

**Rancho Seco**  
**Final Status Survey Summary Report**  
**November 7, 2007**  
**Machine Shop (interior)**  
**Survey Unit F8520001**

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## FINAL STATUS SURVEY SUMMARY REPORT

### **Survey Unit:**

F8520001, Machine Shop (interior)

### **Survey Unit Description:**

**Operating History:** This structure was used for the cutting, drilling, grinding and welding on maintenance materials. This area was reported to have been used for maintenance of components containing radioactive material. Operating records and the HSA document 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 presence of plant-derived radionuclides. Direct measurements of the interior showed a mean gross activity level of 1,973 dpm/100 cm<sup>2</sup> and a maximum value of 2,408 dpm/100 cm<sup>2</sup>. 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. 64.

### **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 141.1 m<sup>2</sup> 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**

<b>Survey Design Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Survey Area:</b>	F852	Machine Shop (interior)
<b>Survey Unit:</b>	0001	Structure Surface
<b>Class:</b>	3	LTP Table 5-4
<b>SU Area (m<sup>2</sup>):</b>	1482	
<b>Evaluator:</b>	DA Tallman	
<b>DCGL (dpm/100 cm<sup>2</sup>):</b>	43000	Gross Activity DCGL
<b>Area Factor:</b>	N/A	Class 3
<b>Design DCGL<sub>emc</sub> (dpm/100 cm<sup>2</sup>):</b>	N/A	Class 3
<b>LBGR (dpm/100 cm<sup>2</sup>):</b>	21500	Default = 50% DCGL
<b>Design Sigma (dpm/100 cm<sup>2</sup>):</b>	288	
<b>Type I Error:</b>	0.05	
<b>Type II Error:</b>	0.05	
<b>Predominant Nuclide:</b>	Cs-137	
<b>Sample Area (m<sup>2</sup>):</b>	N/A	Class 3
<b>Scan Area (m<sup>2</sup>):</b>	141.1	
<b>Scan Coverage (%):</b>	10%	Class 3
<b>Z<sub>1-α</sub>:</b>	1.645	
<b>Z<sub>1-β</sub>:</b>	1.645	
<b>Sign P:</b>	0.99865	
<b>Calculated Relative Shift:</b>	74.6	
<b>Relative Shift Used:</b>	3	Uses 3.0 if Relative Shift is >3
<b>N-Value:</b>	11	
<b>Design N-Value + 20%:</b>	14	NUREG-1575 Table 5-5
<b>Design Min Samples N:</b>	14	Class 3
<b>Grid Spacing L:</b>	N/A	Class 3

### Survey Results:

A total of 14 direct measurements were made in F8520001. 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 1992 to 7285 dpm/100 cm<sup>2</sup>, 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 <sup>2</sup> )
F8520001-C0001BD	2023
F8520001-C0002BD	1738
F8520001-C0003BD	1733
F8520001-C0004BD	1899
F8520001-C0005BD	2070
F8520001-C0006BD	1893
F8520001-C0007BD	2023
F8520001-C0008BD	1857
F8520001-M0009BD	471
F8520001-X0010BD	1530
F8520001-X0011BD	1359
F8520001-X0012BD	1333
F8520001-X0013BD	1484
F8520001-M0014BD	766
Mean:	1584
Median:	1735
Standard Deviation:	478
Range:	471 - 2070

**Table 3. Removable Surface Activity Results**

<b>Measurement ID</b>	<b>Surface Beta Activity (dpm/100 cm<sup>2</sup>)</b>
F8520001C0001SM	-0.27
F8520001C0002SM	2.29
F8520001C0003SM	3.58
F8520001C0004SM	4.86
F8520001C0006SM	-0.27
F8520001C0007SM	2.29
F8520001C0008SM	6.14
F8520001M0009SM	1.01
F8520001X0010SM	2.29
F8520001X0011SM	3.58
F8520001X0012SM	2.29
F8520001X0013SM	2.29
F8520001M0014SM	2.29
F8520001C0005SM	4.86
Mean:	2.66
Median:	2.29
Standard Deviation:	1.84
Range:	-0.27 to 6.14

**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. Since both values of sigma resulted in a relative shift greater than three (3), no additional samples were required.

**Table 4. Data Assessment Results**

Survey Results Parameter	Value	Comment
<b>Material Background Used</b> (dpm/100 cm <sup>2</sup> ):	N/A	
<b>Ambient Background Used</b> (dpm/100 cm <sup>2</sup> ):	N/A	Average Ambient BKG = 0
<b>Actual Direct Measurements (N):</b>	14	
<b>Median</b> (dpm/100 cm <sup>2</sup> ):	1735	
<b>Mean</b> (dpm/100 cm <sup>2</sup> ):	1584	
<b>Direct Measurement Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	478	
<b>Total Standard Deviation</b> (dpm/100 cm <sup>2</sup> ):	478	Based on samples and backgrounds.
<b>Maximum</b> (dpm/100 cm <sup>2</sup> ):	2070	
<b>Material Type:</b>	N/A	Background Subtract Not Applied
<b>Sign Test Final N Value:</b>	14	
<b>S+ Value:</b>	14	
<b>Critical Value:</b>	10	
<b>Sufficient Samples Collected:</b>	Yes	
<b>Maximum Value &lt; DCGL:</b>	Yes	
<b>Median Value &lt; DCGL:</b>	Yes	
<b>Mean Value &lt; DCGL:</b>	Yes	
<b>Maximum Value &lt; DCGL<sub>mc</sub>:</b>	N/A	Class 3
<b>Total Standard Deviation &lt;= Sigma:</b>	Investigate	No additional samples required
<b>Pass the Sign Test?</b>	Yes	
<b>Reject the Null Hypothesis?</b>	Yes	
<b>Does the Survey Unit Pass All Criteria?</b>	Investigate	The survey unit passes all conditions: no additional sample 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 greater than the characterization data used for survey design. However, no additional samples were required. 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 cm<sup>2</sup> 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.

