7.0 INVESTIGATIVE SAMPLING

Examples of investigative samples collected in 2004 included: vegetation, animals, and animal feces. Investigative samples were collected where known or suspected radioactive contamination was present, or to verify radiological conditions at project sites. In 2004, five samples were analyzed for radionuclides at the 222-S Laboratory. Analytical results are provided in Table 7-1. Another 97 contaminated environmental samples were reported and disposed without isotopic analyses (although field instrument readings were recorded) during surveillance and/or cleanup operations. These results are provided in Table 7-2.

7.1 Soil

In 2004, there were 19 instances of radiological contamination in which soil was identified as the carrier of contamination. Of these, 13 were identified only as specks, or soil specks. Often, specks observed under high magnification are found to be small pieces of decomposed vegetation, most often tumbleweeds. External radioactivity levels ranged from a low of approximately 18,000 disintegrations per minute (dpm)/100 cm^2 to greater than 1,000,000 dpm/100cm^2. Contaminated areas were radiologically posted or cleaned up. The number of contamination incidents, the range of radiation dose rate levels, and radionuclide concentrations observed in 2004 were generally within historical ranges.

Contaminated soil was found on top of UPR-200-E-78, the graveled area around the 241-BX-155 diversion box in the 200 East Area. The soil was sent to the laboratory and the results of these analyses can be found in Table 7-1.

7.2 Vegetation

In 2004, there were 60 instances in which vegetation was identified as the carrier of radiological contamination. One vegetation sample, a contaminated tumbleweed found on top of UPR-200-E-77 (the graveled area northeast of the 241-B-154 diversion box in the 200 East Area) was submitted to the laboratory. The radioisotopic analysis results for this sample are provided in Table 7-1.

One instance of contaminated vegetation had field readings in excess of 540,000 dpm/100cm^2. The radioactivity levels and range of radionuclide concentrations were all within historical ranges.

The increased number of incidents from 32 in 2003 to 60 in 2004 can be attributed to favorable growing conditions (moisture) and a possible resistance to the herbicide. Nevertheless, contaminated tumbleweeds that grew in recent years continue to be identified by radiological surveys. It is expected that as contaminated vegetation from past years is identified and cleaned up, subsequent years will show the results of program improvements.

7.3 Animals

Animals were collected either as part of an integrated pest management program or as a result of radiological surveys finding contaminated wildlife-related material (e.g., feces, nests, etc.). Animals were collected directly from or near facilities in an effort to monitor and track effectiveness of preventive measures designed to deter animal intrusion.

In 2004, twenty instances of contaminated animals or animal-related contamination were identified. The highest radionuclide concentrations in 2004 were observed in rabbit feces collected in the 200 East Area. The numbers of animals found to be contaminated with radioactivity, the radioactivity levels, and the range of radionuclide concentrations were within historical ranges.

The following samples were submitted to the laboratory and the analytical results are provided in Table 7-1:

A contaminated starling carcass found inside the 105-KE control room in the 100-K Area;

A contaminated rabbit fece found in the soil outside the 272-S paint shop in the 200 West Area;

Contaminated mouse feces found on top of the cross site transfer line, UPR-600-20, east of the 221-U facility in the 200 West Area.

7.4 Special Characterization Sampling

Listed below are special characterization projects conducted or completed during 2004 to ascertain the radiological, and in some cases, physical condition of specific sites or operations:

- A preoperational monitoring plan (RPP-6877, Rev. 1) was developed in support of the Waste Vitrification initiative. As part of this plan, an ongoing environmental survey is being conducted on the proposed location for the Integrated Disposal Facility, formerly the Immobilized Low-Activity Waste Disposal Facility, in the 200 East Area. Tasks completed in 2004 include soil, vegetation, and small mammal sampling. Following completion of all the tasks outlined in the monitoring plan, the data collected will be published in a final report. The report is currently scheduled for publication in 2006.

- Soil, vegetation, small mammal and ground-dwelling invertebrate samples were collected at the location of the former Gable Mountain Pond, 216-B-3 Pond, and the 216-B-2-2 Ditch in 2004 to identify potential exposure pathways to biota and to support remedial action decisions (Mitchell et al. 2004).

