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ENVIRONMENT, SAFETY, HEALTH AND WASTE MANAGEMENT PLAN

Compiled by
Long-Range Planning

Spring 1989

FEED MATERIALS PRODUCTION CENTER
Westinghouse Materials Company of Ohio
P. O. BOX 398704
CINCINNATI, OHIO 45239-8704

PREPARED FOR THE
U.S. Department of Energy
OAK RIDGE OPERATIONS OFFICE
UNDER CONTRACT DE-AC05-86OR21600

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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)
Y-12	Y-12 Plant, Oak Ridge, TN.

EXECUTIVE SUMMARY

The Feed Materials Production Center (FMPC) was built in the early 1950's to establish an in-house integrated production complex for processing uranium feed materials to finished uranium metal products for use in DOE Defense Programs. General site information is contained in Section 1.0 of this Plan. The site mission is now undergoing a transition from production to environmental restoration, with continued emphasis on employee safety and community protection. This comprehensive management plan integrates the various environment, safety and health improvements and waste management activities to address issues and concerns through FY-1995.

The FMPC must adhere to federal and state statutes and regulations along with administrative and technical guidelines mandated by DOE Orders, outlined in Section 2.0 for implementing environment, safety and health protection. The Federal Clean Air Act is the basis for all regulation to control air pollution. The Clean Water Act specifically subjects federal facilities to NPDES permitting requirements under primacy granted to the State of Ohio. Low-level radioactive wastes generated at the FMPC are managed in accordance with DOE Order 5820.2A and hazardous/mixed wastes and toxic substances in accordance with RCRA and TSCA. Inactive waste storage facilities will be restored in accordance with the provisions of CERCLA. These major drivers and derivative regulations together with the terms of the Federal Facilities Compliance Agreement with the United States EPA and Consent Decree with the State of Ohio comprise the basis for all actions identified in the Plan. The provisions of the FMPC Best Management Practices Plan are outlined.

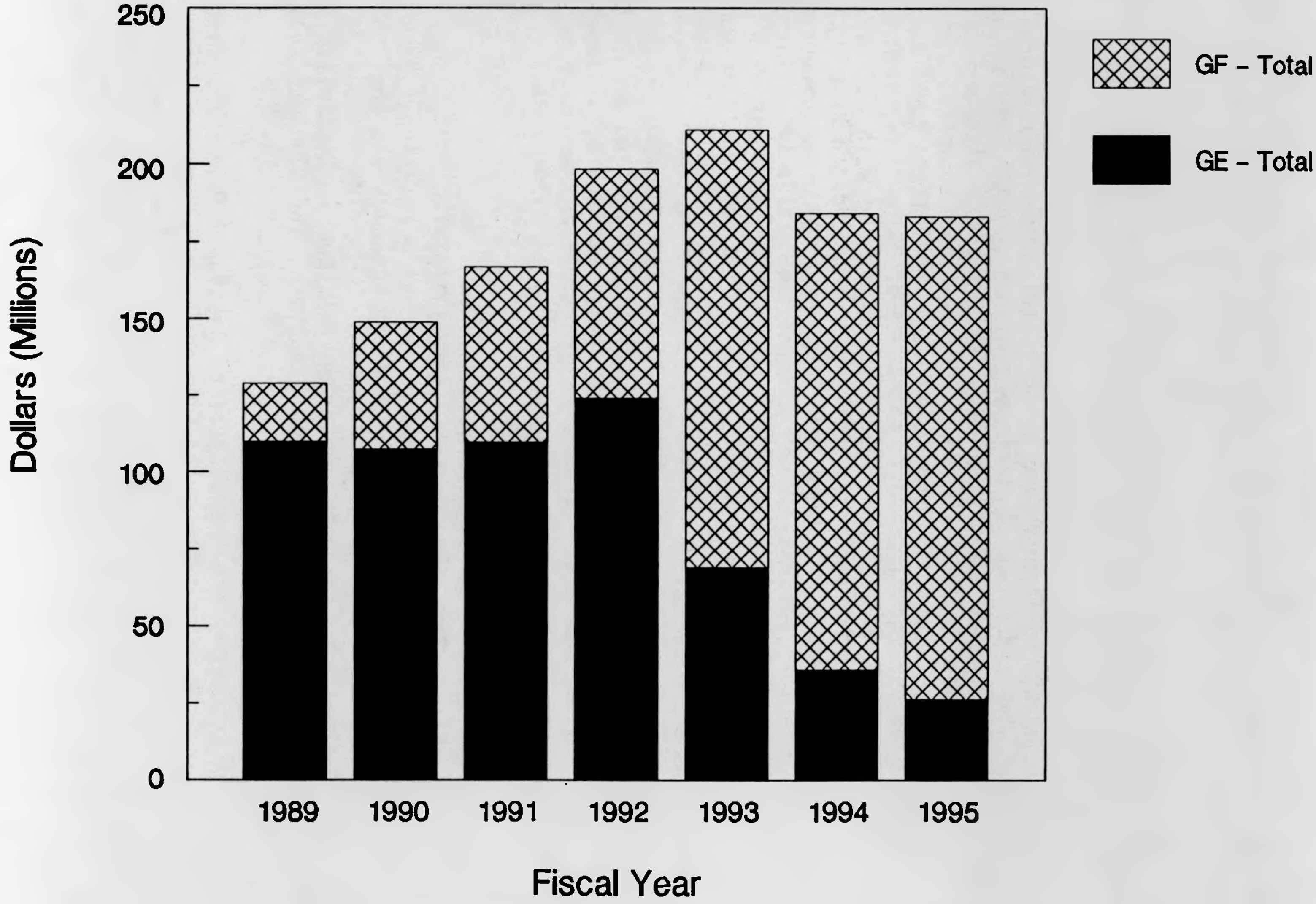
Projects identified in this Plan are prioritized according to criteria that considers: public or employee health and safety; environmental impact; public or government property damage; regulatory compliance; and economic factors. The top priorities for the FMPC center around these five major areas:

- RCRA Compliance
- Disposal of Thorium Materials
- K-65 Silo Sampling and Interim Stabilization
- NESHAPS/Permits and Actions for Reducing Emissions
- External Interfaces with Regulatory Agencies and the Public

Resources for supporting projects are drawn from Nuclear Materials Production (GE), Defense Waste and Transportation Management (GF-01) and Environmental Restoration (GF-11).

Allocations of resources are the subject of Section 3.0 and are summarized in Figure ES-1. For the seven-year period through FY-1995, Program GE supports $581 million in activities and another $639 million supports activities funded by both GF Programs. Program GE operating and capital funding demands for FMPC/RMI decrease from $110 million in FY-1989 to the $30 million level in FY-1994 and 1995. With the full implementation of environmental restoration activities beginning in FY-1990, Program GF demands increase sharply during the near-term

FIGURE ES-1, FMPC AND RMI ES&H/WASTE MANAGEMENT FUNDING SUMMARY



years and reach the $150 million per year level in the outyears. Summaries for all major activities included in this Plan are presented together with scheduling information in Section 3. Operating and capital funding requirements are consistent with the FY-1991 FMPC ES&H Crosscut Budget and Duffy Five-Year Plan for environmental improvements.

A breakdown of FMPC funding requirements for the 7-year improvement period is illustrated by Figure ES-2 for four broad categories of this Plan. About half of the total projected funding will be needed for the restoration of the FMPC site, and 35% for environmental pollution control and management of solid wastes. Funding summaries for all four categories of FMPC improvements are presented in Figures ES-3 through ES-6.

Actions for controlling and minimizing air pollution are outlined in Section 4. The major emphasis is to effectively minimize the discharge of pollutants to the atmosphere from more than 400 emission sources. To control particulates, the FMPC has equipped 59 emission points with stack samplers and utilizes high efficiency dust collection systems. Planned improvement projects at the FMPC will require annual expenditures at the $30 million level through FY-1990, and a total of $47 million for the remainder of the period through FY-1995. These projects include reducing the level of NO_x and other criteria pollutants and monitoring improvements in addition to controlling emissions.

Facilities and equipment used for controlling FMPC water pollutants derived from production and sanitary wastewaters and sitewide stormwater runoff are described in Section 5. Individual projects to improve the FMPC water pollution control system are developed according to these five categories:

- Treating Production Wastewater (11 projects)
- Collecting and Treating Stormwater (4 projects)
- Controlling Runoff and Spill Containment (4 projects)
- Treating Conventional Wastewater/Monitoring (4 projects)
- Pumping Contaminated Groundwater (3 projects)

Of particular importance are three projects for controlling stormwater from the Waste Pit Area and for remediating the South Plume and Plant 6 perched groundwater. Funding of $141 million will be required through FY-1995 to support a total of 26 projects at the FMPC.

Section 6 covers the management of three categories of solid waste materials: low-level radioactive waste (LLW), mixed/hazardous waste and conventional industrial waste. The objective of solid waste management is disposal, treatment or safe storage in compliance with applicable regulations and orders. The strategy is based upon waste minimization and maximizing offsite disposal; maintaining and upgrading storage facilities; and implement programs to reduce disposal costs and liabilities. A RCRA Implementation Plan was issued in FY-1989, and is comprised of ten sets of Action Plans and Milestones designed to integrate compliance into daily FMPC activities. Major projects include the recently completed interim closure of Pit 4 and RCRA closures of the Barium Chloride Facility and Trane Liquid Waste Incinerator. Ten abandoned underground storage tanks will be removed during FY-1990. Funding of $165 million will be

