

Rancho Seco
Final Status Survey Summary Report
October 26, 2007
Receiving Warehouse Exterior Surfaces
Survey Unit F5010011

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Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F5010011, Receiving Warehouse Exterior Surfaces

Survey Unit Description:

Operating History: The structure was used for the staging, shipment and receipt of material, including radioactive material. The HSA documented the presence of radioactive material prepared for shipment within the area.

Site Characterization: Direct measurements were made which confirmed the presence of plant-derived radionuclides. Cs-137 was the primary nuclide of plant origin detected with a mean gross activity level of 1,734 dpm/100 cm² and a maximum value of 2,386 dpm/100 cm². Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the area was determined to be a Class 3 area.

HSA Events: HSA Report Pg. 60, section 6.11.3

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 randomly determined and 119 m² 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:	F501	Receiving Warehouse
Survey Unit:	0011	Exterior Surfaces
Class:	3	Structure Surface
SU Area (m²):	1177	LTP Table 5-4
Evaluator:		
DCGL (dpm/100 cm²):	43000	Gross Activity DCGL
Area Factor:	N/A	Class 3
Design DCGL_{mc} (dpm/100 cm ²):	N/A	Class 3
LBGR (dpm/100 cm²):	21500	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	65	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	N/A	Class 3
Scan Area (m²):	119	
Scan Coverage (%):	10%	Class 3
Z_{1-α} :	1.645	
Z_{1-β} :	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	330.7	
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:	14	Class 3
Grid Spacing L:	N/A	Class 3

Survey Results:

A total of 14 direct measurements were made in F5010011. 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 1,118 dpm/100 cm² to 10,258 dpm/100 cm², 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. In one of the samples alpha activity was detected at a level of 5.99 ± 3.03 dpm/100 cm² which is slightly higher than the MDC shown in Table 2-1 of Attachment 2. The results for all of the other samples counted for alpha were less than the MDC shown in Table 2-1 of Attachment 2.

Table 2. Direct Measurement Results

Measurement ID	Gross Activity (dpm/100 cm ²)
F5010011-M0001BD	969
F5010011-M0002BD	981
F5010011-M0003BD	1144
F5010011-M0004BD	1224
F5010011-M0005BD	1298
F5010011-M0006BD	1240
F5010011-M0007BD	1603
F5010011-M0008BD	861
F5010011-M0009BD	735
F5010011-M0010BD	800
F5010011-M0011BD	763
F5010011-M0012BD	843
F5010011-M0013BD	889
F5010011-M0014BD	735
Mean:	1006
Median:	929
Standard Deviation:	259
Range:	735 - 1603

Table 3. Removable Surface Activity Results

Measurement ID	Surface Beta Activity (dpm/100 cm ²)
F5010011M0001SM	16.39
F5010011M0002SM	11.27
F5010011M0003SM	8.7
F5010011M0004SM	1.01
F5010011M0005SM	-0.27
F5010011M0006SM	2.29
F5010011M0007SM	11.27
F5010011M0008SM	-0.27
F5010011M0009SM	3.58
F5010011M0010SM	-0.27
F5010011M0011SM	2.29
F5010011M0012SM	4.86
F5010011M0013SM	2.29
F5010011M0014SM	1.01
Mean:	4.58
Median:	2.29
Standard Deviation:	5.25
Range:	-0.27 to 16.39

Survey Unit Data Assessment:

The survey design required 14 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 greater than the design standard deviation. Both values of sigma result in a relative shift of greater than 3 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):	14	
Median (dpm/100 cm ²):	929	
Mean (dpm/100 cm ²):	1006	
Direct Measurement Standard Deviation (dpm/100 cm ²):	259	Based on samples and backgrounds.
Total Standard Deviation (dpm/100 cm ²):	259	
Maximum (dpm/100 cm ²):	1603	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	14	
S+ Value:	14	
Critical Value:	10	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	Class 3 no additional samples required
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{mc}:	N/A	
Total Standard Deviation <= Sigma:	Investigate	
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
Does the Survey Unit Pass All Criteria?	Investigate	no additional samples required

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 3 structure survey and the sample results are consistent with that classification. The variability of the survey results was slightly greater 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 3 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.

