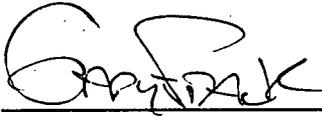
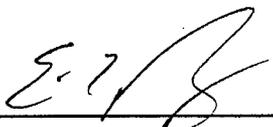


Rancho Seco
Final Status Survey Summary Report
June 4, 2008
Trench 1 Eastern Portion
Survey Unit F8100051

Prepared By:  Date: 6.4.2008
FSS Engineer

Reviewed By:  Date: 11/24/08
Lead FSS Engineer

Approved By:  Date: 2-6-09
Dismantlement Superintendent, Radiological

FINAL STATUS SURVEY SUMMARY REPORT

Survey Unit:

F8100051, Trench 1 Eastern Portion

Survey Unit Description:

Operating History: The area surrounded the tanks used to store radioactive liquids. This area was used for the storage of radioactive material. Operating records and the HSA document several events with the potential for a release of radioactivity associated with this survey area. The HSA documented the storage of radioactive material within the area that may have had the potential to contaminate the area.

The area covered in this portion of Trench 1 is adjacent to the solidification pad and the reactor building equipment hatch and extends 10 meters north of the equipment hatch.

Site Characterization: Soil samples were collected in the area of the survey on the surface and analyzed for the presence of plant-derived radionuclides. Cs-137 was the primary nuclide of plant origin detected with a mean activity level of 0.0469 pCi/g and a maximum value of 0.517 pCi/g. Based on the classification procedure (DSIP-0020) and levels of Cs-137 reported, the area was determined to be a Class 3 land area.

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 750 m² were scanned for approximately 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:	F810	Trench 1 Eastern Portion
Survey Unit:	0051	Open Land Area
Class:	3	LTP Table 5-4
SU Area (m²):	750	
Evaluator:	Gary Frank	
DCGL for Cs-137 surrogate (pCi/g):	52.6	
DCGL for Co-60 (pCi/g):	12.6	
Area Factor:	N/A	Class 3
Design DCGL_{me} (pCi/g):	N/A	Class 3
LBGR (pCi/g):	26.3	Default = 50% Cs-137 DCGL
Design Sigma (pCi/g):	0.095	DTBD-06-001, Table 5-4A or B
Type I Error:	0.05	
Type II Error:	0.05	
Sample Area (m²):	N/A	Class 3
Total Area Scanned (m²):	750	
Scan Coverage (%):	100%	Class 3
Z_{1-α} :	1.645	
Z_{1-β} :	1.645	
Sign P:	0.99865	
Calculated Relative Shift:	276.8	
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 67 direct measurements were made in F8100051. 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. Soil samples were counted to the MDCs shown in Table 2-1 of Attachment 2. None of the particle scan measurements indicated areas of elevated activity with a range of 3987 to 10367 cpm below the investigation setpoint of 10443 cpm.. Structures (Solidification Pad wall and wall under the Reactor Building Equipment Hatch) were exposed during the removal of piping and were beta scanned, beta directs were obtained and smears. Scan activity ranged from 4071 to 6844 dpm/100cm², based on a surveyor efficiency of 0.5 and no background subtracted. The highest Beta Direct measurement is 2837 dpm/100cm². Samples for removable surface activity were less than 10% of the DCGL for beta and alpha activity was below MDC shown in Table 2-1 of Attachment 2.

