Appendix A

Report from Sage Earth Science Addressing Geophysical Survey Activities and Results in the TSF-09/18 and TSF-21 Sites and Surrounding Areas

Appendix-A
Report from Sage Earth Science Addressing Geophysical Survey Activities and Results in the TSF-09/19 and TSF-21 Sites and Surrounding Areas

SAGE EARTH SCIENCE
GEOPHYSICAL SURVEYS

April 16, 2003

Idaho National Engineering and Environmental Laboratory
P.O. Box 1625
Idaho Falls, ID 83415

SUBJECT: INTERIM REPORT *V-TANK AND TAN-607 DRAIN LINE GEOPHYSICAL SURVEYS – **REV-1***

SCOPE
This letter report addresses the scope performed in support of scheduled Waste Area Group 1, Operable Unit 1-10 project objectives. The scope is as follows: to locate buried tanks, associated piping, underground utilities, and other potential drilling and excavation hazards that might be encountered during soil sampling and excavation activities in the area of the Intermediate Level Radioactive Waste (ILRW) feed subsystem V-Tanks and the TAN-607 decontamination shop discharge piping located near the TAN-607 building at Test Area North (TAN).

Time domain electromagnetic induction (TDEMI) and high-resolution magnetic field surveys were performed. The resulting geophysical data along with other supporting information will be used to guide the selection of intrusive sample locations and future excavation activities.

Time Domain Electromagnetic Induction Technology
The TDEMI technology is capable of determining the distribution of subsurface metallic objects. The technology consists of a metal detector that responds not only to ferromagnetic metals and alloys, but also to a range of different metal types. A transmitter generates an electromagnetic pulse, which induces eddy currents in metallic objects. The eddy current decay produces a secondary magnetic field measured by a receiver coils. The secondary field response is sensed and recorded. This method can detect a single 55-gal drum at a depth of over 10 ft or a 2 inch pipe up to 8 feet deep, yet is relatively insensitive to nearby interference, which makes it a good choice for characterizing complex sites.

The TDEMI data were collected using a Geonics EM-61 metal detector in accordance with Sage Earth Science Standard Operating Procedure No. 4.3 *TITLE: TIME DOMAIN ELECTROMAGNETIC INDUCTION (TDEMI).* The TDEMI data were collected over all open areas of the approximate 1/8-acre v-tank site on a 0.5 m by 0.2-m station spacing. TDEMI data were collected over all open areas along the TAN-607 drain line corridor on a 1.0 m by 0.2-m station spacing. The TDEMI data will be used to generate locations of metal objects, primarily steel tanks and pipes, within the survey boundaries.

Magnetic Field Survey
The magnetic field survey method is a passive measurement of the earth's magnetic field. Compact magnetic objects produce local variations in the earth's field. By mapping the character of the field it is possible to delineate the depth and location of objects producing those localized changes. The technology is more sensitive and has a higher resolution than competing metal

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detection methods in sensing buried ferrous objects, but is more susceptible to interferences from surface and nearby magnetic objects at times obscuring deeply buried objects and cannot sense not magnetic metals including some ferrous alloys such as stainless steel alloys.

The magnetic field data were collected using Sage Earth Science proprietary equipment, the Rapid Geophysical Surveyor in accordance with Sage Earth Science Standard Operating Procedure No. 3.1 *TITLE: MAGNETIC FIELD MAPPING (RGS).* The data were collected on a 0.15 m by 0.5-m data spacing over all open areas of the v-tank site.

The magnetic field data can be used to generate locations of buried ferrous objects, primarily steel tanks and pipes, and to develop depth estimates to individual objects within the survey boundaries (as necessary).

DATA PRESENTATION

The following figures show the results off the geophysical surveys. All information is shown in "Tan Local Grid" survey coordinates as provided by INEEL land surveyor to Sage Earth Science. The geophysical data are presented as color contour images. Superimposed onto each geophysical map is the anticipated location of buried utilities as supplied to Sage Earth Science by the INEEL. This revision reflects a correction from the prior revision to the transformation of the INEEL facility drawings into US Standard Survey Foot units. This revision also includes corrections to lines and features that were omitted due to problems encountered in the translation of the DXF formatted facility drawing provided by the INEEL into Geosoft PLT format. Also included are the locations and depths of items both surface and buried identified in the geophysical data.

Many, but not all known systems are seen in the geophysical data as supported by the information supplied by the INEEL. The geophysical anomalies fall in close proximity to the expected locations. Of those systems buried less than 8 feet in depth, the locations can generally be independently supported by the geophysical data. This is not true in all instances, particularly in the immediate vicinity of buildings and other shallow or surface features. In certain instances the geophysical data support or indicate the location of a system, but cannot be used to independently substantiate the location of those systems.

There are a limited number of instances where buried systems are expressed in the geophysical data, but are not indicated in the facility drawings provided to Sage Earth Science. In these cases a boxed line is drawn on the figure to show the position of those systems.

The following maps show the locations of features as provided by the INEEL and as interpreted from the geophysical data. These maps may be used as a basis for selecting intrusive sample locations and other intrusive activities. It is anticipated that a final review of proposed sampling and excavation activities will be made in direct review of the geophysical data for buried lines both anticipated and not anticipated, as well as other, typically isolated geophysical anomalies from unknown features that should be avoided.

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Regards;

Glen Carpenter/geophysicist

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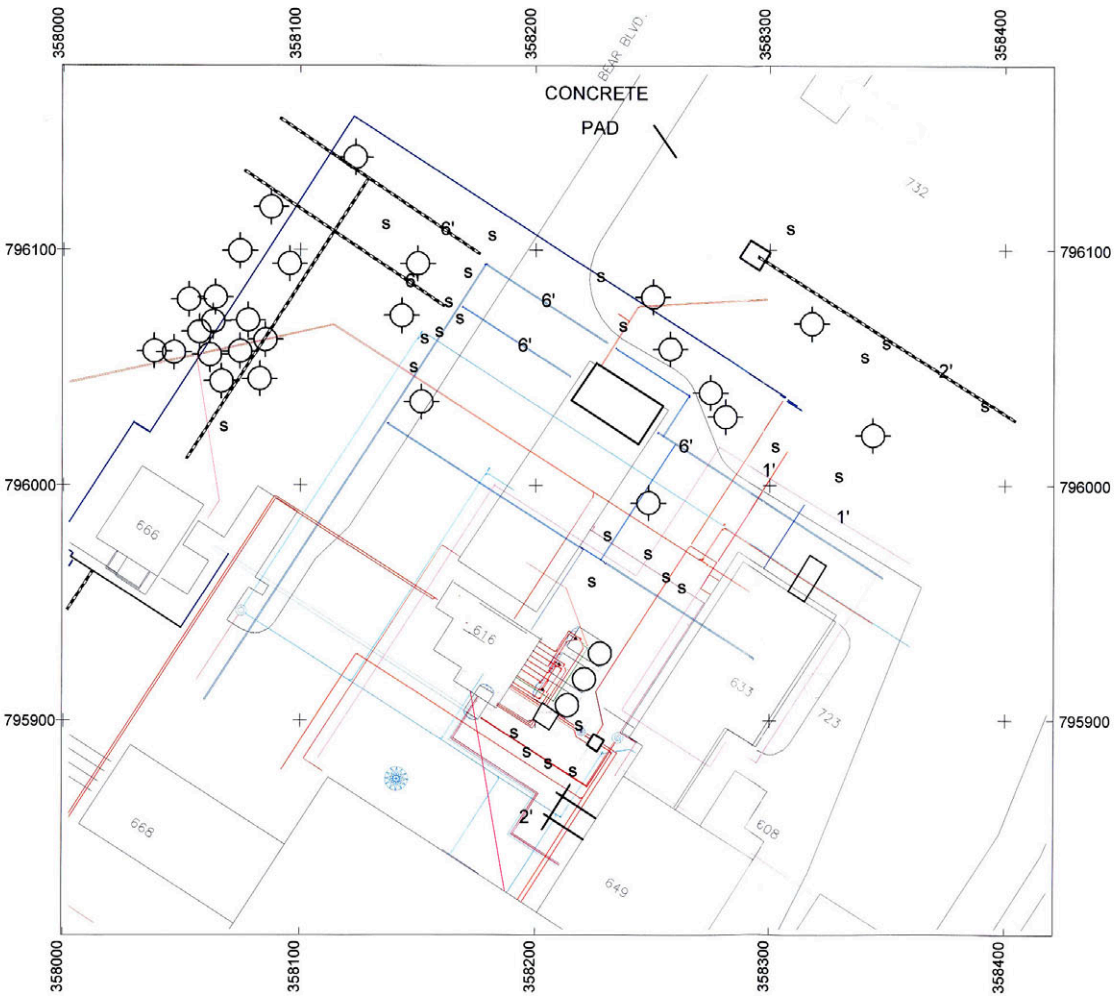


○ – buried object
s – surface object
– interpreted line

N

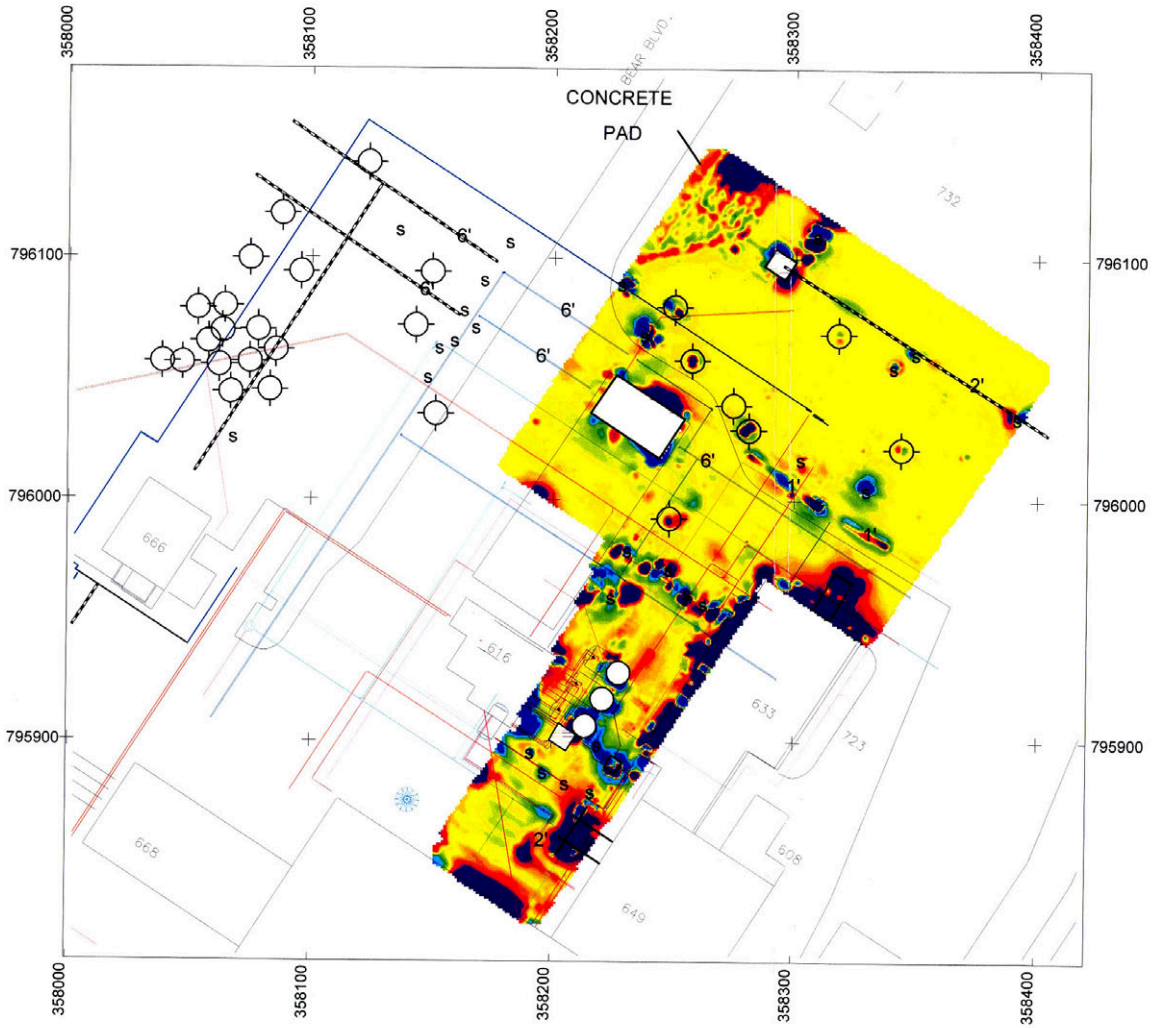
Scale 1:600

25 0 25 50 75 100

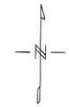
foot

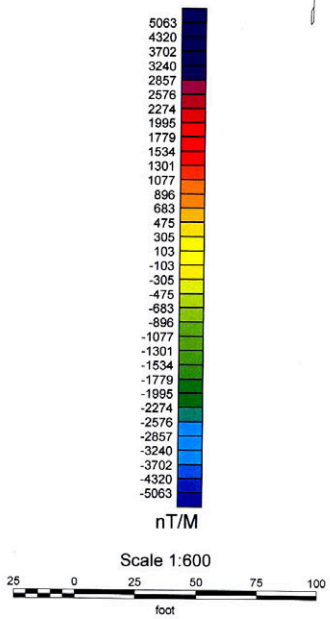
TAN V-Tanks

Sage Earth Science



○ – buried object
s – surface object
– interpreted line





Vertical Gradient Magnetic Field

TAN V-Tanks

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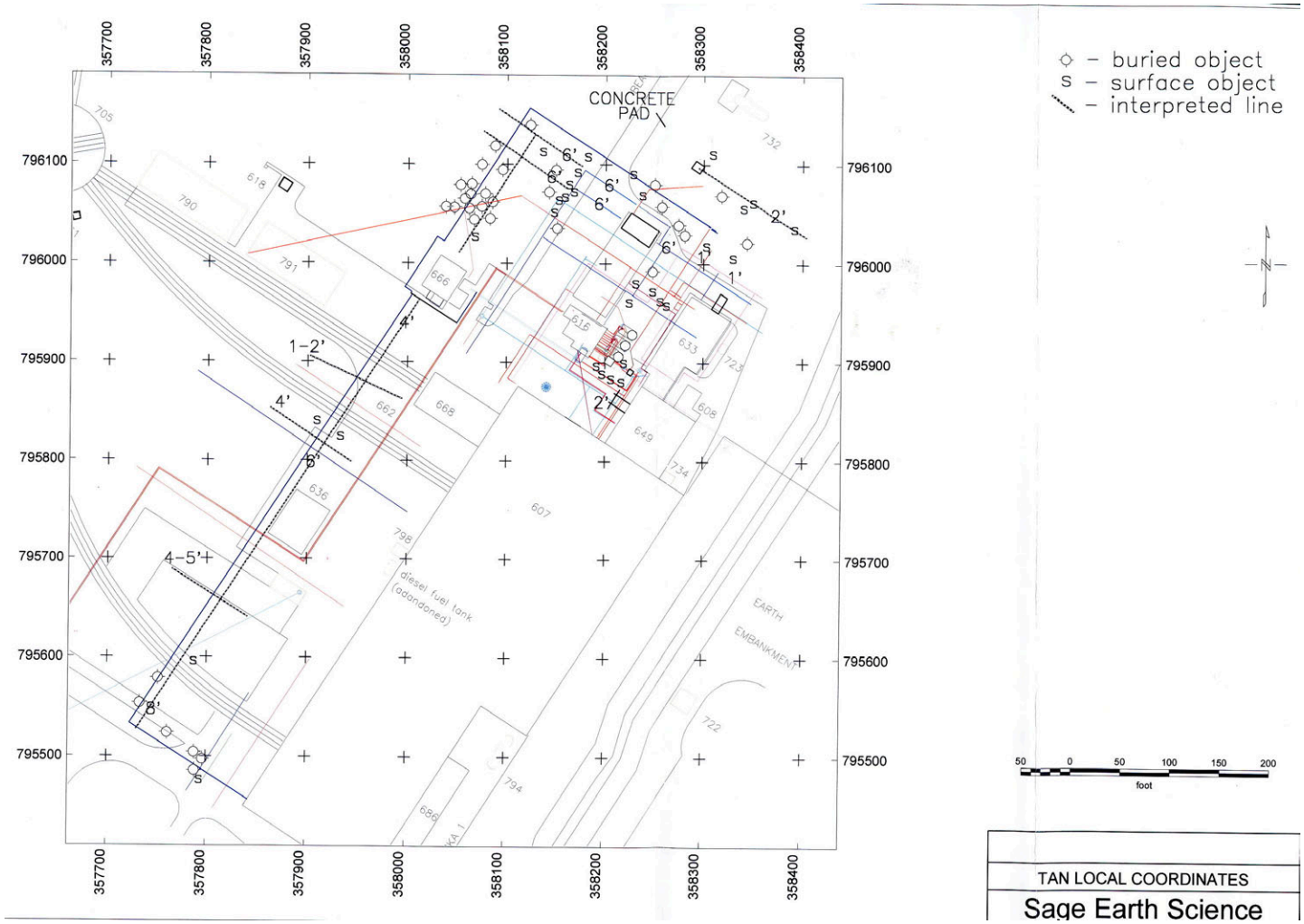
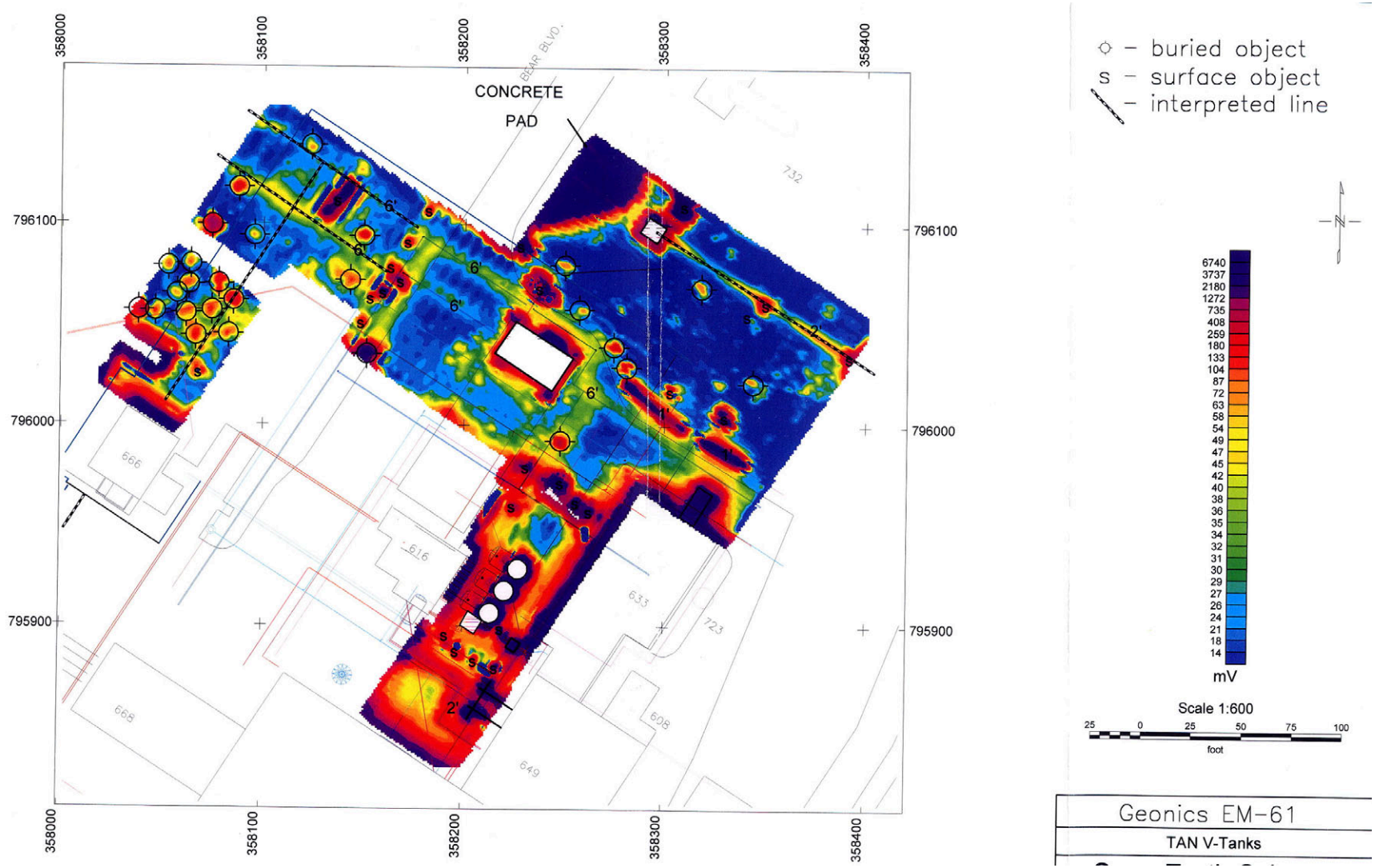


◇ – buried object
s – surface object
– interpreted line
CONCRETE PAD
diesel fuel tank (adandoned)
EARTH EMBANKMENT
foot
TAN LOCAL COORDINATES
Sage Earth Science



CONCRETE
PAD
BEAR BLVD.
358000
358100
358200
358300
358400
796100
796000
795900
666
616
633
723
668
608
649
732
6'
2'
1'
◇ – buried object
s – surface object
– interpreted line
6740
3737
2180
1272
735
408
259
180
133
104
87
72
63
58
54
49
47
45
42
40
38
36
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34
32
31
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29
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24
21
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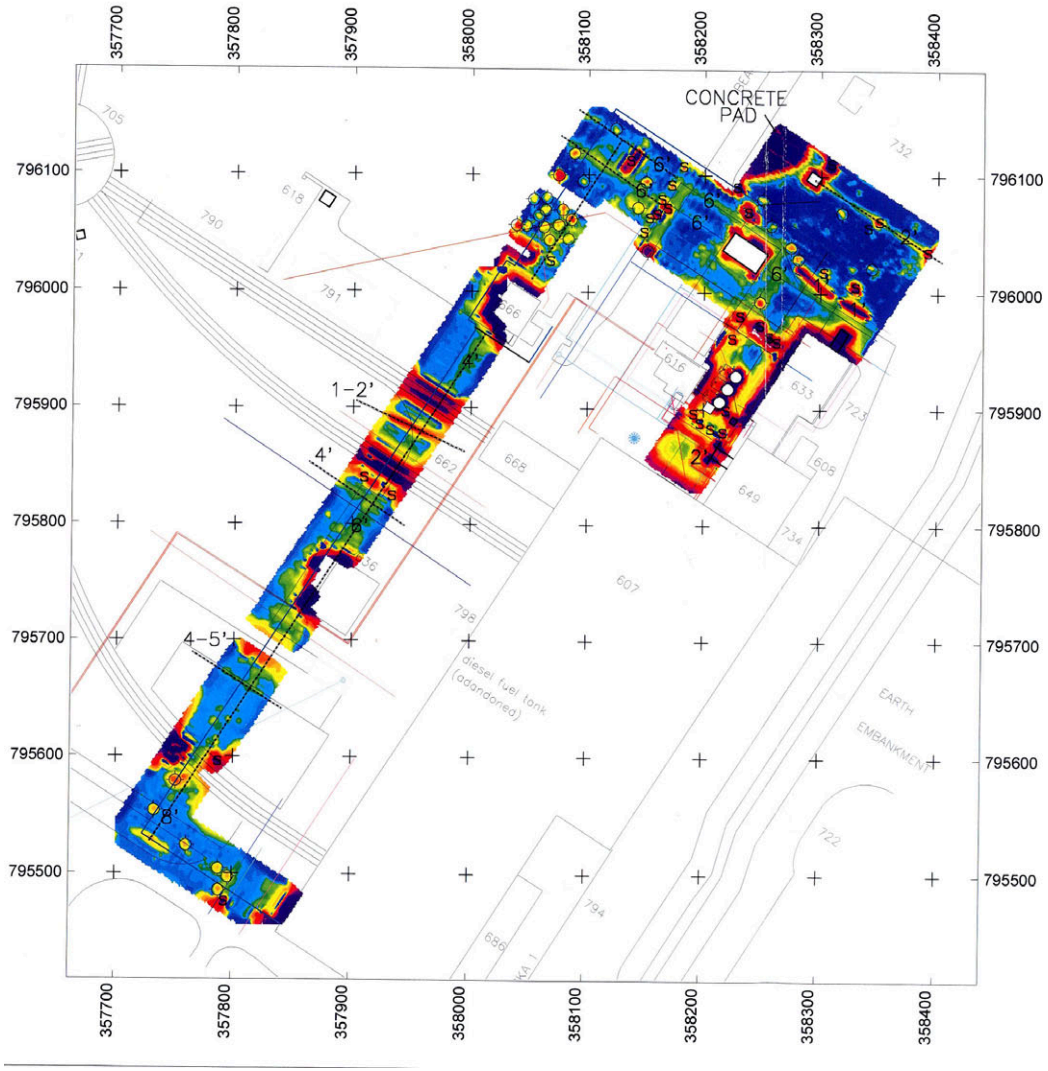
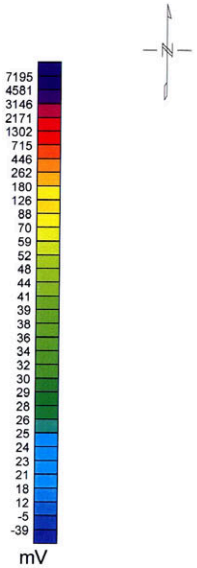
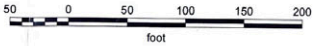
14
mV
Scale 1:600
25 0 25 50 75 100
foot
Geonics EM-61
TAN V-Tanks



○ – buried object
S – surface object
– interpreted line





GEONICS EM-61

TAN LOCAL COORDINATES

Sage Earth Science

Appendix B

Waste Area Group 1, Operable Unit 1-10, Group 2 Soil Surface in Situ Gamma Scan Results Report

Appendix-B
Waste Area Group 1, Operable Unit 1-10, Group 2 Soil Surface in Situ Gamma Scan Results Report

Idaho National Engineering and Environmental Laboratory

INEEL
Home of Science and Engineering Solutions

INTEROFFICE MEMORANDUM

Date:	April 02, 2003		
To:	Jim Jessmore	MS 3930	6-7558
	Paul Sloan	MS 3921	6-6199
	Mark Elliot	MS 3920	6-0872
From:	C. P. Oertel	MS 4110	6-3541
	M. L. Evans	MS 4110	6-3069
	K. C. Thompson	MS 4107	6-2259

Subject: WAG 1 OU 1-10 GROUP 2 Soil Surface InSitu Gamma Scan Results

INTRODUCTION:

We have completed initial field gamma spectrometry measurements and data analysis for the WAG 1 OU 1-10 remediation project. This area is directly north of the V9 tank area at TAN. Figure 1 shows the general location and Figure 2 shows the gridded measurement point locations.

Figure 1. /wag 1 OU 1-10 area photograph.

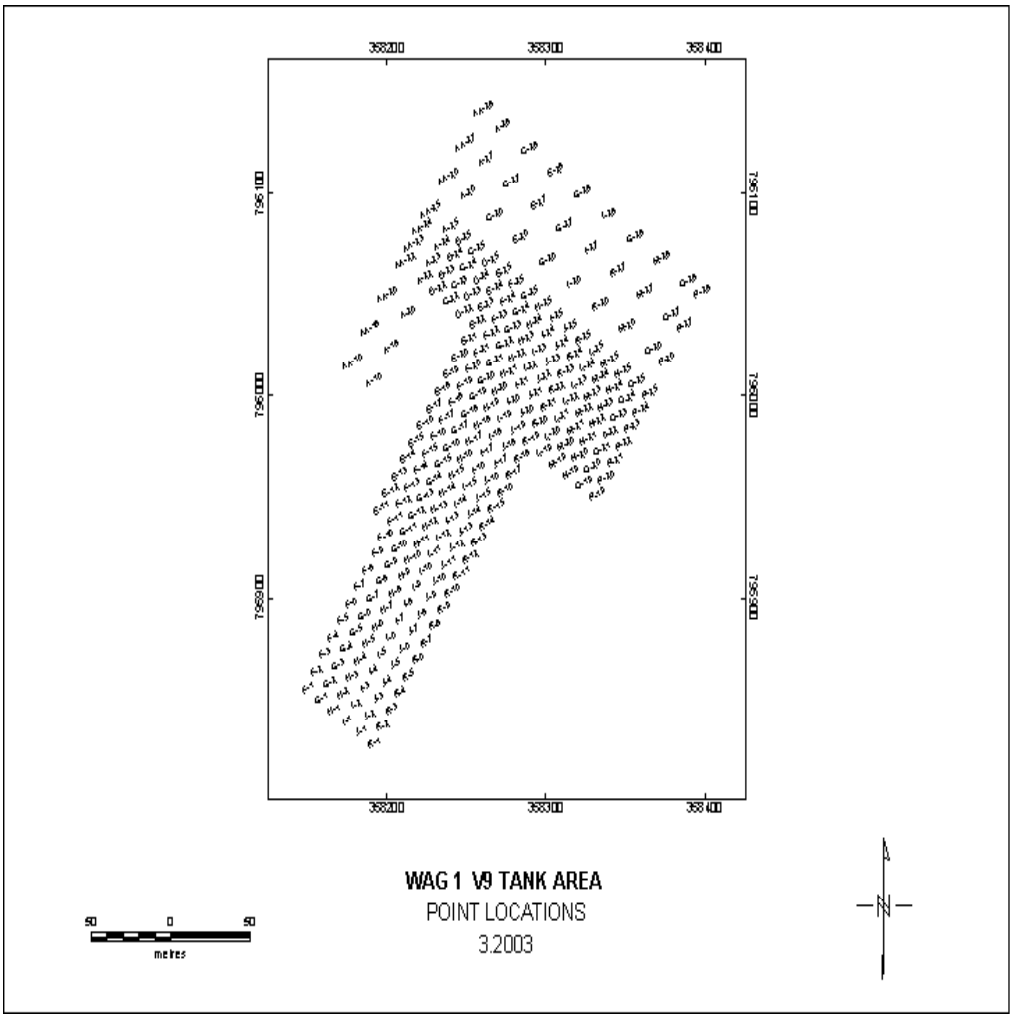


Figure 2. Point locations at WAG 1 OU 1-10 3.2003.

The measurement request for this work stated that the goal was to characterize the Cs-137 distribution at this area and to establish a radiation profile. In order to perform this task, we used a tiered technical approach to performing the measurements:

1. Measurement systems in a collimated/shielded configuration. These measurements "see" an effective field of view of either 12 or 20 feet in diameter. The fields of view match the grid space sizes established by the project management team.

Figure 3 shows a typical detector setup:

Figure 3. Normal detector measurement configuration.

2. Measurements at locations near the V9 tanks were performed using a collimated/shielding arrangement so that the field of view was restricted to about 12 feet in diameter. Due to very high count rates an additional 2 in. thick lead plug was added to the detector collimator arrangement for some of these measurements.

Figure 4 shows the high purity germanium detector with a 2-in. thick lead plug used in the V9 vicinity:

Figure 4. Detector with 2-in. lead plug (bottom) used in the V9 area.

3. The measurements were performed using a 900 second live count time. Random points were remeasured using a 3,600 second live count time in order to assess the counting statistics and measurement precision.

Spectra were acquired and analyzed by the AMETEK-Ortec Isotopic Plus software algorithm. This program specifies a measurement configuration that includes the detector field of view, collimator characteristics, soil density, and detector efficiency. The field of view (12 or 20 ft diameter) is determined

using the collimator thickness, soil-to-detector distance and detector recess. The soil density used for this work was 1.65 g/cc based on previous INEEL studies. The detector efficiency is determined at the factory and onsite using a NIST traceable multinuclide calibaration source. The measured isotopic peak count rates were corrected for the counting geometry, collimator, soil attenuation, and detector efficiency. In order to convert the calculated activity (units of pCi) to concentration (pCi/gram) for each isotope, we used an effective soil measurement depth of 4 inches and converted it to a measured mass using geometrical calculations. This value is based on previous INEEL studies that have generally shown that the highest percentage of Cs-137 in soil resides in the top layers. However, this site has multiple contamination scenarios and underground contamination. We cannot use this technique to assess deep soil contamination.

RESULTS

Appendix A shows the results of 200 insitu gamma measurements. Table 1 shows a summary of all of the Cs-137,Co-60 and K-40 results:

Table B-1. Overall statistic for V9 area (values in pCi/g).

	CS-137	CO-60	K-40
MEAN	4.7E+04	9.1E+00	2.9E+01
SDEV	2.5E+05	4.3E+01	6.2E+01
MIN	1.5E-01	0.0E+00	2.3E+00
MAX	1.9E+06	4.0E+02	4.4E+02

Table 1 shows a very high mean value for Cs-137. It must be noted that this value includes the values from the trench area immediately west of the V9 tanks. It was in this area that we had to use a very thick (2 in.) lead plug in order to perform any measurements. Table 2 shows the results of measurements performed in this higher radiation field area:

Table B-2. Data for trench area (isotopes in pCi/g).

North	East	Elev.	ID	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
795915.62	358203.5	4781.8457	G-9	88.5	1.90E+06	28%	4.01E+02	25%	4.36E+02	26%
795910.17	358211.9	4782.3807	H-9	73	1.20E+06	28%	3.44E+02	25%	3.46E+02	25%
795918.49	358217.3	4781.7411	H-10	39.6	4.30E+05	28%	1.16E+02	25%	3.12E+02	25%
795924	358209	4781.7494	G-10	88.7	1.50E+06	28%	2.05E+02	26%	2.96E+02	27%
795932.36	358214.5	4781.7795	G-11	78.3	1.20E+06	28%	1.27E+02	26%	3.16E+02	26%
795926.91	358222.8	4781.6891	H-11	19.4	1.40E+05	28%	6.92E+01	25%	2.57E+02	25%
795940.74	358220	4781.6976	G-12	84.7	1.49E+06	28%	8.91E+01	26%	3.22E+02	27%
795949.1	358225.4	4781.9039	G-13	69.5	9.84E+05	28%	4.01E+01	25%	2.55E+02	25%
				MEAN	1.11E+06		1.74E+02		3.18E+02	
				SDEV	5.80E+05		1.33E+02		5.72E+01	

The data in Table 2 shows the very high mean values for Cs-137,Co-60, and K-40. These values were calculated using an approximate correction factor that was based on the placement of the lead collimator

under the detector during the measurements in the trench area. These values are very likely biased high since we estimated the magnitude of the correction factor to use for this area. The high bias is confirmed when one examines the K-40 data. The normal K-40 background at the INEEL is about 15-30 pCi/g and for this area the calculated mean is about 15 times higher than normal. However, one should not scale the Cs-137 data in any way. We mention this to show that the magnitude of our correction estimation does not change the conclusion that, for these points, the Cs-137 concentrations are quite high.

Table 3 shows the results of Table 1 without the points from the trench area:

Table 3. V9 data (pCi/g without trench points.

	CS-137	CO-60	K-40
MEAN	6.9E+01	1.9E+00	1.7E+01
SDEV	1.5E+02	4.9E+00	8.3E+00
MIN	1.5E-01	0.0E+00	2.3E+00
MAX	1.1E+03	3.1E+01	5.1E+01

Table 3 shows that the values are much lower, The K-40 is now in the midrange of normal INEEL concentrations for that isotope. The Cs-137 mean of 69 pCi/g has a standard deviation of 15 pCi/g. This value is somewhat higher than we like to see and reflects the wide scatter of the Cs-137 concentrations at this site.

Figure 5 shows the Cs-137 values at this operable unit. Note the predictable high values near the V9 tanks.

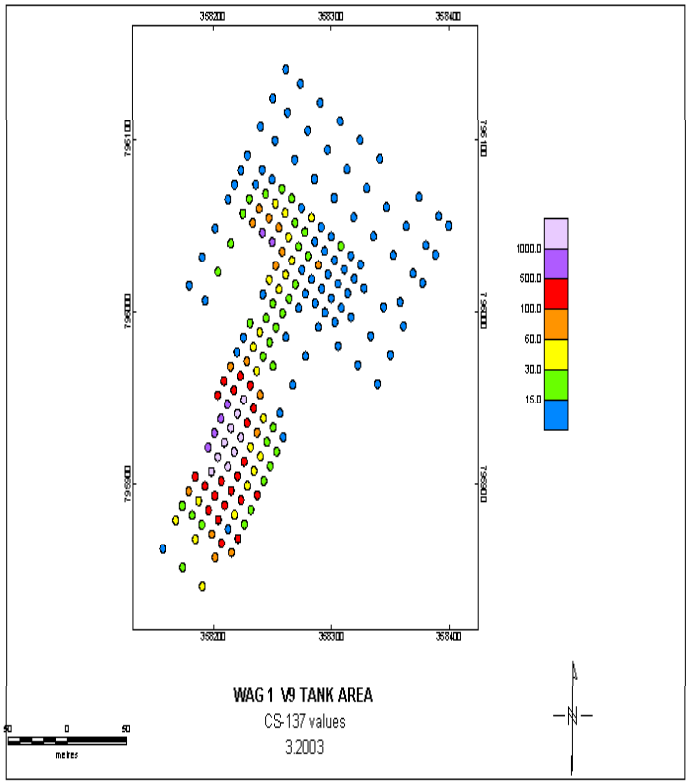


Figure 5. Cs-137 pCi/g values at WAG 1 V9 area 3.2003.

Figure 6 below shows a mathematical contour of the Cs-137 values. This type of map displays the point to point extrapolations of the Cs-137 values and is useful in laterally bounding the data.

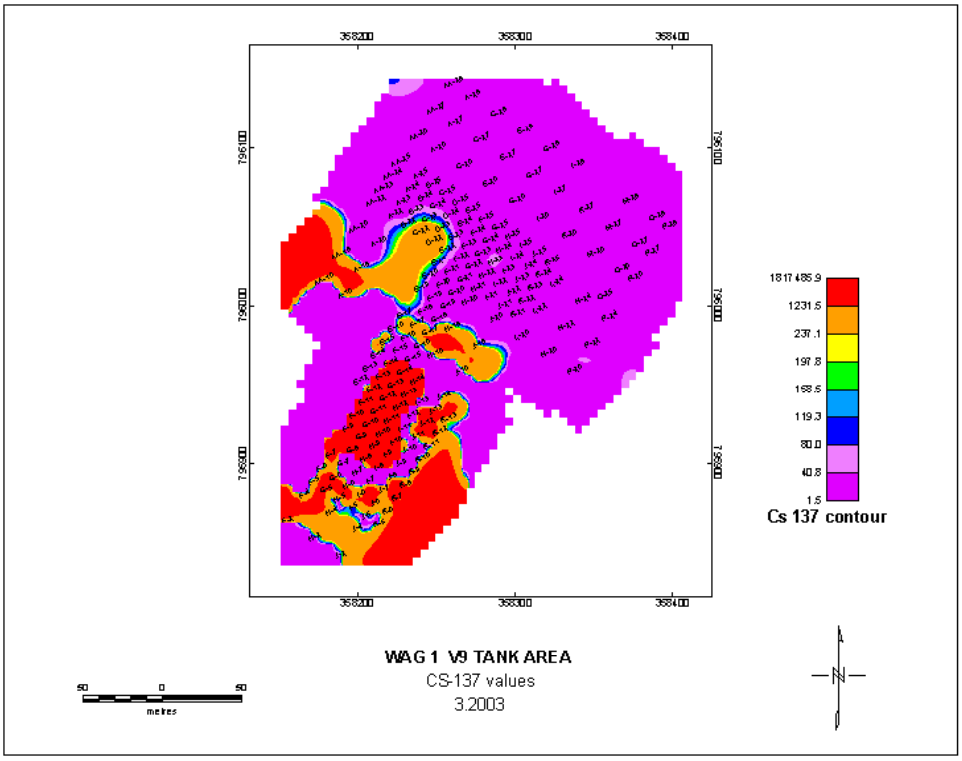


Figure 6. Cs-137 contour at WAG 1 OU 10-1 soil area.

The contours in Figure 6 show the high pCi/g values near the evaporator pit and trench areas. This map can be used to roughly define the lateral extent of these high readings. Again, it is worth stating that the actual calculated Cs-137 values for the trench points are very likely biased high due to the model we used in the calculations.

SUMMARY

A mean Cs-137 value of 69.3 pCi/g was measured at WAG 1 OU 1-10. Measurements with a collimated detector system showed areas of high surface contamination (>100 pCi/g) in the area adjacent to the V9 tanks and evaporator pit area.

Please do not hesitate to call if there are further questions.

Table 4. TITLE NEEDED.

