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ENVIRONMENT, SAFETY, HEALTH AND WASTE MANAGEMENT PLAN APRIL 1988

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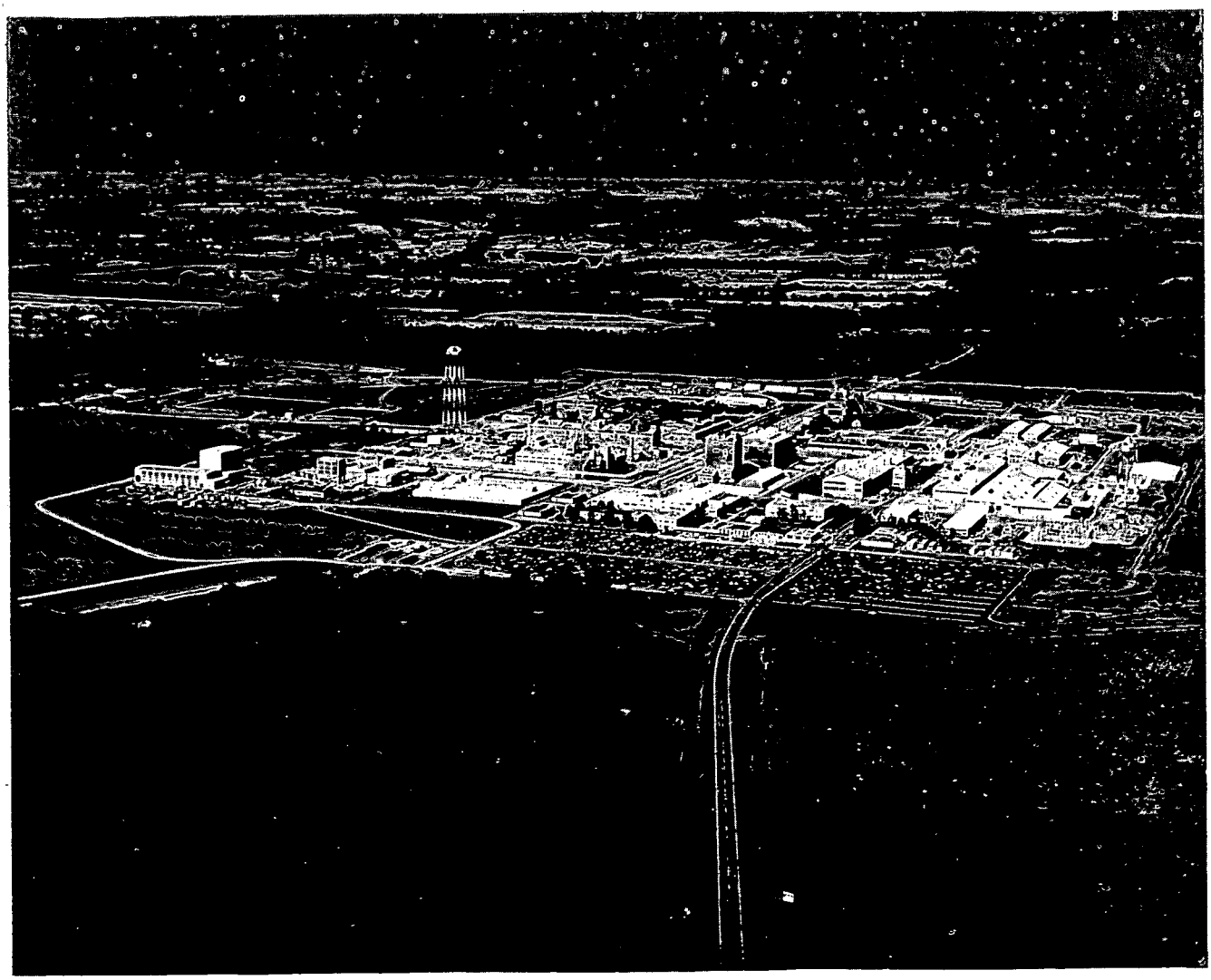
FMPC 2114
Rev. I
Special
UC-11
UC-69
UC-70

ENVIRONMENT, SAFETY, HEALTH and WASTE MANAGEMENT PLAN

APRIL 1988

Prepared for the
FEED MATERIALS PRODUCTION CENTER
Westinghouse Materials Company of Ohio
P.O. Box 398704 . Cincinnati, Ohio 45239-8704

Under Contract DE-AC05-86OR21600
U.S. DEPARTMENT OF ENERGY•Oak Ridge Operations Office



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FMPC-2114
Revision 1
Special
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UC-70

ENVIRONMENT, SAFETY, HEALTH AND WASTE MANAGEMENT PLAN

by

Operations Safety & Health
and Site Remediation Departments

April 15, 1988

Westinghouse Materials Company of Ohio
P.O. Box 398704
Cincinnati, Ohio 45239-8704

Prepared for:

U.S. Department of Energy
Oak Ridge Operations Office
Contract DE-AC05-86OR21600

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Foreword to April 15, 1988 Revision

A number of changes have been made to the Environment, Safety, Health and Waste Management Plan since its initial issue in March. The revisions are considered essential for the accurate presentation of funding requirements for the progress projected for the Feed Materials Production Center.

Plan revisions that have been made are as follows:

- Program GE funding levels have changed to agree with budget information forwarded to DOE on April 12, 1988
- Modifications have been made to the Plan in response to DOE review comments on the initial issue
- The tables of prioritized projects have been altered to incorporate additional information and to clarify the prioritization of multicomponent projects such as the dust collectors, material handling, and heating-ventilation systems.

These revisions will furnish the reader a greater knowledge of the programs that make up the current plan of improvements.

ACKNOWLEDGMENT

This plan was published through the dedicated efforts of various people within Westinghouse Materials Company of Ohio and RMI. Special recognition is given to those who contributed the source material for the plan, and also to those who organized, compiled and edited the material.

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AHF	Anhydrous Hydrogen Fluoride
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
BACT	Best Available Control Technology
BAT	Best Available Technology
BDN	Biodentrification
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
CAA	Clean Air Act
CDR	Conceptual Design Report
Ci	Curie
CE	Capital Equipment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CIS	Characterization Investigation Study
CPR	Cardio-Pulmonary Resuscitation
CPU	Central Processing Unit (computer)
CWA	Clean Water Act
D&I	Dosimetry & Instrumentation
DCS	Digital Control System
DFO	Director's Findings and Orders
DOE	Department of Energy
DOELAP	DOE Laboratory Accreditation Program
EBS	Environmental Baseline Survey
EIS	Environmental Impact Statement
EOC	Emergency Operations Center
EOP	Emission Offset Policy
ERM	Environmental & Radiological Monitoring
FEMA	Federal Emergency Management Agency
FFCA	Federal Facilities Compliance Agreement
FMPC	Feed Materials Production Center (Fernald Plant)
FSAR	Final Safety Analysis Report
FWPCA	Federal Water Pollution Control Act
GE	Funded by Nuclear Materials Production Program
GE-OP	Operating Funds - GE Budget
GF	Funded by Defense Waste and Environmental Restoration Programs

GOCO	Government Owned Contractor Operated
GPP	General Plant Project
HEPA	High Efficiency Particulate Air (filter)
HLW	High-level Waste
HF	Hydrogen Fluoride
HP&RE	Health Physics & Radiological Engineering
HVAC	Heating, Ventilation and Air Conditioning
ICRP	International Commission on Radiological Protection
ICRU	International Commission on Radiological Units and Measurements
I&E	Inspection and Evaluation
IH	Industrial Health
JPIC	Joint Public Information Center
LI	Line Item (budget or project)
LLWDDD	Low-level Waste Disposal, Development and Demonstration Program
LLWPSS	Low-level Waste Processing and Shipping System
MIVRML	Mobile In-Viro Radiation Monitoring Laboratory
MSL	Management Systems Laboratories
MSSA	Master Safeguards and Security Agreement
MT	Metric Ton
MTU	Metric Ton of Uranium
NAAQS	National Ambient Air Quality Standards
NAD	Nuclear Accident Dosimeter
NCP	National Contingency Plan
NCRP	National Commission on Radiological Protection
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutant
NFPA	National Fire Protection Association
NFPC	National Fire Protection Code
NIOSH	National Institute for Occupational Safety and Health
NLO	NLO, Inc. (prior FMPC operating contractor)
NOx	Oxides of Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NUREG	Nuclear Regulation (NRC report numbering system)
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODSA	Ohio Disaster Services Agency
OEPA	Ohio Environmental Protection Agency

OP	Operating Budget
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORGDP	Oak Ridge Gaseous Diffusion Plant
OSHA	Occupational Safety and Health Act
OS&H	Operations Safety and Health
OSR	Operational Safety Requirements
PCBs	Poly-Chlorinated Biphenyls
ppm	Parts Per Million
PRIP	Productivity and Radiological Improvement Program
PRP	Productivity Retention Program
PSD	Prevention of Significant Deterioration
PTA	Plant Test Authorization
PTI	Permit To Install
PTO	Permit To Operate
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RDA	Radiation Detection and Alarm (system)
R&D	Research and Development
Rem	Roentgen equivalent man (radiation unit)
RI/FS	Remedial Investigation/Feasibility Study
RMI	Reactive Metals Incorporated (Astabula, OH)
ROD	Record of Decision
SAIC	Science Applications International Corporation
SAR	Safety Analysis Report
SARA	Superfund Amendment and Reauthorization Act
SARP	Safety Analysis Report for Packaging
SCBA	Self-Contained Breathing Apparatus
SEG	Scientific Ecology Group
SOx	Oxides of Sulfur
SOP	Standard Operating Procedure
SSES	Storm Sewer Evaluation Survey
SWDA	Solid Waste Disposal Act (state of Ohio)
SWRB	Stormwater Retention Basin
TEC	Total Estimated Cost
TDS	Total Dissolved Solids
TLD	Thermo-Luminescent Dosimeter
TRU	Transuranic
TSA	Technical Safety Appraisal

T-NFR	Total Nonfilterable Solids
TSCA	Toxic Substances Control Act
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
TWA	Time-Weighted Average
USEPA	United States Environmental Protection Agency
VHAP	Volatile Hazardous Air Pollutant
WBS	Work Breakdown Structure
WMCO	Westinghouse Materials Company of Ohio (FMPC operating contractor)
WREE	Waste Remediation and Environmental Engineering Section
Y-12	Y-12 Plant, Oak Ridge, TN.

Executive Summary

The mission of the Feed Materials Production Center (FMPC) is the production of high quality uranium metal for use by the U.S. Department of Energy (DOE) in Defense Programs. In order to accomplish this mission and to maintain the FMPC as a viable facility in the DOE production complex, the facility must be brought into full compliance with all federal and state regulations and industry standards for environmental protection and worker safety. Where past practices have resulted in environmental insult, a comprehensive program of remediation must be implemented. How these improvements are to be achieved is of utmost importance to DOE; its contractor, the Westinghouse Materials Company of Ohio (WMCO); and to the regulatory agencies, the Congress, and the local community.

The purpose of this combined Environment, Safety, Health and Waste Management Plan is to provide a road map for achieving these needed improvements. The plan is structured to provide a comprehensive projection from the current fiscal year (FY) through FY-94 of the programs, projects and funding required to achieve compliance. To do this, the plan is subdivided into chapters which discuss the applicable regulations (Chapter 2); project schedules and funding requirements (Chapter 3); details of the various programs for environment, safety, health and waste management (Chapters 4-10); details for compliance with National Environmental Policy Act (NEPA) (Chapter 11); the Quality Assurance Program (Chapter 12) and the Environmental Monitoring Program (Chapter 13).

A second DOE facility assists the FMPC in its mission - the RMI Extrusion Plant in Ashtabula, Ohio. Beginning in FY 1988, WMCO assumed contract responsibility for the RMI operation under its existing prime contract for the FMPC at the Department of Energy's request. Planning for RMI is discussed in Chapter 14 of this document.

The driving forces for the changes discussed in this plan stem from regulatory agency requirements, principally, the Federal Facilities Compliance Agreement (FFCA) between the DOE and the U.S. Environmental Protection Agency (USEPA). This agreement was signed in July 1986, and has compelled the FMPC to implement many programs not anticipated by the budget process in previous funding years. In particular, the requirement to perform a Remedial Investigation and Feasibility Study (RI/FS) will have a significant budget impact in excess of $15 million over the course of the RI/FS study through FY-90. The plan will change and evolve until the RI/FS is completed and a record of decision (ROD) is issued by USEPA Region 5. The estimated cumulative impact is in excess of $1 billion and can only be tabulated once the ROD is issued and the remediation is accomplished.

The FFCA also mandates improvements in the areas of air pollution control and the Resource Conservation and Recovery Act (RCRA), which are currently ongoing, at a cost of $272 million over the planning period. The total cost for completing all

FFCA-mandated requirements is currently estimated to be $660 million in FY-88 dollars. These costs will not be affected by a change in the FMPC's mission.

The FFCA is not the only set of compliance requirements for the FMPC. In FY 1987, the Director of the Ohio Environmental Protection Agency (OEPA) issued 15 Findings and 18 Orders that impact primarily on FMPC's water pollution control programs.

Many of the construction projects associated with these Orders are to be completed in FY 1988 at a cost of $9.5 million. The total cumulative costs, including the completion of the biodenitrification system line item is estimated to be $117 million.

In conjunction with the OEPA Director's Findings and Orders, yet separate from it, the State of Ohio has asked FMPC to begin the process of application for a new National Pollutant Discharge Elimination System (NPDES) permit. Because of the sampling program associated with this process, approximately $500,000 in operating funds in FY-88 and FY-89 will be required to complete this application. Failure to complete this application in a timely manner could significantly damage the improving relations with the OEPA, and would ultimately result in further compliance instruments.

Besides the Director's Findings and Orders, DOE has been negotiating with the State on a new version of a Consent Decree. These negotiations will result in a $5 million cumulative impact over the seven-year period, in the area of RCRA and in additional requirements for the RI/FS.

Similarly, RMI faces a multi-million dollar remediation program during the planning period. Although the extent of this effort is being determined, preliminary estimates could range as high as $21 million.

The extent of RCRA compliance is another major impetus for FMPC. Although some items to improve RCRA compliance are listed in the FFCA and the OEPA Director's Findings and Orders, once these items are completed, other programs and facilities will be required to bring FMPC into full compliance. One of these items is a new RCRA warehouse to store FMPC and RMI wastes which cannot be processed by the Oak Ridge TSCA Incinerator. It is a necessity in order to prevent future violations and is currently estimated to cost $1.2 million. In addition, improved training of FMPC employees, particularly in waste certification, and enhanced documentation are needed to upgrade the program.

The impact of public recognition of FMPC's deficiencies in its health, safety and emergency preparedness programs has been another major force in bringing the FMPC into compliance with industry standards. Although great strides were taken in emergency preparedness during FY-87, improvements in onsite response, communications systems and procedural documentation is still needed. The

cumulative cost of these improvements over the planning period is estimated at $4 million.

In the area of worker health and safety, strategies are based on reducing radiation exposures to As Low As Reasonably Achievable (ALARA) levels. The central concept for creating this change is zoning. By pushing back radiation areas, first to the individual plants and later to individual work areas within the plants, the FMPC can significantly reduce worker exposures, and eliminate the need for much of the safety clothing currently required. The cumulative cost to implement these changes will be approximately $1 million over the next three (3) years.

Other major activities discussed in the plan which will create significant economic impacts during the planning period include: the Technical Safety Appraisal, the Environmental Baseline Survey, and various appraisals by DOE and other outside agencies. The recent National Academy of Sciences report on Safety Issues at the Defense Production Reactors dated October 29, 1987, will have an important cost impact on the site safety analysis program, as well as other safety and engineering programs.

In summary, the strategies for Environment, Safety, Health and Waste Management are designed to bring the FMPC and its companion RMI facility into compliance during the next decade. The strategic outlook over the seven-year planning horizon looks ambitious, but achievable, provided the appropriate manpower and funding resources are provided. It should be stressed that these requirements, particularly in the areas of environment and waste management, will not change appreciably with a change in mission for the FMPC complex. With the appropriate funding, the FMPC will be able to accomplish its nuclear materials production mission in full compliance with all applicable regulations and industry standards well into the next century.

1.0 Introduction

1.1 History and Purpose of the Report

The Feed Materials Production Center (FMPC), which is owned by the U.S. Department of Energy (DOE) and operated by the Westinghouse Materials Company of Ohio (WMCO), is located on a 1,050 acre site northwest of Cincinnati, Ohio. The mission of the 35-year old facility is to produce uranium metal from a variety of feed materials. In line with continued production goals, an integrated and comprehensive management plan has been formulated to address the various environmental, safety and health concerns at the site. The objectives of the plan are to serve as a descriptor for the FY-90 budget and Long-Range Plan submittals and to explain DOE-WMCO management objectives.

This plan differs in several respects with those previously set forth for the FMPC facility. These differences are: a planning period of seven years instead of five; the incorporation of a Waste Management Plan, in accordance with DOE Order 5820.2 requirements, and the addition of the plans for the RMI Company site located at Ashtabula, Ohio (Figure 1-1). The initial two differences are results of direct DOE requests. The last results from a WMCO contract with DOE in FY-87 to oversee environment, safety and health and waste management activities at the RMI facility. With the embodiment of these changes, the plan will have greater utility, not only as a reference document for budget item explanation, but a means of gauging progress in dealing with the various environment, safety and health and waste management issues at both FMPC and RMI.

The plan has been compiled and edited from the submittals of various WMCO and RMI organizations who are involved with environmental, waste management, safety and health efforts being made. The plan presents the work to be performed from FY-88 through FY-94 in such a manner as to provide an overall view but still give the details inherent in each field of endeavor.

Following an explanation of program administration and funding, the various regulations with which FMPC must comply are identified with an explanation of the compliance strategy that is being pursued. The overall plan is next presented and furnishes tables of the projects planned for FMPC and RMI, their schedules and estimated cost. The tables show over 200 items at the FMPC and 35 at RMI. The associated schedules for each project list the dates of start and completion during the seven year time frame. Costs for accomplishing these projects consistent with budgetary considerations are presented in terms of annual and overall funds required. The detailed presentation for each functional area is then provided. These sections furnish a relation of problems to be addressed and descriptions of the projects

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Figure 1-1. Location of FMPC and RMI

initiated to solve them. Finally, details are presented for several of the programs currently underway at the FMPC.

Since the issue of the FY-87 FMPC Environment Safety & Health Management Plan, a significant amount of progress has been realized with respect to the improvements listed in that plan. Eighteen projects have been completed, and fifty others have been initiated. Fourteen other items have been cancelled either because of a change of objective or due to lack of a demonstrated need.

In summary, the requisites for a comprehensive plan have been incorporated as well as the necessary details required to understand the justification, time frame, and costs for the individual projects being undertaken to advance the environment, safety, health and waste management programs of the FMPC and RMI.

1.2 Producing Uranium Metal at the FMPC

The FMPC's primary function is to produce purified uranium metal and compounds for use at other DOE sites. The uranium may be depleted or slightly enriched in U-235. A flow chart of the production process is shown in Figure 1-2. Figure 1-3 identifies major buildings and areas of the FMPC.

The feedstock for uranium production comes primarily from three sources: recovered uranium-bearing residues from uranium processing, uranium tetrafluoride (UF_4) obtained from inventory and uranium hexafluoride (UF_6) from the gaseous diffusion plants. A fourth feedstock, uranium trioxide (UO_3) from the Richland Purex Plant, is no longer produced because of the N-reactor shutdown.

Recycled uranium-bearing residues are first dissolved in nitric acid. The uranium is then extracted into an organic liquid and then back-extracted into deionized water to yield a solution of uranyl nitrate. Evaporation and heating convert the nitrate solution to UO_3 powder. The UO_3 from the FMPC extraction process or from the Purex Plant is reduced to uranium dioxide (UO_2) with hydrogen and then converted to UF_4 by reacting it with anhydrous hydrogen fluoride. Uranium tetrafluoride is the feed material for producing uranium metal. The reaction of UF_4 with magnesium metal in a refractory-lined reduction vessel produces uranium metal called a derby. Some derbies are shipped directly to the Oak Ridge Y-12 Plant and Colorado Rocky Flats Plant, but most remain onsite for casting into cylindrical or flat ingots.

The cylindrical ingots, which may be either depleted or enriched in U-235, are cast from derbies and recycled high-purity uranium metal. The ingots are machined and heat-treated, then sent offsite to RMI Incorporated (RMI) for extrusion into tubes or billets of specific dimensions. After extrusion, RMI returns the depleted uranium tubes to the FMPC, where they are cut into sections, machined to final

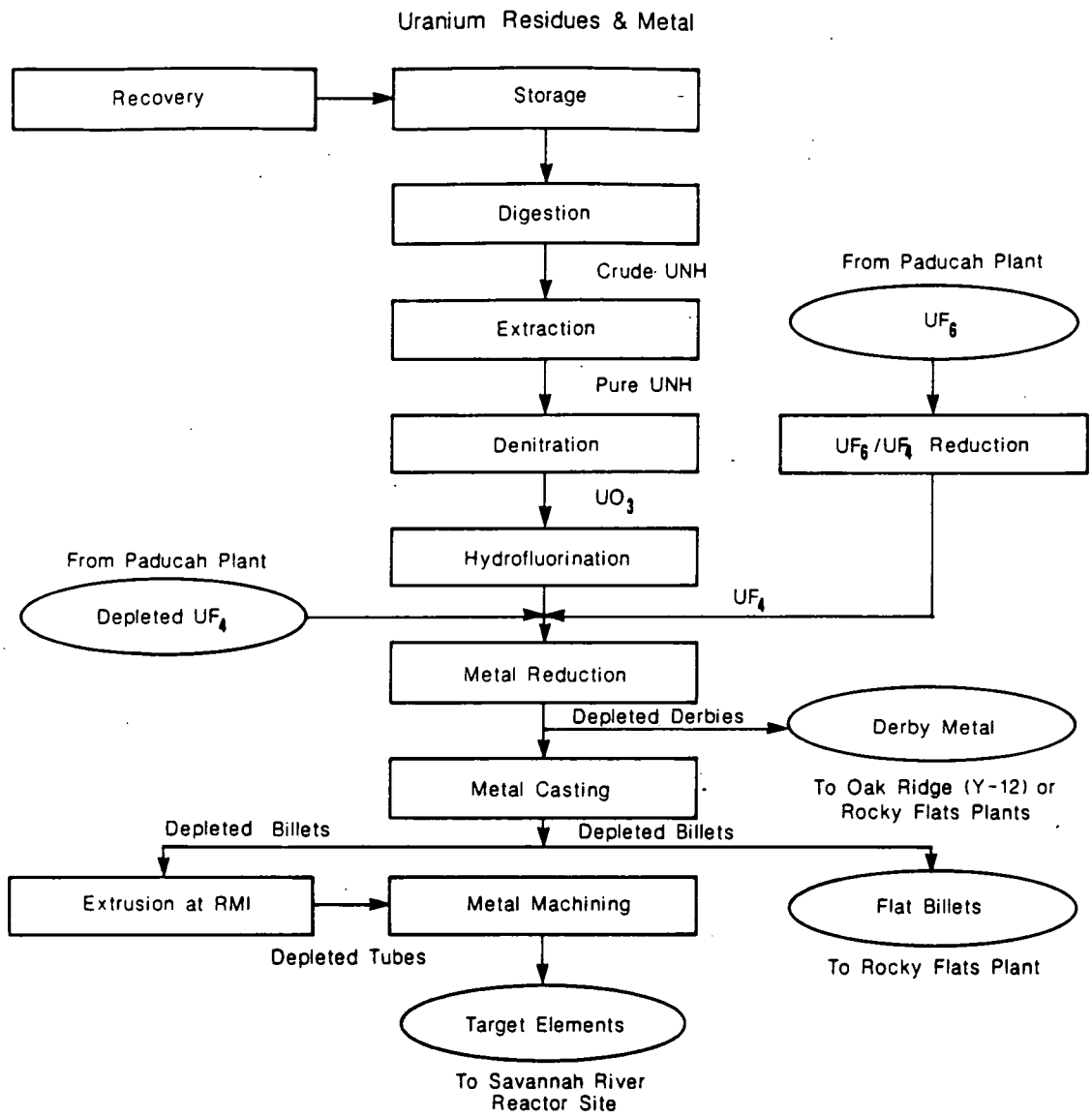

Figure 1-2. Schematic Diagram of the FMPC Process

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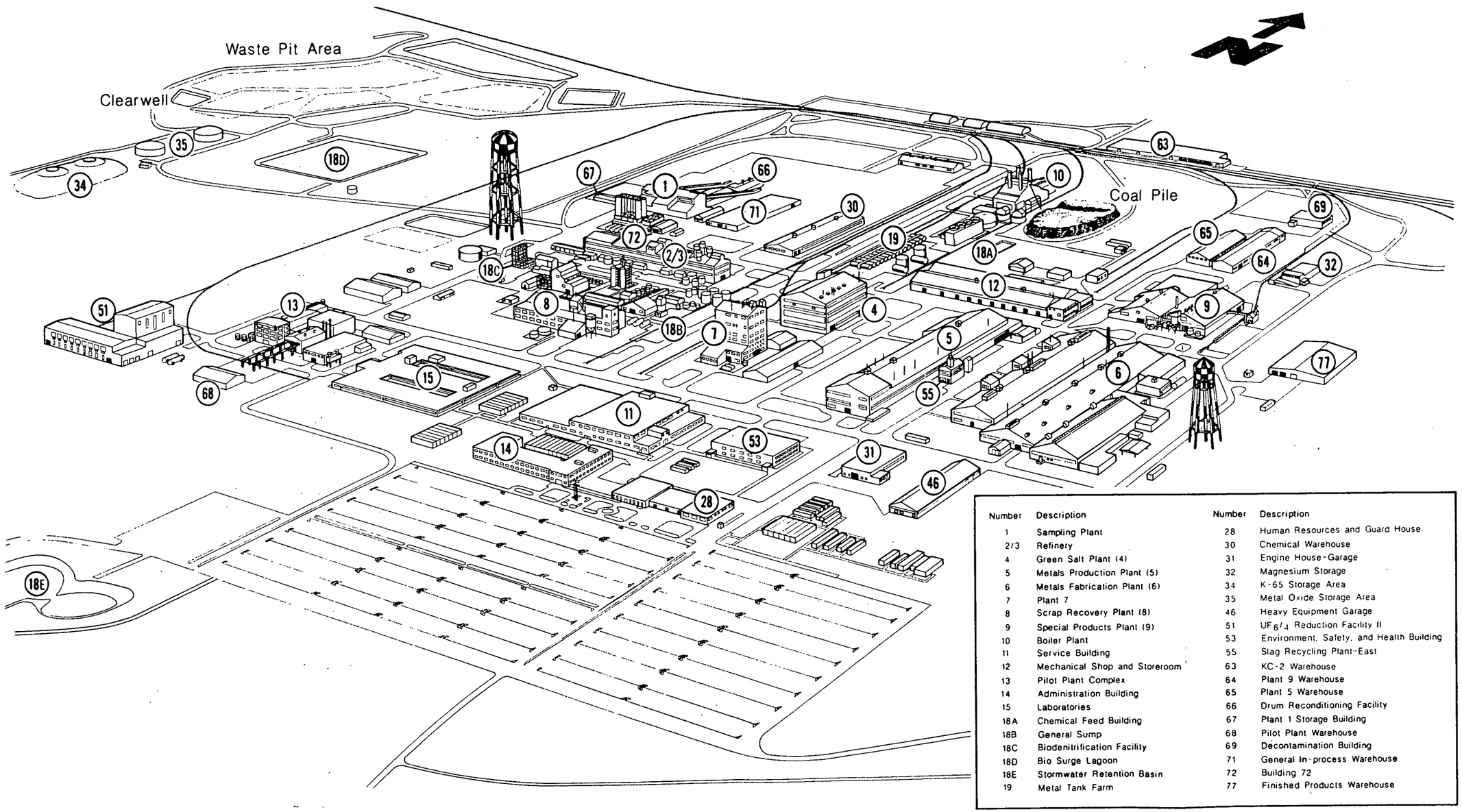

Number	Description	Number	Description
1	Sampling Plant	28	Human Resources and Guard House
2/3	Refinery	30	Chemical Warehouse
4	Green Salt Plant (4)	31	Engine House-Garage
5	Metals Production Plant (5)	32	Magnesium Storage
6	Metals Fabrication Plant (6)	34	K-65 Storage Area
7	Plant 7	35	Metal Oxide Storage Area
8	Scrap Recovery Plant (8)	46	Heavy Equipment Garage
9	Special Products Plant (9)	51	$UF_6/_4$ Reduction Facility II
10	Boiler Plant	53	Environment, Safety, and Health Building
11	Service Building	55	Slag Recycling Plant-East
12	Mechanical Shop and Storeroom	63	KC-2 Warehouse
13	Pilot Plant Complex	64	Plant 9 Warehouse
14	Administration Building	65	Plant 5 Warehouse
15	Laboratories	66	Drum Reconditioning Facility
18A	Chemical Feed Building	67	Plant 1 Storage Building
18B	General Sump	68	Pilot Plant Warehouse
18C	Biodenitrification Facility	69	Decontamination Building
18D	Bio Surge Lagoon	71	General In-process Warehouse
18E	Stormwater Retention Basin	72	Building 72
19	Metal Tank Farm	77	Finished Products Warehouse

Figure 1-3. FMPC Site 26

dimensions, and inspected for product quality. These machined cores are shipped to the DOE Savannah River Site.

All flat ingots are depleted U-235 and are cast from derbies and recycle metal. These ingots are top-cropped and inspected, then shipped to the DOE Rocky Flats Site.

1.3 WMCO Organizations Responsible for this Plan

The WMCO Regulatory Compliance section has overall responsibility for the preparation and coordination of the Environment, Safety, Health and Waste Management Plan. In preparing this plan, Regulatory Compliance draws upon the resources of other WMCO organizations in Operations Safety and Health (OS&H) as well as in the Operations and Technical departments. Regulatory Compliance is charged with ensuring that FMPC meets all federal, state and local regulations with respect to the environment and worker health and safety. Regulatory Compliance is a subdivision of the WMCO OS&H Department.

Waste Remediation and Environmental Engineering (WREE), a subdivision of the WMCO Site Remediation Department, is responsible for the initial planning and design of waste remedial activities. This includes providing engineering and technical support to Impact Assessment, a subdivision of the Site Remediation Department in responding to the Federal Facilities Compliance Agreement (FFCA), the Ohio Environmental Protection Agency's Director's Findings and Orders (DFO), and any future compliance agreements such as the Ohio Consent Decree. WREE also supports Regulatory Compliance, Waste Operations and Waste Technology groups in managing solid wastes, including wastes identified in the Resource Conservation and Recovery Act (RCRA), and liquid waste facilities including the Sewage Treatment Plant and the Biodenitrification facility.

The initial planning and design activities performed by WREE include the drafting of feasibility studies, project authorizations, conceptual designs and permits to install. WREE also contributes to the safety analyses and environmental assessments. Once the project is funded and ready for construction or Title I design, responsibility passes to the Capital Projects section of the WMCO Technical Department. WREE follows the project through the design review process.

The Operations Safety and Health Department has been established to ensure the health and safety of employees and the general public, and to protect the environment from adverse affects of FMPC operation. Responsibilities of OS&H are:

- Maintaining radiological surveillance and protection
- Implementing programs for industrial hygiene, industrial safety, and fire protection
- Coordinating and preparing a comprehensive program for compliance

- Assuring that site operations, construction, design, and administrative activities are performed according to applicable federal, state, and local regulations and DOE Orders
- Preventing inadvertent nuclear criticalities
- Coordinating the OS&H Long Range Plans.

The organizational structure of the responsible WMCO organizations is presented in Figures 1-4 through 1-6.

1.4 Funding for the FMPC

The DOE funds all activities at the FMPC. The funds are divided among several budgets, each with a specific classification. Each budget is further subdivided into one or more of the following major Budget and Reporting (B&R) categories that support the FMPC:

- GE - Nuclear Materials Production in Support of Reactor Operations
- GF - Defense Waste
- 4A - Work for Others Program.

Figure 1-7 illustrates the FMPC budget categories, which are described in the following paragraphs.

1.4.1 GE - Nuclear Materials Production

The GE budget is subdivided into two B&R Categories: GE01 and GE03. The funds for all ongoing feed materials production efforts and associated projects at the FMPC are included in these categories.

GE01 - These funds are used for direct production operations associated with the manufacture of feed materials for all production reactors, including the Savannah River and Hanford reactors.

GE03 - This B&R category covers funding for all services that support production reactor operations. The GE03 category includes the funding for supplies and/or services that are not chargeable to the other GE areas. The GE03 funds also cover shipping waste that is generated by current production operations to offsite storage facilities. Currently generated waste differs from waste created by past production operations for funding purposes. This waste is referred to as backlog waste and is stored onsite.

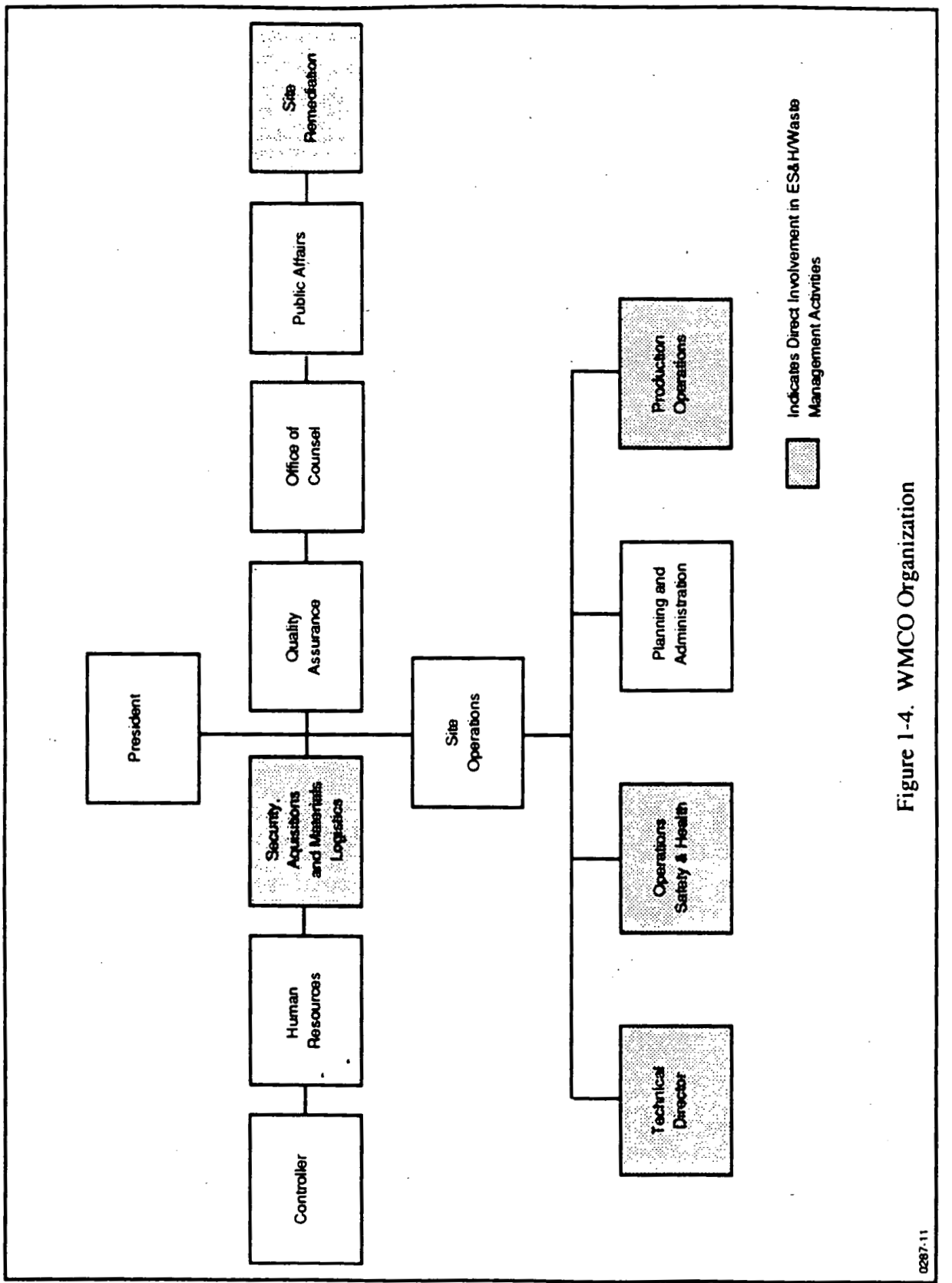

Figure 1-4. WMCO Organization

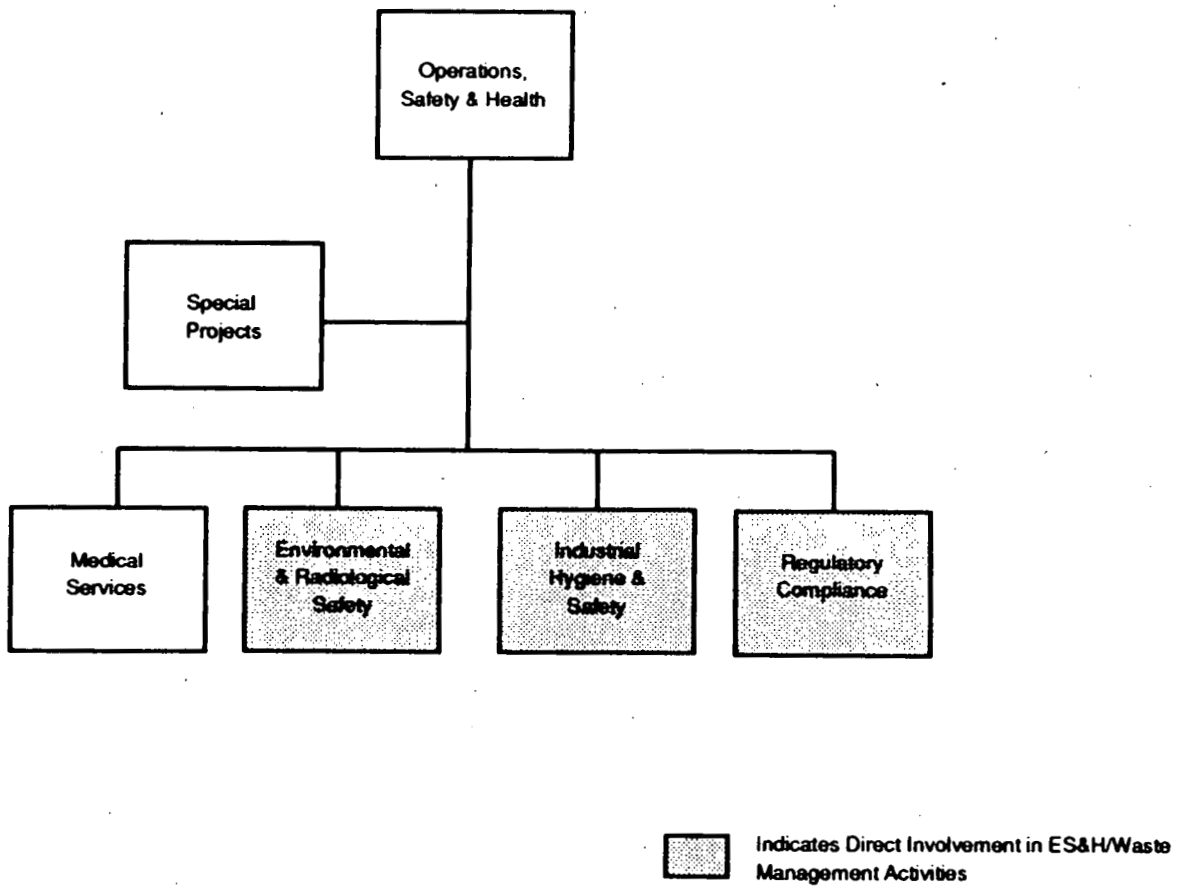

Figure 1-5. WMCO Operations, Safety & Health Department

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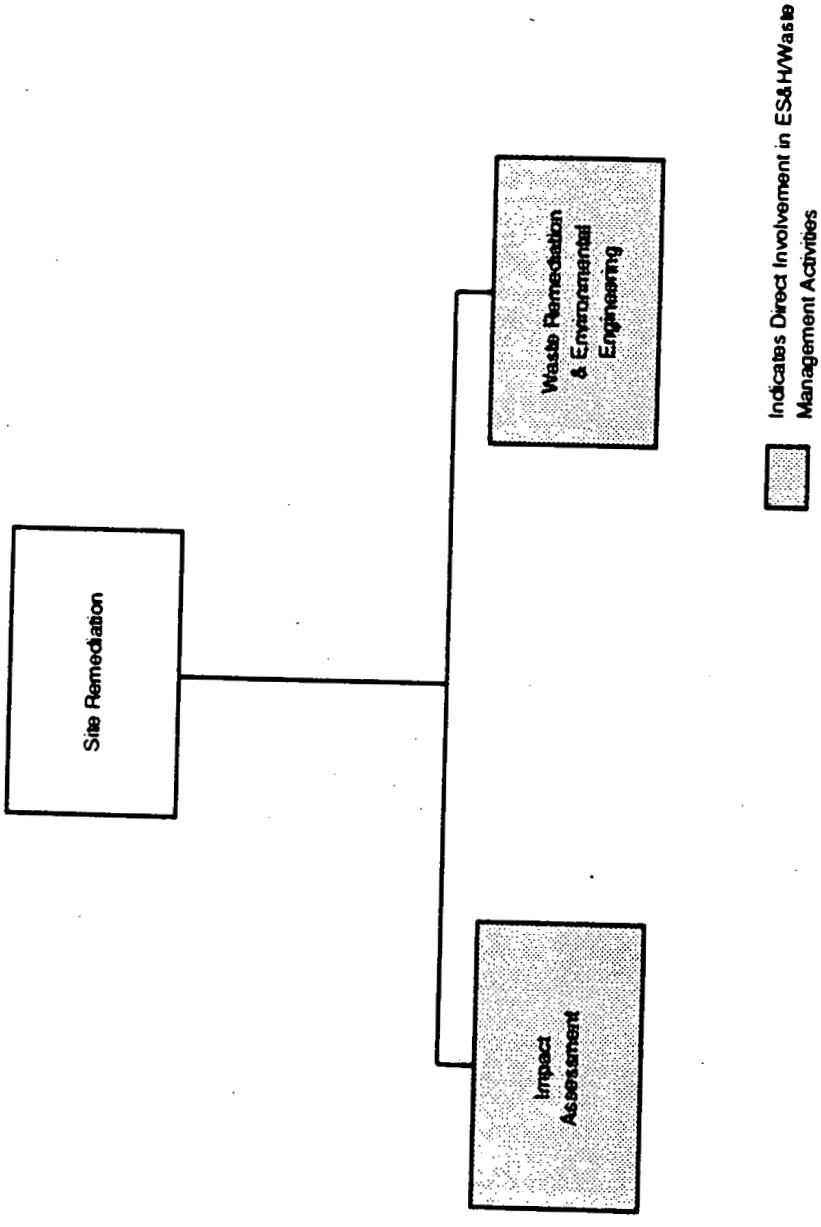

Figure 1-6. WMCO Site Remediation Department

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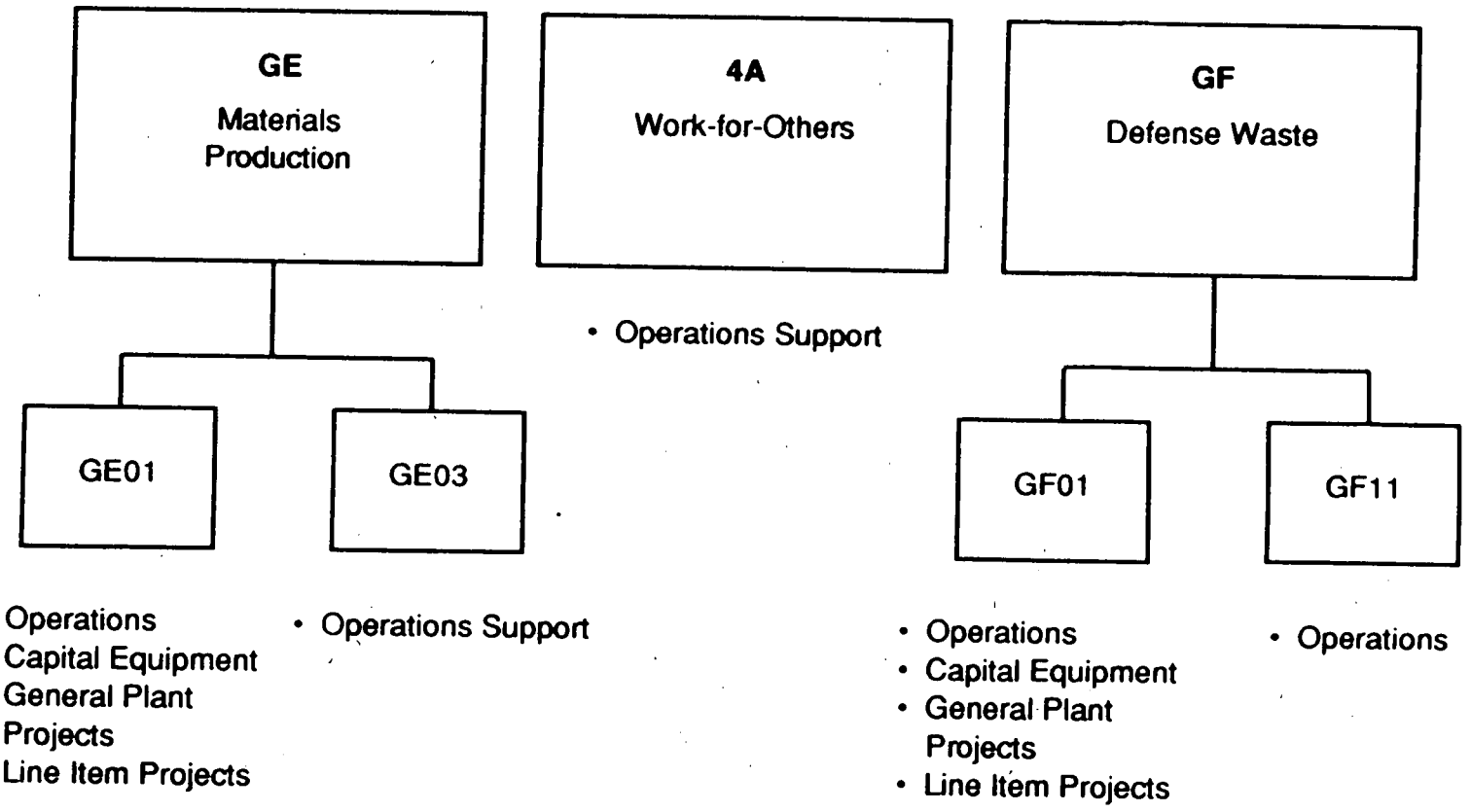

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Figure 1-7. FMPC Budget Categories

1.4.2 GF - Defense Waste

The second major budget designation that applies to the FMPC is the GF budget, and is subdivided into B&R Categories GF01 and GF11.

GF01 - This B&R category funds the management and disposition of low-level radioactive and mixed hazardous waste materials generated at, or handled by, the FMPC in previous years. Specific activities are segregated into five categories: backlog waste processing/shipping; waste remediation engineering; waste technology; environmental compliance; and characterization/investigation study.

GF11 - This is a new environmental restoration category applicable to Defense Program sites. This B&R category includes those costs associated with the following:

- Environmental restoration of inactive sites as required by RCRA or Comprehensive Environmental Response and Liability Act (CERCLA) as amended by the Superfund Amendment and Reauthorization Act (SARA)
- Preliminary environmental assessments or site investigations to establish environmental priorities for further actions
- Remedial Investigations/Feasibility Studies (RI/FS)
- Remedial actions
- Decontamination and decommissioning surplus contaminated facilities.

1.4.3 4A - Work for Others

The third major budget category is 4A, Work for Others. This budget is used for the shipment of 4A related waste and all projects associated with 4A materials production. The 4A program is exclusively Operations, and is not given separate B&R designations.

1.4.4 Divisions Within the Budget and Reporting Categories

Except for GF11, GEO3, and 4A, each B&R category is grouped into four types of funds:

- Operations (OP)
- General Plant Projects (GPP)
- Capital Equipment (CE)
- Line Item Projects (LI).

Operations' funds directly support the main function of the particular B&R category. The remaining types of funds (GPP, CE, LI) are designated, within their respective categories, for specific purposes.

General Plant Project funds support a certain group of tasks aimed at a particular goal. These funds are limited to $1.2 million per project and require approval from DOE-ORO. Projects with a budget greater than $1.2 million are designated as Line Item Projects and these must be approved by Congress.

The funds for purchasing major equipment (items greater than $5,000) come from Capital Equipment. The equipment may or may not be part of a project or task, and has to be budgeted separately.

1.5 Defining Terms Used in this Plan

For purposes of this plan, it is essential that the following terms be defined:

- **Subproject:** An orderly arrangement of activities designed to accomplish the project objective, thus several subprojects may be part of a project as described in Section 1.6
- **Project:** A planned activity intended to accomplish a specific objective
- **Program:** A planned procedure consisting of a group of concerted ongoing activities to attain a goal; thus several projects may be parts of a program
- **Plan:** An orderly arrangement of programs designed to be undertaken to realize certain objectives. The plan describes how projects relate to programs.

1.6 Line-Item Construction Projects

Several major construction projects have been initiated which involve environment, safety, health and waste management concerns at the FMPC. Each of these projects is termed Line-Item and covers a number of subprojects to be undertaken over a period of years. The objectives are to restore FMPC processing capabilities and to provide systems of equipment that are capable of meeting present and future standards for worker safety, radiation control and environmental protection. Each of these projects is described below.

- *Productivity and Radiological Improvements (PRI):* This project, identified as Project No. 85-D-140, consists of eleven subprojects. The PRI was first funded in FY-85 and will continue through FY-89. Three of the subprojects are directly related to air and water pollution control.
- *Productivity Retention Project (PRP):* This project, identified as Project No. 86-D-149, has been divided into three phases and contains a total of 25 subprojects. The funding was initiated in FY-86 and is slated to continue through FY-93. Six of the subprojects relate to improving air and water pollution control.
- *Environmental, Health and Safety Improvements (EHSI) Project:* This project, identified as Project No. 87-D-157, contains over 100 subprojects and is divided into six phases for project management purposes. Funding was

initiated in FY-87 and is planned to continue through FY-94. Subprojects are identified by a work breakdown structure (WBS) numbering system. All subprojects are pertinent to environment, safety, health and waste control efforts at the FMPC.

2.0 Regulations

The FMPC and the RMI Facility both must adhere to regulations and guidelines established by Congress, the DOE, and the State of Ohio to protect employees, the surrounding communities, and the environment. This section describes how these regulations and guidelines affect operations at the FMPC. Figure 2-1 presents a matrix of applicable regulations and DOE Orders which affect operations and project planning at FMPC and RMI.

2.1 Air Regulations

The Clean Air Act (CAA), as passed and amended by Congress, is the basis for all regulations to control air pollution. The CAA includes provisions for setting maximum allowable air pollution emission rates through a combination of a technology-based program and an ambient air quality-based program. Individual states have the primary responsibility for submitting plans and strategies to the United States Environmental Protection Agency (USEPA) to enforce the CAA. These plans are known as State Implementation Plans and are the basis for the state's regulatory authority under the CAA.

Ohio's implementation plan is executed through the provisions of the Ohio Administrative Code (OAC), which is the guiding set of regulations for FMPC air pollution controls. The provisions are discussed later in this chapter.

The CAA designates pollutants as either criteria or noncriteria. Individual pollutants for each category are as follows:

Criteria Pollutants
- Total suspended particulates (TSP)
- Sulfur dioxide (SO2)
- Nitrogen oxides (NOx)
- Carbon monoxide (CO)
- Ozone
- Hydrocarbons(nonmethane)

Noncriteria Pollutants
- Asbestos
- Beryllium
- Mercury
- Vinyl chloride
- Radionuclides
- Lead.

2.1.1 Criteria Pollutant Regulations

National Ambient Air Quality Standards (NAAQS) have been established for criteria pollutants. Geographical regions of the country are evaluated as to whether or not they comply with a NAAQS for a specific pollutant. Regions unable to meet a NAAQS for a specific pollutant are designated as a nonattainment area for that pollutant (but only for that pollutant).

	Air	Water	Waste	Site Remediation	Health Physics/ Radiation Protection	Industrial Hygiene	Industrial Safety	Safety Analysis	Nuclear Criticality	Fire Protection	Handle & Ship Waste	Emergency Preparedness
CAA	X			X								
DOE 5480.4	X	X	X		X							
CERCLA	X		X	X								
DOE 5500.3	X											
RCRA	X	X	X	X								
NPDES		X	X									
CWA		X	X									
DOE 5480.1	X		X		X	X			X	X		
DOE 5820.2			X	X								
DOE 5480.14	X		X	X								
TSCA			X									
DOT		X	X									
SWDA			X									
NAAQS	X											
NESHAP	X			X								
OAC	X	X	X									
40 CFR 264			X									
40 CFR 761			X									
FFCA	X		X	X								
Ohio Consent Decree		X										
Director's Findings & Orders		X										
40 CFR 300				X								
40 CFR 61				X								
DOE 5480.5					X			X	X			X
DOE 5484.1					X		X					
DOE 5480.11 (Proposed)					X							
DOE 5480.10						X						
DOE 5483.1							X					
DOE 5480.3									X		X	
49 CFR											X	
40 CFR											X	
DOE 1540.1											X	
DOE 5500												X
OSHA						X	X					X
DOE 5481.1								X				X
NFPC										X		

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Figure 2-1. Regulations and Compliance Matrix

Geographical locations which comply with ambient air quality standards (attainment areas) operate under the air pollution policy known as the Prevention of Significant Deterioration. This regulation permits moderate industrial growth while maintaining the ambient air quality of the area. The FMPC is located in an attainment area for the previously listed criteria pollutants with the exception of ozone. All new sources of emissions proposed at the FMPC are evaluated to help ensure that the facility complies with these regulations.

2.1.2 Noncriteria Pollutant Regulations

The USEPA National Emission Standards for Hazardous Air Pollutants (NESHAP) program regulates the emissions of hazardous air contaminants (noncriteria pollutants). This program stems from Section 112 of the CAA that mandates the stringent control of hazardous airborne substances. The NESHAP regulations contain provisions for controlling, monitoring, and reporting emissions to help ensure that the release of these substances into the atmosphere will not have a significant effect on public health or ambient air quality.

While only the six substances listed on page 2-1 are specifically regulated under NESHAP, benzene and arsenic can also be regulated as hazardous pollutants if they are emitted from fugitive emission sources as a Volatile Hazardous Air Pollutant. Radionuclides are currently the only NESHAP substance emitted from the FMPC.

For airborne radionuclides, the USEPA has issued final NESHAP regulations. These regulations limit offsite radiological dosages to a committed 70-year dose equivalent, no greater than 25 mrem whole body and 75 mrem to critical 2-3 March 11, 1988organs of any member of the general public. The USEPA will grant waivers of the 25/75 limits if a facility can demonstrate that no member of the public will receive a continuous exposure of more than 100 mrem effective dose equivalent and a noncontinuous exposure of more than 500 mrem effective dose equivalent from all plant sources.

DOE Order 5480.1B sets forth the responsibility and authority for enforcing environmental protection programs for DOE facilities. This order further establishes ambient air concentration standards for radionuclides, while the Nuclear Regulatory Commission (NRC) standards for ambient air are set forth in 10 CFR 20. For compliance purposes, the FMPC compares its monitoring data to the more restrictive standard.

Under the provisions of DOE Order 5480.14 and CERCLA, the release of one pound of radionuclides above normal operating losses (levels established by the source operating permits) to the atmosphere mandates the shutdown of processes involved and the implementation of specific response and reporting procedures. The FMPC complies with these regulations.

2.1.3 Ohio Administrative Code - Permitting Requirements

Since the FMPC is a source of air emissions, it must obtain a state issued "Permit To Operate" (PTO) under the provisions of the OAC. These permits, which are on a three-year renewal cycle, establish allowable source emission levels, monitoring, sampling and reporting requirements. The FMPC has filed over 400 applications with the OEPA for existing sources of air emissions.

A facility must obtain a "Permit to Install" (PTI) from OEPA and allow time for the review and issuance process before it can begin to build a new source of air emissions. New air emission sources are required, under the provisions of the CAA, to use the Best Available Control Technology (BACT). All proposed sources of air emissions at the FMPC are evaluated for CAA compliance.

2.2 Water Regulations

The Water Pollution Control Program for the FMPC addresses the concerns and obligations set forth in the following regulations.

2.2.1 Clean Water Act

Until 1977, the USEPA enforced FMPC compliance with the Federal Water Pollution Control Act. Congress amended this act in 1977, and it is now called the Clean Water Act (CWA). The CWA specifically subjects federal facilities to the substantive and procedural National Pollutant Discharge Elimination System (NPDES) permitting requirements of delegated states such as Ohio. The OEPA considers all waters originating in Ohio to be eligible for NPDES permitting; therefore, the FMPC obtained a permit for the outfall ditch to Paddy's Run and for the outfall to the Great Miami River at Manhole-175. With the recent construction of the Stormwater Retention Basin, only the outfall to the Great Miami River is currently used.

The NPDES permit for the FMPC expired in June 1984, and a renewal permit is currently being processed by OEPA. The FMPC's most recent NPDES permit specified seven onsite sampling locations. Under an agreement with the OEPA, the FMPC currently operates under existing permit conditions during the interim.

2.2.2 River and Harbor Act

The River and Harbor Act, passed by Congress in 1899, directs the U.S. Army Corps of Engineers to reside as the regulatory body over all navigable waters in the U.S. This impacts the FMPC whenever any activity will involve work within the Great Miami River or areas designated as wetlands. An official Corps of Engineers authorization and required permits must be obtained prior to beginning such work.

2.2.3 RCRA Groundwater Monitoring Requirements

The Resource Conservation and Recovery Act (RCRA) defines a hazardous waste as a solid waste that may cause or significantly contribute to serious illness or death, or which may pose a substantial threat to human health or the environment if improperly disposed. The USEPA is considering FMPC Pit 4 as a RCRA waste unit; therefore, all applicable monitoring and reporting requirements must be addressed. RCRA specifies, at a minimum, that one upgradient and three downgradient groundwater monitoring wells be located adjacent to the disposal/storage area. Samples from these wells should allow the FMPC to detect any migration of hazardous waste constituents in the groundwater. RCRA regulations specify analytical parameters and required sampling and reporting time intervals. Currently, all onsite and several offsite groundwater monitoring wells are sampled semiannually and analyzed per RCRA requirements. Data from sampling performed in 1986 can be found in the Environmental Monitoring Annual Report for 1986, FMPC-2076.

2.3 Solid Waste Regulations

The FMPC's conducts Solid Waste Management programs according to the following regulations:

- RCRA
- DOE Orders 5480.1B, 5480.4, 5820.2 and 5480.14
- Toxic Substances Control Act
- Ohio Administrative Code
- Atomic Energy Act, unless superceded by the above
- Ohio SWDA.

2.3.1 Low-level Radioactive Waste

The FMPC manages the low-level radioactive waste (LLW) currently generated by its uranium production operations in order to comply with DOE Regulation 5820.2, "Radioactive Waste Management," Chapter III "Management of Low-level Waste." This order specifies that LLW generated by DOE operations be disposed at DOE burial sites. This order also lists the LLW characteristics to be considered when formulating waste acceptance criteria for a burial site. To this end, the FMPC sends most of its LLW offsite for disposal. A portion of the LLW is shipped to an offsite contractor for processing.

