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April 11, 2006

Mr. Mark R. Shaffer, Chief
Nuclear Materials Inspection Branch
U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-4005

RE: Radioactive Waste Burial Site Assessment

Dear Mr. Shaffer:

As instructed by your letter on March 22, 2006, the University of Idaho has conducted a site assessment on our former radioactive waste burial site in accordance with NUREG-1757, "Consolidated NMSS Decommissioning Guidance," in order to determine compliance with the 25-millirem per year limit specified in 10 CFR 20.1402.

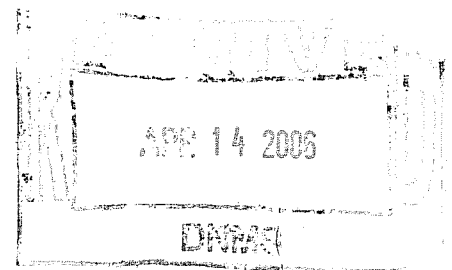
Based on available waste disposal information and the modeling program used, a dose of less than 3 millirems per year was calculated. Attached is the site assessment and modeling program summary reports.

If there are any questions or if additional information is needed, please do not hesitate to contact me.

Thank you.

Sincerely,

Fred Hutchison
Director



Attachment

c: Dr. D. Blair Spitzberg, U.S. Nuclear Regulatory Commission
Ms. Nancy Dunn, Vice-President for Finance and Administration

Docket 030 - 32323
License 11 - 27382-01
Control No. 470968

**FORMER RADIOACTIVE WASTE BURIAL SITE
UNIVERSITY OF IDAHO
EVALUATION OF DECOMMISSIONING COMPLIANCE**

April 11, 2006

by University of Idaho Radiation Safety Officer, Fred Hutchison

SUMMARY OF RESULTS

This is a revision of the burial site evaluation dated 06-13-2001.

The U.S. Nuclear Regulatory Commission (NRC) regulates the release of radioactive property for unrestricted use. The decommissioning compliance program, DandD (Version 2.1.0), used for this evaluation offered two models for the burial site evaluation: residential and building occupancy. The residential model was chosen since this is the most conservative and there are no plans at this time to place a building on this burial site. Equation J-1 in NUREG-1757, Volume 2, for mass balance of the isotopes in soil was used as this is also the most conservative approach.

Records of the individual burials (the nuclides and respective activities on the burial dates) at the University of Idaho former radioactive waste burial site were compiled and reviewed from existing university records. Also, the records requested from the NRC in 2001 were reviewed to determine if any additional information regarding waste burials was available.

Isotope information and soil concentrations were entered into the DandD program and modeling programs were run. Because the number of isotopes entered into DandD apparently exceeded the limit of the program, two separate programs were run. One program included all the isotopes except natural uranium and the second program included just natural uranium. The results of the two programs were 2.67 mrem/yr and 0.0026 mrem/yr, respectively. The combined doses are less than the 25 mrem/yr limit placed on these burial sites. Attached are the summary reports for these two programs.

The University of Idaho has no plans at this time to modify the burial site. The burial site continues to be secured by a chain-link fence and padlock, accessible only to radiation safety office personnel. NRC consultation and approval will be obtained prior to modification of the burial site.

RECORDS EVALUATIONS AND CONCLUSIONS

According to the burial site map (University of Idaho Physical Plant division 05-18-71 computation sheet job 4C-051871) there were 8 burials:

Burial 1 - According to the burial site map, burial 1 was "Approx 1950 ½ life - 45 yr. - lead container". Due to the absence of documentation otherwise, it is likely that this was the burial described in the 01-08-59 letter to the Atomic Energy Commission from UI associate agricultural chemist J.V. Jordan. This letter describes that 2 millicuries of cobalt-60 was disposed of in November 1955 by burial, 12 feet deep in a trench 6 feet long. The burial site map is consistent with this described trench; all other burials are represented as cylindrical holes. The "soil material together with the pots" were buried. This implies that the unsealed form cobalt-60 contaminated soil was placed inside the lead container; due to the absence of documentation otherwise, this particular burial is assumed available for migration. Burial 1 is therefore considered to be as follows on 11-30-55: 2 millicuries cobalt-60.