North	East	Elev	Id	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
796050.2	358399.42	4787.9008	P-28	1.2	8.30E-01	34%	4.00E-02	55%	1.23E+01	32%
796140.65	358261.49	4782.1888	AA-28	1.3	8.40E-01	34%	7.00E-02	38%	1.41E+01	32%
796015.3	358179.22	4782.0849	AA-16	3.6	1.90E+00	34%	1.60E-01	35%	1.61E+01	32%
796006.42	358192.72	4782.172	A-16	3.1	5.80E+00	34%	1.10E-01	37%	8.30E+00	32%
796057.21	358224.66	4782.2362	A-22	4.9	2.75E+01	28%	2.20E-01	27%	1.26E+01	25%
796035.3	358258.04	4782.1972	E-22	5.6	7.89E+01	28%	6.40E-01	27%	2.15E+01	25%

North	East	Elev	Id	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
795985.12	358225.17	4782.3691	E-16	5.3	3.49E+00	29%	0.00E+00	0%	1.61E+01	32%
795851.64	358173.48	4782.0974	H-2	1.9	2.45E+01	30%	1.00E+00	31%	4.04E+01	30%
795862.64	358156.81	4782.3992	F-2	2.2	4.20E+00	34%	9.40E-01	31%	2.98E+01	30%
795857.42	358201.08	4782.1063	J-4	3.2	9.27E+01	30%	6.50E+00	30%	3.85E+01	30%
795868.36	358184.36	4781.9643	H-4	2.5	5.30E+01	30%	1.50E+00	30%	3.50E+01	30%
795879.35	358167.65	4782.1401	F-4	2.5	5.57E+01	30%	0.00E+00	0%	4.26E+01	30%
795882.17	358181.49	4781.8597	G-5	3.5	1.72E+01	28%	6.40E-01	26%	1.25E+01	25%
795890.44	358187.09	4781.7626	G-6	4.8	3.21E+01	27%	1.20E+00	26%	1.46E+01	26%
795896.07	358178.66	4781.8433	F-6	5.3	6.07E+01	28%	7.20E-01	26%	1.25E+01	26%
795904.39	358184.16	4782.0042	F-7	12.6	1.95E+02	28%	6.20E+00	25%	1.63E+01	25%
795876.76	358189.81	4782.0003	H-5	3.6	1.59E+01	28%	1.20E+00	25%	1.35E+01	27%
795871.26	358198.16	4782.035	I-5	3.6	9.02E+01	23%	6.20E+00	22%	4.02E+01	22%
795865.82	358206.56	4781.9876	J-5	3.7	1.21E+02	23%	9.90E+00	22%	4.03E+01	22%
795860.31	358214.9	4781.9693	K-5	3.2	9.13E+01	23%	6.80E+00	22%	4.26E+01	22%
795868.68	358220.51	4782.0487	K-6	4.6	1.38E+02	23%	1.08E+01	22%	5.07E+01	22%
795874.1	358212.11	4782.2097	J-6	4.3	7.90E+00	27%	1.22E+01	22%	4.65E+01	22%
795879.59	358203.77	4781.9811	I-6	4.6	1.51E+02	23%	1.27E+01	22%	4.64E+01	22%
795885.12	358195.45	4781.985	H-6	5.9	2.73E+02	23%	9.70E+00	22%	4.08E+01	22%
795876.99	358225.97	4782.2199	K-7	4.7	2.56E+01	28%	4.70E+00	25%	1.53E+01	25%
795885.33	358231.44	4782.45	K-8	4.4	2.02E+01	28%	1.60E+00	25%	1.60E+01	25%
795893.73	358236.95	4782.3645	K-9	8.5	1.01E+02	28%	4.60E+00	25%	1.86E+01	25%
795902.03	358242.39	4782.1831	K-10	3.5	1.65E+01	28%	1.20E+00	25%	9.80E+00	25%
795910.48	358247.92	4782.1649	K-11	4.5	1.75E+01	28%	6.40E-01	26%	2.76E+01	25%
795918.8	358253.38	4782.1931	K-12	4.4	1.64E+01	28%	3.70E-01	27%	2.72E+01	25%
795927.13	358258.85	4782.2483	K-13	4.1	1.48E+01	28%	3.00E-01	30%	2.68E+01	25%
795976.76	358219.66	4782.0379	E-15	6.3	6.10E+00	28%	1.80E-01	78%	1.60E+01	25%
795968.4	358214.14	4781.7899	E-14	8.1	8.70E+01	28%	5.30E-01	26%	1.27E+01	25%
795960.03	358208.68	4781.8562	E-13	10.2	1.16E+02	28%	7.20E-01	26%	1.29E+01	25%
795951.68	358203.23	4781.7629	E-12	14.5	1.91E+02	28%	1.00E+00	25%	1.49E+01	25%
795957.72	358266.96	4782.1094	J-16	2.8	8.20E+00	34%	1.20E-01	38%	1.41E+01	32%
795968.67	358250.19	4782.1018	H-16	2.8	2.73E+01	34%	2.50E-01	34%	2.18E+01	32%
795974.15	358241.82	4782.1101	G-16	3.3	2.73E+01	28%	2.90E-01	26%	1.39E+01	25%
795979.64	358233.52	4782.3249	F-16	3.2	5.60E+01	28%	5.80E-01	26%	2.07E+01	25%
795958.25	358339.05	4782.1176	P-20	2.1	2.40E+00	34%	1.90E-01	35%	1.47E+01	32%
795969.22	358322.32	4782.3605	N-20	1.4	1.20E+00	34%	1.10E-01	38%	1.39E+01	32%

North	East	Elev	Id	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
795980.19	358305.6	4782.2564	L-20	1.9	1.60E+00	34%	5.00E-02	46%	1.63E+01	32%
795994.05	358302.74	4782.1517	K-21	1.8	4.90E+00	28%	5.00E-02	47%	1.91E+01	25%
795974.98	358350	4781.5088	P-22	2.2	2.10E+00	34%	1.80E-01	36%	1.34E+01	32%
795985.94	358333.27	4782.4154	N-22	2.3	1.50E+00	34%	1.20E-01	37%	8.10E+00	32%
795996.93	358316.6	4782.1205	L-22	2	3.10E+00	34%	8.00E-02	37%	1.10E+01	32%
796002.35	358308.17	4782.6875	K-22	1.6	4.40E+00	28%	5.00E-02	35%	1.07E+01	25%
796010.74	358313.67	4784.2482	K-23	1.9	5.30E+00	28%	6.00E-02	39%	1.07E+01	25%
795991.7	358360.99	4784.6335	P-24	1.9	2.50E+00	34%	1.10E-01	35%	1.10E+01	32%
796002.65	358344.22	4784.0775	N-24	2.4	2.20E+00	34%	1.10E-01	36%	8.90E+00	32%
796013.64	358327.54	4784.3763	L-24	2.4	2.50E+00	34%	8.00E-02	40%	8.30E+00	32%
796019.1	358319.15	4784.1957	K-24	1.6	4.20E+00	28%	1.00E-02	29%	1.14E+01	25%
796027.45	358324.63	4784.0298	K-25	1.5	3.60E+00	28%	9.00E-02	32%	1.34E+01	25%
796005.54	358358.08	4784.9213	O-25	2.9	2.20E+00	34%	1.50E-01	35%	1.15E+01	32%
796016.77	358377.38	4787.0127	P-26	1.7	1.80E+00	34%	1.60E-01	34%	9.20E+00	32%
796022.27	358369.07	4786.4108	O-26	1.6	1.80E+00	34%	1.10E-01	34%	9.20E+00	32%
796033.2	358352.29	4785.7703	M-26	2.2	1.90E+00	34%	4.00E-02	40%	5.90E+00	32%
796044.21	358335.62	4784.5286	K-26	2.7	2.80E+00	34%	8.00E-02	37%	8.80E+00	32%
796060.89	358346.56	4784.4069	K-27	2.1	2.60E+00	34%	1.10E-01	35%	1.20E+01	32%
796049.95	358363.3	4786.1036	M-27	2.3	1.80E+00	34%	5.00E-02	40%	9.20E+00	32%
796038.98	358380.01	4786.7892	O-27	1.5	8.00E-01	34%	1.20E-01	37%	1.15E+01	32%
796033.5	358388.39	4786.8931	P-27	1.4	1.30E+00	34%	6.00E-02	46%	1.38E+01	32%
796055.71	358390.98	4787.77	O-28	1.7	1.30E+00	34%	6.00E-02	41%	2.30E+00	37%
796066.66	358374.25	4787.0445	M-28	2.3	1.30E+00	34%	8.00E-02	41%	1.15E+01	37%
796088.66	358340.85	4784.4356	I-28	2.8	1.60E+00	34%	1.20E-01	35%	1.15E+01	32%
796099.55	358324.09	4782.5838	G-28	1.5	2.10E+00	34%	0.00E+00	0%	1.36E+01	32%
796110.55	358307.38	4781.9587	E-28	1.3	7.60E-01	34%	8.00E-02	40%	1.29E+01	32%
796121.47	358290.66	4781.8486	C-28	1.5	2.40E+00	34%	7.00E-02	49%	1.21E+01	32%
796132.51	358273.93	4782.1366	A-28	1.1	1.50E-01	36%	8.00E-02	46%	1.25E+01	32%
796123.97	358250.43	4782.1452	AA-27	1.5	2.40E+00	34%	1.10E-01	35%	1.34E+01	32%
796115.75	358262.96	4782.1141	A-27	0.8	1.50E-01	38%	6.00E-02	40%	1.31E+01	32%
796104.78	358279.69	4781.5035	C-27	2.1	4.70E+00	34%	1.10E-01	36%	1.32E+01	32%
796093.84	358296.41	4782.0477	E-27	1.8	1.20E+00	34%	1.10E-01	36%	1.35E+01	32%
796082.82	358313.13	4783.1072	G-27	1.8	3.10E+00	34%	8.00E-02	40%	1.41E+01	32%
796071.86	358329.84	4783.327	I-27	1.9	2.40E+00	34%	1.20E-01	38%	1.42E+01	32%
796055.14	358318.88	4783.8925	I-26	2.5	3.50E+00	34%	1.10E-01	35%	8.10E+00	32%

North	East	Elev	Id	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
796066.11	358302.16	4782.7364	G-26	1.9	4.70E+00	34%	1.00E-01	36%	1.00E+01	32%
796077.08	358285.45	4781.8602	E-26	2.1	3.30E+00	34%	8.00E-02	42%	9.80E+00	32%
796088.03	358268.73	4781.4969	C-26	2.3	5.20E+00	34%	1.10E-01	37%	1.21E+01	32%
796099.03	358252.01	4782.0371	A-26	2.1	4.30E+00	34%	1.30E-01	37%	1.01E+01	32%
796107.17	358239.49	4782.0649	AA-26	1.8	3.40E+00	34%	8.00E-02	37%	1.34E+01	32%
796090.55	358228.49	4781.667	AA-25	2.2	4.90E+00	34%	9.00E-02	36%	1.14E+01	32%
796082.33	358241.02	4780.1266	A-25	2.2	7.90E+00	28%	9.00E-02	29%	8.90E+00	25%
796076.79	358249.4	4779.9038	B-25	2.7	1.34E+01	28%	1.10E-01	31%	6.90E+00	25%
796071.33	358257.76	4780.7855	C-25	1.5	1.88E+01	28%	2.70E-01	28%	1.41E+01	25%
796065.8	358266.13	4780.5007	D-25	2.3	2.06E+01	28%	2.30E-01	29%	2.00E+01	25%
796060.34	358274.48	4781.8192	E-25	3.4	1.18E+01	28%	1.40E-01	29%	1.48E+01	25%
796054.83	358282.84	4782.2097	F-25	3.1	3.51E+01	28%	3.70E-01	28%	2.47E+01	25%
796049.39	358291.2	4782.5115	G-25	1.6	1.00E+01	28%	1.60E-01	29%	1.14E+01	25%
796043.92	358299.56	4782.783	H-25	1.4	9.80E+00	28%	1.40E-01	36%	1.54E+01	25%
796038.47	358307.94	4783.4462	I-25	3.3	2.31E+01	28%	1.30E-01	29%	1.02E+01	25%
796032.89	358316.25	4783.7745	J-25	1.3	9.30E+00	28%	1.40E-01	30%	1.94E+01	25%
796024.61	358310.81	4783.6791	J-24	1.3	4.80E+00	28%	1.50E-01	31%	1.60E+01	25%
796030.06	358302.43	4783.49	I-24	1.9	7.20E+00	28%	6.00E-02	32%	8.90E+00	25%
796035.56	358294.08	4782.8954	H-24	1.8	1.45E+01	28%	1.40E-01	30%	1.40E+01	25%
796041.07	358285.72	4782.4333	G-24	2.3	1.20E+01	28%	1.10E-01	30%	1.29E+01	25%
796046.5	358277.35	4782.2449	F-24	2.6	2.79E+01	28%	2.80E-01	29%	2.53E+01	25%
796052.03	358268.99	4781.2797	E-24	4	1.62E+01	28%	1.40E-01	28%	1.41E+01	25%
796057.46	358260.64	4781.9362	D-24	2.5	3.86E+01	28%	3.00E-01	29%	1.90E+01	25%
796063	358252.27	4781.8036	C-24	2.4	3.11E+01	28%	2.80E-01	30%	1.61E+01	25%
796068.43	358243.92	4781.7875	B-24	1.6	1.62E+01	28%	1.80E-01	29%	1.42E+01	25%
796073.94	358235.55	4781.6203	A-24	2.5	4.90E+00	28%	1.30E-01	31%	1.03E+01	25%
796082.13	358223.03	4781.9933	AA-24	2.5	7.90E+00	34%	1.10E-01	40%	1.11E+01	32%
796073.8	358217.54	4782.0247	AA-23	2.8	8.60E+00	34%	1.10E-01	35%	1.48E+01	32%
796065.58	358230.07	4781.901	A-23	4.1	2.09E+01	28%	1.80E-01	29%	1.42E+01	25%
796060.08	358238.44	4781.8253	B-23	3.1	6.09E+01	28%	4.10E-01	27%	1.99E+01	25%
796054.58	358246.8	4782.1045	C-23	4.1	7.32E+01	28%	7.60E-01	26%	2.00E+01	25%
796049.17	358255.14	4782.1225	D-23	4.8	9.91E+01	28%	5.20E-01	26%	2.61E+01	25%
796043.66	358263.51	4782.0287	E-23	3.1	3.51E+01	28%	3.70E-01	28%	2.47E+01	25%
796038.14	358271.88	4781.7105	F-23	2.5	2.61E+01	28%	3.40E-01	27%	2.32E+01	25%
796032.66	358280.23	4781.8955	G-23	2.6	1.52E+01	28%	1.00E-01	33%	1.24E+01	25%

North	East	Elev	Id	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
796027.21	358288.6	4782.4079	H-23	5.4	7.52E+01	28%	3.20E-01	28%	2.00E+01	25%
796021.7	358296.96	4782.7918	I-23	2.3	8.70E+00	28%	1.00E-01	32%	8.40E+00	25%
796016.25	358305.32	4783.445	J-23	1.4	8.40E+00	28%	1.10E-01	32%	1.33E+01	25%
796007.87	358299.84	4782.7785	J-22	1.6	9.20E+00	28%	9.30E-01	31%	1.47E+01	28%
796013.34	358291.47	4782.2071	I-22	1.9	6.10E+00	28%	8.00E-02	31%	8.60E+00	25%
796018.86	358283.11	4782.044	H-22	2.2	1.50E+01	25%	2.40E-01	29%	1.47E+01	25%
796024.34	358274.75	4781.9695	G-22	2.9	1.49E+01	28%	1.10E-01	32%	1.50E+01	25%
796029.82	358266.39	4782.2577	F-22	3.2	3.09E+01	28%	2.10E-01	30%	2.91E+01	25%
796040.74	358249.68	4782.0353	D-22	24.1	7.74E+02	28%	3.30E+00	25%	1.91E+01	25%
796046.23	358241.32	4782.1923	C-22	17.8	5.52E+02	28%	2.62E+00	26%	1.64E+01	25%
796051.71	358232.97	4782.2321	B-22	4.7	8.11E+01	28%	5.80E-01	26%	1.84E+01	25%
796065.4	358212.08	4781.9873	AA-22	3.1	8.80E+00	34%	1.20E-01	36%	1.51E+01	32%
796048.72	358201.09	4781.8948	AA-20	3.1	5.90E+00	34%	1.30E-01	39%	1.07E+01	32%
796031.99	358190.14	4781.6686	AA-18	3.1	1.15E+01	34%	1.40E-01	35%	7.70E+00	32%
796023.21	358203.53	4782.0155	A-18	4.9	2.48E+01	34%	2.30E-01	33%	1.04E+01	32%
796039.99	358214.38	4782.0737	A-20	4.9	1.88E+01	34%	1.70E-01	35%	1.01E+01	32%
796026.93	358252.54	4782.1621	E-21	10.2	7.58E+01	28%	3.90E-01	26%	1.17E+01	25%
796021.49	358260.88	4782.1756	F-21	3.6	4.37E+01	28%	2.30E-01	28%	2.25E+01	25%
796016.01	358269.25	4782.3676	G-21	2.8	1.65E+01	28%	1.60E-01	30%	1.75E+01	25%
796010.45	358277.64	4782.3703	H-21	2.02	1.43E+01	28%	2.50E-01	30%	2.74E+01	25%
796004.98	358285.99	4782.3224	I-21	2.1	7.10E+00	28%	1.00E-01	38%	1.86E+01	25%
795999.52	358294.35	4782.2189	J-21	1.6	9.60E+00	28%	1.90E-01	35%	2.87E+01	25%
795991.17	358288.87	4782.3995	J-20	2.4	5.50E+00	34%	8.00E-02	41%	1.66E+01	32%
796002.13	358272.14	4782.3717	H-20	2.1	1.42E+01	34%	2.50E-01	33%	1.98E+01	32%
796007.57	358263.8	4782.5053	G-20	2.8	1.65E+01	28%	1.40E-01	32%	1.28E+01	25%
796013.08	358255.43	4782.3016	F-20	3.7	3.92E+01	28%	2.80E-01	28%	1.85E+01	25%
796018.56	358247.07	4782.1754	E-20	10.5	4.20E+01	28%	1.10E-01	68%	2.00E+01	34%
796010.19	358241.6	4782.1643	E-19	6.2	1.42E+01	28%	1.80E-01	27%	1.12E+01	25%
796004.69	358249.98	4782.3387	F-19	3.1	2.78E+01	28%	3.30E-01	29%	1.71E+01	25%
795999.23	358258.32	4782.4187	G-19	4	1.69E+01	28%	1.50E-01	29%	1.19E+01	25%
795974.42	358277.87	4782.692	J-18	2.5	3.90E+00	34%	1.00E-01	37%	1.53E+01	32%
795985.38	358261.21	4782.4288	H-18	2.3	1.02E+01	28%	1.10E-01	29%	1.13E+01	25%
795990.88	358252.81	4782.1571	G-18	2.6	1.51E+01	28%	1.50E-01	28%	9.90E+00	25%
795996.36	358244.44	4782.0961	F-18	2.6	2.61E+01	28%	3.60E-01	27%	1.78E+01	25%
796001.84	358236.11	4782.1424	E-18	4.95	1.56E+01	28%	1.10E-01	29%	0.00E+00	0%

North	East	Elev	Id	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
795993.47	358230.63	4782.1763	E-17	5.97	2.22E+01	28%	1.70E-01	29%	1.67E+01	32%
795988	358238.96	4782.1724	F-17	2.6	3.04E+01	28%	2.90E-01	28%	1.90E+01	25%
795982.52	358247.35	4782.1976	G-17	2.7	1.73E+01	28%	1.80E-01	28%	1.22E+01	25%
795887.62	358173.21	4782.0683	F-5	3.1	1.77E+01	28%	4.40E-01	27%	1.48E+01	25%
795840.62	358190.14	4782.2215	J-2	2.1	4.74E+01	30%	2.20E+00	30%	4.02E+01	30%
795898.92	358192.53	4782.0536	G-7	12.7	1.59E+02	28%	6.50E+00	25%	1.57E+01	25%
795893.43	358200.88	4781.9708	H-7	14.6	1.96E+02	28%	1.39E+01	25%	1.47E+01	25%
795887.95	358209.24	4781.9002	I-7	10.5	1.35E+02	28%	2.26E+01	25%	1.74E+01	25%
795882.46	358217.6	4782.2468	J-7	5.4	3.07E+01	28%	7.80E+00	25%	1.59E+01	25%
795890.84	358223.09	4782.9778	J-8	18.3	2.02E+02	28%	3.12E+01	25%	1.86E+01	25%
795896.32	358214.73	4782.4892	I-8	14.3	1.59E+02	28%	2.86E+01	25%	1.68E+01	25%
795901.79	358206.35	4782.2319	H-8	15.5	1.39E+02	28%	2.60E+01	25%	2.00E+01	25%
795907.28	358197.99	4782.2526	G-8	49	1.13E+03	28%	2.08E+01	25%	1.72E+01	25%
795921.1	358195.1	4782.6492	F-9	37	6.44E+02	28%	1.20E+00	25%	2.18E+01	25%
795915.62	358203.47	4781.8457	G-9	88.5	1.90E+06	28%	4.01E+02	25%	4.36E+02	26%
795910.17	358211.87	4782.3807	H-9	73	1.20E+06	28%	3.44E+02	25%	3.46E+02	25%
795904.68	358220.21	4782.5088	I-9	14.4	2.33E+02	28%	1.53E+01	25%	7.20E+00	26%
795899.12	358228.53	4782.3059	J-9	6.6	4.02E+01	28%	3.70E+00	25%	1.43E+01	25%
795907.54	358234.04	4782.3734	J-10	6.3	4.78E+01	28%	1.40E+00	26%	1.51E+01	25%
795913.07	358225.71	4782.4045	I-10	9.8	1.71E+02	28%	2.80E+00	26%	1.38E+01	25%
795918.49	358217.3	4781.7411	H-10	39.6	4.30E+05	28%	1.16E+02	25%	3.12E+02	25%
795924	358208.97	4781.7494	G-10	88.7	1.50E+06	28%	2.05E+02	26%	2.96E+02	27%
795929.46	358200.59	4782.6994	F-10	44.1	9.19E+02	28%	9.92E+00	25%	1.81E+01	25%
795937.79	358206.02	4782.4775	F-11	30.2	5.40E+02	28%	2.54E+00	25%	1.64E+01	25%
795932.36	358214.45	4781.7795	G-11	78.3	1.20E+06	28%	1.27E+02	26%	3.16E+02	26%
795926.91	358222.84	4781.6891	H-11	19.4	1.40E+05	28%	6.92E+01	25%	2.57E+02	25%
795921.38	358231.17	4782.4676	I-11	5.1	5.11E+01	28%	9.00E-01	26%	1.27E+01	25%
795915.93	358239.54	4782.1494	J-11	4.1	5.27E+01	28%	1.00E+00	25%	1.63E+01	25%
795924.3	358245.02	4782.042	J-12	4.9	2.95E+01	28%	4.50E-01	27%	1.85E+01	25%
795929.73	358236.64	4782.4574	I-12	4.7	6.43E+01	28%	5.00E-01	26%	1.27E+01	25%
795935.21	358228.27	4782.2728	H-12	24.1	3.86E+02	28%	1.30E+00	25%	1.27E+01	25%
795940.74	358219.96	4781.6976	G-12	84.7	1.49E+06	28%	8.91E+01	26%	3.22E+02	27%
795946.22	358211.61	4782.3263	F-12	27.1	5.09E+02	28%	3.10E+00	25%	1.41E+01	25%
795954.55	358217.04	4782.2731	F-13	25.1	4.74E+02	28%	2.33E+00	25%	1.28E+01	25%
795949.1	358225.44	4781.9039	G-13	69.5	9.84E+05	28%	4.01E+01	25%	2.55E+02	25%

North	East	Elev	Id	D-time (%)	Cs-137	2-sig	Co-60	2-sig	K-40	2-sig
795943.6	358233.78	4782.3524	H-13	16.6	2.49E+02	28%	6.40E-01	26%	1.23E+01	25%
795938.09	358242.11	4782.5012	I-13	4.1	5.48E+01	28%	3.30E-01	27%	1.23E+01	25%
795932.61	358250.49	4782.133	J-13	2.8	2.05E+01	28%	3.50E-01	26%	1.85E+01	25%
795941.03	358255.98	4782.041	J-14	2.5	1.44E+01	28%	2.00E-01	29%	1.80E+01	26%
795951.92	358239.22	4782.5074	H-14	7.4	6.06E+01	34%	2.30E-01	33%	8.30E+00	32%
795957.41	358230.85	4782.2449	G-14	21.7	3.65E+02	28%	5.40E-01	26%	1.07E+01	25%
795962.91	358222.53	4781.821	F-14	10.8	1.34E+02	28%	1.38E+00	25%	1.11E+01	25%
795965.8	358236.42	4782.5924	G-15	6.6	5.84E+01	28%	3.70E-01	26%	1.05E+01	25%
795971.27	358228.04	4782.4556	F-15	3.9	7.86E+01	28%	7.50E-01	26%	2.12E+01	25%

System Engineering: M. L. Evans, C. P. Oertel, K. C. Thompson3.2003
Field Measurements: M. L. Evans, C. P. Oertel, K. C. Thompson
Data Analysis: K. C. Thompson, M. L. Evans
Mapping/Report: C. P. Oertel

cc: C. P. Oertel Letter File

Uniform File code:
Disposition Authority:
Retention Schedule:

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Appendix C

TSF-09/18 and TSF-21 Sites Waste Area Group 1, Operable Unit 1-10, V-Tank Area Soils Vertical Profiling Report

Appendix-C
TSF-09/18 and TSF-21 Sites Waste Area Group1, Operable Unit 1-10, V-Tank Area Soils Vertical Profiling Report

Idaho National Engineering and Environmental Laboratory

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INTEROFFICE MEMORANDUM

Date: August 21, 2003

To: Distribution

From:	J. R. Giles	MS 3950	6-2350
	C. P. Oertel	MS 4110	6-3541
	K. C. Thompson	MS 4110	6-2259

Subject: WAG 1 OU 1-10 V-TANK AREA SOILS VERTICAL PROFILING

INTRODUCTION

Subsurface gamma-ray spectroscopy measurements and data analysis for the WAG 1 OU 1-10 remediation project have been completed. Ten boreholes were drilled, and subsurface high-resolution gamma-ray spectra were collected at 1-ft. increments for the entire depth of each borehole.

The area where the vertical profiling was conducted included three boreholes inside the soil contamination area enclosed by the orange construction fence and the area directly north of the V-tank area. Figure 1 is a photograph of the area, and Figure 2 is a map showing the locations of the boreholes.

Figure 1. WAG 1 OU 1-10 area photograph.

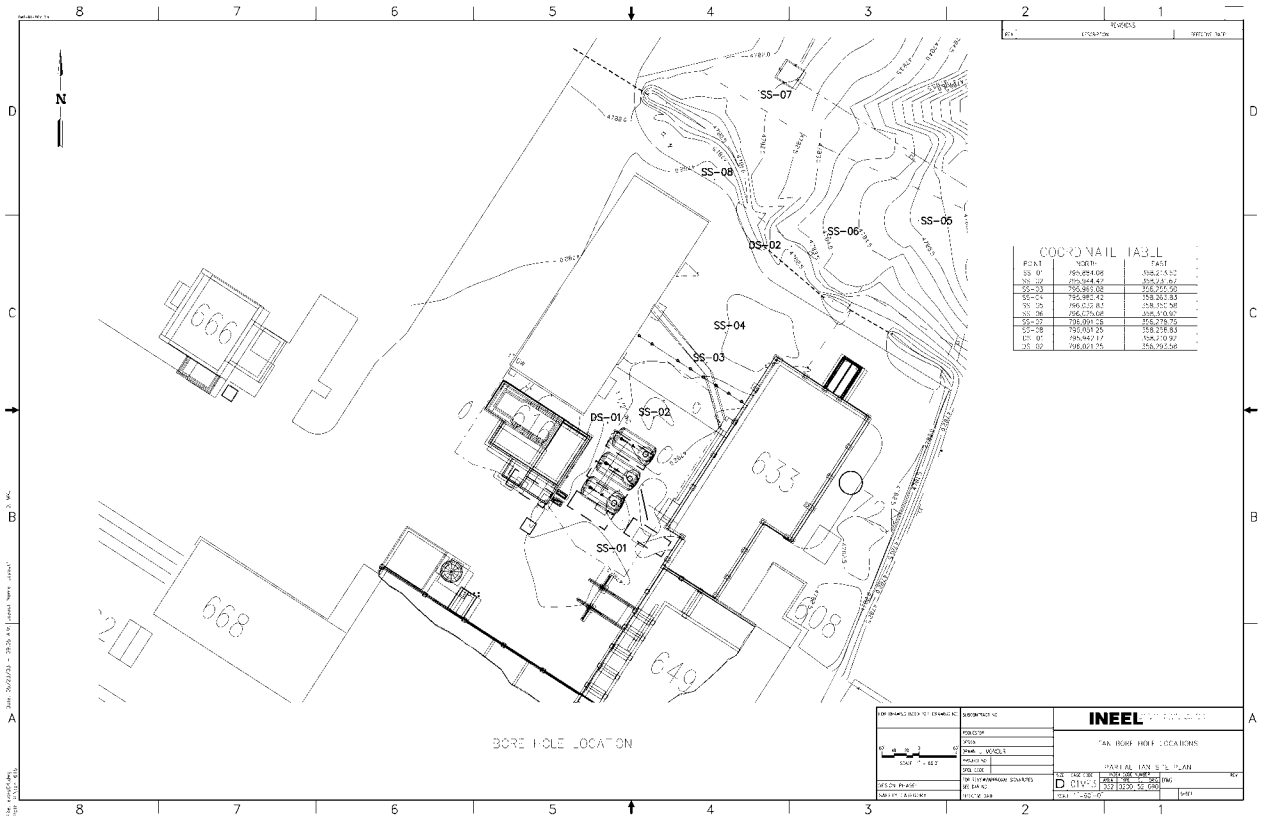

Figure 2. TAN V-Tank area borehold locations.

The objective of the in situ vertical profiling was to provide depth-discrete radiological characterization data, specifically, the concentration of Cs-137 as a function of depth at ten pre-selected locations. The data was used to direct the collection of physical samples for laboratory analysis, serving as baseline information for the V-tank removal remedial design.

This letter report provides a description of the equipment and methods used during the vertical profiling, and a summary of the data collected. Also included are the gamma-ray well logs and associated data.

MATERIALS AND METHODS

The in situ vertical profiling at the TAN V-Tank area was conducted using the INEEL Gamma Spectroscopy Logging System (GSLS). The GSLS consists of hardware and software designed to locate, identify and quantify near-surface and sub-surface radionuclide data in boreholes and monitoring wells. The system is composed of logging tools (detector(s) and housing), nuclear pulse processing equipment, hydraulic winch, and computer control equipment.

The logging tool used to support the vertical profiling at TAN comprised of an 18% relative efficiency high-purity germanium (HPGe) detector, high voltage power supply, and pre-amplifier. This equipment along with a liquid nitrogen dewar are contained in a water-tight casing. The tool has a diameter of 3.65-in.s and can be used in any well or borehole with an I.D. of 4 in. or larger. A partial listing of the radionuclides that can be identified with this system are ^{40}K, ^{60}Co, ^{125}Sb, ^{137}Cs, ^{152}Eu, ^{154}Eu,

^{208}Tl (^{232}Th daughter), ^{214}Pb, ^{214}Bi, ^{226}Ra, ^{234m}Pa (^{238}U daughter), ^{235}U, and ^{238}U. Concentrations are typically reported in pCi/g, with 1-sigma counting uncertainty.

The equipment is mounted in a four-wheel drive van. The power requirements for the system are supplied by the van's diesel engine. A power-take-off unit is connected to the vehicle transmission which provides the hydraulic pressures needed to operate the cable hoisting system. The system is equipped with sufficient length of cable to log to a depth of 760 ft. The entire system is computer controlled using a personal computer. Software allows the user to control the movement of the tool, perform logging activities and data analysis. The software and hardware are configured to allow complete system automation.

The vertical profiling task in and around the TAN V-Tanks included well logging of ten boreholes; 8 shallow boreholes ≤20 ft. deep, and 2 boreholes drilled to the basalt interface, which occurred at depths less than 50 ft. Typical data collection procedures included set-up of the GSLS over the borehole, lowering the detector to the bottom of the borehole and sequential stationary measurements at 1-ft. increments throughout the depth of each borehole from the bottom to land surface. Count times ranged from 200 to 1,000 live-time seconds.

The shallow boreholes were augered to depth using 10 in. augers. The drill head was disconnected from the auger, and 4 in Schedule 40 carbon steel casing was lowered to the bottom of the hole, the drill head reconnected, and the auger flights were removed. Logging was completed through the 4-in. casing. The shallow boreholes were to be augered to 10 ft., unless contamination was encountered at the 10-ft. depth; then the hole was augered an additional 10 ft. to a total depth of 20 ft. The deep boreholes were augered to depth using 6 in. augers. The auger flights were left in-place, and the logging was completed through the augers. The deep boreholes were to be augered to a depth of 50 ft below land surface, or to the soil basalt interface, whichever was less. Table 1 lists the boreholes, and the total depth logged in each borehole.

Borehole ID	North	East	Logged Depth (ft)
SS-01	795887.21	358214.32	19.0
SS-02	795948.01	358232.89	9.5
SS-03	795969.94	358254.98	9.5
SS-04	795983.26	358263.32	9.5
SS-05	796033.68	358350.03	9.5
SS-06	796025.91	358310.36	9.25
SS-07	796091.91	358278.20	9.5
SS-08	796052.03	358258.31	9.5
DS-01	795943.02	358210.38	38.0
DS-02	796022.07	358293.03	43.5

The logged depths in each of the boreholes are less than the total depths due to the fact that the centerline of the HPGe detector is approximately 6 in. above the bottom of the logging tool.

DATA REPORTING AND DETECTOR CALIBRATION

The data provided in this summary are in situ concentrations based on an efficiency calibration performed at the borehole calibration facility in Grand Junction, Colorado. This efficiency calibration assumes a homogenous distribution of the contaminants in the area surrounding the borehole, effectively presenting an infinite, distributed source to the system detector. Based on the nature of the contamination at the V-tank area (i.e., leaks and spills of radioactively contaminated process effluent), it is assumed that the measured contamination is representative of an infinite homogenous source.

The gamma-ray spectra were analyzed using commercially available software (ORTEC GammaVision v.5.31). The Cs-137 count rate data was extracted from each gamma-ray spectrum using a simple region of interest peak strip routine. The uncertainties reported in the data set, and error bars on the gamma logs are 1-sigma, unless otherwise noted. These uncertainties are due to counting statistics. The data presented here are also corrected for attenuation from the steel that was in place during the logging activities (i.e., the 4-in. Schedule 40 casing in the shallow holes, and the 6-in. auger flights in the two deep holes). The correction factors for the augers used in the deep holes are approximated in that they do not account for the effects of the auger flights.

It should be noted that the concentrations reported here were calculated based on the GSLS efficiency calibration that was performed in 1999 at the borehole calibration facility in Grand Junction, Colorado. Due to time constraints, we were unable to update the calibration prior to the start of the field work. The GSLS is currently scheduled to be re-calibrated in the Fall of 2003. Upon completion of the calibration, the logging data presented here will be re-evaluated using the new calibration coefficients, and the data will be adjusted accordingly. Additionally, if possible during the calibration, measurements will be made to refine the correction factor for the 6-in. augers used in the deep boreholes. Based on previous calibrations, it is estimated that the net change in any individual concentration reported here will be 20% or less.

VERTICAL PROFILING RESULTS

As stated previously, each borehole was logged from the bottom to the top at 1-ft. increments. Cesium-137 was the only gamma-ray emitting radionuclide identified in all of the boreholes, with the exception of SS-05, during the vertical profiling activities at TAN. There was no Cs-137 identified above the system detection limit of 0.2 pCi/g in borehole SS-05. Cesium-137 concentrations in the boreholes ranged from below the system detection limit to a maximum of 2,285 ± 7 pCi/g in DS-02 at a depth of 6.5 ft.

The following is a summary, by borehole, of the Cs-137 concentrations identified during the vertical profiling activities at TAN. These summaries are complemented by the well logs and data provided in the attachment.

SS-01

The total logged depth in SS-01 was 19 ft. Cesium-137 was positively identified at all depths, with concentrations ranging from 0.3 ± 0.1 pCi/g at 17 ft. to an apparent concentration of 105.5 ± 0.6 pCi/g at land surface. The concentration increased towards land surface, and shows a spike of 86.4 ± 0.5 pCi/g at a depth of 3 ft. The apparent concentration of 105.5 ± 0.6 pCi/g at land surface is not to be considered a true concentration due to the departure from the system efficiency calibration geometry. It is important to note that the high contamination at land surface identified here is consistent with the elevated concentrations as reported by C. P. Oertel and others during surface in situ measurements conducted prior to the vertical profiling. This contamination is representative of surface soil contamination, or an external radiation source (i.e., shine) from adjacent buildings.

SS-02
The total logged depth in SS-02 was 9.5 ft. Cesium-137 was positively identified at all depths, with concentrations ranging from 2.5 ± 0.1 pCi/g at 5.5 ft. to a concentration of 23.7 ± 0.3 pCi/g at a depth of 0.5 ft. The concentration was uniform from 9.5 ft. to 2.5 ft. with an average of 4.7 ± 0.04 pCi/g. The concentration then rises sharply near land surface, again consistent with surface measurements. This contamination is representative of surface soil contamination, or an external radiation source (i.e., shine) from adjacent buildings.

SS-03
The total logged depth in SS-03 was 9.5 ft. Cesium-137 was detected from a depth of 4.5 ft. to land surface, with concentrations ranging from 0.3 ± 0.1 pCi/g to 3.6 ± 0.1 pCi/g, respectively.

SS-04
The total logged depth in SS-04 was 9.5 ft. Cesium-137 was positively identified at all depths, with concentrations ranging from 0.3 ± 0.1 pCi/g at a depth of 9.5 ft. to 15.4 ± 0.2 pCi/g at a depth of 5.5 ft. The highest concentrations in this borehole occur in a two-foot interval from 6.5 ft. to 4.5 ft.

SS-05
The total logged depth in SS-05 was 9.5 ft. Cesium-137 was not identified above the system detection limit of 0.2 pCi/g at any depth in the borehole.

SS-06
The total logged depth in SS-06 was 9.25 ft. Cesium-137 was positively identified at all depths, with concentrations ranging from 2.9 ± 0.1 pCi/g at 8.25 ft. to 131.5 ± 0.5 pCi/g at a depth of 2.25 ft. The Cs-137 concentration increases sharply from 23.4 ± 0.2 pCi/g to 95.3 ± 0.5 pCi/g from 4.25 ft. to 3.25 ft., respectively.

SS-07
The total logged depth in SS-07 was 9.5 ft. Cesium-137 was not identified above the system detection limit of 0.2 pCi/g at any depth other than 0.5 ft. where the apparent concentration was 0.3 ± 0.1 pCi/g. It should be noted that this borehole was located outside the soil contamination area, but adjacent to a temporary radioactive material storage area. As such the apparent contamination is likely attributed to shine from the stored radioactive material.

SS-08
The total logged depth in SS-08 was 9.5 ft. Cesium-137 was positively identified in the depth interval from 2.5 ft. to 0.5 ft. at concentrations ranging from 0.2 ± 0.1 pCi/g to 0.6 ± 0.1 pCi/g, respectively. It should be noted that this borehole was located outside the soil contamination area, but adjacent to a temporary radioactive material storage area. As such the apparent contamination is likely attributed to shine from the stored radioactive material.

DS-01
The total logged depth in DS-01 was 38 ft. Cesium-137 was positively identified at intermittent depths from 38 ft. to 12 ft., and continuously from 11 ft. to land surface. Cesium-137 contamination detected in the depth interval from 38 to 12 ft. was intermittent, with concentrations at or near the system detection limit and with a high degree of uncertainty. The contamination from 11 ft. to land surface ranged from a low of 0.6 ± 0.4 pCi/g at a depth of 6 ft. to a maximum concentration of 51.8 ± 0.7 pCi/g at land surface. Similar to the well logs for SS-01 and SS-02, this contamination is representative of surface soil contamination, or an external radiation source (i.e., shine) from adjacent buildings.

DS-02
The total logged depth in DS-02 was 43.5 ft. Cs-137 was positively identified in the following depth intervals and concentrations: from 43.5 ft. to 42.5 ft. ranging from 3.7 ± 0.1 pCi/g to 0.3 ± 0.1 pCi/g, respectively; from 21.5 ft. to 20.5 ft. ranging from 0.2 ± 0.1 pCi/g to 0.5 ± 0.1 pCi/g, respectively; and from 11.5 ft. to 0.5 ft. ranging from 0.3 ± 0.1 pCi/g to 131.0 ± 0.6 pCi/g, respectively. The maximum Cs-137 concentration of 2,285 ± 7 pCi/g was identified at a depth of 6.5 ft. This was the maximum concentration throughout the entire borehole in an interval from 7.5 ft. to 2.5 ft. where the average Cs-137 concentration was 1,571 ± 4 pCi/g.