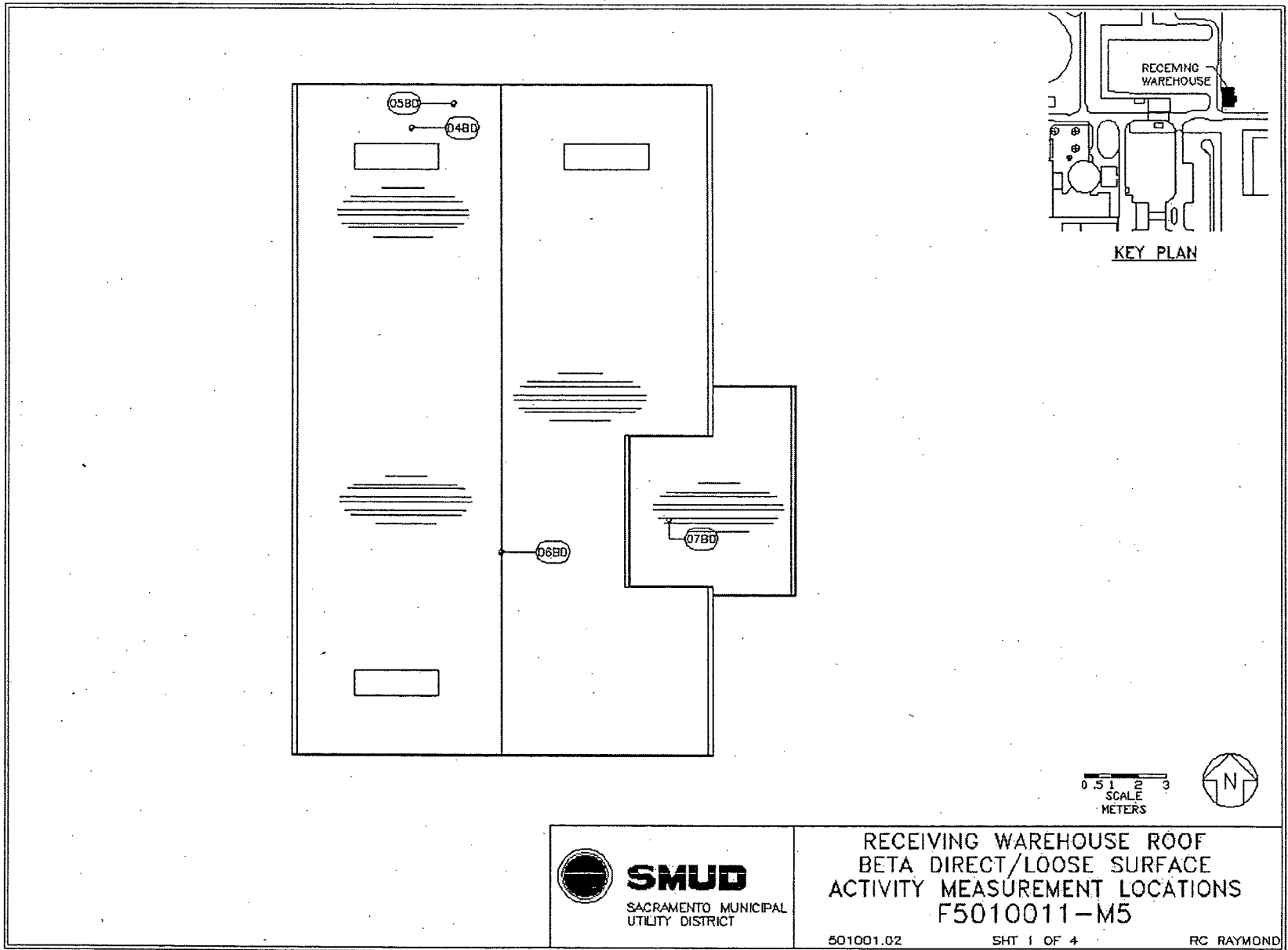
It is concluded that survey unit F5010011 meets the release criteria of 10CFR20.1402.

