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Resource Management Plan

for the
U.S. Department of Energy

Oak Ridge Reservation

Volume 15

Appendix P: Waste Management

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Resource Management Plan

for the

U.S. Department of Energy
Oak Ridge Reservation

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APPENDIX P

WASTE MANAGEMENT

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APPENDIX P

WASTE MANAGEMENT

I. ABSTRACT

Since their inception, the DOE facilities on the Oak Ridge Reservation have been the source of a variety of airborne, liquid, and solid wastes which are characterized as nonhazardous, hazardous, and/or radioactive. The major airborne releases come from three primary sources: steam plant emissions, process discharge, and cooling towers. Precipitation, filters, and chemical traps are utilized to remove nonradioactive and radioactive particulates and gases. Liquid wastes are handled in various manners depending upon the particular waste, but in general, major corrosive waste streams are neutralized prior to discharge with the discharge routed to holding or settling ponds. In some cases, denitrification or electrolytic processes are employed. The major solid wastes are derived from construction debris, sanitary operation, and radioactive processes, and the machining operations at Y-12. Construction debris is normally handled by each facility. Sanitary waste is disposed of in a centralized sanitary landfill. Radioactive solid waste is disposed via hydrofraction, stored in cylinders or buried in shallow landfills. Waste from machining operations is sold (clean scrap), or disposed of in either the sanitary landfill or radioactive burial areas.

Nonradioactive hazardous wastes are disposed in solid waste storage areas, shipped to commercial disposal facilities, returned in sludge ponds, or sent to radioactive waste burial areas. The radioactive-hazardous wastes are treated in two manners: storage of the waste until

acceptable disposal options are developed, or treatment of the waste to remove or destroy one of the components prior to disposal.

Operations of waste management activities have had a variety of impacts on the surrounding environment. These impacts include contamination of soil, ground and surface water, and sediments. Studies and analysis of these impacts is discussed in greater detail in the appendix and other documents. Monitoring programs (Appendix E) routinely take place to alert personnel to potential problem areas so that preventive action can be undertaken before unsafe levels are reached. Numerous projects are underway at each of the three main facilities to mitigate the migration of waste materials. At ORNL, waste management areas are being protected from groundwater intrusion via impermeable caps and diversion systems. At both Y-12 and ORGDP, projects are planned to phase out facilities which allow easy access to the environment. These facilities will be replaced with systems providing long-term isolation of waste materials.

II. OBJECTIVE

Since their inception, the three Department of Energy (DOE) facilities on the Oak Ridge Reservation (ORR) have been the source of a variety of airborne, liquid, and solid wastes. These wastes can be characterized as nonhazardous, hazardous, and/or radioactive. The objective of this appendix is to characterize these waste streams, to describe and to locate the facilities used for their treatment/disposal

(past, present, and future) and to discuss the environmental impacts associated with these facilities. This characterization is consistent with the plant's current operation and with the plans in place to address environmental concerns. Since a number of the projects discussed here are the subject of discussion with the State and EPA, the reader is advised to contact the plant environmental coordinator for up-to-date information.

III. WASTE CHARACTERIZATION

A. Airborne Waste Streams

Major sources of airborne releases at each plant are steam plant emissions, process discharges, and cooling tower drift. These sources and their associated volumes are shown in Tables 1 through 3.

1. Steam plant emissions

Each of the three Oak Ridge facilities maintains its own steam plant for heating and process purposes. All three plants currently use coal as their primary fuel. The plants at ORNL and at ORGDP use spreader stoker boilers; the Y-12 steam plant uses pulverized coal. All three plants currently use electrostatic precipitators for particulate removal; none use emission controls for sulfur removal.

The ORNL and ORGDP plants have been successful in meeting required discharge limitations. The Y-12 plant has had a problem with particulate emissions, because a switch to low-sulfur coal has created operational problems with their electrostatic precipitator units. To solve this

Table 1

Major ORNL Gaseous Waste Discharges

Waste Source	Pollutant Composition	Annual Discharge Quantity	Current Treatment	Future Treatment
Central Gaseous Waste Processing System	Particualte radioactivity, radioiodine, noble gores	70 kCi	HEPA Filtration charcoal adsorbtion scrubbing	-
Steam Plant	Particulate, Sulfur Dioxide, Nitirogen Oxides	Variable	Electrostatic Percipitators	
Degreasers	Volatile Organics	Negl.	-	-
Spray Booths	Volatile Organics	Negl.	-	-
High Flux Isotope Reactor Area	Particulate radioactivity, radioiodine, noble gases	15 kCi	HEPA Filtration Charcoal Adsorption scrubbing	- -
Molten Salt Reactor Experiment	Radioactive Gases and Particulates	Negl.	HEPA Filtration	Decommissioning
Radiochemical Pilot Plant	Radioactive Gases and Particulates	Negl.	HEPA Filtration	-
High Radiation Level Analytical Laboratory	Radioactive Gases and Particulates	Negl.	HEPA Filtration	-
Heavy Ion Facility	Radioactive Gases and Particulates	Negl.	HEPA Filtration	
Laboratory Hoods	Chemical Fumes, Radioactive Gases and Particulates	Negl.	Filtration	-
Tritium Target	Tritium Gas	200 Ci	-	-

Table 2

Major ORGDP Gaseous Waste Discharges

Waste Source	Pollutant Composition	Annual Discharge Quantity	Current Treatment	Future Treatment
Purging of Diffusion Light Gases	Gaseous chlorides and Fluorides, Uranium, and Technicium - 94	Classified	Sodium Fluoride and Aluminum Traps, Scrubber	-
Development Facility Gaseous Exhaust	Gaseous Halogens and Halogenated Particulates	3.6 Tons (max)	Electrostatic Precipitator Scrubber	-
Diffusion Equipment Gaseous Treatment Exhaust	Gaseous Fluorides	3.3 Tons	Scrubber	
Venting of Uranium Hexofluoride Cylinders	Gaseous and Particulate Fluroides, Uranium	0.9 Tons	Cold Traps Aluminum Traps	-
Drying and calcining of Recovered Uranium Compounds	Particulate Uranium Compounds, Nitrogen Oxides	1.8 Tons	-	-
Diffusion Plant Equipment Evalution	Gaseous and Particulate Fluorides, Uranium	6.6 Tons (max)	-	-
Diffusion Pilot Plant Equipment Purging	Gaseous Fluorides, Uranium	1 Ton	-	Scrubber
Fluorine Manufacture Exhaust	Fluorine, Hydrogen Fluoride	1 Ton	-	Facility Shutdown
Barrier Plant	Classified	Classified	-	-

Table 2
(Cont'd)

Waste Source	Pollutant Composition	Annual Discharge Quantity	Current Treatment	Future Treatment
Centrifuge Production Exhaust	Classified	Classified	-	-
Coolant System Leaks	Freon	125 Tons	-	-
TSCA Incinerator (Future)	Particulate, Gaseous Haloyens, Sulfur Dioxide, Nitrogen Oxides	TBD	-	Scrubber
Solvent Vapor Losses	Trichloroethane, Perchlorothylene, Methylene Chloride, Acetone	37 Tons	-	-
Steam Plant	Particulates, Sulfur Dioxide, Nitrogen Oxides	Variable	Electrostatic Precipitators	-

Table 3

Major Y-12 Gaseous Waste Discharges

Waste Source	Pollutant Composition	Annual Discharge Quantity	Current Treatment	Future Treatment
General Plant	Uranium	0.31 Ci	Filtration	-
9206 9212	Hydrogen Fluoride	7000 cu. ft.	Scrubbers	Replacement Scrubbers
Steam Plant	Particulates, Sulfur Dioxide, Nitrogen Oxides	Variable	Electrostatic Precipitators	Baghouses
Degreasers	Perchloroethylene	250 Tons	-	-
Air Conditioning System	Alcohol	420 Tons	-	Improved Seals
Nitric Acid Pickling Baths	Nitrogen Oxides	Not Known	-	Scrubber
Machining Opera-	Perchloroethylene		-	Switch to a Berax/Glycol/ Water Mixture

problem, a project is under way to install baghouses at the plant that are designed to meet emission standards.

2. Process emissions

Airborne process releases from each of the three plants are quite different due to the different missions of the three facilities.

ORNL's process emissions (Table 1) have four major sources:

(1) operations of the two large research reactors onsite,

(2) isctope production activities,

(3) pilot plant operations, and

(4 research and process hoods.

Emissions from these facilities are predominantly radioactive, and all are treated similarly. Particulate emissions are treated by a combination of roughing and high efficiency particulate absolute (HEPA) filters. Certain isotopes, such as radioiodine and tritium, are collected on chemical traps. Other discharges are pretreated by scrubbers prior to filtration.

ORGDP's process discharges (Table 2) are produced by the operation of the gaseous diffusion process: input materials processing (uranium hexafluoride feed, fluorine gas, barrier material, etc.) and purging equipment clean-up (decontamination operations, solvent cleaning, etc.). Radioactive emissions are limited to isotopes of uranium and technicium. Nonradioactive discharges include fluorides, freon, and organic vapors. Treatment of the radioactivity released is accomplished using chemical traps. Fluorides and other halogens are removed by scrubbers.

A major new source of atmospheric emissions at ORGDP will be an incinerator designed to destroy polychlorinated biphenyls (PCB's) and other hazardous organics material. This new facility, which should be operational in 1987, will use scrubbers for emission control. For more details on the facility's impact on the environment, see its environmental impact statement (DOE/EIS, 1982).