JRG:sr

Attachments:
1. Gmma Logs
2. Gamma Log Data

Distribution
M. D. Elliot, MS 3920
J. D. Harris, MS 2510
J. J. Jessmore, MS 2510
G. E. Mc Dannel, MS 2510
P. A. Sloan, MS 2510
R. Sorenson, MS 9208
L. E. Wolford, MS 2510

cc: R. P. Miklos, MS 2510 (w/o Att.)
C. P. Oertel, MS 4110
K. C. Thompson, MS 4110
ARDC Files, MS 3922
J. R. Giles Letter File (JRG-01-03

Uniform File Code: 6102
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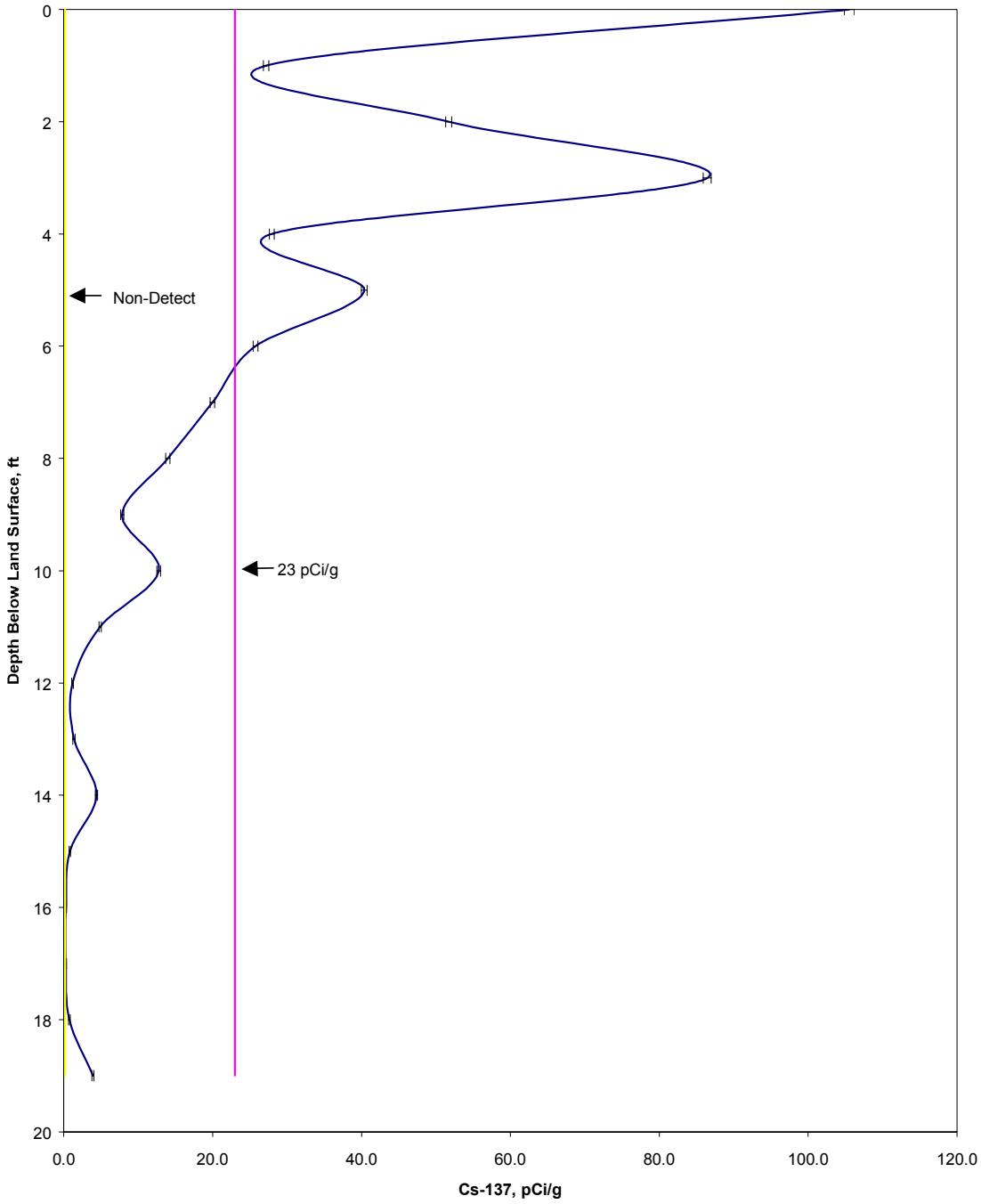
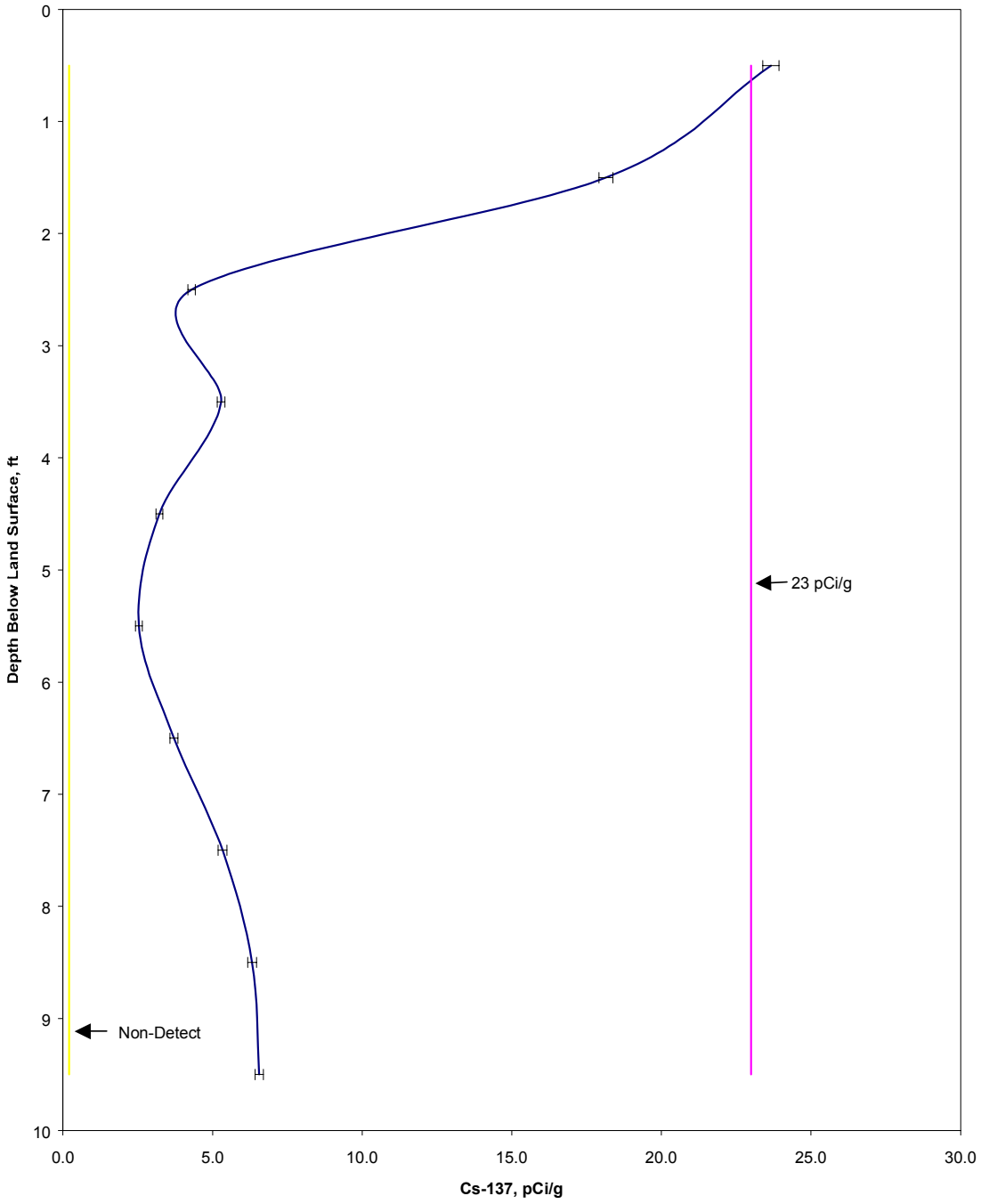
Attachment C-1

Gamma Logs

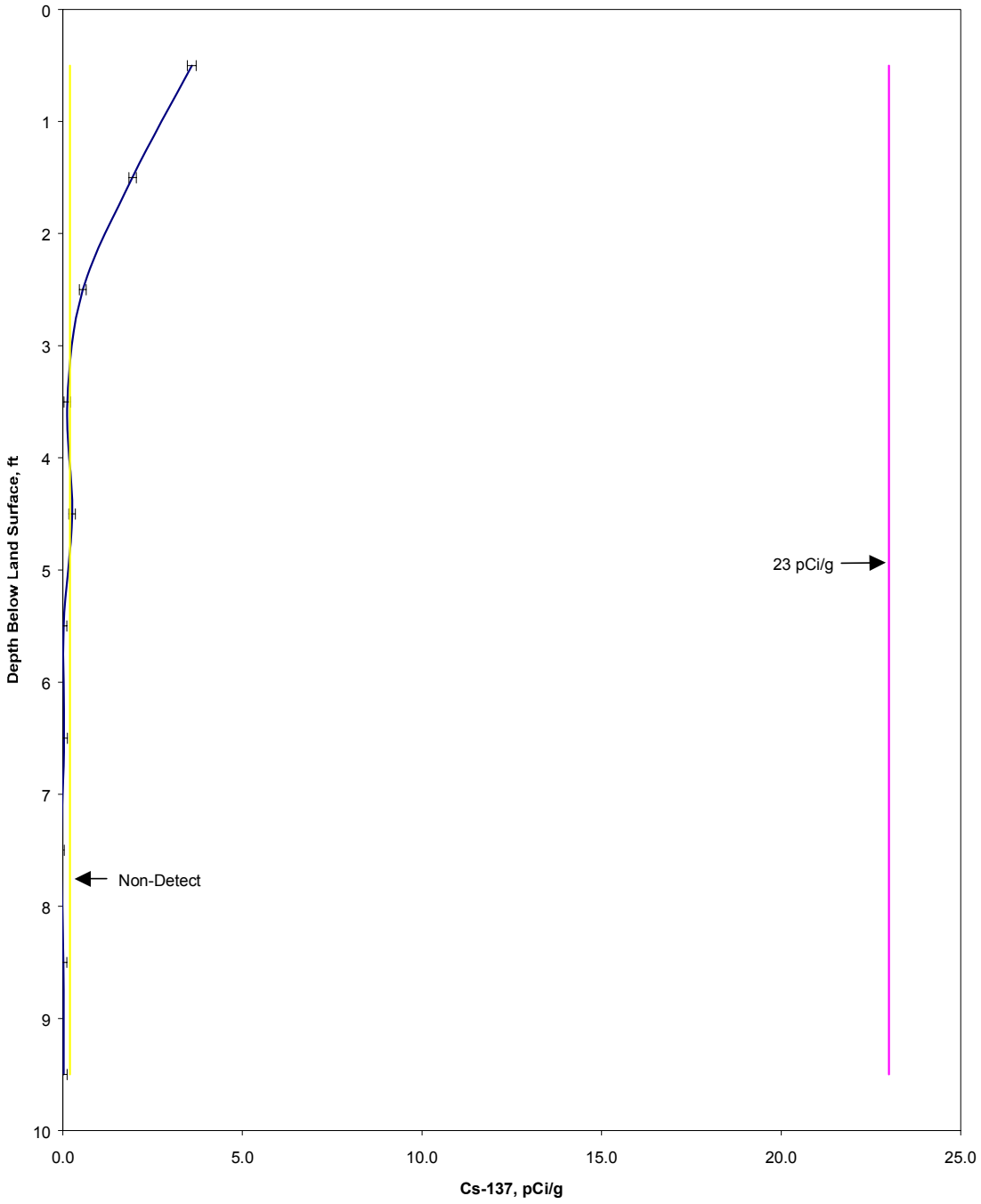
TAN SS-01
Cs-137 Gamma-Ray Log
July 10, 2003



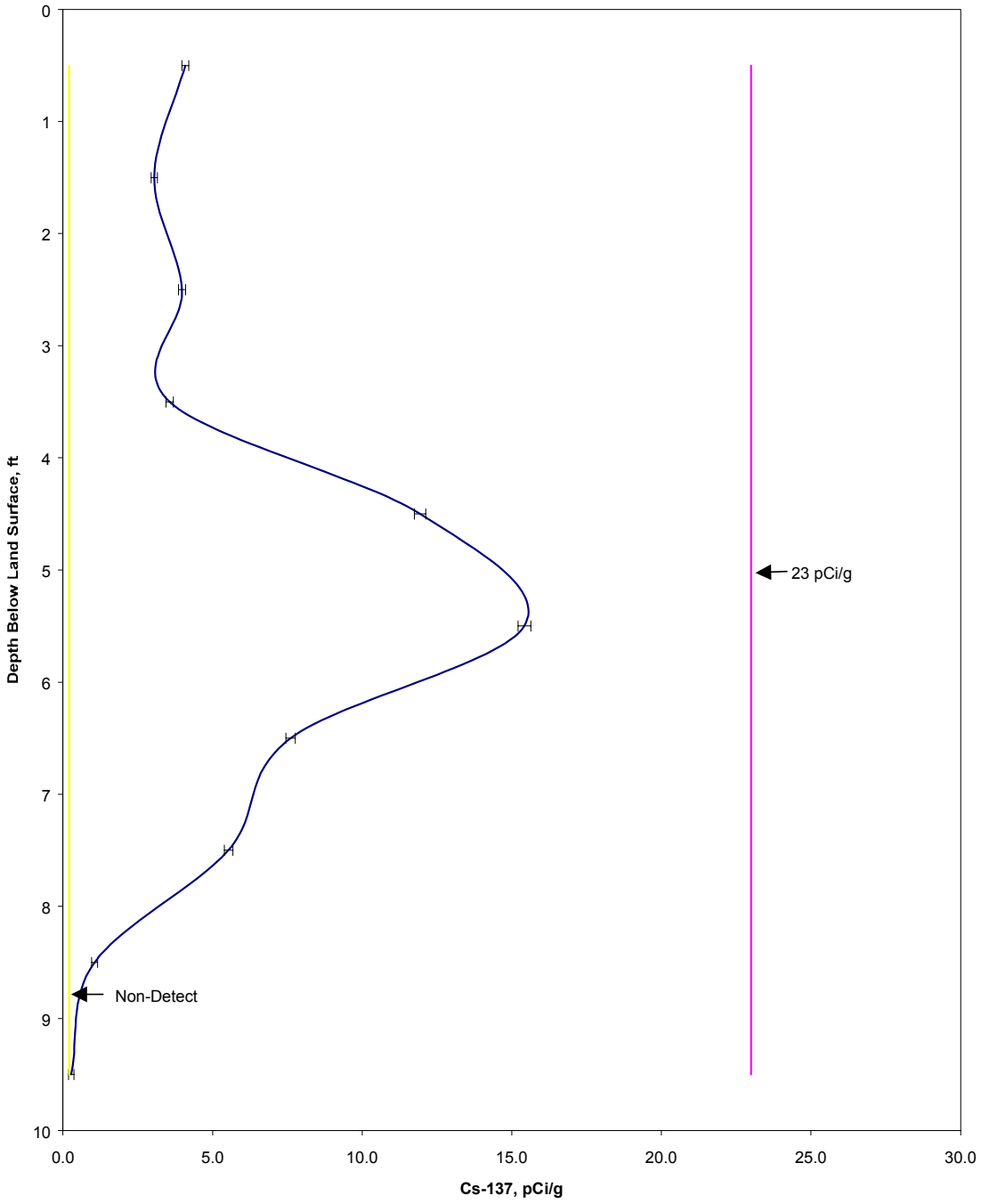
TAN SS-02
Cs-137 Gamma-Ray Log
July 17,2003



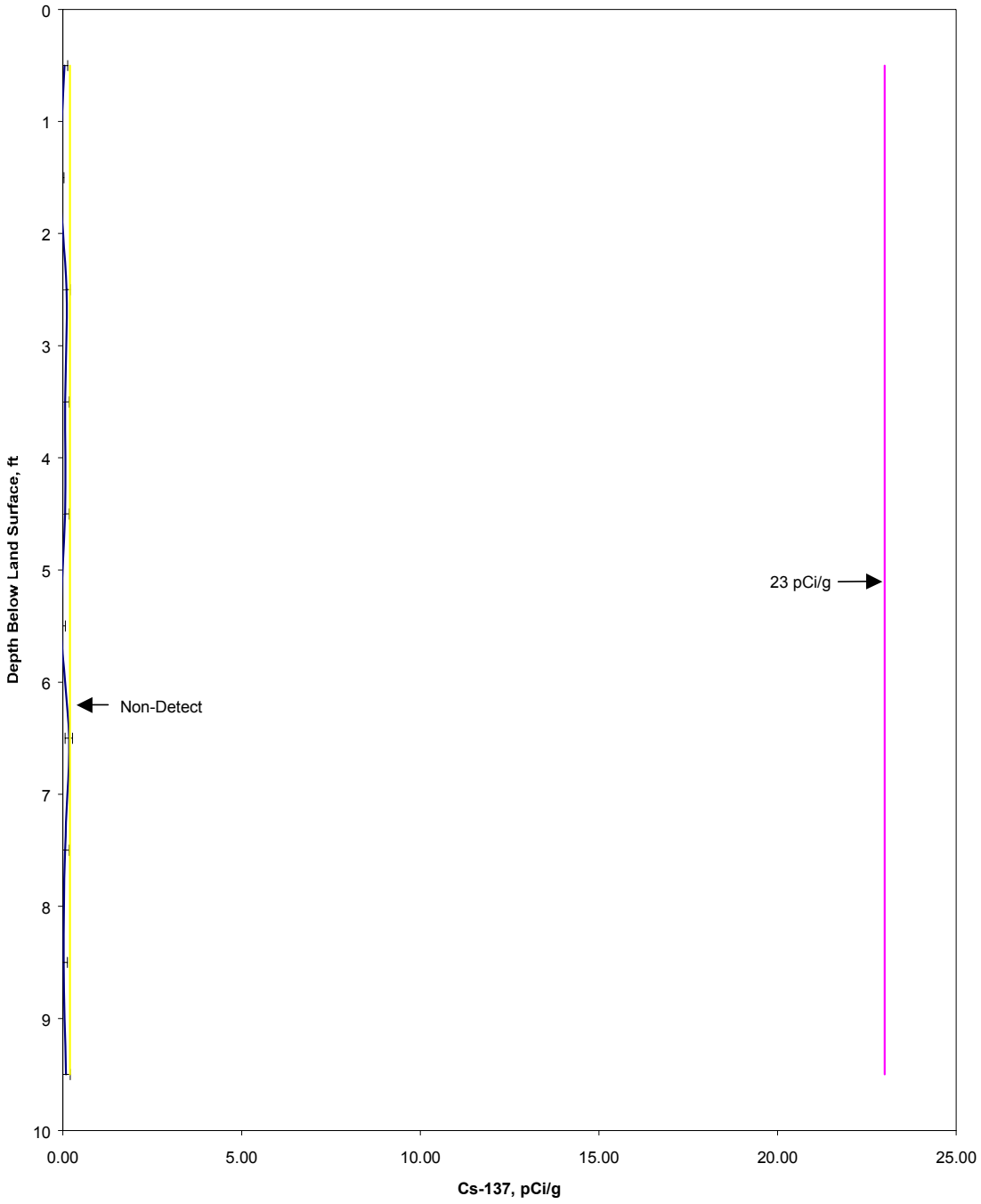
TAN SS-03
Cs-137 Gamma-Ray Log
July 14, 2003



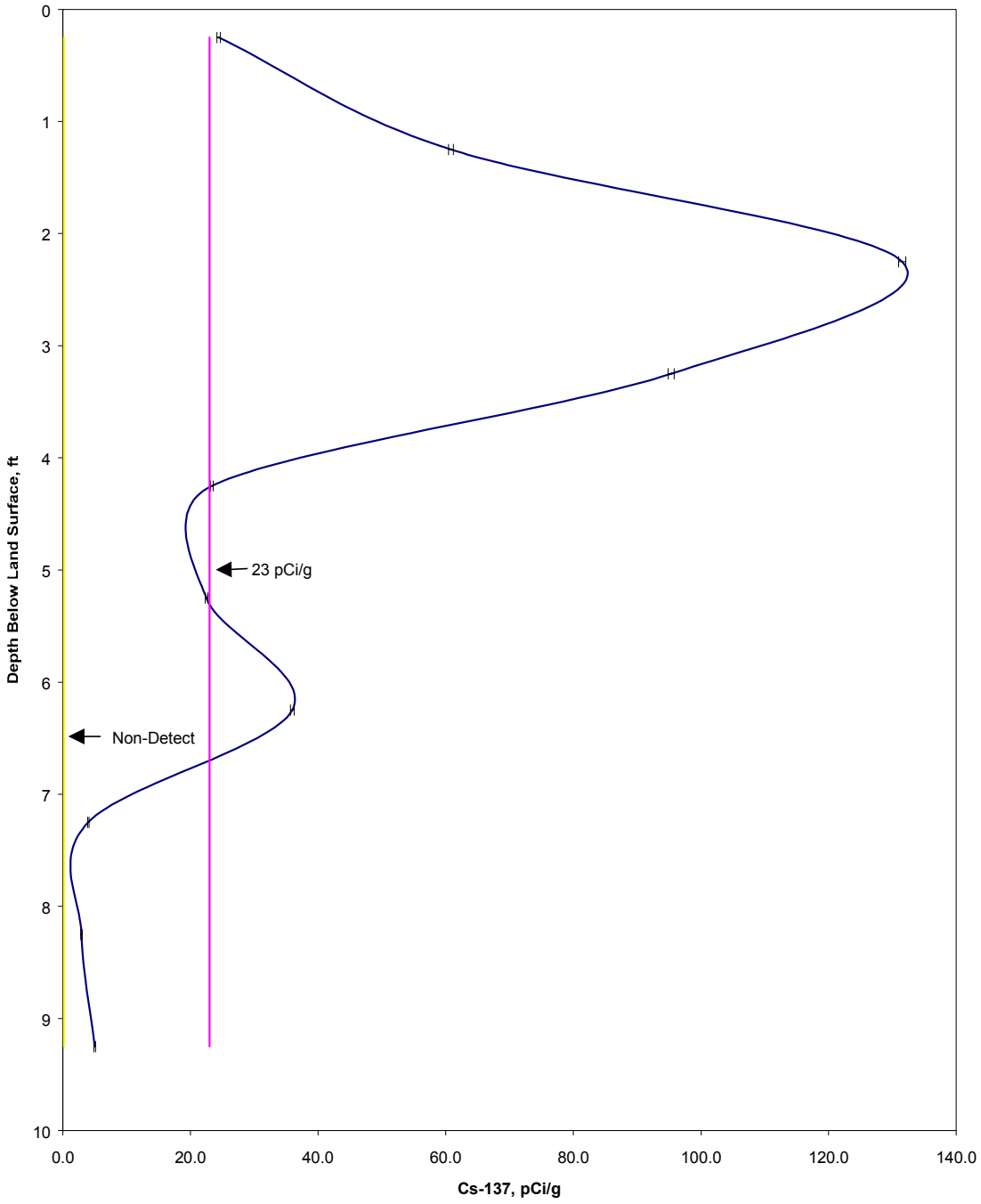
TAN SS-04
Cs-137 Gamma-Ray Log
July 9, 2003



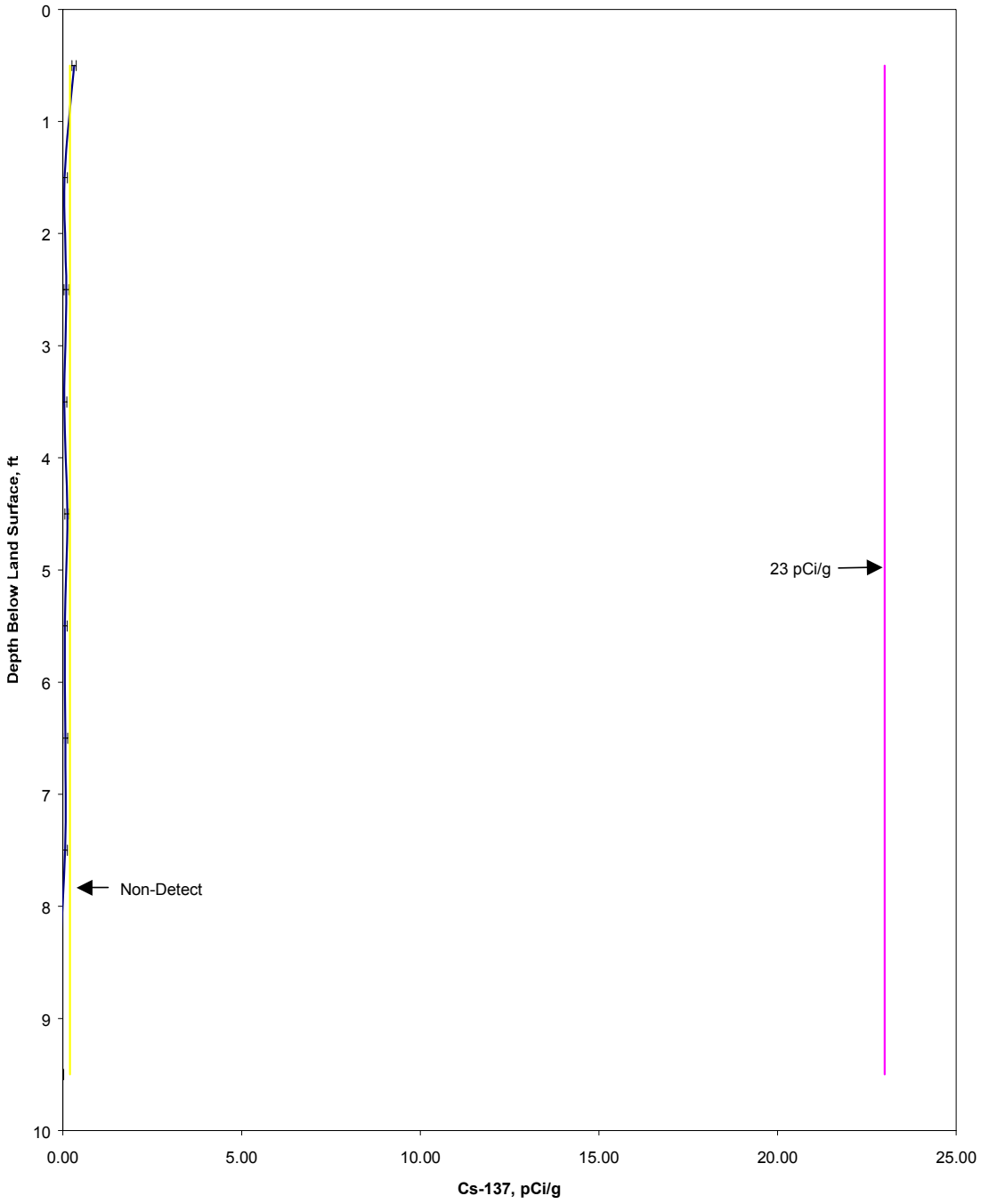
TAN SS-05
Cs-137 Gamma-Ray Log
July 9, 2003



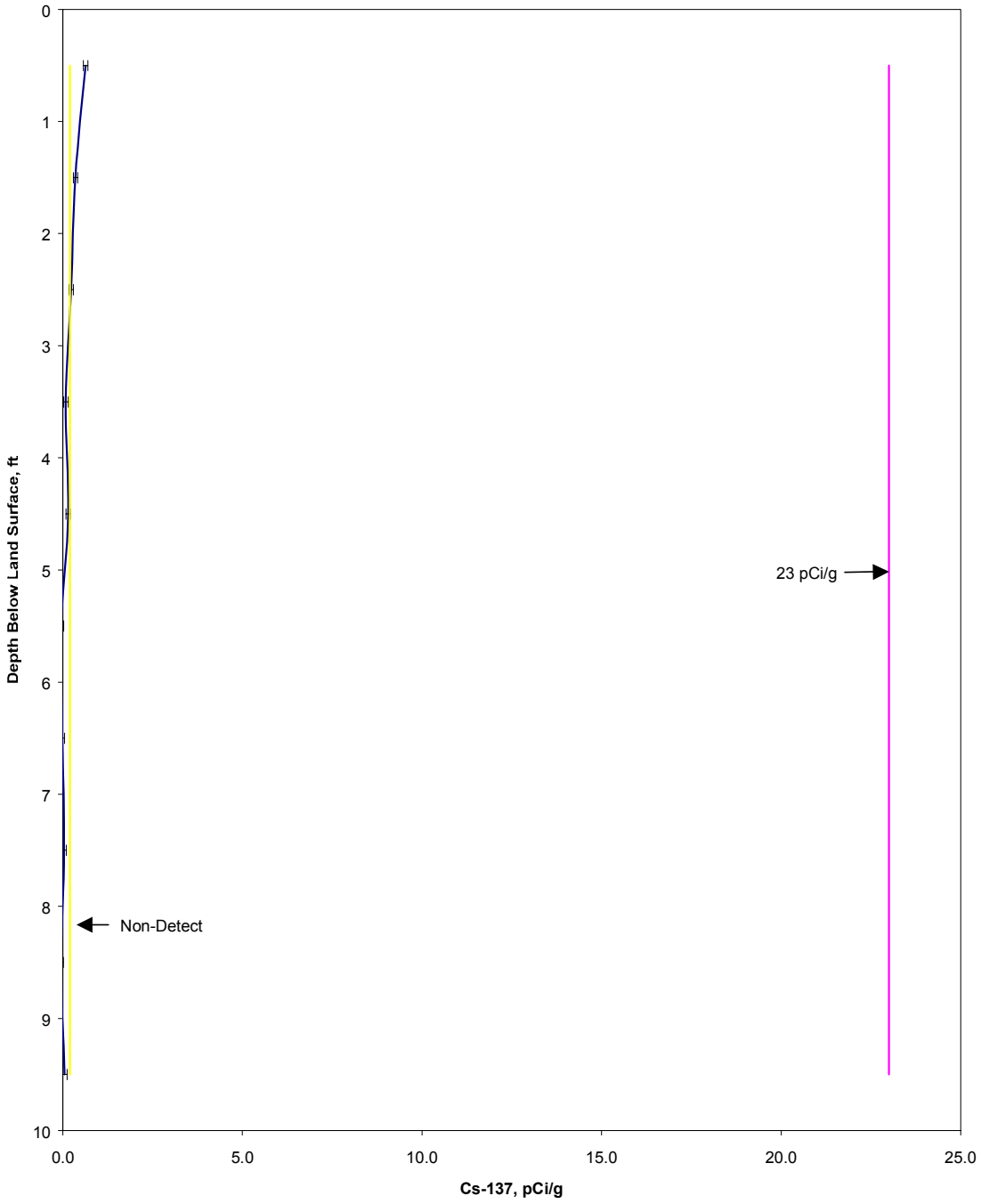
TAN SS-06
Cs-137 Gamma-Ray Log
July 7, 2003



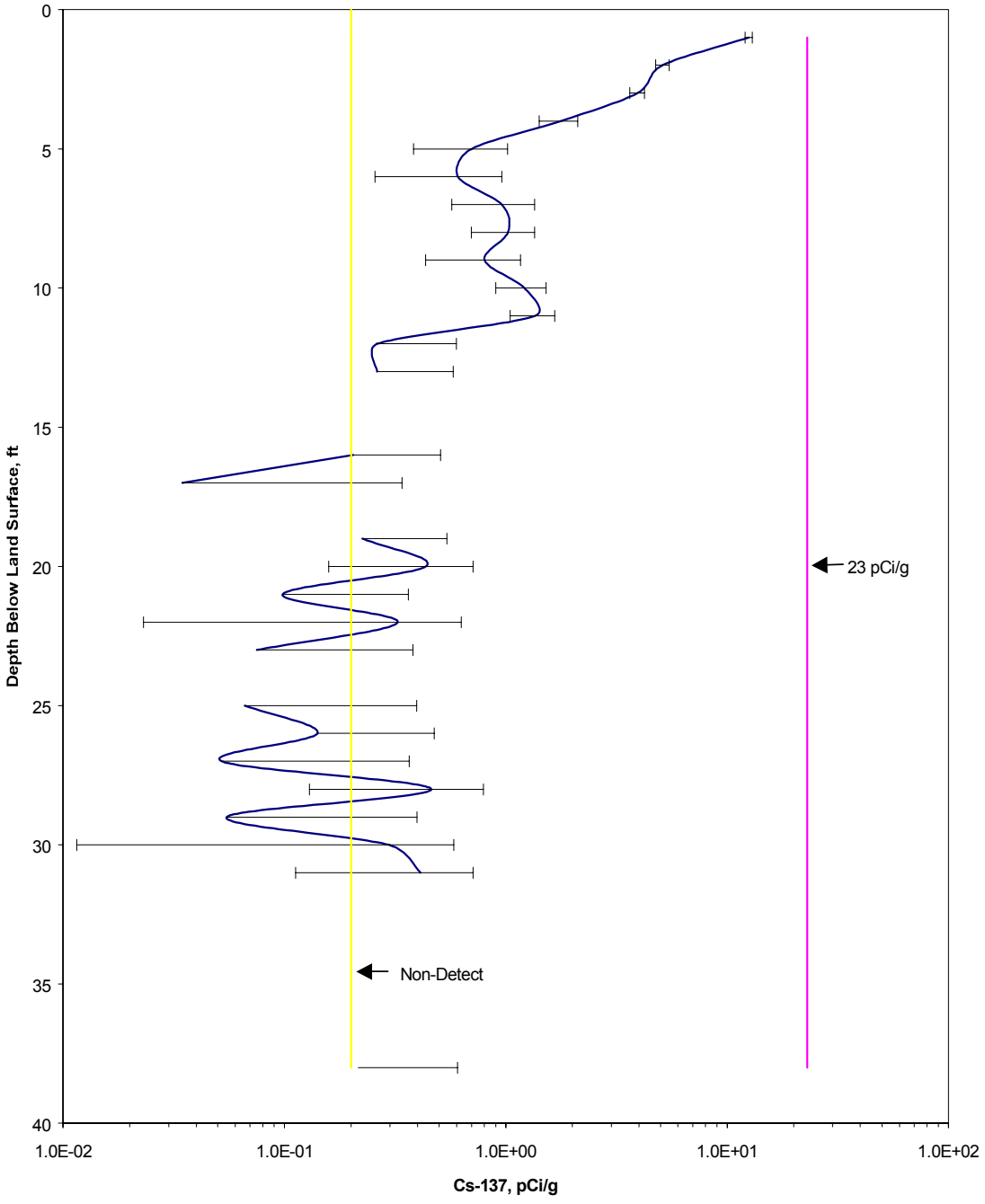
TAN SS-07
Cs-137 Gamma-Ray Log
July 9, 2003



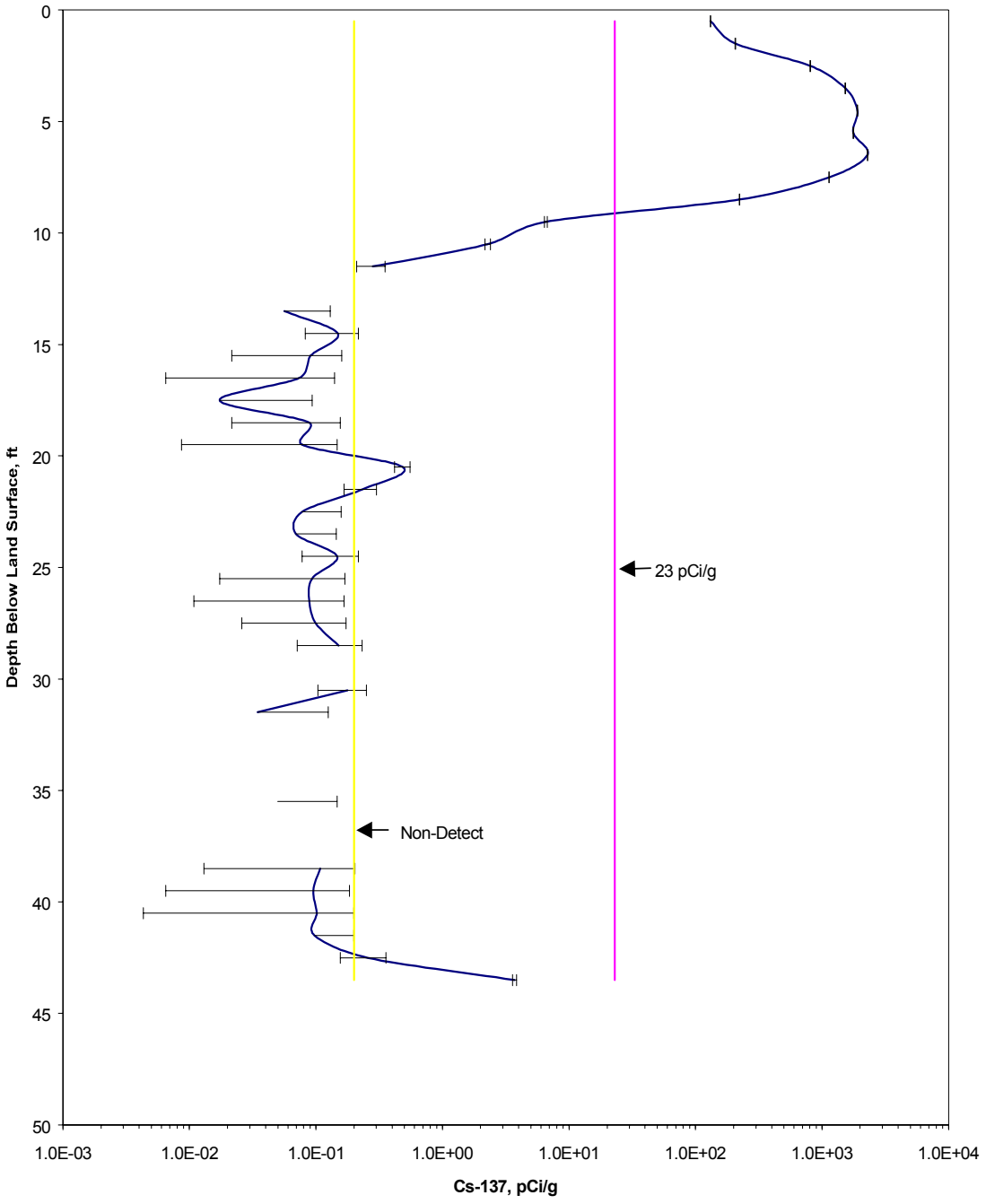
TAN SS-08
Cs-137 Gamma-Ray Log
July 7, 2003



TAN DS-01
Cs-137 Gamma-Ray Log
July 16, 2003



TAN DS-02
Cs-137 Gamma-Ray Log
July 8, 2003



Attachments C2

Gamma Log Data

Cs-137 Gamma-Ray Well Log
TAN SS-01
10-Jul-03

Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
1889	70	2.36	0.09	3.9	0.1	0.3	19	
370	51	0.46	0.06	0.8	0.1	0.2	18	
131	57	0.16	0.07	0.3	0.1	0.2	17	
135	52	0.17	0.07	0.3	0.1	0.2	16	
393	50	0.49	0.06	0.8	0.1	0.2	15	
2122	81	2.65	0.10	4.4	0.2	0.3	14	
657	72	0.82	0.09	1.4	0.1	0.3	13	
569	69	0.71	0.09	1.2	0.1	0.3	12	
2352	85	2.94	0.11	4.9	0.2	0.4	11	
6142	121	7.68	0.15	12.8	0.3	0.5	10	
3777	102	4.72	0.13	7.8	0.2	0.4	9	
6739	129	8.42	0.16	14.0	0.3	0.5	8	
9627	142	12.03	0.18	20.0	0.3	0.6	7	
12419	157	15.52	0.20	25.8	0.3	0.7	6	
19441	178	24.30	0.22	40.4	0.4	0.7	5	
13459	164	16.82	0.21	27.9	0.3	0.7	4	
41641	262	52.05	0.33	86.4	0.5	1.1	3	
24905	197	31.13	0.25	51.7	0.4	0.8	2	
13095	173	16.37	0.22	27.2	0.4	0.7	1	
50814	311	63.52	0.39	105.5	0.6	1.3	0	

Cs-137 Gamma-Ray Well Log
TAN SS-02
17-Jul-03

Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
3159	68	3.95	0.09	6.6	0.1	0.3	9.5	
3047	70	3.81	0.09	6.3	0.1	0.3	8.5	
2570	71	3.21	0.09	5.3	0.1	0.3	7.5	
1788	63	2.24	0.08	3.7	0.1	0.3	6.5	
1222	55	1.53	0.07	2.5	0.1	0.2	5.5	
1552	55	1.94	0.07	3.2	0.1	0.2	4.5	
2545	63	3.18	0.08	5.3	0.1	0.3	3.5	
2071	58	2.59	0.07	4.3	0.1	0.2	2.5	
8740	114	10.93	0.14	18.1	0.2	0.5	1.5	
11398	130	14.25	0.16	23.7	0.3	0.5	0.5	

Cs-137 Gamma-Ray Well Log
TAN SS-03
14-Jul-03

Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
11	46	0.01	0.06	0.0	0.1	0.2	9.5	ND
7	45	0.01	0.06	0.0	0.1	0.2	8.5	ND
-24	44	-0.03	0.06	0.0	0.1	0.2	7.5	ND
17	43	0.02	0.05	0.0	0.1	0.2	6.5	ND
9	43	0.01	0.05	0.0	0.1	0.2	5.5	ND
124	44	0.16	0.06	0.3	0.1	0.2	4.5	
58	45	0.07	0.06	0.1	0.1	0.2	3.5	ND
268	44	0.34	0.06	0.6	0.1	0.2	2.5	
935	52	1.17	0.07	1.9	0.1	0.2	1.5	
1729	59	2.16	0.07	3.6	0.1	0.2	0.5	

Cs-137 Gamma-Ray Well Log
TAN SS-04
09-Jul-03

Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)
134	42	0.17	0.05	0.3	0.1	0.2	9.5
511	46	0.64	0.06	1.1	0.1	0.2	8.5
2666	68	3.33	0.09	5.5	0.1	0.3	7.5
3665	76	4.58	0.10	7.6	0.2	0.3	6.5
7429	103	9.29	0.13	15.4	0.2	0.4	5.5
5749	92	7.19	0.12	11.9	0.2	0.4	4.5
1716	59	2.15	0.07	3.6	0.1	0.2	3.5
1919	56	2.40	0.07	4.0	0.1	0.2	2.5
1470	51	1.84	0.06	3.1	0.1	0.2	1.5
1968	55	2.46	0.07	4.1	0.1	0.2	0.5

Cs-137 Gamma-Ray Well Log
TAN SS-05
09-Jul-03

Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
44	54	0.055	0.0675	0.1	0.1	0.2	9.5	ND
9	55	0.01125	0.06875	0.0	0.1	0.2	8.5	ND
29	54	0.03625	0.0675	0.1	0.1	0.2	7.5	ND
82	51	0.1025	0.06375	0.2	0.1	0.2	6.5	ND
-23	56	-0.02875	0.07	0.0	0.1	0.2	5.5	ND
30	53	0.0375	0.06625	0.1	0.1	0.2	4.5	ND
31	52	0.03875	0.065	0.1	0.1	0.2	3.5	ND
48	50	0.06	0.0625	0.1	0.1	0.2	2.5	ND
-41	53	-0.05125	0.06625	-0.1	0.1	0.2	1.5	ND
24	42	0.03	0.0525	0.0	0.1	0.2	0.5	ND

Cs-137 Gamma-Ray Well Log
TAN SS-06
07-Jul-03

Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
3.01	0.074	5.0	0.1	0.2	9.25	
1.75	0.061	2.9	0.1	0.2	8.25	
2.39	0.066	4.0	0.1	0.2	7.25	
21.65	0.168	36.0	0.3	0.6	6.25	
13.55	0.13	22.5	0.2	0.4	5.25	
14.06	0.135	23.4	0.2	0.4	4.25	
57.4	0.278	95.3	0.5	0.9	3.25	
79.19	0.327	131.5	0.5	1.1	2.25	
36.6	0.231	60.8	0.4	0.8	1.25	
14.7	0.155	24.4	0.3	0.5	0.25	

Cs-137 Gamma-Ray Well Log
TAN SS-07
09-Jul-03

Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
-25	34	-0.03	0.04	-0.1	0.1	0.1	9.5	ND
-36	34	-0.05	0.04	-0.1	0.1	0.1	8.5	ND
28	33	0.04	0.04	0.1	0.1	0.1	7.5	ND
33	32	0.04	0.04	0.1	0.1	0.1	6.5	ND
26	31	0.03	0.04	0.1	0.1	0.1	5.5	ND
58	32	0.07	0.04	0.1	0.1	0.1	4.5	ND
21	31	0.03	0.04	0.0	0.1	0.1	3.5	ND
47	33	0.06	0.04	0.1	0.1	0.1	2.5	ND
23	35	0.03	0.04	0.0	0.1	0.1	1.5	ND
152	29	0.19	0.04	0.3	0.1	0.1	0.5	

Cs-137 Gamma-Ray Well Log
TAN SS-08
07-Jul-03

Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
0.03	0.04	0.0	0.1	0.1	9.5	ND
-0.03	0.04	0.0	0.1	0.1	8.5	ND
0.02	0.038	0.0	0.1	0.1	7.5	ND
-0.01	0.038	0.0	0.1	0.1	6.5	ND
-0.03	0.041	0.0	0.1	0.1	5.5	ND
0.09	0.038	0.1	0.1	0.1	4.5	ND
0.05	0.039	0.1	0.1	0.1	3.5	ND
0.14	0.038	0.2	0.1	0.1	2.5	
0.21	0.036	0.3	0.1	0.1	1.5	
0.38	0.036	0.6	0.1	0.1	0.5	

Cs-137 Gamma-Ray Well Log

DS-01

16-Jul-03

Net Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
50	90	0.125	0.225	0.2	0.4	0.8	38	ND
-4	100	-0.01	0.25	0.0	0.4	0.9	37	ND
-23	100	-0.0575	0.25	-0.1	0.4	0.9	36	ND
-122	102	-0.305	0.255	-0.5	0.4	0.9	35	ND
-102	94	-0.255	0.235	-0.4	0.4	0.8	34	ND
-105	98	-0.2625	0.245	-0.5	0.4	0.8	33	ND
-189	124	-0.315	0.2066667	-0.5	0.4	0.7	32	ND
143	104	0.2383333	0.1733333	0.4	0.3	0.6	31	
103	99	0.1716667	0.165	0.3	0.3	0.6	30	
19	119	0.0316667	0.1983333	0.1	0.3	0.7	29	ND
160	115	0.2666667	0.1916667	0.5	0.3	0.7	28	
18	109	0.03	0.1816667	0.1	0.3	0.6	27	ND
49	116	0.0816667	0.1933333	0.1	0.3	0.7	26	ND
23	114	0.0383333	0.19	0.1	0.3	0.7	25	ND
-4	97	-0.0066667	0.1616667	0.0	0.3	0.6	24	ND
26	106	0.0433333	0.1766667	0.1	0.3	0.6	23	ND
113	105	0.1883333	0.175	0.3	0.3	0.6	22	ND
34	92	0.0566667	0.1533333	0.1	0.3	0.5	21	ND
151	96	0.2516667	0.16	0.4	0.3	0.6	20	
78	110	0.13	0.1833333	0.2	0.3	0.6	19	ND
-18	98	-0.03	0.1633333	-0.1	0.3	0.6	18	ND
12	106	0.02	0.1766667	0.0	0.3	0.6	17	ND
71	105	0.1183333	0.175	0.2	0.3	0.6	16	ND
-179	114	-0.2983333	0.19	-0.5	0.3	0.7	15	ND
0	110	0	0.1833333	0.0	0.3	0.6	14	ND
91	110	0.1516667	0.1833333	0.3	0.3	0.6	13	ND
91	117	0.1516667	0.195	0.3	0.3	0.7	12	ND
470	107	0.7833333	0.1783333	1.4	0.3	0.6	11	
420	108	0.7	0.18	1.2	0.3	0.6	10	
278	127	0.4633333	0.2116667	0.8	0.4	0.7	9	
355	113	0.5916667	0.1883333	1.0	0.3	0.7	8	
333	135	0.555	0.225	1.0	0.4	0.8	7	
211	122	0.3516667	0.2033333	0.6	0.4	0.7	6	
243	110	0.405	0.1833333	0.7	0.3	0.6	5	
613	121	1.0216667	0.2016667	1.8	0.3	0.7	4	
1365	105	2.275	0.175	3.9	0.3	0.6	3	
1774	122	2.9566667	0.2033333	5.1	0.4	0.7	2	
4349	157	7.2483333	0.2616667	12.5	0.5	0.9	1	
17969	232	29.948333	0.3866667	51.8	0.7	1.3	0	

Cs-137 Gamma-Ray Well Log

DS-02

08-Jul-03

Net Counts	+/- (1-sigma)	Count Rate (cts/s)	+/- (1-sigma)	Cs-137 (pCi/g)	+/- (1-sigma)	+/- (2-sigma)	Depth (ft)	Qualifier
1720	63	2.15	0.07875	3.7	0.1	0.3	43.5	
119	47	0.14875	0.05875	0.3	0.1	0.2	42.5	
45	47	0.05625	0.05875	0.1	0.1	0.2	41.5	ND
47	45	0.05875	0.05625	0.1	0.1	0.2	40.5	ND
44	41	0.055	0.05125	0.1	0.1	0.2	39.5	ND
50	44	0.0625	0.055	0.1	0.1	0.2	38.5	ND
-12	7	-0.015	0.00875	0.0	0.0	0.0	37.5	ND
-23	49	-0.02875	0.06125	0.0	0.1	0.2	36.5	ND
23	45	0.02875	0.05625	0.0	0.1	0.2	35.5	ND
-18	36	-0.0225	0.045	0.0	0.1	0.2	34.5	ND
-95	49	-0.11875	0.06125	-0.2	0.1	0.2	33.5	ND
-24	46	-0.03	0.0575	-0.1	0.1	0.2	32.5	ND
16	42	0.02	0.0525	0.0	0.1	0.2	31.5	ND
82	34	0.1025	0.0425	0.2	0.1	0.1	30.5	ND
-25	37	-0.03125	0.04625	-0.1	0.1	0.2	29.5	ND
70	37	0.0875	0.04625	0.2	0.1	0.2	28.5	ND
46	34	0.0575	0.0425	0.1	0.1	0.1	27.5	ND
41	36	0.05125	0.045	0.1	0.1	0.2	26.5	ND
43	35	0.05375	0.04375	0.1	0.1	0.2	25.5	ND
68	32	0.085	0.04	0.1	0.1	0.1	24.5	ND
32	35	0.04	0.04375	0.1	0.1	0.2	23.5	ND
36	37	0.045	0.04625	0.1	0.1	0.2	22.5	ND
108	31	0.135	0.03875	0.2	0.1	0.1	21.5	
225	31	0.28125	0.03875	0.5	0.1	0.1	20.5	
36	32	0.045	0.04	0.1	0.1	0.1	19.5	ND
41	31	0.05125	0.03875	0.1	0.1	0.1	18.5	ND
8	35	0.01	0.04375	0.0	0.1	0.2	17.5	ND
34	31	0.0425	0.03875	0.1	0.1	0.1	16.5	ND
42	32	0.0525	0.04	0.1	0.1	0.1	15.5	ND
69	31	0.08625	0.03875	0.1	0.1	0.1	14.5	ND
26	34	0.0325	0.0425	0.1	0.1	0.1	13.5	ND
-32	39	-0.04	0.04875	-0.1	0.1	0.2	12.5	ND
130	33	0.1625	0.04125	0.3	0.1	0.1	11.5	
1053	53	1.31625	0.06625	2.3	0.1	0.2	10.5	
3040	74	3.8	0.0925	6.6	0.2	0.3	9.5	
102892	377	128.615	0.47125	222.5	0.8	1.6	8.5	
526537	1342	658.17125	1.6775	1138.5	2.9	5.8	7.5	
264174	756	1320.87	3.78	2284.8	6.5	13.1	6.5	
204710	699	1023.55	3.495	1770.5	6.0	12.1	5.5	
219529	727	1097.645	3.635	1898.7	6.3	12.6	4.5	
176650	617	883.25	3.085	1527.8	5.3	10.7	3.5	
93323	381	466.615	1.905	807.1	3.3	6.6	2.5	
95341	348	119.17625	0.435	206.1	0.8	1.5	1.5	
60605	269	75.75625	0.33625	131.0	0.6	1.2	0.5	

Appendix D

TSF-09/18 Historical Soil Sampling Results

Appendix D
TSF-09/18 Historical Soil Sampling Results

Table D-1. Gamma isotope soil data from 1983.