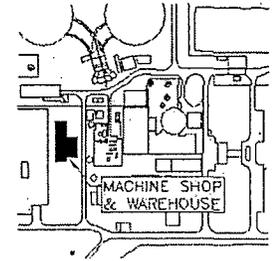
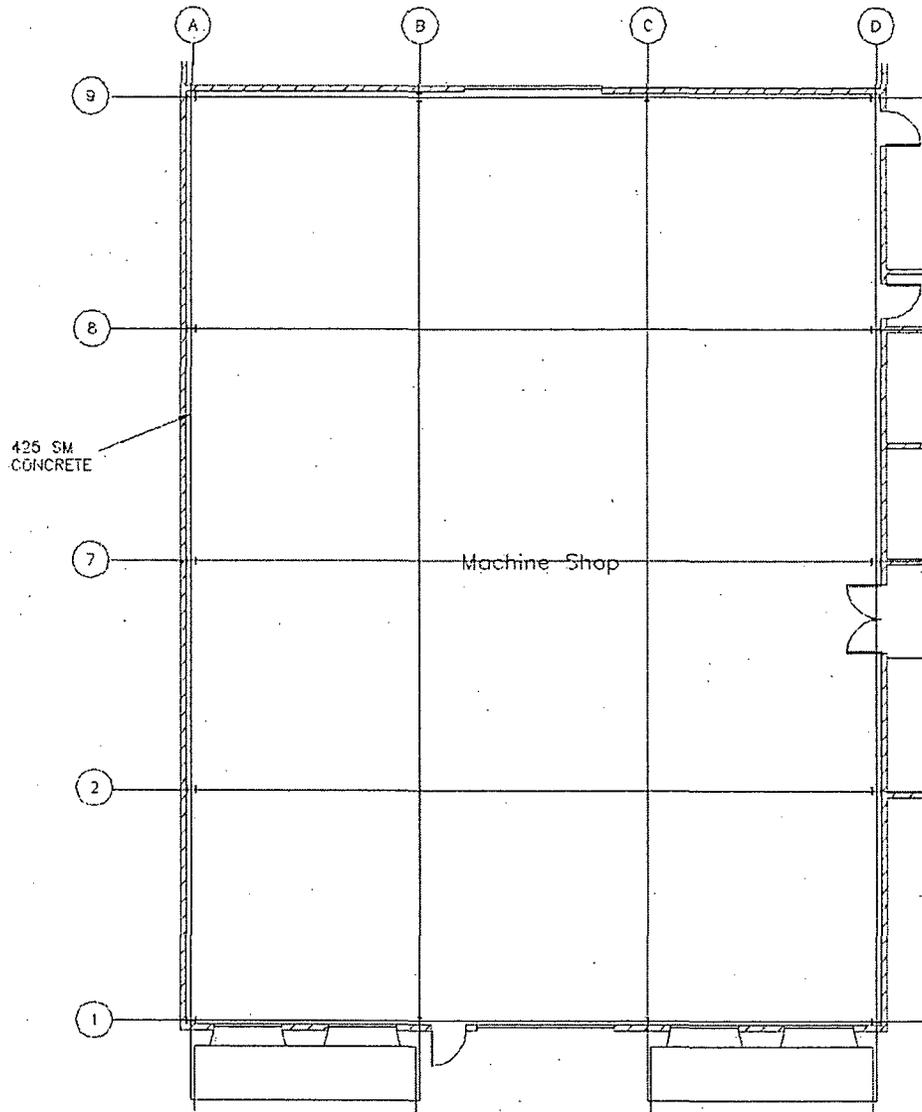
It is concluded that survey unit F8520001 meets the release criteria of 10CFR20.1402.