Penetrations into Pump Alley were performed with this survey to allow the grouting of the penetrations in order to minimize water incursion into the Auxiliary Building. Scan activity ranged from 5300 to 9353 dpm/100cm², based on a surveyor efficiency of 0.5 and no background subtracted. Samples for removable surface activity were less than 10% of the DCGL for beta and alpha activity was below MDC 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	
F8100051S0001SS	3.86E-02	<3.86E-02		0.0007	5.64E-02	<5.64E-02		0.0045	0.0052
F8100051S0002SS	5.37E-02	<5.37E-02		0.001	4.00E-02	<4.00E-02		0.0032	0.0042
F8100051S0003SS	4.29E-02	<4.29E-02		0.0008	4.81E-02	<4.81E-02		0.0038	0.0046
F8100051S0004SS	4.57E-02	<4.57E-02		0.0009	3.94E-02	<3.94E-02		0.0031	0.004
F8100051S0005SS	4.98E-02	<4.98E-02		0.0009	5.69E-02	<5.69E-02		0.0045	0.0055
F8100051S0006SS	4.53E-02	<4.53E-02		0.0009	3.64E-02	<3.64E-02		0.0029	0.0037
F8100051S0007SS	5.16E-02	<5.16E-02		0.001	4.06E-02	<4.06E-02		0.0032	0.0042
F8100051S0008SS	5.17E-02	<5.17E-02		0.001	5.79E-02	<5.79E-02		0.0046	0.0056
F8100051S0009SS	4.32E-02	<4.32E-02		0.0008	5.27E-02	<5.27E-02		0.0042	0.005
F8100051S0010SS	5.95E-02	<5.95E-02		0.0011	9.39E-02	<9.39E-02		0.0075	0.0086
F8100051S0011SS	6.85E-02	<6.85E-02		0.0013	4.62E-02	<4.62E-02		0.0037	0.005
F8100051S0012SS	5.20E-02	<5.20E-02		0.001	5.40E-02	<5.40E-02		0.0043	0.0053
F8100051S0013SS	4.05E-02	<4.05E-02		0.0008	4.13E-02	<4.13E-02		0.0033	0.004
F8100051S0014SS	4.11E-02	<4.11E-02		0.0008	5.46E-02	<5.46E-02		0.0043	0.0051
F8100051S0015SS	4.19E-02	<4.19E-02		0.0008	2.90E-02	<2.90E-02		0.0023	0.0031
F8100051S0016SS	5.62E-02	<5.62E-02		0.0011	4.81E-02	<4.81E-02		0.0038	0.0049
F8100051S0017SS	5.11E-02	<5.11E-02		0.001	5.02E-02	<5.02E-02		0.004	0.005
F8100051S0018SS	4.09E-02	<4.09E-02		0.0008	5.51E-02	<5.51E-02		0.0044	0.0052
F8100051S0019SS	5.00E-02	<5.00E-02		0.001	4.58E-02	<4.58E-02		0.0036	0.0046
F8100051S0020SS	4.38E-02	<4.38E-02		0.0008	4.70E-02	<4.70E-02		0.0037	0.0046
F8100051S0021SS	4.42E-02	<4.42E-02		0.0008	4.58E-02	<4.58E-02		0.0036	0.0045
F8100051S0022SS	4.84E-02	<4.84E-02		0.0009	5.31E-02	<5.31E-02		0.0042	0.0051
F8100051S0023SS	4.64E-02	<4.64E-02		0.0009	4.54E-02	<4.54E-02		0.0036	0.0045
F8100051S0024SS	4.21E-02	<4.21E-02		0.0008	4.62E-02	<4.62E-02		0.0037	0.0045
F8100051S0025SS	4.44E-02	<4.44E-02		0.0008	4.14E-02	<4.14E-02		0.0033	0.0041
F8100051S0026SS	4.57E-02	<4.57E-02		0.0009	3.61E-02	<3.61E-02		0.0029	0.0037
F8100051S0027SS	3.76E-02	<3.76E-02		0.0007	5.57E-02	<5.57E-02		0.0044	0.0051
F8100051S0028SS	4.56E-02	<4.56E-02		0.0009	3.52E-02	<3.52E-02		0.0028	0.0037
F8100051S0029SS	4.93E-02	<4.93E-02		0.0009	4.55E-02	<4.55E-02		0.0036	0.0045
F8100051S0030SS	4.43E-02	<4.43E-02		0.0008	3.42E-02	<3.42E-02		0.0027	0.0036
F8100051S0031SS	5.65E-02	<5.65E-02		0.0011	4.86E-02	1.18E-01	5.51E-02	0.0094	0.0105

F8100051S0032SS	4.49E-02	1.33E-01	4.08E-02	0.0025	4.94E-02	4.46E-01	5.65E-02	0.0354	0.0379
F8100051S0033SS	5.10E-02	4.03E-01	7.87E-02	0.0077	4.34E-02	7.71E-01	1.13E-01	0.0612	0.0688
F8100051S0034SS	4.37E-02	<4.37E-02		0.0008	5.30E-02	<5.30E-02		0.0042	0.005
F8100051S0035SS	4.65E-02	<4.65E-02		0.0009	6.52E-02	<6.52E-02		0.0052	0.0061
F8100051S0036SS	3.19E-02	<3.19E-02		0.0006	3.11E-02	<3.11E-02		0.0025	0.0031
F8100051S0037SS	3.91E-02	<3.91E-02		0.0007	3.60E-02	<3.60E-02		0.0029	0.0036
F8100051S0038SS	3.30E-02	<3.30E-02		0.0006	3.74E-02	<3.74E-02		0.003	0.0036
F8100051S0039SS	4.36E-02	<4.36E-02	2.18E-02	0.0008	2.42E-02	<2.42E-02		0.0019	0.0027
F8100051S0040SS	4.90E-02	<4.90E-02		0.0009	4.60E-02	<4.60E-02		0.0037	0.0046
F8100051S0041SS	3.22E-02	<3.22E-02		0.0006	3.85E-02	<3.85E-02		0.0031	0.0037
F8100051S0042SS	4.14E-02	<4.14E-02	2.22E-02	0.0008	4.20E-02	<4.20E-02		0.0033	0.0041
F8100051S0043SS	4.40E-02	<4.40E-02		0.0008	3.90E-02	<3.90E-02		0.0031	0.0039
F8100051S0044SS	4.74E-02	<4.74E-02		0.0009	3.52E-02	<3.52E-02		0.0028	0.0037
F8100051S0045SS	4.39E-02	<4.39E-02		0.0008	3.87E-02	<3.87E-02		0.0031	0.0039
F8100051S0046SS	4.44E-02	<4.44E-02		0.0008	3.78E-02	<3.78E-02		0.003	0.0038
F8100051S0047SS	4.35E-02	<4.35E-02		0.0008	4.25E-02	<4.25E-02		0.0034	0.0042
F8100051S0048SS	3.63E-02	<3.63E-02		0.0007	4.75E-02	<4.75E-02		0.0038	0.0045
F8100051S0049SS	4.69E-02	<4.69E-02		0.0009	4.76E-02	<4.76E-02		0.0038	0.0047
F8100051S0050SS	4.51E-02	<4.51E-02		0.0009	4.09E-02	<4.09E-02		0.0032	0.0041
F8100051S0051SS	3.77E-02	<3.77E-02		0.0007	4.58E-02	<4.58E-02		0.0036	0.0044
F8100051S0052SS	4.15E-02	<4.15E-02		0.0008	4.07E-02	<4.07E-02		0.0032	0.004
F8100051S0053SS	4.51E-02	<4.51E-02		0.0009	5.43E-02	<5.43E-02		0.0043	0.0052
F8100051S0054SS	4.25E-02	<4.25E-02		0.0008	4.55E-02	<4.55E-02		0.0036	0.0044
F8100051S0055SS	3.61E-02	<3.61E-02		0.0007	4.36E-02	<4.36E-02		0.0035	0.0041
F8100051S0056SS	4.54E-02	<4.54E-02		0.0009	5.22E-02	<5.22E-02		0.0041	0.005
F8100051S0057SS	2.47E-02	<2.47E-02		0.0005	4.68E-02	<4.68E-02		0.0037	0.0042
F8100051S0058SS	3.45E-02	<3.45E-02		0.0007	4.45E-02	<4.45E-02		0.0035	0.0042
F8100051S0059SS	4.67E-02	<4.67E-02		0.0009	5.22E-02	<5.22E-02		0.0041	0.005
F8100051S0060SS	4.19E-02	<4.19E-02		0.0008	4.65E-02	<4.65E-02		0.0037	0.0045
F8100051S0061SS	4.42E-02	<4.42E-02		0.0008	3.37E-02	<3.37E-02		0.0027	0.0035
F8100051S0062SS	4.07E-02	<4.07E-02		0.0008	4.07E-02	<4.07E-02		0.0032	0.004
F8100051S0063SS	4.80E-02	<4.80E-02		0.0009	6.55E-02	<6.55E-02		0.0052	0.0061
F8100051S0064SS	5.61E-02	<5.61E-02		0.0011	5.57E-02	<5.57E-02	5.15E-02	0.0044	0.0055
F8100051S0065SS	4.21E-02	<4.21E-02		0.0008	3.45E-02	<3.45E-02		0.0027	0.0035
F8100051S0066SS	6.29E-02	<6.29E-02		0.0012	4.21E-02	<4.21E-02		0.0033	0.0045
F8100051S0067SS	4.83E-02	<4.83E-02		0.0009	5.03E-02	<5.03E-02		0.004	0.0049

