

Rancho Seco
Final Status Survey Summary Report
March 18, 2008
Plant Effluent Water Course (SU4)
Survey Unit F1000004

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

FSS Engineer

Reviewed By: [Signature] Date: 3/19/08

Lead FSS Engineer

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

Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F1000004, Plant Effluent Water Course (SU4)

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. During the final status survey of F1000001 (Plant Effluent Water Course, SU1), ISOCS gamma measurements identified average activity exceeding the investigation level for a Class 2 soil survey. An investigation was performed and soil activity exceeding the DCGL of 52.6 pCi/g Cs-137 was identified. The 11-meter by 18-meter area was subsequently remediated and reclassified as a Class 1 land area, based on the classification procedure (DSIP-0020). As a result of the reclassification, a new survey package was initiated as F1000004.

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 198 m² were scanned for 100% 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:	F100	Plant Effluent Water Course (SU4)
Survey Unit:	0004	Open Land Area
Class:	1	LTP Table 5-4
SU Area (m ²):	198	F8000071
Evaluator:	D. Anderson	
DCGL for Cs-137 surrogate (pCi/g):	52.6	
DCGL for Co-60 (pCi/g):	12.6	
Area Factor:	2.1	Class 1
Design DCGL _{emc} (pCi/g):	108	Class 1
LBGR (pCi/g):	25.8	Adjusted
Design Sigma (pCi/g):	9.03	DTBD-06-001, Table 5-4A or B
Type I Error:	0.05	
Type II Error:	0.05	
Sample Area (m ²):	13.2	Class 1
Total Area Scanned (m ²):	198	
Scan Coverage (%):	100%	Class 1
Z _{1-α} :	1.645	
Z _{1-β} :	1.645	
Sign P:	0.99379	
Calculated Relative Shift:	2.9	
Relative Shift Used:	2.9	Uses 3.0 if Rel Shift >3
N-Value:	12	
Design N-Value + 20%:	15	NUREG-1575 Table 5-5
Grid Spacing L:	3.6	Class 1

Survey Results:

A total of 15 direct measurements were made in F1000004. The results are shown in Table 2-1. Statistical data including the mean, median, and standard deviation are shown in Table 2-2. All of the direct measurements were less than Unity. None of the scan measurements indicated areas of elevated activity. Soil samples were counted to the MDCs shown in Table 2-1 of Attachment 2.

Table 2-1. Direct Measurement Results

(all activity values in pCi/g)

Sample ID	Cs137				Co60				Unity Total
	MDA	Activity	Uncertainty	Unity Value	MDA	Activity	Uncertainty	Unity Value	
F1000004S0001SS	1.29E-01	1.49E01	4.12E-01	0.2842	1.02E-01	<1.02E-01		0.0081	0.2923
F1000004S0002SS	9.57E-02	4.58E00	2.28E-01	0.087	9.10E-02	<9.10E-02		0.0072	0.0942
F1000004S0003SS	1.14E-01	1.67E01	4.26E-01	0.3169	5.00E-02	1.16E-01	4.02E-02	0.0092	0.3261
F1000004S0004SS	8.10E-02	6.54E00	2.61E-01	0.1242	9.05E-02	<9.05E-02		0.0072	0.1314
F1000004S0005SS	1.08E-01	9.47E00	3.02E-01	0.18	6.25E-02	8.04E-02	3.33E-02	0.0064	0.1864
F1000004S0006SS	1.75E-01	2.76E01	5.78E-01	0.5241	6.30E-02	3.08E-01	5.64E-02	0.0244	0.5486
F1000004S0007SS	6.96E-02	1.22E00	1.10E-01	0.0231	6.32E-02	<6.32E-02		0.005	0.0281
F1000004S0008SS	5.67E-02	1.26E00	1.10E-01	0.0239	6.12E-02	<6.12E-02		0.0049	0.0287
F1000004S0009SS	6.72E-02	1.77E00	1.28E-01	0.0337	6.69E-02	<6.69E-02		0.0053	0.039
F1000004S0010SS	7.60E-02	3.60E00	1.89E-01	0.0684	7.38E-02	<7.38E-02		0.0059	0.0742
F1000004S0011SS	1.26E-01	1.53E01	4.13E-01	0.2917	4.83E-02	1.52E-01	4.05E-02	0.0121	0.3038
F1000004S0012SS	1.02E-01	5.16E00	2.37E-01	0.0981	8.83E-02	<8.83E-02		0.007	0.1051
F1000004S0013SS	8.79E-02	3.08E00	1.76E-01	0.0585	8.17E-02	<8.17E-02		0.0065	0.065
F1000004S0014SS	1.32E-01	1.66E00	1.72E-01	0.0315	9.93E-02	<9.93E-02		0.0079	0.0394
F1000004S0015SS	6.61E-02	1.12E00	1.06E-01	0.0213	6.80E-02	<6.80E-02		0.0054	0.0267