**Attachment 1**

**Maps**

**November 7, 2007**

**Survey Unit F8520001**



KEY PLAN

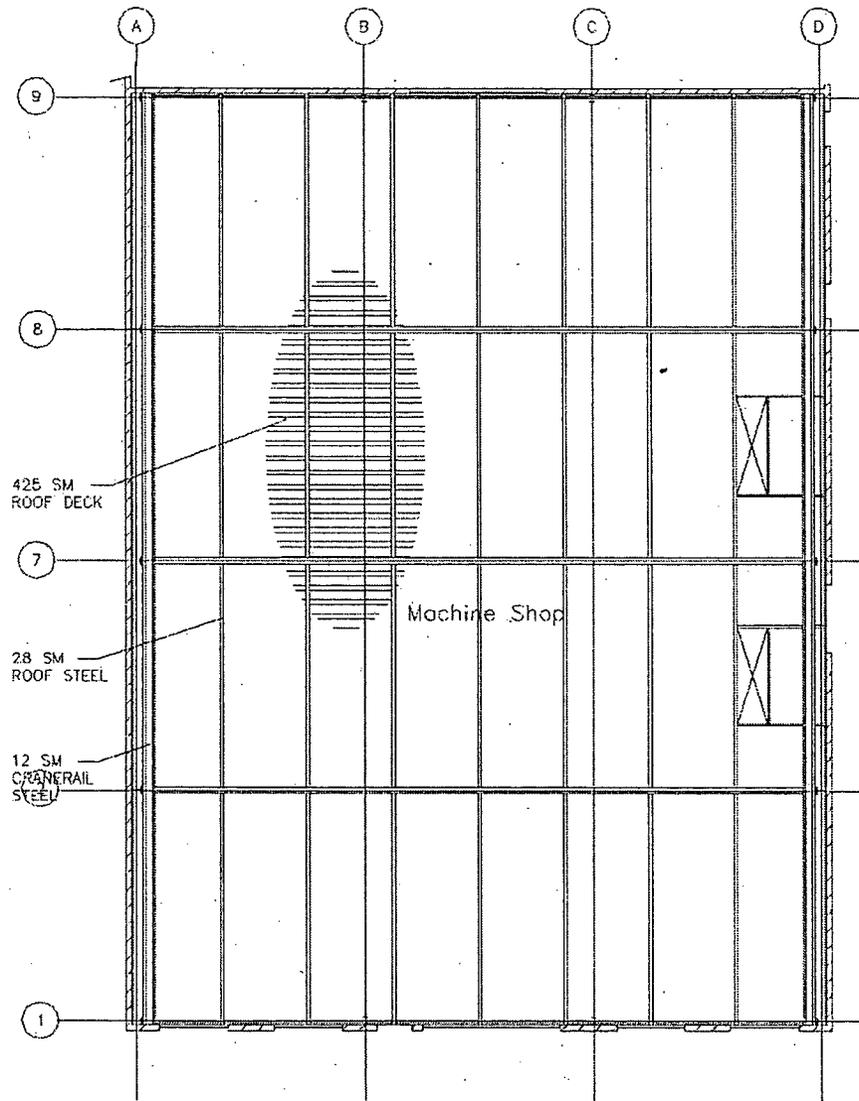


AREA PLAN

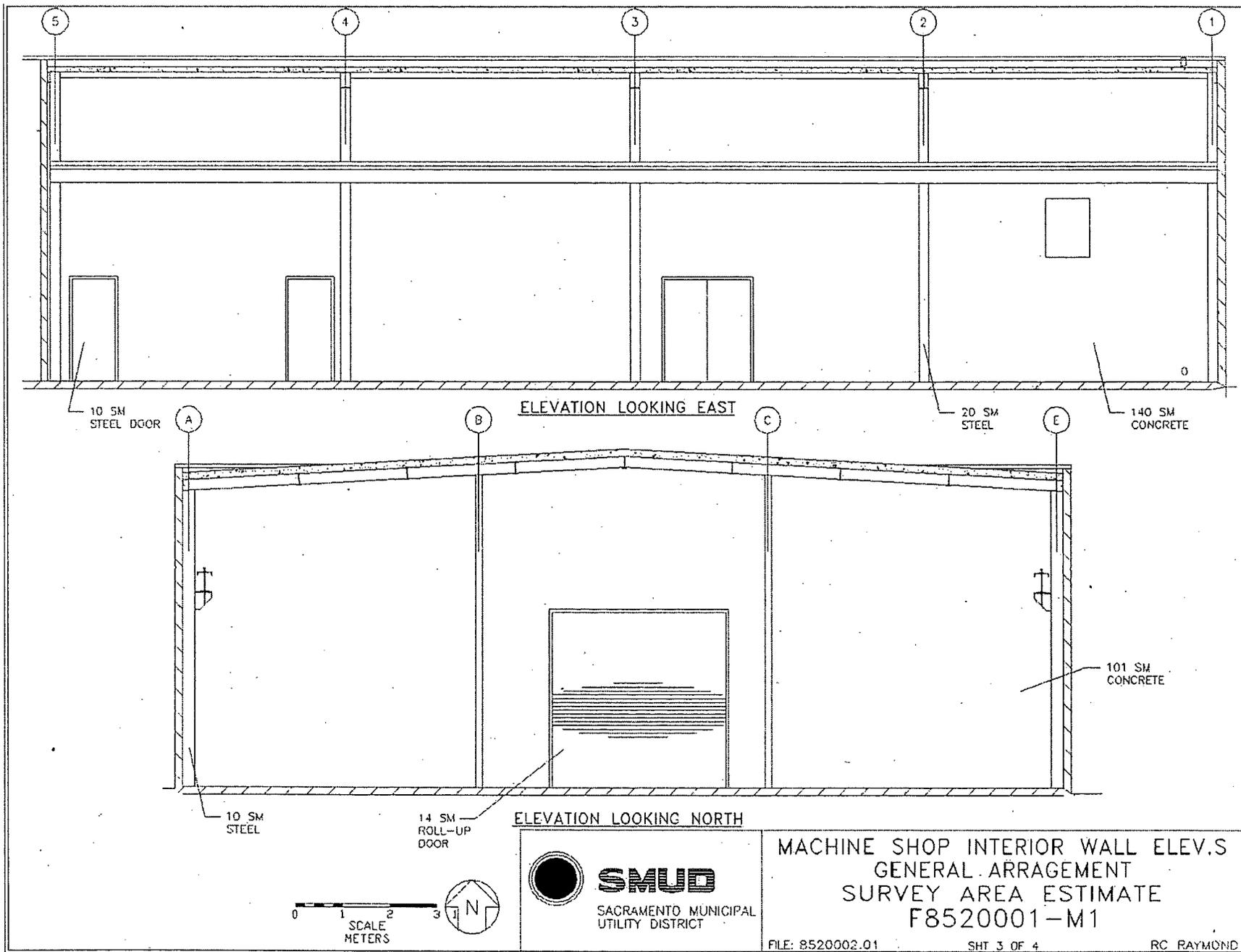


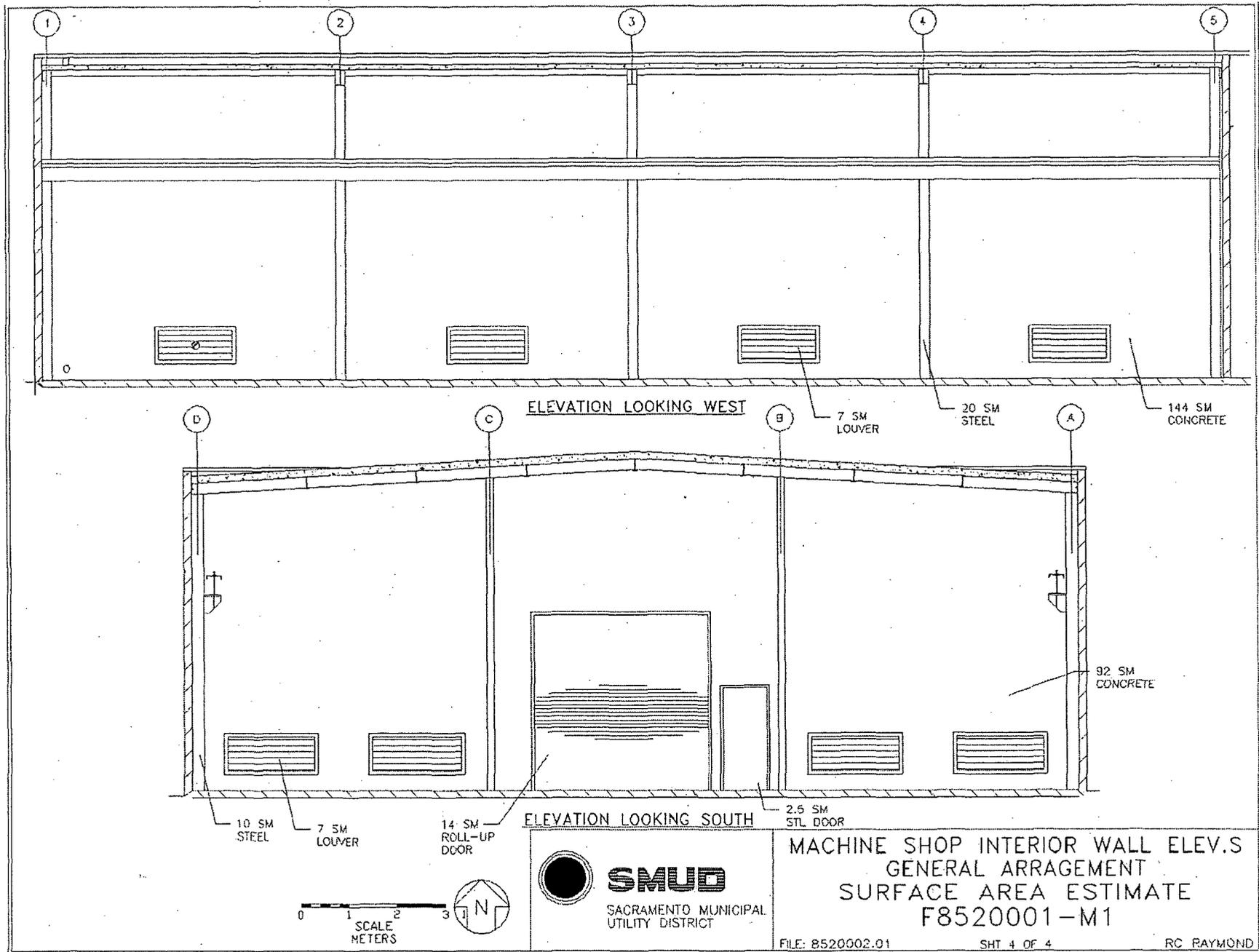
**SMUD**  
 SACRAMENTO MUNICIPAL  
 UTILITY DISTRICT

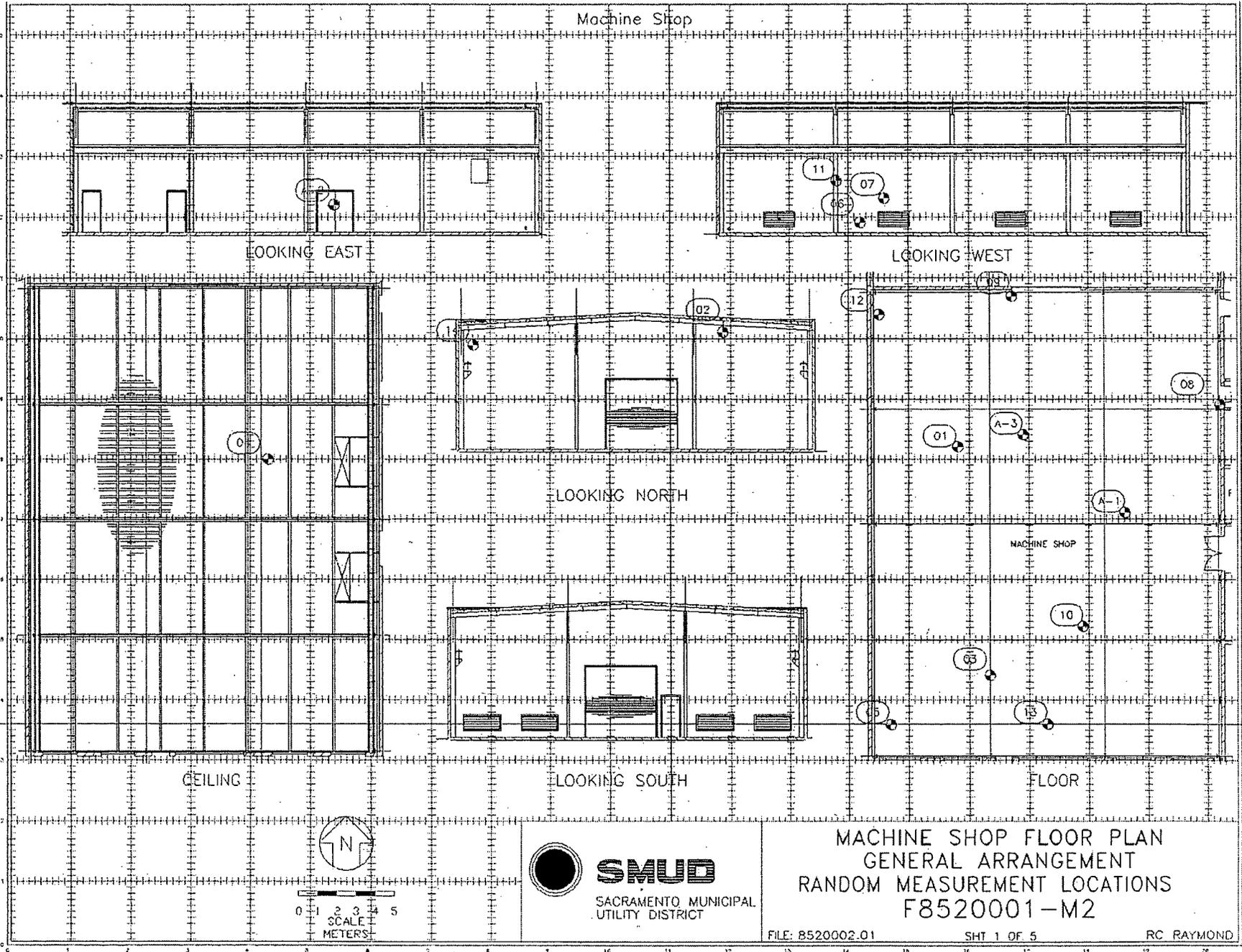
MACHINE SHOP FLOOR PLAN  
 BETA DIRECT/LOOSE SURFACE  
 ACTIVITY MEASUREMENT LOCATIONS  
 F8520001-M1