2.3.2 Hazardous and Mixed Waste

The Resource Conservation and Recovery Act of 1976 regulates the generation, transportation, treatment and disposal of hazardous wastes and regulates facilities disposing of all solid wastes. Source, by-product, and special nuclear material are excluded by provision of the Atomic Energy Act. Programmatic direction on mixed waste management is provided by FMPC Environmental Compliance. Hazardous waste requirements defined under RCRA pertinent to the FMPC include the following:

- Standards for transporters of hazardous waste
- Standards for owners and operators of hazardous waste treatment, storage and disposal facilities
- Permit requirements for treatment, storage or disposal of hazardous wastes
- Inspections, enforcement, hazardous waste site inventory
- Monitoring analysis and test criteria for sanitary landfills.

The Hazardous and Solid Waste Amendment of October 1984 to RCRA has two principal purposes: first, to regulate previously exempt generators and sources; and secondly, to regulate land disposal more stringently than it was previously and eliminate it where possible. These new RCRA requirements are very specific, and detail the standards they impose. The amendments reauthorize and expand RCRA through 1988, and require the USEPA to promulgate new regulations governing several aspects of waste management.

To comply with DOE directives, the FMPC must submit permit applications to environmental regulators. Each permit application has two parts (A and B). Part A permit applications include information such as process throughput, storage capacities, waste characterization by RCRA hazard code, process description, and photographs and sketches. Information required for the Part B permit application includes general facility descriptions, waste characterization and analysis plans, information on processes generating the waste, procedures to prevent hazards, contingency plans and closure/post-closure plans. After negotiation and acceptance of the Part B permit application, the FMPC will be issued a RCRA permit subject to stringent guidelines specified in 40 CFR 264. The USEPA or its designee inspects the FMPC to ensure the facility is complying with RCRA.

Section 3002(b) of RCRA was amended to require that hazardous waste generators have a program to minimize the amount and toxicity of waste generated. Both the FMPC and RMI have initiated programs to assure compliance with Section 3002(b). RMI, in Ashtabula Ohio, generates most of the radioactive/hazardous mixed wastes handled and stored at the FMPC. These programs are outlined in Section 14 of this plan.

The Ohio Hazardous Waste Management Rules found in OAC 3745-54 are virtually identical to RCRA. Although previously granted authority to regulate RCRA

activities, the state of Ohio will need to apply for authorization to administer the Solid and Hazardous Waste Amendments of 1984. However, Ohio continues to regulate RCRA wastes under its own state authorizations.

2.3.3 Toxic Substances

DOE Orders 5480.1B and 5480.4 incorporate the substantive provision of the Toxic Substances Control Act (TSCA) of 1976. Source materials are excluded from TSCA. The only TSCA regulation pertinent to the FMPC environmental management is the polychlorinated biphenyls (PCB) specified in 40 CFR 761.

2.3.4 Conventional Industrial Waste

The Ohio Solid Waste Disposal Act and regulations promulgated under this act govern the planning, designing, constructing, operating and maintaining of solid waste processing and disposal facilities. Solid or dissolved material in domestic sewage flows are subject to NPDES permit, and special nuclear materials, as defined under the Atomic Energy Act (as amended), are excluded. Special wastes, such as low-level radioactive wastes, asbestos and beryllium oxide, cannot be disposed in a conventional facility unless specifically permitted under this act. Any proposed construction or modification to a solid waste disposal or processing facility requires that the FMPC submit a feasibility study or modified plan of design and operation. This includes submitting system and site evaluations to the state for approval. Recordkeeping and documents regarding plans and capacities must also be provided during operation and reported to the OEPA.

The FMPC sanitary landfill expansion project will be governed by the Ohio Solid Waste Disposal Act regulations. A permit application has been submitted to the state for this project.

2.4 Waste Remediation Regulations

In addition to providing guidance on the management of inactive low-level radioactive and hazardous waste disposal facilities, DOE Order 5480.14 also provides for the identification, characterization, and final remedial actions at these facilities.

The second major regulation, CERCLA, is a broad-based federal regulation aimed at identifying and completing remediation at inactive hazardous waste facilities. CERCLA establishes a National Priorities List (NPL) identifying and ranking facilities requiring cleanup actions. Specific procedures governing response and cleanup actions at inactive hazardous waste facilities were developed and promulgated in 1982 as the National Contingency Plan.

Site investigations under CERCLA are implemented through a systematic engineering approach in the RI/FS. Remedial Investigations (RI) under CERCLA require an in-depth examination of the current situation at a facility, a thorough site investigation that may involve sampling and analysis, and performing a site specific risk assessment evaluating potential impacts of the facility on public health or the environment. Feasibility studies under CERCLA provide for a detailed evaluation of potential remedial alternatives for individual facilities based upon the findings of the RI.

In October 1986, SARA included major revisions to CERCLA. These revisions provide strict cleanup standards strongly favoring permanent remediation at waste sites, a mandatory schedule initiating cleanup work and the RI/FS, increased state governmental and regulatory involvement in the cleanup process. This includes federal facilities in the Superfund (CERCLA) program.

2.5 Orders and Agreements

2.5.1 Federal Facilities Compliance Agreement

Pursuant to Executive Order 12088, the USEPA and DOE entered into the Federal Facilities Compliance Agreement (FFCA) on July 18, 1986 in regard to operations at the FMPC. The FFCA provides for the implementation of specific programs and schedules aimed at bringing the FMPC into compliance with existing federal environmental regulations, including the CAA, RCRA, and CERCLA.

For example, to comply with the CAA, the FMPC must establish real-time monitoring of radioactive material emission, a yearly stack testing program, and develop administrative controls to minimize the unplanned release of radioactive and other hazardous materials. To comply with RCRA regulations, the FMPC must make final hazardous determinations on all generated waste streams, establish a RCRA waste analysis program, establish closure plans for existing RCRA facilities, and assess groundwater quality. To comply with CERCLA, the FMPC must initiate interim remedial actions to control radioactive emissions and conduct a sitewide Remedial Investigation/Feasibility Study (RI/FS) at the facility.

The RI/FS examines existing and potential impacts to human health and the environment resulting from past and current operations at the FMPC. As established by the FFCA, the FMPC will perform a detailed characterization and risk assessment of the facility and evaluate potential remedial alternatives applicable to the facility. USEPA will select the preferred remedial action alternative and issue a Record of Decision (ROD) for the RI/FS. Following the ROD, the FMPC will implement the selected remedial alternative.

2.5.2 Director's Findings and Orders

On June 26, 1987, the OEPA issued the Director's Findings and Orders (DFO). The DFO's contain 18 orders which focus on CWA related activities to be undertaken at the FMPC. In brief, the DFO's require the FMPC:

- Cease discharge to Pit 5 and the clearwell
- Install a new liner in the biodenitrification system surge lagoon
- Cease discharges to Paddy's Run
- Remove and dispose of sediments from the biodenitrification surge lagoon and the Stormwater Retention Basin on a routine basis
- Develop contingency plans to minimize impacts to Paddy's Run caused by overflow of the Stormwater Retention Basin
- Install a stormwater retention system capable of collecting and holding stormwater from a 10-year, 24-hour storm event
- Develop, implement, and maintain a Best Management Practice (BMP) plan
- Perform a study of the FMPC outfall line to the Great Miami River
- Provide bi-monthly progress reports for the above activities.

The FMPC has initiated all activities required by the DFO's. To date, all DFO deliverables have been provided to the OEPA either on or ahead of schedule.

2.5.3 Proposed Consent Decree

During 1986, the DOE began negotiations with OEPA regarding a Proposed Consent Decree which focuses on hazardous waste requirements and the control of waste water and runoff. Negotiations regarding the Proposed Consent Decree continued throughout 1987.

On January 5, 1987, DOE directed that certain actions be taken to support the directives contained in the Proposed Consent Decree. These actions include:

- Preparing a plan for process area runoff control for a 10-year, 24-hour storm
- Preparing a plan for waste pit area runoff control
- Preparing a work plan and schedule for nitrate reduction and contingency plan
- Demonstrating the biodenitrification facility
- Preparing a Best Management Practices Plan
- Performing a Zone of Influence Study
- Performing a study of the FMPC outfall line to the Great Miami River
- Constructing a coal pile runoff collection and treatment system
- Establishing requirements for hazardous waste storage, inspection, chemical analysis, groundwater monitoring and documentation.

Progress is tracked and reported to the DOE on a monthly basis.

2.5.4 Proposed National Emission Standards for Hazardous Air Pollutants Compliance Agreement

The USEPA Region V, OEPA and DOE-ORO are working toward an agreement to ensure compliance by the FMPC with the CAA, and in particular, the NESHAP regulations. This agreement also recognizes the authority of the State of Ohio to require permits for emissions sources.

In accordance with the schedules, DOE-ORO will submit certain items, including UF6/UF4 Process #2 Facility's NESHAP application for modification, and a parametric study of the doses calculated from FMPC emissions for multiple-stack emission points versus a representative one-stack emission point, to USEPA Region V. In addition, DOE/ORO will submit five project applications to request USEPA determinations on the need for approvals. Two have already been submitted to DOE for transmittal to the regulatory agencies; a third is currently being prepared.

2.6 Environmental Baseline Survey

On September 18, 1985, the Secretary of Energy announced a major initiative aimed at strengthening the environment, safety and health function within the DOE. Included in this initiative was the implementation of an Environmental Survey designed to identify current or potential environmental problems and areas of environmental risk at DOE facilities.

The DOE survey team review and site visit provided baseline information for the design of the Phase II efforts which included the sampling and analyses activities. The Environmental Survey Preliminary Report was issued in March 1987; WMCO provided technical comments to DOE in April 1987. WMCO developed an action plan during October 1987 to address each of the 68 findings listed in the preliminary report. An interim report will be issued by DOE to address all comments on the preliminary report and to incorporate any other appropriate changes or modified findings. The interim report will serve as the site-specific source for environmental information generated by the survey, and ultimately as the primary source of information for the DOE-wide prioritization of environmental problems in the final survey report.

2.7 Applicable Regulations for Personnel Protection

2.7.1 Health Physics/Radiation Protection Programs

Radiation protection at the FMPC is governed by the following DOE Orders:

- DOE Order 5480.1B, "Environment, Safety, and Health Program for DOE Operations," Chapter XI, "Requirements for Radiation Protection"
- DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"; this order lists prescribed and recommended standards (e.g., ANSI Standards, NRC Regulatory Guides) for operations at DOE facilities
- DOE Order 5480.5, "Safety of Nuclear Facilities" (training requirements)
- DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements."

The following documents contain requirements that will apply to FMPC operations when they are implemented:

- DOE Order 5480.11 (proposed), "Radiation Protection"
- Proposed revisions to DOE Order 5484.1 regarding Radiation Exposure Information Reporting System requirements
- Proposed DOE/ORO Contamination Control Policy
- DOE Laboratory Accreditation Program for Personnel Dosimetry System (Accreditation has been received; however, the program is not yet in place.)

A number of recommended practices for radiation protection programs exist as nonmandatory standards. A partial listing follows:

- National Council on Radiation Protection and Measurements (NCRP) Reports
- ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities"
- ANSI N13.6-1966 (R1972), "Practice for Occupational Radiation Exposure Records Systems"
- DOE/EV/1830-TS,4-80, "A Guide for Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA)"
- lO CFR 20, "Standards for Protection Against Radiation"
- International Commission on Radiological Protection (ICRP) Reports
- International Commission on Radiological Units and Measurements (ICRU) Reports
- ANSI N542-1977, "Sealed Radioactive Sources."

2.7.2 Industrial Hygiene

The authority and regulatory basis for the Industrial Hygiene Program is contained in DOE Orders 5480.1B, 5480.4, and 5480.10. DOE Order 5480.10 contains specific industrial hygiene programs required of all government-owned contractor-operated facilities administered by the Oak Ridge Operations Office. These orders incorporate regulations such as Occupational Safety and Health Act (OSHA) standards and those of the American Conference of Governmental Industrial Hygienists.

The functions of the Industrial Hygiene Program as set forth in DOE Order 5480.10 are:

- Identifying health hazards
- Evaluating hazards
- Overseeing control measures
- Conducting periodic reviews
- Training employees
- Monitoring medical facilities.

2.7.3 Industrial Safety

The guiding document for industrial safety at the FMPC is DOE Order 5483.1A, "Occupational Safety and Health Program for Government-Owned Contractor-Operated (GOCO) Facilities." This document essentially requires that the contractor operate the facility according to OSHA standards. DOE Order 5484.1 requires that the contractor report information having environmental protection, safety, or health protection significance. The FMPC complies with all the written requirements, and has an active safety program to identify and correct potential safety problems before they progress into major accidents.

2.8 Applicable Regulations for Facilities Protection

2.8.1 Safety Analysis

The overall Safety Analysis and Review Program is governed by DOE Orders 5480.5 and 5481.1B. DOE Order 5480.5 requires a facilities protection program consisting of several factors. These factors include an independent safety analysis review process that has a formal documented system to identify and control risks, and an independent review and approval of safety analyses. The order also requires new safety analysis reports be prepared according to the NRC Regulatory Guides on standard format and content of Safety Analysis Reports. To comply with this requirement, WMCO is preparing Safety Analysis Reports. Additionally, WMCO participates with other DOE-ORO contractors in developing guidelines for implementing the NRC requirements.

The facilities protection program must have a system of configuration control that requires independent safety reviews and approvals of all changes to components, equipment, procedures and systems required for facility safety. WMCO is developing a procedure for configuration control to comply with this requirement.

WMCO has prepared Occupational Safety Requirements (OSR) for the facilities/systems that have complete Final Safety Analysis Reports (FSAR). In addition, WMCO must review design criteria, environmental assessments and environmental impact statements, and other design documents. WMCO is preparing safety analysis reports and providing for review by Independent Safety Review and Preoperational Readiness Review Committees to comply with this requirement. These committees review and inspect new or significantly modified systems and preoperational phases during construction.

The facilities protection program includes an independent contractor safety review and appraisal system. In FY-87, WMCO initiated such a program in order to comply with this requirement. Although still in its infancy, the program's participants have conducted an initial set of reviews of all the health, safety and environmental programs.

DOE Order 5481.1B requires safety analyses to identify and demonstrate conformance with applicable guides, codes, and standards. Deviations from current design criteria must be evaluated and documented in the facility safety analysis report. WMCO is currently participating with other ORO contractors to develop guidelines for implementing this requirement which must be fulfilled when the site FSAR is issued. WMCO will require subcontractor assistance in order to accomplish this task.

2.8.2 Nuclear Criticality Safety

Overall Nuclear Criticality Safety for DOE facilities is governed by DOE Orders 5480.3 and 5480.5. The FMPC's Criticality Safety Program is also governed by the DOE Uranium Recycle Task Force Recommendations, Code of Federal Regulations, ANSI Standards, and DOE Order 5480.1B, Chapter XI. DOE Order 5480.3 establishes the requirements for packaging fissile and other radioactive materials. The FMPC currently complies with this order.

DOE Order 5480.5 has six sections that identify requirements that the FMPC must follow. The sections are as follows:

- Process Analysis
- Written Plans and Procedures
- Personnel Selection and Training
- Criticality Alarm System
- Physical Separation of Enriched Materials
- Internal Audits and Appraisals.

Before beginning an operation involving significant quantities of fissionable materials or changing an existing operation, a preoperational audit must be performed to determine if the entire process will be subcritical under both normal and abnormal operating conditions that could reasonably be expected to occur. Nuclear criticality safety limits must be established from data derived from experiments or, in the absence of directly applicable experimental measurements, from calculations made by a method shown to be valid by comparison to experimental data. Allowances must be made for uncertainties in the data and calculations. The FMPC currently complies with this section of the order.

Operations shall be governed by written plans and procedures which take into account limits on receiving, storing, and processing fissionable material. The FMPC currently complies with this section of the order.

A program shall be established to select, train, and retrain all individuals who operate, maintain, or supervise activities in nuclear facilities. While the FMPC currently complies with this section of the order, under recommendations from the DOE Uranium Recycle Task Force, an across-the-board upgrade of all phases of training is underway.

The FMPC shall have a monitoring system which uses gamma- or neutron-sensitive radiation detectors. This system will initiate a clearly audible alarm, distinctive in tone, if criticality occurs. While the FMPC has a system to detect most criticalities, additional detectors must be purchased if the FMPC is to detect a low-power criticality, as is required by this order and ANSI Standard 8.3.

All material shall be stored in racks or equivalent equipment (such as birdcages) capable of securing stored material to prevent displacement, to ensure spacing control, and to meet designs for safety under operational and credible accident conditions. Floor storage within the storage facility will be permitted only where control of location and other safety requirements are inherently provided by the individual containers and their restraints.

While the majority of material handled at the FMPC is stored in 30- and 55-gallon drums stable enough to ensure that they will not be knocked over, a small amount of higher enriched material is handled in 6-inch diameter by 15-inch tall cans which may easily tip over. In order to meet the separation requirement, storage racks have been purchased to ensure physical separation is maintained even under accident conditions.

Internal audits at the operational level and independent appraisals by outside experts are required for all DOE programs. The Nuclear Safety Program currently complies with this section of the order.

A system of fixed (wall-mounted) units capable of yielding burst size and approximate neutron spectrum at all locations is required. The FMPC Nuclear Safety Program currently complies with this section of the order.

2.8.3 Fire Protection

DOE Order 5480.1B, Chapter VII "Fire Protection," requires a level of fire protection that qualifies the FMPC as an "improved risk" facility, as described by the insurance industry. Generally, an improved risk property would qualify for complete insurance coverage by the Factory Mutual System, the Industrial Risk Insurers, and other industrial insurance companies that limit their insurance underwriting to the best protected class of industrial risk. The objectives are four-fold:

- No threat to the public from fire
- No undue hazards to employees from fire
- No unacceptable delays of vital DOE programs as a result of fire
- Potential property damage from fire will be held to manageable levels.

The FMPC complies with these objectives, and the ongoing fire protection program seeks continual improvement in this area.

Other regulations involving safety and fire protection are applied to the FMPC operation as appropriate. For example, DOE Order 5480.1B, Chapter IX, "Construction Safety and Health Program," applies to construction at the site and to crane operations.

2.8.4 Handling, Shipping and Transporting Waste

Shipments of low-level radioactive wastes will comply with applicable regulations, procedures and orders including Title 49 CFR; Title 40 CFR; and DOE Orders 1540.1, 1540.1A and 5480.3.

2.9 Applicable Regulations for Emergency Preparedness

The FMPC Emergency Preparedness Program is governed by DOE-Headquarters Emergency Preparedness Orders, 5500 series, DOE-ORO implementing Emergency Preparedness Orders, by USEPA regulations such as SARA, and by provisions of OSHA 1910.1200 Hazard Communication Standard. In addition, FMPC emergency management documents follow DOE-ORO emergency management plans and procedures and with appropriate State of Ohio and Butler and Hamilton County emergency plans and procedures.

DOE Order 5480.5 requires an annual internal audit of all the programs involved within the Operations, Safety and Health domain and Emergency Preparedness. To meet this requirement, the site Emergency Planning Review Committee will conduct the internal audit of the Emergency Preparedness Program. The Committee will review the plan and prepare a report on its findings, making recommendations as appropriate. An independent audit will be conducted on a two-year basis by an outside consultant; the next one is expected to be performed in FY-88.

2.10 Technical Safety Appraisal

During 1986, a team led by DOE-HQ personnel conducted a Technical Safety Appraisal of the FMPC as part of DOE's plan to conduct special safety reviews at all major DOE sites. The appraisal team made 90 recommendations. WMCO actions taken to comply with the 90 TSA recommendations were reviewed during a Safety Performance Review conducted by a DOE-HQ team, March 7-11, 1988. In addition to the review of actions, the team considered general safety practices at the FMPC. In a draft report issued at the end of the review, the team identified ten new safety concerns and closed 35 of the original 90 recommendations.

2.11 Status of Compliance with DOE Order 5820.2

Table 2-1 compares the DOE order requirements with current FMPC Waste Management practices for low-level waste (LLW). The FMPC does not produce high-level waste (HLW), transuranic waste (TRU), or wastes contaminated with naturally occurring radioisotopes. Therefore, those sections of the DOE order are not addressed in this document.

TABLE 2-1
FMPC REGULATORY COMPLIANCE WITH DOE REGULATION 5820.2
(page 1 of 5)

Regulation	Regulatory Requirement	FMPC Compliance
1.Waste Disposal	A. Dispose solid LLW at Doe shallow land burial or greater confinement sites.	A. Shipment of approved waste offsite for disposal.
	B. Discharge of liquid LLW directly to the environment or on natural soil columns shall be replaced by other techniques prior to disposal or in-place immobilization	B. In storage until a treatment facility is built about 1990.
2.Waste Acceptance (for both shallow land burial and greater confinement disposal)	A. Allowable quantities and/or concentrations of radioactivity, including threshold quantities for radioactive waste.	A. Discard criteria documented in NLCO-1021, Rev. 3. Offsite shipment criteria is outlined in NVO-185, REV 4 and NLCO-2029.
	B. Criticality safety requirements (waste forms and geometries)	B. Nuclear criticality safety is documented in NLCO-1179. Specific criticality requirements for offsite shipments to disposal sites are contained in NLCO-2029 and NVO-185, Rev 4.
	C. Radioactive or thermal energy output for waste.	C. Minimal; requires no unique waste preparations
	D. Restrictions on the generation of harmful gases, vapors, or liquids in waste.	D. Governed by NLCO-2029d, NVO-185, Rev 4, and DOT regulations; generation of vapors from stored radioactive mixed wastes controlled by complying with DOE Order 5480.2.
	E. Restrictions for radioactive waste having hazardous chemical properties (referenced in DOE Order 5480.2)	E. Restricted and controlled by FMPC procedures (LLW and toxic mixed); radioactive mixed waste (organic solvents will be shipped to the ORGDP for interim storage and eventual destruction in the TSCA incinerator).
	F. Mechanical stability requirements for waste packages and any special waste package requirements for greater confinement disposal.	F. Minimal, due to accelerated shipping schedules and secondary controlled measures already in place. Approved DOT shipping containers are used for all offsite shipments of LLW as required by NLCO-2029. and NV-185, Rev 4.

TABLE 2-1
FMPC REGULATORY COMPLIANCE WITH DOE REGULATION 5820.2
(page 2 of 5)

Regulation	Regulatory Requirement	FMPC Compliance
2.Waste Acceptance (continued)	G. Restrictions for chelating and complexing agents or other substances with the potential to mobilize harmful contaminants.	G. Controlled by SOP 43-C-601, NLCO-2029, NV-185.
	H. Physical properties of waste, including restrictions on respirable substances and quantities of free liquids.	H. Controlled by dust suppression and free liquid restriction as outlined in NLCO-2029.
	I. Other items which are deemed necessary by the field organizations.	I. None.
3.Disposal Site Selection	A. Siting criteria shall be developed to establish any new disposal sites for LLW.	A. Not applicable.
4.Disposal Site Design	A. Design criteria shall be established prior to selecting new disposal sites.	A. Not applicable.
5.Disposal Site Operations (develop and implement operating procedures for new and existing LLW disposal sites, addressing regulatory requirements)	A. Training for operating personnel in radiological health and safety and in the use of the equipment and facili ties for which they are responsible.	A. Formal training sessions required as specified in the FMPC Standard Operating Procedure Manual NLCO-1194 and FMPC Certification of LLW Packaging, Storing, and Shipping Requirements.
	B. Techniques and procedures for waste volume reduction, consistent with health, safety, and environmental requirements, economically attractive to implement.	B. Procedures outlined in the FMPC SOP Manual sections pertinent to each waste generator facility.
	C. Emergency response plans identifying persons to contact, response equipment, and testing procedures for both radiological and nonradiological emergency conditions.	C. Documented in tge FMPC Emergency Plan; contingency plan for emergencies associated with radioactive mixed hazardous and/or toxic wastes conforms to DOE Order 5480.2.
	D. Documentation system that identifies disposal excavations with reference to permanent surface markers, records the characteristics and location of bulk waste quantities or waste shipments, and maintains these records in a permanent archive compatible with the Integrated Database Program.	D Documentation procedures and forms contained in NLCO-1021, REV 3. Transfer and storage of radioactive mixed hazardous and toxic wastes operating and inventory logs conforms to DOE Order 5480.2.

TABLE 2-1
FMPC REGULATORY COMPLIANCE WITH DOE REGULATION 5820.2
(page 3 of 5)

Regulation	Regulatory Requirement	FMPC Compliance
5. Disposal Site Operations (continued)	E. Contigency plan for handling waste shipments that fail to meet waste acceptance criterial.	E. Recoverable values of uranium are reprocessed. Waste that fails to meet offsite waste acceptance criteria are reprocessed and repacked to meet the criteria.
	F. Personnel, equipment, and facilities for first aid treatment.	F. Provided by the onsite Medical Department of the Health and Safety Division.
	G. Availability, maintenance, and decontamination of operating equipment.	G. Various types of equipment are used to operate the storage facilities; maintenance is available through existing plant-site maintenance operations. Contaminated equipment is thoroughly decontami nated prior to release to clean areas.
	H. Environmental monitoring program having documentation procedures and access to sampling and analytical equipment.	H. Regular sampling of effluent streams, stack emissions, ambient air quality, soil and vegetation in accordance to the Health Safety Procedures Manual; results are reported in the Environmental Monitoring Annual Report.
	I. Procedures to minimize interactions among the contents of waste packages that could jeopardize attainment of the objective of this order.	I. Procedures outlined in NLCO-2029 assure that the potential for waste interactions are minimized.
	J. Access control to the waste disposal site.	J. All radioactive/toxic mixed wastes not stored within waste surface impoundments and storage silos are currently stored within the FMPC production area. The production area is patrolled by guards and access is strictly limited to cleared personnel. LLW surface impoundments and silos, adjacent to the production area, are encircled by chainlink fence. Access is restricted to cleared personnel by the FMPC Security Department.

TABLE 2-1
FMPC REGULATORY COMPLIANCE WITH DOE REGULATION 5820.2
(page 4 of 5)

Regulation	Regulatory Requirement	FMPC Compliance
5. Disposal Site Operations (continued)	K. Unusual occurrence reporting per DOE 5484.2 and quality assurance and control per DOE 5700.6A.	K. Unusual occurrences are reported in accordance with DOE 5484.2; quality assurance and control policies, procedures, and concepts for FMPC operations are contained in the FMPC Quality Assurance Program Manual, Rev. 9.
6. Disposal Site Closure/Postclosure (develop a site-specific closure plan prior to initiating operations at new or closing existing LLW disposal sites, addressing regulatory requirements)	A. Stabilization of the disposal site for postclosure care including filling and capping of disposal excavations, as specified in design requirements, and removal of unneeded equipment and facilities.	A. Stabilization by retiring and covering waste impoundments with a soil and vegetative cover over stored waste materials to reduce the potential for migration of contaminated materials. A CIS completed in FY-86 assesses the status of waste storage facilities and further stabilization.
	B. Residual radioactivity levels for surface soils that comply with site threshold quantity requirements.	B. Not required; FMPC storage area is maintained as an active facility with continuous surveillance and access control procedures in place. Clean soil and vegetative covers are placed over retired surface impoundments.
	C. Security system to prevent unauthorized entry or removal of equipment or material during closure and a passive security system.	C. Radioactive/toxic mixed waste materials are stored inside the FMPC production area and adjacent to and within sight of the production area. The production area is patrolled and access is restricted.
	D. Maintenance of emergency response plans, facilities, and equipment until closure is complete.	D. Documented in NLCO-1129, Rev. 4; revisions every two years.
	E. Permanent identification markers for locating disposal excavations and monitoring wells when closure is complete.	E. Surface impoundments and storage vessels are tied directly into the FMPC grid system. This grid system utilizes permanent concrete benchmarks and are fully recoverable by a qualified surveyor. Plant site benchmarks are tied to the Ohio State Plans Coordinate System and are also fully recoverable. Records of exact locations of retired surface impoundments are maintained for future transfer of materials to a permanent disposal site.

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TABLE 2-1
FMPC REGULATORY COMPLIANCE WITH DOE REGULATION 5820.2
(page 5 of 5)

Regulation	Regulatory Requirement	FMPC Compliance
6. Disposal Site Closure/Postclosure (continued)	F. Periodic surveillance and maintenance programs until closure is complete and modification of those programs, as necessary, to measure performance and assess the need for corrective measures following closure.	F. Surveillance and maintenance of the impoundments is maintained continuously by plant personnel. Waste storage vessels are inspected routinely for structural integrity by onsite personnel.
	G. Corrective measures to be applied to existing dis posal.sites if conditions occur that could jeopardize attainment of the objectives of this order.	G. Surface impoundments at the FMPC do not meet DOE 5820.2 requirements for permanent disposal and management of radioactive wastes. The RI/FS (initiated in FY-86) will identify corrective measures.

3.0 Schedules and Funding

This section summarizes the schedules and funding requirements for all projects described in succeeding sections of this document.

3.1 Establishing Project Priorities

The projects enumerated in this plan require ranking in their order of importance to determine the allocation of budget funding for their accomplishment. To achieve this ranking, criteria were established and a methodology developed. Each project was evaluated on the basis of the following criteria, listed in order of importance:

Project's Area of Impact	Weight
1. Public or Employee Health and Safety	5
2. Environmental Impact	4
3. Public or Government Property Damage	3
4. Regulatory Compliance	2
5. Project's Financial Commitment	1

The first four criteria, and their order, are identical to those listed in the Oak Ridge Budget Formulation Handbook for construction projects. The last criterion addresses the financial aspects of a project. The weight indicates the relative importance of each criterion. For purposes of prioritization, each project was graded on the above-listed criteria, based upon a numerical scale ranging from 0 to 5. With "0" being the lowest and "5" the highest, each of these projects are graded according to their ability to satisfy the criteria listed. The score for each project was calculated by weighting the grade for each criterion and summing the results. The rank of each project was then determined by comparing its score relative to other project scores.

As an example, consider a project graded as follows:

Criterion	Grade	x	Weight	=	Results
1	4		5		20
2	2		4		8
3	1		3		3
4	4		2		8
5	2		1		2
			Score	=	41

The hypothetical results indicate this project would greatly alleviate a risk to employees and/or the general public, somewhat alleviate an environmental risk, and have little impact on the condition of government or private property. In addition, the project would have a large impact on the status of regulatory compliance, but the source of funding is questionable. This project would be ranked above all others with total scores less than 41.

The project ranking was then reviewed by WMCO management. Some priorities were adjusted to reflect criteria not readily amenable to mathematical scoring and weighting. The revised list represents the final project priorities.

3.2 Funding Requirements

A summary of all projected funding requirements is presented in Table 3-1. To simplify tabulating the budget designations, the designation GE-OP has been substituted for GE01 or GE03. To be consistent, the designation GF-OP has been substituted for GF01.

3.3 Completed and Deleted Projects

Since issuance of the FY-87 Plan in April 1987, some of the projects listed in that plan have been either completed or modified to some degree. To provide a continuum with the FY-87 plan and to permit an assessment of progress, projects which were listed but are now completed or deleted are shown in Sections 3.3.1 and 3.3.2, respectively.

3.3.1 Completed Projects

A total of 8 projects which were listed in the FY-87 plan have since been completed. These projects are listed below.

Project Name	FY-87 Priority
Stack Sampling Equipment	2
Stack Samplers/Monitors/Alarms	7
Waste Inventory Database	10
Replace Medical Ambulances	19
Chemical Warehouse Study	30
20% Storage Racks and Pallets	79
In-house Nuclear Accident Dosimetry	82
Computer for Safety Analysis	114

TABLE 3-1
FMPC AND RMI ES&H/WASTE MANAGEMENT FUNDING SUMMARY
($ Millions)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	21.6	4.9	3.0	3.5	3.5	2.2	2.3	2.2
GE-GPP	14.4	3.7	3.9	0.9	0.6	4.4	0.7	0.2
GE-LI	381.3	51.6	80.0	79.9	90.5	62.3	11.1	5.9
GE-OP	215.9	33.3	30.0	27.2	23.4	33.0	34.0	35.0
GE-Total	**633.2**	**93.5**	**116.9**	**111.5**	**118.0**	**101.9**	**48.1**	**43.3**
GF-CE	2.0	0.4		0.4	0.3	0.3	0.3	0.3
GF-GPP	9.4	1.9		1.5	1.5	1.5	1.5	1.5
GF-OP	83.5	9.9	11.3	10.5	15.8	13.0	12.0	11.0
GF-11	282.8	5.7	9.1	21.5	49.5	60.0	66.0	71.0
GF Total	**377.7**	**17.9**	**20.4**	**33.9**	**67.1**	**74.8**	**79.8**	**83.8**
GE & GF Total	**1,010.9**	**111.4**	**137.3**	**145.4**	**185.1**	**176.7**	**127.9**	**127.1**

KEY

GE-CE - Capital Equipment from GE Budget
GE-OP - Operating Funds from GE Budget
GE-LI - Line Item Projects from GE Budget
GE-GPP - General Plant Projects from GE Budget
GF-OP - Defense Nuclear Waste
GF-11 - Environmental Restoration
GF-CE - Capital Equipment from GF Budget
GF-GPP - General Plant Project from GF Budget

3.3.2 Deleted Projects

A total of 14 projects which were proposed and included in the FY-87 plan have since been deleted.

Project Name	FY-87 Priority
Gas Calibration Balance	14
Comprehensive Ventilation Survey	6
General Plant Housekeeping Equipment	18
Asbestos Pipe Insulation Removal	53
Repair Boiler Plant Insulation	64
Conveyor Chemical Warehouse	72
Change General Shop Solvent	74
Spectrophotostatic Air Monitor for UF6	76
2.1% Enriched Metal Transport Safety Studies	90
Modernization of Buildings	94
R&D for Water Pollution Control	99
Laundry Detention Sump	104
Car/Truck Wash	119
Remedial Action Waste Cleanup (RAWC)	120

3.3.3 N-reactor Impacted Projects

The following subprojects contained in the P&RI and EHSI Line Item Project are impacted by the N-reactor shutdown and have been deleted from this Plan.

Subproject Name		Plant
HF Offgas Dust Collector	G1-104	2/3
H2 Offgas Burner	(D.C. G4-7)	
Dust Collector	G4-13	4
Dust Collector	G4-1	4
Hi-Vac	G4-6	4
Dust Collector	G4-15	4
Dust Collector	G2-6015	
H&V Plant		2/3
Material Handling		4
Controlled Pad		2

3.4 Project Listings and Schedules

The schedules portray the time frames in which the various projects are expected to occur. They are not intended to supply detailed milestone information. Current schedule details are provided by the Level III Milestone Summary Schedules published monthly by the WMCO Program Integration group.

The summary for all FMPC and RMI projects identified in this plan is contained in Tables 3-2 and 3-3, respectively. The schedules for all the projects (FMPC and RMI) were developed concurrently with the FMPC budget targets and are present in Figures 3-1 through 3-11.

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
1	7	E-REMEDIAL	DOE 5820.2/CAA	1.1.3.1.01	Bins and Silos Thorium Repacking	GE-LI	2,261	87
2	5	E-WATER	40CFR151 PROPOSED	1.3.01.12	Tank Farm Restoration	GE-LI	13,049	85
3	7	E-REMEDIAL	CERCLA/DOE5480.14	1.2	Remedial Investigation / Feasibility Study	GF 11	14,652	88
4	4	E-AIR	CAA/OHIO EPA	1.1.1.3.XX	Dust Collectors Thru 1988 Funding Refer Table 3-2A	GE-LI/CE	25,180	85-88
5	7	E-REMEDIAL	DOE 5820.2/CAA	1.7.xx	Drummed/Metallic Thorium Repackaging	GE-OP	2,200	88
6	6	E-WASTE	DOE 5820.2	1.7.xx	Current Proc Waste Ship.	GE-OP	44,100	88
7	6	E-WASTE	DOE 5820.2	1.7.02	Backlog Proc. waste ship.	GF-OP	14,198	88
8	7	E-REMEDIAL	CERCLA/DOE 5480.1	1.5.04	K-65 Silo Interim Stabilization	GF-OP	2,067	88
9	7	E-REMEDIAL	DOE 5820.2/CAA	1.7.xx	Warehouse Thorium Repackaging	GE-OP	3,200	88
10	7	E-REMEDIAL	DOE 5820.2	1.4.02.01	Thorium Repackaging Equipment	GE-CE	410	88
11	5	E-WATER	OHIO EPA	1.4.01.01.02	Stormwater Retention Basin Expansion	GE-GPP	1,200	88
12	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	K-65 Sampling	GF 11	370	88
13	5	E-WATER	CWA/NPDES	1.3.03.01	Biodenitrification Project	GE-LI	8,700	89
14	5	E-WATER	CWA/OHIO EPA	1.4.01.01.02	Surge Lagoon Liner Replacement	GE-GPP	565	88
15	8	H&S	40CFR151, 40CFR112/OSHA	1.4.02.01	Spill Response Vehicle Equipment	GE-CE	30	90
16	6	E-WASTE	RCRA	1.5.04	Solid Waste Compliance (RCRA)	GF-OP	2,101	88
17	9	H&S	DOE 5480.1	1.1.4.2.07	Fire Alarm System Upgrade	GE-LI	372	87
18	7	E-REMEDIAL	RCRA/DOE 5480.4	1.4.01.01.02	Pit 4 Interim Closure	GF-GPP	579	88
19	7	E-REMEDIAL	RCRA/CERCLA/DOE 5480.14	1.1.3.1.02	Pit 5 Remediation	GE-LI	83,826	90
20	6	E-WASTE	DOE 5820.2	1.1.3.1.03	Decontamination & Decommissioning (D&D) Facility	GE-LI	6,409	87
21	4	E-AIR	DOE 5480.4/OHIO EPA	1.1.1.1.01	NOx Destructor - Plant 9	GE-LI	1,546	87
22	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Waste Pits 1-3,6 Engineering	GF 11	7,300	88
23	8	H&S	DOE 5483.1	1.7.xx	Safety Training Program	GE-OP	#	89
24	8	H&S	DOE 5480.1	1.4.01.01.02	In-Vivo Monitoring Facility	GE-GPP	1,160	88
25	4	E-AIR	DOE 5480.4/OHIO EPA	1.3.02.01.09	NOx Destructor - Plant 6	GE-LI	2,964	86
26	9	H&S	DOE 5480.1/NFPA CODE	1.1.4.2.02	Smoke Detection Systems Upgrade	GE-LI	78	88
27	7	E-REMEDIAL		1.6.02	Environmental Baseline Survey	GF 11	600	89
28	5	E-WATER	CWA/NPDES	1.4.01.01.01	pH Control - Manhole 175	GE-GPP	18	88
29	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	RMI Investigation	GF 11	3,400	88
30	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	K-65 and Silo 3 Engineering	GF 11	2,670	88
31	8	H&S	DOE 5480.1/OSHA	1.1.3.3.xx	Material Handling Systems Funding Yr.88 Ref Table 3-2B	GE-LI	2,155	88
32	8	H&S	ALARA	1.1.4.1.05	Receiving & Incoming Materials Inspection Area	GE-LI	3,966	88
33	8	H&S	DOE 5480.1/5483.1	1.1.4.1.04	ES&H Building Expansion & Upgrade	GE-LI	13,251	87

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
34	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.5.04	Controlling Surface Water on Plant 1 Storage Pad	GF-OP	133	87
35	6	E-WASTE	DOE 5820.2	1.5.04	Pretreatment of Backlog Waste/Rubble	GF-OP	3,500	89
36	7	E-REMEDIAL	FFCA/DFO	1.2	FFCA/DFO/PCD Support	GF 11	600	89
37	5	E-WATER	OHIO EPA	1.1.2.3.01	Leakproof Dikes	GE-LI	484	88
38	6	E-WASTE	DOE 5820.2	1.5.04	Waste Shipments to SEG ('88 only)	GF-OP	3,162	88
39	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Interim Ground Water Monitoring	GF 11	400	90
40	9	H&S	DOE 5480.1 CHAPTER V	1.1.4.1.04	Radiation Detection Alarm Upgrade	GE-LI	208	90
41	10	H&S	DOE 5500.2/5500.3/5484.1	1.7.xx	Emergency Training, Drills & Exercises	GE-OP	1,700	90
42	7	E-REMEDIAL	RCRA/DOE 5480.4	1.2	Pit 4 Final Closure	GF 11	600	91
43	8	H&S	DOE 5483.1	1.1.1.4.06	HVAC Cafeteria	GE-LI	345	87
44	6	E-WASTE	DOE 5820.2	1.5.04	Waste Operations Support	GF-OP	15,142	88
45	8	H&S	DOE 5480.1/NPDES/RCRA	1.1.3.2.01	Warehouse - Finished U Metals - Plant 6	GE-LI	1,335	88
46	9	H&S	DOE 5480.1	1.1.4.2.06	Fire Truck Plantwide	GE-LI	173	88
47	5	E-WATER	CWA/NPDES	1.4.01.01.02	Sewage Treatment Plant Upgrade	GE GPP	1,100	89
48	9	H&S	DOE 5480.1	1.1.4.2.04	Fire Prot - Improve Sprinkler System Building 64	GE-LI	255	88
49	7	E-REMEDIAL	RCRA/DOE 5480.4	1.2	Pit 4 Engineering	GF 11	200	90
50	7	E-REMEDIAL	CERCLA/DOE 5480.1	1.1.2.4.04	Reduce Uranium in Off-Site Wells	GE-LI	8,698	91
51	5	E-WATER	CWA/NPDES	1.3.02.01.02	General Sump	GE-LI	5,258	86
52	9	H&S	DOE 5480.1	1.1.4.2.01	Fire Protection System - Pilot Plant	GE-LI	45	90
53	7	E-REMEDIAL	DFO/CERCLA	1.6.02	Zone of Influence Study	GF 11	230	88
54	5	E-WATER	CWA/OHIO EPA	1.4.02.01	Lagoon Sludge Removal System	GE-CE	320	88
55	4	E-AIR	DOE 5480.1/NESHAP	1.1.1.2.01	Air Monitoring Stations	GE-LI	128	88
56	8	H&S	OSHA	1.1.4.1.01	Construct Storage Maintenance near Boiler Plt	GE-LI	457	87
57	6	E-WASTE	RCRA	1.5.04	RCRA Compliance Activities	GF-OP	7,412	89
58	4	E-AIR	OHIO EPA	1.4.01.01.02	Electrostatic Precipitator at Boiler Plant	GE-GPP	1,000	88
59	7	E-REMEDIAL	DOE 5820..2	1.7.xx	Abandoned-In-Place (AIP) Equipment	GE-OP	350	88
60	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.5.04	Characterization Investigation Study	GF-OP	758	88
61	6	E-WASTE	RCRA	1.5.04	Mixed Waste Shipments to ORGDP	GF-OP	2,270	88
62	8	H&S	DOE 5483.1	1.1.4.4.01	Plantwide Lighting Upgrade	GE-LI	5,212	88
63	8	H&S	DOE 5480.10	1.4.02.01	Portable Toxic Gas Detection System	GE-CE	14	90
64	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.05	Greensalt Storage Pilot Plant	GE-LI	253	88
65	8	H&S	DOE NUCLEAR STD. NEF3-43	1.4.02.01	HEPA Test Equipment	GE-CE	15	90
66	4	E-AIR	DOE 5480.1/5500/NESHAP	1.1.4.1.04	Toxic Atmospheric Dispersion Modeling System	GE-LI	*	89

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TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
67	7	E-REMEDIAL	CERCLA/CWA/RCRA	1.2	Underground Storage Tank (UST) Remedial Engineering	GF 11	700	90
68	8	H&S	OSHA	1.1.4.1.02	Locker Room Upgrade/Laundry Upgrade (LU/LU)	GE-LI	7,164	87
69	4	E-AIR	OHIO EPA	1.7.xx	Stack Testing	GE-OP	300	89
70	5	E-WATER	CWA/NPDES	1.4.01.01.02	Upgrade Effluent Flow Sampling Equipment	GE-GPP	359	89
71	10	H&S	DOE 5500.2/5500.3/5484.1	1.7.xx	Sitewide Emergency Procedures	GE-OP	900	90
72	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.01.01.01	Emergency Warning System	GE-GPP	105	90
73	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.03	Warehouse - North Plant 9	GE-LI	715	88
74	7	E-REMEDIAL	CERCLA/CWA/RCRA	1.2	UST Remedial Action	GF 11	1,700	90
75	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.01	Covered Controlled Storage Pad Plant 1	GE-LI	30,108	89
76	6	E-WASTE	DOE 5820.2	1.4.02.01	Surface Decontamination Equipment	GF-CE	55	88
77	6	E-WASTE	RCRA	1.4.01.01.02	RCRA Warehouse	GF GPP	1,100	88
78	5	E-WATER	CWA/NPDES	1.1.x	Collecting Stormwater Runoff from Coal Pile	GE-LI	2,400	89
79	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Interim Air Baseline Monitoring	GF 11	200	90
80	6	E-WASTE	DOE 5820.2	1.5.04	Backlog Construction Rubble Disposition	GF-OP	21,504	91
81	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.07	Storage Warehouse Upgrade (Buildings 64 & 65)	GE-LI	712	90
82	6	E-WASTE	RCRA	1.4.01.01.01	RCRA Satellite System	GF GPP	223	88
83	8	H&S	DOE 5480.10	1.4.02.01	Labeling/Tracking System for Hazardous Chemicals	GE-CE	20	90
84	8	H&S	DOE 5480.4/5480.10	1.4.02.01	Air Sampling Equipment	GE-CE	9	90
85	7	E-REMEDIAL	CERCLA/DFO	1.6.02	FMPC Outfall Line Remediation	GF 11	200	89
86	4	E-AIR	CAA/OHIO EPA	1.1.1.3.XX	Dust Collectors 1989 Funding Refer Table 3-2A	GE-LI/CE	2,246	89
87	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Interim Soil Remedial Action	GF 11	3,050	90
88	5	E-WATER	DOE 5480.1/NPDES	1.1.3.2.06	UF6 Storage Building 54	GE-LI	588	88
89	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Interim Staging Facilities	GF 11	2,150	91
90	8	H&S	DOE 5480.10/5483.1	1.7.xx	Follow-up Ventilation Survey	GE-OP	250	91
91	4	E-AIR	CAA	1.1.1.5.XX	Exhaust Systems Funding yr 1989 Refer Table 3-2C	GE-LI	19,078	89
92	10	H&S	RCRA	1.4.02.01	Hazardous Material Assistance Vehicle	GE-CE	75	90
93	6	E-WASTE	DOE 5820.2	1.4.02.01	Waste Minimization Equipment	GE-CE		88
94	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.03	Covered Controlled Storage Pad - West of Plant 8	GE-LI	362	88
95	5	E-WATER	DOE 5480.1	1.4.01.01.01	Upgrade Groundwater Monitor Wells	GE-GPP	48	90
96	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Soil Characterization	GF 11	1,700	90
97	8	H&S	DOE 5480.10	1.4.02.01	Emergency Van (4WD)	GE-CE	18	90
98	4	E-AIR		1.7.xx	Development Support Program	GE-OP	#	88
99	5	E-WATER	CWA/NPDES	1.3.01.08	Plant 6 Sump (Replacement)	GE-LI	5,219	85

TABLE 3-2

FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
100	8	H&S	DOE 5480.10/5483.1/OSHA	1.4.01.01.01	Respirator Fit Test Facility	GE-GPP	150	89
101	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Interim Groundwater Remedial Action	GF 11	1,700	90
102	7	E-REMEDIAL	DOE 5820.2	1.7.xx	Building Demolition	GE-OP	#	91
103	7	E-REMEDIAL	DOE 5820.2	1.5.04	Contaminated Scrap Metal Management	GF-OP	3,500	89
104	4	E-AIR	CAA	1.1.1.5.XY	Exhaust Systems Funding Yr 1992 Refer Table 3-2C	GE-LI	1,017	92
105	7	E-REMEDIAL	CERCLA	1.4.01.01.02	NW Electrical Substation	GF GPP	600	87
106	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.05	Storage Pad Cover - East of Plant 8	GE-LI	1,018	88
107	9	H&S	DOE 5480.1	1.1.4.2.05	Fire Protection - Improve Sprinkler System Building 65	GE-LI	252	90
108	8	H&S	DOE 5480.10	1.4.02.01	Particulate Air Monitoring Instrument	GE-CE	10	90
109	5	E-WATER	CWA/NPDES	1.3.02.01.11	Automation/Modification of Plant 8 Sump	GE-LI	5,458	86
110	8	H&S	DOE 5480.1	1.4.02.01	Instrumentation - Shielded Counting Chamber	GE-CE	300	91
111	8	H&S	OSHA	1.4.02.01	Noise Monitoring Instrumentation	GE-CE	10	90
112	8	H&S	DOE 5480.1	1.4.02.01	Manual Alpha/Beta Planchet Counter	GE-CE	18	90
113	5	E-WATER	DOE 5480.1/CWA	1.1.2.4.01	Wastewater Treatment Improvements and Water Recycle	GE-LI	23,002	90
114	6	E-WASTE	DOE 5820.2	1.4.02.01	Drum Handling	GF-CE	44	88
115	6	E-WASTE	DOE 5820.2	1.4.02.01	Drum Cleaning	GF-CE	30	88
116	6	E-WASTE	RCRA/CERCLA/DOE 5820.2	1.5.04	Engineering Support of RMI	GF-OP	1,200	89
117	5	E-WATER	CWA/NPDES	1.3.02.01.01	Automation/Modification of Refinery Sump	GE-LI	3,097	86
118	8	H&S	OSHA	1.4.01.01.02	Locker Room Upgrade (Phase I)	GE-GPP	1,130	87
119	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Geochemical Studies	GF 11	100	89
120	6	E-WASTE	RCRA	1.4.02.01	RCRA Items	GF-CE	200	88
121	7	E-REMEDIAL		1.1.2.4.05	Hexavalent chromium Removal	GE-LI		90
122	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.02	Covered Controlled Storage Pad Plant 5	GE-LI	1,648	89
123	8	H&S	DOE 5480.10	1.4.02.01	Respirator Fit Test Instrumentation	GE-CE	40	90
124	6	E-WASTE	DOE 5480.1	1.4.01.01.02	Truck Dock Shelter	GF-GPP	2,000	91
125	8	H&S	DOE 5483.1/5480.10/OSHA	1.7.xx	Breathing Air System Survey	GE-OP	40	90
126	6	E-WASTE	DOE 5820.2	1.4.02.01	Bar Coder	GF-CE	40	88
127	8	H&S	DOE 5480.1/5483.1	1.4.02.01	Respirator Face Piece Test Fixture	GE-CE	7	90
128	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.04	Controlled Storage Pads	GE-LI	7,933	90
129	4	E-AIR	DOE 5480.14/CAA	1.7.xx	Upgrade Operational Procedures	GE-OP	#	88
130	8	H&S	DOE 5480.1	1.4.02.01	Replace Hand and Foot Monitors	GE-CE	50	90
131	8	H&S	DOE 5480.1	1.1.4.3.01	Enclosed Saws and Lathes	GE-LI	2,053	88
132	8	H&S	DOE 5480.1	1.4.02.01	NaI In-Vivo Monitoring Detectors	GE-CE	80	90

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
133	9	H&S	DOE 5480.1	1.1.4.2.03	Fire Protection - Improve Sprinkler System Building 14	GE-LI	69	90
134	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Project Management	GF 11	200	89
135	4	E-AIR	OHIO EPA	1.3.02.02.04	Improve Nitric Acid Recovery System	GE-LI	2,871	87
136	6	E-WASTE	RCRA	1.4.02.01	Analytical Certification	GF-CE	215	88
137	8	H&S	DOE 5480.1	1.4.02.01	Ultrasound Unit - In-Vivo Facility	GE-CE	25	90
138	6	H&S	RCRA	1.1.4.1.03	Analytical Facility Expansion	GE-LI	19,400	89
139	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Soils Engineering	GF 11	1,000	91
140	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Tumulus Construction	GF 11	2,400	91
141	8	H&S		1.4.02.01	Emergency Response Team Training Facility	GE-CE	15	92
142	5	E-WATER	DOE 5480.1/CWA	1.1.2.4.02	Storm Water Treatment	GE-LI	716	90
143	5	E-WATER	DOE 5480.1/CWA/NPDES	1.1.2.4.03	Removal of Uranium from Storm Sewer	GE-LI	3,017	90
144	8	H&S	DOE 5480.10	1.4.02.01	Respirator Washing Facility	GE-CE	220	88
145	8	H&S	DOE 5480.10	1.4.02.01	Portable Fit Test Unit	GE-CE	7	90
146	6	E-WASTE	CWA/NPDES	1.4.01.01.01	Ultraviolet System	GE GPP	85	88
147	7	E-REMEDIAL	CERCLA/DOE5480.14	1.2	Tumulus Engineering	GF 11	500	91
148	6	E-WASTE	CWA/NPDES/SWDA	1.4.01.01.02	Lime Sludge Bed Expansion	GE GPP	277	88
149	6	E-WASTE	SWDA	1.7.xx	Conventional Waste Disposal	GE-OP	300	88
150	8	H&S	DOE 5480.15	1.4.02.01	Replace Automatic TLD Reader	GE-CE	80	90
151	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Flyash Pile Remediation & Sanitary Landfill Expansion	GF 11	2,400	90
152	6	E-WASTE	RCRA	1.1.3.1.04	New Barium Chloride Treatment Facility	GE-LI	2,003	92
153	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Rail Link and Spur Installation	GF 11	1,000	91
154	8	H&S	DOE 5480.1	1.4.02.01	Instrumentation for In-Vivo Facility	GE-CE	300	91
155	8	H&S	DOE 5480.1	1.4.02.01	Replace Automatic Alpha/Beta Planchet Counter	GE-CE	40	90
156	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.4.01.01.02	Remediation Support Facility	GF GPP	3,200	90
157	9	H&S	DOE 5480.3/5480.5	1.7.xx	Storage Racks - Enriched Nuclear Material	GE-OP	75	89
158	8	H&S	DOE 5480.1	1.4.02.01	In-Vivo Facility Phantoms & Calibration Source	GE-CE	50	90
159	5	E-WATER	DOE 5480.1/CWA	1.1.2.2.01	Nitric Acid recovery	GE-LI	6,402	92
160	6	E-WASTE	DOE 5820.2	1.4.02.01	Oil Reclamation System	GF-CE	50	91
161	5	E-WATER	CWA/NPDES	1.1.2.2.02	Sump Improvements - Pilot Plant	GE-LI	3,715	91
162	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Schedule/Program Integration	GF 11	1,500	90
163	6	E-WASTE	DOE 5820.2	1.4.02.01	Acid Transfer Pump (Building 69)	GE-CE	10	89
164	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Shredder/Compactor Facility Design	GF 11	200	90
165	8	H&S	DOE 5480.1	1.4.01.01.02	Shielded Counting Chamber - In-Vivo Facility	GE-GPP	300	91

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
166	7	E-REMEDIAL	CERCLA	1.2	Remedial Training	GF 11	500	91
167	7	E-REMEDIAL	CERCLA	1.2	Waste Repackaging System	GF 11	600	91
168	8	H&S	DOE 5480.1/OSHA	1.1.3.3.xx	Material Handling Systems Funding Yr.92 Ref Table 3-2B	GE-LI	119	92
169	6	E-WASTE	DOE 5820.2	1.4.02.01	Skid Cleaning Equipment	GE-CE	130	90
170	6	E-WASTE	DOE 5820.2	1.1.3.1.04	Trash/Scrap Monitoring Facility	GE-LI	12,047	92
171	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.04	Storage Warehouse Upgrade Building 30	GE-LI	932	90
172	6	E-WASTE	DOE 5820.2/RCRA	1.4.02.01	Bar Coder	GE-CE	20	88
173	7	E-REMEDIAL	CERCLA	1.2	Shredder/Compactor Facility Construction	GF 11	1,400	90
174	8	H&S	DOE 5480.15	1.4.02.01	TLD System Computer & Software	GE-CE	60	89
175	5	E-WATER	DOE 5480.4/CWA	1.4.02.01	Surge Lagoon Piping Replacement	GE-CE	500	92
176	8	H&S	40CFR151/40CFR112/OSHA	1.4.02.01	Spill Response Vehicle Equipment	GE-CE	20	90
177	8	H&S	ANSI N3.23	1.4.02.01	Calibration Source Range	GE-CE	100	90
178	7	E-REMEDIAL	CERCLA	1.2	RMI Site Remediation	GF 11	3,550	91
179	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Benchscale Studies	GF 11	1,200	90
180	7	E-REMEDIAL	CERCLA	1.2	Public Awareness Interaction	GF 11	2,000	91
181	8	H&S	DOE 5480.10	1.4.02.01	Gas/Vapor Standard Generation System	GE-CE	28	90
182	7	E-REMEDIAL	CERCLA	1.2	Offsite Remedial Engineering	GF 11	400	91
183	8	H&S	DOE 5480.10	1.4.02.01	Portable Mercury Vapor Unit	GE-CE	6	90
184	7	E-REMEDIAL	CERCLA	1.2	RMI Remedial Engineering	GF 11	750	91
185	7	E-REMEDIAL	CERCLA	1.2	Offsite Remedial Action	GF 11	2,350	91
186	6	E-WASTE	RCRA	1.4.02.01	Oil Reclamation Upgrade	GE-CE	180	90
187	6	E-WASTE	DOE 5483.1	1.4.02.01	Dry Cleaning System	GE-CE	45	90
188	7	E-REMEDIAL	CERCLA	1.2	Paddy's Run Channel Engineering	GF 11	500	91
189	6	E-WASTE	DOE 5820.2	1.5.04	Technology Demonstration Durable Storage	GF-OP	6,716	89
190	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.02	U03 Warehouse - Plant 8	GE-LI	977	88
191	6	E-WASTE	DOE 5480.1	1.4.02.01	Floor Scrubber	GF-CE	32	88
192	7	E-REMEDIAL	CERCLA	1.2	Waste Containers	GF 11	2,350	91
193	7	E-REMEDIAL	CERCLA	1.2	Access Road Upgrade Construction	GF 11	1,000	90
194	8	H&S	DOE 5483.1	1.1.1.4.xx	HVAC Funding Yr. 1990 Refer Table 3-2D	GE-LI	1,648	90
195	7	E-REMEDIAL	CERCLA	1.4.01.01.02	Personnel Support Systems	GF-GPP	1,600	90
196	9	H&S	DOE 5480.1 CHAPTER V	1.7.xx	Nuclear Criticality Safety Training	GE-OP	#	89
197	7	E-REMEDIAL	CERCLA	1.2	Development Engineering Support	GF 11	1,500	90
198	7	E-REMEDIAL	CERCLA	1.2	Remediation Contractor Mobilization	GF 11	3,500	91

