

# ornl

OAK RIDGE  
NATIONAL  
LABORATORY

MARTIN MARIETTA

OPERATED BY  
MARTIN MARIETTA ENERGY SYSTEMS, INC.  
FOR THE UNITED STATES  
DEPARTMENT OF ENERGY

MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES

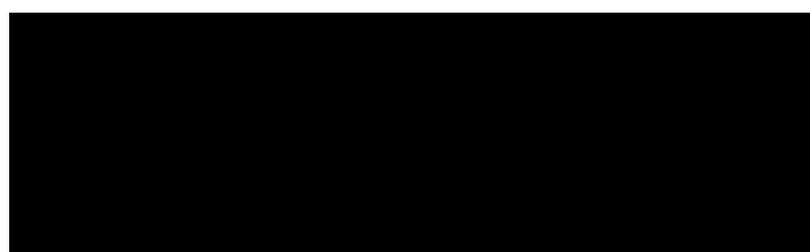


3 4456 0266592 5

ORNL/RAP-12/V3

## RCRA Facilities Assessment (RFA) Oak Ridge National Laboratory Addendum August 25, 1987

OAK RIDGE NATIONAL LABORATORY  
CENTRAL RESEARCH LIBRARY  
CIRCULATION SECTION  
4500N ROOM 175  
**LIBRARY LOAN COPY**  
DO NOT TRANSFER TO ANOTHER PERSON  
If you wish someone else to see this  
report, send in name with report and  
the library will arrange a loan.  
UCN-7969 13 9-77



per TIO  
2010

Printed in the United States of America. Available from  
the U.S. Department of Energy  
Technical Information Center  
P.O. Box 62, Oak Ridge, Tennessee 37830

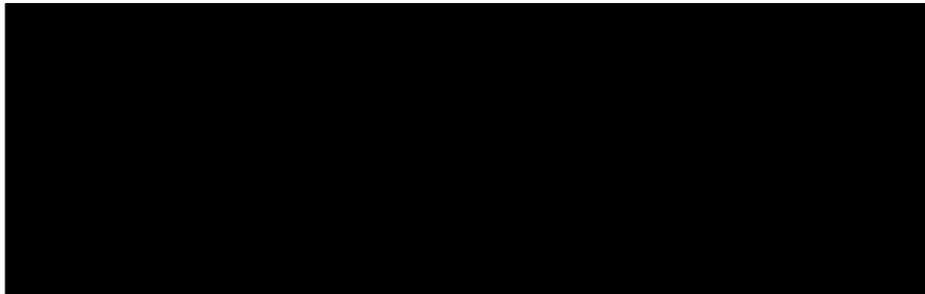
This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

ORNL/RAP-12/V3

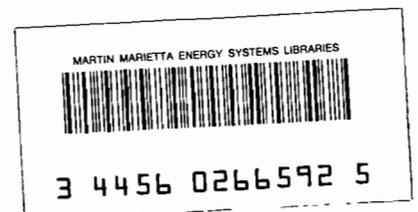
**RCRA FACILITIES ASSESSMENT (RFA)  
OAK RIDGE NATIONAL LABORATORY  
Addendum August 25, 1987**

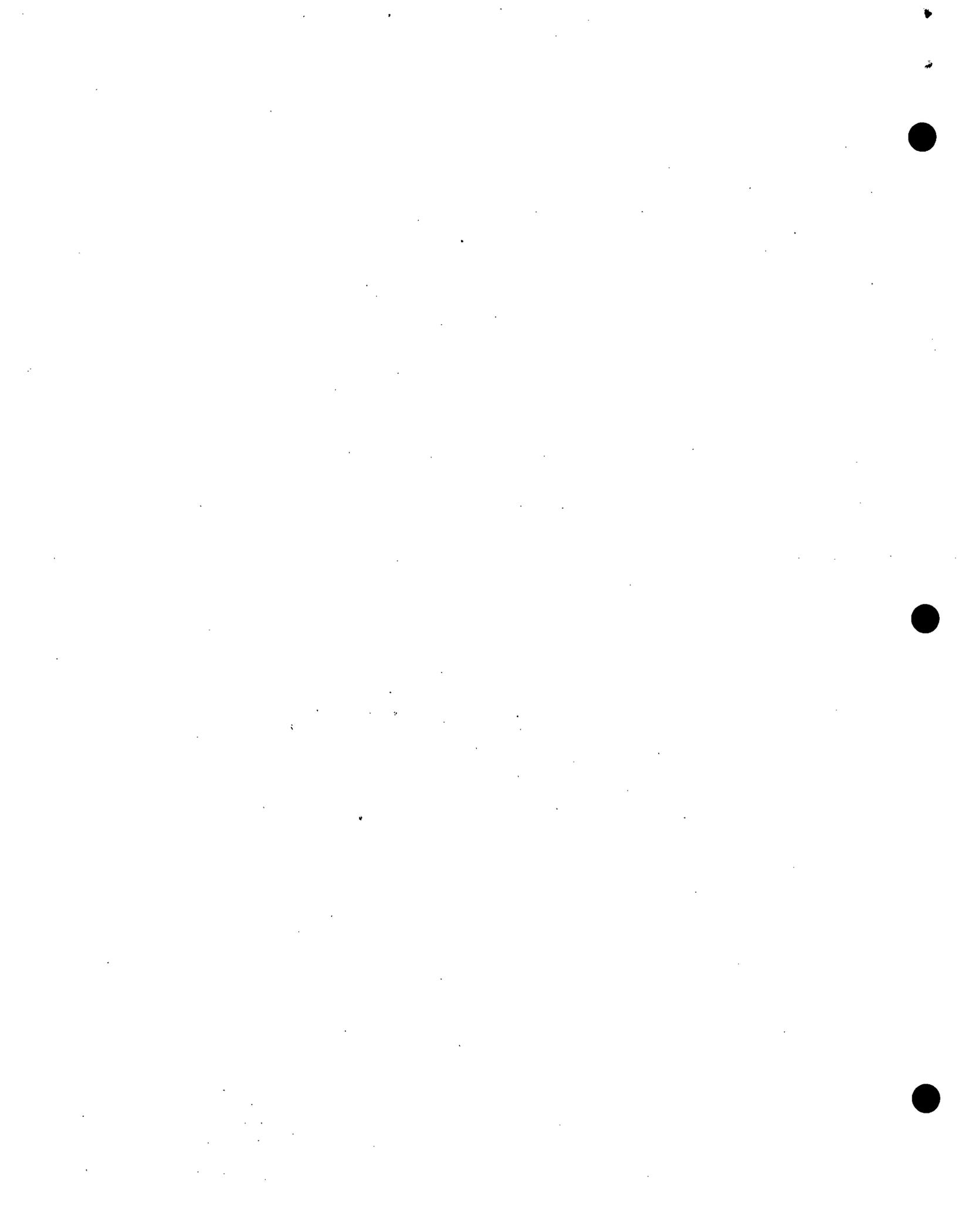
Date of Issue: August 1987

**NUCLEAR AND CHEMICAL WASTE PROGRAMS  
(Activity No. KG 02 00 00 0; ONLKG02)**



Prepared by the  
**OAK RIDGE NATIONAL LABORATORY**  
Oak Ridge, Tennessee 37831  
operated by  
**MARTIN MARIETTA ENERGY SYSTEMS, INC.**  
for the  
**U.S. DEPARTMENT OF ENERGY**  
under Contract No. DE-AC05-84OR21400





## CONTENTS

LIST OF TABLES .....	v
LIST OF FIGURES .....	vii
ABSTRACT .....	1
1. INTRODUCTION .....	3
2. ADDITIONAL SOLID WASTE MANAGEMENT UNITS (SWMUs) .....	5
3. ADDITIONAL SAMPLING SURVEY DATA FOR SELECTED WAGs .....	15
3.1 WAG 11—WHITE WING SCRAP YARD .....	15
3.2 WAG 12—CLOSED CONTRACTORS' LANDFILL .....	18
3.3 WAG 13—ENVIRONMENTAL RESEARCH AREAS .....	18
3.4 WAG 15—ORNL FACILITIES AT THE Y-12 PLANT .....	22
3.5 WAG 16—HEALTH PHYSICS RESEARCH REACTOR AREA .....	23
3.6 WAG 19—HAZARDOUS WASTE TREATMENT AND STORAGE FACILITIES ..	23
3.7 OTHER SITES—ABANDONED BURN PIT .....	24
4. REVISION OF WAG BOUNDARY .....	27
5. SUMMARY .....	29
5.1 REGULATORY STATUS OF ADDITIONAL SWMUs AND SELECTED WAGs ..	29
5.2 RI/FS SCHEDULE REVISIONS .....	30
APPENDIX A .....	35
APPENDIX B .....	53



## LIST OF TABLES

Table		Page No.
2.1	Addendum to ORNL SWMU listing .....	5
2.2	Environmental Research Areas .....	14
3.1	Survey results from WAG 11 in 1987 .....	15
3.2	Survey results from piezometer wells at WAG 11 .....	17
3.3	Survey results from piezometer wells at WAG 12 .....	20
3.4	Survey results from WAG 12 in 1987 .....	20
3.5	Survey results from WAG 13 in 1987 .....	22
3.6	Survey results from WAG 16 in 1987 .....	23
3.7	Survey results from Abandoned Burn Pit in 1987 .....	26
4.1	Recommended actions for additional SWMUs .....	29
4.2	Recommended actions for the WAGs .....	31
4.3	Preliminary schedules for ORNL Remedial Investigations/Feasibility Study .....	33
B.1	Recommended actions for the Environmental Research Areas .....	56



## LIST OF FIGURES

Figure		Page No.
2.1	WAG 1—Main Plant Area, showing locations of new SWMUs 1.55, 1.56a, and 1.56b .....	7
2.2	WAG 5—Solid Waste Disposal Area 5, showing locations of new SWMUs 5.11, 5.12, and 5.13 .....	8
2.3	WAG 7—LLW Pits and Trenches Area, showing locations of new SWMUs 7.4d and 7.11 .....	9
2.4	WAG 8—Melton Valley Area, showing location of new SWMU 8.11 .....	10
2.5	WAG 16—Health Physics Research Reactor Area, showing location of new SWMUs 16.3, 16.4, and 16.5 and new sampling site .....	11
2.6	WAG 19—Hazardous Waste Treatment and Storage Facilities, showing location of new SWMUs 19.7 and 19.8 .....	12
3.1	WAG 11—White Wing Scrap Yard, showing location of new sampling sites (stream and well samples) .....	16
3.2	WAG 12—Closed Contractors' Landfill, showing locations of new sampling sites ...	19
3.3	WAG 13—Environmental Research Areas, showing locations of new sampling sites .	21
3.4	OS-1—Abandoned Burn Pit, showing location of new sampling sites .....	25
4.1	WAG 2—White Oak Creek/White Oak Lake .....	28
B.1	Locations of Environmental Research Areas .....	57
B.2	Locations of Environmental Research Areas .....	58
B.3	Locations of Environmental Research Areas .....	59
B.4	Locations of Environmental Research Areas .....	60



## ABSTRACT

The Resource Conservation and Recovery Act (RCRA) Facilities Assessment (RFA) report identified approximately 250 Solid Waste Management Units (SWMUs) that were grouped into 20 Waste Area Groupings (WAGs).

Descriptions of SWMUs included location, type, size, dates of operation, type of waste handled, and evidence of releases. Analytical results from preliminary sampling studies around each of the WAGs served as the basis for recommendations concerning further actions, Remedial Investigations (RIs), or deletion from any additional action under RCRA Section 3004(u). For several of the WAGs the evidence concerning the possible release of contaminants was inconclusive and additional sampling was recommended. Also a number of additional SWMUs and Environmental Research Areas (non-SWMUs) were listed but descriptive data were not submitted.

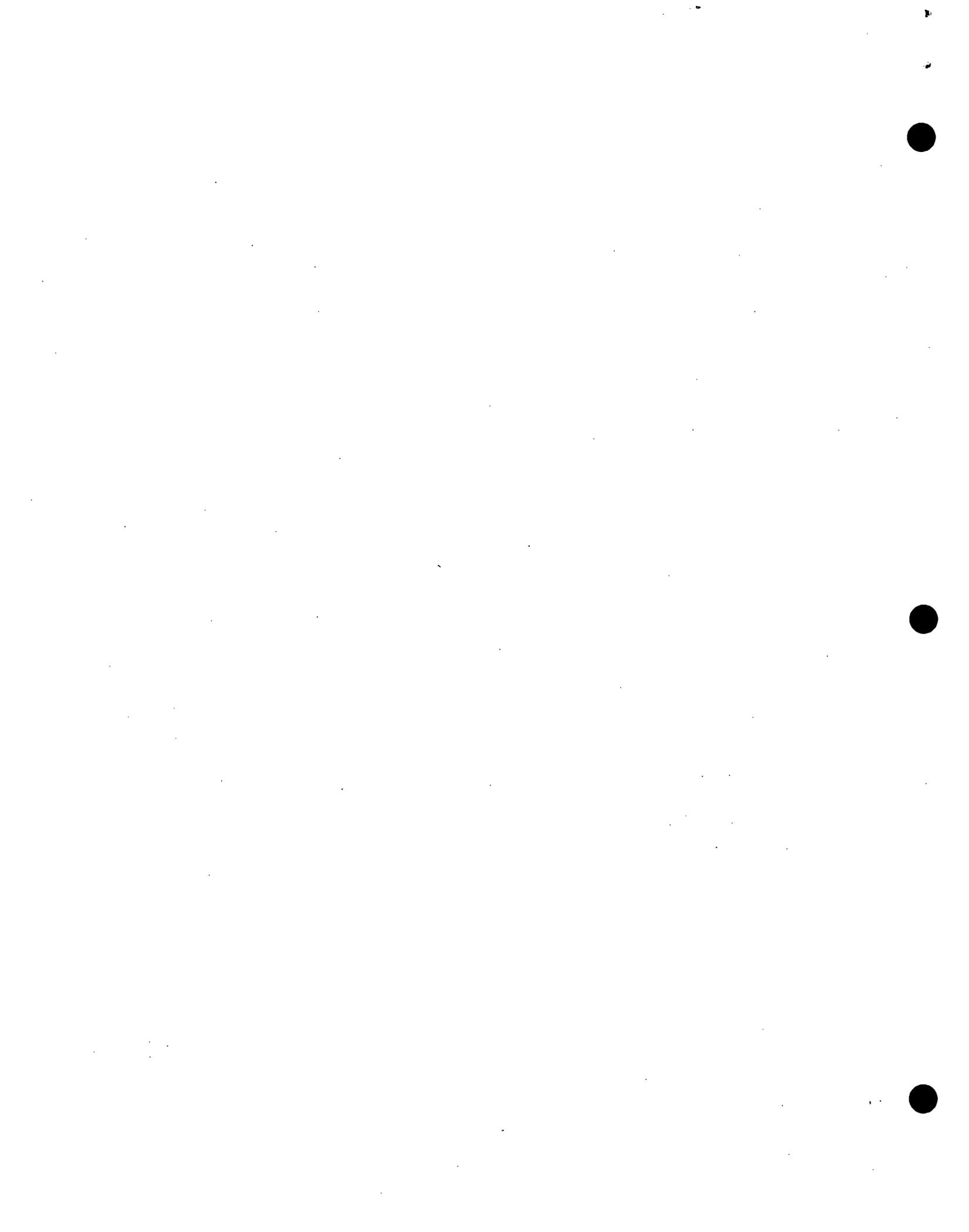
The purpose of this Addendum is to report the analytical data from additional sampling surveys of selected WAGs, to make recommendations concerning future remedial actions at these WAGs, and to provide descriptive information for additional SWMUs that were identified in the RFA.

Descriptions of additional SWMUs include summary sheets, selected sampling data, and recommendations for future RCRA Section 3004(u) remedial actions. Summary sheets for 34 Environmental Research Areas are included to maintain a comprehensive inventory of all ORNL potential remedial action sites.

Analytical results from additional sampling of selected WAGs are presented. Based on results from these previous sampling campaigns, recommendations concerning the necessity for RI Plans for all WAGs are included. This completes the RFA process for those SWMUs (excluding the container storage accumulation areas) listed in the HSWA RCRA permit for the ORNL Hazardous Waste Storage Facility, Building 7652.

Also included in this Addendum is a revised schedule for remedial investigations/feasibility studies (RI/FS).

This Addendum is a supplement to the RFA. Since information concerning the rationale for identifying releases, the sampling survey methodology, and the background information for each WAG is presented in the RFA, it is not repeated in the Addendum.



## 1. INTRODUCTION

The *RCRA Facilities Assessment (RFA)* report identified approximately 250 Solid Waste Management Units (SWMUs) that were grouped into 20 Waste Area Groupings (WAGs). Identification of each SWMU included information as to location, type, size, dates of operation, type of waste handled, and evidence of releases. Preliminary sampling studies were performed around each WAG to determine if there was evidence of releases beyond its perimeter. Analytical results from the surveys and historical information were the basis for recommendations concerning further actions for each WAG. Remedial investigations (RIs) were recommended for WAGs 1-10 and 17; for WAGs 14, 16, 18, and 20, it was suggested that they be removed from further consideration for remedial action. For the remaining WAGs (11, 12, 13, 15, and 19) the evidence concerning the possible release of contaminants was inconclusive and additional sampling was recommended. The purpose of this Addendum is to report the analytical data obtained from the additional surveys, to make recommendations concerning future remedial actions within these WAGs, and to provide descriptive information for additional sites listed in Table 1.2 of the RFA.

Since information concerning the rationale for identifying releases, the sampling survey methodology, and background information for each WAG is presented in the RFA, it is not repeated in this Addendum.



## 2. ADDITIONAL SOLID WASTE MANAGEMENT UNITS (SWMUs)

During the preparation of the original RFA, several additional SWMUs were discovered (see Table 2.1). No description of these additional sites was included in the RFA because there was insufficient time for an assessment of their potential for releases. Summary sheets for these newly identified sites are included in Appendix A.

Nine of the 17 SWMUs listed in Table 2.1 are septic tanks. There is no evidence that hazardous substances have been discharged into the tanks; therefore, it is recommended that they be

Table 2.1 Addendum to ORNL SWMU listing

SWMU No.	Description
<b>WAG 1</b>	
1.36	Inactive LLW Waste Collection Tank (WC-4)
1.55	Septic tank for Building 5505 (5507)
1.56a,b	Inactive LLW waste collection tanks (W-19, W-20) (formerly listed as part of the Metal Recovery Facility)
<b>WAG 5</b>	
5.11	Septic tank (7831)
5.12	Septic tank (7860)
5.13	Septic tank (7853)
<b>WAG 7</b>	
7.4d	Transfer line from Decontamination Facility to Pit 1
7.11	Septic tank (7819)
<b>WAG 9</b>	
9.4	Septic tank (7503)
<b>WAG 16</b>	
16.3	Buried scrap metal
16.4	Septic tank (7709)
16.5	Septic tank (7710)
<b>WAG 19</b>	
19.7	Soil injection of radioactive gas (7659c)
19.8	Explosive and shock-sensitive waste detonation facility (7667)
<b>Other Sites</b>	
OS.1	Abandoned burn pit near sanitary waste compactor (0904)
OS.2	Septic tank (0907) at Katy's Kitchen

deleted from consideration as potential sources of continuing release of hazardous constituents. As will be seen in later discussions, most of these tanks are located in WAGs that will require the preparation of an RI Plan.

Table 2.1 indicates that three additional SWMUs have been identified in WAG 1, and SWMU 1.36 is listed only for the purpose of indicating a change in operational status from active to inactive (no Summary Sheet is included in Appendix A, because the data in the RFA are still correct). SWMUs 1.56a and 1.56b (inactive LLW waste collection tanks W-19 and W-20) were originally included as a component of the non-SWMU remedial action site 1A.7 (Metal Recovery Facility) but have now been removed from that facility and identified as SWMUs. Finally, a septic tank (SWMU 1.55) has been identified and added to the list. The locations of these SWMUs are given in Fig. 2.1.

The number of SWMUs in WAG 5 has been increased to 13 by the addition of 3 septic tanks that were installed to provide sewage services to remote experimental facilities located in the WAG (Fig 2.2). The addition of these SWMUs does not alter the recommendation for WAG 5 that was presented in the RFA.

WAG 7 (LLW Pits and Trenches Area) has had two SWMUs added: a septic tank (SWMU 7.11) and a leak site in a waste transfer line (SWMU 7.4d) (Fig. 2.3). The RFA indicated that an RI Plan will be required for WAG 7, and the addition of another leak site does not alter the initial recommendation.

An additional SWMU (SWMU 8.11) has been included in WAG 8 (Melton Valley Area). Addition of this septic tank (see Fig. 2.4) does not alter the recommendation of the RFA to develop an RI Plan for WAG 8.

WAG 16 (Health Physics Research Reactor Area) has had three additional SWMUs identified. Two of these are septic tanks, and the third site is a buried scrap metal area (Fig. 2.5). Although the two septic tanks are not considered sources of hazardous waste discharge, the scrap metal area is a potential source. Since the RFA recommended eliminating WAG 16 from further 3004(u) evaluations, additional sampling has been conducted at this WAG (see Sect. 3).

