Rancho Seco

Final Status Survey Summary Report

March 27, 2008

South Buffer/Outfall Area

Survey Unit F2000001

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FSS Engineer

Reviewed By: _____ **Date:** 3/27/08
Lead FSS Engineer

Approved By: _____ **Date:** 5-5-08
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F2000001, South Buffer/Outfall Area

Survey Unit Description:

Operating History: This area bordered the release point for non-controlled/unmonitored liquid effluents released from the plant (ie. storm drains). The area extended from the south Industrial Area fence to the South Non-Impacted Area. Operating records and the HSA document the release of radioactivity in this survey area. The HSA recorded several unplanned release events from the RHUT with the potential to contaminate the area.

Site Characterization: Soil and sediment samples were collected and analyzed for the presence of plant-derived radionuclides. A special gamma scan survey was performed using vehicle-mounted HPGe detectors. Cs-137 was the only detected nuclide of plant origin with a mean activity level of 0.129 pCi/g and a maximum value of 0.301 pCi/g. (Site background levels of Cs-137 have been determined to be approximately 0.312 pCi/g.) As described in section 2 of the LTP, the area was evaluated and determined to be "not significantly different from background", however based on the history of spills along the south industrial area fence, the area was designated as a Class 3.

HSA Events: ODR-740017, 840217, 840317.

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 2268 m^2 were scanned for approximately 1% 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

Survey Design Parameter	Value	Comment
Survey Area:	F200	South Buffer/Outfall Area
Survey Unit:	0001	Open Land Area
Class:	3	LTP Table 5-4
SU Area (m^2)**:**	226567	
Evaluator:	D.A.Tallman	
DCGL Cs137 surrogate (pCi/g)**:**	51.2	
Area Factor:	N/A	Class 3
Design DCGLemc (pCi/g)**:**	N/A	Class 3
LBGR (pCi/g)**:**	25.6	Default = 50% DCGL
Design Sigma (pCi/g)**:**	0.15	DTBD-06-001, Table 5-4D
Type I Error:	0.05	
Type II Error:	0.05	
Nuclide:	Cs137	
Sample Area (m^2)**:**	N/A	Class 3
Total Area Scanned (m^2)**:**	2268	
Scan Coverage (%):	1%	Class 3
$Z_{1-\alpha}$ **:**	1.645	
$Z_{1-\beta}$ **:**	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	170.6	
Relative Shift Used:	3	Uses 3.0 if Rel Shift >3
N-Value:	11	
Design N-Value + 20%:	14	NUREG-1575 Table 5-5
Grid Spacing L:	N/A	Class 3

Survey Results:

A total of 14 direct measurements were made in F2000001. 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
Mean:		2.72E-01	
Median:		2.75E-01	
Standard Deviation:		1.59E-01	
Range:	5.13E-02 to 5.31E-01		
F2000001S0001SS	7.14E-02	< 7.14E-02	
F2000001S0002SS	7.56E-02	2.53E-01	6.66E-02
F2000001S0003SS	1.15E-01	1.79E-01	1.21E-01
F2000001S0004SS	6.92E-02	3.81E-01	9.07E-02
F2000001S0005SS	5.77E-02	1.69E-01	5.11E-02
F2000001S0006SS	7.53E-02	5.10E-01	1.14E-01
F2000001S0007SS	7.82E-02	2.97E-01	7.26E-02
F2000001S0008SS	7.65E-02	5.31E-01	1.07E-01
F2000001S0009SS	1.04E-01	< 1.04E-01	
F2000001S0010SS	5.13E-02	< 5.13E-02	
F2000001S0011SS	7.69E-02	3.31E-01	7.88E-02
F2000001S0012SS	8.21E-02	1.27E-01	5.65E-02
F2000001S0013SS	8.49E-02	4.09E-01	8.14E-02
F2000001S0014SS	7.86E-02	3.93E-01	9.02E-02

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 3. 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 3. Data Assessment Results

