

Rancho Seco
Final Status Survey Summary Report
March 3, 2008
Carbon Dioxide System Piping
Survey Unit F8990511

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FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8990511, Carbon Dioxide System Piping

Survey Unit Description:

Operating History: This system transported liquid carbon dioxide for fire protection in areas of the site in which water could not be used. This system was designed to be clean. Operating records and the HSA document no occurrences of radioactive contamination associated with this system piping. In addition, the system was maintained at or above atmospheric pressure which prevented any contamination from entering the system.

Site Characterization: Direct measurements were made of the interior surfaces of the system piping which confirmed the absence of plant-derived radionuclides. Direct measurements of the interior showed a mean gross activity level of 8,585 dpm/100 cm² and a maximum value of 23,654 dpm/100 cm². Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the system was determined to be a Class 2 system.

HSA Events: None

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 spaced at 15cm intervals and 1.8 m² were scanned for approximately 72% coverage. 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:	F899	Carbon Dioxide System
Survey Unit:	0511	Piping
Class:	2	Structure Surface
SU Area (m²):	2.5	LTP Table 5-4
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm²):	100000	Gross Activity DCGL
Area Factor:	N/A	Class 2
Design DCGL_{me} (dpm/100 cm²):	N/A	Class 2
LBGR (dpm/100 cm²):	50000	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	8930	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	3	Class 2
Scan Area (m²):	1.8	
Scan Coverage (%):	72%	Class 2
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	5.6	
Relative Shift Used:	3	Uses 3.0 if Relative Shift is >3
N-Value:	11	
Design N-Value + 20%:	14	NUREG-1575 Table 5-5
Design Min Samples N:	14	Class 2
Grid Spacing L:	0.4	Class 2

Survey Results:

A total of 40 direct measurements were made in F8990511. 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 1655 to 2275 dpm/100 cm², based on the pipe detector efficiency.

Table 2. Direct Measurement Results

Measurement ID	Gross Activity (dpm/100 cm ²)
F8990511-M0001GI	1925
F8990511-M0002GI	1742
F8990511-M0003GI	1858
F8990511-M0004GI	1963
F8990511-M0005GI	1854
F8990511-M0006GI	1767
F8990511-M0007GI	1796
F8990511-M0008GI	1655
F8990511-M0009GI	1714
F8990511-M0010GI	1944
F8990511-M0011GI	1957
F8990511-M0012GI	1897
F8990511-M0013GI	2050
F8990511-M0014GI	1882
F8990511-M0015GI	1925
F8990511-M0016GI	1828
F8990511-M0017GI	2196
F8990511-M0018GI	1981
F8990511-M0019GI	1888
F8990511-M0020GI	1834
F8990511-M0021GI	1740
F8990511-M0022GI	1908
F8990511-M0023GI	1852
F8990511-M0024GI	1866
F8990511-M0025GI	1912
F8990511-M0026GI	1796
F8990511-M0027GI	1712
F8990511-M0028GI	1838
F8990511-M0029GI	2043
F8990511-M0030GI	1761
F8990511-M0031GI	1716
F8990511-M0032GI	2024
F8990511-M0033GI	2011
F8990511-M0034GI	2131
F8990511-M0035GI	2097
F8990511-M0036GI	2103
F8990511-M0037GI	2248
F8990511-M0038GI	2275
F8990511-M0039GI	2254
F8990511-M0040GI	2207

Mean:	1929
Median:	1903
Standard Deviation:	164
Range:	1655 - 2275

Survey Unit Data Assessment:

The survey design required 40 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 less than the design standard deviation so no additional samples were required.

Table 4. Data Assessment Results

Survey Results Parameter	Value	Comment
Material Background Used (dpm/100 cm ²):	N/A	
Ambient Background Used (dpm/100 cm ²):	N/A	Average Ambient BKG = 0
Actual Direct Measurements (N):	40	
Median (dpm/100 cm ²):	1903	
Mean (dpm/100 cm ²):	1929	
Direct Measurement Standard Deviation	164	
(dpm/100 cm ²):		
Total Standard Deviation (dpm/100 cm ²):	164	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	2275	
Material Type:	N/A	Background Subtract Not Applied
Sign Test Final N Value:	40	
S+ Value:	40	
Critical Value:	25	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{mc}:	N/A	Class 2
Total 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 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), the ALARA criterion has been met.

Changes in Initial Survey Unit Assumptions:

The survey unit was designed as a Class 2 structure 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. No direct measurements exceeded the DCGL of 100000 dpm/100 cm² or the grout limit of 21,000dpm/100cm². 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.