Two additional SWMUs have been added to WAG 19 (Hazardous Waste Treatment and Storage Facilities) (Fig. 2.6). Investigations conducted after these SWMUs were included in the RFA indicated that SWMU 19.7 (Soil Injection of Radioactive Gas) was identified based on incorrect verbal information, and that no gas (radioactive or nonradioactive) was injected at the site. The experiment conducted was a thermal study performed for the high-level radioactive waste



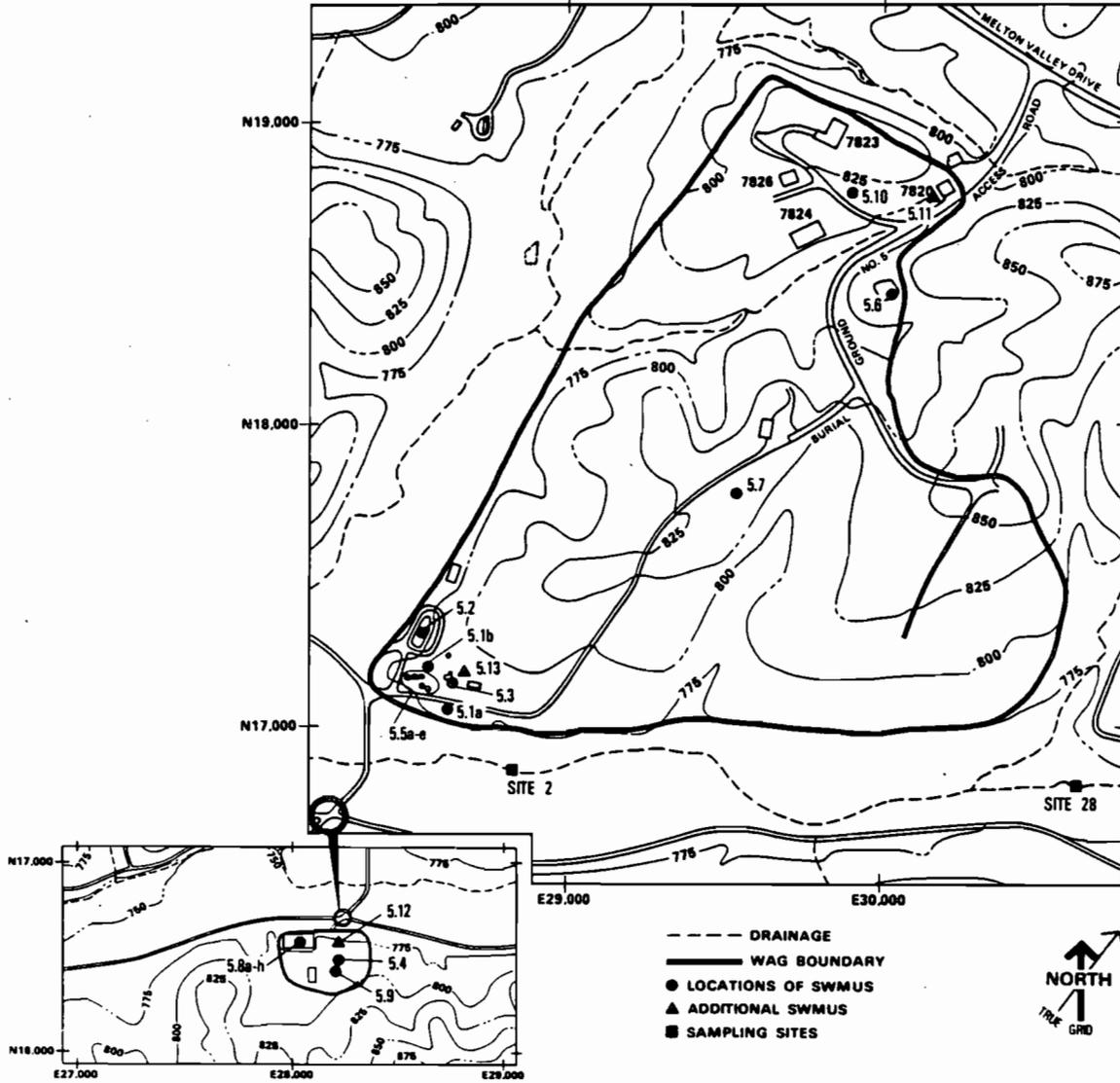


Fig. 2.2. WAG 5—Solid Waste Disposal Area 5, showing locations of additional SWMUs 5.11, 5.12, and 5.13.

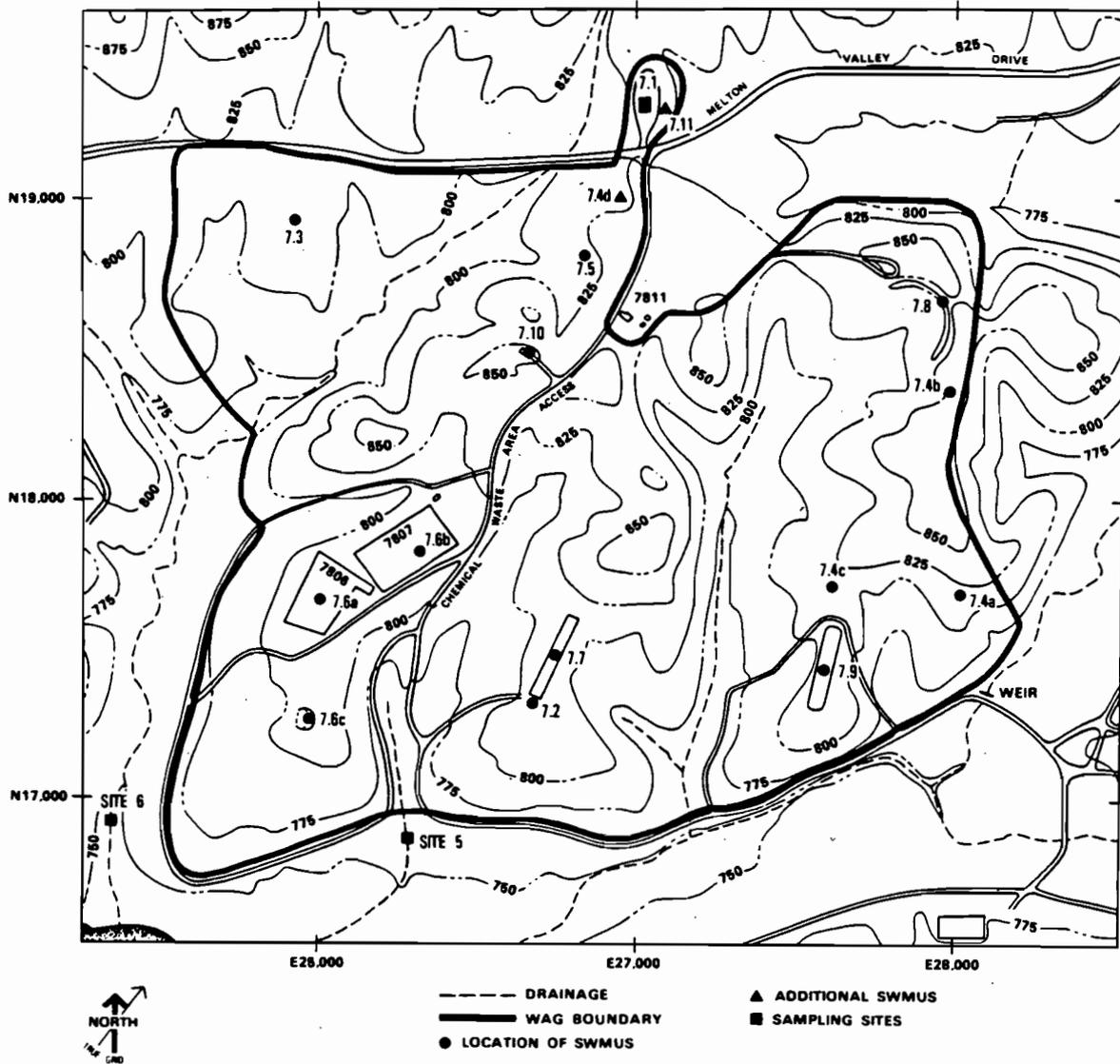


Fig. 2.3. WAG 7—LLW Pits and Trenches Area, showing locations of additional SWMUs 7.4d and 7.11.

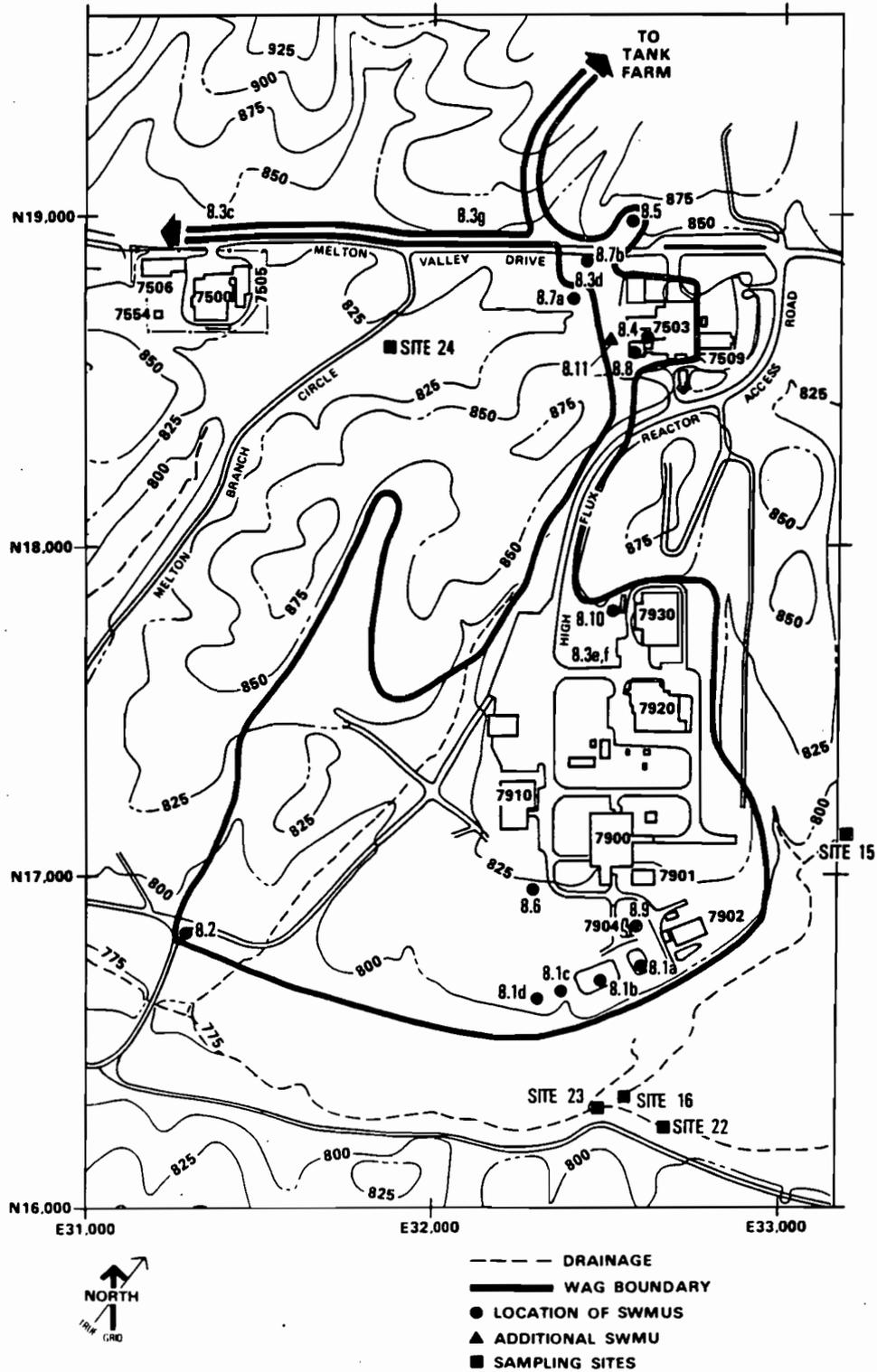


Fig. 2.4. WAG 8—Melton Valley Area, showing location of additional SWMU 8.11.

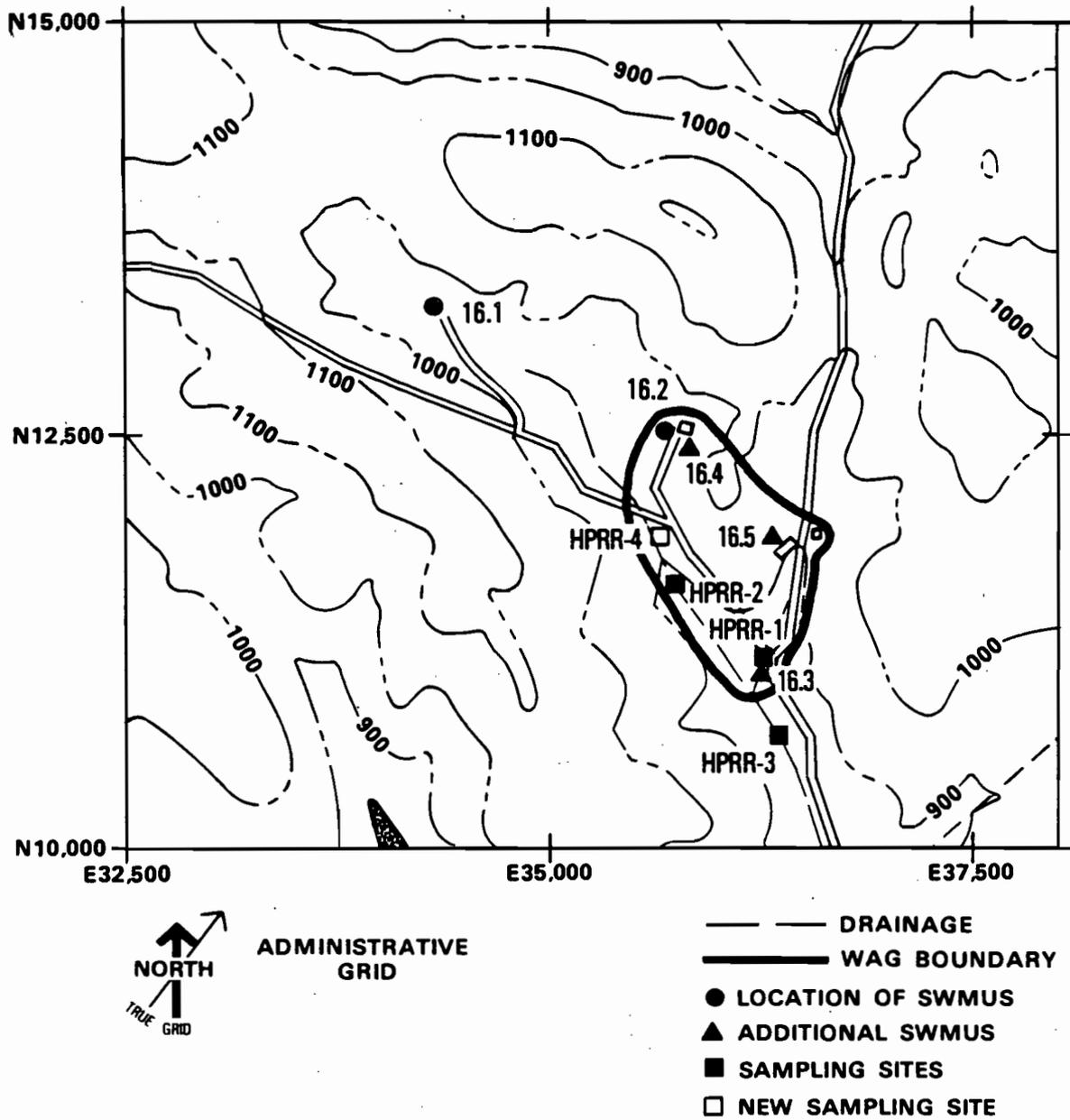


Fig. 2.5. WAG 16—Health Physics Research Reactor Area, showing location of additional SWMUs 16.3, 16.4, and 16.5 and new sampling site (HPRR-4).

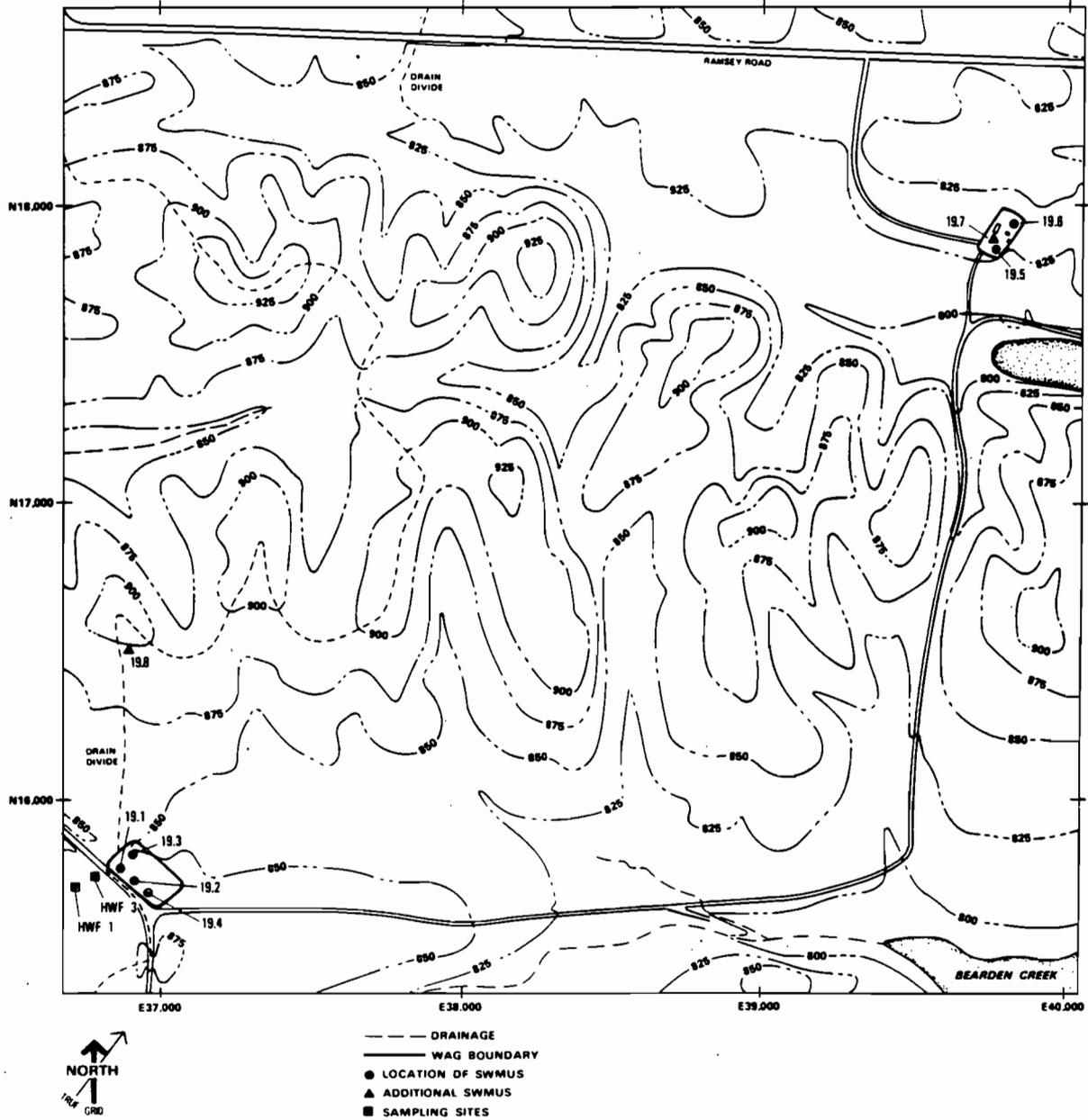


Fig. 2.6. WAG 19—Hazardous Waste Treatment and Storage Facilities, showing location of additional SWMUs 19.7 and 19.8.

repository program and did not involve any waste materials. Although it had previously been identified as an SWMU, current information indicates that it should be removed from the RCRA Section 3004(u) SWMU listing. SWMU 19.8 (Explosive and Shock-Sensitive Waste Detonation Facility) was only recently constructed and has not been used. It will be managed according to present RCRA standards (as well as other pertinent management practices), and a RCRA permit application will be submitted when the new "subpart X" requirements are finalized. Additional discussion of WAG 19 is included in Sect. 3.

The final new SWMUs are located outside the WAG boundaries that were developed for the RFA. One of these is the Abandoned Burn Pit (OS-1), which is discussed in Sect. 3, and the second is a septic tank located at a remote facility locally known as "Katy's Kitchen." There is no record of this tank receiving hazardous wastes, and it appears that it should be removed from further consideration under RCRA Section 3004(u).

Although they are not regulated under RCRA Section 3004(u), surplus facilities were included in the RFA site list to maintain a comprehensive inventory of all Oak Ridge National Laboratory (ORNL) potential remedial action sites. In accordance with this policy, we have listed additional contaminated sites, the Environmental Research Areas (Table 2.2), and have prepared information summaries similar to those included in the RFA (see Appendix B) for surplus facilities.