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
199	4	E-AIR	CAA/OHIO EPA	1.1.1.3.XX	Dust Collectors 1992 Funding Refer Table 3-2A	GE-LI/CE	10,440	92
200	7	E-REMEDIAL		1.2	DOE/FMPC Technical Support	GF 11	1,500	88
201	7	E-REMEDIAL	CERCLA	1.2	Concrete Recycling System	GF 11	600	91
202	6	E-WASTE	DOE 5820.2	1.4.01.01.02	Shipping Building Expansion	GF GPP	500	91
203	8	H&S	DOE 5480.1	1.4.02.01	Ion Chromatograph Ultraviolet Detector	GE-CE	10	90
204	7	E-REMEDIAL	CERCLA	1.2	Topographic Flyover Update	GF 11	200	90
205	7	E-REMEDIAL	CERCLA	1.2	Agency/DOE Interaction	GF 11	500	91
206	7	E-REMEDIAL	CERCLA	1.2	Access Road Upgrade Engineering	GF 11	200	90
207	8	H&S	DOE 5480.10	1.4.02.01	Calibration Wind Tunnel	GE-CE	10	90
208	7	E-REMEDIAL	CERCLA	1.2	Hydraulic Crane	GF 11	350	92
209	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.02.01	Alternate Emergency Operation Center	GE-CE	150	90
210	8	H&S	DOE 5480.1	1.4.02.01	Gamma Spectroscopy System	GE-CE	13	90
211	8	H&S	DOE 5483.1	1.1.1.4.xx	HVAC Funding Yr. 1991 Refer Table 3-2D	GE-LI	4,962	91
212	6	E-WASTE	DOE 5820.2/RCRA	1.4.02.01	Motor Vehicle	GF-CE	35	88
213	8	H&S	OSHA	1.4.02.01	New Vacuum System	GE-CE	15	89
214	8	H&S	DOE 5480.10	1.4.02.01	Document Storage System	GE-CE	8	90
215	7	E-REMEDIAL	CERCLA	1.2	Lab. and QA Program Upgrade	GF 11	4,200	90
216	9	H&S	DOE 5480.1 CHAPTER V	1.7.xx	Nuclear Criticality Safety Studies	GE-OP	#	89
217	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.02.01	Personnel Accountability Card Reader System	GE-CE	500	90
218	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.02.01	Automate Emergency Operations Center PART A	GE-OP	#	89
219	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.02.01	Automate Emergency Operations Center PART B	GE-GPP	105	89
220	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.02.01	Automate Emergency Operations Center PART C	GE-CE	30	90
221	7	E-REMEDIAL	CERCLA		Industrial Truck	GF-CE	40	90
222	8	H&S		1.4.02.01	Establishing Employee Incentive Program	GE-OP	#	89
223	8	H&S	ANSI N3.23	1.4.02.01	Electric Cart for Servicing & Retrieving Instruments	GE-CE	6	90
224	7	E-REMEDIAL	CERCLA	1.2	Mobile Vacuum System	GF 11	250	90
225	9	H&S	DOE 5480.5	1.7.xx	Nuclear Criticality Safety Audit Program	GE-OP	#	89
226	8	H&S	DOE 5483.1	1.1.1.4.xx	HVAC Funding Yr. 1992 Refer Table 3-2D	GE-LI	4,440	92
227	7	E-REMEDIAL	CERCLA/DOE 5480.14		Flyash Pile Remedial Action	GF-11		
228	7	E-REMEDIAL	CERCLA/DOE 5480.14	1.2	Pits 1-3,6 Remedial Action	GF-11		a
229	7	E-REMEDIAL	CERCLA/DOE 5480.14		Final Soil Remedial Action	GF-11		a
230	7	E-REMEDIAL	CERCLA/DOE 5480.14		K-65 and Silo 3 Remedial Action	GF-11		a
231	7	E-REMEDIAL	CERCLA	1.4.01.01.02	NW Substation Expansion	GF-11		a

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	TITLE	TYPE OF FUNDING	TEC ($1,000)	SCHED START
232	6	E-WASTE	SWDA		Sanitary Landfill Engineering	GF-11		@
233	7	E-REMEDIAL	CERCLA/DOE 5480.14		Final Groundwater Remedial Action	GF-11		@
234	7	E-REMEDIAL	CERCLA/DOE 5820.2		Decommission Site	GF-11		@

Footnotes:

= Included in operating funds for the designated section
* = Included in EHSI Line Item Project WBS 1.1.4.1.04
@ = Beyond 1992; funding level to be determined

TABLE 3-2A
DUST COLLECTOR SYSTEMS
CAPITAL PROJECTS

INDEX	WBS NO	PROJECT	PLANT OR LOCATION	FUNDING TYPE	K$	START YEAR
	----------	FUNDING YR THRU 88	---------			
1	1.5.02.x	FILTRATION SYSTEM DUST COLLECTOR	5	4A		85
2	1.4.02.x	DUST COLLECTOR REPLACEMENT (G2-172) - PLANT 1	1	CE		85
3	1.3.01.x	REPLACE G5-258,259 DUST COLLECTORS	5	PRI		85
4	1.4.02.x	REPLACE DUST COLLECTOR G5-251	5	CE		87
5	1.4.02.x	DUST COLLECTOR G4-14 #1 PACKAGING STATION	4	CE		87
6	1.1.1.3.09	Dust Collector G5A-100	5	EHSI	$2,431	87
7	1.1.1.3.14	Dust Collector (DC) 735-13-7041/7051	37	EHSI	$2,204	87
8	1.4.02.x	REACTOR VENTILATION D.C. G4-7,13,15,3,1	4	CE		88
9	1.1.1.3.10	Dust Collector G5-247 and 248	5	EHSI	$2,376	88
10	1.1.1.3.13	Dust Collector G42-615	9	EHSI	$2,235	88
11	1.1.1.3.11	Dust Collector G43-27 & 29	8	EHSI	$2,200	88
	----------	FUNDING YR THRU 89	---------			
12	1.1.1.3.02	Dust Collector G2-6042	1	EHSI	$1,867	89
13	1.1.1.3.04	Dust Collector G1-856	2	EHSI	$379	89
	----------	FUNDING YR THRU 92	---------			
14	1.4.02.x	REPLACE DUST COLLECTOR G5-253	5	CE		92
15	1.4.02.x	DUST COLLECTOR G4-2 #2 PACKAGING STATION	4	CE		92
16	1.4.02.x	REPLACE G55-E-100 DUST COLLECTOR	5	CE		92
17	1.1.1.3.15	Spark and Flame Arrestor-Dust Collector G6-93A	37	EHSI	$1,039	92
18	1.1.1.3.17	Dust Collectors G1 and G2	54	EHSI	$1,532	92
19	1.1.1.3.12	Neutralizing Tanks-Dust Collector 8-021, 8-024, an	8	EHSI	$2,649	92

TABLE 3-2B
MATERIAL HANDLING SYSTEMS
CAPITAL PROJECTS

INDEX	WBS NO	PROJECT	PLANT OR LOCATION	FUNDING TYPE	K$	START YEAR
	----------	FUNDING YR. 88	---------			
1	1.1.3.3.09	Laundry Handling -BLD 11	11	EHSI	$21,555	88
2	1.1.3.3.01	The Material Handling PLT.1	1	EHSI		88
3	1.1.3.3.10	Chain Hoist Replacement BLD 12	12	EHSI		88
4	1.1.3.3.05	The Material Handling PLT.6	6	EHSI		88
5	1.1.3.3.07	The Material Handling PLT.9	9	EHSI		88
6	1.1.3.3.04	The Material Handling PLT.5	5	EHSI		88
7	1.1.3.3.12	Intraplant Movement/Materials	PLTWIDE	EHSI		88
8	1.1.3.3.13	T-Hopper Maintenance Facility Plt.4	4	EHSI	$366	88
	----------	FUNDING YR. 92	---------			
9	1.1.3.3.11	Freight Elevator BLD 54	54	EHSI	$86	92
10	1.1.3.3.08	Jib & Hoist - BLD 11	10	EHSI	$33	92

TABLE 3-2c
EXHAUST SYSTEMS
CAPITAL PROJECTS

INDEX	WBS NO	PROJECT	PLANT OR LOCATION	FUNDING TYPE	K$	START YEAR
	----------	FUNDING YR 89	---------			
1	1.1.1.5.22	Machine Room Fume Collection Electrostatic	9	EHSI	$ 3,427	89
2	1.1.1.5.01	Exhaust Modification Scrubbing System	2	EHSI	$ 1,036	89
3	1.1.1.5.06	The North, South, and Middle Electrostatic	6	EHSI	$ 9,965	89
4	1.1.1.5.09	The Flat Machining Area	6	EHSI	$250	89
5	1.1.1.5.10	The Lathe Exhausts Systems	6	EHSI	$1,410	89
6	1.1.1.5.11	The Sunstrand Lathe Exhaust	6	EHSI	$197	89
7	1.1.1.5.12	The Harding Lathe/Exhaust Removal	6	EHSI	$63	89
8	1.1.1.5.13	The Cincinnati Grinder/Exhaust Removal	6	EHSI	$64	89
9	1.1.1.5.14	The Heald Machines & J&L Lathes Exhaust Systems -	6	EHSI	$233	89
10	1.1.1.5.15	The Coolant Clarifiers	6	EHSI	$363	89
11	1.1.1.5.16	The Tocco Induction Furnaces	6	EHSI	$79	89
12	1.1.1.5.17	The Cross Transfermatics - The existing system	6	EHSI	$221	89
13	1.1.1.5.18	The Crunch Area Machine	6	EHSI	$108	89
14	1.1.1.5.19	The Inspection Area	6	EHSI	$10	89
15	1.1.1.5.20	The Chip Briquetting Press and Conveyor	6	EHSI	$96	89
16	1.1.1.5.21	The Salt Oil Treatment Room	6	EHSI	$416	89
17	1.1.1.5.04	Reduction Furnaces Ventilation	5	EHSI	$ 321	89
18	1.1.1.5.03	Furnace Pot Cooler	5	EHSI	$ 397	89
19	1.1.1.5.05	Maintenance, Saw Sharpening, & Furnace Repair Shops	5	EHSI	$ 422	89
	----------	FUNDING YR 92	---------			
20	1.1.1.5.24	UF6 to UF4 Fire Retardant Exhaust System	54	EHSI	$592	92
21	1.1.1.5.23	Exhaust Systems BLD 12	12	EHSI	$ 425	92

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TABLE 3-2D
HEATING & VENTILATING SYSTEMS
CAPITAL PROJECTS

INDEX	WBS NO	PROJECT	PLANT OR LOCATION	FUNDING TYPE	K$	START YEAR
	----------	FUNDING YR.90	---------			
100	1.1.1.4.03	Heating & Ventilating System Plt 5	5	EHSI	$1,416	90
101	1.1.1.4.23	Heating & Ventilating System - Buld 55	55	EHSI	$98	90
102	1.1.1.4.11	Ventilation System	25a	EHSI	$22	90
103	1.1.1.4.12	Heating & Ventilation System	25c	EHSI	$56	90
104	1.1.1.4.22	Heating & Ventilating System	54	EHSI	$56	90
	----------	FUNDING YR.91	---------			
105	1.1.1.4.04	Heating & Ventilating system	6	EHSI	$4,318	91
106	1.1.1.4.08	Ventilating System	13	EHSI	$292	91
107	1.1.1.4.10	Heating System	24	EHSI	$12	91
108	1.1.1.4.09	Heating & Air Conditioning System	20	EHSI	$113	91
109	1.1.1.4.13	Air Conditioning System Bld 28	28	EHSI	$227	91
	----------	FUNDING YR.92	---------			
110	1.1.1.4.07	Heating & Ventilating System	12	EHSI	$1,213	92
111	1.1.1.4.14	Heating & Ventilating System	30	EHSI	$76	92
112	1.1.1.4.15	Heating & Ventilating System - Bldg. 31	31	EHSI	$82	92
113	1.1.1.4.16	Heating & Ventilating System - Bld 32	32	EHSI	$1,506	92
114	1.1.1.4.17	Heating & Ventilating System	37	EHSI	$134	92
115	1.1.1.4.18	Heating & Ventilating System	38	EHSI	$67	92
116	1.1.1.4.21	Heating & Ventilating System Bld 46	46	EHSI	$285	92
117	1.1.1.4.05	Heating & Ventilating System	9	EHSI	$775	92
118	1.1.1.4.19	Heating & Ventilating System	39	EHSI	$25	92
119	1.1.1.4.20	Heating & Ventilating System Bld 45	45	EHSI	$12	92
120	1.1.1.4.24	Heating & Ventilating System - Building 56	56	EHSI	$76	92
121	1.1.1.4.27	Heating & Ventilating System Bld 62	62	EHSI	$55	92
122	1.1.1.4.26	Heating & Ventilating System - Building 61	61	EHSI	$55	92
123	1.1.1.4.25	Heating & Ventilating System - Building 60	60	EHSI	$79	92

TABLE 3-3
RMI PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	TITLE	TYPE OF FUNDING	TEC ($1,000'S)	SCHED START
1	14	ES&H	DOE/EPA/OSHA	Base Environmental and Support Costs	GE-OP	8,884	
2	14	E-Air	DOE 5480.4/CAA	Press/Die Head Ventilation System Upgrade	GE-CE	629	
3	14	E-Air	DOE 5480.4/CAA	Uranium Chip Incinerator Upgrade	GE-CE	528	
4	14	E-Water	DOE 5480.4/NPDES/CWA	Process Wastewater Treatment Facility	GE-GPP	731	
5	14	E-Water	DOE 5480.4/NPDES/CWA	Wastewater Outfall Sampling Improvements	GE-CE	32	
6	14	E-Water	DOE 5480.4/NPDES/CWA	Acid Neutralization Wastewater Evaporator	GE-CE	60	
7	14	E&H	CAA/DOE 5480.4	Cooling Table Ventilation System	GE-CE	508	
8	14	H	DOE 5480.4	Office Air Filtration	GE-CE	70	
9	14	ES&H	DOE/EPA/OSHA	Generate Additional Lab Space	GE-GPP	550	
10	14	E-Waste	DOE 5820.2/DOT	Low-level Radioactive Waste Shipments	GE-OP	2,500	
11	14	E-Water	DOE/5820.2/RCRA/CERCLA	Groundwater Contamination Studies	GE-OP	900	
12	14	E-Water	DOE 5820.2/RCRA/CERCLA	Laboratory Gas Chromatograph/Mass Spectrometer	GE-CE	300	
13	14	ES&H	CAA/EPA/DOE/OSHA	Miscellaneous Monitoring and Sampling Equipment	GE-CE	375	
14	14	H&S	OSHA/NFPC	Flammable Liquid Storage	GE-GPP	65	
15	14	E	RCRA	RCRA Hazardous Waste Storage	GE-GPP	300	
16	14	E-Water	NPDES/DOE/RCRA	Laboratory Analytical Equipment	GE-CE	625	
17	14	E-Air	DOE 5480.4	Main Plant Uranium Pickling Ventilation Upgrade	GE-CE	835	
18	14	E-Air	CAA/DOE 5480.4	Uranium Tube Transfer Table Ventilation System	GE-CE	515	
19	14	E-Air	CAA/DOE 5480.4	Forge Billet Quench Crane Ventilation	GE-CE	5	
20	14	E_Air	CAA/DOE 5480.4/OSHA	Salt Bath Ventilation System	GE-CE	900	
21	14	E	DOE 5480.4	Laboratory Thermal Mass Spectrometer	GE-CE	300	
22	14	E-Waste	DOE 5820.2	Sludge Dryers	GE-CE	60	
23	14	H&S	DRAFT DOE 5480.11	Health Physics Equipment	GE-OP	300	
24	14	E-Air	CAA/DOE 5480.4/OSHA	Forge Billet Inspection Uranium Pickling Ventilation Upgrade	GE-CE	800	
25	14	E-Air	CAA/DOE 5480.4	Uranium Tube Roll Straightener Ventilation System	GE-CE	450	
26	14	E-Air	CAA/DOE 5480.4	Forge Billet Cleaner Ventilation System	GE-CE	25	
27	14	H&S	DOE 5480.1A	Whole Body Lung Counter	GE-CE	600	
					GE-GPP	300	
28	14	E	RCRA/NPDES	Laboratory Atomic Absorption Spectrophotometer	GE-CE	50	
29	14	E-Air	CAA/DOE 5480.4	Meteorological Tower	GE-CE	100	
30	14	E-Waste	CERCLA	Fields Brook Cleanup	CF-11	5,000	
31	14	E	CAA	Stack Monitor Replacement Equipment	GE-CE	200	
32	14	E-Air	CAA/DOE 5480.4	Continuous Air Sampling Equipment	GE-CE	75	
33	14	E	CWA	Continuous Water Sampling Equipment	GE-CE	125	
34	14	E	CAA	Miscellaneous Replacement Equipment for Air Filtration	GE-CE	75	

TABLE 3-3

RMI PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	TITLE	TYPE OF FUNDING	TEC ($1,000'S)	SCHED START
35	14	ES&H	EPA/DOE/OSHA	Projects Less Than One Million Dollars	GE-CE	3,000	

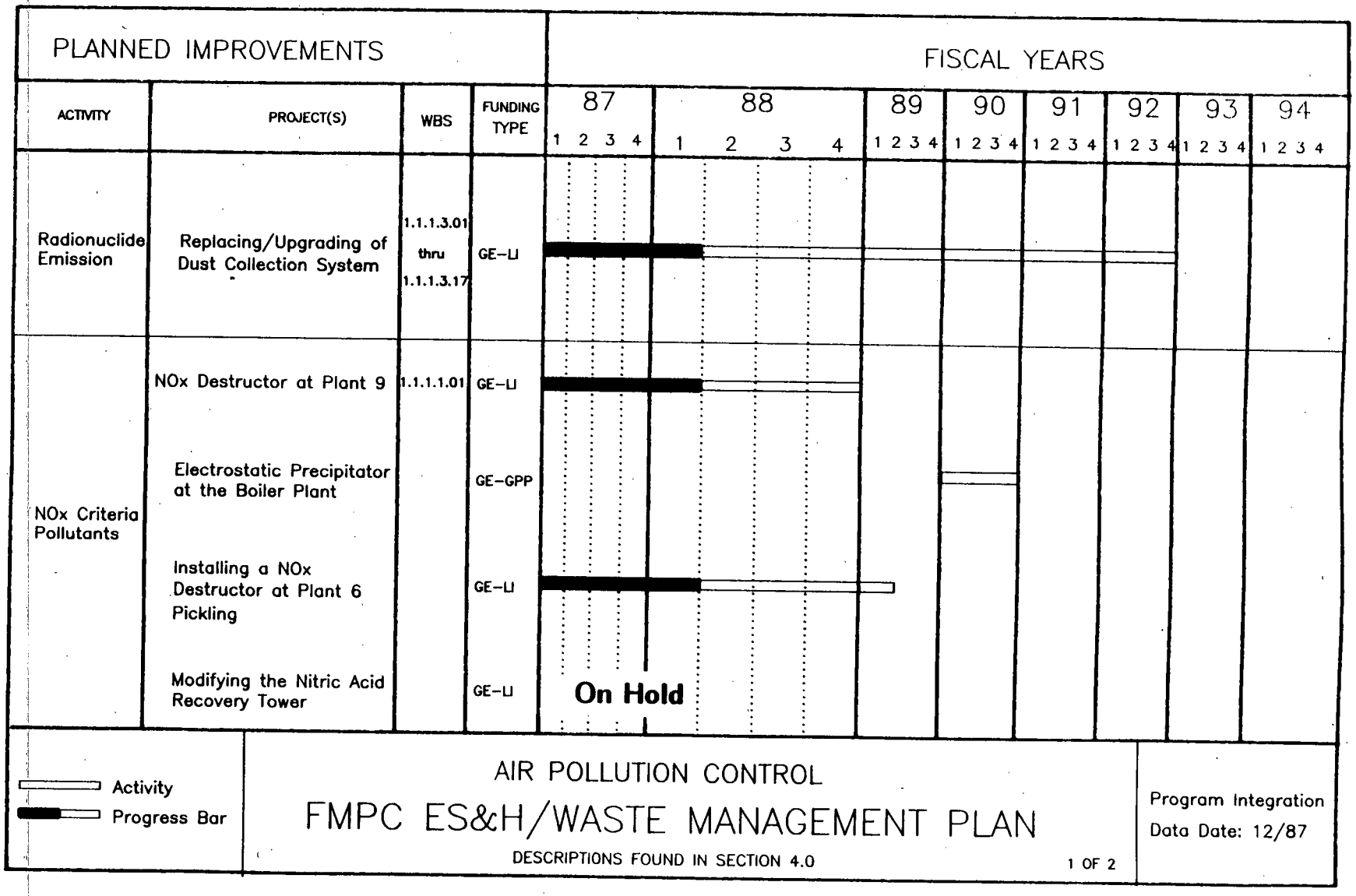


Figure 3-1. Air Pollution Control Project Schedule

PLANNED IMPROVEMENTS				FISCAL YEARS							
ACTIVITY	PROJECT(S)	WBS	FUNDING TYPE	87	88	89	90	91	92	93	94 (1 2 3 4)
Other Air Pollution Control And Monitoring Improvements	Upgrade Exhaust Systems	1.1.1.5.01 thru 1.1.1.5.06 & 1.1.1.5.09 thru 1.1.1.5.24	GE-LI								
	Installing Additional Air Monitoring Stations	1.1.1.2.01	GE-LI								
	Implementing a Development Support Program		GE-OP								
	Upgrading Operational Procedures		GE-OP								
	Developing the Toxic Atmospheric Modeling System	1.1.4.1.04	GE-LI								
	Stack Testing		GE-OP								

Activity
Progress Bar

AIR POLLUTION CONTROL

FMPC ES&H/WASTE MANAGEMENT PLAN

DESCRIPTIONS FOUND IN SECTION 4.0

2 OF 2

Program Integration
Data Date: 12/87

Figure 3-1. (Continued)

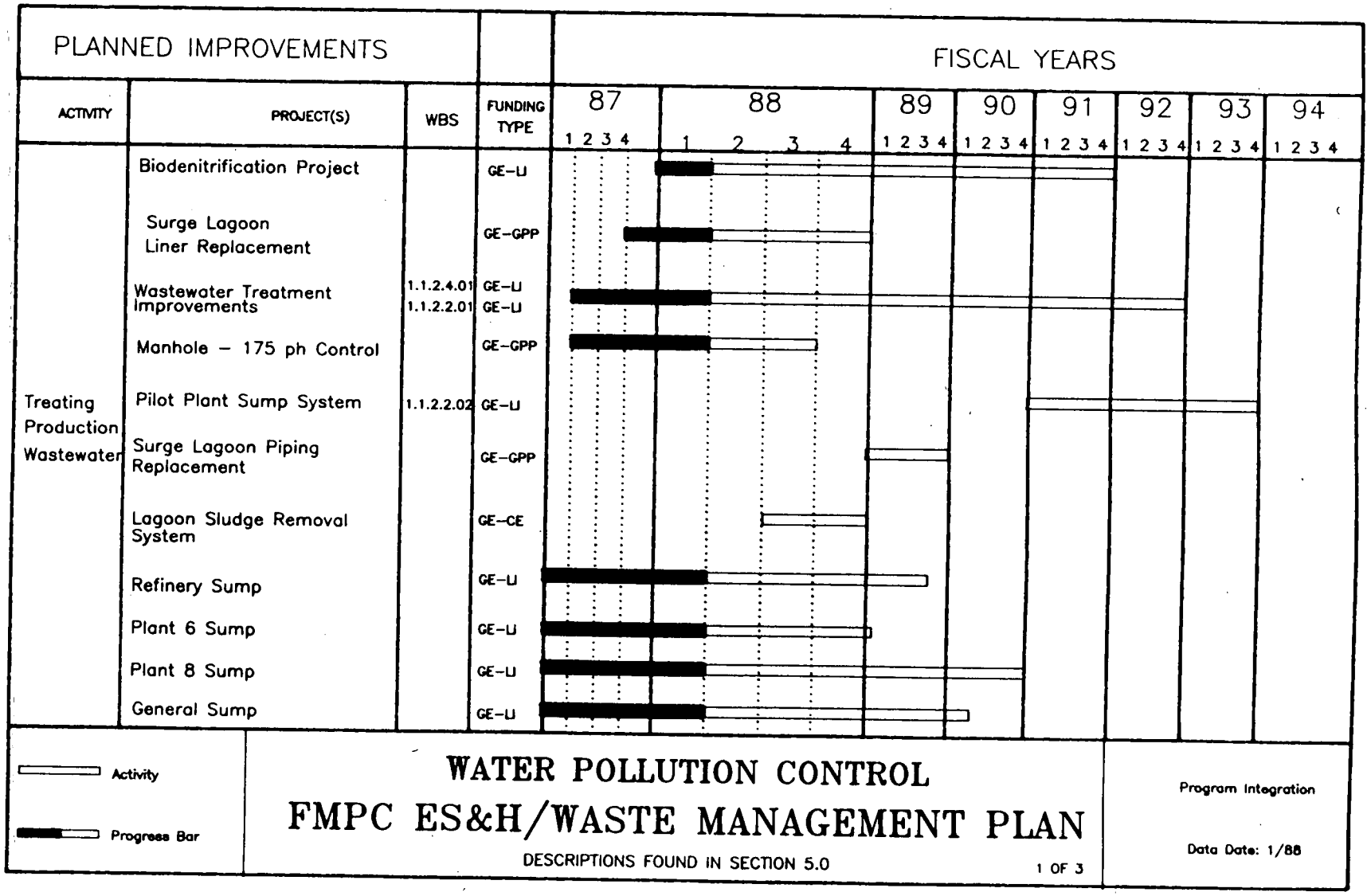


Figure 3-2. Water Pollution Control Project Schedule

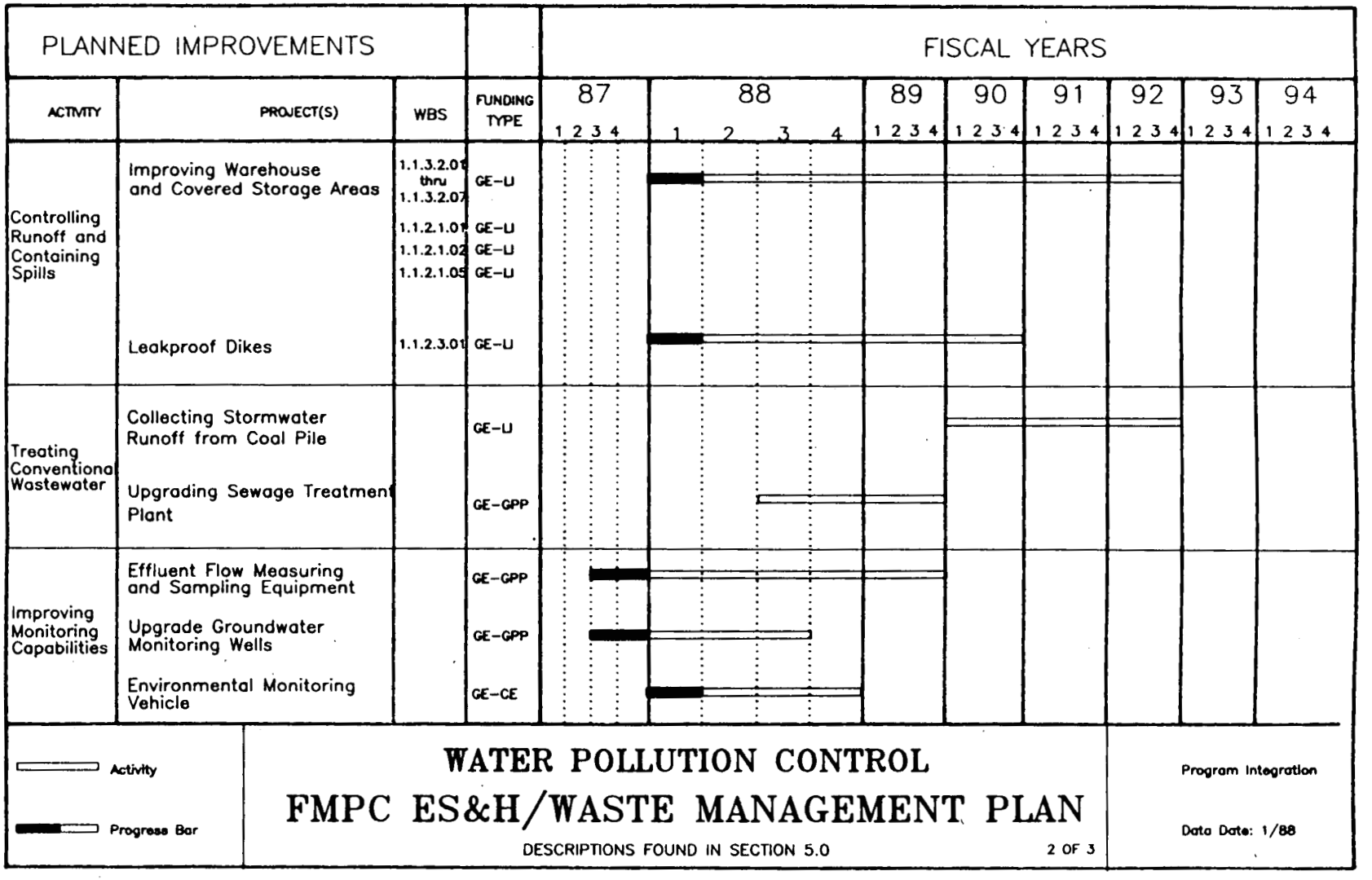


Figure 3-2. (Continued)

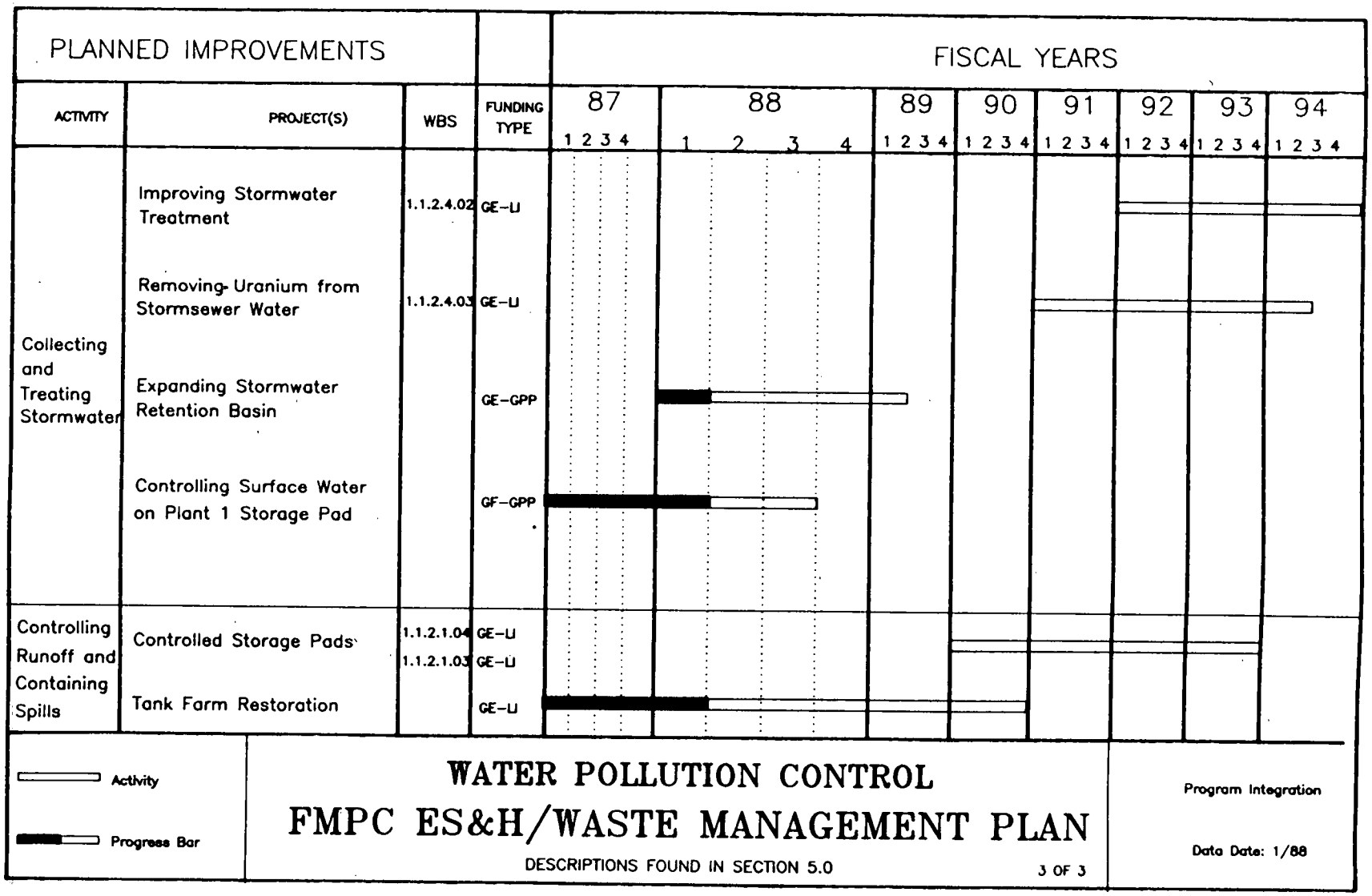


Figure 3-2. (Continued)

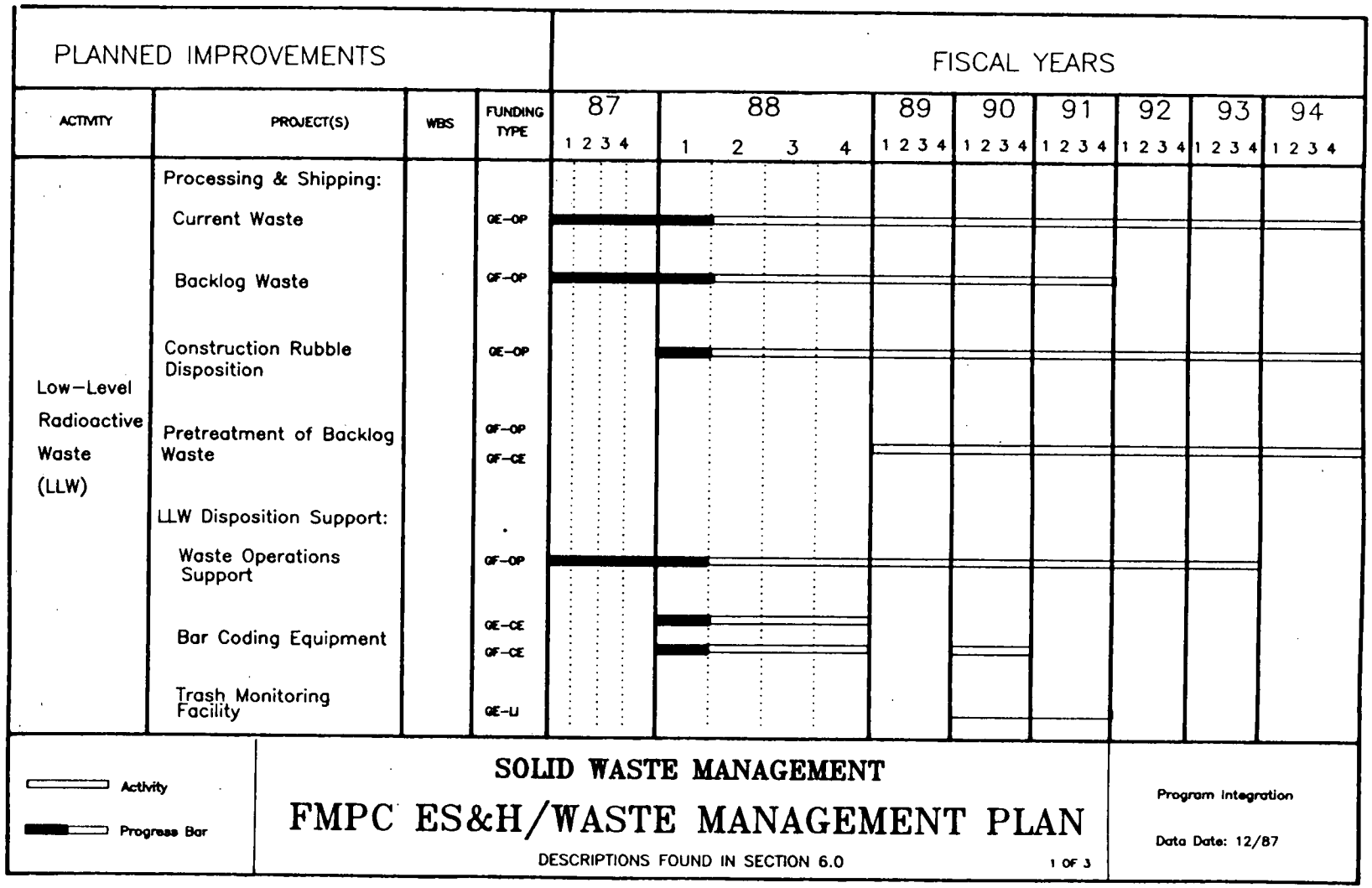
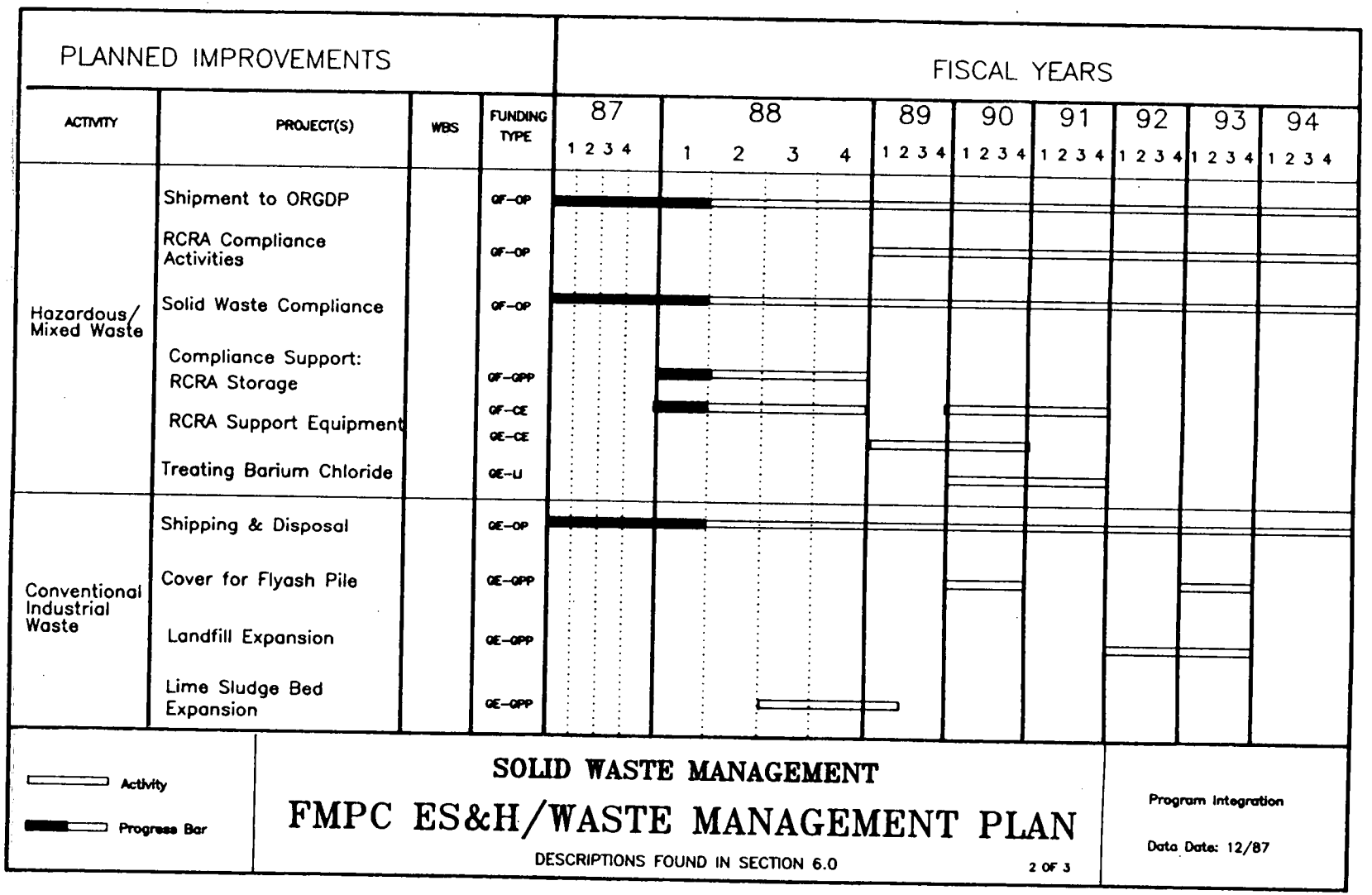


Figure 3-3. Solid Waste Management Project Schedule



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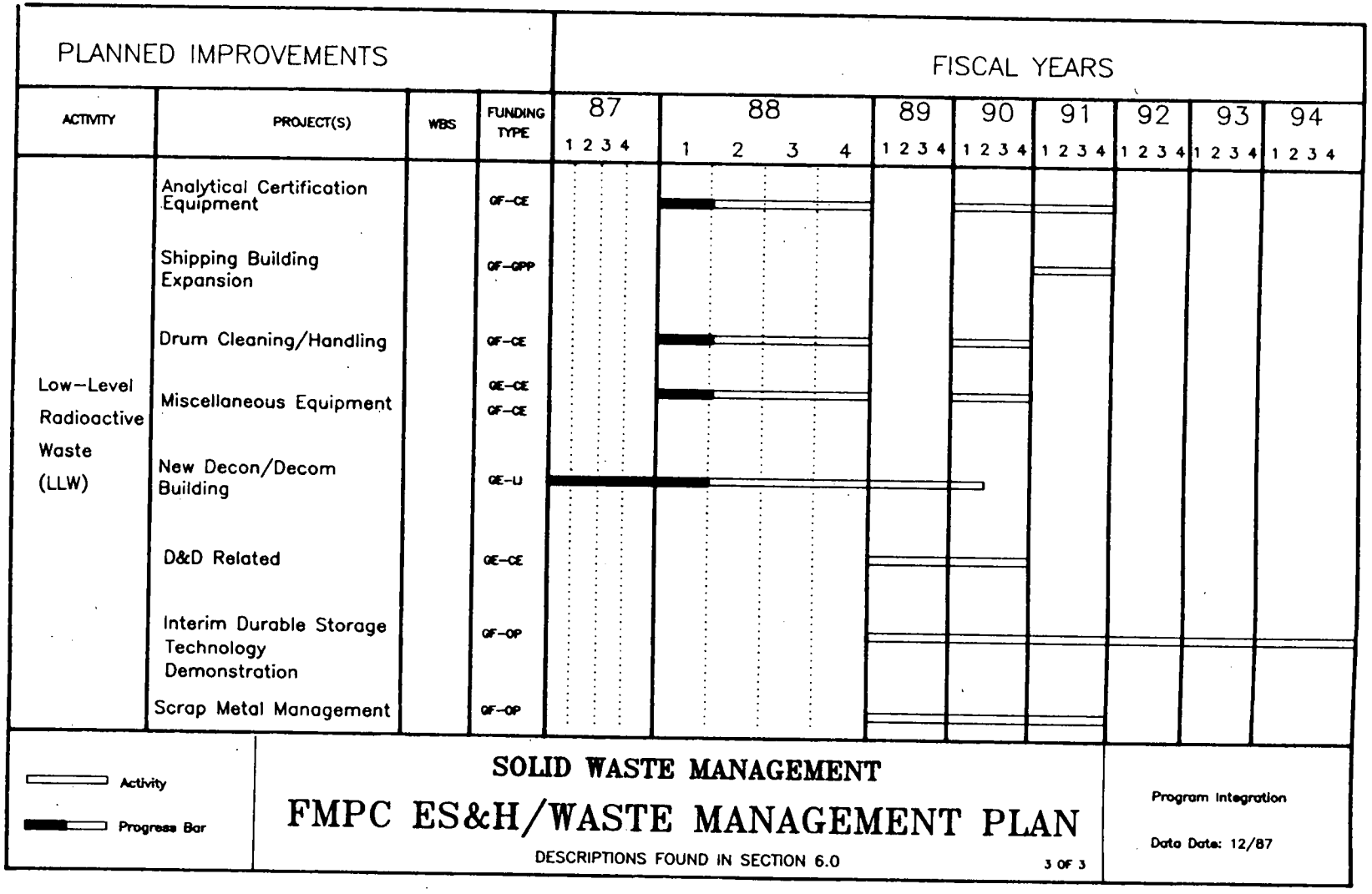

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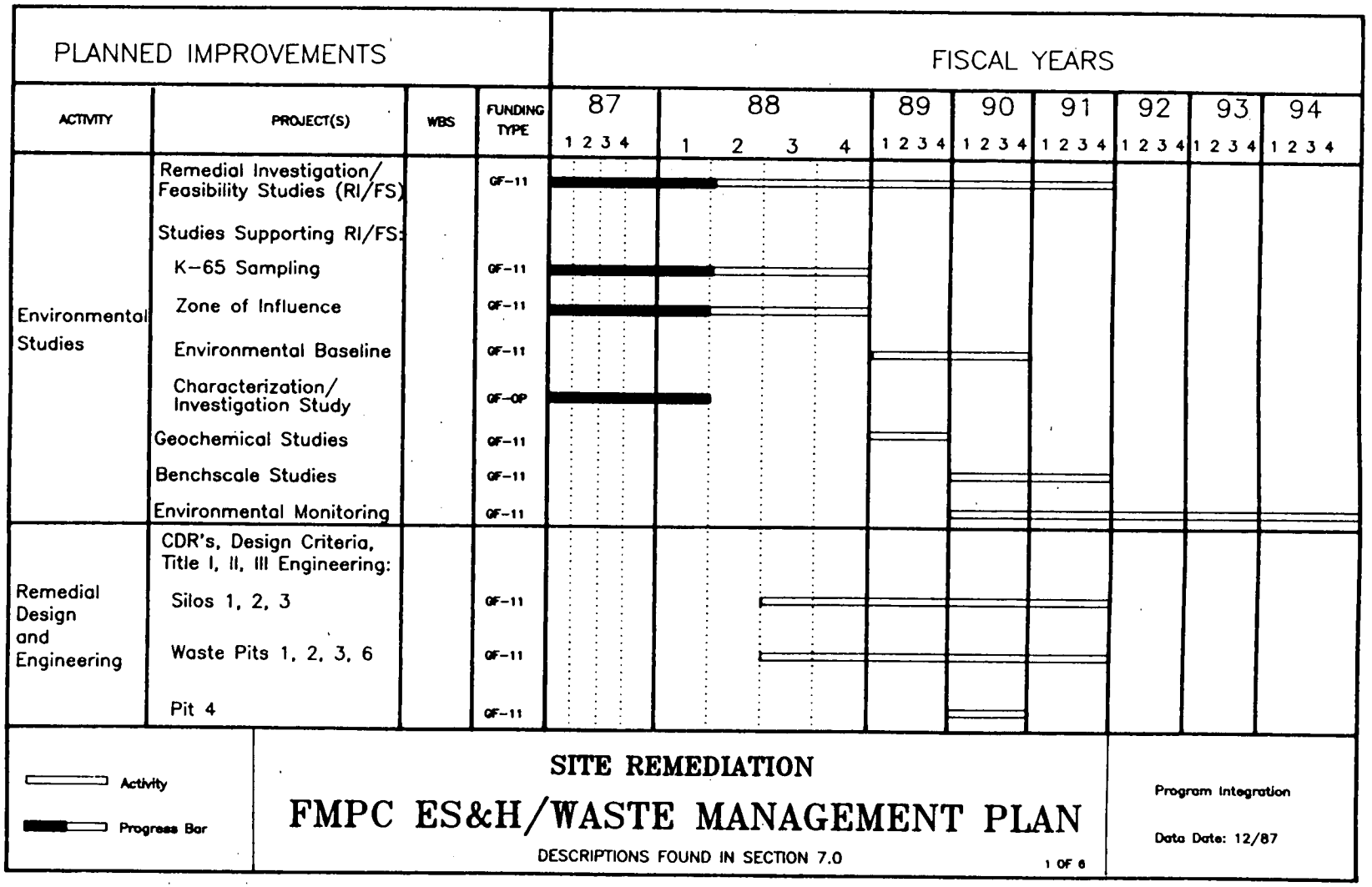
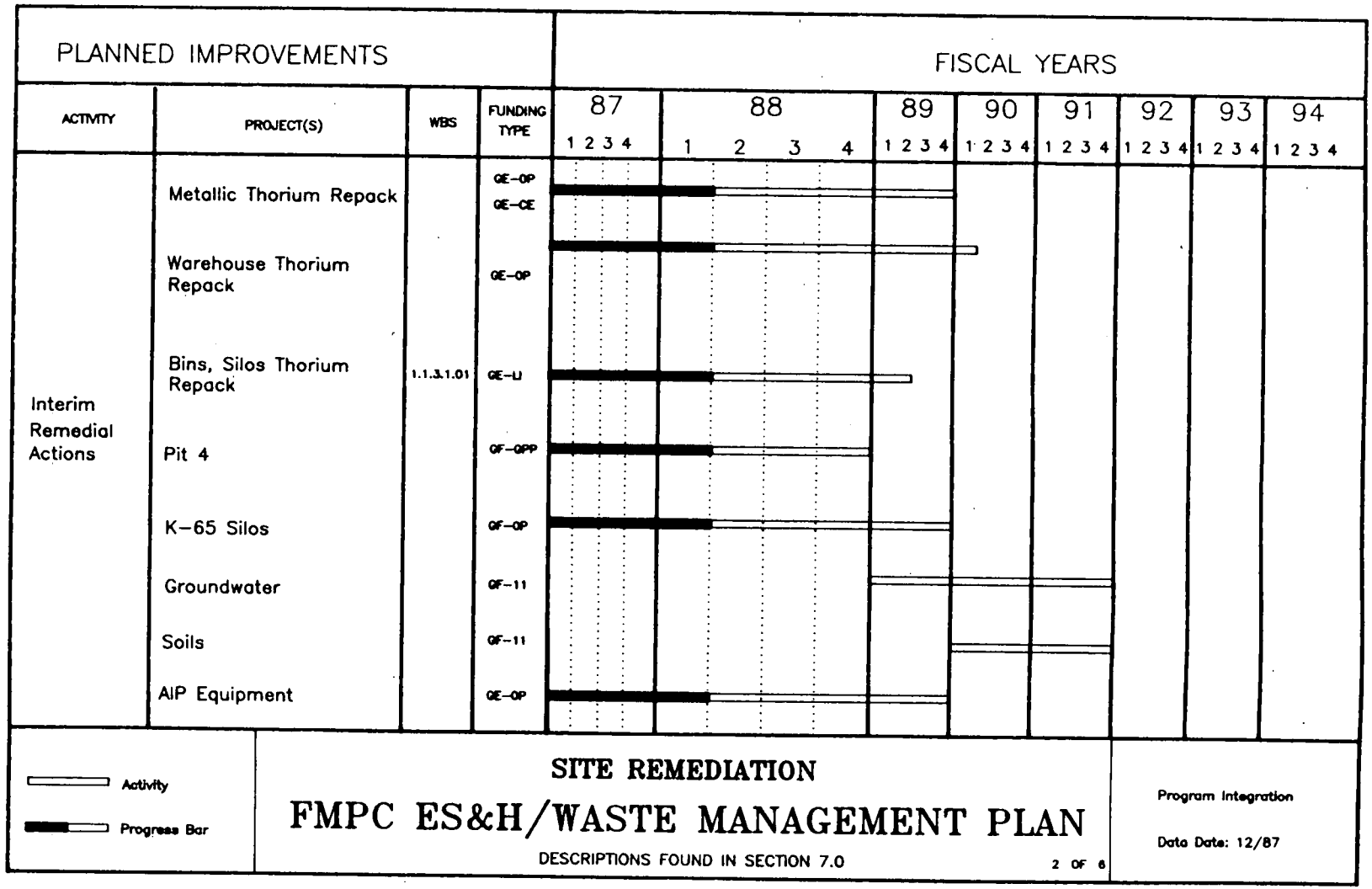


Figure 3-4. Site Remediation Project Schedule



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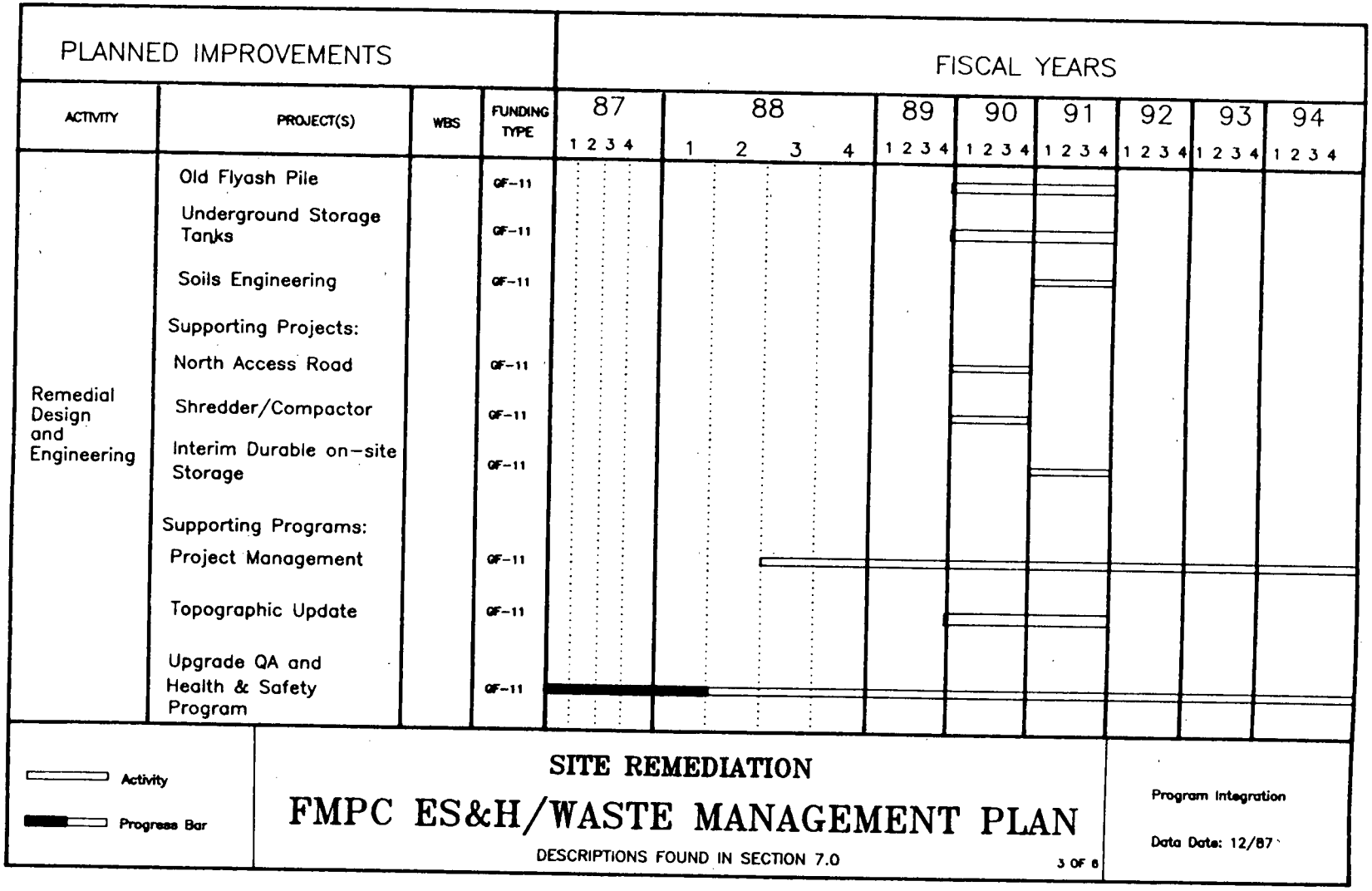

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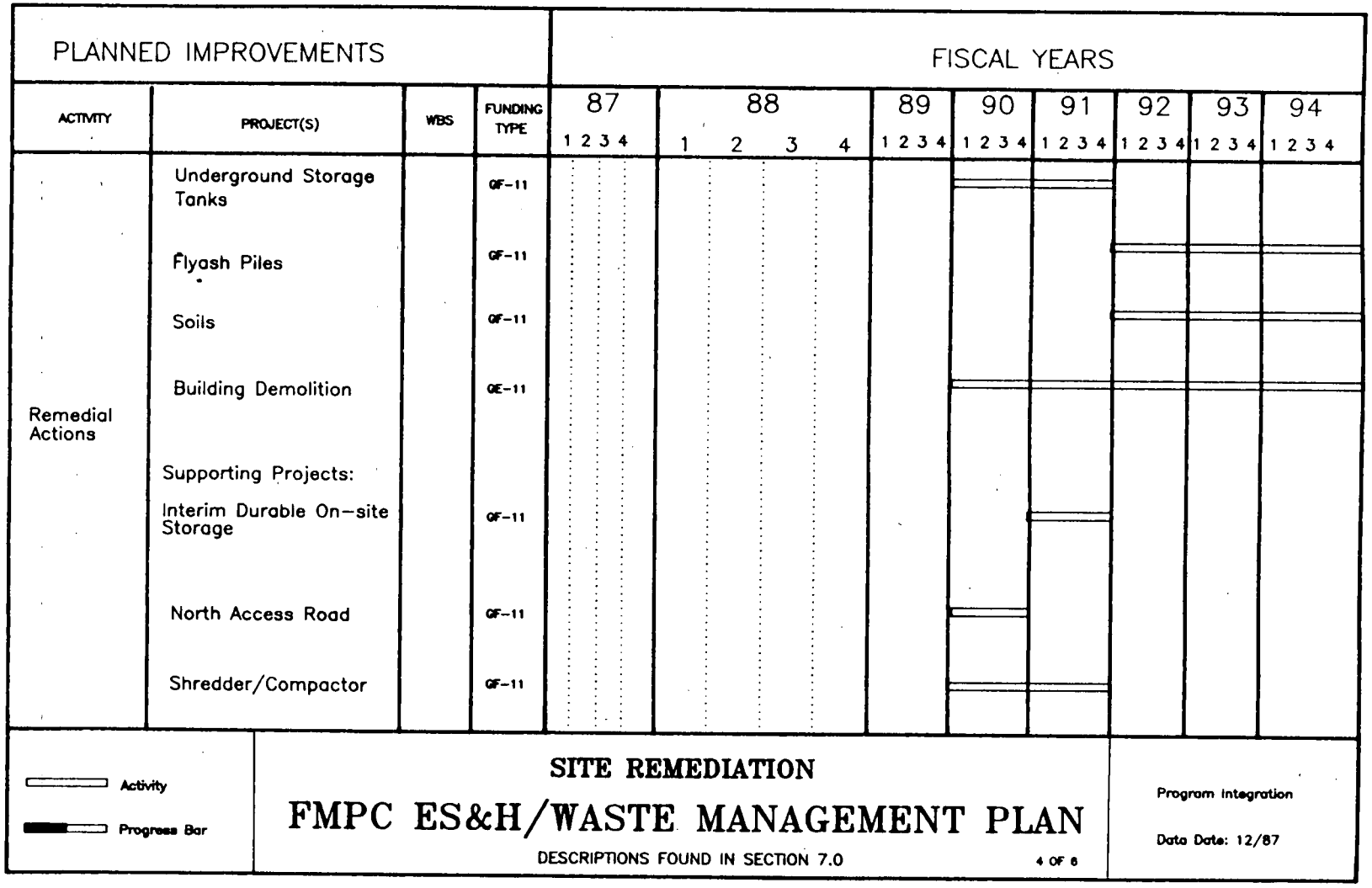