Burial 2 - According to the burial site map, burial 2 was in "1964". After reviewing records obtained from the NRC, a June, 1966 AEC inspection report listed a burial of radioactive materials occurring on March 27, 1963, consisting of 30 microcuries of carbon-14, 1 microcurie of sodium-22, 1 microcurie of manganese-64 (assumed to be manganese-54 since there is no isotope of manganese with this number), 5 microcuries of iron-55, 1 microcurie of cobalt-57, 1 microcurie of cobalt-60, 1 microcurie of zinc-65, 1 microcurie of nickel-63, 1 microcurie of cesium-137, 1 microcurie of barium-133, 5 microcuries of promethium-147, 5 microcuries of thallium-207 (assumed to be thallium 204 since the half-life of thallium 207 is on the order of minutes), 5 microcuries of lead-210, and 2 grams of uranium nitrate (approximately 1 gram uranium). The inspection report stated this burial was recorded by our Physical Plant and the waste was from the laboratory of Dr. Freeman (license no. 11-197-2). We are assuming that the March, 1963 burial 2 was the 1964 burial listed on the site map and contains the material listed above.

Burial 3 - According to the burial site map, burial 3 was "7/27/66 burial - 10' deep". This was the burial described in the 07-27-66 inter-office memo to George McKean from Denny Naylor. This letter describes that the following nuclides and activities were disposed of via burial on 07-27-66: 2 microcuries chlorine-36; 2.15 microcuries strontium-90; 20 microcuries scandium-46; 155 microcuries carbon-14; 15 microcuries lead-210; 1 microcurie barium-133; 1 microcurie cesium-137; and 0.015 microcurie calcium-45. The Agricultural Biochemistry and Soils lab generated this waste. The physical form was not described; based on the numerous nuclides, low activities and absence of documentation otherwise, unsealed form is assumed (which would make this particular burial possibly available for migration). Burial 3 is therefore considered to be as follows on 07-27-66: 2 microcuries chlorine-36; 2.15 microcuries strontium-90; 155 microcuries carbon-14; 15 microcuries lead-210; 1 microcurie barium-133; and 1 microcurie cesium-137 (calcium-45 and scandium-46 were not included in the assessment as their half-lives are too short).

Burial 4 - According to the burial site map, burial 4 was “8/16/67 burial - 10' deep”. Due to the absence of documentation otherwise, it is likely that this was the burial described in the 08-17-67 inter-office memo to Denny Naylor from C.O. Hower. This letter describes that the following nuclides and activities were disposed of via burial on 08-17-67: 20 microcuries carbon-14; 2 microcuries cerium-144; 1 microcurie cesium-137; 1 microcurie iron-55; 5 microcuries phosphorus-32; 10 microcuries “Pd-210”; 5 microcuries sodium-22; 5 microcuries thallium-204; and 20 microcuries unidentified nuclide. There is no nuclide “paladium-210”; the only long-lived (more than 17-day half-life) paladium isotope is paladium-107 (6.5E6 year half-life); it is assumed that this was lead-210 because other burials included lead-210. Due to the absence of documentation otherwise, the 20 microcuries unidentified nuclide was assigned to be the longest-lived nuclide above (carbon-14). The Chemistry department apparently generated this waste. The form was described as “liquid and solid material” (no specific assignment to each nuclide), otherwise known as unsealed form (which would make this particular burial possibly available for migration). Burial 4 is therefore considered to be as follows on 08-17-67: 40 microcuries carbon-14; 2 microcuries cerium-144; 1 microcurie cesium-137; 1 microcurie iron-55; 10 microcuries lead-210; 5 microcuries sodium-22; and 5 microcuries thallium-204 (phosphorus-32 was not included as it's half-life is too short).

Burial 5 - According to the burial site map, burial 5 was “5/18/71 - 10' deep - 2' inside fence”. A review of all of our records do not show any documents that a burial of radioactive waste occurred. There are documents in our records that show later in 1971 that other entities outside of the university were contacted for disposal of certain radioactive materials, indicating that we were not using the waste burial site anymore. Based on the 04-14-78 newspaper article stating that there were approximately 15 holes that had been dug and were subsequently refilled, in the 02-16-79 newspaper article stating that burial at the site terminated in 1970, and on the fact that the date of the burial site map is also 05-18-71, it is assumed that burial 5 was not a burial of radioactive waste; the hole was refilled with clean soil only.