FIGURE ES-2, BREAKDOWN OF 7-YEAR FUNDING REQUIREMENTS FOR THE FMPC

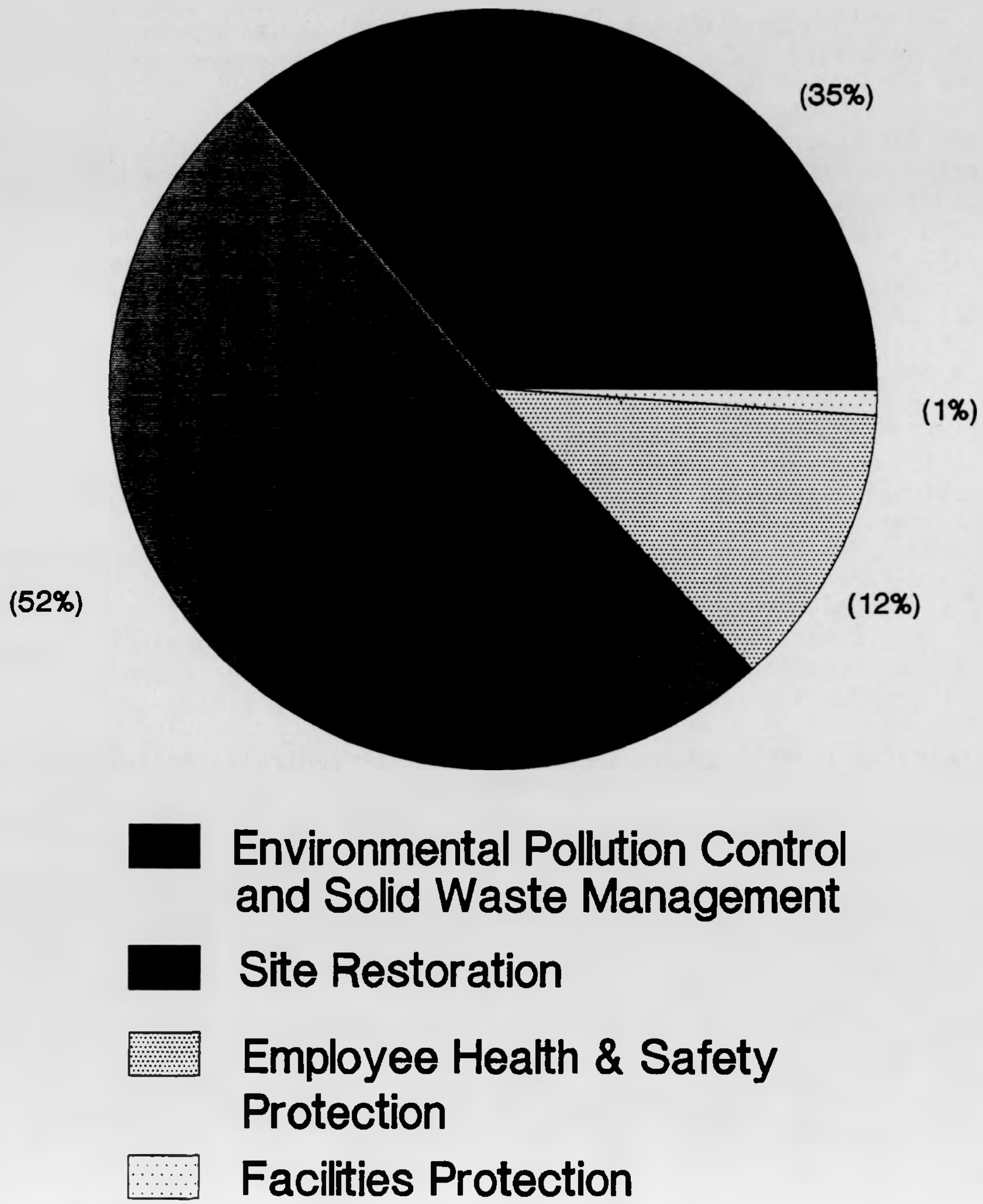


FIGURE ES-3, FMPC ENVIRONMENTAL POLLUTION CONTROL AND SOLID WASTE MANAGEMENT FUNDING SUMMARY

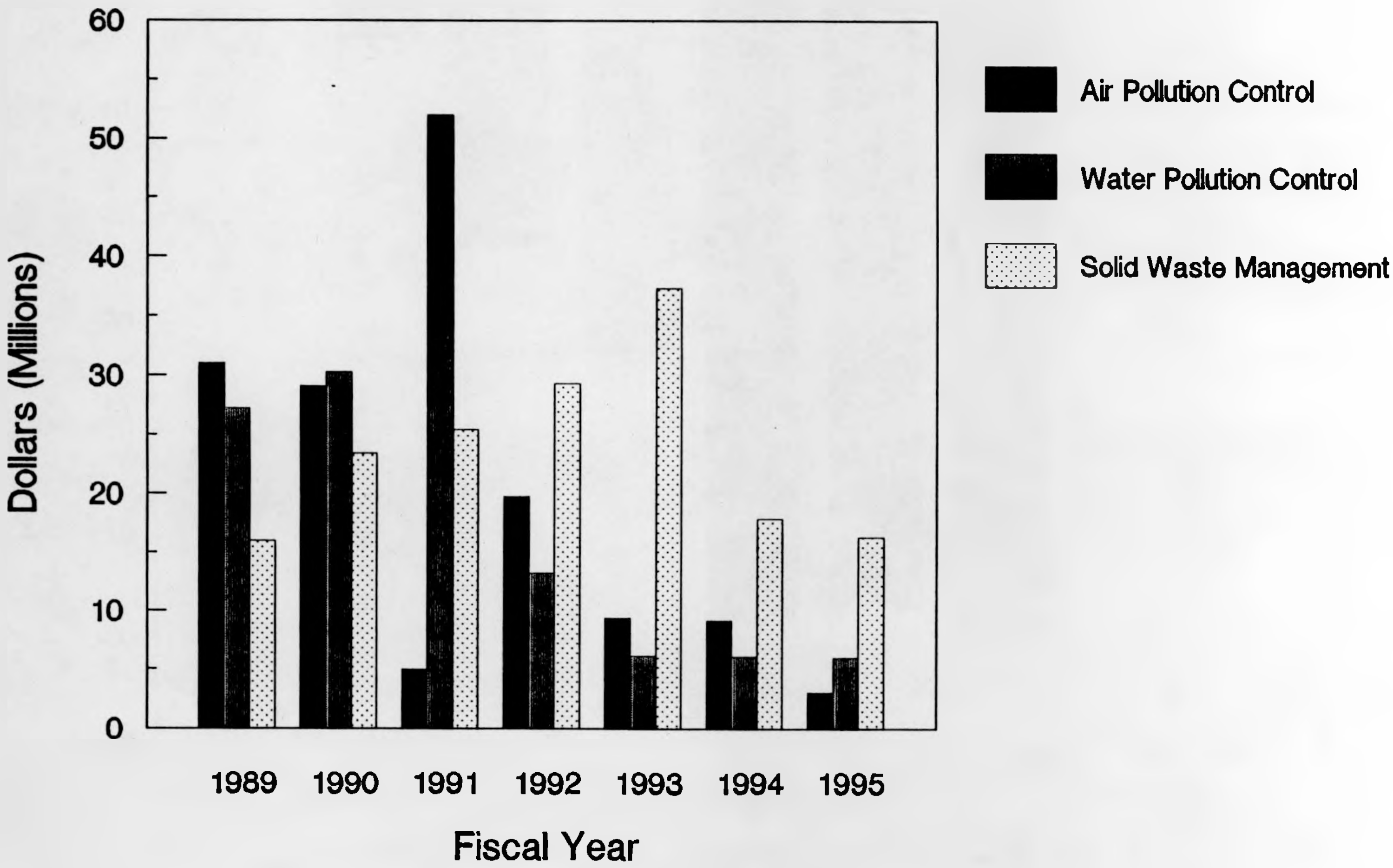


FIGURE ES-4, FMPC SITE RESTORATION FUNDING SUMMARY

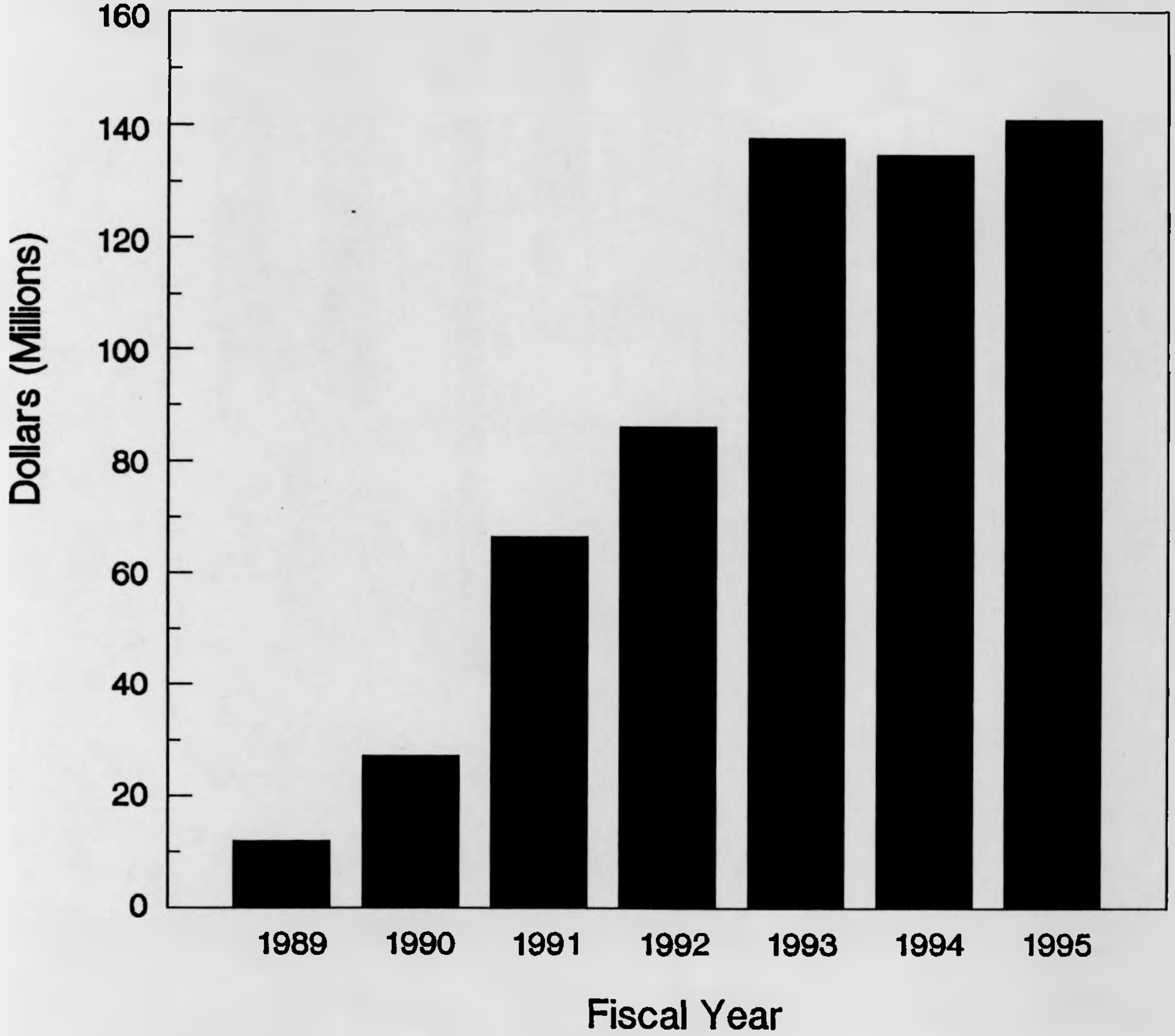


FIGURE ES-5, FMPC EMPLOYEE HEALTH AND SAFETY PROTECTION FUNDING SUMMARY

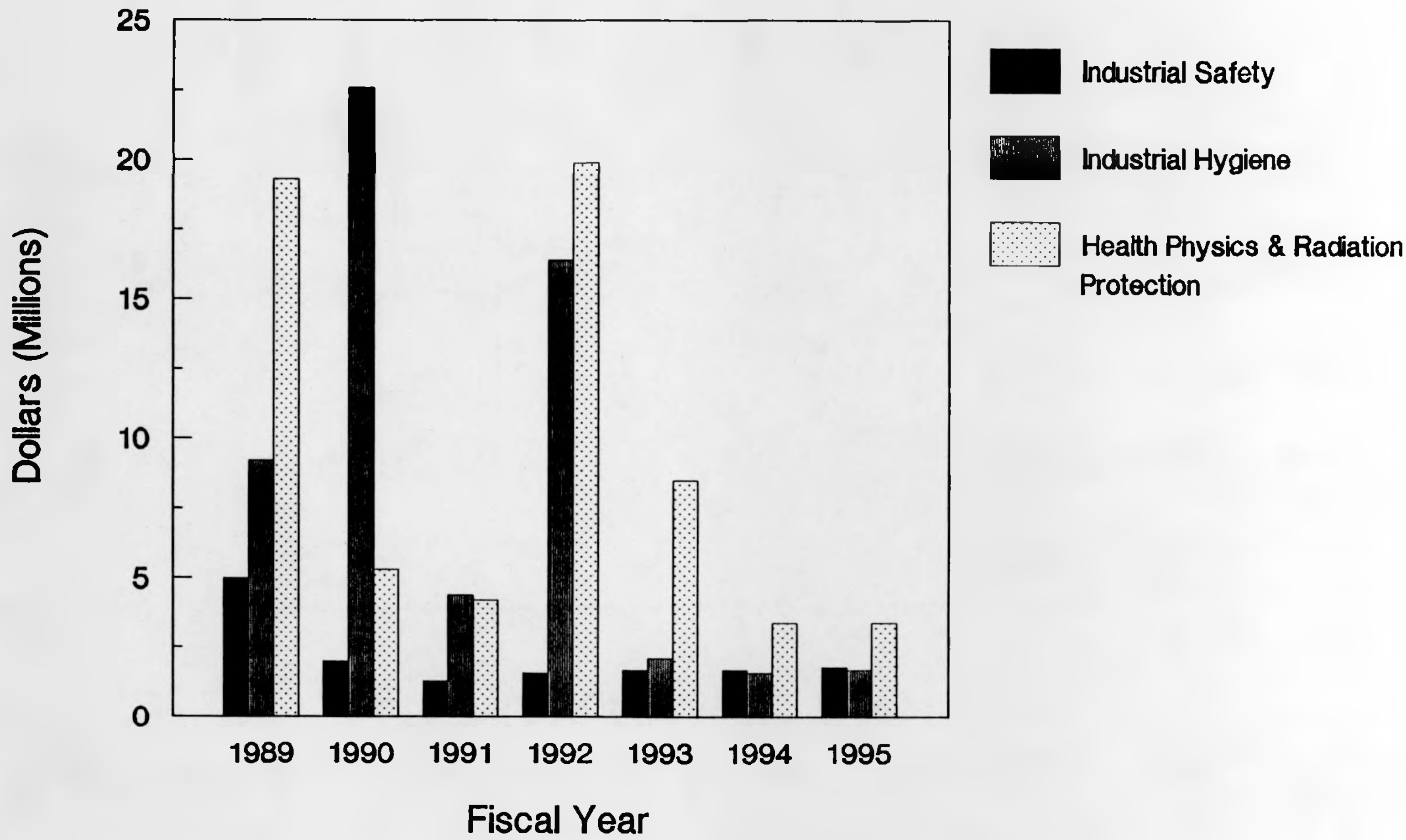
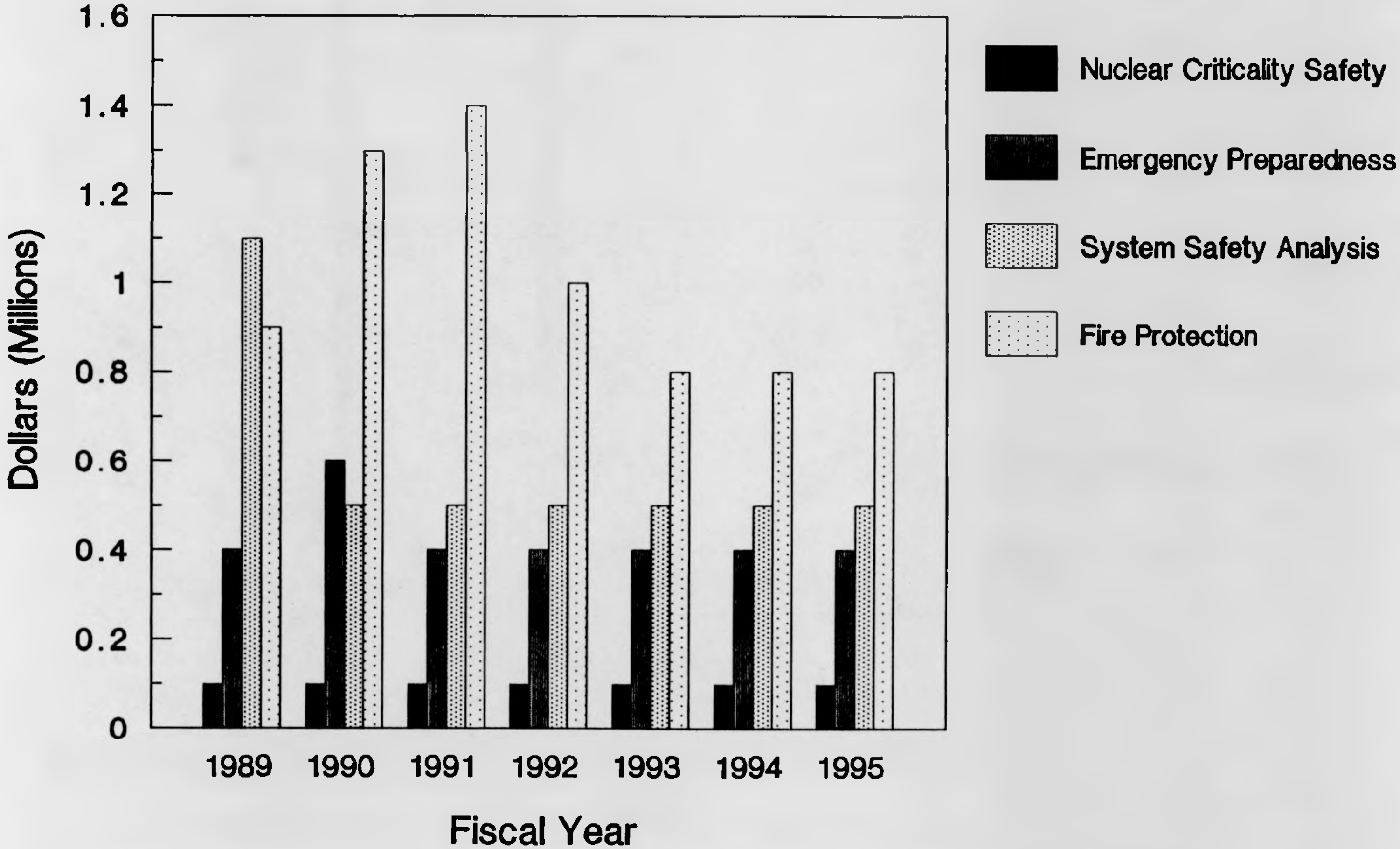


FIGURE ES-6, FMPC FACILITIES PROTECTION FUNDING SUMMARY



required at the FMPC through FY-1995 to support: 8 activities for processing and disposing LLW; 6 mixed/hazardous waste actions; 4 conventional industrial waste projects; and the waste minimization program. The inventory of backlog LLW will be eliminated during FY-1992.

The FMPC has accumulated an inventory of LLW, mixed/hazardous waste and other contaminated materials, equipment and facilities from over 35 years of operation. The methodology and funding requirements for environmentally restoring the FMPC site and designated surrounding areas are the subject of Section 7. A sitewide RI/FS is being conducted to characterize the extent of any contamination and to assess the relative impacts associated with remediating waste storage facilities. In order to expedite the restoration process, the RI/FS has been segmented into six