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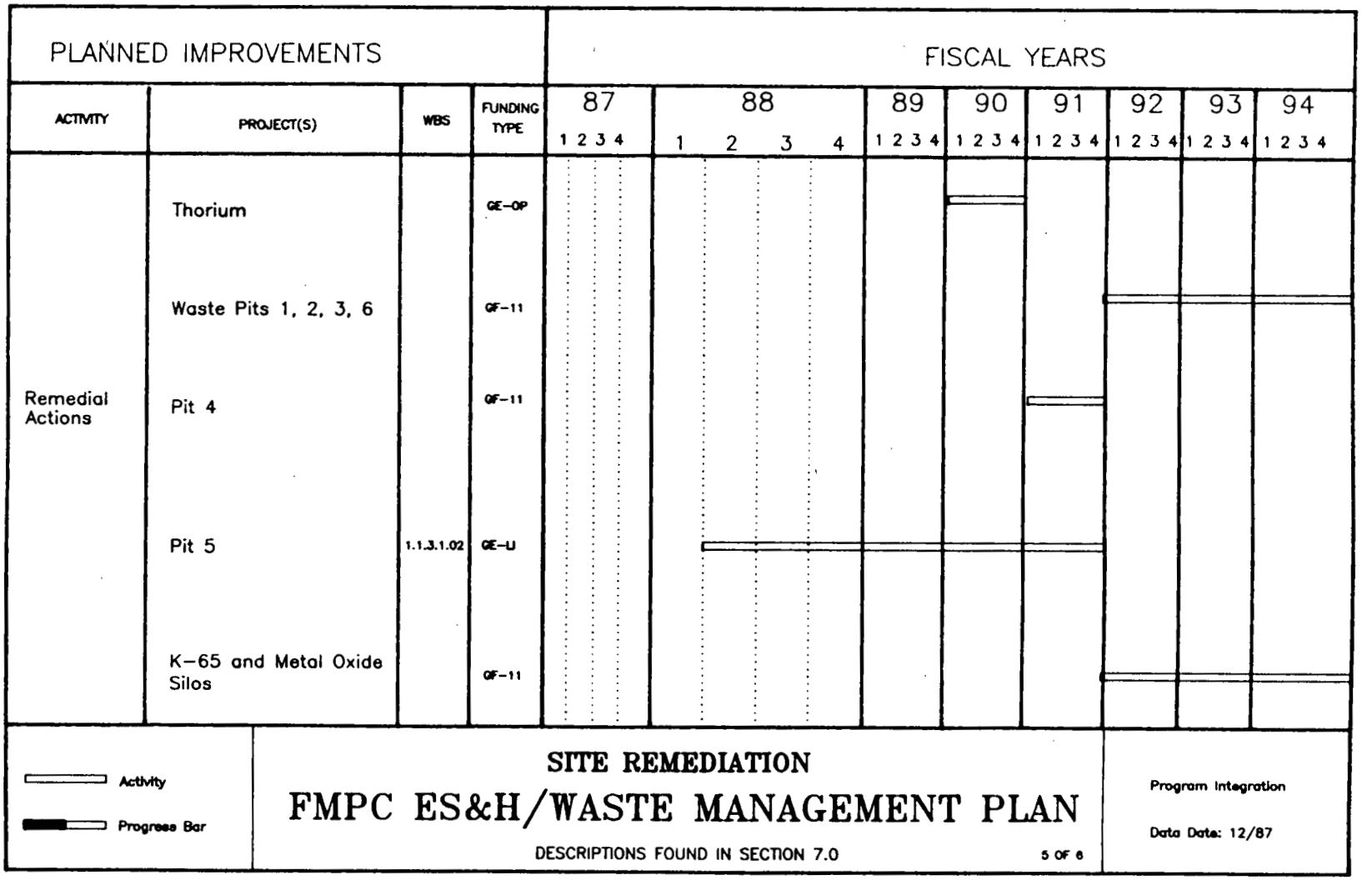

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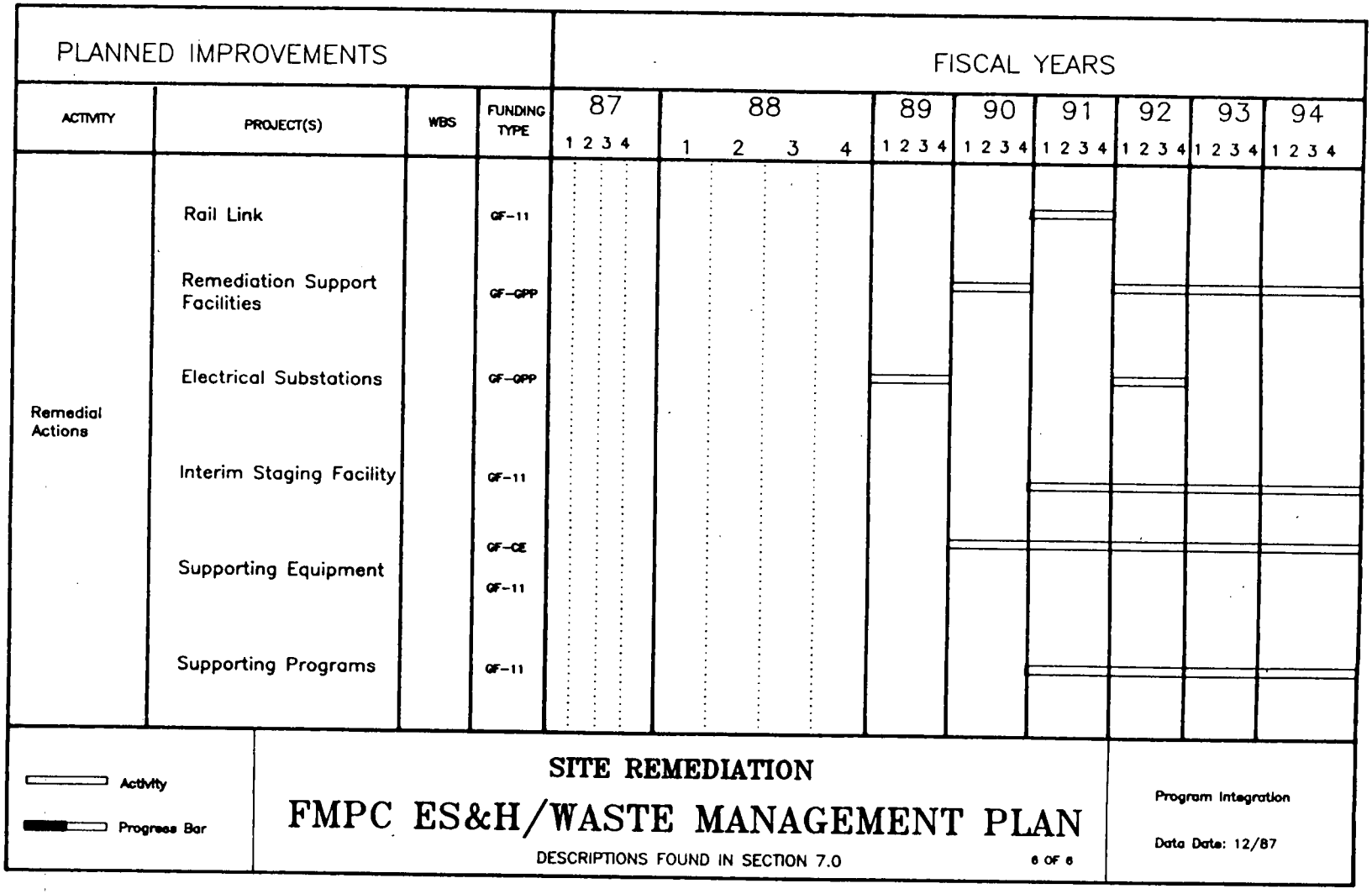

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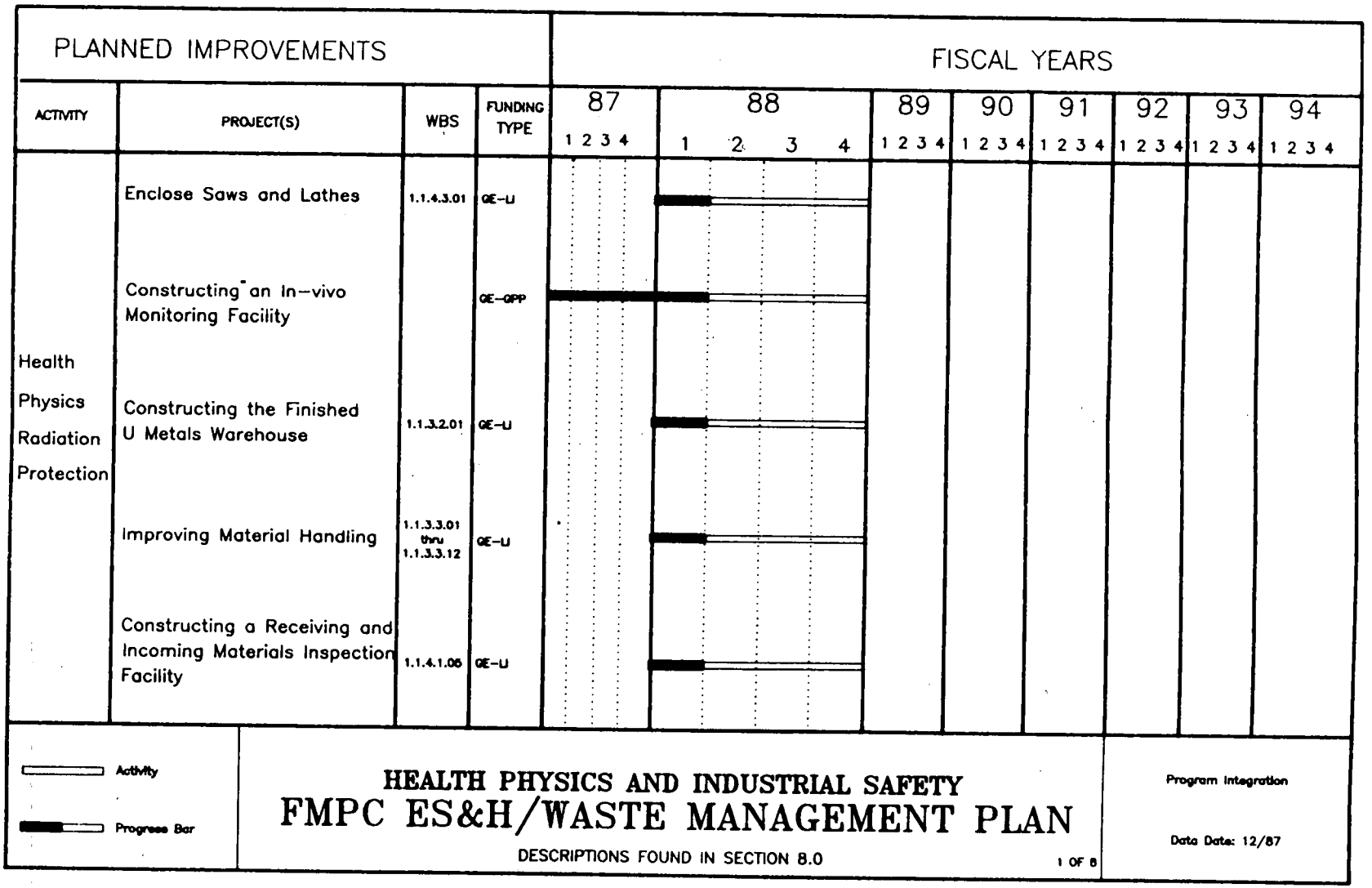
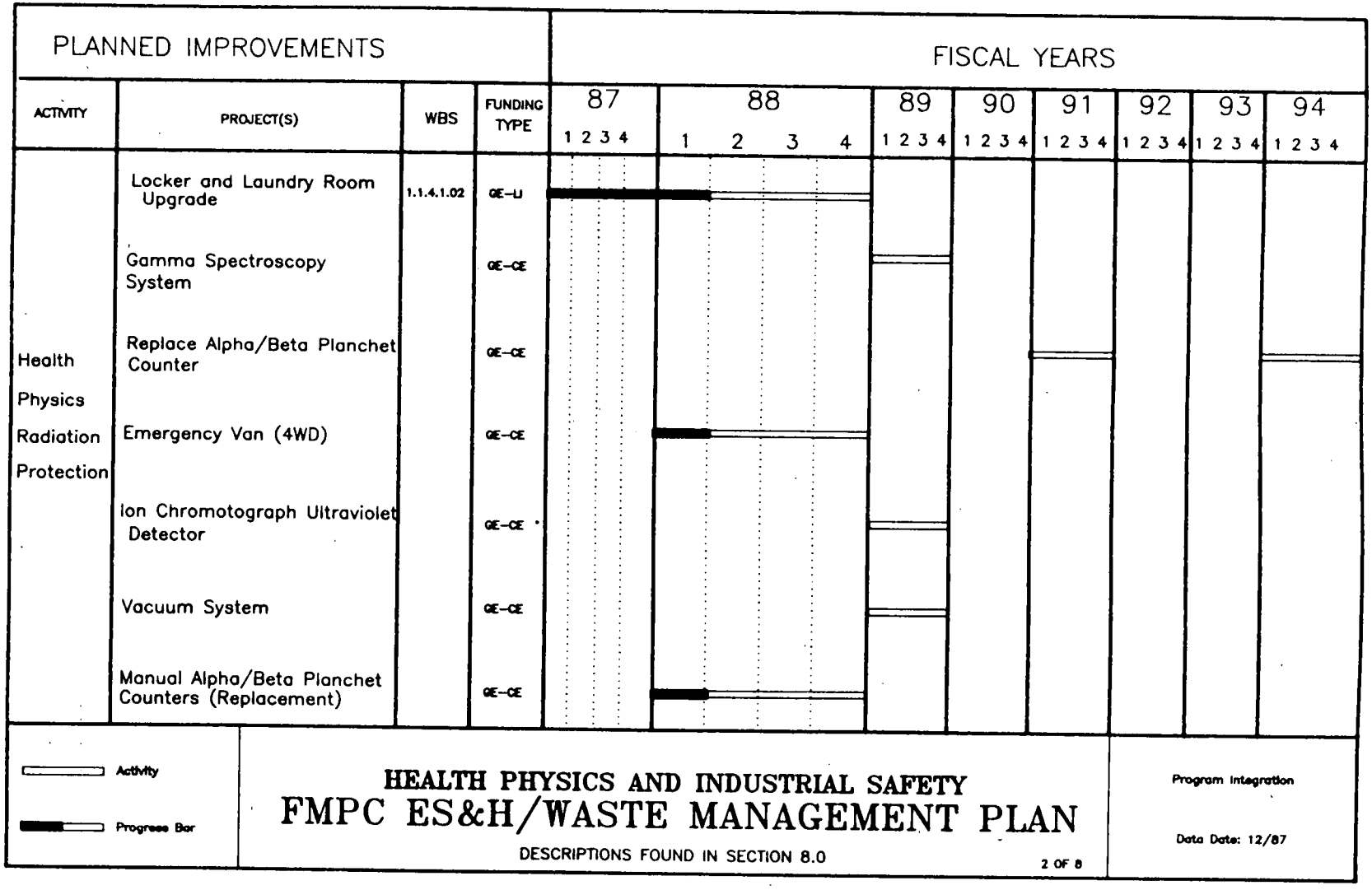


Figure 3-5. Health Physics and Industrial Safety Project Schedule



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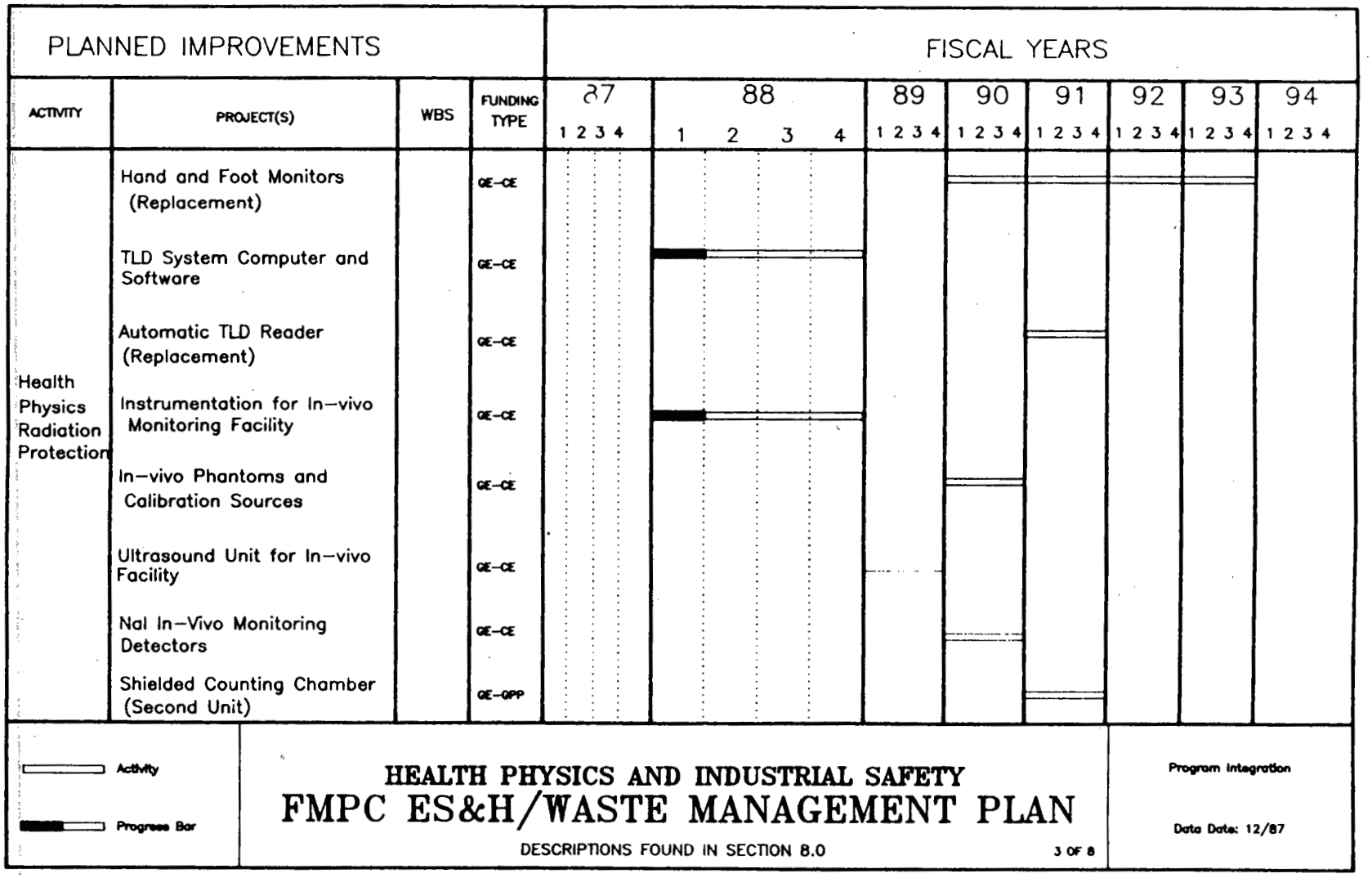


Figure 3-5. (Continued)

PLANNED IMPROVEMENTS				FISCAL YEARS							
ACTIVITY	PROJECT(S)	WBS	FUNDING TYPE	87 (1 2 3 4)	88 (1 2 3 4)	89 (1 2 3 4)	90 (1 2 3 4)	91 (1 2 3 4)	92 (1 2 3 4)	93 (1 2 3 4)	94 (1 2 3 4)
Health Physics Radiation Protection	Instrumentation for Shielded Counting Chamber (Second Unit)		GE-CE								
	Electric Cart for Servicing/ Receiving Instruments		GE-CE								
	Calibration Source Range		GE-CE								
Industrial Safety	Plantwide Lighting Upgrade	1.1.4.4.01	GE-LI								
	Increasing Safety Training Programs		GE-OP								
	Establishing Employe Incentive Program		GE-OP								
	Constructing a Storage, Maintenance and Office Building near the Boiler Plant	1.1.4.1.01	GE-LI								

Activity

Progress Bar

HEALTH PHYSICS AND INDUSTRIAL SAFETY

FMPC ES&H/WASTE MANAGEMENT PLAN

DESCRIPTIONS FOUND IN SECTION 8.0

4 OF 8

Program Integration

Data Date: 12/87

Figure 3-5. (Continued)

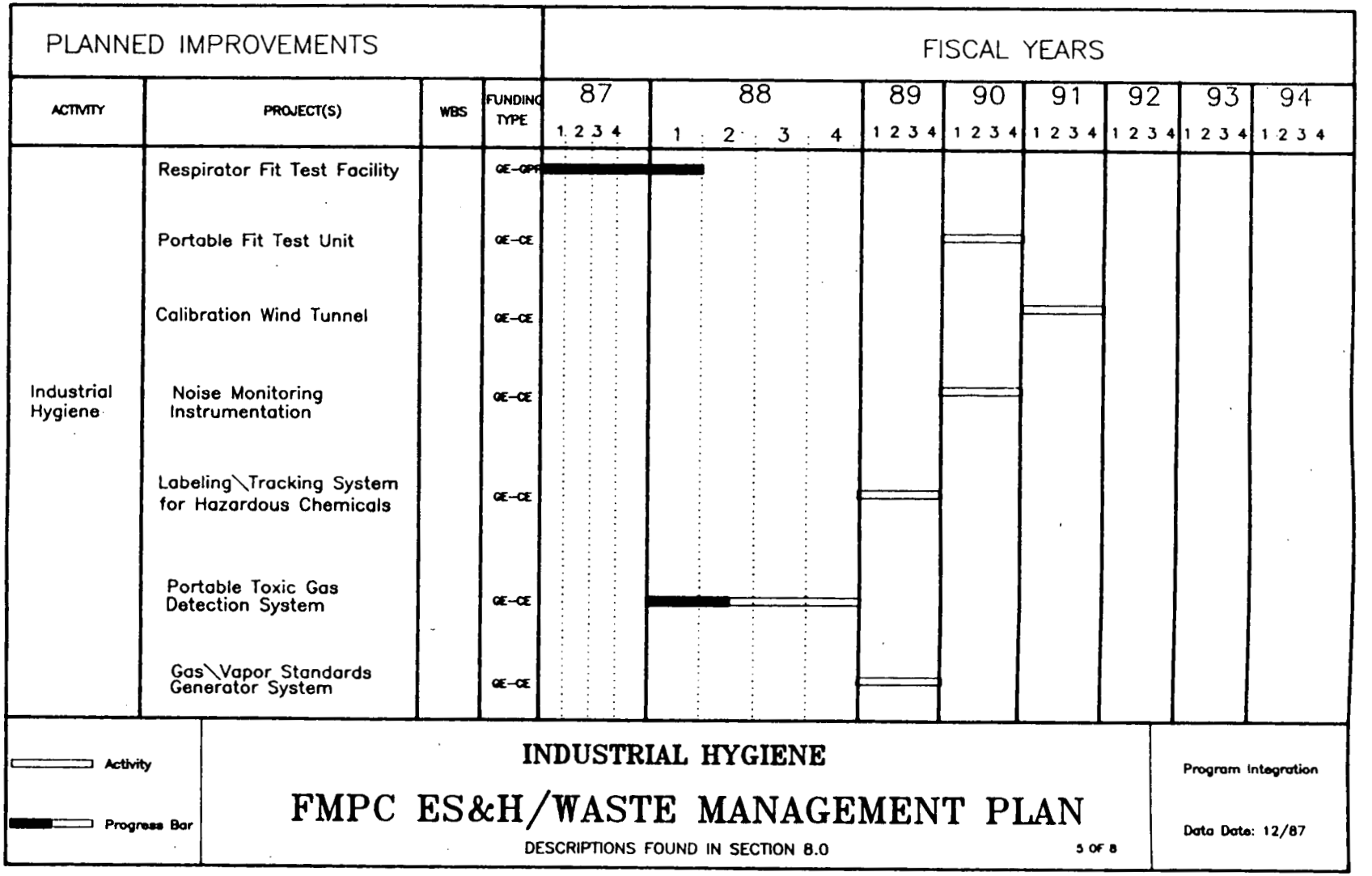
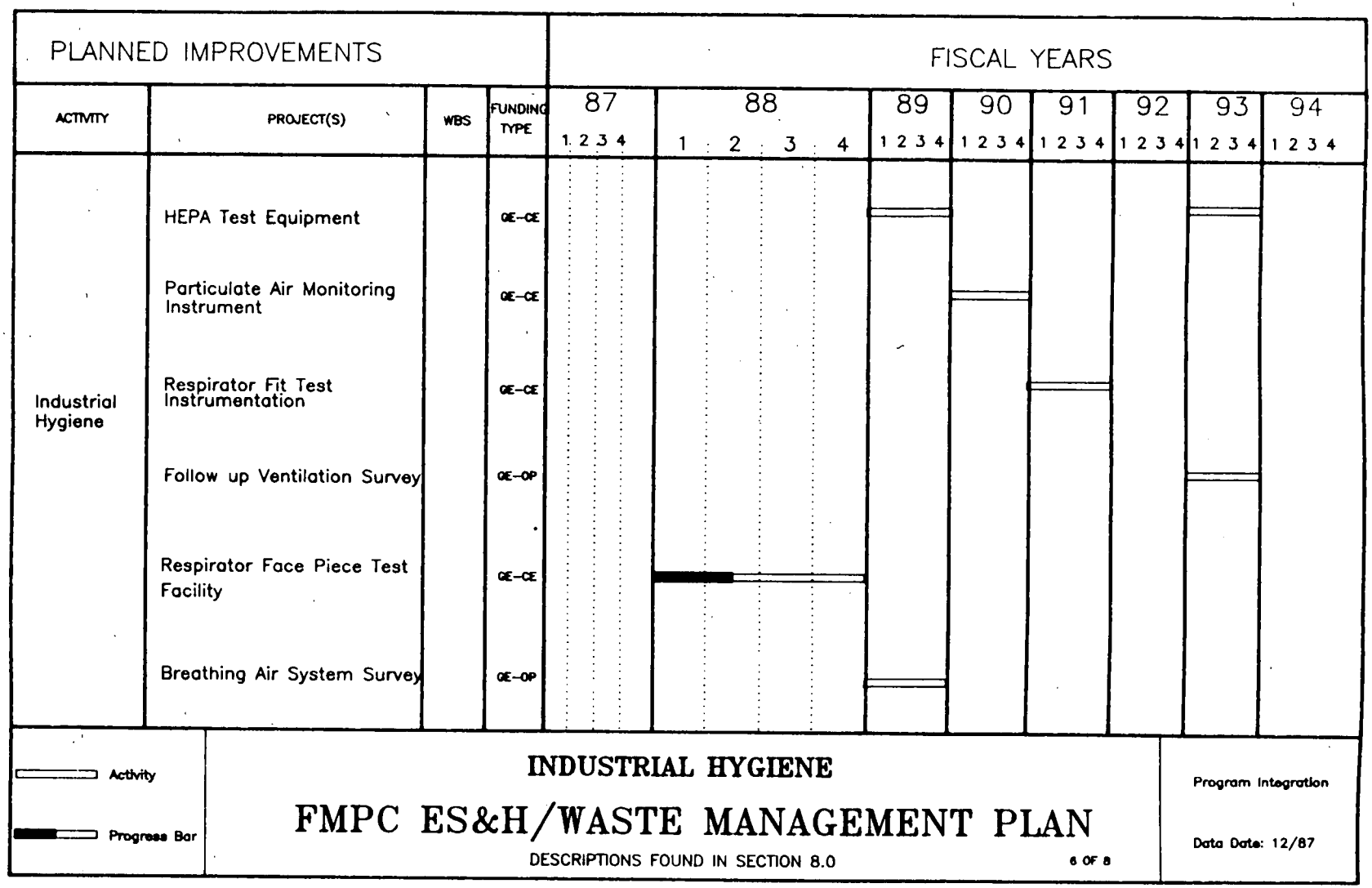


Figure 3-6. Industrial Hygiene Project Schedule



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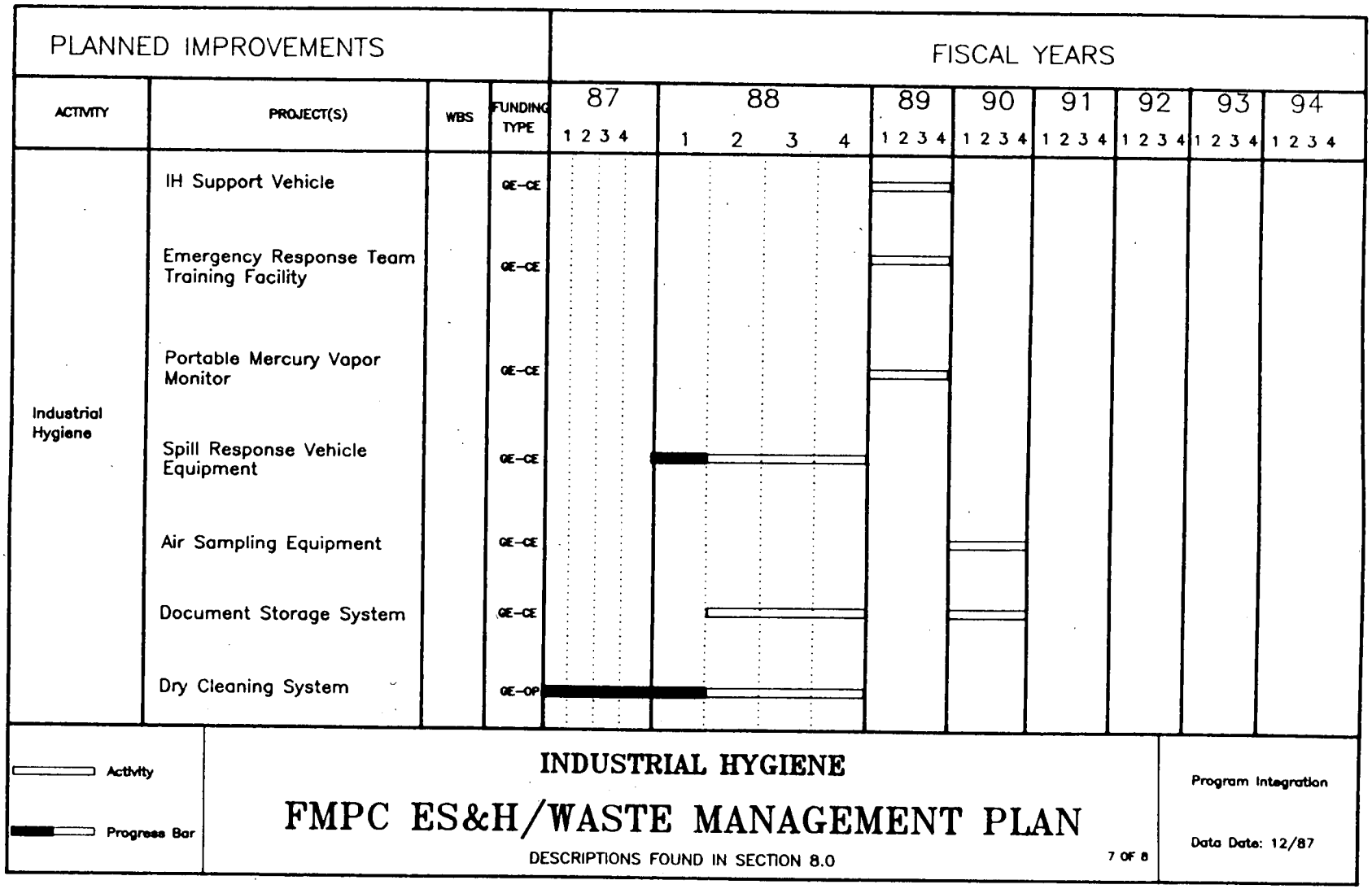

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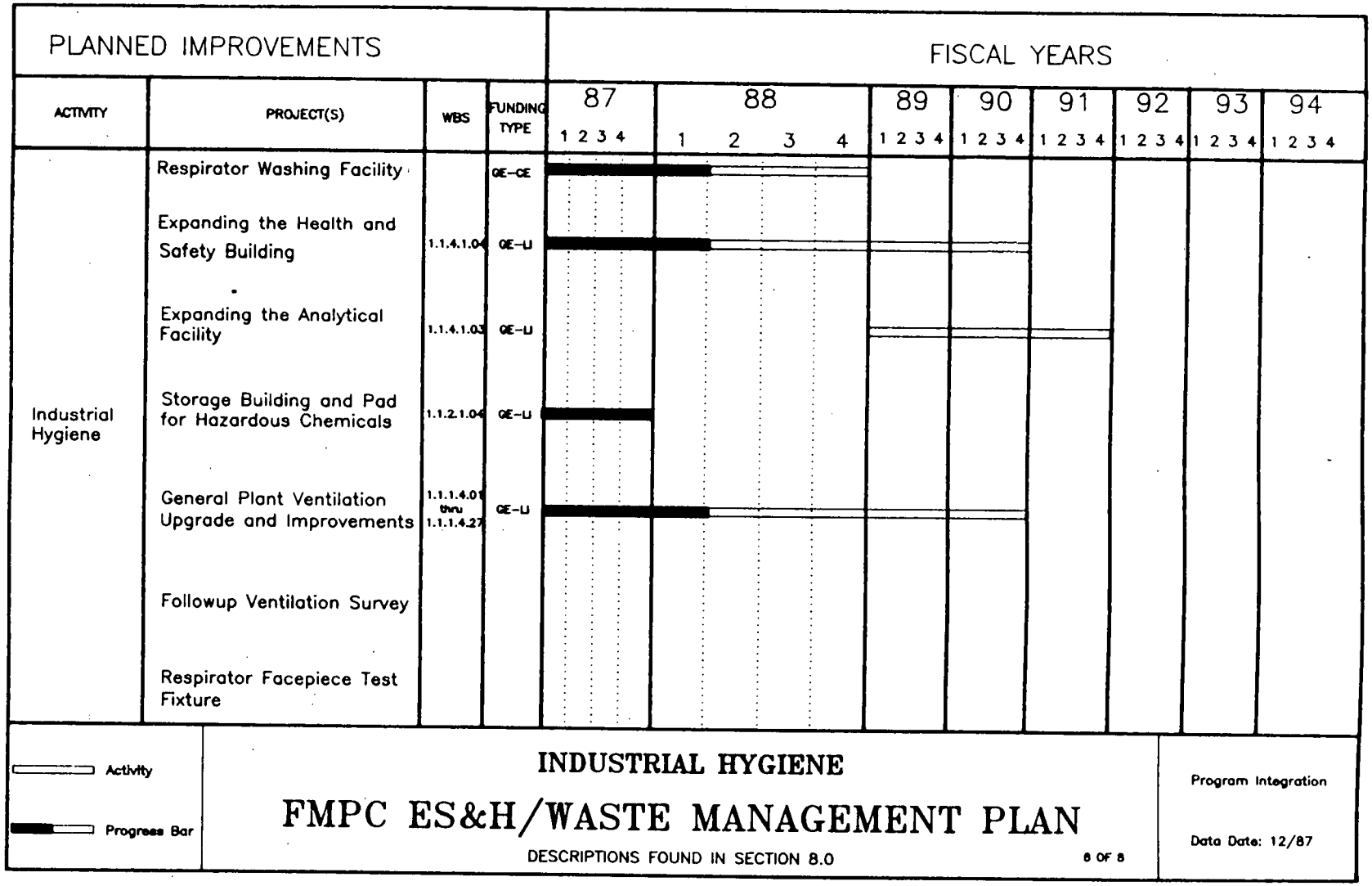

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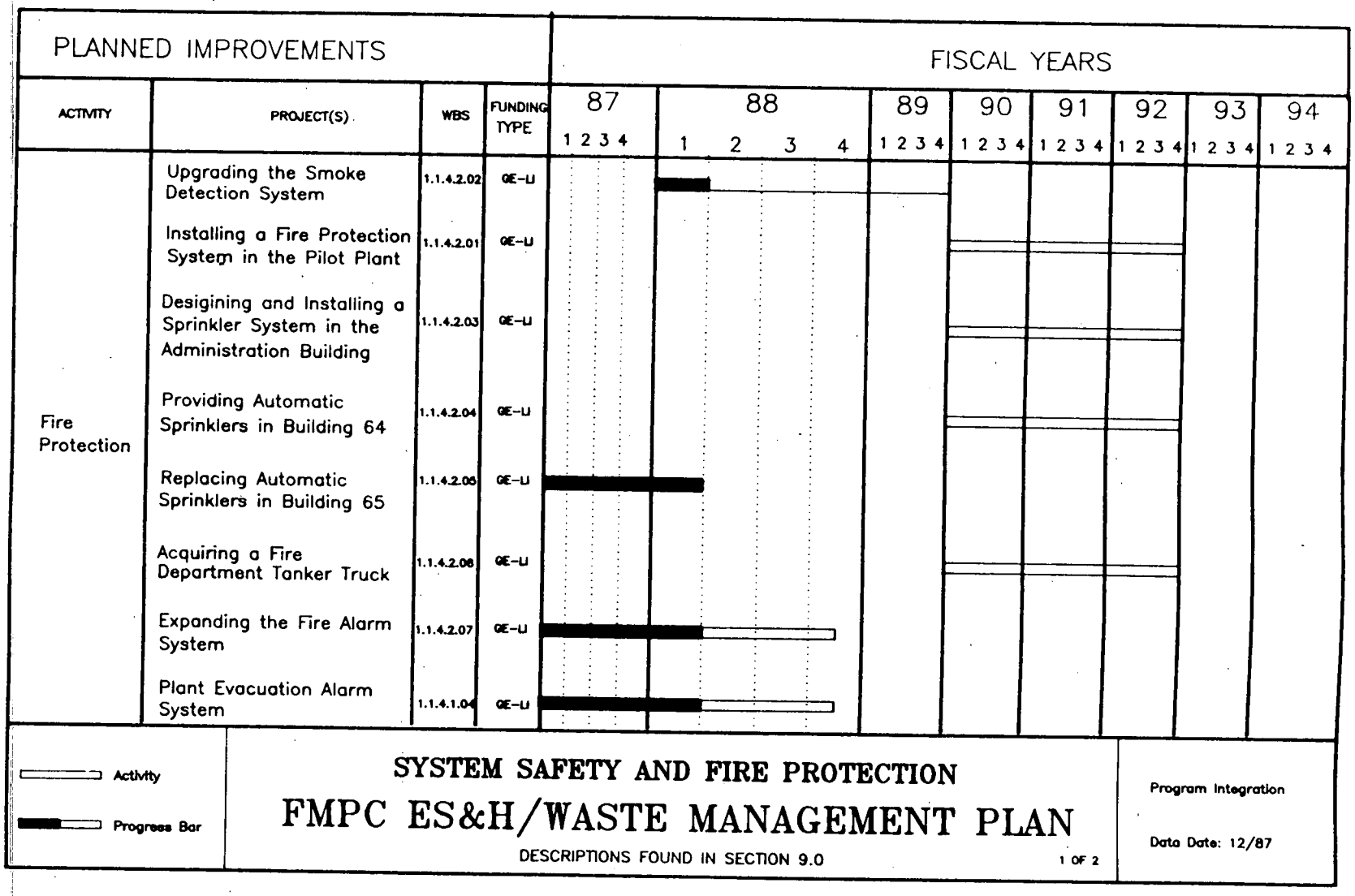
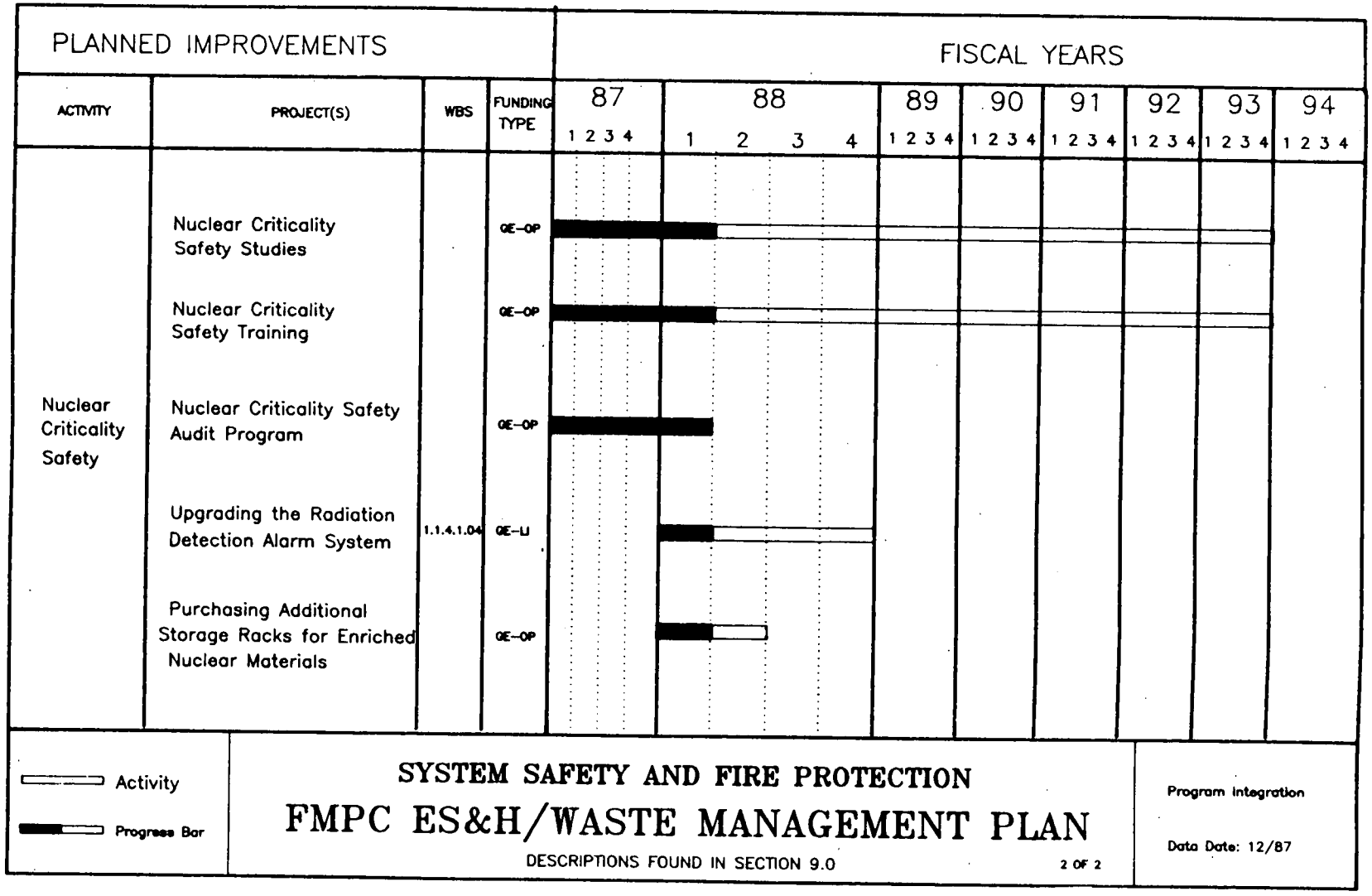


Figure 3-7. System Safety and Fire Protection Project Schedule



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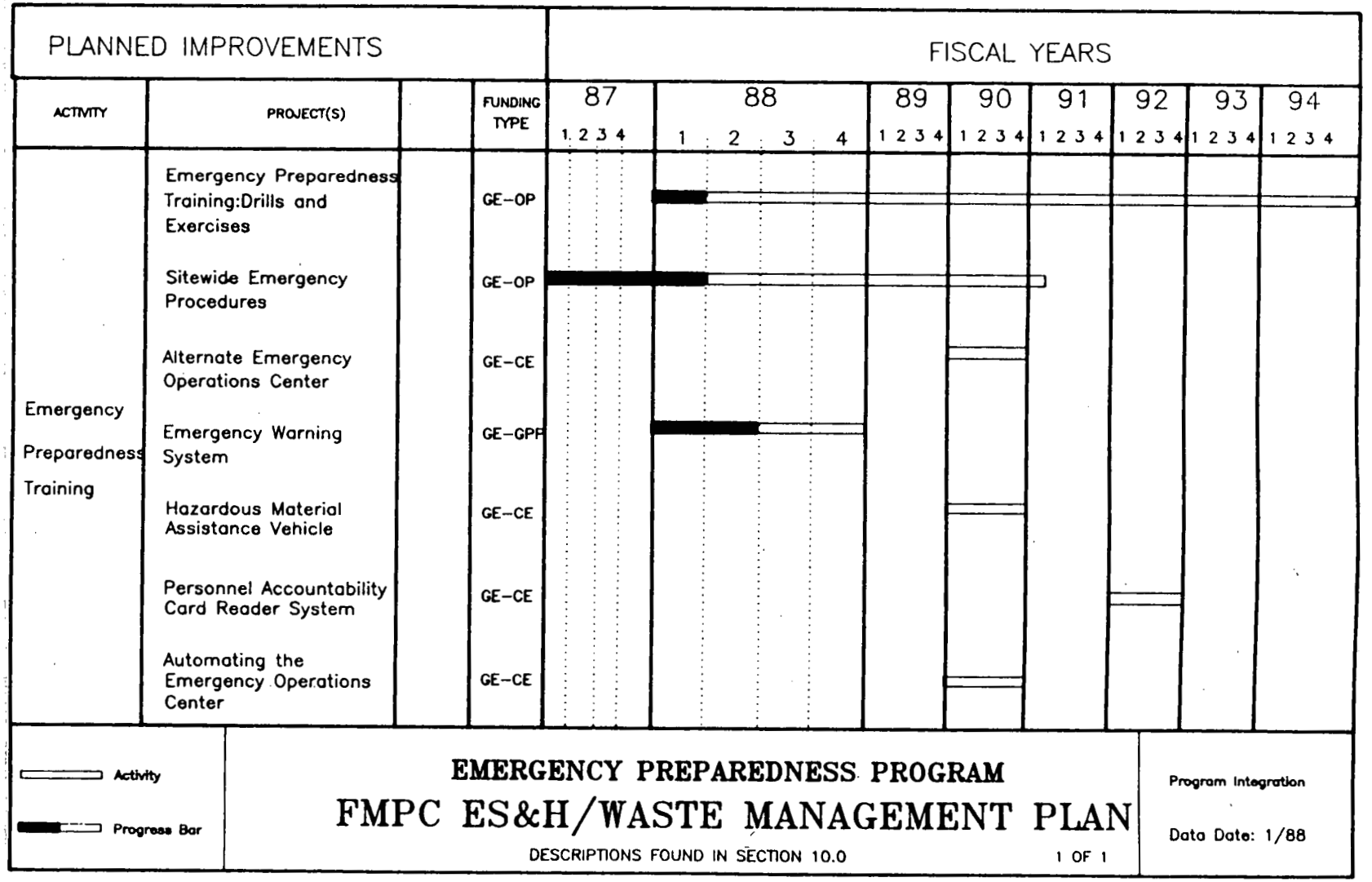

Figure 3-8. Emergency Preparedness Project Schedule

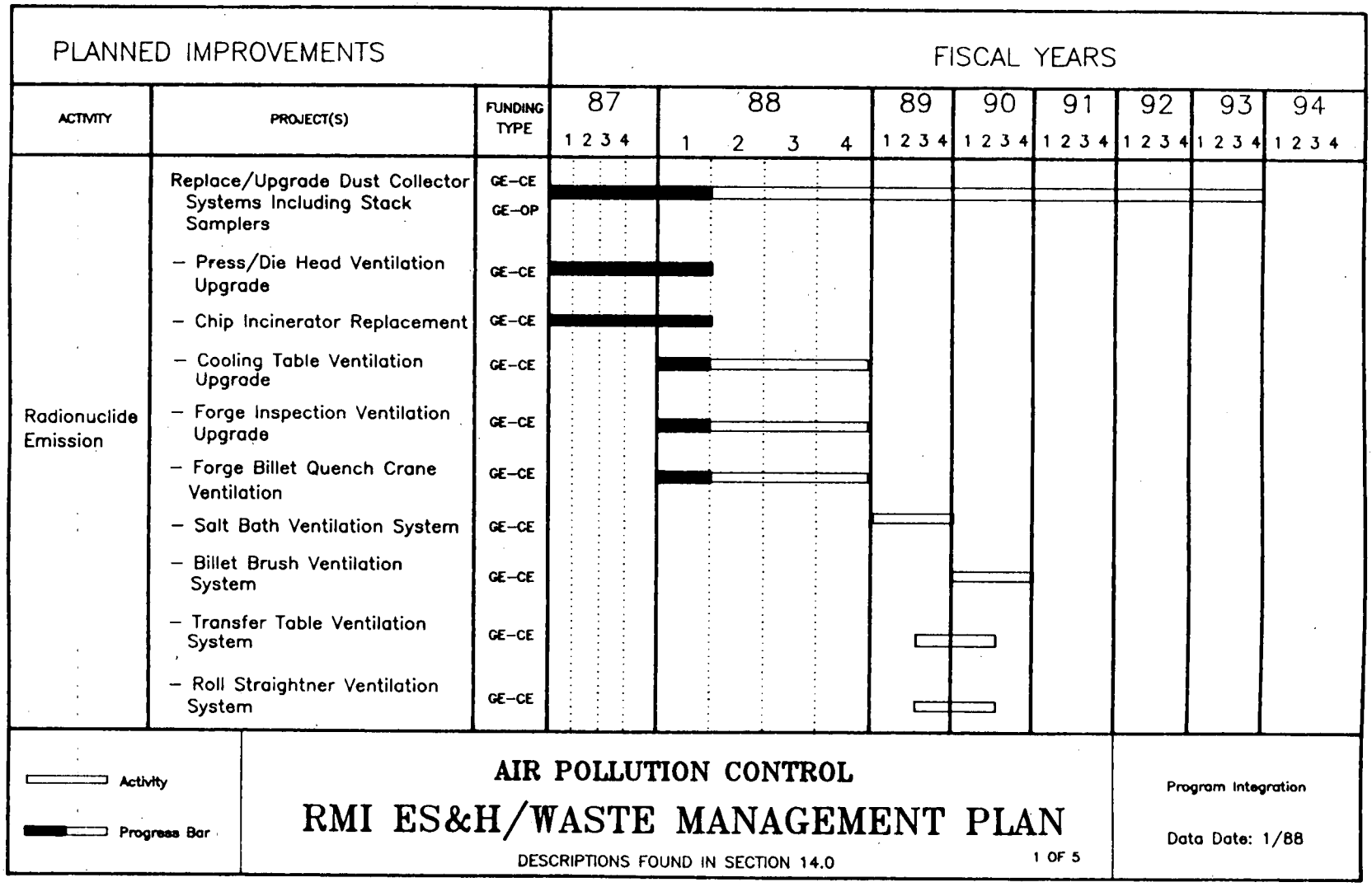

Figure 3-9. RMI Air Pollution Control Project Schedule

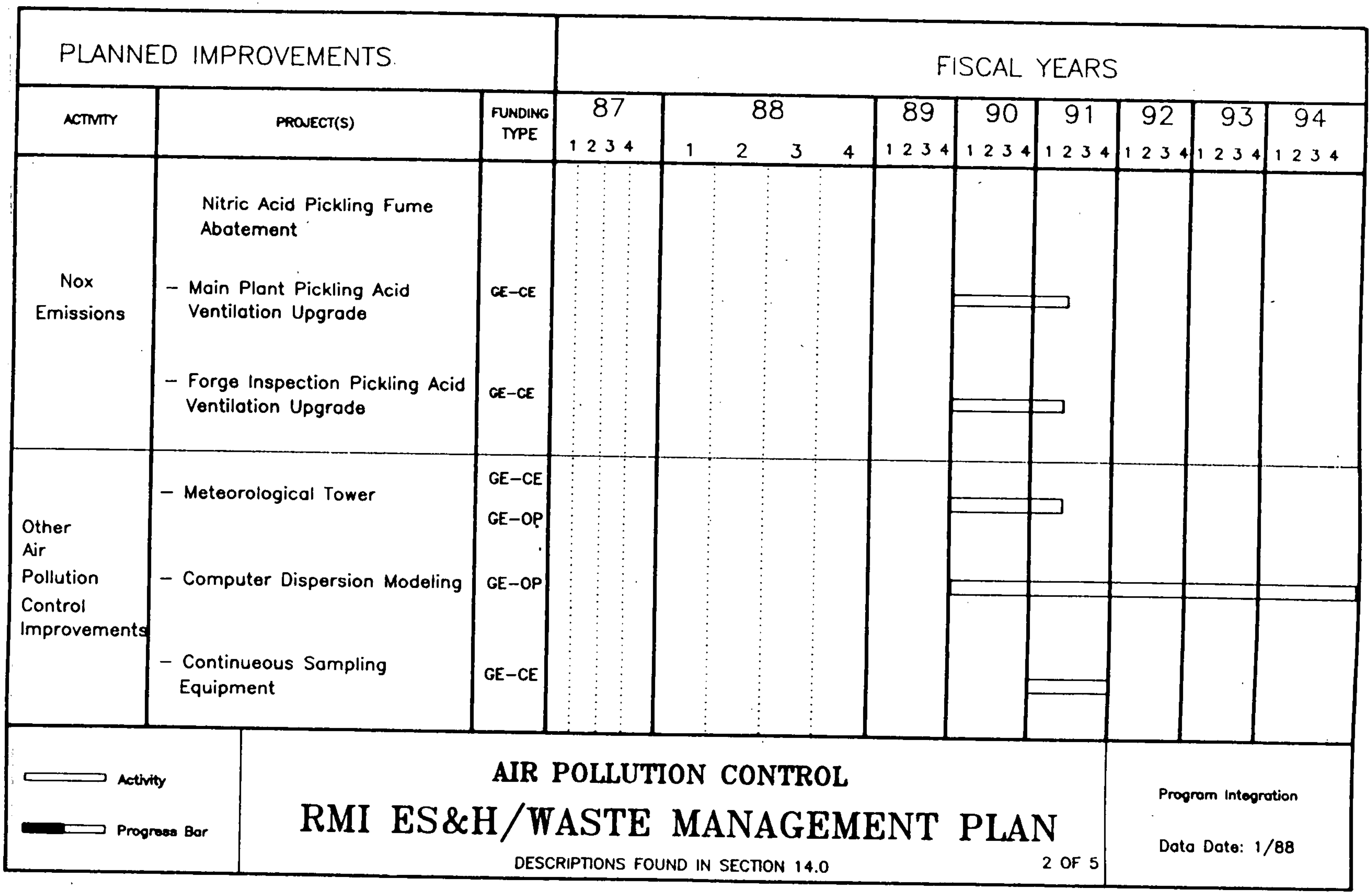

Figure 3-9. (Continued)

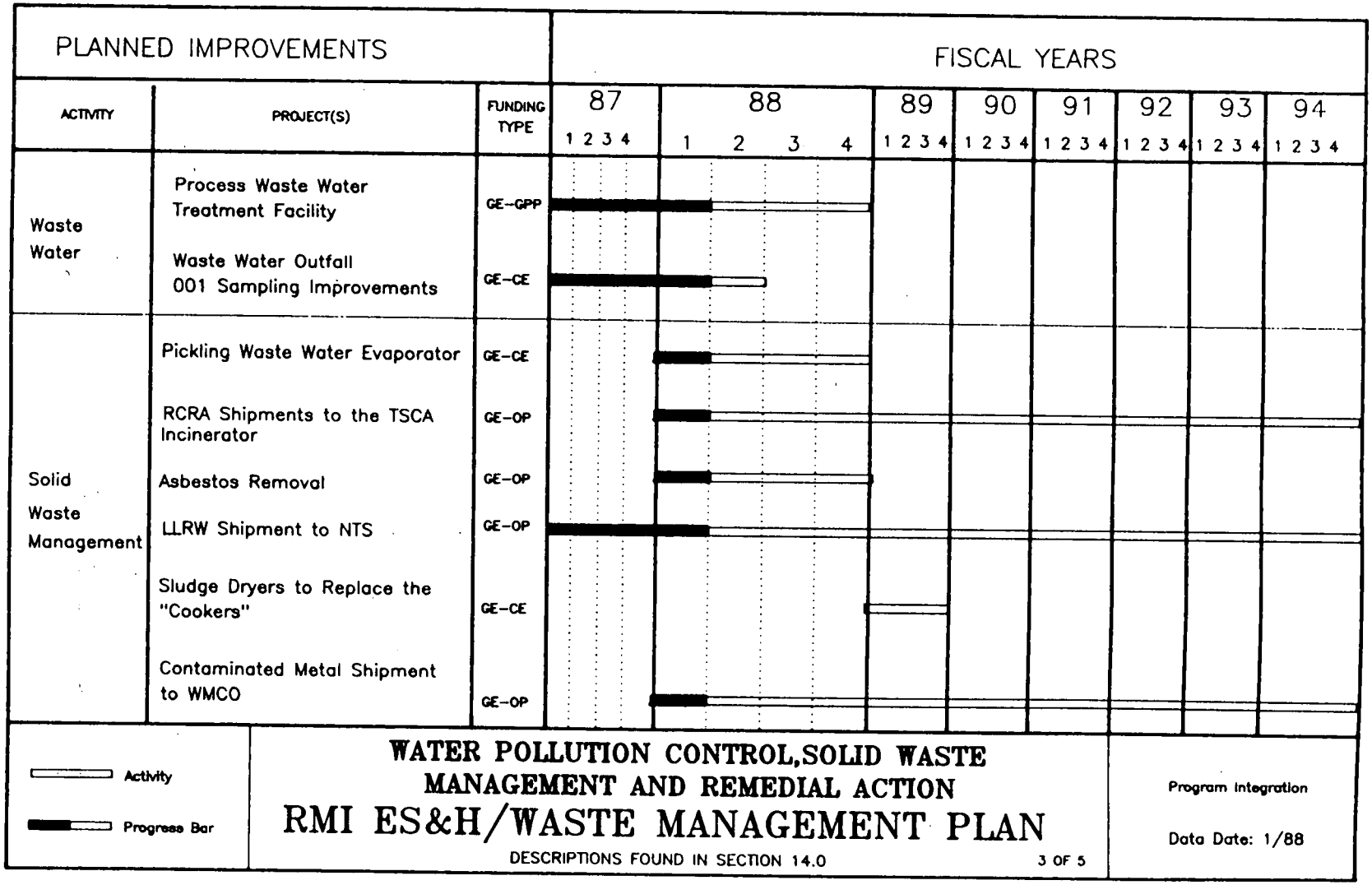

Figure 3-10. RMI Water Pollution Control, Solid Waste Management and Remedial Action Project Schedule

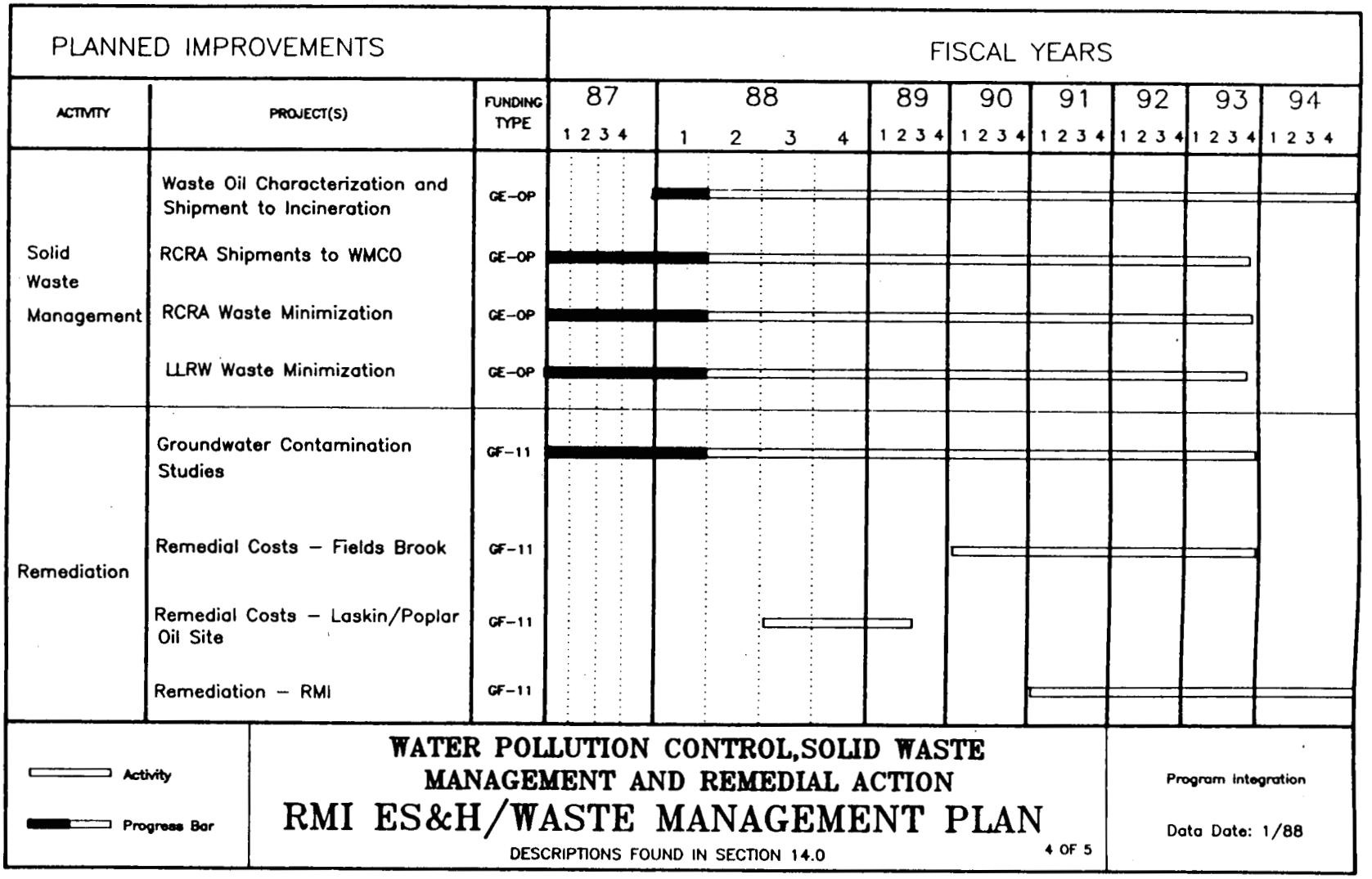

Figure 3-10. (Continued)

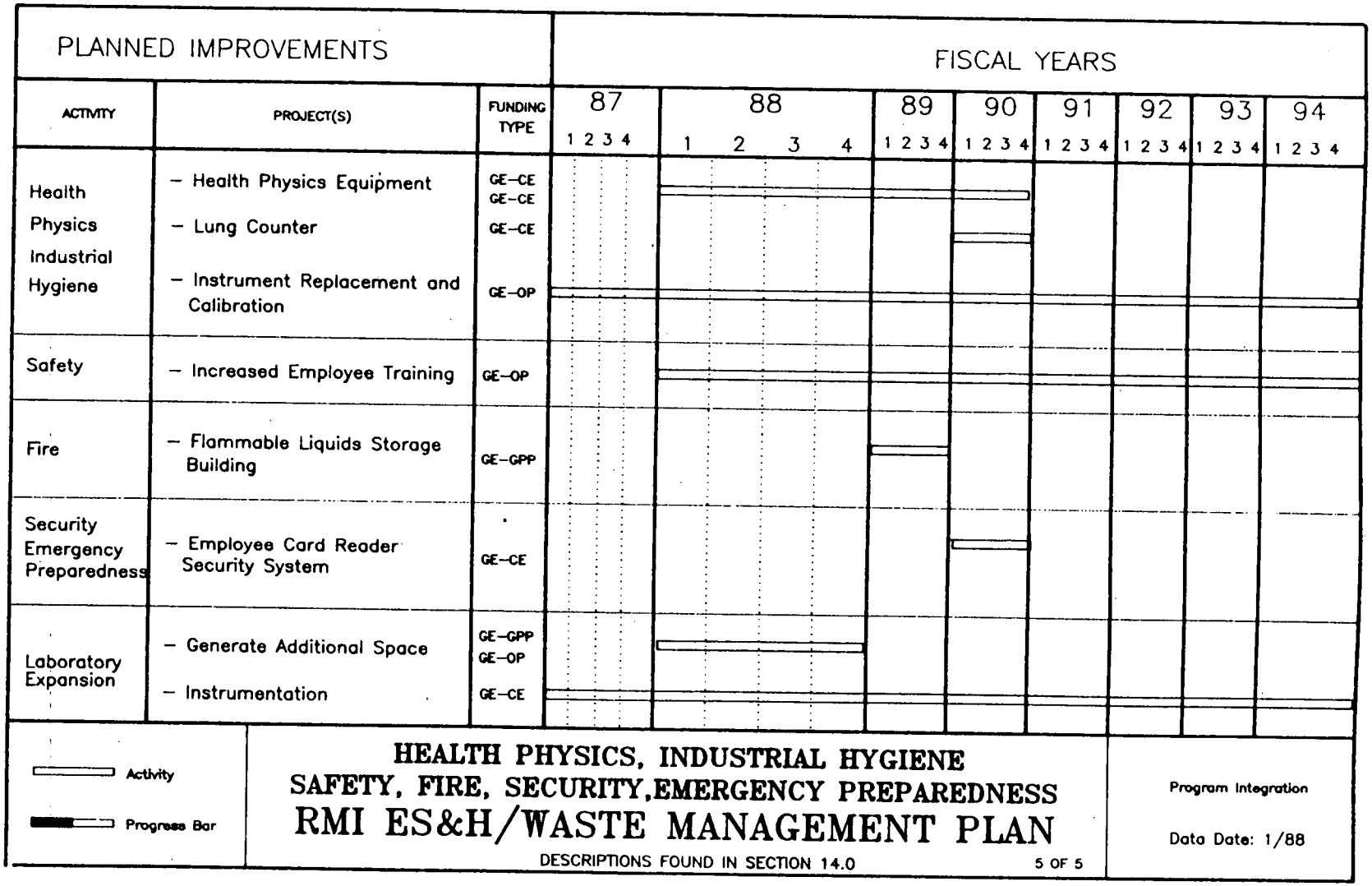

Figure 3-11. RMI Health Physics, Industrial Hygiene, Safety, Security, and Emergency Preparedness Project Schedule

4.0 Air Pollution Control

The major emphasis of the Air Pollution Control Program is to effectively minimize the discharge of air pollutants to the atmosphere from FMPC process emission points. By following the intent of the proposed ALARA program, WMCO will upgrade control equipment, improve equipment that generates emissions, and increase operational and administrative controls.