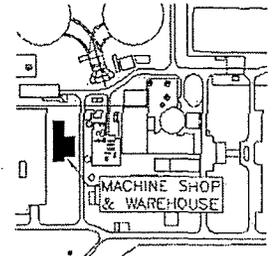
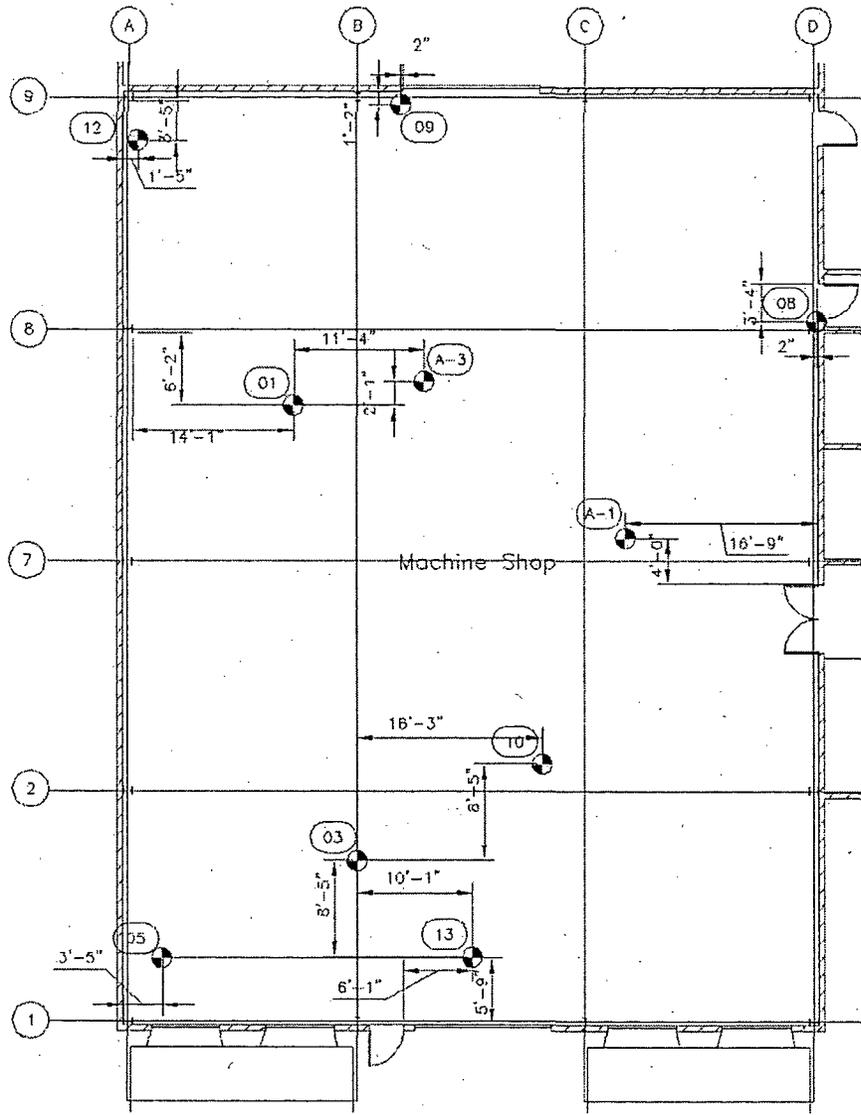