Table 2-2. Direct Measurements Results Summary

	Cs137 Activity (pCi/g)	Co60 Activity (pCi/g)	Cs137 Unity	Co60 Unity	Unity Total
DCGLw	52.6	12.6			
Mean	7.60E00	1.03E-01	0.1444	0.0082	0.1526
Median	4.58E00	8.83E-02	0.087	0.007	0.0942
Standard Deviation	7.76E00	6.14E-02	0.1476	0.0049	0.1518
Cs137 Activity Range (pCi/g)	1.12E00 to 2.76E01				
Co60 Activity Range (pCi/g)	6.12E-02 to 3.08E-01				
Cs137 Unity Range	0.0213 to 0.5241				
Co60 Unity Range	0.0049 to 0.0244				
Total Unity Range	0.0267 to 0.5486				
Sample Count	15				

Survey Unit Data Assessment:

The survey design required 15 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

Survey Results Parameter	Value	Comment
Actual Direct Measurements (N):	15	
Median (Unity):	0.094	
Mean (Unity):	0.153	
Direct Measurement Std Deviation (Unity):	0.152	
Maximum (Unity):	0.549	
Sign Test Final N Value:	15	
S+ Value:	15	
Critical Value:	11	
Sufficient Samples Collected:	Yes	
Maximum Value < Unitized DCGL:	Yes	
Median Value < Unitized DCGL:	Yes	
Mean Value < Unitized DCGL:	Yes	
Maximum Value < DCGL_{me} (Unity):	Yes	Class 1
Standard Deviation <= Sigma:	Yes	
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
Does the Survey Unit Pass All Criteria?	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 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. Therefore the EMC criterion was met.

Conclusion:

The FSS of this survey unit was properly designed as a Class 1 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 Unity. 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.