The Production Operations department is responsible for operating emission control equipment, exclusive of sampling/monitoring instrumentation. This department also has responsibility for preventive and routine maintenance on equipment that has the potential to emit pollutants into the atmosphere. Operational procedures involving emission control systems are reviewed and approved by the Environmental Compliance group prior to implementation.

Facility upgrades involving emission control systems and monitoring and sampling equipment are the responsibility of the Technical Services section of the Technical Department. Improvements to emission control systems are reviewed and approved by the Regulatory Compliance group prior to implementation.

4.1 Description of Air Pollutants at the FMPC

Emissions from the FMPC are generally limited to particulates containing low-level radioactivity, gaseous oxides of nitrogen (NOx), sulphur dioxide (SO2), trace amounts of hydrogen fluoride (HF), and kerosene fumes. The FMPC's largest category of air pollutants is particulate emissions, which generally contain some radionuclides. Particulates are classified as criteria pollutants in the Clean Air Act. (See Section 2.1 of this report.)

4.1.1 Air Pollution Control Strategy

The FMPC has more than 400 air emission sources which have the potential to emit pollutants to the atmosphere. An emission source is defined as an individual piece of equipment or process that generates a potential pollutant. An emission point is a stack or other device where emission actually occurs. Thus, many sources may be involved in a single emission point. To control particulates and gaseous emissions from these sources and points, the FMPC utilizes high efficiency dust collection and scrubber systems.

4.2 Air Pollution Control Facilities and Equipment

The FMPC has equipped 59 particulate emission points with stack samplers. These samplers draw a continuous sample from a fixed point within the stack across a pleated filter paper at an isokinetic rate. Technicians inspect the filter papers at least once a week, and when requested by Production Operations. The filter papers are changed if soiled. If soiling is not evident, the technicians change the filter papers at least monthly. The stack samplers on critical dust collectors are inspected at least twice a week and upon request. Upon removal, all filter papers are analyzed onsite to determine both particulate and uranium emissions. It is planned to analyze these samples for other radionuclides beginning in FY-88.

The isokinetic flow rate for each sampler is based upon velocity traverse data obtained in the stack. Traverse data are collected from each stack annually, and a representative sample flow rate is determined. The sampler flow rate is monitored weekly using a calibrated rotameter to confirm the accuracy of the panelboard rotometer. Plant personnel check panelboard rotameter settings hourly to ensure that the proper sampler flow is present. WMCO has refurbished FMPC stack sampler probes to minimize entrance disturbance to flow. A procedure to inspect the stack sample probes on a periodic basis will be initiated in 1988.

Twenty-three of the 59 FMPC stack samplers are currently equipped with Ludlum monitors. By continuously monitoring the air for radioactivity, a monitor activates an alarm at the control panelboard should the dust collector filter system fail. The 15 most recently installed monitors are also linked to the FMPC central alarm system in the Guardhouse Communications Center. All future monitors will be linked to the central alarm system.

A database of monitor count rate records has been established to statistically define optimum monitor activation-level settings. Monitors are calibrated electronically and inspected semiannually, and the settings will be modified, as appropriate, as the database is further refined. Panelboard alarms are checked every two weeks to ensure they are functioning properly.

WMCO has instituted a plantwide program to characterize emissions from all major process emission points based on the implementation of the FFCA. This program is being conducted by private consulting firms under contract to WMCO. Required particle size distributions and a radionuclide scan will be performed on collected materials from the tested dust collection system. This information will serve as input to collection system upgrade/replacement programs, permitting compliance and atmospheric dispersion modeling.

Tests, designated in USEPA regulations as "Method 5 Stack Tests," are performed on plant stacks on an as-needed basis. All compliance testing is performed in concurrence with OEPA by a private consulting firm under contract to WMCO.

To assess the effectiveness of the air pollution controls, 13 high-volume ambient air samplers collect continuous samples of airborne particulate matter. At each of the nine onsite stations and four offsite stations currently in operation, air is drawn through a 20 by 25 cm pleated filter paper at a rate of approximately 1 m^3 per minute. Samples from these units are collected and analyzed at weekly intervals for particulate emissions, uranium content and beta activity. Calibrations on the air sampler flow rates are checked once per week at the time the filters are changed, and the flow rates adjusted as necessary. Samples are composited quarterly to be analyzed for other radionuclides. A small sample of radioactive material assayed to determine the radioactivity of the entire sample is composited into a semiannual sample.

4.3 Quantity of Air Pollutants Discharged

The FMPC has discharged an estimated 21.5 kg of uranium from particulate stacks and scrubbers in 1987, through the month of September. Data presented in Table 4-1 shows most of the emissions occurred from the Plant 8 scrubbers. The scrubber data are estimates since conventional samplers cannot be used due to the high moisture content of the gas. The estimation takes into account operating hours, material feed rates, and other critical emission factors. Because the algorithum for determining the release rates is based on 1987 data, a program of scrubber testing will be initiated in FY-88 to validate the current estimation methods. The tests will be performed by the Roy F. Weston Company.

TABLE 4-1
SUMMARY OF 1987 URANIUM EMISSIONS FROM PARTICULATE STACKS AND SCRUBBERS
(Data through 9/87)

Emission Source	Total U Emissions(kg)	% of FMPC Total Emissions
Plant 1	0.0	0.0
Plant 2/3	0.0	0.0
Plant 4	0.5	2.3
Plant 5	0.9	4.2
Plant 6	0.0	0.0
Plant 8	0.7	3.3
Plant 8 Scrubbers	19.4	90.2
Plant 9	0.0	0.0
Pilot Plant	0.0	0.0
Laboratory	0.0	0.0
Total Emissions	**21.5 kg**	

4.4 Description of Air Pollution Projects

Extensive improvements and procedural updates for air pollution control are planned at the FMPC and are concentrated in three areas:

- Improving control of airborne radionuclide emissions (Section 4.4.1)
- Reducing the level of NOx and other criteria pollutants (Section 4.4.2)
- mproving air pollution control and monitoring (Section 4.4.3).

The planned improvements are discussed in the following paragraphs and the fiscal year funding requirements are presented in Table 4-2.

TABLE 4-2
FUNDING SUMMARY FOR WATER POLLUTION CONTROL
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	3,500	1,200	400	410	1,420		35	35
GE-LI	102,948	21,004	24,730	26,769	1,945	16,700	5,900	5,900
GE-OP	23,850	4,715	5,645	4,750	3,815	1,575	1,650	1,700
GE-GPP	1,344	869	475					
Totals:	131,642	27,788	31,250	31,929	7,180	18,275	7,585	7,635

KEY

GE-CE - Capital Equipment from GE Budget
GE-LI - Line Item Projects from GE Budget
GE-OP - Operating Funds from GE Budget
GE-GPP - General Plant Projects from GE Budget

4.4.1 Improving Control of Airborne Radionuclide Emissions

The one planned improvement in the radionuclide emission control area is discussed in the next paragraph.

Replacing/Upgrading of Dust Collection System: The majority of existing FMPC dust collection equipment is from 20 to 30 years old, and most systems are at or are approaching the end of their original design life. Therefore, the FMPC is developing a program to replace these plant dust collection systems. These systems will include state-of-the-art dust collection equipment, high efficiency particulate filters (HEPA) if necessary, isokinetic samplers, and monitors with alarms. This subproject is

included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.1.3.01 through 1.1.1.3.17.

4.4.2 Reducing the Level of NOx and Other Criteria Pollutants

The four planned improvements specifically designed to reduce the level of criteria pollutants at the FMPC are described in the paragraphs that follow this list:

- Installing a NOx destructor at Plant 9
- Electrostatic precipitator at the Boiler Plant
- Modifying the nitric acid recovery tower.

NOx Destructor at Plant 9: The FMPC uses nitric acid to recover uranium from the pickling of scrap materials in Plant 9. The FMPC will install a scrubber to reduce NOx emissions from the pickling operation and to protect employees from NOx fumes. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.1.1.01.

Electrostatic Precipitator at the Boiler Plant: Boiler No. 4 is currently in standby status and has not been operated in recent years. A backup boiler is needed to ensure that steam generation for the site is maintained should one of the operating boilers malfunction. To meet current OEPA emission control standards, an electrostatic precipitator will be installed prior to boiler startup to remove particulate matter from the boiler offgas stream.

Installing a NOx Destructor at Plant 6 Pickling: Scrap and core pickling operations in Plant 6 discharge visible NOx emissions to the atmosphere. New NOx destructors will be installed on existing pickling equipment to reduce NOx emissions to a clear-stack condition. This subproject is included in the PRP Line Item 86-D-149.

Modifying the Nitric Acid Recovery Tower: The existing nitric acid recovery tower removes NOx and nitric acid fumes from the offgases of Plant 2/3. Modifications are necessary to improve equipment performance in order to further reduce NOx emissions. This subproject is included in the PRP Line Item 86-D-149.

4.4.3 Improving Air Pollution Control and Monitoring

The six planned improvements in the air pollution control and monitoring area are described in the paragraphs that follow this list:

- Installing additional air monitoring stations
- Implementing a development support program
- Upgrading operational procedures
- Developing the toxic atmospheric dispersion modeling system

- Stack testing
- Upgrading Exhaust Systems.

Installing Additional Air Monitoring Stations: Additional high volume air monitoring stations and associated controls are required for selected onsite and/or offsite locations. The location of offsite air monitors is based on meteorological data, availability of electrical power, access to the location, and agreement with property owners. Currently there are thirteen air monitoring stations located around the FMPC; WMCO will install additional monitoring stations to improve their assessment of the airborne environmental impact of FMPC operations (Figure 4-1). This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.1.2.01.

Implementing a Development Support Program: A development program will be established to optimize both engineering design and operational procedures by evaluating new control technology and source and process modifications to reduce potential emissions.

Upgrading Operational Procedures: Both production and environmental sampling/monitoring procedures (SOPs) are being revised to incorporate the newly issued, more stringent requirements of the CAA and CERCLA. Emphasis is initially being placed upon updating SOPs involving critical control systems. Tight preventive maintenance and inspection procedures have been implemented on all air emission systems involving potential radionuclide emissions in accordance with the strict standards established through NESHAP and CERCLA legislation.

Developing the Toxic Atmospheric Dispersion Modeling System: A computer system is being developed to model the dispersion of accidental atmospheric discharges from the FMPC, and to collect, store, and manipulate source-release data. The software will accept inputs to model emissions from a variety of onsite sources. The input information will be retrievable and itemized according to source, time, location, height and amount of emission. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.1.04.

The objectives of the Air Pollution Modeling Program are to:

- Provide timely and accurate atmospheric dispersion information in the event of a release of gaseous or airborne radioactive material such that the path of the plume can be determined and its impact evaluated
- Assist emergency personnel in making a decision to evacuate or shelter employees and the public if necessary
- Provide a record of plume behavior after an accidental release to document which locations were affected.

The model, which will be developed by the National Oceanic and Atmospheric Administration (NOAA), will be activated in parallel with the FMPC Emergency

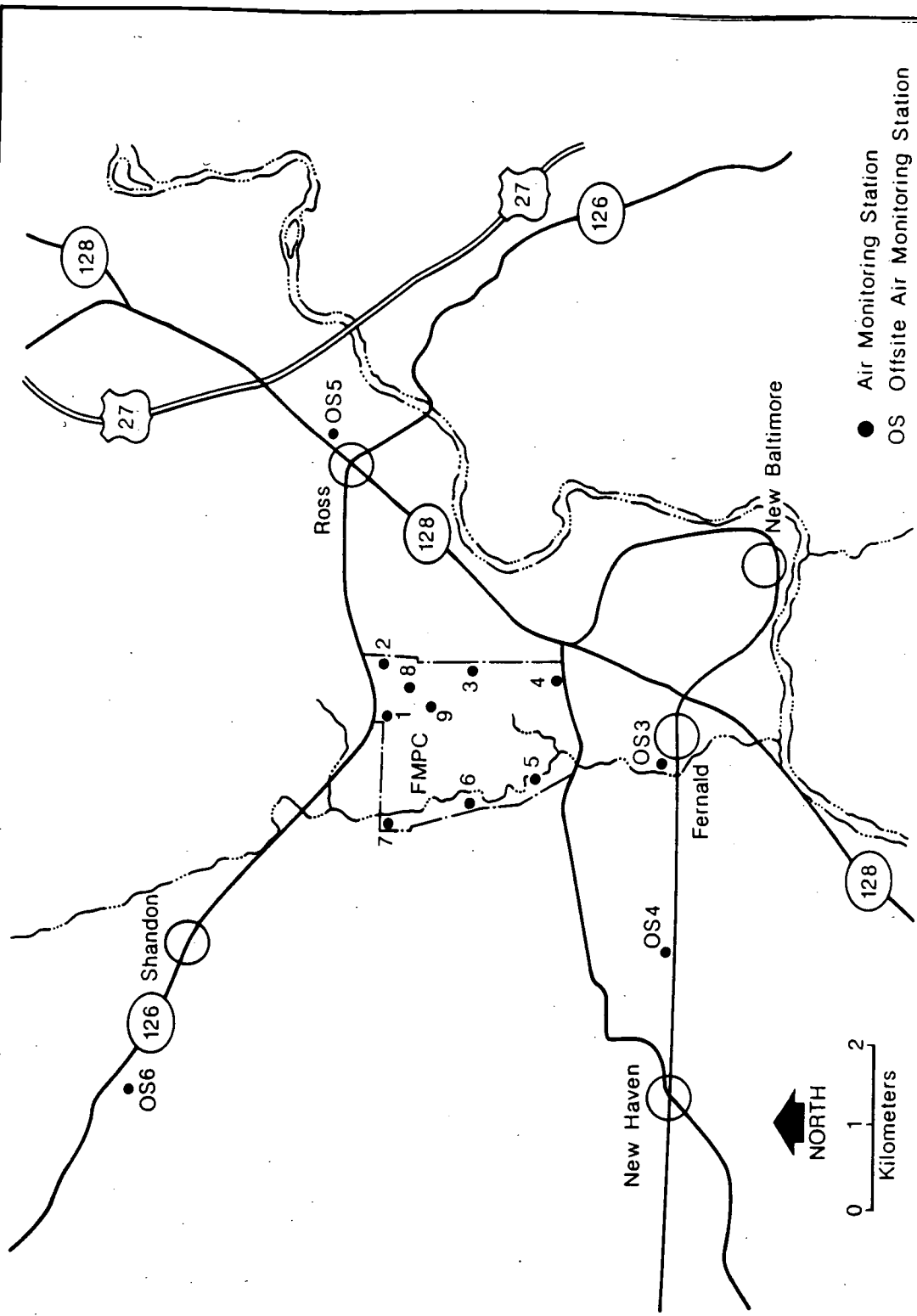

Figure 4-1. Air Monitoring Stations

Operations Center (EOC). NOAA performed a study in 1987 to determine the topographical effects on the local meteorological conditions in the vicinity of the FMPC. The results will be incorporated into the model's development to accurately reflect plume dispersion.

The computed trajectory of the effluent plume will be based on the source of emissions, the plume's height, and meteorological data obtained from the FMPC meteorological tower. The tower provides wind speed, direction, stability class, and temperature data for these calculations.

Stack Testing: Stack compliance testing using USEPA methods and procedures for determining compliance with OEPA limits will require outside services during the period through FY-94.

Upgrading Exhaust Systems: The majority of exhaust systems at the FMPC are 20 to 30 years old and inefficient. Therefore, the FMPC is developing a program to update the plant exhaust systems. Those exhaust systems no longer required will be removed, new systems added where required, and inefficient exhaust systems will be updated with the latest technology. This subproject is included in the EHSI Line Item Project, reference WBS 1.1.1.5.01 through 1.1.1.5.06 and 1.1.1.5.09 through 1.1.1.5.24.

5.0 Water Pollution Control

It is a WMCO priority to eliminate the potential for contaminating the local surface waters and underlying groundwater due to FMPC operations that generate liquid wastes. These liquid waste streams are classified as either production wastewater, sanitary wastewater, or stormwater runoff.

5.1 Description of Water Pollutants at the FMPC

The first step in controlling the migration of water pollutants into the environment is to identify the pollutants in each waste stream and their sources.

5.1.1 Production Wastewater

All wastewater generated from uranium production processes is collected and treated in plant sumps, the General Sump, the Biodenitrification Facility (BDN), and the Sewage Treatment Plant before discharge to the Great Miami River. Sources of process waste streams are shown in Figure 5-1.

Process wastewater pollutants in the FMPC effluent stream of primary concern include:

- Nitrates
- Fluorides
- Hexavalent & total chromium
- Nickel
- pH
- Gross alpha and beta activities.
- BOD
- Fecal Coliforms.
- Ammonia
- Suspended solids
- Uranium
- Iron
- Copper
- Technetium
- TSS

5.1.2 Sanitary Wastewater

Sanitary wastewater from various potable water uses is collected and treated at the FMPC Sewage Treatment Plant before it is discharged into the Great Miami River. The primary pollutants in sanitary wastewaters are:

- Fecal coliforms
- Total suspended solids (TSS)
- Biochemical oxygen demand (BOD)
- Uranium
- Residual chlorine.

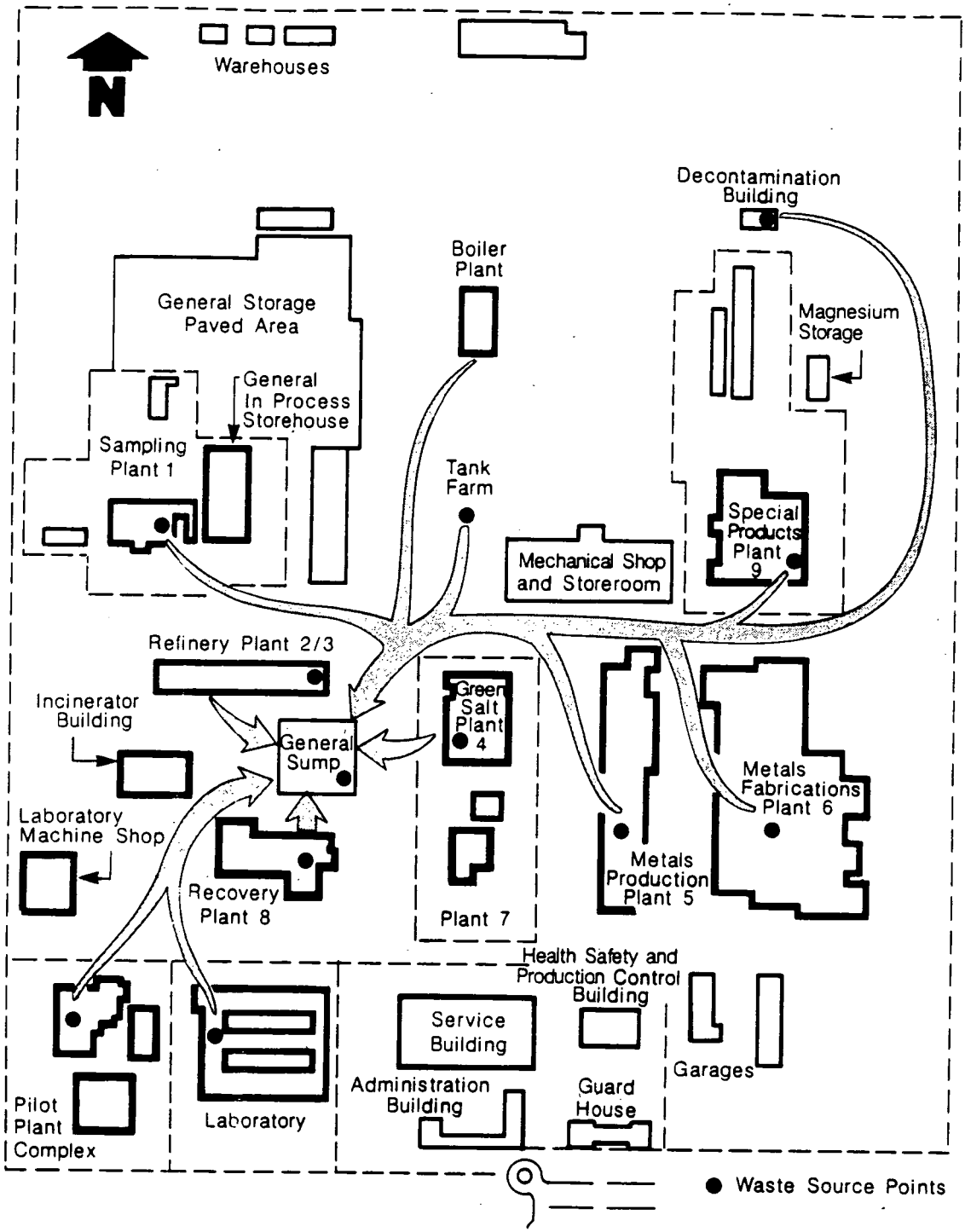

Figure 5-1. Sources of Production Wastes Collected & Treated in the General Sump

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5.1.3 Stormwater Runoff

Depending upon the intensity and duration of a rainfall, stormwater runoff from the production area is either collected and immediately pumped to the Great Miami River via Manhole-175, or flows by gravity to the Emergency Spill Containment/Stormwater Retention Basin System. Some of the solids in the water settle in the basin, and then the water is pumped to the Great Miami River. Should the runoff fill the Stormwater Retention Basin, the water will flow via a spillway into the stormsewer outfall ditch which flows into Paddy's Run.

Most of the runoff from stormwater that falls directly on the waste pits is collected in the Clearwell and is currently pumped to the Great Miami River via Manhole-175. Runoff from Pit 4 is collected, sampled and pumped into Pit 6, which in turn is pumped to the biodentrification system for treatment. Runoff from the area surrounding the pits flows into Paddy's Run. Primary pollutants in stormwater runoff include suspended solids and uranium.

5.2 Water Pollution Control Facilities and Equipment

The FMPC uses several wastewater treatment technologies to minimize pollutant discharges into the Great Miami River. A block diagram of the current wastewater treatment facilities is shown in Figure 5-2. All production plants which produce liquid effluents have plant sumps to collect and initially treat process wastewater by precipitation and sedimentation. This removes more than 99% of the contained uranium. Effluents from the plant sumps are collected at the General Sump for neutralization with lime and precipitation. Sludges from the plant sump treatment operations are taken to Plant 8, where they may be processed to recycle uranium. The filtrates generated in this process are returned to the General Sump. Neutralized wastewater from the General Sump is pumped to the Biosurge Lagoon from where it is processed in the Biodenitrification facility to remove nitrates. Following treatment at the Biodenitrification facility, the effluent containing high amounts of BOD and TSS is pumped to Tank 8 at the General Sump and aerated before it is discharged to the Sewage Treatment Plant. After treatment, the wastewater is pumped to Manhole-175 where it is discharged into the Great Miami River.

Sanitary wastes may contain small amounts of uranium from the laundry and showering facilities. Process effluent from the Biodenitrification facility also contains some uranium. The Sewage Treatment Plant removes some of the uranium. However, the effluent from the facility may still contain up to 2 mg/l uranium after treatment. WMCO is evaluating use of advanced water treatment (BAT) to remove uranium and other isotopes from FMPC effluents at Manhole-175.

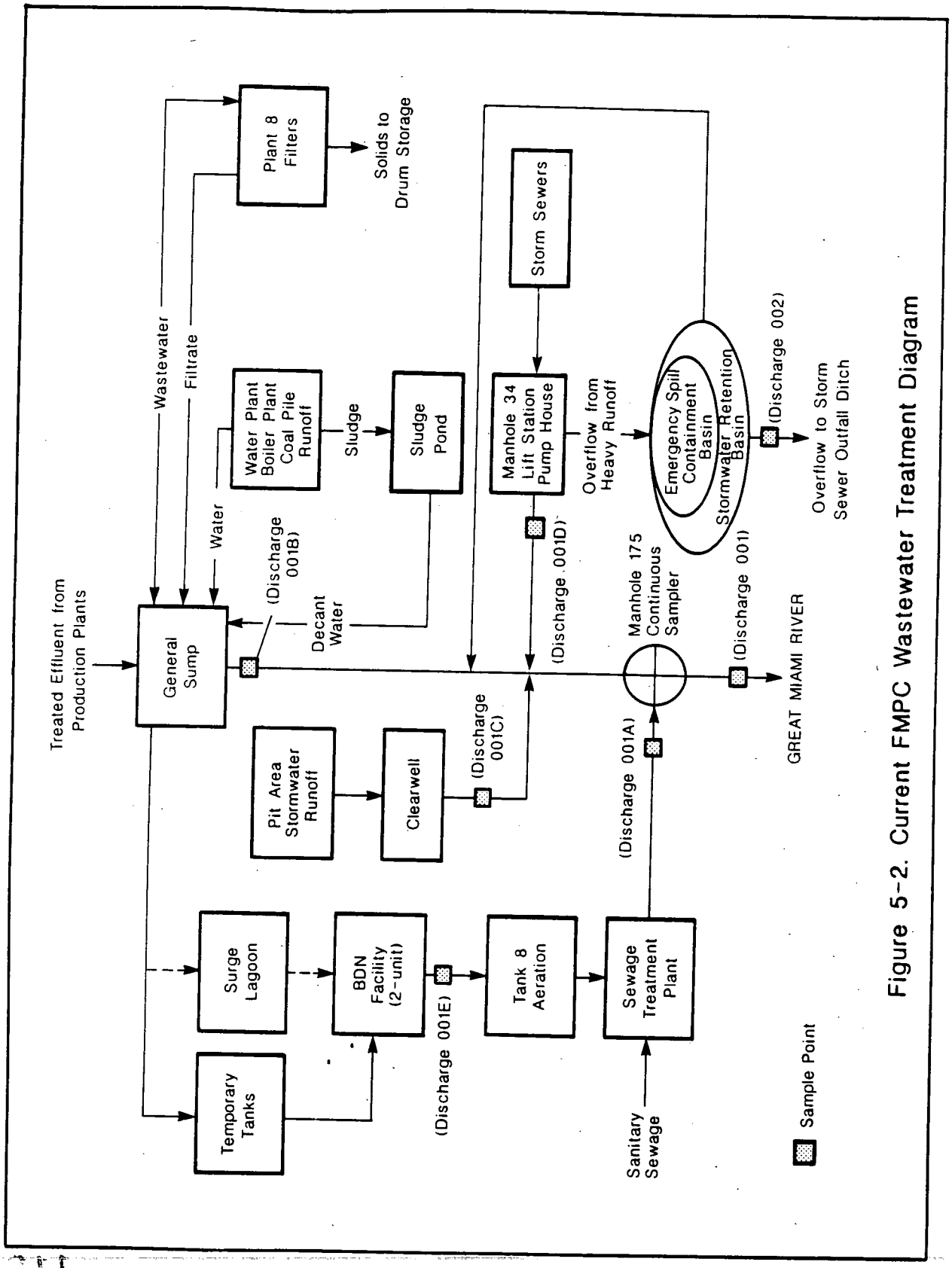

Figure 5-2. Current FMPC Wastewater Treatment Diagram

The FMPC's largest discharge of uranium is in the stormwater. Uranium can enter the system through accidental spills and runoff from uncontrolled pad areas and roadways. Accidental spills are routed to the Emergency Spill Containment Basin which contains them until they are subsequently pumped to the General Sump to remove uranium.

5.2.1 Monitoring the Liquid Waste Streams

Monitoring of the liquid waste streams consists of daily grab and composite samples along with flow metering at locations such as the General Sump, Storm Sewer Lift Station, Stormwater Retention Basin Overflow, Clearwell, Sewage Treatment Plant, the Biodenitrification Facility and Manhole-175.

Monthly composites from two of these sampling locations are analyzed for radium-226 and radium-228; semiannual composites are analyzed for other radionuclides. Some results are submitted monthly to OEPA as required by the National Pollutant Discharge Elimination System (NPDES) permit for the FMPC, while the remainder of the results are retained onsite to determine treatment efficiency. Monthly reports of total uranium and gross alpha and beta activities are also sent to the OEPA, ODH, and the USEPA as required by the FFCA. Approximately 150 analyses per month are performed on water samples taken solely for NPDES and radiation discharge reporting purposes.

Groundwater samples collected monthly from 10 onsite and 26 offsite wells are analyzed for uranium. Offsite wells are analyzed annually for other metals. Semiannual groundwater samples collected from 35 onsite and six offsite wells are analyzed for 94 parameters as outlined by RCRA guidelines. Location of these onsite and offsite monitoring wells is shown in Figure 5-3.

Daily grab samples are collected at Great Miami River sampling points W1 (upstream) and W3 (downstream) as shown in Figure 5-4; these samples are composited monthly for radium analyses. A weekly grab sample is collected at point W4, 7.5 km downstream from the confluence of Paddy's Run with the Great Miami River. At least one sample per week from each of the three river sampling points is analyzed for uranium, alpha and beta activity, chloride, fluoride, nitrates, TSS, and pH. Semiannual composites of river water from W1, W3, and W4 are analyzed for other radionuclides. Weekly grab samples are also collected from each Paddy's Run sampling location. These samples are analyzed for uranium, alpha and beta activity and pH. Chloride, fluoride and nitrate analyses are performed on one grab sample each month, while radium-226 and -228 are analyzed on bimonthly composite samples taken from the W5 location and monthly composite samples taken from the W7 location.

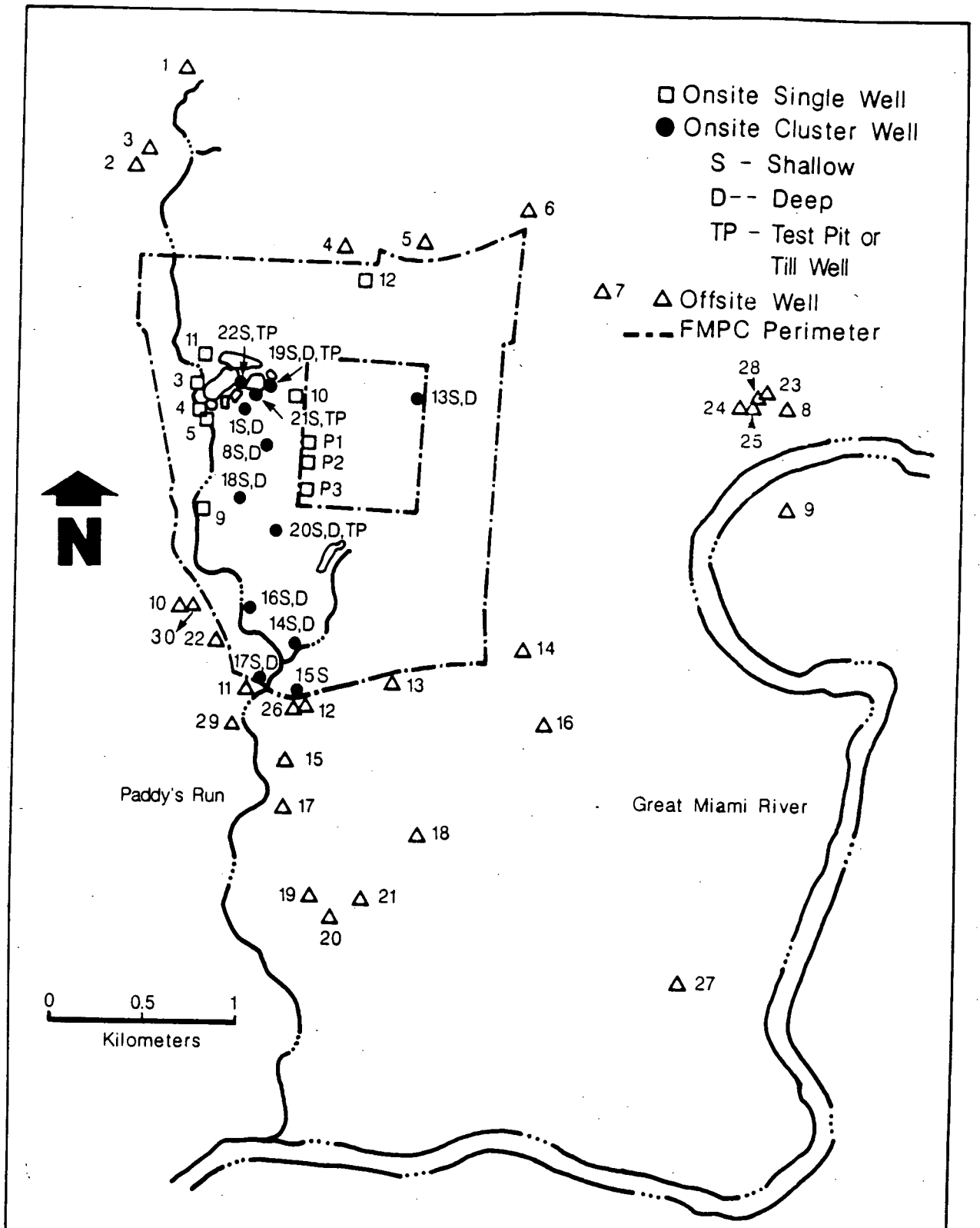

Figure 5-3. Monitoring Well Locations

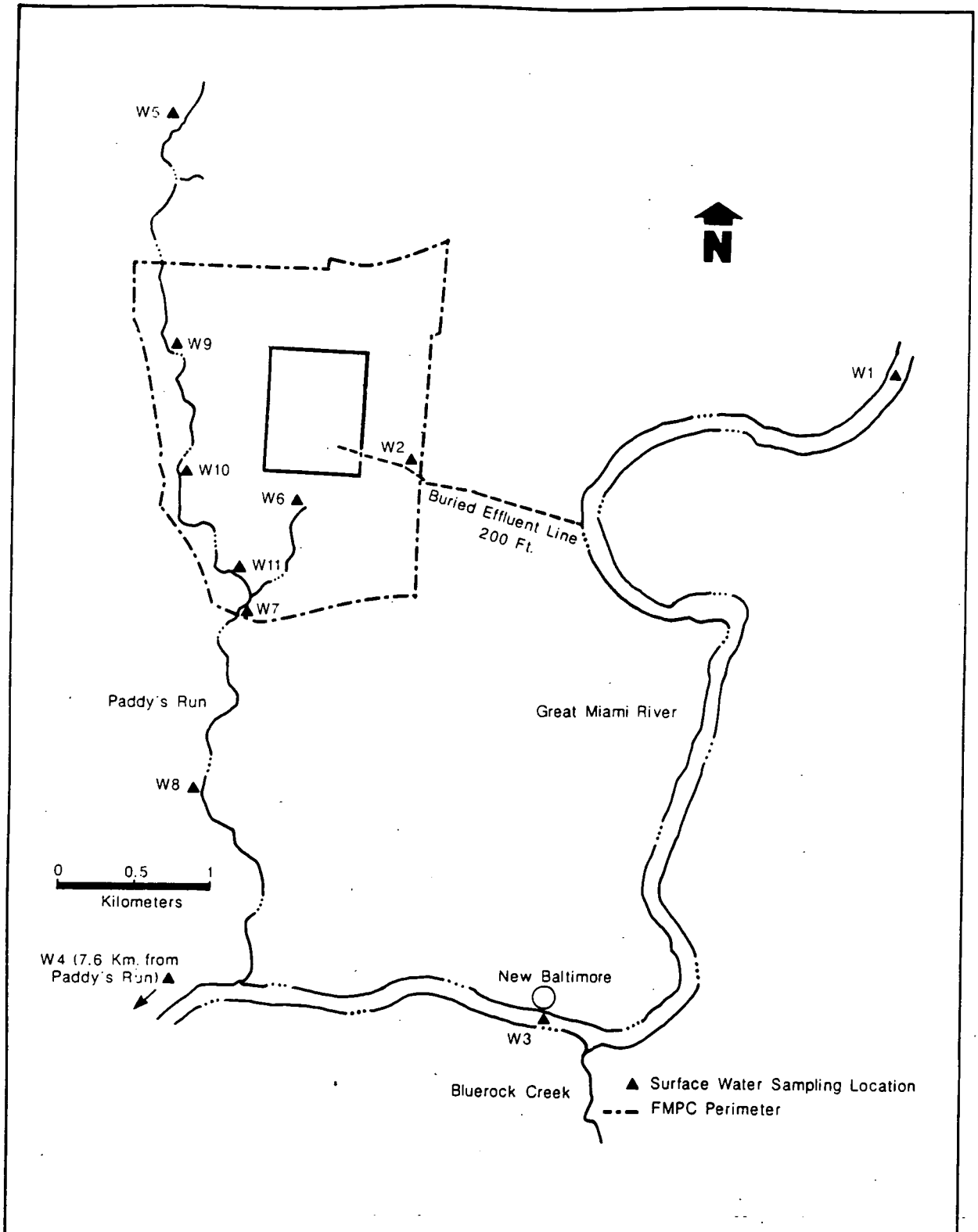

Figure 5-4. Surface Water Sampling Locations

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5.3 Quantity of Pollutants Treated or Discharged

Table 5-1 summarizes pollutants discharged from MH-175 into the Great Miami River in 1987. Table 5-2 summarizes the pollutants discharged into Paddy's Run via the Stormwater Retention Basin overflow in 1987. The major pollutant discharged

TABLE 5-1
ESTIMATED QUANTITY OF POLLUTANTS DISCHARGED TO THE GREAT MIAMI RIVER VIA MANHOLE-175 DURING 1987

Pollutant	Estimated Annual Discharge (Kg)
Flow	219,000,000 gallons
BOD	9125
TSS	12410
NH3-N	548
Oil & Grease	400
Residual Cl	8
NO_3-N	29200
Uranium	657
Cr +6	0.2
Total Cr	0.3
Fe	8
Ni	0.3
Cu	0.5
	Estimated Annual Discharge (Ci) *
Cs-137	0.001
Np-237	0.0001
Pu-238	0.0001
Pu-239/240	0.0001
Ra-226	0.0046
Ra-228	0.0041
Ru-106	0.01
Sr-90	0.0009
Tc-99	1.50
Th-232	0.00054
U-234	0.11
U-235	0.0059
U-236	0.02
U-238	0.18
U-Total	0.31

* Based on Measured 1986 Discharges

TABLE 5-2 QUANTITY OF POLLUTANTS DISCHARGED TO PADDY'S RUN VIA THE STORMWATER RETENTION BASIN OVERFLOW DURING 1987	
Pollutant	Estimated Annual Discharge (kg)
Flow	0.076 million gallons*
TSS	14.2
Oil and Grease	1.0
Uranium	0.1
* One-time overflow occurred on 7/13/87.	

into the Great Miami River from the FMPC is nitrate. The Biodenitrification facility will significantly reduce the mass of this pollutant. The Stormwater Retention Basin dramatically reduced the pollutant load discharged to Paddy's Run during 1987.

5.4 Description of Water Pollution Projects

The water pollution control system includes three general strategies for proposed improvements. The first strategy involves constructing facilities to prevent stormwater and accidental spills containing uranium and other pollutants from entering the environment. The second strategy involves renovating and improving wastewater systems to provide efficient treatment and collection capabilities and improve NPDES compliance. The third strategy involves increasing monitoring of effluent discharges and groundwater to better detect possible contaminant sources and potential migration pathways. The individual projects to improve the water pollution control system fall under these four categories:

- Treating production wastewater (Section 5.4.1)
- Collecting and treating stormwater (Section 5.4.2)
- Controlling runoff and containing spills (Section 5.4.3)
- Treating conventional wastewater (Section 5.4.4).

The planned improvements in the water pollution control system are discussed in the following paragraphs and the fiscal year funding requirements are presented in Table 5-3.

TABLE 5-3 FUNDING SUMMARY FOR WATER POLLUTION CONTROL ($ Thousands)								
Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	1,830	530	350	500	450			
GE-GPP	8,959	1,384	3,030	570	75	3,900		
GE-LI	115,065	2,515	19,570	26,846	58,134	8,000		
GE-OP	23,485	3,780	4,495	3,950	2,965	2,680	2,760	2,855
Totals:	149,339	8,209	27,445	31,866	61,624	14,580	2,760	2,855

KEY

GE-CE - Capital Equipment from GE Budget
GE-GPP - General Plant Projects from GE Budget
GE-LI - Line Item Projects from GE Budget
GE-OP - Operating Funds from GE Budget

5.4.1 Treating Production Wastewater

A FMPC NPDES Compliance Strategy for Production Wastewaters was drafted, approved by DOE and forwarded to the OEPA during FY-87. This report presented the general strategy to bring the FMPC into compliance with OEPA requirements for discharge of production wastewaters. Figure 5-5 illustrates the proposed wastewater flow scheme and relates proposed projects.

The planned improvements for production wastewater treatment are described in the paragraphs that follow this list:

- The Biodenitrification Project
- Biodenitrification Surge Lagoon Liner Replacement
- Replacing the Surge Lagoon Piping
- Lagoon Sludge Removal System
- Wastewater Treatment Improvements
- Manhole-175 pH Control
- Pilot Plant Sump System
- Refinery Sump
- Plant 6 Sump
- Plant 8 Sump
- General Sump.

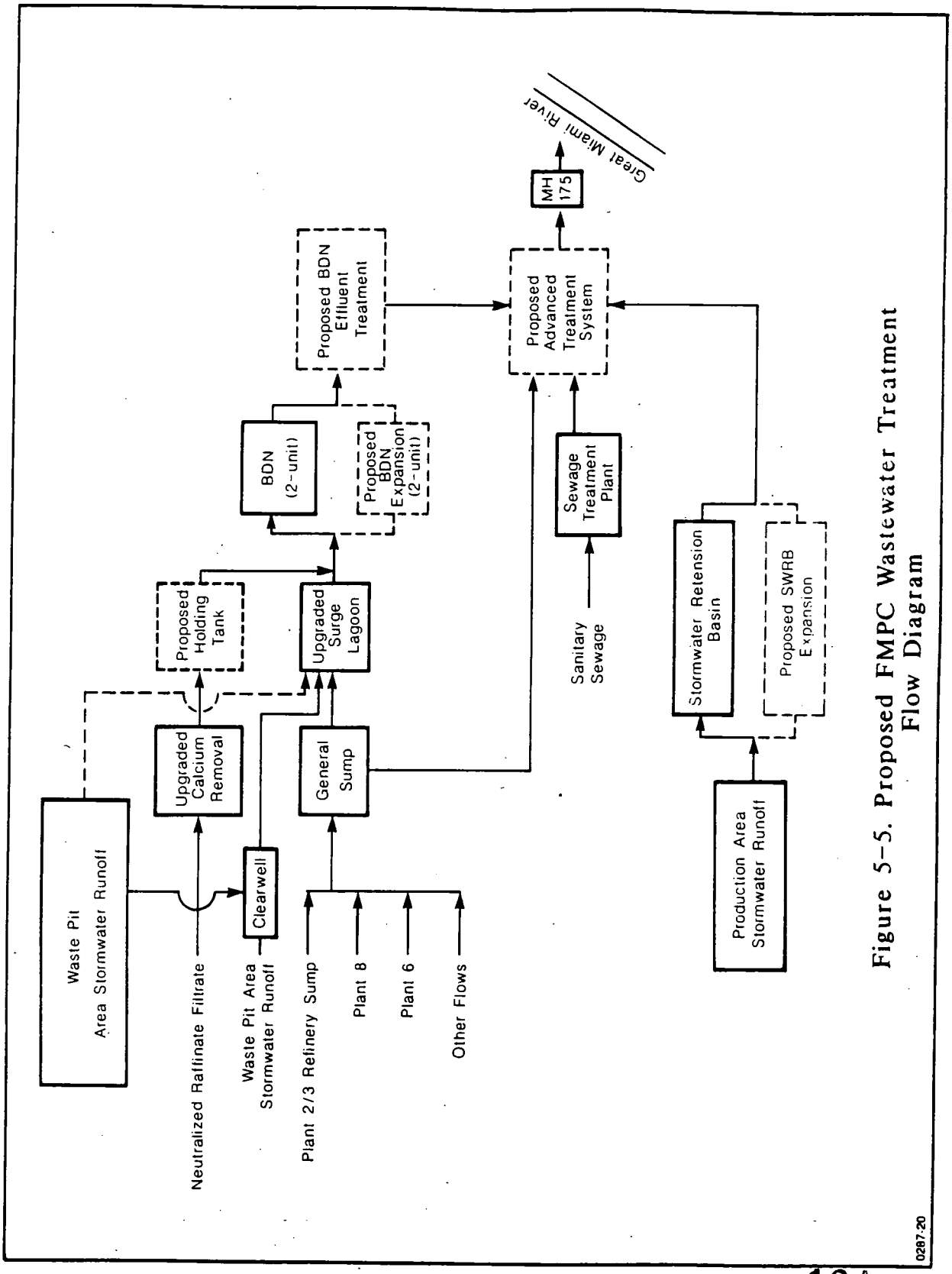

Figure 5-5. Proposed FMPC Wastewater Treatment Flow Diagram

The Biodenitrification Project: The Biodenitrification facility operated continuously with no unscheduled downtime from May 1987 through the end of the fiscal year. The test results showed that the existing facility could operate such that the proposed NPDES limits for nitrate nitrogen would be met. A Demonstration Test Report was written, approved by DOE and forwarded to OEPA by August 31, 1987. The facility will continue to operate to further develop a data base which will be used in the design criteria for upgrading the facility.

The current project addresses the necessary improvements to complete and upgrade the biodenitrification unit and related systems. Upgrades include improving the calcium removal system, adding an influent nitrate concentration control system which includes a high nitrate holding tank, the tie-in of two additional (existing) bioreactors, and installing an effluent treatment system to remove the extra BOD and suspended solids produced by the Biodenitri-fication facility. The Biodenitrification facility will be enclosed in a building. A control laboratory/mechanical equipment building will be constructed adjacent to the Biodenitrification facility. This is Line Item Project 83-D-146.

Biodenitrification Surge Lagoon Liner Replacement: The Biodenitrification Surge Lagoon is used to equalize and settle process wastewater and waste pit area stormwater runoff flows for processing in the downstream Biodenitri-fication facility. The current lagoon liner leaks and it must be repaired. An improved lagoon liner design will provide a three-layer system to contain the wastewaters. The outer liner consists of 18 inches of a bentonite-soil mixture. The first and second inner liners are oil and solvent resistant synthetic flexible membrane liners having a minimum thickness of 30 mils. Two under-drain collection systems protect the groundwater. The existing lower under-drain system is located between the bentonite-soil mixture and the first membrane liner and a proposed upper under-drain collection system will be installed between the two membrane liners. Separate collection sumps have also been provided so that any leakage through the liners can be individually collected, monitored, and pumped back into the lagoon.

A temporary tank system is now being used to store process wastewater while the Surge Lagoon liner is being repaired. This tank system segregates waste water into high and low nitrate streams. These streams can be blended so that the nitrate concentration fed to the Biodenitrification facility will be constant.

Replacing the Surge Lagoon Piping: The surge lagoon supply lines are too close to the lagoon wall. A line rupture could potentially wash away the wall, causing the lagoon to drain into nearby Paddy's Run. These lines have a history of leaks, and one leak has damaged the lagoon wall.

Lagoon Sludge Removal System: Over time, a layer of sludge and sediment will build up on the floor of the surge lagoon liner. A system is needed to remove the sediment from the floor of the surge lagoon. Options are being explored to remove the sediment. The option chosen will also be used to remove the sediment from the Stormwater Retention Basin.

Wastewater Treatment Improvements: The Wastewater Treatment Improvement Project is a continuation of FMPC's efforts to meet NPDES permit limits. The original objective of this project were to recover nitric acid from the Plant 2/3 raffinate stream, and to treat and recycle water from the Stormwater Retention Basin for use as a process or possibly non-potable water. Changes are now being considered which would further reduce pollutant discharges. For the nitric acid subproject, the emphasis would be on nitrate/nitrite removal, not necessarily nitric acid recovery.

For the stormwater cleanup system, the plan is to treat the combined flow of all FMPC waste streams before they are either discharged or recycled. The facility would employ a treatment unit followed by ion exchange, reverse osmosis, and/or ultra filtration units to remove dissolved solids, radionuclides and heavy metals, including hexavalent chromium ions. A wastewater recycle system consisting of pipes, pumps, and tanks would be able to recycle treated effluent from the final wastewater treatment facility back to the non-potable process water feed tank, if it meets feedwater quality. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.2.2.01 and WBS 1.1.2.4.01.

Manhole-175 pH Control: Effluents from the FMPC process and the sewage treatment plant currently mix at Manhole-175 before they are discharged into the Great Miami River. At times, the combined flow can have a pH above the NPDES permit discharge limit of 9.0. For safe, reliable neutralization, an automatic acid injection system will be installed.

Pilot Plant Sump System: Sump liquor from the hydrogen fluoride scrubber, the wet area, and the extraction area will be pumped to accumulation tanks for subsequent treatment. Sodium hydroxide or another base will be added to the liquor to raise its pH. Solid residues removed by filtration will be loaded into drums and the filtered wastewater will be stored in holding tanks then batch transferred to the General Sump. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.2.2.02.

Refinery Sump: Upgrade of the present Refinery Sump is planned as part of the PRP program. This project will provide a bulk storage and handling facility for magnesium oxide, replacing two 25,000 gallon wastewater surge tanks, replacing the thickener with a simpler filtration system, improving process controls, and installing a heating system for process liquors. A new bag unloading and dust exhaust system will be provided for filter precoat. This subproject is included in the PRP Line Item Project 86-D-149.

Plant 6 Sump: This facility provides two parallel treatment systems for enriched and depleted uranium-bearing waste streams. It will consist of two 10,000-gallon precipitation tanks, two oil separation tanks, two 4,000-gallon precipitation tanks, two oil coalescers, four filter presses, and two 5,000-gallon filtrate tanks. Total capacity is 48,000 gal/day based on a production rate of twelve 4,000 gallon batches. The caustic soda handling system will also be upgraded. This subproject is included in the PRI Line Item Project 85-D-140.

Plant 8 Sump: This project provides two separate treatment systems to process wastewaters. One system will treat high fluoride waste streams and the other will process low fluoride streams. Additional treatments will remove heavy metals and oil and grease. To implement this project, five agitated treatment tanks will be provided. Two tanks will be provided for filtrates. Tanks will also be provided for chemical additives. Three rotary vacuum filters will be installed to remove solids. Process instrumentation, pumps, and piping will also be provided. This subproject is included in the PRP Line Item Project 86-D-149.

General Sump: This project provides equipment for bulk lime unloading, storage, slaking, distribution to treatment tanks, additional tanks for process wastewaters, a new control room, improved instrumentation and controls, a new sampling system for process influents and effluents, and new pumps and piping. Existing tanks will be retrofitted with sloped bottoms to improve sludge drainage. This subproject is included in the PRP Line Item Project 86-D-149.

5.4.2 Collecting and Treating Stormwater

The planned improvements to collect and treat stormwater runoff in order to reduce pollutant concentrations in the stormwater system are described in the paragraphs that follow this list:

- Improving stormwater runoff control
- Isolating uranium in production area stormwater
- Expanding the Stormwater Retention Basin
- Controlling surface water on the Plant 1 Storage Pad.

Stormwater Treatment: The current storm-sewer lift station will be modified so that all water collected will flow to the Stormwater Retention Basin (SWRB). A rearrangement of the valving will also allow any process area spills to be more readily diverted to the General Sump for treatment. If the valves are not employed in time, a spill will be channeled to the expanded SWRB. Because of the increased flow to the SWRB, larger pumps and new control valves will be required to operate and control the SWRB.

Contaminated stormwater runoff in the waste pit area will be segregated into uranium contaminated and noncontaminated streams by means of berms, drainage ditches, and existing topographical features. The noncontaminated water will be allowed to continue to flow by gravity to Paddy's Run. The contaminated water will be collected in a concrete sump or holding basin and pumped to the Surge Lagoon. This water will be processed through the Biodenitrification facility, through the final proposed wastewater treatment facility, and eventually discharged to the Great Miami River. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.2.4.02.

Removing Uranium from Storm Sewer Water: Water sample studies conducted by Dames and Moore indicate that dissolved and suspended uranium is entering the storm-sewer system from sources other than the storm sewers themselves. The purpose of this project is to identify and repair those portions of the system through which infiltration occurs. Methods of repair might include replacing sections of line, grouting, waterproofing and parging manholes. Also, extraneous sources from production processes will be located and rerouted if the stream contains significant uranium concentrations. Storm-sewer sampling scheduled as part of the Best Management Practices Plan can aid in isolating these sources. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.2.4.03.

Expanding the Stormwater Retention Basin: As required by the OEPA Director's Findings and Orders, the existing Stormwater Retention Basin will be expanded to a capacity of 10.8 million gallons, which will make the basin large enough to hold the runoff from a 10 year-24 hour rainfall event as required by OEPA. The new basin will include a synthetic liner and will operate in parallel with the existing basin.

Controlling Surface Water on the Plant 1 Storage Pad: The Plant 1 Storage Pad is an outdoor drum storage area. Some of the stormwater runoff does not drain into the site storm sewer. A curb will be added around the periphery of the pad to help direct all stormwater to the pad drainage system. The drainage line will be redirected to a catch basin that is tied into the plant storm sewer system.

5.4.3 Controlling Runoff and Containing Spills

The planned improvements to control runoff and contain spills of potential contaminants are described in the paragraphs that follow this list:

- Controlled storage pads
- Improving warehouse and covered storage areas
- Tank Farm restoration/south ammonia tank farm
- Leakproof dikes.

Controlled Storage Pads: To increase WMCO's ability to contain accidental chemical spills and to control stormwater runoff from the production area, WMCO has identified several pad improvement projects. The new pads may have a sump system to collect contaminated water for processing at the local plant sump system. Currently some of the deteriorated concrete pads drain directly into the storm sewer system. The following subprojects are included in EHSI Line Item Project 87-D-159:

- Storage Building South of Plant 2 (Reference WBS 1.1.2.1.04)
- Lab Pad & Hazardous Chemical Building (Reference WBS 1.1.2.1.04)
- Controlled Storage Pad East of Plant 4 (Reference WBS 1.1.2.1.04)
- Controlled Storage Pad East of Plant 8 (Reference WBS 1.1.2.1.04)
- Storage Pad North of CP Warehouse (Reference WBS 1.1.2.1.04)
- Caustic Unloading Area Upgrade (Reference WBS 1.1.2.1.04)
- Maintenance Warehouse North of Building 12 (Reference WBS 1.1.2.1.04)
- Covered Controlled Storage Pad West of Plant 8. (Reference WBS (1.1.2.1.03)

Improving Warehouse and Covered Storage Areas: In general, the warehouses in the list following this paragraph have deteriorated over the years. Floors, drains, roofs, walls, windows, doors, mechanical systems, and other components need to be replaced or extensively rebuilt. The repairs will help keep expensive and/or hazardous chemicals and production materials dry (production materials are adversely affected by moisture, thus increasing the cost of maintaining the highest quality standards for FMPC finished products). In addition, improved warehouse facilities will help reduce contamination of stormwater runoff, and operations now performed outdoors can be performed indoors in all weather conditions. The following subprojects are included in EHSI Line Item Project 87-D-159:

- Warehouse North of Plant 9 (Reference WBS 1.1.3.2.03)
- UO3 Warehouse - Plant 8 (Reference WBS 1.1.3.2.02)
- Green Salt Interim Storage (Reference WBS 1.1.3.2.05)
- Storage Pad Cover - East of Plant 8 (Reference WBS 1.1.2.1.05)
- Covered Controlled Storage Pad - Plant 1 (Reference WBS 1.1.2.1.01)
- Finished Uranium Metal Warehouse - East of Plant 6 (Reference WBS 1.1.3.2.01)
- Storage Warehouse Building 30 (Reference WBS 1.1.3.2.04)
- UF6 Storage - South of Building 54 (Reference WBS 1.1.3.2.06)
- Covered Controlled Storage Pad - Plant 5 (Reference WBS 1.1.2.1.02)
- Storage Warehouse Upgrade Buildings 64/65. (Reference WBS 1.1.3.2.07)

Tank Farm Restoration/South Ammonia Tank Farm: The existing FMPC main tank farm is used to store bulk chemicals used in plant processes. It will be rebuilt as part of the Productivity and Radiological Improvement project and will have secondary containment dikes for both tanks and the loading/unloading area. The new South Ammonia Tank Farm located at the Pilot Plant has already had secondary containment dikes installed. This subproject is included in the PRI Line Item Project 85-D-140.

