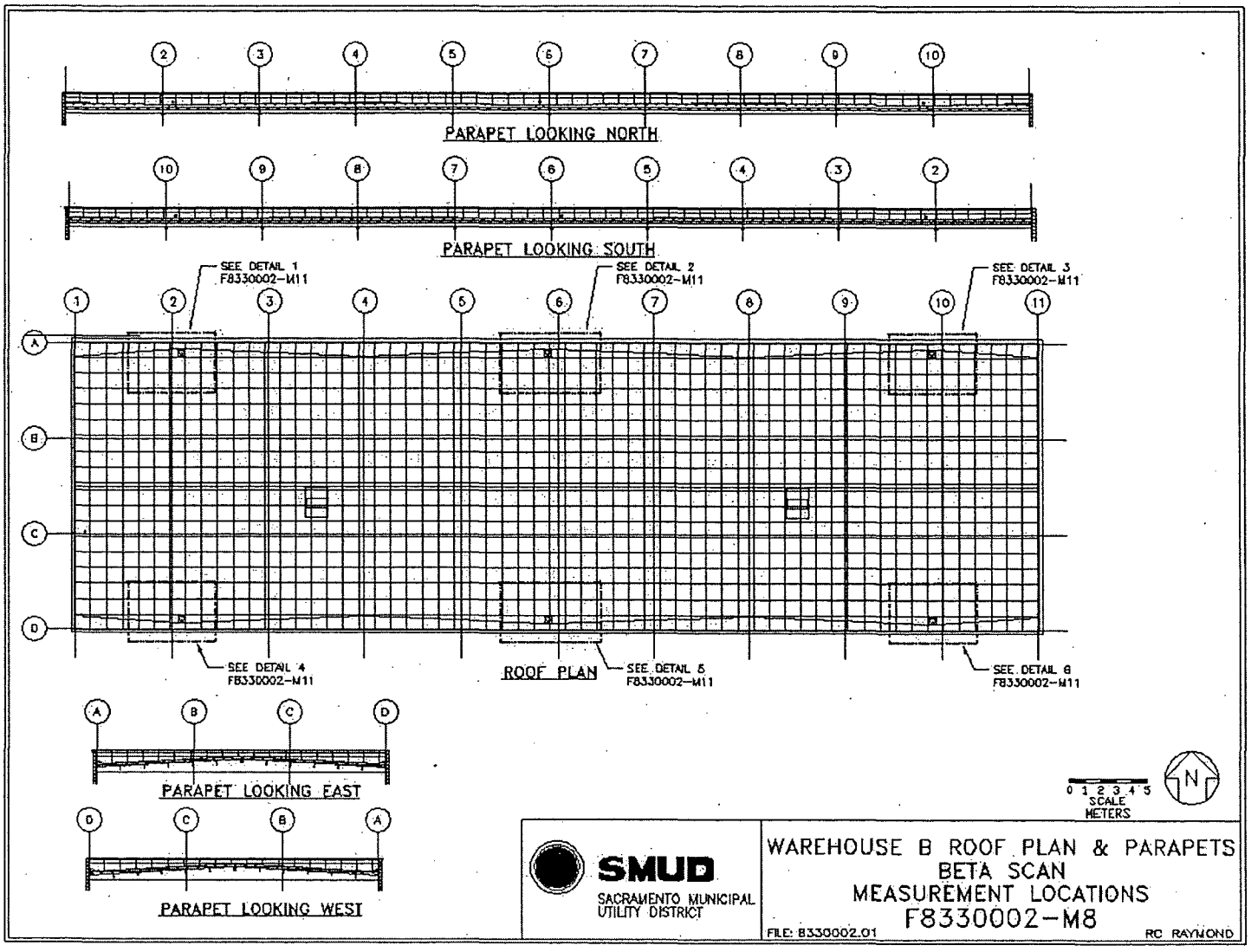
October 29, 2007

Survey Unit F8330002


13'-6" 4.1m
43'-0" 13.1m
BD06
BD07
BD08
BD09
BD10
T.O.PARAPET EL. 22'-2"
T.O. EL. 21'-0"
PARAPET LOOKING NORTH
PARAPET LOOKING SOUTH
BD01
BD02
BD03
BD04
BD05
18'-9" 5.7m
ROOF PLAN
PARAPET LOOKING EAST
PARAPET LOOKING WEST
0 1 2 3 4 5
SCALE METERS
N
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
WAREHOUSE B ROOF PLAN & PARAPETS
BETA DIRECT-LOOSE SURFACE
ACTIVITY MEASUREMENT LOCATIONS
F8330002-M5
FILE: 8330002.01
RC RAYMOND


