



FORM INEL-2631#
(Rev. 02-95)

Project File Number	<u>Tank Program 11.31</u>
EDF Serial Number	<u>ER-BWP-88</u>
Functional File Number	<u>INEL-96/009</u>

ENGINEERING DESIGN FILE

Project/Task Buried Mixed Waste Tank Program
Subtask ARA-02 Septic Tanks

EDF Page 1 of 5

TITLE: <u>Source Term Determination of the ARA-02 Septic Tanks</u>			
SUMMARY: The ARA-02 Septic Tanks were sampled in 1992. After decay correction to 1995, the source term was determined for each tank. The respective activity for Tank # 1, 2, and 3 is 1.1, 1.5, 4.4 mCi. Since the concentration of many of the radionuclides exceeds the limits established in DOE Order 5400.5, Radiation Protection of the Public and the Environment, the tanks' contents should be regarded as radioactive material.			
Distribution (complete package):		R. G. Akins MS 3920, A. D. Coveleskie MS 7110, G. G. Hall MS 4138, R. A. Jones MS 3960, D. J. Kuhns MS 3920, A. L. Lengyel MS 3920, S. E. MacLeod MS 4138, G. E. Matthern MS 2203, C. L. Reese MS 3954	
Distribution (summary page only):			
Author <i>A. D. Coveleskie</i> A. D. Coveleskie	Dept. 1341	Reviewed <i>S. E. MacLeod</i> S. E. MacLeod	Date 1-8-96
		Approved <i>W. C. Craft</i> W. C. Craft	Date 1-8-96
		LITCO Review <i>S. E. MacLeod</i> S. E. MacLeod	Date 1-15-96
		LITCO Approval <i>D. J. Kuhns</i> D. J. Kuhns	Date 1-15-96



FORM INEL-2631#

(Rev. 02-95)

System Description - Contained within the Auxiliary Reactor Area I (ARA-I) is a septic system designated as ARA-02. The system consists on three septic tanks (1, 2, and 3), a seepage pit, and associated piping. From 1960 to 1988 ARA-02 received sanitary waste from Building # 626, 627, 628, and Trailer # 1 and 2. These areas contained various laboratories, a hot cell, print shop, offices and a guard house. All the tanks are interconnected and eventually drain to the seepage pit. This EDF addresses only the contents of the three septic tanks.

Radiological Characterization - As part of a Track 2 investigation the septic tanks were sampled and analyzed for radionuclide concentration. The results, published by S. L. Pickett et al 1993, were used to determine the source term of the tanks and are shown in Attachment 1. Total activity was based on tank volumes reported in June 1995 (R. G. Akins 1995). The following data and assumptions were used in the source term determination.

1. Septic tank volumes are: #1 - 2.62 E +6 ml; #2 - 2.08 E +6 ml; #3 - 1.42 E +6 ml.
2. As noted in Attachment 1 radionuclides were decay corrected from August 1992 to December 1995.
3. S. L. Pickett et. al. 1993 reported radionuclide concentrations in activity per gram. For the purpose of converting to activity per volume, it was assumed the sludge density is 1.2 g/ml.
4. It was assumed all three tanks contained only sludge.

Conclusions - Septic tanks 1, 2, and 3 respectively contain 1.1, 1.5, and 4.4 mCi of activity. Although the concentrations are low, they do exceed the limits established in DOE 5400.5. The tanks' contents should therefore be regarded as radioactive material.

References -

1. S. L. Pickett, K. J. Poor, P. E. Seccomb, S. N. Stanisich, Track 2 Summary Report for Operable Unit 5-07 ARA-I Sites ARA-02 and ARA-03, EGG-ER-10593, May 1993, Revision 0.
2. DOE Order 5400.5, Radiation Protection of the Public and the Environment, February 8, 1990.
3. R. A. Akins, Three ARA-I Septic Tank Volumes, Engineering Design File # ER-BWP-86, July 1995.



FORM INEL-2631#
(Rev. 02-95)

Attachment 1

Table 1

Tank 1

Radionuclide	Activity (pCi/g)	Activity (uCi/ml)	Total Activity (Ci)
Co-60 ¹	3.495 E +1	4.19 E -5	1.10 E -4
Cs-137 ¹	3.007 E +1	3.61 E -5	9.45 E -5
Eu-152 ¹	4.30 E -1	5.16 E -7	1.35 E -6
Eu-154 ¹	-	-	-
Eu-155 ¹	-	-	-
Sr-90 ¹	6.007 E +1	7.21 E -5	1.89 E -4
Am-241	2.5 E 0	3.00 E -6	7.86 E -6
Pu-239/240	3.9 E 0	4.68 E -6	1.23 E -5
U-234	1.80 E +2	2.16 E -4	5.66 E -4
U-135	1.6 E +1	1.92 E -5	5.03 E -5
U-238	3.7 E +1	4.44 E -5	1.16 E -4
Total	-	-	1.15 E -3

¹ These radionuclides have been decay corrected from 8-1-92 to 12-1-95



FORM INEL-2631#
(Rev. 02-95)

Attachment 1 continued

Table 2

Tank 2

Radionuclide	Activity (pCi/g)	Activity (uCi/ml)	Total Activity (Ci)
Co-60 ¹	6.58 E 0	7.9 E -6	1.29 E -5
Cs-137 ¹	3.823 E +1	4.59 E -5	7.52 E -5
Eu-152 ¹	7.18 E -1	8.62 E -7	1.41 E -6
Eu-154 ¹	-	-	-
Eu-155 ¹	-	-	-
Sr-90 ¹	7.303 E +1	8.76 E -5	1.44 E -4
Am-241	1.00 E 0	1.20 E -6	1.97 E -6
Pu-239/240	2.40 E 0	2.88 E -6	4.72 E -6
U-234	3.50 E +2	4.20 E -4	6.89 E -4
U-235	6.10 E +1	7.32 E -5	1.20 E -4
U-238	2.10 E +2	2.52 E -4	4.13 E -4
Total	-	-	1.46 E -3

¹ These radionuclides have been decay corrected from 8-1-92 to 12-1-95



FORM INEL-2631 #
(Rev. 02-95)

Attachment 1 continued

Table 3

Tank 3

Radionuclide	Activity (pCi/g)	Activity (uCi/ml)	Total Activity (Ci)
Co-60 ¹	5.353 E +1	6.42 E -5	9.12 E -5
Cs-137 ¹	3.461 E +1	4.15 E -5	5.90 E -5
Eu-152 ¹	5.08 E 0	6.10 E -6	8.66 E -6
Eu-154 ¹	3.17 E -1	3.80 E -7	5.40 E -7
Eu-155 ¹	1.43 E -1	1.72 E -7	2.44 E -7
Sr-90 ¹	8.50 E +2	1.02 E -3	1.45 E -3
Am-241	1.50 E 0	1.80 E -6	2.56 E -6
Pu-239/240	6.40 E 0	7.68 E -6	1.09 E -5
U-234	5.00 E +2	6.00 E -4	8.52 E -4
U-235	5.20 E +1	6.24 E -5	8.86 E -5
U-238	9.20 E +2	1.68 E -3	2.39 E -3
Total	-	-	4.37 E -3

¹ These radionuclides have been decay corrected from 8-1-92 to 12-1-95.