Leakproof Dikes: Existing dikes which surround processing tanks containing corrosive acids and uranium solutions are constructed of concrete and/or acid brick, and may be lined with a chemical coating to protect the dike from corrosion. These dikes are in various states of disrepair and are deteriorating. Several will be included in the sitewide upgrading of all concrete and acid brick dikes. In addition, a sealant will be applied to the structural pads inside the dikes to prevent any potential migration of solutions into the soil. Dike sizes will be increased as necessary to ensure containment of any spills. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.2.3.01.

5.4.4 Treating Conventional Wastewater

The planned improvements for conventional wastewater systems are described in the paragraphs that follow this list:

- Collecting stormwater runoff from the coal pile
- Upgrading the Sewage Treatment Plant.

Collecting Stormwater Runoff from the Coal Pile: The present coal pile stormwater runoff system may need to be upgraded to include a clay liner beneath the pile.

Upgrading the Sewage Treatment Plant: The capacity of the FMPC Sewage Treatment Plant must be increased in order to handle the current demands on the dissinfection system. The current treatment system will be upgraded to meet this demand. Additional upgrading may be needed in the future.

5.4.5 Improving Monitoring Capabilities

The three planned improvements which will enable the FMPC to upgrade its monitoring of ground and surface waters are described in the paragraphs that follow this list:

- Upgrading the environmental effluent flow measurement and sampling equipment
- Upgrading groundwater monitoring wells
- Environmental monitoring vehicle.

Upgrading the Environmental Effluent Flow Measurement and Sampling Equipment: Effluent flow monitoring and sampling will be improved at Manhole-175, the Stormwater Retention Basin, Storm-sewer Lift Station (Manhole-34), the Sewage Treatment Plant, and the Clearwell. New flow measuring, sampling and monitoring instruments will be installed at these locations as part of this project.

Upgrading Groundwater Monitoring Wells: Thirty-five wells within the FMPC boundaries are used to monitor groundwater. The thirteen wells completed before 1984 must be upgraded to prevent potential groundwater contamination and aid in effective groundwater monitoring.

Environmental Monitoring Vehicle: A new environmental monitoring vehicle equipped with a mobile sample preparation lab has been ordered. The vehicle will provide clean storage of sampling equipment, and an area to collect and prepare offsite or nonprocess area environmental samples. Additional space will be necessary in the clean area of the FMPC to store sampling supplies and equipment.

6.0 Solid Waste Management

The FMPC's production process, along with the utility and administrative services that support production, generates solid waste that must be treated, stored, and ultimately disposed. These wastes can be grouped into three categories: low-level radioactive waste (LLW), hazardous or mixed radioactive/hazardous waste, and conventional industrial waste. Examples of types of waste found in each category are listed below.

Low-level radioactive waste

- Process residues (slags, neutralized raffinates, sump sludges)
- Trash (paper, rags plastic, clothing)
- Scrap wood (pallets)
- Scrap metal (baled drums)
- Sediments from the Stormwater Retention Basin and the Biodenitrification Surge Lagoon
- Construction rubble

Hazardous and mixed radioactive hazardous waste

- Contaminated cutting and cooling oils
- Spent BaCl2 salts
- Solvent still bottoms and sludges
- PCB-containing materials

Conventional industrial wastes

- Nonprocess trash
- Boiler Plant fly ash and water treatment sludges
- Spent lime sludge
- Sewage

The objective of the FMPC's Solid Waste Management Program is to dispose of, eliminate, or safely store these solid wastes in compliance with the regulations discussed in Section 2.3. This objective covers both solid waste that is currently generated and that which was generated after closure of the waste pits, but before the beginning of offsite waste disposal shipments. This latter waste is called backlog solid waste.

The FMPC's strategy for meeting this objective is as follows:

- Pursue an aggressive waste minimization program
- Dispose of as much solid waste as possible
- Maintain and upgrade storage facilities for solid waste that cannot be disposed of or eliminated
- Develop and implement programs to reduce disposal costs and/or regulatory liability.

6.1 Description of Solid Waste Generating Processes

6.1.1 Low-level Radioactive Waste

The FMPC production process generates most of the LLW. The largest amount of process waste, magnesium fluoride (MgF_2), is produced during the reduction of UF4 with magnesium. It is contaminated with depleted uranium and depleted uranium oxide, and also contains some magnesium and magnesium oxide. The second largest process waste is generated when MgF_2 containing enriched uranium is recycled to the Refinery. The neutralized, filtered precipitate left after most of the enriched uranium is extracted (leached) from the MgF_2 is called slag leach filter cake.

Neutralized, filtered raffinate, the third largest waste stream, is generated following extraction of uranium from other refinery feed materials. The raffinate stream is also the largest source of nitrates which contribute to water pollution at the FMPC. Other process wastes contaminated with depleted uranium include dust collector residues, sump sludges, uranium metal chips, and spilled uranium salts.

Most of the currently generated low-level waste is shipped offsite for disposal. However, approximately 8,500 drums of process waste resulting from past operations remain onsite awaiting further processing before it can be disposed.

Many items become classified as low-level waste after contacting depleted uranium. These include metal drums, wooden pallets, and trash such as contaminated rags, paper, and wood. Other wastes, such as contaminated construction rubble and scrap metal, are generated from the large number of ongoing renovation projects at the FMPC.

As a result of maintenance and renovation activities over the years, approximately 4,600 tons of contaminated scrap ferrous metal and refuse have accumulated at the FMPC. This scrap is stored on a controlled runoff pad adjacent to the decontamination building in the northeast corner of the site. In addition, approximately 1,500 tons of contaminated scrap copper are stored on a controlled pad in the northwest part of the site. The copper scrap, consisting mostly of motor windings, was generated during the Cascade Improvement and Upgrade program during the 1970's. It was transferred to the FMPC for interim storage. Although the metal is stored on controlled pads, it remains a potential source of airborne contamination and radiation exposure to FMPC employees working nearby.

6.1.2 Hazardous and Mixed Waste

The FMPC generates and stores hazardous and mixed wastes onsite. RMI also generates similar waste during its extrusion process and these wastes are shipped to and stored at the FMPC.

Examples of these wastes include the general plant-use solvent 1,1,1-trichloroethane, xylene and mineral spirits (paint thinners), and perchloroethylene which is used to dry clean leather-palmed gloves. The use of perchloroethylene has been discontinued. These solvents are added to the bulk storage tanks located at the FMPC. Spent solvent generated at RMI and 1,1,1-trichloroethane from degreasing operations at National Electric Coil (NEC) in Louisville, Kentucky, are also stored in the spent solvent tanks. The solvents from NEC were generated during decontamination activities in the 1970's and are no longer being shipped to the FMPC.

Approximately 36,000 pounds of spent barium chloride salt are generated annually by RMI. The salt is packaged and shipped to the FMPC for interim storage until a disposal strategy can be implemented. The barium contained in this salt is a RCRA hazardous waste, and the salt is contaminated with uranium.

PCB-containing capacitors removed from service at the FMPC and articles used in their handling (rags, clothes, gloves) are stored in drums in a curbed storage area within the KC-2 warehouse (Building 63 located north of the coal pile). PCP is a toxic substance as discussed in section 2.3.3.

Approximately 20,000 pounds of 1,1,1-trichloroethane still bottoms and sludges are presently stored in the KC-2 warehouse. These wastes are contaminated with uranium and PCBs. They were generated as a result of attempts to distill the NEC waste to reclaim the solvent.

Contaminated waste oils consisting primarily of cutting/cooling oil are generated in machine tool operations and contain a heavy sludge of uranium metal chips, fines, and turnings, along with other assorted debris. Approximately 800 drums of waste oil are currently stored onsite.

In addition, the old $BaCl_2$ treatment facility and the liquid waste oil incinerator, which are no longer used, must be dismantled according to the regulations discussed in Section 2.3.1. Other facilities potentially contaminated with mixed waste may also have to be dismantled.

6.1.3 Conventional Industrial Waste

This category consists of nonradioactive wastes normally associated with a large industrial facility: sanitary waste, boiler plant waste, and nonprocess trash.

Solid waste associated with the boiler plant includes fly ash and sludges from boiler water treatment. Nonprocess trash includes cafeteria waste and paper and plastics from offices located outside the process area. Spent lime sludges from water treatment are pumped to a lime settling pond which is nearly filled.

6.2 Description of Current Solid Waste Management Activities

6.2.1 Low-level Radioactive Waste

The MgF_2 slag from the reduction process in Plant 5, the largest FMPC waste stream, is processed into a powder. Some of this material is reused as reduction furnace pot liner, while the remainder is packaged in Building 55 and prepared for offsite disposal. Precipitate from the neutralization of Refinery raffinates is filtered in Plant 8, drummed and temporarily stored. This filter cake, contaminated with trace quantities of uranium, is the largest component of the backlog residue waste; it must be dried before it is shipped offsite. Sump sludges also must be filtered and dried before shipment offsite. Process residues from the various plants are packaged for disposal or further processing. Residues that might contain metallic uranium are passed through oxidation furnaces in Plant 8. Certain waste items such as contaminated glass and steel rods have been shipped to an offsite contractor for processing before being disposed.

Process area trash is currently being compacted, baled, and shipped offsite for disposal. A segregation procedure is planned to reduce the quantity of contaminated trash.

Contaminated scrap wood has also been shipped to an offsite contractor for processing and disposal. All of the backlog of waste wood has been disposed. Replacements for wooden pallets, the largest waste wood stream, are currently being investigated. Contaminated construction rubble, soil, and asbestos are being packaged and temporarily stored.

Scrap metal generated during demolition and maintenance activities is being radiologically surveyed at the point of generation. If it is noncontaminated and potentially usable, it is stockpiled for shipment to local scrap dealers or for use somewhere else in the plant. Contaminated, nonusable metal is packaged and shipped offsite for disposal. A large inventory of rusted, baled drums has also accumulated at FMPC. Offsite processing and disposal is planned for this backlog waste.

Contaminated scrap metal that is thick-gauged and potentially usable is transported to the scrap yard on the decontamination pad and will eventually be recycled as part

of DOE's Scrap Reclamation Program. Phase I of the two-phase program is complete. Private companies interested in the metal have taken samples to determine if it is economically feasible to decontaminate it. If the Phase I results are positive, interested vendors will bid on Phase II to take title to all or part of the scrap inventory. They would then decontaminate the scrap and return it to the private sector.

In order to prepare the metal for Phase II activities, the 4,600 tons of scrap ferrous metal in the scrap yard was separated by a subtractor into three categories: 2,031 tons of usable ferrous metal, 179 tons of usable nonferrous metal, and 2,390 tons of refuse. The refuse included non metals, mixed metals, and in general, material that is not salvageable. Also separated was a considerable quantity of asbestos. Refuse will be disposed of as LLW. The separation and eventual disposal of refuse metal and asbestos will also improve environmental conditions around the scrap yard and create space for additional metal.

6.2.2 Hazardous and Mixed Waste

Much of the mixed waste discussed in Section 6.1.2 is being shipped to the Oak Ridge Gaseous Diffusion Plant (ORGDP) for interim storage. These wastes will be eliminated in that plant's TSCA incinerator, which is scheduled to begin operation in FY-88. In FY-87, 184 drum equivalents of mixed waste were shipped to the ORGDP. So far in FY-88, 606 additional drum equivalents have been shipped. Shipments of drummed oils and solvents will continue to ORGDP until the allotted storage space of 1,000 drum equivalents is used. The 13,000 gallons in the FMPC spent solvent tanks can be shipped to ORGDP storage tanks once the TSCA incinerator begins operation. Barium chloride salt, and oils and solids containing the salt, continue to be shipped from RMI to the FMPC for storage. There are currently no facilities for disposing of this material.

An area has been constructed in the KC-2 warehouse to temporarily store these wastes prior to their disposition. This additional space, however, will not be enough to accommodate the expected generation of FMPC and RMI wastes. Additional RCRA storage space will be needed at both the FMPC and RMI.

Barium Chloride will be stored at the FMPC until its final disposition is established. The $BaCl_2$ could be decontaminated in a new $BaCl_2$ treatment facility planned for operation in FY-91. The treatment effectively separates the uranium from the $BaCl_2$ and converts the barium to a nonsoluble sulfate. Alternatively, the $BaCl_2$ could be disposed of at the Nevada mixed-waste disposal facility planned for operation in the early 1990's.

Closure plans have been written for the retired $BaCl_2$ treatment facility and the liquid waste incinerator. The plan for the $BaCl_2$ facility has been submitted to OEPA; DOE is reviewing the incinerator plan.

6.2.3 Conventional Industrial Waste

The segregation of nonprocess area trash, initiated in FY-87, had a major impact FMPC's waste management activities. Nonprocess area trash includes cafeteria waste and paper from office areas outside the process area. This material is now collected and monitored according to procedures which will ensure that it contains no radioactive material. This trash is then shipped to a local sanitary landfill for disposal. This procedure for collecting and monitoring nonprocess trash has significantly reduced the quantity of trash that would otherwise be considered low-level waste. A similar procedure is being developed for the process area.

The Boiler Plant produces fly ash, sludges from boiler water treatment, and runoff from the coal pile. Fly ash is taken to the flyash pile in the southwest corner of the site. A cover will eventually have to be placed over the fly ash pile to prevent water runoff and air dispersal. The boiler water sludges and coal pile runoff are currently drained to a retention pond. The pond is unlined and will eventually have to be upgraded. This upgrade is discussed in Section 5.4.4.

The FMPC drinking water is treated with water softeners. The lime from this process is collected in lime sludge beds on the western side of the site; these beds are nearly full. Options are currently being studied to address these problems.

6.3 Shipping and Storing Solid Waste

Table 6-1 summarizes the solid wastes shipped offsite for disposal in FY-87, backlog wastes currently stored for future disposal, and remedial wastes stored onsite pending resolution of their disposition. Remedial wastes are discussed in detail in Section 7.0. Information on future shipments is given in Section 6.4.

6.4 Descriptions of Solid Waste Projects

This section describes projects in each of the waste categories that are needed to meet the solid waste management objectives discussed at the beginning of this section. Table 6-2 presents the funding levels by fiscal year.

TABLE 6-1 WASTE SHIPMENTS AND STORAGE INvENTORY FOR FY-87	
Waste Shipped	
Destination	Quantity (drum equivalents)
LLW Offsite Disposal	44,828
RCRA to ORGDP	184
Waste Stored (Backlog)	
Type	Quantity (drum equivalents)
RCRA Waste	833
LLW	77,581
Waste Stored (Remedial)	
Type	Quantity (drum equivalents)
Total Thorium	20,672
Contaminated Residue in pits	1,660,000
Contaminated Residue in silos	56,700

6.4.1 Processing and Disposing Low-level Waste

This section addresses the following seven projects related to LLW.

- Processing and Shipping LLW
- Pretreatment of Backlog Wastes
- Backlog Rubble Disposition
- LLW Disposition Support
- Decontamination and Decommissioning Facility
- Interim Durable Storage Technology Demonstration
- Scrap Metal Management.

TABLE 6-2
FUNDING SUMMARY FOR SOLID WASTE MANAGEMENT
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	960	50	10			300	300	300
GE-GPP	305				105		200	
GE-LI	2,465	2,083	382					
GF-CE	1,362	402		310	200	175	150	125
GE-OP	31,040	850	985	935	990	8,795	9,090	9,395
GF-OP	83,469	9,873	11,316	10,515	15,765	13,000	12,000	11,000
GF-GPP	1,323	1,323						
Totals:	120,924	14,581	12,693	11,760	17,060	22,270	21,740	20,820

KEY

GE-CE - Capital Equipment from GE Budget
GE-GPP - General Plant Projects from GE Budget
GE-LI - Line Item Projects from GE Budget
GF-CE - Capital Equipment from GF Budget
GE-OP - Operating Funds from GE Budget
GF-OP - Funding for Shipment of Backlogged Waste,
- Mixed Waste, and Interim Remedial Activities
GF-GPP - General Plant Projects from GF Budget

Processing and Shipping LLW: Table 6-3 lists the projected shipments of solid LLW from the FMPC for disposal over the 1988-1994 time frame. These shipments are divided between currently-generated LLW, funded by GE-OP, and backlog LLW, funded by GF-OP.

The backlog shipments for FY-88 include approximately 100 shipments of baled drums to an offsite contractor for further processing and disposal, thus eliminating this category of backlog waste. Backlog wooden pallets, steel tubing, and glass have been similarly eliminated from the FMPC. Some of the backlog process residues will need to be dried in Plant 8 before shipping to meet offsite acceptance criteria. This will also reduce the volume of the waste by about 30%. The inventory of backlog process waste should be eliminated by FY-91.

The currently-generated LLW includes process wastes, trash, metal refuse and dried lagoon sediments. The waste shipment forcast for FY-88 through FY-91 is based on decreased production levels due to the N-reactor shutdown, combined with

increased plant housekeeping efforts. The result is a net decreasing trend in waste shipments through FY-91. The forecast for FY-92 through FY-94 is based on increased production of Mark-31 fuel elements beginning in late 1991.

TABLE 6-3
WASTE DISPOSAL FORECAST
(Number of shipments)

Fiscal Year	Current Waste	Backlog Waste	Construction Rubble
1988	300	200	200
1989	216	200	400
1990	192	200	400
1991	180	176	400
1992	223	0	400
1993	223	0	400
1994	223	0	400

Construction Rubble Disposition: An increasing inventory of construction rubble will accumulate at the FMPC as as result of ongoing renovation, maintenance, and remediation activities. This project covers the implementation of methods for handling, processing, packaging, storing and/or disposing of backlog construction rubble.

Pretreatment of Backlog Waste: This activity addresses the special processing needed for waste materials so that they can be shipped for offsite disposal. These materials cannot be directly packaged and shipped in their present form. Additional screening, segregation, drying or chemical treatment is required. An example is the drying of backlog process wastes mentioned in the previous section. Another example is contaminated concrete, the volume of which might be reduced by suitable surface decontamination methods. A study has been initiated to identify the wastes, their volumes, and the projected pretreatment processes.

LLW Disposition Support: This activity encompasses several programs and capital projects that support LLW disposition:

- *Waste Operations Support:* This activity supports all phases of waste disposition including the writing of procedures, waste minimization, cost reduction, and liaison with plant operations to identify and solve waste disposition problems. An example of waste minimization is the study of alternate pallets made of durable material to replace the wooden pallets now in use. Examples of cost reduction include the investigation of bulk shipping methods and alternate packaging designs for LLW. Plant liaison is needed to establish acceptable interim storage space for contaminated materials such as construction rubble.

- *Bar Coders:* This equipment, which facilitates the tracking and documenting of waste containers, will be used at offsite disposal facilities. Installing similar equipment at the FMPC will enhance the quality of FMPC's waste shipping offsite, making tracking errors less likely.

- *Analytical Certification Equipment:* This equipment will provide an on-line, nondestructive assaying capability, resulting in more rapid and accurate analytical results than is now possible. Conventional sampling and assay methods used at the FMPC do not account for variations in contaminant concentration, and also impose a time lag between sampling and results. This is especially true for certain backlog and remedial wastes.

- *Trash Monitoring Facility:* This facility will house the analytical certification equipment and the activities associated with the nondestructive assay of waste packages.

- *Shipping Building Expansion:* An expansion of the shipping building and the addition of a weather shelter at the truck dock is planned to provide an environment for all-weather, year-round waste shipping. Presently, much of the waste packaging, certifying, and vehicle loading is performed outside. Inclement weather not only curtails these activities, but also deteriorates the waste packages. These problems will intensify as waste shipments are increased to accommodate remedial, as well as backlog and currently-generated waste.

- *Drum Cleaning/Handling Equipment:* Portable washers are needed for the safe, effective and timely cleaning of the surfaces of drums and other containers containing backlog or remedial waste. The FMPC must ensure that surface contamination limits are met before waste containers are shipped offsite for disposal. Equipment such as handstackers and forklifts are also needed to handle backlog waste on the Plant 1 pad and the pad east of Building 64. This equipment will also be used for remediation wastes in the future.

- *Miscellaneous Equipment:* Equipment such as floor scrubbers are needed to support FMPC's contamination control program. Equipment such as balers and compactors with air filters are needed to support FMPC's waste minimization effort.

Interim Durable Storage Technology Demonstration: Should offsite disposal of LLW be unavailable to the FMPC in the future, remediation and disposal plans will be greatly impacted. Even if available, the magnitude of LLW and other wastes generated by FMPC remediation might be so large that current disposal sites could not accommodate the wastes. Therefore, WMCO will explore possible onsite technologies for interim durable storage including a demonstration. The funding for this project will cover feasibility studies, design, construction, monitoring and reporting associated with the demonstration. The experience gained from the Low-level Waste Disposal, Development, and Demonstration (LLWDDD) program will

be of considerable benefit. The LLWDDD program was developed by DOE-ORO to demonstrate solutions to waste management problems. The experience from the demonstration tumulus at the West Valley site will also be useful.

Scrap Metal Management: The 2,210 tons of potentially usable ferrous metal separated from the scrap yard, and the 1,500 tons of scrap copper will remain onsite until they are recycled to the private sector as part of DOE's scrap reclamation program. Contracts for Phase II of this program will be awarded in FY-88. Large-scale reclamation is unlikely to begin before 1992.

It is likely that the scrap copper will be quickly claimed by the private sector during Phase II and will be removed from the site by the end of FY-92. It is unlikely, however, that all of the ferrous scrap will be reclaimed. Scrap from the renovation (or decommissioning) projects will be added to the scrap yard and storage space will disappear. Plans must be established soon to address this problem. Possible solutions include additional storage space, size reduction and storage in durable containers, decontamination of the scrap in the new D&D facility to releasable levels, or disposal as low-level waste.

In the meantime, packaging and disposal or storage plans must be implemented for the 2,390 tons of refuse metal and asbestos that was also separated from the scrap yard.

Decontamination and Decommissioning Facility: The existing Decontamination and Decommissioning (D&D) facility has inadequate capacity to meet current and future needs. A new facility is being designed to decontaminate a wide variety of contaminated items, many of which can be reused. This helps reduce the amount of LLW. Equipment that can be reused after decontamination includes maintenance items, furnace pots, T-hoppers, and scrap metal. The new D&D facility will also support future renovation and remediation projects and will significantly contribute toward FMPC's Contamination Control Program.

Near-term D&D needs will be met through capital equipment expenditures. An acid transfer pump is needed to transfer used acid in the current D&D facility to waste storage tanks. Additional equipment will be needed to safely and effectively decontaminate the permanent pallets that will replace the wooden pallets now used. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.03.

6.4.2 Hazardous and Mixed Waste Management

Hazardous and mixed waste is regulated under RCRA (see section 2.3.2) and is referred to in this section as RCRA waste. The RCRA Waste Management program consists of the following projects:

- Shipping RCRA Wastes to ORGDP
- Compliance Support
- Treating Barium Chloride
- RCRA Compliance Activities
- Solid Waste Compliance.

Shipping RCRA Waste to ORGDP: This program funds the characterizing of hazardous or mixed waste, and shipping it to ORGDP for interim storage before incineration. This program also covers the engineering support associated with transferring contaminated oils from RMI to the FMPC (packaging, characterizing, shipping, unloading).

Compliance Support: A RCRA storage area was constructed in the KC-2 warehouse to temporarily store FMPC and RMI RCRA waste. Also, space was made available at the ORGDP to store FMPC RCRA wastes. However, additional storage space will be needed. Funds for a RCRA storage warehouse and RCRA satellite system have been budgeted for FY-88 to cover design and construction. Equipment such as dedicated handstackers and bar coders are also needed to ensure compliance.

Treating Barium Chloride: One option for disposing of contaminated $BaCl_2$ is a treatment facility to separate the hazardous component, barium from the radioactive component, uranium. This program also covers the engineering support associated with transferring contaminated $BaCl_2$ from RMI to the FMPC (packaging, characterizing, shipping and unloading). The $BaCl_2$ will be temporarily stored at the FMPC. Such a facility is included as a subproject in the EHSI Line Item Project 87-D-159, reference WBS 1.1.2.1.04.

RCRA Compliance Activities: Operating funds must be budgeted to revise FMPC's RCRA, Part B, Permit. The necessary information will be documented and submitted to OEPA. Approval is expected in FY-89.

Solid Waste Compliance: The suspended use of the old Barium Chloride Treatment Facility and the Waste Oil Incinerator requires that closure plans be submitted per 40 CFR 265. The plan for the $BaCl_2$ facility was submitted to the OEPA in FY-87. DOE and WMCO are now waiting OEPA approval. The closure plan and OEPA approval for the incinerator are projected for completion in FY-88 and FY-89, respectively.

6.4.3 Conventional Industrial Waste

The four projects for conventional industrial waste are described in the paragraphs following this list:

- Shipping and Disposing
- Covering the Fly Ash Pile
- Expanding the Landfill
- Expanding the Lime Sludge Bed.

Shipping and Disposing: Funding for this effort includes collecting, transporting, and disposing of noncontaminated, conventional waste such as office trash and cafeteria waste. Possible future waste streams include sediments from the boiler plant waste pit and sludge from the lime sludge beds.

Covering the Fly Ash Pile: A soil and grass cover is planned for the current fly ash pile to prevent water runoff and air dispersal. A Project Authorization for the cover design is planned for FY-89.

Expanding the Landfill: A permit to expand the existing landfill was filed in FY-85. It is currently being reviewed by the OEPA. The FMPC is developing this option in case it can no longer ship its conventional waste to a local landfill. Approval of the permit, a Project Authorization, and a final design will leave the FMPC prepared to handle the cessation of conventional waste shipments.

Expanding the Lime Sludge Bed: The lime sludge beds from the treatment of plant water are nearly filled. Funds have been budgeted to expand the beds in FY-89.

6.5 Waste Minimization

An aggressive waste minimization program is being implemented at the FMPC. This program is receiving priority attention because of increasing burial costs, concern over continued availability of burial space, and decreasing availability of storage space at the FMPC. Also, Westinghouse Corporate policy, the 1984 RCRA amendments, and a forthcoming revision to DOE Order 5820.2 require a waste minimization program.

During FY-87, several waste minimization programs were implemented:

- Nonprocess trash - The 1986 closure of FMPC's trash incinerator and storage impoundments resulted in a large accumulation of potentially contaminated trash. A compactor/baler was purchased to volume reduce the trash. Also, a procedure was implemented to segregate nonprocess trash, which could be disposed at a local landfill. This segregation procedure, which was discussed in Section 6.2.3, reduces the volume of trash considered contaminated by approximately 25% and saves up to $3,000 per week.
- A mobile high-force compactor was leased to process the trash stored in 55-gallon drums. Over a 6-month period, the compactor crushed drums from 1/3 to 1/6 of the original volume, depending on the drum contents. The

crushed drums were packaged in metal overpacks and shipped offsite for disposal.

- Paint substitution - Water-based paint has been substituted for xylene-based paint in the drum reconditioning facility. This substitution also eliminates many of the safety concerns associated with xylene.
- Performed analyses which indicates that the economic discard limits for slag residues could be raised.
- Machining improvements have been implemented on graphite molds which reduces the generation of scrap molds by 50% and saves approximately $120,000 per year.
- Removed a dry cleaning system and thereby eliminated a generator of the hazardous waste perchloroethane.

Several waste minimization projects are planned for FY-88 and beyond:

- Develop a procedure to segregate clean trash from the process area
- Test metal and plastic pallets as substitutes for wooden pallets
- Test an alternate treatment for raffinate which could decrease the volume of neutralized raffinate waste by as much as 50%
- Continue work on economic discard limits for uranium residues
- Develop a recognition program to encourage employees to submit waste minimization suggestions
- Develop a program to track waste generation in process areas and charge these areas for the waste they generate
- Issue the FMPC Waste Minimization Plan which will delineate FMPC's goals and strategies
- Reduce the volume of backlog process residue by drying it in Plant 8
- Procure equipment to reduce the volume of contaminated concrete.
- Implement a precedure to keep hazardous waste oils from being mxed with nonhazardous waste oils.
- Reduce raffinate solids generation by approximately one third by substituting magnesium hydroxide for calcium hydroxide during raffinate neutralization.

WMCO is also investigating advanced technologies for their potential to minimize the FMPC's major waste streams. One technology, developed at ORNL, uses a magnetic field gradient to separate paramagnetic materials from diamagnetic materials. Bench scale tests on contaminated MgF_2 have indicated that a magnetic field can concentrate uranium in MgF_2. This technology could reduce the wastes associated with processing MgF_2 containing enriched uranium.

The plasma torch is another technology that could potentially reduce MgF_2 waste. A proof-of-principle test in which pure MgF_2 was hydrolyzed to produce magnesium oxide and hydrogen fluoride was conducted at the Westinghouse Plasma Center. The results confirm the analytical model used to predict products in plasmas.

7.0 FMPC Remediation

During the past 35 years of operation, the FMPC has accumulated an inventory of low-level radioactive waste, mixed radioactive/hazardous wastes, and contaminated materials, equipment and facilities. These materials present a potentially adverse impact to the public health or the environment.

As part of the FFCA (Section 2.5.1), WMCO has been conducting a RI/FS to characterize the nature of the stored waste materials and assess the relative impacts associated with current storage practices. The RI/FS is the initial step in ultimate disposition of these stored inventories. To support DOE Order 5480.1B/Phase II and the sitewide RI/FS, the FMPC also initiated a CIS aimed at completing an in-depth investigation of the FMPC waste storage area. The following is a partial list of facilities or materials potentially requiring some remedial actions:

- Thorium in drums, bins, and silos
- Storage silos containing radium-bearing residues
- Waste storage pits containing low-level waste and hazardous waste
- Abandoned-In-Place equipment and facilities
- Contaminated soil
- Other facilities and materials as identified in the RI/FS.

The strategy for dealing with the FMPC site remediation is as follows:

- Pursue interim remediation to maintain the stored materials and facilities in a safe, stable condition until the methodology for final disposition of the materials is identified
- Initiate resource planning to support eventual remedial actions
- Provide appropriate focus on the RI/FS and milestone schedules
- Implement the remedial actions recommended by the RI/FS Record of Decision and the EIS (the EIS is described in Section 11.0).

The following subsections will describe the potential major remedial sites, the environmental studies, remedial engineering and design, and interim and final remedial actions.

7.1 Description of FMPC Areas Requiring Remediation

7.1.1 Storing Thorium at the FMPC

The FMPC has served as the thorium materials repository for DOE since 1972. Approximately two-thirds of this material was processed at the FMPC. The

remainder originated from other DOE facilities. There are 1,087 metric tons of thorium stored in a silo, bins, and in steel drums on the plant site. The stored thorium is primarily a mixture of thorium metal, thorium oxides, and process residues. The thorium inventory (exclusive of the Plant 8 silo and bins) is stored in over 13,000 drums in four FMPC warehouses. Twenty-one of these drums contain potentially pyrophoric thorium metal millings. A summary of the FMPC thorium inventory is presented in Table 7-1.

TABLE 7-1
FMPC THORIUM INVENTORY

Form of Material	Quantity (metric tons)	Storage Location
ThO_2 Dense (GE-Bettis)	4.3	Building 67
ThO_2 Sol Gel	25.9	Building 67
Pilot Plant - WIP	9.2	Pilot Plant Tank #2 and Laboratory
Impure Thoria Gel	338.3	Pilot Plant Warehouse
Thorium Oxides	174.6	Plant 8 Silo and Bins
Thorium Oxalate Cake	1.2	Building 67
Thorium Nitrate Crystals	1.2	Building 67
Thorium Nitrate Solution	0.9	Building 67
Low-Grade Residues from General Atomic	321.7	Building 65
Thorium Hydroxide received from offsite	10.8	Building 67
Thorium Oxides received from offsite	74.4	Building 67
ThF_4	0.8	Building 67
Metal	79.9	Building 67 and west of Building 65
Clad Metal	4.4	West of Building 65
Alloyed metal;	3.5	Building 67 and west of Building 65
Material held for historical purposes	0.5	Building 67 and west of Building 65
High-grade residues (>30% Th)	35.7	Building 67 and west ofBuilding 65
Low-grade residues (<30% Th)	0.2	Building 67.
Total	**1,087.5**	

There are many concerns associated with the stored thorium inventory. For example, because the structural integrity of the Plant 8 silo was questioned in 1985, the silo supports were reinforced with steel beams. The thorium inventory is a direct source of radiation exposure to FMPC employees working around the storage area. Deteriorated drums of thorium could spread contamination.

7.1.2 K-65 and Metal Oxide Silos

There are four concrete waste storage silos at the FMPC located west of the production area, as shown in Figure 7-1. The K-65 Silos 1 and 2 contain refinery residues from the processing of high-grade pitchblende ores. These residues have elevated concentrations of radium. Silo 3 contains cold metal oxides having concentrations of uranium and minor quantities of other select radionuclides; Silo 4 is empty. Approximately 850 curies of radon, a gaseous radium decay product, are released each year from the K-65 silos. Although the radiation dose to employees and area residents from this source is negligible, these emissions will be reduced as part of the interim remediation discussed in Section 7.3. The types and quantities of material in each silo are listed in Table 7-2.

In 1985, a physical inspection and structural analysis of the silos showed that the center portion of each of the two K-65 silo domes was structurally unsound. A number of interim remedial activities, including covering the center of the domes, enhancing surveillance of the area around the silos, and conducting studies to identify methods to provide additional support for the domes were initiated immediately following completion of the structural analysis report. These remedial activities are discussed in Section 7.2.

TABLE 7-2
INVENTORY OF FMPC RADIOACTIVE WASTES

Structure	Total Waste (metric tons)	Uranium (kg)	U-235 (kg)	Thorium, (kg)	Radium-226 (Curies)
Silos 1,2	8,800	11,200	80		1,652
Silo 3	3,500	18,000	130		15
Pit 1	40,500	52,000	370		Unavailable
Pit 2	13,000	1,206,000	2,550	400	Unavailable
Pit 3	255,000	129,000	1,010	400	19
Pit 4	64,970	3,048,094	5,529	61,700	
Pit 5	88,348	50,249	420	17,100	118
Pit 6	9,309	843,142	1,740		
TOTAL*	483,427	5,357,685	11,829	79,600	1,804

* (Total as of December 1985)

7.1.3 Waste Storage Pits

During past operations, FMPC's low-level waste and some mixed wastes were discarded into six lined waste storage pits (Pits 1-6) located west of the plant (refer to Figure 7-1). Although this practice has been discontinued, the pit contents are a potential source of environmental contamination. Pits 1-4 have a dirt cover and are

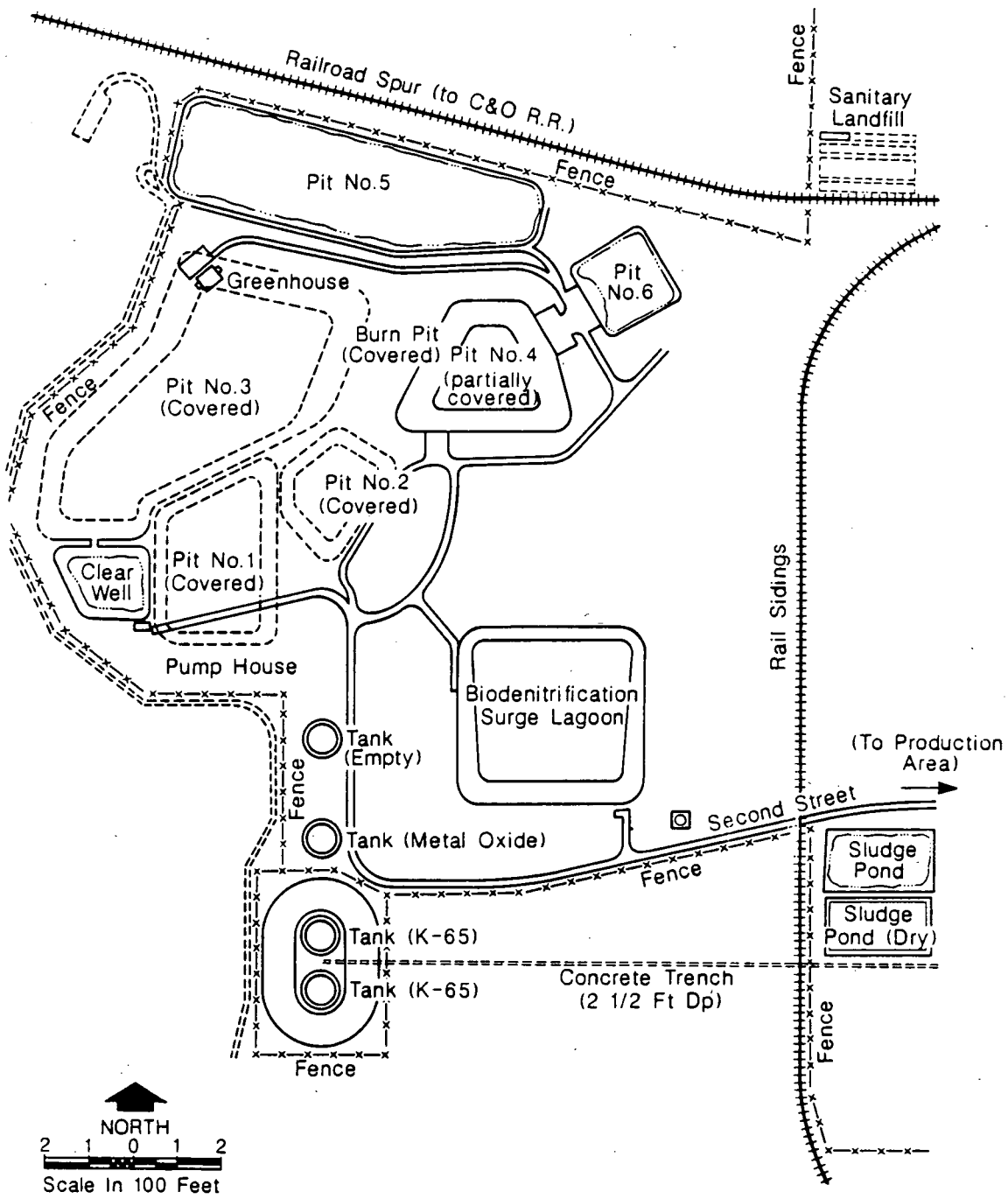

Figure 7-1. Location of FMPC Waste Pits and Silos

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graded to ensure positive drainage. Pits 5 and 6 are retired but remain uncovered. The contents of the six waste storage pits are also summarized in Table 7-2. Interim remedial measures, discussed in Section 7.2, are planned for these pits. The final disposition of the pit contents will be identified after issuance of the Record of Decision for the RI/FS.

The waste storage area also contains an inactive sanitary landfill, a retired burn pit, a retired fly ash pile, two lime sludge ponds, and clearwell. Any required remediation in these areas will be completed in accordance with the results of the ROD for the RI/FS.

7.1.4 Description of Abandoned-In-Place Equipment and Facilities

Abandoned-In-Place equipment is located throughout the FMPC, and consists of equipment unused for many years. Abandoned facilities, similarly unused, will eventually have to be demolished and the removed materials processed and/or transferred to an appropriate disposal facility. Many of these facilities are contaminated, and as such, represent a source of radiation exposure to FMPC employees.

Examples of abandoned equipment include control panels, pumps, and scales located throughout the FMPC. Also included are underground storage tanks which represent a potential source of groundwater contamination. Examples of abandoned facilities include Plant 7, the rolling mill in Plant 6, and the ore silos at Plant 1.

7.1.5 Contaminated Soil

Based on soil sampling associated with renovation and maintenance projects, a large volume of potentially contaminated soil exists at the FMPC. Most of the contamination of surface soils at the FMPC is the result of deposition of airborne emissions over the life of the plant. Exceptions would include areas where accidental spills occurred, zones contiguous to waste storage units, or production units. As a result, the contamination of surface soils is expected to be dispersed and variable.

Likely contamination of subsurface soils is a result of deposition of airborne emissions, accidental spills or line leaks, or surface water transport along drainageways to low spots within the production area. Subsurface soil contaminated would be expected to be dispersed and variable, but associated with drainageways and low elevation surfaces.

In the future, soil will be characterized according to its existing and potential source of environmental impacts, existing environmental pathways ultimately to man, and the identification and assessment of risks to offsite receptors.

7.2 Description of Site Remediation Activities

Site remediation activities are described in this section. The fiscal year funding requirements are presented in Table 7-3.

TABLE 7-3
FUNDING SUMMARY FOR SITE REMEDIATION
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-LI	52,662		28	2,612	26,622	23,400		
GE-CE	423	423						
GE-OP	6,660	5,330	445	440	445			
GE-GPP	86	86						
GF-11	260,950	5,300	8,000	20,500	44,200	54,650	61,800	66,500
GF-GPP	8,100	600		1,500	1,500	1,500	1,500	1,500
GF-CE	640			40	150	175	150	125
GF-OP	2,825	2,825						
Totals:	329,521	11,739	8,473	25,092	72,917	79,725	63,450	68,125

KEY

GE-LI - Line Item Projects from GE Budget
GE-CE - Capital Equipment from GE Budget
GE-OP - Operating Funds from GE Budget
GE-GPP - General Plant Projects from GE Budget
GF-11 - Funding for Site Remediation Projects
GF-GPP - General Plant Project from GF Budget
GF-CE - Capital Equipment from GF Budget
GF-OP - Funding for Interim Remedial Activities.

7.2.1 Environmental Studies

In accordance with the requirements of applicable DOE orders, environmental regulations and existing FMPC orders and agreements, comprehensive environmental studies are underway at the FMPC. The intent of these studies is to provide a broad framework to support remediation initiatives at the FMPC.

Environmental studies include those activities necessary to support Preliminary Assessments, Site Inspections, the RI/FS and Interim Environmental Monitoring.

Remedial Investigation/Feasibility Study: According to the provisions of the CERCLA section of the FFCA, the FMPC must complete a sitewide RI/FS fulfilling the requirements of Section 106 of CERCLA and the National Contingency Plan. The purpose of the RI is to determine the nature and extent of the existing and potential environmental impacts associated with current and historical operations at the FMPC. A detailed public health and environmental risk assessment will be completed as part of the RI.

The RI involves the evaluation of the current situation and the completion of a comprehensive site investigation. The site investigation includes the performance of an extensive sampling program involving all environmental media. In particular, a detailed radiation measurements program, surface water and sediment sampling program, surface and subsurface soil sampling program, and groundwater sampling programs are being conducted as part of the RI site investigation. The RI final report is scheduled for completion in the first quarter of CY-90.

The intent of the FS is to perform a detailed engineering feasibility study evaluating potential remedial technologies applicable to the FMPC. The FS will recommend a preferred remedial alternative(s) to address the environmental and public health concerns identified by the RI. The USEPA will issue a ROD selecting the appropriate remedial alternative(s) to be implemented by the DOE at the FMPC. The ROD on the RI/FS is tentatively scheduled for issue in September 1990.

Related or Supporting Studies:

- *Characterization Investigation Study*: The CIS was initiated in March 1986 to fulfill the requirements of DOE Order 5480.14 Phase II. The purpose of the CIS was to perform a detailed characterization study of the FMPC waste storage area to assess the nature and extent of the existing and potential environmental impacts associated with the operation of those facilities. The scope of the CIS was limited to the FMPC waste storage area including the six pits, burnpit, sanitary landfill, fly ash piles, and adjacent areas.

  Activities under the CIS were concentrated in three areas. A comprehensive geophysical investigation was completed across the entire waste storage area to identify existing subsurface anomolies and help examine localized hydrogeologic conditions. The geophysical survey of the area, which included ground penetrating radar, electromagnetic terrain conducting and a magnetometer survey, was completed in December 1986.

  A detailed study was also completed of the chemical, radiological and geotechnical characteristics of the contents of the waste storage facilities. Characterization activities included the collection of representative samples of

the contents of the facilities and the subsequent analysis of these samples for full radiological and chemical parameters. Chemical analyses included RCRA characteristics and the Superfund Hazardous Substances List. All sample collection and analysis was performed in strict accordance with established USEPA protocols.

Also, a comprehensive radiological survey was performed of the surface soils in the waste storage area. This survey was accomplished through a detailed program utilizing hand-held radiological detection instrumentation coupled with extensive surface soil sampling.

All final reports for the CIS were completed during CY-87. All data during the CIS has been transferred to the RI/FS database for use during this ongoing program.

- *K-65 Sampling:* In support of the data requirements of the sitewide RI/FS, representative samples of the contents of the K-65 Silos and Silo 3 will be collected following interim stabilization. Analytical data characterizing the chemical, radiological, geochemical and geotechnical properties of the stored materials are necessary to support the risk assessment of the RI and the alternatives evaluation of the FS. The samples shall be collected in strict accordance with DOE ALARA and USEPA sampling protocol.

- *Environmental Baseline Survey Support:* The DOE Environmental Survey Preliminary Report defined certain environmental and programmatic concerns which could potentially impact the environment or the ongoing compliance programs at the facility. Selected suspect areas of contamination and production facilities will be investigated under the RI/FS program. Site investigations are proposed to be initiated which shall include sampling activities to assess the nature and extent of existing environmental contaminants at these locations. All collected data will be evaluated under the risk assessment of the RI/FS.

- *Geochemical Studies:* As part of the ongoing site investigation of the RI/FS, The FMPC is performing a detailed radiological characterization of the surface and subsurface soils on and adjacent to the FMPC property. To support a detailed risk assessment to evaluate the potential impacts associated with the identified soil concentrations of radionuclides, an investigation must be conducted to establish site specific geochemical properties of local soils.

- *Zone of Influence:* In accordance with the requirements of Order 14 B of DFO, the FMPC is performing a hydrogeologic investigation of the FMPC outfall to the Great Miami River. The study will investigate whether the FMPC outfall lies within the zone of influence of some production wells located adjacent to the Great Miami River. If the outfall is found to be located within the zone of influence, the study will further evaluate the environmental impacts associated with the present location of the outfall and the need to relocate the sewer line.

In accordance with the DFO, a final report on the zone of influence study is required to be submitted to OEPA in August 1988.

- *RI/FS Benchscale Study:* Under Task 5 of the scope of work for the RI/FS, the FMPC is required to perform laboratory and benchscale studies to support the development of the risk assessment and the final RI report. These studies could potentially include geotechnical evaluations of waste materials or potential cover materials, treatment studies of waste inventories, or radon emanation studies. Clear definition of the scope and depth of these studies will be developed at the conclusion of Task 3 Site Investigation activities of the RI/FS.

Interim Environmental Monitoring:

- *Interim Monitoring-Groundwater:* Following completion of field activities associated with the sitewide RI/FS interim environmental monitoring of regional groundwater is necessary until completion of the selected remedial alternatives. Existing wells will be refurbished or new wells installed as necessary to support this interim monitoring.

- *Interim Monitoring-Air:* In order to support remedial actions at select FMPC facilities, an interim environmental sampling program must be initiated to establish a site specific baseline for ambient air concentrations of radionuclides, chemical constituents, and asbestos. This baseline data is necessary so as to assess the actual impacts associated with the implementation of remedial actions.

7.2.2 Remedial Design and Engineering

Detailed design and engineering must be performed to support the implementation of the selected remedial alternatives. In order for the FMPC to support a major remedial action program, various plant and facility upgrades must be initiated at the FMPC. Also, in order for the effective utilization of existing FMPC resources to support a remedial program, upgrades are necessary to FMPC programs.

Design and Engineering: Conceptual Design Reports (CDR), Design Criteria documentation and Title I-III engineering designs must be completed to effectively implement remedial actions at the FMPC. In general, detailed engineering will be prepared to support all significant remedial activities including, but not limited to, remediation for the K-65 silos, waste storage pits, soils, underground storage tanks and fly ash piles. Remedial Design and Engineering will also support the implementation of interim remedial actions in addition to those discussed in Section 7.2.3 that are initiated prior to issuance of the ROD for the RI/FS.

Final remedial actions will begin within a reasonable time period following the ROD, but in no event longer than that required under SARA. To support this effort, high priority Feasibility Studies and Conceptual Designs for the remediation of the

waste pits and silos will be initiated during FY-88. In addition, Design Criteria documents and some Title I design for the high priority remedial actions will be initiated in FY-90, prior to issuance of the ROD. While facility upgrades necessary to support remedial actions will begin in FY-90, final remedial actions generally will not begin prior to issuance of the ROD.

Supporting Projects: In order to support a major remedial action program at the FMPC, renovations and/or upgrades are required at selected FMPC facilities. Improvements to the north access road are necessary to accommodate the increased construction truck traffic. Improvements include installing a vehicle wash station to avoid the migration of contaminants from the FMPC controlled area. Engineering design of improvements on the north access will be initiated in FY-90.

Engineering design of a shredder/compactor facility is proposed for FY-90. The facility is necessary to support volume reduction of low-level waste generated as a result of remedial action programs at the FMPC. The shredder/compactor will improve material handling and create an environmentally acceptable waste form.

As discussed in Section 6.4.1, future access to offsite disposal cannot be guarenteed. WMCO is planning for this contingency by establishing onsite storage demonstrations. The design of an actual storage facility is planned once the site remediation begins.

Existing QA and health and safety programs must be augmented to fulfill USEPA criteria specific to remedial actions projects. Program management systems, including cost and scheduling systems, will be revised to be consistent with USEPA program requirements. Also, to support the overall remedial action program management and detailed engineering design, an updated topographic survey will be performed to provide necessary design information.

7.2.3 Interim Remedial Actions

Several remedial projects are being implemented before the RI/FS ROD because they alleviate situations which represent an obvious risk to employees, the public, or the environment. These projects are designed to reduce the risk until final remedial measures are chosen.

Thorium Remediation: The remediation planned for the FMPC thorium inventory is to repackage the material and provide interim storage onsite until final disposition plans are complete. The interim plan is sequenced as follows:

- Remove and package the thorium oxide stored in the Plant 8 bins and silo
- Repackage the drums containing thorium metal and millings
- Repackage the remaining drummed thorium inventory stored in warehouses.

Other interim remedial actions have been initiated. In FY-87, a security fence was placed around Building 65 and the pad storing the thorium metal in order to minimize potential radiation exposures to FMPC employees. In FY-86, steel beams were installed on the Plant 8 silo to reinforce the silo supports. A design of a system was completed to repackage the thorium metal; performance specifications were written to remove the thorium in the Plant 8 bins and silo. Separate subcontractors were chosen to design the systems to repackage the drummed thorium material (metal and warehoused) and the material in the bins and silos. Repackaging on both projects is scheduled to begin in FY-88. The repackaged thorium will be temporarily stored at the FMPC.

Upon completion of the K-65 structural analysis, several interim remediations were immediately initiated. Dome cap covers were placed over the center portion of the domes and weatherproofing of the entire dome suface was initiated. The fenced area surrounding the silos was secured. Radiation work permits are now required for maintenance activities at or near the silos. Closed-circuit television monitoring of the domes, additional environmental radon monitoring, and pressure and temperature monitoring of the silo void space were initiated. This monitoring is meant to aid in the detection of further deterioration of the domes and will also provide data needed in the planning of remedial actions.

Measures for establishing the K-65 domes have been recently completed and additional measures are planned for FY-88. Weatherproofing of the entire dome surface was completed in December 1987. A rigid polyurethane foam was placed over the dome surface to provide for weather protection and to help minimize pressure and temperature fluctuations within the silos. Feasibility studies and conceptual designs have been completed on ways to bolster the structural integrity of the dome and reduce radon emissions. The alternative chosen is filling the dome void space with polyurethane foam. The use of polyurethane foam will essentially eliminate radon emissions and will provide structural support to the weakened dome structure. Sampling, laboratory analysis, and television monitoring of the silo residues are also planned for FY-88. These activities will be concurrent with the dome stabilization project.

Interim Remediation of the Waste Storage Pits: Interim remediation efforts are directed toward maintaining the three open pits in a safe, stable condition. Toward this end, Pit 4 was bermed to limit the spread of contaminants and Pit 6 was bermed in FY-86 to divert surface water away from it.

Among the material contaminated with uranium in Pit 4 is barium chloride, making this a mixed waste impoundment. As part of the FFCA, DOE has agreed to provide an interim cover for Pit 4. A closure plan has been submitted to the OEPA. Constructing an interim cover for Pit 4 will prevent the infiltration of water and reduce the possibility of spreading contamination to the environment. During FY-87, WMCO completed a conceptual design for the interim closure of Pit 4. The

conceptual design was used to support the Project Authorization and NEPA documentation.

Interim Groundwater Remediation: The following three projects have been identified to reduce infiltration of contaminants to the groundwater:

- *Reducing Uranium in Offsite Wells:* The purpose of this EHSI project is to reduce the migration of uranium from the waste pit area to the surrounding FMPC environment. It consists of three parts: the first part consists of redirecting some of the waste pit stormwater runoff to the Stormwater Retention Basin, thus minimizing the runoff into Paddy's Run. The second part consists of expanding the existing FMPC groundwater monitoring system for areas surrounding the plant. This expansion will include the location of existing private wells and the installation of six new wells. The third part consists of investigating, by radiological survey and sampling, the extent of uranium-bearing sediment along the stormsewer outfall ditch. This material, which may be active as an intermediate or secondary uranium source, will be excavated.

- *FMPC Outfall Line Remediation:* According to the DFO, the FMPC must complete the necessary testings of the FMPC outfall to locate any leaks in the line. The FMPC will then seal any identified leaks. Due to scaling of the internal surfaces of the outfall line, standard grouting techniques for sealing the outfall may not be suitable. The FMPC must also evaluate the potential environmental impacts associated with the gravel pack surrounding the outfall line. Activities associated with this order will be initiated following completion of the Zone of Influence Study.

- *Paddy's Run Channelization:* Certain areas of Paddy's Run contain sediments with some uranium contamination. This represents a potential infiltration source to the groundwater. Plans are being made to channel Paddy's Run around these areas.

Interim Soil Remediation: Surface soils exhibiting concentrations of radionuclides above the action level defined by the RI risk assessment, are proposed to be removed and temporarily stabilized onsite until the final remedial alternative is implemented. This action will reduce an active environmental source of contamination.

Abandoned-in-Place Equipment: The interim remediation plan for abandoned equipment is to identify the equipment, determine its radiological condition, and gradually remove it from the plant.

Much progress was made in FY-87. All abandoned equipment at the FMPC was identified and bar coded. Plant drawings have been updated to show the location of this equipment. In FY-88, the abandoned equipment will begin to be disconnected from utilities and radiologically surveyed. The disposition of abandoned-in-place

equipment will continue beyond FY-88 depending on budget and manpower constraints.

7.2.4 Remedial Actions

Thorium: Efforts will continue to identify actions for the final disposition of the repackaged thorium. The disposition of the empty bins, silo, and other equipment contaminated with thorium will also be addressed.

Waste Pits 1, 2, 3, and 6: The final disposition of the pit material will be established following the RI/FS ROD. For planning purposes, FMPC assumes that the pit contents will be excavated, packaged, and placed in durable onsite storage.

Pit 4: Pursuant to the FFCA, DOE is obligated to complete final closure of Pit 4. Toward this end, a conceptual design has been completed for final closure. The actual closure is scheduled in FY-91. The final closure process could be impacted by the RI/FS ROD.

Pit 5: Plans are underway to expedite the final remediation of Pit 5. A conceptual design was completed in FY-87. Completion of Pit 5 remediation is expected in FY-94.

K-65 and Metal Oxide Silos: The final disposition of these silos and their contents will be decided after the EIS and RI/FS are completed. For planning purposes, it is assumed that the silo contents will be removed and packaged for durable interim storage. The silos will be dismantled and packaged for disposal as LLW.

Underground Storage Tanks: The FMPC has identified underground storage tanks which require pressure testing and/or monitoring under RCRA regulation. This project will provide for the removal of these storage tanks, environmental studies to determine any impacts of leaks discovered during testing, removal and disposal of any contaminated soil, and the testing and treatment of any groundwater that would have been affected by tank leakages.

Fly Ash Piles: The final remedial action for the old flyash pile will be determined by the RI/FS ROD. The same remedial action will likely be applied to the uncovered portions of the new flyash pile.

Contaminated Soil: The extent of contaminated soil at the FMPC and the final disposition of this material will be determined by the RI/FS and other surveys. A plan for this contaminated soil will be developed following receipt of the RI/FS ROD.

Building Demolition: The decontamination and decommissioning of abandoned facilities must be carefully planned and coordinated with other remediation projects. The long-term planning will begin in FY-89 with a feasibility study. Beyond FY-89, planning will continue with a conceptual design, and finally Title I and II engineering. Plant 7 or the Plant 1 silos will likely be the first projects addressed.

Supporting Projects: Several supporting projects, as outlined below, must be implemented to support the remediation effort.

- *Construction Activities:* This involves the completion of the following improvements which were discussed previously: Interim Onsite Durable Storage Facility, North Access Road and the Shredder/Compactor.

- *Rail Link:* This project involves upgrading and/or expanding the existing rail system. Many remediation technologies encompass large, preassembled equipment which is most economically shipped by rail. Also, bulk wastes such as excavated soil or construction rubble can similarly best be handled by rail transport.

- *Remediation Support Facilities:* This facility will include change rooms, showers, radiation survey equipment, and other necessary amenities. It will be located in the northwest section of the FMPC in the location where most of the future planned remediation will take place. This project also covers the utilities necessary to support operations within the facility.

- *New Electrical Substation:* Existing facilities located in the northwest corner of the FMPC (i.e. the Biodenitrification Facility) are fed from a single electrical power source near Plant 1. This substation is now operating at near maximum capacity. A new substation is needed to supply power to facilities that will be constructed in relation to future remediation activities planned for this area.

- *Interim Staging Facilities:* Large quantities of potentially contaminated soil and construction rubble at the FMPC will require interim storage while awaiting packaging and final disposition. To prevent the spread of contamination to the environment, the soil and rubble will be crated and staged in a warehouse-type building.

- *Supporting Equipment:* Several pieces of equipment will be needed to support the remediation effort. These include a concrete recyler, a waste repackaging system, hydraulic lift crank, containers, vacuum systems and vehicles.

- *Supporting programs:* Several programs are also needed to support the remediation effort. These iclude establishing organizations for public interaction, agency/DOE interaction, and remediation contractor mobilization.

8.0 Personnel Protection Programs

Provisions for health and safety at the FMPC are covered through the efforts of several groups integrated through the management of the OS&H Department. Though not mutually exclusive of each other, the programs at the FMPC have been divided into three categories:

- Personnel Protection
- Safety of Nuclear Facilities
- Emergency Preparedness.

The functions and programs as related to Personnel Protection are described in the sections below. Safety of Nuclear Facilities and Emergency Preparedness will be discussed in Sections 9.0 and 10.0, respectively.

Personnel protection is divided into three areas:

- Health Physics and Radiation Protection
- Industrial Hygiene
- Industrial Safety.

The plans and programs of each of these entities are presented in the sections that follow.