7
8
9
10
11
D
2'-3"
5'-3"
DOCK PLAN
23 SQ IN STEEL
T.O.DOCK EL. 4'-4"
GRADE
ELEVATION LOOKING NORTH
D
11
T.O.DOCK EL. 4'-4"
GRADE
ELEVATION LOOKING WEST
ELEV LKG SOUTH
0 1 2 3
SCALE METERS
N
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
WAREHOUSE B ROOF DOCK PLAN
BETA DIRECT-LOOSE SURFACE
ACTIVITY MEASUREMENT LOCATIONS
F8330002-M6
FILE: 8330002.01
RC RAYMOND


3 SQ M
LOUVER
ELEVATION LOOKING SOUTH
14'-0"
4.25m
43'-0"
13.1m
43'-0"
13.1m
℄ EL. 1'-0"
BD11
BD12
BD13
ELEVATION LOOKING NORTH
43'-0"
13.1m
4'-0"
4.25m
℄ EL. 1'-0"
BD16
BD17
ELEVATION LOOKING EAST
4'-0"
4.25m
43'-0"
13.1m
℄ EL. 1'-0"
BD18
BD19
ELEVATION LOOKING WEST
0 1 2 3 4 5
SCALE
METERS
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
WAREHOUSE B EXTERIOR ELEVATIONS
BETA DIRECT-LOOSE SURFACE
ACTIVITY MEASUREMENT LOCATIONS
F8330002-M7
FILE: B330002.01
RC RAYMOND