	1983 Units in pCi/g			
Grid No.	Depth, ft	Cs-137	Co-60	K-40
15	0	79	38	9
	0.5	307	376	14
	1	112	64	13
	1.5	15	0.8	14
	2	7	0.5	16
	2.5	10	0.6	12
	3	15	14	18
22	0	1074	25	9
	0.5	2	6.2	10
	1	16	10	14
	1.5	2.9	0.4	10
	2	2.9	0.32	10
	2.5			
	3			
24	0	175	32	11
	0.5	40	1.4	6
	1	54120	176	17
	1.5	28	0.5	10
	2	2.5	0.22	4.7
	2.5	3.3	0.8	11
	3	2.8	0.7	14
34	0	106	6.2	8
	0.5	50	16.2	10
	1	38	1.2	11
	1.5	2.5		9
	2	0.2		12
	2.5	0.5		14
	3	1.7	20	10
37	0	179	52	5
	0.5	515	30	10
	1	0.24	1.1	9
	1.5	45800	500	
	2	16	18	14
	2.5	420	17	9
	3	20	15	10

Table D-1. (continued).

		1983 Units in pCi/g		
Grid No.	Depth, ft	Cs-137	Co-60	K-40
38	0	1242	610	6
	0.5	49	2.9	10
	1	48	4.6	7
	1.5	0.2	0.2	12
	2	0.2		8
	2.5			5
	3	3	1.2	4
15	0	49.92	2.74	9.00
	0.5	193.99	27.09	14.00
	1	70.77	4.61	13.00
	1.5	9.48	0.06	14.00
	2	4.42	0.04	16.00
	2.5	6.32	0.04	12.00
	3	9.48	1.01	18.00
22	0	678.65	1.80	9.00
	0.5	1.26	0.45	10.00
	1	10.11	0.72	14.00
	1.5	1.83	0.03	10.00
	2	1.83	0.02	10.00
	2.5			
	3			
24	0	110.58	2.31	11.00
	0.5	25.28	0.10	6.00
	1	34197.96	12.68	17.00
	1.5	17.69	0.04	10.00
	2	1.58	0.02	4.70
	2.5	2.09	0.06	11.00
	3	1.77	0.05	14.00
34	0	66.98	0.45	8.00
	0.5	31.59	1.17	10.00
	1	24.01	0.09	11.00
	1.5	1.58		9.00
	2	0.13		12.00
	2.5	0.32		14.00
	3	1.07	1.44	10.00
37	0	113.11	3.75	5.00
	0.5	325.42	2.16	10.00
	1	0.15	0.08	9.00
	1.5	28940.62	36.02	0.00

Table D-1. (continued).

	1983 Units in pCi/g			
Grid No.	Depth, ft	Cs-137	Co-60	K-40
	2	10.11	1.30	14.00
	2.5	265.39	1.22	9.00
	3	12.64	1.08	10.00
38	0	784.81	43.94	6.00
	0.5	30.96	0.21	10.00
	1	30.33	0.33	7.00
	1.5	0.13	0.01	12.00
	2	0.13		8.00
	2.5			5.00
	3	1.90	0.09	4.00

Table D-2. Metals soil data from 1988.

Units= mg/kg Sample ID.	Location 1 IN824014	Location 2 IN824025	Location 3 IN824036
Aluminum	1.01E+04	1.63E+04	1.34E+04
Arsenic	8.60E+00	8.60E+00	9.90E+00
Barium	1.27E+02	1.86E+02	1.68E+02
Beryllium	1.70E+00	1.80E+00	1.70E+00
Cadmium	1.00E+00	1.10E+00	1.10E+00
Calcium	1.48E+05	9.23E+04	1.05E+05
Chromium	2.20E+01	3.20E+01	2.50E+01
Cobalt	4.90E+00	7.00E+00	6.30E+00
Copper	1.40E+01	2.20E+01	2.00E+01
Iron	1.27E+04	1.91E+04	1.65E+04
Lead	8.10E+00	1.40E+01	1.30E+01
Magnesium	1.16E+04	1.29E+04	1.23E+04
Manganese	2.50E+02	4.10E+02	4.09E+02
Mercury	1.20E-01	8.00E-02	8.00E-02
Nickel	2.20E+01	3.00E+01	2.80E+01
Potassium	2.50E+03	3.80E+03	3.00E+03
Silver	9.60E-01	1.10E+00	1.10E+00
Sodium	6.60E+02	6.13E+02	4.72E+02
Vanadium	3.30E+01	4.80E+01	3.90E+01
Zinc	6.70E+01	1.01E+02	9.80E+01

Table D-3. Volatile organic compound soil data from 1993.

	Location A		Location B		Location C	
	T0910101VL	T0910101VM	T0905601VL	T0905602VL	T0910202VL	T0910201VL
Units = ug/kg	2.5 to 4 ft	22 to 24 ft	7 to 8 ft	7 to 8 ft	2.5 to 4.5 ft	20 to 22 ft
chloromethane	11 U	12 U	12 U	11 U	12 U	12 U
bromomethane	11 U	12 U	12 U	11 U	12 U	12 U
vinyl chloride	11 U	12 U	12 U	11 U	12 U	12 U
chloroethane	11 U	12 U	12 U	11 U	12 U	12 U
methylene chloride	11 U	27 U	12 U	11 U	12 U	12 U
acetone	7	41	12 U	12 U	15 U	12 U
carbon disulfide	11 U	12 U	12 U	11 U	12 U	12 U
1,1 -dichloroethylene	11 U	12 U	12 U	11 U	12 U	12 U
1,1-dichloroethane	11 U	12 U	12 U	11 U	12 U	12 U
1,2-dichloroethylene (total)	11 U	12 U	12 U	11 U	12 U	12 U
chloroform	11 U	12 U	12 U	11 U	12 U	12 U
1,2-dichloroethane	11 U	12 U	12 U	11 U	12 U	12 U
2-butanone	11 R	12 R	12 R	11 R	12 R	12 R
1,1,1-trichloroethane	11 U	12 U	12 U	11 U	12 U	12 U
carbon tetrachoride	11 U	12 U	12 U	11 U	12 U	12 U
bromodichloromethane	11 U	12 U	12 U	11 U	12 U	12 U
1,2-dichloropropane	11 U	12 U	12 U	11 U	12 U	12 U
cis-1,3-dichloropropylene	11 U	12 U	12 U	11 U	12 U	12 U
trichloroethylene	11 U	9	12 U	11 U	12 U	3
dibromochloromethane	11 U	12 U	12 U	11 U	12 U	12 U
1,1,2-trichloroethane	11 U	12 U	12 U	11 U	12 U	12 U
benzene	11 U	12 U	12 U	11 U	12 U	12 U
trans-1,3-dichloropropylene	11 U	12 U	12 U	11 U	12 U	12 U
bromoform	11 U	12 U	12 U	11 U	12 U	12 U
4-methyl-2-pentanone	11 U	12 U	12 U	11 U	12 U	12 U
2-hexanone	11 U	12 U	12 U	11 U	12 U	12 U

Table D-3. (continued).

	Location A		Location B		Location C	
	T0910101VL	T0910101VM	T0905601VL	T0905602VL	T0910202VL	T0910201VL
Units = ug/kg	2.5 to 4 ft	22 to 24 ft	7 to 8 ft	7 to 8 ft	2.5 to 4.5 ft	20 to 22 ft
tetrachloroethylene	11 U	12 U	12 U	11 U	12 U	12 U
1,1,2,2-tetrachloroethane	11 U	12 U	12 U	11 U	12 U	12 U
toluene	11 U	12 U	12 U	11 U	12 U	12 U
chlorobenzene	11 U	12 U	12 U	11 U	12 U	12 U
ethylbenzene	11 U	12 U	12 U	11 U	12 U	12 U
styrene	11 U	12 U	12 U	11 U	12 U	12 U
xylene	11 U	12 U	12 U	11 U	12 U	12 U

Table D-4. Semivolatile organic compound soil data from 1993.

	Location A		Location B		Location C	
	T0910101EL	T0905201EL	T0905601EL	T0905602EL	T0905702EL	T0905701EL
Units = ug/kg	2.5 to 4 ft	22 to 24 ft	7 to 8 ft	7 to 8 ft	2.5 to 4.5 ft	20 to 22 ft
phenol	360 U	400 U	390 U	370 U	410 U	390 U
bis(2-chloroethyl)ether	360 U	400 U	390 U	370 U	410 U	390 U
2-chlorophenol	360 U	400 U	390 U	370 U	410 U	390 U
1,3-dichlorobenzene	360 U	400 U	390 U	370 U	410 U	390 U
1,4-dichlorobenzene	360 U	400 U	390 U	370 U	410 U	390 U
1,2-dichlorobenzene	360 U	400 U	390 U	370 U	410 U	390 U
2-methylphenol	360 U	400 U	390 U	370 U	410 U	390 U
2,2'-oxybis(1-chloropropane)	360 U	400 U	390 U	370 U	410 U	390 U
4-methylphenol	360 U	400 U	390 U	370 U	410 U	390 U
N-nitroso-di-n-propylamine	360 U	400 U	390 U	370 U	410 U	390 U
hexachloroethane	360 U	400 U	390 U	370 U	410 U	390 U
nitrobenzene	360 U	400 U	390 U	370 U	410 U	390 U
isophorone	360 U	400 U	390 U	370 U	410 U	390 U
2-nitrophenol	360 U	400 U	390 U	370 U	410 U	390 U
2,4-dimethylphenol	360 U	400 U	390 U	370 U	410 U	390 U
bis(2-chloroethoxy)methane	360 U	400 U	390 U	370 U	410 U	390 U
2,4-dinitrophenol	360 U	400 U	390 U	370 U	410 U	390 U
1,2.4-trichlorobenzene	360 U	400 U	390 U	370 U	410 U	390 U
naphthalene	360 U	400 U	390 U	370 U	410 U	390 U
4-chloroaniline	360 U	400 U	390 U	370 U	410 U	390 U
hexachlorobutadiene	360 U	400 U	390 U	370 U	410 U	390 U

Table D-4. (continued).

	Location A		Location B		Location C	
Units = ug/kg	T0910101EL 2.5 to 4 ft	T0905201EL 22 to 24 ft	T0905601EL 7 to 8 ft	T0905602EL 7 to 8 ft	T0905702EL 2.5 to 4.5 ft	T0905701EL 20 to 22 ft
4-chloro-3-methylphenol	360 U	400 U	390 U	370 U	410 U	390 U
2-methylnaphthalene	360 U	400 U	390 U	370 U	410 U	390 U
hexachlorocyclopentadiene	360 U	400 U	390 U	370 U	410 U	390 U
2,4,6-trichlorophenol	360 U	400 U	390 U	370 U	410 U	390 U
2,4,5-trichlorophenol	900 U	1000 U	980 U	930 U	1000 U	980 U
2-chloronaphthalene	360 U	400 U	390 U	370 U	410 U	390 U
2-nitroaniline	900 U	1000 U	980 U	930 U	1000 U	980 U
dimethylphthalate	360 U	400 U	390 U	370 U	410 U	390 U
acenaphthylene	360 U	400 U	390 U	370 U	410 U	390 U
2,6-dinitrotoluene	360 U	400 U	390 U	370 U	410 U	390 U
3-nitroaniline	900 U	1000 U	980 U	930 U	1000 U	980 U
acenaphthene	360 U	400 U	390 U	370 U	410 U	390 U
2,4-dichlorophenol	900 U	1000 U	980 U	930 U	1000 U	980 U
4-nitrophenol	900 U	1000 U	980 U	930 U	1000 U	980 U
dibenzofuran	360 U	400 U	390 U	370 U	410 U	390 U
2,4-dinitrotoluene	360 U	400 U	390 U	370 U	410 U	390 U
diethylphthalate	420 U	490 U	390 U	370 U	500 U	480 U
4-chlorophenyl-phenyl ether	360 U	400 U	390 U	370 U	410 U	390 U
fluorene	360 U	400 U	390 U	370 U	410 U	390 U
4-nitroaniline	900 U	1000 U	980 U	930 U	1000 U	980 U
4,6-dinitro-2-metylphenol	900 U	1000 U	980 U	930 U	1000 U	980 U
N-nitrosodiphenylamine	360 U	400 U	390 U	370 U	410 U	390 U

Table D-4. (continued).

	Location A		Location B		Location C	
Units = ug/kg	T0910101EL 2.5 to 4 ft	T0905201EL 22 to 24 ft	T0905601EL 7 to 8 ft	T0905602EL 7 to 8 ft	T0905702EL 2.5 to 4.5 ft	T0905701EL 20 to 22 ft
4-bromophenyl-phenyl ether	360 U	400 U	390 U	370 U	410 U	390 U
hexachlorobenzene	360 U	400 U	390 U	370 U	410 U	390 U
pentachlorophenol	900 U	1000 U	980 U	930 U	1000 U	980 U
phenanthrene	360 U	400 U	390 U	370 U	410 U	390 U
anthracene	360 U	400 U	390 U	370 U	410 U	390 U
carbozole	360 U	400 U	390 U	370 U	410 U	390 U
di-n-butylphthalate	360 U	400 U	390 U	370 U	410 U	390 U
fluoranthene	360 U	400 U	390 U	370 U	410 U	390 U
pyrene	360 U	400 U	390 U	370 U	410 U	390 U
butylbenzylphthalate	360 U	400 U	390 U	370 U	410 U	390 U
3,3'-dichlorobenzidine	360 U	400 U	390 U	370 U	410 U	390 U
benzo(a)athracene	360 U	400 U	390 U	370 U	410 U	390 U
chrysene	360 U	400 U	390 U	370 U	410 U	390 U
bis(2-ethylhexyl)phthalate	360 U	400 U	390 U	370 U	410 U	390 U
di-n-octylphthalate	360 U	400 U	390 U	370 U	410 U	390 U
benzo(k)fluoranthene	360 U	400 U	390 U	370 U	410 U	390 U
benzo(a)perylene	360 U	400 U	390 U	370 U	410 U	390 U
indeno(1,2,3-cd)pyrene	360 U	400 U	390 U	370 U	410 U	390 U
dibenz(a,h)anthracene	360 U	400 U	390 U	370 U	410 U	390 U
benzo(g,h,i)perylene	360 U	400 U	390 U	370 U	410 U	390 U
tributylphosphate	360 U	400 U	390 U	370 U	410 U	390 U

Table D-5. Radionuclide soil data from 1993.

					Units=pCi/g					
Analyte	T0920001	T0910101	T0905201	T0920101	T0905501	T0905602	T0920201	T0920202	T0905601	T0905701
Gross Alpha	18	9.2	4.9	16	26	21	16	13	11	12
Gross Beta	210	47	20	1110	110	160	76	66	20	49
Gamma										
Co-60		0.24				0.13				0.3
Cs-137		1.2				103			0.06	22.1
Depth	0 to 0.5	0 to 2.5	20 to 22	0 to 0.5	6 to 7	6 to 7	0 to 0.5	0 to 0.5	0 to 2.5	18 to 20
Location	A	A	A	B	B	B	C	C	C	C

Table D-6. PCB soil data from 1993.

	Location A		Location B		Location C	
Units = ug/kg	T0910101PC	T0905201PC	T0905601PC	T0905602PC	T0905702PC	T0910201PC
	2.5 to 4 ft	22 to 24 ft	7 to 8 ft	7 to 8 ft	2.5 to 4.5 ft	20 to 22 ft
Aroclor-1016	87 U	97 U	95 U	89 U	490 UD	94 U
Aroclor-1221	87 U	97 U	95 U	89 U	490 UD	94 U
Aroclor-1232	87 U	97 U	95 U	89 U	490 UD	94 U
Aroclor-1242	87 U	97 U	95 U	89 U	490 UD	94 U
Aroclor-1248	87 U	97 U	95 U	89 U	490 UD	94 U
Aroclor-1254	170 U	190 U	190 U	180 U	1085 D	190 U
Aroclor-1260	170 U	190 U	190 U	180 U	980 UD	191 U

Table D-7. Metal soil data from 1993.

	Location A		Location B	Location C	
Units = mg/kg	T0910101LM	T0905101LM	T0905601LM	T0905602LM	T0905702LM
	2.5 to 4 ft	20 to 22 ft	6 to 7 ft	0 to 2.5 ft	18 to 20 ft
Barium	124	236	99.6	201	253
Cadmium	1.3	2.4	1.2	2.3	2.7
Chromium	21	32.2	14.2	25.5	31.7
Lead	17.3	27.9	26.7	23.5	17.9
Mercury	0.05 U	0.06 U	0.15 U	0.09 U	0.06 U
Silver	0.22 U	0.24 U	0.24 U	0.23 U	0.24 U

Table D-8. Volatile organic compound soil data from 1998.

	Location C11						Location A7						Location B5						Location D6					
	0 to 2.5 ft 1WG00401VA		5 to 7.5 ft 1WG00801VA		7.5 to 10 ft 1WG01201VA		0 to 2.5 ft 1WG00201VA		5 to 7.5 ft 1WG00601VA		7.5 to 10 ft 1WG01001VA		0 to 2.5 ft 1WG00301VA		5 to 7.5 ft 1WG00701VA		7.5 to 10 ft 1WG01101VA		0 to 2.5 ft 1WG00501VA		0 to 2.5 ft 1WG00502VA		5 to 7.5 ft 1WG00901VA		7.5 to 10 ft 1WG01301VA	
Chloromethane	0.011	UJ	0.012	U	0.012	U	0.011	U	0.012	U	0.012	U	0.01	U	0.012	U	0.012	U	0.011	U	0.011	U	0.011	U	0.012	U
Bromomethane	0.011	U	0.012	U	0.012	U	0.011	U	0.012	U	0.012	U	0.01	U	0.012	U	0.012	U	0.011	U	0.011	U	0.011	U	0.012	U
Vinyl chloride	0.011	U	0.012	U	0.012	U	0.011	U	0.012	U	0.012	U	0.01	U	0.012	U	0.012	U	0.011	U	0.011	U	0.011	U	0.012	U
Chloroethane	0.011	U	0.012	U	0.012	U	0.011	U	0.012	U	0.012	U	0.01	U	0.012	U	0.012	U	0.011	U	0.011	U	0.011	U	0.012	U
Methylene chloride	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Acetone	0.022	R	0.036	U	0.023	U	0.026	U	0.024	U	0.027	U	0.034	U	0.045	U	0.042	U	0.023	U	0.022	U	0.036	U	0.04	U
Carbon disulfide	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
1,1-Dichloroethylene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
1,1-Dichloroethane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
1,2-Dichloroethylene (total)	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Chloroform	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
1,2-Dichloroethane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Methyl Ethyl Ketone	0.022	UJ	0.024	U	0.023	U	0.023	U	0.024	U	0.024	U	0.021	U	0.023	U	0.023	U	0.022	U	0.024	J	0.023	U	0.023	U
1,1,1-Trichloroethane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Carbon tetrachloride	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Bromodichloromethane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
1,2-dichloropropane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
cis-1,3-Dichloropropylene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Trichloroethylene	0.006	U	0.003	J	0.002	J	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.002	J
Dibromochloromethane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
1,1,2-Trichloroethane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Benzene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
trans-1,3-Dichloropropylene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Bromoform	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Methyl isobutyl ketone	0.022	U	0.024	U	0.023	U	0.023	U	0.024	U	0.024	U	0.021	U	0.023	U	0.023	U	0.022	U	0.022	U	0.023	U	0.023	U
Methyl n-butyl ketone	0.022	UJ	0.024	U	0.023	U	0.023	U	0.024	U	0.024	U	0.021	U	0.023	U	0.023	U	0.022	U	0.022	U	0.023	U	0.023	U
Tetrachloroethylene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Toluene	0.056	J	0.006	U	0.006	U	0.006	U	0.008	U	0.006	U	0.001	J	0.005	J	0.005	J	0.016	J	0.011	J	0.006	J	0.01	J
1,1,2,2-Tetrachloroethane	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Chlorobenzene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Ethylbenzene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.002	J	0.002	J	0.006	U	0.006	U
Styrene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U
Xylenes (total)	0.018	U	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U	0.005	J	0.003	J	0.002	J	0.012	J	0.013	J	0.002	u	0.004	J
Vinyl Chloride	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
1,1-Dichloroethylene	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Chloroform	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
1,2-Dichloroethane	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Methyl Ethyl Ketone	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.075	J	0.075	J	0.097	U	0.2	J	0.094	J
Carbon Tetrachloride	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Trichloroethylene	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Benzene	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Tetrachloroethylene	0.05	U	0.05	UJ	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Chlorobenzene	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U

Appendix E

TSF-21 Historical Soil Sampling Results

Appendix-E
TSF-21 Historical Soil Sampling Results

The data represented in this appendix is a synopsis of the data that were generated from the TSF-21 characterization. In three separate events (1993, 1996, and 1997), the soil around Valve Pit #2 (TSF-21) was sampled. Brief descriptions are provided for each of these sampling efforts.

In 1993, three verification soil samples were collected in July from the soil directly beneath the valve pit and along the north-south axis of the pit. In late December, two soil borings were completed in order to determine the extent and concentration of the potential soil contamination; one boring was in the center of TSF-21 and the other was 15 ft to the west of TSF-21. Sample results for these five samples were presented in the Preliminary Scoping Track 2 Summary Report for the Test Area North Operable Unit 1-05: Radioactive Contamination Sites (INEL 1994). During September–November of 1993, soil was excavated from TSF-21 and placed into four boxes (4 × 4 × 8 ft each). The applicable L&V reports (with Form 1 data) are:

EG&G, Idaho Interoffice Memorandum from R. P. Wells to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report Tan Ou 1-04 & 1-05 Gamma Ray Analysis, Sdg #1ta10901r4*, Letter File RPW-146-93, December 23, 1993.

EG&G, Idaho Interoffice Memorandum from R. P. Wells to T. J. Meyer, *Transmittal of L&V Report Tan Ou 1-05 &1-04 Radiochemical Analysis Sdg #1ta10401ab*, Letter File RPW- 08-94, January 7, 1994.

EG&G, Idaho Interoffice Memorandum from J. A. Challender to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report Ou 1-04 & 1-05 Tan Target Compound List Semi-Volatile Data Sdg #1ta11201c1*, Letter File JAC-12-94, January 13, 1994.

EG&G, Idaho Interoffice Memorandum from J. A. Challender to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report Ou 1-04 & 1-05 Tan Target Compound List Volatile Data Sdg #1ta11201c1*, Letter File JAC-13-94, January 13, 1994.

EG&G, Idaho Interoffice Memorandum from J. A. Challender to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report, Tan Ou 1-04 & 1-05 Target Analyte List Inorganic Data Sdg #1ta11201c1*, Letter File JAC-15-94, January 19, 1994.

EG&G, Idaho Interoffice Memorandum from R. P. Wells to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report Tan Ou 1-04 & 1-05 Gamma Ray Analysis Sdg #1ta20101r4*, Letter File RPW-29-94, February 9, 1994.

EG&G, Idaho Interoffice Memorandum from R. P. Wells to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report Ou 1-04 & 1-05 Tan Tsf-21 Strontium-90 Analysis Sdg #1ta20101r4 Report #Era-Nre-94-011*, Letter File RPW-78-94, June 13, 1994.

EG&G, Idaho Interoffice Memorandum from J. A. Challender to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report Tan Ou 1-04 & 1-05 Contract Laboratory Program (Clp) Volatile Data Sdg #1ta20101*, Letter File JAC-17-94, February 7, 1994.

EG&G, Idaho Interoffice Memorandum from J. A. Challender to T. J. Meyer, *Transmittal of Limitations and Validation (L&V) Report Tan Ou 1-04 & 1-05 Contract Laboratory Program (Clp) Target Analyte List Metal Data Sdg #1ta20101*, Letter File JAC-18-94, February 7, 1994.

In 1996, a single sample was removed from one of the boxes, collected in 1993, and analyzed for PCBs, TCLP volatiles, TCLP metals and gamma spectroscopy. There were no L&V reports for this sample.

In 1997, additional samples were collected from all four boxes. One composite sample (for TCLP metals, PCBs, and radionuclide analyses) and three grab samples (for VOC analysis) were removed from each box. The applicable L&V reports (with Form 1 data) are:

LMITCO Interoffice Memorandum from M. W. Hudson to J. M. Connolly, *Transmittal of Limitations and Validation (L&V) Report Pertaining To Tcl Volatile For Tsf-21 Concrete Vault Investigation Derived Waste (Idw) Project Sdg #Tsf01601vf & Tsf00101vg*, Letter File MWH-118-97, May 13, 1997.

LMITCO Interoffice Memorandum from M. W. Hudson to J. M. Connolly, *Transmittal of Limitations and Validation (L&V) Report Pertaining To Metals & Inorganic Data Validation For Tsf-21 Concrete Vault Investigation Derived Waste (Idw) Project Sdg #Tsf01101bv & Tsf03101la*, Letter File MWH-119-97, May 13, 1997.

LMITCO Interoffice Memorandum from M. W. Hudson to J. M. Connolly, *Transmittal of Limitations and Validation (L&V) Report Pertaining To Pesticide & Pcb Data Validation For Tsf-21 Concrete Vault Investigation Derived Waste (Idw) Project Sdg #Tsf01101pc & Tsf03101pb*, Letter File MWH-120-97, May 13, 1997.

Table E-1. Detected values from 1993 (July).

	ITA11201	ITA11301	ITA11401
mg/kg			
Barium	250	241	260
Cadmium	2	2	2.4
Chromium	22	23.7	25.1
Lead	28.6	18.1	23.3
ug/kg			
Methylene chloride	43	62	5
Acetone	13		
Di-n-butylphalate			44
pCi/g			
Cs-137	821	13	265
Co-60	1.73	0.14	1.55

Table E-2. Detected values from 1993 (December)

	Center of TSF-21	15 ft to the west
mg/kg		
Barium	228	253
Cadmium	2.2	1.9
Chromium	17.1	19.1
Lead	17.6	22.4
ug/kg		
Methylene chloride	4	3
Acetone	4	
Trichloroethylene	16	20
pCi/g		
Cs-137	20.57	
Co-60	0.12	

Table E-3. Boxed soil sample from 1996.

	1WC20101	Flag
pCi/g		
Cs-137	2.46E+02	
Co-60	2.86E-01	
Cs-134	7.40E-02	
ug/kg		
Aroclor-1016	37	U
Aroclor-1221	74	U
Aroclor-1232	37	U
Aroclor-1242	37	U

Table E-3. (continued).

	1WC20101	Flag
Aroclor-1248	37	U
Aroclor-1254	37	U
Aroclor-1260	37	U
TCLP metals, ug/kg		
Arsenic	33.8	
Barium	2000	
Cadmium	3.3	U
Chromium	5.2	U
Lead	26.3	U
Mercury	0.1	U
Selenium	35.6	U
Silver	6.8	U
Copper	5.4	U
Zinc	71.9	U
TCLP VOCs, ug/kg		
Vinyl Chloride	100	U
Methyl Ethyl Ketone	100	U
1,1-Dichloroethylene	50	U
Chloroform	50	U
1,2-Dichloroethane	50	U
Carbon Tetrachloride	50	U
Trichloroethylene	50	U
Benzene	50	U
Tetrachloroethylene	50	U
Chlorobenzene	50	U

Table E-4. Sampling in 1997 from each of the four boxed TSF-21 soil samples (below detection levels – U flagged in red).

	Box 1 TSF01601	Box 1 TSF01701	Box 1 TSF01801	Box 3 TSF02201	Box 3 TSF02301	Box 3 TSF02401	Box 4 TSF02501	Box 4 TSF02502	Box 4 TSF02601	Box 5 TSF02901	Box 5 TSF03001
VOC, ug/kg											
1,1,1-Trichloroethane	11	11	11	11	11	11	12	12	12	12	12
1,1,2,2-Tetrachloroethane	11	11	11	11	11	11	12	12	12	12	12
1,1,2-Trichloroethane	11	11	11	11	11	11	12	12	12	12	12
1,1-Dichloroethane	11	11	11	11	11	11	12	12	12	12	12
1,1-Dichloroethene	11	11	11	11	11	11	12	12	12	12	12
1,2-Dichloroethane	11	11	11	11	11	11	12	12	12	12	12
1,2-Dichloropropane	11	11	11	11	11	11	12	12	12	12	12
2-Butanone	11	11	11	11	11	11	12	12	12	12	12
2-Hexanone	11	11	11	11	11	11	12	12	12	12	12
4-Methyl-2-pentanone	11	11	11	11	11	11	12	12	12	12	12
Acetone	7 J	18	21	24	15	13	13	14	6 J	12	12
Benzene	11	11	11	11	11	11	12	12	12	12	12
Bromodichloromethane	11	11	11	11	11	11	12	12	12	12	12
Bromoform	11	11	11	11	11	11	12	12	12	12	12
Bromomethane	11	11	11	11	11	11	12	12	12	12	12
Carbon disulfide	11	4 J	11	11	11	11	12	12	12	12	12
Carbon tetrachloride	11	11	11	11	11	11	12	12	12	12	12
Chlorobenzene	11	11	11	11	11	11	12	12	12	12	12
Chloroethane	11	11	11	11	11	11	12	12	12	12	12
Chloroform	11	11	11	11	11	11	12	12	12	12	12
Chloromethane	11	11	11	11	11	11	12	12	12	12	12
cis-1,2-Dichloroethene	11	11	11	11	11	11	12	12	12	12	12
cis-1,3-Dichloropropene	11	11	11	11	11	11	12	12	12	12	12
Dibromochloromethane	11	11	11	11	11	11	12	12	12	12	12
Ethylbenzene	11	11	11	11	11	11	12	12	12	12	12
Methylene Chloride	11	11	11	11	11	11	12	12	12	12	12
m-Xylene & p-Xylene	11	2 J	4 J	1 J	11	2 J	12	12	12	12	12

Table E-4. (continued).

	Box 1 TSF01601	Box 1 TSF01701	Box 1 TSF01801	Box 3 TSF02201	Box 3 TSF02301	Box 3 TSF02401	Box 4 TSF02501	Box 4 TSF02502	Box 4 TSF02601	Box 5 TSF02901	Box 5 TSF03001
o-Xylene	11	1 J	1 J	1 J	11	11	12	12	12	12	12
Styrene	11	11	11	11	11	11	12	12	12	12	12
Tetrachloroethene	11	11	11	11	11	11	12	12	12	12	12
Toluene	11	3 J	4 J	3 J	1 J	3 J	12	12	12	1 J	1 J
trans-1,2-Dichloroethene	11	11	11	11	11	11	12	12	12	12	12
trans-1,3-Dichloropropene	11	11	11	11	11	11	12	12	12	12	12
Trichloroethene	11	11	11	11	11	11	12	12	12	12	12
Vinyl Chloride	11	11	11	11	11	11	12	12	12	12	12
ug/kg											
Aroclor-1016	39			37	37		40			38	
Aroclor-1221	78			73	74		80			76	
Aroclor-1232	39			37	37		40			38	
Aroclor-1242	39			37	37		40			38	
Aroclor-1248	39			37	37		40			38	
Aroclor-1254	39			37	22 J		40			38	
Aroclor-1260	39			37	37		28 J			38	
TCLP metals, ug/L											
Arsenic	19.4			19.4	19.4		19.4			19.4	
Barium	1649			1671	1620		1462			1738	
Cadmium	5.8			5.8	5.8		7.2			8.6	
Chloride	7.4			7.4	7.4		7.4			7.4	
Lead	29.6			29.6	29.6		29.6			35.4	
Mercury	0.21			0.21	0.21		0.21			0.21	
Selenium	40.2			40.2	40.2		40.2			40.2	
Silver	4.6			4.6	4.6		4.6			4.6	
Copper	4.5			4.5	4.5		4.5			4.5	
Zinc	179.3			143.3	143.9		73.2			165	

Table E-4. (continued).

	Box 1 TSF01601	Box 1 TSF01701	Box 1 TSF01801	Box 3 TSF02201	Box 3 TSF02301	Box 3 TSF02401	Box 4 TSF02501	Box 4 TSF02502	Box 4 TSF02601	Box 5 TSF02901	Box 5 TSF03001
pCi/g											
Cs-137	1.12E+03			1.82E+02	2.33E+02		1.30E+03			1.58E+04	
Co-60	3.18E+00			3.12E-01	2.13E-01		1.18E+00			8.20E+00	
Cs-134				4.55E-02	3.67E-02		1.37E-01			1.31E-01	
Uranium-233/234	3.33E+00			1.28E+00	1.58E+00		3.00E+00			2.66E+00	
Uranium-238	1.16E+00			1.16E+00	1.35E+00		1.20E+00			1.15E+00	
Sr-90	8.69E+01			1.13E+01	1.16E+01		2.34E+02			1.50E+03	
Europium-152					2.63E-01					2.75E+00	
Europium-154	2.04E-01									3.99E-01	
Niobium-95				4.33E-02	5.23E-02						
Silver-110m	1.10E+01			5.86E+00	2.97E+01		2.96E+00			6.58E+02	
Europium-155				1.01E-01	2.58E-01						
Silver-108m				4.30E-02			3.16E-01			1.16E+00	

Appendix F

Fiscal Year 2003 CERCLA V-Tank Soil Sampling Results

Appendix-F
Fiscal Year 2003 CERCLA V-Tank
Soil Sampling Results

Validated data have been compiled in the attached tables as listed below. The tables list the summary data and qualifier for each analyte of each sample. The qualifiers are flags provided by the analytical laboratory (denoted in the tables as LQ) and by the validator (denoted in the tables as VQ). These flags are as follows:

- Unmarked samples have no qualifier.
- "J" flags imply that the data is estimated when data point is below the calibrated range, but above the statistically derived method detection limit (MDL). The associated value is an estimate and may be inaccurate or imprecise.
- "U" flags imply that the data is below the MDL. Value typically reported at the reported quanitation level (RQL)—the lowest concentration at which analyte can effectively be quantified. For ***radioactive*** measurements, either the result is not statistically positive at the 95% confidence level and/or the result was below the MDC).
- "UJ" flags imply that the result is highly questionable due to serious analytical and/or quality control anomalies (e.g., significant blank contamination, known photopeak interferences or peak resolutions problems, matrix interferences, unacceptable laboratory control sample recoveries, serious instrument calibration problems, improper sample preservation). The use of such data is strongly discouraged.
- "R" flags indicate that the accuracy of the data is so questionable that it is recommended that the data not be used. For a given data point, an "R" validation flag overrides all other applicable flags.

The following flags are additional flags used by the analytical labs:

- "B" flags indicate blank contamination. This flag is assigned from the laboratory.
- "*" flags indicate that the relative percent difference obtained from the designated sample duplicate or matrix spike duplicate was not within the acceptance criteria of 20%.
  (NOTE: This error only affected the inorganic metals data.)
- "N" flags indicate that the percent recoveries obtained from the matrix spike analyses did not meet the acceptance criteria. The percent recoveries are evaluated when the sample concentration is less than four times the spike concentration added.
- "E" flags indicate interferences due to matrix suppression or enhancement as assessed from serial dilutions.

Table 1. Support Data – Indicates where each sample was taken, when it was taken, how it was analyzed, and the logbook and contaminant of concern (COC) references.

Table 2. Radionuclide data (alpha emitters, plus strontium and nickel).

Table 3. Radionuclide data (gamma emitters).

Table 4. Radionuclide data (Iodine and tritium).

Table 5. Total metals data.

Table 6. Miscellaneous data (pH, cyanide, fluoride, and sulfide).

Table 7. Total volatile organic compound (VOC) data.

Table 8. Total semivolatile (SVOC) data.

Table 9. Polychlorinated biphenyl (PCB) data.

Table 10. Total herbicide data.

Table 11. Total pesticide data.

Table 12. Toxicity characteristic leaching procedure (TCLP) metals data.

Table 13. TCLP herbicide data.

Table 14. TCLP pesticide data.

Table 15. TCLP VOC data.

Table 16. TCLP SVOC data.

The data compiled in the tables listed above have been extracted from the following limitations and validation reports:

INEEL Interoffice Memorandum from S. Shinn to J. J. Jessmore, *Transmittal of the Limitations and Validation (L&V) Report for the PCB Organic Compounds Analyses in Support of the Test Area North (TAN) Group 2 Early Remedial Action Characterization of V-Tank Soils, Sample Delivery Group (SDG) #1WM751013A*, Letter File SOS-TL193-03, September 17, 2003.

INEEL Interoffice Memorandum from S. Shinn to J. J. Jessmore, *Transmittal of the Limitations and Validation (L&V) Report for the Radiological Analyses Pertaining to the Group 2 Early Remedial Action Characterization of V-Tank Soils Project, Sample Delivery Group (SDG) #1WM75101R4*, Letter File SOS-TL205-03, September 30, 2003.

INEEL Interoffice Memorandum from D. N. Thompson to J. J. Jessmore, *Transmittal of the Limitations and Validation (L&V) Report Pertaining to Inorganic and Miscellaneous Classical Analysis (I&MCA) of Samples Collected in Support of the Test Area North (TAN) Group 2 Early Remedial Action Characterization of V-Tank Soils, Sample Delivery Group (SDG) #1WM75101C2*, Letter File DNT-201-03, September 18, 2003.

INEEL Interoffice Memorandum from D. N. Thompson to J. J. Jessmore, *Transmittal of the Limitations and Validation (L&V) Report Pertaining to Inorganic and Miscellaneous Classical Analysis (I&MCA) of Samples Collected in Support of the Test Area North (TAN) Group 2 Early Remedial Action Characterization of V-Tank Soils, Sample Delivery Group (SDG) #1WM75101C1*, Letter File DNT-219-03, October 6, 2003.