8.1 Health Physics/Radiation Protection Program

The Environmental & Radiological Safety Section, which consists of the ES&H Chemistry Lab, Environmental & Radiological Monitoring (ERM), Health Physics & Radiological Engineering (HP&RE), Dosimetry & Instrumentation (D&I) Subsections, and the OS&H Document Control & Review activity, administers the Health Physics/Radiation Program at the FMPC. This program is concerned with minimizing the exposure of personnel at the FMPC to ionizing radiation. Current production operations at the FMPC involve handling only uranium, an alpha emitter. However, beta-emitting thorium and protactinium isotopes from the U-238 decay chain are present in virtually all materials handled at the FMPC, so direct beta radiation exposures are of concern in many parts of the plant. In addition to radioactive materials used in current production, the FMPC has stored large quantities of radioactive materials from previous operations. These include the radium-bearing K-65 residues and thorium-bearing wastes and compounds. Both radium and thorium are strong gamma emitters, and both generate isotopes of radon.

8.1.1 Health Physics Concerns at the FMPC

The Health Physics concerns at the FMPC (in approximate order of importance) are:

- Inhalation/ingestion of uranium compounds
- Direct radiation skin doses arising from beta-emitting isotopes of thorium and protactinium in the U-238 decay chain
- Radioactive contamination in the process area
- Direct radiation whole body doses arising from thorium- and radium- bearing materials during remediation of waste storage facilities
- Inhalation of radon isotopes during remediation of waste storage facilities.

8.1.2 Health Physics/Radiation Protection Strategy

The strategy for addressing radiation protection concerns at the FMPC consists of the following six elements:

- Characterizing the radiological conditions at the facility
- Monitoring personnel
- Developing work practices to minimize radiation exposures
- Designing new or modified facilities and equipment to minimize radiation exposures
- Establishing controls to restrict the movement of contamination
- Reducing doses, dose rates, contamination levels, or other radiological factors in selected areas of the facility.

The first element in the strategy is for the ERM subsection to perform routine and special surveys to determine the location and magnitude of direct radiation fields, airborne contamination, and surface contamination at the FMPC.

The second element in the strategy involves the D&I Subsection which monitors employee exposures to external and internal radiation. This group operates the Mobile In-Vivo Radiation Monitoring Laboratory (MIVRML), as well as defining the sampling frequency and interpreting the results for the Uranium Urinalysis Program. The OS&H Chemistry Laboratory analyzes the urine samples.

The third element in the strategy, the development of work practices that minimize radiation exposures, is the result of several related areas working together. Workplace observation, coupled with knowledge of radiological conditions, enable ERM and HP&RE personnel to recommend specific radiation control practices for various work stations. These practices include the use of temporary or permanent shielding, respiratory protection, modifications to equipment, and alterations to existing work practices such as moving stored radioactive materials away from work stations and utilizing remote handling devices.

Personnel in HP&RE review Standard Operating Procedures (SOPs) for Production Operations. This group's review ensures that work practices incorporate radiation protection measures. For operations where SOPs do not exist, HP&RE personnel rely on the Radiation Work Permit program to ensure that proper radiation protection practices are followed. For nonroutine operations such as waste remediation projects, work descriptions are prepared, and these are also submitted to the OS&H document review system.

These procedures would not be effective without proper training programs for employees. These programs, conducted by HP&RE personnel, include general radiation safety training as well as job-specific radiation protection practices, and can be formal courses (such as Radiation Worker Training) or informal presentations to safety meetings or other groups.

The fourth element in the strategy is to design new or modified facilities and equipment so that radiation exposure is kept to a minimum. Personnel in HP&RE review all documents that deal with new designs or modifications to ensure they include adequate ventilation, shielding, remote handling, or other applicable measures to keep exposure to employees and to the environment as low as reasonably achievable (ALARA).

The fifth element in the strategy is to control the spread of radioactive contamination, establish clearly-defined borders between process and nonprocess areas, and mandate contamination monitoring for personnel and equipment moving from process to nonprocess areas. Furthermore, all vehicles leaving the FMPC process area must pass a single control point where ERM personnel monitor them for direct radiation and surface contamination. Shipments of radioactive materials are also monitored to ensure that the vehicles are not contaminated.

The sixth element in the strategy is to identify specific improvements in the radiation protection program (ALARA). The ALARA Program is administered by an ALARA Task Force whose membership is drawn from several operations and support organizations onsite. The ALARA Task Force selects a chairman, ALARA goals, recommends ways for meeting those goals, and evaluates progress toward attaining them. Periodic reports on that progress are made to facility management.

8.1.3 Health Physics/Radiation Protection Programs

The nine programs that comprise the overall FMPC Radiation Protection Program, along with descriptions of their major activities, are listed below. Capital equipment expenditures anticipated are identified in Section 8.4.1.

The first program is the Sample Analysis Program. The OS&H Chemistry Lab is primarily responsible for this program, and the lab provides analytical services to OS&H subsections. One of the lab's tasks is to analyze FMPC employee urine

samples for uranium and to promptly report results in excess of action levels to the Dosimetry & Instrumentation Subsection.

When urine or fecal samples must be analyzed for radioactive materials other than uranium, the OS&H Chemistry Lab arranges for other DOE or commercial laboratories to analyze the samples. The OS&H lab serves as contact point to those labs, minimizing communication problems between the offsite labs and the FMPC group requesting the analysis. In addition, the OS&H lab performs a wide variety of analyses on effluent and environmental samples.

The Environmental & Radiological Monitoring Subsection is primarily responsible for the second program, the Workplace Monitoring Program. The HP&RE subsection helps ERM personnel determine monitoring frequencies and action levels. The activities listed below are described in the following four paragraphs:

- Conducting special and routine surveys for direct radiation, and airborne and surface contamination in all FMPC production plants
- Issuing Radiation Work Permits which describe radiation controls for maintenance and nonroutine activities
- Continuous monitoring and surveying for nonroutine activities that pose severe radiological concerns
- Counseling on proper work practices.

ERM personnel monitor radioactive waste that is ready for shipment, contaminated scrap and rubble that is generated by construction projects, and the remedial actions at thorium and K-65 storage locations. Additional workplace monitoring includes conducting a routine radiological survey and monitoring program of the site. This includes direct radiation and contamination surveys, issuing Radiation Work Permits, prescribing protective clothing or equipment, and surveying scrap and rubble to determine appropriate methods for disposition.

ERM personnel provide radiological monitoring support for both RUST Engineering and their subcontractors' onsite projects. Many of RUST's construction projects at the FMPC involve demolition of contaminated structures or equipment and/or working in radiation fields.

Other responsibilities include maintaining and operating necessary counting equipment such as scintillation and gas proportional planchet counters to support the above work activities. In addition, ERM performs routine operational and QC checks to ensure that the equipment operates properly.

Design and Document Review and Control is the third Health Physics/Radiation Protection program, and is coordinated by the Document Control & Review function. Most of the actual reviews are performed by HP&RE. The two main activities in this program are:

- Coordinating OS&H document reviews, including engineering documents, Operations' SOPs, Production Test Authorizations, Site SOPs, and OS&H SOPs
- Providing independent engineering evaluations relative to radiation dose reduction in plant design, remodeling and SOP development.

The documents HP&RE reviews include Conceptual Design Reports, Design Reviews at various stages of completion (30% reviews, 50% reviews), Project Authorizations, and Maintenance Work Orders.

The fourth program is the Dose Reduction Program (ALARA Program). HP&RE subsection identifies methods for reducing worker doses, workplace contamination levels, and other radiological indicators. Activities which contribute to dose reduction efforts include the following:

- Applying radiological engineering principles to solve specific radiological problems in plant operations such as identifying and correcting non-optimum work practices and equipment, and identifying areas or specific jobs where dose or contamination reductions are warranted
- Specifying radiological controls, administrative guides and other action levels for the radiation protection program.

HP&RE specifies program elements (other than bioassay program elements) such as measurement frequency for radiation measurements, action levels and associated actions, and initiates policies to control contamination; restricts employees who are approaching radiation exposure limits; and establishes airborne contamination levels that require respiratory protection.

The Health Physics & Radiological Engineering Subsection and the Environmental & Radiological Monitoring Subsection have responsibilities in Contamination Control, the fifth program. This program includes the following activities:

- Providing radiological monitoring service for receipt and shipment of radioactive materials; ERM performs direct radiation and contamination surveys on shipments of radioactive materials to ensure that the FMPC complies with DOT regulations
- Implementing a comprehensive contamination control program based on dividing the FMPC into uncontrolled zones (administrative offices), controlled zones (general areas in process buildings), and contaminated zones (areas where uncontained radioactive materials are handled and where there is a significant potential for routine contamination); each area will have separate contamination limits, clothing requirements, and work practices.

The Dosimetry & Instrumentation Subsection is primarily responsible for the External Dosimetry Program which includes the following activity:

- Providing personnel external dosimetry for assessing whole body and extremity radiation exposures.

D&I prepares, issues, and processes radiation dosimeters for WMCO employees, subcontractor employees, and visitors to the process area. All personnel who enter the process area, with the exception of certain delivery truck drivers, wear whole body dosimeters for measuring both shallow and deep radiation doses. Selected WMCO employees also wear wrist dosimeters for assessing extremity doses, and ring dosimeters are being evaluated. The whole body dosimetry system has been accredited by the DOE's Laboratory Accreditation Program (DOELAP).

The seventh program is the Internal Dosimetry Program and is the responsibility of the Dosimetry & Instrumentation Subsection. The program includes the following activity:

- Providing personnel internal radiation dosimetry to assess intakes of radioactive material and resulting radiation doses.

Two personnel monitoring programs are conducted to assess internal radiation doses--the Uranium Urinalysis Program and the In-Vivo Monitoring Program. D&I determines monitoring frequency, action levels, and interprets results for both programs. The group also performs in-vivo monitoring using the MobileIn-Vivo Radiation Monitoring Laboratory (MIVRML) from the Y-12 Plant at Oak Ridge. Monitoring frequencies are based on employee job classifications. A permanent in-vivo monitoring facility is being constructed at FMPC (FY-85 GPP Funding). It will be placed in service at the end of FY-88 and will replace the MIVRML after a sufficient number of intercomparison counts have been performed.

The Instrument Calibration/Maintenance Program is the eighth Health Physics/Radiation Protection program. Dosimetry & Instrumentation is responsible for this program which includes the following activity:

- Maintaining and calibrating all OS&H instruments or arranging for manufacturers or outside facilities to perform those services.

A computerized scheduling system is maintained, as are all maintenance and calibration records. Each month, radiation monitoring instruments that are due for calibration or maintenance are identified by letter to ERM which retrieves the instruments and returns them to the Instrument Lab.

The last program in this section is the Radiation Protection Training Program. The HP&RE subsection is primarily responsible for developing training programs for radiation workers. Each subsection in OS&H is responsible for training its members in specific duties. The Radiation Protection Training Program includes the following activities:

- Conducting a training program for ERM technicians
- Expanding the FMPC radiation worker training program.

Depending on previous training and experience, ERM technicians receive varying degrees of training in general principles of radiation protection, site-specific radiological conditions, and FMPC policies and procedures. This training program is coordinated by a training technician within the ERM Subsection, and is designed to ensure proper, uniform application of the FMPC radiation protection program.

During FY-88, the first round of radiation worker training for FMPC employees will be completed and the second round will begin. The second round will include more detailed radiation safety information.

The planned improvements for Health Physics/Radiation Protection are described in Section 8.4. The fiscal year funding requirements are presented in Table 8-1.

TABLE 8-1
FUNDING SUMMARY FOR HEALTH PHYSICS/RADIATION PROTECTION
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	2,709	1,010	172	117	320	350	370	370
GE-GPP	1,135	65			150	460	460	
GE-LI	41,299	5,951	20,130	2,668		7,350	5,200	
GE-OP	47,715	6,840	6,220	5,655	5,250	7,630	7,815	8,305
Totals:	92,858	13,866	26,522	8,440	5,720	15,790	13,845	8,675

KEY

GE-CE - Capital Equipment from GE Budget
GE-GPP - General Plant Projects from GE Budget
GE-LI - Line Item Projects from GE Budget
GE-OP - Operating Funds from GE Budget

8.2 The Industrial Hygiene Program

The function of the FMPC Industrial Hygiene (IH) group is to implement and maintain an effective Industrial Hygiene Program designed to preserve employee health and well-being. This is accomplished by identifying, evaluating, and controlling environmental factors and stresses found at the FMPC which could adversely impact employee health. These factors and stresses include:

- Chemical agents (hazardous liquids, particulates, vapors, and gases)
- Physical agents (noise, vibration, heat and nonionizing radiation such as microwaves)
- Biological agents (airborne or waterborne pathogens).

The IH Group must ensure that the FMPC complies with all applicable DOE, OSHA, and EPA laws and regulatory requirements involving employee health protection. This group evaluates FMPC industrial hygiene operations, reviews procedures, evaluates employee exposures to hazardous substances and radiation, recommends control measures, provides industrial hygiene training assistance, and communicates findings to management, the medical staff, and to employees. The FMPC Health and Safety Manual outlines the responsibilities of management and employees in regard to maintaining and enforcing health and safety procedures and requirements.

The IH staff consists of administrative, professional, technical, and clerical personnel. Additional professional personnel will be necessary in 1989 for industrial hygiene training, monitoring, and for coordinating and handling industrial hygiene data. The fiscal year funding requirements are presented in Table 8-2.

TABLE 8-2
FUNDING SUMMARY FOR INDUSTRIAL HYGIENE
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	1,295	745	225	150	100	20	55	
GE-GPP	468	268						200
GE-OP	14,970	1,570	2,185	1,880	1,710	2,390	2,765	2,470
GE-LI	54,966	14,912	9,940	20,021	3,284	6,809		
Totals:	71,699	17,495	12,350	22,051	5,094	9,219	2,820	2,670

KEY

GE-CE - Capital Equipment from GE Budget
GE-GPP - General Plant Projects from GE Budget
GE-OP - Operating Funds from GE Budget
GE-LI - Line Item Projects from GE Budget

8.2.1 Industrial Hygiene Concerns at the FMPC

The major industrial hygiene concern at the FMPC is the potential exposure of employees to hazardous substances which are not radioactive or for which radioactivity is of secondary importance to toxicity. Hazardous substances of concern at the FMPC may be placed in three categories: airborne particulates, hazardous chemicals, and solvents.

To combat these hazards, the IH group studies the workplace and then suggests ways to improve conditions, such as reducing noise levels or improving ventilation. The FMPC's aging ventilation system is a particular concern of the IH group.

8.2.2 Industrial Hygiene Strategy

The strategy to solve industrial hygiene problems includes developing engineering and administrative controls and recommending protective equipment for employees. Existing facilities and equipment are retrofitted with engineering controls considered feasible, and consideration is given to substituting for or eliminating defined hazardous chemicals. Administrative controls include complying with all plant operating procedures. Protective equipment is used to control exposures where engineering or administrative controls are not feasible for the equipment or operation involved, or for nonroutine situations.

The recognition of potential industrial hygiene health risks is accomplished through various means, including:

- Surveying the FMPC by professional IH staff
- Monitoring ventilation systems
- Reviewing details of all processes
- Reviewing all preliminary engineering designs of facilities and process additions/modifications
- Analyzing maintenance work requirements
- Reviewing FMPC standard operating procedures and intended changes
- Verifying routine bioassay results
- Collecting and reviewing routine air sampling data
- Identifying all defined hazardous chemicals onsite
- Following-up on requests from supervisory personnel, employees, medical staff and others to investigate potential risks and assist in implementing solutions.

Industrial Hygiene exposure results obtained through these evaluations are being used to establish a database. Reliability and quality assurance of the industrial hygiene data require that calibration equipment be available for all industrial hygiene sampling and monitoring instrumentation.

Industrial Hygiene helps the first-line supervisors develop appropriate employee information and training programs. These include providing monitoring results required by DOE Orders and referenced standards, informing management, medical and other environmental, safety and health personnel of monitoring results as needed, and recommending corrective measures. The potential hazards of exposure to toxic or hazardous chemical materials used at the site are made known to employees, and customers are told of FMPC product hazards.

8.2.3 Specific Industrial Hygiene Programs

The above-mentioned strategies for industrial hygiene are accomplished through programs which are described in the following paragraphs:

- Air sampling
- Respiratory protection
- Hearing conservation
- Hazard communication
- Ventilation monitoring
- Permitting.

The primary purpose of the FMPC Air Sampling Program is to determine the level of employee exposure to airborne emissions. Air sampling may be performed to determine:

- Employee exposures to potential health risks
- Magnitude of employee exposure at the start-up of a new process or a change in a process or material used
- Justification of employee complaints or grievances concerning an alleged health risk
- Performance of engineering control measures
- Chemical and/or physical characteristics of gaseous and airborne emissions for engineering design or R&D purposes
- FMPC compliance with DOE health standards.

The air sampling program considers principles of air sampling, equipment, types of samples (including personal breathing zone and fixed-area sampling of various durations), quantity of samples, and exposure calculations. The program also includes procedures to calibrate sampling pumps and to collect samples.

The Respiratory Protection Program has been established at the FMPC to coordinate the selection, use, maintenance, and inspection of respirators. The program complies with DOE regulations which incorporate the substantive provisions of OSHA, and meets the recommendations of ANSI. In addition, the program lists respirators approved for use at the FMPC and describes procedures for conducting respirator storage audits for performance of medical evaluation of respirator users.

All users of respirators at the FMPC must be fitted and trained as part of this program.

The Hearing Conservation Program has been established to protect the hearing acuity of employees and to prevent noise-induced hearing loss. This program identifies noise-hazard areas of the site and suggests methods to reduce noise exposure to noise levels at a Time-Weighted Average (TWA) of 85 dBA (slow) or more.

The Hazard Communication Program provides formal procedures for many practices which have been implemented at the FMPC. Hazard communication standards require the proper labeling of hazardous materials, providing adequate employee training, and listing all chemicals used at the site. Material Safety Data Sheets and employee information and training files must also be maintained.

The Ventilation Monitoring Program verifies the adequacy of ventilation controls used at the FMPC, and includes procedures for monitoring plant workplace and laboratory hood ventilation systems. These systems direct airborne contaminants such as vapors, gases and particulates to control equipment for treatment and to prevent the contaminants from escaping into the workplace environment. Furthermore, they are designed to comply with the industrial hygiene standards included in DOE Orders 5480.4 and 5480.10.

The last program is the issuance of Industrial Hygiene procedures to cover entry into enclosed spaces where harmful quantities of gases or vapors may be present or where an oxygen deficiency may occur. They also cover work involving asbestos which may be present in old insulation but which has been prohibited for all new and replacement work.

8.3 Industrial Safety Plan

The FMPC has active Safety and Fire Protection Programs to maximize personnel safety and prevent property loss and/or interruption of production. The Safety and Fire Protection areas are continually reviewed, and needed improvements have been identified. The fiscal year funding requirements are presented in Table 8-3.

8.3.1 Industrial Safety Strategy

Occupational Safety and Fire Protection at the FMPC is administered by the Fire and Safety Group of the Operations Safety & Health Department, but is in reality the responsibility of line managers in each plant area. Safety strategy focuses on intensive training of employees and management in safety awareness and safety implementation, including CPR and first aid training, crane and hoist operator training, and material handling. Planned improvements include increasing Fire

and Safety staffing and training, and suggesting physical improvements in the plant. Safe work practices will be encouraged by incentive award programs, internal audits and other structured training. The projects planned are described in Section 8.4.3.

TABLE 8-3
FUNDING SUMMARY FOR INDUSTRIAL SAFETY
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-LI	10,287	5,212	4,498	569	8			
GE-OP	9,985	1,110	1,135	1,350	1,220	1,705	1,680	1,785
GE-GPP	50				50			
Totals:	20,322	6,322	5,633	1,919	1,278	1,705	1,680	1,785

KEY

GE-LI - Line Item Projects from GE Budget
GE-OP - Operating Funds from GE Budget
GE-GPP - General Plant Projects from GE Budget

8.4 Description of Personnel Protection Projects

8.4.1 Health Physics/Radiation Protection Project Descriptions

The six planned improvements in the Health Physics/Radiation Protection area are described in the paragraphs that follow this list:

- Enclosing saws and lathes in Plants 5 and 9
- Constructing an In-vivo Monitoring Facility
- Constructing the Finished Uranium Metal Warehouse
- Improving Material Handling
- Constructing a Receiving and Incoming Materials Inspection Area
- Upgrading the Laundry and Locker Room.

Enclosing Saws and Lathes in Plants 5 and 9: Since the uranium chips generated by cutting and machining operations are pyrophoric, they can easily ignite unless they are submerged in machining fluid. While basins of machining fluid are provided beneath the saws and lathes, chips still occasionally fall to the floor and spontaneously ignite. Since smoke generated by these burning chips is part uranium oxide, ventilated enclosures at these locations will shield operators from

beta radiation and reduce airborne exposure. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.3.01.

Constructing an In-vivo Monitoring Facility: Funding has been approved for an in-vivo monitoring facility to measure uranium lung burdens of employees. Housed in a new building south of the existing Health & Safety Building, the facility will consist of a shielded counting chamber, gamma radiation detectors, and associated computer hardware necessary for control and data analysis. An A/E has been retained and design has begun. The facility is scheduled for completion in FY-88.

Constructing the Finished Uranium Metal Warehouse: This warehouse will be constructed east of Plant 6. The 17,000 ft^2 building will be used for short and long-term storage of uranium products for staging into the Plant 6 inspection area or for offsite shipment. A remote storage facility will minimize radiation exposure to operating personnel and relieve the existing congestion caused by storage of these materials in plant work areas. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.3.2.01.

Improving Material Handling: This subproject includes 12 planned improvements which involve improving the way materials are handled in many of the process areas. In virtually every FMPC production plant, there are work stations where operators must directly handle radioactive materials which may or may not be in containers. By increasing the use of conveyors and remote handling equipment, the FMPC can minimize direct handling of radioactive materials which in turn will decrease employee exposure to radiation as well as reduce the opportunities for injury. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.3.3.01 through 1.1.3.3.12.

Constructing a Receiving and Incoming Materials Inspection Area: This facility will be located near the south fence line on the east side of the FMPC site. Since the present receiving facility is located in the process area, all deliveries are made to an area where contamination is possible. Furthermore, all delivery vehicles must be monitored before they leave the process area. The new facility will allow personnel to inspect incoming materials for conformance to specifications before they enter the process area, greatly reducing the potential for contamination. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.1.05.

Upgrading the Laundry and Locker Rooms: This modification of Building 11 includes removing or relocating existing walls and doors, adding showers in the men's locker room, constructing a process-side entrance into the women's locker room, expanding the women's facilities to meet proposed future needs, and installing fencing for clearer separation of process/nonprocess areas. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.1.02.

In addition to the previous six planned improvements, there are numerous items which are needed to support the programs discussed in Section 8.1.3:

- Gamma spectroscopy system
- Ion chromatograph-ultraviolet detector
- Vacuum system
- Manual alpha/beta planchet counter
- Four-wheel drive van
- Automatic alpha/beta planchet counters (replacement)
- Hand & foot monitors (replacements)
- TLD system computer and software
- Automatic TLD reader (replacement)
- Instrumentation for In-vivo Monitoring Facility
- In-vivo phantoms and calibration sources
- Ultrasound unit for In-vivo Facility
- NaI In-vivo monitoring detectors
- Shielded counting chamber (second unit)
- Instrumentation for shielded counting chamber (second unit)
- Electric cart for servicing/retrieving instruments
- Calibration source range.

There is also a management initiative, the "5-Alive" program which involves design changes and equipment upgrades to improve radiological conditions in Plant 5.

8.4.2 Industrial Hygiene Project Descriptions

There are 24 planned improvements in the Industrial Hygiene area. They are described in the paragraphs that follow this list:

- Respirator Fit-test Facility
- Portable Fit-test Units
- Calibration Wind Tunnel
- Noise Monitoring Instrumentation
- Labeling/Tracking System for Hazardous Chemicals
- Portable Toxic Gas Detection System
- Gas/Vapor Standards Generator System
- HEPA Test Equipment
- Particulate Air Monitoring Instrument
- Fit-test Instrumentation
- Breathing Air System Survey
- Emergency Response Team Training Facility
- IH Support Vehicle
- Portable Mercury Vapor Monitor
- Spill Response Vehicle Equipment
- Air Sampling Equipment
- Document Storage System
- Dry Cleaning System

- Respirator Washing Facility
- Expand the Health & Safety Building
- Expand the Analytical Facility
- Storage Building and Pad for Hazardous Chemicals
- General Plant Ventilation Upgrade and Improvements
- Followup Ventilation Survey
- Respirator Facepiece Test Fixture.

Respirator Fit-test Facility: The new respirator fit-test enclosure was erected during FY-87. A computerized fit-test instrument will be installed in early FY-88. The project for the permanent respirator fit-testing facility has been integrated into the ES&H Training Center Project 53-86101. The new fit-test facility will consolidate fitting operations currently performed in two areas. The new fit-test enclosure and computerized fit-test instrument will increase reliability and accuracy while fitting more employees.

Portable Fit-test Unit: This unit is needed to fit-test air-line respirators in the field. Significant changes in NIOSH-certification of respirators make it necessary to determine actual protection factors for air-line respirators used in the field. This additional equipment will improve the confidence of air-line respirator use.

Calibration Wind Tunnel: This tunnel will enable FMPC personnel to verify that sampling pumps and airflow measuring devices are properly calibrated. The wind tunnel will improve the air volume and flowrate measurements used by Industrial Hygiene. This is a secondary calibration standard for volumetric air flow rates. It will supplement current techniques for calibrating air sampling pumps, pitot-tubes, anemometers or other instruments.

Noise Monitoring Instrumentation: This instrumentation will replace noise monitoring equipment damaged due to normal usage and to take advantage of technological advances and changes in regulations.

Labeling/Tracking System for Hazardous Chemicals: This system consists of a system that provides labels which include required health and safety information for chemicals used at the FMPC. A hazardous chemical labeling and tracking system is needed to ensure that the FMPC complies with hazard communication standards.

Portable Toxic Gas Detection System: This system will extend the capabilities of the industrial hygiene monitoring programs. This portable instrument to monitor airborne contaminants can reliably measure HF and possibly other contaminants.

Gas/Vapor Standards Generator System: This system will enable IH personnel to generate atmospheres containing low levels of gas and vapor contaminants in order to calibrate real-time IH monitoring instruments and check the validation of sampling methods. This combines projects formerly titled "Gas Calibration Balance" and "Calibration Equipment."

HEPA Test Equipment: Two sets of test equipment are needed for the in-place testing of HEPA filters to ensure the HEPA filters comply with DOE requirements at offsite facilities. However, the entire HEPA dust collection system must be tested to ensure the filters are properly installed and are not damaged. This system is anticipated to consist of a particulate generator and a detector unit.

Particulate Air Monitoring Instrument: This instrument will be used for real-time monitoring of particulates for workplace air contaminant screening surveys.

Respirator Fit-Test Instrumentation: This instrumentation will enable IH to maintain necessary fit-test services by replacing worn-out fit-test instrumentation.

Breathing Air System Survey: This survey is a comprehensive evaluation of the FMPC in-plant breathing air system. The survey will identify the need for any upgrades, evaluate the existing system, will be a basis for future surveillance programs.

IH Support Vehicle: A support vehicle (van) is required to transport IH personnel and equipment as the personnel perform daily required surveillance activities at the FMPC. Also, since IH personnel are members of the FMPC Emergency Response Team, they will use this vehicle on emergency runs.

Emergency Response Team Training Facility: An enclosed modular-type training facility is planned in the Heavy Equipment Building (Building 55) to provide adequate seating, media, and utilities necessary for a training environment. Building 55 is close to the emergency rescue apparatus.

Portable Mercury Vapor Monitor: This equipment will enable IH personnel to monitor mercury vapors in the workplace. The instrument resists interference from organic solvents and cigarette smoke, and gives real-time results for evaluation of mercury health hazards in workrooms or from spills. Current methods are not sensitive enough or require long turnaround times for sample analysis.

Spill Response Vehicle Equipment: Procurement of the spill response vehicle was initiated in FY-87. Some equipment, including a generator, spill control kits, and protective clothing, was obtained. Additional equipment, including monitoring instruments, encapsulating suits, foam suppressant, and patching kits are needed. This spill response vehicle and equipment will be used to handle incidents involving FMPC hazardous materials.

Air Sampling Equipment: Air sampling pumps are required for industrial hygiene monitoring. These air samplers will be used to evaluate employee exposures to hazardous gases and vapors.

Document Storage System: A computerized document storage system for correspondence will facilitate the retrieval of documents and information when correspondence related to particular plants, operations, employees, or hazardous materials is needed.

Dry Cleaning System: This system will be completed in conjunction with the Laundry Upgrade project. The dry cleaning equipment will use freon instead of perchloroethylene. This substitution anticipates more stringent industrial hygiene controls of perchloroethylene, regulatory requirements for solvent disposal, and high concentration generated by current equipment.

Respirator Washing Facility: New respirator cleaning equipment will be purchased and installed in conjuction with the Laundry Upgrade project. The equipment will be installed in the area currently used to wash respirators. It will then be moved to the new north addition of the building when completed. The new equipment will improve the efficiency and effectiveness of respirator cleaning and reduce damage to the respirators.

Expand the Health and Safety Building: This subproject will enlarge the medical facilities and increase office and laboratory space. It is included in the EHSI Line Item Project, reference WBS 1.1.4.1.04.

Expand the Analytical Facility: The existing facility will be renovated and expanded to meet the increased demands for sampling and analysis. Additional office and storage space and an emergency personnel shelter are included. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.1.03.

Storage Building and Pad for Hazardous Chemicals: This subproject involves building a facility to store hazardous chemicals. Presently, hazardous chemicals are stored within the analytical laboratory stockroom of the Technical Laboratory. Personnel must frequently enter the stockroom to obtain supplies such as nonhazardous chemicals and laboratory equipment. Such chemicals should be stored in a separate building. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.2.1.04.

General Plant Ventilation Upgrade and Improvements: This subproject includes 27 heating and ventilation systems and involves new process equipment to be installed in virtually every section of the plant. The new ventilation systems will reduce contaminant concentrations in the workers' breathing zones as well as reduce emissions to the atmosphere. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.1.4.01 through WBS 1.1.1.4.27.

Followup Ventilation Survey: A comprehensive follow-up survey of all in-plant ventilation systems designed for contaminant containment and control is planned. This survey will be conducted after currently planned renovations and additions to

ventilation systems are completed. The survey will document existing conditions and form a basis for future surveillance activities.

Respirator Facepiece Test Fixture: A respirator facepiece test fixture will be used to check the integrity of cleaned/reconditioned repirators prior to reissue. This is especially important for the complex full-face models which are difficult to visually inspect. WMCO could reduce costs by using this system to check the integrity of used filter cartridges for recertification and reuse.

8.4.3 Industrial Safety Project Descriptions

The four planned improvements in the Industrial Safety area are described in the following paragraphs:

- Plantwide Lighting Upgrade
- Increasing Safety Training Programs
- Establishing Employee Incentive Programs
- Constructing a Storage, Maintenance and Office Building near the Boiler Plant.

Plantwide Lighting Upgrade: This subproject is based upon studies of specific locations and illumination standards. Modern fixtures and lamps, complete with required auxiliaries, will replace existing installations on a priority basis. Equipment selection will depend upon minimum energy consumption, ease of maintenance and availability of replacement parts. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.4.01.

Increasing Safety Training Programs: Areas requiring additional employee training consist of the existing safety programs for initial employee training, cardio-pulmonary resuscitation and first aid training for selected personnel, crane and hoist operator training, material handling equipment training, and supervisor safety training.

Establishing Employee Incentive Programs: A new employee safety incentive program will provide greater interest in job safety performance. Presently, awards are issued based on the achievement of a preset goal over a 12-month period. An incentive award will be established based on individual safety performance throughout the award period. The new incentive award program will provide various levels of annual awards depending upon total plant, departmental, and individual safety performance. Implementation is expected in FY-88.

A number of employees have completed 15, 20, and 25 years without a reported injury. These people have made a significant contribution to the good safety performance at the FMPC over the past years. A program structured to recognize

these employees for their achievements will be developed and should be in place in FY-88.

Constructing a Storage, Maintenance and Office Building near the Boiler Plant: A 2,400 square foot metal building will be constructed near the Boiler Plant and Water Treatment Plant to store chemicals, lubricants and various equipment used in the two plants, and to provide two new offices, two rest rooms and a utility closet. This new building is needed to store hoses, fittings, portable pumps and other equipment essential to operation of both plants. These items are now stored in the Boiler Plant and Water Plant work areas and aisleways, which is an unsafe situation. Maintenance tasks and spare parts are mandatory in both plants because they operate 24 hours a day and are vital to the entire FMPC operation. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.1.01.

9.0 Safety of Nuclear Facilities

The safety of nuclear facilities at the FMPC is the primary responsibility of these four groups:

- System Safety Analysis
- Nuclear Criticality Safety
- Materials Handling, Packaging and Transporting
- The Fire Protection area of the Fire and Safety Group.

The roles played by these groups and the programs which they administer are presented in the sections that follow.

9.1 System Safety Analysis

The system safety aspects of FMPC operations are assessed and documented in Safety Analysis Reports which result from an integrated preparation effort by Production Operations, Capital Projects, Engineering and Construction, Quality Assurance, Operations Safety & Health, and other supporting groups. This ensures that all those affected understand the systematic risks involved in site operations.

During FY-87, the WMCO System Safety Analysis Program was established by issuing site procedure FMPC-508, "Safety Analysis Documentation Program." This procedure defines WMCO's safety analysis policy and guides the preparation of safety analysis documentation. During FY-88, FMPC-508 will be supplemented by the issuance of a site topical manual for System Safety Analysis. This manual will expand the procedure as well as formally establish programs such as configuration control of safety systems, design features for safety, and OSR-affected procedures.

WMCO has developed a schedule to complete the existing site FSAR by the end of FY-90. This program includes developing a series of safety studies for existing facilities which include process descriptions and risk analyses. Also included in this program is the preparation of natural phenomena analyses for all existing facilities. The natural phenomena analyses are being prepared by a subcontractor and evaluate the structures against current design criteria for protection against natural phenomena events such as tornados, earthquakes and straight wind hazards.Furthermore, WMCO prepares safety analysis documentation for new projects. The schedule for project safety analyses is dependent on the schedule of projects established by Capital Projects.

Operating funds for FMPC personnel and outside contractor assistance may be required for some of these analyses. The fiscal year funding requirements are presented in Table 9-1. Although the Safety Analysis Group supports Line Item

projects and General Plant Projects, none is directly associated with the Safety Analysis and Review Program.

TABLE 9-1
FUNDING SUMMARY FOR SYSTEM SAFETY ANALYSIS
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-OP	10,715	2,140	2,410	1,690	915	1,225	1,105	1,230
Totals:	10,715	2,140	2,410	1,690	915	1,225	1,105	1,230

KEY
GE-OP - Operating Funds from GE Budget

9.1.1 System Safety Analysis Concerns

System safety at the FMPC is essential since large quantities of fissile and hazardous materials are routinely handled and stored. The majority of fissile material being processed and stored at the FMPC has an enrichment of less than or equal to 1.25% U-235. Currently, the FMPC is allowed to store materials with a maximum enrichment of 20% U-235.

Hazardous materials used or stored in large quantities onsite include:

- Thorium
- Uranium metal
- Uranium compounds (UO_2, UO_3, U_3O_8, UF_4, UF_6, $UO_2(NO_3)_2$)
- Anhydrous Hydrogen Fluoride (AHF)
- Hydrofluoric Acid (HF)
- Anhydrous Ammonia (NH_3)
- Nitric Acid (HNO_3)
- Sodium Hydroxide (NaOH)
- Potassium Hydroxide (KOH)
- Magnesium metal
- Magnesium Fluoride (MgF_2)
- Process waste products.

WMCO personnel use a documented process to systematically identify the hazards of an operation, to describe and analyze the adequacy of the measures taken to

eliminate, control, or mitigate identified hazards, and to analyze and evaluate potential accidents and their associated risks. The safety analysis program excludes those risks which are routinely encountered and accepted in the course of everyday living and working by the vast majority of the public.

At the FMPC, System Safety Analysis is divided into three categories: 1) existing plant safety analyses, 2) new project safety analyses, and 3) transportation safety analyses.

The first category covers all existing facilities systems. Safety Analysis Reports have been prepared for several FMPC facilities since safety analyses first began in 1979.

The second category includes new projects such as line-item projects and capital improvements to the existing plant. There is a program in place to ensure that Safety Assessments and, where needed, safety analysis reports are prepared for all engineering projects.

In the third category, transportation safety analysis, the FMPC has four Safety Analysis Reports for Packaging (SARP) in effect. As transportation container requirements change, these reports are revised to reflect container design changes.

9.1.2 Strategy for System Safety Analysis

The System Safety Analysis Program includes preparing safety analysis reports, conducting independent safety reviews, and establishing the configuration control. Each element of the program is described in the following paragraphs.

The first element in the strategy is preparing Safety Analysis Reports. Responsibility for safety analysis at the FMPC is shared between the Technical and the Operations Safety & Health Departments. Project engineers in Capital Projects of the Technical Department and Waste Remediation and Environmental Engineering of Site Remediation prepare the Facility and Process Descriptions for project PSAR and Final Safety Analysis Reports (FSAR). The Nuclear Systems Safety subsection prepares Safety Assessments and the Accident Analysis portion of project PSAR and FSAR, coordinates the issuing of the document, prepares all safety studies for existing plant facilities and systems, prepares Safety Analysis Reports for Packaging, and manages the overall FMPC Safety Analysis Program.

All project FSAR and existing plant safety studies will be combined to form the FSAR for the FMPC, which will supercede all previously issued safety analysis reports. The site FSAR will then be updated as changes occur. Natural phenomena studies are being prepared for all facilities which will evaluate the ability of the facilities to withstand events such as tornados or earthquakes. These reports will be included in the site FSAR.

A concern which has not yet been addressed is the new requirement in DOE Order 5481.1B to identify and demonstrate conformance with applicable codes and standards and to have this information included in the FSAR. This must be resolved before the site FSAR is issued.

The second element in the strategy is conducting Independent Safety Reviews. An Independent Safety Review Committee was established in FY-87 to independently and objectively review safety analysis reports and Operational Safety Requirements (OSR) documents to ensure technical accuracy and conformity between the two. Pre-operational readiness reviews of new or modified systems or facilities are conducted to ensure that the pertinent commitments expressed by the OSR document have been satisfied.

The third element in the strategy is establishing the Configuration Control Program. Configuration control assures that functional and physical characteristics of components, equipment, structures and systems required for safety are identified and documented. In addition, any and all changes must be identified, controlled, approved by authorized persons, and documented upon implementation.

A Configuration Control Program is being developed to ensure the configuration of safety systems, design features for safety, OSR-affected Standard Operating Procedures, and other procedures as they are identified in subsequent safety analysis reports and OSR documents. This program will supplement the FMPC Configuration Management Plan. Procedures are being drafted which define the purpose, goals and organizational responsibilities of this Configuration Control Program. The program for Configuration Control of Safety Systems, Design Features for Safety, and OSR-affected procedures will be implemented in FY-88.

9.2 Nuclear Criticality Safety Plan

The predominant means of criticality control has been through administrative controls based on the double contingency principle, that is, two independent incidents must occur before a nuclear criticality accident can occur. Generous safety factors are then applied to assure that should the double contingency be breached, an accident still will not occur. Administrative controls enforced at the FMPC include:

- Minimum spacing of two feet between safe masses
- Mass restrictions on certain enriched materials
- Restricted concentrations on certain enriched solutions.

The Nuclear Criticality Safety Group provides Nuclear Criticality Safety Training to all employees to ensure an understanding of the administrative controls. In addition, the group routinely inspects all areas where fissile material is stored or handled to ensure the administrative controls are enforced.

9.2.1 Nuclear Criticality Safety Concerns

The Nuclear & Systems Safety subsection is responsible for Nuclear Criticality Safety at the FMPC. Nuclear Criticality Safety is concerned with the prevention or termination of inadvertent nuclear criticality, mitigation of consequences, and protection against injury or damage due to an accidental criticality. An inadvertent nuclear criticality is possible wherever enriched uranium (>0.71% U-235) is processed or stored.

The FMPC presently handles incoming uranium material enriched to <20% U-235. This material is blended down to various enrichments for the metal-end product. The FMPC's current products include metal enriched to 0.95% and 1.25% U-235. While limits exist for all current processes, any modification to equipment or procedures must be reviewed and approved by the Nuclear Criticality Safety Group. Plans exist for the possible restarting of the 1.1% U-235 Mark-15 Program. While the enrichment of these fuel cores is less than the current 1.25% cores, the dimensions of the Mark 15 cores tend to increase their reactivity. If this program is restarted, new analyses will be required to confirm or modify the administrative controls for each situation, including the addition of new facilities.

An additional concern is the transportation of fissile and radioactive materials onsite and to other DOE sites. The Nuclear Criticality Safety Group provides advice on nonroutine shipments of fissile materials and assists in the design of fissile material containers.

9.2.2 Strategy for Nuclear Criticality Safety

Administrative controls based on the double contingency principle are used as the primary means of criticality control. These controls are validated by computer analyses and enforced by regular process area inspections by Nuclear Criticality Safety personnel.

To ensure criticality safety as higher enrichments are encountered, it may be necessary to construct equipment which prohibits the violation of one or more components of the double contingency principle. One example would be to construct physical barriers limiting the minimum spacing between individual elements in an array, such as the "rabbit hutches" which store uranium oxides (<20% U-235) in Plant 1. Another example could be the use of safe-geometry equipment, which has been installed on a limited basis at the FMPC. This equipment includes a safe geometry calciner and safe geometry extraction columns (currently abandoned in place), and a safe geometry digester. The safe geometry digester is currently approved for unlimited use up to 16% U-235 enrichment, and could be approved for enrichments up to but not including 20% U-235 with slight modifications. Should the DOE require these facilities, experiments for 20% U-235

oxide and uranyl nitrate should be conducted to enhance the available acceptable benchmark experimental data.

Since so many operations are controlled by administrative methods, an extensive training program is in place at the FMPC. All FMPC employees receive a Nuclear Criticality Safety orientation during their first week on the job. Refresher training is held every two years. Job-specific training is conducted for all production area employees, and Advanced Criticality Safety Training for engineers and scientists is held at least every two years. In FY-88, a new Supervisor's Criticality Training Program will be initiated.

In addition, criticality analyses are being performed for all the new facilities proposed for the FMPC. Many of these studies require computer simulation techniques to study neutron behavior. The principal codes for performing these analyses are KENO IV and KENO Va; KENO IV has been obtained and loaded onto the FMPC VAX 750. When needed, KENO Va is available from ORNL via a modem.

Section 9.5.2 includes the descriptions of the Nuclear Criticality Safety projects.

9.3 Handling, Packaging and Transporting Materials

9.3.1 Transport Mode/Carrier

WMCO hazardous wastes for the TSCA incinerator will be shipped to the Oak Ridge Gaseous Diffusion Plant in van-type trailers or cargo tanks.

Wastes being shipped in vans will be packaged in DOT-approved drums/containers and transportation provided by an EPA-licensed waste carrier. The carrier selected to provide this service is A.J. Metler Hauling & Rigging, Inc. (The Logistics Management and Services Branch of DOE-ORO has concurred in the carrier selection.) Bulk liquid waste requiring tank trailers will be shipped in DOE-owned cargo tanks using A.J. Metler tractors and drivers. The required Uniform Hazardous Waste Manifest and bills of lading will be prepared by the WMCO Traffic section.

9.3.2 Transportation Safety Training

Hazardous materials "Compliance Training" has been provided to approximately 136 WMCO Traffic employees; this training was conducted in accordance with Title 49 CFR. In addition, those persons primarily responsible for transportation operations have attended both the basic and advanced radioactive and hazardous materials workshops conducted by Science Application International Corporation and sponsored by DOE. Production Operations personnel involved in the packaging, loading and handling of wastes have been provided RCRA Hazardous

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Waste Operations Training; the training was conducted by subcontractor personnel as coordinated by the Environmental Compliance staff.

9.3.3 Emergency Response Procedure

In the event of an offsite accident, the state and local authorities have responsibility for emergency response. If deemed necessary, bills of lading are noted with emergency telephone numbers in case of an accident.

9.4 Fire Protection

The FMPC has an active Protection Program to maximize personnel safety, to prevent property loss and/or interruption of production, and to prevent damage to the environment. The Fire and Safety subsection inspects, tests and maintains over 45 separate fire protection systems onsite. Furthermore, WMCO maintains a fire suppression force of six emergency vehicles manned by about 60 volunteers, all of whom are State of Ohio certified in fire fighting. In addition to their normal fire fighting training, the volunteers are trained in controlling hazardous material spills and releases, and function as the FMPC Emergency Response Team. Site facilities are continually reviewed, and needed improvements have been identified.

9.5 Facilities Safety Projects

9.5.1 System Safety Analysis Project Descriptions

There are no planned improvements associated with the System Safety Analysis Program.

9.5.2 Nuclear Criticality Safety Project Descriptions

The five planned improvements in the Nuclear Criticality Safety area are described in the paragraphs that follow this list:

- Nuclear Criticality Safety Studies
- Nuclear Criticality Safety Training
- Nuclear Criticality Safety Audit Program
- Upgrading the Radiation Detection Alarm System
- Purchasing Additional Storage Racks for Nuclear Materials.

Nuclear Criticality Safety Studies: In order to accomplish the FMPC's objectives of enhanced productivity while maintaining criticality safety, the use of neutron-

transport computer codes such as KENO IV and KENO Va must be increased. Currently, the FMPC has KENO IV on its VAX 750 computer in order to perform simple criticality safety analyses. However, to perform complex analyses such as a mock-up of an entire facility, the more complex code, KENO for criticality safety as an integral part of their safety analysis reports for packaging. The DOE requires extensive analysis of all shipping containers before approvals are issued.

The FMPC accesses KENO Va by using an HP-150 personal computer and a 1200 baud modem to access the IBM computer at ORNL. The FMPC is charged for the time using the host computer. For a fee, personnel at ORNL are available to answer questions concerning the KENO Va program, and to assist in setting up the input.

To aid in computer analysis, either the VAX computer system will be upgraded in 1988 by adding a computer output microfiche processor and VAX compatible software, or a contract will be set up with an outside vender for microfiche services. Several microfiche readers/printers will be purchased. Furthermore, the FMPC may purchase a color graphics terminal and plotter to help analyze KENO output.

Nuclear Criticality Safety Training: In response to the DOE Uranium Recycle Task Force Recommendations, a commitment was made to develop and implement a Nuclear Safety Training Program for FMPC Supervisory and Management Personnel. A videotape, lesson plans, and tests will be developed in FY-88. Job-specific training programs will be developed and implemented on an as-needed basis.

Nuclear Criticality Safety Audit Program: The Nuclear Criticality Safety Audit Program is a management review of the WMCO Criticality Safety Program. Outside auditors will be contracted, either from the University of Cincinnati or another DOE site, to review the Criticality Safety Program.

Upgrading the Radiation Detection Alarm System: The new RDA System, which became operational at the end of 1985, will not adequately cover all process areas in case of a low power, steady-state criticality. This system was planned several years ago and does not take into account shielding factors of buildings, machinery or the reactivation of abandoned equipment. Also, there is presently no means of remotely reading the detectors or resetting alarmed units. Purchasing and testing four additional RDA (two detectors per unit), Multiplexer Piops units and a Central Control Console will give the FMPC the flexibility of meeting ANSI Standard 8.3 ("Criticality Accident Alarm System"). The estimated cost includes all necessary components and systems testing and installation. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.1.04.

Purchasing Additional Storage Racks for Enriched Nuclear Materials: Currently, the FMPC has eight storage racks approved for storing materials with <20% U-235 content. The existing racks have room for 72 six-inch by fifteen inch containers of material. Not only is the number of racks insufficient, but they must be replaced

immediately. Indeed, several audits of the Nuclear Criticality Safety Program within the last several years have recommended that new racks be purchased. The purchase of 16 new racks with a total storage capacity of 240 containers will provide sufficient space to accommodate all the enriched material normally onsite that requires special handling. These racks will be installed in FY-88. The cost includes the designing, purchasing, and installing the storage racks in Plant 1.

The fiscal year funding requirements are presented in Table 9-2.

TABLE 9-2
FUNDING SUMMARY FOR NUCLEAR CRITICALITY SAFETY
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-OP	3,185	625	410	340	320	470	505	515
Totals:	3,185	625	410	340	320	470	505	515

KEY
GE-OP - Operating Funds from GE Budget

9.5.3 Handling, Packaging, and Transportation Project Descriptions

There are no planned improvements associated with the handling, packaging, and transportation of hazardous wastes.

9.5.4. Fire Protection Project Descriptions

The seven planned improvements for the Fire Protection program are described in the paragraphs that follow this list:

- Upgrading the Smoke Detection Systems
- Installing a Fire Protection System in the Pilot Plant
- Designing and Installing a Sprinkler System in the Administration Building (Building 14)
- Providing Automatic Sprinklers in Building 64
- Replacing Automatic Sprinklers in Building 65
- Acquiring a Fire Department Tanker Truck

- Expanding the Fire Alarm System
- Plant Evacuation Alarm System.

Upgrading the Smoke Detection Systems: The three existing smoke detection systems located in the Magnesium Storage Warehouse, Plant 5 Motor Generator Room, and the Plant 5 Magnesium Storage Area need to be replaced. Although all function properly at this time, repairs are becoming more frequent and replacement parts more difficult to locate. The present high-voltage (110V) systems cannot be expanded and are not compatible with new smoke detection systems. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.2.02.

Installing a Fire Protection System in the Pilot Plant: A fire protection system will be installed under the raised metal floor in the UF6-UF4 operations control room. This will provide fire suppression for the distributive control system cable, significantly upgrading the fire protection in this Pilot Plant facility. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.2.01.

Designing and Installing a Sprinkler System in the Administration Building (Building 14): Automatic sprinklers designed and installed for ordinary hazards (Group 1) will be installed in areas of this building currently without fire protection. With the increase in personnel and fire loading within this building, an urgent need has developed for fixed fire protection. Manually operated outside sprinklers will be installed along the north side of the Administration Building. This system will protect this building from fires originating in the wood-frame trailers installed next to the building. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.2.03.

Providing Automatic Sprinklers in Building 64: A dry pipe sprinkler system for Building 64 will be designed and installed. The new sprinkler system will enable this building to be used for combustible storage, thus easing the shortage of storage space. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.2.04.

Replacing Automatic Sprinklers in Building 65: The present sprinkler system will be overhauled and all deteriorated pipe valves and sprinklers will be replaced. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.2.05.

Acquiring a Fire Department Tanker Truck: A new 3000 gallon/6500 watt-generator-tanker truck complete with hoses, valves, pump and all other necessary equipment will be purchased. The vehicle will conform to all provisions listed under the National Fire Protection Code (1985) Volume 6, Section 1901. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.2.06.

Expanding the Fire Alarm System: The present Honeywell fire alarm system, which was installed in 1980, needs to be expanded and the information retention/retrieval methods associated with it must be improved. An additional central processing unit (CPU) and upgrade of the existing CPU will keep the alarm system operational at all times. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.2.07.

Plant Evacuation Alarm System: All of the major production and administration buildings will have a local electronically-controlled evacuation alarm system capable of audible voice transmission within the building.

Each building will have an individual command center which will allow local actuation of the building evacuation alarm system. In addition, audible voice communication throughout the building will be possible from this command center. Through a central control panel, located in the Communications Center, the systems may be activated either individually or collectively. The Central Command Center will be capable of audible voice communication, individually or collectively, through the local building evacuation alarm systems. This subproject is included in the EHSI Line Item Project 87-D-159, reference WBS 1.1.4.1.04.

The fiscal year funding requirements are presented in Table 9-3.

TABLE 9-3
FUNDING SUMMARY FOR FIRE PROTECTION
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-LI	960	198	280	415		67		
GE-OP	23,305	2,600	2,650	3,145	2,845	3,980	3,920	4,165
GE-GPP	250				250			
Totals:	24,515	2,798	2,930	3,560	3,095	4,047	3,920	4,165

KEY

GE-LI - Line Item Projects from GE Budget
GE-OP - Operating Funds from GE Budget
GE-GPP - General Plant Projects from GE Budget

10.0 Emergency Preparedness

10.0 Emergency Preparedness Program

The Emergency Preparedness Department, in the Security, Acquisitions, and Material Logistics group, is responsible for coordinating emergency preparedness activities at the FMPC, including the following:

- Producing, maintaining, and distributing sitewide emergency plans and procedures
- Supporting the development of plant, department, and organization specific emergency procedures
- Maintaining emergency facilities and equipment
- Auditing and evaluating all aspects of emergency preparedness at the FMPC
- Training or supporting the training of emergency responders, emergency managers, supervisors and employees
- Installing, maintaining and ensuring the response readiness of emergency communications systems and alarms and the Offsite Emergency Warning System.

10.1 Emergency Preparedness Strategy

The FMPC seeks to prevent emergencies through the comprehensive development of engineered safety systems and safety oriented worker training. Accident investigation reports are reviewed by the Emergency Preparedness Department to determine if new emergency prevention measures are required. Based upon hazards analysis in Safety Analysis Reports, the FMPC Environmental Impact Statement, and hazards revealed in accident investigation reports, comprehensive response capabilities are developed for employees, supervisors, responders, and plant management. All emergency preparedness activities are coordinated with state and local emergency planning agencies.

10.2 Emergency Preparedness Documents

The FMPC Emergency Plan was issued in January 1988. The FMPC Emergency Procedures, currently under development, will be issued in FY-89. The FMPC Emergency Procedures will be a comprehensive document covering sitewide emergency procedures, plant-specific emergency procedures and organization-specific emergency procedures. Organization-specific emergency procedures that have been developed or are currently being developed include:

- Emergency Operations Center Procedure (under development)
- Emergency Preparedness Training Plan (under development)
- Emergency Preparedness Exercise Procedure (under development)
- Offsite Emergency Warning System Procedure
- AEDO Classification, Notification, and Reporting Procedure
- Joint Public Information Center Procedure
- Emergency Preparedness Audit and Appraisal Plan (under development).

All plant-specific emergency procedures are being reviewed and updated in order to improve the format and method of presentation, and to ensure compliance with DOE requirements and best emergency preparedness practices. The Pilot Plant Emergency Procedure 11-C-240 has been selected as the model plant-procedure to be updated. An update of all plant-specific emergency procedures will be completed by January 1990.

10.3 Emergency Preparedness Training

A comprehensive program of onsite emergency response training is being developed. Specific training includes:

- Plant Worker General Emergency Response
- Emergency Response Team
- Security Organization
- Emergency Duty Officer
- Assistant Emergency Duty Officer
- Mutual aid (fire, medical, life squad)
- Joint Public Information Center staff
- Emergency Operations Center staff.
- Local hospitals (radiological and hazardous materials related to injuries)
- County EOC staff and communications coordination and mutual aid responders.

The Emergency Preparedness Department develops and administers training, which is conducted in cooperation with the WMCO Training Department.

10.4 Emergency Drills and Exercises

The FMPC conducts a quarterly emergency procedures training drill and exercise program. This quarterly program supports other annually conducted exercises which involve a larger number of participants including state and federal disaster and emergency management agencies. In even-numbered years, a tabletop exercise is conducted and includes all onsite and offsite agencies and groups with responsibilities in the event of a major accident at the FMPC. Joint Emergency

Response exercises are conducted in odd-numbered years and provide all groups the opportunity to interact during a realistic disaster scenario. All exercises and most drills are evaluated by trained evaluators according to defined performance criteria. Exercise reports including evaluation results are provided for quarterly exercise and Joint Response events. Deficiencies identified during exercise evaluation are tracked until completed.

The quarterly training program is designed to develop emergency response skills in critical areas. The program is targeted to provide necessary training to members of the Emergency Response Team, EOC and JPIC personnel and employees involved in production operations. The program is not designed to train all personnel each quarter, only specifically designated groups.

10.5 Cooperating with State and Local Governments and Agencies

FMPC-specific hazardous materials emergency response plans have been prepared for both Butler and Hamilton counties. These plans were issued and revised in 1987, and will be updated as needed and reviewed annually to ensure continued integration with the FMPC Emergency Plan.

Working with the counties and the Ohio Disaster Services Agency (ODSA), the FMPC conducts biannual (during odd-numbered years) Joint Response exercises involving all relevant emergency management agencies. These exercises test both the FMPC response and management capability and the ability of the FMPC and local governments to respond together to a hazardous materials incident at the FMPC. A rigorous evaluation program notes deficiencies and areas for further development.

During even-numbered years, large-scale tabletop exercises are conducted to review procedural changes which have taken place since the previous Joint Emergency Response exercise was held.

The FMPC conducts quarterly exercises involving onsite organizations. The DOE, state, and county organizations also take an active role in these quarterly exercise.

10.6 Superfund Amendment and Reauthorization Act (SARA)

The Emergency Preparedness Department is responsible for coordinating the SARA Title III Community Right to Know activities for the FMPC. Emergency Preparedness representatives serve on the following SARA Committees:

- Chairperson, Butler County Local Emergency Preparedness Committee Industrial Section
- SARA Advisory Committee, Ohio Chemical Council.

10.7 Emergency Operations Center

The Emergency Operations Center (EOC) is located in the FMPC Administration Building. This facility provides an environmentally secure area to manage and direct all emergency response activities. In the event that the primary EOC were to be inoperable, an alternate EOC complete with adequate communications equipment is located at the Fairfield Training Center.

A comprehensive communications system of telephones, telephone facsimile equipment, and computer equipment has been installed; radio equipment will be installed during FY-88. The EOC will be able to monitor, augment, and supplement the existing FMPC emergency communications control system located in the Communications Center.

Computer systems are being developed to manage information and support decision making in the EOC. The operations area has conference tables, fotoboards, maps, engineering drawings, and a library of emergency reference materials.

10.8 Emergency Communications, Alarms and Warning Systems

Four principal systems are used to provide emergency communications and alarms to onsite personnel and the neighboring community. These systems include radiation detection alarms, local building evacuation alarms, the plant alarm system (three digit code), and the Emergency Message System.

A number of departments share responsibility for these systems even though the Emergency Preparedness Department coordinates the installation and maintains the reliability of these systems. In addition, Emergency Preparedness has direct responsibility for the Emergency Message System and the Offsite Emergency Warning System.

10.8.1 Emergency Message System

The Emergency Message System is being upgraded to include a series of hardwired speakers in each building at the FMPC, with sufficient volume to ensure that everyone will hear the message without leaving their work stations. The system

which originates at the Communications Center has been partially upgraded by the addition of wall-mounted speakers.

Additional speakers, a backup power supply, and a supervisory system for the amplifying units are being negotiated. This effort is being accomplished in conjunction with the WMCO Information Systems Department. This equipment will be included in the new master communications contract that will be negotiated during FY-88.

10.8.2 Offsite Emergency Warning System

The FMPC Emergency Warning System warns nearby residents to take shelter in the event of a hazardous materials incident. The system also has established radio and dedicated telephone communications with offsite county emergency response centers. The warning system has a multiple tone module capability of which four distinct tones will be used. These tone modules are:

- National attack
- Severe weather
- FMPC emergency pulse wail
- Test chime.

The FMPC can activate the last two tone modules, while both counties can activate all four. Eight sirens have been installed; seven of these are offsite. Three additional sirens will be installed in FY-88. Tone activated radios will be provided for special occupancy buildings (schools, day care centers, nursing homes) within a five mile radius of the plant. Advanced communication and radio equipment have been installed to ensure rapid communication between the FMPC and Butler and Hamilton Counties. This warning system was tested during FY-87, with additional major tests scheduled during FY-88. The FMPC conducts a three-minute test of the system each month in conjunction with the county-wide siren system.

10.9 Emergency Public Information

The FMPC is improving its emergency public information capability and is providing community information on the other enhancements specified in this document.

A Joint Public Information Center (JPIC) has been designated at the Westinghouse Training Center in Fairfield, Ohio. This center has communications and media briefing equipment, trained personnel, and procedures for operation. The JPIC was extensively tested during "Joint Response '87" and will continue to be tested during subsequent drills and exercises.

