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Post-Remedial Action Report for the Water Boiler Reactor Site

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POST-REMEDIAL ACTION REPORT FOR THE WATER BOILER REACTOR SITE

by

Gilbert M. Montoya

Abstract

The TA-2 Water Boiler Reactor Decommissioning Project decontaminated and decommissioned the Water Boiler Reactor, TA-2-1-122, at Los Alamos National Laboratory in Los Alamos, New Mexico, to provide reusable space at the TA-2 site and to eliminate the hazard of accidental intrusion into a contaminated structure. This report documents the radiological condition of the site after the decommissioning and decontamination between June 1989 and April 1990.

1.0 INTRODUCTION

1.1 Purpose

This report documents the radiological condition of the Water Boiler Reactor site, TA-2-1-122, at Los Alamos National Laboratory in Los Alamos, New Mexico, following decommissioning and decontamination (D&D). The D&D was done by the Laboratory with Pan Am World Services from June 1989 to April 1990. The work was performed under the Surplus Facilities Management Program (SFMP), a program of the US Department of Energy (DOE) that provides for the safe caretaking (surveillance and maintenance) and disposition (decommissioning) of retired, DOE-sponsored nuclear facilities that supported energy research and the development of nuclear power. The Laboratory is the Project Management Contractor for DOE and represents DOE in planning, managing, and implementing SFMP projects.

1.2 Location and Description

Figure 1 shows the location of TA-2-1-122. Figure 2 shows the layout of Building 1. TA-2 is isolated from the rest of the Laboratory because of its location in Los Alamos Canyon. No direct access to the site from other technical areas is available except by the Los Alamos Canyon Road.

D&D work was done in Room 122, excluding the northern section where experimental equipment is used. The other rooms are office space, laboratory space, and the Omega West Reactor (OWR) area.

Room 122 is in the east end of Building 1, which housed the Water Boiler, an enriched-uranium (89%) homogeneous reactor. The reactor operated from 1944 until 1974, when the uranyl nitrate fuel was removed. The reactor vessel and its associated recombiner and plumbing were contained in a 5 m x 5 m x 4 m high concrete, graphite-lined biological shield. The reactor and its biological shield and control room were housed in a frame building approximately 18 m x 28 m x 8 m.

The reactor consisted of a 1-ft diameter stainless steel sphere that was filled with a water solution of uranyl nitrate and surrounded with a graphite neutron reflector. Other major components included two thermal columns, various shielding materials, experimental access ports, and a gas recombination system.[1]

Although the Los Alamos Water Boiler was the first reactor of its general type, its main function was to provide Laboratory personnel with an intense source of neutrons. Various samples were introduced into irradiation ports for analysis; therefore, over the years, different solutions of various isotopes and activities were spilled onto the floor surface in numerous locations. The locations were identified after the asbestos floor tile was removed.

Removal of external structures and underground piping associated with the gaseous effluent (stack) line from the TA-2 Water Boiler Reactor was performed in 1986 as Phase I of reactor decommissioning. Six concrete structures were dismantled, and 435 ft of contaminated underground piping was removed. Extensive soil contamination by Cs-137 was encountered.[2]

2.0 REMEDIAL ACTION GUIDELINES

The upper-limit soil concentration guides are developed to ensure conformance with the requirement that no member of the operating group (INC-5 Research Reactor Group) receives more than 100 mrem/y total effective dose commitment above background because of exposure to residual contamination. Every effort was made to ensure that actual doses to the room occupants were as far below the basic limit as is reasonably achievable. As low as reasonably achievable (ALARA) is a policy of reducing personnel radiation exposures to the lowest levels commensurate with sound economics and operating practices. The Environmental Surveillance Group, HSE-8, has developed appropriate guidelines based on scenarios suggested by SFMP in *A Manual for Implementing Residual Radioactive Material Guidelines* (January 1988).

The guidelines for upper-limit concentration were used in the Water Boiler Project as follows.

2.1 Surface Contamination Criteria

Analysis of concrete and soil samples by the Health and Environmental Chemistry Group, HSE-9, determined that 75% of surface contamination at the Water Boiler Project can be attributed to Cs-137, which would have an average allowable total surface contamination of 5000 dpm/100 cm^2 (total, average); 15,000 dpm/100 cm^2 (total, maximum); and 1000 dpm/100 cm^2 (removable). See Appendix F in the SFMP Resource Manual.[3] The remaining 25% can be attributed to additional radionuclides identified, which include Eu-152 Co-60, and Sr-90. Because Sr-90 guidelines are more stringent than Cs-137 guidelines (Table IA), the 75%:25% ratio was taken into consideration. Thus, the guidelines to be used for all surfaces inside Room 122 are as follows: 2500 dpm/100 cm^2 (total, average); 7,500 dpm/100 cm^2 (total, maximum); and 500 dpm/100 cm^2 (removable). The Laboratory's Health and Environmental Chemistry Group, HSE-9, provided and maintains information used to support the derived values, e.g., gamma spectroscopy and Sr-90 results.

2.2 Soil Contamination

Based on field surveys, Cs-137 is the predominant radionuclide in the soil; thus, the cleanup criteria for soil exposed beneath the slab inside Room 122 and east of the reactor room were developed primarily for this radionuclide, although Eu-152 and Sr-90 were also

present. The code for residual radioactive material guidelines (RESRAD) yielded cleanup guides assuming no cover on the contaminated area.[4] Attenuation of direct gamma photons by a new four-inch poured concrete floor would increase Table IA guidelines even more. The survey team from Oak Ridge Associated Universities (ORAU) also identified Eu-152 and Sr-90 in soil samples collected during the final independent verification survey. The RESRAD code was prepared to reflect all radionuclides identified. (See also L. Soholt "Plan For Environmental Sampling, Removal of Contaminated Soil Associated with the Water Boiler Reactor, TA-2, Los Alamos National Laboratory, Los Alamos, New Mexico.") Table IB includes data for all radionuclides that were identified as being present inside Room 122.

3.0 REMEDIAL ACTION

After the determination that the Water Boiler Reactor should be decommissioned and decontaminated, the reactor was designated for remedial action. Because the Water Boiler Reactor was known to be contaminated with radioactive materials because of program activities by the Office of Nuclear Energy (NE), the facility was accepted into the SFMP.[5] Radiological surveys determined that Room 122 had isolated areas that would require remedial action. Surface contamination was heavy on the floor surface where the biological shield was removed, an area of approximately 250 ft^2. The soil in one area, the utility trench (sand trap), was found to be contaminated with Cs-137 in concentrations greater than 850 pCi/g. Furthermore, a utility trench inside Room 122 was found to contain many lead plates and required the removal of approximately 2 m^3 of soil. Figure 3 shows the location of these areas inside Room 122.

3.1 Remedial Action Activities

Remedial action consisted of removing radioactive contamination. Three types of remedial action were done at the Water Boiler Reactor.

The first was decontaminating the floor surfaces having removable contamination where the biological shield was removed. The floor surfaces were vacuumed with a high-efficiency filter or cleaned with a wet cloth.

The second was decontaminating floor surfaces having fixed contamination by scabbling and jackhammering the areas of contamination. In some places, the concrete was saw-cut along all joints or cracks to remove all residual contamination.

The third involved removing contaminated soil with a shovel at various locations, including the reactor pit; sand trap; utility tunnel, which was also contaminated with lead residual; and various other locations throughout the biological shield area.

Waste from all these remedial action activities was placed in 55-gal. steel drums for disposal or proper storage. All the water generated from the remedial action activities was placed in an approved 250-gal. tank and transported to the liquid waste treatment plant, TA-50-1, for treatment.

3.2 Contamination Control During Remedial Action

During remedial action operations, measures were taken to prevent the spread of contamination and to control exposure rates of the workers. Measures were taken to monitor airborne radioactivity resulting primarily from the dust and to limit personnel exposure from carbon monoxide exhaust gases from various pieces of engine-driven equipment.

The following contamination control measures were implemented during remedial action at the Water Boiler Reactor.

- All scabbling and jackhammering activities used water to keep the dust down. Plastic on the walls and ceiling protected the room from the dust created during concrete removal. A portable high-efficiency filter system was used to exhaust the room.

- All personnel wore respiratory protection when working around an operation that could produce contaminated dust or harmful exhaust gases.

- The room was isolated from the rest of the building by a partition of sheets of plastic and wood.

- A controlled area was established outside the east entrance to Room 122. This controlled area was the access and egress area from the contaminated zone, where all personnel and equipment leaving the area were checked for contamination.

Air was sampled in the room to ensure the success of these measures to control contamination.

4.0 POST-REMEDIAL ACTION MEASUREMENTS

After decommissioning and decontamination were completed, the Radiation Protection Group, HSE-1, did the final surveys of Room 122. Survey result Drawings 1-7 are included as Appendix A.

The quantity of surface contamination left on the walls and ceiling in Room 122 is well below the residual activity guidelines based on the Sr-90:Cs-137 activity ratio of 25:75.

After remedial action activities were completed, most of the floor, walls, ceiling, and crane structure were below residual activity guidelines. The highest floor reading was taken from grid 53. The average maximum beta/gamma fixed-activity reading in this area was 261K dpm/100 cm^2. Because the entire floor area was capped with four inches of concrete after completion of floor restoration and any residual radioactivity was entombed, the Water Boiler Project Management Team has concluded that the concrete will provide adequate protection, giving due consideration to health and safety, the environment, and costs. Therefore, a request for supplemental limits or an exception is not considered appropriate in this case.

The Radiation Protection Group, HSE-1, surveyed grid 53 to determine what the average maximum beta/gamma fixed-activity reading was after the concrete pour. The average of five readings was 418 dpm/100 cm^2. The Radiation Protection Group performs a weekly instrumentation survey of the TA-2 facility, looking for area readings exceeding 0.1 mrem/h. A monthly swipe survey is also performed throughout the site, including Room 122.

Three surveys were performed after post-remedial action activities were completed: a fixed contamination survey, a removable contamination survey, and a soil sampling survey.

4.1 Fixed-Contamination Survey

A 1-m^2 grid was used on surfaces most likely to contain the highest levels of contamination, the floor and utility tunnels. Readings were taken at the center and at four other points midway between the center and the corners of a grid block.