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	5.16E-02	6.36E-02	0.001	0.0051	0.006
Median	4.44E-02	4.58E-02	0.0008	0.0036	0.0045
Standard Deviation	4.54E-02	1.01E-01	0.0009	0.008	0.0089
Cs137 Activity Range (pCi/g)	2.47E-02 to 4.03E-01				
Co60 Activity Range (pCi/g)	2.42E-02 to 7.71E-01				
Cs137 Unity Range	0.0005 to 0.0077				
Co60 Unity Range	0.0019 to 0.0612				
Total Unity Range	0.0027 to 0.0688				
Sample Count	67				

Survey Unit Data Assessment:

The survey design required 67 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):	67	
Median (Unity):	0.004	
Mean (Unity):	0.006	
Direct Measurement Std Deviation (Unity):	0.009	
Maximum (Unity):	0.069	
Sign Test Final N Value:	67	
S+ Value:	67	
Critical Value:	40	
Sufficient Samples Collected:	Yes	
Maximum Value < Unitized DCGL:	Yes	
Median Value < Unitized DCGL:	Yes	
Mean Value < Unitized DCGL:	Yes	
Maximum Value < DCGL_{emc} (Unity):	N/A	Class 3
Standard Deviation <= Sigma:	Yes	All Values <0.5 DCGL
Pass the Sign Test?	Yes	
Reject the Null Hypothesis?	Yes	
Does the Survey Unit Pass All Criteria?	Yes	Survey Unit Passes

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, 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.

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 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 F8100051 meets the release criteria of 10CFR20.1402.

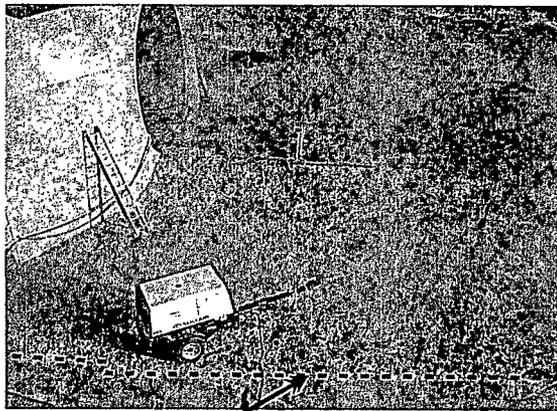
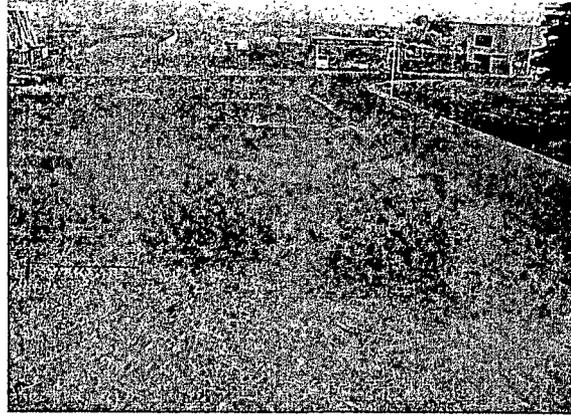
Attachment 1