MACHINE SHOP REFLECT CEILING PLAN  
GENERAL ARRANGEMENT  
SURFACE AREA ESTIMATE  
F8520001-M1





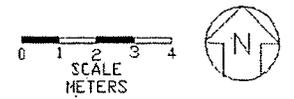




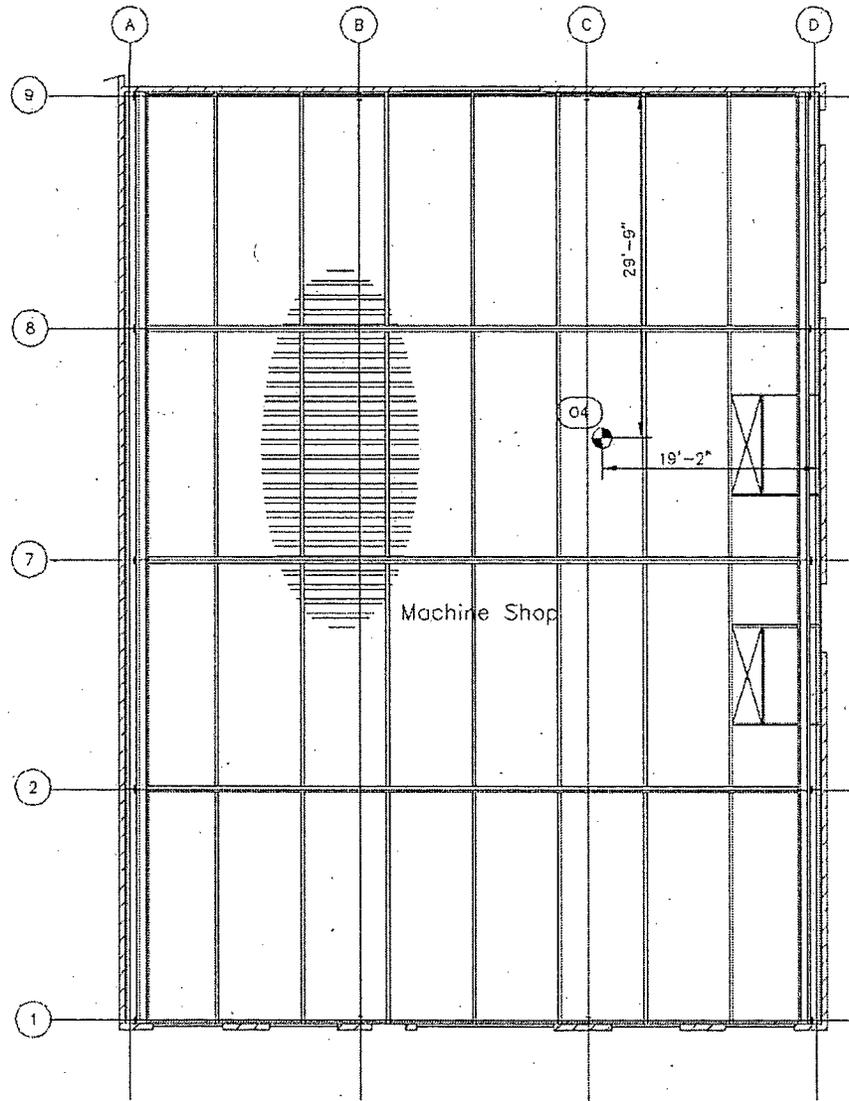
KEY PLAN



AREA PLAN



MACHINE SHOP FLOOR PLAN  
 BETA DIRECT/LOOSE SURFACE  
 ACTIVITY MEASUREMENT LOCATIONS  
 F8520001-M2



**SMUD**

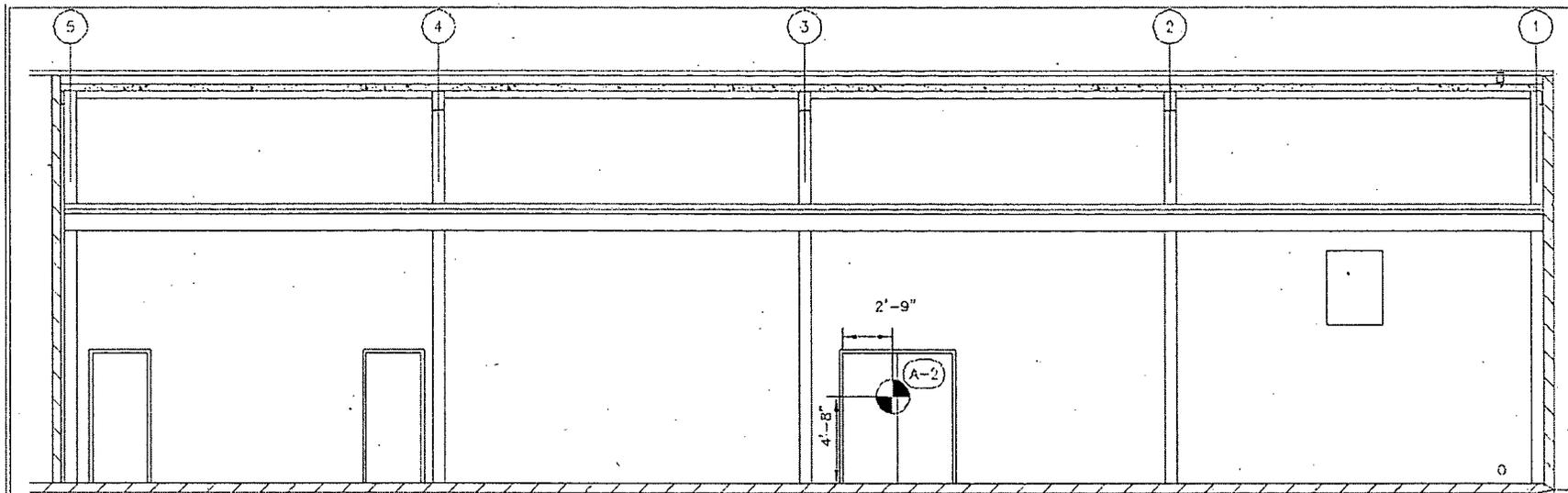
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

MACHINE SHOP FLOOR PLAN  
BETA DIRECT/LOOSE SURFACE  
ACTIVITY MEASUREMENT LOCATIONS  
F8520001-M2

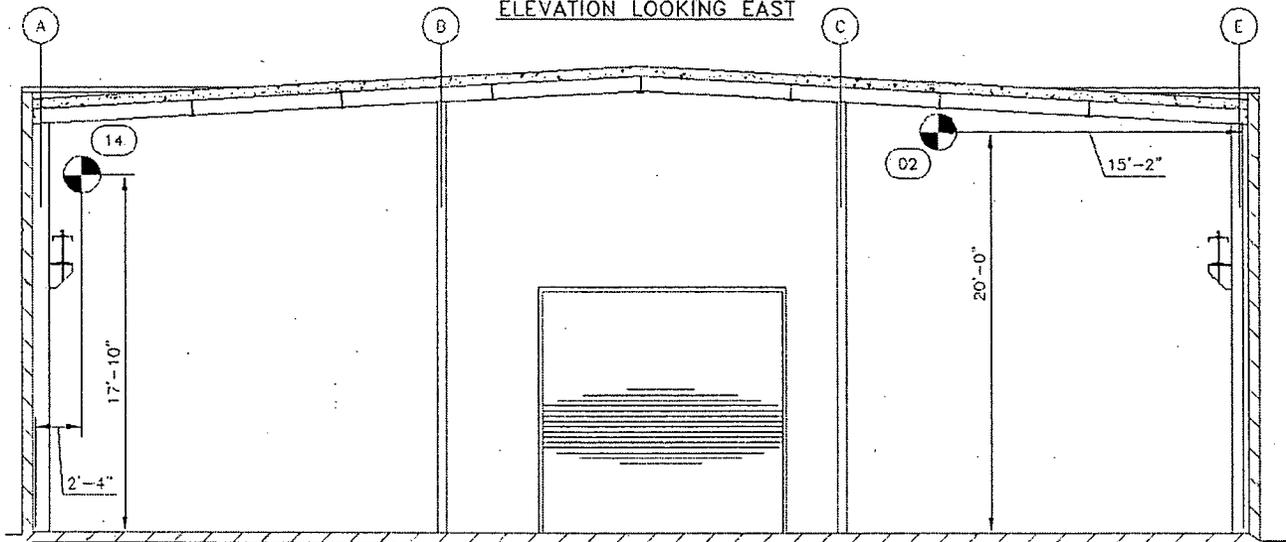
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SHT 3 OF 4