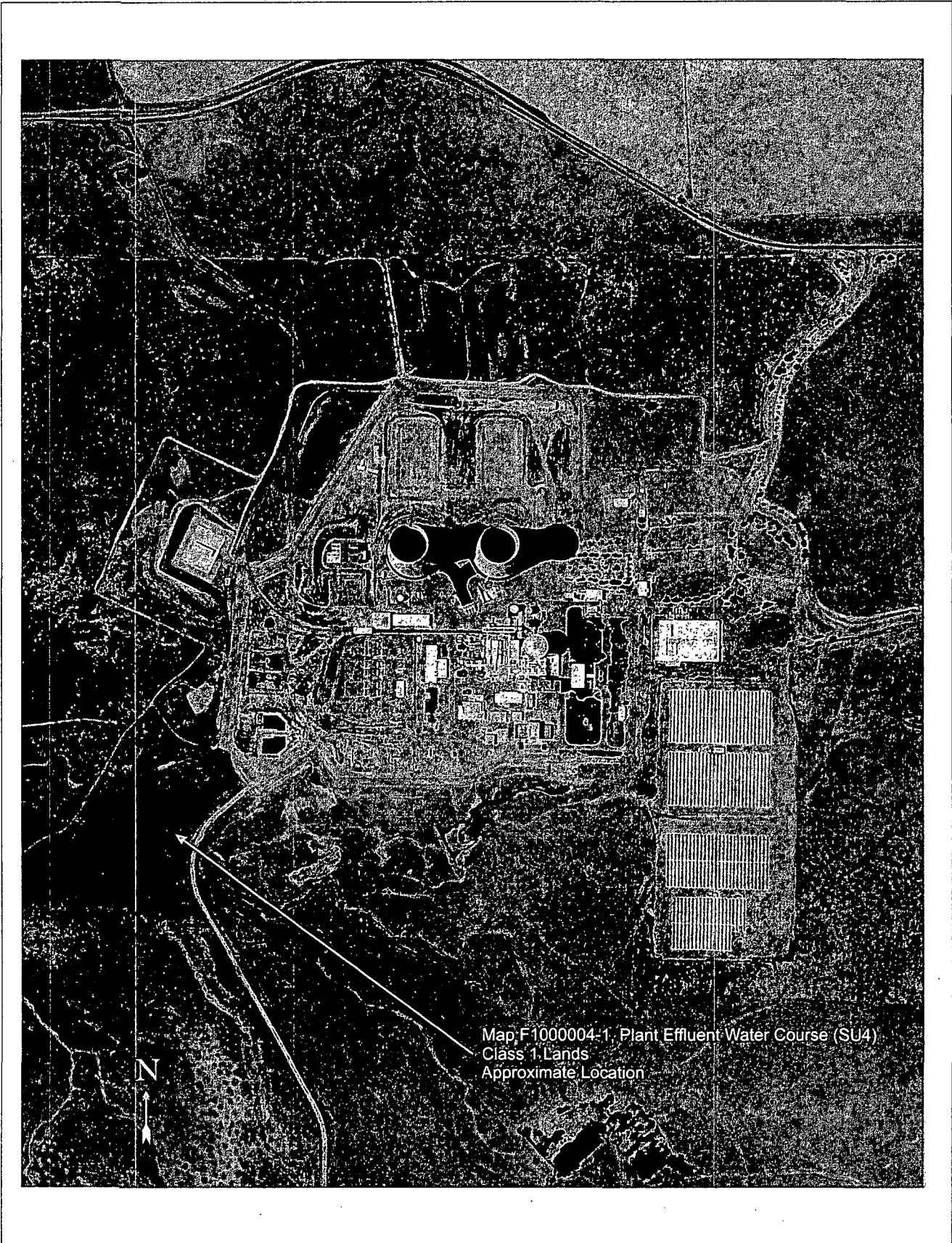
It is concluded that survey unit F1000004 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