Y-12's process discharges (Table 3) are the result of component manufacture for the U.S. nuclear weapons program. Major emissions include uranium, fluorides, nitrogen oxides, and organic solvents. Treatment of the uranium released is accomplished by filtration. Nitrogen oxide discharges are treated with scrubbers. New scrubbers are also planned to control hydrogen fluoride emissions.

3. Cooling tower drift

Each of the three facilities use mechanical draft cooling towers for heat dissipation. By far, however, the ORGDP towers are the main source of drift on the ORR and have the greatest impact on the environment. The reason is twofold:

- the ORNL and Y-12 towers are relatively small; the ORGDP system, however, dissipates approximately 1900 MW of heat
- unlike the towers at ORNL and at Y-12, the ORGDP cooling towers still use a chromate system for corrosion inhibition.

It is estimated that drift losses from these towers exceed 90,000 gal/day with an approximate chromium concentration of 9 mg/L (DOE 1979).

B. Liquid Waste Streams

Major liquid waste streams include storm water, sanitary wastewater, process wastewater, and chemical wastes. These waste streams are shown in Tables 4 through 6.

1. Storm water

Each of the three facilities has a system designed specifically to collect storm water runoff and to route it to nearby surface streams. The discharge of this water is not inherently a problem; however, this water can create a pathway for chemicals (e.g., coal yard runoff) or radioactivity to reach the environment (see Section III.D). Coal Yard Runoff is treated at both ORNL and ORGDP. Y-12 also plans to treat its runoff as part of a Stream Plant Wastewater Treatment System.

2. Sanitary wastewater

Each of the three facilities maintains a collection system for sanitary sewage. The Y-12 Plant sends its sewage to the Oak Ridge West Sewage Treatment Plant. ORNL and ORGDP maintain sewage treatment plants onsite to handle their sewage.

3. Process Wastewater

As with the airborne process emissions (Section A.2, above), the process wastewater generated by each plant varies according to its mission.

At ORNL, there are three main sources of process wastewater (Fig. 4):

Table 4
Major ORNL Liquid Waste

Waste Source	Waste Composition	Annual Generation (gals x 1000)	Current Treatment	Future Treatment	Ultimate Disposal
Reproduction Waste	Silver, Cyanide, High pH, High BOD	15.0	Recovery of Silver, Removal of Cyanide, BOD Removal at Sewage Treatment Plant	-	Discharge to White Oak Creek
Plating Shops	Acids, Cyanides, Chromates	0.5	Collection into drums	-	Disposal in EPA Approved Landfill
Laboratory Process Wastes	Dilute Inorganic and Organic Solution	160,000	-	Nonradiological Wastewater Treatment Plant	Discharge to White Oak Creek and Melton Branch
Radioactive Process Waste	Low level radioactive liquid	4,500	Cationic Demineralizers	Further Treatment as Laboratory Process Waste	Discharge to White Oak Creek
Intermediate Level Waste	Higher activity solutions	1,200	Evaporation	-	Hydrofracture
Sewage Treatment Plant	Sanitary Waste, Laundry Waste, Discharge of Silver Recovery System	80,000	Aerated Lagoons	Extended Aeration	Discharge to White Oak Creek
Cooling Tower Blowdown	Solids, Biocide, Corrosion, Inhibitor	114,000	-	-	Discharge to White Oak Creek and Melton Branch

Table 4 (Continued)

Waste Source	Waste Composition	Annual Generation (gal x 1000)	Current Treatment	Future Treatment	Ultimate Disposal
Waste Oil	Oils without PCBs or radioactivity	35.0	Storage	Sale to Offsite reclaimer	-
	Oils contaminated with PCBs	1.0	Storage	Incineration	Shipment to EPA approved landfill
	Oils contaminated with radioactivity	0.6	Storage	Incineration	Disposal of ash (Future)
Laboratories	Hazarodus chemicals	25.0	Storage	-	Shipment to EPA Approved Landfill
	Co-contaminated Wastes	2.0	Storage	Incineration or Fixation	Disposal as Solid Radwaste (Future)
Biology Division	Dilute inorganic and organics in solution	26,000	-	Biology Wastewater Treatment System	Discharge to East Fork of Poplar Creek
Isotope Sepa-	Concentrate Nitric Acid solutions	0.6	Storage for shipment offsite	Y-12's West End Treatment Plant	Discharge to East Fork of Poplar Creek
	Rinse Solutions	65.0	-	Isotope Separations Facility Wastewater Treatment	Discharge to East Fork of Poplar Creek
Solid Waste Storage Areas	Leachate for burial	3,700,000	-	Elimination of Leaching	Discharge to White Oak Creek and Melton Branch
Steam Plant	coal Yard Runoff	4,500	Neutralization, settling	Neutralization, settling, sludge dewatering	Discharge to White Oak Creek
	Demineralizer Regeneration		Neutralization	-	Discharge to White Oak Creek
Steam Plant	Boiler Blowdown	26,000	K-1407B Pond	Chemical Treatment	Poplar Creek
	Zeolite Regeneration	18,000	Neutralization, Settling	Chemical Treat-	Poplar Creek
	Coal Yard Runoff	58,000	Neutralization, Settling	-	Poplar Creek

Table 5

Major ORGDP Liquid Waste Streams

Waste Source	Waste Composition	Annual Generation (gal x 1000)	Current Treatment	Future Treatment	Ultimate Disposal
Recirculating Cooling Water	Softening Waste	24.0	K-901A Pond	Filtration	Poplar Creek
	Blowdown	55,000	Electrlytic Reduction Precipitation	-	Poplar Creek
	Drift and Windage	80,000	-	Drift Elimi-nators	Land around Cooling Towers
Cooling Towers (Small)	Blowdown	20,000	-	-	Poplar Creek
Sewage Treatment Plant	Sanitary Waste	230,000	Extended Aeration	-	Poplar Creek
Sanitary Water Plant	Sand Filter Backwash	18,000	K-1515 Holding Pond	-	Clinch River
Nickel Plating	Plating Acids	0.75	Neutralization and settling (K-1407B)	Chemical Treat-ment	Poplar Creek
	Plating Solutions	1.6	Neutralization and Settling (K-1407B)	Chemical Treat-ment	Poplar Creek

Table 5
(Cont'd)

Waste Source	Waste Composition	Annual Generation (gal x 1000)	Current Treatment	Future Treatment	Ultimate Disposal
	Plating Wastes	20.0	Neutralization and Settling (K-140'B)	Chemical Treatment	Poplar Creek
	Plating Rinse	2,500		Chemical Treatment	Poplar Creek
Metals Cleaning Facility	Acidic and basic cleaning solutions	13,000	Neutralization and Settling (K-1407B)	Chemical Treatment	Poplar Creek
Uranium Decontamination and	Dilute nitric acid, uranium, technicium	11,000	K-1407B Pond	Chemical Treatment	Poplar Creek
	Evaporator condensate	12.0	Neutralization and Settling (K-1407B)	Biodenitrification at Y-12	Poplar Creek
Laboratories	Dilute organic and inorganic solutions	70,000	K-1007B Pond	-	Poplar Creek
Transformers	PCB waste and solvents with	4.5	Storage	TSCA Incinerator	Disposal of Ash (Future)
Diffusion equipment	Radioactive waste oil (no PCB)	20.0	Storage	TSCA Incinerator	Disposal of Ash (Future)
	Fissile Waste Oil and PCB	0.4	Storage	TSCA Incinerator	Disposal of Ash (Future)

Table 5 (Continued)

Waste Source	Waste Composition	Annual Generation (gal x 1000)	Current Treatment	Future Treatment	Ultimate Disposal
Hydraulic systems and Machine Stops	Radioactive Waste Oil and PCB	2.7	Storage	TSCA Incinerator	Disposal of Ash (Future)
	Water Soluble Waste Cutting Oils, Uranium, PCBs	0.5	Storage	TSCA Incinerator	Disposal of Ash (Future)
Centrifuge Rotor Manufacture	Classified	30	Storage	TSCA Incinerator	Disposal of Ash (Future)
Uranium Recovery Solvent Extraction	Recovery Waste Solvents Uranium, Technicium	1.0	Waste Coolant Biodegradation	-	Discharge to East Fork of Poplar Creek
Degredation and Point Stripping	Waste Solvents and Uranium	20.0		Incinerator	Disposal of Ash (Future)

Table 6
Major Y-12 Liquid Waste Streams

Waste Source	Waste Composition	Annual Generation (gal x 1000)	Current Treatment	Future Treatment	Ultimate Disposal
Sanitary Facilities	Sanitary Waste	Unknown	Treated by City of Oak Ridge	-	-
Cooling Tower Blowdown	Solids, Biocid Corrosion Inhibitor	160,000	-	-	Discharge to East Fork of Poplar Creek
Photography Labs	Concentrated Photographic Processing Solutions	16	Recovery of Silver, removal of Cyanide and BOD	-	Discharge to White Oak Creek
	Dilute photographic Processing Solutions	1600	-	Central Pollution Control Facility	Discharge to East Fork of Poplar Creek
Electroplating Operations	Metals, Acids, and Bases, and other plating solutions	110	Shipment to ORGDP	Central Pollution Control Facility	Discharge to East Fork of Poplar Creek
Production Activities	Uranium contaminated mopwater	68,000	Shipment to ORGDP	Central Pollution Control Facility	Discharge to East Fork of Poplar Creek
	Beryllium contaminated mopwater	320	Shipment to ORGDP	Central Pollution Control Facility	Discharge to East Fork of Poplar Creek
	Machine coolants	230	Waste Coolant Biodegradation Facility	-	Discharge to East Fork of Poplar Creek
	Perchloroethylene	40	Storage	Switch to Water/ Glycol/Borox mixture	-