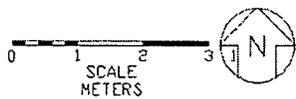
RC RAYMOND



ELEVATION LOOKING EAST



ELEVATION LOOKING NORTH



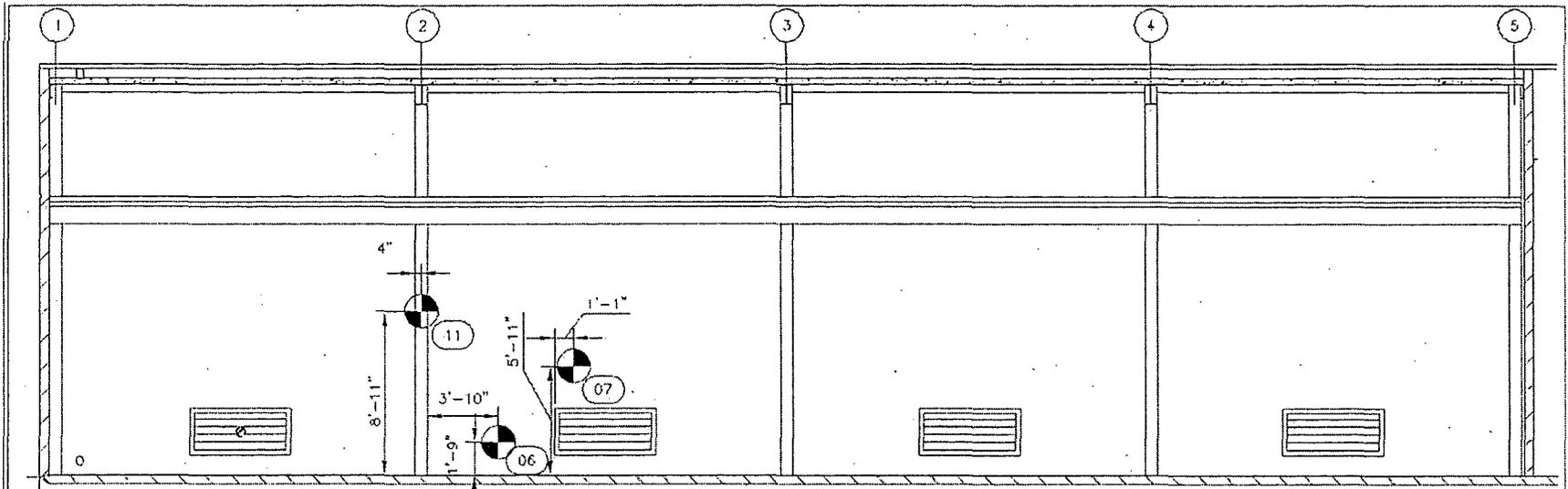
**SMUD**  
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

MACHINE SHOP FLOOR PLAN  
BETA DIRECT/LOOSE SURFACE  
ACTIVITY MEASUREMENT LOCATIONS  
F8520001-M2

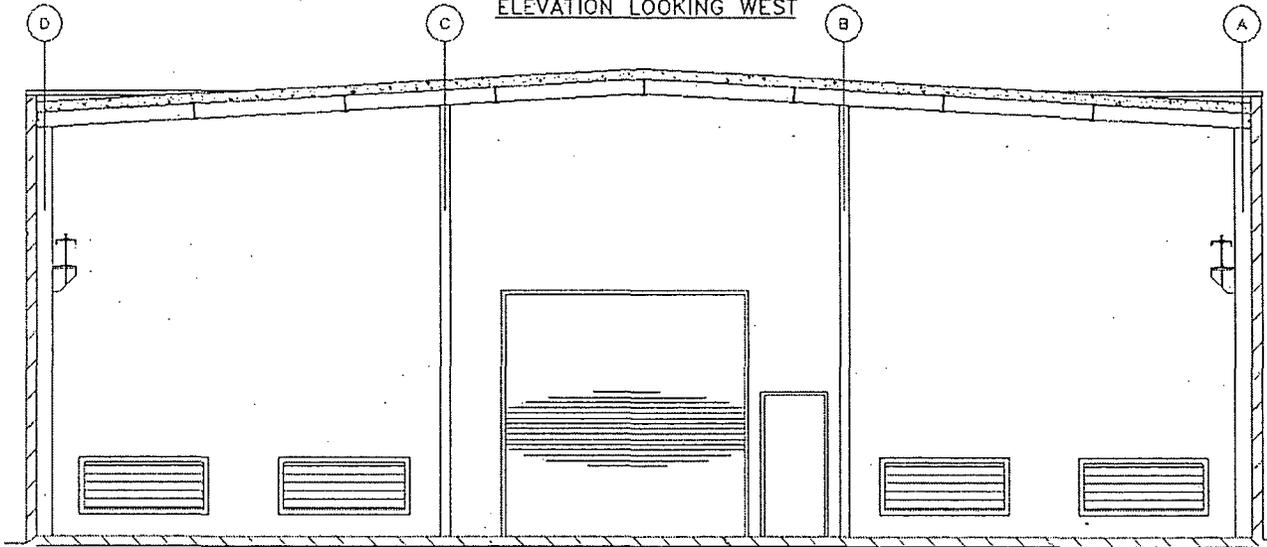
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SHT 4 OF 5

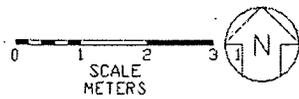
RC RAYMOND



ELEVATION LOOKING WEST



ELEVATION LOOKING SOUTH



**SMUD**

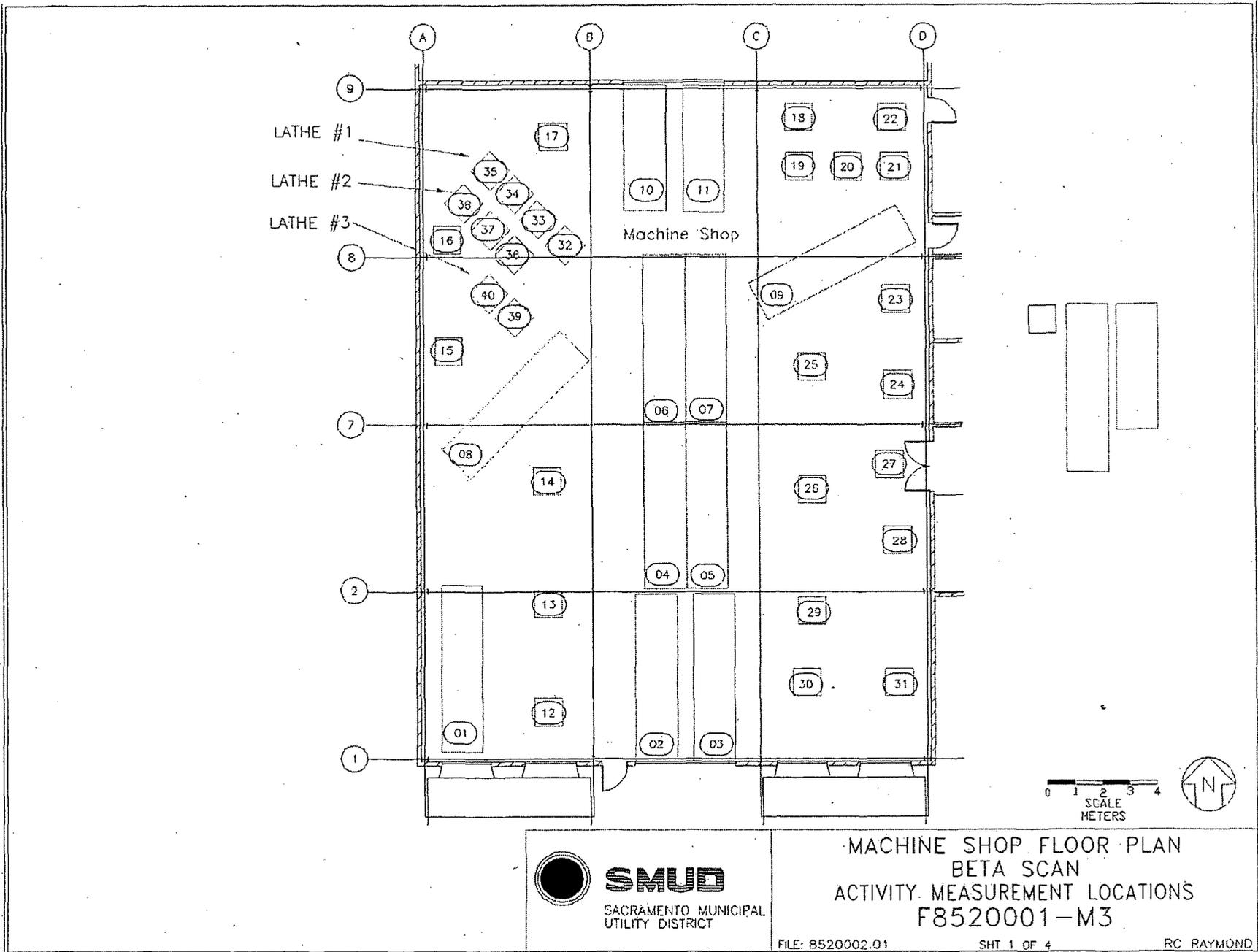
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