March 18, 2008

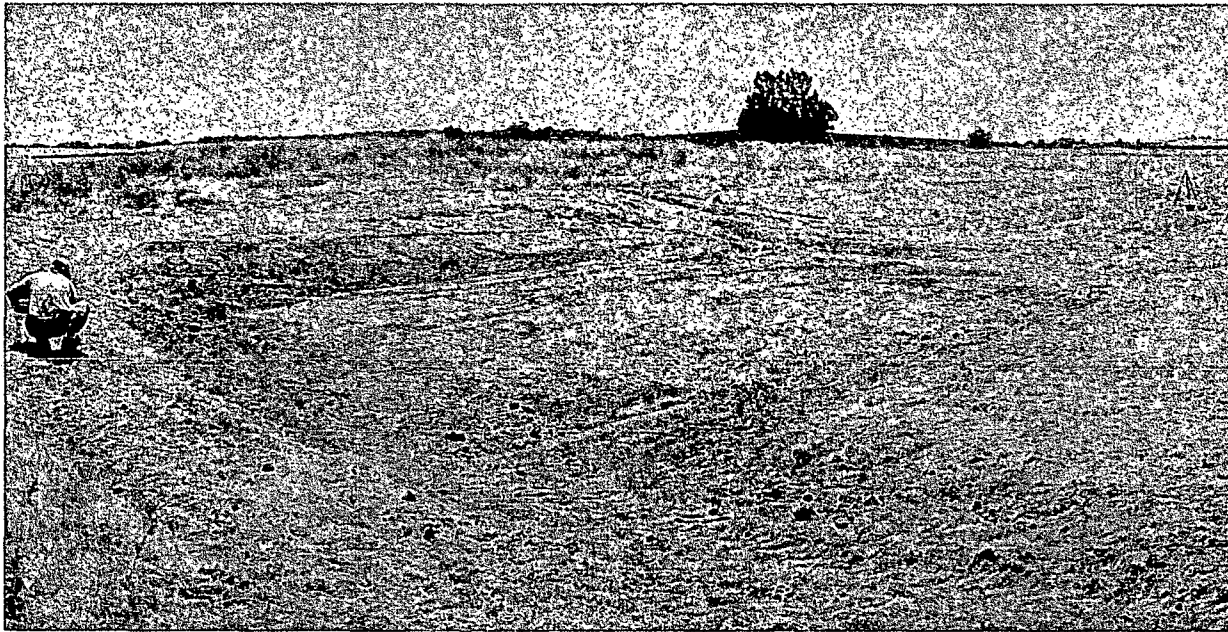
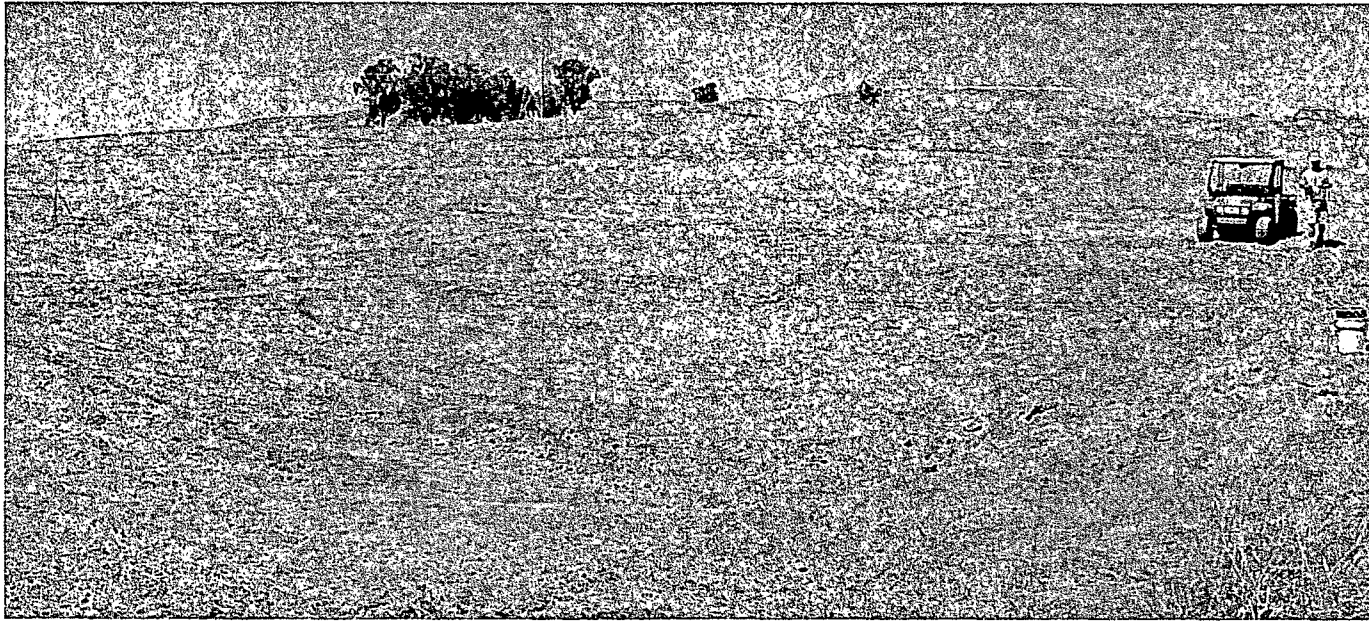
Survey Unit F1000004