Table 6 (Continued)

Waste Source	Waste Composition	Annual Generation (gal x 1000)	Current Treatment	Future Treatment	Ultimate Disposal
Uranium Recovery	Nitrate Waste	600	Biodenitrification	West End Treatment System	Discharge to East Fork of Poplar Creek
	Hydrogen fluoride Scrubber Solutions	50	Shipment to ORGDP	Central Pollution Control Facility	Discharge to East Fork of Poplar Creek
Steam Plant	Coal Yard Runoff, Blowdown, Regeneration Wastes	15,800	-	Steam Plant Wastewater Facility	Contractor's Burial Area
Lithium Chemistry	Sodium Hypochlorite	60	Given to City of Knoxville	-	Use offsite
Plantwide	Uncontaminated Waste Oil	40	-	-	Sold to off-site Contractor
	Radioactive Waste Oil without PCBs	20	Storage	Incinerator	Central Waste Disposal Facility
	Waste Oil Contaminated with PCB	3	Storage	Incinerator	Central Waste Disposal Facility
	Berryllium Contaminated Oil	35	Storage	Incinerator	Central Waste Disposal Facility
S-3 Ponds	Acid, high nitrate wastewater contaminated with uranium	6000 *	Onsite neutralization	Biodenitrification, Sludge Fixation Facility	Central Waste Disposal Facility
Waste Oil Pond	PCB contaminated oil and water	20 *	Storage	Incinerator	Central Waste Disposal Facility

*Total quantity not the annual generation.

(1) corrosive solutions generated by the treatment of water needed for plant operations (e.g., boiler feedwater, reactor coolant water make-up),

(2) process wastewater, which comes from sources (e.g., laboratory drains) where radioactivity might be present, and

(3) intermediate-level wastewater, which is generated by radioactive operations throughout ORNL and which is known to contain radioactivity.

The corrosive solutions are neutralized prior to discharge. Process wastewater is checked for radioactivity and, if any is found, is treated with demineralizers prior to discharge. If no radioactivity is found, the solutions are currently discharged without treatment. The need for treatment of the nonradioactive process wastewater is under study. Intermediate-level wastewater is reduced in volume with an evaporator. Condensate from the evaporator is sent to the process wastewater treatment system; the concentrated residue from the evaporator is sent to the Hydrofracture Facility.

ORNL also operates a number of facilities which are located at the Y-12 Plant. There facilities include the Biology Division, which generates chemical toxicity data, and the Isotope Separations Facility, which produces stable isotopes for sale to the public. Process discharges from the Biology Division are not treated currently. However, plans are being made to construct a treatment facility for them. The Isotope Separations Facility generates acidic wastewater from cleaning operations. Concentrated wastewater is currently collected and disposed

of offsite; future plans are to ship it to Y-12's Central Pollution Control Facility. Dilute wastewater is currently being discharged without treatment; future plans call for a treatment system for this wastewater.

ORGDP's process discharges have five major sources (Table 5):

(1) wastes generated in the treatment of raw water for process usage, sources including makeup water, clean-up wastes, and boiler blowdown,

(2) chromated recirculating cooling water (RCW) blowdown,

(3) nickel plating and metal cleaning facility wastes,

(4) uranium decontamination solutions, and

(5) laboratory discharges.

Raw water treatment, nickel plating, and metal cleaning wastes are neutralized where necessary and routed to settling ponds for solids removal prior to discharge. RCW blowdown is electrolytically reduced to remove chromium prior to settling and discharge. Uranium decontamination solutions are routed either to a settling pond or a biodentrification facility at Y-12. Finally, laboratory discharges are routed directly to Poplar Creek.

Y-12 process discharges include five major sources (Table 6):

(1) discharges from the biodenitrification facility,

(2) cleaning solutions and contaminated mop water,

(3) plating shop wastes,

(4) photographic wastes, and

(5) hydrogen fluoride scrubber solutions.

Most of this wastewater is shipped to ORGDP for neutralization. Depending on the nitrate concentrations, the treated water is either discharged or returned to Y-12 for denitrification. Plans call for treatment of this waste at Y-12's new Central Pollution Control Facility. Some of the cleaning solutions are discharged directly to Poplar Creek. Photographic waste is being shipped to ORNL for treatment.

C. Solid Waste Streams

Major solid waste streams include construction debris, sanitary wastes, radioactive wastes, and sludges. The solid waste streams of the three plants are shown in Tables 7 through 9.

1. Spoil and construction waste

Each plant as part of routine maintenance or of capital projects generates a significant amount of waste material. This material, usually large in volume and environmentally inert, is sent to a special landfill at each plant. At ORNL and at ORGDP, flyash from steam plant operation is also sent to this landfill. These landfills, called contractor's or industrial landfills, are operated to minimize nuisance conditions but do not pose any environmental problems.

2. Sanitary waste

Operations at each plant also generate sanitary wastes, which are comprised of both biodegradable and nonbiodegradable materials. This

Table 7
Major ORNL Solid Waste Streams

Waste Source	Waste Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
Steam Plant	Ash	10,000 Tons	Collutron in Hopper	-	Industrial Landfill
	Coal Yard Runoff Sludge	44 Tons	Pond Settling	Settling and Dewatering	Industrial Land-
Sewage Treatment Plant	Sewage Sludge	22 Tons	Settling in Lagoon	Sand Drying Beds	Sanitary Landfill
Cooling Towers	Sludge	1,200 cu. ft.	Collection in basin	-	Sanitary Landfill
Laboratory Operations	Garbage	1,200 Tons	Compaction	-	Sanitary Landfill
	Removal of asbestos	300 Tons	Double bagging	-	S.W.S.A. #6 *
	Construction Debris	3,200 Tons	-	-	Industrial Landfill
	Recyclable materials (e.g. paper, empty drums, vehicles, etc.)	800 Tons	-	-	Property sales
	General low level radioactive waste	80,000 cu. ft.	Compaction	-	SWSA #6

Table 7 (Continued)

Waste Source	Waste Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
	Contaminated equipment	570 Tons	-	-	SWSA #6
	Transuranic Waste	110 Tons	Packaged into Drums	-	Retrievable Storage SWSA #5
	Transuranic Equipment	12 Tons	-	-	Retrievable Storage SWSA #5
	Animal Carcasses	24 Tons	Freezing	Incinerator	SWSA #6 *
	Waste Cage Lining Material	26 Tons	-	-	Sanitary Landfill
	Water Reactive Material	1 Ton	Hydration at Ken Hollow Quarry	-	Dissolution in Quarry Water

*These waste streams may be diverted to the Indistrual Landfill in the near future.

Table 8
Major ORGDP Solid Waste Streams

Waste Source	Waste Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
Steam Plant	Flyash	3,000 Tons	-	Dewatering	Contractor's Burial Area
	Zeolite Neutralization Sludge	500 Tons	Settling in K-1407B	Sludge Fixation Facility	Central Waste Disposal Facility
	Coal Yard Runoff Sludge	30 Tons	Settling in K-1700	Sludge Fixation Facility	Central Waste Disposal Facility
Sewage Treatment Plant	Sewage Sludge	4 Tons	Sand Drying Beds	-	Classified Burial Area
Plant Operations	Garbage Construction	1,900 Tons	Compaction	-	Sanitary Landfill
	Construction Debris	37,500 Tons	-	-	Contractor's Burial Area
	Waste Insulation (non-asbestos)	1 Ton	-	-	Contractor's Burial Area
	Waste Insulation (asbestos)	20 Tons	Double Bagging	-	Sanitary Landfill
	Broken Glass	20 Tons	Rinsing	-	Classified Burial Area
	Classified Rubbish	150 Tons	Compaction	-	Classified Burial Area

Table 8 (Continued)

Waste Source	Waste Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
	PCB Transformers and Capacitors	190 Tons	Storage	- -	EPA Approved Disposal Facility
	Non-contaminated Scrap Metal	1,130 Tons	-	-	Property
	Contaminated Scrap Metal	100 Tons	-	Smelter	Storage
	General Low Level Radioactive Waste	20 Tons	-	-	Y-12 Burial Area
Recirculating Cooling Water System	Softening Sludge	1,300 Tons	Dewatering	-	Contractor's Burial Area
	Chromium Sludge	52 Tons	Settling in K-901A	Sludge Fixation Facility	Central Waste Disposal Facility
	Cooling Tower Sludge	900 Tons	-	Dewatering	Contractor's Burial Area
Sanitary Water Plant	Softening Sludge	500 Tons	Settling in K-1515	Dewatering	Contractor's Burial Area
Decontamination and Recovery Facility	Uranium and Technicium Contaminated	45 Tons	Settling in K-1407B	Sludge Fixation Facility	Central Waste Disposal Facility
Metals Cleaning Facility	Neutralization Pit Sludge	52 Tons	Settling in K-1407B	Sludge Fixation Facility	Central Waste Disposal Facility

Table 8 (Continued)

Waste Source	Waste Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
Nickel Plating Facility Facility	Neutralization Sludge	48 Tons	Settling in K-1407B	Sludge Fixation Facility	Central Waste Disposal
K-1131	Fluorine Cell Cleaning Neutralization Sludge	1 Ton	Settling in K-1407C	Sludge Fixation Facility	Classified Burial Ground
K-1232 Facility II	Classified Sludge	490 Tons	Settling in K-1407C	Sludge Fixation Facility	Classified Burial Ground
K-402-9 Purge Cascade	Scrubber Sludge	50 Tons	Settling in K-1407C	Sludge Fixation Facility	Classified Burial Ground
Barrier Treatment	Classified Slatrifization Sludge	4 Tons	Settling in K-1407C	Sludge Fixation Facility	Classified Burial Ground
Diffusion Process	Waste Aluminum	40 Tons	Leached to remove uranium	-	Y-12 Burial Area
	Depleted Uranium Hexafluoride in Cylinders	Unknown	-	-	Storage