Survey Results Parameter	Value	Comment
Actual Direct Measurements (N):	14	
Median (pCi/g)**:**	2.75E-01	
Mean (pCi/g)**:**	2.72E-01	
Standard Deviation (pCi/g)**:**	1.59E-01	
Maximum (pCi/g)**:**	5.31E-01	
Sign Test Final N Value:	14	
S+ Value:	14	
Critical Value:	10	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGLemc:	N/A	Class 3
Standard Deviation <= Sigma:	Investigate	Sufficient number of sample acquired
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
The survey unit passes all conditions?	Yes	Standard Deviation vs. design sigma (0.15 vs. 0.159) did not alter required number of samples or evaluation outcome.

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 land 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. No potential areas of elevated activity were detected; therefore the EMC criterion was met.

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. 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 F2000001 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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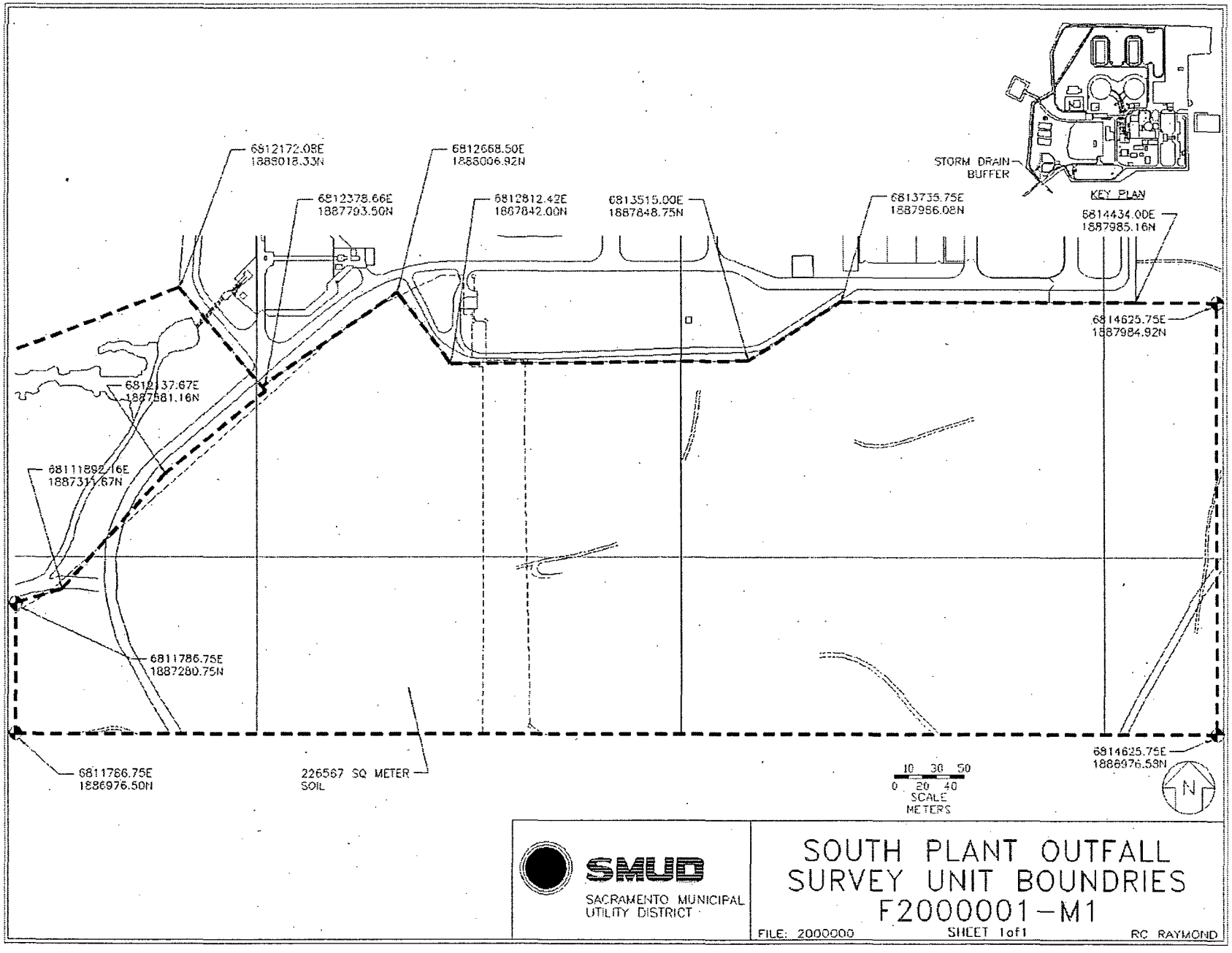
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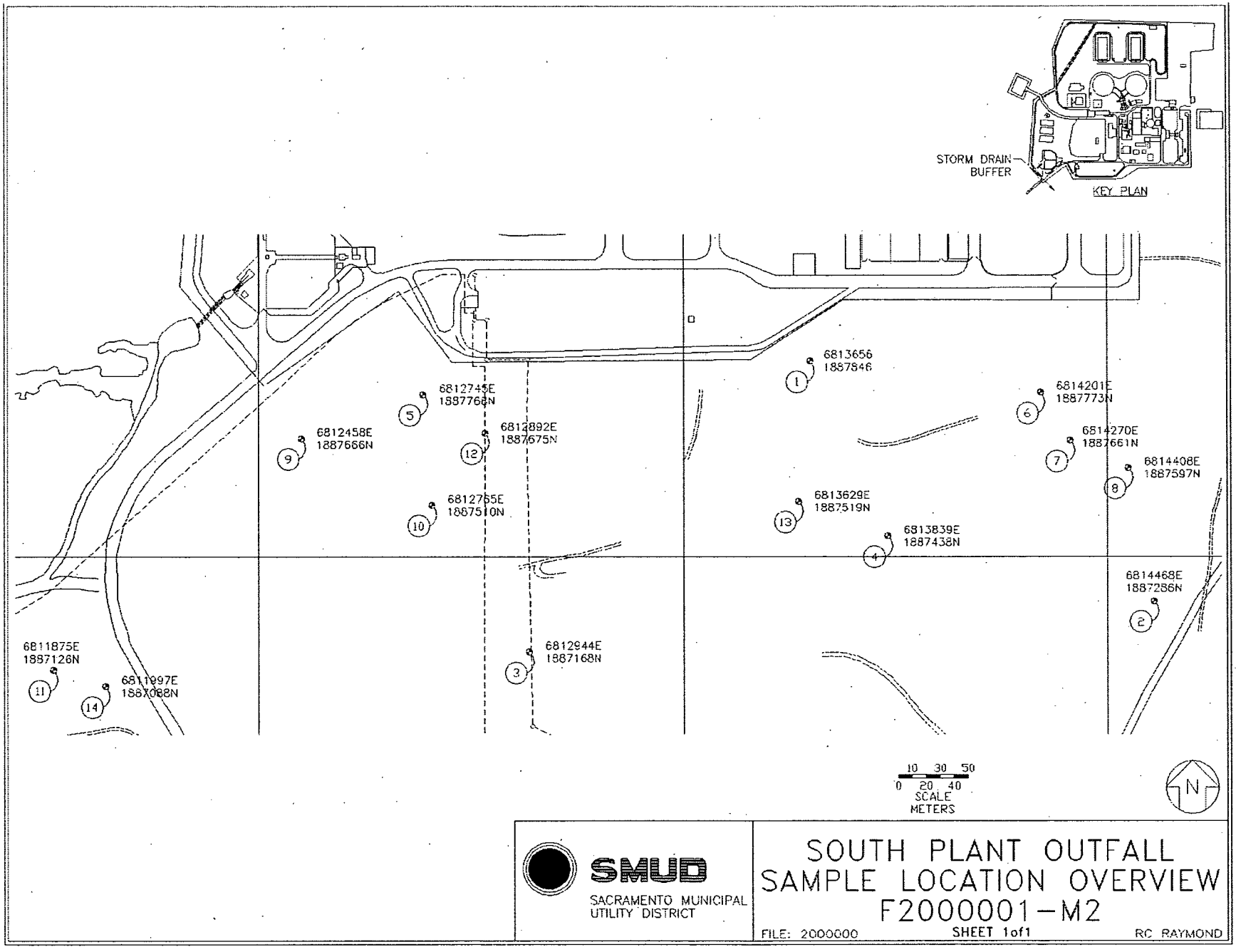
1888018.33N
6812668.50E
1888006.92N
6812378.66E
1887793.50N
6812812.42E
1887842.00N
6813515.00E
1887848.75N
6813735.75E
1887956.08N
6814434.00E
1887985.16N
6814625.75E
1887984.92N
STORM DRAIN BUFFER
KEY PLAN
6812137.67E
1887881.16N
6811892.16E
1887311.67N
6811786.75E
1887280.75N
6811786.75E
1886976.50N
226567 SQ METER
SOIL
6814625.75E
1886976.58N
10 30 50
0 20 40
SCALE
METERS
N
SMUD
SACRAMENTO MUNICIPAL
UTILITY DISTRICT
SOUTH PLANT OUTFALL
SURVEY UNIT BOUNDRIES
F2000001-M1
FILE: 2000000
SHEET 1of1
RC RAYMOND