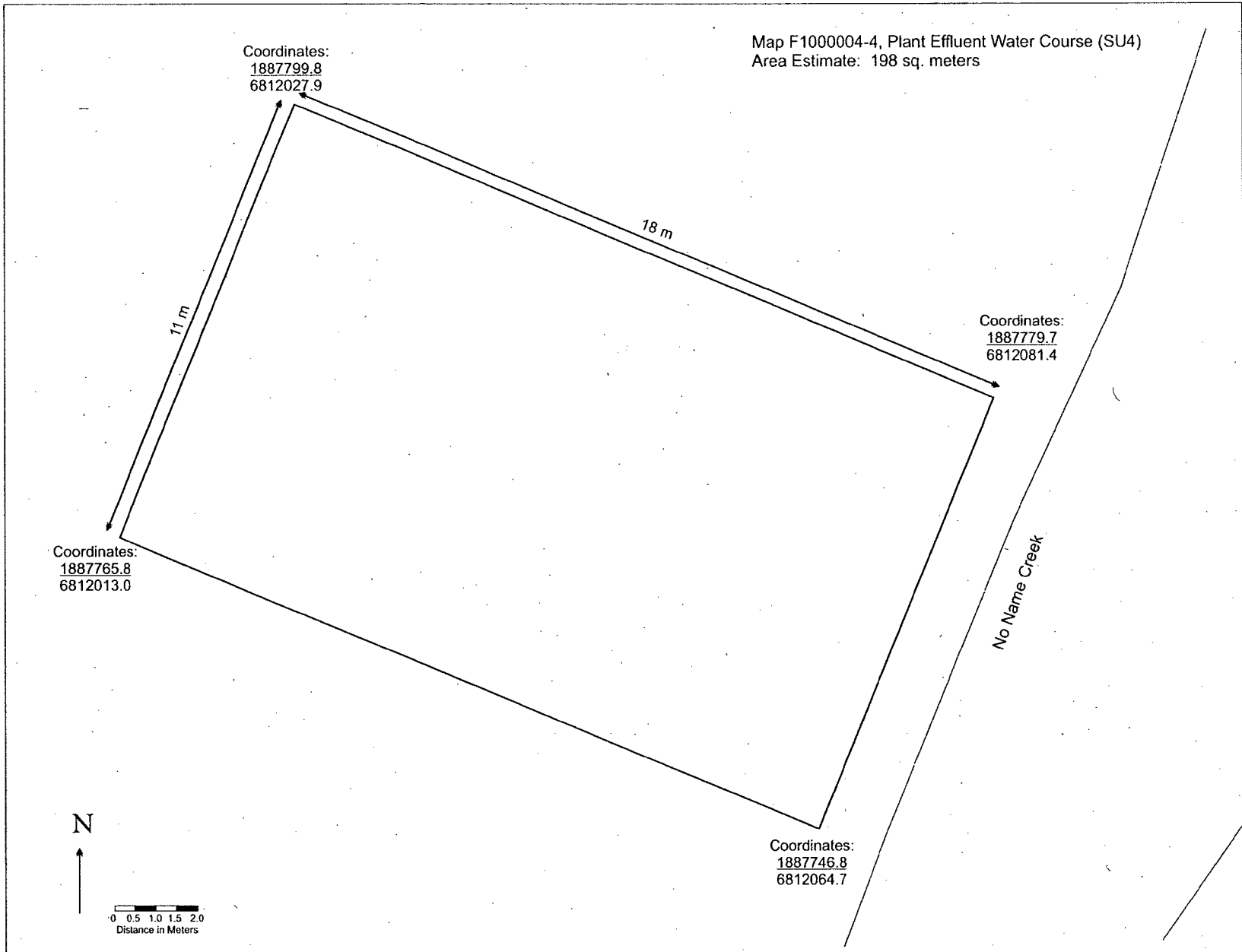
Map F1000004-1. Plant Effluent Water Course (SU4)
Class 1 Lands
Approximate Location