operable units to address critical environmental and/or community concerns. A Record of Decision will be made for each operable unit during FY-1991 and 1992 for the corrective actions and waste disposition having the least environmental impact. The disposition of thorium materials in the FMPC inventory continues to be a high priority item and efforts will be directed toward offsite disposal. Annual funding required to support site restoration of the FMPC site is projected to increase sharply beyond FY-1989, reaching the $130-$140 million per year level in the outyears. Cumulative funding of $605 million will be required at the FMPC for the seven-year improvement period.

By agreement between the DOE and EPAs, the FMPC is pursuing five interim remedial action subprojects to expedite corrective actions prior to the issuance of RODs for Operable Units No. 3, 4, 5 and 6, as follows:

Subproject	Start Construction	Months Advanced	(Operable Unit) ROD
South Plume Groundwater Pumping	October 1990	9	(6) September 1990
Plant 6 Perched Groundwater Pumping	July 1989	33	(5) January 1992
Other Facilities Perched Groundwater Pumping	TBD	TBD	(5) January 1992
Phase II Waste Pit Area Stormwater Runoff Control	June 1990	27	(5) January 1992
K-65 Silo Sand Fill	TBD	22	(4) November 1990

Costs and schedules are frequently revised as a result of ongoing negotiations with the federal and state EPAs.