Table 7-1. Investigative Sample Results, 2004. (2 sheets total)

Matrix	Location	Date	Field Reading[a]	Isotope	Result[b] (pCi/Sample)	± Analytical Uncertainty
Starling	105-KE Control Room	03/01/04	90,000 dpm/100cm^2	^{60}Co	<5.6E-02	
				^{89,90}Sr	1.5E+02	± 2.3E+00
				^{134}Cs	<8.3E-02	
				^{137}Cs	5.2E+01	± 8.7E-01
				^{152}Eu	<2.4E-01	
				^{154}Eu	<1.5E-01	
				^{155}Eu	<3.0E-01	
				^{Total}U	<7.0E+01	
				^{238}Pu	1.0E+01	± 2.8E+00
				^{239,240}Pu	7.3E+01	± 2.1E+00

Matrix	Location	Date	Field Reading[a]	Isotope	Result[b] (pCi/gram)	± Analytical Uncertainty
Mouse Feces	UPR-600-20 @ 221-U	03/01/04	650,000 dpm/100cm^2	^{60}Co	<8.7E+03	
				^{89,90}Sr	1.8E+00	± 1.7E+00
				^{134}Cs	<1.2E+04	
				^{137}Cs	7.3E+06	± 1.2E+04
				^{152}Eu	<2.7E+04	
				^{154}Eu	<2.2E+04	
				^{155}Eu	<2.3E+04	
				^{Total}U	<1.0E+07	
				^{238}Pu	<6.0E+02	± 1.0E+02
				^{239,240}Pu	9.9E+03	± 2.1E+00

Matrix	Location	Date	Field Reading[a]	Isotope	Result[b] (pCi/gram)	± Analytical Uncertainty
Rabbit Pellet	272-S Paint Shop	08/08/03	100,000 dpm/100cm^2	^{60}Co	<9.2E+02	
				^{89,90}Sr	4.3E+05	± 3.9E+00
				^{134}Cs	<1.5E+03	
				^{137}Cs	7.7E+05	± 1.2E+00
				^{152}Eu	<2.9E+03	
				^{154}Eu	<3.3E+03	
				^{155}Eu	<2.4E+03	
				^{Total}U	<1.1E+06	
				^{238}Pu	<4.3E+02	± 9.0E+00
				^{239,240}Pu	5.4E+02	± 7.5E+00

(a) dpm = disintegrations per minute

(b) A "<" symbol indicates that the analyte was analyzed for but not detected. Uncertainty values were not reported by the laboratory for all results. To convert to international metric system units (SI), multiply pCi/g by 0.03704 to obtain Bq/g.

Table 7-1. Investigative Sample Results, 2004. (2 sheets total)

Matrix	Location	Date	Field Reading[a]	Isotope	Result[b] (pCi/gram)	± Analytical Uncertainty
Soil	UPR-200-E-78	09/03/03	600,000 dpm/100cm^2	^{60}Co	<3.9E-02	
				^{89,90}Sr	2.7E+03	± 4.4E-01
				^{134}Cs	<4.4E-02	
				^{137}Cs	1.90E-01	± 2.7E+01
				^{152}Eu	<9.1E-02	
				^{154}Eu	<1.2E-01	
				^{155}Eu	<9.2E-02	
				^{Total}U	<2.4E+01	
				^{238}Pu	<3.6E-01	± 1.1E+01
				^{239,240}Pu	<3.6E+00	± 2.8E+00

Matrix	Location	Date	Field Reading[a]	Isotope	Result[b] (pCi/gram)	± Analytical Uncertainty
Tumbleweed	UPR-200-E-77	09/04/03	60,000 dpm/100cm^2	^{60}Co	<2.5E+00	
				^{89,90}Sr	1.2E+00	± 4.2E+00
				^{134}Cs	<2.1E+00	
				^{137}Cs	<3.7E+00	
				^{152}Eu	<4.1E+00	
				^{154}Eu	<8.3E+00	
				^{155}Eu	<4.0E+00	
				^{Total}U	<1.2E+03	
				^{238}Pu	1.7E+00	± 6.9E+00
				^{239,240}Pu	1.3E+00	± 8.2E+00

(a) dpm = disintegrations per minute

(b) A "<" symbol indicates that the analyte was analyzed for but not detected. Uncertainty values were not reported by the laboratory for all results. To convert to international metric system units (SI), multiply pCi/g by 0.03704 to obtain Bq/g.