Table 2.2 Environmental Research Areas

Site No.	Site description
ER-1	Ca-45 tagged trees
ER-2	Ca-45 tagged soil and vegetation
ER-3	Na-22 contaminated soil
ER-4	Cs-137 bagged leaves study
ER-5	Hg-197 tagged stream
ER-6	Cs-134 tagged tree
ER-7	Ca-45 tagged forest
ER-8	Cs-137, Fe-59 contaminated animal pens (McNew Hollow)
ER-9	Hg-203 tagged stream
ER-10	H-3 contaminated trees
ER-11	Cs-137, Co-60 contaminated forest area
ER-12	Cs-134 contaminated oak trees
ER-13	Zn-65 tagged red oak seedlings
ER-14	Cs-134 contaminated pine and oak seedlings
ER-15	Rb-86 contaminated plants
ER-16	Cs-134 contaminated soybean and sorghum
ER-17	Cs-134 contaminated grasses
ER-18	Cs-134 contaminated lichens and mosses
ER-19	Tc-95m contaminated soil and plants
ER-20	Tc-95m uptake studies
ER-21	Tc-95m and I-131 contaminated pasture
ER-22	Cr-51 contaminated grass plots
ER-23	Tc-99 and Np-237 contaminated soil lysimeters
ER-24	Cs-137 contaminated forest floor
ER-25	Cs-137 contaminated forest understory
ER-26	Cs-137 contaminated meadow
ER-27	Cs-134 contaminated persimmon tree
ER-28	Co-60 and Mn-54 animal study
ER-29	C-14 maintenance-respiration study
ER-30	C-14 sucrose inoculation of oak and pine trees
ER-31	C-14 allocation in white oak trees
ER-32	C-14 allocation in white pine trees
ER-33	C-14 efflux in yellow poplar stand
ER-34	C-14 allocation in woody biomass plantation species

### 3. ADDITIONAL SAMPLING SURVEY DATA FOR SELECTED WAGS

The RFA recommended additional sampling for WAGs 11, 12, 13, 15, and 19. This section presents the results of these additional surveys along with recommendations concerning regulatory status. Additional data from WAG 16 are included because of the discovery of the Buried Scrap Metal Area. Another category, Other Sites, is used because some of the newly discovered SWMUs do not fit within any current WAG boundary.

#### 3.1 WAG 11—WHITE WING SCRAP YARD

Analytical results obtained from water, mud, and stream sediment samples were summarized in the RFA. A follow-up sampling program was conducted in May 1987, and the results are presented in Table 3.1. Five sites (Fig. 3.1) were sampled including one site (WW-2) sampled in the previous

Table 3.1. Survey results from WAG 11 in 1987

Element	BKDG	WW-2	WW-3	WW-4	WW-5	WW-6
<i>Gravels<sup>a</sup></i>						
Pu-239 <sup>b</sup>	0.63	0.04 ± 0.19	0.06 ± 0.12	<0.05		0.05 ± 0.13
U-238 <sup>b</sup>	14.4	66 ± 3	6.4 ± 1	14		3.8 ± 0.9
Sr-90 <sup>b</sup>	5.2	0.3 ± 4.5	7.9 ± 6	6.0		2.5 ± 4.1
Cd <sup>c</sup>	0.05	0.40	0.27	0.22	0.13	0.20
Cr <sup>c</sup>	0.4	0.81	1.1	0.47	0.46	0.45
Cu <sup>c</sup>	0.5	2.8	1.1	0.79	1.5	0.76
Ni <sup>c</sup>	4.8	12	4.2	12	6.6	10
Pb <sup>c</sup>	2.0	3.6	<2.0	<2.0	<2.0	<2.0
Zn <sup>c</sup>	3.8	29	6.5	10	6.7	11
<i>Water (Bq/L)</i>						
Pu-239			<0.01	<0.01		<0.01
U-238			0.014 ± 0.005	0.0005 ± 0.0044		0.0036 ± 0.0061
Sr-90	<0.2		0.09 ± 0.12	0.06 ± 0.11		0.12 ± 0.12
<i>Semivolatile organics (µg/kg)</i>						
Di-n-butylphthalate			4400	4400		

<sup>a</sup>Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in µg/g.

<sup>b</sup>Backgrounds estimated from the mean of samples collected at several remote sampling sites (*Environmental Surveillance Report—Oak Ridge, 1986*).

<sup>c</sup>Backgrounds estimated from several uncontaminated samples. Values are those typical for Conasauga shale.

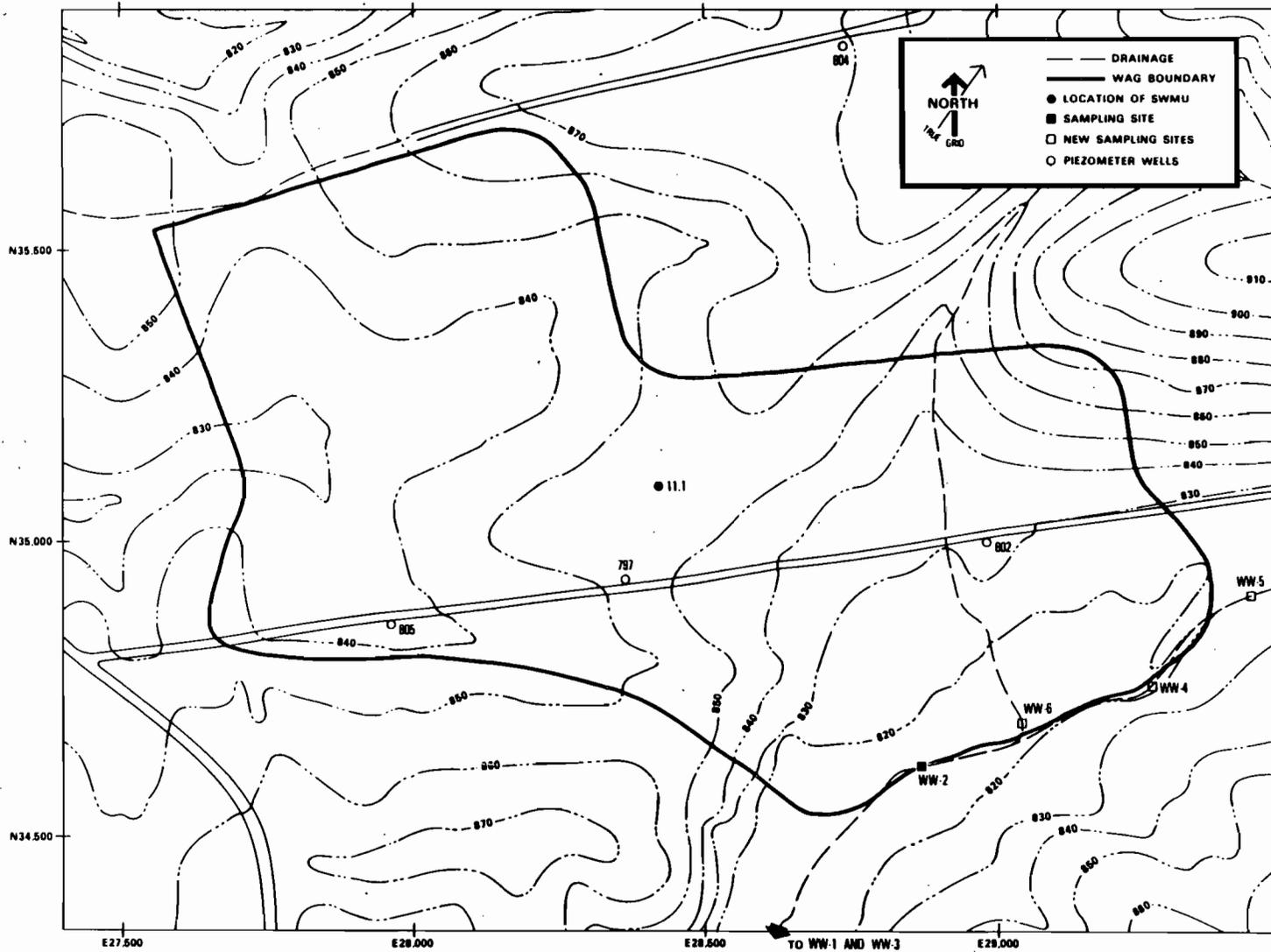


Fig. 3.1. WAG 11—White Wing Scrap Yard, showing location of new sampling sites (stream and well samples).

survey. Sites WW-2, WW-6, and WW-4 are located within the WAG. Site WW-5 is slightly upstream, and W-3 is downstream south of the scrap yard. For the extractable metals from the stream gravel samples, concentrations of Cd, Cu, and Zn were 5 to 8 times background levels at WW-2. Cadmium exceeded background levels in all samples but was the highest at WW-2. Remaining metal concentrations that were detected did not exceed 2 times background at any of the sites.

Radionuclide concentrations in the stream gravels were below background levels in most samples. The concentrations of U-238 were about five times background at site WW-2, and Sr-90 levels were slightly above background at WW-3 and WW-4.

As in the previous survey, the only semivolatile organic detected was di-n-butylphthalate, a component of plastic materials that is common in sediments.

Groundwater samples were taken from selected piezometer wells in WAG 11, and the results from a metals analysis are summarized in Table 3.2 (for well locations, consult Fig. 3.1). Most of the values obtained from the downgradient wells are not significantly above those observed in the upgradient well; however, the concentration of chromium in the upgradient well is above the National Interim Primary Drinking Water Standard. Magnesium concentrations in downgradient wells ranged from 20 to 140 times the value observed in the upgradient well.

Analysis of groundwater samples for volatile and semivolatile organics established the presence of three volatile contaminants, methylene chloride, trichloroethylene, and acetone at concentrations of 6 ppb, 184 ppb, and 23 ppb respectively. Only methylene chloride was detected in more than one sample. Concentrations of all the semivolatile organics were below detection limits. The

Table 3.2. Survey results from piezometer wells at WAG 11

Well No.	Metals <sup>a</sup> (mg/L)							
	Al	Ba	Cu	Cr	Fe	Mg	Mn	Zn
797	1.3	0.089	0.063	nd <sup>b</sup>	1.3	19	0.076	0.035
802	0.57	0.029	0.054	nd	0.37	14	0.048	0.033
805	0.85	0.031	0.010	0.084	0.97	2.7	0.044	0.030
804 <sup>c</sup>	1.2	0.083	0.059	0.35	0.46	0.13	0.028	0.021

<sup>a</sup>Only those metals that were detected in at least one sample are included.

<sup>b</sup>nd = not detected

<sup>c</sup>Upgradient wells.

concentration of trichloroethylene is significantly above the recently determined allowable limit of 5 ppb in drinking water.

Previous radiological surveys detected surface radiation levels up to 5 mrad/h; however, the source of these "hot spots" remains undetermined.

Based on the results from previous scoping studies (RFA) and those presented in this Addendum, it appears that WAG 11 is not a significant source of releases of hazardous constituents. There remain, however, uncertainties concerning the source of elevated levels of Cr, Cd, some organic contaminants, and surface radiation "hot spots." Further investigations are needed to resolve these concerns. Evidence indicates that an RI Plan is needed for WAG 11.

### **3.2 WAG 12—CLOSED CONTRACTORS' LANDFILL**

Results from previous scoping surveys presented in the RFA were inconclusive concerning the possible release of organic contaminants. Accordingly, additional samples were collected at two sites adjacent to the landfill (Fig. 3.2 and Table 3.3) and analyzed for semivolatile organic constituents. As was the case in previous surveys, the only semivolatile organics detected were the phthalates, a fairly common component found in sediments.

Since a number of piezometer wells have been installed in and around WAG 12, groundwater samples were taken for metals analysis. Relatively high concentrations of Al, Ba, Fe, Mg, and Mn were found in one of the downgradient wells (915), while elevated levels of Cr were seen in another (913). Volatile organics detected included methylene chloride and 1,2 dichloroethane at concentrations of 7 ppb and 5 ppb respectively. The only semivolatile organic detected was di-n-butylphthalate at a level of 10 ppb (see Table 3.4).

Based on the results presented in the RFA and those of additional surveys, including analysis of groundwater (reported here), it does not appear that WAG 12 is a source of past releases. ORNL recommends that WAG 12 be removed from further consideration as a RCRA Section 3004(u) site.

### **3.3 WAG 13—ENVIRONMENTAL RESEARCH AREAS**

This WAG contains two sites that were handled as SWMUs (13.1 and 13.2) in the RFA; however, ORNL has subsequently determined that these sites are non-SWMUs because they do not fall

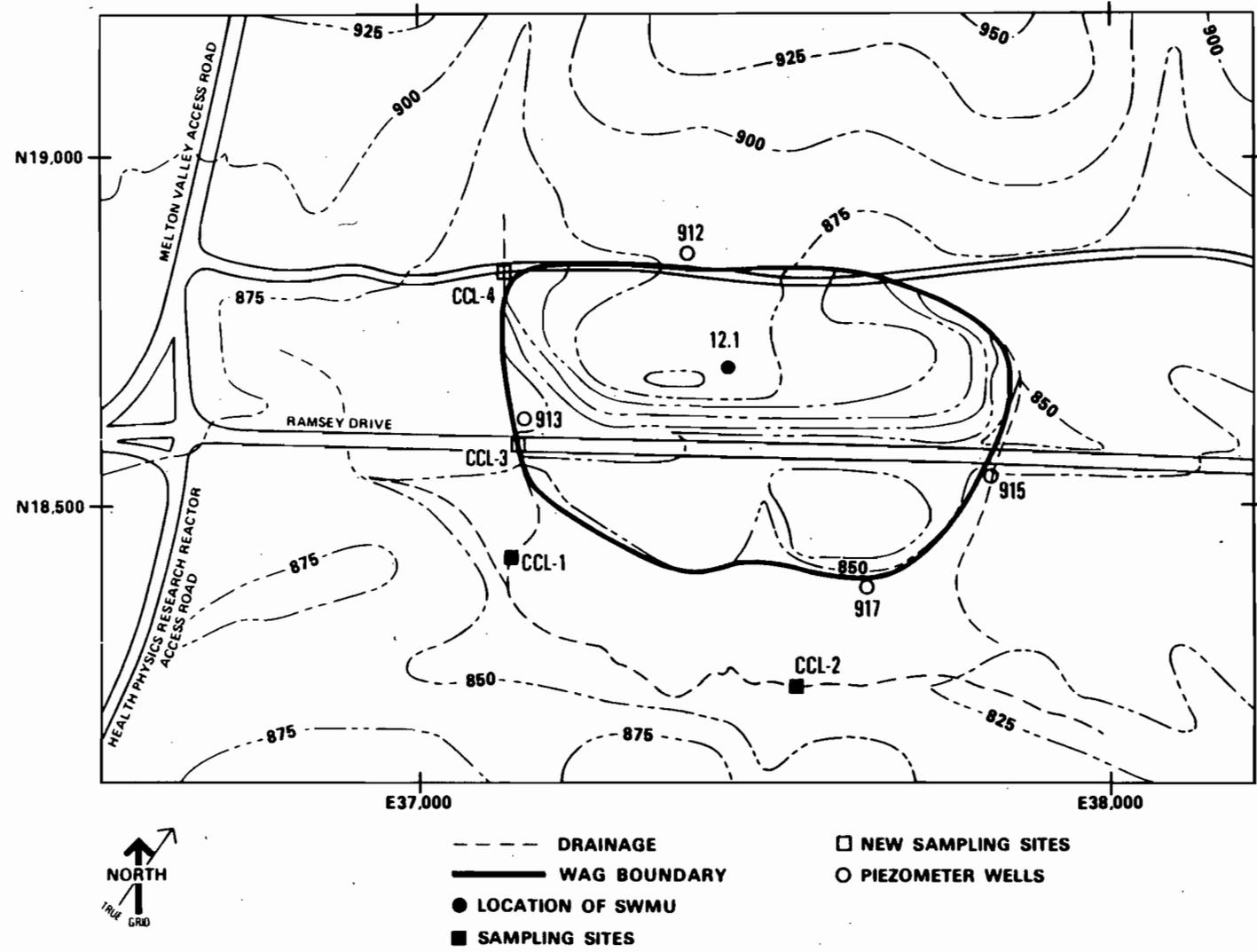


Fig. 3.2. WAG 12—Closed Contractors' Landfill, showing locations of new sampling sites.

**Table 3.3. Survey results from piezometer wells at WAG 12**

Well No.	Metals <sup>a</sup> (mg/L)							
	Al	Ba	Cu	Cr	Fe	Mg	Mn	Zn
913	nd	0.079	nd	0.14	0.045	13	0.016	nd
917	0.32	0.17	nd	0.065	0.53	5.2	0.066	nd
915	8.5	0.31	nd	nd	49	19	27	0.025
912 <sup>c</sup>	0.17	0.060	nd	nd	0.22	3.9	0.023	nd

<sup>a</sup>Only those metals that were detected in at least one sample are included.

<sup>b</sup>nd = not detected

<sup>c</sup>Upgradient wells.

**Table 3.4. Survey results from WAG 12 in 1987**

Element	Background <sup>a</sup>	CCL 3	CCL 4
<i>Water</i> (Bq/L)			
Co-60	<0.2	<0.2	
Sr-90	<0.2	0.08 ± 0.12	
Cs-137	<0.2	<0.3	
<i>Semivolatile organics</i> (µg/kg)			
Di-n-butylphthalate		4600	4400
Bis(2-ethylhexyl) phthalate		7000	1100

<sup>a</sup>Backgrounds estimated from the mean of samples collected at several remote sites (*Environmental Surveillance Report-Oak Ridge, 1986*).

under the guidelines used to identify SWMUs. Preliminary survey data detected minimal contamination from site 13.2, but levels of Cs-137 at site 13.1 were considerably above background. Recommendations in the RFA for WAG 13 included collection of additional samples to better define the extent of Cs-137 migration from site 13.1. Additional samples were taken from two locations that are between site 13.1 and the original sampling point (Fig. 3.3), and the results are shown in Table 3.5. It is evident that Cs-137 has migrated from site 13.1, as the concentrations in the soil are 15 to 60 times background.

Based on the results from the sampling surveys, ORNL recommends that interim corrective measures be employed at site 13.1 to limit further radionuclide migration. Since all contaminated

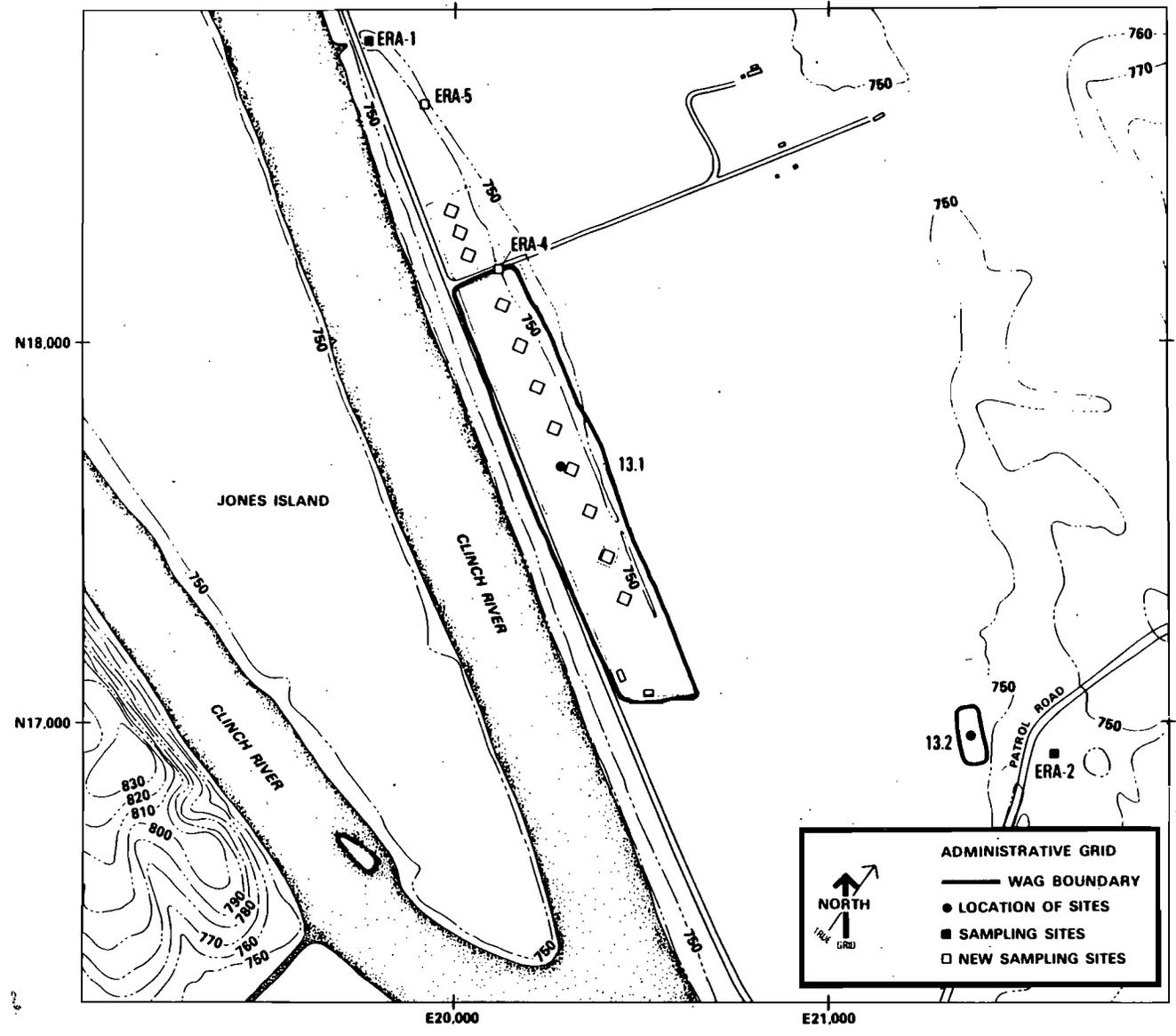


Fig. 3.3. WAG 13—Environmental Research Areas, showing locations of new sampling sites.