Table 9
Major Y-12 Solid Waste Streams

Waste Source	Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
Steam Plant	Ash	23,000 Tons	Rogers	-	Burial
	Wastewater Treatment Sludge	1,700 Tons *	-	Dewatering	Contractor's Burial Area
Plant Operations	Garbage	4,200 Tons	Compaction	-	Sanitary Landfill
	Construction Debris and Spoils	1,000 Tons	-	-	Contractor's Burial Area
	Waste Asbestos Insulation	20 Tons	Double	-	Sanitary Landfill
	Cooling Tower Sludge	Unknown	Sluice to East Fork of Poplar	Concrete Fixation Facility	Central Waste Disposal Facility
	Crushed Glass	70 Tons	-	-	Sanitary Landfill
	Aluminum Chips	20 Tons	-	-	Property Sales
	Noncontaminated scrap metal	1,400 Tons	-	-	Property Sales
	Contaminated Scrap Metal	214 Tons	Storage	Smelter	Storage

Table 9 (Continued)

Waste Source	Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
	Uranium Contaminated Trash including Filters	120 Tons	-	-	Y-12 Burial Area
	Uranium Chips	1,130 Tons	Underground Oxidation	Oxidation and Above Ground Storage	Y-12 Burial Area
	Uranium Powder	40 Tons	Underground Oxidation	Oxidation	Y-12 Burial Area
	Contaminated Classified Trash	300 Tons	-	-	Classified Burial Area
	PCB Contaminated Debris	2 Tons	Storage	Incineration	EPA Approved Disposal Facility
	PCB Contaminated Soil	1,000 Tons	Storage	Incineration	Central Waste Disposal Facility
	Plutonium Contaminated Waste	3 Tons	-	-	SWSA #6
Lithium Chemistry	Reactive Metals	1.5 Tons	Reaction in Kerr Hollow Quarry	-	Dissolution in quarry water
Metal Preparation	Reactive Metals	0.5 Tons	Reaction in Kerr Hollow Quarry	-	Dissolution in quarry water
Coolant Disposal	Sludge from Waste Coolant Biodegradation Facility	27,000 Gals.	Dewatering	-	Y-12 Burial Area

Table 9 (Continued)

Waste Source	Composition	Annual Generation	Current Treatment	Future Treatment	Ultimate Disposal
Fabrication	Beryllium-contaminated Waste	35 Tons	Packaged	-	Sanitary Landfill
Machine Shops	Mixed Metal Chips with Uranium Contamination	350 Tons	-	-	Y-12 Burial Area
Carbon Shop	Carbon Solids and Dust	82 Tons	-	-	Property Sales
	Classified carbon shapes with potential contamination	300 Tons	-	-	Classified Burial Area
Biodenitrification Facility	Organic Sludge	600,000 Gals.	West End Tank Farm	Concrete Fixation Facility	Central Waste Disposal Facility
S-3 Ponds	Sludge	11,000,000 Gals.**	-	Concrete Fixation Facility	Central Waste Disposal Facility
New Hope Pond	Sludge	4,000,000 Gals.**	-	Concrete Fixation Facility	Central Waste Disposal Facility

* Sludge to come from future Steam Plant Wastewater Treatment Facility.
** Values given are total volumes not annual generation rates.

waste is currently disposed of in a sanitary landfill, located at and operated by the Y-12 Plant.

3. Classified waste

Certain operations at both Y-12 and ORGDP generate wastes which, due either to their source or to their nature, are classified. These wastes can be radioactive or nonradioactive. They are disposed of in burial areas specifically set aside for this purpose.

4. Radioactive wastes

The radioactive wastes produced by each plant reflect the nature of its operation. At ORNL, a large number of radioisotopes are handled, in isotope production and packaging, in reactor and accelerator operations, in reprocessing studies on nuclear fuel, and in investigations into the interactions of radioactivity with living systems (see Table 7). The radioactive wastes generated by these activities can be classified as follows:

(1) concentrates generated by the treatment of intermediate-level wastes, which are disposed of by hydrofracture;

(2) low-level wastes, contaminated with beta/gamma emitting radioactivity. These wastes, which have a low surface dose rate, are compacted if possible and disposed of in earthen trenches; those wastes which exhibit a high surface dose rate are disposed of in augered holes;

(3) transuranic wastes, which are retrievably stored; and

(4) low-level alpha-emitting wastes, which are evaluated for criticality hazards before disposal in augered holes.

Radioactive wastes at ORGDP are contaminated with one of two radioactive elements, uranium and technicium. The latter isotope is present due to its past introduction into the diffusion process by production reactor returns. The various forms of this waste are (see Table 8):

(1) depleted uranium hexafluoride, which is stored in cylinders;

(2) contaminated scrap metal, which is being stored pending a decision on its decontamination or disposal; and

(3) miscellaneous radioactive waste, which is disposed of at Y-12.

Radioactive wastes generated by the Y-12 Plant are contaminated with either uranium or thorium (from past operations). All of these wastes are disposed of via shallow land burial (see Table 9). The wastes have the following forms:

(1) pyrophoric wastes such as uranium chips and uranium/thorium powders, which are buried and allowed to oxidize slowly underground;

(2) solid uranium metal;

(3) biooxidation sludges from coolant disposal; and

(4) uranium- and/or thorium-contaminated waste.

Finally, some contaminated scrap metal is being stored.

5. Miscellaneous wastes

In addition to the wastes mentioned above, there are a variety of wastes generated at each plant which have some value as scrap. This material is checked for the presence of radioactivity and of hazardous materials (e.g., polychlorinated biphenyls). If none is found, the material is sold to offsite companies.

6. Sludges

As part of both past and current waste treatment operations at the three plants, different types of sludges have been generated. These sludges, which are stored in holding ponds or basins, can be hazardous, radioactive, or both. To treat this waste stream, a concrete fixation facility is being designed for the ORGDP. This facility will solidify the sludges in specially-formulated grout to minimize the leachability of the grout and permit their disposal in the new Central Waste Disposal Facility. This process is also described in Section IV.B.

D. Hazardous Wastes

All of the Oak Ridge plants produce wastes that are classified as hazardous by the EPA regulations which implement the Resource Conservation and Recovery Act. These wastes can be classified as nonradioactive and radioactive.

1. Nonradioactive hazardous wastes

Two of the largest hazardous waste streams are present due to the vintage of the Oak Ridge facilities: asbestos and polychlorinated biphenyls (PCBs). Both materials were in common use when the three plants were built and are still in use at them today. As older equipment is retired, these materials appear as wastes. Asbestos wastes are handled in the same manner at each plant -- the wastes are bagged, sealed, and disposed of on the ORR. At ORNL, this waste is disposed of at Solid Waste Storage Area (SWSA) #6, in a special area designated for asbestos. When its new industrial landfill is opened, ORNL will move asbestos disposal trenches to that location. ORGDP and Y-12 send their asbestos waste to the Y-12 radioactive burial area. Plans are being made, however, to move this disposal operation to the sanitary landfill.

PCBs are used at each plant primarily in dielectric fluids for transformers and capacitors. In certain cases, they have also been used in coolant systems and as hydraulic fluids. PCB wastes are generated as the equipment containing them is cleaned out or prepared for disposal. The primary means of disposal for these wastes is shipment to a commercial disposal facility. In addition, the Y-12 plant has cleaned up a significant amount of oil by destroying the PCBs using a proprietary process run by the Sunohio Corp. In the future, PCB waste generated on the ORR will be disposed of at a new incinerator being constructed at ORGDP.

Other hazardous wastes are generated at each plant as part of its operation. At ORNL, these wastes include laboratory chemicals, by-products of coal liquefaction pilot plants, reactive materials, and explosives. Those wastes that are safe to transport are shipped to a commercial disposal facility. Reactive chemicals and explosives are neutralized onsite. Certain other wastes (e.g., spent photographic processing solutions) are processed onsite into a nonhazardous state.

ORGDP's hazardous waste streams include spent solvents from degreasing operations, metallic sludges from softening and plating operations, and laboratory chemicals. The solvents are either stored onsite or shipped to a commercial disposal facility. Laboratory chemicals are also shipped offsite. The sludge material is currently collected in settling basins, as described in Section III.C.6.

Y-12's major hazardous waste streams including metallic sludges from plating shop operations, beryllium oxide wastes, and reactive materials. The metallic sludges are collected currently at ORGDP in anticipation of the Concrete Fixation Facility operation. Beryllium oxide wastes are sent to the radioactive waste burial area. As with asbestos, this disposal operation may soon move to the sanitary landfill. Reactive materials are neutralized onsite.

2. Radioactive hazadous wastes

Wastes that are both radioactive and hazardous in nature pose a particular problem for the three Oak Ridge facilities, since in most cases

no specific disposal options exist for them. As a result, one of two options is followed:

(1) storage of the wastes until an acceptable disposal option is found, or

(2) treatment of the waste to remove or destroy either the hazardous or the radioactive component prior to disposal.

At ORNL, most of the wastes are being stored. Major exceptions, however, are animal carcasses, which must be disposed of in SWSA #6 for health reasons. ORGDP's and Y-12's largest streams are uranium contaminated PCB wastes, which are being stored until an incinerator (described in Section IV.B) is constructed.