PARAPET LOOKING NORTH
PARAPET LOOKING SOUTH
SEE DETAIL 1 F8330002-M11
SEE DETAIL 2 F8330002-M11
SEE DETAIL 3 F8330002-M11
SEE DETAIL 4 F8330002-M11
ROOF PLAN
SEE DETAIL 5 F8330002-M11
SEE DETAIL 6 F8330002-M11
PARAPET LOOKING EAST
PARAPET LOOKING WEST
SCALE METERS
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
WAREHOUSE B ROOF PLAN & PARAPETS
BETA SCAN
MEASUREMENT LOCATIONS
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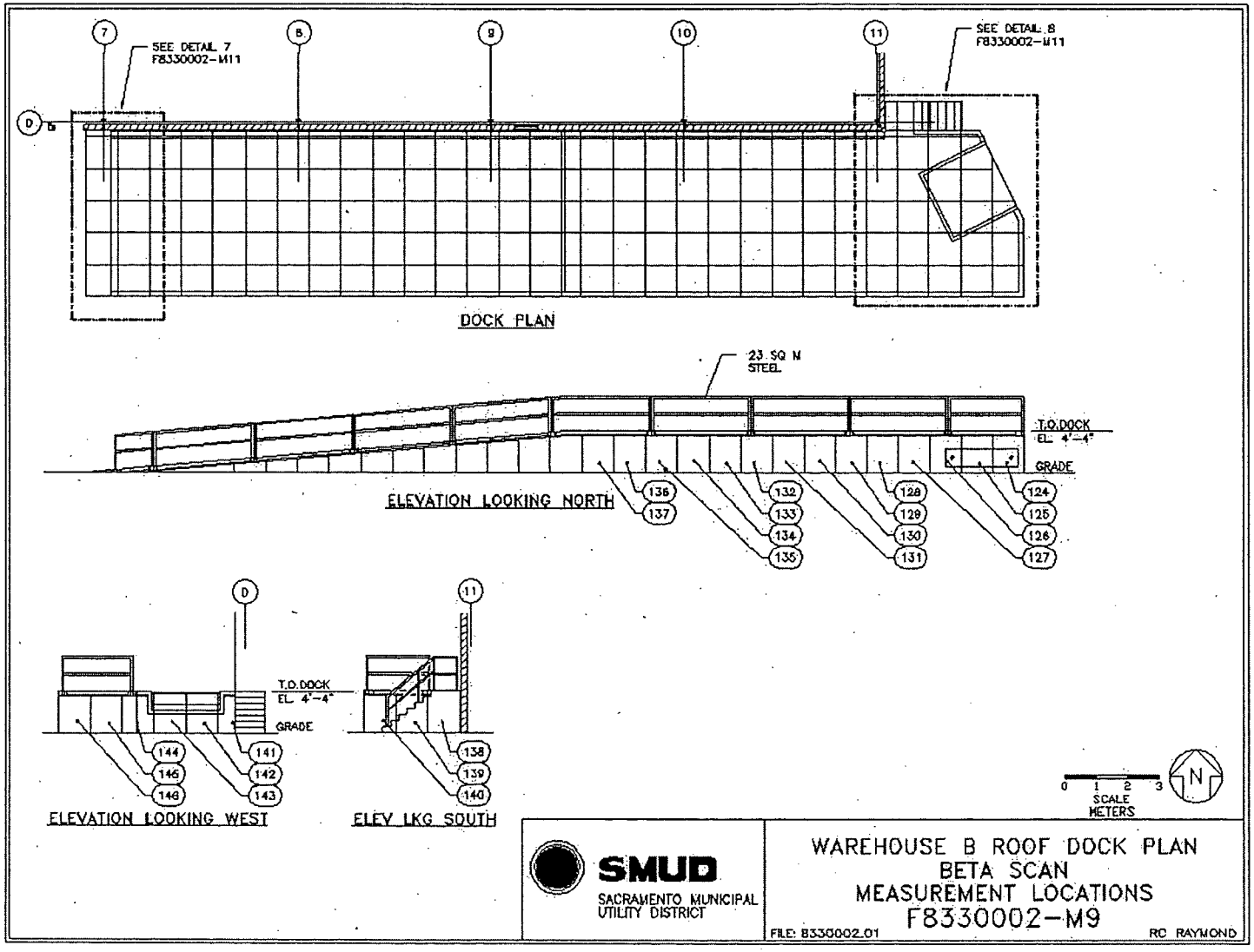
FILE: 8330002.01
RC RAYMOND