MACHINE SHOP FLOOR PLAN  
 BETA DIRECT/LOOSE SURFACE  
 ACTIVITY MEASUREMENT LOCATIONS  
 F8520001-M2

FILE: 8520002.01

SHT 5 OF 5

RC RAYMOND

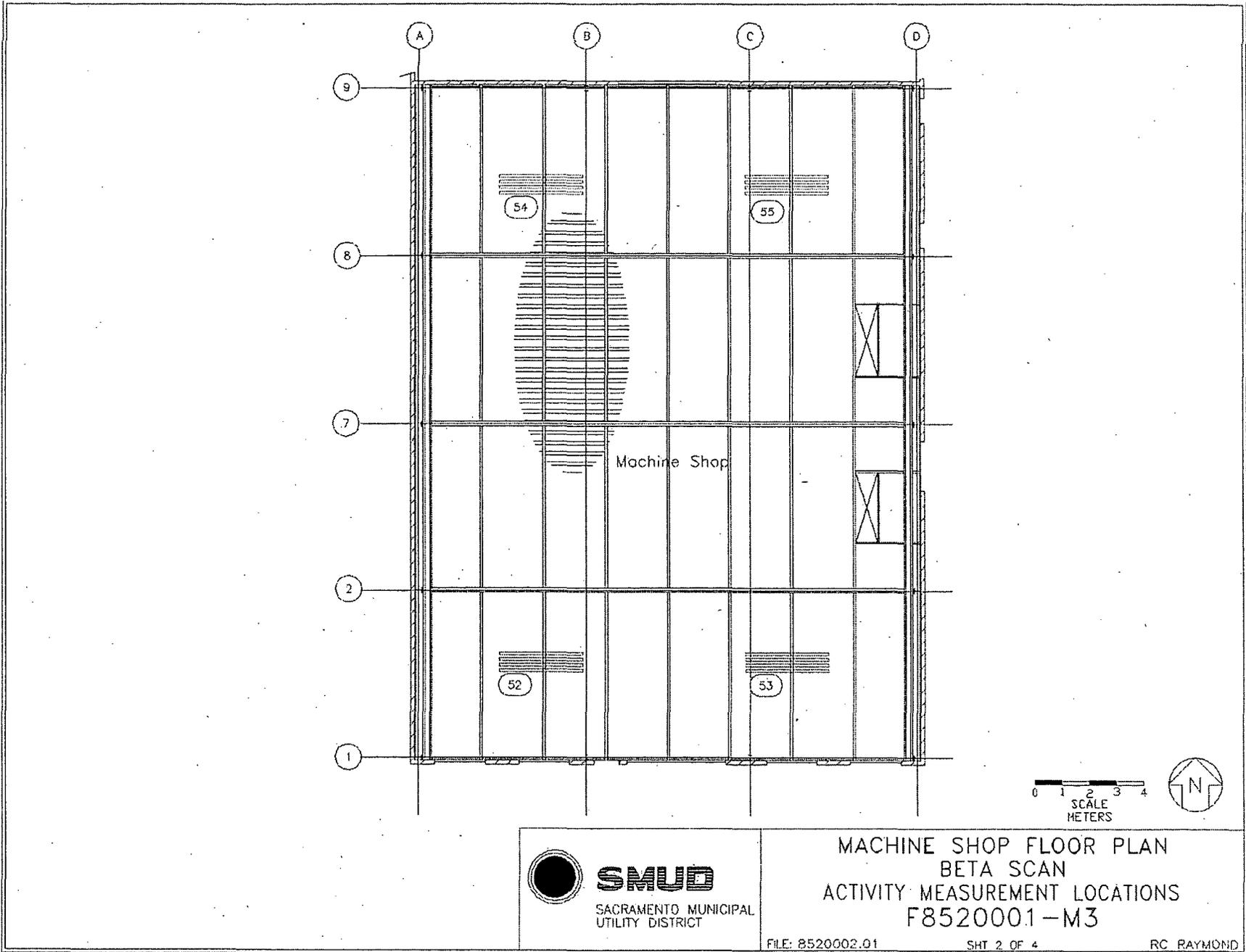


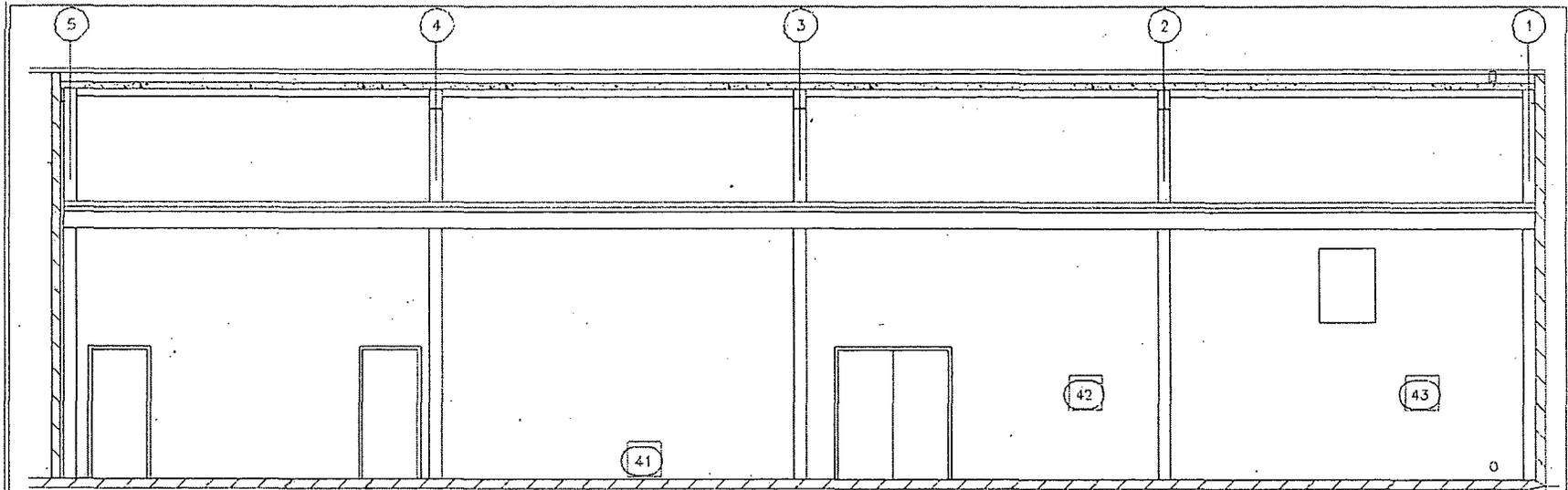
MACHINE SHOP FLOOR PLAN  
BETA SCAN  
ACTIVITY MEASUREMENT LOCATIONS  
F8520001-M3

