

**Rancho Seco**  
**Final Status Survey Summary Report**  
**March 17, 2008**  
**Plant Effluent Water Course (SU2)**  
**Survey Unit F1000002**

Prepared By: *D. Anderson* Date: *3/18/2008*

**FSS Engineer**

Reviewed By: *[Signature]* Date: *3/18/08*

**Lead FSS Engineer**

Approved By: *[Signature]* Date: *5-7-08*

**Dismantlement Superintendent, Radiological**

## FINAL STATUS SURVEY SUMMARY REPORT

### Survey Unit:

F1000002, Plant Effluent Water Course (SU2)

### Survey Unit Description:

Operating History: This area was the release point for liquid effluents released from the plant. The area was impacted by both planned and unplanned liquid releases. Effluents were monitored under the operating RETS/REMP program. Operating records and the HSA document the release of radioactivity in this survey area. The HSA recorded multiple unplanned release events.

Site Characterization: Soil and sediment samples were collected and analyzed for the presence of plant-derived radionuclides. Cs-137 was the predominant nuclide with a mean activity level of 9.2 pCi/g and a maximum value of 48.2 pCi/g. The Characterization data were found to be conservative when compared to the historical information found in the reports referenced in the PDP. Based on the classification procedure (DSIP-0020), the area was determined to be a Class 2 land area.

HSA Events: ODR-740017, 740052, 750046, 760079, 810192, 810193, 810209, 83008, 830023, 830248, 840117, 840118, 840225, 840223, 850299, 850112, 860555, 870764, 870905.

### 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 1,760 m<sup>2</sup> were scanned for approximately 23% coverage. Soil samples were collected at each direct measurement location and 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>	F100	Plant Effluent Water Course (SU2)
<b>Survey Unit:</b>	0002	Open Land Area
<b>Class:</b>	2	LTP Table 5-4
<b>SU Area (m<sup>2</sup>):</b>	7,744	
<b>Evaluator:</b>	D. Anderson	
<b>DCGL Cs137 surrogate (pCi/g):</b>	51.2	
<b>Area Factor:</b>	N/A	Class 2
<b>Design DCGL<sub>mc</sub> (pCi/g):</b>	N/A	Class 2
<b>LBGR (pCi/g):</b>	25.6	Default = 50% DCGL
<b>Design Sigma (pCi/g):</b>	14.7	DTBD-06-001, Table 5-4D
<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>	455.5	Class 2
<b>Total Area Scanned (m<sup>2</sup>):</b>	1,760	
<b>Scan Coverage (%):</b>	22.7%	Class 2
<b>Z<sub>1-α</sub>:</b>	1.645	
<b>Z<sub>1-β</sub>:</b>	1.645	
<b>Sign P:</b>	0.955435	
<b>Calculated Relative Shift:</b>	1.7	
<b>Relative Shift Used:</b>	1.7	Uses 3.0 if Rel Shift >3
<b>N-Value:</b>	14	
<b>Design N-Value + 20%:</b>	17	NUREG-1575 Table 5-5
<b>Grid Spacing L:</b>	21.3	Class 2

## Survey Results:

A total of 17 direct measurements were made in F1000002. The results including mean, median, standard deviation and range are shown in Table 2. All of the direct measurements were less than the DCGL. None of the scan measurements indicated areas of elevated activity. 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>		6.91E-01	
<b>Median:</b>		7.25E-02	
<b>Standard Deviation:</b>		1.43E00	
<b>Range:</b>	5.79E-02 to 4.32E00		
F1000002S0001SS	7.09E-02	< 7.09E-02	
F1000002S0002SS	6.84E-02	< 6.84E-02	
F1000002S0003SS	7.97E-02	4.32E00	3.68E-01
F1000002S0004SS	5.79E-02	< 5.79E-02	
F1000002S0005SS	5.35E-02	5.87E-02	3.40E-02
F1000002S0006SS	5.81E-02	8.30E-02	4.27E-02
F1000002S0007SS	7.25E-02	< 7.25E-02	
F1000002S0008SS	7.46E-02	4.20E00	3.49E-01
F1000002S0009SS	6.07E-02	< 6.07E-02	
F1000002S0010SS	6.28E-02	< 6.28E-02	
F1000002S0011SS	9.34E-02	< 9.34E-02	
F1000002S0012SS	7.01E-02	< 7.01E-02	
F1000002S0013SS	5.41E-02	9.18E-02	6.03E-02
F1000002S0014SS	6.69E-02	< 6.69E-02	
F1000002S0015SS	8.64E-02	2.07E00	1.72E-01
F1000002S0016SS	7.57E-02	< 7.57E-02	
F1000002S0017SS	6.11E-02	2.18E-01	7.30E-02