Burial 6 - According to the burial site map, burial 6 was “4/23/70 - 8' deep”. The notes on an old map are “April 1970 burial reactor irradiated glassware and contaminated mercury”. Records confirm that mercury-203 was possessed/used in the early 1970s. The least recent records available (03-07-77) specify the possession limit of 5 millicuries mercury-203; due to the absence of documentation otherwise, it is assumed that the possession/use prior to 1977 did not exceed this limit (most of our research programs do not significantly vary over time). The Chemistry department generated this waste. The mercury-203 used was aqueous form, otherwise known as unsealed form (which would make this particular burial possibly available for migration). Burial 6 is therefore considered to be 5 millicuries mercury-203 on 04-30-70 but is not included in the assessment since it's half-life is too short..

Burials 7 and 8 - According to the burial site map, burial 7 was “8/13/68 burial - 10' deep - 2' inside fence”, and burial 8 was “8/16/68 burial - 10' deep - 2' inside fence”. Due to the absence of documentation otherwise, it is likely that these were the burials described in the 08-19-68 inter-office memo to Denny Naylor from C.O. Hower. This letter describes that the following nuclides and activities were disposed of via burial on 08-15-68: “reactor irradiated lucite - 200 cpm at surface”; “reactor irradiated soft glass - 20 mr/hr at 6 inches”; “tritium in sealed container

- 20 mCi"; and "misc. waste from undergraduate radiochem laboratory - no detectable activity at surface of container".

The burials 7 and 8 "reactor irradiated lucite" and the "reactor irradiated soft glass" are immobile solid form and do not present any migration hazard (are not available to migrate through the soil or into groundwater). The least recent records available (06-29-72) specify the unsealed possession limits for the authorization approved to teach the radiochemistry class as: 500 millicuries tritium; 25 millicuries carbon-14; 1 millicurie phosphorus-32; 50 millicuries sulfur-35; 10 millicuries tin-119m; 10 millicuries cobalt-57; 25 millicuries chlorine-38; 2 millicuries bromine-80; 2 millicuries bromine-82; 1 millicurie nitrogen-13; and 10 millicuries sodium-24; of these nuclides, only the following would have been undetectable by the survey Geiger counter: tritium; carbon-14; and sulfur-35. Inventory records confirm that no sealed sources used for the radiochemistry class were disposed of in the burial site. The least recent records available (Spring 1979) specify the actual inventory of unsealed radioactive material possessed by the authorization approved to teach the radiochemistry class as: 50 microcuries carbon-14; 1 microcurie cobalt-60; 1 microcurie nickel-63; 10 microcuries zinc-65; 0.1 microcurie strontium-90; 1 microcurie barium-133; 1 microcurie cesium-137; 5 microcuries thallium-204; 1 millicurie lead-210; and 0.1 millicurie radium-226; of these nuclides, only the following would have been undetectable by the survey Geiger counter: carbon-14; and nickel-63. Due to the absence of documentation otherwise, it is assumed that the possession/use prior to 1979 did not exceed this actual possession (most of our research programs do not significantly vary over time). The Chemistry department generated this waste. The physical form was not described; based on the numerous nuclides, low activities and absence of documentation otherwise, unsealed form is assumed (which would make this particular burial possibly available for migration). Although it is referred to as "sealed", the container type for the 20 millicuries tritium was not specified and is therefore considered possibly available for migration. Burials 7 and 8 are therefore considered to be as follows on 08-15-68: 20 millicuries tritium; 50 microcuries carbon-14; and 1 microcurie nickel-63.

Review of additional documents related to the radioactive waste burial site identified:

- a 04-14-78 newspaper article stating that there were approximately 15 holes that had been dug, that the holes were 8' - 10' deep, and were subsequently refilled. This implies that the holes were all dug at one time, and were left open to be filled each time waste was added.

- a 02-16-79 newspaper article stating that there were eight burials, the pits were 10' deep and 6' apart, and that burial at the site terminated in 1970 according to the 1979 UI radiation safety officer Jasper Avery.

SUMMARY OF INCOMPLETE ISSUES

Several of the waste disposal forms provided incomplete information. Assumptions were made accordingly on a case-by-case basis as described above for each burial.