A 1-m^2 grid was used on the walls up to a height of 2 meters. Readings were taken at the center of each grid block.[6]

Table II shows the results of the portable instrument survey for fixed contamination. The maximum beta/gamma fixed- activity reading in Room 122 was on the east steel support beam used for the overhead bridge crane, which, after paint removal and sanding, read approximately 900K dpm/probe area, which corresponds to 5,850,000 dpm/100 cm^2. Although the contamination in this area (Drawing 7) is fixed and remote (7 meters above floor grade), there is a remote possibility that room occupants would come in contact with this area. To ensure that no contact occurs, a four-in. square 1/4-in. steel plate was welded over the source to entomb and eliminate the fixed direct reading. The crane railings will be removed soon to eliminate the source of fixed contamination.

Personnel used an Eberline ESP-1 with HP-260 pancake GM probe for beta/gamma (15 cm^2 probe area). The minimum detectable activity counting one minute with the ESP-1 is approximately 380 dpm/100 cm^2, assuming that activity 20% above background can be detected.

4.2 Swipe Survey (Removable Contamination Survey)

Samples for removable contamination were taken using the same methodology outlined in "Fixed Contamination Survey," above.

Table III shows the swipe survey results, which include swipes of the floor, walls, utility tunnels, bridge crane, lamps, windows, and remaining electrical equipment.

The highest swipable beta/gamma activity in Room 122 was 207 dpm/100 cm^2, below the limit of 500 dpm/100 cm^2. The swipe survey for removable activity was conducted by a standard dry Nucon smear over an area of 100 cm^2 or greater. Swipe samples were subjected to gross alpha/gross beta-gamma analysis at the Los Alamos Health Physics Analysis Laboratory (HPAL).

Spectrographic analyses of selected swipe samples from Room 122 have shown Cs-137 to be the predominant fission product remaining. Other radionuclides identified are Eu-152, Sr-90, and Co-60.

4.3 Soil Sample Survey

Soil samples were taken from a grid laid out on the floor at 2-m intervals (Fig. 3). Samples from each exposed trench wall were taken at the same interval. The characterization of residual Cs-137 and final cleanup required about 21 samples inside Room 122. Table IV contains the results of the soil sample analysis. Concentration of Cs-137 was determined by a NaI deep-well counter configured to count the appropriate part of the gamma spectrum. Three samples were collected from the excavated material to determine whether hazardous substances regulated under the Resource Conservation and Recovery Act (RCRA) were present. These samples were submitted to the Health and Environmental Chemistry Group, HSE-9, for analysis by methods approved by the

Environmental Protection Agency. Analysis showed that no hazardous substances were present in the soil once remediation had been completed.

5.0 POST-REMEDIAL ACTION STATUS

Measurements taken after removing radioactive materials indicated that no accessible areas of concern exist. (See also Section 4.0.) Under the Radiological Site Assessment Program, ORAU independently assessed the remedial action done at the Water Boiler Reactor. Table V identifies all "hot spots" located by the Laboratory.

After reviewing the data collected, the Laboratory determined that the Water Boiler Reactor Room conforms to the applicable derived guidelines established for release of this site to Laboratory groups for light laboratory usage. TA-2 will remain as a restricted site under the control of the Isotope and Nuclear Chemistry Division, which currently occupies the site.

All remedial action was completed by April 1990. The action produced 73 30-gal. drums of low-level radioactive waste; and 18 55-gal. barrels of mixed waste, contaminated lead (35 m^3) were stored in a secured area pending permanent disposal. The action generated 173 m^3 of low-level solid waste, which was treated as outlined in AR 10-1 and 10-3 in the Laboratory's Health and Safety Manual.[7]

REFERENCES

1. G. M. Montoya, "TA-2 Water Boiler Reactor Decommissioning Project Management Plan," DAD-HSE-7-PMP-02, R00.

2. J. C. Elder and C. L. Knoell, "TA-2 Water Boiler Reactor Decommissioning (Phase I)," Los Alamos National Laboratory report LA-10890-MS (December 1986).

3. United States Department of Energy, *Resource Manual Surplus Facilities Management Program*, April 1989.

4. L. F. Soholt, "Plan For Environmental Sampling Excavation of Soils Beneath The Water Boiler Reactor, TA-2," December 22, 1989.

5. United States Department of Energy, *Resource Manual Surplus Facilities Management Program, Appendix F, Guidelines For Residual Radioactive Material At FUSRAP And SFMP Sites*, April 1989.

6. G. M. Montoya, "Radiological Survey Plan For Surface Contamination at the Water Boiler Reactor (Room 122)," July 21, 1989.

7. Los Alamos National Laboratory, *Environment, Health, and Safety Manual*, October 1989.

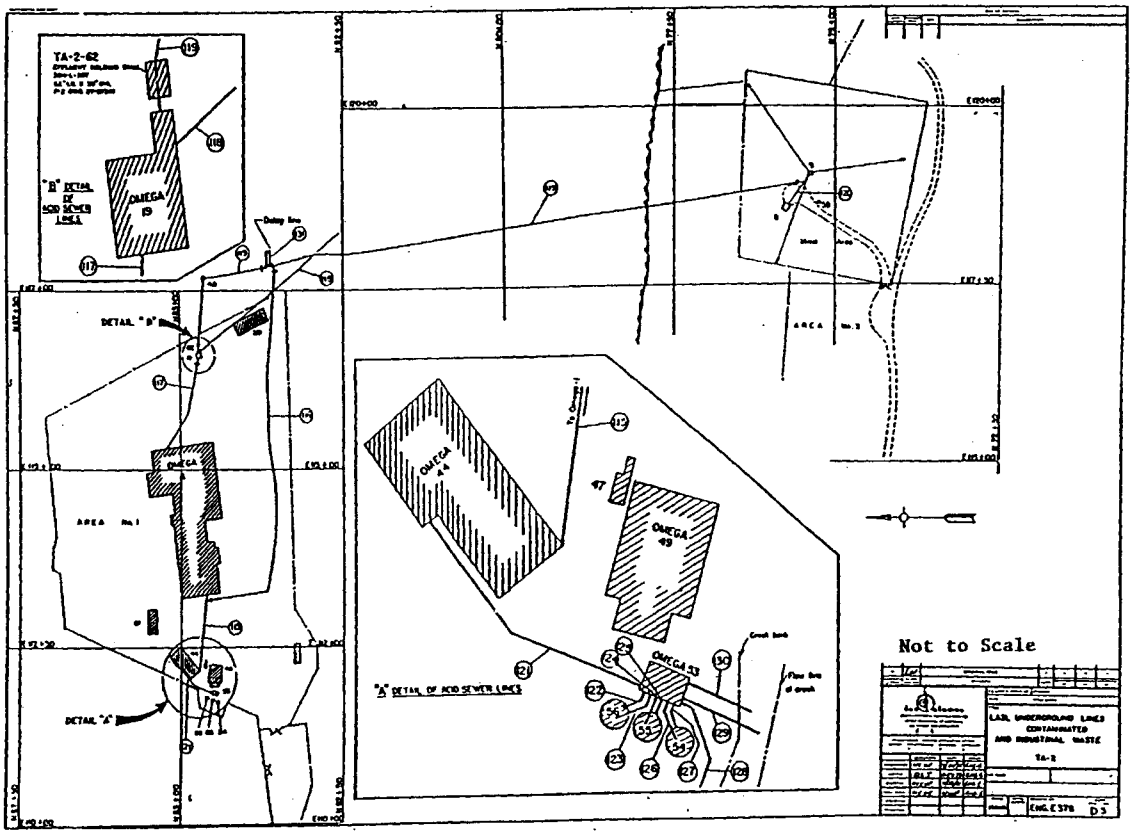
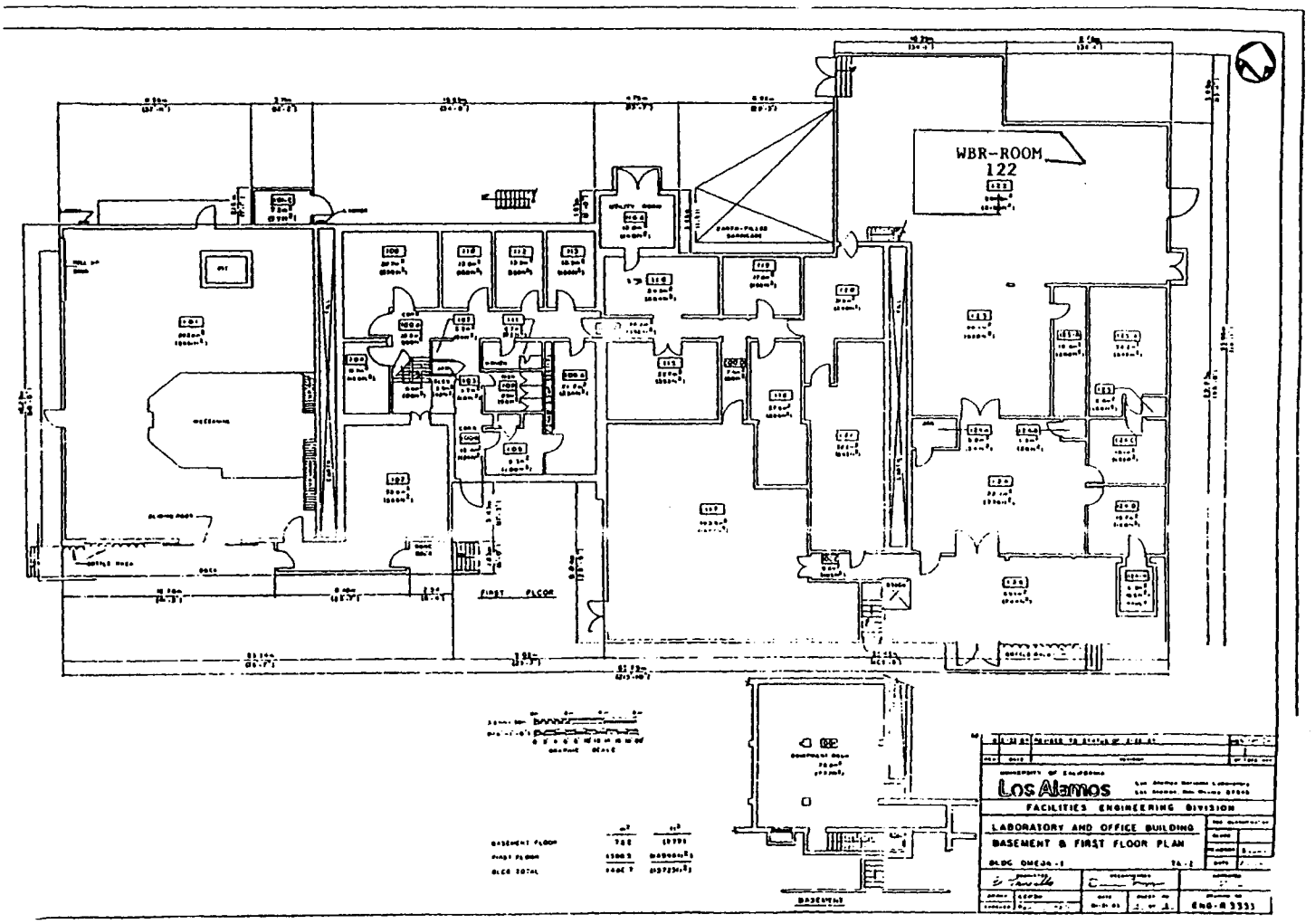


Figure 1. Site Plan of TA-2 Showing Relationship of Building 1 with Other Buildings at the Site.


