

Rancho Seco
Final Status Survey Summary Report
March 25, 2008
Turbine Building Drains
Survey Unit F8990071

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FSS Engineer

Reviewed By: [Signature] Date: 3/25/08
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Approved By: [Signature] Date: 5-12-08
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8990071, Turbine Building Drains

Survey Unit Description:

Operating History: This system collected clean water leakage and condensate from the turbine and routed it to the drain tank. This system was contaminated by radioactive system leakage into steam, feed and cooling water systems. Operating records and the HSA document occurrences of radioactive contamination associated with this system piping.

Site Characterization: Direct measurements were made of the interior surfaces of the system piping which confirmed the presence of plant-derived radionuclides. Direct measurements of the interior showed a mean gross activity level of 56,208 dpm/100 cm² and a maximum value of 680,000 dpm/100 cm². Based on the classification procedure (DSIP-0020) and levels of gross activity reported, the system was determined to be a Class 1 system.

HSA Events: ODR-800111, 871122.

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 11.1 m² were scanned for 100% 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	Turbine Building Drains
Survey Unit:	0071	Structure Surface
Class:	1	LTP Table 5-4
SU Area (m²):	11.1	
Evaluator:	Erin L. Brown	
DCGL (dpm/100 cm²):	100000	Gross Activity DCGL
Area Factor:	1	Class 1
Design DCGL_{mc} (dpm/100 cm²):	100000	Class 1
LBGR (dpm/100 cm²):	50000	Default = 50% DCGL
Design Sigma (dpm/100 cm²):	23464	
Type I Error:	0.05	
Type II Error:	0.05	
Predominant Nuclide:	Cs-137	
Sample Area (m²):	N/A	Class 1
Scan Area (m²):	11.1	
Scan Coverage (%):	100%	Class 1
Z_{1-α}:	1.645	
Z_{1-β}:	1.645	
Sign P:	0.97725	
Calculated Relative Shift:	2.2	
Relative Shift Used:	2.2	Uses 3.0 if Relative Shift is >3
N-Value:	12	
Design N-Value + 20%:	15	NUREG-1575 Table 5-5
Design Min Samples N:	15	Class 1
Grid Spacing L:	0.8	Class 1

Survey Results:

A total of 409 direct measurements were made in F8990071. 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 measurements indicated areas of elevated activity. Scan activity ranged from 838 to 20923 dpm/100 cm², based on the pipe detector efficiency.

Table 2. Direct Measurement Results

Measurement ID	Gross Activity (dpm/100 cm ²)
F8990071-M0001	2539
F8990071-M0002	2490
F8990071-M0003	2905
F8990071-M0004	3174
F8990071-M0005	3266
F8990071-M0006	3304
F8990071-M0007	3083
F8990071-M0008	3367
F8990071-M0009	3251
F8990071-M0010	3565
F8990071-M0011	3261
F8990071-M0012	3179
F8990071-M0013	3309
F8990071-M0014	3256
F8990071-M0015	3449
F8990071-M0016	3434
F8990071-M0017	2948
F8990071-M0018	3439
F8990071-M0019	3256
F8990071-M0020	3377
F8990071-M0021	3362
F8990071-M0022	3314
F8990071-M0023	3420
F8990071-M0024	3565
F8990071-M0025	3343
F8990071-M0026	3531
F8990071-M0027	3396
F8990071-M0028	3565
F8990071-M0029	3478
F8990071-M0030	3425
F8990071-M0031	3329
F8990071-M0032	3434
F8990071-M0033	3550
F8990071-M0034	3516
F8990071-M0035	3560
F8990071-M0036	3801
F8990071-M0037	3141
F8990071-M0038	2962
F8990071-M0060	2490
F8990071-M0061	1643