SEE DETAIL 7
F8330002-M11
SEE DETAIL 8
F8330002-M11
DOCK PLAN
23 SQ M
STEEL
T.O.DOCK
EL 4'-4"
GRADE
ELEVATION LOOKING NORTH
T.O.DOCK
EL 4'-4"
GRADE
ELEVATION LOOKING WEST
ELEV LKG SOUTH
SCALE
METERS
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
WAREHOUSE B ROOF DOCK PLAN
BETA SCAN
MEASUREMENT LOCATIONS
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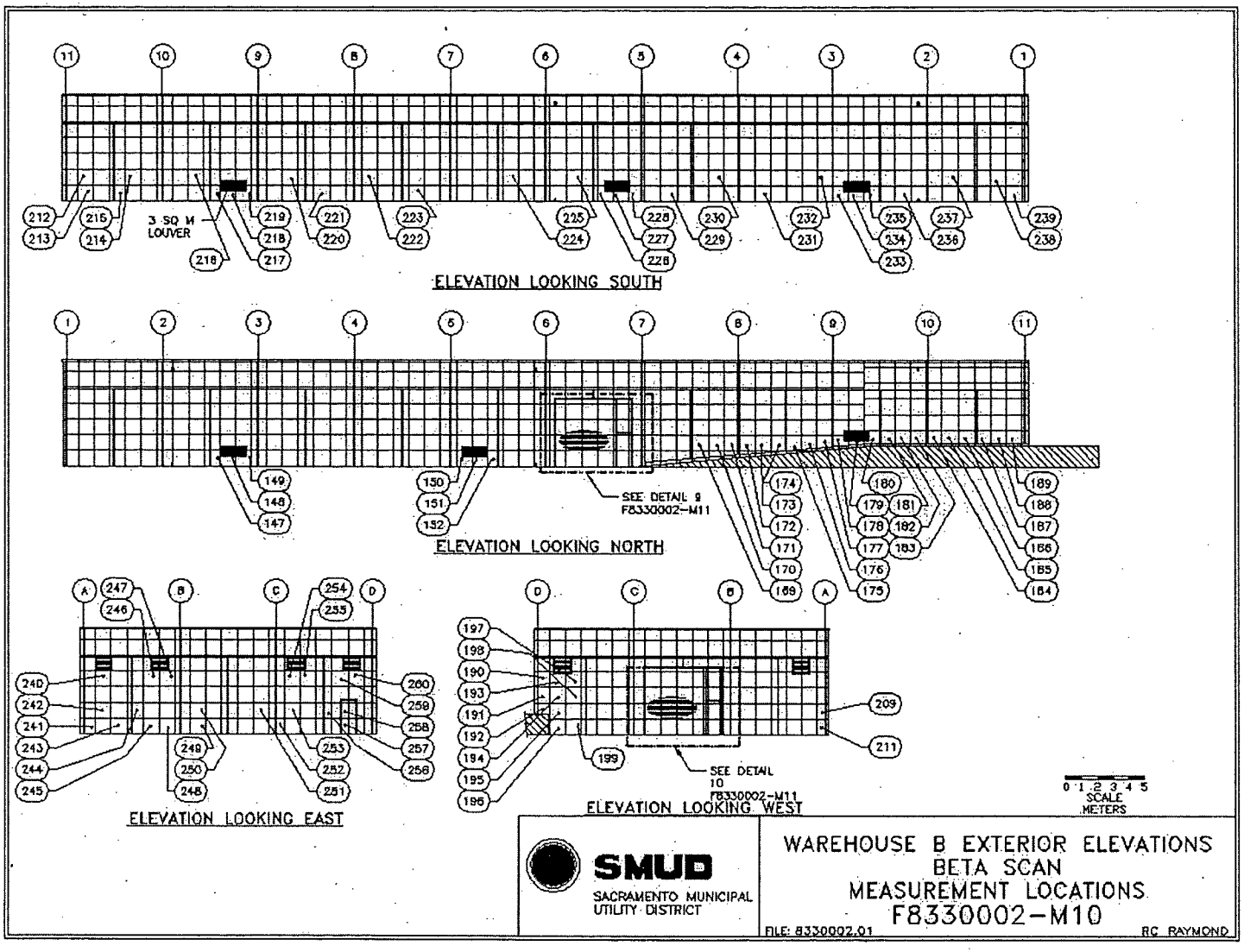
FILE: B330002_01
RC RAYMOND