**Table 3.5. Soil survey results from WAG 13 in 1987 (Bq/kg)**

Element	Background <sup>a</sup>	ERA-4	ERA-5
Co-60	<2	<2	2
Cs-137	40.7	580 ± 10	2300 ± 100

<sup>a</sup>Backgrounds estimated from the mean of samples collected at several remote sites (*Environmental Surveillance Report-Oak Ridge, 1986*).

sites within the WAG boundary are non-SWMUs, WAG 13 should be deleted from further consideration under RCRA Section 3004(u). However, continued surveillance and corrective action are warranted and will be implemented under CERCLA (SARA) and applicable DOE Orders.

### 3.4 WAG 15—ORNL FACILITIES AT THE Y-12 PLANT

The SWMUs at the Y-12 Plant include areas where surplus transformers and capacitors containing PCBs were located and Building 9201-2, where ORNL operated a cyclotron using Z-oil as the coolant. The only documented release was an instance where records indicate that PCB-contaminated oils leaked from one transformer located at the SY-200 Scrap Yard. Oil contained in this transformer had PCB concentrations ranging from 2 to 17 ppm.

In order to determine the possible existence of the residual PCB contamination resulting from the reported oil leak and other sites where transformers and capacitors were stored, several soil samples were collected and analyzed for PCBs (PCB-1254 and PCB-1260). Several samples were taken in the area of the oil leak and in areas where there was no visible evidence of contamination. Concentrations ranged from less than 1 ppm to 10 ppm. Only 2 samples out of the total of 14 had concentrations greater than 3 ppm, and both of these were outside the known oil leak site. Based on the results of this preliminary survey, it is concluded that the ORNL SWMUs (transformer sites) at the Y-12 Plant are not a source of continuing release.

Since the submittal of the RFA, arrangements have been made with Environmental Protection personnel at the Y-12 Plant to include these sites in their Remedial Action Program. Our assessment of these SWMUs will be forwarded to them to be integrated into their plans. Pursuant to the discussions with Y-12 Plant personnel, WAG 15 is being removed from the ORNL RAP list.

Other non-SWMU sites will be covered under the Surplus Facilities Management Program.

### 3.5 WAG 16—HEALTH PHYSICS RESEARCH REACTOR AREA

In the RFA, it was recommended that WAG 16 be omitted from further consideration as a RCRA Section 3004(u) site. However, an additional SWMU (16.3, Buried Scrap Metal Area) was discovered in this WAG. Thus, additional soil and stream gravel samples were collected (see Fig. 2.5 for locations) and analyzed for metals, organics, and radionuclides (Table 3.6). No organics

Table 3.6. Soil and gravel survey results from WAG 16 in 1987<sup>a</sup>

Element	Background	HPRR-3	HPRR-4
Co-60 <sup>b</sup>	<2		<1
Sr-90 <sup>b</sup>	5.2	<4	
Cs-137 <sup>b</sup>	40.7		11 ± 1
Cd <sup>c</sup>	0.5	0.15	
Cr <sup>c</sup>	1.4	1.8	
Cu <sup>c</sup>	0.5	1.4	
Ni <sup>c</sup>	2.6	1.5	
Pb <sup>c</sup>	2.4	4.3	
Zn <sup>c</sup>	17	16	

<sup>a</sup>Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in µg/g.

<sup>b</sup>Backgrounds estimated from the samples collected at several remote sampling sites (*Environmental Surveillance Report-Oak Ridge, 1986*).

<sup>c</sup>Backgrounds estimated from several uncontaminated samples. Values are those typical of the Knox geologic group.

were detected, and the concentrations of metals that were detected were at background levels. No significant radioactivity was present in any of the samples. These results and those of the previous survey confirm that there is no evidence of past or continuing releases. There is no change in our recommendation that this WAG be removed from further consideration as a RCRA Section 3004(u) site.

### 3.6 WAG 19—HAZARDOUS WASTE TREATMENT AND STORAGE FACILITIES

Two additional SWMUs have been added to WAG 19 (Fig. 2.6). SWMU 19.8, the Explosive and Shock-Sensitive Waste Detonation Facility, has not been used. Future use will be according to all applicable regulations and no releases should occur. If releases do occur, corrective action will be taken as outlined in future permit applications. SWMU 19.7, Soil Injection of Radioactive Gas,

originally listed as an SWMU, should be removed from the list because it has been determined that solid waste was not a part of the experiments conducted at this site (see Sect. 1.2 and the Summary Sheet).

An additional soil sample was collected (for sampling site location, see Fig. 2.6) and analyzed for organic constituents. Di-n-butylphthalate was the only organic detected; the concentration was 2900  $\mu\text{g}/\text{kg}$ . It is recommended that WAG 19 be omitted from further consideration as a RCRA Section 3004(u) site.

### 3.7 OTHER SITES—ABANDONED BURN PIT

This SWMU was originally placed in WAG 17, ORNL Services Area. Since it is not located within the boundaries of WAG 17, the Burn Pit is considered separately in this report. The site is located north of WAG 17 on Chestnut Ridge Road in the area of the Sanitary Waste Compactor (see Fig. 3.4).

The site was used for burning combustible trash. There are no records as to the exact nature of the material burned, but it has been reported (interviews with retired employees) that on at least two occasions laundry materials contaminated with very-low-level radioactivity were burned in the pit. Operations ceased when the Sanitary Waste Compactor was placed on the site.

The SWMU is located in the same geologic setting as WAG 17 and WAG 1 (the ORNL Main Plant Area). The underlying formation is apparently the Chickamauga Limestone. The major surface water drainage is to the west into White Oak Creek.

Soil samples were collected from two sites, OSA-2 and OSA-3 (Fig. 3.4) and analyzed for metals, organics, and radionuclides. Results from this analysis are summarized in Table 3.7. Concentrations of Cd, Cu, Pb, and Zn were significantly above background in the sample taken from site OSA-2. Except for cadmium, the sample taken from OSA-3 was near background levels. Samples from both sites showed slightly elevated Cs-137 activity. No organics were detected in either sample.

Sufficient uncertainties exist concerning the past history and the nature of releases at this site to warrant additional characterization. It is recommended that additional sampling of this site be undertaken before placing it into or removing it from the RI process.

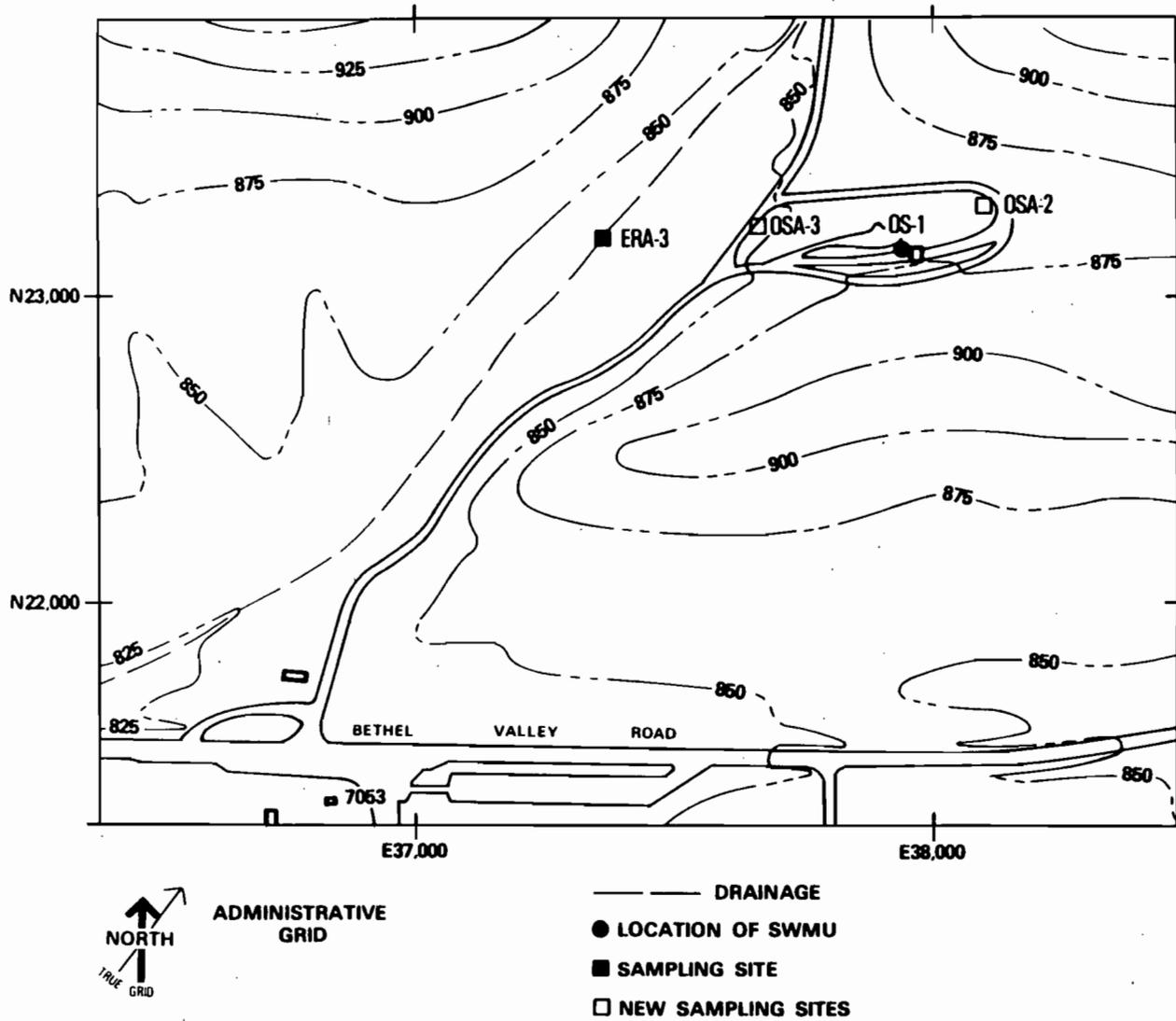


Fig. 3.4. OS-1—Abandoned Burn Pit, showing location of new sampling sites.

Table 3.7. Soil survey results from Abandoned Burn Pit in 1987<sup>a</sup>

Element	Background	OSA-2	OSA-3
Co-60 <sup>b</sup>	<2	<2	<1
Sr-90 <sup>b</sup>	5.2	6.2 ± 5.1	11 ± 5
Cs-137 <sup>b</sup>	40.7	43 ± 3	17 ± 1
Pu-239 <sup>b</sup>	0.63	1.5 ± 0.5	0.01 ± 0.35
U-238 <sup>b</sup>	14.4	0.06 ± 0.20	1.1 ± 0.5
Cd <sup>c</sup>	0.05	1.4	0.44
Cr <sup>c</sup>	0.4	2.6	1.2
Cu <sup>c</sup>	0.2	22	1.8
Ni <sup>c</sup>	0.9	3.5	1.5
Pb <sup>c</sup>	2.4	21	5.1
Zn <sup>c</sup>	3.6	31	16

<sup>a</sup>Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in µg/g.

<sup>b</sup>Backgrounds estimated from the samples collected at several remote sampling locations (*Environmental Surveillance Report-Oak Ridge, 1986*).

<sup>c</sup>Backgrounds estimated from several uncontaminated samples. Values are those typical of Chickamauga limestone.

#### **4. REVISION OF WAG BOUNDARY**

In the RFA, WAG 2 was identified as consisting of two SWMUs: (1) SWMU 2.1, which includes White Oak Lake (WOL), White Oak Dam (WOD), and the embayment (the portion of WOC from WOD to where it empties into the Clinch River), and (2) SWMU 2.2, which is the area encompassed by the stream channels of White Oak Creek and Melton Branch. Since Fig. 3.3 in the RFA did not show the embayment in its entirety, a revised map of WAG 2 that includes the embayment is shown in Fig. 4.1 of this Addendum. These revisions will also be reflected in the amended topographic maps (RFA Volume 2) that will be submitted at a later time.

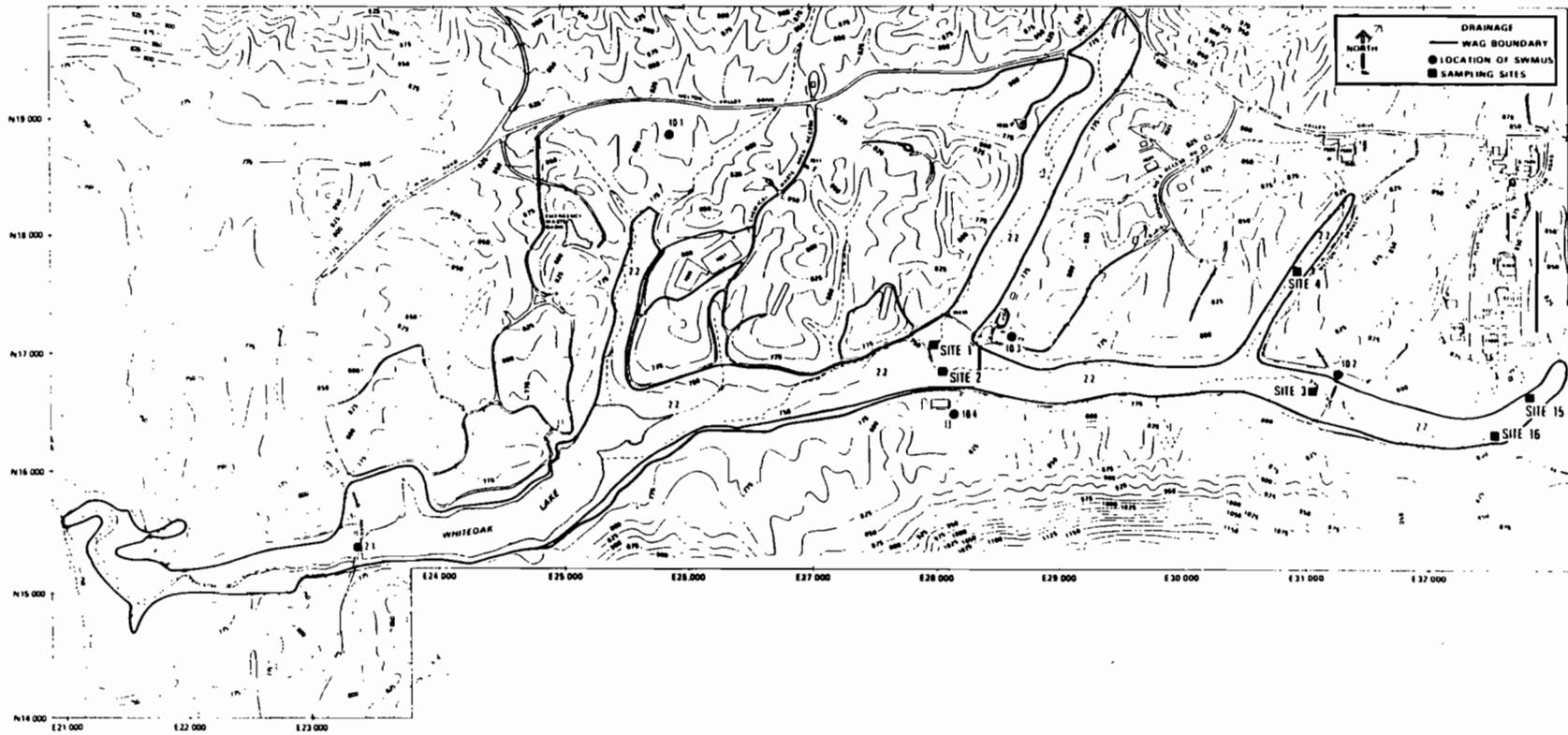


Fig. 4.1. WAG 2—White Oak Creek/White Oak Lake.

## 5. SUMMARY

### 5.1 REGULATORY STATUS OF ADDITIONAL SWMUS AND SELECTED WAGS

Summary sheets for the 16 additional SWMUs that were not described in the RFA are included in Appendix A. Included in Appendix B are summary sheets for 34 Environmental Research Areas. Although little or no contamination remains at the non-SWMU sites (summarized in Table B.1, Appendix B), they are listed for the purpose of maintaining a complete inventory of potential contaminated sites.

In Table 5.1, the additional SWMUs are listed along with recommendations concerning any future RCRA Section 3004(u) remedial actions. In the RFA, ORNL suggested additional sampling at several of the WAGs before making recommendations concerning further remedial actions under

**Table 5.1. Recommended actions for additional SWMUs**

SWMU	Description	Recommended action	Comment
1.55	Septic tank	Delete	No hazardous materials
1.56a, b	Inactive LLW tanks	Include in RI for WAG 1	Tanks are empty but are internally contaminated
5.11	Septic tanks	Delete	No hazardous materials
5.12	Septic tank	Delete	No hazardous materials
5.13	Septic tank	Delete	No hazardous materials
7.4d	Leak site	Include in RI for WAG 7	Radionuclides present
7.11	Septic tank	Delete	No hazardous materials
8.11	Septic tank	Delete	No hazardous materials
16.3	Buried scrap metal	Delete	No evidence of releases
16.4	Septic tank	Delete	No hazardous materials
16.5	Septic tank	Delete	No hazardous materials
19.7	Soil injection of gas	Delete	No hazardous materials
19.8	Detonation Facility	No RI needed	New facility
OS.1	Old Burn Pit	Additional sampling	Nature and release of hazardous material uncertain
OS.2	Septic tank	Delete	No hazardous materials

RCRA Section 3004(u). Additional sampling has been completed and the analytical results are described in Sect. 3. This information, along with that from previous surveys, is the basis for further recommendations concerning the need for additional RCRA Section 3004(u) evaluations. The information summarized in Table 5.2 completes ORNL's assessment of the regulatory status of the 20 WAGs. Changes from those contained in Table 5.2 of the RFA include WAGs 11, 12, 13, 15, and 19; there are no changes in the remaining 15 WAGs.

## **5.2 RI/FS SCHEDULE REVISIONS**

In the RFA a tentative schedule for the completion of Phase IIA (RI or RFI Plans) was submitted. Several completion dates shown in Table 5.3 of the RFA have been revised to reflect revisions to the subcontract award for performing the RI/FS at the ORNL complex; changes in relative priority of some of WAGs, i.e., WAGs 2, 4, and 5; and consideration given to cost-effective resource utilization during preparation of RI/RFI Plans. These revisions are shown in Table 5.3.

**Table 5.2. Recommended actions for the WAGs**

Wag	Description	Recommended action	Comment
1	Main Plant Area	RI Plan	Of the 99 SWMUs, 23 are tanks in service that are permitted by rule, 6 are facilities included in the NPDES permit, 3 are SWMUs (1.4, 1.53 and 1.54) that have no releases.
2	WOC/WOL	RI Plan	Both SWMUs in this WAG have continuing releases.
3	SWSA 3 Area	RI Plan	There are data indicating that the three SWMUs in WAG 3 have produced releases.
4	SWSA 4 Area	RI Plan	Two of the three SWMUs (4.1 and 4.3) have documented releases. SWMU 4.2 no longer contains radioactive material and has no reported releases.
5	SWSA 5 Area	RI Plan	The LLW concentrate tanks (SWMU 5.8a-h) are still in service and are included in ORNL's permits. SWMU 5.10 is an operating facility subject to DOE Order 5820.2. The balance of the SWMUs have reported releases (with the exception of SWMU 5.5a-e, which have not had reported releases).
6	SWSA 6 Area	RI Plan	SWMU 6.3 has had no releases. SWMU 6.2 has never been used, and no releases are recorded. Only SWMU 6.1 (SWSA 6) shows indications of continuing releases of radionuclides. Part of this facility is being closed under RCRA guidance. An RI Plan has been prepared (12/86) for SWMU 6.1.
7	Pits and Trenches Area	RI Plan	Only one SWMU (7.10) has reported no release. All of the other SWMUs are potential or existing sources of continuing releases.
8	Melton Valley Area	RI Plan	Two of the SWMUs are active facilities (SWMUs 8.4 and 8.8). SWMU 8.10 is not operating at this time; however, a permit for operating is in preparation. SWMUs 8.5, 8.6, and 8.7 are still in service and have reported no releases. SWMU 8.9 is a sewage treatment plant that should not be included in Section 3004(u).
9	HRE Area	RI Plan	Of the three SWMUs in WAG 9, SWMU 9.3 (septic tank) should be removed from Section 3004(u) evaluations.
10	Hydrofracture Injection Wells and Grout Sheets	RI Plan	An RI Plan was prepared for this WAG in February 1987 and is currently under review by EPA and TDHE.
11	White Wing Scrap Yard	Additional sampling	There is some indication of surface contamination by radionuclides. Releases of metals and some organics may have occurred. The sources of "hot spots" of surface radiation remain undetermined. An RI Plan is suggested to define the extent of contamination.