F8990071-M0062	2688
F8990071-M0063	2645
F8990071-M0064	2755
F8990071-M0065	2490
F8990071-M0066	2423
F8990071-M0067	2355
F8990071-M0068	3006
F8990071-M0069	2808
F8990071-M0070	2852
F8990071-M0071	2823
F8990071-M0072	2577
F8990071-M0073	2900
F8990071-M0074	2832
F8990071-M0075	2726
F8990071-M0076	2697
F8990071-M0077	2755
F8990071-M0078	2799
F8990071-M0079	2712
F8990071-M0080	3030
F8990071-M0081	2934
F8990071-M0082	2813
F8990071-M0083	2856
F8990071-M0084	2905
F8990071-M0085	2789
F8990071-M0086	2842
F8990071-M0087	3083
F8990071-M0088	2842
F8990071-M0089	3001
F8990071-M0090	3126
F8990071-M0091	2977
F8990071-M0092	2669
F8990071-M0093	2669
F8990071-M0094	2789
F8990071-M0095	2847
F8990071-M0096	2779
F8990071-M0097	2640
F8990071-M0098	2722
F8990071-M0099	2640
F8990071-M0100	3035
F8990071-M0101	2972
F8990071-M0102	2750
F8990071-M0103	2799
F8990071-M0104	2881
F8990071-M0105	2803
F8990071-M0106	2731
F8990071-M0107	3073
F8990071-M0108	2962
F8990071-M0109	3121
F8990071-M0110	3136
F8990071-M0111	2895
F8990071-M0112	2283
F8990071-M0113	1975
F8990071-M0114	2558
F8990071-M0115	2365
F8990071-M0125	2755
F8990071-M0126	2736

F8990071-M0127	2009
F8990071-M0128	2563
F8990071-M0129	2659
F8990071-M0130	2539
F8990071-M0131	2779
F8990071-M0132	2466
F8990071-M0133	2726
F8990071-M0134	2693
F8990071-M0135	2856
F8990071-M0136	2688
F8990071-M0137	2697
F8990071-M0138	2871
F8990071-M0139	2327
F8990071-M0140	2490
F8990071-M0141	2953
F8990071-M0142	2871
F8990071-M0143	3155
F8990071-M0144	3102
F8990071-M0145	3198
F8990071-M0146	2958
F8990071-M0147	2712
F8990071-M0148	2852
F8990071-M0149	2437
F8990071-M0150	2914
F8990071-M0151	2760
F8990071-M0152	2510
F8990071-M0153	2664
F8990071-M0154	2770
F8990071-M0155	2818
F8990071-M0156	2688
F8990071-M0157	2712
F8990071-M0158	2876
F8990071-M0159	3353
F8990071-M0160	4037
F8990071-M0161	3357
F8990071-M0162	3646
F8990071-M0163	3285
F8990071-M0166	3738
F8990071-M0167	4436
F8990071-M0168	4302
F8990071-M0169	2004
F8990071-M0170	2919
F8990071-M0171	2996
F8990071-M0172	2539
F8990071-M0173	2895
F8990071-M0174	2712
F8990071-M0175	2645
F8990071-M0176	2818
F8990071-M0177	2813
F8990071-M0178	2962
F8990071-M0179	2779
F8990071-M0180	2799
F8990071-M0181	2726
F8990071-M0182	2519
F8990071-M0183	2784
F8990071-M0184	2967

F8990071-M0185	2630
F8990071-M0186	2924
F8990071-M0187	2861
F8990071-M0188	2794
F8990071-M0189	2789
F8990071-M0190	2775
F8990071-M0191	2736
F8990071-M0192	2770
F8990071-M0193	2755
F8990071-M0194	2808
F8990071-M0195	2645
F8990071-M0196	2722
F8990071-M0197	2842
F8990071-M0198	2572
F8990071-M0199	2832
F8990071-M0200	2934
F8990071-M0201	2688
F8990071-M0202	2750
F8990071-M0203	2853
F8990071-M0204	2522
F8990071-M0205	2895
F8990071-M0206	3085
F8990071-M0207	2869
F8990071-M0208	2738
F8990071-M0209	2832
F8990071-M0210	2922
F8990071-M0211	2796
F8990071-M0212	2806
F8990071-M0213	3095
F8990071-M0214	2817
F8990071-M0215	2832
F8990071-M0216	3090
F8990071-M0217	2974
F8990071-M0218	2874
F8990071-M0219	2974
F8990071-M0220	2743
F8990071-M0221	2906
F8990071-M0222	2859
F8990071-M0223	2669
F8990071-M0224	2990
F8990071-M0225	2827
F8990071-M0226	2806
F8990071-M0227	2775
F8990071-M0228	3074
F8990071-M0229	3001
F8990071-M0230	2817
F8990071-M0231	2995
F8990071-M0232	2874
F8990071-M0233	3053
F8990071-M0234	2880
F8990071-M0235	2633
F8990071-M0236	2727
F8990071-M0237	2985
F8990071-M0238	2995
F8990071-M0239	2885
F8990071-M0240	2937