FILE: 8520002.01

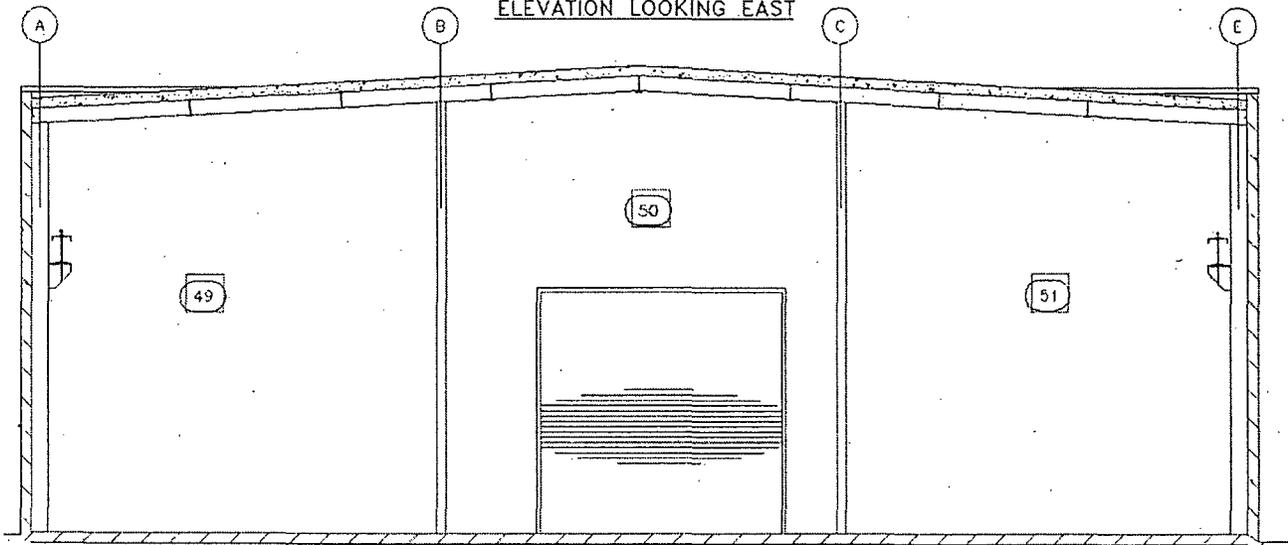
SHT 1 OF 4

RC RAYMOND

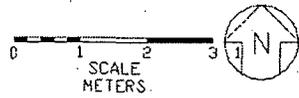




ELEVATION LOOKING EAST



ELEVATION LOOKING NORTH



**SMUD**

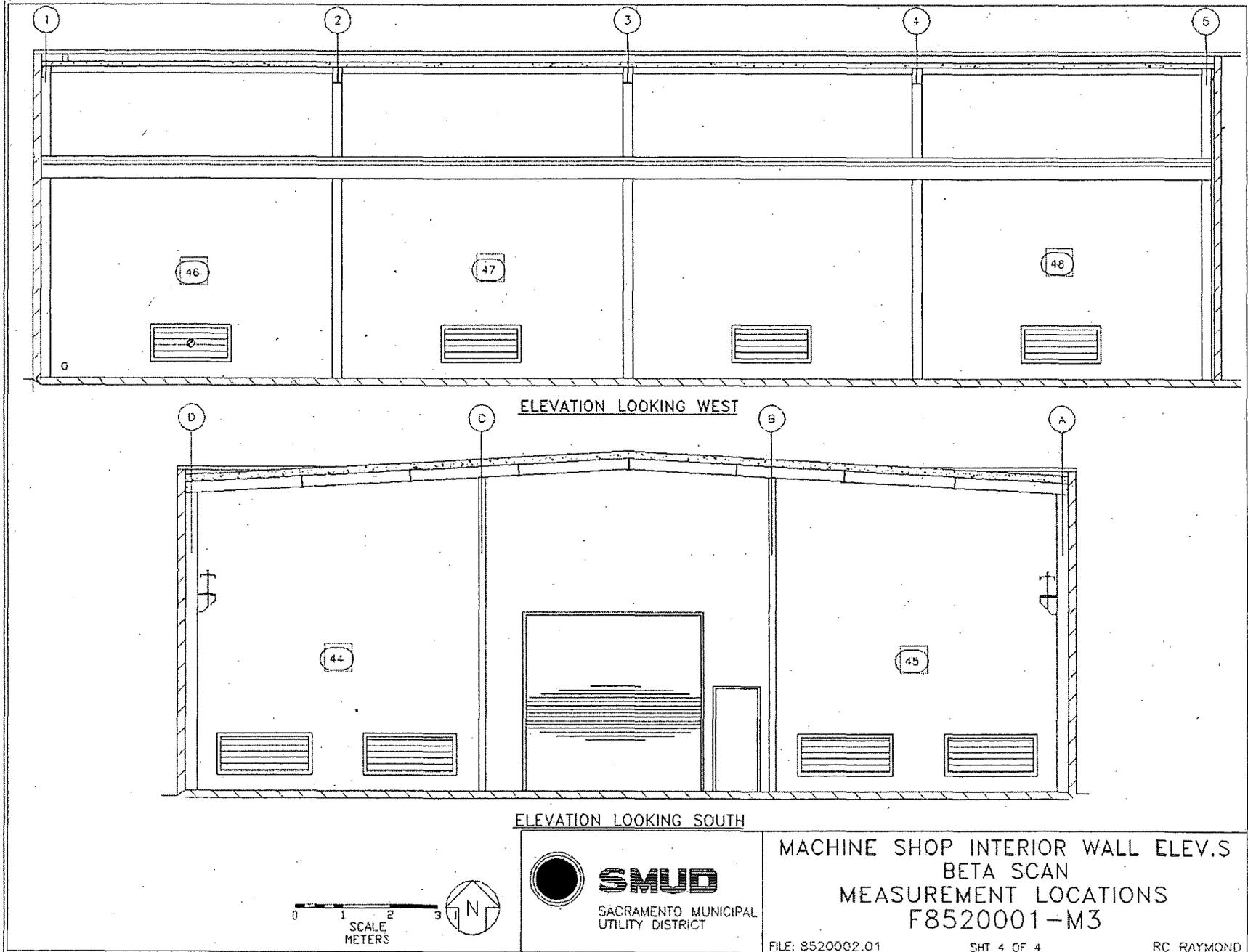
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

MACHINE SHOP INTERIOR WALL ELEV.S  
 BETA SCAN  
 MEASUREMENT LOCATIONS  
 F8520001-M3

FILE: 8520002.01

SHT 3 OF 4

RC RAYMOND



**Attachment 2**

**Instrumentation**

**November 7, 2007**

**Survey Unit F8520001**

**Table 2-1. Survey Unit Instrumentation**

<b>Instrument Model; Serial No.</b>	<b>Detector Model; Serial No.</b>	<b>MDC Static (dpm/100 cm<sup>2</sup>)</b>	<b>MDC Scan (dpm/100 cm<sup>2</sup>)</b>
M2350; 203481	43-68B; 161405	433	1033
M2350; 175834	43-68B; 148634	256 <sup>1</sup>	611 <sup>1</sup>
M2350; 175834	43-68B; 148634	433	1033
M2350; 142499	43-37; 148502	198	616
Tennelec; 0401171	N/A	5 dpm $\alpha$ , 11 dpm $\beta$	N/A

<sup>1</sup> Metal

**Table 2-2. Investigation Criteria and DCGL**

<b>Parameter</b>	<b>Value (dpm/100 cm<sup>2</sup>)</b>
Investigation Criteria - Direct	21500
Investigation Criteria – Scan	43000
DCGL <sub>W</sub>	43000
DCGL <sub>EMC</sub>	N/A

**Attachment 3**  
**Investigation**  
**November 7, 2007**  
**Survey Unit F8520001**

**(none required)**

**Attachment 4**  
**Data Assessment**  
**November 7, 2007**  
**Survey Unit F8520001**