Table 7-2. Investigative Samples Not Analyzed, 2004. (2 sheets total)

DATE	SAMPLE MATRIX	LOCATION	FIELD READING (Beta/Gamma)
02/02/04	Specks	North end of 241-C Tank Farm	300,000dpm/100cm^2
02/03/04	Mud Dauber Wasp Nest	Crane #17T-5673 in 2711-E Shop	1,500dpm/100cm^2
02/03/04	Paint chips	233-S Demolition Site	63,000dpm/100cm^2 Alpha
02/04/04	Tumbleweeds (30)	218-E-12B	100,000dpm/100cm^2
02/05/04	Tumbleweeds (24)	218-E-12B	180,000dpm/100cm^2
02/06/04	Tumbleweeds (65)	218-E-12B	480,000dpm/100cm^2
02/12/04	Paint chips	233-S Demolition Site	210dpm/100cm^2 Alpha
02/18/04	Tumbleweeds (2)	UPR-600-20 (UN-216-E-41)Cross Site Transfer Line	6,000dpm/100cm^2
02/20/04	Tumbleweeds (6)	UPR-200-W-38 Waste Line Break @ 241-TX-154	11,000dpm/100cm^2
03/01/04	Mouse Fece	UPR-600-20 (UN-216-E-41)Cross Site Transfer Line	649,000dpm/100cm^2
03/04/04	Rabbit Feces	200-W-54 @ 241-S/SX/SY	10,000dpm/100cm^2
03/12/04	Starling	105-KE Control Room 11	90,000dpm/100cm^2
03/18/04	Switch Gear	Load Lugger @ 272-WA	82,000dpm/100cm^2
03/20/04	Tumbleweeds (3)	216-S-21 Crib (between 216-S-21 & 216-S-4)	30,000dpm/100cm^2
03/22/04	Specks	241-BX-155 Access Rd. between Atlanta & Baltimore	>1,000,000dpm/100cm^2
03/23/04	Rabbit Feces	In CA south of 272-S	200,000dpm/100cm^2
03/27/04	Tumbleweed (1)	CHG RMA-060 "Rock slinger"	21,000dpm/100cm^2
03/31/04	Rabbit Brush	216-B-59 Trench	102,000dpm/100cm^2
03/31/04	Rabbit Feces	216-B-59 Trench	60,000dpm/100cm^2
04/01/04	Tumbleweed (1)	216-A-18 Crib	150,000dpm/100cm^2
04/02/04	Mouse	NR-2-1 RMA conex, 100-N	8,000dpm/100cm^2
04/05/04	Tumbleweeds (2)	218-E-12A Burial Ground	85,000dpm/100cm^2
04/06/04	Tumbleweeds	218-E-12A Burial Ground	42,000dpm/100cm^2
04/06/04	Tumbleweeds (1)	218-E-12B Burial Ground	294,000dpm/100cm^2
04/08/04	Tumbleweeds (57)	218-E-12A Burial Ground	420,000dpm/100cm^2
04/13/04	Bird Feces	306-W Building	20,000dpm/100cm^2
04/13/04	Soil	216-B-8 Crib	18,000dpm/100cm^2