3 SQ M LOUVER
ELEVATION LOOKING SOUTH
SEE DETAIL 9 F8330002-M11
ELEVATION LOOKING NORTH
ELEVATION LOOKING EAST
SEE DETAIL 10 F8330002-M11
ELEVATION LOOKING WEST
0 1 2 3 4 5 SCALE METERS
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
WAREHOUSE B EXTERIOR ELEVATIONS
BETA SCAN
MEASUREMENT LOCATIONS
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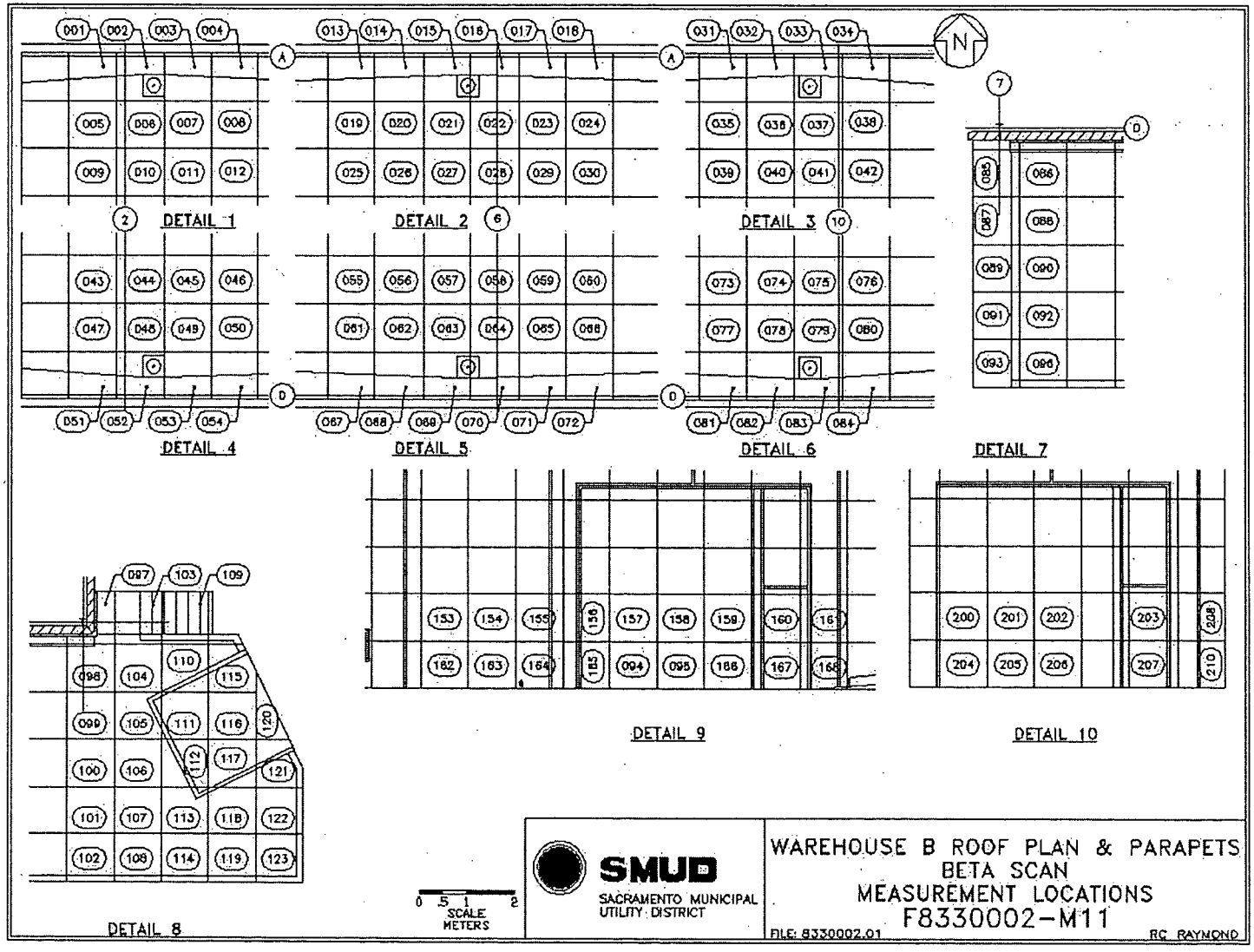
RC RAYMOND


DETAIL 1
DETAIL 2
DETAIL 3
DETAIL 4
DETAIL 5
DETAIL 6
DETAIL 7
DETAIL 8
DETAIL 9
DETAIL 10
N
0 .5 1 2
SCALE METERS
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
WAREHOUSE B ROOF PLAN & PARAPETS
BETA SCAN
MEASUREMENT LOCATIONS
F8330002-M11
FILE: 8330002.01
RC RAYMOND

Attachment 2

Instrumentation

October 29, 2007

Survey Unit F8330002

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; 149802	43-68B; 148453	433	1033
Tennelec; 0401171	N/A	5 dpm α, 11 dpm β	N/A

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm^2)
Investigation Criteria - Direct	43000
Investigation Criteria – Scan	43000
$DCGL_W$	43000
$DCGL_{EMC}$	N/A