3. Leachate From Past Waste Disposal Operations

There is evidence that radioactive and/or hazardous material is migrating from past waste disposal areas. This problem is especially important at ORNL and Y-12, where stream water quality is being affected. At ORNL, efforts are underway to control and ultimately to eliminate this migration by erecting barriers between the waste and the intruding water (surface and ground). At Y-12, facilities are in place to capture some of the leachate. In addition, means to stop and to prevent the migration are being studied. This topic is also discussed in Section V.A, below.

E. Surplus Facilities

In addition to the waste streams mentioned above, there is one other

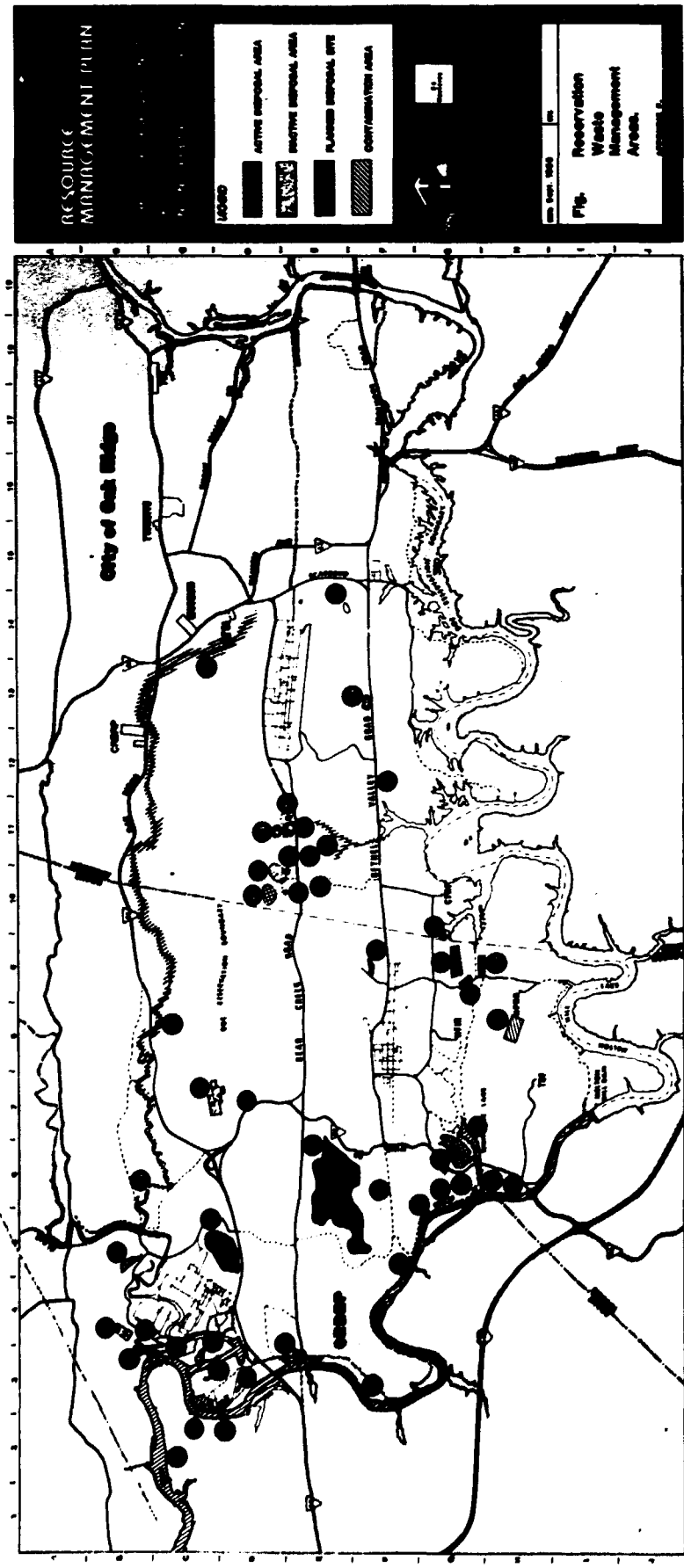
major source of waste at the three plants -- surplus facilities. These facilities are no longer operated, either due to their age or because their mission is completed. Demolition or renovation of these facilities creates wastes which fall into all of the categories mentioned above: radioactive (contaminated structural materials, cleaning solutions, etc.), hazardous (asbestos, PCBs, mercury, etc.), and normal construction debris. Planning for these facilities will have a major impact on waste management facilities on the ORR (see next section).

IV. WASTE TREATMENT/DISPOSAL FACILITIES

A. ORNL Facilities

The facilities at ORNL that have had the largest impact on the ORR land use involve landfill operations and intermediate-level waste disposal. Waste facilities at ORNL are shown in Fig. 1 and 2 and described in Tables 10 and 11.

Landfill operations have been used in the disposal of both construction debris (four sites) and low-level radioactive waste (six sites). At present, three of these sites are still operational: the Contractor's Burial Area, at the extreme east end of the plant, SWSA #5 for the retrievable storage of transuranic (TRU) waste, and SWSA #6 for the disposal of low-level solid radioactive waste. Future plans include the opening of a new Contractor's landfill and two new low-level waste disposal areas -- SWSA #7 (for higher activity waste) and the Central


RESOURCE
MANAGEMENT PLAN
City of Oak Ridge

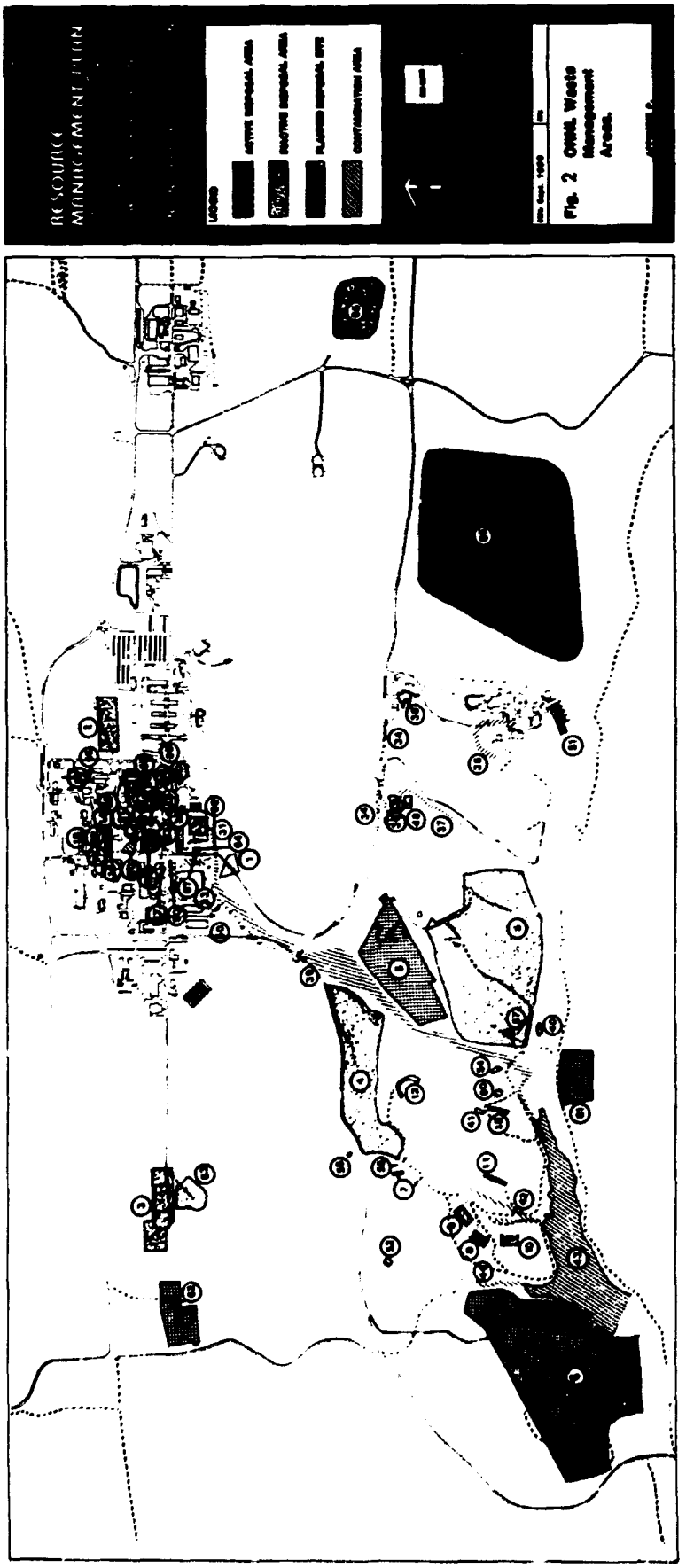

RESOURCE
MANAGEMENT
LEGEND
Fig. 2 ONWL Waste Management Areas.