STORM DRAIN BUFFER
KEY PLAN
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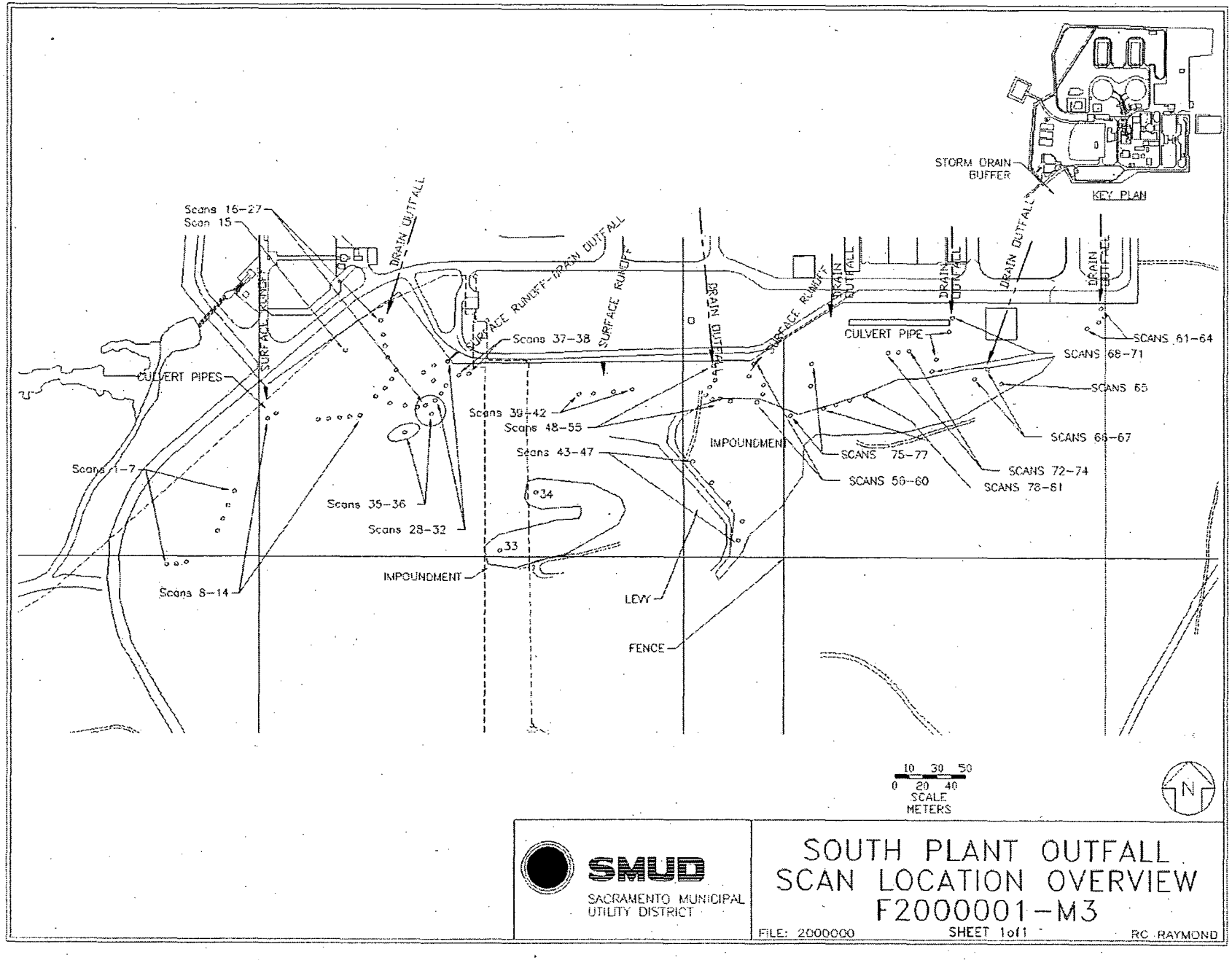
6814201E 1887773N
6814270E 1887661N
6814408E 1887597N
6813629E 1887519N
6813839E 1887438N
6814468E 1887256N
6812745E 1887768N
6812892E 1887675N
6812458E 1887666N
6812755E 1887510N
6812944E 1887168N
6811875E 1887126N
6811997E 1887088N
10 30 50
0 20 40
SCALE METERS
N
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
SOUTH PLANT OUTFALL
SAMPLE LOCATION OVERVIEW
F2000001-M2
FILE: 2000000
SHEET 1of1
RC RAYMOND