Attachment 3

Investigation

October 29, 2007

Survey Unit F8330002

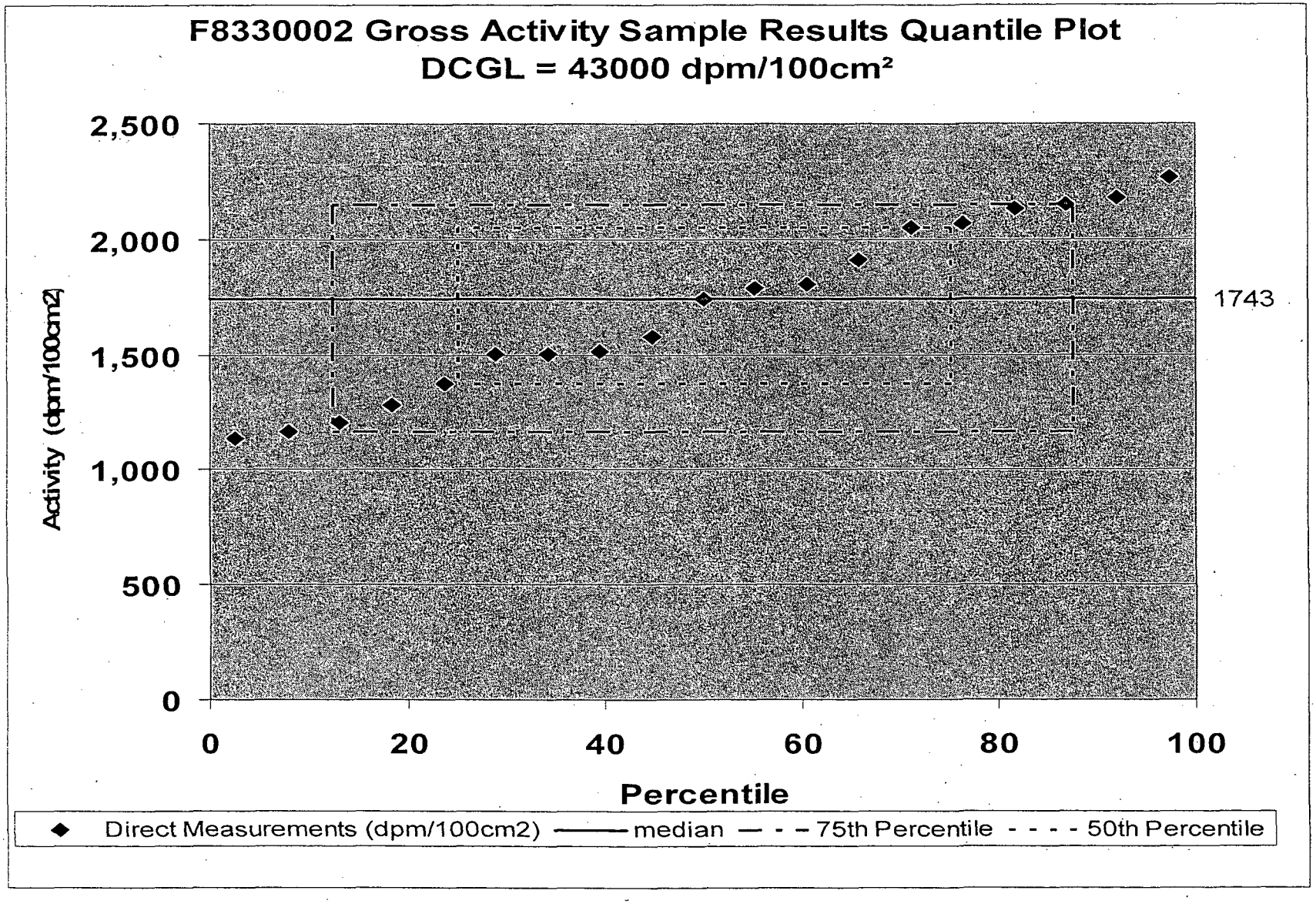
(none required)