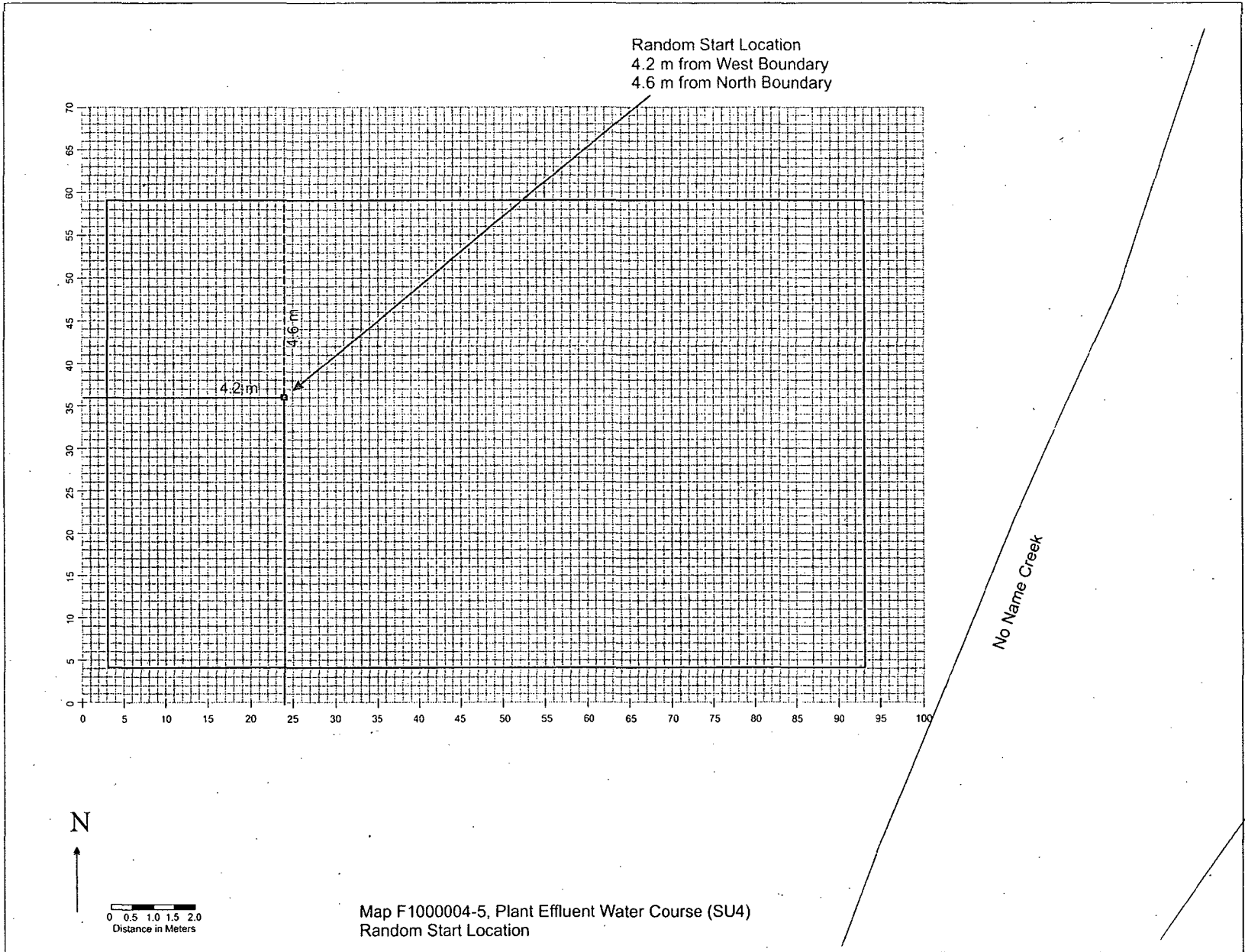


Map F1000004-2, Plant Effluent Water Course (SU4)
Approximate Area to be Remediated