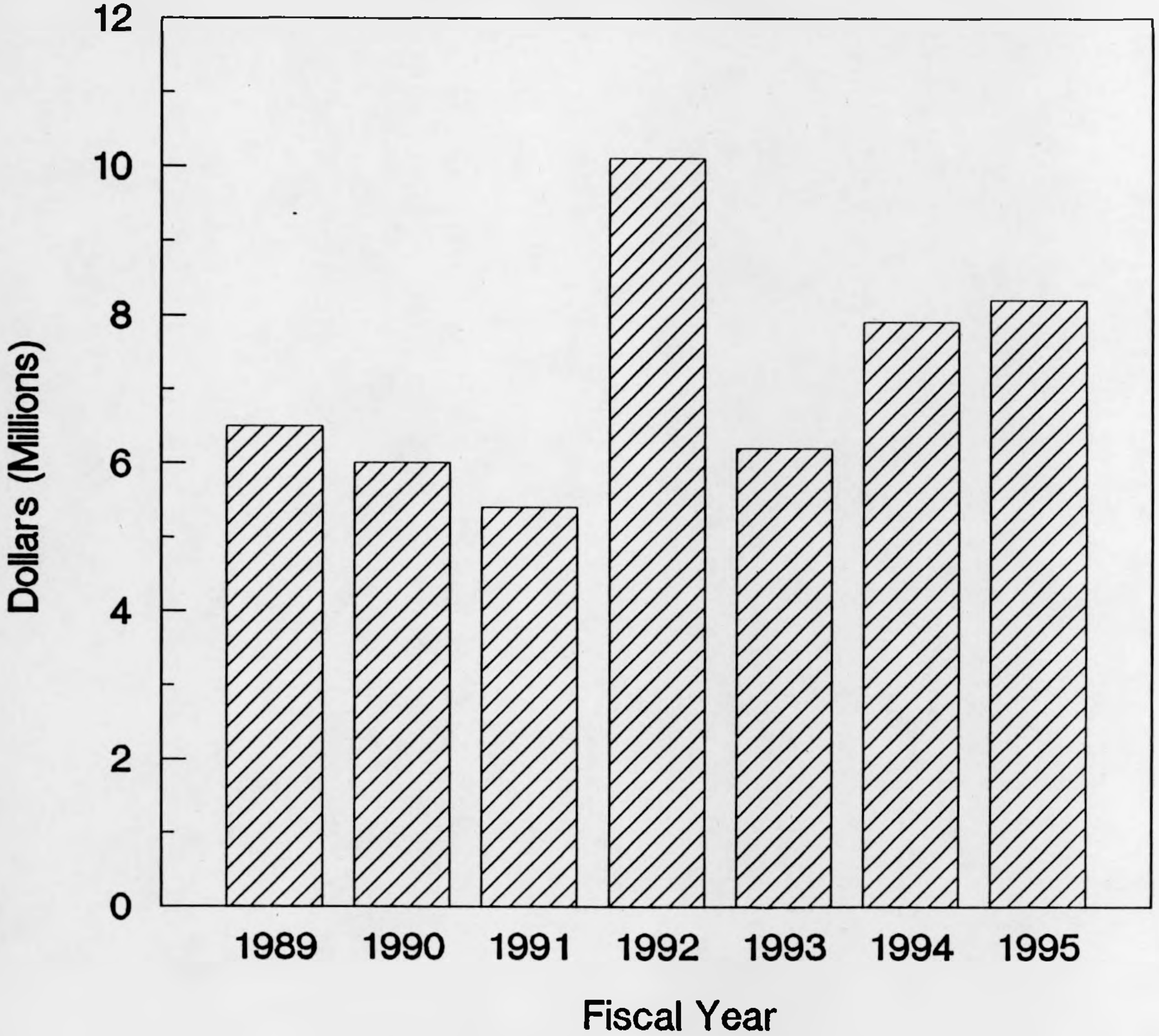
Provisions for health and safety are divided into three areas: health physics/radiation protection, industrial hygiene and industrial safety. Strategies and initiatives for maintaining and improving personal protection are discussed in depth in Section 8. Annual funding of health physics/radiation protection at the FMPC averages $9 million with wide fluctuations from year-to-year. For industrial hygiene activities, near-term funding requirements increase to nearly $23 million in FY-1990, and decrease sharply thereafter as EHSI Line-Item subprojects are completed. Industrial safety protection requires annual funding at the $1.5-2.0 million level beyond FY-1989.

The safety and protection of FMPC facilities against loss by naturally occurring events, fires, conventional industrial and transportation hazards and nuclear criticality are covered in Sections 8-10. Fire protection will require about $1.0 million annually. The System Safety Analysis Program defines safety analysis policy and guides the preparation of analysis documentation. Annual funds of nearly $500,000 are needed to support this activity beyond FY-1989. The strategy for nuclear criticality control is based on the double contingency principle. Controls are validated by computer analysis incorporated into the appropriate designs and procedures. Annual funds of approximately $130,000 are typical for this activity.

The remaining six sections of the report deal with Emergency Preparedness, NEPA Documentation, Quality Assurance, Environmental Monitoring Programs, Uranium Materials Processing and Handling, and the RMI Extrusion Plant located at Ashtabula, Ohio. Annual funding requirements for Emergency Preparedness average $400,000 through FY-1995, and will provide for training, drills and exercises in addition to supporting all aspects of maintaining the Emergency Operations Center. NEPA documentation is required to assess the environmental impacts of proposed renovations and remedial actions as early as possible, prior to the start of construction. Quality Assurance procedures employed in the management of environmental, safety, health and waste activities for the FMPC are designed to ensure conformance with all applicable federal, state and local environmental and industrial safety requirements. The FMPC Environmental Monitoring Program ensures compliance with federal and state environmental regulations that apply to federal facilities. The annual Environmental Monitoring Report is the controlling document for monitoring surveillance and control. Control and accountability of uranium materials used and stored at the FMPC is a major task that tracks the utilization and disposition of process materials. All of these activities are expected to continue through FY-1995. Associated projects for upgrading and improving these functions are outlined.

A five-year plan, which delineates the stepwise progression for environmentally restoring the RMI facility, is currently under development. Major areas of this plan are included in Section 15. Annual funding requirements average $7 million and are illustrated in Figure ES-7. Funds for the environmental restoration of the RMI site are at the target levels for FY-1990 and 1991, and increase sharply in the outyears in parallel with stepped-up GF funding for the FMPC.

FIGURE ES-7, RMI EXTRUSION PLANT FUNDING SUMMARY



1.0 Introduction

1.1 Site Location

The Feed Materials Production Center (FMPC) is located in southwestern Ohio, approximately twenty miles northwest of downtown Cincinnati near the communities of Miamitown and Ross, Ohio, as shown in Figure 1-1. Of the total site area of 1050 acres, 850 are in Morgan and Crosby Townships of Hamilton County and 200 are in Ross Township of Butler County, Ohio. The FMPC is owned by the U.S. Department of Energy (DOE) and operated by the Westinghouse Materials Company of Ohio (WMCO).

1.2 General Site Information

The FMPC site was selected and construction initiated in 1950. Built by the United States Atomic Energy Commission, the FMPC began full operation in 1953. Site modifications since then have not resulted in significant expansion of the approximately 300 acres originally established for production and waste management purposes.

The FMPC was built to establish an in-house integrated production complex for processing uranium and its compounds from natural uranium ore concentrates. A wide variety of chemical and metallurgical process steps are utilized to support the production of uranium metal products.

1.3 Population Distribution

Approximately 100,000 people live within a ten-mile radius of the site. Population centers, distances, and directions from the site boundaries are given in Table 1-1. Most of the residential areas in the vicinity of the FMPC are unincorporated small towns varying from an estimated population of 30 at Fernald to 3000 at Ross.

Between 1960 and 1970, the population of Hamilton and Butler Counties grew at rates of 6.8 percent and 13.6 percent, respectively. However, between 1970 and 1984, the population of Hamilton County decreased 6.5 percent, from 924,018 to 863,989, whereas, the population of Butler County increased 21.48 percent from 226,207 to a projected 1985 population of 274,800. Within Crosby, Morgan, and Ross townships, population increases have occurred because of the desirability of living in rural areas and commuting to urban centers.

The area around the site has been and is expected to remain a low population density area. The future population trends are expected to level off at annual growth rates of about 1% or less.