INEEL Interoffice Memorandum from D. N. Thompson to J. J. Jessmore, *Transmittal of the Limitations and Validation (L&V) Report Pertaining to Inorganic and Miscellaneous Classical Analysis (I&MCA) of Samples Collected in Support of the Test Area North (TAN) Group 2 Early Remedial Action Characterization of V-Tank Soils, Sample Delivery Group (SDG) #1WM75101TI*, Letter File DNT-220-03, October 7, 2003.

INEEL Interoffice Memorandum from D. M. Grigg to J. J. Jessmore, *Transmittal of the Semivolatiles Limitations and Validation (L&V) Report For Group 2 Early Remedial Action Characterization of V-Tanks Soils, SDG #1WM750013A*, Letter File DMG-103-03, October 6, 2003.

INEEL Interoffice Memorandum from D. M. Grigg to J. J. Jessmore, *Transmittal of the Pesticides Limitations and Validation (L&V) Report For Group 2 Early Remedial Action Characterization of V-Tanks Soils, SDG #1WM75001T8*, Letter File DMG-104-03, October 7, 2003.

INEEL Interoffice Memorandum from D. M. Grigg to J. J. Jessmore, *Transmittal of the Herbicides Limitations and Validation (L&V) Report For Group 2 Early Remedial Action Characterization of V-Tanks Soils, SDG #1WM75001TH*, Letter File DMG-105-03, October 7, 2003.

INEEL Interoffice Memorandum from D. M. Grigg to J. J. Jessmore, *Transmittal of the Semivolatiles Limitations and Validation (L&V) Report For Group 2 Early Remedial Action Characterization of V-Tanks Soils, SDG #1WM750013A*, Letter File DMG-107-03, October 8, 2003.

INEEL Interoffice Memorandum from J. G. Jolley to J. J. Jessmore, *Transmittal of Volatile Organic Compounds (VOCs) Including Toxicity Characteristic Leaching Procedure (TCLP) VOCs Limitations and Validation (L&V) Report For Group 2 Early Remedial Action Characterization of V-Tanks Soils, SDG #1RA75001VL*, Letter File JGJ-080-03, October 7, 2003.

INEEL Interoffice Memorandum from J. G. Jolley to J. J. Jessmore, *Transmittal of Polychlorinated Biphenyls (PCBs) as Aroclors Limitations and Validation (L&V) Report For Group 2 Early Remedial Action Characterization of V-Tanks Soils, SDG #1RA750013A*, Letter File JGJ-095-03, November 6, 2003.

INEEL Interoffice Memorandum from J. G. Jolley to J. J. Jessmore, *Transmittal of Semivolatile Organic Compounds (SVOCs) Limitations and Validation (L&V) Report For Group 2 Early Remedial Action Characterization of V-Tanks Soils, SDG #1RA750013A*, Letter File JGJ-096-03, November 7, 2003.

Table F-1. Support data for V-Tank soil.

Field Sample Number	Location	Type of Location	Depth	Method Description	Date Sample Collected	COC Number
1WM75101C1	DS-02A	TSF-21 VLVE PIT	0-10	SW Method 6010B: Inductively Coupled Plasma - Atomic Emission Spectroscopy	07/21/2003	19995
1RA75101C1	DS-02	TSF-21 VLVE PIT	12-16	SW Method 6010B: Inductively Coupled Plasma - Atomic Emission Spectroscopy	07/21/2003	19995
1WM75001C1	SS-01	WEST OF V-3	0-6	SW Method 6010B: Inductively Coupled Plasma - Atomic Emission Spectroscopy	07/23/2003	22088
1RA75001C1	SS-01	WEST OF V-3	6-10	SW Method 6010B: Inductively Coupled Plasma - Atomic Emission Spectroscopy	07/23/2003	22073
1WM75101C2	DS-02A	TSF-21 VLVE PIT	0-10	SW Method 9012A: Total and Amenable Cyanide (Automated Colorimetric With Off-Line Distillation)	07/21/2003	19995
1WM75101PH	DS-02A	TSF-21 VLVE PIT	0-10	SW Method 9045A: pH	07/21/2003	19995
1WM75101S3	DS-02A	TSF-21 VLVE PIT	0-10	SW-846, chpt. 7.3: Cyanide/Sulfide Reactivity	07/21/2003	19995
1WM75101F1	DS-02A	TSF-21 VLVE PIT	0-10	U.S. EPA Method 300.0: Inorganic Anions by Ion Chromatography	07/21/2003	19995
1WM75001C2	SS-01	WEST OF V-3	0-6	SW Method 9012A: Total and Amenable Cyanide (Automated Colorimetric With Off-Line Distillation)	07/23/2003	22088
1WM75001PH	SS-01	WEST OF V-3	0-6	SW Method 9045A: pH	07/23/2003	22088
1WM75001F1	SS-01	WEST OF V-3	0-6	U.S. EPA Method 300.0: Inorganic Anions by Ion Chromatography	07/23/2003	22088
1WM75001S3	SS-01	WEST OF V-3	0-6	SW-846, chpt. 7.3: Cyanide/Sulfide Reactivity	07/23/2003	22088
1WM75101TI	DS-02A	TSF-21 VLVE PIT	0-10	SW Method 6010B: Inductively Coupled Plasma - Atomic Emission Spectroscopy	07/21/2003	19995
1WM75001TI	SS-01	WEST OF V-3	0-6	SW Method 6010B: Inductively Coupled Plasma - Atomic Emission Spectroscopy	07/23/2003	22088
1WM75201C1	DW-01	DECON WATER	NA	SW Method 6010B: Inductively Coupled Plasma - Atomic Emission Spectroscopy	07/21/2003	19995
1WM75201F1	DW-01	DECON WATER	NA	U.S. EPA Method 300.0: Inorganic Anions by Ion Chromatography	07/21/2003	19994
1WM75201C2	DW-01	DECON WATER	NA	SW Method 9012A: Total and Amenable Cyanide (Automated Colorimetric With Off-Line Distillation)	07/21/2003	19995
1WM75201S3	DW-01	DECON WATER	NA	U.S. EPA Method 376.2: Sulfide	07/17/2003	19998
1WM75201PH	DW-01	DECON WATER	NA	SW Method 9040B: pH, Electrometric Measurement	07/17/2003	19998
1RA75001VL	SS-01	WEST OF V-3	6-10	Volatile Organic Compounds by GC/MS	07/23/2003	22072
1WM75101VL	DS-02A	TSF-21 VLVE PIT	7-7.6	Volatile Organic Compounds by GC/MS	07/21/2003	19996
1RA75101VL	DS-02	TSF-21 VLVE PIT	12-16	Volatile Organic Compounds by GC/MS	07/21/2003	19996
1RA75001VL(1)	SS-01	WEST OF V-3	2.6-3.6	Volatile Organic Compounds by GC/MS	07/23/2003	19999
1WM75001VL	SS-01	WEST OF V-3	2.6-3.6	Volatile Organic Compounds by GC/MS	07/23/2003	19999
1WM751013A	DS-02A	TSF-21 VLVE PIT	0-10	Semivolatile Organic Compounds by GC/MS	07/21/2003	19996
1RA751013A	DS-02	TSF-21 VLVE PIT	12-16	Semivolatile Organic Compounds by GC/MS	07/21/2003	19996
1WM75101TA	DS-02A	TSF-21 VLVE PIT	7-7.6	Semivolatile Organic Compounds by GC/MS	07/21/2003	19996
1WM75001TA	SS-01	WEST OF V-3	2.6-3.6	Semivolatile Organic Compounds by GC/MS	07/23/2003	19999
1WM75101TH	DS-02A	TSF-21 VLVE PIT	0-10	Chlorinated Herbicides by GC	07/21/2003	19996
1WM75001TH	SS-01	WEST OF V-3	2.6-3.6	Chlorinated Herbicides by GC	07/23/2003	19999
1RA750013A	SS-01	WEST OF V-3	6-10	Chlorinated Herbicides by GC	07/23/2003	22072
1WM751013A	DS-02A	TSF-21 VLVE PIT	0-10	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	07/21/2003	19996

Table F-1. (continued).

Field Sample Number	Location	Type of Location	Depth	Method Description	Date Sample Collected	COC Number
1RA751013A	DS-02	TSF-21 VLVE PIT	12-16	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	07/21/2003	19996
1WM750013A	SS-01	WEST OF V-3	2.6-3.6	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	07/23/2003	19999
1WM75101T8	DS-02A	TSF-21 VLVE PIT	0-10	Organochlorine Pesticides by Gas Chromatography	07/21/2003	19996
1WM75001T8	SS-01	WEST OF V-3	2.6-3.6	Organochlorine Pesticides by Gas Chromatography	07/23/2003	19999
1RA750013A	SS-01	WEST OF V-3	6-10	Organochlorine Pesticides by Gas Chromatography	07/23/2003	22072
1WM752019A	DW-01	DECON WATER	NA	Chlorinated Herbicides by GC	07/21/2003	19992
1WM75201EM	DW-01	DECON WATER	NA	Semivolatile Organic Compounds by GC/MS	07/21/2003	19991
1WM75201VM	DW-01	DECON WATER	NA	Volatile Organic Compounds by GC/MS	07/21/2003	19991
TBK10001VL	QC	TRIP BLANK	NA	Volatile Organic Compounds by GC/MS	07/24/2003	19991
1WM75101RH	DS-02A	TSF-21 VLVE PIT	0-10	Alpha spectroscopy	07/21/2003	19995
1RA75101RH	DS-02	TSF-21 VLVE PIT	12-16	Alpha spectroscopy	07/21/2003	19997
1WM75001RH	SS-01	WEST OF V-3	0-6	Alpha spectroscopy	07/23/2003	22088
1RA75001RH	SS-01	WEST OF V-3	6-10	Alpha spectroscopy	07/23/2003	22073
1WM75101RH	DS-02A	TSF-21 VLVE PIT	0-10	Gas Flow Proportional Counter	07/21/2003	19995
1RA75101RH	DS-02	TSF-21 VLVE PIT	12-16	Gas Flow Proportional Counter	07/21/2003	19997
1WM75001RH	SS-01	WEST OF V-3	0-6	Gas Flow Proportional Counter	07/23/2003	22088
1RA75001RH	SS-01	WEST OF V-3	6-10	Gas Flow Proportional Counter	07/23/2003	22073
1WM75101R4	DS-02A	TSF-21 VLVE PIT	0-10	Gamma spectroscopy	07/21/2003	19995
1RA75101R4	DS-02	TSF-21 VLVE PIT	12-16	Gamma spectroscopy	07/21/2003	19997
1WM75101RI	DS-02A	TSF-21 VLVE PIT	0-10	Gamma spectroscopy	07/21/2003	19995
1RA75101RI	DS-02	TSF-21 VLVE PIT	12-16	Gamma spectroscopy	07/21/2003	19995
1WM75001R4	SS-01	WEST OF V-3	0-6	Gamma spectroscopy	07/23/2003	22088
1RA75001R4	SS-01	WEST OF V-3	6-10	Gamma spectroscopy	07/23/2003	22073
1WM75001RI	SS-01	WEST OF V-3	0-6	Gamma spectroscopy	07/23/2003	22088
1RA75001RI	SS-01	WEST OF V-3	6-10	Gamma spectroscopy	07/23/2003	22073
1WM75101RH	DS-02A	TSF-21 VLVE PIT	0-10	Liquid scintillation	07/21/2003	19995
1RA75101RH	DS-02	TSF-21 VLVE PIT	12-16	Liquid scintillation	07/21/2003	19997
1WM75101R8	DS-02A	TSF-21 VLVE PIT	0-10	Liquid scintillation	07/21/2003	19995
1RA75101R8	DS-02	TSF-21 VLVE PIT	12-16	Liquid scintillation	07/21/2003	19997
1WM75001R8	SS-01	WEST OF V-3	0-6	Liquid scintillation	07/23/2003	22088
1RA75001R8	SS-01	WEST OF V-3	6-10	Liquid scintillation	07/23/2003	22073
1WM75001RH	SS-01	WEST OF V-3	0-6	Liquid scintillation	07/23/2003	22088
1RA75001RH	SS-01	WEST OF V-3	6-10	Liquid scintillation	07/23/2003	22073
1WM75201RH	DW-01	DECON WATER	NA	Alpha spectroscopy	07/21/2003	19994
FBK10001RH	QC	FIELD BLANK	NA	Alpha spectroscopy	07/10/2003	22079

Table F-1. (continued).

Field Sample Number	Location	Type of Location	Depth	Method Description	Date Sample Collected	COC Number
1WM75201RI	DW-01	DECON WATER	NA	Radiochemistry by LANL EM-9	07/21/2003	19994
FBK10001RI	QC	FIELD BLANK	NA	Radiochemistry by LANL EM-9	07/10/2003	22079
1WM75201RH	DW-01	DECON WATER	NA	Gas Flow Proportional Counter	07/21/2003	19994
FBK10001RH	QC	FIELD BLANK	NA	Gas Flow Proportional Counter	07/10/2003	22079
1WM75201R4	DW-01	DECON WATER	NA	Gamma spectroscopy	07/21/2003	19994
FBK10001R4	QC	FIELD BLANK	NA	Gamma spectroscopy	07/10/2003	22079
1WM75201RH	DW-01	DECON WATER	NA	Liquid scintillation	07/21/2003	19994
1WM75201R8	DW-01	DECON WATER	NA	Liquid scintillation	07/21/2003	19994
FBK10001R8	QC	FIELD BLANK	NA	Liquid scintillation	07/10/2003	22079
FBK10001RH	QC	FIELD BLANK	NA	Liquid scintillation	07/10/2003	22079

Table F-2. alpha-emitting radionuclide analysis (plus strontium and nickel) for V-Tank soil.

Units = pCi/g Isotope	0 to 10 feet 1WM75101RH			12 to 16 feet 1RA75101RH			0 to 6 feet 1WM75001RH			6 to 10 feet 1RA75001RH		
	Value	Error	VQ	Value	Error	VQ	Value	Error	VQ	Value	Error	VQ
Curium-242	-3.90E-03	2.77E-03	U	9.06E-03	9.08E-03	U	-1.69E-03	1.69E-03	U	5.88E-03	3.41E-03	U
Americium-241	7.39E-03	7.40E-03	U	6.26E-03	8.48E-03	U	1.21E-01	2.92E-02		1.23E-02	5.32E-03	UJ
Curium-243/244	9.47E-03	1.09E-02	U	1.45E-02	1.19E-02	U	4.86E-02	1.86E-02	J	1.94E-02	6.43E-03	
Neptunium-237	8.77E-03	7.51E-03	U	1.14E-02	9.80E-03	U	4.82E-03	8.57E-03	U	-2.72E-03	4.97E-03	U
Plutonium-238	1.11E-02	7.87E-03	U	0.00E+00	1.00E+00	U	6.49E-01	7.56E-02		1.92E-02	1.22E-02	U
Plutonium-239/240	1.11E-02	7.87E-03	U	6.67E-03	6.68E-03	U	3.51E+00	2.46E-01		9.58E-02	2.66E-02	
Uranium-233/234	2.21E+00	2.20E-01		4.86E+00	3.42E-01		1.28E+00	1.57E-01		9.09E-01	8.11E-02	
Uranium-235	3.18E-01	5.25E-02		5.92E-01	5.57E-02		6.59E-02	2.56E-02	J	1.65E-01	2.54E-02	
Uranium-238	7.61E-01	9.42E-02		1.12E+00	9.13E-02		1.00E+00	1.30E-01		1.00E+00	8.75E-02	
Sr-90	6.80E+01	1.03E+01		2.70E+00	3.85E-01	J	5.49E+02	8.01E+01		1.47E+01	1.87E+00	
Ni-63	1.40E+01	1.18E+00		1.64E+01	1.30E+00		1.20E+02	3.07E+00		3.65E+00	1.01E+00	

Table F-3. Gamma-emitting radionuclide analysis for V-Tank soil.

Units = pCi/g	0 to 10 feet			12 to 16 feet			0 to 6 feet			6 to 10 feet		
Isotope	1WM75101R4			1RA75101R4			1WM75001R4			1RA75001R4		
	Value	Error	VQ	Value	Error	VQ	Value	Error	VQ	Value	Error	VQ
Silver-108m	3.59E-02	2.79E-02	U	-5.78E-04	8.38E-03	U	1.06E-01	1.01E-01	U	3.47E-02	2.27E-02	U
Silver-110m	3.27E-01	2.67E-02	UJ	1.16E-03	7.50E-03	U	4.79E+00	3.13E-01	UJ	2.81E-02	1.82E-02	U
Americium-241	2.72E-02	1.91E-02	U	5.50E-02	3.72E-02	U	1.10E-01	8.61E-02	U	-6.42E-03	2.11E-02	U
Cerium-144	-6.31E-02	7.06E-02	U	-4.16E-02	3.79E-02	U	2.04E-01	3.44E-01	U	-5.03E-02	8.32E-02	U
Cobalt-58	-1.23E-02	1.04E-02	U	-5.31E-03	6.78E-03	U	-5.79E-02	1.16E-01	U	-1.57E-02	1.89E-02	U
Cobalt-60	5.96E-01	3.22E-02		1.16E-01	1.35E-02		2.53E+02	1.07E+01		1.43E+00	7.87E-02	
Cesium-134	-7.71E-03	1.36E-02	U	4.16E-03	6.55E-03	U	6.83E-02	7.77E-02	U	-1.51E-02	1.48E-02	U
Cesium-137	7.37E+01	4.19E+00		6.25E+00	3.13E-01		6.84E+02	4.11E+01		1.89E+01	1.03E+00	
Europium-152	6.28E-02	5.05E-02	U	-2.76E-02	2.12E-02	U	1.22E+00	3.53E-01	J	7.32E-02	5.62E-02	U
Europium-154	-1.08E-03	2.29E-02	U	3.21E-03	1.94E-02	U	1.28E+00	2.70E-01		1.62E-01	8.20E-02	U
Europium-155	8.45E-02	3.66E-02	UJ	3.56E-02	2.55E-02	U	-1.36E-02	1.67E-01	U	3.64E-02	3.83E-02	U
Potassium-40	1.61E+01	7.78E-01		1.83E+01	9.20E-01		1.35E+01	1.06E+00		1.70E+01	9.28E-01	
Manganese-54	4.69E-03	8.38E-03	U	1.45E-02	7.19E-03	UJ	5.58E-02	1.02E-01	U	7.22E-03	1.44E-02	U
Niobium-94	1.76E-02	6.49E-03	UJ	8.17E-03	5.62E-03	U	1.83E+00	1.65E-01		1.79E-02	1.32E-02	U
Niobium-95	3.23E-02	1.38E-02	UJ	2.06E-02	1.05E-02	U	-1.43E-01	1.34E-01	U	2.39E-02	2.27E-02	U
Promethium-147	3.05E+04	1.73E+04	U	-5.57E+03	9.65E+03	U	5.75E+05	2.98E+05	U	2.26E+04	2.25E+04	U
Radium-226	1.11E+00	8.52E-02		1.02E+00	6.57E-02		9.41E-01	2.32E-01		9.70E-01	9.00E-02	
Ruthenium-103	4.42E-03	2.60E-02	U	-4.79E-03	1.01E-02	U	-1.99E-02	1.41E-01	U	2.42E-02	2.87E-02	U
Ruthenium-106	6.10E-02	1.22E-01	U	1.45E-03	5.78E-02	U	7.79E-01	7.99E-01	U	5.61E-02	1.41E-01	U
Antimony-125	-6.69E-02	5.91E-02	U	1.39E-02	2.36E-02	U	6.99E-02	3.21E-01	U	5.33E-02	6.15E-02	U
Uranium-235	1.78E-01	1.02E-01	U	1.47E-01	5.31E-02	J	8.90E-02	3.47E-01	U	2.12E-01	1.15E-01	U
Zinc-65	1.26E-02	2.04E-02	U	7.09E-03	1.77E-02	U	6.10E-01	2.46E-01	UJ	-4.62E-02	4.14E-02	U
Zirconium-95	2.78E-02	1.63E-02	U	1.83E-02	2.22E-02	U	-1.20E-01	1.92E-01	U	3.55E-02	3.01E-02	U

Table F-4. Iodine and tritium analysis for V-Tank soil.

Units = pCi/g Isotope	0 to 10 feet 1WM75101RI		VQ	12 to 16 feet 1RA75101RI		VQ	0 to 6 feet 1WM75001RI		VQ	6 to 10 feet 1RA75001RI		VQ
Iodine-129	3.86E+00	5.82E-01	UJ	-5.22E-02	2.97E-01	U	5.07E+00	5.33E-01	UJ	1.42E-01	2.68E-01	U

PCi/g Isotope	0 to 10 feet 1WM75101R8		VQ	12 to 16 feet 1RA75101R8		VQ	0 to 6 feet 1WM75001R8		VQ	6 to 10 feet 1RA75001R8		VQ
H-3	2.76E+00	3.08E+00	U	2.85E+01	4.05E+00		4.79E+01	4.86E+00		-1.53E+00	3.24E+00	U

Table F-5. Total metals analysis for V-Tank soil.

Units = ug/kg Compound	0 to 10 feet 1WM75101C1	LQ	VQ	12 to 16 feet 1RA75101C1	LQ	VQ	0 to 6 feet 1WM75001C1	LQ	VQ	6 to 10 feet 1RA75001C1	LQ	VQ
Aluminum	16560000	*	J	12270000	*	J	15090000	*	J	12550000	*	J
Antimony	654	BN*	R	842	BN*	R	685	BN*	R	399	BN*	R
Arsenic	16700			10800			15100			12100		
Barium	232000	*		212000	*		211000	*		216000	*	
Beryllium	924			670			858			677		
Cadmium	759			408	B		1040			662		
Calcium	84790000		J	39800000		J	95140000		J	111720000		J
Chromium	35300			27000			32900			32900		
Cobalt	9360	E		8370	E		8710	E		7720	E	
Copper	28100		J	20800		J	26600		J	22700		J
Iron	21950000	*		18670000	*		20410000	*		18970000	*	
Lead	23800	*N	J	13200	*N	J	22000	*N	J	15500	*N	J
Magnesium	14110000		J	10700000		J	13590000		J	12240000		J
Manganese	458000	*	J	370000	*	J	417000	*	J	372000	*	J
Mercury	47.7	N	J	55.7	N	J	126	N	J	42	N	J
Nickel	35500	N	J	25200	N	J	34700	N	J	34300	N	J
Potassium	2730000	*		1940000	*		2510000	*		2410000	*	
Selenium	1470			974			824			1230		
Silver	425	B		191	U		193	U		184	U	
Sodium	1260000	*	J	371000	*	J	192000	*	J	209000	*	J
Thallium	1050	U		410	U		414	U		395	U	
Vanadium	53900	N	J	38400	N	J	49400	N	J	43100	N	J
Zinc	114000	N	J	71600	N	J	137000	N	J	98200	N	J

Table F-6. Miscellaneous analysis for V-Tank soil.

Units = mg/kg (except for pH)	0 to 10 feet			0 to 6 feet		
Compound	1WM75101C2,PH,F1,S3	LQ	VQ	1WM75001C2,PH,F1,S3	LQ	VQ
Cyanide (Total)	0.0619	J		0.00967	U	
Corrosivity (as pH)	9.55	H	R	8.96	H	R
Fluoride	2.61			1.66		
Reactive Releasable Sulfide	-6.25	U	UJ	-6.03	U	UJ

Table F-7. Total volatile organic compound analysis for V-Tank soil.

Units = ug/kg Compound	6 to 10 feet 1RA75001VL	LQ	VQ	7 to 7.6 feet 1WM75101VL	LQ	VQ	12 to 16 feet 1RA75101VL	LQ	VQ	2.6 to 3.6 feet 1RA75001VL(1)	LQ	VQ	2.6 to 3.6 feet 1WM75001VL	LQ	VQ
Cyclohexane	11	U		11	U		12	U		11	U		12	U	
Methyl acetate	11	U	R	11	U	R	12	U	R	11	U	R	12	U	R
Methyl cyclohexane	11	U		11	U		12	U		11	U		12	U	
Dichlorodifluoromethane	11	U		11	U		12	U		11	U		12	U	
Chloromethane	11	U		11	U		12	U		11	U		12	U	
Bromomethane	11	U		11	U		12	U		11	U		12	U	
Chloroethane	11	U		11	U		12	U		11	U		12	U	
Trichlorofluoromethane	11	U		11	U		12	U		11	U		12	U	
1,1,2-Trichloro-1,2,2-trifluoroethane	11	U		11	U		12	U		11	U		12	U	
Acetone	11	U	R	11	U	R	12	U	R	11	U	R	12	U	R
1,1-Dichloroethene	11	U		11	U		12	U		11	U		12	U	
Methylene Chloride	11	U	UJ	11	U	UJ	12	U	UJ	11	U	UJ	12	U	UJ
Carbon disulfide	11	U		11	U		12	U		11	U		12	U	
1,2-Dichloroethene (total)	11	U													
trans-1,2-Dichloroethene	11	U		11	U		12	U		11	U		12	U	
1,1-Dichloroethane	11	U		11	U		12	U		11	U		12	U	
2-Butanone	11	U	R	11	U	R	12	U	R	11	U	R	12	U	R
cis-1,2-Dichloroethene	11	U		11	U		12	U		11	U		12	U	
Chloroform	11	U		11	U		12	U		11	U		12	U	
1,1,1-Trichloroethane	11	U		11	U		12	U		11	U		12	U	
m-Xylene & p-Xylene	5.5	U													
o-Xylene	5.5	U													
Carbon tetrachloride	11	U		11	U		12	U		11	U		12	U	
1,2-Dichloroethane	11	U		11	U		12	U		11	U		12	U	
Benzene	11	U		11	U		12	U		11	U		12	U	
Trichloroethene	0.58	J		0.9	J		2.6	J		0.86	J		1.7	J	

Table F-7. (continued).

Units = ug/kg Compound	6 to 10 feet 1RA75001VL	LQ	VQ	7 to 7.6 feet 1WM75101VL	LQ	VQ	12 to 16 feet 1RA75101VL	LQ	VQ	2.6 to 3.6 feet 1RA75001VL(1)	LQ	VQ	2.6 to 3.6 feet 1WM75001VL	LQ	VQ
1,2-Dichloropropane	11	U		11	U		12	U		11	U		12	U	
Bromodichloromethane	11	U		11	U		12	U		11	U		12	U	
4-Methyl-2-pentanone	11	U		11	U		12	U		11	U		12	U	
cis-1,3-Dichloropropene	11	U		11	U		12	U		11	U		12	U	
Toluene	11	U		11	U		12	U		11	U		12	U	
trans-1,3-Dichloropropene	11	U		11	U		12	U		11	U		12	U	
1,1,2-Trichloroethane	11	U		11	U		12	U		11	U		12	U	
2-Hexanone	11	U		11	U		12	U		11	U		12	U	
Tetrachloroethene	11	U		11	U		12	U		11	U		12	U	
Dibromochloromethane	11	U		11	U		12	U		11	U		12	U	
1,2-Dibromoethane	11	U		11	U		12	U		11	U		12	U	
Chlorobenzene	11	U		11	U		12	U		11	U		12	U	
Ethylbenzene	11	U		11	U		12	U		11	U		12	U	
Vinyl Chloride	11	U		11	U		12	U		11	U		12	U	
Xylene (Total)	11	U		11	U		12	U		11	U		12	U	
Styrene	11	U		11	U		12	U		11	U		12	U	
Bromoform	11	U		11	U		12	U		11	U		12	U	
Isopropylbenzene	11	U		11	U		12	U		11	U		12	U	
1,1,2,2-Tetrachloroethane	11	U		11	U		12	U		11	U		12	U	
1,3-Dichlorobenzene	11	U		11	U		12	U		11	U		12	U	
1,4-Dichlorobenzene	11	U		11	U		12	U		11	U		12	U	
1,2-Dichlorobenzene	11	U		11	U		12	U		11	U		12	U	
1,2-Dibromo-3-chloropropane	11	U	UJ	11	U	UJ	12	U	UJ	11	U	UJ	12	U	UJ
Methyl t-butyl ether	11	U		11	U		12	U		11	U		12	U	
1,2,4-Trichlorobenzene	11	U		11	U		12	U		11	U		12	U	

Table 8. Total semivolatile organic compound analysis for V-Tank soil.

Units = ug/kg Compound	2.6 to 3.6 feet 1WM750013A	LQ	VQ	0 to 10 feet 1WM751013A	LQ	VQ	12 to 16 feet 1RA751013A	LQ	VQ	6 to 10 feet 1RA750013A-- 1RA75001VL	LQ	VQ
Pyridine	720	U		740	U		760	U		760	U	R
1,2,4-Trichlorobenzene	360	U										
Phenol	360	U		370	U		380	U		380	U	R
bis-(2-Chloroethyl)ether	360	U		370	U		380	U		380	U	R
2-Chlorophenol	360	U		370	U		380	U		380	U	R
2-Methylphenol (o-Cresol)	360	U		370	U		380	U		380	U	R
3-Methylphenol & 4-Methylphenol	330	U		340	U		340	U		760	U	R
2,2'-oxybis(1-Chloropropane)	360	U		370	U		380	U		380	U	R
Acetophenone	360	U		370	U		380	U		380	U	R
n-Nitrosodi-n-propylamine	360	U		370	U		380	U		380	U	R
Hexachloroethane	360	U		370	U		380	U		380	U	R
Nitrobenzene	360	U		370	U		380	U		380	U	R
Isophorone	360	U		370	U		380	U		380	U	R
2-Nitrophenol	360	U		370	U		380	U		380	U	R
2,4-Dimethylphenol	360	U		370	U		380	U		380	U	R
bis-(2-chloroethoxy)methane	360	U		370	U		380	U		380	U	R
2,4-Dichlorophenol	360	U		370	U		380	U		380	U	R
Naphthalene	360	U		370	U		380	U		380	U	R
4-Chloroaniline	360	U		370	U		380	U		380	U	R
Hexachlorobutadiene	360	U		370	U		380	U		380	U	R
4-Chloro-3-methylphenol	360	U		370	U		380	U		380	U	R
2-Methylnaphthalene	360	U		370	U		380	U		380	U	R
Hexachlorocyclopentadiene	360	U		370	U		380	U		380	U	R
2,4,6-Trichlorophenol	360	U		370	U		380	U		380	U	R
2,4,5-Trichlorophenol	910	U		930	U		960	U		950	U	R
2-Chloronaphthalene	360	U		370	U		380	U		380	U	R

Table F-8. (continued).

Units = ug/kg Compound	2.6 to 3.6 feet 1WM750013A	LQ	VQ	0 to 10 feet 1WM751013A	LQ	VQ	12 to 16 feet 1RA751013A	LQ	VQ	6 to 10 feet 1RA750013A-- 1RA75001VL	LQ	VQ
2-Nitroaniline	910	U		930	U		960	U		950	U	R
Dimethyl phthalate	360	U		370	U		380	U		380	U	R
Acenaphthylene	360	U		370	U		380	U		380	U	R
2,6-Dinitrotoluene	360	U		370	U		380	U		380	U	R
3-Nitroaniline	910	U		930	U		960	U		950	U	R
Acenaphthene	360	U		370	U		380	U		380	U	R
2,4-Dinitrophenol	910	U		930	U		960	U		950	U	R
4-Nitrophenol	910	U		930	U		960	U		950	U	R
Dibenzo(a,h)anthracene	360	U		370	U		380	U		380	U	R
Dibenzofuran	360	U		370	U		380	U		380	U	R
2,4-Dinitrotoluene	360	U		370	U		380	U		380	U	R
Diethyl Phthalate	360	U		370	U		380	U		380	U	R
Fluorene	360	U		370	U		380	U		380	U	R
4-Chlorophenyl phenyl ether	360	U		370	U		380	U		380	U	R
4-Nitroaniline	910	U		930	U		960	U		950	U	R
4,6-Dinitro-2-methylphenol	910	U		930	U		960	U		950	U	R
n-Nitrosodiphenylamine	360	U		370	U		380	U		380	U	R
Pyrene	360	U		370	U		380	U		380	U	R
4-Bromophenyl phenyl ether	360	U		370	U		380	U		380	U	R
Hexachlorobenzene	360	U		370	U		380	U		380	U	R
Pentachlorophenol	910	U		930	U		960	U		950	U	R
Phenanthrene	360	U		370	U		380	U		380	U	R
Anthracene	360	U		370	U		380	U		380	U	R
Carbazole	360	U		370	U		380	U		380	U	R
Di-n-butyl phthalate	360	U		370	U		380	U		380	U	R
Fluoranthene	360	U		370	U		380	U		380	U	R
Butyl benzyl phthalate	360	U		370	U		380	U		380	U	R

Table F-8. (continued).

Units = ug/kg Compound	2.6 to 3.6 feet 1WM750013A	LQ	VQ	0 to 10 feet 1WM751013A	LQ	VQ	12 to 16 feet 1RA751013A	LQ	VQ	6 to 10 feet 1RA750013A-- 1RA75001VL	LQ	VQ
Benzo(a)anthracene	360	U		370	U		380	U		380	U	R
3,3'-Dichlorobenzidine	360	U		370	U		380	U		380	U	R
Chrysene	360	U		370	U		380	U		380	U	R
bis-(2-ethylhexyl)phthalate	360	U		370	U		380	U		380	U	R
Di-n-octyl phthalate	360	U		370	U		380	U		380	U	R
Benzo(b)fluoranthene	360	U		370	U		380	U		380	U	R
Benzo(k)fluoranthene	360	U		370	U		380	U		380	U	R
Benzo(a)pyrene	120	J	J	370	U		380	U		380	U	R
Indeno(1,2,3-cd)pyrene	360	U		370	U		380	U		380	U	R
Benzo(g,h,i)perylene	120	J	J	370	U		380	U		380	U	R
Benzaldehyde	360	U		370	U		380	U		380	U	R
Atrazine	360	U		370	U		380	U		380	U	R
Caprolactam	360	U		370	U		380	U		380	U	R
1,1'-Biphenyl	360	U		370	U		380	U		380	U	R

Table F-9. Polychlorinated biphenyls analysis for the V-Tank soil.

Units = ug/kg Compound	0 to 10 feet 1WM751013A	LQ	VQ	12 to 16 feet 1RA751013A	LQ	VQ	2.6 to 3.6 feet 1WM750013A	LQ	VQ	1RA751013A-- 1RA75001VL	LQ	VQ
Aroclor-1016	38	U		38	U		36	U		38	U	R
Aroclor-1221	38	U		38	U		36	U		38	U	R
Aroclor-1232	38	U		38	U		36	U		38	U	R
Aroclor-1242	38	U		38	U		36	U		38	U	R
Aroclor-1248	38	U		38	U		36	U		38	U	R
Aroclor-1254	38	U		38	U		36	U		38	U	R
Aroclor-1260	38	U		38	U		36	U		38	U	R

Table F-10. Total herbicides analysis for V-Tank soil.

Units = ug/kg Compound	6 to 10 feet 1RA750013A	LQ	VQ
2,4-D	270	U	
Dalapon	91	U	UJ
2,4-DB	51	U	
Dicamba	11	U	
Dichlorprop	17	U	
Dinoseb	570	U	
MCPA	1100	U	
MCPP	800	U	
2,4,5-TP (Silvex)	39	U	
2,4,5-T	46	U	

Table F-11. Total pesticides analysis for V-Tank soil.

Units = ug/kg Compound	6 to 10 feet 1RA750013A	LQ	VQ
Aldrin	31	U	
alpha-BHC	23	U	
beta-BHC	45	U	
delta-BHC	68	U	
gamma-BHC (Lindane)	31	U	
Chlordane	110	U	
4,4'-DDD	85	U	
4,4'-DDE	31	U	
4,4'-DDT	90	U	
Dieldrin	16	U	
Endosulfan I	16	U	
Endosulfan II	31	U	
Endosulfan sulfate	510	U	
Endrin	45	U	
Endrin aldehyde	180	U	
Heptachlor	23	U	
Heptachlor Epoxide	61	U	
Methoxychlor	1400	U	
Toxaphene	1900	U	

Table F-12. Toxicity characteristic leaching procedure metals analysis for V-Tank soils.

Units = mg/L metal	0 to 10 feet 1WM75101TI	LQ	VQ	0 to 6 feet 1WM75001TI	LQ	VQ
Arsenic	0.033	U		0.033	U	
Barium	1.55	B		1.91	B	
Cadmium	0.015			0.008	B	
Chromium	0.017	U		0.017	U	
Lead	0.024	U		0.024	U	
Mercury	0.0003	U		0.001	UN	UJ
Selenium	0.034	U		0.034	U	
Silver	0.017	U		0.017	U	

Table F-13. Toxicity characteristic leaching procedure herbicide analysis for V-Tank soils.

Units = ug/L Compound	0 to 10 feet 1WM75101TH	LQ	VQ	2.6 to 3.6 feet 1WM75001TH	LQ	VQ
2,4-D	120	U		120	U	
2,4,5-TP (Silvex)	17	U		17	U	

Table F-14. Toxicity characteristic leaching procedure pesticide analysis for V-Tank soils.

Units = ug/L Compound	0 to 10 feet 1WM75101T8	LQ	VQ	2.6 to 3.6 feet 1WM75001T8	LQ	VQ
alpha-BHC	0.3	U		0.3	U	
beta-BHC	0.6	U		0.6	U	
delta-BHC	0.9	U		0.9	U	
Dieldrin	0.2	U		0.2	U	
Endosulfan sulfate	6.6	U		6.6	U	
Endrin aldehyde	2.3	U		2.3	U	
gamma-BHC (Lindane)	40	U		40	U	
Heptachlor	0.3	U		0.3	U	
Heptachlor Epoxide	0.8	U		0.8	U	
Endrin	0.6	U		0.6	U	
Methoxychlor	18	U		18	U	
Chlordane	1.4	U		1.4	U	
Toxaphene	25	U		25	U	

Table F-15. Toxicity characteristic leaching procedure volatile organic compound analysis for V-Tank soil.

Units = ug/L Compound	7 to 7.6 feet 1WM75101TV	LQ	VQ	2.6 to 3.6 feet 1WM75001TV	LQ	VQ
Benzene	50	U		50	U	
2-Butanone	50	U	R	50	U	R
Carbon tetrachloride	50	U		50	U	
Chlorobenzene	50	U		50	U	
Chloroform	50	U		50	U	
1,2-Dichlorobenzene	50	U		50	U	
1,4-Dichlorobenzene	50	U		50	U	
1,2-Dichloroethane	50	U		50	U	
1,1-Dichloroethene	50	U		50	U	
Tetrachloroethene	50	U		50	U	
Trichloroethene	50	U		50	U	
Vinyl Chloride	50	U		50	U	

Table F-16. Toxicity charcteristic leaching procedure semivolatile organic compound analysis for V-Tank soil.

Units = ug/L Compound	7 to 7.6 feet 1WM75101TA	LQ	VQ	2.6 to 3.6 feet 1WM75001TA	LQ	VQ
1,4-Dichlorobenzene	50	U		50	U	
2,4-Dinitrotoluene	50	U		50	U	
Hexachlorobenzene	50	U		50	U	
Hexachlorobutadiene	50	U		50	U	
Hexachloroethane	50	U		50	U	
2-Methylphenol (o-Cresol)	50	U		50	U	
Nitrobenzene	50	U		50	U	
Pentachlorophenol	250	U		250	U	
Pyridine	50	U		50	U	
2,4,5-Trichlorophenol	50	U		50	U	
2,4,6-Trichlorophenol	50	U		50	U	
3-Methylphenol & 4-Methylphenol	100	U		100	U	

Appendix G

Fiscal Year 2003 Decontamination and Decommissioning Soil Sampling Results

Appendix-G
Fiscal Year 2003 Decontamination and Decommissioning Soil Sampling Results

Along with the CERCLA sampling effort (denoted as V-Tank sampling in FY-03), there was also soil sampling affiliated with decontamination and decommissioning (D&D) during FY-03. This soil sampling was performed to determine the extents of soil contamination due to underground piping or valve box leakages. Some of the samples from this activity are used in this report to provide additional data points for the V-Tank soil database. Decontamination and decommissioning soil data from the following sources were used:

- Five composite soil samples taken along the piping from building TAN-616 toward Valve Box #1 and north toward Valve Box #2
- Three grab samples around a piping tee (near building TAN-633)
- Three grab samples 3—5 ft south of Valve Box #2 (TSF-21)
- Three grab samples 3—5 ft west of Valve Box #2 (TSF-21)
- Three grab samples 5—7 ft west of Valve Box #2 (TSF-21).

TAN 650	81.1	
TAN 651	69.6	95
TAN 652	4.15	
TAN 653	199	
TAN 654	0.096	
TAN 656	244	
TAN 657	119	
TAN 658	95.6	
TAN 659	1.01	
TAN 660	6.24	
TAN 698	0.539	
TAN 699	0.508	
TAN 700	1.13	0.652
TAN 701	0.184	
TAN 702	5.94	
TAN 703	0.0576	
TAN 704	0.026	
TAN 708	2.64	
TAN 709	8.7	

TAN 710	10.8	
TAN 711	7.96	10.2
TAN 720	725	
TAN 721	757	
TAN 722	261	
TAN 723	0.332	0.338
TAN 724	0.158	
TAN 726	0.0824	
TAN 727	1.07	1.02
TAN 728	0.595	
TAN 729	0.704	
TAN 732	0.768	
TAN 733	1.14	
TAN 734	4190	
TAN 735	726	
TAN 736	369	
TAN 737	1770	
TAN 738	448	
TAN 739	34.5	

	T by building TAN-633	Average =	751 pCi/g	95% ucl =	2279 pCi/g
	3 to 5 ft south of VB#2	Average =	1762 pCi/g	95% ucl =	5320 pCi/g
	3 to 5 ft west of VB#2	Average =	153 pCi/g	95% ucl =	287 pCi/g
	5 to 7 ft west of VB#2	Average =	0.97 pCi/g	95% ucl =	1.29 pCi/g
	Composite of four surface locations along piping from Tan 616 to TSF-21				

Figure G-1. Grab sample locations.

Table G-1. Metals and inorganic data for the decontamination and decommissioning sampling in FY-03 (units in mg/kg).