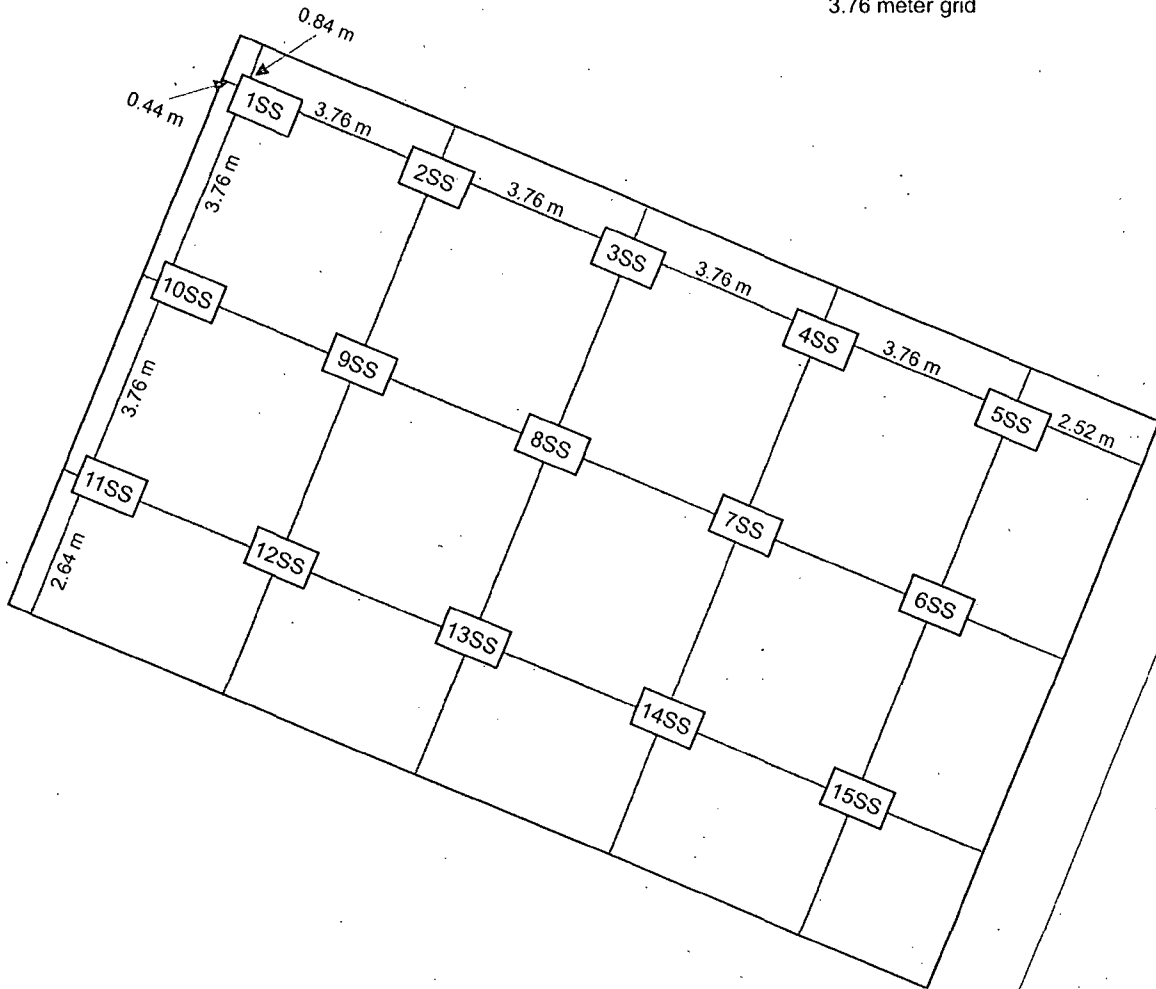
Map F1000004-3, Plant Effluent Water Course (SU4), Appearance of area following remediation efforts