WBR-ROOM
122
FIRST FLOOR
BASEMENT
Los Alamos
FACILITIES ENGINEERING DIVISION
LABORATORY AND OFFICE BUILDING
BASEMENT & FIRST FLOOR PLAN

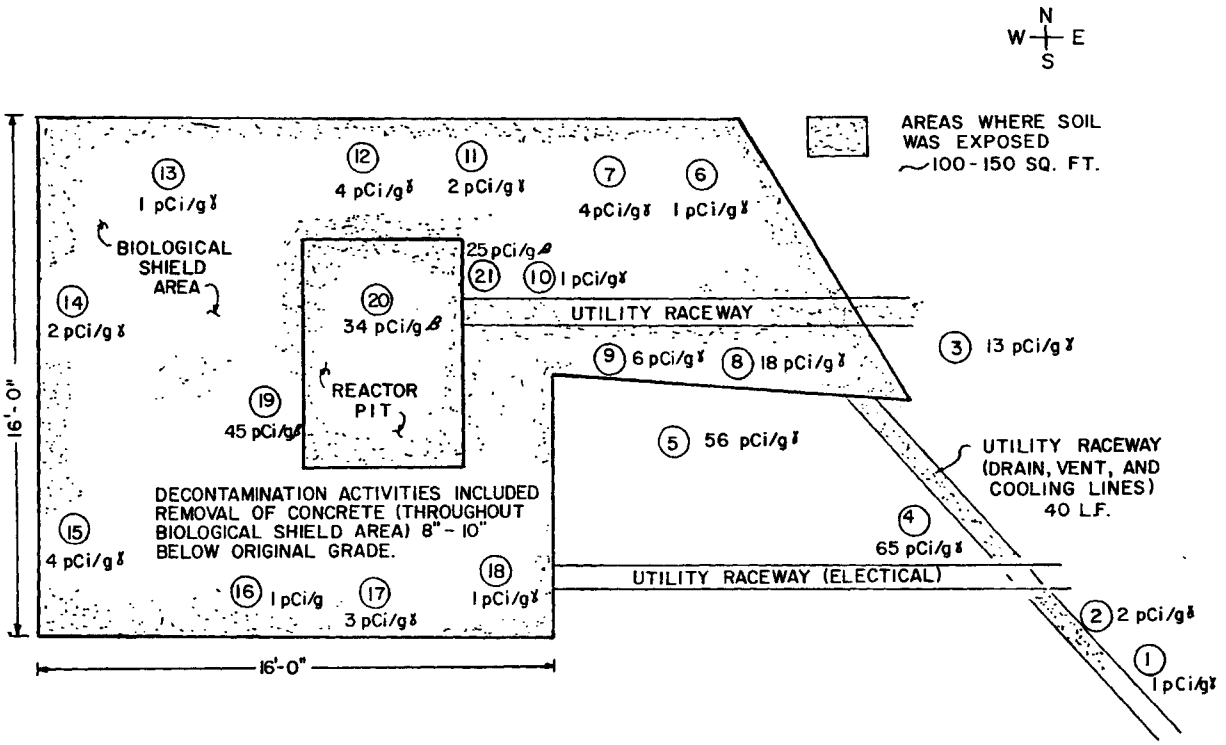


Figure 3. Floor Plan Showing Areas in which Remedial Action Activities Occurred and Final Results. (See Figure 1 for location of biological shield.)

NOT TO SCALE

Table IA. Surface Contamination Guidelines.

	Allowable total residual surface contamination (dpm/100 cm^2)[a]		
Radionuclides[b]	**Average**[c,d]	**Maximum**[d,e]	**Removable**[d,f]
TRU, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	100	300	20
Th-natural, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{131}I, ^{133}I	1000	3000	200
U-natural, ^{235}U, ^{238}U, and associated decay products	5000 alpha	15000 alpha	1000 alpha
beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and others noted above	5000 beta-gamma	15000 beta-gamma	1000 beta-gamma

[a]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with instrumentation.

[b]When surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[c]Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

[d]The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

[e]The maximum contamination level applies to an area of not more than 100 cm^2.

[f]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area, and the entire surface should be wiped. The numbers in this column are maximum amounts.

Table IB. Soil Concentration Guidelines (pCi/g above Background) Based upon a Radiation Standard of 100 mrem/y Total Effective Dose Commitment.

Parameter	Surface	Subsurface[a]
Co-60	10	80
Cs-137	70	5000
Eu-152	30	100
Sr-90	90	1000

[a]Subsurface soils are considered to be below the first 0.15 m.

Table II. Fixed Contamination Survey (Floor)			
Grid Number	Beta-Gamma Activity (dpm/100 cm^2)		
(1-Meter)	Average	Maximum	Minimum
1	394	416	380
2	432	516	380
3	378	702	380
4	465	490	380
5	1,526	5,525	380
6	384	1,261	380
7	520	832	380
8	12,952	50,960	1,066
9	1,934	4,862	520
10	442	663	380
11	1,258	1,742	572
12	1,214	1,950	767
13	730	884	494
14	439	728	380
15	1,313	1,612	390
16	1,167	1,391	806
17	1,145	1,352	936
18	1,794	3,978	380
19	517	910	380
20	1,334	1,885	380
21	1,201	2,015	546
22	1,417	2,262	546
23	1,422	2,236	390
24	845	1,170	380
25	559	910	380
26	1,089	2,340	650
27	1,487	1,885	1,248
28	1,212	1,924	494
29	2,044	3,068	1,040
30	1,329	1,924	741
31	1,407	1,872	884
32	1,568	1,937	1,235
33	1,183	1,864	1,469
34	1,235	1,976	1,547
35	1,352	1,924	858
36	1,014	1,586	494
37	1,108	2,678	380
38	1,737	2,756	858
39	1,321	1,937	884
40	2,178	2,340	1,820
41	2,945	4,030	2,054
42	2,496	4,199	1,508
43	1,141	1,638	663
44	1,100	2,335	380
45	1,235	1,820	416
46	1,758	2,782	520

Table II. Fixed Contamination Survey (Floor) (Cont.)

Grid Number	Beta-Gamma Activity (dpm/100 cm^2)		
(1-Meter)	Average	Maximum	Minimum
47	894	1,586	416
48	1,171	1,807	819
49	SOIL	SOIL	SOIL
50	1,728	1,794	1,161
51	1,180	1,898	494
52	1,321	2,067	494
53	1,347	2,366	585
54	668	1,092	380
55	944	1,586	572
56	1,352	1,950	1,014
57	SOIL	SOIL	SOIL
58	SOIL	SOIL	SOIL
59	1,085	1,508	663
60	1,352	1,924	728
61	1,511	2,054	1,196
62	884	1,937	416
63	785	1,508	380
64	3,507	6,916	1,118
65	1,674	2,041	1,391
66	2,177	2,925	1,430
67	4,550	4,550	4,550
68	1,698	3,185	380
69	3,078	8,164	6,024
70	3,034	8,164	6,024
71	975	1,313	380
72	660	1,092	380
73	5,047	1,870	380
74	874	1,079	689
75	1,225	1,507	1,001
76	2,305	4,173	1,079
77	964	2,132	380
78	411	1,040	380
79	554	1,391	380
80	1,329	3,484	507
81	1,089	2,509	637
82	1,321	2,522	380
83	907	2,288	380
84	915	1,404	546
85	1,269	1,794	416
86	426	1,365	380
87	754	1,391	380
88	996	1,664	637
89	694	1,365	380
90	991	1,768	819
91	1,014	1,456	380

Table II. Fixed Contamination Survey (Floor) (Cont.)

Grid Number (1-Meter)	Beta-Gamma Activity (dpm/100 cm^2) Average	Maximum	Minimum
92	736	1,014	598
93	767	1,534	380
94	5,486	9,139	1,352
95	1,076	2,158	380
96	399	767	380
97	850	1,521	380
98	2,249	3,159	1,040
99	1,394	1,482	442
100	538	1,898	380
101	629	1,300	380
102	383	1,196	380
103	2,647	4,667	1,196
104	892	2,067	380
105	407	520	380
106	876	1,781	380
107	1,399	2,262	767
108	2,553	8,164	390
109	884	793	380
110	1,069	2,054	380
111	435	936	380
112	408	910	380
113	384	858	380
114	427	521	380
115	681	1,261	380
116	842	1,508	380
117	1,206	2,652	380
118	772	1,365	380
119	1,082	2,639	380
120	697	1,586	380
121	1,084	1,885	380
122	1,118	1,664	559
123	460	1,573	380
124	824	1,287	559
125	837	1,807	380
126	499	1,027	380
127	384	533	380
128	827	1,664	380
129	1,521	3,536	380
130	2,015	6,513	380
131	2,291	7,605	767
132	1,739	2,873	936
133	1,089	1,664	507
134	1,667	3,458	416
135	1,115	3,107	380
136	848	1,794	380

Table II. Fixed Contamination Survey (Floor) (Cont.)