Table 10[a]
ORR waste management areas

Site[a]	Description	Activity	Status	Comments
1	Cesium field	Soil contaminated with ^{137}Cs	Active	
2	Cesium forest	Soil and vegetation contaminated with ^{137}Cs	Inactive	
3	Tagged forest	Trees contaminated with ^{45}Ca	Inactive	
4	Tagged forest	Soil and vegetation tagged with ^{45}Ca	Inactive	
5	Sodium field	Soil contaminated with ^{22}Na	Inactive	
6	Runoff area	Radionuclide runoff study area	Inactive	
7	Cesium field	Area contaminated with ^{134}Cs	Inactive	
8	Tagged forest	Trees contaminated with ^{45}Ca	Inactive	
9	McNew Hollow	Contamination area	Inactive	
10	White Wing Storage Area	Buried scrap area contaminated with	Inactive	
11	Sanitary waste blowdown	Settling basin for sludge from K-1515 Water filtration plant	Active	
12	ORGDP contractors' burial area	Construction debris disposal	Active	
13	Contaminated burial area	Uranium and thorium contaminated waste	Inactive	62 trenches, 35,575 cu ft of uranium waste, 2,430 cu ft of thorium waste
14	Concrete storage area	Concrete slab storate	Inactive	No detectable radioactivity
15	K901A settling basin	Sludge removal from RCW softening and blowdown	Active	Chromium contamination, trace of radioactivity
16	Scrap area	Scrap metal and wood	Inactive	No detectable radioactivity
17	Contractors' burial area	Construction debris disposal	Inactive	
18	K-722 contamination metal yard	Storage of contaminated metal	Active	
19	K-722 scrap metal yard	Storage of uncontaminated scrap metal	Active	
20	Disposal area	Unknown	Inactive	No detectable radioactivity
21	Ash disposal area	Disposal of flyash and cinders from Powerhouse	Inactive	
22	Burning pit	Construction debris burning and disposal area	Inactive	
23	Walker Branch Watershed	Periodic release of short-lived radioactivity	Activity	

Table 10 (Continued)

Site[a]	Description	Activity	Status	Comments
24	Oil landfarm	Disposal of uranium contaminated non-PCB oil	Inactive	
25	Sanitary landfill	Disposal of sanitary wastes	Inactive	Shutdown in 1983
26	Burial ground oil pond	Seepage collection from oil disposal trenches	Active	PCB contamination
27	Chemical waste isolation area	Disposal of solvents and other chemicals	Inactive	Groundwater contaminated with perchloroethylene
28	Contaminated solid waste disposal area	Disposal of radioactive wastes	Inactive	
29	Roger's Quarry	Disposal of flyash and carbon wastes	Active	NPDES monitoring point
30	Kerr Hollow Quarry	Disposal area for reactive metals		
31	Oak Ridge Solid Waste Disposal Facility	Low hazard radioactive waste disposal area	Planned	
32	Contamination area	White Oak Lake sediments contaminated with radioactivity	N/A	
33	Watts Bar Lake	Contamination area	N/A	
34	Poplar Creek	Mercury contamination	N/A	
35	SWSA #6	Low-level radwaste disposal	Active	
36	Hazardous waste storage area	Storage prior to offsite shipment	Planned	
37	Contamination area	White Oak Creek below White Oak Dam has radioactivity in its sediments	N/A	
38	Cylinder bleed-off area	Emergency storage of leaking gas cylinders at ORNL	Active	
39	Contractor's landfill	Disposal of construction debris (two possible sites)	Planned	
40	Contaminated solid waste disposal area B, C, D	Disposal of radioactive wastes	Active	
41	Hazardous chemical disposal area	Disposal of hazardous chemicals	Inactive	Formerly combustible burn area

[a]The site numbers on this table refer to those shown on Fig. 1.

Table 11
ORNL waste management areas[a]

Site[a]	Description	Activity	Status	Comments
1	SWSA #1	Low-level radwaste disposal	Inactive	Closed in 1944
2	SWSA #2	Low-level radwaste disposal	Inactive	Closed in 1946
3	SWSA #3	Low-level radwaste disposal	Inactive	Closed in 1951
4	SWSA #4	Low-level radwaste disposal	Inactive	Closed in 1959
5	SWSA #5	Low-level radwaste disposal	Active	Shallow land burial stopped, north section used for retrievable storage of TRU waste
6	SWSA #6	Low-level radwaste disposal	Active	
7	Chemical Waste Pit #1	Intermediate-level waste disposal	Inactive	
8	Chemical Waste Pit #2	Intermediate-level waste disposal	Inactive	
9	Chemical Waste Pit #3	Intermediate-level waste disposal	Inactive	
10	Chemical Waste Pit #4	Intermediate-level waste disposal	Inactive	
11	Chemical Waste Pit #5	Intermediate-level waste disposal	Inactive	
12	Chemical Waste Pit #6	Intermediate-level waste disposal	Inactive	
13	Chemical Waste Pit #7	Intermediate-level waste disposal	Inactive	
14	Contamination area	Overflow of Graphite Reactor fuel pool	N/A	
15	Contamination area	Line leak area around Building 3019		
16	Contamination area	Ground contaminated by 1959 explosion at Building 3019	N/A	
17	Contamination area	Same as Item 16	N/A	
18	Contamination area	Base of Building 3019 stack contaminated	Active	
19	Contamination area	Contamination around LITR settling basin area	Inactive	
20	Contamination area	North Tank Farm	Active	
21	Contamination area	Leakage from Building 3026	Active	
22	Contamination area	Tank WC-1	Inactive	Surplus facility
23	Contamination area	Gunite tank area	Inactive	Surplus facility - sludge being sent to Hydrofracture
24	Contamination area	Leakage from Builing 3515	Inactive	Surplus facility
25	Contamination area	Leakage from liquid radwaste into a sump	N/A	

Table 11 (Continued)

Site[a]	Description	Activity	Status	Comments
26	Contamination area	Leakage from Building 3550	N/A	
27	Contamination area	Building 3505	Inactive	Surplus facility
28	Contamination area	Tanks WC-15 and WC-17	Inactive	Surplus facility
29	Contamination area	^{90}Sr found north of Building 4508	N/A	
30	Equilization basin	Head end of Process Waste Treatment Plant	Active	
31	Settling basin	Process waste sludge collection	Inactive	Surplus facility
32	Process waste ponds	Collection of process waste from 4500 area	Active	
33	Contamination area	Intermediate-level waste leak	N/A	
34	Contamination area	Leaks around intermediate-level waste transfer line	N/A	Line abandoned
35	Contamination area	Intermediate-level waste leak	N/A	
36	Homogenous Reactor	Site of reactor testing	Inactive	Surplus facility
37	Contaminated area	Discharge from hot storage pool at 7500	N/A	
38	Molten Salt Reactor Experiment	Shutdown Reactor	Inactive	Surplus facility
39	Contamination area	Seepage from SWSA #4	N/A	
40	Contamination area	Leakage from Hydrofracture injection	N/A	
41	Contamination area	Intermediate-level waste transfer line break	N/A	
42	Contamination area	Seepage from chemical waste pits	N/A	
43	Contamination area	White Oak Lake sediment	N/A	
44	Contamination area	Seepage from chemical waste pits	N/A	
45	Contamination area	Radwaste spill near Building 3092	N/A	
46	Contamination area	Break in line between tanks WC-1 and W-5	N/A	
47	Contamination area	Drainline break near Building 2531	N/A	
48	Contamination area	Settling Basin for Bldg. 7500 and adjacent waste burial area	Inactive	Basin has been filled in and paved
49	Waste Tank TH-4	Wastewater collection	Inactive	Surplus facility
50	Contamination area	Leak in intermediate-level waste transfer line	N/A	
51	Process waste ponds	Collection of process waste in 7900 area	N/A	
52	Contamination area	Release of grout from Hydrofracture operation	N/A	
53	Contamination area	Leak in transfer line between tanks WC-5 and WC-19	N/A	

Table II (Continued)

Site[a]	Description	Activity	Status	Comments
54	Contamination area	Leak in intermediate-level waste transfer line	N/A	
55	Contamination area	Leak in intermediate-level waste transfer line	N/A	
56	Contamination area	Rupture of Oak Ridge Research Reactor Decay Tank	N/A	
57	Old Hydrofracture Facility	Intermediate-level waste disposal	Inactive	Surplus facility
58	Decontamination pad	Clean-up of contaminated equipment	Active	
59	Contamination area	Abandoned line north of Bldg. 3500	N/A	
60	Contamination area	Seep from Chemical Waste Pit #7	N/A	
61	Hydrofracture Facility	Intermediate-level waste disposal	Active	
62	Contractors' burial area	Construction debris disposal	Active	
63	Scrap metal disposal area	Abandoned scrap yard	Inactive	
64	Process waste treatment plant	Low-level liquid waste treatment	Active	
65	Contractor's burial area	Construction debris disposal	Inactive	
66	SWSA #7	Low-level radwaste disposal	Planned	
67	Settling basin	Filled-in process pond	Inactive	

[a]The site numbers on this table refer to those shown on Fig. 2.

Waste Disposal Facility or CWDF (for low activity wastes) which will serve all three plants.

Disposal of the intermediate-level waste has involved 10 different areas. At first, the waste was transformed into a sludge and allowed to settle in the Gunite Tank farm. The sludge was in these tanks until recently, when a project was completed to remove it. Beginning in 1951, the waste was pumped to seepage trenches; the soil in the trenches, having a high affinity for the radioactive elements, adsorbed the radioactivity while the water was allowed to seep or evaporate away. Seven trenches were used for this purpose over a 15-year period.

In 1966, hydrofracture operations began. Wastes were concentrated in an evaporator and sent to hydrofracture for disposal. At this facility, the concentrated waste was mixed with cement and injected into a shale formation approximately 1000 feet below the surface. The first hydrofracture facility operated until 1979. In 1980, a second hydrofracture facility became operational; it is the current disposal operation for all intermediate-level wastes.

Other locations shown in Fig. 1 and 2 involve mainly three activities:

1. surplus facilities, which are being evaluated for decontamination/decommissioning,
2. areas deliberately contaminated with radioactivity for long-term uptake studies, and
3. areas contaminated as a result of past waste management operations.