	TAN65001			TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
Antimony	5.49	U		5.47	UN		5.7	UN		5.83	UN		5.71	UN		5.91	UN		5.44	UN	UJ	5.34	UN	UJ	5.45	UN	UJ
Arsenic	23	B		18.8	B		24.7	B		22.7	B		20.1	B		28.8	B		17.2			15.4			15.1		
Barium	218			168			234			227			169			277			264			259			246		
Beryllium	0.822	B		0.667	B		0.898	B		0.894	B		0.697	B		1.05	B		1.05		U	1.05		U	1.09		U
Cadmium	1.47	B		1.14	B		1.41	B		1.17	B		1.53	B		1.54	B		0.728		J	0.841		J	0.944		J
Chromium	36.9			26.6	B		39.1			36.3			29.6			40.9			45.2			52.7			42.6		
Cobalt	7.53	B		5.25	B		7.41	B		6.86	B		5.51	B		9.63	B		8.85			7.93			9.35		
Copper	21.6	B		16.7	B		21.9	B		32.3	B		18.1	B		28.4	B		26.2			22.6			25.9		
Lead	23.2	B		15.8	B		22.1	B		22.5	B		17.3	B		25.7	B		25.2			21.1			25.5		
Nickel	31.3	B		22.6	B		31	B		30.4	B		27.4	B		36	B		35.6		J	35.6		J	36.5		J
Selenium	5.45	U		5.42	U		5.66	U		5.78	U		5.66	U		5.86	U		5.4	U		5.3	U		5.4	U	
Silver	1.06	U		1.05	U		1.1	U		1.12	U		1.1	U		1.14	U		1.05	U		1.03	U		1.05	U	
Thallium	9.5	B		10.5	B		9.72	U		13.3	B		9.73	U		13.3	B		39.8			44.4			39.3		
Vanadium	52.6			41.2			57.3			53			42.4			61.7			66.2			66.5			63.1		
Zinc	103			76.2			101			104			94.6			118			113			108			116		
Tin	4.13	U		4.11	U		4.29	U		4.38	U		4.29	U		4.44	U		4.09	U		4.02	U		4.1	U	
Mercury	0.035	B		0.039	B		0.027	B		0.014	B		0.024	B		0.05	B		0.031		J	0.047		J	0.035		J
Cyanide	0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U	
Fluoride	2.37	U		2.42	NU		2.23	NU		2.44	NU		2.42	NU		2.35	NU		2.78			2.59			3.11		

	TAN65901			TAN73201			TAN73301			TAN73401			TAN73501			TAN73601			TAN73701			TAN73801			TAN73901		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
Antimony	5.24	U		5.25	U		5.08	U		5.64	UN		5.63	UN		5.9	UN		5.61	NU		5.27	NU		5.54	NU	
Arsenic	12.3	B		13.8	B		18.5	B		23.6	B		29.2	B		27	B		14.3	B		15.7	B		17.4	B	
Barium	143			185			262			259			223			269			237			222			219		
Beryllium	0.639	B	U	0.807	B	U	0.98	B	U	0.932	B		0.843	B		0.999	B		0.951	B		0.809	B		0.829	B	
Cadmium	0.887	B		1.18	B		1.3	B		1.58	B		1.53	B		1.65	B		0.973	B		0.602	B		0.698	B	
Chromium	29.4			35.6			45.3			39.1			33.6			42.6			41.1			37			37.7		
Cobalt	4.35	B		5.63	B		7.2	B		7.39	B		7.14	B		7.83	B		6.7	B		6.54	B		7.27	B	
Copper	12.8	B		17	B		21.4	B		23.7	B		21.2	B		24	B		19.7	B		18.1	B		19.8	B	
Lead	13.2	B		14.4	B		21.1	B		23.4	B		22.6	B		25.1	B		21.9	B		19.8	B		22.7	B	
Nickel	22.1	B		28.4	B		32.7	B		31	B		29.5	B		32.6	B		29.2	B		27.1	B		29.8	B	
Selenium	5.2	U		5.21	U		5.04	U		5.59	U		5.59	U		5.86	U		5.57	U		5.23	U		5.5	U	
Silver	2.87	B		1.01	U		0.98	U		1.09	U		1.09	U		1.14	U		1.08	U		1.02	U		1.07	U	
Thallium	8.93	U		8.96	U		8.66	U		10.9	B		9.6	U		10.1	U		9.57	U		10.6	B		9.45	U	
Vanadium	40.3			55.8			68.5			57.3			49.4			64.4			58.1			55.4			53.8		
Zinc	76.3			101			109			105			96.7			107			98			89.7			96.1		
Tin	4.95	B		3.95	U		3.82	U		4.24	U		4.24	U		4.44	U		3.76	U		3.53	U		3.71	U	
Mercury	0.012	U	UJ	0.012	U	UJ	0.016	B	J	0.038	B		0.014	B		0.024	B		0.013	U		0.012	U		0.013	U	
Cyanide	0.05			0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U		0.05	U	
Fluoride	2.34	U		2.46	U		2.38	U		2.45	NU		2.41	NU		2.35	NU		2.29	U		2.37	U		2.29	U	

Table G-2. Volatile organic compounds data for the decontamination and decommissioning sampling in FY-03 (units in µg/kg).

Table G-2. (continued).

	TAN65001			TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
Dichlorodifluoromethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Chloromethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Vinyl Chloride	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Bromomethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Chloroethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Trichlorofluoromethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Acrolein	11.6	U		12	U		11.9	U		11.4	U		10.8	U		11.7	U		11	U		10.7	U		10.9	U	
1,1-Dichloroethylene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Acetone	4.1	J		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Iodomethane	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Carbon disulfide	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Acetonitrile	29.1	U		29.9	U		29.8	U		28.5	U		27.1	U		29.2	U		27.6	U	R	26.8	U	R	27.3	U	R
Isobutyl alcohol	58.2	U		59.8	U		59.6	U		57	U		54.2	U		58.4	U		55.2	U	R	53.6	U	R	54.6	U	R
Allyl chloride	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Methylene Chloride	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Acrylonitrile	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
trans-1,2-Dichloroethylene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,1-Dichloroethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Vinyl Acetate	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
2-Chloro-1,3-butadiene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
2-Butanone	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
cis-1,2-Dichloroethylene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Methacrylonitrile	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Propionitrile	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Chloroform	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,1,1-Trichloroethane	1.2	U		0.68	J		0.98	J		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Carbon tetrachloride	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,2-Dichloroethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Benzene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Trichloroethylene	1.2	U		0.82	J		2.1			1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,2-Dichloropropane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Methylmethacrylate	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Dibromomethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Bromodichloromethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
cis-1,3-Dichloropropylene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
4-Methyl-2-pentanone	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Toluene	0.86	J		1.4			2.1			1	J		1	J		1.2			0.53	J	J	0.73	J	J	0.64	J	J
trans-1,3-Dichloropropylene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,1,2-Trichloroethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
2-Hexanone	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
Tetrachloroethylene	1.2	U		1.2	U		1	J		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Dibromochloromethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,2-Dibromoethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Chlorobenzene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,1,1,2-Tetrachloroethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	

Table G-2. (continued).

	TAN65001			TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
Ethylbenzene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Xylene (Total)	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Styrene	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
Bromoform	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,1,2,2-Tetrachloroethane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
trans-1,4-Dichloro-2-butene	5.8	U		6	U		6	U		5.7	U		5.4	U		5.8	U		5.5	U		5.4	U		5.5	U	
1,2,3-Trichloropropane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,2-Dibromo-3-chloropropane	1.2	U		1.2	U		1.2	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.1	U	
1,4-Dioxane	58.2	U		59.8	U		59.6	U		57	U		54.2	U		58.4	U		55.2	U	R	53.6	U	R	54.6	U	R

Table G-3. Volatile Organic Compounds Data for the D&D Sampling in FY-03 (units in µg/kg).

	TAN65901			TAN73201			TAN73301			TAN73401			TAN73501			TAN73601			TAN73701			TAN73801			TAN73901		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
Dichlorodifluoromethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Chloromethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Vinyl Chloride	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Bromomethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Chloroethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Trichlorofluoromethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Acrolein	10.3	U		10.4	U		10.5	U		11.2	U		11.2	U		11.7	U		11.3	U		10.9	U		11.6	U	
1,1-Dichloroethylene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Acetone	5.2	U		5.1	J	J	5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Iodomethane	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Carbon disulfide	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Acetonitrile	25.9	U		25.9	U		26.2	U		28	U		28	U		29.3	U		28.3	U		27.3	U		29	U	
Isobutyl alcohol	51.7	U	R	51.8	U	R	52.4	U	R	56	U		56	U		58.6	U		56.7	U		54.7	U		58	U	
Allyl chloride	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Methylene Chloride	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Acrylonitrile	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
trans-1,2-Dichloroethylene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,1-Dichloroethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Vinyl Acetate	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
2-Chloro-1,3-butadiene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
2-Butanone	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
cis-1,2-Dichloroethylene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Methacrylonitrile	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Propionitrile	5.2	U	R	5.2	U	R	5.2	U	R	5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Chloroform	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,1,1-Trichloroethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Carbon tetrachloride	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,2-Dichloroethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Benzene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Trichloroethylene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,2-Dichloropropane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Methylmethacrylate	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Dibromomethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Bromodichloromethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
cis-1,3-Dichloropropylene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
4-Methyl-2-pentanone	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
Toluene	0.5	J	J	1.3			0.79	J	J	1.1	J		1	J		1	J		1.1	U		1.1	U		1.2	U	
trans-1,3-Dichloropropylene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,1,2-Trichloroethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
2-Hexanone	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	

Table G-3. (continued).

	TAN65901			TAN73201			TAN73301			TAN73401			TAN73501			TAN73601			TAN73701			TAN73801			TAN73901		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
Tetrachloroethylene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Dibromochloromethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,2-Dibromoethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Chlorobenzene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,1,1,2-Tetrachloroethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Ethylbenzene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Xylene (Total)	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Styrene	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
Bromoform	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,1,2,2-Tetrachloroethane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
trans-1,4-Dichloro-2-butene	5.2	U		5.2	U		5.2	U		5.6	U		5.6	U		5.9	U		5.7	U		5.5	U		5.8	U	
1,2,3-Trichloropropane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,2-Dibromo-3-chloropropane	1	U		1	U		1	U		1.1	U		1.1	U		1.2	U		1.1	U		1.1	U		1.2	U	
1,4-Dioxane	51.7	U	R	51.8	U	R	52.4	U	R	56	U		56	U		58.6	U		56.7	U		54.7	U		58	U	

Table G-4. Semi-volatile organic compounds data for the decontamination and decommissioning sampling in FY-03 (units in µg/kg).

	TAN65001			TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
n-methyl-n-nitrosomethylamine	185	U		384	U		381	U		368	U		377	U		391	U		182	U		181	U		179	U	
Pyridine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Aniline	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Phenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
bis-(2-Chloroethyl)ether	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Chlorophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
1,3-Dichlorobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
1,4-Dichlorobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Benzyl alcohol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
1,2-Dichlorobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
bis(2-Chloroisopropyl)ether	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
o-Cresol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Acetophenone	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
n-Nitrosodi-n-propylamine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
m,p-Cresols	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Hexachloroethane	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Nitrobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Isophorone	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Nitrophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,4-Dimethylphenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
bis-(2-chloroethoxy)methane	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,4-Dichlorophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
1,2,4-Trichlorobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Naphthalene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
4-Chloroaniline	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Hexachlorobutadiene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
4-Chloro-3-methylphenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Methylnaphthalene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Hexachlorocyclopentadiene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,4,6-Trichlorophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,4,5-Trichlorophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Chloronaphthalene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
o-Nitroaniline	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
m-Nitroaniline	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Dimethyl phthalate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,6-Dinitrotoluene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Acenaphthylene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Acenaphthene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
2,4-Dinitrophenol	739	U		767	U		763	U		736	U		754	U		783	U		726	U		724	U		715	U	
Dibenzofuran	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,4-Dinitrotoluene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Diethyl Phthalate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
4-Nitrophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Fluorene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	

Table G-4. (continued).

	TAN65001			TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
4-Chlorophenyl phenyl ether	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Methyl-4,6-dinitrophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
p-Nitroaniline	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Diphenylamine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
4-Bromophenyl phenyl ether	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Hexachlorobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Pentachlorophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Phenanthrene	37	U		29.7	J		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Anthracene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Di-n-butyl phthalate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Fluoranthene	37	U		20.8	J		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Pyrene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Butyl benzyl phthalate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Benzo(a)anthracene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
3,3'-Dichlorobenzidine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Chrysene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
bis-(2-ethylhexyl)phthalate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Di-n-octyl phthalate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Benzo(b)fluoranthene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Benzo(k)fluoranthene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Benzo(a)pyrene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Indeno(1,2,3-cd)pyrene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Dibenzo(a,h)anthracene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Benzo(g,h,i)perylene	37	U		38.4	U		38.1	U		36.8	U		37.7	U		39.1	U		36.3	U		36.2	U		35.7	U	
Methylmethacrylate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Ethyl methacrylate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Picoline	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
n-Nitrosomethylethylamine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Methyl methanesulfonate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
n-Nitrosodiethylamine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Ethyl methanesulfonate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Pentachloroethane	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
n-Nitrosopyrrolidine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
n-Nitrosomorpholine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
o-Toluidine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
n-Nitrosopiperidine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
a,a,-Dimethylphenethylamine	739	U		767	U		763	U		736	U		754	U		783	U		726	U		724	U		715	U	
Triethylphosphorothioate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,6-Dichlorophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Hexachloropropene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
p-Phenylenediamine	739	U		767	U		763	U		736	U		754	U		783	U		726	U		724	U		715	U	
n-Nitroso-di-n-butylamine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Safrole	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
1,2,4,5-Tetrachlorobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Isosafrole	370	U		384	U		381	U		368	U		377	U		391	U		363	U	R	362	U	R	357	U	R

Table G-4. (continued).

	TAN65001			TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
1,4-Naphthoquinone	370	U		384	U		381	U		368	U		377	U		391	U		363	U	R	362	U	R	357	U	R
m-Dinitrobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Pentachlorobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
1-Naphthylamine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Naphthylamine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2,3,4,6-Tetrachlorophenol	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
5-Nitro-o-toluidine	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Thionazin	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
1,3,5-Trinitrobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Phenacetin	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
4-Aminobiphenyl	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Pentachloronitrobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Pronamide	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Dinoseb	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
4-Nitroquinoline 1-oxide	370	U		384	U		381	U		368	U		377	U		391	U		363	U	R	362	U	R	357	U	R
Methapyrilene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Aramite	370	U		384	U		381	U		368	U		377	U		391	U		363	U	R	362	U	R	357	U	R
p-Dimethylaminoazobenzene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Chlorobenzilate	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
3,3'-Dimethylbenzidine	1850	U		1920	U		1910	U		1840	U		1890	U		1960	U		1820	U		1810	U		1790	U	
Famphur	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
2-Acetylaminofluorene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
7,12-Dimethylbenz(a)anthracene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
3-Methylcholanthrene	370	U		384	U		381	U		368	U		377	U		391	U		363	U		362	U		357	U	
Hexachlorophene	18500	U		19200	U		19100	U		18400	U		18900	U		19600	U		18200	U	R	18100	U	R	17900	U	R

Table G-5. Semi-volatile organic compounds data for the decontamination and decommissioning sampling in FY-03 (units in µg/kg).

	TAN65901			TAN73201			TAN73301			TAN73401			TAN73501			TAN73601			TAN73701			TAN73801			TAN73901		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
n-methyl-n-nitrosomethylamine	171	U		172	U		174	U		365	U		371	U		387	U		180	U		177	U		186	U	
Pyridine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Aniline	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Phenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
bis-(2-Chloroethyl)ether	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Chlorophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
1,3-Dichlorobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
1,4-Dichlorobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Benzyl alcohol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
1,2-Dichlorobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
bis(2-Chloroisopropyl)ether	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
o-Cresol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Acetophenone	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
n-Nitrosodi-n-propylamine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
m,p-Cresols	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Hexachloroethane	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Nitrobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Isophorone	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Nitrophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,4-Dimethylphenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
bis-(2-chloroethoxy)methane	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,4-Dichlorophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
1,2,4-Trichlorobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Naphthalene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
4-Chloroaniline	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Hexachlorobutadiene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
4-Chloro-3-methylphenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Methylnaphthalene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Hexachlorocyclopentadiene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,4,6-Trichlorophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,4,5-Trichlorophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Chloronaphthalene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
o-Nitroaniline	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
m-Nitroaniline	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Dimethyl phthalate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,6-Dinitrotoluene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Acenaphthylene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Acenaphthene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
2,4-Dinitrophenol	684	U		686	U		694	U		730	U		741	U		774	U		720	U		709	U		745	U	
Dibenzofuran	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,4-Dinitrotoluene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Diethyl Phthalate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		114	J		373	U	
4-Nitrophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Fluorene	5.5	J	J	34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	

Table G-5. (continued)

	TAN65901			TAN73201			TAN73301			TAN73401			TAN73501			TAN73601			TAN73701			TAN73801			TAN73901		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
4-Chlorophenyl phenyl ether	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Methyl-4,6-dinitrophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
p-Nitroaniline	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Diphenylamine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
4-Bromophenyl phenyl ether	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Hexachlorobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Pentachlorophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Phenanthrene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Anthracene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Di-n-butyl phthalate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Fluoranthene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Pyrene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Butyl benzyl phthalate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Benzo(a)anthracene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
3,3'-Dichlorobenzidine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Chrysene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
bis-(2-ethylhexyl)phthalate	342		U	343		U	347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Di-n-octyl phthalate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Benzo(b)fluoranthene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Benzo(k)fluoranthene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Benzo(a)pyrene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Indeno(1,2,3-cd)pyrene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Dibenzo(a,h)anthracene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Benzo(g,h,i)perylene	34.2	U		34.3	U		34.7	U		36.5	U		37.1	U		38.7	U		36	U		35.5	U		37.3	U	
Methylmethacrylate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Ethyl methacrylate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Picoline	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
n-Nitrosomethylethylamine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Methyl methanesulfonate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
n-Nitrosodiethylamine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Ethyl methanesulfonate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Pentachloroethane	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
n-Nitrosopyrrolidine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
n-Nitrosomorpholine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
o-Toluidine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
n-Nitrosopiperidine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
a,a,-Dimethylphenethylamine	684	U		686	U		694	U		730	U		741	U		774	U		720	U		709	U		745	U	
Triethylphosphorothioate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,6-Dichlorophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Hexachloropropene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
p-Phenylenediamine	684	U		686	U		694	U		730	U		741	U		774	U		720	U		709	U		745	U	
n-Nitroso-di-n-butylamine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Safrole	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
1,2,4,5-Tetrachlorobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Isosafrole	342	U	R	343	U	R	347	U	R	365	U		371	U		387	U		360	U		355	U		373	U	

Table G-5. (continued)

	TAN65901			TAN73201			TAN73301			TAN73401			TAN73501			TAN73601			TAN73701			TAN73801			TAN73901		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V
1,4-Naphthoquinone	342	U	R	343	U	R	347	U	R	365	U		371	U		387	U		360	U		355	U		373	U	
m-Dinitrobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Pentachlorobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
1-Naphthylamine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Naphthylamine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2,3,4,6-Tetrachlorophenol	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
5-Nitro-o-toluidine	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Thionazin	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
1,3,5-Trinitrobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Phenacetin	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
4-Aminobiphenyl	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Pentachloronitrobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Pronamide	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Dinoseb	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
4-Nitroquinoline 1-oxide	342	U	R	343	U	R	347	U	R	365	U		371	U		387	U		360	U		355	U		373	U	
Methapyrilene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Aramite	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
p-Dimethylaminoazobenzene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Chlorobenzilate	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
3,3'-Dimethylbenzidine	1710	U		1720	U		1740	U		1820	U		1850	U		1930	U		1800	U		1770	U		1860	U	
Famphur	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
2-Acetylaminofluorene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
7,12-Dimethylbenz(a)anthracene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
3-Methylcholanthrene	342	U		343	U		347	U		365	U		371	U		387	U		360	U		355	U		373	U	
Hexachlorophene	17100	U	R	17200	U	R	17400	U	R	18200	U		18500	U		19300	U		18000	U		17700	U		18600	U	

Table G-6. Polychlorinated biphenyls data for the decontamination and decommissioning sampling in FY-03 (units in µg/kg).

	TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801			TAN65901			TAN73201			TAN73301			TAN73401			TAN73501		
Constituent	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V	Value	L	V												
Aroclor-1016	19	U		19.9	U		3.8	U		3.8	U		3.8	U		3.6	U		3.6	U		3.6	U		3.4	U		3.4	U		3.5	U		3.6	U		3.6	U	
Aroclor-1221	19	U		19.9	U		3.8	U		3.8	U		3.8	U		3.6	U		3.6	U		3.6	U		3.4	U		3.4	U		3.5	U		3.6	U		3.6	U	
Aroclor-1232	19	U		19.9	U		3.8	U		3.8	U		3.8	U		3.6	U		3.6	U		3.6	U		3.4	U		3.4	U		3.5	U		3.6	U		3.6	U	
Aroclor-1242	19	U		19.9	U		3.8	U		3.8	U		3.8	U		3.6	U		3.6	U		3.6	U		3.4	U		3.4	U		3.5	U		3.6	U		3.6	U	
Aroclor-1248	19	U		19.9	U		3.8	U		3.8	U		3.8	U		3.6	U		3.6	U		3.6	U		3.4	U		3.4	U		3.5	U		3.6	U		3.6	U	
Aroclor-1254	75.1			64.2			6.7			6.5			3.8	U		5			2.3	J	J	3.6			16.3			3.7			16.3			6.6			6.1		
Aroclor-1260	147			177			38.4			6.6			1.5	J		4.4			4.3			5.1			3.1	J	J	1.8	J	J	3.3	J	J	13.2			3.1	J	

Table G-7. Radioactive isotope data for the decontamination and decommissioning sampling in FY-03 (units in pCi/g).

	TAN65001			TAN65101			TAN65102			TAN65201			TAN65301			TAN65401			TAN65601			TAN65701			TAN65801		
Constituent	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V
Gross Alpha	2.20E+01	4.18E+00		2.42E+01	2.11E+00		1.81E+01	1.95E+00		1.08E+01	1.25E+00		1.53E+01	1.52E+00		1.61E+01	1.58E+00		1.60E+01	1.76E+00	J	1.61E+01	2.75E+00	J	1.58E+01	2.26E+00	J
Gross Beta	1.47E+02	5.51E+00		3.88E+02	9.26E+00		4.27E+02	1.32E+01		3.26E+01	1.64E+00		2.99E+02	5.90E+00		2.42E+01	1.46E+00		2.92E+02	7.92E+00	J	1.50E+02	8.38E+00	J	2.27E+02	1.21E+01	J
Strontium-90	1.69E+01	2.10E+00		8.54E+01	1.04E+01		4.90E+01	5.57E+00		2.24E+00	3.40E-01		1.24E+01	1.50E+00		9.42E-02	1.39E-01		3.60E+01	4.31E+00		3.40E+01	4.03E+00		1.92E+01	2.28E+00	
Silver-108m	-2.36E-02	3.39E-02		1.59E-02	3.64E-02		-8.31E-03	3.74E-02		4.37E-03	1.29E-02		4.02E-02	6.49E-02		1.65E-02	9.53E-03		1.00E-05	7.56E-02	U	1.50E-01	6.68E-02	UJ	-5.32E-02	3.40E-02	U
Silver-110m	2.19E+00	9.98E-02		5.62E-01	3.38E-02		4.29E+00	1.88E-01		6.99E-03	1.17E-02		2.48E-01	4.25E-02		-1.49E-02	1.06E-02		2.12E+00	1.41E-01	UJ	1.06E+00	9.17E-02	UJ	1.29E+01	6.79E-01	UJ
Americium-241	-2.13E-02	1.61E-01		1.16E-02	1.02E-01		-3.43E-01	1.46E-01		-3.08E-02	5.10E-02		-1.08E-01	2.23E-01		-1.77E-03	4.45E-02		6.52E-02	8.75E-02	U	9.75E-02	7.92E-02	U	-2.37E-01	1.32E-01	U
Cerium-144	-9.85E-02	1.30E-01		-2.05E-01	1.32E-01		3.05E-01	1.49E-01		-6.65E-02	5.59E-02		5.34E-01	2.47E-01		-4.87E-02	5.52E-02		-5.72E-01	2.73E-01	U	6.97E-02	2.39E-01	U	-1.39E-01	1.35E-01	U
Cobalt-58	-7.43E-03	1.25E-02		4.95E-03	1.14E-02		-1.15E-03	1.55E-02		1.03E-03	9.08E-03		-2.22E-03	1.03E-02		3.75E-03	1.04E-02		-1.16E-02	1.70E-02	U	-1.13E-02	1.77E-02	U	-3.83E-03	9.05E-03	U
Cobalt-60	3.64E+00	1.39E-01		1.03E+00	4.08E-02		6.72E+00	2.47E-01		-2.34E-03	1.08E-02		2.65E-02	1.10E-02		-2.33E-03	1.07E-02		4.29E-01	4.05E-02	J	2.50E-01	3.62E-02	J	1.34E-01	1.88E-02	J
Cesium-134	4.82E-02	1.80E-02		5.79E-02	2.03E-02		3.09E-02	2.15E-02		3.73E-02	2.99E-02		5.35E-02	1.81E-02		8.12E-02	1.68E-02		7.12E-02	3.17E-02	UJ	3.95E-02	1.83E-02	UJ	7.57E-02	1.78E-02	UJ
Cesium-137	8.11E+01	3.34E+00		6.96E+01	2.25E-01		9.50E+01	3.91E+00		4.15E+00	1.53E-01		1.99E+02	3.83E-01		9.60E-02	2.09E-02		2.44E+02	1.32E+01	J	1.19E+02	6.45E+00	J	9.56E+01	4.92E+00	J
Europium-152	-1.16E-01	8.00E-02		1.82E-01	8.97E-02		4.70E-02	1.01E-01		2.62E-02	3.35E-02		2.06E-01	1.48E-01		2.34E-03	2.73E-02		2.54E-01	1.71E-01	U	4.61E-02	1.49E-01	U	-7.68E-02	8.01E-02	U
Europium-154	-2.18E-02	3.09E-02		1.32E-01	5.10E-02		-1.57E-02	3.38E-02		-2.29E-02	2.81E-02		2.34E-02	3.32E-02		-1.86E-02	3.30E-02		-2.72E-03	3.83E-02	U	-6.41E-02	4.67E-02	U	-7.31E-04	2.44E-02	U
Europium-155	4.34E-02	7.16E-02		1.16E-01	6.62E-02		1.22E-01	8.16E-02		2.55E-02	2.83E-02		5.32E-02	1.01E-01		1.42E-02	2.86E-02		3.19E-01	1.26E-01	UJ	6.70E-02	1.11E-01	U	1.62E-01	6.87E-02	UJ
Manganese-54	2.11E-02	1.55E-02		3.45E-02	1.66E-02		3.24E-03	1.51E-02		2.96E-02	1.53E-02		7.17E-03	9.70E-03		1.12E-02	1.10E-02		-1.13E-02	1.41E-02	U	-1.73E-02	1.65E-02	U	2.67E-03	7.98E-03	U
Niobium-95	4.10E-02	1.67E-02		2.57E-02	1.47E-02		4.28E-02	1.89E-02		5.74E-03	1.27E-02		3.46E-03	1.77E-02		1.47E-03	1.97E-02		4.58E-03	2.14E-02	U	5.34E-02	3.35E-02	U	1.36E-02	2.11E-02	U
Radium-226	1.07E+00	7.71E-02		8.19E-01	8.25E-02		8.29E-01	8.55E-02		5.73E-01	5.72E-02		9.55E-01	1.15E-01		1.12E+00	8.41E-02		1.09E+00	1.49E-01	J	1.15E+00	1.61E-01	J	1.14E+00	1.04E-01	J
Ruthenium-103	-3.39E-02	3.22E-02		1.63E-02	3.49E-02		-3.66E-02	3.44E-02		-1.21E-04	1.20E-02		-5.01E-02	5.75E-02		-4.36E-03	9.92E-03		3.19E-02	8.52E-02	U	-1.05E-01	7.85E-02	U	-3.87E-03	3.58E-02	U
Ruthenium-106	1.93E-01	1.82E-01		9.93E-02	2.04E-01		1.99E-02	2.06E-01		2.00E-02	8.99E-02		-8.99E-02	3.14E-01		9.13E-03	8.35E-02		-2.18E-01	4.55E-01	U	5.26E-01	4.02E-01	U	2.21E-01	1.77E-01	U
Antimony-125	1.16E-01	9.22E-02		1.39E-02	9.79E-02		-1.00E-01	1.02E-01		4.61E-02	3.48E-02		-2.15E-01	1.77E-01		1.13E-02	2.58E-02		-1.19E-01	2.07E-01	U	-1.65E-01	1.83E-01	U	9.48E-02	9.30E-02	U
Uranium-235	1.62E-01	1.32E-01		5.67E-02	1.34E-01		1.98E-01	1.51E-01		8.20E-02	6.06E-02		2.20E-01	2.08E-01		1.50E-02	5.81E-02		1.46E-01	2.70E-01	U	-3.27E-01	2.37E-01	U	-5.76E-02	1.34E-01	U
Zinc-65	7.07E-03	3.36E-02		-2.02E-02	4.26E-02		-9.01E-02	4.11E-02		-1.12E-02	2.54E-02		2.30E-04	3.41E-02		4.61E-02	2.76E-02		1.46E-02	3.45E-02	U	-1.39E-01	5.07E-02	U	4.85E-02	2.27E-02	UJ
Zirconium-95	3.12E-02	2.16E-02		2.99E-02	2.00E-02		3.20E-02	2.60E-02		1.29E-02	1.67E-02		9.37E-03	1.73E-02		1.86E-02	1.93E-02		2.82E-02	3.06E-02	U	-3.14E-02	3.25E-02	U	7.84E-04	1.63E-02	U

Table G-8. Radioactive isotope data for the decontamination and decommissioning sampling in FY-03 (units in pCi/g).

	TAN65901			TAN73201			TAN73301			TAN73401			TAN73501			TAN73601			TAN73701			TAN73801			TAN73901		
Constituent	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V	Value	Error	V
Gross Alpha	1.41E+01	1.56E+00	J	1.27E+01	2.20E+00	J	1.62E+01	1.73E+00	J	5.30E+01	4.27E+00		3.61E+01	2.65E+00		1.49E+01	1.51E+00		6.95E+01	9.77E+00		1.71E+01	2.50E+00		2.04E+01	2.44E+00	
Gross Beta	2.65E+01	1.73E+00	J	2.19E+01	1.86E+00	J	2.60E+01	1.71E+00	J	5.89E+03	1.00E+02		8.15E+02	1.30E+01		1.01E+03	1.58E+01		2.67E+03	3.14E+01		7.09E+02	9.07E+00		8.43E+01	2.35E+00	
Strontium-90	1.05E-01	8.72E-02	UJ	3.61E-01	2.45E-01	UJ	3.63E-02	5.58E-02	UJ	4.95E+02	6.03E+01		7.10E+01	8.50E+00		2.31E+02	2.76E+01		3.31E+02	4.02E+01		5.28E+01	5.93E+00		7.50E+00	8.88E-01	
Silver-108m	-1.58E-03	6.37E-03	U	-3.62E-03	7.61E-03	U	9.07E-04	6.75E-03	U	2.99E-01	2.49E-01		1.52E-01	1.40E-01		9.07E-02	6.35E-02		2.31E-01	1.83E-01		1.27E-01	8.86E-02		4.04E-02	2.82E-02	
Silver-110m	8.27E-02	9.45E-03	UJ	-4.06E-04	8.79E-03	U	3.88E-02	8.14E-03	UJ	2.57E+01	1.50E+00		7.47E+00	3.89E-01		1.10E+01	5.77E-01		1.45E+01	6.79E-01		2.87E+00	1.25E-01		8.50E-02	2.16E-02	
Americium-241	4.89E-02	5.37E-02	U	-2.78E-02	3.68E-02	U	-8.73E-03	2.89E-02	U	-1.39E-01	6.73E-01		8.97E-02	2.82E-01		-2.25E-01	1.32E-01		1.65E-02	1.19E-01		-3.35E-01	4.36E-01		9.32E-03	2.20E-02	
Cerium-144	-2.07E-02	4.08E-02	U	8.68E-03	5.01E-02	U	1.27E-02	4.57E-02	U	1.23E+00	9.85E-01		-6.81E-01	4.47E-01		8.88E-02	2.45E-01		-7.08E-03	5.44E-01		3.32E-01	3.32E-01		-7.40E-02	9.30E-02	
Cobalt-58	-8.48E-03	6.79E-03	U	-8.49E-03	8.82E-03	U	-4.08E-03	6.94E-03	U	-6.00E-02	5.85E-02		2.39E-02	1.76E-02		-1.72E-02	8.19E-03		2.28E-02	3.53E-02		-5.63E-03	1.13E-02		-6.09E-03	1.15E-02	
Cobalt-60	4.88E-03	1.35E-02	U	6.24E-03	9.12E-03	U	6.03E-03	7.59E-03	U	8.50E-01	5.10E-02		8.53E-02	2.38E-02		1.14E-01	2.15E-02		7.77E-01	5.48E-02		9.74E-02	2.46E-02		3.14E-02	1.19E-02	
Cesium-134	4.39E-02	9.88E-03	UJ	2.49E-02	9.64E-03	UJ	5.33E-02	1.21E-02	UJ	1.64E-01	6.32E-02		3.53E-02	1.75E-02		3.51E-02	2.02E-02		-4.24E-03	3.38E-02		4.29E-02	2.21E-02		2.00E-02	1.22E-02	
Cesium-137	1.01E+00	5.65E-02		7.68E-01	3.60E-02		1.14E+00	6.69E-02		4.19E+03	2.38E+02		7.26E+02	3.53E+01		3.69E+02	1.90E+01		1.77E+03	7.91E+01		4.48E+02	1.42E+01		3.45E+01	1.45E+00	
Europium-152	9.42E-03	1.85E-02	U	-1.04E-02	2.30E-02	U	-1.66E-02	2.04E-02	U	5.90E-01	5.61E-01		-1.05E-01	2.89E-01		-9.90E-02	1.46E-01		3.56E-01	4.25E-01		-3.94E-01	2.22E-01		-6.84E-02	6.26E-02	
Europium-154	-2.81E-02	2.00E-02	U	3.85E-02	2.37E-02	U	4.23E-03	2.10E-02	U	-6.44E-02	9.12E-02		1.96E-03	3.70E-02		-1.83E-02	2.89E-02		3.12E-01	1.16E-01		7.65E-02	3.30E-02		-2.11E-03	3.32E-02	
Europium-155	-2.35E-02	2.23E-02	U	7.82E-02	2.30E-02	J	5.02E-02	2.94E-02	U	-1.27E-01	4.89E-01		2.08E-01	2.15E-01		-3.31E-03	1.22E-01		-3.42E-01	2.30E-01		3.11E-01	1.64E-01		5.73E-02	6.25E-02	
Manganese-54	1.19E-02	7.31E-03	U	-9.21E-03	8.87E-03	U	4.81E-03	7.23E-03	U	1.13E-01	6.08E-02		-1.09E-02	1.52E-02		-1.49E-02	8.97E-03		2.62E-02	3.07E-02		-1.06E-02	1.04E-02		1.68E-02	1.15E-02	
Niobium-95	2.22E-02	1.39E-02	U	1.03E-02	1.16E-02	U	3.48E-02	1.01E-02	UJ	4.28E-02	6.79E-02		4.71E-02	2.06E-02		3.07E-02	1.14E-02		3.82E-02	5.09E-02		2.29E-03	2.83E-02		3.02E-02	3.01E-02	
Radium-226	6.50E-01	4.83E-02	J	8.61E-01	5.59E-02	J	8.61E-01	6.10E-02	J	1.13E+00	3.45E-01		1.14E+00	2.00E-01		8.49E-01	1.07E-01		1.20E+00	2.59E-01		7.32E-01	1.42E-01		8.65E-01	7.76E-02	
Ruthenium-103	1.57E-03	6.81E-03	U	-2.58E-02	8.54E-03	U	-6.40E-03	7.75E-03	U	-5.04E-01	2.43E-01		1.33E-01	1.20E-01		1.05E-01	6.15E-02		-1.74E-01	2.13E-01		-1.43E-01	1.04E-01		1.12E-02	3.32E-02	
Ruthenium-106	-5.32E-02	4.95E-02	U	1.25E-01	6.21E-02	UJ	-1.14E-02	5.92E-02	U	-1.94E+00	1.33E+00		2.21E-02	6.34E-01		2.28E-02	3.20E-01		1.16E+00	8.83E-01		9.21E-01	4.61E-01		3.23E-02	1.54E-01	
Antimony-125	3.70E-03	1.85E-02	U	-1.81E-02	2.11E-02	U	7.66E-03	1.98E-02	U	1.07E+00	6.81E-01		5.72E-01	4.29E-01		1.91E-01	1.74E-01		-1.06E-01	5.01E-01		2.10E-01	2.44E-01		-5.09E-02	7.56E-02	
Uranium-235	4.49E-02	4.36E-02	U	4.74E-02	4.74E-02	U	8.91E-02	5.92E-02	U	1.87E+00	9.97E-01		4.40E-02	4.53E-01		-2.08E-01	2.50E-01		-3.76E-02	5.52E-01		-1.56E-01	3.27E-01		2.31E-01	1.30E-01	
Zinc-65	2.17E-02	1.60E-02	U	-2.44E-03	2.12E-02	U	-1.67E-02	1.87E-02	U	-4.94E-02	8.90E-02		-4.37E-03	3.13E-02		9.86E-03	2.04E-02		1.06E-01	6.43E-02		1.05E-02	2.10E-02		-3.38E-02	3.08E-02	
Zirconium-95	-1.55E-02	1.11E-02	U	6.23E-03	1.49E-02	U	2.33E-02	1.94E-02	U	4.05E-03	1.09E-01		-6.53E-02	2.77E-02		3.94E-02	2.07E-02		5.73E-02	6.63E-02		5.30E-02	2.28E-02		2.73E-02	2.27E-02	

The majority of the data has undergone validation. The validation reports will be presented in a data called for the D&D project when all validation is complete.

Appendix H

Risk-Based Soil Screening

Appendix H

Risk-Based Soil Screening

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
D&D	decontamination and decommissioning
EBSL	ecologically based screening levels
ECO	ecological
EPA	U.S. Environmental Protection Agency
ERA	early remedial action
ESS	ecological soil screening
FRG	final remediation goal
FY	fiscal year
HHRA	Human Health Risk Assessment
HQ	hazard quotient
INEEL	Idaho National Engineering and Environmental Laboratory
L&V	limitation and validation
OSWER	Office of Solid Waste and Emergency Response
PRG	preliminary remediation goal
RA	risk assessment (sample)
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SLHQ	screening level hazard quotient
SSL	soil screening levels

TSF	Technical Support Facility
UCL	upper confidence limit
USC	United States Code
UTL	upper tolerance limit
WAG	waste area group
WM	waste management (sample)

Risk-Based Soil Screening

H-1. INTRODUCTION

The *Final Record of Decision for Test Area North, Operable Unit 1-10* (DOE-ID 1999) presented the selected remedial actions to be carried out for contaminated soils at Waste Area Group (WAG) 1. These were based on the analysis documented in the *Comprehensive Remedial Investigation/Feasibility Study for Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory* (DOE-ID 1997) that determined Cs-137 was the primary risk driver. In the Record of Decision (ROD) (DOE-ID 1999) (hereinafter referred to as the OU 1-10 ROD), a final remediation goal (FRG) of 23.3 pCi/g was developed based on 1E-04 risk to a hypothetical future resident at the site due to exposure solely from Cs-137. Any soil containing Cs-137 at 23.3 pCi/g or greater will be remediated at those sites identified in the ROD. This will remove any other contaminants that are present in this soil. However, it is important to ensure that other detected contaminants do not also require cleanup to protect human and ecological receptors.

This assessment will perform a screening level risk assessment using the approach documented in the *Risk-Based Screening and Assessment Approach for Waste Area Group 1 Soils* (VanHorn and Stacey 2004) to evaluate those soil samples where the Cs-137 concentration is below the FRG. If no other contaminants are of concern, then Cs-137 can become our "signature" contaminant and serve to formulate contamination and dig maps for the area of contamination and as closure verification from surface gamma measurements.

The data presented in Section 7 will be evaluated. First the data from the V-Tank soil sampling performed in FY-03 will be assessed (see Section 7.3 and Appendix F). Second the historical data from TSF-09/18 and TSF-21, along with FY-03 decontamination and decommissioning (D&D) sampling, will be evaluated (see Section 7.1 and Appendix D, Section 7.2 and Appendix E, and Section 7.4 and Appendix G respectively).

H-2. RISK-BASED SCREENING APPROACH

The screening approach is documented in the *Risk-Based Screening and Assessment Approach for Waste Area Group 1 Soils* (VanHorn and Stacey 2004). The process screens against accepted risk-based concentrations (RBCs) to allow a reduction in effort while ensuring that remediation of soils at these sites is compliant with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.) and the Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.).

The initial contaminant screening process for human health includes four steps:

1. Background comparison

2. Essential nutrient identification

3. Comparison against the RBCs (1E-06 and hazard quotient [HQ]=0.1)

4. Elimination of contaminants based on other rationale.

The ecological screening includes five steps:

1. Background comparison

2. Essential nutrient identification

3. Comparison against ecologically-based screening levels and U.S. Environmental Protection Agency (EPA) Region 4 ecological soil screening levels (SSLs)

4. Elimination of contaminants based on other rationale

5. Development of screening level quotients and total screening level quotients.

The exposure-based screening process:

1. Calculate 95% UCL based on scenario depth

2. Exposure scenario screen (occupational and future residential scenarios [1E-06 and HQ = 0.1])

3. Exposure scenario screen (occupational and future residential scenarios [1E-05 and HQ = 0.1/1.0]).

Table H-1 shows the depth and exposure routes for the scenarios included in the assessment. Human health (both future residential and occupational scenarios) RBCs for nonradionuclides were obtained from the most conservative values provided by EPA *Region 9 Preliminary Remediation Goals* (EPA 2003a). Additional data were also used for chemicals that did not have a Region 9 value (EPA 2003b, OSWER 1994). Radionuclide RBCs were provided for screening radionuclides in a memorandum.[a] The RBCs and a detailed explanation of the screening approach is presented in *Risk-Based Screening and Assessment Approach for Waste Area Group 1 Soils* (VanHorn and Stacey 2004).

Table H-1. Exposure routes from soil contamination.

Depth	Exposure Route(s)
0–0.2 m (0–0.5 ft)	HHRA occupational scenario: soil ingestion, inhalation of fugitive dust, inhalation of volatiles
0–1.2 m (0–4 ft)	HHRA occupational scenario: external radiation exposure
0–3 m (0–10 ft)	HHRA residential scenario: all soil pathway and air pathway exposure routes; ecological risk assessment
All sample results included regardless of depth.	HHRA residential scenario: all groundwater pathway exposure routes.

HHRA = Human Health Risk Assessment

Step 3 of the human health screening process is to compare potential contaminants with the human health risk-based concentration (RBC), also called a preliminary remediation goal (PRG). Risk-based concentrations are chemical concentrations in soil, air, and water that correspond to fixed levels of risk (generally either a one-in-one million [10^{-6}] cancer risk or a noncarcinogenic hazard quotient [HQ] of 1). These values are presented in Attachment H-1 to this Appendix. Risk-based concentrations that equate to

a. Fromm, J., Idaho Department of Health and Welfare, to Waste Area Groups Manager and Technical Support Staff, INEEL, "Radionuclide Risk-Based Concentration Tables," 1996.

a probabilistic cancer risk (such as one in one million) are indicated by "ca," while RBCs that equate to a hazard quotient for noncarcinogenic concerns are indicated by "nc." Most radionuclides are assessed based on carcinogenic risk; however, care must be taken (as in the case of uranium) to ensure that no other health effects may be possible.