Grid Number (1-Meter)	Beta-Gamma Activity (dpm/100 cm^2) Average	Maximum	Minimum
137	1,264	1,989	380
138	1,258	2,470	380
139	533	1,027	380
140	446	871	380
141	1,339	2,821	559
142	952	1,521	380
143	484	1,287	380
144	848	1,807	380
145	463	1,118	380
146	733	1,092	507
147	887	1,833	507
148	447	767	380
149	465	611	380
150	435	611	380
151	471	1,378	380
152	478	585	380
153	798	1,092	390
154	420	598	380
155	407	490	380
156	460	793	380
157	494	598	380
158	394	793	380
159	590	1,339	380
160	447	663	380
161	408	546	380
162	452	498	380
163	386	416	380
164	447	599	380
165	572	871	380
166	385	456	380
167	381	585	380
168	434	438	380
169	503	663	380
170	481	598	380

Table II. Fixed Contamination Survey (East Wall)

Grid Number	Beta-Gamma Activity ($dpm/100\ cm^2$)		
(2-Meter)	Average	Maximum	Minimum
171		380	
172		380	
173		380	
174		380	
175		380	
176		380	
177		380	
178		380	
179		380	
180		380	
181		380	
182		380	
183		380	
184		380	

Table II. Fixed Contamination Survey (South Wall)

Grid Number (2-Meter)	Beta-Gamma Activity (dpm/100 cm^2) Average	Maximum	Minimum
185		390	
186		380	
187		380	
188		380	
189		380	
190		380	
191		1,196	
192		380	
193		380	
194		380	
195		380	
196		380	
197		380	
198		380	
199		380	
200		380	
201		380	
202		380	
203		380	
204		380	
205		380	
206		380	
207		380	
208		380	
209		380	
210		380	
211		380	
212		380	
213		380	
214		380	

Table II. Fixed Contamination Survey (West Wall)

Grid Number	Beta-Gamma Activity (dpm/100 cm^2)		
(2-Meter)	Average	Maximum	Minimum
215		380	
216		380	
217		380	
218		380	
219		380	
220		380	
221		380	
222		380	
223		380	
224		380	
225		380	
226		380	
227		380	
228		380	

Table II. Fixed Contamination Survey (North Wall)

Grid Number	Beta-Gamma Activity (dpm/100 cm^2)		
(2-Meter)	Average	Maximum	Minimum
229		1,436	
230		380	
231		380	
232		380	
233		380	
234		380	
235		380	
236		380	
237		380	
238		380	
239		380	
240		380	
241		380	
242		380	
243		380	
244		380	
245		380	
246		380	
247		380	
248		380	

Table II. Fixed Contamination Survey (Ceiling and Crane Structure)

Survey Location Number	Beta-Gamma Activity (dpm/100 cm^2)		
	Average	Maximum	Minimum
249		380	
250		380	
251		380	
252		380	
253		380	
254		380	
255		380	
256		380	
257		380	
258		380	
259		380	
260		380	
261		380	
262		380	
263		380	
264		380	
265		380	
266		380	
267		380	
268		380	
269		380	
270		380	
271		380	
272		380	
273		380	
274		380	
275		380	
276		380	
277		5,850,000	
278		380	
279		380	
280		12,260	
281		1,054	
282		382	
283		380	
284		380	
285		11,000	
286		580	
287		11,308	
288		380	
289		512	
290		380	
291		380	
292		3,352	
293		362	
294		436	

Table II. Fixed Contamination Survey (Ceiling and Crane Structure) (Cont.)

Survey Location Number	Beta-Gamma Activity (dpm/100 cm^2)		
	Average	Maximum	Minimum
295		4,296	
296		380	
297		5,372	
298		392	
299		406	
300		380	
301		380	
302		380	
303		380	

Table III. Pu, U, and Other Data Sheet

TA: 2
Building: 1
Room: 122
Sample Date: 1-11-90
H.P.S: Veverka/Windham
Parameter: β/γ Cs-137, U-235
Analysis Date: 1-12-90
Analysis By: Jerry W. Herold

Swipe No.	Location	Alpha*	Beta*	Swipe No.	Location	Alpha*	Beta*
1	See Map	NDA	NDA	2	See Map	NDA	NDA
3	See Map	NDA	NDA	4	See Map	NDA	NDA
5	See Map	NDA	NDA	6	See Map	NDA	NDA
7	See Map	NDA	NDA	8	See Map	NDA	NDA
9	See Map	NDA	NDA	10	See Map	NDA	NDA
11	See Map	NDA	NDA	12	See Map	NDA	NDA
13	See Map	NDA	NDA	14	See Map	NDA	NDA
15	See Map	NDA	NDA	16	See Map	NDA	NDA
17	See Map	NDA	NDA	18	See Map	NDA	NDA
19	See Map	NDA	NDA	20	See Map	NDA	NDA
21	See Map	NDA	NDA	22	See Map	NDA	NDA
23	See Map	NDA	NDA	24	See Map	NDA	NDA
25	See Map	NDA	NDA	26	See Map	NDA	NDA
27	See Map	NDA	NDA	28	See Map	NDA	NDA
29	See Map	NDA	NDA	30	See Map	NDA	NDA
31	See Map	NDA	NDA	32	See Map	NDA	NDA
33	See Map	NDA	NDA	34	See Map	NDA	NDA
35	See Map	NDA	NDA	36	See Map	NDA	NDA
37	See Map	NDA	NDA	38	See Map	NDA	NDA
39	See Map	NDA	NDA	40	See Map	NDA	NDA
41	See Map	NDA	NDA	42	See Map	NDA	NDA
43	See Map	NDA	NDA	44	See Map	NDA	NDA
45	See Map	NDA	NDA	46	See Map	NDA	NDA
47	See Map	NDA	NDA	48	See Map	NDA	NDA
49	See Map	NDA	NDA	50	See Map	NDA	NDA
51	See Map	NDA	NDA	52	See Map	NDA	NDA
53	See Map	NDA	NDA	54	See Map	NDA	NDA
55	See Map	NDA	NDA	56	See Map	NDA	NDA
57	See Map	NDA	NDA	58	See Map	NDA	NDA

*d/m/100 cm.^{2}

Special Information: Post-decommisioning and decontamination of TA-2 Omega East Reactor Area. Map is drawings 1 through 7.

(NDA)—no detectable activity. NDA for alpha is considered anything at or below 16 dpm/100 cm^2. NDA for beta is anything at or below 32 dpm/100 cm^2.

Table III. Pu, U, and Other Data Sheet (Cont.)

TA: 2
Building: 1
Room: 122
Sample Date: 1-11-90
H.P.S: Veverka/Windham
Parameter: β/γ Cs-137, U-235
Analysis Date: 1-12-90
Analysis By: Jerry W. Herold

Swipe No.	Location	Alpha*	Beta*	Swipe No.	Location	Alpha*	Beta*
59	See Map	NDA	NDA	60	See Map	NDA	NDA
61	See Map	NDA	NDA	62	See Map	NDA	NDA
63	See Map	NDA	NDA	64	See Map	NDA	NDA
65	See Map	NDA	NDA	66	See Map	NDA	NDA
67	See Map	NDA	NDA	68	See Map	NDA	NDA
69	See Map	NDA	NDA	70	See Map	NDA	NDA
71	See Map	NDA	NDA	72	See Map	NDA	NDA
73	See Map	NDA	NDA	74	See Map	NDA	NDA
75	See Map	NDA	NDA	76	See Map	NDA	NDA
77	See Map	NDA	NDA	78	See Map	NDA	NDA
79	See Map	NDA	NDA	80	See Map	NDA	NDA
81	See Map	NDA	NDA	82	See Map	NDA	NDA
83	See Map	NDA	NDA	84	See Map	NDA	NDA
85	See Map	NDA	NDA	86	See Map	NDA	NDA
87	See Map	NDA	NDA	88	See Map	NDA	NDA
89	See Map	NDA	NDA	90	See Map	NDA	NDA
91	See Map	NDA	NDA	92	See Map	NDA	NDA
93	See Map	NDA	NDA	94	See Map	NDA	NDA
95	See Map	NDA	NDA	96	See Map	NDA	52
97	See Map	NDA	NDA	98	See Map	NDA	NDA
99	See Map	NDA	NDA	100	See Map	NDA	NDA
101	See Map	NDA	NDA	102	See Map	NDA	NDA
103	See Map	NDA	NDA	104	See Map	NDA	42
105	See Map	NDA	NDA	106	See Map	NDA	NDA
107	See Map	NDA	NDA	108	See Map	NDA	NDA
109	See Map	NDA	NDA	110	See Map	56	NDA
111	See Map	NDA	NDA	112	See Map	27	207
113	See Map	NDA	NDA	114	See Map	NDA	NDA

*d/m/100 cm.^{2}

Special Information: Post-decommisioning and decontamination of TA-2 Omega East Reactor Area. Map is drawings 1 through 7.

(NDA)—no detectable activity. NDA for alpha is considered anything at or below 16 dpm/100 cm^2. NDA for beta is anything at or below 32 dpm/100 cm^2.

Table III. Pu, U, and Other Data Sheet (Cont.)

TA: 2
Building: 1
Room: 122
Sample Date: 1-11-90
H.P.S: Veverka/Windham
Parameter: β/γ Cs-137, U-235
Analysis Date: 1-12-90
Analysis By: Jerry W. Herold

Swipe No.	Location	Alpha*	Beta*	Swipe No.	Location	Alpha*	Beta*
115	See Map	NDA	NDA	116	See Map	NDA	NDA
117	See Map	NDA	NDA	118	See Map	NDA	NDA
119	See Map	NDA	NDA	120	See Map	NDA	NDA
121	See Map	NDA	NDA	122	See Map	NDA	NDA
123	See Map	NDA	NDA	124	See Map	NDA	NDA
125	See Map	NDA	NDA	126	See Map	NDA	NDA
127	See Map	NDA	NDA	128	See Map	NDA	NDA
129	See Map	NDA	NDA	130	See Map	NDA	NDA
131	See Map	NDA	NDA	132	See Map	NDA	NDA
133	See Map	NDA	NDA	134	See Map	NDA	NDA
135	See Map	NDA	NDA	136	See Map	NDA	NDA
137	See Map	NDA	NDA	138	See Map	NDA	NDA
139	See Map	NDA	NDA	140	See Map	NDA	NDA
141	See Map	NDA	NDA	142	See Map	NDA	NDA
143	See Map	NDA	NDA	144	See Map	NDA	NDA
145	See Map	NDA	NDA	146	See Map	NDA	NDA
147	See Map	NDA	NDA	148	See Map	NDA	NDA
149	See Map	NDA	NDA	150	See Map	45	NDA
151	See Map	NDA	NDA	152	See Map	NDA	94
153	See Map	NDA	NDA	154	See Map	23	NDA
155	See Map	NDA	NDA	156	See Map	NDA	NDA
157	See Map	NDA	NDA	158	See Map	NDA	NDA
159	See Map	NDA	NDA	160	See Map	NDA	NDA
161	See Map	NDA	47	162	See Map	NDA	NDA
163	See Map	NDA	NDA	164	See Map	NDA	NDA
165	See Map	NDA	NDA	166	See Map	NDA	NDA
167	See Map	NDA	NDA	168	See Map	NDA	NDA
169	See Map	NDA	NDA	170	See Map	NDA	NDA
171	See Map	NDA	NDA	172	See Map	NDA	NDA
173	See Map	NDA	NDA	174	See Map	NDA	NDA

*d/m/100 cm.^{2}

Special Information: Post-decommisioning and decontamination of TA-2 Omega East Reactor Area. Map is drawings 1 through 7.