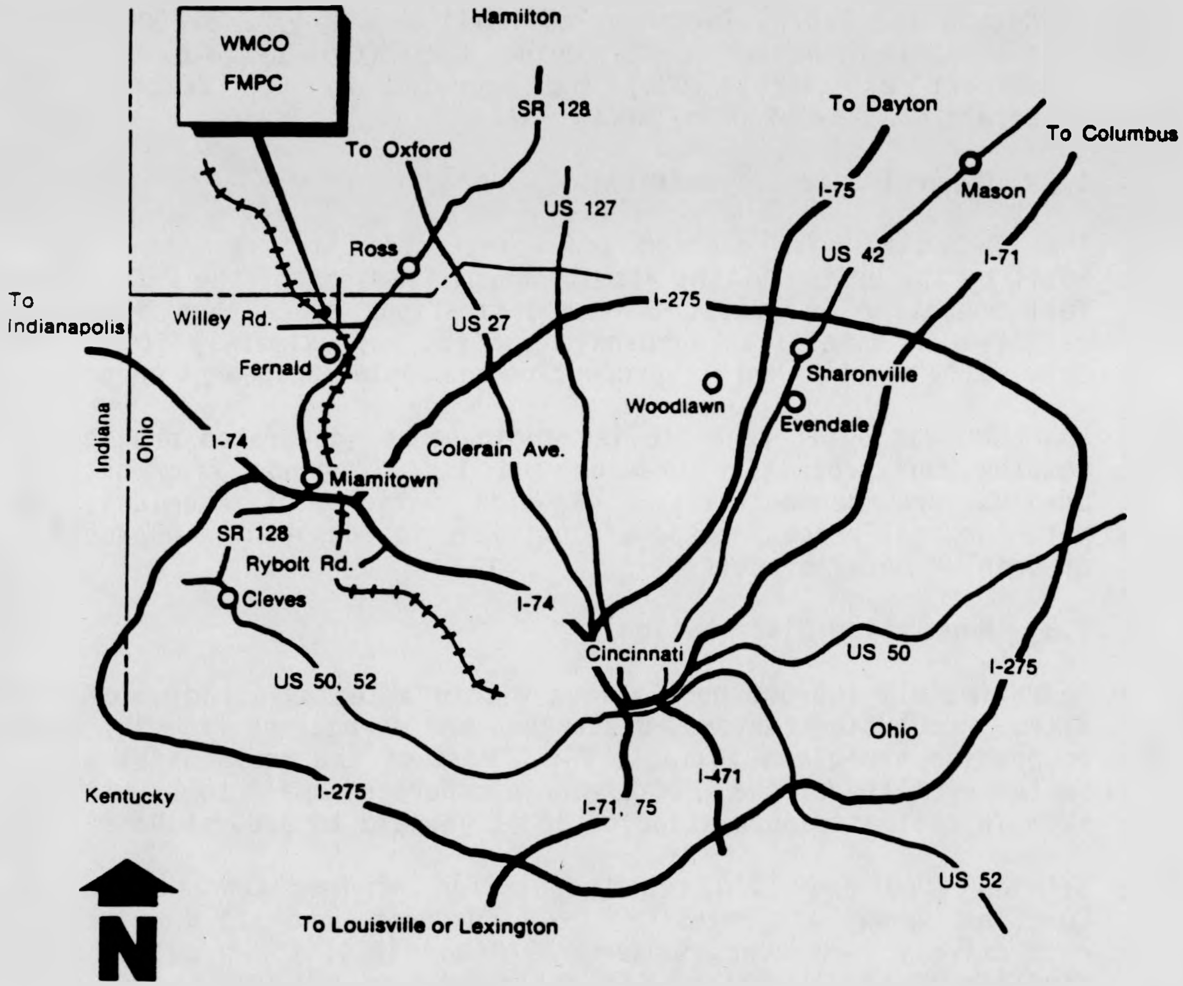


Figure 1-1. Location of FMPC

0770.14

TABLE 1-1
POPULATION CENTERS WITHIN A TEN-MILE RADIUS

Selected Communities Within 10-Mile Radius of the FMPC	Distance Miles	Direction	*Population
Hamilton (B)	9	NE	63,189
Fairfield (B)	7	ENE	30,777
Ross (B)	3	ENE	5,626
Shandon (B)	3	NW	<1,000
New Haven (H)	3	SW	<1,000
Fernald (H)	1	S	<1,000
New Baltimore (H)	2	SSE	<1,000
Harrison (H)	6	WSW	5,855
Dunlap (H)	3	E	<1,000
Miamitown (H)	7	SSW	<1,000
Millville (B)	7	NNE	<1,000

(H) Hamilton County - 873,176

(B) Butler County - 258,787

* Population figures from US Census Bureau, 9/30/82.

1.4 Geographic Features And Climate Conditions

The FMPC varies in elevation from approximately 530 to 700 feet above sea level. The main portion of the site is on a generally flat plateau with slopes of 1-2 percent. The greatest slope occurs on the north side of the site where the slope averages 5.2% from the site center to the site boundary . The land north of the main production areas rises to form a ridge about 60 feet high. The stream bed and the narrow valley of Paddy's Run along the western border of the site are approximately 20 feet lower than the main production area. The changes in elevation do not occur so abruptly to present restrictions to development on the site.

According to the National Oceanic and Atmospheric Administration records (1913-1983), tornados are not a common phenomenon in southwestern Ohio. Only one is known to have touched the FMPC (May 10, 1969) and that tornado caused no damage. Another tornado was sighted near the northeast boundary of the FMPC on May 13, 1972. This one also caused no damage to the property. Winds are predominantly from the southwest, averaging about 11 mph (see Figure 1-2).

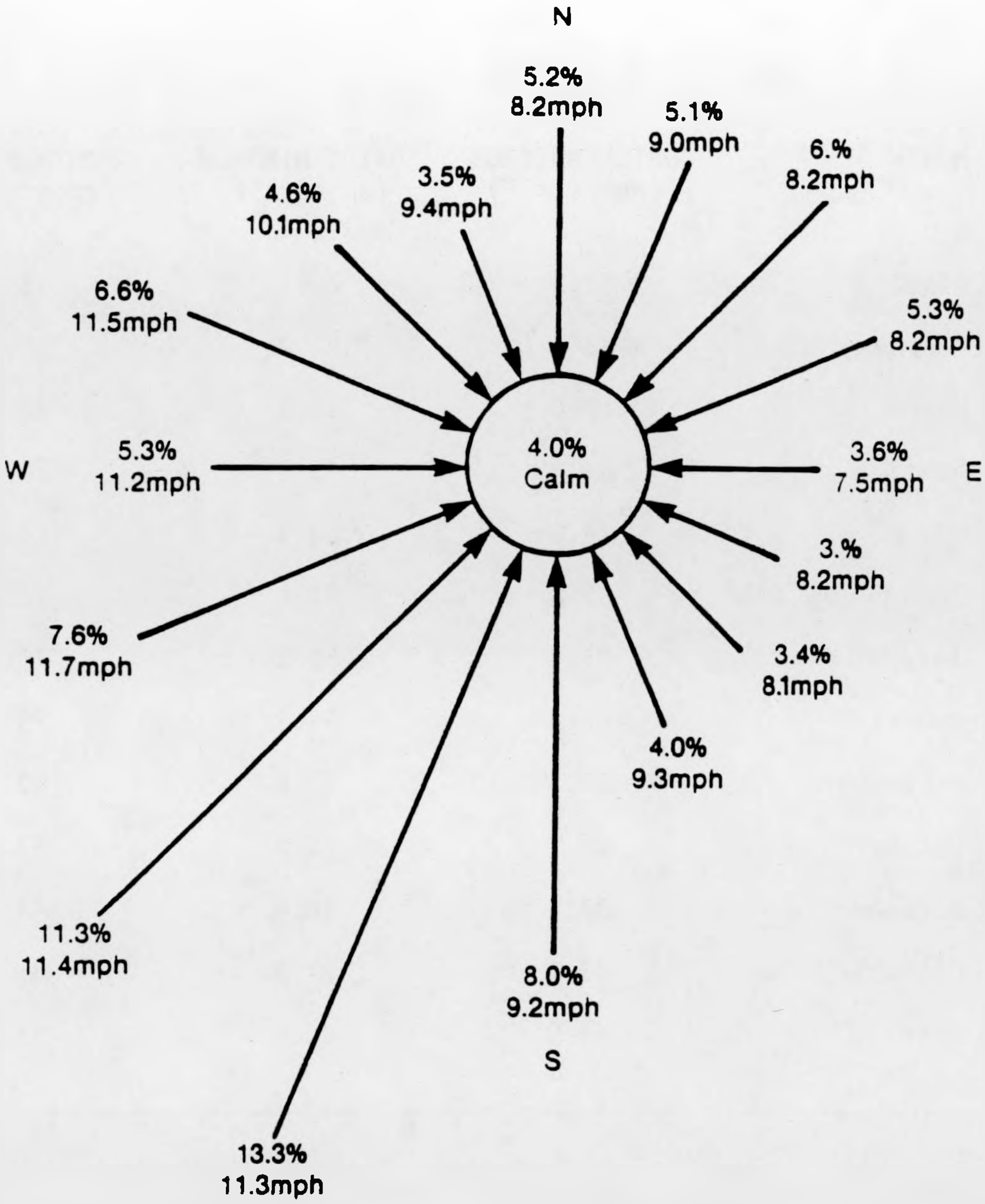
Precipitation ranges from 29.2 to 47.7 inches and averages about 38 inches annually. Historically it appears to be most frequent during the months of March, April, July and September. The precipitation during the spring months could normally be expected to be from one to three days duration. During the summer months, mostly due to thunderstorm activity, the duration would most likely not endure for more than an hour.

Temperature historically has reached freezing levels an average of 115 days per year during the winter months. Daily means range from 33.7 to 76.9 F (Table 1-2).

1.5 Geology And Hydrogeologic Conditions

The site is located in a two-mile wide valley filled with glacial deposits. This valley parallels the Great Miami River between the towns of Ross and Hooven, Ohio. A generalized geologic cross-section for the FMPC site area is presented in Figure 1-3.

The major aquifer in the region is the very permeable glacial fill (i.e., outwash) aquifer which occupies the New Haven Trough. The relatively impermeable bedrock shale beneath the glacial materials acts as an aquifier, which yields large quantities of water for domestic, municipal, and industrial uses throughout the region. However, it is extremely variable due to the spatial variations of the composition of the glacial fill that comprises the aquifer. Therefore, aquifer properties are very locally dependent and testing has shown that the system behaves as a single hydrostatic unit. Transmissivity has been reported to be between 150,000 and 500,000 gallons per day per foot (gpd/ft); a storage coefficient of 0.20 has been calculated. Well yields range up to 3,000 gpm.



Based on Hourly Surface Wind Observations Taken at Greater Cincinnati Airport From 1951-1960.

Figure 1-2. Wind Direction and Speed Occurrences

0770.9

TABLE 1-2
NORMAL TEMPERATURES AT CINCINNATI'S
ABBE OBSERVATORY (1915-1969)

MONTH	DAILY MAXIMUM (degrees F)	DAILY MINIMUM (degrees F)	MONTHLY MEAN (degrees F)
January	41.3	26.1	33.7
February	43.4	26.7	35.1
March	52.0	33.3	42.7
April	64.4	43.9	54.2
May	74.9	53.5	64.2
June	83.8	63.0	73.4
July	87.5	66.3	76.9
August	86.4	64.9	75.7
September	80.3	57.6	69.0
October	68.9	46.8	57.9
November	53.2	36.0	44.6
December	42.6	27.9	35.3
Year	64.9	45.5	55.2

