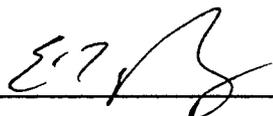


**Rancho Seco**  
**Final Status Survey Summary Report**  
**December 2, 2008**  
**RHUT/Aux Boiler Pad Area**  
**Sub-Surface Soil**  
**Survey Unit F8370002**

Prepared By: Dan A. Tallman  Date: December 5, 2008  
FSS Engineer

Reviewed By:  Date: 12/8/08  
Lead FSS Engineer

Approved By:  Date: 2-27-09  
Dismantlement Superintendent, Radiological

## FINAL STATUS SURVEY SUMMARY REPORT

### Survey Unit:

F8370002, Sub-Surface Soil - RHUT/Aux Boiler Pad Area

### Survey Unit Description:

**Operating History:** The area surrounded the A and B Regenerant Hold Up Tanks. This area was used for the storage of radioactive material. Operating records and the HSA document several leaks/spills with the potential for a release of radioactivity associated with this survey area. The HSA documented the storage of radioactive material within the area that may have had the potential to contaminate the area.

**Site Characterization:** As documented in F8370001, surface soil samples were analyzed for the presence of plant-derived radionuclides. In this survey, Cs-137 was the primary nuclide of plant origin detected with a mean activity level of 0.144 pCi/g and a maximum value of 0.90 pCi/g.

Based on the potential for sub-surface contamination within the unit, the decision to perform an investigation of the sub-surface soil was made. This investigation resulted in the collection of 30 soil samples, the locations of which coincided with those of the surface soil evaluation. The results of these samples and the statistical tests performed are also consistent with the evaluations performed on the surface soil component evaluated in F8370001. Based on the classification procedure (DSIP-0020) and consistent with the classification applied to the surface soil component, the area was designated a Class 1 land area.

### 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 spatial locations were based on the surface soil locations sampled in F8370001. Sub-Surface samples were then collected at one meter intervals. Samples taken from a depth of -15 cm (depth of surface soil samples) to -115 cm are designated as minus one meter (-1m) samples while those taken from the interval -115cm to -215 cm are referred to as minus two meter (-2m) samples. Due to the existence of numerous sub-surface utility support structures (piping, cable duct-boxes, sewer lines, etc.) as well as over dimension fill and debris existing undetected below grade level, sample refusal was not an uncommon occurrence. Two incidents of refusal culminated in the inability to acquire a two meter sample within a one meter radius (the relocation allowance criteria) of the surface and one meter sample locations accounting for the existence of 16 minus one meter samples and 14 minus two meter samples. Each soil sample taken was analyzed by HPGe detector. 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>	F837	RHUT/Aux Boiler Pad Area / Sub-Surface Soil
<b>Survey Unit:</b>	0002	Open Land Area
<b>Class:</b>	1	Consistent with F8370001
<b>SU Area (m<sup>2</sup>):</b>	1819	
<b>Evaluator:</b>	D.A.Tallman	
<b>DCGL Cs137 surrogate (pCi/g):</b>	51.2	
<b>Area Factor:</b>	1.2	Class 1
<b>Design DCGL<sub>me</sub> (pCi/g):</b>	61.9	Class 1
<b>LBGR (pCi/g):</b>	25.6	Default = 50% DCGL
<b>Design Sigma (pCi/g):</b>	9.83	Consistent with F8370001
<b>Type I Error:</b>	0.05	
<b>Type II Error:</b>	0.05	
<b>Nuclide:</b>	Cs137	
<b>Sample Area (m<sup>2</sup>):</b>	121.3	Class 1
<b>Total Area Scanned (m<sup>2</sup>):</b>	0	Sub-Surface Evaluation
<b>Scan Coverage (%):</b>	0%	Sub-Surface Evaluation
<b>Z<sub>1-α</sub> :</b>	1.645	
<b>Z<sub>1-β</sub> :</b>	1.645	
<b>Sign P:</b>	0.99379	
<b>Calculated Relative Shift:</b>	2.6	
<b>Relative Shift Used:</b>	2.6	Uses 3.0 if Rel Shift >3
<b>N-Value:</b>	12	
<b>Design N-Value + 20%:</b>	15	NUREG-1575 Table 5-5
<b>Grid Spacing L:</b>	11	Class 1

## Survey Results:

A total of 30 direct measurements were made in F8370002. The results including mean, median, standard deviation and range are shown in Table 2. All of the direct measurements were less than the DCGL. Soil samples were counted to the MDC shown in Table 2-1 of Attachment 2.