For more information on these areas, see Section V.A, below.

B. ORGDP Facilities

Past and present operations of waste management facilities at ORGDP involve landfills, scrap metal areas, and settling basins. These facilities are shown on Fig. 1 and 3 and described in Tables 11 and 13.

Past landfill operations have involved construction debris. low-level radioactive wastes, and classified wastes, New facilities are in use currently for construction debris and classified waste; low-level radioactive waste is disposed of currently at Y-12. Future plans call for the continued use of onsite landfills for construction debris and classified wastes. Low level wastes will be handled as part of the Central Waste Disposal Facility (see Section IV.D, below).

While the settling basins are still being used for a variety of sludges, plans are under way to construct a facility that will fix sludges containing hazardous materials in a concrete matrix. This matrix will be designed to resist leaching of the materials, rendering them nonhazardous.

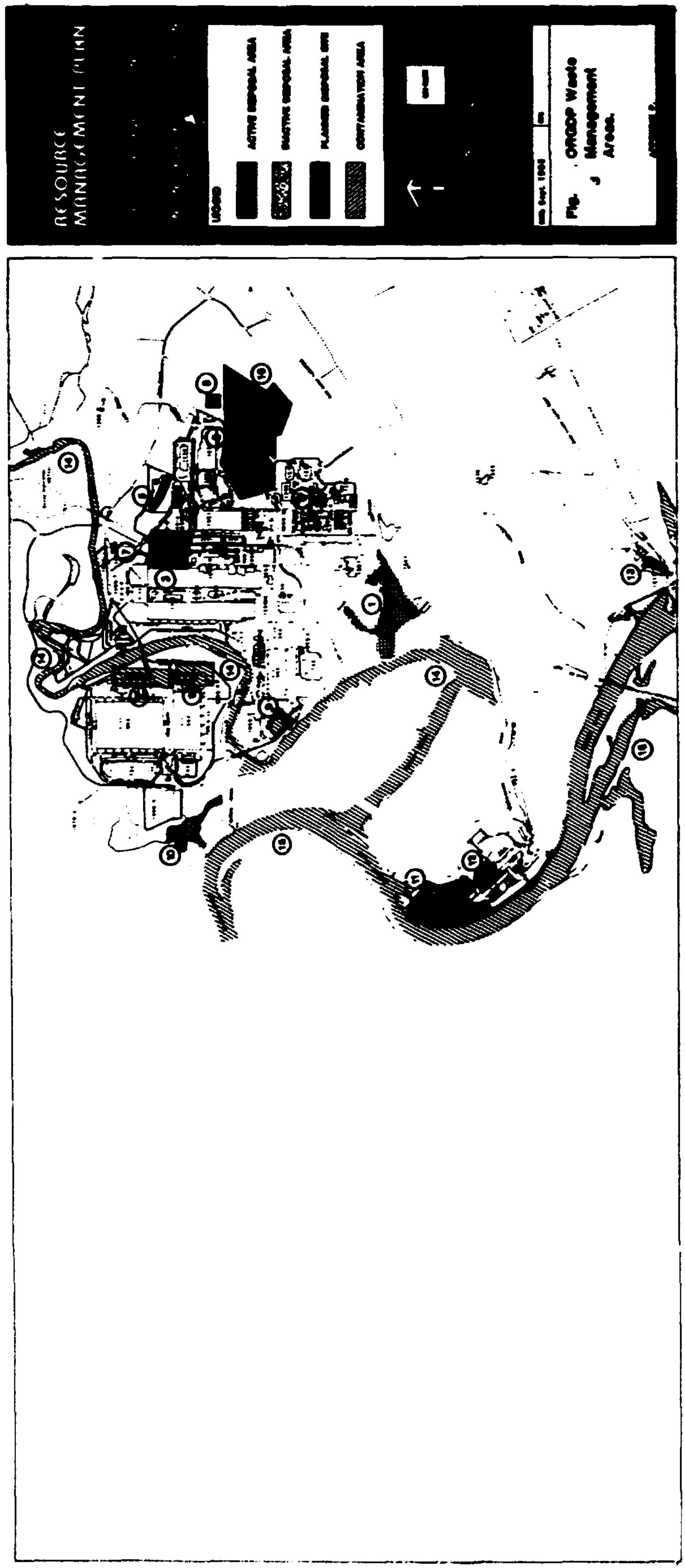
Scrap metal is a persistent problem at ORGDP. The decontamination of the metal using a smelter to concentrate the radioactivity in the slag has been studied; however, further action awaits a decision on allowable residual radioactivity limits. Until this decision is made, the storage operation will continue.

Finally, an incinerator facility is being planned at ORGDP to handle radioactive/hazardous wastes (particularly radioactively contaminated

Table 12
ORGDP waste management areas[a]

Site[a]	Description	Activity	Status	Comments
1	K-1007B holding pond	Settling for laboratory and photographic chemicals	Active	
2	Classified burial ground	Disposal of classified waste	Active	
3	Classified burial ground	Disposal of classified waste	Inactive	
4	K1407B settling basin	Settling for neutralized wastes from decontamination plating and cleaning operations and from the steam plant	Active	
5	K1407C Settling Basin	settling for neutralized waste	Active	
6	Contamination area	Area found under Building K-1004J		
7	K1700 settling basin	coal yard runoff holdup	Active	
8	Incinerator facility	Destruction of chlorinated organics	Planned	
9	Contamination area	Chromium contamination around cooling towers	N/A	
10	K-901A settling basin	Sludge removal from RCW softening and blowdown	Active	See Fig. 1, item 5
11	Contaminated scrap metal yard	Storage of contaminated scrap metal	Active	See Fig. 1, item 18
12	Clean scrap metal yard	Storage of noncontaminated scrap metal prior to sale	Active	See Fig. 1, item 19
13	Sanitary waste blowdown	Settling basin for Water Treatment Plant	Active	See Fig. 1, item 11
14	Contamination area	Sediments of Poplar Creek are potentially contaminated with heavy metals	N/A	
15	Contamination	Sediments of Watts Bar Lake are contaminated with radioactivity	N/A	
16	Classified burial ground	Expansion of existing burial ground (see item 2)	Planned	

[a]The site numbers on this table refer to those shown on Fig. 3.


RESOURCE MANAGEMENT PLAN
LEGEND
ACTIVE DISPOSAL AREA
INACTIVE DISPOSAL AREA
PLANNED DISPOSAL SITE
CONTAMINATION AREA
Fig. J ORGDP Waste Management Areas.

PCBs) from the three Oak Ridge facilities and the gaseous diffusion plant in Paducah, Kentucky. This facility will help to alleviate storage problems for this type of waste at all three plants.

C. Y-12 Facilities

Past and present operations of waste management facilities at Y-12 have involved landfills, landfarms, settling basins, and storage facilities. These facilities are shown on Fig. 1 and 4 and described in Tables 10 and 13.

Landfills have and are being used for construction debris, sanitary wastes, classified wastes, and low-level radioactive wastes. Special landfills have been used for sediments dredged from New Hope Pond and for disposal of material from United Nuclear Corporation. Future plans call for the continued use of landfills, with a new sanitary landfill now operational and a new low-level waste disposal facility planned (see Section IV.D, below).

Landfarming had been used to biodegrade non-PCB organic wastes. This process has been hampered by rainfall floating the organics out of the area and the movement of some organics, particularly perchloroethylene, into the groundwater system. Operation of this facility has been discontinued. Future plans for these organics are to destroy them in ORGDP's incinerator.

Settling basins have been used in the past for neutralizing acidic wastes (the S-3 ponds), for disposal of flyash (Rogers' Quarry), and for

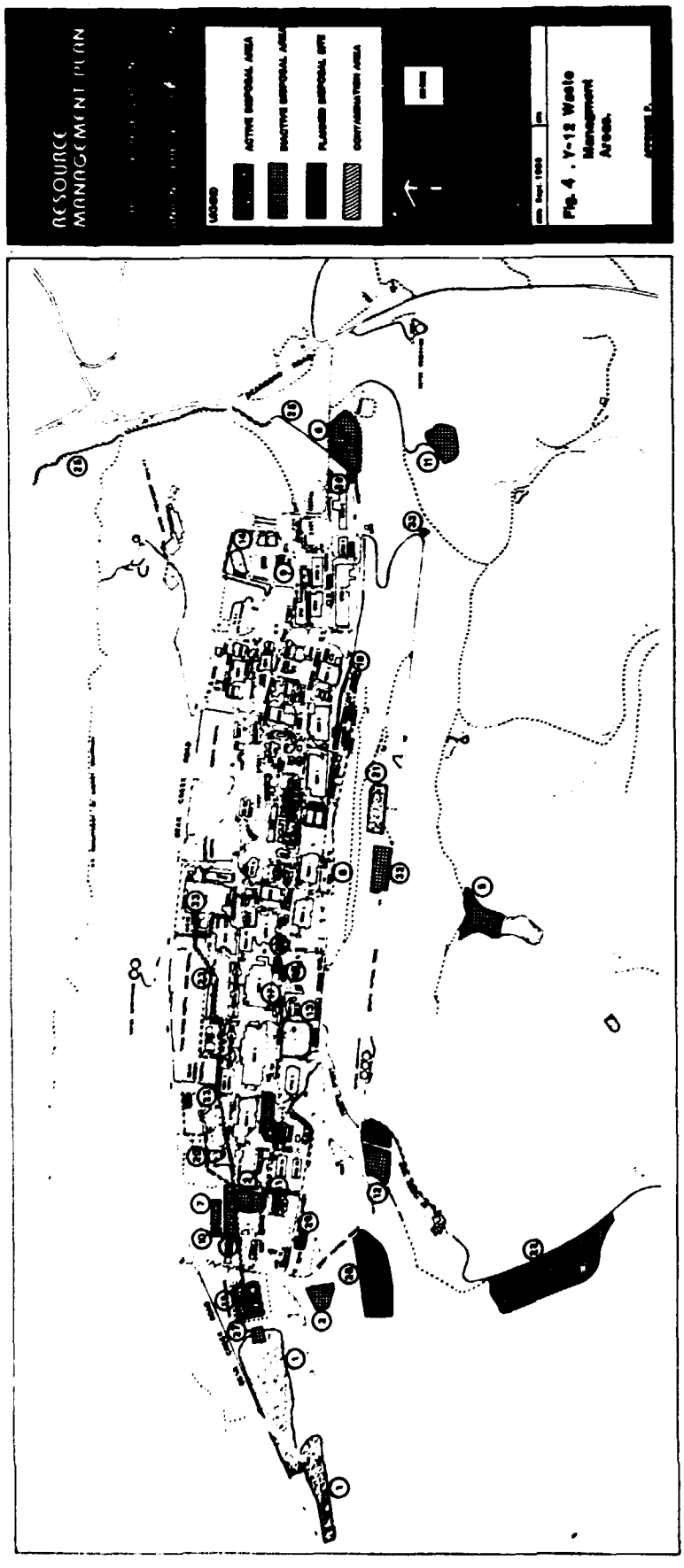
Table 13
Y-12 waste management areas[a]