0770.10

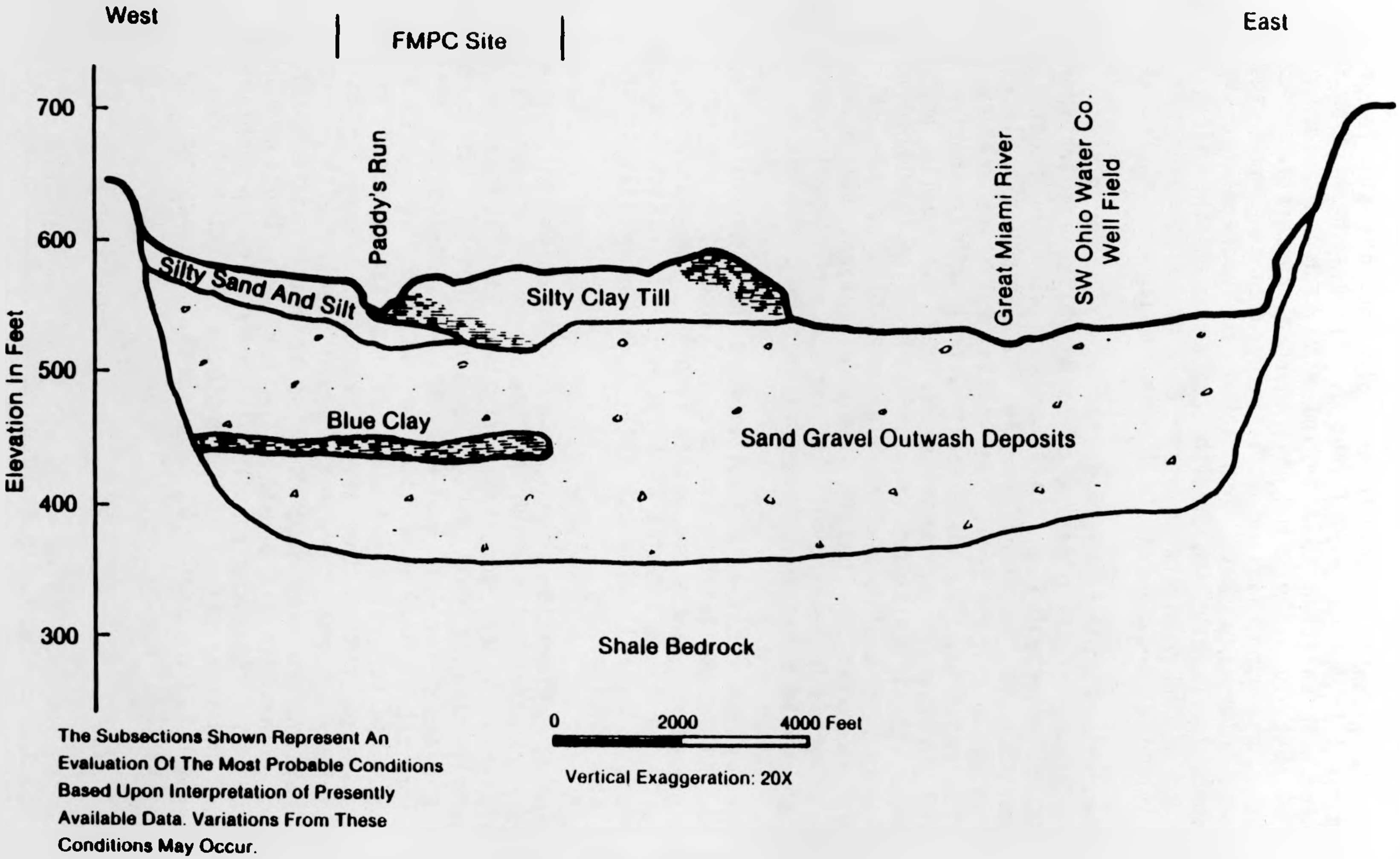


Figure 1-3. Generalized Geologic Cross Section of New Haven Trough

1.6 History and Purpose of the Report

The initial mission of the 37-year old facility was to produce uranium metal from a variety of feed materials. The mission is now undergoing a transition to a period with increasing focus being placed on waste management and environmental restoration. In line with this changing mission, 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-92 budget submittal and to explain DOE-WMCO management objectives.

This plan will follow the same format as last year's plan. Items included are: a planning period of seven years; the incorporation of a Waste Management Plan, in accordance with DOE Order 5820.2A requirements, and the plans for the RMI Company site located at Ashtabula, Ohio (Figure 1-4). The initial two items 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. The plan presents the work to be performed from FY-89 through FY-95 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 150 items at the FMPC and 25 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 initiated to solve them. Finally, details are presented for several of the programs currently underway at the FMPC.

Figure 1-4. Location of FMPC and RMI

0770.8

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.

1.7 Producing Uranium Metal at the FMPC

One of the FMPC's function has been to produce purified uranium metal and compounds for use at other DOE sites. The uranium may be depleted or slightly enriched in U-235. Recent direction from DOE has terminated low enriched uranium (LEU) production for the N-Reactor. Production facilities will be used to convert the LEU inventory into storable UO_3. A flow chart of the entire production process is shown in Figure 1-5. Figure 1-6 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. Another feedstock, uranium trioxide (UO_3, slightly enriched in U-235) is from the Richland Purex Plant.

Recovery of enriched uranium from residue material begins with dissolving the materials 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 and can also be produced from the reduction of UF_6 with hydrogen. 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 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 dimensions, and inspected for product quality. These machined cores are shipped to the DOE Savannah River Site.

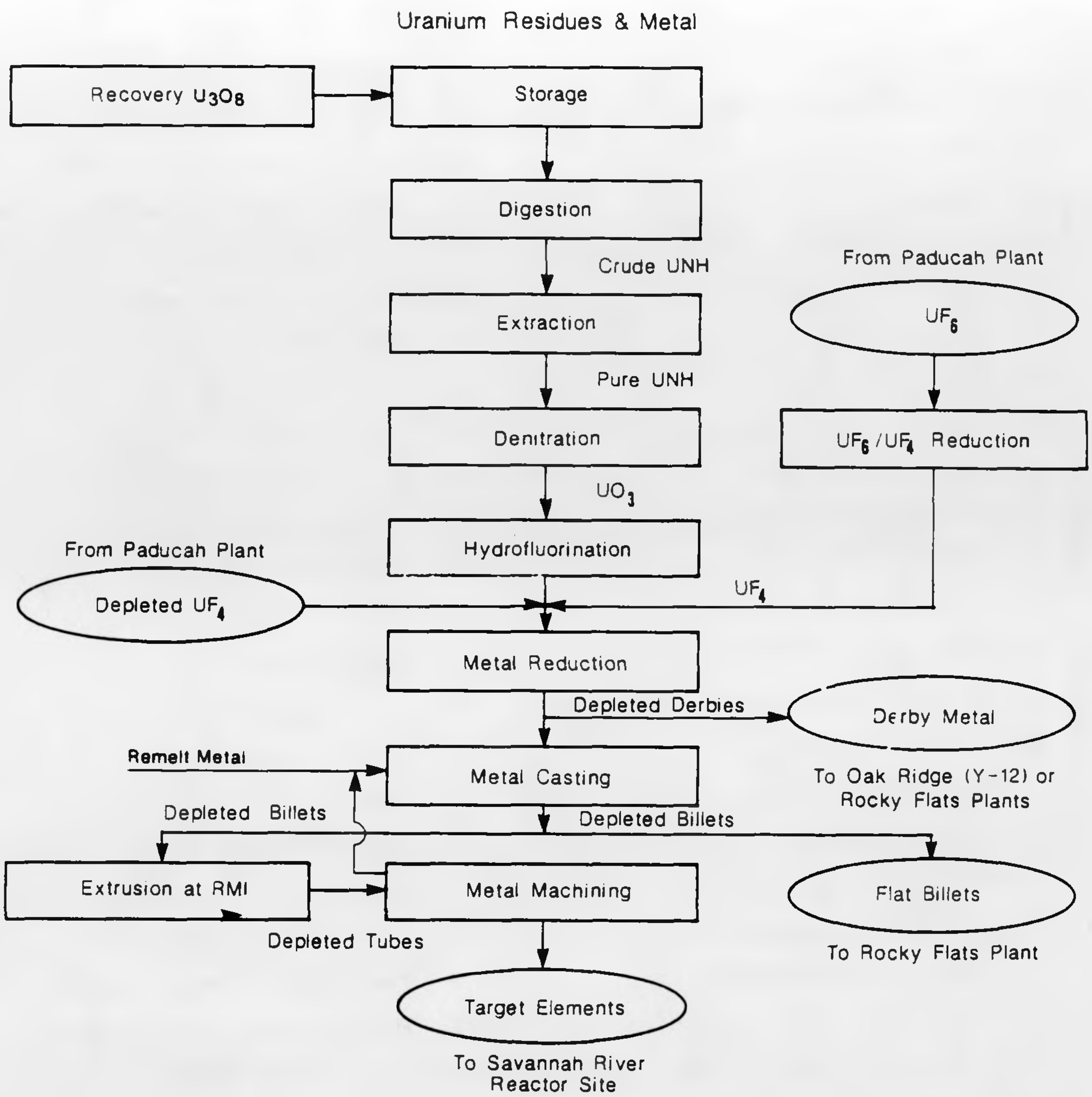


Figure 1-5. Schematic Diagram of the FMPC Process

0770.11

Building I.D. No.	Title	Building I.D. No.	Title
1a	Preparation Plant	37	Pilot Plant Annex
2a	Ore Refinery Plant	38	Propane Storage
3a	Maintenance Building	39a	Incinerator Building
4a	Green Salt Plant	45	Building 45
5	Metals Production Plant	46	Heavy Equipment Garage
6	Metals Fabricating Plant	51	UF_6 to UF_4 Reduction Facility II
7	Plant 7	53a	Health, Safety & Production Control Building
8a	Recovery Plant	53b	In-Vivo Building
9	Special Products Plant	54a	UF_6 to UF_4 Reduction Facility I
10a	Boiler Plant	55a	Slag Recycling Plant
11	Service Building	56	CP Storage Warehouse
12a	Maintenance Building (Main)	60	Quonset Number 1
13a	Pilot Plant Wet Side	61	Quonset Number 2
14	Administration Building	62	Quonset Number 3
15	Laboratories	63	KC-2 Warehouse
16	Main Electrical Substation	64	Plant 9 Warehouse
19a	Metal Tank Farm	65	Plant 5 Warehouse
20d	Elevated Storage Tank (Potable H_2O)	66	Drum Reconditioning Building
22a	Gas Meter Building	67	Plant 1 Storage Building
23	Meteorological Tower	68	Pilot Plant Warehouse
28a	Security Building	69	Decontamination Building
28b	Human Resources Building	71	General In-Process Storage Warehouse
30a	Chemical Warehouse	72	Drum Storage Building
31	Engine House - Garage	73	Fire Brigade Training Center Building
32	Magnesium Storage	77	Finished Products Warehouse
34a	K-65 Storage Tank - North	79	Plant 6 Warehouse
34b	K-65 Storage Tank - South	80	Plant 8 Warehouse
35a	Metal Oxide Storage Tank - North	81	Plant 9 Warehouse
35b	Metal Oxide Storage Tank - South	82	Receiving & Incoming Materials Inspection Area