**Table 2. Direct Measurement Results**

(all activity values in pCi/g)

Measurement ID	Cs137 MDA	Cs137 Activity	Uncertainty
<b>Mean:</b>		5.48E-02	
<b>Median:</b>		5.25E-02	
<b>Standard Deviation:</b>		1.19E-02	
<b>Range:</b>	3.59E-02 to 8.03E-02		
F8370002S0021SS	7.31E-02	< 7.31E-02	
F8370002S0031SS	7.84E-02	< 7.84E-02	
F8370002S0051SS	6.04E-02	< 6.04E-02	
F8370002S0061SS	5.05E-02	< 5.05E-02	
F8370002S0071SS	5.66E-02	< 5.66E-02	
F8370002S0081SS	5.23E-02	< 5.23E-02	
F8370002S0091SS	4.38E-02	< 4.38E-02	
F8370002S0101SS	7.16E-02	< 7.16E-02	
F8370002S0111SS	5.65E-02	< 5.65E-02	
F8370002S0121SS	6.18E-02	< 6.18E-02	
F8370002S0131SS	6.60E-02	< 6.60E-02	
F8370002S0141SS	4.09E-02	< 4.09E-02	
F8370002S0151SS	5.07E-02	< 5.07E-02	
F8370002S0161SS	5.19E-02	< 5.19E-02	
F8370002S0171SS	5.27E-02	< 5.27E-02	
F8370002S0181SS	4.01E-02	< 4.01E-02	
F8370002S0022SS	5.96E-02	< 5.96E-02	
F8370002S0032SS	5.30E-02	< 5.30E-02	
F8370002S0052SS	8.03E-02	< 8.03E-02	
F8370002S0062SS	6.61E-02	< 6.61E-02	
F8370002S0072SS	3.66E-02	< 3.66E-02	
F8370002S0082SS	5.00E-02	< 5.00E-02	
F8370002S0092SS	4.95E-02	< 4.95E-02	
F8370002S0102SS	6.84E-02	< 6.84E-02	
F8370002S0112SS	5.08E-02	< 5.08E-02	
F8370002S0122SS	5.44E-02	< 5.44E-02	
F8370002S0132SS	4.77E-02	< 4.77E-02	
F8370002S0142SS	3.59E-02	< 3.59E-02	
F8370002S0162SS	4.16E-02	< 4.16E-02	
F8370002S0172SS	4.19E-02	< 4.19E-02	

**Survey Unit Data Assessment:**

The survey resulted in 30 direct measurements for the Sign Test. The critical value and the results of the Sign Test are presented in Table 3. 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 3. Data Assessment Results**

<b>Survey Results Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Actual Direct Measurements (N):</b>	30	16 samples at 1 meter, 14 at 2 meters
<b>Median (pCi/g):</b>	5.25E-02	
<b>Mean (pCi/g):</b>	5.48E-02	
<b>Standard Deviation (pCi/g):</b>	1.19E-02	
<b>Maximum (pCi/g):</b>	8.03E-02	
<b>Sign Test Final N Value:</b>	30	
<b>S+ Value:</b>	30	
<b>Critical Value:</b>	20	
<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>emc</sub>:</b>	Yes	Class 1
<b>Standard Deviation &lt;= Sigma:</b>	Yes	
<b>Pass the Sign Test?</b>	Yes	
<b>Reject the Null Hypothesis?</b>	Yes	
<b>The survey unit passes all conditions?</b>	Yes	

### **Survey Unit Investigations and Results:**

No investigations were required 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 land 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 show, for a survey designed as a Class 1 survey, the required number of direct measurements were made. As a sub-surface survey, the scan coverage data was not applicable. All of the direct measurements were less than 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.