F8990071-M0241	2964
F8990071-M0242	2985
F8990071-M0267	3714
F8990071-M0268	2230
F8990071-M0269	2794
F8990071-M0270	2765
F8990071-M0271	2278
F8990071-M0272	2490
F8990071-M0273	2529
F8990071-M0274	2278
F8990071-M0275	2298
F8990071-M0276	2389
F8990071-M0277	2673
F8990071-M0278	2630
F8990071-M0279	2731
F8990071-M0280	2712
F8990071-M0281	2847
F8990071-M0282	2958
F8990071-M0283	2563
F8990071-M0284	2587
F8990071-M0285	2813
F8990071-M0286	4128
F8990071-M0287	4244
F8990071-M0288	3849
F8990071-M0289	3295
F8990071-M0290	3391
F8990071-M0291	3618
F8990071-M0292	4485
F8990071-M0293	4224
F8990071-M0308	4133
F8990071-M0309	2784
F8990071-M0310	4436
F8990071-M0311	3767
F8990071-M0312	3054
F8990071-M0313	2375
F8990071-M0314	2914
F8990071-M0315	2702
F8990071-M0316	2736
F8990071-M0317	2755
F8990071-M0318	2972
F8990071-M0319	2962
F8990071-M0320	2953
F8990071-M0321	2779
F8990071-M0322	2360
F8990071-M0323	2577
F8990071-M0324	2808
F8990071-M0325	2789
F8990071-M0326	2606
F8990071-M0327	2640
F8990071-M0328	2534
F8990071-M0329	2587
F8990071-M0330	2842
F8990071-M0331	2755
F8990071-M0332	2765
F8990071-M0333	2572
F8990071-M0334	2659

F8990071-M0335	2683
F8990071-M0336	2505
F8990071-M0337	2927
F8990071-M0338	2880
F8990071-M0339	2843
F8990071-M0340	3121
F8990071-M0341	3058
F8990071-M0342	2901
F8990071-M0343	2380
F8990071-M0344	2790
F8990071-M0345	2359
F8990071-M0346	2853
F8990071-M0347	2733
F8990071-M0348	2980
F8990071-M0349	2775
F8990071-M0350	3027
F8990071-M0351	2859
F8990071-M0352	2486
F8990071-M0353	2202
F8990071-M0354	1855
F8990071-M0355	1802
F8990071-M0356	1892
F8990071-M0357	1634
F8990071-M0358	1781
F8990071-M0359	1871
F8990071-M0360	2028
F8990071-M0361	2018
F8990071-M0362	1971
F8990071-M0363	1802
F8990071-M0364	2002
F8990071-M0365	1950
F8990071-M0366	2160
F8990071-M0367	2223
F8990071-M0368	2223
F8990071-M0369	2281
F8990071-M0370	2091
F8990071-M0371	2244
F8990071-M0372	2328
F8990071-M0373	2176
F8990071-M0374	2564
F8990071-M0375	2612
F8990071-M0376	2454
F8990071-M0377	2044
F8990071-M0378	2023
F8990071-M0379	1939
F8990071-M0380	1871
F8990071-M0381	1876
F8990071-M0382	1703
F8990071-M0383	1739
F8990071-M0384	1682
F8990071-M0385	1597
F8990071-M0386	1503
F8990071-M0387	1561
F8990071-M0388	1477
F8990071-M0389	1529
F8990071-M0390	996