Maps

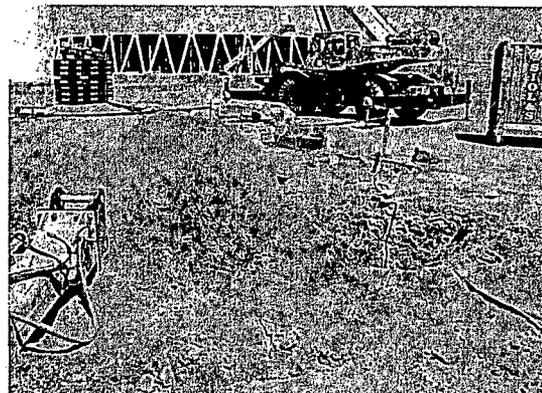
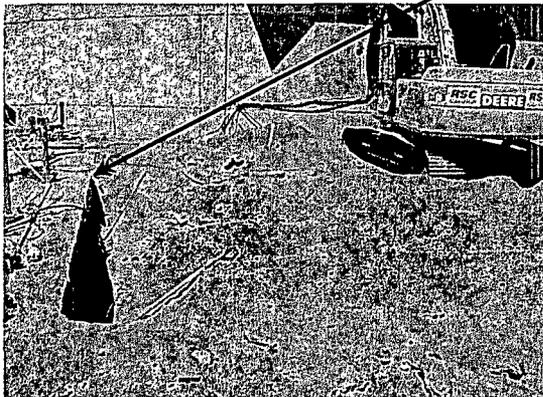
June 4, 2008

Survey Unit F8100051

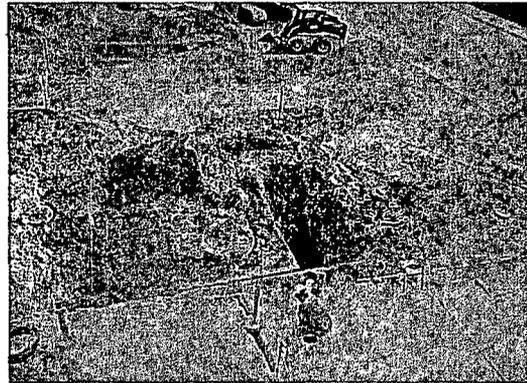
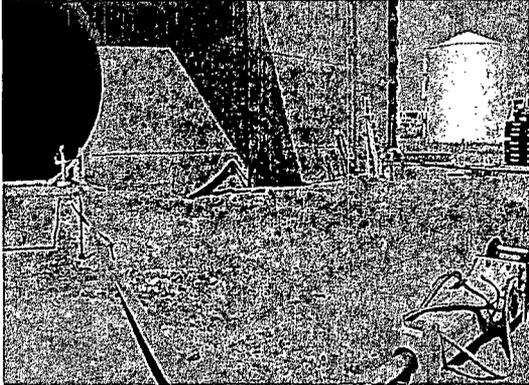
F8100051 Trench 1 Eastern Portion Original condition



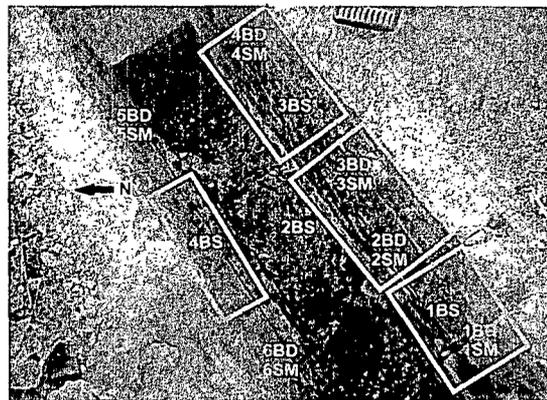
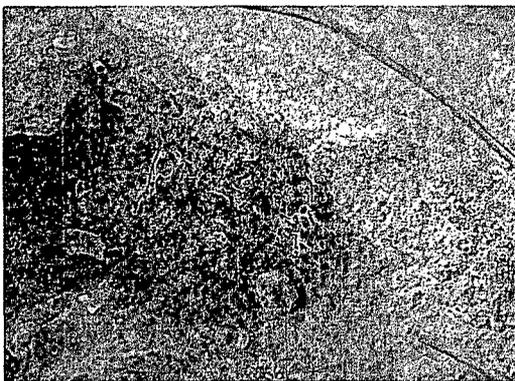
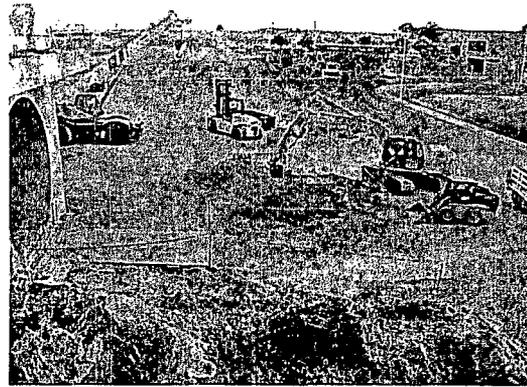
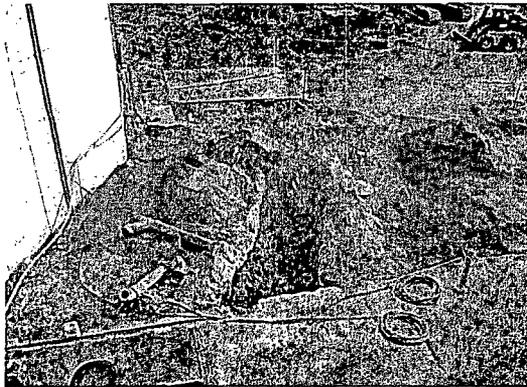
Edge of Solidification Pad