**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 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>	17	
<b>Median (pCi/g):</b>	7.25E-02	
<b>Mean (pCi/g):</b>	6.91E-01	
<b>Standard Deviation (pCi/g):</b>	1.43E00	
<b>Maximum (pCi/g):</b>	4.32E00	
<b>Sign Test Final N Value:</b>	17	
<b>S+ Value:</b>	17	
<b>Critical Value:</b>	12	
<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>	N/A	Class 2
<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 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 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 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. 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 F1000002 meets the release criteria of 10CFR20.1402.

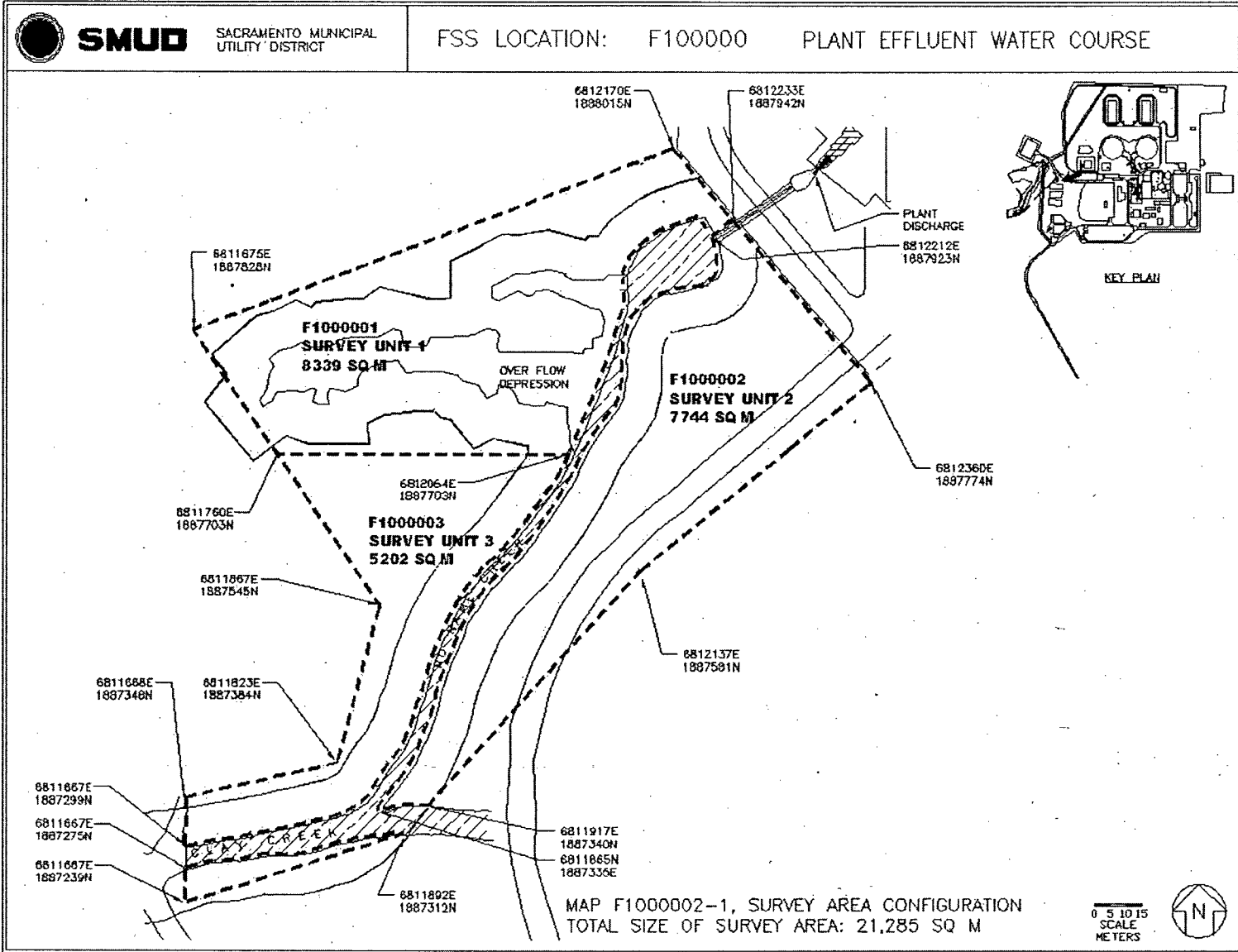
**Attachment 1**

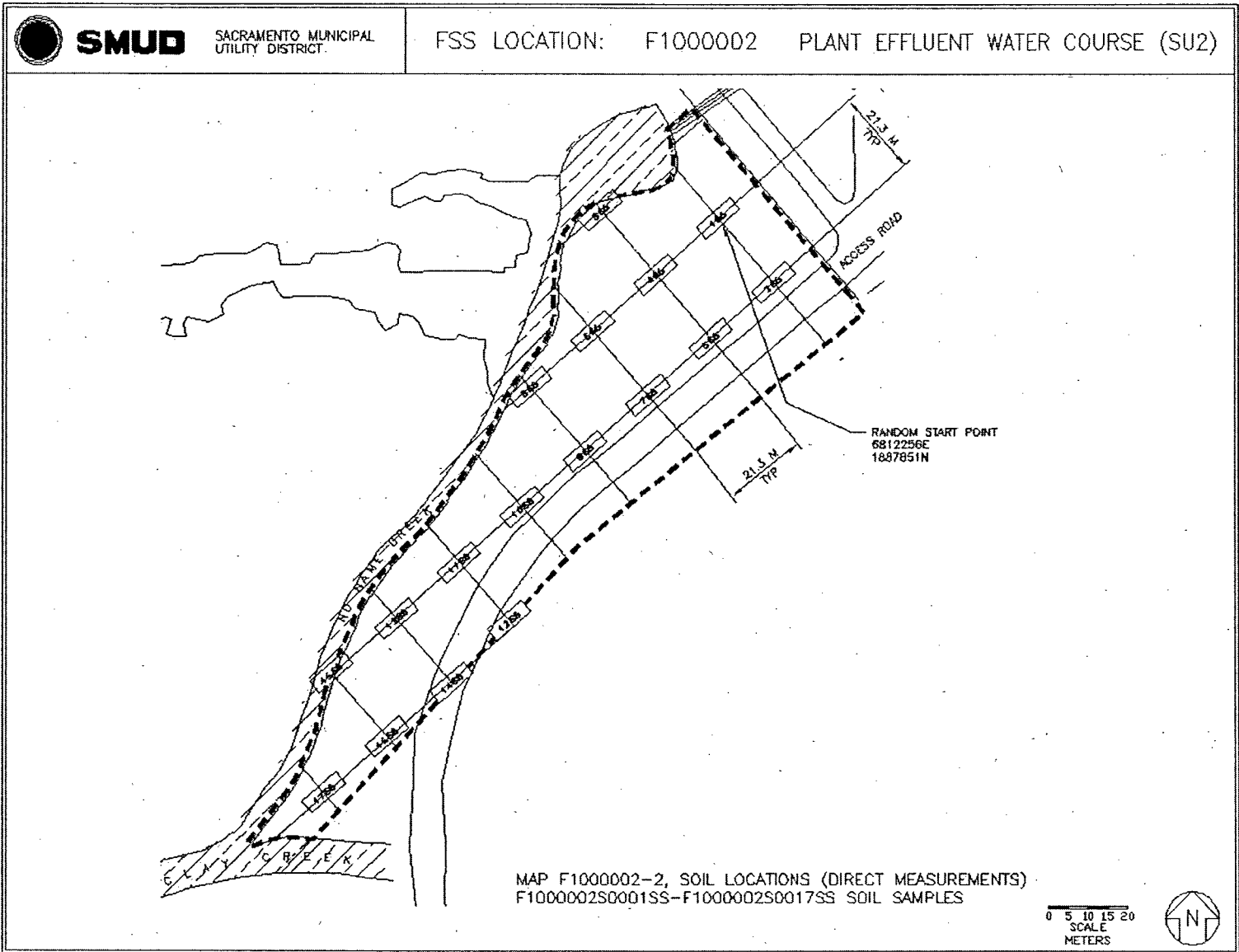
**Maps**

**March 17, 2008**

**Survey Unit F1000002**





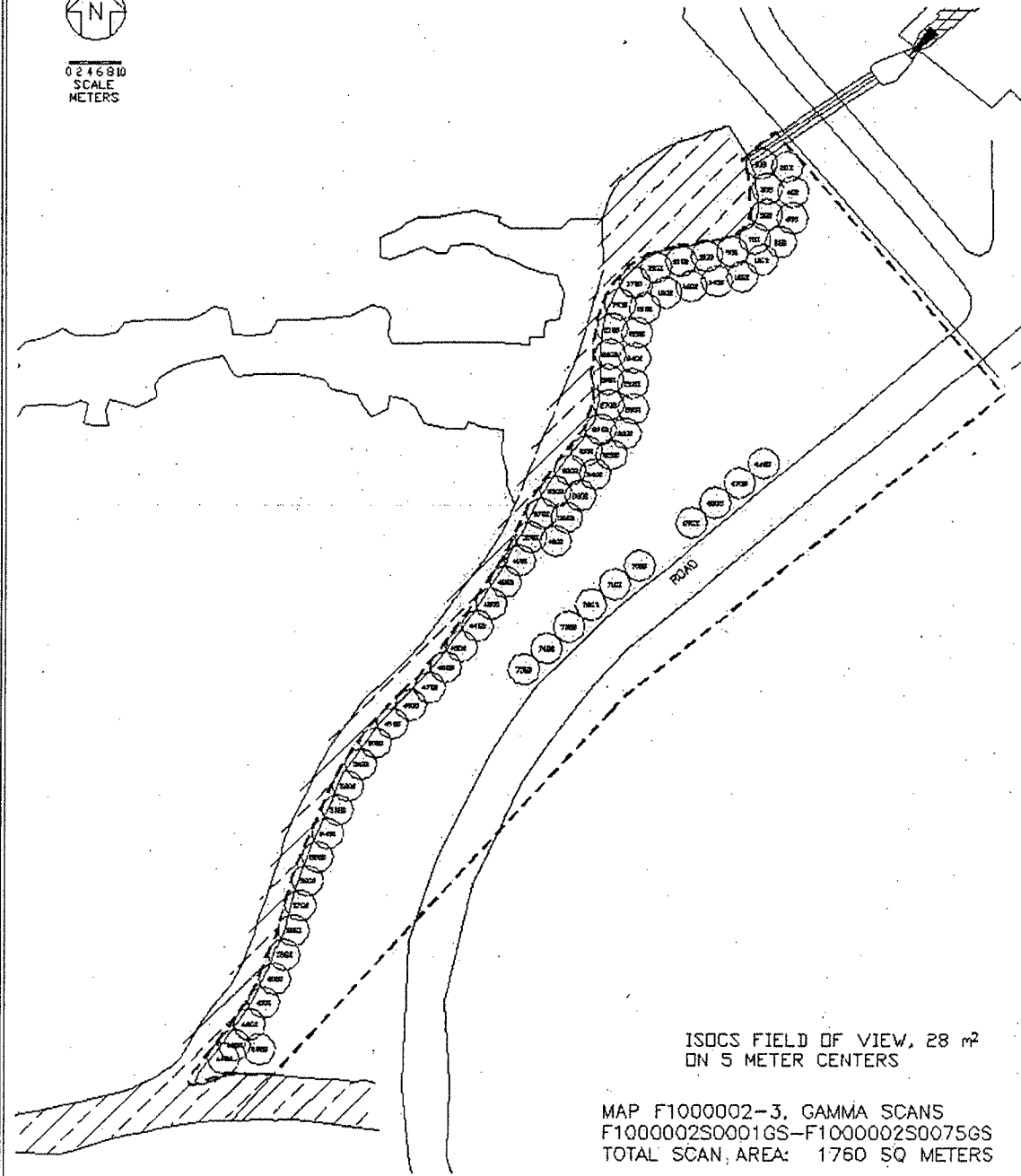




FSS LOCATION: F1000002  
PLANT EFFLUENT WATER COURSE (SU2)