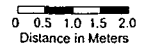


Map F1000004-5. Plant Effluent Water Course (SU4)
Random Start Location

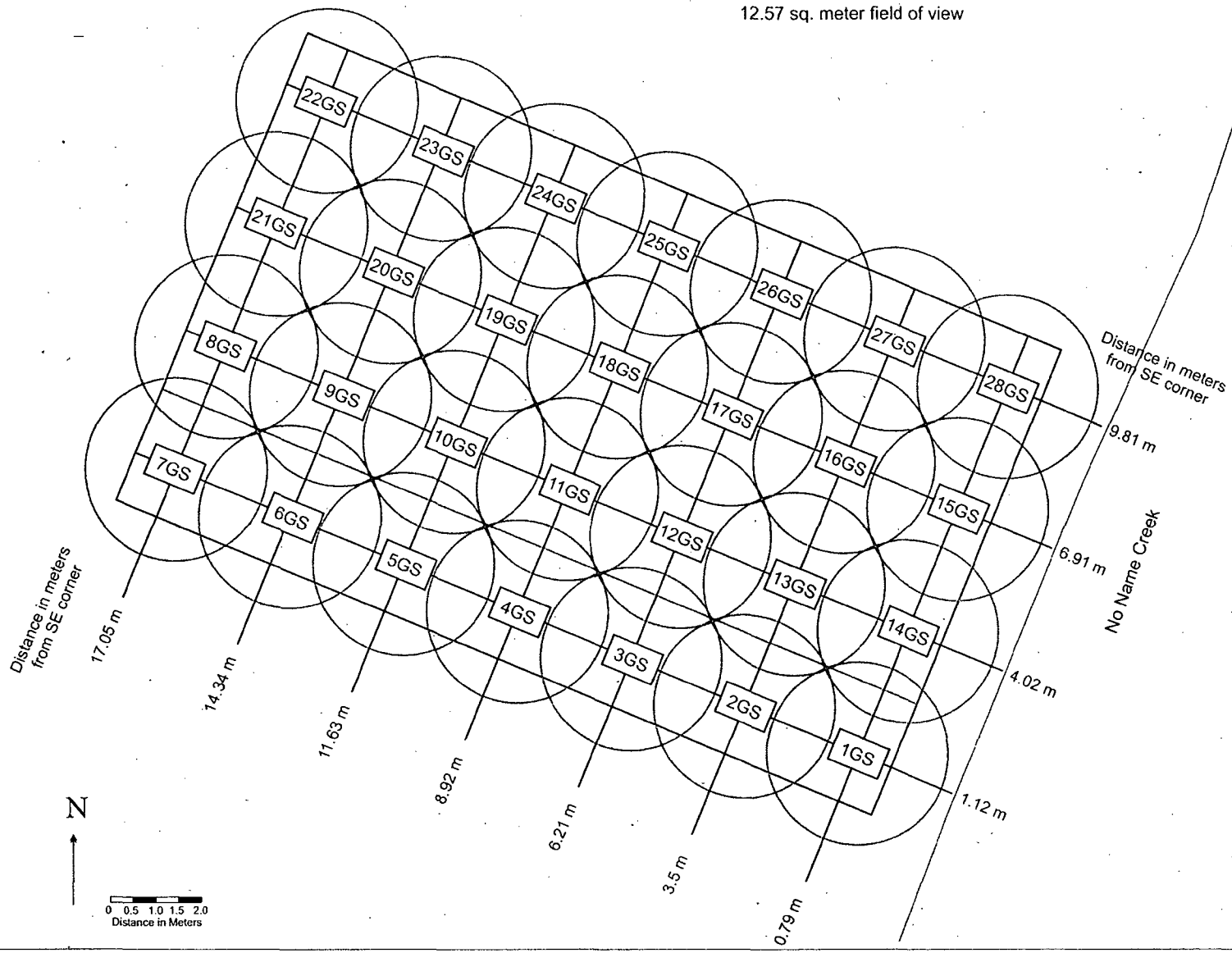
Map F1000004-6, Plant Effluent Water Course (SU4)
Soil Sample (Direct Measurement) Locations
F1000004S0001SS to F1000004S0015SS
3.76 meter grid



No Name Creek



Map F1000004-7, Plant Effluent Water Course (SU4)
ISOCS Gamma Scan Measurements
F1000004S0001GS to F1000004S0028GS
12.57 sq. meter field of view



Attachment 2

Instrumentation

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Survey Unit F1000004

Table 2-1. Survey Unit Instrumentation

Instrument	Detector Model No.	Detector Serial No.	MDC
HPGe	N/A	05069128	Soil – 1.75E-01 pCi/g Cs-137 Soil – 1.02E-01 pCi/g Co-60
ISOCS	N/A	2983947	Soil – 2.74E-01 pCi/g Cs-137 Soil – 2.25E-01 pCi/g Co-60

Table 2-2. Investigation Criteria and DCGL

Instrument	Parameter	Value
ISOCS	Investigation Criteria - Scan	Soil – 50 pCi/g Cs-137 Soil – 10 pCi/g Co-60
All	DCGL _w	52.6 Cs-137 12.6 Co-60
All	DCGL _{EMC}	108 pCi/g Cs-137

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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