Legend for Figure 1-6. FMPC Site

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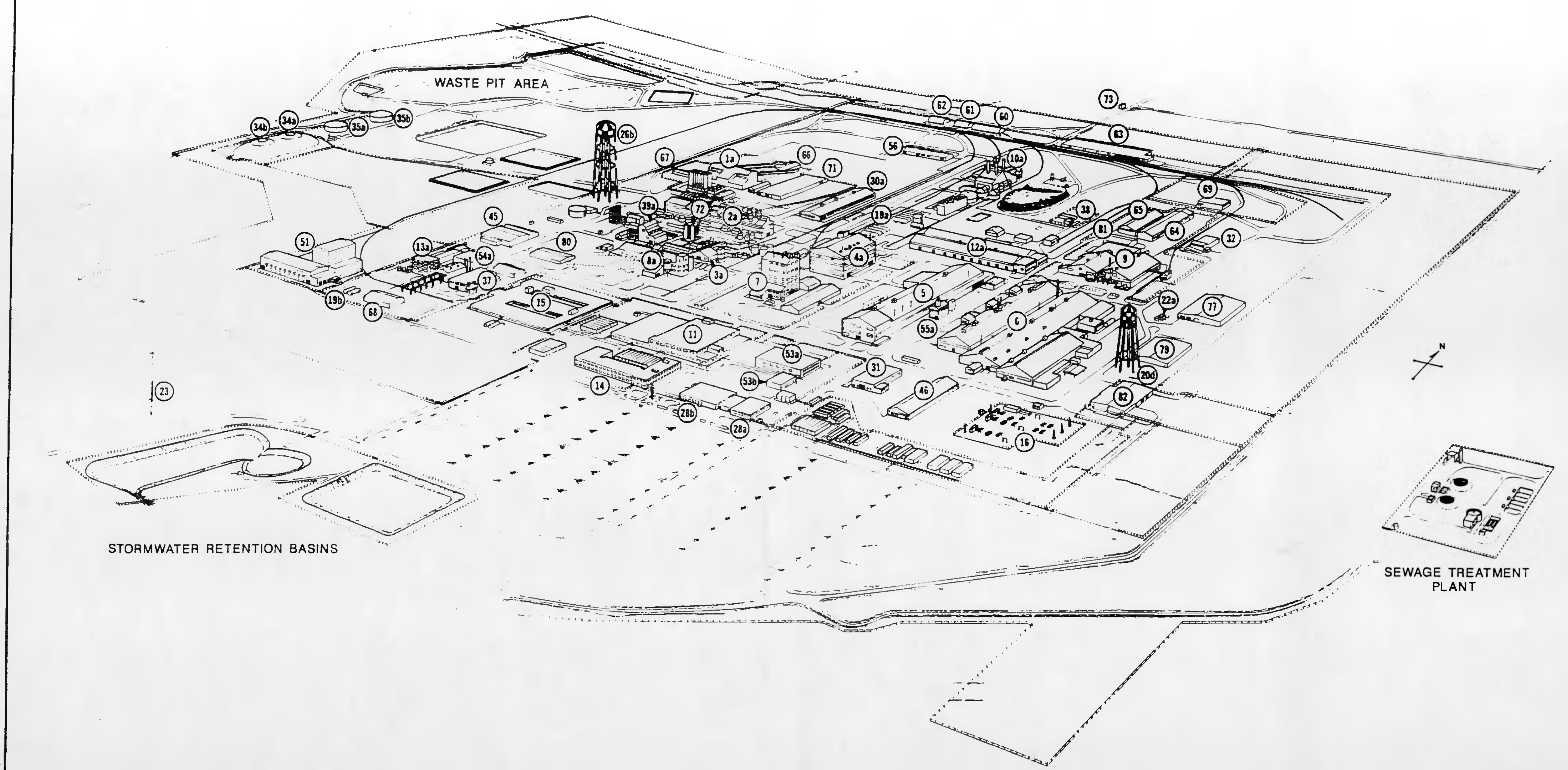

Figure 1-6. FMPC Site

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.

1.8 WMCO Organizations Responsible for this Plan

The WMCO Long Range Planning Section of the Controller Department has overall responsibility for the preparation and coordination of the Environment, Safety, Health and Waste Management Plan. In preparing this plan, the Planning Section draws upon the resources of other WMCO organizations in the Operations Safety and Health (OS&H) Section of Quality & Safety and FMPC Restoration 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 FMPC Restoration Department.

Environmental Engineering, a section of the WMCO FMPC Restoration Department, is responsible for the planning and design of waste remedial activities. This includes providing engineering and technical support to the RI/FS Section, another section of the FMPC Restoration 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. Environmental Engineering interacts with Regulatory Compliance and Waste Operations 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 RCRA Program Management activity was established to provide overall management, direction and coordination of FMPC activities required to assure and maintain compliance with requirements of RCRA.

The planning activities performed by Environmental Engineering include the drafting of feasibility studies, project authorizations, and conceptual designs and permits to install. Environmental Engineering 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 WMCO Construction Department, which is responsible for conceptual design, project authorizations, and preliminary engineering. This department is also responsible for preparation of all project related regulatory permits (e.g. permits to install, permits to operate, NESHAP request for approval) and for preparation of NEPA related documentation.

The Operations Safety and Health Section 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 1-7 through 1-9.

1.9 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
- GF - Defense Waste and Environmental Restoration
- 4A - Work for Others Program.

Figure 1-10 illustrates the FMPC budget categories, which are described in the following paragraphs. Effective April 1989, Programs GF-71, 72 and 73 were identified to replace GF-01 and GF-11, which this plan is based upon.

1.9.1 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 support direct production operations associated with the manufacture of feed materials for all production reactors, including the Savannah River and Hanford reactors. Currently, a major portion of the site's GE-01 budget supports landlord functions such as environmental monitoring, pollution control, facility maintenance, waste treatment, storage and disposal.

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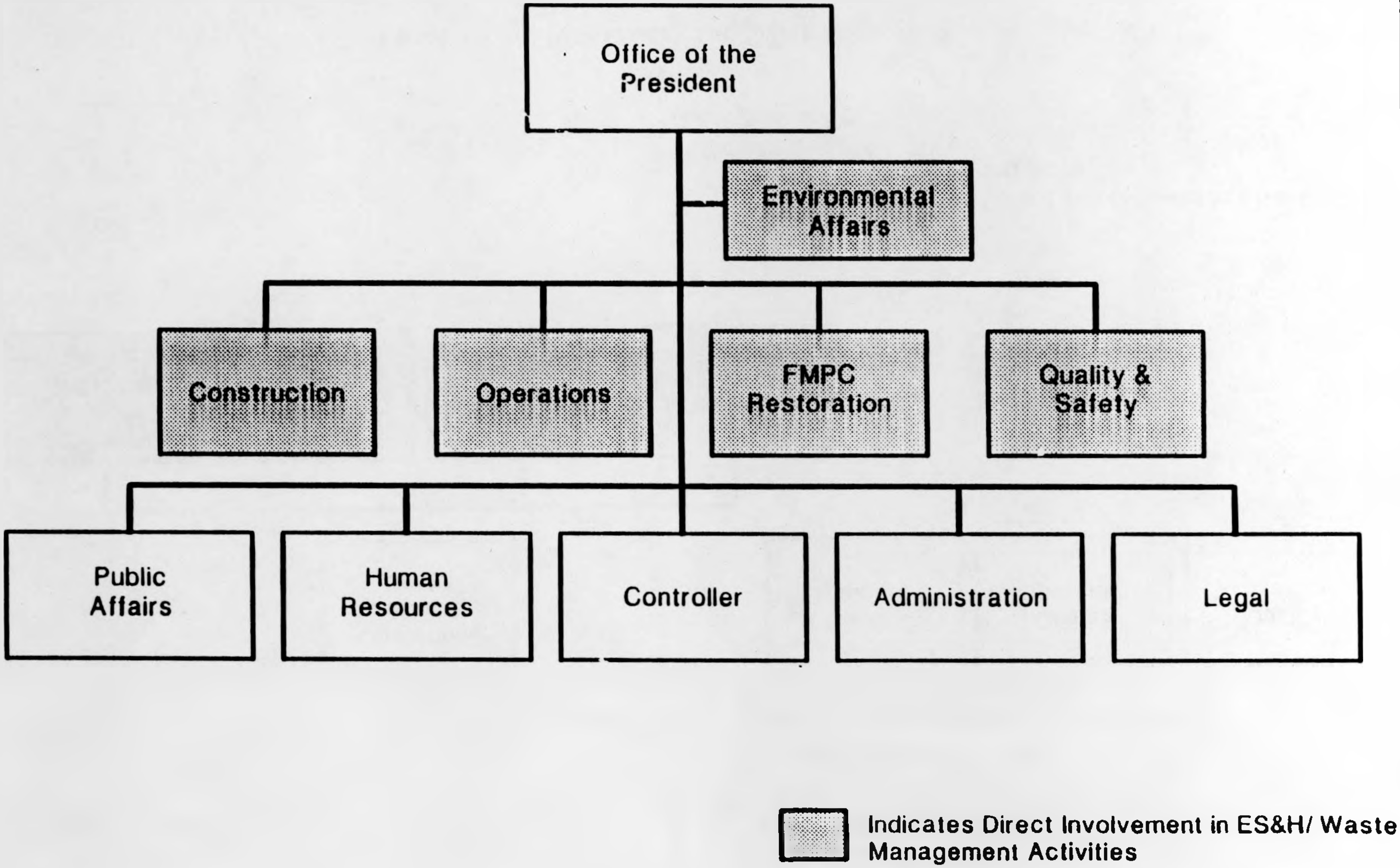