(NDA)—no detectable activity. NDA for alpha is considered anything at or below 16 dpm/100 cm^2. NDA for beta is anything at or below 32 dpm/100 cm^2.

Table III. Pu, U, and Other Data Sheet (Cont.)

TA: 2
Building: 1
Room: 122
Sample Date: 1-11-90
H.P.S: Veverka/Windham
Parameter: β/γ Cs-137, U-235
Analysis Date: 1-12-90
Analysis By: Jerry W. Herold

Swipe No.	Location	Alpha*	Beta*	Swipe No.	Location	Alpha*	Beta*
175	See Map	NDA	NDA	176	See Map	NDA	NDA
177	See Map	NDA	NDA	178	See Map	NDA	NDA
179	See Map	NDA	NDA	180	See Map	NDA	NDA
181	See Map	NDA	NDA	182	See Map	NDA	NDA
183	See Map	NDA	NDA	184	See Map	NDA	NDA
185	See Map	NDA	NDA	186	See Map	NDA	NDA
187	See Map	NDA	NDA	188	See Map	NDA	NDA
189	See Map	NDA	NDA	190	See Map	NDA	NDA
191	See Map	NDA	NDA	192	See Map	NDA	NDA
193	See Map	NDA	NDA	194	See Map	NDA	37
195	See Map	NDA	NDA	196	See Map	NDA	NDA
197	See Map	NDA	NDA	198	See Map	NDA	NDA
199	See Map	NDA	NDA	200	See Map	NDA	NDA
201	See Map	NDA	NDA	202	See Map	NDA	NDA
203	See Map	NDA	NDA	204	See Map	NDA	NDA
205	See Map	NDA	NDA	206	See Map	NDA	NDA
207	See Map	NDA	NDA	208	See Map	NDA	NDA
209	See Map	NDA	NDA	210	See Map	NDA	NDA
211	See Map	NDA	NDA	212	See Map	NDA	NDA
213	See Map	NDA	NDA	214	See Map	NDA	NDA
215	See Map	NDA	NDA	216	See Map	NDA	NDA
217	See Map	NDA	152	218	See Map	NDA	NDA
219	See Map	NDA	NDA	220	See Map	NDA	NDA
221	See Map	NDA	NDA	222	See Map	NDA	NDA
223	See Map	NDA	NDA	224	See Map	NDA	NDA
225	See Map	NDA	NDA	226	See Map	NDA	NDA
227	See Map	NDA	NDA	228	See Map	NDA	NDA
229	See Map	NDA	NDA	230	See Map	NDA	NDA
231	See Map	NDA	NDA	232	See Map	NDA	NDA

*d/m/100 cm.^{2}

Special Information: Post-decommisioning and decontamination of TA-2 Omega East Reactor Area. Map is drawings 1 through 7.

(NDA)—no detectable activity. NDA for alpha is considered anything at or below 16 dpm/100 cm^2. NDA for beta is anything at or below 32 dpm/100 cm^2.

Table III. Pu, U, and Other Data Sheet (Cont.)

TA: 2
Building: 1
Room: 122
Sample Date: 1-11-90
H.P.S: Veverka/Windham
Parameter: β/γ Cs-137, U-235
Analysis Date: 1-12-90
Analysis By: Jerry W. Herold

Swipe No.	Location	Alpha*	Beta*	Swipe No.	Location	Alpha*	Beta*
233	See Map	NDA	NDA	234	See Map	NDA	NDA
235	See Map	NDA	NDA	236	See Map	NDA	NDA
237	See Map	NDA	NDA	238	See Map	NDA	NDA
239	See Map	NDA	NDA	240	See Map	27	NDA
241	See Map	NDA	NDA	242	See Map	NDA	NDA
243	See Map	NDA	NDA	244	See Map	20	NDA
245	See Map	NDA	NDA	246	See Map	NDA	NDA
247	See Map	NDA	NDA	248	See Map	NDA	NDA
249	See Map	NDA	NDA	250	See Map	NDA	NDA
251	See Map	NDA	NDA	252	See Map	NDA	NDA
253	See Map	NDA	NDA	254	See Map	NDA	NDA
255	See Map	NDA	NDA	256	See Map	NDA	NDA

*d/m/100 cm.^{2}

Special Information: Post-decommisioning and decontamination of TA-2 Omega East Reactor Area. Map is drawings 1 through 7.

(NDA)—no detectable activity. NDA for alpha is considered anything at or below 16 dpm/100 cm^2. NDA for beta is anything at or below 32 dpm/100 cm^2.

Table III. Pu, U, and Other Data Sheet

TA: 2
Bldg: 1
Rm: 122
Sample Date: 3-16-90
H.P.S: Oliver/Windham
U: 235
Parameter: β/γ Cs-137
Analysis Date: 3-16-90
Analysis By: Jerry W. Herold

Swipe No.	Location	Alpha*	Beta*	Swipe No.	Location	Alpha*	Beta*
257	See Map	NDA	NDA	258	See Map	NDA	NDA
259	See Map	NDA	NDA	260	See Map	NDA	NDA
261	See Map	NDA	NDA	262	See Map	NDA	NDA
263	See Map	NDA	NDA	264	See Map	NDA	59
265	See Map	NDA	34	266	See Map	NDA	37
267	See Map	NDA	109	268	See Map	NDA	NDA
269	See Map	NDA	NDA	270	See Map	NDA	NDA
271	See Map	NDA	NDA	272	See Map	NDA	NDA
273	See Map	NDA	NDA	274	See Map	NDA	NDA
275	See Map	NDA	NDA	276	See Map	NDA	NDA
277	See Map	NDA	NDA	278	See Map	NDA	NDA
279	See Map	NDA	NDA	280	See Map	NDA	NDA
281	See Map	NDA	NDA	282	See Map	NDA	NDA
283	See Map	NDA	NDA	284	See Map	NDA	NDA
285	See Map	NDA	NDA	286	See Map	NDA	NDA
287	See Map	NDA	NDA	288	See Map	NDA	NDA
289	See Map	NDA	NDA	290	See Map	NDA	34
291	See Map	NDA	NDA	292	See Map	NDA	NDA
293	See Map	NDA	NDA	294	See Map	NDA	NDA
295	See Map	NDA	NDA	296	See Map	NDA	NDA
297	See Map	NDA	NDA	298	See Map	NDA	NDA
299	See Map	NDA	NDA	300	See Map	NDA	NDA
301	See Map	NDA	NDA	302	See Map	NDA	NDA
303	See Map	NDA	NDA				

*d/m/100 cm.^{2}

Special Information: Post-decommisioning and decontamination of TA-2 Omega East Reactor Area. Map is drawings 1 through 7.

(NDA)—no detectable activity. NDA for alpha is considered anything at or below 16 dpm/100 cm^2. NDA for beta is anything at or below 32 dpm/100 cm^2.

Table IV. Soil Sample Analysis Results

Sample Location (Refer to Fig. 3.0)	Beta (MDA)* 18 pCi/g at 3 Sigma	Gamma (MDA)* 1/10 of 1 pCi/g (pCi/g Cs-137)
1	< MDA	1
2	< MDA	2
3	< MDA	13
4	< MDA	65
5	< MDA	56
6	< MDA	1
7	< MDA	4
8	< MDA	18
9	< MDA	6
10	< MDA	1
11	< MDA	2
12	< MDA	4
13	< MDA	1
14	< MDA	2
15	< MDA	4
16	< MDA	1
17	< MDA	3
18	< MDA	1
19	45 pCi/g Cs-137	
20	34 pCi/g Cs-137	
21	25 pCi/g Cs-137	