Table 5.2 (continued)

Wag	Description	Recommended action	Comment
12	Old Contractors' Landfill	Delete	Sampling and survey studies detected some metals and organics at levels slightly above background values; hence it is recommended that the WAG be deleted from further RCRA Section 3004(u) evaluation.
13	Environmental Research Areas	Delete	One site (13.2) showed no releases in the preliminary sampling survey. Site 13.1 indicated that some Cs-137 had migrated from experimental plots. It is recommended that this WAG be deleted from further consideration under RCRA Section 3004(u) because these sites are not SWMUs. Appropriate corrective actions per CERCLA (SARA) and DOE Orders will be implemented.
14	Tower Shielding Facility	Delete	Scrap yard (SWMU 14.1) contains radionuclides (activation products); However, there is no record of releases. Preliminary sampling survey confirms no release. SWMU 14.2 (septic tank) should be removed from further Section 3004(u) evaluations.
15	ORNL Facilities at Y-12	Delete	Most of the contaminants have been removed or are being removed as a part of ongoing DOE remedial action programs. Soil contamination by PCBs at the site ranges from <1 ppm to 10 ppm. Responsibility for this site has been assumed by Y-12 Plant personnel. One release reported is related to contamination from one transformer leak (PCBs).
16	Health Physics Research Reactor Area	Delete	One SWMU (16.2) has never been used. SWMU 16.1 is an environmental research area contaminated with mCi levels of Cs-137. No releases have been reported. Sampling surveys confirm no release.
17	ORNL Services Area	RI Plan	Although no records exist of releases from any of the SWMUs listed, the preliminary sampling survey indicates that contamination is being released. An RI Plan is suggested to identify the source(s).
18	Consolidated Fuel Reprocessing Area	Delete	There are no recorded releases from any of the SWMUs. Preliminary sampling surveys have shown no indication of radionuclide or hazardous material releases.
19	Hazardous Waste Facilities	Delete	All of the SWMUs in this WAG are permitted under RCRA. Preliminary sampling surveys have shown no indication of radionuclide or hazardous material releases.
20	Oak Ridge Landfarm	Delete	Preliminary sampling surveys have shown no indication of radionuclide or hazardous material releases. Site usage has been terminated.

Table 5.3. Preliminary schedules for ORNL Remedial Investigations/Feasibility Study

Waste Area Groupings	Completion schedules by phases <sup>a,b</sup> (month/year)	
	I	IIA
	RFA	(RI or RFI)
1 Main Plant Area	4/87	12/87
2 White Oak Creek and White Oak Lake	4/87	9/88
3 Solid Waste Storage Area 3	4/87	6/88
4 Solid Waste Storage Area 4	4/87	4/88
5 Solid Waste Storage Area 5	4/87	3/88
6 Solid Waste Storage Area 6	4/87	12/86
7 LLW Pits and Trenches Area	4/87	9/88
8 Melton Valley Area	4/87	9/88
9 Homogeneous Reactor Experiment Area	4/87	5/88
10 Hydrofracture Injection Wells and Grout Sheets	4/87	2/87
11 White Wing Scrap Yard	8/87	12/88
12 Closed Contractors' Landfill	8/87	<i>c</i>
13 Environmental Research Areas	8/87	<i>d</i>
14 Tower Shielding Facility	4/87	<i>c</i>
15 ORNL Facilities at Y-12	8/87	<i>c</i>
16 Health Physics Research Reactor Area	4/87	<i>c</i>
17 ORNL Services Area	4/87	12/88
18 Consolidated Fuel Reprocessing Area	4/87	<i>c</i>
19 Hazardous Waste Facilities	8/87	<i>c</i>
20 Oak Ridge Landfarm	4/87	<i>c</i>

<sup>a</sup>All schedules following completion of Draft Phase IIA (RI or RFI plans) are tentative and subject to change based on DOE and regulatory agency review/negotiations. All RCRA units within a grouping subject to new or interim status permit requirements will also adhere to the applicable permit requirements.

<sup>b</sup>Comparison between phases in DOE Order 5480.14, CERCLA, and RCRA Section 3004(u):

- Phase I is comparable to the EPA's RCRA Facility Assessment (RFA). RFA report covering all units will be provided to EPA in April 1987.
- Phase IIA is comparable to the EPA's Remedial Investigation (RI) Plan under CERCLA or the RCRA Facilities Investigation (RFI) Plan.

<sup>c</sup>No further action is deemed necessary (Table 5.2).

<sup>d</sup>No further action under RCRA Section 3004(u) is deemed necessary since the ERAs are not SWMUs. Appropriate corrective actions per CERCLA (SARA) and applicable DOE Orders will be implemented.



**APPENDIX A**

**SWMUs IDENTIFIED SINCE RFA WAS ISSUED**



**EPA II.A.1 DATA SUMMARY SHEET**

**WAG ID Number: 1**

**WAG Name: Main Plant Area**

**SWMU ID Number: 1.55**

**SWMU Name: Septic Tank—Building 5507**

**Location of Unit:** The septic tank is located southwest of Building 5505 in the Main Plant Area. The ORNL grid coordinates are N 20,910 and E 33,090.

**General Dimensions and Capacities:** Tank is a concrete structure with a capacity of 750 gal (2840 L).

**Function of the SWMU:** Septic tank is used to collect and dispose of raw domestic sewage from Building 5505.

**Dates of Operation:** Septic tank was installed in 1967 and is still in use (20 years).

**Waste Characteristics:** Only domestic sewage from Building 5505 has been collected/stored in the tank. No hazardous or radioactive wastes have been added to the system.

**Release Data:** There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1

WAG Name: Main Plant Area

SWMU ID Number: 1.56a

SWMU Name: Inactive LLW Collection Tank W-19

**Location of Unit:** Tank is located north of Building 3517 (Fission Product Development Laboratory) and west of Building 3505 (Metal Recovery Facility). ORNL grid coordinates are N 21,815 and E 31,008.

**General Dimensions and Capacities:** Tank is 7.5 ft wide by 8.5 ft long and is constructed of stainless steel. The tank is installed in a concrete vault. Capacity of the tank is 2250 gal (8520 L).

**Function of the SWMU:** This tank [and W-20 (SWMU 1.56b)] were installed for the purpose of collecting LLW solutions from Building 3505. After closure of the Metal Recovery Facility in 1960, the tanks were used for a period of 1-2 years by the Fission Product Development Laboratory for LLW collection.

**Dates of Operation:** The Metal Recovery Facility was constructed in 1951 and commissioned in 1952. The tanks collected wastes from 1952 until the early 1960s, when they were removed from service.

**Waste Characteristics:** The tanks are reportedly empty but they remain internally contaminated. Primary wastes handled by the Metal Recovery Facility contained Sr-90, Cs-137, Pu-238, Pu-239, and Pu-240. In addition, wastes from the Fission Product Development Laboratory contained significant quantities of Ce-144 and Pm-147.

**Release Data:** There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1

WAG Name: Main Plant Area

SWMU ID Number: 1.56b

SWMU Name: Inactive LLW Collection Tank W-20

**Location of Unit:** Tank is located north of Building 3517 (Fission Product Development Laboratory) and west of Building 3505 (Metal Recovery Facility). ORNL Grid coordinates are N 21,805 and E 31,008.

**General Dimensions and Capacities:** Tank is 7.5 ft wide by 8.5 ft long and is constructed of stainless steel. The tank is installed in a concrete vault. Capacity of the tank is 2250 gal (8520 L).

**Function of the SWMU:** This tank [and W-19 (SWMU 1.56a)] were installed for the purpose of collecting LLW solutions from Building 3505. After closure of the Metal Recovery Facility in 1960, the tanks were used for a period of 1-2 years by the Fission Product Development Laboratory for LLW collection.

**Dates of Operation:** The Metal Recovery Facility was constructed in 1951 and commissioned in 1952. The tanks collected wastes from 1952 until the early 1960s, when they were removed from service.

**Waste Characteristics:** The tanks are reportedly empty but they remain internally contaminated. Primary wastes handled by the Metal Recovery Facility contained Sr-90, Cs-137, Pu-238, Pu-239, and Pu-240. In addition, wastes from the Fission Product Development Laboratory contained significant quantities of Ce-144 and Pm-147.

**Release Data:** There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.11

SWMU Name: Septic Tank—Building 7831

*Location of Unit:* Septic tank is located within the boundary of SWSA 5. ORNL grid coordinates are N 18,750 and E 31,140.

*General Dimensions and Capacities:* Tank is a concrete structure with a capacity of 500 gal (1890 L).

*Function of the SWMU:* Septic tank is used to collect and dispose of raw domestic sewage from the Waste Compactor Building (7831).

*Dates of Operation:* Installation date is not known; tank is still in service.

*Waste Characteristics:* Only domestic sewage from Building 7831 has been collected / stored in the tank. No hazardous or radioactive wastes have been added to the system.

*Release Data:* There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.12

SWMU Name: Septic Tank - Building 7860

*Location of Unit:* The septic tank is located in the southwest corner of WAG 5 and serves the New Hydrofracture Facility (7860). The ORNL grid coordinates are N 16,537 and E 28,250.

*General Dimensions and Capacities:* Tank is a concrete structure with a capacity of 500 gal (1890 L).

*Function of the SWMU:* Septic tank is used to collect and dispose of raw domestic sewage from the New Hydrofracture Facility (7860).

*Dates of Operation:* Septic tank was installed in 1978 and is still in use (9 years).

*Waste Characteristics:* Only domestic sewage from Building 7860 has been collected / stored in the tank. No hazardous or radioactive wastes have been added to the system.

*Release Data:* There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.13

SWMU Name: Septic Tank - Building 7853

*Location of Unit:* The septic tank is located in the southwest corner of SWSA 5 and serves the Old Hydrofracture Facility (Bldg. 7853). The ORNL grid coordinates are N 17,130 and E 28,710.

*General Dimensions and Capacities:* Tank is a concrete structure with a capacity of 750 gal (2840 L).

*Function of the SWMU:* Septic tank is used to collect and dispose of raw domestic sewage from Building 7853.

*Dates of Operation:* Septic tank was installed in 1968 and is currently not in service.

*Waste Characteristics:* Only domestic sewage from Building 7853 has been collected/stored in the tank. No hazardous or radioactive wastes have been added to the system.

*Release Data:* There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.4d

SWMU Name: Leak in Transfer Line from  
Decontamination Facility  
(7819) to Pit 1 (7805)

*Location of Unit:* The leak site is located 60 ft (18.3 m) south of Lagoon Road and 35 ft (10.7 m) west of the access road to the Pits and Trenches Area. The ORNL grid coordinates are N 19,020 and E 26,940.

*General Dimensions and Capacities:* The total area of contamination is reported to encompass about 925 ft<sup>2</sup> (86 m<sup>2</sup>).

*Function of the SWMU:* A 6-in. (15-cm) drain line served to transfer decontamination waste solutions from the Decontamination Facility (Bldg. 7819, SWMU 7.1) to LLW Pit 1 (Bldg. 7805, SWMU 7.5).

*Dates of Operation:* The date of the leak is not known; however, the facility was operated from the early 1960s through the early 1970s.

*Waste Characteristics:* A preliminary environmental survey for Bldg. 7819 found Cs-137 to be the dominant radionuclide in soils surrounding the facility. It is believed that the wastes from Bldg. 7819 would consist of corrosive wastes (i.e., acids) and radionuclides associated with the equipment being decontaminated.

*Release Data:* The dominant detectable radionuclide was Cs-137. There may have been some corrosive wastes and additional radionuclides that were associated with the decontamination procedures.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.11

SWMU Name: Septic Tank—Building 7819

*Location of Unit:* The septic tank is located north of SWSA 4 at the intersection of Lagoon Road and the road leading to the LLW Pits and Trenches. The ORNL grid coordinates are N 19,320 and E 26,980.

*General Dimensions and Capacities:* Tank is a concrete structure with a capacity of 540 gal (2040 L).

*Function of the SWMU:* Septic tank is used to collect and dispose of raw domestic sewage from Building 7819 (Decontamination Facility).

*Dates of Operation:* Installation date is not known; tank is not in service.

*Waste Characteristics:* Only domestic sewage from Building 7819 has been collected / stored in the tank. No hazardous or radioactive wastes have been added to the system.

*Release Data:* There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8

WAG Name: Melton Valley Area

SWMU ID Number: 8.11

SWMU Name: Septic Tank—Building 7503

*Location of Unit:* The septic tank is located adjacent to the Molten Salt Reactor Facility (Building 7503). The ORNL grid coordinates are N 18,670 and E 32,490.

*General Dimensions and Capacities:* Tank is a concrete structure with a capacity of 1500 gal (5680 L).

*Function of the SWMU:* Septic tank is used to collect and dispose of raw domestic sewage from Building 7503.

*Dates of Operation:* Septic tank was installed in 1951 and is still in use (36 years).

*Waste Characteristics:* Only domestic sewage from Building 7503 has been collected/stored in the tank. No hazardous or radioactive wastes have been added to the system.

*Release Data:* There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 16

WAG Name: Health Physics Research  
Reactor (HPRR) Area

SWMU ID Number: 16.3

SWMU Name: Buried Scrap Metal Area

*Location of Unit:* The site is located south of Building 7710 at the point where the road to the reactor (Bldg. 7709) turns west. The ORNL grid coordinates are N 11,150 and E 36,250.

*General Dimensions and Capacities:* The size of the burial trench is undetermined. It is estimated that the total area is approximately 40 ft by 50 ft (12.2 m by 15.2 m).

*Function of the SWMU:* The area was used as a waste pile prior to burial in place.

*Dates of Operation:* Material was stored on the surface from the early 1960s to the early 1980s when some of the material was removed to other areas and the remainder was buried in place.

*Waste Characteristics:* The known materials buried included a container (4 ft by 3 ft [1.2 m by 0.9 m]) of polyethylene beads and a collection of Japanese building construction materials. These were uncontaminated materials which originated from the Nevada Test Site. Three sealed radiation sources, cesium and cobalt, were stored in the area but were removed to SWSA 6 in 1983.

*Release Data:* There have been no reported releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 16

WAG Name: Health Physics Research  
Reactor (HPRR) Area

SWMU ID Number: 16.4

SWMU Name: Septic Tank—Building 7709

*Location of Unit:* The septic tank is located west of the DOSAR Reactor Building (7709) in the HPRR Area. The ORNL grid coordinates are N 12,310 and E 35,840.

*General Dimensions and Capacities:* Tank is a concrete structure with a capacity of 500 gal (1890 L).

*Function of the SWMU:* Septic tank is used to collect and dispose of raw domestic sewage from Building 7709.

*Dates of Operation:* Septic tank was installed in 1962 and is still in use (25 years).

*Waste Characteristics:* Only domestic sewage from Building 7709 has been collected/stored in the tank. No hazardous or radioactive wastes have been added to the system.

*Release Data:* There have been no reported leaks or releases.

**EPA II.A.1 DATA SUMMARY SHEET****WAG ID Number: 16****WAG Name: Health Physics Research  
Reactor (HPRR) Area****SWMU ID Number: 16.5****SWMU Name: Septic Tank—Building 7710**

***Location of Unit:*** The septic tank is located at the DOSAR Facility Control Building (7710) in the HPRR Area. The ORNL grid coordinates are N 13,320 and E 36,450.

***General Dimensions and Capacities:*** Tank is a concrete structure with a capacity of 1200 gal (4540 L).

***Function of the SWMU:*** Septic tank is used to collect and dispose of raw domestic sewage from the DOSAR Facility.

***Dates of Operation:*** Septic tank was installed in 1962 and is still in use (25 years).

***Waste Characteristics:*** Only domestic sewage from Building 7710 has been collected / stored in the tank. No hazardous or radioactive wastes have been added to the system.

***Release Data:*** There have been no reported leaks or releases.

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19

WAG Name: Hazardous Waste Treatment  
and Storage Facilities

SWMU ID Number: 19.7

SWMU Name: Soil Injection of Radioactive  
Gas

**Location of Unit:** The site is located in the same general area as SWMUs 19.5 and 19.6 (the Leaking Gas Cylinder and Reactive Chemical Disposal Areas, respectively). ORNL grid coordinates are N 17,850 and E 39,750.

**General Dimensions and Capacities:** The area is fenced and measures about 75 by 150 ft (23 by 46 m).

**Function of the SWMU:** The original description of this unit was based on verbal information and is incorrect. More detailed investigation indicates that this site (known as the "Sandia Site") was used to perform heater tests in the shale to obtain thermal information for use in the high-level waste repository program. No radioactivity or chemical wastes were involved at the site. No records exist to suggest any gas injections at this site.

**Dates of Operation:** The site was constructed and operated during the period 1976-1977.

**Waste Characteristics:** No wastes (radioactive or hazardous chemical) were involved in the studies at this site.

**Release Data:** No releases have occurred. Equipment has been removed from the site. Site is currently used for SWMUs 19.5 and 19.6 (see RFA).

## EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19

WAG Name: Hazardous Waste Treatment  
and Storage Facilities

SWMU ID Number: 19.8

SWMU Name: Explosive and Shock-  
Sensitive Waste Detonation

**Location of Unit:** The facility is located about 200 ft (61 m) northwest of the Hazardous Waste Management Area (located on Health Physics Research Reactor Access Road approximately 1/2 mile [0.8 km] south of Melton Valley Drive). The ORNL grid coordinates are N 16,550 and E 37,000.

**General Dimensions and Capacities:** The site consists of two explosive material storage magazines, a detonation trench, and a control site. The storage magazines are separated by a dirt berm and are located on concrete pads. The entire structure is surrounded by a security fence. The detonation trench is 10 ft long, 5 ft wide, and 4 ft deep (3.0 m x 1.5 m x 1.2 m) and is surrounded by a security fence.

**Function of the SWMU:** The function of the facility is to provide a safe, effective, and environmentally acceptable method for the disposal of explosive and shock-sensitive chemicals.

**Dates of Operation:** This facility has not been used as of August, 1987. This SWMU will replace the detonation trench in SWSA 6 that had been used for a number of years (SWMU 6.3).

**Waste Characteristics:** Examples of chemicals that will be detonated include picric acid, phosphorus, hydrogen peroxide, ammonium nitrate, and other shock-sensitive chemicals.

**Release Data:** Chemicals, explosives, and, in most instances, their containers, are vaporized or pulverized in the explosion. Any fragments that remain after the explosion are removed; hence no releases will occur.

## EPA II.A.1 DATA SUMMARY SHEET

SWMU ID Number: OS.1

SWMU Name: Abandoned Burn Pit

*Location of Unit:* The site is located north of Bethel Valley Road across from the 7000 area (WAG 17, ORNL Services Area) on Chestnut Ridge Road. The Sanitary Waste Compactor (Bldg. 0954) is currently located on the site. ORNL grid coordinates are N 23,100 and E 37,950.

*General Dimensions and Capacities:* No records of the exact dimensions of this facility exist.

*Function of the SWMU:* During the early operation of the Laboratory, this site was used for burning of combustible trash. The pit in which the burning took place has been backfilled. The Sanitary Waste Compactor is currently located at this site.

*Dates of Operation:* Believed to have begun operation at or near the time of closure of SWSA 4 about 1959. Operations ceased in 1969 when the compactor was installed at the site.

*Waste Characteristics:* Wood, refuse, and combustible construction debris were burned in the pit. No records exist as to the exact nature of the material burned. It has been reported, however, that on at least two occasions laundry materials contaminated with very-low-level radioactivity were burned in the pit. Materials stored on the surface in this area may have been buried in the area immediately north of the compactor.

*Release Data:* There is no historical information on releases of hazardous or radioactive materials. Results from sampling surveys reported in Sect. 3.7 of this Addendum suggest elevated levels of Cd, Cu, Pb, and Zn. Cesium-137 activity was observed at 5-15 times background.

## EPA II.A.1 DATA SUMMARY SHEET

SWMU ID Number: OS.2

SWMU Name: Septic Tank - Building 0907

*Location of Unit:* The septic tank is located east of Building 0907, which is north of Bethel Valley Road about 2-3 miles from the Main Plant Area.

*General Dimensions and Capacities:* Tank is a concrete structure with a capacity of 550 gal (2080 L).

*Function of the SWMU:* Septic tank is used to collect and dispose of raw domestic sewage from Building 0907.

*Dates of Operation:* Septic tank was installed in 1958 and is still in use (29 years).

*Waste Characteristics:* Only domestic sewage from Building 0907 has been collected/stored in the tank. No hazardous or radioactive wastes have been added to the system.

*Release Data:* There have been no reported leaks or releases.