The WMCO Public Affairs staff has initiated a Public Education and Awareness Program to inform FMPC neighbors and community leaders of the new warning system and of the substantial improvements in the FMPC Emergency Preparedness Program. This program consists of mailings to local area residents, posters in public places, newspaper ads, public addresses from the FMPC Speaker's Bureau, and community forums.

10.10 Emergency Preparedness Project Descriptions

The seven planned improvements in Emergency Preparedness are discussed in paragraphs following this list:

- Emergency Preparedness Training, Drills and Exercises
- Sitewide Emergency Procedures
- Alternate Emergency Operations Center
- Emergency Warning System
- Hazardous Materials Assistance Vehicle
- Personnel Accountability Card Reader System
- Automating the Emergency Operations Center.

The breakdown by type of funding and fiscal year is shown in Table 10-1.

TABLE 10-1
FUNDING SUMMARY FOR EMERGENCY PREPAREDNESS
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	380			275	105			
GE-OP	5,930	985	1,220	615	670	750	910	780
GE-GPP	555	555						
Totals:	6,865	1,540	1,220	890	775	750	910	780

KEY

GE-CE - Capital Equipment from GE Budget
GE-OP - Operating Funds from GE Budget
GE-GPP - General Plant Projects from GE Budget

Emergency Preparedness Training, Drills and Exercises: This is ongoing throughout the identified time period. Emergency Preparedness is developing sitewide emergency preparedness training, requirements and guidelines. Based on these guidelines, Emergency Preparedness personnel will conduct training for the staffs of the EOC, JPIC and the Communications Center. In addition, Emergency Preparedness oversees, administers and audits training provided to the Emergency Response Team, Production Operations personnel and others as required.

Quarterly Emergency Exercises provide onsite groups the opportunity to practice new procedures and improve cooperation, coordination and information management among the various groups. Offsite agencies also participate in these exercises.

Joint Response excercises are conducted biannually to test the FMPC's ability to interact with county, state and federal agencies. These major exercises are evaluated by expert emergency response personnel with the results being forwarded to DOE and WMCO.

Sitewide Emergency Procedures: Sitewide emergency procedures are being developed along with the update of plant and organization-specific emergency procedures in oder to ensure an adequate FMPC response to any emergency condition that could occur. Revision of these procedures was initiated in FY-88 and will continue until FY-90. Emergency drills and exercises are providing a unique and valuable forum to evaluate and improve all emergency procedures.

Alternate Emergency Operations Center: The FMPC is finalizing the development of an alternate EOC in the event a major accident would render the onsite EOC inoperable. The alternate EOC is currently located in the Fairfield Training Center; weaknesses already identified with this location include distance from the site and co-location with the media.

A long-term solution to meet the needs for an alternate EOC is therefore being implemented. A tractor trailer is being modified to serve as a mobile, alternate EOC. This center will be operational in FY-89.

Emergency Warning System: Three additional siren units will be added to the existing eight units. Their locations will be identified by a consultant to ensure their proper positioning. The consultant will also provide an independent evaluation of the performance of the siren system after installation is completed.

Hazardous Materials Assistance Vehicle: This vehicle will be equipped with survey instruments, decontamination equipment, protective clothing, self-contained breathing apparatus units and respirators, power supply, portable lighting, and other equipment suitable for monitoring contamination and cleanup of radioactive and hazardous material incidents, for onsite and offsite use. Communication

equipment will be necessary to interact with offsite groups and the FMPC Communications Center.

Personnel Accountability Card Reader System: This computerized system will reflect the work done at the Lawrence Livermore National Laboratory which includes a bar code on the badge for personnel accountability and access control to sensitive facilities.

Anticipating this new badge system, the FMPC is researching a card reader system for personnel accountability that can be used on the security badge. The proposed FMPC bar coded badge system will reflect DOE requirements and will provide a comprehensive log of who is onsite. This information is critically important for personnel accountability in a major emergency.

The proposed badge system could contain much information about each employee. For example, in addition to name and badge number, medical information could be encoded on the badge. The Emergency Response Team could then treat injured employees with extra confidence by reviewing an employee's medical history on his or her badge.

Automating the Emergency Operations Center: This project will continue through FY-88 and enhancements included thereafter. Computerizing the EOC will give its staff complete access to plant engineering and personnel records. This will provide necessary information support for responding field units and the respective DOE and county EOC facilities remotely located from the FMPC.

Plume modeling, atmospheric dispersions and related meteorological functions will also be performed with this equipment. (See Section 4.4.3.)

11.0 National Environmental Policy Act

11.0 National Environmental Policy Act

In 1982, the need for feed materials increased; consequently, DOE began planning for renovation of the FMPC. Design activities for renovation began in 1983. The renovation will enable the FMPC to meet production goals through the remainder of this century, and ensure that environmental, health and safety conditions are addressed. Design and implementation of the entire renovation project is to be completed in 1992. The appropriate National Environmental Policy Act (NEPA) documentation is prepared to assure that the environmental impacts of these renovations are addressed.

A number of remedial actions are planned for the FMPC. Many of these remedial actions have potential environmental impacts, and the NEPA needs for these projects must be assessed.

11.1 Overview of NEPA

National Environmental Policy Act (NEPA) documentation is required to assess the environmental impacts of proposed renovations and remedial actions. This documentation is prepared as early as possible, prior to the construction start date. As part of the NEPA effort, DOE initiated an Environmental Impact Statement (EIS) for the FMPC in 1986. The EIS addresses the possible impacts of all renovations and remedial actions occurring between FY-82 and FY-92.

Interim actions are taken during the course of the EIS. These actions are addressed in interim NEPA documentation, which assesses the possible environmental impacts of each particular action. Listed below are the required interim NEPA documents along with the highest levels of approval required for each.

- NEPA Checklist; DOE/FMPC
- Action Description Memorandum; DOE/ORO
- Environmental Assessment; DOE/HQ.

11.2 The Environmental Impact Statement

In 1986, DOE began preparation of an Environmental Impact Statement (EIS). The scope of the EIS, as published in the Federal Register, extends to all remedial actions and renovations performed between 1982 and 1992. Prior to implementing remedial actions and renovations, each construction project included in the EIS is evaluated on the basis of potential environmental impacts versus reasonable

alternative actions. The EIS is being conducted by the Oak Ridge National Laboratory (ORNL) with WMCO supplying all necessary information.

The tentative EIS schedule is as follows:

- Two scoping meetings held; September 1986
- EIS Implementation Plan approved; December 1987
- Draft EIS issued for review; October 1988
- Record of Decision for the EIS; October 1989.

11.2.1 Remedial Actions Considered under the EIS

Remedial actions will consist of the following:

- In-situ stabilization of the contamination source
- Improved containment of the waste contamination source
- Removal of the contamination source with onsite disposal
- Removal of the contamination source with offsite disposal.

Seven sources that may require remedial action are:

- Pits/fly ash piles/ponds/basin
- Silos/above-ground tanks
- Thorium inventory
- Drummed waste inventory
- Scrap metal piles
- Underground storage tanks
- Abandoned-in Place facilities.

The EIS will address the impacts of applying the appropriate remedial actions to sources at the FMPC to ensure that the cumulative effects of all activities are considered. The EIS will present an assessment of the impact of no-action alternatives as well. (See Section 11.2.3.)

11.2.2 Issues Discussed in the EIS

Based on the evaluation noted above, the following issues were selected for analysis in the EIS:

- Potential air quality impacts
- Potential water quality impacts
- Potential radiological impacts
- Potential impacts from chemical use at FMPC
- Potential ecological impacts

- Potential socioeconomic impacts
- Potential issues related to monitoring and mitigation
- Potential institutional issues
- Potential engineering issues
- Cumulative impacts (including past, present, and future practices)
- Potential cost.

Other issues may also be analyzed in the EIS.

11.2.3 Alternatives Evaluated under the EIS

Regulations governing EIS preparation require federal agencies to explore and evaluate alternatives to the proposed actions, including those not within the jurisdiction of the lead agency. The preliminary list of potential alternatives given in the Notice of Intent has been revised and includes input from the public scoping process.

Alternative 1: DOE's preferred approach is to conduct the renovation and remedial action activities as planned. This currently consists of about 300 individual projects planned through the mid-1990's. It is anticipated that, the analysis will be done categorically. Projects may be grouped by emission type, facility or process to ensure meaningful analysis. Impacts from construction and operation will be assessed, and operational impacts will be evaluated for a range of FMPC production levels.

Alternative 2: The required no-action alternative would involve the general conditions existing at FMPC at the time DOE decided to prepare an EIS (approximately those at the end of FY-85). This baseline would be presented as 1985 data, with more recent data being provided to establish trends since 1985. Projects completed prior to October 1, 1985, would be considered in the cumulative impact analysis.

Alternative 3: This alternative assumes a partial renovation scenario wherein a portion of the 300 renovation projects proposed in Alternative 1 will be completed. Other actions would be assumed not to be undertaken.

Alternative 4: All or a portion of the FMPC activities would be relocated or terminated, and necessary remedial actions would be conducted at the Fernald site. FMPC operations could be relocated to existing DOE facilities or to a "Greenfield" site.

11.2.4 Impacts Assessed under the EIS

Impacts from the renovation projects will be evaluated as follows. Impacts from construction and operation will be assessed for projects undertaken after October 1, 1985. Operational impacts will be assumed to come from normal operating conditions or accidents. For projects completed between October 1, 1981 (the beginning of fiscal year 1982) and September 30, 1985, only operational impacts will be considered. For the purposes of assessing impacts, projects will be grouped into four major categories:

- Chemical plants
- Metals plants
- UF6-to-UF4 processes
- Support facilities.

Impacts from remedial actions and renovations will be combined to arrive at a cumulative impact analysis of planned activities at FMPC. The extent of impacts from remedial actions and their contributions to impacts from renovation, are also of interest. Cumulative impact analyses will also ensure that proposed renovations do not prejudice future remedial actions.

11.3 Preparing the EIS - Roles and Responsibilities

DOE-ORO has overall responsibility for preparing the EIS. DOE-ORO responsibilities are discharged through the DOE Site Office located at the FMPC.

WMCO will provide information needed to prepare the EIS, including site characterization data, waste characterization data and information on the engineering design and implementation schedules for the projects constituting the proposed action.

Oak Ridge National Laboratory has been selected by DOE to independently analyze the environmental impacts of the alternatives including the proposed action. ORNL will prepare the EIS using information provided by WMCO, and will supplement the information, as necessary, by visiting the site, meeting and consulting with other agencies, performing technical analyses, and reviewing existing documents. DOE guides ORNL in preparing the EIS, and independently evaluates the statement before it is approved.

12.0 Quality Assurance Program

The programs identified in the Environment, Safety, Health and Waste Management Plan will be structured and implemented to meet the requirements of the WMCO Quality Assurance (QA) Program and other applicable documents. Document review and approval, QA involvement in the procurement cycle, and support of the internal appraisal function will comply with the QA Program requirements applicable to these activities. Provisions of the QA Program that apply to modification and construction programs will be imposed on the facility and equipment upgrading effort.

12.1 Quality Assurance for Environment Safety Health and Waste Management

The quality assurance procedures employed in the management of the environment, safety, health and waste activities for the FMPC are designed to ensure that they conform to all applicable federal, state, and local environmental and industrial safety requirements.

Quality assurance at the FMPC is the responsibility of individual departments, and is verified by the Quality Assurance Department through surveillances and audits. The QA site plan contains policies which are reviewed and updated annually. A Quality Assurance plan specific to offsite waste shipments has also been developed.

The Quality Assurance Program uses "graded" levels of quality assurance related to the importance to safety. The amount and type of verification applied to FMPC activities varies based on the quality level classifications determined for the component, system, structures or process. This determination is based on performing a risk assessment for the new or modified facility or process according to the applicable site procedure.

Special QA Plans are developed for use on programs or projects where additional guidelines or controls are needed to prevent failures or to mitigate the consequences of accepted risks. The Quality Assurance Program reviews and approves these special QA Plans.

12.2 Reviewing Standard Operating Procedures

Procedures used in waste management at the FMPC are prepared as Standard Operating Procedures (SOP). The procedures are reviewed by involved departments (including Quality Assurance) and then approved for use by the responsible department (Waste Operations or Waste Management).

Waste Management activities also include use of the Plant Test Authorization (PTA). The PTA identifies the steps necessary to test a potential new operation or procedure before the SOP is completed or changed. The PTA is normally conducted for a trial period during which the stepwise procedures are refined and reformatted as needed. PTAs are reviewed by involved departments (including Quality Assurance) and approved for in-plant use.

Applicable SOPs are revised by the responsible departments. Changes to a SOP are noted and a formal revision to the SOP is prepared, circulated to the departments which originally approved the SOP, and incorporated into the SOP. Waste Management activities require an internal self-audit of SOPs at least annually.

The OS&H Department uses an internal review and approval cycle for their procedures.

12.3 Surveying and Auditing Products and Processes

The QA department verifies performance for the quality requirements by conducting surveillances and audits. Planned and systematic audits of waste process operations result in better operating procedures regulations as well as health and safety requirements. Two types of audits are used for waste management activities.

The first type of audit is the annual audit of the waste management operations. This audit will be conducted by DOE based on the waste acceptance criteria established by the FMPC Waste Management and Waste Operations Departments.

The other type of QA audit is an annual internal (internal to FMPC) audit of the operation. The internal audit team shall be selected by the Manager of Quality Systems, QA Department. Waste Management may also request an internal audit as needed to check its own performance.

The OS&H Department conducts an internal appraisal program of all sections within it. Quality Assurance personnel have participated in this program by assisting in its initiation and by serving as members of the appraisal teams.

12.4 Conducting and Documenting Training

To comply with NQA-1, NVO-185, and DOE Order 5480.1B, all personnel directly involved in waste shipments will receive formal training in the waste handling system. The training will be documented, updated annually, and available for inspection by any auditing official. Those receiving training may include, but are not limited to, the following:

- Transportation supervisors, checkers, and material handlers
- Production supervisors and chemical operators
- OS&H supervisors and personnel
- QA personnel
- Nuclear Materials Control personnel
- Technical supervisors and packers.

Personnel involved in the handling and offsite disposal of waste will be trained in applicable procedures. All training will be documented and records will be maintained by the WMCO Training section.

The FMPC Transportation section will be an integral part of the waste transportation training program. This department has maintained a training manual and training program for employees directly involved in site shipments. These employees include, but are not limited to transportation supervisors, checkers, and materials handlers.

The Transportation section also furnishes industrial equipment and operators for shipping low-level waste. A program exists for training operators in the safe operation of powered industrial trucks. The program is administered by an FMPC transportation supervisor and a training instructor utilizing classroom instructors, demonstrations, and on-the-job training. The program consists of four phases: familiarization, operation, qualifications (written examination and performance tests), and nuclear safety. The FMPC Transportation Manual, Section 2, and the FMPC Health & Safety Manual should be consulted for additional details.

13.0 FMPC Environmental Monitoring Program

The Regulatory Compliance section of the OS&H Department is responsible for the management and implementation of all FMPC environmental monitoring activities. The FMPC Environmental Monitoring Program document is the controlling document for the activities in the area of environmental monitoring and surveillance.

The Environmental Monitoring program was developed to comply with Federal and state environmental regulations that apply to facilities such as the FMPC. The main elements of the program are:

- Environmental monitoring and surveillance
- Sampling and analysis, including quality assurance and quality control
- The Environmental Monitoring Annual Report
- Communication with regulators and FMPC neighbors
- Selecting media and analytical parameters based on constituents of the FMPC effluents
- Efficient data management and reduction appropriate to the sampling and counting techniques employed.

Basic definitions and areas of responsibility are outlined in the Environmental Monitoring Program document. Much of the material contained in this document directly supports the activities that are presented in the FMPC Environmental Monitoring Annual Report.

Specific programs within air and water monitoring are discussed in detail along with the specific procedures necessary to perform the required sampling and monitoring. A listing of the media monitored follows:

- Stack discharges
- High volume environmental air filters
- Radon/thoron
- Soils and sediments
- Groundwater
- Grass/vegetables
- Milk
- Surface water
- FMPC liquid effluent
- Fish.

14.0 RMI Extrusion Plant

During FY-87, WMCO assumed contract responsibility for the ES&H and Waste Management programs at the RMI facility. The facility, located in Ashtabula, Ohio, consists of eight separate buildings on 26 acres. Approximately 105 people are employed at the facility, which operates on an 8-hour, 5-day per week schedule. The RMI facility layout is shown in Figure 14-1. The management organization for the facility is presented in Figure 14-2; the specific areas of responsibility of the ES&H section are shown in Figure 14-3. The efforts of the ES&H section have been directed heavily toward the environmental aspects of the facility.

The plant is located in a sparsely populated industrial community, comprised mainly of chemical production and metal processing plants. (The nearest domestic residence is approximately one-quarter mile from the site.) The principal activity at the facility is the extrusion of depleted and slightly enriched uranium billets into tube-shaped products. Additional processing includes cutting, machining, heat treating and acid-pickling of the extruded products.

14.1 Air Pollution Control

Air pollution control projects at the RMI Extrusion Plant are selected and priorities established according to the ALARA philosophy for environmental protection.

Individual improvement projects utilize an integrated approach which includes emission controls, in-plant ventilation upgrades, ergonomic and plant operational improvements, and other environmental improvements. Several factors are considered when establishing priorities:

- Importance as an offsite emitter
- Importance in controlling in-plant airborne contaminants
- General condition of any existing system
- Scheduling relative to other plant projects and activities.

An objective of the improvement program is to eliminate the need for roof fans used for general ventilation in the main plant.

Relative to air pollution control, RMI is determining whether to construct an onsite meteorological tower or to use meteorological data from the nearby (30 miles) Erie International Airport National Weather Service Station. After completing improvements to the sources of major air pollution emitters, appropriate

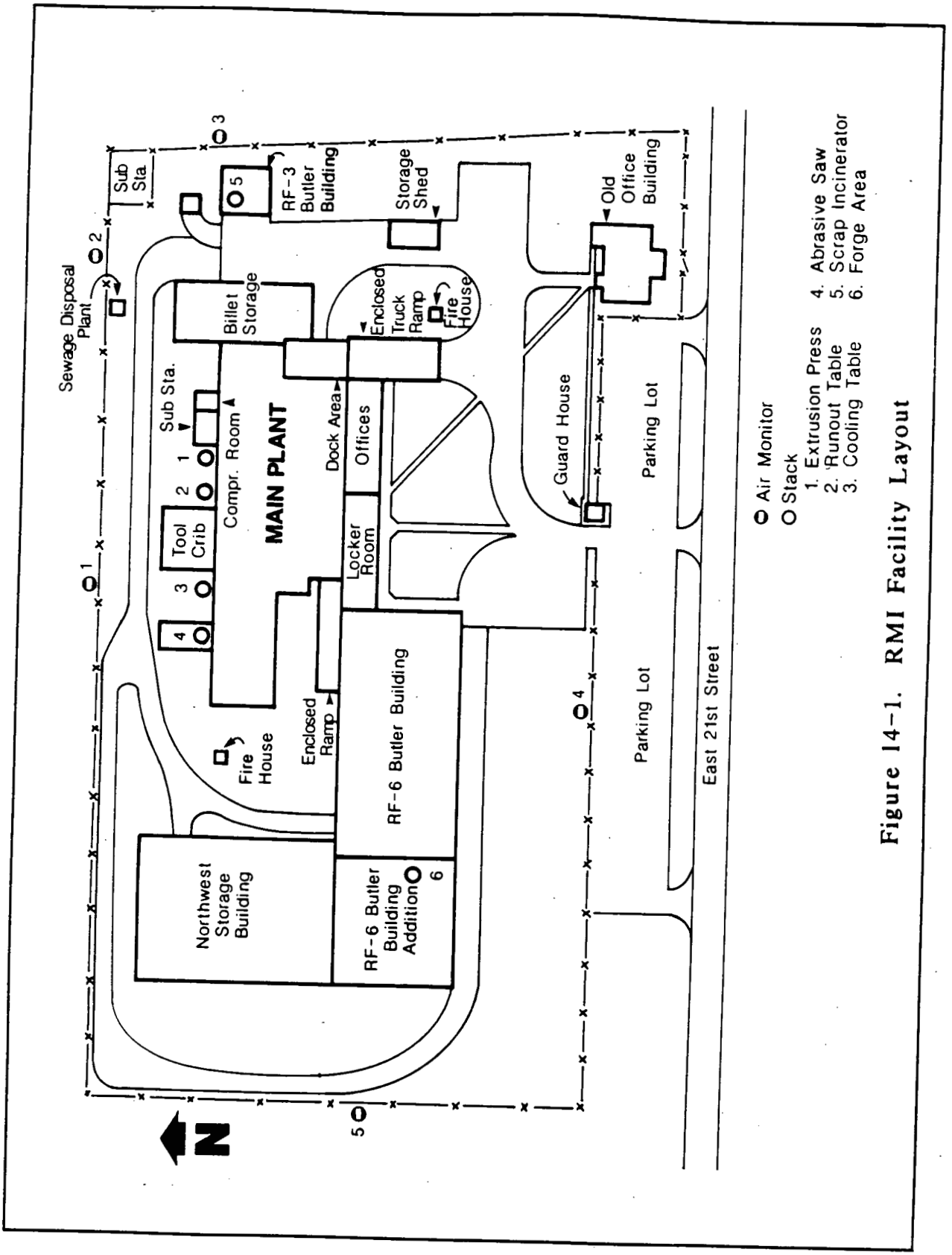

Figure 14-1. RMI Facility Layout

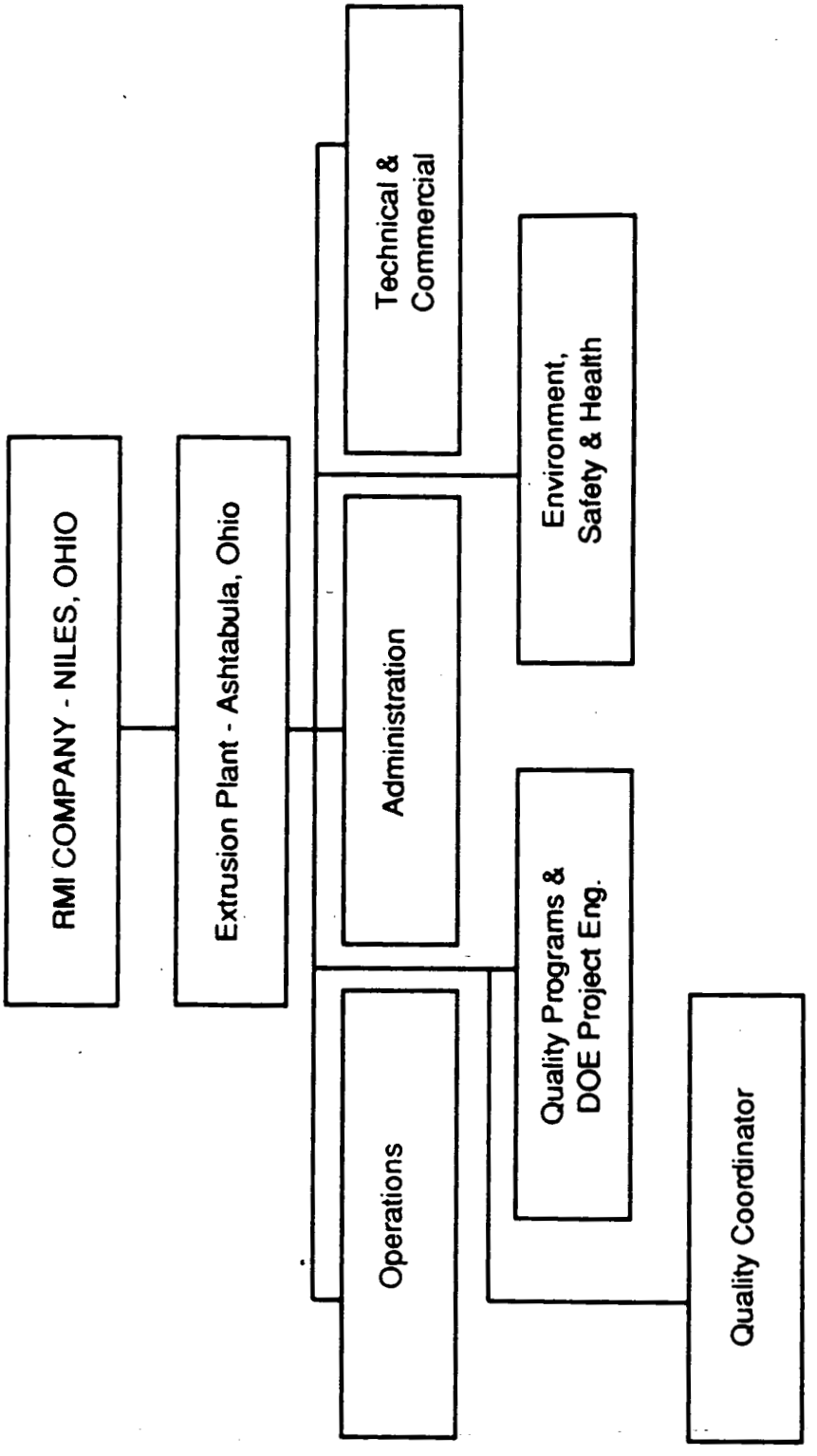

Figure 14-2. RMI Organization

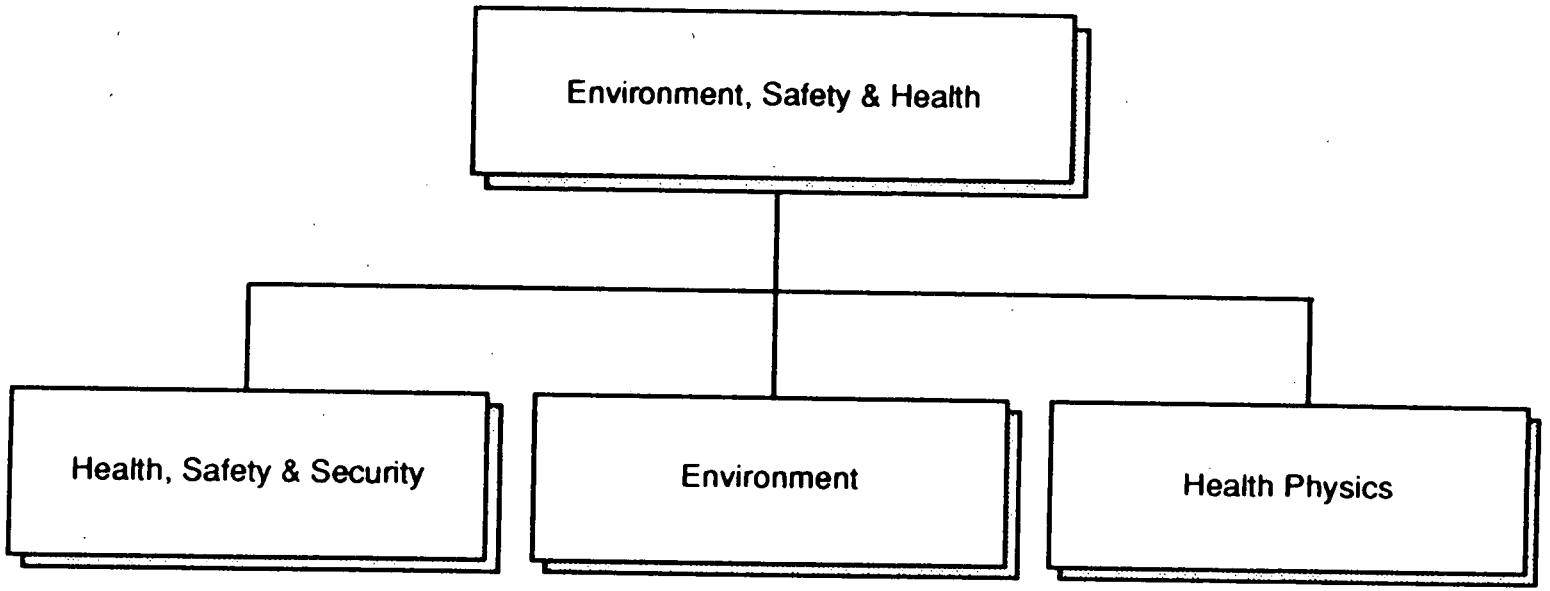

Figure 14-3. RMI Environmental, Safety and Health Organization

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meteorological information will be used to conduct an emissions dispersion modeling study. Based on dispersion modeling, the location and number of the site perimeter air monitors will be reevaluated.

Air pollution control project descriptions are contained in Section 14.8.1.

14.2 Water Pollution Control

Water Pollution Control Projects at RMI are mandated by DOE and EPA requirements. Wastewater treatment improvements will improve uranium removal levels consistent with DOE orders. OEPA is currently drafting an NPDES permit for RMI. Limits concerning effluent discharge limits will be based on the water quality guidelines as set forth by the non-ferrous metal forming effluent standard. (Treatment will be required to meet the limits.) The planned wastewater treatment facility will utilize the Best Available Technology (BAT) that is economically achievable as described in the effluent standard. Water Pollution Control project descriptions are contained in Section 14.8.2.

14.3 Solid Waste Management

Operations at RMI have generated several types of waste materials, many of which are considered radioactive low-level wastes due to contamination with uranium. The goal of solid waste management personnel at RMI is to minimize waste and to properly dispose currently generated wastes in a timely manner. Due to the small size of RMI, timely offsite disposal is particularly important to limit the potential for the spread of contamination and the direct radiation exposure to onsite personnel. Solid Waste Management project descriptions are contained in Section 14.8.3.

14.4 Site Remediation

Past industrial and waste disposal practices, many of which were common and acceptable at the time, are now known to have significant potential environmental impacts. For many years, RMI operated a small (10 x 30 foot) clay-lined evaporation pond to evaporate water from sodium nitrate solution. Recent downgradient groundwater monitoring and hydrogeological studies of the pond have shown radioactive contamination as well as contamination with trichloroethylene, a degreasing solvent. Investigations to determine the extent of the contamination are nearing completion and several remedial actions are under consideration.

Fields Brook, which flows north of the Extrusion Plant into the Ashtabula River Harbor and then into Lake Erie, receives wastewater effluent from several plants

including RMI. This brook has been placed on the National Priorities List due to the presence of various contaminants, including chlorinated solvents, PCBs and toxic metals. Since RMI is located on the brook, it has been identified as a potentially responsible party.

The Laskin/Poplar Oil site in Ashtabula County also has been placed on the National Priorities List. RMI again has been named as a responsible party since it has sent 3,109 gallons of waste oil to this site. Site Remediation project descriptions are contained in Section 14.8.4.

14.5 Personnel Protection

Health Physics and other Industrial Hygiene equipment improvements are based upon several factors. Equipment improvements are necessary when these improvements satisfy one or more of the following conditions:

- Provides a comprehensive Industrial Hygiene program
- Replaces worn out and obsolete equipment
- Provides in-house capabilities spurred by reasons of economics, accuracy, or potentially quick turnaround requirements.

An integral part of RMI's comprehensive Industrial Safety Program is employee safety awareness and employee knowledge of safe job procedures and hazard recognition. Ongoing job safety training is a basic part of the RMI operations philosophy. Additional training in specific areas is now mandated by various new regulations and orders.

Personnel Protection project descriptions are contained in Section 14.8.5.

14.6 Facilities Protection Improvements

Currently, flammable liquids are stored at several locations throughout the site. Provisions for a flammable liquid storage building are needed to provide a consolidated location to store these materials, thus resulting in a safer working environment for site personnel.

In-house laboratory support provides accurate and rapid analysis, but existing facilities cannot accommodate all the requests generated by ongoing environmental programs. In addition to lacking a complete environmental monitoring capability, RMI has no capability for in-house transuranic analysis. The joint WMCO/RMI Task Force on Recycle Material recommended sampling of incoming, in-process, and outgoing material and waste residues for transuranics and fission products. In-house capability cannot be realized until sufficient lab space is generated.

Facilities protection improvement project descriptions are contained in Section 14.8.6.

14.7 Emergency Preparedness

A card-reader system will improve personnel accountability as discussed in the May 1987 report, RMI Emergency Preparedness Appraisal, written and conducted by DOE-ORO. Many general site security improvements will also be implemented as a result of the findings contained in this report. This project description is contained in Section 14.8.7

14.8 RMI Extrusion Plant Project Descriptions

A listing and description of all planned RMI improvements are contained in the sections that follow. An overall funding summary for these projects is presented in Table 14-1.

TABLE 14-1
FUNDING SUMMARY FOR RMI
($ Thousands)

Funding		Fiscal Year						
Type	Total	1988	1989	1990	1991	1992	1993	1994
GE-CE	11,285	700	2,960	2,325	800	1,500	1,500	1,500
GE-OP	15,015	2,740	2,180	2,471	2,221	1,801	1,801	1,801
GE-GPP	1,215	550	365	300				
GF-11	21,750	400	1,000	1,000	5,300	5,350	4,200	4,500
Totals:	49,265	4,390	6,505	6,096	8,321	8,651	7,501	7,801

KEY

GE-CE - Capital Equipment from GE Budget
GE-OP - Operating Funds from GE Budget
GE-GPP - General Plant Projects from GE Budget
GF-11 - Funding for Site Remediation Projects

14.8.1 Air Pollution Control Projects

The five planned improvements for air pollution control are described in the paragraphs that follow this list:

- Dust Collection Systems
- Nitric Acid Fume Abatement
- Meteorological Tower
- Emission Dispersion Modeling Studies
- Perimeter Air Samplers.

Dust Collection Systems: Existing ventilation of the process areas consists principally of systems equipped with inefficient air pollution control devices; ventilation fans are also used in certain areas. To comply with applicable DOE regulations and provisions of the Clean Air Act, the ventilation systems at nine key process points are being replaced with air scrubbers, HEPA filters and new discharge stacks equipped with air samplers. The installation of upgraded ventilation fan systems began in FY-86 and will be carried out in accordance with the ALARA philosophy for environmental protection.

Nitric Acid Fume Abatement: Nitrogen oxides generated by metal pickling operations require proper control in order to maintain compliance with OSHA and DOE regulations and provisions of the Clean Air Act. Therefore, installation of two separate NOx control systems consisting of fume scrubbers, exhaust fans and stacks is being planned for FY-90; this equipment will replace existing ventilation systems.

Meteorological Tower: RMI plans to construct an onsite meteorological tower in order to more accurately determine atmospheric conditions at the facility than is currently possible from the data collected at the Erie International Airport weather station, located 30 miles northeast of the RMI site. The feasibility of this proposed project is currently being evaluated.

Emission Dispersion Modeling Studies: Subsequent to completing the improvements to major emissions sources, a computer program will be used in conjunction with appropriate meteorological data to formulate an emission dispersion model. This model will enable studies to be performed of the parameters governing dispersion.

Perimeter Air Samplers: OS&H upon results received from emission dispersion modeling studies, the number and location of the air sampling stations located on the periphery of the facility will be reviewed to determine needs for additional air sampling stations.

14.8.2 Water Pollution Control Projects

The two planned improvements for water pollution control are described in the paragraphs that follow this list:

- Process Wastewater Treatment Facility
- Wastewater Outfall Sampling Improvements.

Process Wastewater Treatment Facility: The existing treatment facility is inadequately designed to meet effluent discharge requirements. Consequently, an upgraded system is currently being constructed which will utilize the BAT philosophy in order to ensure that the equipment is capable of satisfying the existing effluent discharge limits. The new system is designed to more efficiently remove uranium, oil and grease, and total dissolved solids than is currently possible.

Wastewater Outfall Sampling Improvements: Concurrent with the upgrade of the Wastewater Treatment Facility, the existing wastewater sampling system is being replaced. The upgraded system will ensure a more accurate determination of the actual effluent contamination levels.

14.8.3 Solid Waste Management Projects

The nine planned improvements for solid waste management are described in the paragraphs that follow this list:

- Pickling Waste Evaporator
- Asbestos Removal
- RCRA Shipments to the TSCA Incinerator
- Low-level Waste Shipments
- Sludge Dryers
- Contaminated Metal Shipments to FMPC
- RCRA Shipments to FMPC
- Waste Oil Characterization
- Waste Minimization.

Pickling Waste Evaporator: Equipment is necessary to evaporate water from the uranium-contaminated sodium nitrate solution, a process waste stream generated as a result of the acid pickling operations. The resulting nitrate solution becomes part of the radioactive low-level waste which is shipped offsite for disposal.

Asbestos Removal: Insulation applied to some of the process piping contains asbestos and must be removed. This improvement is designed to remove the asbestos from the piping and prepare it for shipment.

RCRA Shipments to the TSCA Incinerator: This improvement provides for shipment of contaminated machining oil generated during the extrusion process to the Oak Ridge TSCA Incinerator, where it will be safely disposed.

Low-level Waste Shipments: Radioactive low-level waste generated at RMI consists of solid materials that have become contaminated in association with the processing of uranium metal. These materials are suitably packaged and shipped to FMPC. Direct shipments to an offsite disposal location are planned during FY-88.

Sludge Dryers: Scrap material which accumulates in process equipment collection basins must be periodically collected, dried and disposed. Currently, the materials are dried in inefficient gas-fired furnaces. This improvement provides for the procurement and installation of state-of-the-art dryers to increase the efficiency of the operation.

Contaminated Metal Shipments to FMPC: Scrap construction steel contaminated with uranium is routinely shipped to FMPC where it is stored with other contaminated ferrous metal. This improvement provides funding for the continued shipment of these materials to FMPC for processing and storage.

RCRA Shipments to FMPC: The uranium-contaminated barium chloride used in the RMI heat treating process is periodically shipped to FMPC for storage and eventual disposal. These periodic shipments are essential due to the very limited storage space at the RMI facility. This improvement provides funding necessary to support these continuing shipments.

Waste Oil Characterization: This improvement identifies and characterizes the physical properties of the waste oil generated at RMI so that it may be shipped to the Oak Ridge TSCA incinerator.

Waste Minimization: The generation of RCRA and low-level wastes results in significant increases in RMI operating expenses. A considerable savings will be realized by the use of procedures and practices which minimize the generation of these wastes. This improvement requires funding necessary for investigation into methods of minimization suitable for implementation at the RMI facility.

14.8.4 Site Remediation Projects

The three planned improvements for site remediation are described in the paragraphs that follow this list:

- Groundwater Contamination Studies
- Fields Brook Cleanup
- Laskin/Poplar Oil Site.

Groundwater Contamination Studies: Recent hydrogeologic studies and results of groundwater monitoring have proven that radioactive and solvent contamination exists in the vicinity of a small clay-lined pond located within the site boundaries. For years, the pond had been used to evaporate water from effluent pickling solutions. Investigations are now determining the extent of contamination and several remedial actions are being proposed. This improvement requires funding for ongoing studies as related to the investigation and selection of future remedial actions at RMI as well as Fields Brook and the Laskin/Poplar Oil Site.

Fields Brook Cleanup: Fields Brook, which flows north of the RMI site and eventually empties into the Ashtabula River, receives effluent wastewater from several nearby facilities, including RMI. Due to the presence of PCBs, chlorinated solvents and toxic metals, Fields Brook has been placed on the National Priorities List. RMI has been identified as a potentially responsible party. This improvement requires funding for engineering and cleanup efforts associated with Fields Brook. Currently, neither the cost of cleanup nor the extent, if any, of liability can be determined.

Laskin/Poplar Oil Site: The Laskin/Poplar Oil Site, located in Ashtabula County, has been placed on the National Priorities List for remediation. In the past, RMI has shipped 3,100 gallons of contaminated oil to this site and as a result, has been identified as a potentially responsible party. This improvement requires funding for underwriting the engineering and remediation of Laskin/Poplar Oil Site.

14.8.5 Personnel Protection Projects

The four planned improvements for personnel protection are described in the paragraphs that follow this list:

- Health Physics Equipment
- In-vivo Monitoring Facility
- Instrument Replacement and Calibration
- Employee Training.

Health Physics Equipment: This improvement involves the procurement and installation of new health physics equipment to replace the existing obsolete instrumentation. The new equipment will greatly expand in-house capabilities and provide a comprehensive Health Physics Program.

In-vivo Monitoring Facility: This equipment will provide in-house capability for monitoring lung burdens of RMI employees suspected of having ingested contaminated materials. This improvement, in itself, will significantly enhance the RMI Health Physics Program.

Instrument Replacement and Calibration: Instrumentation associated with the Health Physics Program requires frequent recalibration to ensure the accuracy of results obtained. This improvement is necessary to maintain these instruments at their peak performance levels.

Employee Training: Employee safety awareness and knowledge of job procedures and hazard recognition is a key part of RMI's safety program. To achieve these conditions, RMI provides continual on-the-job training and job-specific training as mandated by new and ever changing rules and regulations.

14.8.6 Facilities Protection Projects

The two planned improvements for facilities protection described in the paragraphs that follow this list:

- Constructing a Flammable Liquids Storage Building
- Expanding the Laboratory Facilities.

Constructing a Flammable Liquid Storage Building: Funding has been requested for construction of a flammable liquids storage building during FY-88. This improvement is designed to provide a consolidated and safe storage area for bulk flammable materials.

Expanding the Laboratory Facilities: Funding has been requested for the addition of an administration building during FY-88 which will allow expansion of the laboratory into the existing administrative office space. Existing laboratory space is insufficiently sized and inadequately equipped to deal with the greatly expanded workload imposed by the current environmental monitoring programs. This additional space is a necessary prerequisite for performing the accurate and rapid analyses required.

14.8.7 Emergency Preparedness Projects

The one planned improvement for Emergency Preparedness is discussed in the next paragraph.

Card-Reader System: The installation of a card-reader system will improve security as well as satisfy personnel accountability deficiencies as outlined in the Emergency Preparedness Appraisal written and conducted by DOE-ORO in May 1987.

14.9 Accomplishments at RMI

The work performed in calendar year 1986 in regard to environmental concerns is described in the following sections.

14.9.1 Air Pollution Control

Uranium processing operations at the extrusion plant are ventilated for worker protection. The effluent from these operations is discharged from six stacks (see Figure 14-1) that extend 25 to 40 feet above ground. Periodic isokinetic sampling is performed in each stack. Table 14-2 summarizes this sampling.

TABLE 14-2
STACK SAMPLING RESULTS FOR URANIUM, 1986

Stack Number	Identification	# of Samples	Highest Concen. µCi/ml	Lowest Concen. µCi/m;	Average Concen. µCi/ml
1	Extrusion Press	66	3.06×10^{-10}	1.77×10^{-12}	2.32×10^{-11}
2	Runout Table	33	1.85×10^{-10}	1.75×10^{-12}	2.85×10^{-11}
3	Cooling Table	15	9.42×10^{-11}	3.00×10^{-12}	2.83×10^{-11}
4	Abrasive Saw	32	6.53×10^{-8}	5.00×10^{-15}	5.72×10^{-9}
5	Scrap Incinerator	46	1.24×10^{-9}	1.80×10^{-12}	1.77×10^{-10}
6	Forge Booths	46	1.01×10^{-9}	3.41×10^{-12}	1.69×10^{-10}

TABLE 14-3
PERIMETER SAMPLING SUMMARY FOR URANIUM, 1986

Station Number	Location	# of Samples	Highest Concen. µCi/ml	Lowest Concen. µCi/ml	Average Concen. µCi/ml
1	North Fence - west	44	6.32×10^{-13}	1.70×10^{-16}	4.44×10^{-14}
2	North Fence - east	44	8.26×10^{-13}	8.21×10^{-15}	1.13×10^{-13}
3	East Fence	44	6.29×10^{-13}	4.54×10^{-15}	7.40×10^{-14}
4	South Fence	44	2.14×10^{-13}	4.80×10^{-16}	3.40×10^{-14}
5	West Fence	44	1.16×10^{-13}	1.08×10^{-15}	1.25×10^{-14}
	Total Average				**5.56×10^{-14}**

Variations in the number of samples from each stack listed in Table 14-2 exist due to scheduling of specific DOE operations and the ventilation equipment dedicated to these operations.

Perimeter air samplers are located on the plant boundary fence line (see Figure 14-1). The samplers continuously draw air at 35 liters per minute through a 47 mm filter which is changed weekly during regular plant operations. Table 14-3 summarizes this sampling.

Stack emissions totalled 0.0173 curie (41.2 kilograms) uranium (99.7% U-238, 0.3% U-235) for DOE operations and 0.000074 curie (0.21 kilograms) uranium (99.8% U-238, 0.2% U-235) for NRC operations. Radiation dose to the public from stack emissions is calculated using the EPA AIRDOS model and is compared to EPA NESHAP standards. AIRDOS calculations of RMI data predict a committed dose to a maximally exposed organ (lung) of 9.8 mrems, 13.1% of the allowable limit under the current NESHAP regulations. The whole body dose is estimated at 9.6×10^{-5} mrem/year, well below the 25 mrem/year limit. The effective 50-year dose equivalent to the population is 4.2 person-rem due primarily to inhalation.

The highest average perimeter air concentration in 1986 was 1.13×10^{-13} microcurie natural uranium per ml; this figure represents 110% of the DOE guideline for concentrations in air in uncontrolled areas. The average perimeter air concentration was 56% of the established DOE guidelines.

14.9.2 Water Pollution Control

Prior to discharge, all process water from plant operations passes through a three micron diatomaceous earth filter. Sanitary waste is treated in a sequencing batch reactor treatment plant which was installed early in 1986. Process water, sanitary sewage, storm sewer runoff and salt bath noncontact cooling water all combine to form the final effluent. In 1986, total uranium in waste water discharged from all operations was 0.0797 curie (117.6 kg) based on total effluent volume and average uranium concentration at the monitoring point. A contract has been issued for installation of additional wastewater treatment facilities as part of RMI's ALARA program. Start-up of the new system is scheduled for late FY-88.

Sampling is done at the release point to Fields Brook. Each week, hourly samples are taken and composited for a 24-hour period from the release point. These samples are analyzed for uranium. The same samples are also analyzed for the NPDES permit parameters twice each month or more often as specified by the permit. Each week, composite samples are taken from Fields Brook. Upstream and downstream samples are taken at 700 and 2000 feet respectively, from the RMI outfall. Tables 14-4 and 14-5 summarize the sampling.

TABLE 14-4
WASTEWATER MONITORING SUMMARY FOR URANIUM, 1986

Sample Location	# of Samples	Highest Concen. µCi/ml	Lowest Concen. µCi/ml	Average Concen. µCi/ml
Plant Outfall	53	2.06×10^{-5}	8.58×10^{-8}	1.51×10^{-6}
Fields Brook Upstream	53	5.05×10^{-8}	1.72×10^{-10}	2.74×10^{-9}
Fields Brook Downstream	53	6.52×10^{-8}	4.95×10^{-10}	7.27×10^{-9}

TABLE 14-5
NPDES PERMIT SUMMARY FOR 1986

Parameter	# of Samples	Concentration Highest	Concentration Lowest	Concentration Average	Permit Limit	Compliance with Permit Limits (%)
pH (S.U.)	53	8.3	6.5	7.8	6-9	100
Total Dissolved Solids	24	440.0	217.0	287.5	400 avg.	97
Total Nonfilterable Residue (mg/l)	26	47.0	1.0	8.8	10 avg.	86
Oil and Grease (mg/l)	24	19.2	1.0	6.8	10	75
Copper (µg/l)	24	320	< 50.0	141.0	500	100

During calendar year 1986, there were thirteen instances of noncompliance with the NPDES permit for the Extrusion Plant. Table 14-5 also compares high, low and average values to the permit limit for each parameter. NPDES wastewater sampling indicated an average of 93% compliance with permit limits. Several minor noncompliances for dissolved solids, suspended solids, and oil and grease were noted. The following is a listing by parameter and suspected cause for these noncompliances:

Parameter	Number of Exceedances	Cause
Oil and grease (O&G)	6	(3)Wastewater accumulator tank oil skimmer malfunction (3) Equipment clean-up operations
Total nonfilterable residue (T-NFR)	4	New sanitary sewer plant malfunction
Total dissolved solids (TDS)	3	New sanitary sewer plant start-up malfunction

The total nonfilterable residue exceedances have been alleviated with the proper operation of a new sanitary sewer sequencing batch reactor. The wastewater treatment facility planned for early FY-88 start-up is designed for more efficient removal of oil & grease, total dissolved solids and uranium than the current diatomaceous earth filter. Table 14-6 presents a tabulation of total wastewater discharged with respect to NPDES parameters.

TABLE 14-6
SUMMARY OF 1986 WASTEWATER DISCHARGE FROM THE RMI EXTRUSION PLANT

	Average (mg/l)	Annual (kg/year)
Total Dissolved Solids	287.5	22,010
Total Nonfilterable Residue	8.8	670
Oil and Grease	6.8	520
Copper	0.141	10.8

Water Usage during 1986 in MG

January	2.009
February	1.754
March	1.836
April	1.766
May	1.764
June	1.671
July	1.571
August	1.572
September	1.665
October	1.681
November	1.486
December	1.450
Total	**20.225 million gallons**

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Wastewater sampling data for the period predicted an effective dose equivalent of 0.12 mrem at the downstream sampling point, and 0.05 mrem at the upstream sampling point based on consumption of 2 liters of Fields Brook water per day per person for a year. The average downstream concentration was 1.2% of the DOE guideline for concentrations in water in uncontrolled areas.

14.9.3 Groundwater Monitoring

During 1985, Dames & Moore Engineering completed a phase I hydrogeological study of the RMI site. The purpose of the study was three-fold:

- To develop an understanding of the site hydrogeology
- To install detection groundwater monitoring wells at the site perimeter
- To perform initial detection groundwater monitoring.

Groundwater flow at the site was determined to be generally north-northwest. Groundwater contamination by trichloroethylene (200 parts per million) and uranium (150 pCi/l) was detected in one of the six monitoring wells installed. The contaminated monitoring well (MW 104) is located inside the north fence.

The most probable route of entry into the groundwater was through a small (900 ft^3) clay-lined solar evaporation pond located upgradient from MW 104. The sodium nitrate solution placed in the pond for evaporation contained some uranium. The presence of trichloroethylene probably resulted from a single unauthorized disposal into the pond prior to 1972. The pond was closed in 1984.

Since the initial detection phase I study indicated the presence of contamination, phase II and phase III studies were completed in 1986. Phase II included soil resistivity measurements to scope the extent of a possible plume. Phase III included the drilling of eleven additional monitoring wells (200 series) which were located within 400 feet of the RMI site, based on the results of the phase II study. (Refer to Figure 14-4 for locations of these 11 wells.)

During 1986, it was determined that MW 104 also contained technetium-99 (0.050 parts per million or 900,000 pCi/l). Downgradient MW 206 contains traces of trichloroethylene (0.005 ppm) and technetium-99 (0.002 ppm or 26,000 pCi/l) as well, even though MW 209 which is located between MW 104 and MW 206 shows no sign of contamination. These technetium-99 levels can be compared to USEPA National Interim Primary Drinking Water Regulations Maximum Permissible Concentration of 900 pCi/l and the DOE derived concentration guideline of 100,000 pCi/l. Additional monitoring wells and hydrogeological study are planned to better define the extent of the contaminant plume.

All monitoring wells are sampled and analyzed quarterly for the four RCRA indicator parameters. These include four replicate analyses for each of pH, specific conductance, total organic carbon and total organic halogens. Other routine analyses include uranium, gross alpha and beta radiation, sodium, chloride and trichloroethylene. Table 14-7 summarizes the RMI monitoring well findings. Work plans detailing a remedial action plan based on the studies described herein will be required.

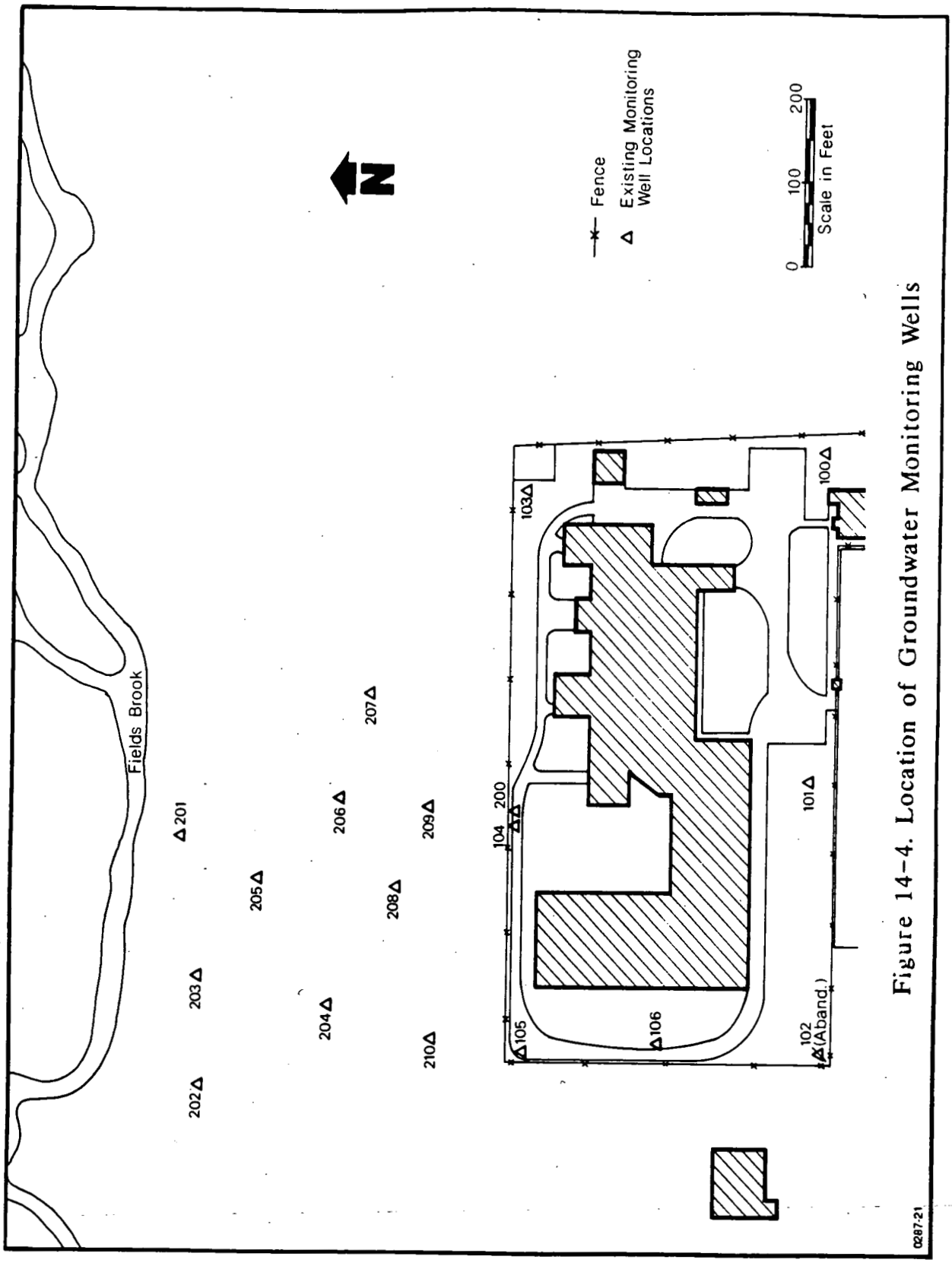

Figure 14-4. Location of Groundwater Monitoring Wells

TABLE 14-7
AVERAGE 1986 MONITORING WELL CONCENTRATIONS FOR RMI

Parameter	Units	Perimeter Wells (# 100,101,103) 105,106)	Wells of Special Concern Due to Trichloroethylene and/or gross alpha or beta			Downgradient Wells (# 204,205,207 208,209,210)	Downgradient Wells affected by offsite contamination (# 201,202,203)
			104	200	206		
pH[1,2]	S.U.	7.4	8.0	7.2	7.0	7.3	7.3
Specific Conductance[1]	µmhu	1,550.0	23,000.0	6,500.0	1,250.0	1,450.0	2,400.0
Total Organic Carbon[1]	mg/l	2.8	13.5	3.4	3.8	2.7	7.8
Total Organic Halogen[1]	mg/l	< 0.014	30.0	0.430	0.019	< 0.019	0.337
Trichloroethylene[3]	mg/l	< 0.001	170.0	0.47	0.004	< 0.001	0.171
Uranium[4]	pCi/l	23.0	155.0	6.0	1.9	3.8	4.2
Gross Alpha[5]	p/Ci	30.8	230.0	22.5	3.6	4.9	5.5
Gross Beta[5]	pCi/l	43.6	145,000.0	23.1	5,000.0	26.8	27.7
Sodium[6]	mg/l	59.0	5,600.0	988.0	205.0	92.0	306.0
Chloride[2]	mg/l	47.0	165.0	970.0	41.0	126.0	591.0

The following citations are included for reference:

1. RCRA indicator parameter - Look for statistically significant increase in downgradient well compared to upgradient well using student's t-test, 40 CFR 265.93.
2. National Secondary Drinking Water Regulations 40 CFR 143.3, Recommended levels for public water systems:
   chloride - 250 mg/l pH - 6.5 to 8.5.
3. National Primary Drinking Water Regulations. Proposed maximum contaminant level for trichloroethylene - 0.005 mg/l. 50 FR 46902, 11/13/85.
4. National Primary Drinking Water Regulations; Radionuclides; Advanced Notice of Proposed Rulemaking. 51 FR 9/30/86 4 mrem/year - 40 pCi/l for U-238, U-234.
5. National Primary Drinking Water Regulations 40 CFR 141.11. Maximum contaminant level for public water systems -
   Gross Alpha (excluding radium and uranium) 15 pCi/l
   Gross Beta - 4 mrem/year dose to body or organ.
6. USEPA recommended drinking water maximum contaminant level for sodium of 20 mg/l for persons on sodium restricted diets. 49 FR 6/18/84.

15.0 References

1. Westinghouse Materials Company of Ohio, *Feed Materials Production Center Environmental Monitoring Report for 1986*, FMPC-2076 Special, April 30, 1987.

2. U.S. Environmental Protection Agency and the U.S. Department of Energy, *Federal Facilities Compliance Agreement for the DOE Feed Materials Production Center, Fernald*, Ohio, July 19, 1986.

3. Ohio Environmental Protection Agency, *Director's Findings and Orders, DOE Feed Materials Production Center, Fernald, Ohio*, June 26, 1987.

4. U.S. Department of Energy, Environment, Safety and Health Office of Environmental Audit, *Environmental Survey Preliminary Report, Feed Materials Production Center*, March 1987.

5. S.J. Wentzel, Westinghouse Materials Company of Ohio, *FMPC Emergency Plan*, FMPC-2046 Topical Manual, (Revision to NLCO-1129, Rev. 5), February 1988.

6. A.K. Benear, et al., Westinghouse Materials Company of Ohio, *Biodenitrification Demonstration Test Report*, FMPC-2095 Special, August 1987.

7. Westinghouse Materials Company of Ohio, Fiscal Year 1990/1991 Budget Capital Programs, Feed Materials Production Center, February 1, 1988.

8. Westinghouse Materials Company of Ohio, *Fiscal Year 1990/1991 Budget Environmental Restoration Program GF-11, Feed Materials Production Center*, February 22, 1988.

9. Westinghouse Materials Company of Ohio, *Fiscal Year 1990/1991 Budget Defense Waste Program, GF-01, Feed Materials Production Center*, February 29, 1988.

10. Lockwood Greene Engineers, Inc., *Environment, Safety and Health Conceptual Design Report*, Revision 1, Volume 1, October 21, 1986.

11. W.L. Brown and D.J. Loudin, Westinghouse Materials Company of Ohio, *FY-87 Feed Materials Production Center Environmental, Safety and Health Plan*, FMPC-2075 Special, April 1987.

12. RMI Company, Ashtabula, Ohio, *Annual Environmental Monitoring Summary for the RMI Company Extrusion Plant,* Covers the Period from January 1, 1986 through December 31, 1986.

13. Westinghouse Materials Company of Ohio, *Feed Materials Production Center NPDES Compliance Strategy for Process Wastewaters,* Revision 1, August 31, 1987.

14. Westinghouse Materials Company of Ohio, *Feed Materials Production Center Radiation Control Manual,* FMPC-2084 Topical Manual, September 14, 1987.