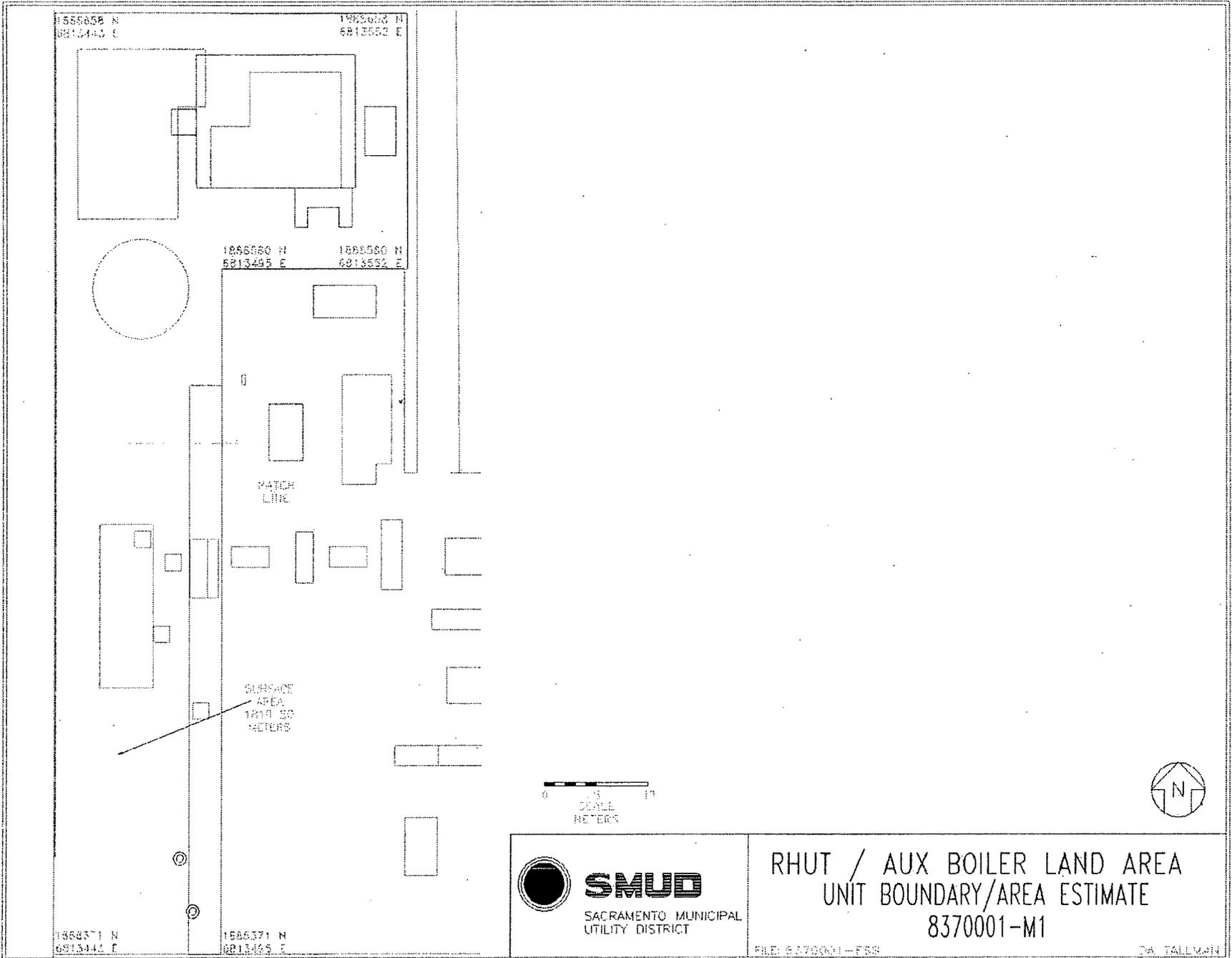
It is concluded that survey unit F8370002 meets the release criteria of 10CFR20.1402.