**APPENDIX B**

**SUMMARY SHEETS—ENVIRONMENTAL RESEARCH AREAS**



## APPENDIX B

### ENVIRONMENTAL RESEARCH AREAS

During the past 25 years, a number of field studies have been performed in areas surrounding ORNL related to the cycling and fate of radionuclides in terrestrial and aquatic ecosystems (Taylor 1986, Saylor 1986). Several of these studies were related to obtaining a better understanding of the fate of radionuclides resulting from fallout from nuclear detonations. Although these sites do not fall under the guidelines that identify SWMUs, and as a result are not to be considered a part of the RFA, ORNL has elected to include summary information (using the same format followed in developing the SWMU Summary Sheets in the RFA and this Addendum) on these sites so that a complete picture of all currently identified contaminated areas can be presented. Table B.1 summarizes ORNL's recommendations regarding future actions for these 34 sites.

The locations of these areas relative to ORNL are illustrated in Figs. B.1 through B.4. Many of the areas are a considerable distance from the ORNL Main Plant Area and have not been assigned ORNL grid coordinates. Also, the exact location of some of the sites is only vaguely reported. As a result, in this Addendum and the supporting documents, these sites are located by azimuths and distances from known road intersections.

Table B.1. Recommended actions for the Environmental Research Areas

Site No.	Site description	Action	Comment	Quantity, date (initial)
ER-1	Ca-45 tagged trees	Delete	Foliage was removed, >40 elapsed half-lives	1.25 Ci, 1969
ER-2	Ca-45 tagged soil and vegetation	Delete	Labelled material removed, >40 elapsed half-lives	136 mCi, 1969
ER-3	Na-22 contaminated soil	Delete	Insects/foliage removed, >10 elapsed half-lives	unknown, 1969
ER-4	Cs-137 bagged leaves study	Delete	All labelled materials removed	2 mCi, 1961
ER-5	Hg-197 tagged stream	Delete	>85 elapsed half-lives	4.5 mCi, 1971
ER-6	Cs-134 tagged tree	Delete	>11 elapsed half-lives	5.7 mCi, 1964
ER-7	Ca-45 tagged forest	Delete	All materials removed, >40 elapsed half-lives	30 mCi, 1966
ER-8	Cs-137, Fe-59 contaminated animal pens	Deleted	All animals removed, no significant contamination	45 $\mu$ Ci, 1969
ER-9	Hg-103 tagged stream	Delete	>100 elapsed half-lives	1.65 $\mu$ Ci, 1971
ER-10	H-3 contaminated trees	Delete	All contaminated materials removed	180 mCi, 1971
ER-11	Cs-137, Co-60 contaminated forest	Evaluate	Radiological surveys indicate "hot spots"	111 mCi, 1970
ER-12	Cs-134 contaminated oak trees	Delete	Trees removed at the end of the study	28 mCi, 1960
ER-13	Zn-65 tagged red oak seedlings	Delete	Labelled material removed, >33 elapsed half-lives	1.3 mCi, 1975
ER-14	Cs-134 contaminated pine/oak seedlings	Delete	Labelled material removed, >9 elapsed half-lives	261 $\mu$ Ci, 1968
ER-15	Rb-86 contaminated plants	Delete	>230 elapsed half-lives	32.3 mCi, 1969
ER-16	Cs-134 contaminated soybean/sorghum	Delete	Labelled materials removed, >8 elapsed half-lives	682 $\mu$ Ci, 1970
ER-17	Cs-134 contaminated grasses	Delete	Labelled material removed, >8 elapsed half-lives	1.23 mCi, 1970
ER-18	Cs-134 contaminated lichens/mosses	Delete	Labelled material removed, >8 elapsed half-lives	147 $\mu$ Ci, 1971
ER-19	Tc-95m contaminated soil/plants	Delete	>48 elapsed half-lives	3.7 mCi, 1979
ER-20	Tc-95m uptake studies	Delete	>31 elapsed half-lives	336 $\mu$ Ci, 1981
ER-21	Tc-95m, I-131 contaminated pasture	Delete	>16 and 126 elapsed half-lives respectively	70 mCi, 1983
ER-22	Cr-51 contaminated grass plots	Delete	>130 elapsed half-lives	125 $\mu$ Ci, 1976
ER-23	Tc-99, Np-237 contaminated lysimeters	Evaluate	Lysimeters in storage awaiting disposal	96 $\mu$ Ci, 1984
ER-24	Cs-137 contaminated forest floor	Evaluate	Site will be evaluated for residual contamination	1 mCi, 1964
ER-25	Cs-137 contaminated forest understory	Evaluate	Site will be evaluated for residual contamination	360 $\mu$ Ci, 1966
ER-26	Cs-137 contaminated meadow	Evaluate	Site will be evaluated for residual contamination	5 mCi, 1964
ER-27	Cs-134 contaminated persimmon tree	Delete	>9 elapsed half-lives	2 mCi, 1970
ER-28	Co-60, Mn-54 animal study	Delete	Radiological decay and animal dispersal preclude any residual contamination	34 $\mu$ Ci, 1970
ER-29	C-14 maintenance/respiration study	Delete	All labelled material removed	3 mCi, 1984
ER-30	C-14 sucrose inoculation of oak/pine	Delete	All labelled material removed	10 $\mu$ Ci, 1972/76
ER-31	C-14 allocation in white oak trees	Delete	All labelled material removed	110 $\mu$ Ci, 1972-77
ER-32	C-14 allocation in white pine trees	Delete	Most of labelled material removed	360 $\mu$ Ci, 1979
ER-33	C-14 efflux in yellow poplar stand	Delete	All labelled material removed	3 mCi, 1976
ER-34	C-14 allocation in woody biomass	Delete	All labelled material removed	1 $\mu$ Ci,

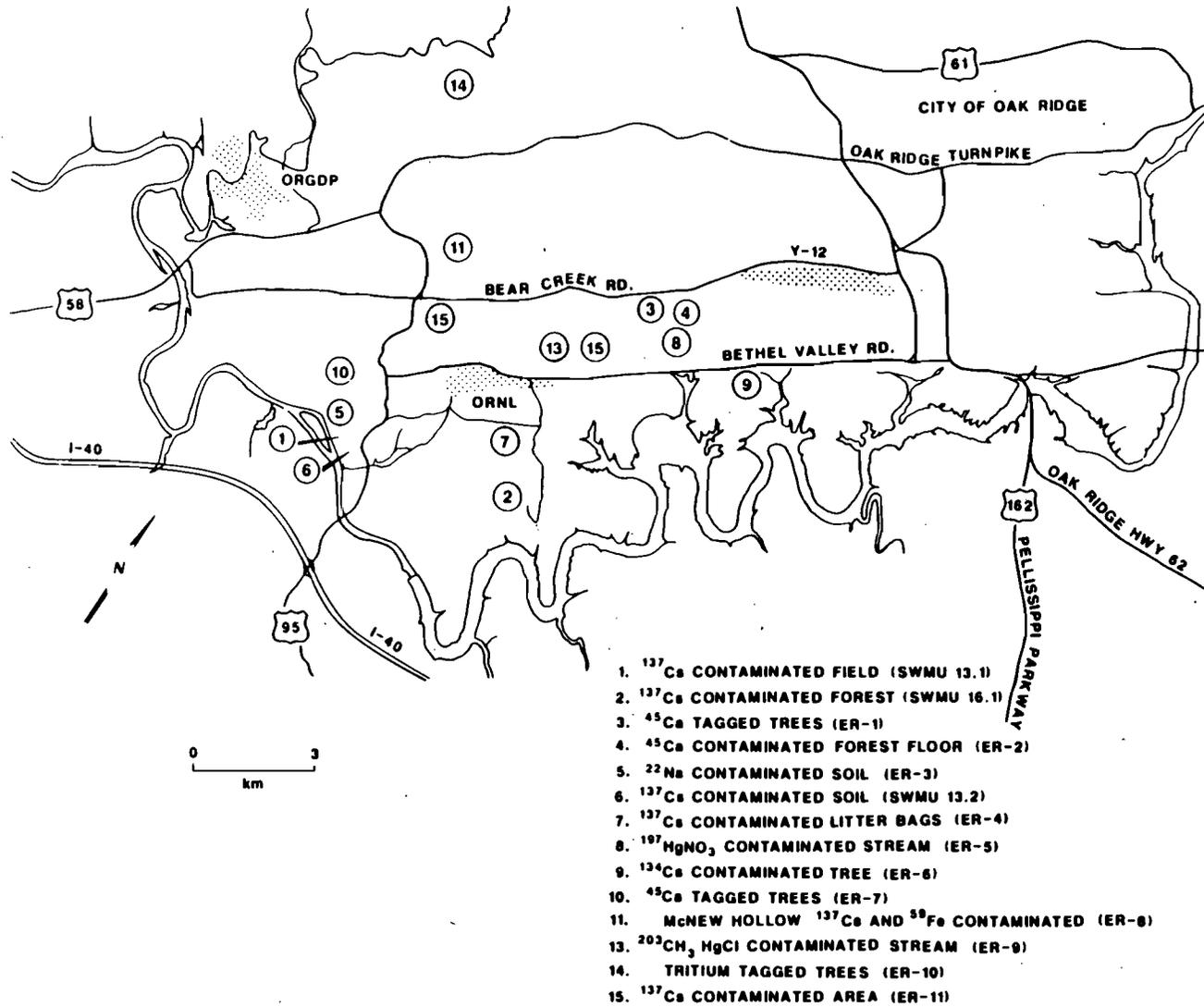


Fig. B.1. Locations of Environmental Research Areas.

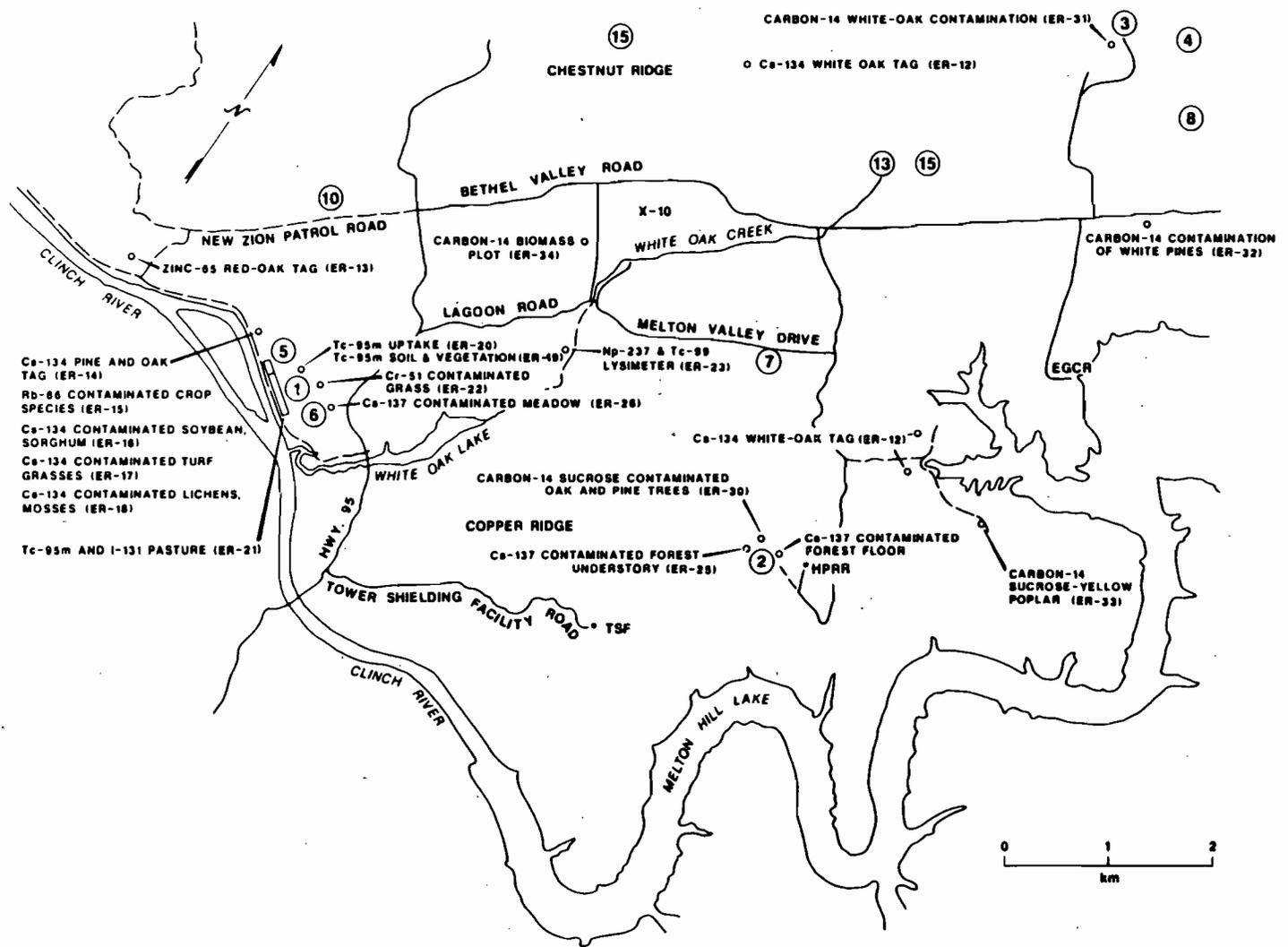


Fig. B.2. Locations of Environmental Research Areas.

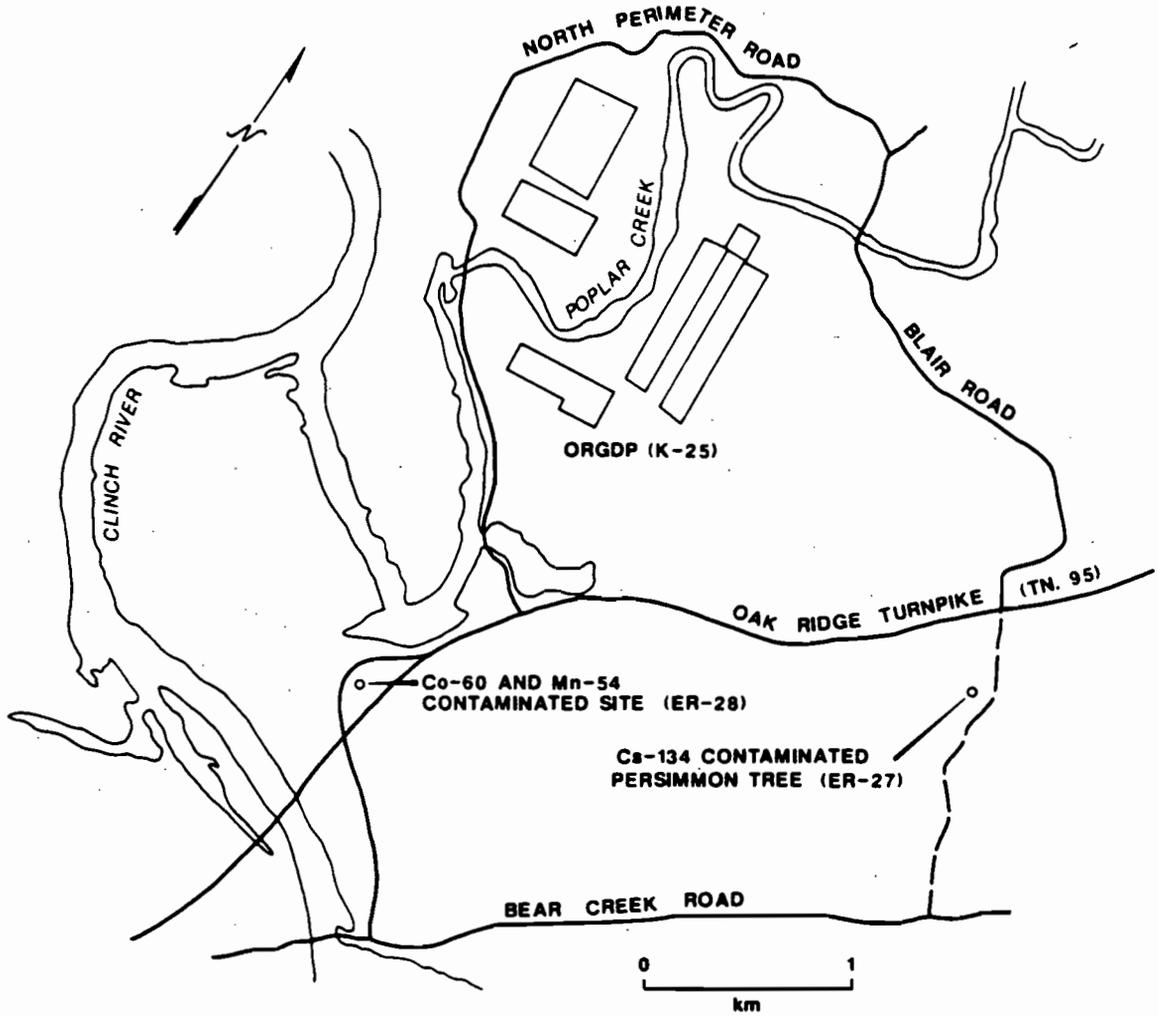


Fig. B.3. Locations of Environmental Research Areas.

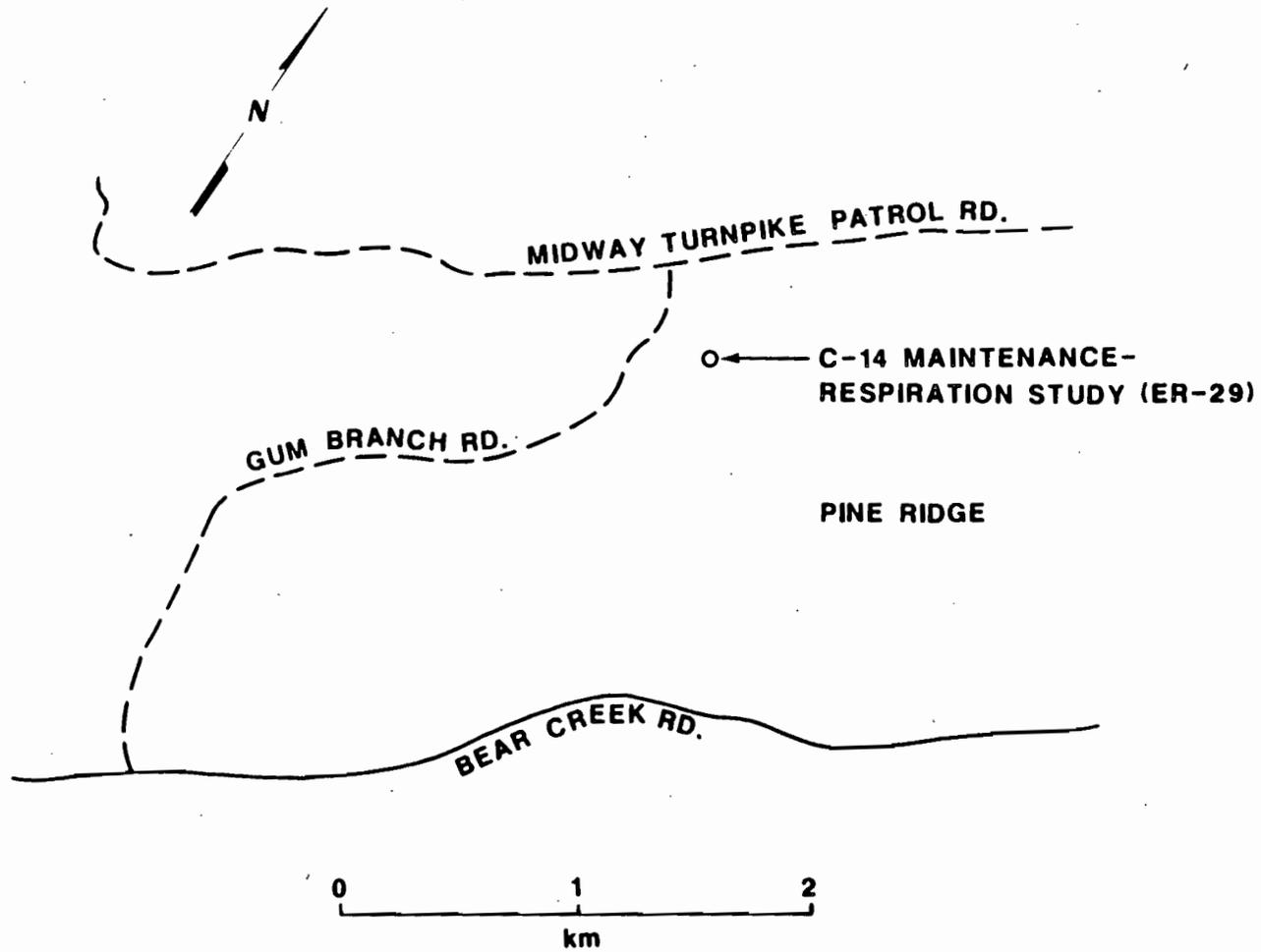


Fig. B.4. Locations of Environmental Research Areas.

**REFERENCES FOR APPENDIX B**

- Saylor, R. E. 1986. A summary of ORNL Remedial Action Program data and identification of data deficiencies for low-level waste leak sites, environmental research areas, and hazardous waste sites. ORNL/RAP/LTR-86/26. Oak Ridge National Laboratory, Oak Ridge, Tennessee.
- Taylor, F. G. 1986. Inventory of ORNL remedial action sites: 6. environmental research areas. ORNL/RAP/LTR-86/18. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-1

Name: Ca-45 Tagged Trees

*Location of Unit:* Site ER-1 is located on Walker Branch watershed (Chestnut Ridge), a distance of 2 miles (3.2 km) on an azimuth of N 24 E from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* The contaminated area was probably less than 1.2 acres (0.5 ha).