F8100051 Trench 1 Eastern Portion

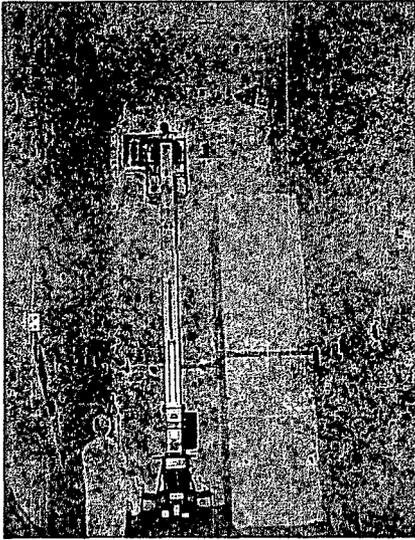


Obtaining soil samples

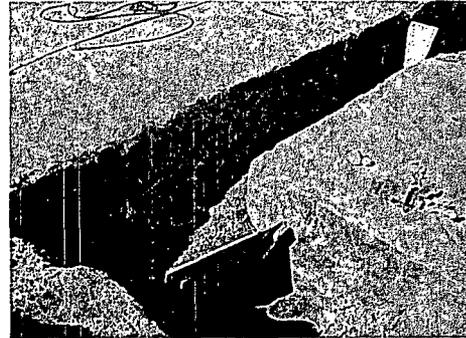


Survey of concrete surface prior to grouting penetrations into Pump Alley

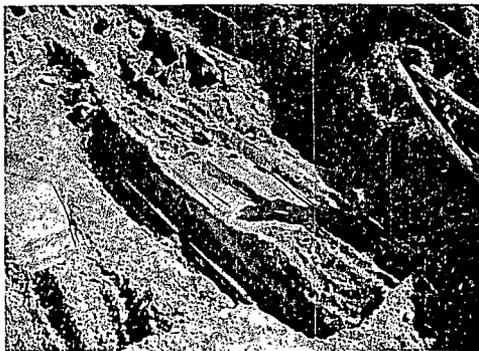
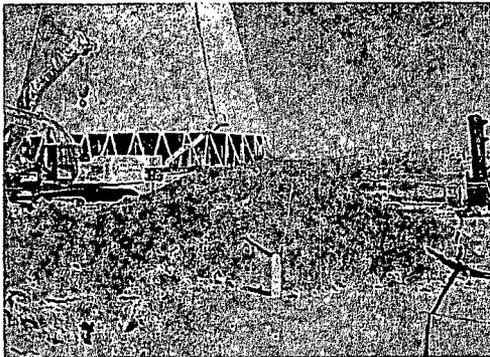
F8100051 Trench 1 Eastern Portion



Survey of penetrations
from Pump Alley

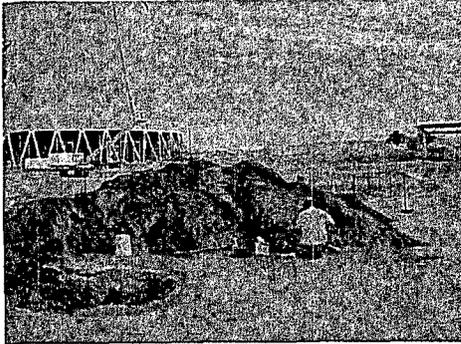


Grouting of penetrations
into Pump Alley

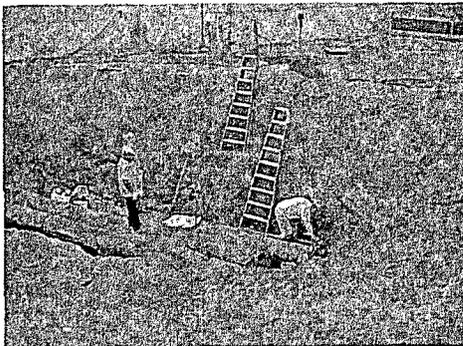


Soil sample locations on spoils pile

F8100051 Trench 1 Eastern Portion



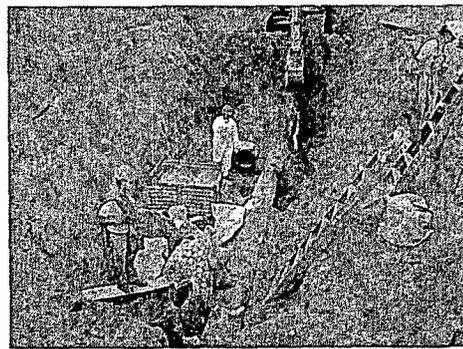
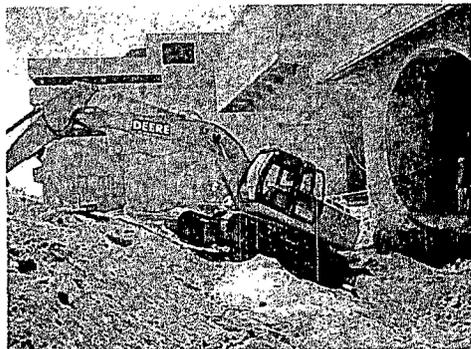
Obtaining soil samples