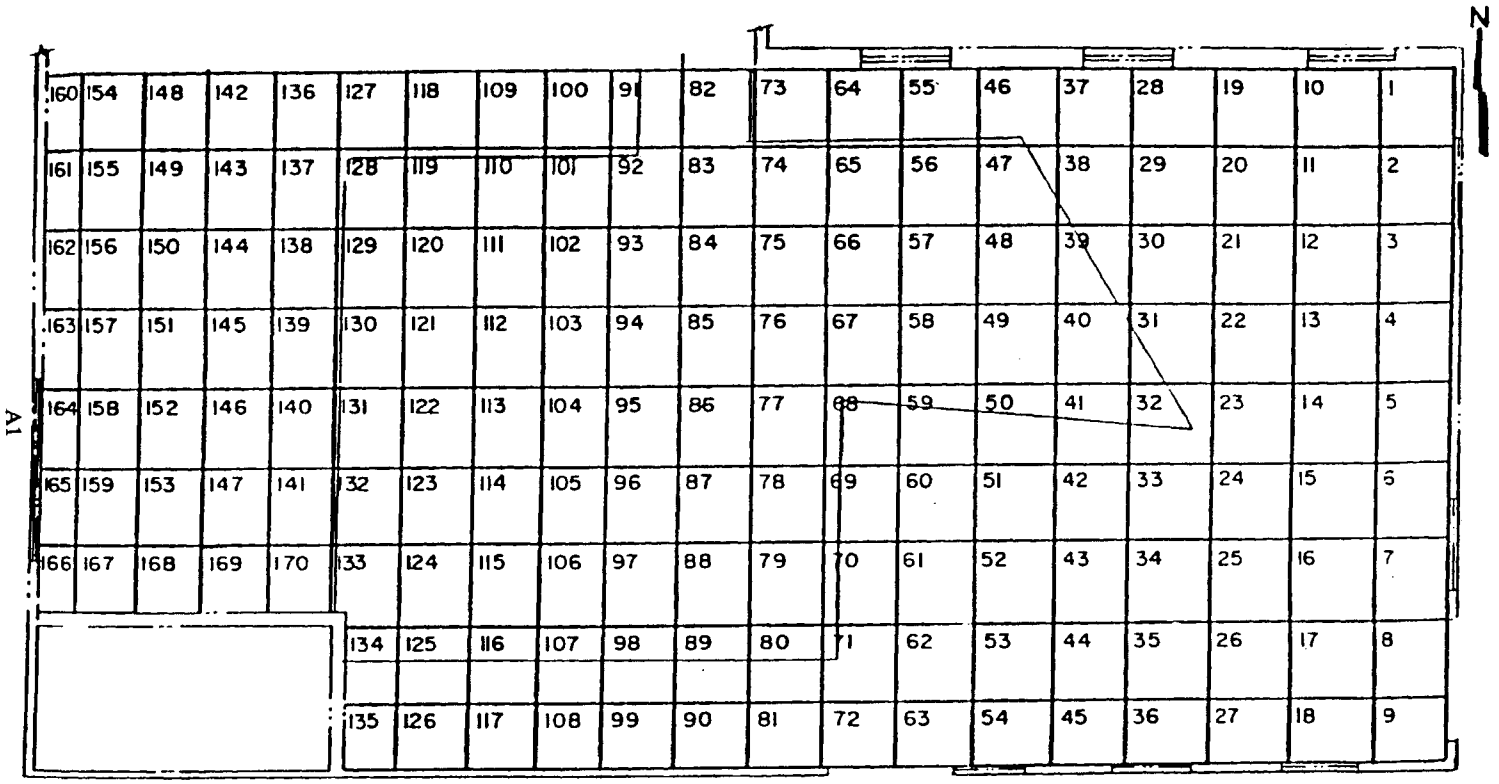
*MDA—Minimum Detectable Activity

Table V. LANL-Identified Hot Spots (Floor)		
Grid Number (1-Meter)	Area (cm^2)	Beta-Gamma Activity (dpm)
8	15	32,400
8	15	4,360
8	15	50,960
12	30	4,580
15	15	31,000
15	15	23,620
16	15	11,300
18	15	4,860
23	15	25,600
24	15	26,220
25	15	4,600
29	15	6,300
31	30	5,200
36	15	6,200
41	50	3,040
43	30	15,280
47	15	6,300
50	15	2,540
53	15	261,000
54	15	4,800
55	15	19,370
64	15	2,840
70	15	5,020
81	15	15,730
87	15	160,420
90	15	3,740
128	15	8,820
130	15	10,020
141	30	3,920
146	15	4,020
153	15	5,500
169	30	2,820
170	15	12,620

Table V. LANL Identified Hot Spots (Cont.)

Location	Area (cm^2)	Beta-Gamma Activity (dpm)
Fan over grid #177*	15	3,276
Blind over grid #183*	15	2,704
Top of shelf over grid #215*	50	12,090

*Items were removed and disposed of.