*Function of the Unit:* Several red maple trees were inoculated with Ca-45, which was allowed to move in the transpiration stream throughout the tree. Objective was to produce Ca-45 containing leaves for use in experiments at ER-2.

*Dates of Operation:* The isotope was injected into the trees on June 7, 1969. Leaves were removed and processed prior to December 20, 1969 (see ER-2).

*Waste Characteristics:* The maples were injected with 1.25 Ci of Ca-45 (half-life 165 d) in solution.

*Release Data:* Following several days posttagging, all foliage from the trees was removed, processed, and prepared for use at Site ER-2. Due to the short half-life, all of the remaining Ca-45 at ER-1 will have decayed to nondetectable levels.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-2

Name: Ca-45 Tagged Soil and  
Vegetation

*Location of Unit:* Site ER-2 is located in an oak/hickory forest on the Walker Branch watershed (Chestnut Ridge), a distance of 2.2 miles (3.6 km) on an azimuth of N 31 E from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* Approximately 160 ft<sup>2</sup> (15 m<sup>2</sup>) of land surface was included in the experimental plot.

*Function of the Unit:* The site was contaminated with Ca-45 labeled foliage to determine the movement of the isotope into soil and soil-water solution. The method of contamination was to introduce maple leaves containing Ca-45 (from ER-1) to the soil at ER-2. A quantity of contaminated leaves were placed in mesh bags and were dispersed at the site.

*Dates of Operation:* The radioactivity (Ca-45) was introduced on December 20, 1969. The duration of the study was 72 weeks.

*Waste Characteristics:* It is reported that 136 mCi of Ca-45 (half-life 165 d) was contained in the leaves.

*Release Data:* At the termination of the experiment, all leaves contained in the mesh bags were removed and disposed. Because the half-life of Ca-45 is only 165 d, no detectable radioactivity from the experiment is present at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-3

Name: Na-22 Contaminated Soil

*Location of Unit:* Site ER-3 is in the vicinity of the 0800 area. It is located off Jones Island Patrol Road near the Clinch River, a distance of 1.1 miles (1.6 km) on an azimuth of S 10 W from the intersection of Bethel Valley Road and State Highway 95.

*General Dimensions and Capacities:* Area of the site was 1.2 acres (0.5 ha).

*Function of the Unit:* Activities at this site span several years and involved Ca-47, K-42, and Na-22. It is believed that isotopes were applied to vegetation in the laboratory and the contaminated vegetation fed to grasshoppers and crickets housed in cages in the field.

*Dates of Operation:* The exact dates of isotope contamination are unknown; however, activities occurred during 1968-1969 at ER-3.

*Waste Characteristics:* Foliage was contaminated with an unknown quantity of Ca-47, K-42, and Na-22. Sodium was the most significant isotope because of its longer half-life (2.62 years).

*Release Data:* Although the exact amounts of radionuclides involved are unknown, almost 10 half-lives have lapsed since the tracer was introduced. No records exist to indicate that contaminated animal residues were removed; however, the insects and foliage were removed from the site. It is doubtful that detectable radionuclides remain at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-4

Name: Cs-137 Bagged Leaves Study

*Location of Unit:* Site ER-4 is located south of Melton Valley Drive, a distance of 0.8 miles (1.3 km) on an azimuth of E 83 S from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* Information on the size of the contaminated area is unknown.

*Function of the Unit:* ER-4 was utilized as a bagged leaves study area to determine differences in isotope solubility from leaves under natural conditions. Leaves were contaminated with Cs-137 and Co-60 in mesh bags within a pine oak forest. The bagged leaves were periodically removed for analysis during a one-year period.

*Dates of Operation:* The initial date of contamination occurred at an unknown time during early 1961 and the site was utilized for about one year.

*Waste Characteristics:* Foliage and soil were contaminated with approximately 2 mCi equally divided between Cs-137 and Co-60. It has also been reported that some bags containing leaves contaminated with Ru-106 and Sr-90 were placed at the site. The quantity of radionuclides involved is not known.

*Release Data:* More than 25 years have elapsed (0.8 half-life for the Cs-137 and 4.8 half-lives for the Co-60) since the mesh bags were first placed in the field. If all of the bags and foliage contents had remained at the site approximately 0.55 mCi and 36  $\mu$ Ci would remain for the Cs-137 and Co-60, respectively. Since all experimental materials were removed at the completion of the study, no detectable contamination remains at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-5

Name: Hg-197 Tagged Stream

**Location of Unit:** Site ER-5 is located 2.2 miles (3.6 km) on an azimuth of N 41 E from the intersection of Bethel Valley Road and Melton Valley Access Road. The site is downstream from the Walker Branch watershed weirs.

**General Dimensions and Capacities:** The study area involves a 330-ft (100-m) section of stream in Walker Branch.

**Function of the Unit:** A section of Walker Branch was tagged with radioactive mercuric nitrate [ $^{197}\text{Hg}(\text{NO}_3)_2$ ] to determine the fate of that mercury compound in a natural stream ecosystem. The sample matrix consisted of water, fish, watercress, periphyton, and sediments.

**Dates of Operation:** The radioactivity was introduced into Walker Branch on October 5, 1971.

**Waste Characteristics:** 4.48 mCi of mercuric nitrate (Hg-197; half-life 65 h) was applied to the stream.

**Release Data:** At a streamflow rate of 347.8 L/min, 75% of the mercury isotope was retained in the first 330 ft (100 m) of the stream. Because of the isotope's short half-life, no detectable Hg-197 remains at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-6

Name: Cs-134 Tagged Tree

*Location of Unit:* Site ER-6 is located 2.2 miles (4.5 km) on an azimuth of N 55 E from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* Approximately 1100 ft<sup>2</sup> (100 m<sup>2</sup>) of area containing a red cedar tree was involved.

*Function of the Unit:* This study was designed to determine the uptake and transfer of Cs-134 through metamorphosis of the bagworm moth. A red cedar tree was inoculated with Cs-134 and the insects were contained in cages suspended by wires near the canopy of the host tree.

*Dates of Operation:* The red cedar tree was inoculated with Cs-134 on August 15, 1964.

*Waste Characteristics:* 5.69 mCi of Cs-134 (half-life 2.05 years) was injected into the tree.

*Release Data:* Approximately 11 half-lives have lapsed since the tree was contaminated, potentially leaving a maximum of 3.4  $\mu$ Ci of radioactivity. However, this quantity has been further diluted by natural processes, weathering, leaf transport, and soil leaching.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-7

Name: Ca-45 Tagged Forest

*Location of Unit:* Site ER-7 is located 0.45 mile (0.7 km) on an azimuth of W 25 S from the intersection of Bethel Valley Road and State Highway 95 in Roane County.

*General Dimensions and Capacities:* The extent of the contamination is unknown but is assumed to be less than 2.47 acres (1 ha).

*Function of the Unit:* The purpose of the study was to document the accumulation of calcium by various plant organs and to determine the rate of calcium cycling in the tree-soil system. Twelve dogwood trees were inoculated with amounts of isotope ranging from 0.67 to 2.51 mCi per tree.

*Dates of Operation:* The dogwood trees were inoculated with the Ca-45 (half-life 165 d) on May 4, 1966.

*Waste Characteristics:* The total amount of isotope used in this study was approximately 30 mCi. Sampling of wood, foliage, and plant organs (i.e., flowers, etc.) was conducted.

*Release Data:* Because all experimental materials were removed at the termination of the study and more than 40 half-lives have lapsed since the site was contaminated, no detectable Ca-45 should be present.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-8

Name: Cs-137, Fe-59 Contaminated  
Animal Pens (McNew Hollow)

*Location of Unit:* Site ER-8 is located 2.1 miles (3.4 km) on an azimuth of N 18 W from the intersection of Bethel Valley Road and State Highway 95 in an area called McNew Hollow.

*General Dimensions and Capacities:* Four pens (each 33 ft by 33 ft [10 m by 10 m]) were utilized. The extent of contamination is about 4300 ft<sup>3</sup> (400 m<sup>2</sup>).

*Function of the Unit:* This field study was conducted to determine the elimination of Cs-137 and Fe-59 by wild small rodents. Periodically, the animals were live-trapped and taken to the laboratory for radiological analysis.

*Dates of Operation:* Cotton rats, contaminated using a dual isotope technique, were released into the pens in January 1969.

*Waste Characteristics:* The cotton rats were contaminated by injection with Cs-137 (half-life 30 years) and Fe-59 (half-life 45.6 d). A total of 32  $\mu$ Ci of Cs-137 and 12.8  $\mu$ Ci of Fe-59 was utilized.

*Release Data:* All animals in the pens were removed at the end of the experiment. Correcting for radiological decay, approximately 21  $\mu$ Ci of Cs-137 would remain at the site if all of the isotope remained there. Iron-59 would have decayed to nondetectable levels. No detectable radioactivity remains at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-9

Name: Hg-203 Tagged Stream

*Location of Unit:* Site ER-9 is a portion of White Oak Creek located in Bethel Valley 0.5 mile (0.8 km) on an azimuth of N 12 E from the junction of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* The contaminated area encompasses 330 ft (100 m) of stream length.

*Function of the Unit:* This site was utilized to clarify the fate of methylmercury ( $\text{CH}_3^{203}\text{HgCl}$ ) in a natural stream ecosystem.

*Dates of Operation:* The methylmercury was introduced into the stream on September 1, 1971.

*Waste Characteristics:* Water, fish, plants, and sediments were contaminated with 1.65 mCi of methylmercury containing Hg-203 (half-life 46.9 d).

*Release Data:* At a streamflow of 325.6 L/min, 81% of the radioisotope was retained in the first 330 ft (100 m) below the point of release. No detectable radionuclides are present at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-10

Name: H-3 Contaminated Trees

*Location of Unit:* Site ER-10 is located 1.6 miles (2.6 km) on an azimuth of W 8 S from the intersection of the East Ridge Patrol Road and the Oak Ridge Turnpike on Blackoak Ridge adjacent to the East Ridge Patrol Road.

*General Dimensions and Capacities:* The area involved in the study was about 0.6 acre (0.25 ha). The area included two yellow poplar trees, one hickory tree, and a 43-ft<sup>2</sup> (4-m<sup>2</sup>) soil plot.

*Function of the Unit:* This ridgetop site was utilized in a pilot study to investigate the feasibility of using tritiated water to measure rates of transpiration of deciduous tree species (yellow poplar and hickory) under field conditions.

*Dates of Operation:* The tritium was introduced into the trees on May 16, 1971.

*Waste Characteristics:* Approximately 180 mCi of tritiated water (half-life 12.26 years) was injected into the trees.

*Release Data:* Correcting for radiological decay, approximately 77  $\mu$ Ci of tritium would be the maximum amount present at the site; however, following completion of the study all materials were removed from the site. Because tritium is mobile, it is doubtful that any residual tritium could be detected at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-11

Name: Cs-137, Co-60 Contaminated  
Forest Area

*Location of Unit:* Site ER-11 contained two radioisotope treatment plots on Chestnut Ridge. One plot was located 0.8 mile (1.35 km) on an azimuth of S 84 W from Bldg. 2001 at ORNL, and the other 1.55 miles (2.51 km) on an azimuth of N 49 E. A third plot (location undefined) served as a control.

*General Dimensions and Capacities:* The treatment plots were 4.85 acres (1.96 ha) each. A total of about 9.7 acres (4 ha) was involved in the study.

*Function of the Unit:* The objective of the study was to utilize the radioisotopes to determine annual and seasonal consumption rates of white pine seeds by small forest mammals. Animals in the study plots were live-trapped, isotopic body burdens determined in the laboratory, and the animals returned to the forest at the point of trapping.

*Dates of Operation:* Each of the two study areas received applications of contaminated seeds (tagged with Cs-137 and Co-60) between July 31, 1969 and September 3, 1970.

*Waste Characteristics:* The total amount of isotope in the applied seeds was approximately 5.8 mCi of Cs-137 (half-life 30 years) and 49.7 mCi of Co-60 (half-life 5.2 years) for each plot.

*Release Data:* As a result of the long-term study, the radioactive materials were constantly being removed from the site by feeding, but a fraction was being returned through body-elimination processes. Correcting for radiological decay, approximately 4 mCi of Cs-137 and 5.5 mCi of Co-60 would be the maximum amount of activity that would remain at the site if none were removed. These quantities would be further diluted by feed (food) placement by the resident animals, in excrement of animals meandering from the site, and scavenging by animals passing through the area. Field radiological surveys indicate that there may be some "hot spots" (1-2 mR/h) present in the plots.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-12

Name: Cs-134 Contaminated Oak Trees

*Location of Unit:* Site ER-12 consists of four subsites, each selected to represent a different soil type. Two of the sites (Landisburg and Fullerton) are on the north slope of Chestnut Ridge on azimuths of N 29 E and W 32 N at distances of 2.7 miles (4.4 km) and 1 mile (1.6 km) respectively from the intersection of Bethel Valley Road and Melton Valley Access Road. The other two sites (Monongahela and Sequoia) are in Melton Valley on azimuths of E 30 S and E 36 S at distances of 1.3 miles (2.1 km) and 1.4 miles (2.2 km) respectively from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* Each of the four sites covers an area of less than 550 ft<sup>2</sup> (50 m<sup>2</sup>).

*Function of the Unit:* The study was conducted on 12 white oak trees at 4 sites of contrasting soil types and moisture conditions. Throughout the growing season leaves were collected and analyzed for radionuclide distribution.

*Dates of Operation:* The trees were injected with Cs-134 in April of 1960. Two trees were double-tagged by injection with K-42.

*Waste Characteristics:* All trees in the study were injected with 2 mCi of Cs-134 (half-life 2.05 years), and two trees in each plot were also injected with 2 mCi of K-42 (half-life 12.4 h). Total activity used was 24 mCi of Cs-134 and 4 Ci of K-42.

*Release Data:* If all of the original cesium inoculum remained in any single tree, less than 0.3  $\mu$ Ci of activity would remain. Because the trees were harvested at the end of the study, it was estimated that only 25% of the inoculum would remain. This would result in less than 0.1  $\mu$ Ci remaining at any tree site. Radioactive decay has eliminated the K-42 (half-life 12.4 h).

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-13

Name: Zn-65 Tagged Red Oak  
Seedlings

*Location of Unit:* Site ER-13 is located 1.6 miles (2.5 km) on an azimuth of S 46 W from the intersection of State Highway 95 and the New Zion Patrol Road. The site is about 660 ft (200 m) north of Clinch River Mile 19.25.

*General Dimensions and Capacities:* Approximately 1100 ft<sup>2</sup> (100 m<sup>2</sup>) of land was involved in this study.

*Function of the Unit:* Gamma-irradiated red oak seedlings were contaminated with Zn-65 to investigate the effects of ionizing radiation on zinc uptake. A total of 26 containers of seedlings were used.

*Dates of Operation:* The 12-week study period was initiated in June 1975.

*Waste Characteristics:* A total of 1.3 mCi of Zn-65 (half-life 245 d) was introduced into the 26 seedling containers.

*Release Data:* Planted seedlings and all experimental materials were removed from the site when the study was completed. If the materials had been allowed to remain, less than 1 pCi (total) of Zn-65 would exist at this site and would not be detectable.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-14

Name: Cs-134 Contaminated Pine and  
Oak Seedlings

*Location of Unit:* Site ER-14 is located in the 0800 area a distance of 1.1 miles (1.7 km) on an azimuth of S 18 W from the intersection of State Highway 95 and the New Zion Patrol Road.

*General Dimensions and Capacities:* The total contaminated area is reported to be less than 1100 ft<sup>2</sup> (100 m<sup>2</sup>).

*Function of the Unit:* A number of short-term experiments conducted in the 0800 area were designed to determine initial interception and retention of fallout particles by various plant taxa.

*Dates of Operation:* In June 1968 white pine and red oak seedlings were contaminated with Cs-134 particles and sampling was carried out over a 33-d period.

*Waste Characteristics:* A total of 261  $\mu$ Ci of Cs-134 particles (half-life 2.05 years) was applied to 30 seedlings (8.7  $\mu$ Ci/container).

*Release Data:* By the end of the study all experimental materials had been removed for sampling and analysis. There is a possibility that some contamination of the soil and grass at the site may have occurred due to dislodged particles. Considering that nine half-lives have lapsed, less than 1  $\mu$ Ci (total) would still be present if all of the radioactive material had been left in the field.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-15

Name: Rb-86 Contaminated Plants

*Location of Unit:* Site ER-15 is located at the site of the pine-oak contamination study (ER-14) in the 0800 area. The site is a distance of 1.1 miles (1.7 km) on an azimuth of S 18 W from the intersection of State Highway 95 and the New Zion Patrol Road.

*General Dimensions and Capacities:* Two plots (33 ft by 33 ft [10 m by 10 m]) were utilized in this study.

*Function of the Unit:* This was another fallout-related study. Agricultural species were sprayed with particles contaminated with Rb-86 to determine fractional interception and retention times of particles in two size classes.

*Dates of Operation:* The particles were applied to the plots in June 1969. The study was completed after seven weeks.

*Waste Characteristics:* A total of 12.48 mCi of Rb-86 (half-life 18.66 d) was applied to one plot, and the other plot received 19.8 mCi.

*Release Data:* Approximately 230 half-lives have lapsed, and no detectable Rb-86 activity remains at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-16

Name: Cs-134 Contaminated Soybean  
and Sorghum

*Location of Unit:* Site ER-16 is located in the 0800 area 1.1 miles (1.7 km) on an azimuth of S 18 W from the intersection of State Highway 95 and the New Zion Patrol Road.

*General Dimensions and Capacities:* The contaminated area utilized was about 2150 ft<sup>2</sup> (200 m<sup>2</sup>).

*Function of the Unit:* This study was a continuation of research in plants and fallout effects. Twenty-five plants each of soybeans and sorghum were contaminated with Cs-134. Particle sizes used in this study were less than 10  $\mu$  in diameter.

*Dates of Operation:* The site was contaminated in July 1970. The study lasted seven weeks.

*Waste Characteristics:* A total of 682  $\mu$ Ci of Cs-134 (half-life 2.05 years) was used in this study. Each week three plants of each species were removed for radiological determinations.

*Release Data:* The removal of the plants reduced the amount of radioactivity at the site each week. At the end of the experiment all remaining experimental materials were removed. Considering that about eight half-lives have now lapsed, only 3.0  $\mu$ Ci (total) would remain if all of the experimental materials had been left at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-17

Name: Cs-134 Contaminated Grasses

*Location of Unit:* Site ER-17 is located in the 0800 area 1.1 miles (1.7 km) on an azimuth of S 18 W from the intersection of State Highway 95 and the New Zion Patrol Road.

*General Dimensions and Capacities:* Four 8- by 33-ft (2.5- by 10-m) plots totaling 1080 ft<sup>2</sup> (100 m<sup>2</sup>) were used in this study.

*Function of the Unit:* The study was designed to investigate the interception and retention of Cs-134 contaminated particles on forage and turf grasses. Each of the four study plots contained different grass species.

*Dates of Operation:* Each of the four plots was contaminated in June 1970. The duration of the study was seven weeks.

*Waste Characteristics:* Each plot received particles contaminated with 307  $\mu$ Ci of Cs-134 (half-life 2.05 years); a total of 1.23 mCi of Cs-134 was utilized.

*Release Data:* The removal of plant materials combined with radioactive decay of the isotope reduced the amount of radioactivity of the site after each sampling period. Considering that nearly eight half-lives have lapsed since contamination, approximately 5.0  $\mu$ Ci (total) of Cs-134 would remain if all of the experimental materials had remained at the site. Since all materials were removed, the remaining radioactivity should be negligible.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-18

Name: Cs-134 Contaminated Lichens  
and Mosses

*Location of Unit:* Site ER-18 is located in the 0800 area 1.1 miles (1.7 km) on an azimuth of S 18 W from the intersection of State Highway 95 and the New Zion Patrol Road.

*General Dimensions and Capacities:* One of the 33- by 33-ft (10- by 10-m) plots used in previous fallout studies was used.

*Function of the Unit:* This was the final fallout study and examined lower plants' (lichens and mosses) effects due to fallout particulates. Cesium-134 was used as the contaminant.

*Dates of Operation:* In June 1971, the Cs-134 contaminated particles were applied to individual moss and lichen tussocks (21 for each species).

*Waste Characteristics:* Each contaminated point (155 in.<sup>2</sup> [1000 cm<sup>2</sup>]) received 3.5  $\mu$ Ci of Cs-134 (half-life 2.05 years); a total of 147  $\mu$ Ci was used in the study.

*Release Data:* All contaminated moss and lichen tussocks were removed for radiological examination during the study. All experimental materials were also removed from the study area; however, if all of the radioactivity had been left at the site, less than 1  $\mu$ Ci (total) of Cs-134 would remain following radioactive decay.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-19

Name: Tc-95m Contaminated Soil and  
Plants

*Location of Unit:* Site ER-19 is located in the 0800 area about 330 ft (100 m) north of the western end of the fenced enclosure (SWMU 13.1 in the RFA) north of the Clinch River at mile 20.5 (km 33.2) on an azimuth south, 1.3 miles (2.1 km) from the intersection of Bethel Valley Road and State Highway 95.