Surveying and securing pipe ends

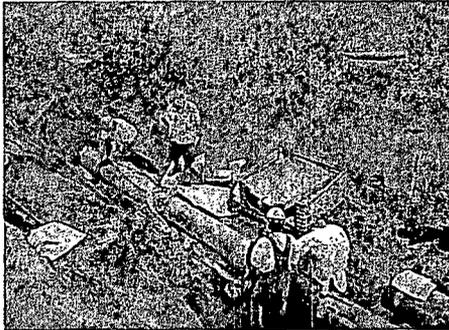


Preparing for another cut

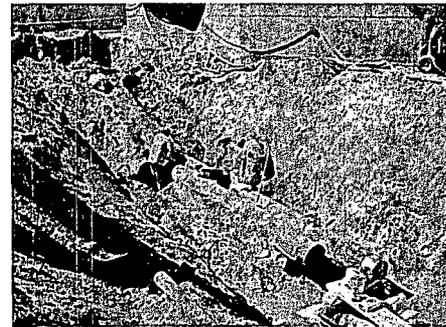


Preparing a section of pipe for removal

F8100051 Trench 1 Eastern Portion



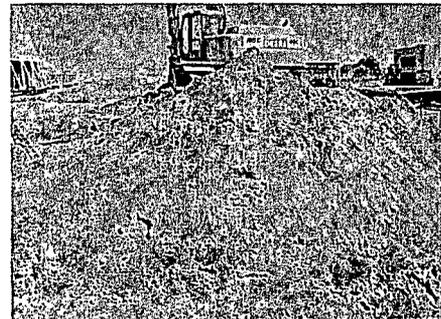
Ends of the pipes are secured and the ground below the drip pan is sampled



Much of the soil removal is accomplished by hand due to the proximity of the pipes.



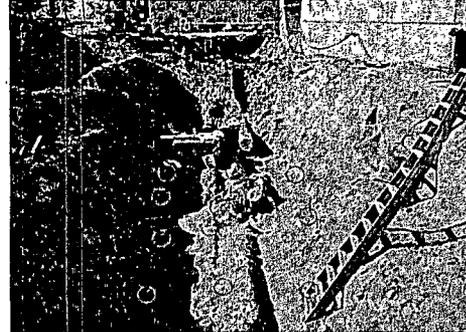
Cutting the pipe section requires capture of the lubricant and shavings into a lined drip pan.



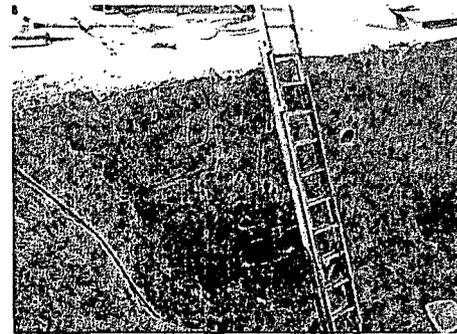
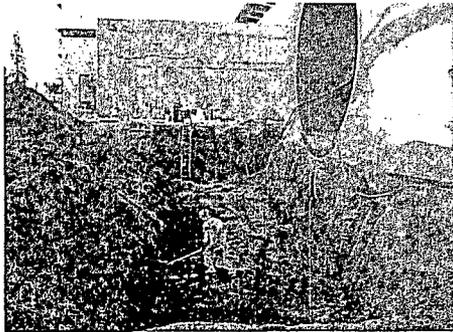
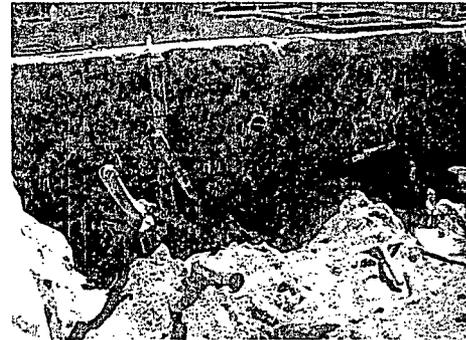
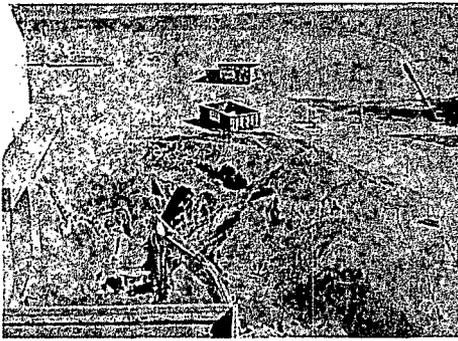
F8100051 Trench 1 Eastern Portion



Removal of abandoned
water lines

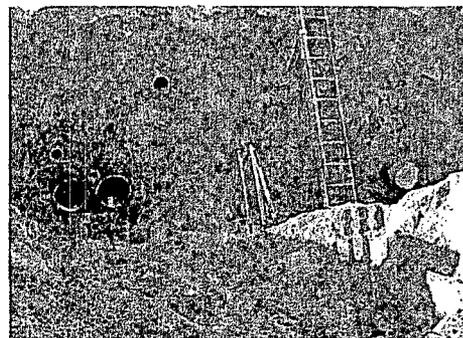
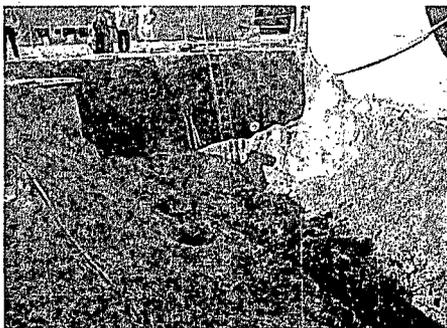
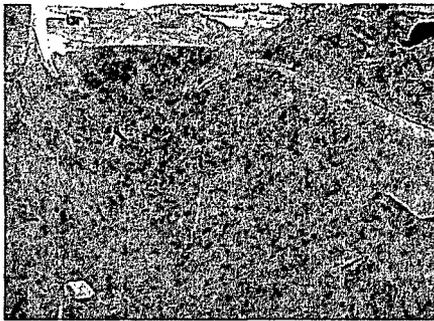
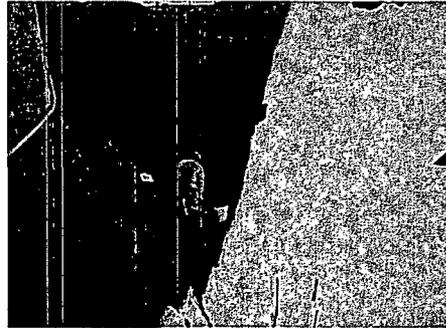
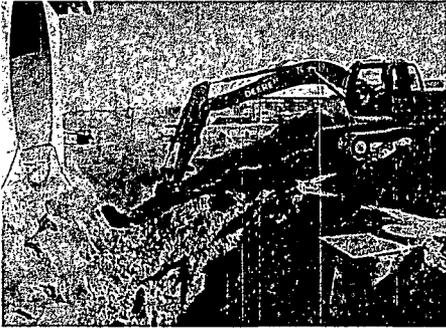