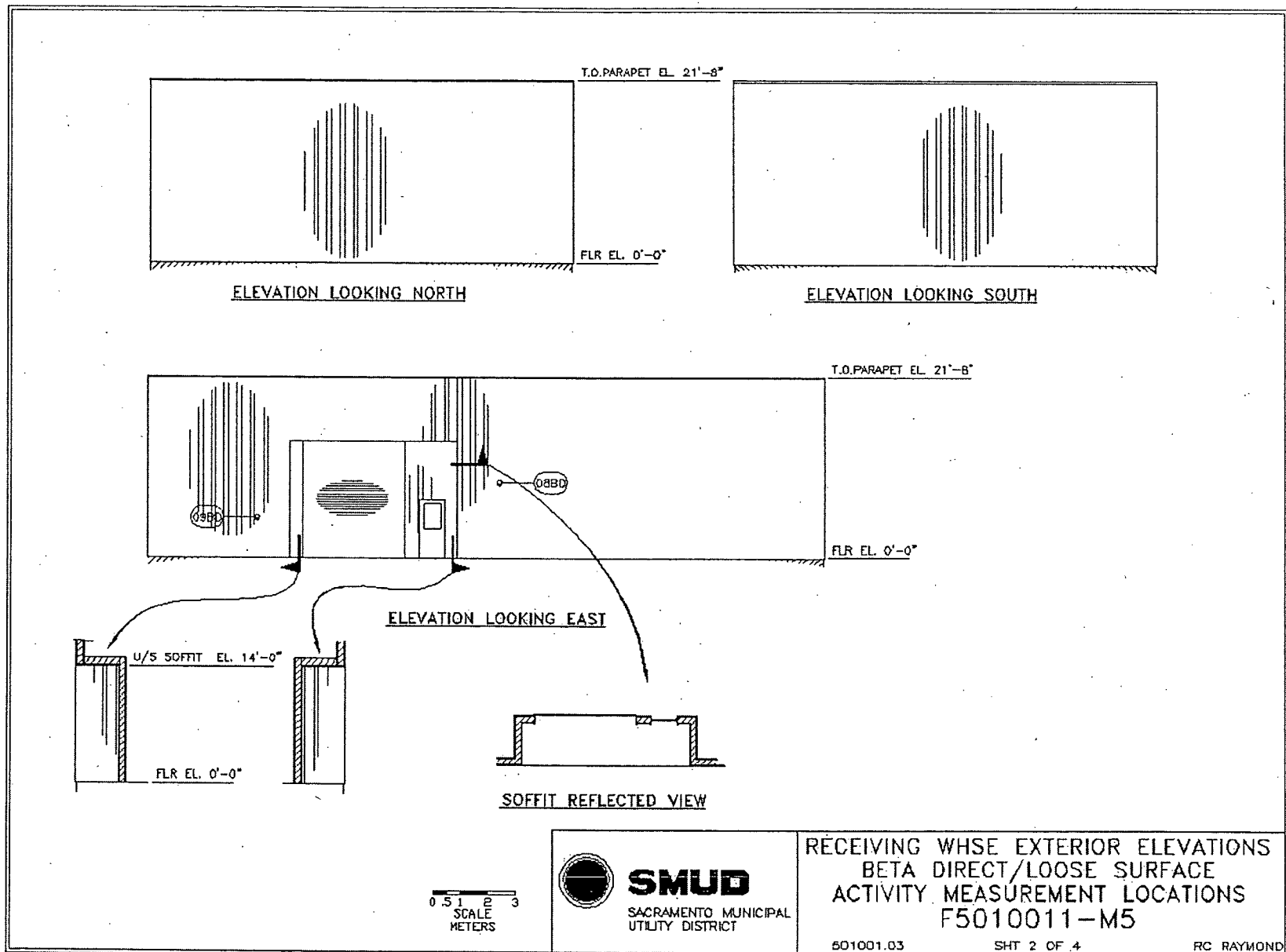
Attachment 1

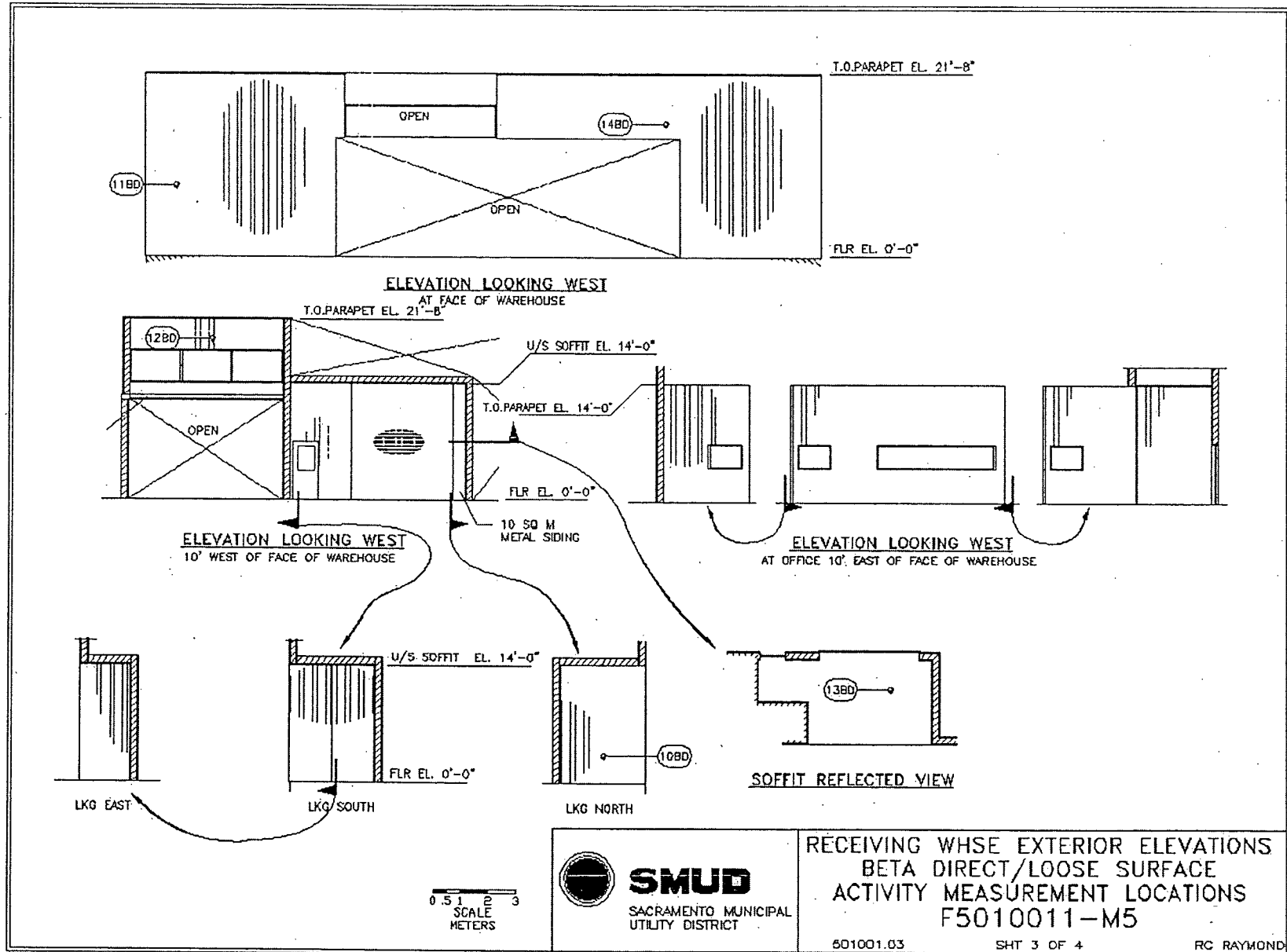
Maps

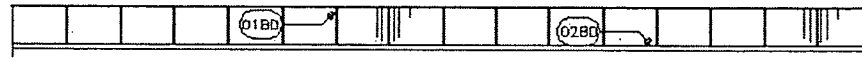
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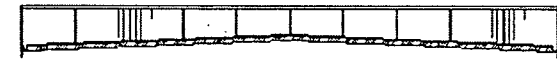
ELEVATION LOOKING WEST