With multiple contaminants of potential concern (COPCs) it is important to ensure that the sum of the HQs does not exceed 1. *EPA Region 3 Risk-Based Concentrations (RBCs) Table* (EPA 2003b) recommends using one-tenth of the RBC as the basis for individual contaminant screening. Therefore, the HQs in this screening step are set to 0.1, thereby ensuring that contaminants with additive effects are not prematurely eliminated during screening. However, it is considered acceptable in the contaminant screening process to use the RBC for cancerous contaminants without modification. This is due to the fact that remedial decisions at the INEEL generally are based on the carcinogenic future residential risk level of 1E-04 or a noncarcinogenic hazard quotient of 1. (There is no range of "acceptable" noncarcinogenic "risk," so that under no circumstances should noncancer RBCs be multiplied by 10 or 100 when setting a cleanup value). In other words, if a site's estimated future residential risk exceeds a value of 1E-04, the site typically is considered for remedial action. The 1E-04 risk level is two orders of magnitude greater than the 1E-06 risk level that was used to calculate the RBCs, so the 1E-06 RBCs are adequately protective.

All sample results, regardless of depth, are used in the human health future residential scenario to evaluate the groundwater pathway exposure routes. The soil located greater than 3 m (10 ft) below the ground is not considered to be an issue for ecological receptors since at this site there is no pathway. It is also necessary to evaluate possible risks to the groundwater pathway for the future (100-year) residential exposure scenario. Although the EPA Region 9 (EPA 2003a) RBCs for nonradionuclides are not developed specifically to be protective of groundwater, they are accepted at the INEEL as being conservative enough for screening (VanHorn and Stacey 2004). The memorandum from Jeff Fromm (see footnote a) does not include radionuclide RBCs for the groundwater migration pathway. However, based on Track 2 guidance given the depth to groundwater and the low infiltration rate at the INEEL, radionuclides with a half-life of less than 100 years would generally pose a significant risk from exposure pathways before potential groundwater contamination would be the exposure route that would drive cleanup efforts. For longer-lived radionuclides, the EPA SSLs will be used. The SSLs are back-calculated from acceptable groundwater concentrations (i.e., maximum contaminant goal levels, maximum contaminant levels, or risk-based preliminary remediation goals). The SSLs are considered fairly conservative for the INEEL since the methodologies for developing SSLs are based on conservative, simplifying assumptions about the release and transport of contaminants to the subsurface. Any SSL derived from equations will combine exposure information assumptions with EPA radiotoxicity data. The methodology is outlined in the *Soil Screening Guidance for Radionuclides:User Guide* (EPA 1996).

H-2.1 Evaluation of the V-Tank Fiscal Year 2003 Data

The FY-03 soil samples for the V-Tanks were divided into a *waste management* sample (shallow sample) and a *risk assessment* sample (deeper sample). The purpose was to directly compare depth of sample with risk for areas that were assumed to require excavation. This was to allow the project to validate the assumption that the excavation maps could be directly tied to the Cs-137 concentration.

The sample numbers, sample depths and associated contaminant concentrations are presented in Table F-1 and Appendix F. One sample location was at DS-02 (at Valve Pit #2) and the other sample was at SS-01 (southwest of Tank V-9). As is seen, both samples with the designation of "WM" (for waste management sample) have Cs-137 levels above the FRG. They will be remediated and were not assessed further.

The other two samples with the "RA" designation (for risk assessment sample) indicate samples where the Cs-137 level is lower than 23.3 pCi/g FRG. Tables H-2 through H-3 present the assessment of these two samples for radionuclides. Tables H-4 to H-5 present the assessment of these two samples for nonradionuclides. As is seen in Table H-2a and H-2b, sample number 1RA751 is eliminated as an ecological risk in the first screening and as a human health risk in the second. Although sample 1RA751 was taken from the 12 to 16 ft range, which is outside of the depths of the ecological assessment, it was evaluated.

Tables H-3a through H-3c present the screening of sample number 1RA750. All ecological concerns are eliminated in the first screen. As is shown in Tables H-3b and H-3c, Co-60 appears to remain a concern to the current worker at the 1E-06 risk. However, the concentration of concern (1.43 pCi/g) is below the 1E-04 risk level (7.2 pCi/g). The Co-60 concentration of concern is at depth and of limited extent, and therefore Co-60 is not considered a concern at this location. Institutional controls are already required in this area to ensure protection from Cs-137 concentrations in the general area based on the future residential scenario. Due to Co-60's short half-life (approximately 5 years) it will have decayed to acceptable levels during this timeframe.

As is shown in Tables H-4 and H-5, the nonradionuclides are not a concern at these locations. Sample number 1RA751 was taken at depth and although some contaminants exceed the initial screening, they are not a concern to ecological receptors since there is no pathway. However, rationale for the elimination of arsenic for sample 1RA750 (as shown by table footnotes) will be discussed later in this appendix.

H-2.2 Evaluation of the Selected Data

The soil data from TSF-09/18, TSF-21, and the D&D data having Cs-137 levels below the FRG were complied as discussed in Section 7 (subsequently referred to as the selected data) and evaluated in this Appendix. Tables H-6a through H-6b present the assessment of the selected data for radionuclides. Table H-7 presents the assessment of the selected data for nonradionuclides. As is seen in Table H-6a, all ecological concerns are eliminated in the first screen. As is shown in Tables H-6b and H-6c, Co-60 remains a concern to the current worker at the 1E-06 risk level. However, the concentration of concern (1.44 pCi/g) is again below the 1E-04 risk level (7.2 pCi/g) for the current occupational worker. The Co-60 concentration of concern is of limited extent, and therefore Co-60 is not a considered a concern at this location. Institutional controls are already required in this area to ensure protection from Cs-137 concentrations in the general area based on the future residential scenario. Due to Co-60's short half-life (approximately 5 years) it will have decayed to acceptable levels during this time frame.

As shown in Table H-7a, thallium and vanadium exceeded the initial human health screening. Cadmium was eliminated as a concern in the risk assessment. There are ten detections for cadmium in the soils of interest. The two highest detections were obtained at depths below 10 ft during the 1993 Track 1 Investigation sampling. This includes the 2.7 mg/kg concentration for cadmium taken at 18–20 ft, and the 2.3 mg/kg taken at 20–22 ft. The next highest concentration in the 10 ft depth is 2.2 mg/kg, which is at background. Additionally, rationale for the elimination of arsenic (as shown by table footnotes) will be discussed later in this appendix. As shown in Table H-7a, chromium, silver, thallium, and vanadium exceeded the initial screening for ecological risks.

Thallium and vanadium underwent a second screening for human health, and both remained as human health risks (shown in Table H-7b). It was noted that of the five vanadium detections in these soils of concern, three were from grab samples. Two of these samples (D&D samples 732 [55.8 mg/kg] and 733 [68.5 mg/kg]) are below the Rood et al. (1996) background for grab samples at the 95%/95% UTL (70 mg/kg) and should be considered within background concentrations. Using the next highest value for

vanadium, an additional screen was performed as presented in Table H-7c. As is shown, the highest concentration of vanadium that is above background is less than two-tenths of the RBC. The highest concentration of thallium above background is less than three-tenths of the RBC (Table H-7c). Together, thallium and vanadium would have a HQ less than 0.5 based on a noncancer RBC, and therefore can be eliminated as a concern to human receptors.

Chromium, thallium, silver, and vanadium were evaluated. Based on this level of screening, both thallium and silver have a screening HQ below 10 and can be eliminated as a concern, while chromium and vanadium could not be eliminated as a concern to ecological receptors. However, these contaminants are not considered to be of concern. First, both the concentrations of chromium and vanadium are 1.24 and 1.37 times background respectively. The RBCs for ecological receptors for these two contaminants would show risk at background concentrations. The documentation for chromium is still not available, and vanadium is currently under review by EPA to develop a more appropriate screening value. Finally, it is unlikely, given the limited extent of the contamination, that they would present a concern if a baseline approach was used to further assess these results.

Table H-2a. Initial screening Steps 1–4 for Human Health Risk Assessment and early remediation action for radionuclides for sample # 1RA751 (12–16 ft).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
									Other Rationale	
Detected Contaminants	Max Source Concentration (pCi/g)	Background Concentration (pCi/g)	Max Concentration > Background?	Nontoxic Metal?	RBC For 1E-06 (pCi/g)	Max Concentration > RBC?	Screening Value (pCi/g)	Max Concentration > Screening Level?	HHRA	ECO
Co-60	1.16E-01	NA	NA	No	7.2E-02	Yes	1.18E+03	No	**Yes**	No
Cs-137	6.25E+00	8.20E-01	Yes	No	2.3E+01	No	4.95E+03	No	No	No
H-3	2.85E+01	NA	NA	No	8.8E+04	No	3.43E+05	No	No	No
K-40	1.83E+01	2.40E+01	No	No	5.7E-02	Yes	No EBSL	No	No	No
Ni-63	1.64E+01	NA	NA	No	3.2E+03	No	No EBSL	No	No	No
Ra-226	1.02E+00	NA	NA	No	5.5E-03	Yes	2.04E+01	No	No[a]	No
Sr-90	2.70E+00	4.90E-01	Yes	No	7.8E+01	No	3.34E+03	No	No	No
U-234	4.86E+00	1.44E+00	Yes	No	1.8E+01	No	2.05E+01	No	No	No
U-235	5.92E-01	NA	NA	No	1.3E-01	Yes	2.27E+01	No	**Yes**	No
U-238	1.12E+00	1.40E+00	No	No	6.7E-01	Yes	2.32E+01	No	No	No

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that a risk-based concentration is not available.

"No EBSL" indicates that a risk-based ecological screening level is not available.

a. Ra-226 at this level can be eliminated from the assessment based on the discussion included in the text.

ECO = ecological
HHRA = Human Health Risk Assessment

Table H-2b. Initial screening Step 5 in the Human Health Risk Assessment process for radionuclides for sample # 1RA751 (12–16 ft).

		Step 5		
Detected Contaminants	Max Source Concentration (pCi/g)	RBC 1.00E-05 (pCi/g)	Max Concentration > RBC?	Remains
Co-60	1.16E-01	7.2E-01	No	No
U-235	5.92E-01	1.3E+00	No	No

Source: V-Tank soil sampling results

"No RBC" indicates that a risk-based concentration is not available.

Table H-3a. Initial screening Steps 1-4 for Human Heath Risk Assessment and early remedial action for radionuclides for sample # 1RA750 (6–10 ft).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
									Other Rationale	
Detected Contaminants	Max Source Concentration (pCi/g)	Background Concentration (pCi/g)	Max Concentration > Background?	Nontoxic Metal?	RBC For 1E-06 (pCi/g)	Max Concentration > RBC?	Screening Value (pCi/g)	Max Concentration > Screening Level?	HHRA	ECO
Co-60	1.43E+00	NA	NA	No	7.2E-02	Yes	1.18E+03	No	**Yes**	No
Cs-137	1.89E+01	8.20E-01	Yes	No	2.3E+01	No	4.95E+03	No	No	No
Cm-243/244	1.94E-02	NA	NA	No	2.4E+01	No	1.68E+01	No	No	No
K-40	1.70E+01	2.40E+01	No	No	5.7E-02	Yes	No EBSL	No	No	No
Ni-63	3.65E+00	NA	NA	No	3.2E+03	No	No EBSL	No	No	No
Ra-226	9.70E-01	NA	NA	No	5.5E-03	Yes	2.04E+01	No	No[a]	No
Sr-90	1.47E+01	4.90E-01	Yes	No	7.8E+01	No	3.34E+03	No	No	No
Pu-239/240	9.58E-02	1.00E-01	No	No	2.6E+00	No	1.89E+01	No	No	No
U-234	9.09E-01	1.44E+00	No	No	1.8E+01	No	2.05E+01	No	No	No
U-235	1.65E-01	NA	NA	No	1.3E-01	Yes	2.27E+01	No	**Yes**	No
U-238	1.00E+00	1.40E+00	No	No	6.7E-01	Yes	2.32E+01	No	No	No

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that a risk-based concentration is not available.

"No EBSL" indicates that a risk-based ecological screening level is not available.

a. Ra-226 at this level can be eliminated from the assessment based on the discussion included in the text.

ECO = ecological
HHRA = Human Health Risk Assessment

Table H-3b. Initial screening Step 5 in the Human Health Risk Assessment process for radionuclides for sample # 1RA750 (6–10 ft).

		Step 5		
Detected Contaminants	Max Source Concentration (pCi/g)	RBC 1.00E-05 (pCi/g)	Max Concentration > RBC?	Remains
Co-60	1.43E+00	7.2E-01	Yes	**Yes**
U-235	1.65E-01	1.3E+00	No	No

"No RBC" indicates that a risk-based concentration is not available.

Table H-3c. Ecological soil screening Steps 1 through 3 of the five in the Human Health Risk Assessment process for radionuclides for sample #1RA750 (6–10 ft).

	Step 1	ESS Step 2-Residential		ESS Step 2-Occupational	
Detected Contaminants	Max Concentration (pCi/g)	RBC 1.00E-06 (pCi/g)	Max Concentration > RBC?	RBC 1.00E-06 (pCi/g)	Max Concentration > RBC?
Co-60	1.43E+00	6.6E+02	No	7.20E-02	**Yes**

"No RBC" indicates that a risk-based concentration is not available.

ESS = ecological soil screening

Table H-4a. Initial screening Steps 1–4 for Human Health Risk Assessment and early remediation action for nonradionuclides for sample #1RA751 (12–16 ft).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
Detected Contaminants	Max Source Concentration (mg/kg)	Background Concentration (mg/kg)	Max Concentration > Background?	Nontoxic Metal?	RBC 1E-06 or HQ>0.1 (mg/kg)	Max Conc > RBC?	Screening Value (mg/kg)	Max Conc > Screening Values?	Other Rationale	
									HHRA	ECO
Aluminum	1.23E+04	1.60E+04	No	Yes	7.6E+03	Yes	5.00E+01	Yes	No	No
Antimony	8.42E-01	4.80E+00	No	No	3.1E+00	No	3.50E+00	No	No	No
Arsenic	1.08E+01	5.80E+00	Yes	No	3.9E-01	Yes	1.00E+01	Yes	No[a]	No[a]
Barium	2.12E+02	3.00E+02	No	No	5.4E+02	No	1.65E+02	Yes	No	No
Beryllium	6.70E-01	1.80E+00	No	No	1.5E+02	No	1.10E+00	No	No	No
Cadmium	4.08E-01	2.20E+00	No	No	1.7E+00	No	1.60E+00	No	No	No
Calcium	3.98E+04	2.40E+04	Yes	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Chromium	2.70E+01	3.30E+01	No	No	2.1E+02	No	1.00E+00	Yes	No	No
Cobalt	8.37E+00	1.10E+01	No	No	9.0E+02	No	2.00E+01	No	No	No
Copper	2.08E+01	2.20E+01	No	No	3.1E+02	No	4.00E+01	No	No	No
Iron	1.87E+04	2.40E+04	No	Yes	2.3E+03	Yes	2.00E+02	Yes	No	No
Lead	1.32E+01	1.70E+01	No	No	4.0E+01	No	5.00E+01	No	No	No
Magnesium	1.07E+04	1.20E+04	No	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Manganese	3.70E+02	4.90E+02	No	No	1.8E+02	Yes	1.05E+01	Yes	No	No
Mercury	5.57E-02	5.00E-02	Yes	No	2.3E+00	No	3.00E-01	No	No	No
Nickel	2.52E+01	3.50E+01	No	No	1.6E+02	No	3.00E+01	No	No	No
Potassium	1.94E+03	4.30E+03	No	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Selenium	9.74E-01	2.20E-01	Yes	No	3.9E+01	No	8.10E-01	Yes	No	No[a]
Silver	1.91E-01	NA	NA	No	3.9E+01	No	2.00E+00	No	No	No
Sodium	3.71E+02	3.20E+02	Yes	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Thallium	4.10E-01	4.30E-01	No	No	5.2E-01	No	1.00E+00	No	No	No
Vanadium	3.84E+01	4.50E+01	No	No	5.5E+01	No	2.00E+00	Yes	No	No
Zinc	7.16E+01	1.50E+02	No	No	2.3E+03	No	5.00E+01	Yes	No	No

Table H-4a. (continued).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
Detected Contaminants	Max Source Concentration (mg/kg)	Background Concentration (mg/kg)	Max Concentration > Background?	Nontoxic Metal?	RBC 1E-06 or HQ>0.1 (mg/kg)	Max Conc > RBC?	Screening Value (mg/kg)	Max Conc > Screening Values?	Other Rationale	
									HHRA	ECO

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that a risk-based concentration is not available.

"No EBSL" indicates that a risk-based ecological screening level is not available.

a. This sample is below depths of concern for ecological receptors and human residents.

ECO = ecological
HHRA = Human Health Risk Assessment
HQ = hazard quotient

Table H-5a. Initial screening Steps 1–4 for Human Health Risk Assessment and early remediation action for nonradionuclides for sample #1RA750 (6–10 ft).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
Detected Contaminants	Max Source Concentration (mg/kg)	Background Concentration (mg/kg)	Max Concentration > Background?	Nontoxic Metal?	RBC 1E-06 or HQ>0.1 (mg/kg)	Max Concentration > RBC?	Screening Value (mg/kg)	Max Concentration > Screening Values?	Other Rationale	
									HHRA	ECO
Aluminum	1.26E+04	1.60E+04	No	Yes	7.6E+03	Yes	5.00E+01	Yes	No	No
Antimony	3.99E-01	4.80E+00	No	No	3.1E+00	No	3.50E+00	No	No	No
Arsenic	1.21E+01	5.80E+00	Yes	No	3.9E-01	Yes	1.00E+01	Yes	Noa	Noa
Barium	2.16E+02	3.00E+02	No	No	5.4E+02	No	1.65E+02	Yes	No	No
Beryllium	6.77E-01	1.80E+00	No	No	1.5E+02	No	1.10E+00	No	No	No
Cadmium	6.62E-01	2.20E+00	No	No	1.7E+00	No	1.60E+00	No	No	No
Calcium	1.12E+05	2.40E+04	Yes	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Chromium	3.29E+01	3.30E+01	No	No	2.1E+02	No	1.00E+00	Yes	No	No
Cobalt	7.72E+00	1.10E+01	No	No	9.0E+02	No	2.00E+01	No	No	No
Copper	2.27E+01	2.20E+01	Yes	No	3.1E+02	No	4.00E+01	No	No	No
Iron	1.90E+04	2.40E+04	No	Yes	2.3E+03	Yes	2.00E+02	Yes	No	No
Lead	1.55E+01	1.70E+01	No	No	4.0E+01	No	5.00E+01	No	No	No
Magnesium	1.22E+04	1.20E+04	Yes	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Manganese	3.72E+02	4.90E+02	No	No	1.8E+02	Yes	1.05E+01	Yes	No	No
Mercury	4.20E-02	5.00E-02	No	No	2.3E+00	No	3.00E-01	No	No	No
Nickel	3.43E+01	3.50E+01	No	No	1.6E+02	No	3.00E+01	Yes	No	No
Potassium	2.41E+03	4.30E+03	No	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Selenium	1.23E+00	2.20E-01	Yes	No	3.9E+01	No	8.10E-01	Yes	No	**Yes**
Silver	1.84E-01	NA	NA	No	3.9E+01	No	2.00E+00	No	No	No
Sodium	2.09E+02	3.20E+02	No	Yes	NO RBC	No RBC	No EBSL	No EBSL	No	No
Thallium	3.95E-01	4.30E-01	No	No	5.2E-01	No	1.00E+00	No	No	No
Vanadium	4.31E+01	4.50E+01	No	No	5.5E+01	No	2.00E+00	Yes	No	No
Zinc	9.82E+01	1.50E+02	No	No	2.3E+03	No	5.00E+01	Yes	No	No

Table H-5a. (continued).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
Detected Contaminants	Max Source Concentration (mg/kg)	Background Concentration (mg/kg)	Max Concentration > Background?	Nontoxic Metal?	RBC 1E-06 or HQ>0.1 (mg/kg)	Max Concentration > RBC?	Screening Value (mg/kg)	Max Concentration > Screening Values?	Other Rationale	
									HHRA	ECO

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that a risk-based concentration is not available.

"No EBSL" indicates that a risk-based ecological screening level is not available.

a. Arsenic was eliminated as an ecological concern. Arsenic backgrounds in this soil type were determined to be within the range seen in this sample. See discussion in text.

ECO = ecological
HHRA = Human Health Risk Assessment
HQ = hazard quotient

Table H-5b. ECO Step 5 in the ecological process for nonradionuclides for sample #1RA750 (6–10 ft).

		ECO Step 5	
Detected Contaminants	Max Source Concentration (mg/kg)	Screening Value (mg/kg)	SLHQ for ECO
Selenium	1.23E+00	8.1E-01	1.5

Source: V-Tank soil sampling results

"No EBSL" indicates that a risk-based ecological screening level is not available.

ECO = ecological
SLHQ = screening level hazard quotient

Table H-6a. Initial screening Steps 1–4 for Human Health Risk Assessment and early remediation action for nonradionuclides for selected soil samples with Cs-137 below final remediation goal (all depths).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
Detected Contaminants	Max Source Concentration (pCi/g)	Background Concentration (pCi/g)	Max Concentration > Background?	Nontoxic Metal?	RBC for 1E-06 (pCi/g)	Max Concentration > RBC?	Screening Value (pCi/g)	Max Concentration > Screening Level?	Other Rationale	
									HHRA	ECO
Ag-110m	8.27E-02	NA	NA	No	1.2E+00	No	1.08E+03	No	No	No
Co-60	1.44E+00	NA	NA	No	7.2E-02	Yes	1.18E+03	No	**Yes**	No
Cs-134	8.12E-02	NA	NA	No	3.6E-01	No	1.90E+03	No	No	No
Eu-155	7.82E-02	NA	NA	No	1.2E+01	No	3.25E+04	No	No	No
Nb-95	3.48E-02	NA	NA	No	6.8E+00	No	3.56E+03	No	No	No
K-40	2.00E+01	2.40E+01	No	No	5.7E-02	Yes	No EBSL	No	No	No
Ra-226	1.12E+00	NA	NA	No	5.5E-03	Yes	2.04E+01	No	No[a]	No
Sr-90	2.24E+00	4.90E-01	Yes	No	7.8E+01	No	3.34E+03	No	No	No

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that a risk-based concentration is not available.

"No EBSL" indicates that a risk-based ecological screening level is not available.

a. Ra-226 is eliminated at this step of the screening assessment based on the discussion included in the text.

ECO = ecological
HHRA = Human Health Risk Assessment

Table H-6b. Initial screening Step 5 in the Human Health Risk Assessment process for radionuclides for selected soil samples with Cs-137 below final remediation goal (all depths).

		Step 5		
Detected Contaminants	Max Source Concentration (pCi/g)	RBC 1.00E-05 (pCi/g)	Max Concentration > RBC?	Remains
Co-60	1.44E+00	7.20E-01	Yes	**Yes**

Source: V-Tank soil sampling results

"No RBC" indicates that a risk-based concentration is not available.

Table H-6c. Ecological soil screening Steps 1 through 3 of the five in the Human Health Risk Assessment process for radionuclides for selected soil samples with Cs-137 below final remediation goal (all depths).

	Step 1	ESS Step 2-Residential		ESS Step 2-Occupational	
Detected Contaminants	Max Concentration (pCi/g)	RBC 1.00E-06 (pCi/g)	Max Concentration > RBC?	RBC 1.00E-06 (pCi/g)	Max Concentration > RBC?
Co-60	1.44E+00	6.6E+02	No	7.20E-02	**Yes**

"No RBC" indicates that a risk-based concentration is not available.

ESS = ecological soil screening

Table H-7a. Initial screening Steps 1–4 for Human Health Risk Assessment and early remediation action for nonradionuclides for selected soil samples with Cs-137 below final remediation goal (all depths).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
Detected Contaminants	Max Source Concentration (mg/kg)	Background Concentration (mg/kg)	Max Concentration > Background?	Nontoxic Metal?	RBC 1E-06 or HQ>0.1 (mg/kg)	Max Concentration > RBC?	Screening Value (mg/kg)	Max Concentration > Screening Values?	Other Rationale	
									HHRA	ECO
Arsenic	1.85E+01	5.80E+00	Yes	No	3.90E-01	Yes	1.00E+01	Yes	No[a]	No[a]
Barium	2.77E+02	3.00E+02	No	No	5.40E+02	No	1.65E+02	Yes	No	No
Beryllium	1.05E+00	1.80E+00	No	No	1.50E+02	No	1.10E+00	No	No	No
Cadmium	2.70E+00	2.20E+00	Yes	No	1.70E+00	Yes	1.60E+00	Yes	No[b]	No[b]
Chromium	4.53E+01	3.30E+01	Yes	No	2.10E+02	No	1.00E+00	Yes	No	**Yes**
Cobalt	9.63E+00	1.10E+01	No	No	9.00E+02	No	2.00E+01	No	No	No
Copper	3.23E+01	2.20E+01	Yes	No	3.10E+02	No	4.00E+01	No	No	No
Cyanide	5.00E-02	NA	NA	No	1.20E+03	No	1.43E-01	No	No	No
Lead	2.57E+01	1.70E+01	Yes	No	4.00E+01	No	5.00E+01	No	No	No
Mercury	5.00E-02	5.00E-02	Yes	No	2.30E+00	No	3.00E-01	No	No	No
Nickel	3.60E+01	3.50E+01	Yes	No	1.60E+02	No	3.00E+01	Yes	No	No[c]
Silver	2.87E+00	NA	NA	No	3.91E+01	No	2.00E+00	Yes	No	**Yes**
Thallium	1.44E+00	4.30E-01	Yes	No	5.20E-01	Yes	1.00E+00	Yes	**Yes**	**Yes**
Tin	4.95E+00	NA	NA	No	4.70E+03	No	5.30E+01	No	No	No
Vanadium	6.85E+01	4.50E+01	Yes	No	5.50E+01	Yes	2.00E+00	Yes	**Yes**	**Yes**
Zinc	1.18E+02	1.50E+02	No	No	2.30E+03	No	5.00E+01	Yes	No	No

Table H-7a. (continued).

		Step 1		Step 2	HHRA Step 3		ECO Step 3		Step 4	
Detected Contaminants	Max Source Concentration (mg/kg)	Background Concentration (mg/kg)	Max Concentration > Background?	Nontoxic Metal?	RBC 1E-06 or HQ>0.1 (mg/kg)	Max Concentration > RBC?	Screening Value (mg/kg)	Max Concentration > Screening Values?	Other Rationale	
									HHRA	ECO

"NA" in Step 1 indicates that a background value is not available.

"No RBC" indicates that a risk-based concentration is not available.

"No EBSL" indicates that a risk-based ecological screening level is not available.

a. Arsenic was eliminated as a concern. Arsenic backgrounds in this soil type were determined to be within the range seen in this sample. See discussion in text.

b. Cadmium was eliminated as a concern in the risk assessment. There are ten detections for cadmium in the soils of interest (see Table H-1). The two highest detections were obtained at depths below 10 ft during the 1993 Track 1 Investigation sampling. This includes the 2.7 mg/kg concentration for cadmium taken at 18–20 ft, and the 2.3 mg/kg taken at 20–22 ft. The next highest concentration in the 10-ft depth is 2.2 mg/kg, which is at background.

c. The contaminant was eliminated as a concern to ecological receptors. This one hit of nickel is only over background by .1 mg/kg (less than 1%) and was J-flagged (indicating an estimated value) in the L&V (bias on the high side) (see DNT-060-04).

ECO = ecological
HHRA = Human Health Risk Assessment
HQ = hazard quotient
L&V = limitation and validation

Table H-7b. Step 5 in the Human Health Risk Assessment process for nonradionuclides for selected soil samples with Cs-137 below final remediation goal (all depths).

		HHRA Step 5		
Detected Contaminants	Max Source Concentration (mg/kg or pCi/g)	RBC for 1E-05 or HQ>0.1 RBC (mg/kg)	Max Concentration > RBC?	Remains
Thallium	1.44E+00	5.20E-01	Yes	**Yes**
Vanadium	6.17E+01	5.50E+01	Yes	**Yes**

"No RBC" indicates that a risk-based concentration is not available.

a. Of the five vanadium detections in these soils of concern, three are grab samples. Two of these samples (D&D samples 732 [55.8 mg/kg] and 733 [68.5 mg/kg]) are below the Rood et al. (1996) background for grab samples at the 95%/95% UTL (70 mg/kg). The concentration of the highest composite sample is used here.

D&D = decontamination and decommisioning
HHRA = Human Health Risk Assessment
HQ = hazard quotient
UTL = upper tolerance limit

Table H-7c. Step 5 in the Human Health Risk Assessment process for nonradionuclides for selected soil samples with Cs-137 below final remediation goal (all depths).

		HHRA Step 5		
Detected Contaminants	Max Source Concentration (mg/kg or pCi/g)	RBC for 1E-05 or HQ>1.0 RBC (mg/kg)	Max Concentration > RBC?	Remains
Thallium	1.44E+00	5.20E+00	No	**No**
Vanadium	6.17E+01	5.50E+02	No	No

"No RBC" indicates that a risk-based concentration is not available.

a. Of the five vanadium detections in these soils of concern, three are grab samples. Two of these samples (D&D samples 732 [55.8 mg/kg] and 733 [68.5 mg/kg]) are below the Rood et al. (1996) background for grab samples at the 95%/95% UTL (70 mg/kg).

HHRA = Human Health Risk Assessment
HQ = hazard quotient

Table H-7d. Step 5 in the ecological process for nonradionuclides for selected soil samples with Cs-137 below final remediation goal (above 10 ft depth).

		Step 5		
Detected Contaminants	Max Source Concentration (mg/kg)	Screening Value (mg/kg)	Max Concentration > Screening Value?	SLHQ for ECO
Chromium	4.09E+01	1.00E+00	Yes	40.9
Thallium	1.44E+00	1.00E+00	Yes	1.33
Silver	2.87E+00	2.00E+00	Yes	1.4
Vanadium[a]	6.17E+01	2.00E+00	Yes	30.9

a. Of the five vanadium detections in these soils of concern, three are grab samples. Two of these samples (D&D samples 732 [55.8 mg/kg] and 733 (68.5 mg/kg]) are below the Rood et al. (1996) background for grab samples at the 95%/95% UTL (70 mg/kg). The next highest value was used.

D&D = decontamination and decommissioning
SLHQ = screening level hazard quotient
UTL = upper tolerance limit

Table-H-7e. Ecological soil screening Steps 1 and 2 in the Human Health Risk Assessment process for nonradionuclides for selected soil samples with Cs-137 below final remediation goal (all depths).

	Step 1	ESS Step 2-Residential		ESS Step 2-Occupational	
Detected Contaminants	95% UCL or Max Concentration (pCi/g)	RBC 1.00E-06 (pCi/g)	Max Concentration > RBC?	RBC 1.00E-06 (pCi/g)	Max Concentration > RBC?
Thallium	1.44E+00	0.52	**Yes**	6.7	**No**
Vanadium	6.17E+01	72	No	55	**Yes**

"No RBC" indicates that a risk-based concentration is not available.

ESS = ecological soil screening
UCL = upper confidence limit

H-3. RATIONALE FOR ELIMINATION OF SELECTED CONTAMINANTS FROM THE ASSESSMENT

In Step 4 of both the HHRA and ECO screening process, it is appropriate to evaluate the additional elimination of contaminants (VanHorn and Stacey 2004). This is important since it eliminates the inappropriate assessment of contaminants that are not a risk. Those contaminants eliminated at this step are footnoted in the appropriate table and directed to the text. The discussion of arsenic and Ra-226 are included below.

H-3.1 Arsenic

It is accepted that the arsenic background commonly used for risk assessment at the INEEL is generally not applicable to the soil types found surrounding most of the WAGs. This background is provided in the *Executive Summary for Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory* (Rood et al. 1996). As discussed in detail in Appendix K of the *Comprehensive Remedial Investigation/Feasibility Study for Waste Area Groups 6 and 10 Operable Unit 10-04* (DOE-ID 2001), soil type and soil characteristics found at the INEEL vary greatly, depending on location. Due to sampling issues (as discussed in Appendix K of the OU 10-04 Comprehensive RI/FS [DOE-ID 2001]), Rood et al. (1996) used only the data from the New Production Reactor (NPR) study to calculate background values for arsenic for risk assessment purposes.

The NPR study was conducted to provide site-specific background soil contamination levels of radionuclide and metal concentrations in surface soil for the proposed NPR site on the INEEL (Anderson 1991). A limiting factor with the NPR study was that it only collected soil samples from one soil type—sands over basalt. The average presented in Rood et al. (1996) for arsenic is 3.8 ppm for this soil type. The range of arsenic levels in this soil type is not known, but the concentrations of arsenic found in basalt ranged from 0.06–113 ppm with an average of 2 ppm. The background value obtained from this study will generally underestimate the concentration of arsenic found in other soil types.

Most of TAN is located within deep, alkaline, fine-grained lacustrine sediments from the ancestral Lake Terreton (Olson et al. 1995). These soils were derived from alluvial deposits of the Big Lost River and Birch Creek (Olson et al. 1995). As identified in Table K1-1 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001), the range of arsenic concentrations from soil with this type of deposition range from 2.1–27.0, with an average 8.2 ppm. The arsenic concentrations detected in samples #1RA etc. are 10.8 and 12, which are within this range. The highest values of arsenic come from the D&D sampling surrounding the pipeline. All are at approximately 5 ft of depth and appear to be associated with the piping. All of the piping areas fall within the prescribed area of contamination and therefore will be removed from the ground.

H-3.2 Radium-226

The radionuclide Ra-226, at the levels seen in these samples, is commonly eliminated as a risk. First, Ra-226 is a daughter product of naturally occurring U-238 and is generally considered a naturally occurring radioactive material and not a product of any known operational discharge at the INEEL. (It is neither a fission byproduct nor an activation product.) Second, the concentrations of Ra-226 are generally greater than background in the risk assessment due to issues with the analytical methods, although there is limited documentation on the background concentrations of radium and other naturally occurring radioactive materials at the INEEL. However, Rood et al. (1996) presented a summary of radionuclide concentrations for the INEEL. This summary reports a Sitewide U-238 background concentration upper

tolerance limit (UTL) for composite samples of 1.40 pCi/g and 1.54 pCi/g at the 95% and 99% confidence intervals, respectively. The U-238 is a good determiner of Ra-226 background since Ra-226 is a naturally occurring radionuclide in the U-238 decay chain. The activity of the daughter, Ra-226, is expected to be equivalent to that of the parent, U-238 (1.12 pCi/g). The levels of Ra-226 (1.02, 0.7, and 1.12 pCi/g) seen in these samples are at or below this level and should be considered background.

H-4. SUMMARY AND CONCLUSION

The evaluation of the FY-03 sampling concluded that Co-60 could be a concern to current workers. However, institutional controls in place for Cs-137 should provide protection to workers possibly exposed in the near future. Due to its short half-life (5 years), it is anticipated that the Co-60 will quickly decay to an acceptable level.

The evaluation of the other selected data indicated that there were no contaminants of concern for human health and that chromium and vanadium may be of concern for ecological receptors. The detections of concern for these contaminants all come from the D&D sampling surrounding the pipeline. The majority of the soil in contact with waste pipes will be removed during the main excavations. No other detections of these contaminants at levels of concern were seen in other locations. Due to the limited spatial distribution, these contaminants are, on an average, unlikely to pose a concern to ecological receptors across the site.

The conclusion drawn from the risk screening evaluation is that Cs-137 remains as the COC for the cleanup of the AOC. Excavation maps for Cs-137 contamination above 23.3 pCi/g are acceptable and should ensure protection of both human and ecological receptors.

H-5. REFERENCES

Anderson, J. E., 1991, "Vegetation Studies to Support the NPR Environmental Impact Statement," Final Report to EG&G, Idaho, Inc., Idaho Falls, Idaho.

42 USC § 6901 et seq., 1976, "Resource Conservation and Recovery Act (Solid Waste Disposal Act)," *United States Code,* October 21, 1976.

42 USC § 9601 et seq., 1980, "Comprehensive Environmental, Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code,* December 11, 1980.

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Attachment H-1

Tables

Attachment H-1

Tables

Att-H-1. INEEL background and risk-based concentrations for 1E-06 risk, or HQ = 0.1 for nonradionuclides for both the current occupational and future resident Att-H-5

Att-H-2. INEEL background and risk-based concentrations (at 1E-06 risk) for radionuclides for both the current occupational and future resident..... Att-H-7

Att-H-3. Risk-based concentrations (1E-05 or HQ = 0.1) for nonradionuclides for both the current occupational and future resident Att-H-9

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Att-H-5. INEEL background, ecological soil screening levels, and INEEL ecologically based screening levels for nonradionuclides and radionuclides..... Att-H-13

Table Att-H-1. INEEL background and risk-based concentrations for 1E-06 risk, or HQ = 0.1 for nonradionuclides for both the current occupational and future resident.

Column number	1	2	3	4	5	6
Nonradionuclide COPCs	CAS Number	Cancer or Noncancer	INEEL Background Concentration (mg/kg)[a]	EPA Region 9 Occupational PRGs (mg/kg) (1E-06 or HQ of 0.1)[b]	EPA Region 9 Residential PRGs (mg/kg) (1E-06 or HQ of 0.1)[b]	Lowest PRG of Columns 4 and 5
Aluminum[c]	7429-90-5	nc	1.60E+04	1.0E+04	7.6E+03	7.6E+03
Anthracene	120-12-7	nc	NA	1.0E+04	2.2E+03	2.2E+03
Antimony	7440-36-0	nc	4.80E+00	4.1E+01	3.1E+00	3.1E+00
Arsenic	7440-38-2	ca*	5.80E+00	1.6E+00	3.9E-01	3.9E-01
Barium	7440-39-3	nc	3.00E+02	6.7E+03	5.4E+02	5.4E+02
Beryllium	7440-41-7	ca**	1.80E+00	1.9E+03	1.5E+02	1.5E+02
Boron	7440-42-8	nc	1.73E+01	1.0E+04	1.6E+03	1.6E+03
Cadmium	7440-43-9	nc	2.20E+00	4.5E+01	3.7E+00	3.7E+00
Chromium	18540-29-9	ca**	3.30E+01	6.4E+01	3.0E+01	3.0E+01
Chrysene	218-01-9	ca	NA	2.1E+02	6.2E+01	6.2E+01
Cobalt	7440-48-4	ca**	1.10E+01	1.9E+03	9.0E+02	9.0E+02
Copper	7440-50-8	nc	2.20E+01	4.1E+03	3.1E+02	3.1E+02
Iron[c]	7439-89-6	nc	2.40E+04	1.0E+04	2.3E+03	2.3E+03
Lead	7439-92-1	nc	1.70E+01	7.5E+01	4.0E+01	4.0E+01
Magnesium[c]	7439-95-4	—	1.20E+04	NA	NA	NA
Manganese	7439-96-5	nc	4.90E+02	1.9E+03	1.8E+02	1.8E+02
Mercury	7487-94-7	nc	5.00E-02	3.1E+01	2.3E+00	2.3E+00
Nickel	7440-02-0	nc	3.50E+01	2.0E+03	1.6E+02	1.6E+02
Potassium[c]	7440-09-7	—	4.30E+03	NA	NA	NA
Selenium	7782-49-2	nc	2.20E-01	5.1E+02	3.9E+01	3.9E+01
Silica	7631-86-9	—	NA	NA	NA	NA

Table Att-H-1. (continued).

Column number	1	2	3	4	5	6
Nonradionuclide COPCs	CAS Number	Cancer or Noncancer	INEEL Background Concentration (mg/kg)[a]	EPA Region 9 Occupational PRGs (mg/kg) (1E-06 or HQ of 0.1)[b]	EPA Region 9 Residential PRGs (mg/kg) (1E-06 or HQ of 0.1)[b]	Lowest PRG of Columns 4 and 5
Silver	7440-22-4	nc	NA	5.1E+02	3.9E+01	3.9E+01
Sodium[c]	7440-23-5	—	3.20E+02	NA	NA	NA
Thallium	7440-28-0	nc	4.30E-01	6.7E+00	5.2E-01	5.2E-01
Tin	7440-31-5	nc	NA	1.0E+04	4.7E+03	4.7E+03
Vanadium	7440-62-2	nc	4.50E+01	7.2E+02	5.5E+01	5.5E+01
Zinc	7440-66-6	nc	1.50E+02	1.0E+04	2.3E+03	2.3E+03

Ca = carcinogenic PRG
ca* = where nc < 100 × ca
ca** = where nc < 10 × ca
nc = noncarcinogenic PRG
nc** = where ca < 10 × nc
max = ceiling limit

a. (Rood et al. 1996)
b. (EPA 2003a)
c. This contaminant is an essential nutrient and can be screened unless the detected concentration is greater than 10 times the INEEL background concentration.

COPC = contaminants of potential concern
EPA = U.S. Environmental Protection Agency
HQ = hazard quotient
PRG = preliminary remediation goal

Table Att-H-2. INEEL background and risk-based concentrations (at 1E-06 risk) for radionuclides for both the current occupational and future resident.

Column #	1	2	3	4	5	6	7
Radionuclide COPCs	CAS Numbers	Half-life (years)	INEEL Background Concentration (pCi/g)[a]	Current Occupational (External only) (pCi/g) [b]	Current Occupational (Soil ingestion) (pCi/g)[b]	Future Resident (Lowest of external and soil ingestion values) (pCi/g) [b]	Lowest RBC of Columns 4, 5, and 6 (pCi/g)
Ag-108m	14391-65-2	1.27E+02	NA	3.5E-02	5.7E+02	1.2E-02	1.2E-02
Ag-110m	14391-76-5	6.85E-01	NA	1.2E+00	2.6E+04	8.9E+42	1.2E+00
Am-241	14596-10-2	4.32E+02	1.10E-02	4.0E+01	1.0E+01	2.9E+00	2.9E+00
Ce-144	14762-78-8	7.78E-01	NA	6.3E+01	5.8E+03	2.9E+39	2.2E+02
Cm-242	15510-73-3	4.47E-01	NA	1.4E+06	1.5E+04	2.4E+70	1.5E+04
Cm-243/244	13981-15-2	1.81E+01	NA	1.4E+04	2.4E+01	2.9E+02	2.4E+01
Co-58	13981-38-9	1.94E-01	NA	NA	NA	NA	NA
Co-60	10198-40-0	5.27E+00	NA	7.2E-02	6.6E+02	7.4E+03	7.2E-02
Cs-134	13967-70-9	2.06E+00	NA	3.6E-01	8.0E+02	2.4E+13	3.6E-01
Eu-152	14683-23-9	1.36E+01	NA	8.2E-02	1.0E+03	2.7E+00 5.2E+01	8.2E-02
Eu-154	15585-10-1	8.80E+00	NA	9.6E-02	8.5E+02	5.2E+01	9.6E-02
Eu-155	14391-16-3	4.96E+00	NA	1.2E+01	8.0E+03	2.9E+06	1.2E+01
H-3	10028-17-8	1.23E+01	NA	NA	8.8E+04	6.5E+06	8.8E+04
I-129	15046-84-1	1.57E+07	NA	6.7E+01	1.7E+01	1.3E+01	1.3E+01
K-40	13966-00-2	1.28E+09	NA	2.9E-01	2.6E+02	5.7E-02	5.7E-02
Mn-54	13966-31-9	8.58E-01	NA	2.5E+00	7.4E+04	3.3E+34 34	2.5E+00
Nb-94	14681-63-1	2.03E+04	NA	5.8E-03	1.2E+02	5.8E-03	5.8E-03
Nb-95	13967-76-5	9.64E-02	NA	NA	NA	NA	NA
Ni-63	13981-37-8	1.00E+02	NA	NA	6.4E+03	NA	NA

Table Att-H-2. (continued).