*General Dimensions and Capacities:* Approximately 3200 ft<sup>2</sup> (300 m<sup>2</sup>) of land area was used in this study. Twenty-two separate 10.8-ft<sup>2</sup> (1-m<sup>2</sup>) plots were used during the study.

*Function of the Unit:* Used to evaluate the interception and retention of fission products by grasses and soils. The method of radioisotope application differed from previous retention studies in that the nuclide was applied by liquid spray.

*Dates of Operation:* Three separate applications of Tc-95m occurred: 15 plots during September 1978, 4 plots during April 1979, and 3 plots during July 1979.

*Waste Characteristics:* The Tc-95m (half-life 61 d) was sprayed on the grass. In the first application, 200  $\mu$ Ci was applied to each of the 15 plots (3 mCi); in the second application 10  $\mu$ Ci was applied to each of the the four plots (40  $\mu$ Ci); and in the final application 10  $\mu$ Ci was applied to each of the three plots (30  $\mu$ Ci). Total Tc-95m applied was 3.07 mCi.

*Release Data:* Because of the short half-life and the amount of time that has lapsed since application (8 years or more), radioactive decay has reduced the concentration to levels that are not detectable at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-20

Name: Tc-95m Uptake Studies

*Location of Unit:* Site ER-20 is located in the same general area as ER-19.

*General Dimensions and Capacities:* Three 10.8-ft<sup>2</sup> (1-m<sup>2</sup>) plots were contaminated. Estimated area utilized is 108 ft<sup>2</sup> (10 m<sup>2</sup>).

*Function of the Unit:* The uptake of the technetium by emerging plants in the field was compared with uptake in a companion greenhouse study in which soil columns were contaminated and emerging plants analyzed.

*Dates of Operation:* The field portion of the study was performed in late February 1981.

*Waste Characteristics:* Each plot was contaminated with 112  $\mu$ Ci of Tc-95m (half-life 61 d) in solution (total 336  $\mu$ Ci).

*Release Data:* Approximately 31 half-lives have lapsed since initial field contamination. Considering the original microcurie quantities and the radiological decay, the presence of the isotope at the site is below detection.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-21

Name: Tc-95m and I-131 Contaminated  
Pasture

**Location of Unit:** Site ER-21 is located in the same general area as SWMU 13.1 in the RFA. The areas contaminated with Tc-95m and I-131 were isolated from the original Cs-137 contaminated pens used in SWMU 13.1.

**General Dimensions and Capacities:** The contaminated pasture area encompassed 43,000 ft<sup>2</sup> (4000 m<sup>2</sup>).

**Function of the Unit:** The purpose of the study was to assess the transfer of the radioisotopes Tc-95m and I-131 from forage grass to milk in goats.

**Dates of Operation:** In May, July, and September of 1983 I-131 was sprayed on the site. In September Tc-95m was also sprayed on the site.

**Waste Characteristics:** The total amount of I-131 (half-life 8.05 d) applied was 60 mCi, and the Tc-95m (half-life 61 d) was 10 mCi.

**Release Data:** Radioactivity of both isotopes is not detectable because of radiological decay, the technetium having gone through approximately 16 half-lives and the iodine 126 half-lives.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-22

Name: Cr-51 Contaminated Grass  
Plots

*Location of Unit:* Site ER-22 is located in the 0800 area approximately 0.2 mile (0.3 km) on an azimuth of N 6 E of the northeast corner of the 0800 area enclosure.

*General Dimensions and Capacities:* Twenty-five 10.8-ft<sup>2</sup> (1 m<sup>2</sup>) plots were exposed.

*Function of the Unit:* The purpose of the study was to investigate the interception and retention of simulated cooling tower drift on vegetation (pine, yellow poplar, and fescue grass foliage).

*Dates of Operation:* Chromium-51 was applied to the grass plots in July 1976. Duration of the study was nine weeks.

*Waste Characteristics:* The plots were contaminated with an aerosol spray containing Cr-51 (half-life 27.8 d). The 25 exposed plots received a total of 125  $\mu$ Ci of Cr-51.

*Release Data:* Because Cr-51 has a short half-life and over 3800 days have passed since the plots were contaminated, no detectable radioactivity remains at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-23

Name: Tc-99 and Np-237 Contaminated  
Soil Lysimeters

*Location of Unit:* Site ER-23 is located 0.3 mile (0.5 km) on an azimuth of E 75 S from the intersection of Melton Valley Drive and Lagoon Road. The site is commonly referred to as the plutonium floodplain, which is southeast of SWSA 4.

*General Dimensions and Capacities:* The contaminated area was about 43.2 ft<sup>2</sup> (4 m<sup>2</sup>).

*Function of the Unit:* Eight lysimeter cylinders 11 in. (28 cm) in diameter were contaminated with Np-237 and four additional cylinders were contaminated with Tc-99. The cylinders were covered on the bottom with mesh such that downward migration of the radionuclide could occur. The cylinders were lowered into a hole such that the soil level in the cylinders was the same as that of the surrounding soil. Agricultural species were cultured in the lysimeters, harvested, and analyzed for concentration ratio calculations.

*Dates of Operation:* The study was performed in June 1984.

*Waste Characteristics:* A total of 64  $\mu\text{Ci}$  of Np-237 (half-life  $2.14 \times 10^6$ ) and 32  $\mu\text{Ci}$  of Tc-99 (half-life  $2.12 \times 10^5$ ) was added to the 12 lysimeter cylinders.

*Release Data:* At the termination of the study, all of the cylinders were removed from the soil and encased in plastic; they are presently in storage awaiting disposal. No radioactivity remains at the site.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-24

Name: Cs-137 Contaminated Forest  
Floor

*Location of Unit:* Site ER-24 is located near (160 ft [50 m]) the lower slope forest of Copper Ridge, a distance of 1.8 miles (2.92 km) on an azimuth of E 66 S from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* A 16.5- by 16.5- ft (5- by 5-m) plot was contaminated with Cs-137. Estimated contaminated area is 270 ft<sup>2</sup> (25 m<sup>2</sup>).

*Function of the Unit:* The purpose of the study was to determine the transfer of the cesium from the litter to successive soil depths following rain-leaching and decay of the litter.

*Dates of Operation:* The forest floor was contaminated by spraying with Cs-137 in April 1964.

*Waste Characteristics:* The exact amount of Cs-137 (half-life 30 years) applied is not known; however, it is thought to have been in the order of 1 mCi or less.

*Release Data:* Since the initial contamination occurred, about 23 years have lapsed. If the initial radioactivity was about 1 mCi, then about 0.6 mCi would remain, subject to dilution by leaching and decay of the litter.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-25

Name: Cs-137 Contaminated Forest  
Understory

*Location of Unit:* Site ER-25 is located about 33 ft (10 m) west of the cesium forest study enclosure (SWMU 16.1 in the RFA). The site is 1.8 miles (2.92 km) on an azimuth of E 66 S from the intersection of Bethel Valley Road and the Melton Valley Access Road near the lower slope forest of Copper Ridge.

*General Dimensions and Capacities:* A 110-ft<sup>2</sup> (10-m<sup>2</sup>) plot was contaminated with Cs-137.

*Function of the Unit:* The study was designed to determine the movement of radiocesium to litter and soil from the understory canopy.

*Dates of Operation:* The area was sprayed with Cs-137 on June 27, 1966.

*Waste Characteristics:* Plants, soil, and litter were contaminated with 360 mCi of Cs-137 (half-life 30 years).

*Release Data:* Twenty years have passed (0.67 half-life) since the radionuclide was applied. The maximum residual radioactivity today would be about 220 mCi. Because of annual leaf-fall and wind dispersal, decomposition of the litter, runoff, and infiltration, it is unlikely that detectable levels remain.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-26

Name: Cs-137 Contaminated Meadow

**Location of Unit:** Site ER-26 is thought to be an area of detectable radioactive contamination adjacent (65 ft [20 m] north) to the Cs-137 runoff plot (SWMU 13.2 in the RFA). The exact position is not known.

**General Dimensions and Capacities:** An 8- by 8-ft (2.4- by 2.4-m) plot was contaminated with Cs-137. Total area contaminated was 64 ft<sup>2</sup> (10 m<sup>2</sup>).

**Function of the Unit:** This area served as a pilot study for the runoff soil-erosion study (SWMU 13.2 in the RFA).

**Dates of Operation:** The exact date of isotope application is not known but is thought to be in June 1964.

**Waste Characteristics:** 5 mCi of Cs-137 (half-life 30 years) was applied in the form of a spray to clipped (short meadow) and unclipped (long meadow) grass cover within the plot.

**Release Data:** If the June 1964 date is correct, nearly 23 years (approximately 0.73 half-life) have elapsed since the field was contaminated. If the only loss of radioactivity were through radiological decay, approximately 3 mCi would remain. Much less would actually be present due to losses from rainout, plant fragmentation, and wind dispersal.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-27

Name: Cs-134 Contaminated Persimmon  
Tree

*Location of Unit:* Site ER-27 is located 0.3 mile (0.4 km) on an azimuth of E 73 S from the intersection of the Oak Ridge Turnpike and Blair Road.

*General Dimensions and Capacities:* The contaminated area is estimated to be 65 ft<sup>2</sup> (6 m<sup>2</sup>).

*Function of the Unit:* The study was designed to determine the transfer of the Cs-134 radionuclide from a contaminated canopy to the understory by rainout.

*Dates of Operation:* In June 1970, a single persimmon tree was inoculated with Cs-134. Duration of the study was approximately ten weeks.

*Waste Characteristics:* The tree was inoculated with approximately 2 mCi of Cs-134 (half-life 2.05 years).

*Release Data:* Nearly 18 years (or 9 half-lives) have passed since the radionuclide was introduced at the site. The maximum possible contaminant remaining would be approximately 8  $\mu$ Ci, providing there were no losses from the site by rain (runoff or leaching), wind, or animal consumption.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-28

Name: Co-60 and Mn-54 Animal Study

*Location of Unit:* Site ER-28 is located 0.52 mile (0.8 km) on an azimuth of S 40 W from the intersection of the Oak Ridge Turnpike and the North Perimeter Patrol Road (ORGDP).

*General Dimensions and Capacities:* The site was a 2.5-acre (1-ha) field.

*Function of the Unit:* The purpose of the experiment was to determine the effects of near-lethal irradiation and natural environmental factors on the retention and excretion of the two nuclides used (Co-60 and Mn-54) in members of a field population.

*Dates of Operation:* In July 1970, 34 pine voles were gamma-irradiated; of these, 17 were injected with Co-60 and the other 17 were injected with Mn-54 and released to the field.

*Waste Characteristics:* The animals were injected with a total of 17  $\mu\text{Ci}$  of Co-60 (half-life 5.2 years) and 17  $\mu\text{Ci}$  of Mn-54 (half-life 0.82 years).

*Release Data:* Considering that over three half-lives have lapsed in the decay of the Co-60 contaminant, approximately 2.6  $\mu\text{Ci}$  of this isotope would remain today provided that all 17 animals remained within the 2.5-acre field. In the case of the Mn-54, radiological decay would have reduced the remaining amount to less than 16 pCi. The amounts of radioactivity present at the site are expected to be much less than these values and thus would be undetectable.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-29

Name: C-14 Maintenance-Respiration  
Study

*Location of Unit:* Site ER-29 is located 1.7 miles (2.75 km) on an azimuth of N 22 E from the intersection of Bear Creek Road and Gum Branch Road. Site is on the north side of Pine Ridge.

*General Dimensions and Capacities:* The area involved in the study was 2150 ft<sup>2</sup> (200 m<sup>2</sup>).

*Function of the Unit:* Thirty-six trees were contaminated with C-14 to study the movement of carbon during respiration. The isotope was introduced as carbon dioxide.

*Dates of Operation:* Twenty trees were contaminated with the C-14 in June 1983, and another 16 trees in June 1984.

*Waste Characteristics:* The first group of 20 trees were contaminated by foliar tagging with a total of approximately 1 mCi of C-14, and the second group with 2 mCi. The half-life of C-14 is 5479 years.

*Release Data:* Research data demonstrated that exposed foliage absorbed  $\geq 2\%$  of the contaminant (C-14) gas. It was also noted that most of the radiocarbon was released within the first week of sampling foliage. Experimental protocol identified C-14 labeled branches with tags. All tagged branches were removed upon completion of the study. Due to low levels of exposure, no detectable radiation would be present at the site today. Radiocarbon has a long half-life, but because of the weak beta energy (0.156 MeV) it does not constitute an exposure hazard. As the plant material decomposed, a portion of the radiocarbon was dispersed into the atmosphere as carbon dioxide.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-30

Name: C-14 Sucrose Inoculation of  
Oak and Pine Trees

*Location of Unit:* Site ER-30 is located near the Cs-134 contaminated forest (SWMU 16.1 in the RFA). It is 1.8 miles (2.9 km) on an azimuth of E 66 S from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* The area of contamination is reported to be 1100 ft<sup>2</sup> (100 m<sup>2</sup>).

*Function of the Unit:* Two studies were conducted. Both were designed to determine the spatial and temporal pattern of carbohydrate movement and respiratory use by the root systems of trees.

*Dates of Operation:* In October 1972, three trees were inoculated with C-14 sucrose, and in October 1976 a single white oak tree was inoculated with C-14 sucrose.

*Waste Characteristics:* Each of the three trees received 1.65 mCi of C-14 (half-life 5479 years), and the fourth tree received 5 mCi (total of 9.95 mCi).

*Release Data:* Study protocol required tagging of labeled branches and all tagged branches were subsequently removed upon study completion. Radiocarbon has a long half-life, but because of the weak beta energy (0.156 MeV) it does not constitute an exposure hazard. As the plant material decomposed, a portion of the radiocarbon was dispersed into the atmosphere as carbon dioxide.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-31

Name: C-14 Allocation in White Oak  
Trees

*Location of Unit:* Site ER-31 is located a distance of 1.9 miles (3.1 km) on an azimuth of N 25 E from the intersection of Bethel Valley Road and Melton Valley Access Road.

*General Dimensions and Capacities:* The area of contamination is reported to be 2150 ft<sup>2</sup> (200 m<sup>2</sup>).

*Function of the Unit:* Two studies were conducted in this area. The purpose of the first was to determine seasonal changes in photosynthate translocation and allocation by following the rates of movement of the C-14 from labeled foliage, and the second was to follow the rate and efficiency of the utilization of food reserves.

*Dates of Operation:* The studies were conducted between 1972 and 1977.

*Waste Characteristics:* In the first study, two trees were contaminated by foliar tagging using C-14. Each of the two trees received 50  $\mu$ Ci. In the second study, two trees received inoculations of 5  $\mu$ Ci of C-14 sucrose. The half-life of C-14 is 5479 years.

*Release Data:* Upon completion of the study, tagged trees were removed. One large oak remained; however, all tagged branches were removed from the oak tree. Radiocarbon has a long half-life, but because of the weak beta energy (0.156 MeV) it does not constitute an exposure hazard. As the plant material decomposed, a portion of the radiocarbon was dispersed into the atmosphere as carbon dioxide.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-32

Name: C-14 Allocation in White Pine  
Trees

*Location of Unit:* Site ER-32 is located a distance of 1.8 miles (2.9 km) on an azimuth of N 55 E from the intersection of Bethel Valley Road and the Melton Valley Access Road. It is identified by a pine stand south of Bethel Valley Road near the Walker Branch Embayment of Melton Hill Lake.

*General Dimensions and Capacities:* The area of contamination is reported to be 1.25 acres (0.5 ha).

*Function of the Unit:* The purpose of the study was to determine the rate and cause of declining vigor of oxidant-stressed trees by following the rate of photosynthetically fixed C-14.

*Dates of Operation:* Between June and November 1979, nine white pine trees were labeled by foliar tagging with C-14.

*Waste Characteristics:* A total of 360  $\mu\text{Ci}$  of C-14 (half-life 5479 years) was introduced to foliage at four times during the growing season.

*Release Data:* Study protocol required tagging of labeled branches. At the end of the study all tagged branches were cut. Any residual C-14 was diluted in the biomass and, therefore, could not be detected. (At a later date, a number of these trees were removed with the construction of a power line.) Radiocarbon has a long half-life, but because of the weak beta energy (0.156 MeV) it does not constitute an exposure hazard. As the plant material decomposed, a portion of the radiocarbon was dispersed into the atmosphere as carbon dioxide.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-33

Name: C-14 Efflux in Yellow Poplar  
Stand

*Location of Unit:* Site ER-33 is located a distance of 1.8 miles (2.9 km) on an azimuth of E 76 S from the intersection of Bethel Valley Road and Melton Valley Access Road. Site is on the north slope of Copper Ridge.

*General Dimensions and Capacities:* The area of contamination is reported to be 2150 ft<sup>2</sup> (200 m<sup>2</sup>).

*Function of the Unit:* The purpose of the study was to measure carbon dioxide efflux of the roots through the soil. Following introduction of the C-14 to three trees, the trees were girdled to inhibit upward translocation.

*Dates of Operation:* The three yellow poplar trees were contaminated in July 1976.

*Waste Characteristics:* A total of 3 mCi was inoculated into the trees as C-14 sucrose (half-life 5479 years).

*Release Data:* Stems were girdled to inhibit upward translocation of the radiocarbon. At the end of the study, roots, trees, and/or labeled branches were removed. Radiocarbon has a long half-life, but because of the weak beta energy (0.156 MeV) it does not constitute an exposure hazard. As the plant material decomposed, a portion of the radiocarbon was dispersed into the atmosphere as carbon dioxide.

## EPA II.A.1 DATA SUMMARY SHEET

ID Number: ER-34

Name: C-14 Allocation in Woody  
Biomass Plantation Species

*Location of Unit:* Site ER-34 is located at the ORNL site in the Woody Biomass Plantation south of Building 1503.

*General Dimensions and Capacities:* The area of contamination is reported to be 1.25 acres (0.5 ha).

*Function of the Unit:* The purpose of the study was to determine photosynthate allocation. Several species of trees in the Woody Biomass Plantation were included in the study.

*Dates of Operation:* The C-14 was introduced as a gas to foliage contained in exposure cuvettes.

*Waste Characteristics:* A total of 1 nCi of C-14 carbon dioxide was used in the study.

*Release Data:* Study protocol required tagging of labeled branches and all tagged branches were subsequently removed upon study completion. Radiocarbon has a long half-life, but because of the weak beta energy (0.156 MeV) it does not constitute an exposure hazard. Following this study, all plant material was removed and disposed. No contamination should remain at the site.

**LIST OF PREPARERS**

C. E. Nix	EC & HP
Ann Geisler	EC & HP
J. T. Kitchings III	EC & HP
W. J. Boegly, Jr.	ESD
D. D. Huff	ESD
J. R. Trabalka	ESD
R. H. Ketelle	ED
T. E. Myrick	OP

**REPORT PREPARATION**

C. M. Sekula	Editor
J. S. Cox	ESD
D. G. Cottrell	Graphics
Graphics Dept.	ESD

EC & HP	=	Environmental Compliance & Health Protection
ED	=	Energy Division
ESD	=	Environmental Sciences Division
OP	=	Operations Division

**INTERNAL DISTRIBUTION**

- |                      |                                      |
|----------------------|--------------------------------------|
| 1. J. S. Baldwin     | 41-55. P. T. Owen                    |
| 2. J. B. Berry       | 56. D. C. Parzyck                    |
| 3-4. W. J. Boegly    | 57. T. A. Perry                      |
| 5. T. A. Bowers      | 58. D. E. Reichle                    |
| 6. T. W. Burwinkle   | 59. P. S. Rohwer                     |
| 7. J. B. Cannon      | 60. T. H. Row                        |
| 8. W. W. Chance      | 61. C. M. Sekula                     |
| 9. K. E. Cook        | 62. F. E. Sharples                   |
| 10. N. H. Cutshall   | 63. B. P. Spalding                   |
| 11. P. E. Hollenbeck | 64. S. H. Stow                       |
| 12. F. J. Homan      | 65-66. L. E. Stratton                |
| 13-14. D. D. Huff    | 67. J. H. Swanks                     |
| 15. R. H. Ketelle    | 68. T. O. Tallant                    |
| 16-17. L. W. Long    | 69. J. R. Trabalka                   |
| 18. L. L. McCauley   | 70. L. D. Voorhees                   |
| 19. L. E. McNeese    | 71. R. S. Wiltshire                  |
| 20. L. J. Mezga      | 72. Laboratory Records Department—RC |
| 21. M. E. Mitchell   | 73-74. Laboratory Records Department |
| 22. F. R. Mynatt     | 75. Central Research Library         |
| 23-38. T. E. Myrick  | 76. Y-12 Technical Library           |
| 39. C. E. Nix        | 77. ORNL Patent Section              |
| 40. R. E. Norman     |                                      |

**EXTERNAL DISTRIBUTION**

78. Assistant Manager, Energy Research and Development, DOE/ORO, P.O. Box E, Oak Ridge, TN 37831
- 79-80. Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831