STORM DRAIN BUFFER
KEY PLAN
Scans 16–27
Scan 15
DRAIN OUTFALL
SURFACE RUNOFF
SURFACE RUNOFF–DRAIN OUTFALL
Scans 37–38
SURFACE RUNOFF
DRAIN OUTFALL
SURFACE RUNOFF
DRAIN OUTFALL
DRAIN OUTFALL
DRAIN OUTFALL
CULVERT PIPE
SCANS 61–64
SCANS 68–71
SCANS 65
SCANS 66–67
CULVERT PIPES
Scans 39–42
Scans 48–55
Scans 43–47
IMPOUNDMENT
SCANS 75–77
SCANS 72–74
SCANS 78–81
SCANS 59–60
Scans 1–7
Scans 35–36
Scans 28–32
34
33
IMPOUNDMENT
Scans 8–14
LEVY
FENCE
10 30 50
0 20 40
SCALE
METERS
N
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
SOUTH PLANT OUTFALL
SCAN LOCATION OVERVIEW
F2000001–M3
FILE: 2000000
SHEET 1of1
RC RAYMOND

Attachment 2

Instrumentation

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Table 2-1. Survey Unit Instrumentation

Instrument	Detector Model No.	Detector Serial No.	MDC
HPGe	N/A	9987008	Soil – 0.115 pCi/g Cs-137 Soil – 0.0712 pCi/g Co-60
HPGe	N/A	05047773	Soil – 0.104 pCi/g Cs-137 Soil – 0.0699 pCi/g Co-60
ISOCS	N/A	1983920	Soil – 0.301 pCi/g Cs-137 Soil – 0.211 pCi/g Co-60
ISOCS	N/A	2983947	Soil – 0.323 pCi/g Cs-137 Soil – 0.197 pCi/g Co-60

Table 2-2. Investigation Criteria and DCGL

Instrument	Parameter	Value
ISOCS	Investigation Criteria - Scan	Soil – 23 pCi/g Cs-137 Soil – 5 pCi/g Co-60
All	$DCGL_W$	52.6 Cs-137 12.6 Co-60