04/15/04	Soil	North side of 8th Street in 200-E-139	149,000dpm/100cm^2
04/22/04	Tumbleweeds	20'X30' Area of 216-B-63	72,000dpm/100cm^2
04/23/04	Mud Dauber Wasp Nest	105-H Rental Change Trailer	440,000dpm/100cm^2
04/29/04	Speck	North side of DACS Trailer @ 241-SY	65,000dpm/100cm^2
05/04/04	Steam line support poles	Adjacent to the 314 Building	58,000dpm/100cm^2
05/05/04	2-Red Ant Hills	218-E-2 Burial Ground	150,000dpm/100cm^2
05/10/04	Mud Dauber Wasp Nest	Vent Louvers 332 Building	4,000dpm/100cm^2
05/10/04	Soil Specks	Road South of Atlanta Ave and West of Baltimore	150,000dpm/100cm^2
05/12/04	Soil	215-A-36B Crib	240,000dpm/100cm^2
05/17/04	Specks	Outside west Fenceline of 241-S	136,000dpm/100cm^2
05/18/04	Wood Debris	221-B Plant Laydown Area	6,000dpm/100cm^2
06/01/04	Shoes	233-S Demolition Site	2,100dpm/100cm$^{2\ Alpha}$
06/02/04	Mouse Nest	Inside 2251-E Building south of 221-B Plant	4,000dpm/100cm^2
06/02/04	Soil Specks	Outside west gate of 241-A Tank Farm	150,000dpm/100cm^2
06/08/04	Paint Chip	Outside of 241-U Tank Farm Perimeter	160,000dpm/100cm^2
06/22/04	Soil	In excavation outside 234-5Z Plant	28,000dpm/100cm$^{2\ Alpha}$
06/24/04	Jumper Jigs	Outside the 277-W Fabrication Shop	9,000dpm/100cm^2
06/30/04	Tumbleweeds	UPR-600-20 (SCA W of 241-ER-151)	6,000dpm/100cm^2
07/03/04	Specks	UPR-600-20 (SCA W of 241-ER-151)	550,000dpm/100cm^2
07/12/04	Tumbleweeds	200-E-112, 241-B Process Sewer	240,000dpm/100cm^2
07/13/04	Tumbleweeds	200-E-112, 241-B Process Sewer	18,000dpm/100cm^2
07/21/04	Tumbleweed	216-B-25 Covered Trench BC Control Area	30,000dpm/100cm^2
07/29/04	Specks	241-CR Vault	>1,000,000dpm/100cm^2
08/03/04	Tumbleweed	200-W-63	72,000dpm/100cm^2
08/05/04	speck	241-S/SX/SY Tank Farm	250,000dpm/100cm^2
08/11/04	Tumbleweeds (3)	241-U-151 Diversion Box	120,000dpm/100cm^2
08/19/04	Tumbleweed Fragment	200-E-121 (East of 241-BX/BY)	10,000dpm/100cm^2
08/25/04	Tumbleweeds (30)	216-E-12B	100,000dpm/100cm^2