Column #	1	2	3	4	5	6	7
Radionuclide COPCs	CAS Numbers	Half-life (years)	INEEL Background Concentration (pCi/g)[a]	Current Occupational (External only) (pCi/g) [b]	Current Occupational (Soil ingestion) (pCi/g)[b]	Future Resident (Lowest of external and soil ingestion values) (pCi/g) [b]	Lowest RBC of Columns 4, 5, and 6 (pCi/g)
Np-237	13994-20-2	2.14E+06	NA	3.9E-01	1.1E+01	7.6E-02	3.9E-01
Pu-238	13981-16-3	8.78E+01	4.90E-03	1.0E+04	1.2E+01	6.7E+00	6.7E+00
Pu-239/240	14119-33-6	2.41E+04	1.00E-01	9.6E+03	1.0E+01	2.5E+00	2.5E+00
Ra-226	13982-63-3	1.60E+03	NA	2.7E-02	1.1E+01	5.5E-03	5.5E-03
Ru-103	13968-53-1	1.08E-01	NA	NA	NA	NA	NA
Ru-106	13967-48-1	1.01E+00	NA	8.1E+00	3.2E+03	6.9E+29	8.1E+00
Sb-125	14234-35-6	2.77E+00	NA	1.1E+00	7.3E+03	1.4E+10	1.1E+00
Sr-90	10098-97-2	2.86E+01	4.90E-01	NA	7.8E+01	2.3E+02	7.8E+01
U-233/234	13966-29-5	2.45E+05	1.44E+00	8.4E+03	7.2E+01	1.8E+01	1.8E+01
U-235	15117-96-1	7.04E+08	NA	6.8E-01	6.8E+01	1.3E-01	1.3E-01
U-238	7440-61-1	4.47E+09	1.40E+00	3.4E+00	5.2E+01	6.7E-01	6.7E-01
Zn-65	13982-39-3	6.68E-01	NA	5.8E+00	2.4E+04	5.0E+44	5.8E+00
Zr-95	13967-71-0	1.75E-01	NA	NA	NA	1.5E+03	1.5E+03 +03

(Rood et al. 1996)

Values from Jeff Fromm Memorandum (Fromm 1996) for RBCs for radionuclides decayed through the exposure period.

COPC = contaminant of concern
RBC = risk-based assessment

Table Att-H-3. Risk-based concentrations (1E-05 or HQ = 0.1) for nonradionuclides for both the current occupational and future resident.

Column #	1	2	3	4	5
Nonradionuclide COPCs	CAS Number	Cancer or Noncancer	EPA Region 9 Occupational PRGs (mg/kg) (1E-05 or HQ of 0.1)[a]	EPA Region 9 Residential PRGs (mg/kg) (1E-05 or HQ of 0.1)[a]	Lower PRG from Columns 3 and 4
Aluminum[b]	7429-90-5	nc	1.0E+04	7.6E+03	7.6E+03
Antimony	7440-36-0	nc	4.1E+01	3.1E+00	3.1E+00
Arsenic	7440-38-2	ca*	1.6E+01	3.9E+00	3.9E+00
Barium	7440-39-3	nc	6.7E+03	5.4E+02	5.4E+02
Beryllium	7440-41-7	nc	1.9E+04	1.5E+02	1.5E+02
Cadmium	7440-43-9	nc	4.5E+01	3.7E+00	3.7E+00
Chromium	18540-29-9	ca**	6.4E+02	3.0E+02	3.0E+02
Cobalt	7440-48-4	ca**	1.9E+04	9.0E+03	9.0E+03
Copper	7440-50-8	nc	4.1E+03	3.1E+02	3.1E+02
Iron[b]	7439-89-6	nc	1.0E+04	2.3E+03	2.3E+03
Lead	7439-92-1	nc	7.5E+01	4.0E+01	4.0E+01
Magnesium[b]	7439-95-4	—	NA	NA	NA
Manganese	7439-96-5	nc	1.9E+03	1.8E+02	1.8E+02
Mercury	7487-94-7	nc	3.1E+01	2.3E+00	2.3E+00
Nickel	7440-02-0	nc	2.0E+03	1.6E+02	1.6E+02
Potassium[b]	7440-09-7	—	NA	NA	NA
Selenium	7782-49-2	nc	5.1E+02	3.9E+01	3.9E+01
Silver	7440-22-4	nc	5.1E+02	3.9E+01	3.9E+01
Sodium[b]	7440-23-5	—	NA	NA	NA
Thallium	7440-28-0	nc	6.7E+00	5.2E-01	5.2E-01

Table Att-H-3. (continued).

Column #	1	2	3	4	5
Nonradionuclide COPCs	CAS Number	Cancer or Noncancer	EPA Region 9 Occupational PRGs (mg/kg) (1E-05 or HQ of 0.1)[a]	EPA Region 9 Residential PRGs (mg/kg) (1E-05 or HQ of 0.1)[a]	Lower PRG from Columns 3 and 4
Tin	7440-31-5	nc	1.0E+04	4.7E+03	4.7E+03
Vanadium	7440-62-2	nc	7.2E+02	5.5E+01	5.5E+01
Zinc	7440-66-6	nc	1.0E+04	2.3E+03	2.3E+03

ca = carcinogenic PRG
ca* = where nc < 100 × ca
ca** = where nc < 10 × ca
nc = noncarcinogenic PRG
nc** = where ca < 10 × nc
sat = soil saturation limit
max = ceiling limit

a. (EPA 2003a)

b. This contaminant is an essential nutrient and can be screened unless the detected concentration is greater than 10 times the INEEL background concentration.

COPC = contaminants of potential concern
EPA = U.S. Environmental Agency
HQ = hazard quotient
PRG = preliminary remediation goal

Table Att-H-4. Risk-based concentrations (1E-05) for radionuclides for both the current occupational and future resident.

Column Number	1	2	3	4	5	
Radionuclide COPCs	CAS Numbers	Half-life (years)	Current Occupational (External only) (pCi/g) [a]	Current Occupational (Soil ingestion) (pCi/g)[a]	Future Resident (Lowest of external and soil ingestion values) (pCi/g) [a]	Lowest RBC of Columns 4, 5, and 6 (pCi/g)
Ag-108m	14391-65-2	1.27E+02	3.50E-01	5.7E+03	1.20E-01	1.20E-01
Ag-110m	14391-76-5	6.85E-01	1.20E+01	2.6E+05	8.90E+43	1.20E+01
Am-241	14596-10-2	4.32E+02	4.00E+02	1.0E+02	2.90E+01	2.90E+01
Ce-144	14762-78-8	7.78E-01	6.30E+02	5.8E+04	2.90E+40	6.30E+02
Cm-242	15510-73-3	4.47E-01	1.40E+07	1.5E+05	2.40E+71	1.50E+05
Cm-243/244	13981-15-2	1.81E+01	1.40E+05	2.4E+02	2.90E+03	2.40E+02
Co-58	13981-38-9	1.94E-01	NA	NA	NA	NA
Co-60	10198-40-0	5.27E+00	7.20E-01	6.6E+03	7.40E+04	7.20E-01
Cs-134	13967-70-9	2.06E+00	3.60E+00	8.0E+03	2.40E+14	3.60E+00
Eu-152	14683-23-9	1.36E+01	8.20E-01	1.0E+04	2.70E+01	8.20E-01
Eu-154	15585-10-1	8.80E+00	9.60E-01	8.5E+03	5.20E+02	9.60E-01
Eu-155	14391-16-3	4.96E+00	1.20E+02	8.0E+04	2.90E+07	1.20E+02
H-3	10028-17-8	1.23E+01	NA	8.8E+05	6.50E+07	8.80E+05
I-129	15046-84-1	1.57E+07	6.70E+02	1.7E+02	1.30E+02	1.30E+02
K-40	13966-00-2	—	—	—	—	—
Mn-54	13966-31-9	8.58E-01	2.50E+01	7.4E+05	3.30E+35	2.50E+01
Nb-94	14681-63-1	—	—	—	—	—
Nb-95	13967-7-65	9.64E-02	NA	NA	NA	NA
Ni-63	13981-37-8	1.00E+02	NA	6.4E+04	NA	NA

Table Att-H-4. (continued).

Column Number	1	2	3	4	5	
Radionuclide COPCs	CAS Numbers	Half-life (years)	Current Occupational (External only) (pCi/g) [a]	Current Occupational (Soil ingestion) (pCi/g)[a]	Future Resident (Lowest of external and soil ingestion values) (pCi/g) [a]	Lowest RBC of Columns 4, 5, and 6 (pCi/g)
Np-237	13994-20-2	2.14E+06	3.90E+00	1.1E+02	7.60E-01	3.90E+00
Pu-238	13981-16-3	8.78E+01	1.00E+05	1.2E+02	6.70E+01	6.70E+01
Pu-239/240	14119-33-6	2.41E+04	9.60E+04	1.0E+02	2.50E+01	2.50E+01
Ra-226	13982-63-3	1.60E+03	2.70E-01	1.1E+02	5.50E-02	5.50E-02
Ru-103	13968-53-1	1.08E-01	NA	NA	NA	NA
Ru-106	13967-48-1	1.01E+00	8.10E+01	3.2E+04	6.90E+30	8.10E+01
Sb-125	14234-35-6	2.77E+00	1.10E+01	7.3E+04	1.40E+11	1.10E+01
Sr-90	10098-97-2	2.86E+01	NA	7.8E+02	2.30E+03	7.80E+02
U-233/234	13966-29-5	2.45E+05	8.40E+04	7.2E+02	1.80E+02	1.80E+02
U-235	15117-96-1	7.04E+08	6.80E+00	6.8E+02	1.30E+00	1.30E+00
U-238	7440-61-1	4.47E+09	3.40E+01	5.2E+02	6.70E+00	6.70E+00
Zn-65	13982-39-3	6.68E-01	5.80E+01	2.4E+05	5.00E+45	5.80E+01
Zr-95	13967-71-0	1.75E-01	NA	NA	1.50E+04	1.50E+04

a. Values were taken from Rood et al. 1996.

COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
HQ = hazard quotient
PRG = preliminary remedial goal

Table Att-H-5. INEEL background, ecological soil screening levels, and INEEL ecologically based screening levels for nonradionuclides and radionuclides.

Column number	1	2	3	4
Nonradionuclide COPCs	CAS Number	INEEL Background Concentration (mg/kg)[a]	Region 4 Ecological Soil Screening Levels (mg/kg)[b]	INEEL EBSLs[c]
Aluminum	7429-90-5	1.60E+04	5.00E+01	8.50E+00
Antimony	7440-36-0	4.80E+00	3.50E+00	1.35E+00
Arsenic	7440-38-2	5.80E+00	1.00E+01	8.44E-01
Barium	7440-39-3	3.00E+02	1.65E+02	1.10E+01
Beryllium	7440-41-7	1.80E+00	1.10E+00	7.14E-01
Cadmium	7440-43-9	2.20E+00	1.60E+00	2.36E-03
Chromium	18540-29-9	3.30E+01	4.00E-01	1.00E+00
Chrysene	218-01-9	NA	NA	NA
Cobalt	7440-48-4	1.10E+01	2.00E+01	4.27E-01
Copper	7440-50-8	2.20E+01	4.00E+01	2.11E+00
Iron	7439-89-6	2.40E+04	2.00E+02	NA
Lead	7439-92-1	1.70E+01	5.00E+01	9.94E-01
Magnesium	7439-95-4	1.20E+04	NA	NA
Manganese	7439-96-5	4.90E+02	1.00E+02	1.05E+01
Mercury	7487-94-7	5.00E-02	1.00E-01	3.00E-01
Nickel	7440-02-0	3.50E+01	3.00E+01	3.00E+01
Potassium	7440-09-7	4.30E+03	NA	NA
Selenium	7782-49-2	2.20E-01	8.10E-01	1.72E-01
Silica	7631-86-9	NA	NA	NA
Silver	7440-22-4	NA	2.00E+00	2.00E+00

Table Att-H-5. (continued).

Column number	1	2	3	4
Nonradionuclide COPCs	CAS Number	INEEL Background Concentration (mg/kg)[a]	Region 4 Ecological Soil Screening Levels (mg/kg)[b]	INEEL EBSLs[c]
Sodium	7440-23-5	3.20E+02	NA	NA
Tetrachloroethylene	127-18-4	NA	1.00E-02	3.33E+00
Thallium	7440-28-0	4.30E-01	1.00E+00	1.01E-01
Tin	7440-31-5	NA	5.30E+01	3.73E+00
Vanadium	7440-62-2	4.50E+01	2.00E+00	1.49E+00
Zinc	7440-66-6	1.50E+02	5.00E+01	3.29E+00
Ag-108m	14391-65-2	NA	NA	1.82E+03
Ag-110m	14391-76-5	NA	NA	1.08E+03
Am-241	14596-10-2	1.10E-02	NA	1.78E+01
Ce-144	14762-78-8	NA	NA	2.27E+04
Cm-242	15510-73-3	NA	NA	1.60E+01
Cm-243/244	13981-15-2	NA	NA	1.68E+01
Co-60	10198-40-0	NA	NA	1.18E+03
Cs-134	13967-70-9	NA	NA	1.90E+03
Cs-137	10045-97-3	8.20E-01	NA	4.95E+03
Eu-152	14683-23-9	NA	NA	2.18E+03
Eu-154	15585-10-1	NA	NA	2.48E+03
Eu-155	14391-16-3	NA	NA	3.25E+04
H-3	10028-17-8	NA	NA	3.43E+05
I-129	15046-84-1	NA	NA	4.76E+04
Mn-54	13966-31-9	NA	NA	3.53E+03

Table Att-H-5. (continued).

Column number	1	2	3	4
Nonradionuclide COPCs	CAS Number	INEEL Background Concentration (mg/kg)[a]	Region 4 Ecological Soil Screening Levels (mg/kg)[b]	INEEL EBSLs[c]
Nb-95	13967-76-5	NA	NA	3.56E+03
Ni-63	13981-37-8	NA	NA	1.14E+05
Np-237	13994-20-2	NA	NA	1.94E+01
Pu-238	13981-16-3	4.90E-03	NA	1.78E+01
Pu-239/240	14119-33-6	1.00E-01	NA	1.89E+01
Ra-226	13982-63-3	NA	NA	2.04E+01
Ru-103	13968-53-1	NA	NA	6.38E+03
Ru-106	13967-48-1	NA	NA	1.94E+05
Sb-125	14234-35-6	NA	NA	6.02E+03
Sr-90	10098-97-2	4.90E-01	NA	3.34E+03
U-233/234	13966-29-5	1.44E+00	NA	2.05E+01
U-235	15117-96-1	NA	NA	2.27E+01
U-238	74406-1-1	1.40E+00	NA	2.32E+01
Zn-65	13982-39-3	NA	NA	5.21E+03
Zr-95	13967-71-0	NA	NA	3.69E+03

a. Values were taken from (Rood et al. 1996).
b. Values were taken from (EPA 2000b).
c. Values were taken from (DOE-ID 1999).

COPC = contaminant of potential concern
EBSL = ecologically based screening levels
SSL = soil screening levels

Appendix I

V-9 Outlet Line Camera Inspection Radiological Survey Reports/Airborne Survey Reports/Glove Bag Certification

Appendix-I
V-9 Outlet Line Camera Inspection Radiological Survey Reports/Airborne Survey Reports/Glove Bag Certification

[illegible]

141.45#
10/10/97
Rev. #03

RADIOLOGICAL SURVEY REPORT **COPY**

INSTRUMENTS		
Type	Serial #	Efficiency
		%
		%
		%
Scaler	343592	44.2 %βγ
		30.1 %α
R020	661779	

SURVEY DATA AND LEGEND

ALL SWIPE, LARGE AREA WIPE (LAW), AND DIRECT SCAN SURVEY LOCATIONS ARE IDENTIFIED ON THE MAP. THOSE LOCATIONS WHERE ACTIVITY IS GREATER THAN OR EQUAL TO THE RADCON MANUAL (RCM) TABLE 2-2 LIMITS* ARE RECORDED BELOW.

SWIPE No.	LAW No.	DIRECT SCAN No.	LOCATION OR ITEM DESCRIPTION	SWIPE/SCAN (dpm/100cm²)		LAW (dpm)	
				βγ	α	βγ	α
*		*	RCM Table 2-2 limits used for this survey.	1000/5000	20/500		
1			wall (south)	1002.			
2			wall (south)	2448			
3			wall (south)	1138			
4			wall (south) hanger	654			
5			ceiling hanger metal	686		N/A	
6			ceiling hanger metal	468			
7			ceiling hanger metal	4129			
8			ceiling hanger metal	1012			
			N/A				

A	Contamination Area
CA	High Contamination Area
A	Radiation Area
RA	High Radiation Area
HRA	Very High Radiation Area
MA	Radioactive Material Area
RA	Airborne Radioactivity Area
BA	Radiological Buffer Area
CA	Fixed Contamination Area
CA	Soil Contamination Area
RMA	Underground Radioactive Material Area
OP	Step-Off Pad

-x—x- Radiological Barrier

ALL dose rates are in mrem/hr, unless otherwise noted.

#	General Area Dose Rate
#@#(cm)	Dose Rate at Distance From Source
*#	Contact Dose Rate
#β / #γ	Beta Corrected / Gamma Dose Rates
α	Alpha
β	Beta
γ	Gamma
n	Neutron

□ = Direct Scan
○ = Swipe (Smear)
L = Large Area Wipe (LAW)
△ = Air Sample
⌂ = Tritium Swipe

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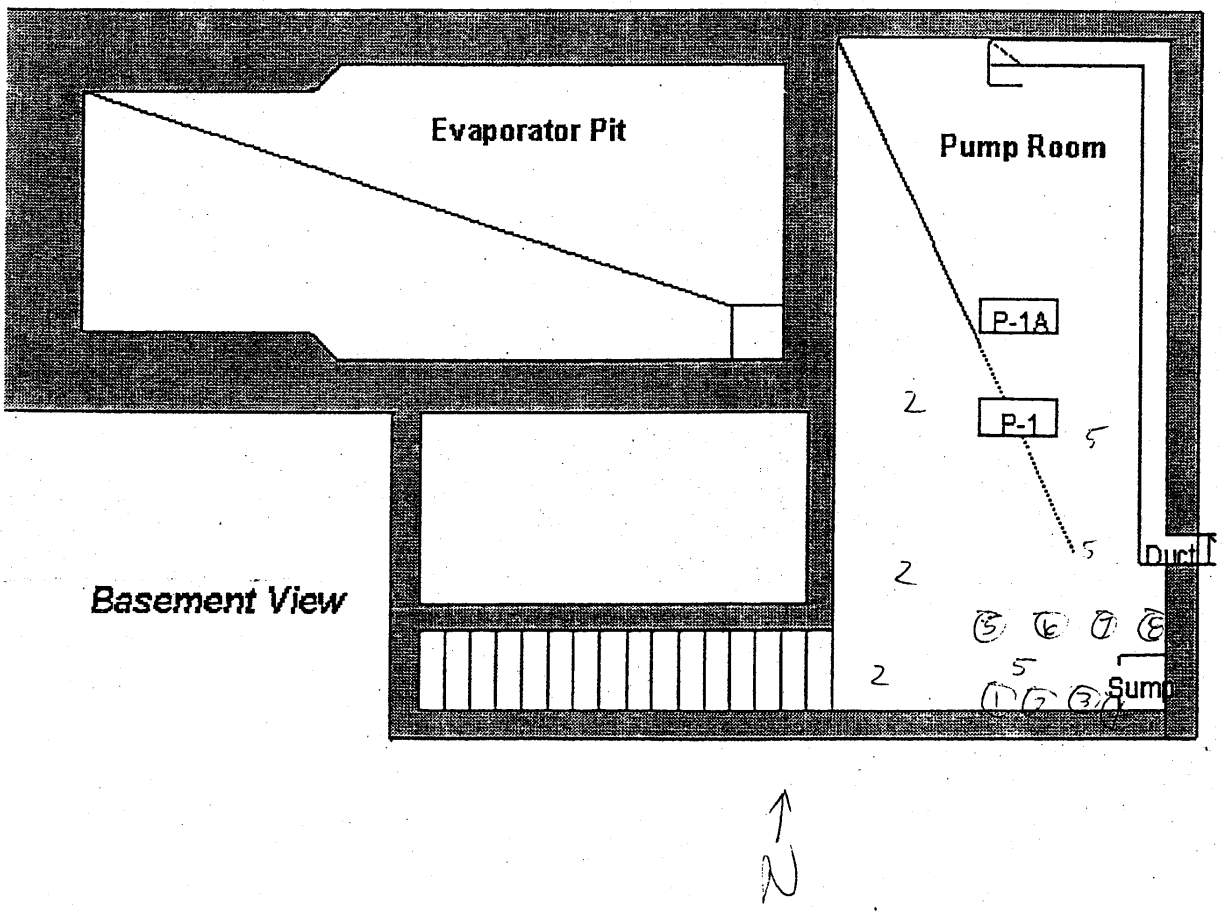
RADIOLOGICAL SURVEY REPORT

BARCODE #

BLDG.: TAN-616	☐ ROUTINE JOB DESCRIPTION
AREA/ROOM: Pump Room	☒ NON ROUTINE (SPECIFY) ☐ FOLLOW UP
RWP #: 3100 3022 01	COMMENTS: TAN-616 BASEMENT PUMP ROOM installation
LOG #: 2	of Total containment Glove Bag
DATE: 4/24/03	bivouac #1-4 on wall #5-8 on ceiling
TIME: 1630	

RCT: C. ECKSEN (PRINT/SIGNATURE) REVIEWED BY:

TAN-616
PUMP ROOM



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RADIOLOGICAL SURVEY REPORT

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INSTRUMENTS		
Type	Serial #	Efficiency
L-3	802251	10 %
		%
		%
Scaler		%βγ
		%α
RO-20	801783	

SURVEY DATA AND LEGEND

ALL SWIPE, LARGE AREA WIPE (LAW), AND DIRECT SCAN SURVEY LOCATIONS ARE IDENTIFIED ON THE MAP. THOSE LOCATIONS WHERE ACTIVITY IS GREATER THAN OR EQUAL TO THE RADCON MANUAL (RCM) TABLE 2-2 LIMITS* ARE RECORDED BELOW.

SWIPE No.	LAW No.	DIRECT SCAN No.	LOCATION OR ITEM DESCRIPTION	SWIPE/SCAN (dpm/100cm²) βγ	SWIPE/SCAN (dpm/100cm²) α	LAW (dpm) βγ	LAW (dpm) α
*		*	RCM Table 2-2 limits used for this survey.	1000/5000	20/500		
1			Inside Pipe Before Camera was inserted.	100K	NT		
2			Outside of Pipe After Camera was inserted	80K	NT		
3			Inside Glovebag After Insertion	150K	NT		
4			Inside Glovebag After Insertion	200K	NT		
5			Inside Glovebag After Insertion	150K	NT		
6			End of Camera (After Insertion)	300K	NT		
7			Bottom of Stairs (Post Job)	<1K	<20		
8			FLOOR	<1K	<20		
9			FLOOR	<1K	<20		
10			FLOOR	<1K	<20		
11			FLOOR	<1K	<20		
12			FLOOR	<1K	<20		
13			FLOOR	<1K	<20		
14			FLOOR	<1K	<20		
15			Pump Base	1K	<20		
16			Pump Base	<1K	<20		
17			FLOOR	<1K	<20		
18			FLOOR	<1K	<20		
19			FLOOR	<1K	<20		
20			FLOOR	4840	<20		
21			Pipe	3520	<20		
22			Pipe and Lead	5000	300		
23			Pipe after Decon and Glove bag removal	3523	<20		
24			Ladder (Post Job)	<1K	<20		
25			Stairs. (Post Job)	1000	<20		

CA	Contamination Area
ICA	High Contamination Area
A	Radiation Area
RA	High Radiation Area
HRA	Very High Radiation Area
MA	Radioactive Material Area
RA	Airborne Radioactivity Area
BA	Radiological Buffer Area
CA	Fixed Contamination Area
CA	Soil Contamination Area
RMA	Underground Radioactive Material Area
OP	Step-Off Pad

-x—x- Radiological Barrier

ALL dose rates are in mrem/hr, unless otherwise noted.

#	General Area Dose Rate
#@#(cm)	Dose Rate at Distance From Source
*#	Contact Dose Rate
#β / #γ	Beta Corrected / Gamma Dose Rates
α	Alpha
β	Beta
γ	Gamma
n	Neutron

□ = Direct Scan

○ = Swipe (Smear)

L = Large Area Wipe (LAW)

△ = Air Sample

⬡ = Tritium Swipe

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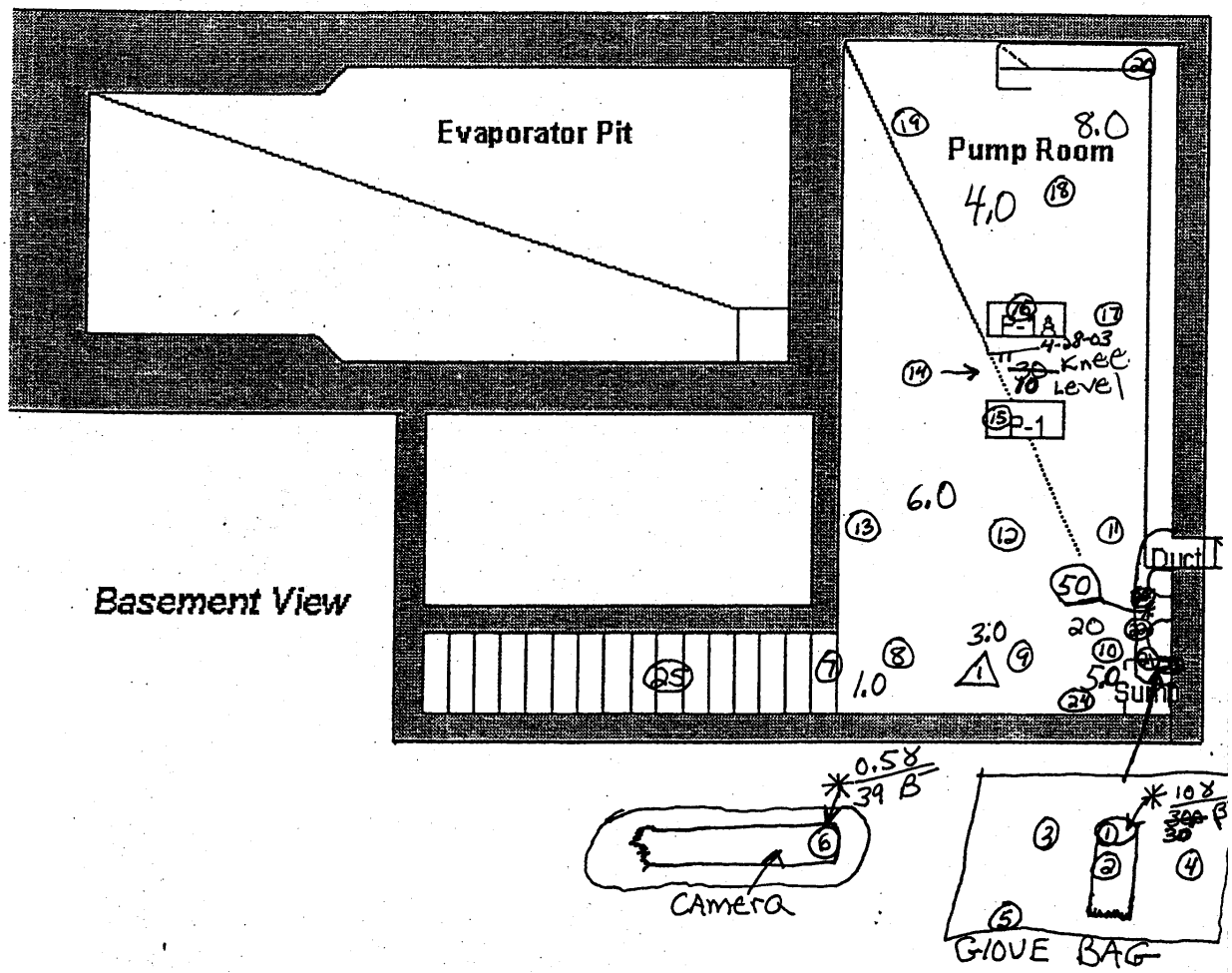
RADIOLOGICAL SURVEY REPORT

BARCODE #

BLDG.: TAN-616	☐ ROUTINE JOB DESCRIPTION
AREA/ROOM: Pump Room	☒ NON ROUTINE (SPECIFY) ☐ FOLLOW-UP
RWP #: 31003022-01	COMMENTS: TAN-616 BASEMENT PUMP ROOM. Insert camera into V-9 header pipe.
LOG #: 2	
DATE: 4-28-03	
TIME: 1015	

RCT: T. Terry / T. Terry (PRINT/SIGNATURE) REVIEWED BY: [signature]

TAN-616
PUMP ROOM



441.48
07/30/2001
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AIRBORNE SURVEY RESULTS

COPY

Use this form in conjunction with MCP-7, MCP-356, MCP-357, TPR-6430, and TPR-6431.

Initial Count

Facility: TAN Building: 616 Room/Area: Tent area

RWP No.: 3100 3022 00 ALARA Task No.: 2900 1813 01 07

Job Description: U-9 Tank inspection through TAN 616

Date/Time Taken: 4/24/03 0902 Sampler ID: SAMCOM0904 Sampler Type: Staplex

Total Time (min): 14 X Flow Rate (cfm)/lpm): 11.6 = Total Vol. (ft³/liters): 162.4

Comments: T1/2 = 43 min after 80 min decay, natural activity noted.

Counter Type: Protean Counter ID No.: 343592 % Eff. β/γ: 44.2

Count Time (min): 1 Date and Time Counted: 4/24/03 0920 % Eff. α: 30.1

Gross CPM β/γ: 1686 – Bkgd. CPM β/γ: 126.9 = Net CPM β/γ: 1559

Gross CPM α: 527 – Bkgd. CPM α: 0.1 = Net CPM α: 527.9

Activity, µCi/cc β/γ: 3.46 E^{-10} ÷ Applicable DAC β/γ: 2E^{-9} = DAC Fraction β/γ: 0.173

Activity, µCi/cc α: 1.69 E^{-10} ÷ Applicable DAC α: 2E^{-12} = DAC Fraction α: 84.46

Respirator Protection Factor: 1000 Total DAC Fraction: 84.63

Effective DAC Fraction: 0.085

RadCon: CE OLSEN (Print Name) (Signature)

Delayed Count

Counter Type: Protean Counter ID No.: 343592 % Eff. β/γ: 44.2

Count Time (min): 1 Date and Time Counted: 4/24/03 1050 % Eff. α: 30.1

Gross CPM β/γ: 443 – Bkgd. CPM β/γ: 126.9 = Net CPM β/γ: 316.1

Gross CPM α: 126 – Bkgd. CPM α: 0.1 = Net CPM α: 125.9

Activity, µCi/cc β/γ: 7.01 E^{-11} ÷ Applicable DAC β/γ: 2E^{-9} = DAC Fraction β/γ: 0.035

Activity, µCi/cc α: 1.02 E^{-11} ÷ Applicable DAC α: 2E^{-12} = DAC Fraction α: 20.11

Respirator Protection Factor: 1000 Total DAC Fraction: 20.14

Effective DAC Fraction: 0.020

RadCon: CE OLSEN (Print Name) (Signature)

Evaluation

Effective DAC Fraction = Total DAC Fraction ÷ Respirator Protection Factor

If Effective DAC Fraction < 0.3 then DAC-hour tracking is not required.

If Effective DAC Fraction ≥ 0.3 then DAC-hour tracking is required.

Review

RadCon Foreman/Supervisor: G.L. Lusk (Print Name)

(Signature) Date: 4-29-03

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AIRBORNE SURVEY RESULTS

COPY

U/L

Delayed Count

Counter Type: TAN Counter ID No.: 616 % Eff. β/γ: 44.2 4/28
Count Time (min): 1 Date and Time Counted: 4/28/03 0820 % Eff. α: 30.7 4/28/
Gross CPM β/γ: 122 − Bkgd. CPM β/γ: 117.8 = Net CPM β/γ: 4.2
Gross CPM α: 0 − Bkgd. CPM α: 0.4 = Net CPM α: 0
Activity, µCi/cc β/γ: 9.32×10^{-13} ÷ Applicable DAC β/γ: 2.0×10^{-9} = DAC Fraction β/γ: 0.00
Activity, µCi/cc α: N/A ÷ Applicable DAC α: 2.0×10^{-12} = DAC Fraction α: 0.00
Respirator Protection Factor: 1000 Total DAC Fraction: 0.00
Effective DAC Fraction: 0.00

RadCon: William R. Mesiano (Print Name) William R. Mesiano (Signature)

Delayed Count

Counter Type: Counter ID No.: % Eff. β/γ:
Count Time (min): Date and Time Counted: % Eff. α:
Gross CPM β/γ: − Bkgd. CPM β/γ: = Net CPM β/γ:
Gross CPM α: − Bkgd. CPM α: = Net CPM α:
Activity, µCi/cc β/γ: ÷ Applicable DAC β/γ: = DAC Fraction β/γ:
Activity, µCi/cc α: ÷ Applicable DAC α: = DAC Fraction α:
Respirator Protection Factor: Total DAC Fraction:
Effective DAC Fraction:

RadCon: (Print Name) (Signature)

Delayed Count

Counter Type: Counter ID No.: % Eff. β/γ:
Count Time (min): Date and Time Counted: % Eff. α:
Gross CPM β/γ: − Bkgd. CPM β/γ: = Net CPM β/γ:
Gross CPM α: − Bkgd. CPM α: = Net CPM α:
Activity, µCi/cc β/γ: ÷ Applicable DAC β/γ: = DAC Fraction β/γ:
Activity, µCi/cc α: ÷ Applicable DAC α: = DAC Fraction α:
Respirator Protection Factor: Total DAC Fraction:
Effective DAC Fraction:

RadCon: (Print Name) (Signature)

Review

RadCon Foreman/Supervisor: G.L. Lusk (Print Name)
(Signature) Date: 4-27-03

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AIRBORNE SURVEY RESULTS

COPY

Use this form in conjunction with MCP-7, MCP-356, MCP-357, TPR-6430, and TPR-6431.

Initial Count

Facility: TAN Building: 616 Room/Area: Pump Rm

RWP No.: 3100 3022 00 ALARA Task No.: 2900 1813 0107

Job Description: V-9 Tank inspection through Tan 616

Date/Time Taken: 4/24/03 0918 Sampler ID: SAMCOM 0906 Sampler Type: Staplex

Total Time (min): 23 X Flow Rate (cfm/lpm): 11.6 = Total Vol. (ft³/liters): 266.8

Comments: T1/2 = 40.5 min. after 90 min decay. natural activity noted.

Counter Type: Protean Counter ID No.: 343592 % Eff. β/γ: 44.2

Count Time (min): 1 Date and Time Counted: 4/24/03 1009 % Eff. α: 30.1

Gross CPM β/γ: 3061 – Bkgd. CPM β/γ: 126.9 = Net CPM β/γ: 2934.1

Gross CPM α: 993 – Bkgd. CPM α: 0.1 = Net CPM α: 992.9

Activity, µCi/cc β/γ: 3.96 E^{-10} ÷ Applicable DAC β/γ: 2E^{-9} = DAC Fraction β/γ: 0.198

Activity, µCi/cc α: 1.93 E^{-10} ÷ Applicable DAC α: 2E^{-12} = DAC Fraction α: 96.51

Respirator Protection Factor: 1000 Total DAC Fraction: 96.71

Effective DAC Fraction: 0.097

RadCon: CEOLSEN (Print Name) [signature] (Signature)

Delayed Count

Counter Type: Protean Counter ID No.: 343592 % Eff. β/γ: 44.2

Count Time (min): 1 Date and Time Counted: 4/24/03 1139 % Eff. α: 30.1

Gross CPM β/γ: 794 – Bkgd. CPM β/γ: 126.9 = Net CPM β/γ: 667.1

Gross CPM α: 213 – Bkgd. CPM α: 0.1 = Net CPM α: 212.9

Activity, µCi/cc β/γ: 9.01 E^{-11} ÷ Applicable DAC β/γ: 2E^{-9} = DAC Fraction β/γ: 0.045

Activity, µCi/cc α: 4.14 E^{-11} ÷ Applicable DAC α: 2E^{-12} = DAC Fraction α: 20.69

Respirator Protection Factor: 1000 Total DAC Fraction: 20.74

Effective DAC Fraction: 0.021

RadCon: CEOLSEN (Print Name) [signature] (Signature)

Evaluation

Effective DAC Fraction = Total DAC Fraction ÷ Respirator Protection Factor

If Effective DAC Fraction < 0.3 then DAC-hour tracking is not required.

If Effective DAC Fraction ≥ 0.3 then DAC-hour tracking is required.

Review

RadCon Foreman/Supervisor: G. L. Lusk (Print Name)

[signature] (Signature) Date: 4-29-03

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AIRBORNE SURVEY RESULTS

COPY

P/R

Delayed Count

Counter Type: Protean Counter ID No.: 343592 % Eff. β/γ: 44.2
Count Time (min): 1 Date and Time Counted: 4/28/03 0815 % Eff. α: 30.7
Gross CPM β/γ: 269 – Bkgd. CPM β/γ: 117.8 = Net CPM β/γ: 151.2
Gross CPM α: 1 – Bkgd. CPM α: 0.4 = Net CPM α: 0.6
Activity, μCi/cc β/γ: ~~3.35x10^-11~~ 2.04E-11 + Applicable DAC β/γ: 2.0x10^-9 = DAC Fraction β/γ: 0.010
Activity, μCi/cc α: ~~1.92x10^-12~~ 1.19E-13 + Applicable DAC α: 2.0x10^-12 = DAC Fraction α: 0.059
Respirator Protection Factor: 1000 Total DAC Fraction: 0.069
Effective DAC Fraction: 0.000

RadCon: William R. Mesiano (Print Name) William R. Mesiano (Signature)

Delayed Count

Counter Type: _____ Counter ID No.: _____ % Eff. β/γ: _____
Count Time (min): _____ Date and Time Counted: _____ % Eff. α: _____
Gross CPM β/γ: _____ – Bkgd. CPM β/γ: _____ = Net CPM β/γ: _____
Gross CPM α: _____ – Bkgd. CPM α: _____ = Net CPM α: _____
Activity, μCi/cc β/γ: _____ + Applicable DAC β/γ: _____ = DAC Fraction β/γ: _____
Activity, μCi/cc α: _____ + Applicable DAC α: _____ = DAC Fraction α: _____
Respirator Protection Factor: _____ Total DAC Fraction: _____
Effective DAC Fraction: _____

RadCon: _____ (Print Name) _____ (Signature)

Delayed Count

Counter Type: _____ Counter ID No.: _____ % Eff. β/γ: _____
Count Time (min): _____ Date and Time Counted: _____ % Eff. α: _____
Gross CPM β/γ: _____ – Bkgd. CPM β/γ: _____ = Net CPM β/γ: _____
Gross CPM α: _____ – Bkgd. CPM α: _____ = Net CPM α: _____
Activity, μCi/cc β/γ: _____ + Applicable DAC β/γ: _____ = DAC Fraction β/γ: _____
Activity, μCi/cc α: _____ + Applicable DAC α: _____ = DAC Fraction α: _____
Respirator Protection Factor: _____ Total DAC Fraction: _____
Effective DAC Fraction: _____

RadCon: _____ (Print Name) _____ (Signature)

Review

RadCon Foreman/Supervisor: G. L. Lusk (Print Name)

[signature] (Signature) Date: 4-29-03

Page 2 of 2

Part N

441.37
12/15/99
Rev. 03

RADIOLOGICAL CONTROL
TOTAL CONTAINMENT (TC) GLOVEBAG CERTIFICATION
(MINIMUM REQUIREMENTS)

COPY

Location: Bldg: TAN 616 Room or Area: Pump Rm

System or Component:

RCT Performing Inspection: CE ELSEN 4/24/03

Date: 4/24/03 Time: ~~1515~~ 1575

Certified: Yes: ☒ No: ☐

Deficiencies Reported to: Installer: Yes: ☐ No: ☐ User: Yes: ☐ No: ☐

		YES	NO	N/A
1.	Components and surfaces inside the TC covered where possible to minimize decontamination.	✓		
2.	Inside seals are used where possible.	✓		
3.	Verify water leak test of seals if liquid is expected in the TC.			✓
4.	Verify air test of TC if positive pressure expected (air powered tools, pressure in system being worked on, etc.)			✓
5.	Verify proper installation of components (filters, drains, pumps, transfer sleeves, etc.)	✓		✓
6.	Drain is installed in low point and is unobstructed (if used).	✓		
7.	End of drain line is properly secured to prevent end from being inadvertently pulled out (if used).	✓		
8.	Drain tubing which is not in sight of the TC should be marked as containing radioactive liquids.			N
9.	Drain bottles (if used):			
	A. Have 3/4 full level indicated.	✓		
	B. Have properly installed filters, hoses, and fittings.	✓		
	C. Has dye been added to aid in seeing liquid level?	✓		
	D. Is bottle contained in overflow bag?	✓		
10.	HEPA filters <100 cfm (if used) are undamaged and have adequate seal to containment.	✓		
11.	Glovebag is free of tears, loose seams, cuts or any other loss of integrity.	✓		
12.	Containment adequately supported.	✓		
13.	Gloves, filter, transfer sleeve and similar penetrations located such that liquids will not drain into these attachments.	✓		
14.	Sharp edges blunted or taped over. Power tools unplugged when not in use.			N
15.	Transfer sleeve is pleated out of the way and is not in a position where it could be punctured or torn.	✓		
16.	Support devices used for components to be disconnected appear to be adequate (if used).			✓
17.	HEPA filter vacuum DOP/aerosol test is current (if used).			✓
18.	Inspect gloves for integrity and proper installation.	✓		✓
19.	Zipper is taped.			✓
20.	Absorbent material is placed inside TC if no drain assembly is installed.			✓
21.	Drain bottle(s) are secured to prevent tipping over (if used).	✓		
22.	Is remaining space in drain bottle adequate (if used)?	✓		
23.	Approved/disapproved tag or sticker attached and updated as necessary.	✓		

Comments:

NOTE: Notify responsible organization of any deficiencies.