Additional items:

- 1) A 1961 inspection report by the AEC reported a burial of less than 1 microcurie of phosphorus-32/sulfur-35 on July 7, 1959. Because of the short half-life of these isotopes, they are not included in this assessment.
- 2) A 1961 inspection report by the AEC reported that the university received badges from the Army that may have contained radioactive material and were subsequently buried (the inspector guessed it could be radium). Because we have no documentation that these were radioactive, or what was the isotope and activity if radioactive, this burial was not included in the assessment.
- 3) The D&D program did not allow the option to include the following radioactive material in the burial site: 0.13 microcuries barium-133 and 0.06 microcuries thallium-204. Therefore, these nuclides and their respective activities were not included in this assessment. It is unlikely that these nuclides and activities would contribute a significant dose to the model evaluations.

SUMMARY OF ATTACHMENTS

Attachments 1 and 2	DandD Residential Summary Modeling Program Reports
Attachment 3	Burial site nuclides & activities on 04-05-2006.



DandD Residential Scenario

DandD Version: 2.1.0

Run Date/Time: 4/11/2006 8:18:46 AM

Site Name: Waste Burial Site-1

Description: University of Idaho - All Isotopes Except Uranium

FileName: C:\Documents and Settings\Fred Hutchison\My Documents\Waste Burial Site-1.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses

Nuclide concentrations are distributed among all progeny

Number of simulations: 209

Seed for Random Generation: 8718721

Averages used for behavioral type parameters

External Pathway is ON

Inhalation Pathway is ON

Secondary Ingestion Pathway is ON

Agricultural Pathway is ON

Drinking Water Pathway is ON

Irrigation Pathway is ON

Surface Water Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m ²)	Distribution
3H	UNLIMITED	CONSTANT(pCi/g)
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value 4.60E+00
14C	UNLIMITED	CONSTANT(pCi/g)
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value 5.30E-01
22Na	UNLIMITED	CONSTANT(pCi/g)
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value 3.50E-07
36Cl	UNLIMITED	CONSTANT(pCi/g)

Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	3.90E-03
55Fe	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	2.50E-07
60Co	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	5.20E-03
63Ni	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	2.90E-03
90Sr	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	1.60E-03
137Cs	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	2.30E-03
144Ce	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	4.50E-18
210Pb	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	1.70E-02
54Mn	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	1.50E-18
65Zn	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	2.30E-05
147Pm	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	1.10E-07
57Co	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value	6.70E-21

Site Specific Parameters:

General Parameters:

None

Element Dependant Parameters

None

Correlation Coefficients:

None

Summary Results:

90.00% of the 209 calculated TEDE values are $< 2.67E+00$ mrem/year .

The 95 % Confidence Interval for the 0.9 quantile value of TEDE is $2.10E+00$ to $3.53E+00$ mrem/year



DandD Residential Scenario

DandD Version: 2.1.0

Run Date/Time: 4/11/2006 8:07:08 AM

Site Name: Waste Burial Site-1

Description: University of Idaho - Uranium Only

FileName: C:\Documents and Settings\Fred Hutchison\My Documents\Waste Burial Site - Uranium.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses

Nuclide concentrations are distributed among all progeny

Number of simulations: 109

Seed for Random Generation: 8718721

Averages used for behavioral type parameters

External Pathway is ON

Inhalation Pathway is ON

Secondary Ingestion Pathway is ON

Agricultural Pathway is ON

Drinking Water Pathway is ON

Irrigation Pathway is ON

Surface Water Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m ²)	Distribution
U_Nat	UNLIMITED	CONSTANT(pCi/g)
Justification for concentration: Soil concentration value calculated from the mass balance equation, J-1, in NUREG-1757, Volume 2.		Value 1.20E-03

Site Specific Parameters:

General Parameters:

None

Element Dependant Parameters

None

Correlation Coefficients:

None

Summary Results:

90.00% of the 109 calculated TEDE values are $< 2.58E-03$ mrem/year .