Site[a]	Description	Activity	Status	Comments
1	Contractors' burial areas	Disposal of construction debris	Inactive	
2	Contractors' burial area	Disposal of construction debris	Active	
3	Scrap metal yard	Storage of clean scrap metal	Active	
4	Coolant and oil Storage facility	Storage of non-PCB oils and coolants	Active	
5	Flyash pond		Active	
6	New Hope Pond	Settling basin	Active	
7	Oil storage Aaea	Storage of clean oil	Active	
8	PCB storage building	Storage of PCB-contaminated solids and liquids	Active	
9	PCB storage tanks	Underground tanks (2)	Active	
10	PCB storage tanks	Above ground tanks	Active	
11	Sediment disposal area	Disposal of New Hope Pond sludge	Active	
12	Radioactive disposal area	Disposal of United Nuclear waste	Inactive	
13	Classified solid waste burial area	Disposal of classified wastes	Inactive	
14	Contaminated scrap burial area	Disposal of radioactive scrap	Inactive	
15	S-3 Ponds	Neutralization of acid wastes, settling of heavy metals	Inactive	To be replaced by Central Waste Treatment Facility
16	Old Cooling Tower Basin	Storage of plating shop wastes	Active	
17	Contamination area	Mercury contaminated sumps	N/A	
18	Old Cooling Tower Basin	PCB storage	Active	
19	Contaminated metal storage yard	Storage of uranium contaminated scrap	Active	
20	Classified solid waste burial area	Disposal of classified wastes	Inactive	
21	Classified solid waste burial area	Disposal of classified wastes	Inactive	
22	Sanitary landfill	Disposal of three plants' wastes	Active	Operation begun in 1983
23	Acid waste line	Transport of acid waste to S-3 Ponds	Inactive	

Table 13 (Continued)

Site[a]	Description	Activity	Status	Comments
24	Oil collection system	Skimmer and collection system for oil before it enters New Hope Pond	Active	
25	Contamination area	Sediments of E. Fork Poplar Creek contain mercury	N/A	
26	Central Waste Treatment Facility	Replacement of S-3 Ponds	Planned	
27	West End Tank Farm	Storage and treatment of acid wastes	Active	
28	Interim low level	Interim facility until the Central Waste Disposal Facility is completed	Planned	
29	Solid waste processing facility	Shredding and compaction of low level solid waste	Planned	
30	Storage vault	Storage of uranium dioxide	Planned	
31	GSA storage	Mercury storage	Active	
32	Classified solid waste burial area	Disposal of classified wastes	Active	
33	Acid recycle and biodenitrification facility	Recovery and treatment of acid wastes	Active	
34	Cylinder bleed-off area	Storage of leaking gas cylinders	Active	

[a]The site numbers on this table refer to those shown on Fig. 13.


RESOURCE
MANAGEMENT PLAN
LEGEND
ACTIVE DISPOSAL AREA
INACTIVE DISPOSAL AREA
PLANNED DISPOSAL SITE
CONTAMINATION AREA
Fig. 4 . Y-12 Waste
Management
Areas.

capturing mercury-contaminated sediments (New Hope Pond). The S-3 Ponds are no longer in operation -- waste is being shipped to ORGDP for neutralization until a new facility (Central Waste Treatment Facility) has been completed. A bypass has been constructed around New Hope Pond so that the sediments can be dredged out and the pond eliminated as a settling basin.

D. Other Planned Facilities

The planning process for waste management led to the consideration of a single facility on the ORR to handle sanitary, hazardous, and radioactive wastes. This facility became known as the Oak Ridge Solid Waste Disposal Facility (ORSWDF). As the planning process proceeded, however, it was decided to construct a separate sanitary waste landfill. With commercial disposal facilities available, the need for hazardous waste disposal became unnecessary. Therefore, the scope of the ORSWDF has been limited to the disposal of low-level radioactive wastes. It has also been renamed the Central Waste Disposal Facility (CWDF).

As currently envisioned, low activity radioactive solid wastes from Y-12 and ORGDP would be disposed of at this facility. Higher activity wastes will be disposed of at SWSA's #6 and #7. Subsurface investigations are under way for both of these new landfills. Operation of the CWDF is scheduled to begin in August, 1985. No operational date has been set for SWSA #7, however.

In addition to these facilities, a new storage area for uranium waste is being constructed at Y-12. Uranium brought to this facility in metallic form will be oxidized and stored as an oxide in concrete vaults.

V. IMPACTS OF WASTE MANAGEMENT FACILITIES

A. Pathways Identified

Operations of waste management activities on the ORR have had a variety of impacts on the surrounding environment. These impacts include contamination of soil, groundwater and surface water, and sediments. These impacts are discussed at length in environmental assessments of analyses of the three plants (DOE, 1979. DOE, 1982; ORNL, 1982).

At ORNL, the groundwater system has provided a ready pathway for radionuclides to reach the creeks that drain the site. Once in the creeks, the radioisotopes have been both chemically bound in the sediments and discharged into the Clinch River. In addition, due to sediment transport during high flows, contaminated sediments have reached the Clinch River. Studies to determine the extent of this contamination have found the levels to be small; however, monitoring is performed periodically to ensure that the situation does not deteriorate. (See Section 2, below).

Due to the past spills of mercury and of PCBs, higher than normal concentrations of these materials are also found in the sediments of ORNL's White Oak Creek. Only mercury is found in higher than normal

concentrations in the water, however. As with the radioactivity discussed above, monitoring is performed to ensure that problems are identified before unsafe levels are reached.

At ORGDP, pathways to the environment have been created by sediment transport out of settling basins and by cooling tower drift. Sediment transport has resulted in the discharge of heavy metals to the Clinch River. Cooling tower drift has resulted in higher than normal chromium concentrations in the soil and vegetation within and around ORGDP and in the release of chromium to the Clinch River. As with ORNL, monitoring programs are maintained to evaluate the extent of these releases.

At Y-12, groundwater provides the major pathway to the environment. As mentioned above, the groundwater around the landfarm area contains perchloroethylene. In addition, seepage from the S-3 ponds has led to the discharge of heavy metals to Bear Creek. Finally past spills of mercury and PCBs have created high concentrations of these materials in New Hope Pond and in Poplar Creek. Monitoring programs are discussed below.

B. Environmental Monitoring

Routine monitoring programs are discussed in Appendix E. As a supplement to these programs, a number of special programs have been completed to characterize the extent of waste movement through the environment:

(1) At ORNL, special sediment studies have been completed in the White Oak Creek watershed and in the Clinch River to determine

the extent of contamination and, where previous studies exist, the movement (if any) of the contamination.

(2) At ORGDP, special studies to monitor the chromium concentration in soils and vegetation have been completed.

(3) At Y-12, studies of the mercury levels in New Hope Pond and in Poplar Creek have been completed and more are underwqay. Fish samples are also routinely analyzed in the Clinch River for mercury levels.

These studies will be repeated as necessary to monitor the extent of pollutant movement.

C. Remedial Actions Taken or Planned

Numerous projects are under way at each facility to mitigate the migration discussed above. At ORNL, waste management areas are being protected from groundwater intrusion via impermeable caps and diversion systems. At both Y-12 and ORGDP, projects are being planned to phase out facilities which allow easy access to the environment. These facilities will be replaced with systems providing long-term isolation of waste materials.

D. Impacts on Future Land Use

As can be seen from Fig. 1 through 4, past and present waste management activities have resulted in the removal of large panels of land from possible future uses. Furthermore, as discussed in Appendix K, the

amount of land available for future waste management areas is limited. Waste management areas also must compete with other future facilities for this land. The reaction to the shrinking land resource has been varied -- volume reduction has become a real concern at both the generator and disposer levels, the use of commercial disposal facilities has increased, and processes to detoxify waste streams are being evaluated. These steps and others will continue to be followed in an attempt to extend the life of current and planned waste management areas.

VI. REFERENCES

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