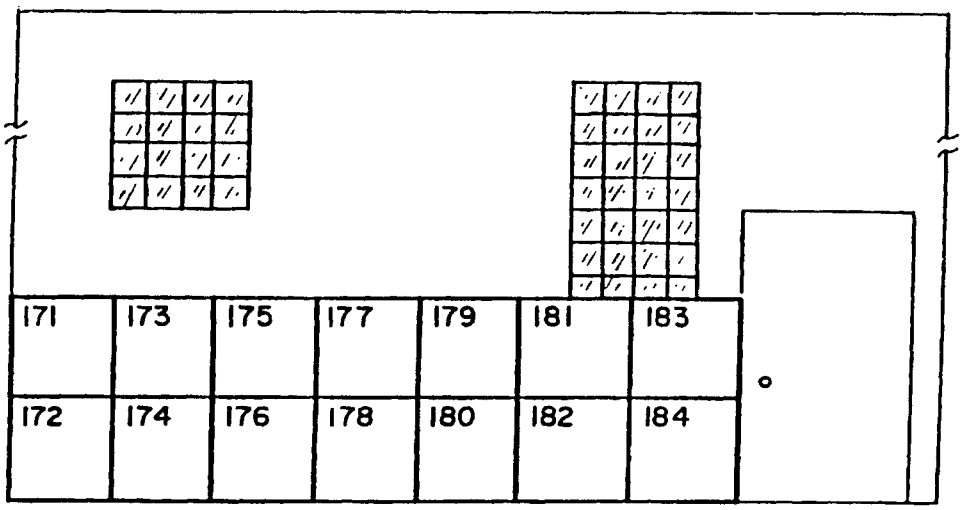


A1

FLOOR PLAN
WATER BOILER REACTOR - RM. 122

1 grid box = 1 square meter

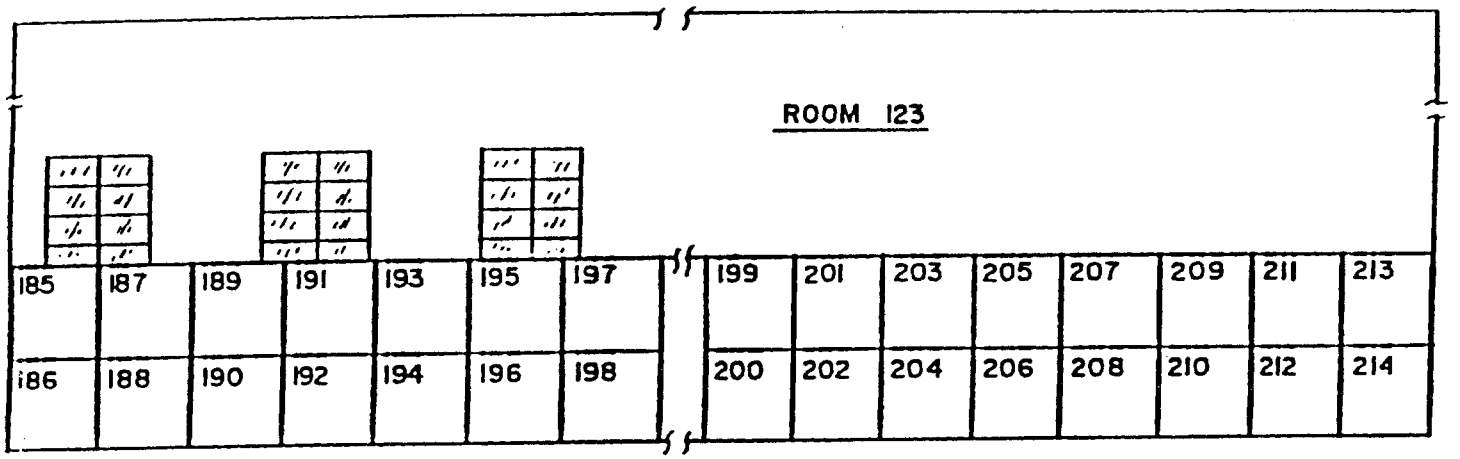
Drawing 1



EAST WALL
WATER BOILER REACTOR - RM. 122

1 grid box = 1 square meter

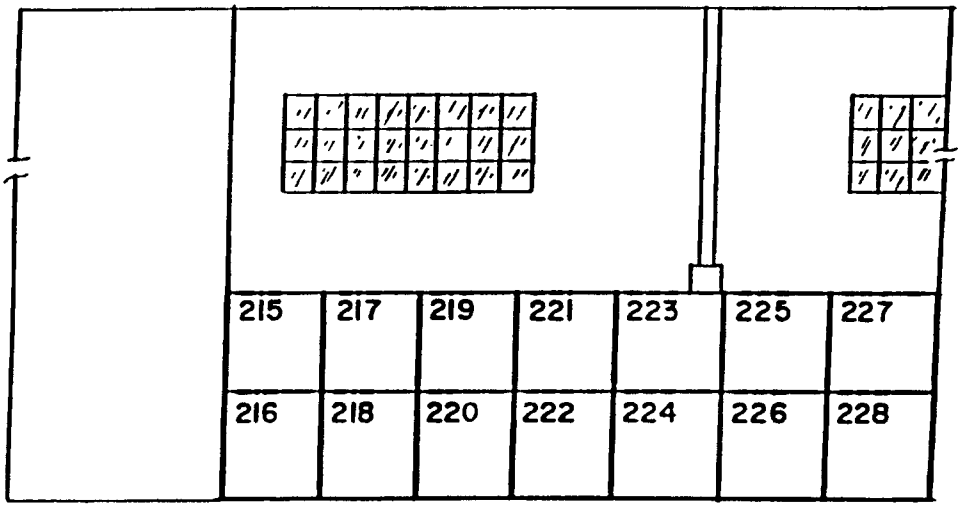
Drawing 2



SOUTH WALL
WATER BOILER REACTOR - RM. 122

1 grid box = 1 square meter

Drawing 3

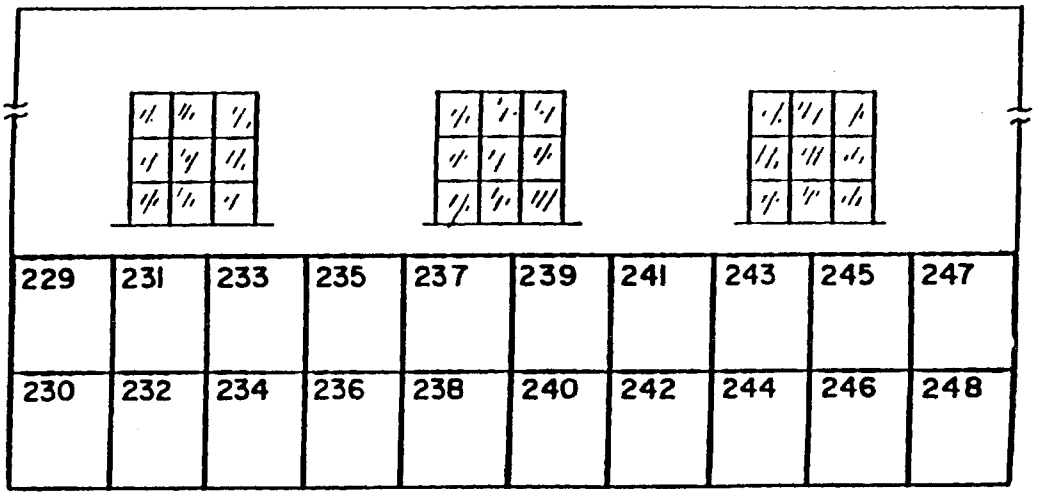


WEST WALL

WATER BOILER REACTOR - RM. 122

1 grid box = 1 square meter

Drawing 4

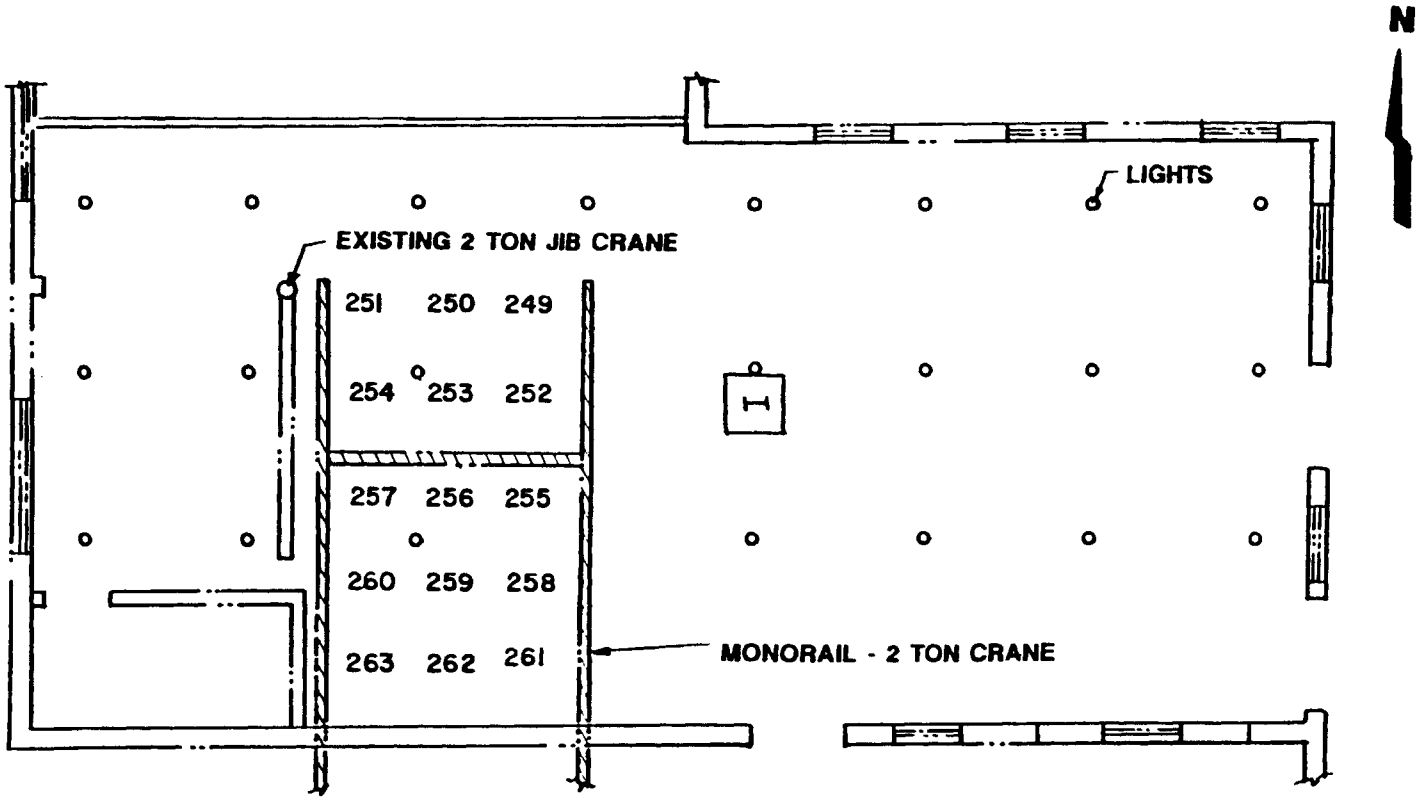


NORTH WALL

WATER BOILER REACTOR RM. 122

1 grid box = 1 square meter

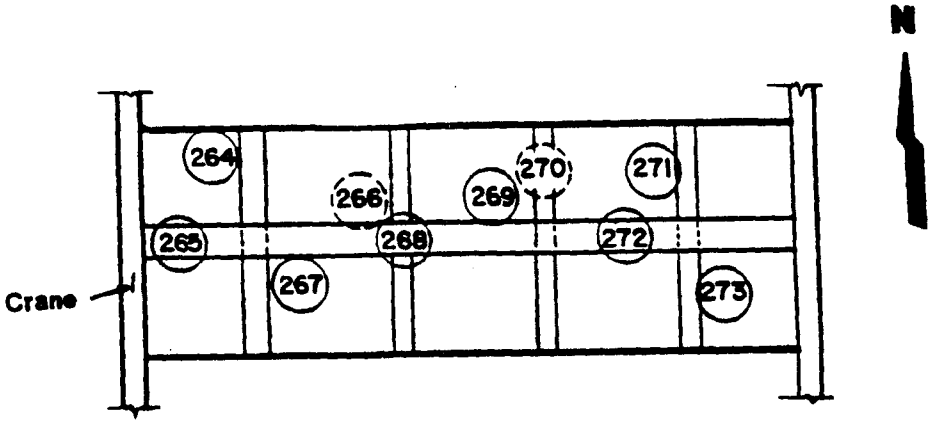
Drawing 5



CEILING PLAN
WATER BOILER REACTOR - RM. 122

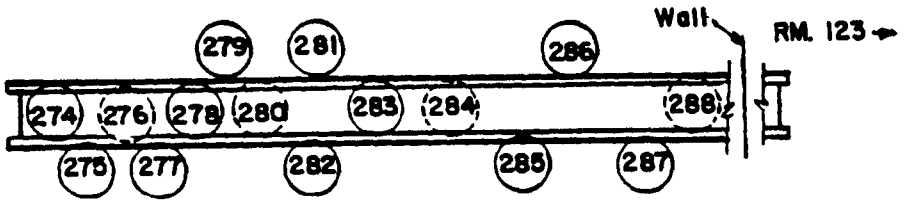
Numbers Indicate Survey Location

Drawing 6



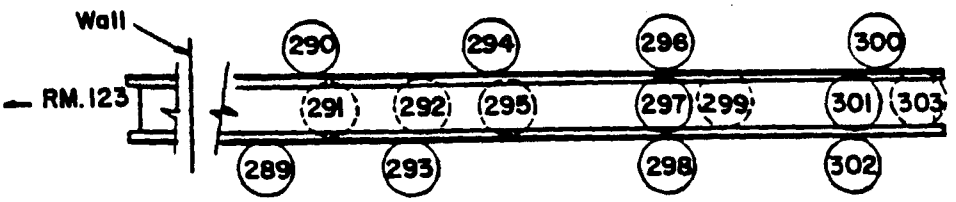
CRANE PLAN VIEW

WATER BOILER REACTOR - RM. 122



SIDE VIEW - EAST BEAM

WATER BOILER REACTOR RM. 122



SIDE VIEW - WEST BEAM

WATER BOILER REACTOR - RM. 122

Numbers Indicate Survey Location
( ) Indicates Survey On Backside Of Beam

Drawing 7

Appendix B. Abbreviations

cm	centimeter
cm^2	square centimeter
cpm	counts per minute
dpm	disintegrations per minute
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
ft	foot
g	gram
gal.	gallon
in.	inch
m	meter
m^2	square meter
uR/h	microroentgens per hour
mrad	millirad
mrad/h	millirad per hour
mrem	millirem
mrem/y	millirem per year
pCi/g	picocuries per gram
y	year

Appendix C. Glossary

Background radiation - Background radiation is naturally occurring radiation emitted from either cosmic (from the sun) or terrestrial (from the earth) sources. Exposure to this type of radiation is unavoidable, and its level varies greatly depending on geographic location. For example, New Jersey typically receives 100 millirem (mrem) per year; Colorado receives about 300 mrem/y; and some areas in South America receive up to 7000 mrem/y. Naturally occurring terrestrial radionuclides include uranium, radium, potassium, thorium, etc. (see definition of radionuclide below). These dose levels do not include the concentrations of naturally occurring radon inside buildings.

Centimeter - A centimeter (cm) is a metric unit of measurement for length; 1 inch is equal to 2.54 cm; 1 foot is equal to approximately 30 cm.

Contamination - Contamination generally means a concentration of one or more radioactive materials that exceeds naturally occurring levels. Contamination may or may not exceed the DOE cleanup guidelines.

Counts per minute - A count is the unit of measurement registered by a radiation detection instrument when radiation imparts its energy within the sensitive range of the detector probe. The number of disintegrations per minute can be related to the number of disintegrations per minute occurring from a radioactive material. See the definition of disintegrations per minute.

Disintegrations per minute - Disintegrations per minute (dpm) is the measurement indicating the amount of radiation being released from a substance per minute. See the definition of picocurie.

Dose - Dose as used in this report is actually dose equivalent and is used to relate absorbed dose (mrad) to an effect on the body. Dose is measured in mrem. For the purpose of comparison, a dose of 500,000 mrem to the whole body within a short time causes death in 50 percent of the people who receive it; a dose of 5,000,000 mrem may be delivered to a cancerous tumor during radiation treatment; normal background radiation results in an annual dose of about 100 mrem. DOE radiation protection standards limit the dose to members of the general public to 100 mrem/y above background levels. Living in a brick house typically results in a dose of about 75 mrem/y above the background level.

Exposure rate - Exposure rate is the rate at which radiation imparts energy to the air. Exposure is typically measured in microroentgens (uR), and exposure rate is typically expressed as uR/h. The dose to the whole body can be approximated by multiplying the exposure rate by the number of hours of exposure. For example, if a person were exposed to gamma radiation at a rate of 20 uR/h for 168 hours per week (continuous exposure) for 52 weeks per year, the whole-body dose would be 178 mrem.

Gram - A gram (g) is a metric unit of weight. There are 454 g in a pound and 28 g in an ounce.

Meter - A meter (m) is a metric unit of length; 1 m is equal to approximately 39 inches.

Microcurie - A microcurie is 1,000,000 picocuries (see also the definition of picocurie).

Millirad - The millirad (mrad) indicates the amount of energy imparted by radiation to a unit of mass. An absorbed dose rate is expressed in terms of mrad per hours (mrad/h).

Millirem - The millirem (mrem) is the unit used to measure radiation dose to a person. The DOE dose limit is 100 mrem above background radiation levels within any one-year period for members of the general public. Naturally occurring radioactive substances in the ground result in a yearly exposure of about 100 mrem to each member of the population. To date, no difference can be detected in the health of population groups exposed to 100 mrem/y above background and in the health of groups who are not exposed.

Picocurie - A picocurie (pCi) is the unit of measure for radioactivity, just as an ounce is a unit to measure weight. A measurement of 1 pCi means that one radioactive particle is released on the average of every 27 seconds.

Radiation - There are three primary types of radiation: alpha, beta, and gamma. Alpha radiation travels less than an inch in air before it stops. Alpha radiation cannot penetrate the outer layer of skin on the body. Beta radiation can penetrate the outer layers of skin but cannot reach the internal organs of the body. Gamma radiation is the most penetrating type and can usually reach the internal organs.