**Attachment 1**

**Maps**

**December 2, 2008**

**Survey Unit F8370002**

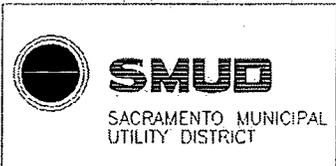
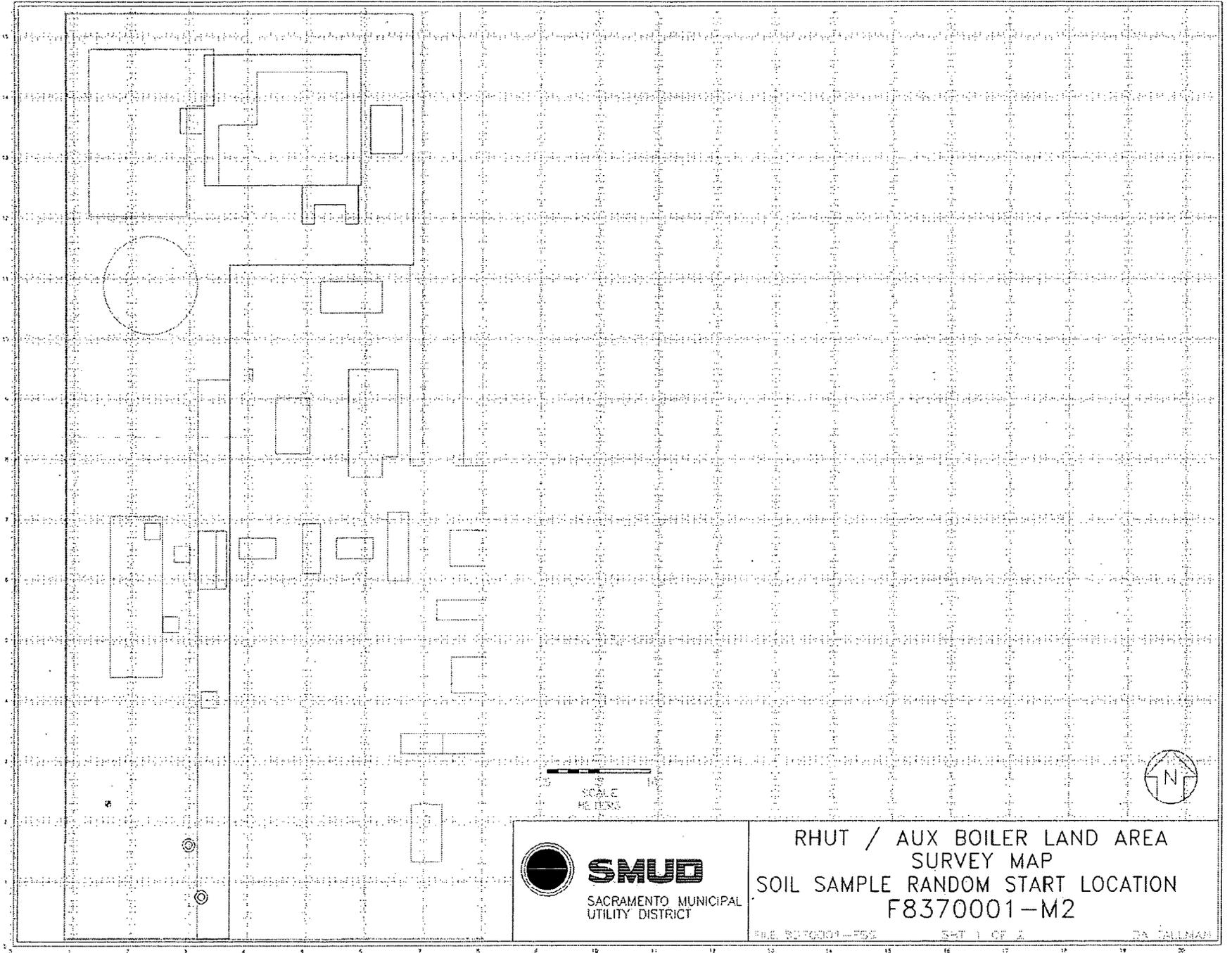