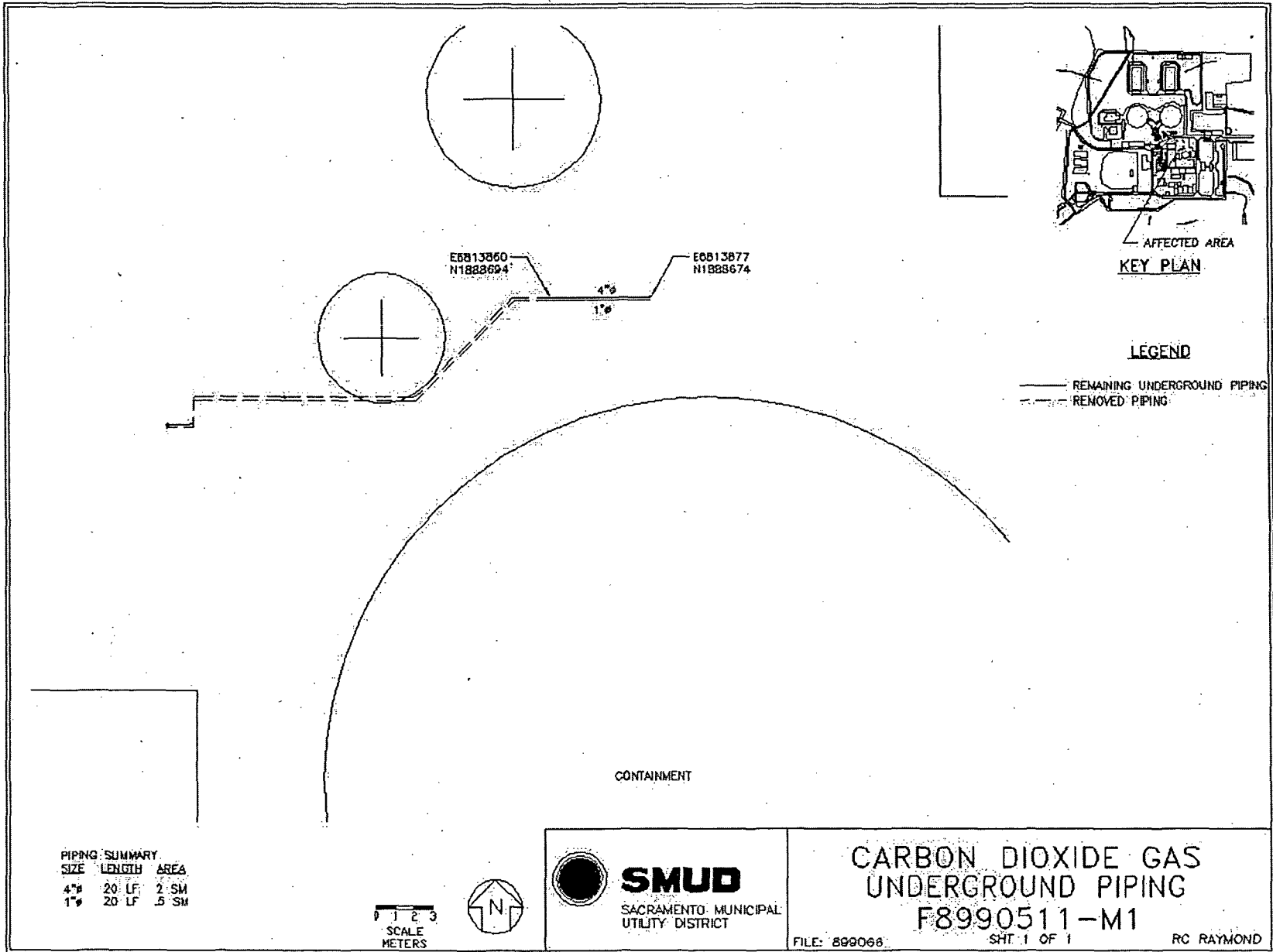
It is concluded that survey unit F8990511 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

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Survey Unit F8990511



Attachment 2

Instrumentation

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Table 2-1. Survey Unit Instrumentation

Instrument Model; Serial No.	Detector Model; Serial No.	MDC Static (dpm/100 cm²)	MDC Scan (dpm/100 cm²)
M2350; 189081	44-159; 199736	2860	N/A

Table 2-2. Investigation Criteria and DCGL

Parameter	Value (dpm/100 cm²)
Investigation Criteria - Direct	100000
Investigation Criteria – Scan	N/A
DCGL _w	100000
DCGL _{EMC}	N/A

Attachment 3

Investigation

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(none required)

Attachment 4

Data Assessment

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