Table 7-2. Investigative Samples Not Analyzed, 2004. (2 sheets total)

09/03/04	Gravel	241-B-151 Diversion Box (UPR-200-E-77)	550,000dpm/100cm^2
09/07/04	Vegetation/Grout	241-B-151 Diversion Box (UPR-200-E-77)	30,000dpm/100cm^2
09/08/04	Ant Hill Speck	241-ER-151 Diversion Box	70,000dpm/100cm^2
09/09/04	Speck	241-S Tank Farm	86,000dpm/100cm^2
09/17/04	Tumbleweeds (20)	216-S-16 Pond	42,000dpm/100cm^2
09/17/04	Mud Dauber Wasp Nest	1712-N Insulator Shop	140,000dpm/100cm^2
09/21/04	Mud Dauber Wasp Nest	13-N Storage Building	167,000dpm/100cm^2
09/22/04	Tumbleweed	218-E-12B Burial Ground	90,000dpm/100cm^2
09/27/04	Tumbleweeds (100)	216-U-1 & 2 Cribs	198,000dpm/100cm^2
09/27/04	Rabbit Feces	241-C Tank Farm	>1,000,000dpm/100cm^2
09/28/04	Tumbleweeds	200-E-111 URM Pipeline	30,000dpm/100cm^2
09/29/04	Specks	241-C Tank Farm	100,000dpm/100cm^2
10/01/04	Mouse	241-U Tank Farm	300,000dpm/100cm^2
10/07/04	Soil	216-A-4 Crib	184,000dpm/100cm^2
10/11/04	Mouse	Unknown	30,000dpm/100cm^2
10/11/04	Nylon Rope	Vehicle G63-09249 inside 6290 Bldg. Rigging Loft	5,500dpm/100cm^2
10/14/04	Radioactive Sources	218-W-4A Burial Ground	15,000dpm/100cm^2
10/14/04	Sagebrush (1)	200-E-111 URM Pipeline	42,000dpm/100cm^2
10/18/04	Tumbleweeds (20)	UPR-200-E-88 TC-4 RR Spur	36,000dpm/100cm^2
10/20/04	Tumbleweeds	218-W-4A Burial Ground	24,000dpm/100cm^2
10/21/04	Tumbleweeds (2)	200-E-111 URM Pipeline	54,000dpm/100cm^2
10/22/04	Mouse Feces	North side of 241-BX/BY Tank Farm	25,000dpm/100cm^2
10/27/04	Tumbleweeds	216-U-14 Ditch South End	18,000dpm/100cm^2
10/28/04	Rabbit Feces	241-C Tank Farm	400,000dpm/100cm^2
10/29/04	Tumbleweeds	218-E-12B Burial Ground	120,000dpm/100cm^2
11/06/04	Tumbleweeds	218-E-1 Burial Ground	84,000dpm/100cm^2
11/08/04	Tumbleweed (1)	216-S-5 Crib	18,000dpm/100cm^2
11/08/04	Tumbleweeds	241-B Tank Farm	150,000dpm/100cm^2
11/11/04	Tumbleweed (1)	241-C Tank Farm	90,000dpm/100cm^2
11/11/04	Tumbleweeds	218-E-12B Burial Ground	540,000dpm/100cm^2
11/14/04	Specks	241-C Tank Farm	500,000dpm/100cm^2
11/14/04	Tumbleweeds (6)	URM Transfer Line 241-TX-152 to 241-U-152	15,000dpm/100cm^2
11/15/04	Tumbleweed Fragments	218-E-12B Burial Ground	300,000dpm/100cm^2
11/18/04	Speck	241-ER-151 Diversion Box	100,000dpm/100cm^2
11/20/04	Tumbleweeds	216-A-34 Crib	114,000dpm/100cm^2
11/21/04	Tumbleweeds	200-E-112, 241-B Process Sewer	6,000dpm/100cm^2
11/21/04	Tumbleweeds	216-A-8 Crib	144,000dpm/100cm^2
12/01/04	Tumbleweeds	216-U-10 Pond	120,000dpm/100cm^2
12/03/04	Tumbleweeds	216-U-10 Pond	10,000dpm/100cm^2
12/04/04	Tumbleweeds	216-U-10 Pond	5,000dpm/100cm^2
12/06/04	Tumbleweeds	216-S-6 Crib	90,000dpm/100cm^2
12/06/04	Tumbleweeds	216-S-17 Pond	32,000dpm/100cm^2
12/07/04	Tumbleweeds	216-S-17 Pond	90,000dpm/100cm^2
12/08/04	Shackle Pin	6290 Shop Building	2,000dpm/100cm^2
12/08/04	Tumbleweed Fragments	Outside NE corner of 241-U Tank Farm	55,000dpm/100cm^2
12/08/04	Tumbleweeds	216-S-5 Crib	18,000dpm/100cm^2
12/09/04	Tumbleweeds	UPR-600-20	16,500dpm/100cm^2
12/10/04	Tumbleweeds	218-E-12A Burial Ground	84,000dpm/100cm^2
12/12/04	Rabbit Brush	216-A Diversion Box	30,000dpm/100cm^2
12/12/04	Tumbleweeds	216-A-34 Crib	12,000dpm/100cm^2
12/12/04	Tumbleweeds	216-A-8 Crib	30,000dpm/100cm^2
12/12/04	Tumbleweeds	218-W-4B Burial Ground	45,000dpm/100cm^2
12/12/04	Tumbleweeds	216-A-24 Crib	30,000dpm/100cm^2
12/14/04	Specks (2)	outside of 241-BY Tank Farm Perimeter	300,000dpm/100cm^2
12/14/04	Tumbleweeds	200-E-127 (PUREX to 216-A-25 Pipeline)	12,000dpm/100cm^2
12/19/04	Tumbleweeds	218-E-2 & 218-E-9 Burial Grounds	18,000dpm/100cm^2