0 2 4 6 8 10  
SCALE  
METERS



ISOCS FIELD OF VIEW, 28 m<sup>2</sup>  
ON 5 METER CENTERS

MAP F1000002-3. GAMMA SCANS  
F1000002S0001GS-F1000002S0075GS  
TOTAL SCAN AREA: 1760 SQ METERS

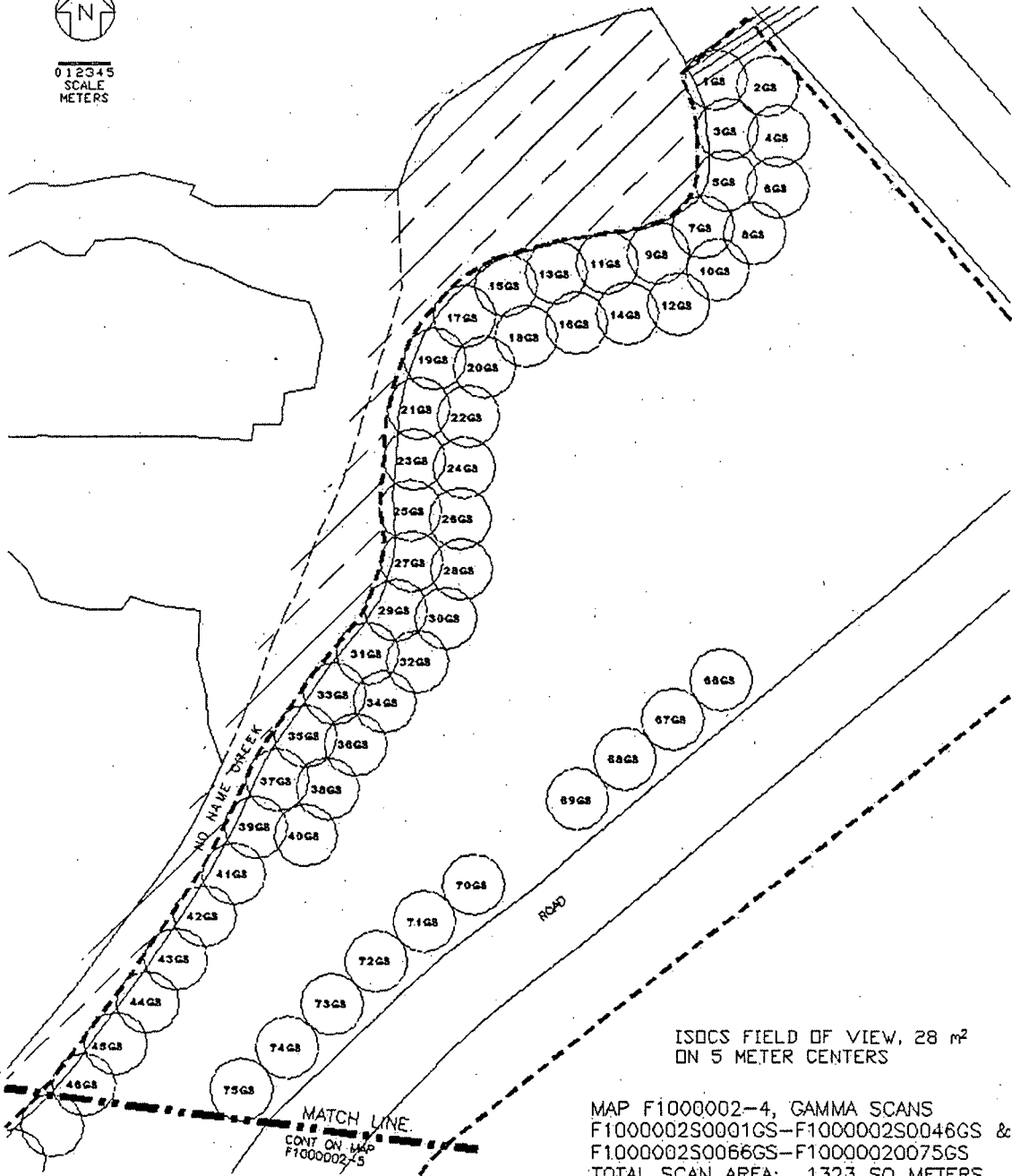
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FSS LOCATION: F1000002  
PLANT EFFLUENT WATER COURSE (SU2)