F8990071-M0391	969
F8990071-M0392	838
F8990071-M0393	858
F8990071-M0394	1222
F8990071-M0395	1291
F8990071-M0396	2097
F8990071-M0397	2031
F8990071-M0398	2198
F8990071-M0399	2665
F8990071-M0400	3211
F8990071-M0401	2652
F8990071-M0402	3257
F8990071-M0403	8288
F8990071-M0404	20923
F8990071-M0419	3415
F8990071-M0420	3073
F8990071-M0421	2876
F8990071-M0422	2900
F8990071-M0423	2490
F8990071-M0424	2298
F8990071-M0425	2592
F8990071-M0426	2611
F8990071-M0427	2688
F8990071-M0428	2813
F8990071-M0429	2876
F8990071-M0430	3198
F8990071-M0431	2900
F8990071-M0432	2900
F8990071-M0433	2799
F8990071-M0444	3256
F8990071-M0445	2172
F8990071-M0446	2476
F8990071-M0447	3049
F8990071-M0448	4051
F8990071-M0449	3295
F8990071-M0450	3353
F8990071-M0451	2948
F8990071-M0452	3083
F8990071-M0453	2866
F8990071-M0454	2240
F8990071-M0455	2278
F8990071-M0456	2317
F8990071-M0457	2298
F8990071-M0458	2519
F8990071-M0459	2567
F8990071-M0460	2452
F8990071-M0461	2264
F8990071-M0462	2148
F8990071-M0463	2355
F8990071-M0464	2139
F8990071-M0465	2283
F8990071-M0466	1874
F8990071-M0467	2245
F8990071-M0468	2500
F8990071-M0469	2519
F8990071-M0470	3064

F8990071-M0471	2775
F8990071-M0472	3165
F8990071-M0473	3049
F8990071-M0474	3314
F8990071-M0475	4552
F8990071-M0476	5014
F8990071-M0477	5130
F8990071-M0478	5761
F8990071-M0479	6089
F8990071-M0480	5313
F8990071-M0481	4456
F8990071-M0482	2943
F8990071-M0483	3203
F8990071-M0484	3030
F8990071-M0485	3160
F8990071-M0486	2876
F8990071-M0487	3333
F8990071-M0488	3039
F8990071-M0489	3391
F8990071-M0490	3165
F8990071-M0491	3160
F8990071-M0492	2775
F8990071-M0493	2818
F8990071-M0494	3165
F8990071-M0495	3314
F8990071-M0496	3353
F8990071-M0497	3507
F8990071-M0498	3998
F8990071-M0499	5197
F8990071-M0500	5578
F8990071-M0501	4778
F8990071-M0502	4586
F8990071-M0503	3001
Mean:	2901
Median:	2813
Standard Deviation:	1139
Range:	838 - 20923

Survey Unit Data Assessment:

The survey design required 409 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	Average Ambient BKG = 0
Ambient Background Used (dpm/100 cm ²):	N/A	
Actual Direct Measurements (N):	409	
Median (dpm/100 cm ²):	2813	
Mean (dpm/100 cm ²):	2901	
Direct Measurement Standard Deviation (dpm/100 cm ²):	1139	
Total Standard Deviation (dpm/100 cm ²):	1139	Based on samples and backgrounds.
Maximum (dpm/100 cm ²):	20923	Background Subtract Not Applied
Material Type:	N/A	
Sign Test Final N Value:	409	Class 1
S+ Value:	409	
Critical Value:	221	
Sufficient Samples Collected:	Yes	
Maximum Value < DCGL:	Yes	
Median Value < DCGL:	Yes	
Mean Value < DCGL:	Yes	
Maximum Value < DCGL_{mc}:	Yes	
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 1 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 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. 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.