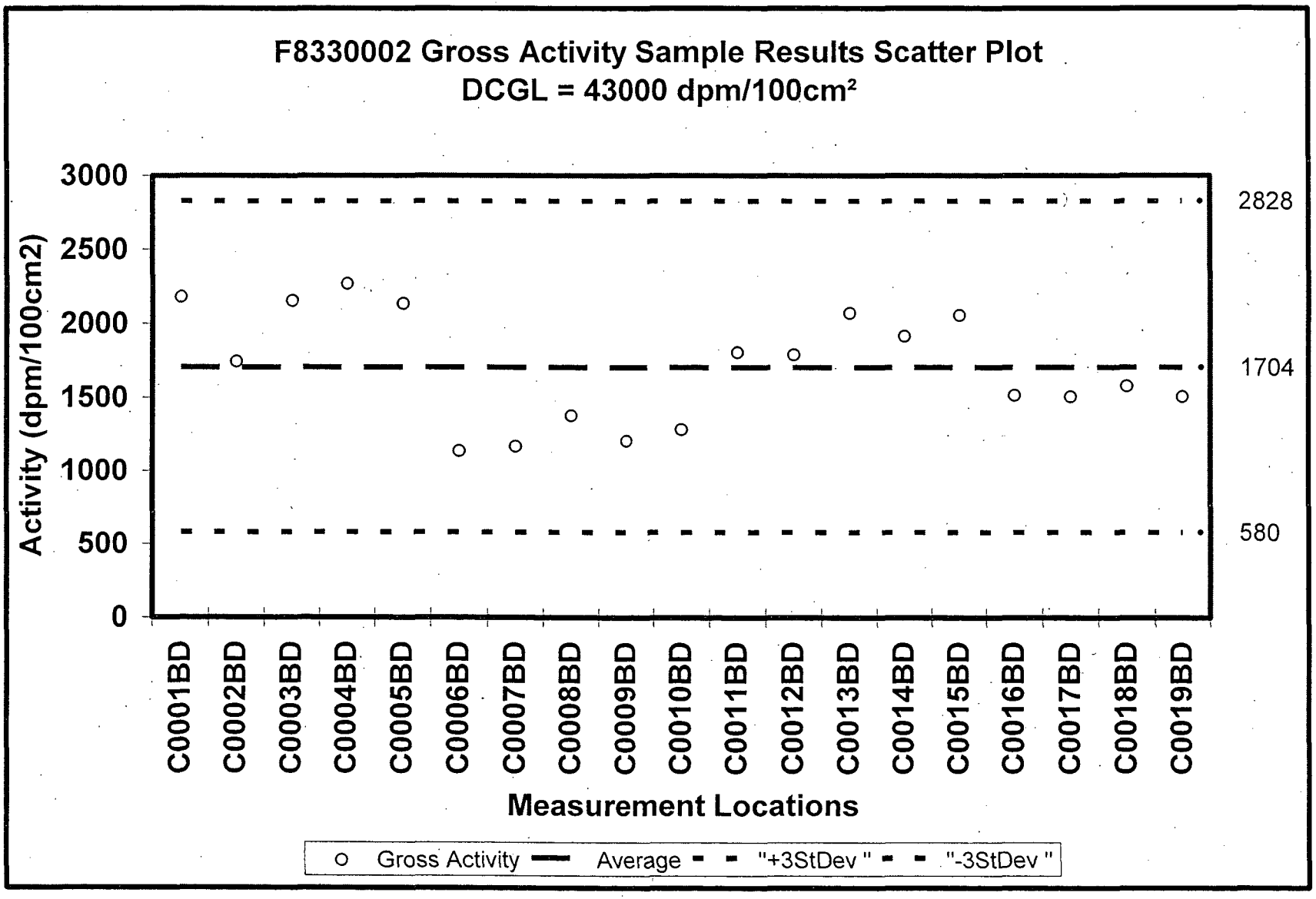
Attachment 4

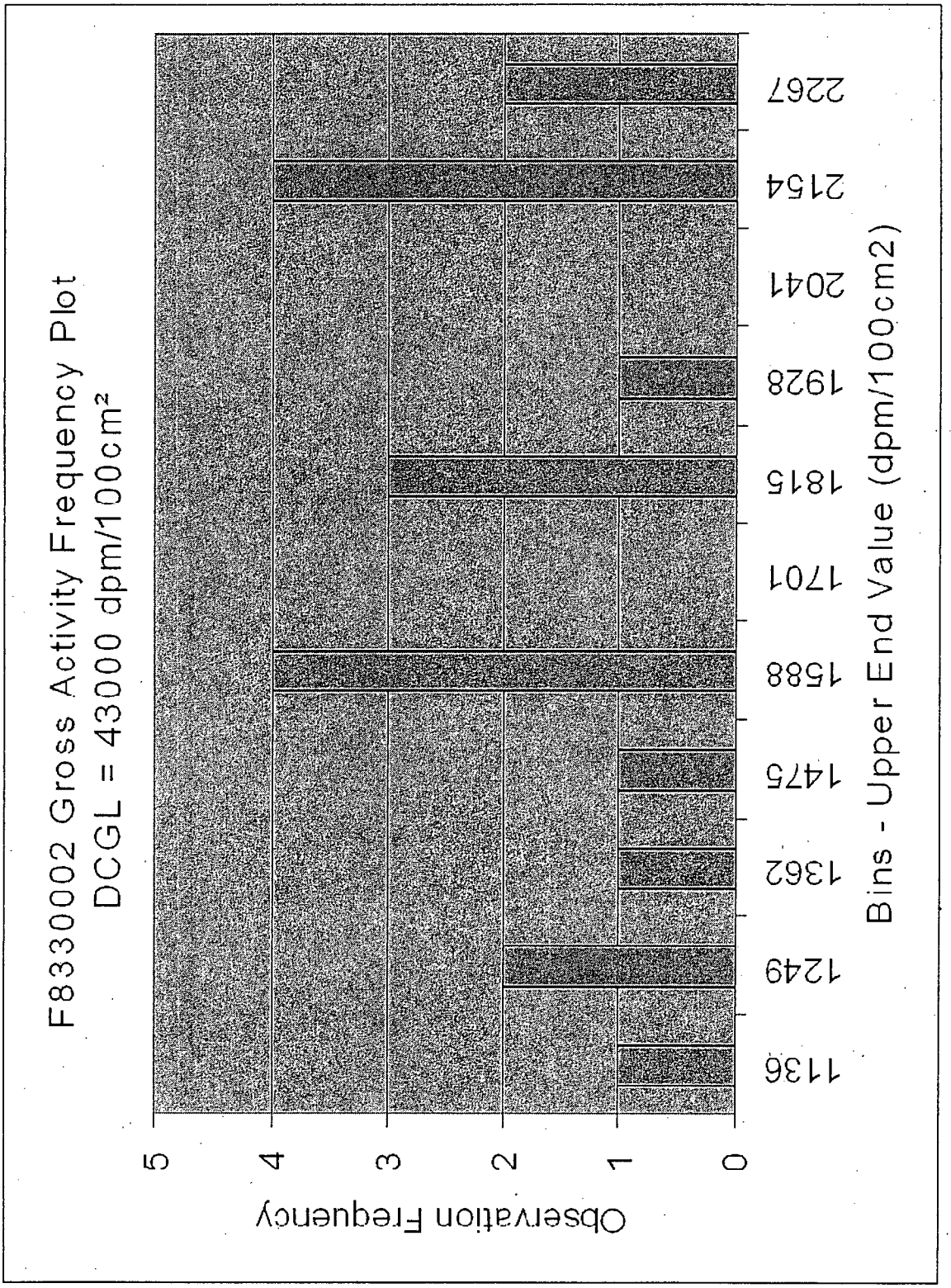
Data Assessment

October 29, 2007

Survey Unit F8330002


F8330002 Gross Activity Sample Results Quantile Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
2,500
2,000
1,500
1,000
500
0
1743
0
20
40
60
80
100
Percentile
Direct Measurements (dpm/100cm2)
median
75th Percentile
50th Percentile


F8330002 Gross Activity Sample Results Scatter Plot
DCGL = 43000 dpm/100cm²
Activity (dpm/100cm2)
3000
2500
2000
1500
1000
500
0
2828
1704
580
C0001BD
C0002BD
C0003BD
C0004BD
C0005BD
C0006BD
C0007BD
C0008BD
C0009BD
C0010BD
C0011BD
C0012BD
C0013BD
C0014BD
C0015BD
C0016BD
C0017BD
C0018BD
C0019BD
Measurement Locations
Gross Activity
Average
"+3StDev "
"-3StDev "


F8330002 Gross Activity Frequency Plot
DCGL = 43000 dpm/100cm²
Observation Frequency
0
1
2
3
4
5
1136
1249
1362
1475
1588
1701
1815
1928
2041
2154
2267
Bins - Upper End Value (dpm/100cm2)