The 95 % Confidence Interval for the 0.9 quantile value of TEDE is $1.51E-03$ to $4.56E-03$ mrem/year

Assessment of University of Idaho Former Radioactive Waste Burial Site

		Total nuclides & activities in burial site on 04-05-2006							
Nuclide	Half-life (days)	Date of Burial	Date of Exposure Assessment	Original Activity (microcuries)	Activity on Date of Exposure Assessment (microcuries)	Activity on Date of Exposure Assessment (picocuries)	Mass Balance Based on Eq. J-1 (pCi/g)		
3 H	4485.2	8/15/1968	4/5/2006	20000	2.4E+03	2.4E+09	4.6E+00		
14 C	2092882	8/15/1968	4/5/2006	50	5.0E+01	5.0E+07			
14 C	2092882	7/27/1966	4/5/2006	155	1.5E+02	1.5E+08			
14 C	2092882	8/17/1967	4/5/2006	40	4.0E+01	4.0E+07			
14 C	2092882	3/27/1963	4/5/2006	30	3.0E+01	3.0E+07			
				275	2.7E+02	2.7E+08	5.3E-01		
22 Na	949.7	8/17/1967	4/5/2006	5	1.7E-04	1.7E+02			
22 Na	949.7	3/27/1963	4/5/2006	1	1.0E-05	1.0E+01			
				6	1.8E-04	1.8E+02	3.5E-07		
36 Cl	109940250	7/27/1966	4/5/2006	2	2.0E+00	2.0E+06	3.9E-03		
54 Mn	312.7	3/27/1963	4/5/2006	1	7.5E-16	7.5E-10	1.5E-18		
55 Fe	985.5	8/17/1967	4/5/2006	1	4.9E-05	4.9E+01			
55 Fe	985.5	3/27/1963	4/5/2006	5	7.9E-05	7.9E+01			
				6	1.3E-04	1.3E+02	2.5E-07		
57 Co	270.9	3/27/1963	4/5/2006	1	3.5E-18	3.5E-12	6.7E-21		
60 Co	1924.9	11/30/1955	4/5/2006	2000	2.7E+00	2.7E+06			
60 Co	1924.9	3/27/1963	4/5/2006	1	3.5E-03	3.5E+03			
				2001	2.7E+00	2.7E+06	5.2E-03		
63 Ni	36561.5	8/15/1968	4/5/2006	1	7.7E-01	7.7E+05			
63 Ni	36561.5	3/27/1963	4/5/2006	1	7.4E-01	7.4E+05			
				2	1.5E+00	1.5E+06	2.9E-03		
65 Zn	2444.4	3/27/1963	4/5/2006	1	1.2E-02	1.2E+04	2.3E-05		
90 Sr	10446	7/27/1966	4/5/2006	2.15	8.2E-01	8.2E+05	1.6E-03		
133 Ba	3834.5	7/27/1966	4/5/2006	1	7.3E-02	7.3E+04			
133 Ba	3834.5	3/27/1963	4/5/2006	1	5.8E-02	5.8E+04			
				2	1.3E-01	1.3E+05	2.5E-04		
137 Cs	11019	7/27/1966	4/5/2006	1	4.0E-01	4.0E+05			
137 Cs	11019	8/17/1967	4/5/2006	1	4.1E-01	4.1E+05			
137 Cs	11019	3/27/1963	4/5/2006	1	3.7E-01	3.7E+05			
				3	1.2E+00	1.2E+06	2.3E-03		
144 Ce	284.3	8/17/1967	4/5/2006	2	2.3E-15	2.3E-09	4.5E-18		

Nuclide	Half-life (days)	Date of Burial	Date of Exposure Assessment	Original Activity (microcuries)	Activity on Date of Exposure Assessment (microcuries)	Activity on Date of Exposure Assessment (picocuries)	Mass Balance Based on Eq. J-1 (pCi/g)
147 Pm	957.4	3/25/1963	4/5/2006	5	5.7E-05	5.7E+01	1.1E-07
204 Tl	1379.3	8/17/1967	4/5/2006	5	4.2E-03	4.2E+03	
204 Tl	1379.3	3/27/1963	4/5/2006	5	1.9E-03	1.9E+03	
				10	6.0E-03	6.0E+03	1.2E-05
210 Pb	8129.9	7/27/1966	4/5/2006	15	4.4E+00	4.4E+06	
210 Pb	8129.9	8/17/1967	4/5/2006	10	3.0E+00	3.0E+06	
210 Pb	8129.9	3/27/1963	4/5/2006	5	1.3E+00	1.3E+06	
				30	8.7E+00	8.7E+06	1.7E-02
Nat. U	1.64E+12	3/25/1963	4/5/2006	0.63	6.3E-01	6.3E+05	1.2E-03
			TOTALS	24684.78	3.0E+03	3.0E+09	