ELEVATION LOOKING NORTH



ELEVATION LOOKING EAST



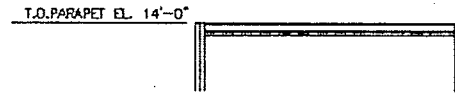
ELEVATION LOOKING SOUTH



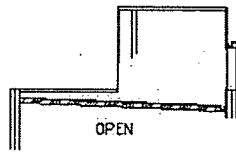
LKG SOUTH
AT WHSE



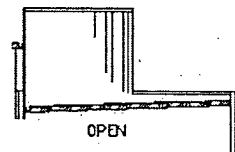
LKG NORTH
AT WHSE



ELEVATION LOOKING EAST
OFFICE PARAPET



LKG SOUTH
AT OFFICE



LKG NORTH
AT OFFICE



SMUD

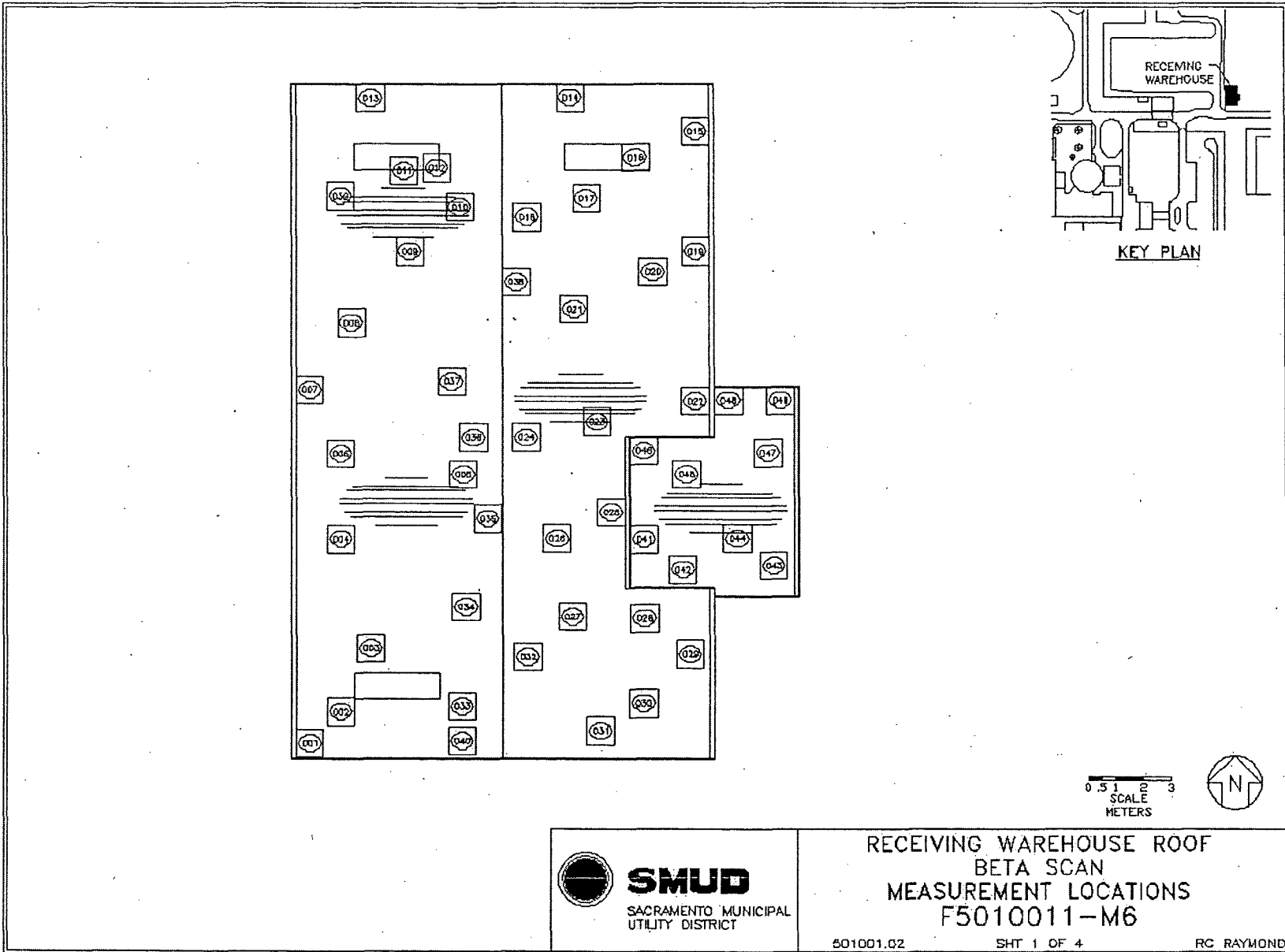
SACRAMENTO MUNICIPAL
UTILITY DISTRICT

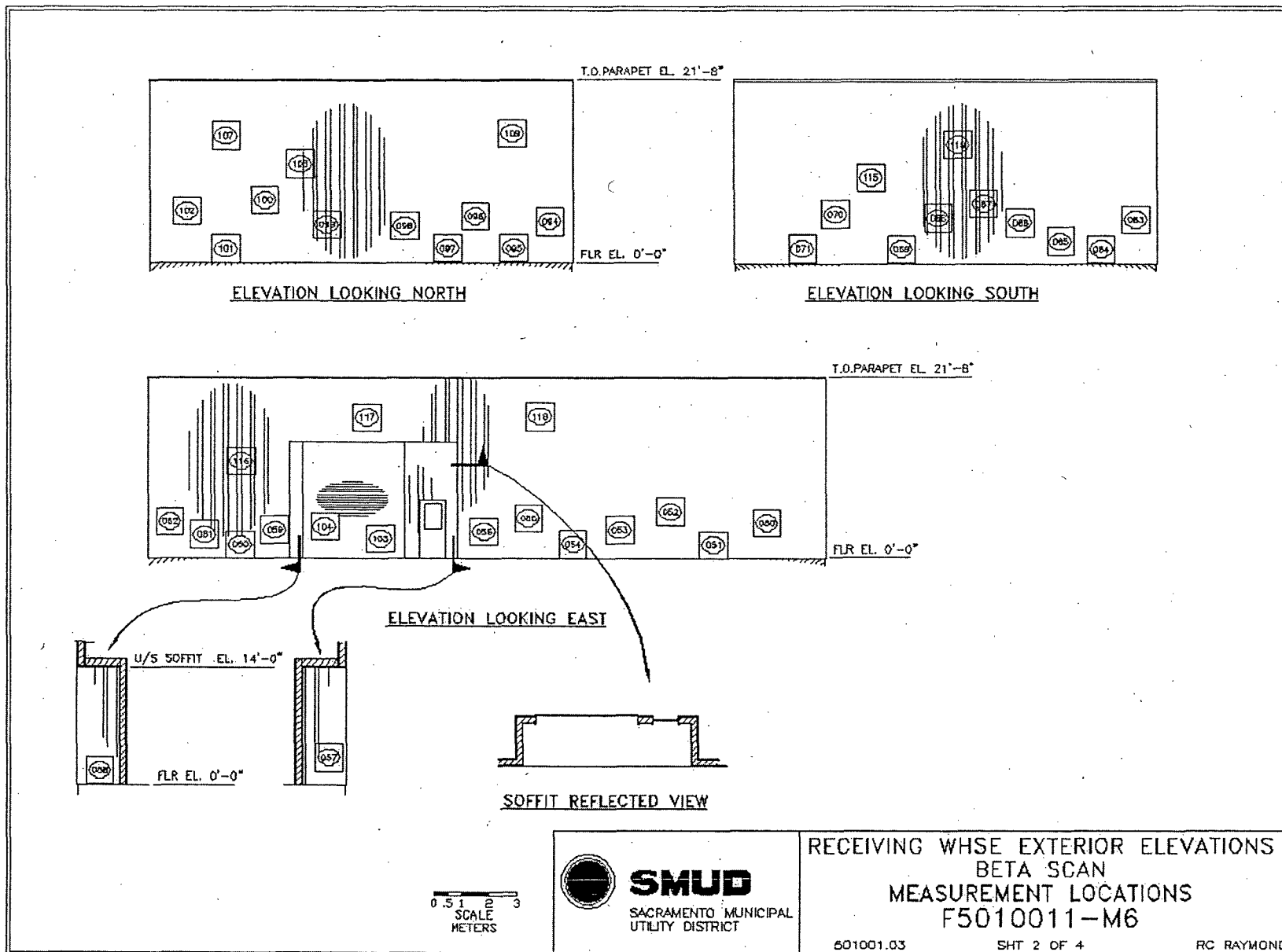
RECEIVING WAREHOUSE ROOF PARAPETS
BETA DIRECT/LOOSE SURFACE
ACTIVITY MEASUREMENT LOCATIONS
F5010011-M5