0 1 2 3 4 5  
SCALE  
METERS



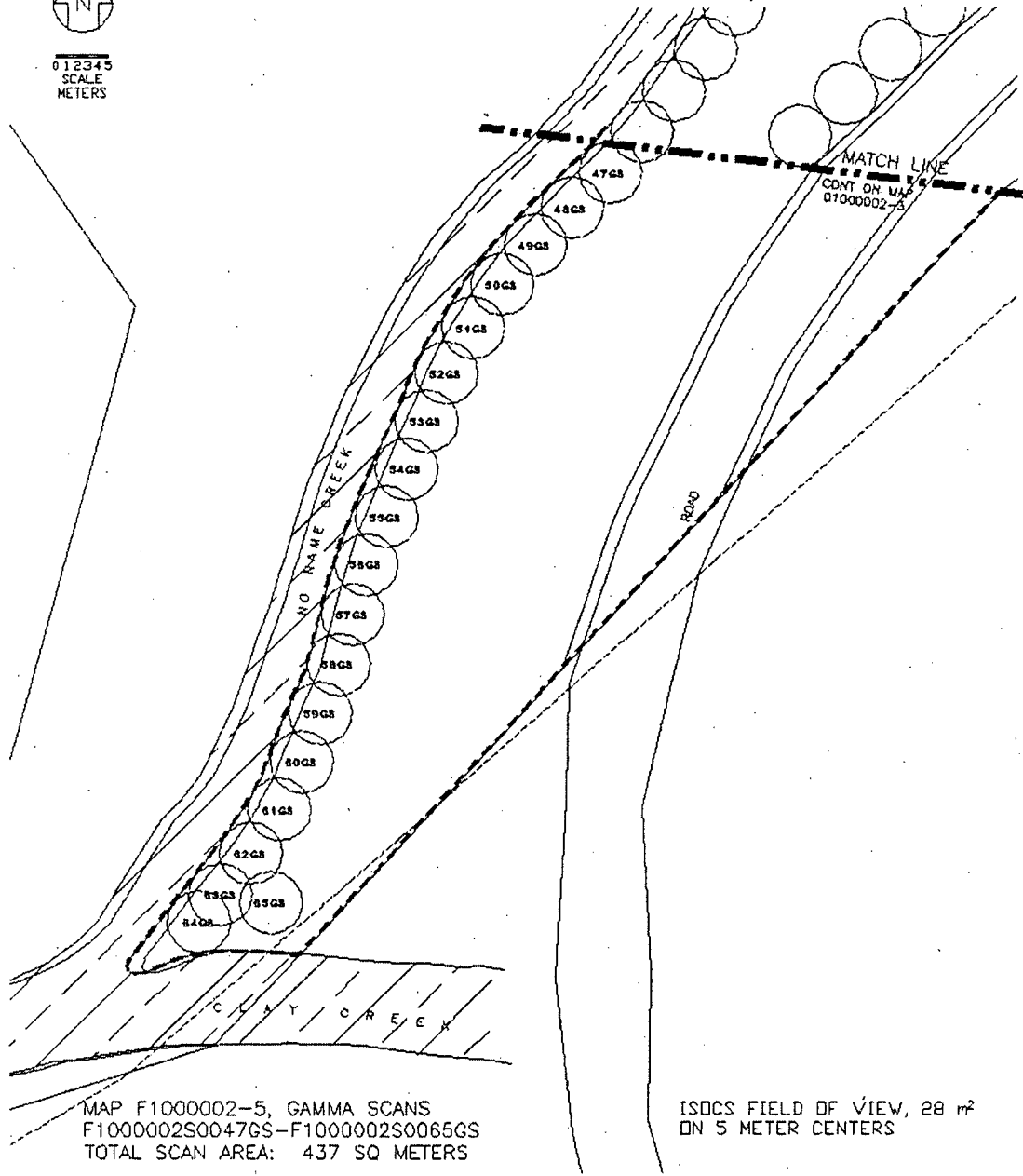
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FSS LOCATION: F1000002  
PLANT EFFLUENT WATER COURSE (SU2)



012345  
SCALE  
METERS



MAP F1000002-5, GAMMA SCANS  
F1000002S0047GS-F1000002S0065GS  
TOTAL SCAN AREA: 437 SQ METERS

ISDCS FIELD OF VIEW, 28 m<sup>2</sup>  
DN 5 METER CENTERS

100001.01

**Attachment 2**

**Instrumentation**

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**Survey Unit F1000002**

**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	9987008	Soil – 9.34E-02 pCi/g Cs-137 Soil – 9.17E-02 pCi/g Co-60
HPGe	N/A	05047773	Soil – 8.64E-02 pCi/g Cs-137 Soil – 1.03E-01 pCi/g Co-60
ISOCS	N/A	2983947	Soil – 4.16E-01 pCi/g Cs-137 Soil – 2.64E-01 pCi/g Co-60