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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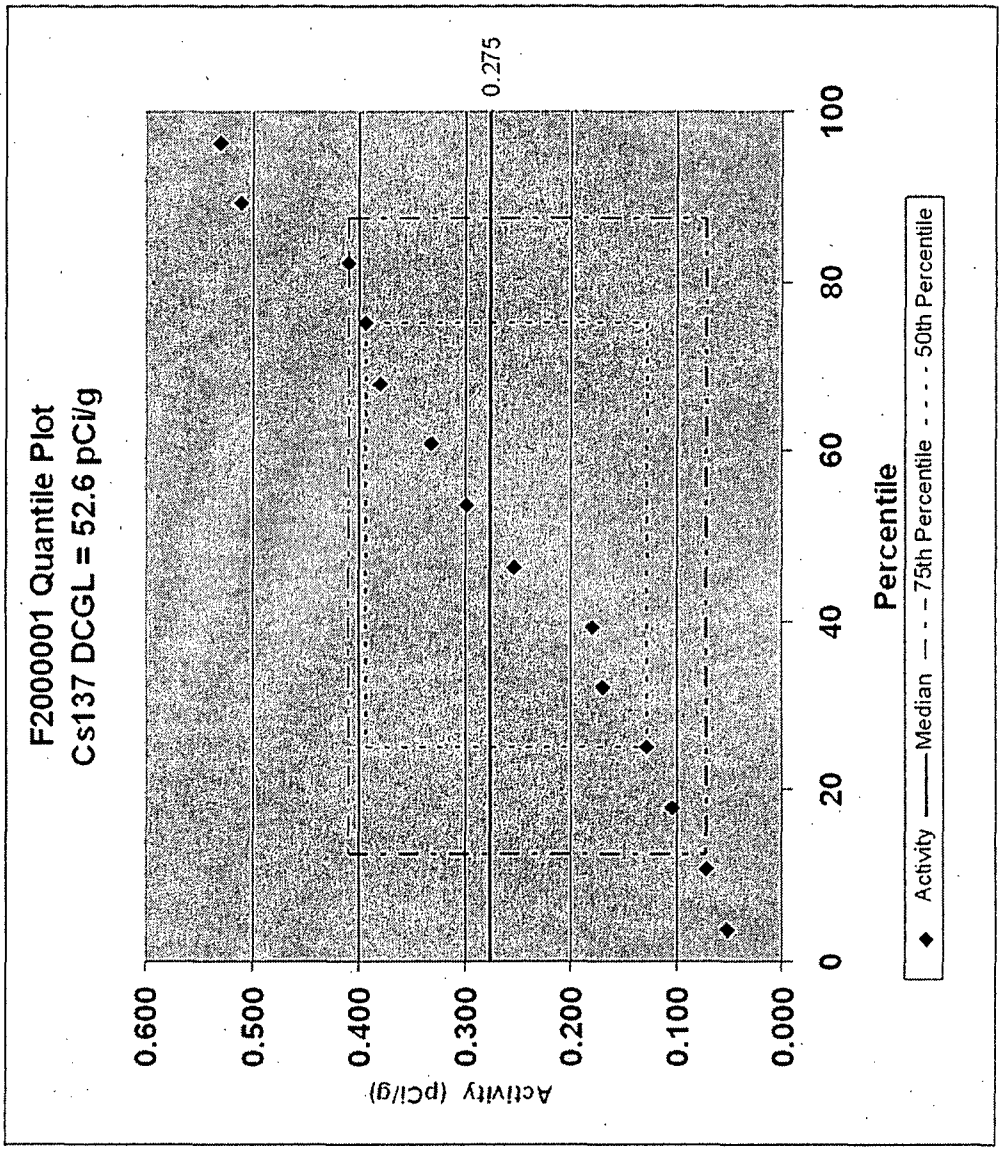
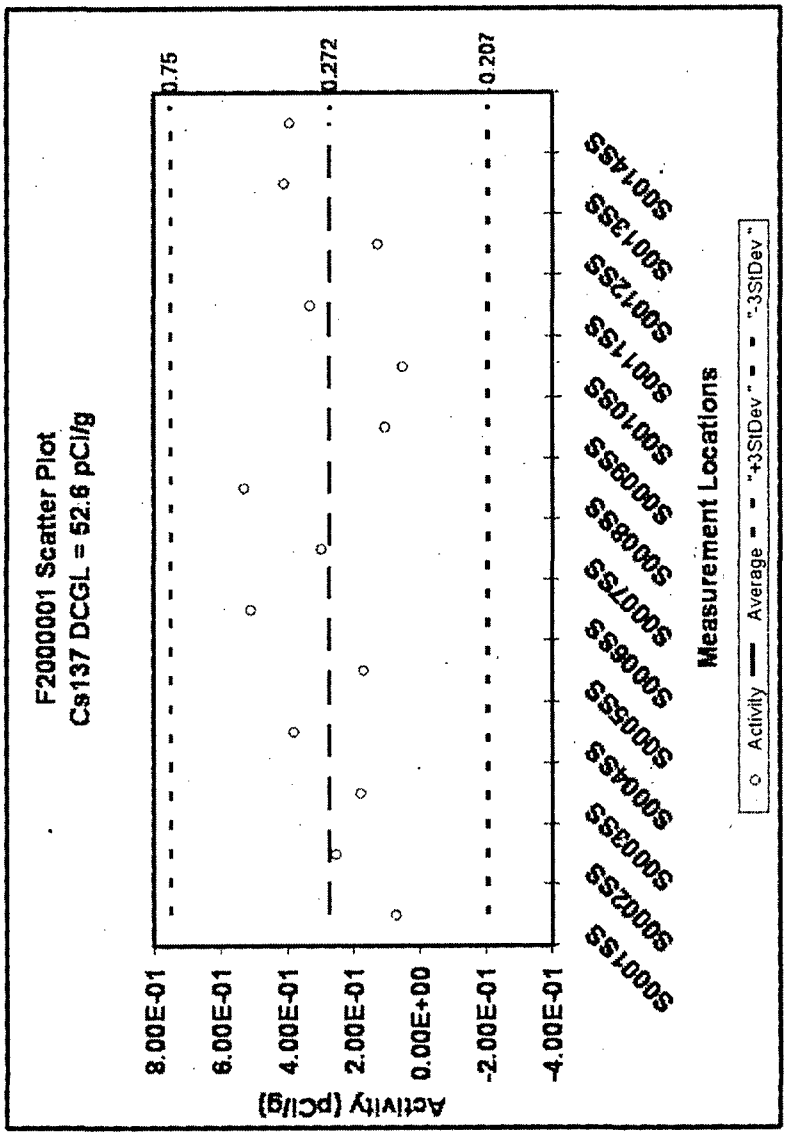
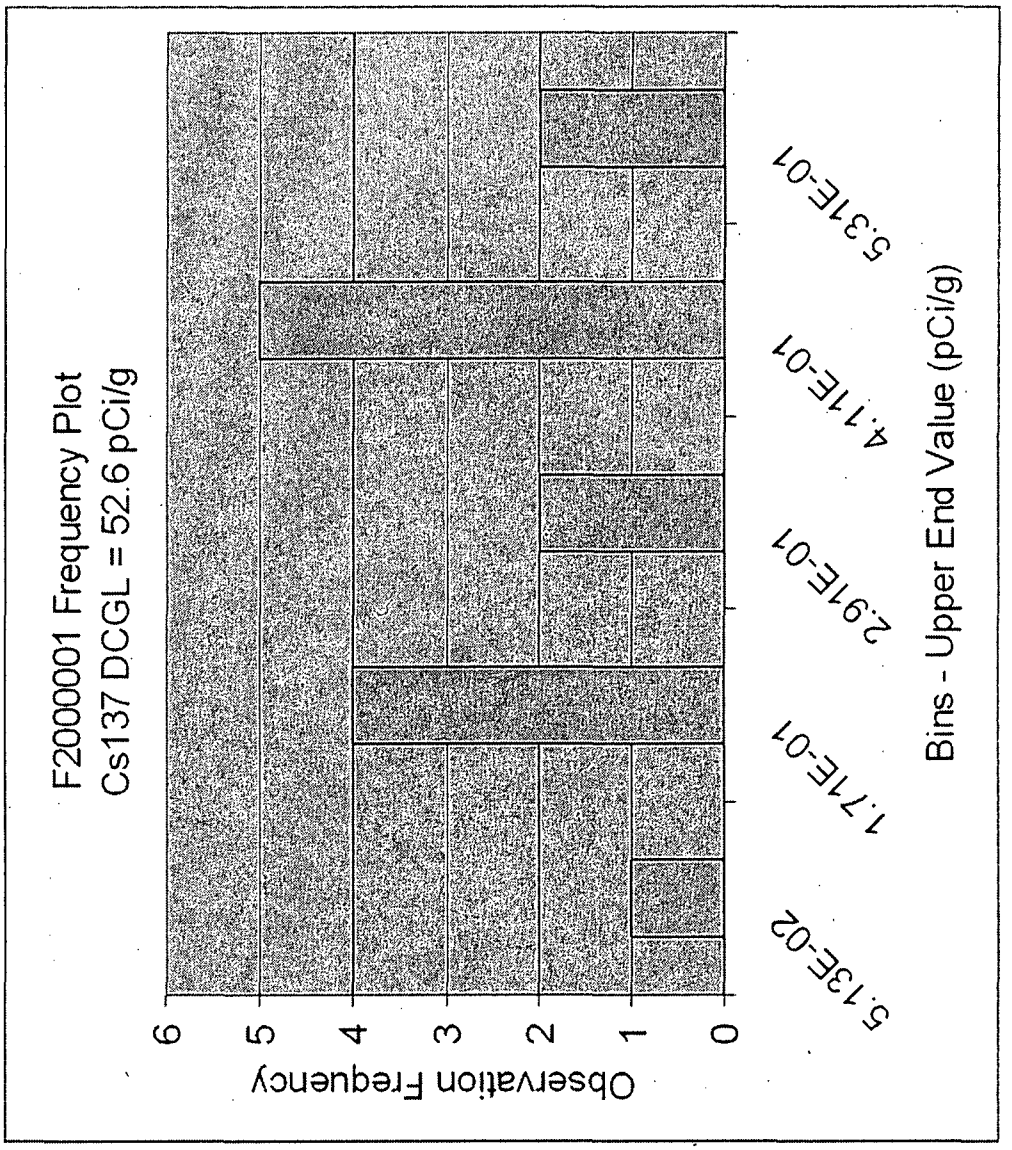
Survey Unit F2000001


F2000001 Quantile Plot
Cs137 DCGL = 52.6 pCi/g
0.275
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Activity (pCi/g)
0
20
40
60
80
100
Percentile
Activity
Median
75th Percentile
50th Percentile


F2000001 Scatter Plot
Cs137 DCGL = 52.8 pCi/g
Activity (pCi/g)
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
-2.00E-01
-4.00E-01
0.75
0.272
0.207
S0001SS
S0002SS
S0003SS
S0004SS
S0005SS
S0006SS
S0007SS
S0008SS
S0009SS
S0010SS
S0011SS
S0012SS
S0013SS
S0014SS
Measurement Locations
Activity
Average
"+3StDev"
"-3StDev"


F2000001 Frequency Plot
Cs137 DCGL = 52.6 pCi/g
Observation Frequency
0
1
2
3
4
5
6
5.13E-02
1.77E-01
2.97E-01
4.17E-01
5.37E-01
Bins - Upper End Value (pCi/g)