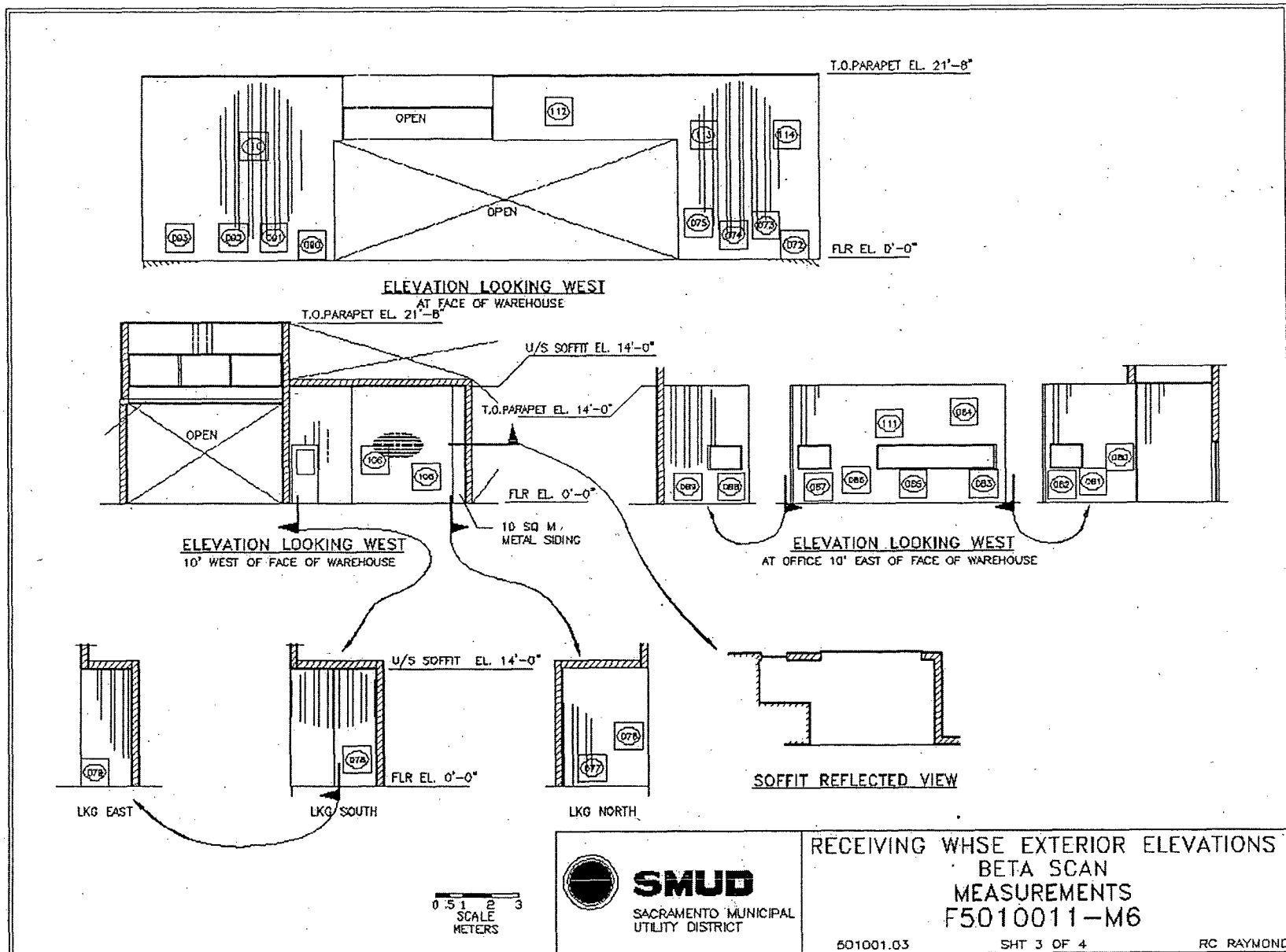
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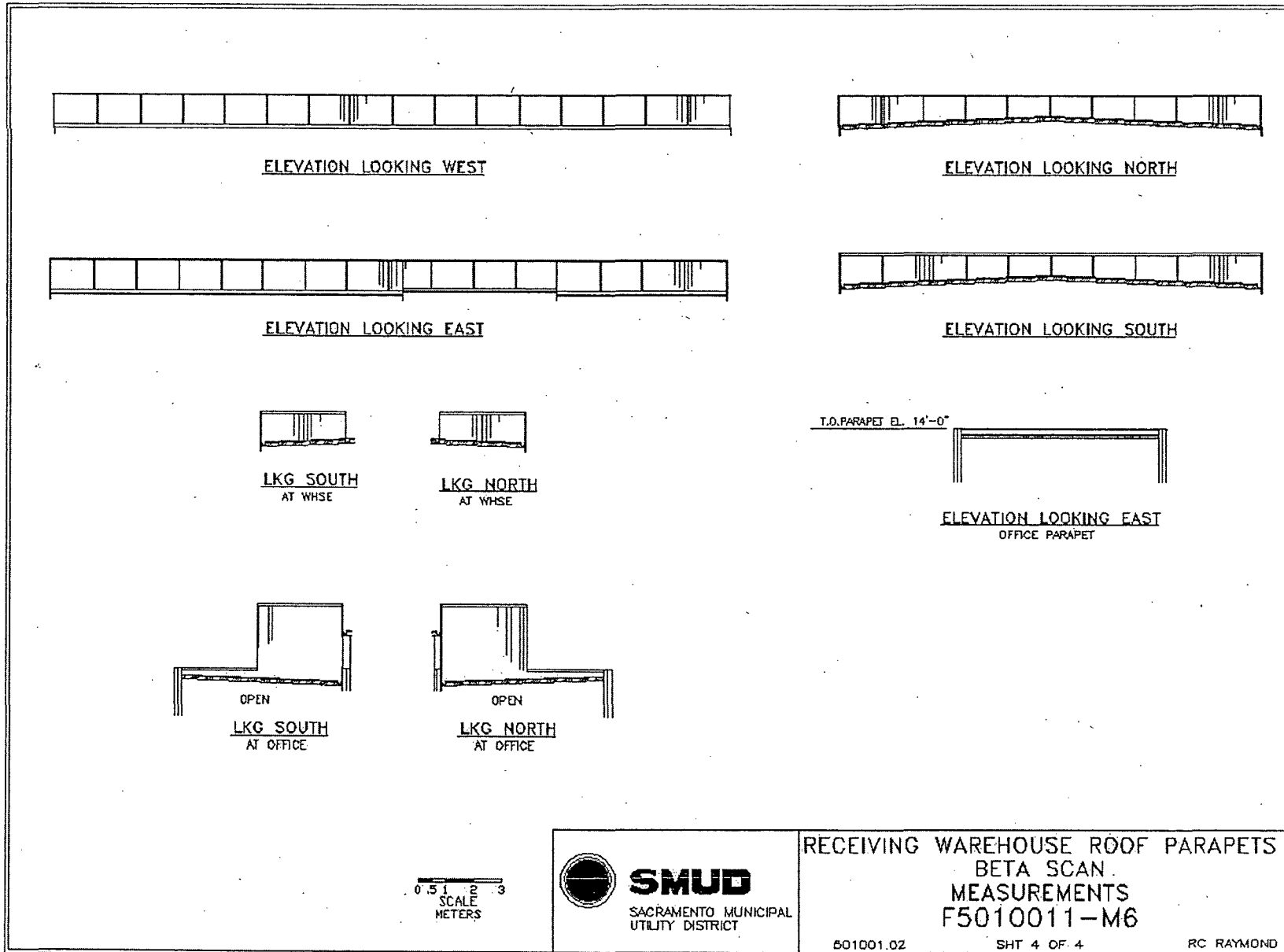
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RC RAYMOND









Attachment 2

Instrumentation

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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; 193715	43-68B; 160703	433	1033
M2350; 203465	43-68/5B; 148942	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 cm²)
Investigation Criteria - Direct	21500
Investigation Criteria – Scan	43000
DCGL _w	43000
DCGL _{EMC}	N/A

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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