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

<b>Instrument</b>	<b>Parameter</b>	<b>Value</b>
ISOCS	Investigation Criteria - Scan	Soil – 20 pCi/g Cs-137
All	DCGL <sub>w</sub>	51.2 Cs-137 12.6 Co-60
All	DCGL <sub>EMC</sub>	N/A

**Attachment 3**

**Investigation**

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**(none required)**



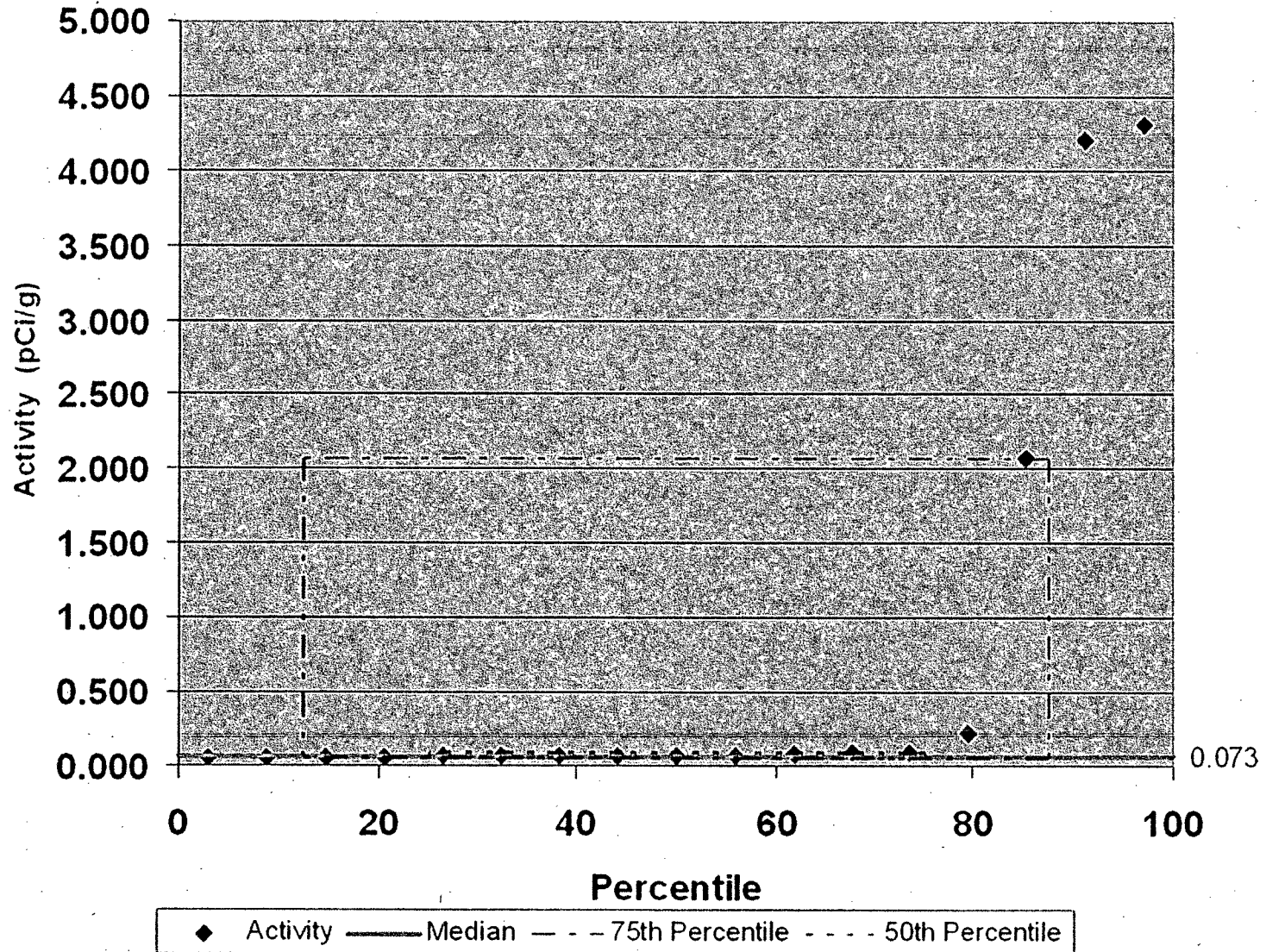
**Attachment 4**

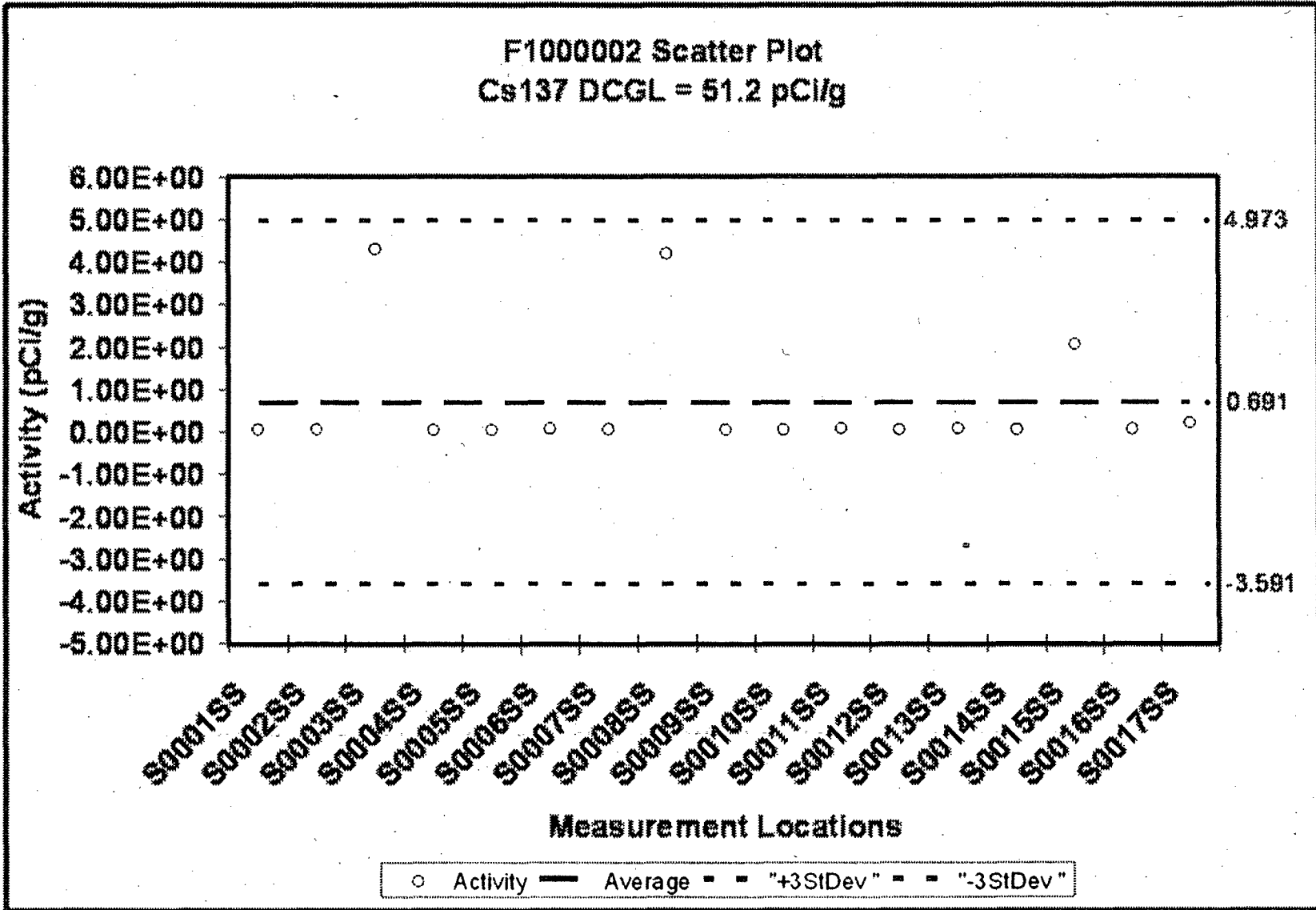
**Data Assessment**

**March 17, 2008**

**Survey Unit F1000002**

F1000002 Quantile Plot  
Cs137 DCGL = 51.2 pCi/g





F1000002 Frequency Plot  
Cs137 DCGL = 51.2 pCi/g