Radionuclide - Radioactive elements are also referred to as radionuclides. For example, cesium-137 is a radionuclide, strontium-90 is another, and uranium-235 is a third.

Remedial action - Remedial action generally means "cleanup of contamination that exceeds DOE guidelines." It refers to any action required so that property can be released for unrestricted use as uncontaminated. In practice, remedial action may mean removing grass and soil, cutting trees, removing asphalt, etc. Remedial action also includes restoring remediated properties to their original conditions to the extent possible.

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AFFIX BAR CODE LABEL WITH ER I.D. NUMBER HERE

6996

DATE RECEIVED: 7-30-92 PROCESSOR: Haa

LOS ALAMOS

LOS ALAMOS NATIONAL LABORATORY

ENVIRONMENTAL RESTORATION
Records Processing Facility
ER Record Index Form
(Side 1 of 2)

Part I: Complete all fields; indicate if not applicable or appropriate; please write legibly.

DOCUMENT TO: —— DOCUMENT DATE: 5-1-91

ORIGINATOR NAME: Gilbert M. Montoya ORGANIZATION: ——

SYMBOL: LA-12012 PAGE COUNT: 25

SUBJECT/TITLE: Post-Remedial Action Report for the Water Boiler Reactor Site

RECORD TYPE (Circle relevant type for primary record; type of attachments should be selected on *Keywords List*):

Analytical Data	FAX	Map	Plan	Study
Chain-of-Custody	Figure	Memo	Procedure	Telephone Record
Computer Output	Form	Microform	Purchase Request	Transcription
Contract	Interview	Notebook	Receipt Acknowledgment	Video
Controlled Distribution	Letter	Personal Notes	(Report)	Work Plan
Drawing	Logbook	Photo	Review	Other ____

RECORD CATEGORY: R
(P for Programmatic or R for Reference)

RECORD PACKAGE #: ——

RECORD FILMED (Y/N): no

RECORD LOCATION: Reference Library
(Indicate location of record if not filmed.)

Part II: Complete all fields; indicate if not applicable or appropriate; please write legibly. Use *ER Record Index Form Attachment Sheet* if needed.

ATTACHMENTS FILMED (Y/N): ——
(Were attachments to this record filmed?)

LOCATION: ——
(Indicate location of attachments.)

TECH AREA(S)	ADS NO(S)	WBS NO(S)	STRUCTURE NO(S)/MDA
LIST RELEVANT TECH AREA(S)	LIST RELEVANT ADS NO(S).	LIST RELEVANT WBS NO(S).	LIST RELEVANT STRUCTURE NO(S)/MDA
2	1098	1.5.11	2-1-122

Part III: Complete all fields; indicate if not applicable or appropriate; please write legibly. Use *ER Record Index Form Attachment Sheet* if needed.

PRS NO(S)	DOCUMENT TO	ORIGINATOR NAMES
LIST RELEVANT PRS NO(S)	LIST MULTIPLE RECIPIENTS	LIST MULTIPLE ORIGINATORS

CORRECTION (Y/N): _____
(Is this a correction to a record previously processed?)

CORRECTED #: _____
(If answer is Yes, please give ER Record # for corrected record.)

CORRECTION DESCRIPTION (Optional): _____

SUPERCEDE: ____ REPLACE: ____ DELETE: ____ ADD: ____ REVISE: ____

ATTACHMENT LIST

Memo
Mercury
Metal
Microform
Minimization
Minutes
MIS (Management Information System)
Mixed Waste
MOA (Memo of Agreement)
Model
Modification
Money (Allocation, Appropriation, Budget, Cost, Funding, etc.)
Monitoring
Monthly Report
Mortar Impact Area
MOU (Memo of Understanding)
MSA (Major System Acquisition)

NEPA (National Environmental Policy Act)
NFA (No Further Action)
Nitrate
NMED (New Mexico Environmental Division)
NMEID (New Mexico Environmental Improvement Division)
NOD (Notice of Deficiency)
Non-explosive
Notebook
Notification
NPDES (National Pollutant Discharge Elimination System)
NRC (Nuclear Regulatory Commission)
Nuclear

Observation
Off-gas
Oil
Open
Open Burning
Operation
Order
Organic
Organization
OSHA (Occupational Safety & Health Administration)
OU (Operable Unit)
Outfall
Outline

PA/RFA (Preliminary Assessment /RCRA Facility Assessment)
PCB (Polychlorinated Biphenyl)
Permit
Personal Notes
Personnel
Personnel Qualification
Photo
Pilot Study
Pipe
Pit
Plan
Plant
Plutonium
Pollution
Polonium
Polaroid
Potential
Presentation
Prevention
Priority
Procedure
Program
Programmatic
Project
Project Leader
Propellant
Property
Proposal
Protection
Protocol
PRS (Potential Release Site)
Public
Pump
Purchase Request

Quality
QA (Quality Assurance)
QP (Quality Procedure)
Quarterly Report

Radioactive
Radiochemistry
Radionuclide
Rationale
RCRA (Resource, Conservation, and Recovery Act)
Reactor
Receipt Acknowledgment
Recommendation
Reconnaissance
Records
Recovery
Recycle
Reduction
Reference
Regulation
Release
Remediation
Removal
Report
Request
Requirements
Research
Resin Bed
Resolution
Resource
Response
Restoration
Restriction
Results
Review
Revision
RFI/RI (RCRA Facility Investigation/Remedial Investigation)
Risk
RPF (Records Processing Facility)

Safety
Salamander
Salvage
Sample
Sampling Plan
Sanitary
Satellite
Schedule
Scope
Scrap Detonation Site
Screening
Scrubber
Security
Seep
Seminar
Semivolatile
Septic
Sewer
Shaft
Shell
Shot
Silver
Site
Sludge
Soil
Solid
Solvent
SOP (Standard Operating Procedure)
SOW (Statement of Scope of Work)
Specific
Spill
Stack
Standard
Statistics
Steamline
Steel
Storage
Strontium
Structure
Study
Subcontractor
Subsurface
Summary
Sump
Support
Surface
Surveillance
Survey
Swipe
SWMU (Solid Waste Management Unit)
System

Tank
Task
TCLP (Toxicity Characteristic Leaching Procedure)
TDD (Technical Document Description)
Technical
Technical Team
Technology
Telephone Record
Test Area
Testing
TLD (Thermoluminescent Dosimeter)
TOC (Table of Contents)
Townsite
Toxic
Tracking
Training
Transcription
Transfer
Transformer
Transport
Treatment
Trench
Trip Report
Tritium
TRU (Transuranic)
TSCA (Toxic Substances Control Act)
Tuballoy
Tuff

Underground
Uranium
Urine
USGS (United States Geological Survey)
UST (Underground Storage Tanks)
Utility

Validation
Variance
VE (Value Engineering)
Ventilation
Verification
Video
Volatile
Volume

Warehouse
Waste
Water
WBS (Work Breakdown Structure)
Weapon
Well
Work
Working Group

Zinc

KEYWORDS: Circle relevant KEYWORDS from the list below for ER Record #: 6996

MISCELLANEOUS (List other indexing criteria as necessary; please write legibly):

Abandon
Aboveground Tank
Absorption
Abstract
Accelerator
Access
Accident
Accumulation
Acid
Active
Administrative
ADS (Activity Data Sheet)
Adsorption
AEC (Atomic Energy Commission)
Aerial
Agenda
Agreement
Air
Alpha
Americium
Analysis
Analytical
AOC (Area of Concern)
Approval
Aquifer
ARAR (Applicable, Relevant, or Appropriate Requirements)
Archeology
Archive
Area
Arsenic
Asbestos
Asphalt
Assessment
Audit

Bacteria
Barium
Baseline
BCP (Baseline Change Proposal)
Beds
Bermed Area
Beryllium
Beta
Biology
Blank
Boiler
Boneyard
Buried
Burn
Burn Site

Cadmium
Caisson
Calibration
Canyon
Capacitor
Caustic
CEARP (Comprehensive Environmental Assessment and Response Program)
Cement
CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act)
Certification
Cesium
Chain-of-Custody
Chamber
Change Control
Change Order
Charge
Chart
Checklist
Chemical
Chromium
Cleanup
Clearance
Clothing
Closure
CMI/RA (Corrective Measures Implementation/Remedial Action)
CMS/FS (Corrective Measures Study/ Feasibility Study)
Comment
Committee
Community Relations
Compliance
Compressed Gas
Computer Modeling
Computer Output
Concern
Concrete
Concurrence
Configuration
Construction
Container
Containment
Contaminant
Contract
Control

Controlled Distribution
Core
Corrective Action
Correspondence
Criteria

Data
Deadline
Debris
Decision Analysis
Decommission
Decontamination
Deficiency
Deliverables
Demolition
Description
Detection
Detonation
Development
Discharge
Disposal
Documentation
DOE (Department of Energy)
DQO (Data Quality Objectives)
Draft
Drainage
Drainline
Drawing
Drilling
Drop Tower
Drum
Dry Well
Dump
Duplicates

Ecology
Effluent
EIS (Environmental Impact Statement)
Emission
Engineering
Environmental
EPA (Environmental Protection Agency)
Equipment
ERDA (Energy Research and Development Administration)
Erosion
Error
ES&H (Environment, Safety, and Health)
Estimate

Evacuation
Evaluation
Evaporator
Excavation
Exclusion
Exhaust
Experiment
Explosive
Exposure
Extension
Extraction

Facility
Farm
FAX
Fence
Field
Figure
Filter
FIMAD (Facility for Information Management, Analysis, and Display)
Finding
Fire
Firing Site
Fiscal
Five Year Plan
Flowchart
Fluid
Form
Framework
Free
Fuel

Gamma
Gas
Generation
Generic
Geochemistry
Geology
Geophysics
Glass Breaker
Glove Box
Graph
Guidance
Gun

Handling
Hazardous
Health
HE (High Explosive)
History
Hole
Home Owner

HSWA (Hazardous and Solid Waste Amendments)
Hydrology
Hygiene

Implementation
Implosion
Impoundment
Inactive
Incinerator
Industrial
Injection Well
Inorganic
Inspection
Installation
Interim
Interim Action
Internal
Interview
Inventory
Investigation
IRM (Interim Remedial Measure)
Isotope
IWP (Installation Work Plan)

Lab Job
Laboratory
Lagoon
Land
Landfill
Laundry
Leach
Lead
Leak
Legal
Letter
Limit
Lines
Liquid
List
Log
Logbook

Magazine
Management
Manhole
Map
Material
MDA (Material Disposal Area)
Media
Meeting