**SMUD**  
SACRAMENTO MUNICIPAL  
UTILITY DISTRICT

RHUT / AUX BOILER LAND AREA  
UNIT BOUNDARY/AREA ESTIMATE  
8370001-M1

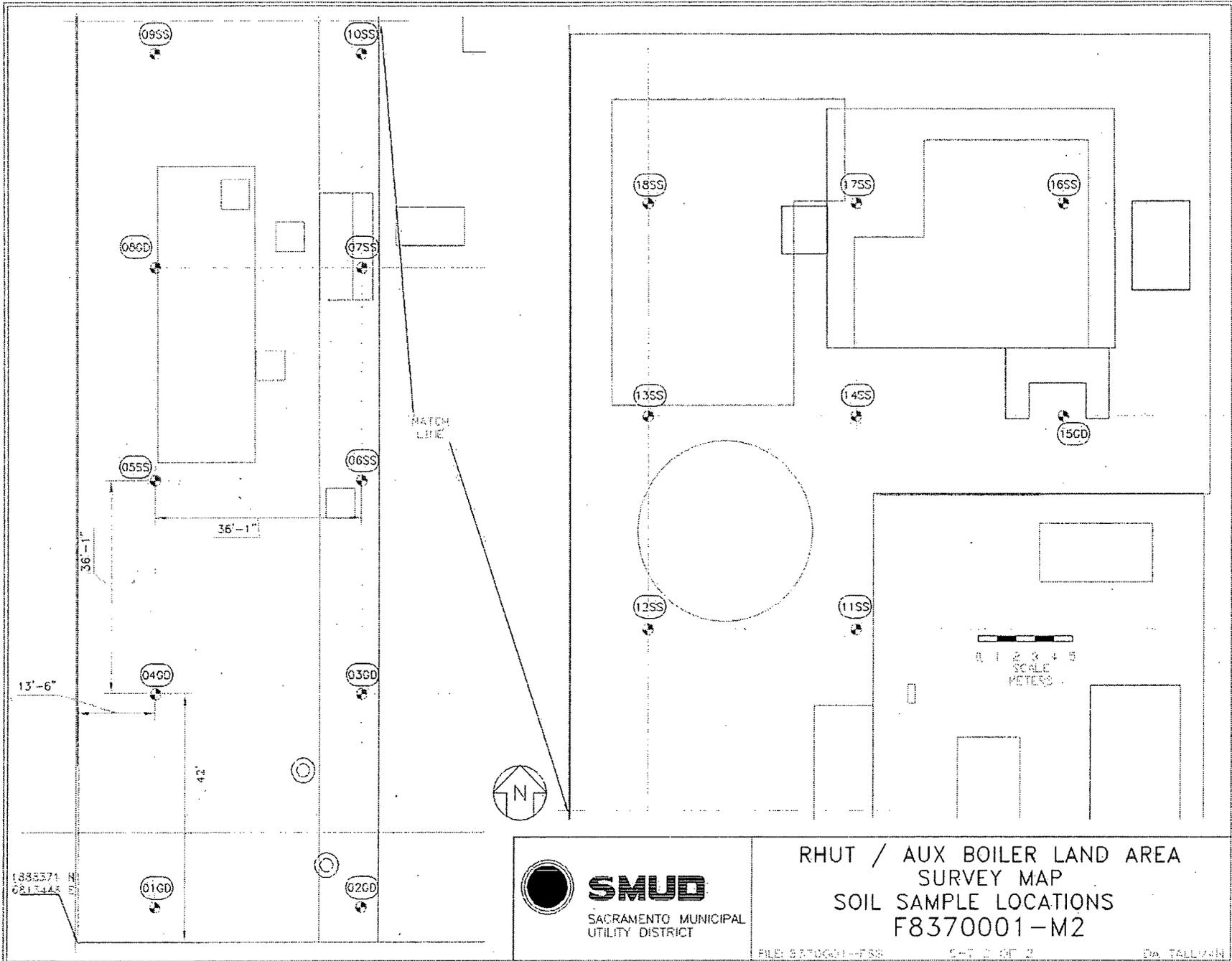
FILE: 8370001-F88

DA. TALLMAN



RHUT / AUX BOILER LAND AREA  
SURVEY MAP  
SOIL SAMPLE RANDOM START LOCATION  
F8370001-M2

SHEET 1 OF 2 DA FALLMAN



RHUT / AUX BOILER LAND AREA  
SURVEY MAP  
SOIL SAMPLE LOCATIONS  
F8370001-M2

**Attachment 2**

**Instrumentation**

**December 2, 2008**

**Survey Unit F8370002**

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

<b>Instrument</b>	<b>Detector Model No.</b>	<b>Detector Serial No.</b>	<b>MDC</b>
HPGe	N/A	05069128	Soil – 0.08 pCi/g Cs-137 Soil – 0.088 pCi/g Co-60

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

<b>Instrument</b>	<b>Parameter</b>	<b>Value</b>
HPGe	Investigation Criteria - Direct	Soil – 51.2 pCi/g Cs-137 <sub>(surr.)</sub> <sup>1</sup>
All	DCGL <sub>w</sub>	51.2 Cs-137 12.6 Co-60
All	DCGL <sub>EMC</sub>	61.95 pCi/g Cs-137 <sub>(surr.)</sub>

<sup>1</sup> Investigation level set conservatively at the DCGL<sub>w</sub> in accordance with the survey design for F8370001 for surface soils.

**Attachment 3**  
**Investigation**  
**December 2, 2008**  
**Survey Unit F8370002**

**(none required)**

**Attachment 4**  
**Data Assessment**  
**December 2, 2008**  
**Survey Unit F8370002**