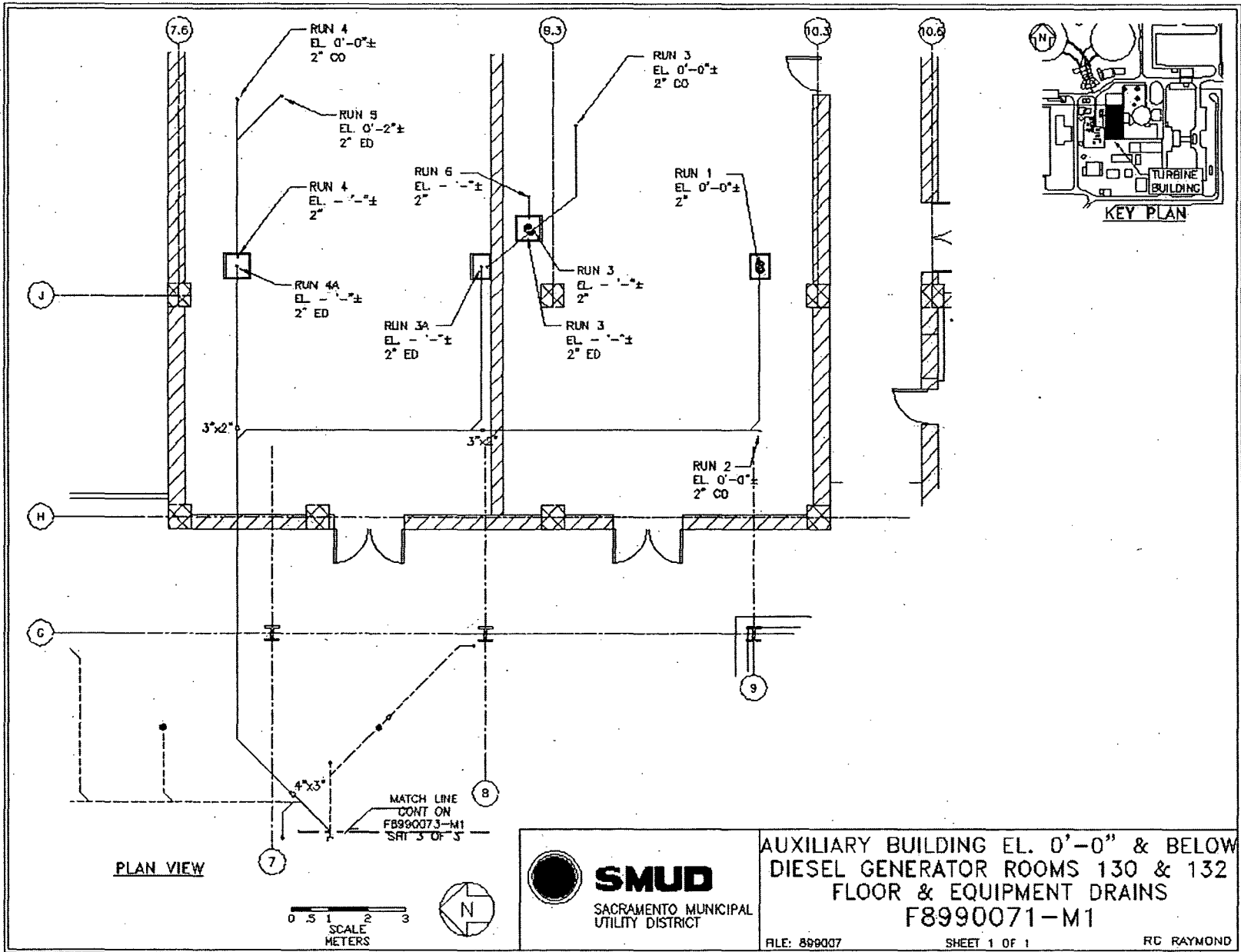
It is concluded that survey unit F8990071 meets the release criteria of 10CFR20.1402.

Attachment 1

Maps

March 25, 2008

Survey Unit F8990071



Attachment 2

Instrumentation

March 25, 2008

Survey Unit F8990071

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; 142509	44-159; 238370	5720	N/A
M2350; 142512	44-159; 201637	5720	N/A

The MDC noted for the detector model 44-159 is for the 3” diameter piping which is the most conservative.

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

March 25, 2008

Survey Unit F8990071

(none required)

Attachment 4

Data Assessment

March 25, 2008

Survey Unit F8990071