Gamma scan areas and soil sample
marked with flags (noted with circle)

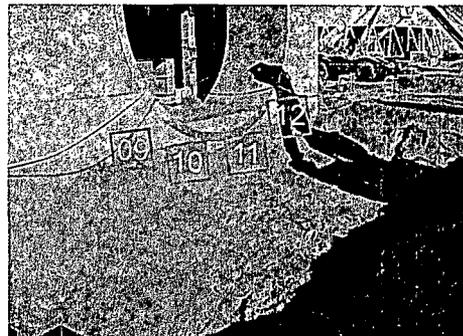
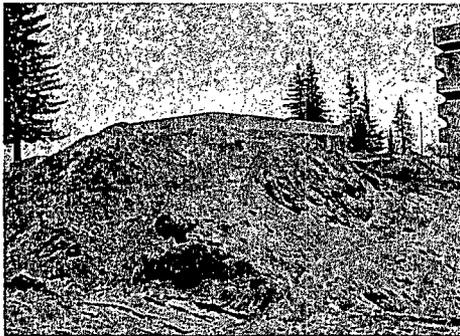
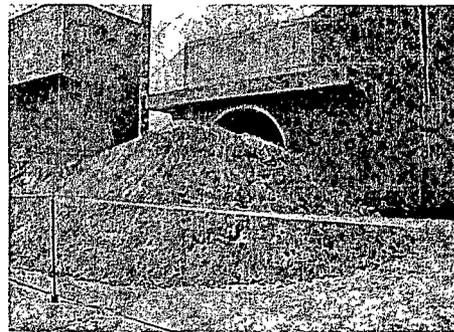
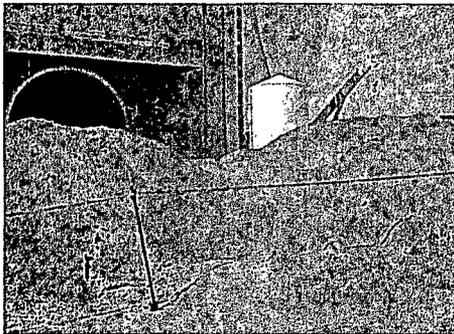
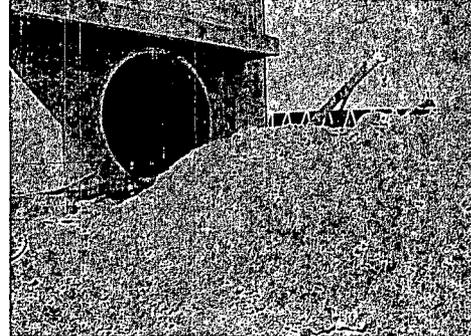
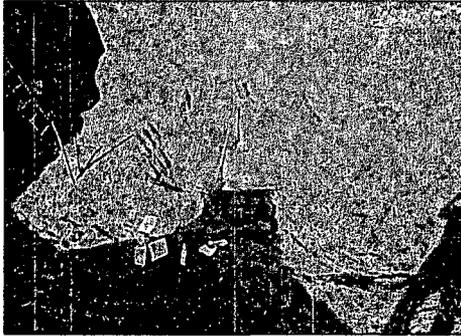


Beta scans on Solidification Pad wall
looking south

F8100051 Trench 1 Eastern Portion

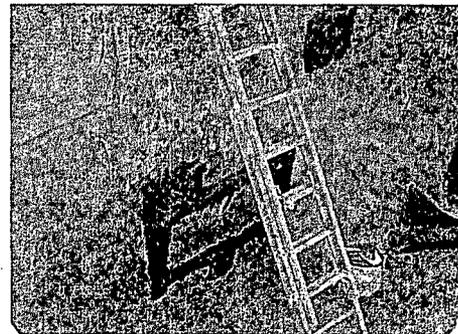
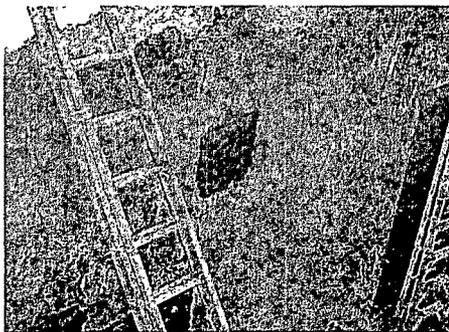
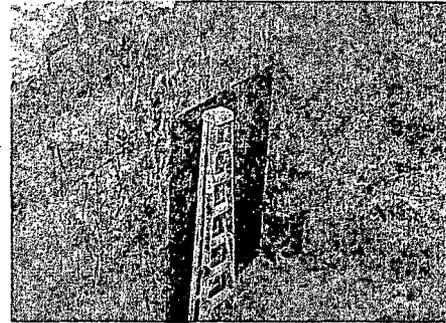
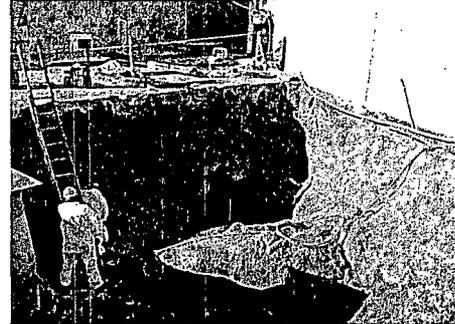
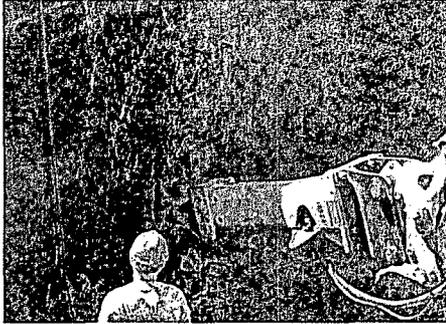


F8100051 Trench 1 Eastern Portion

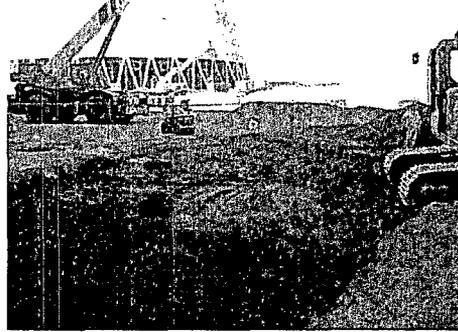
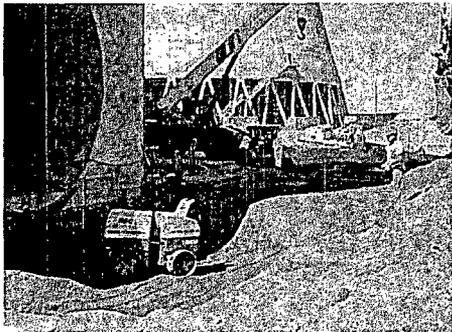
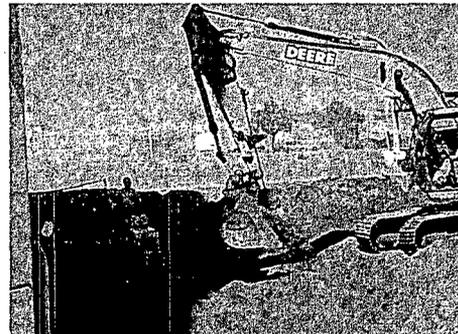
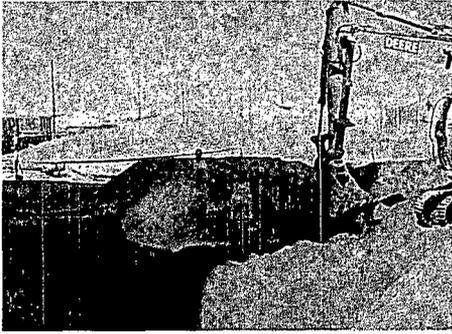


Beta scans below the RX Bldg
Equipment Hatch

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F8100051 Trench 1 Eastern Portion



The open trench was backfilled and the soil compacted in preparation for the removal of the internal concrete of the reactor building.

After the completion of the reactor building concrete/polar crane removal the area will be resurveyed as part of the tank farm land survey.

Attachment 2

Instrumentation

June 4, 2008

Survey Unit F8100051

Table 2-1. Survey Unit Instrumentation

Instrument	Detector Model No.	Detector Serial No.	MDC
HPGe	GC2820	9987008	Soil – 0.3 pCi/g Cs-137
HPGe	GC3020	05047773	Soil – 0.3 pCi/g Cs-137
Tennelec	N/A	0401171	6 dpm α , 12 dpm β
2350-1, 180738	43-68B	148633	433 dpm/100cm ² Static, 1033 dpm/100cm ² Scan
2350-1, 193700	43-68B	190294	433 dpm/100cm ² Static, 1033 dpm/100cm ² Scan
2350-1, 203481	43-68B	148629	433 dpm/100cm ² Static, 1033 dpm/100cm ² Scan
2350-1, 193700	SPA-3	404397	5.2 pCi/g Scan
2350-1, 203482	44-10	211672	5.2 pCi/g Scan
2350-1, 142509	44-159	238370	5250 dpm/100cm ² Static

Table 2-2. Investigation Criteria and DCGL

Instrument	Parameter	Value
HPGe	Investigation Criteria	Soil – 25.6 pCi/g Cs-137 Soil – 6.3 pCi/g Co-60
43-68B	Investigation Criteria	2910 cpm Scan, 4150 cpm Static
SPA-3/44-10	Investigation Criteria	10443 cpm Scan
44-159	Investigation Criteria	1200 cpm Scan
All	DCGL _w	52.6 Cs-137 12.6 Co-60
All	DCGL _{EMC}	Design DCGL _{EMC} from Table 1 of FSS Summary Report or from DQA Evaluation Summary

Attachment 3

Investigation

June 4, 2008

Survey Unit F8100051

(none required)

Attachment 4

Data Assessment

June 4, 2008

Survey Unit F8100051