Figure 1-7. WMCO Organization

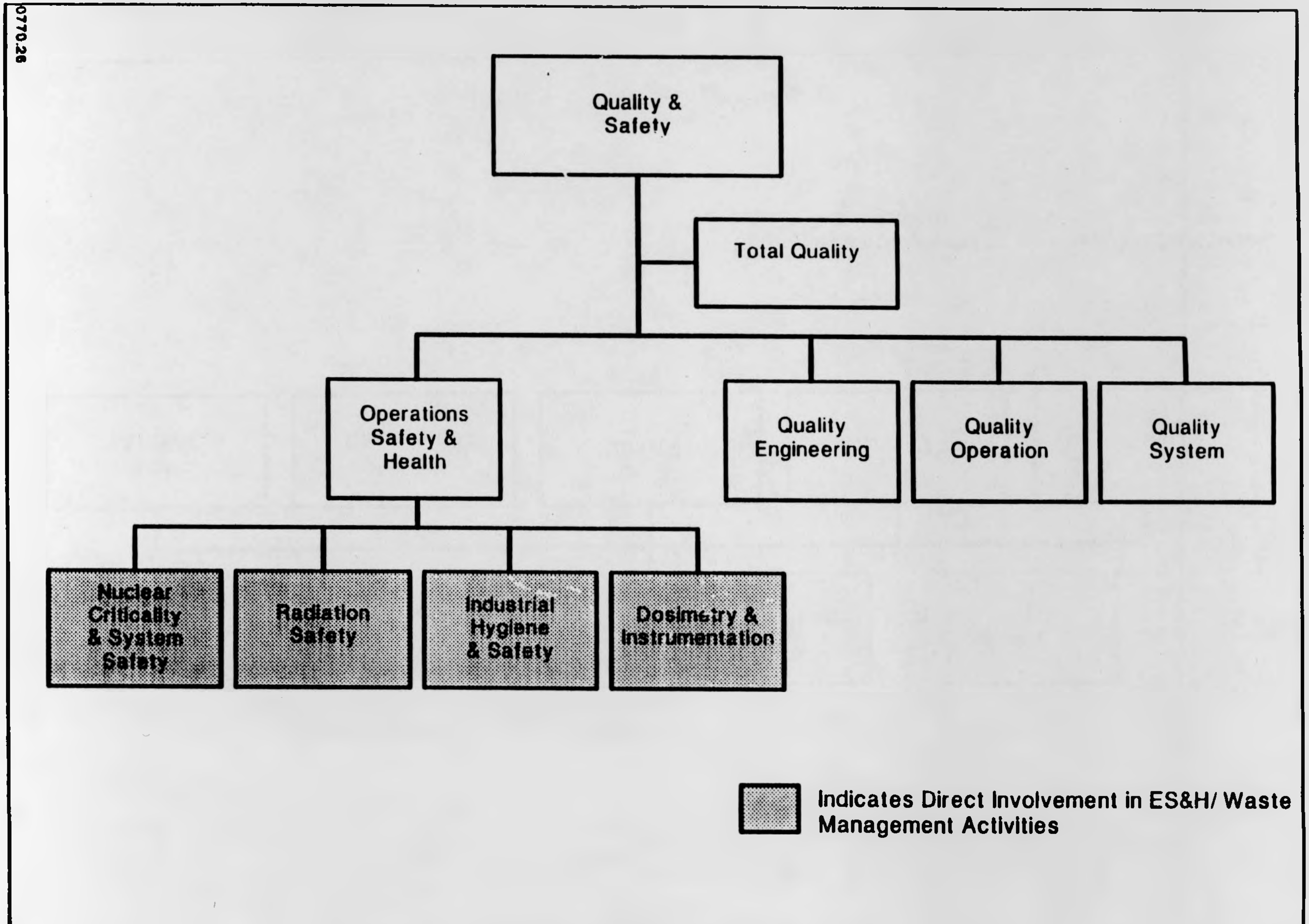

Figure 1-8. WMCO Quality and Safety Department

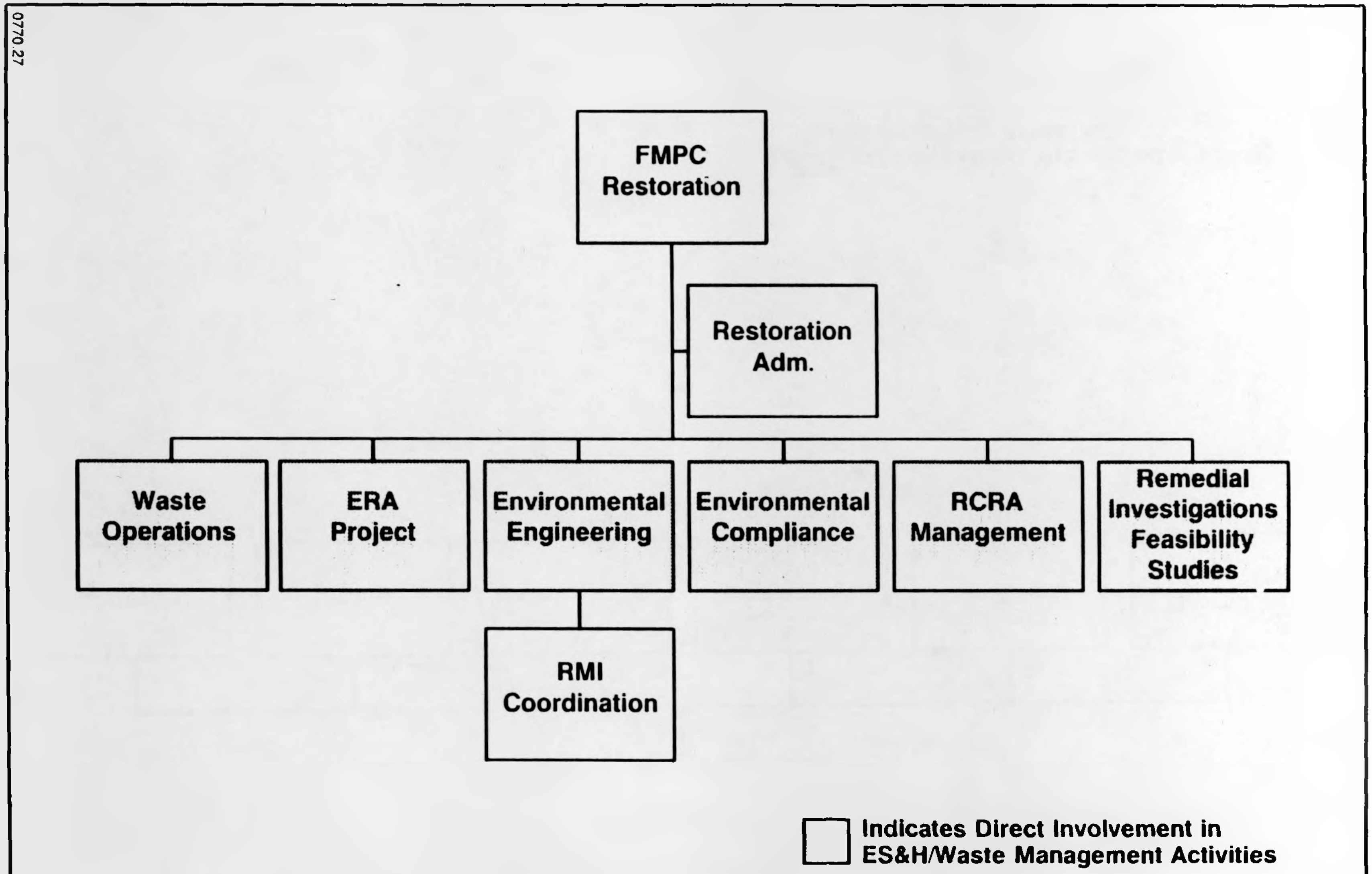

Figure 1-9. WMCO Restoration Department

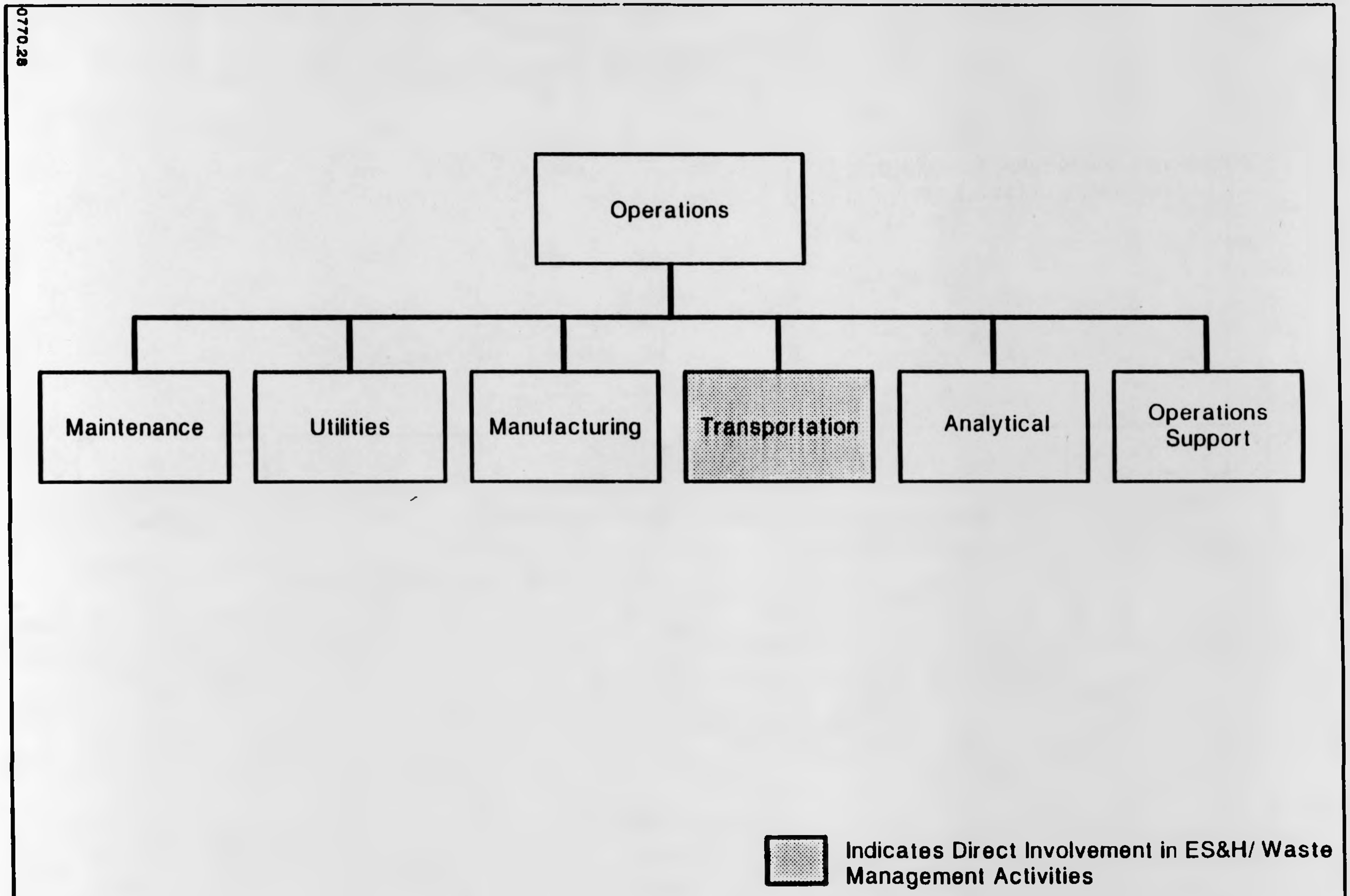

Figure 1-10. WMCO Operations Department

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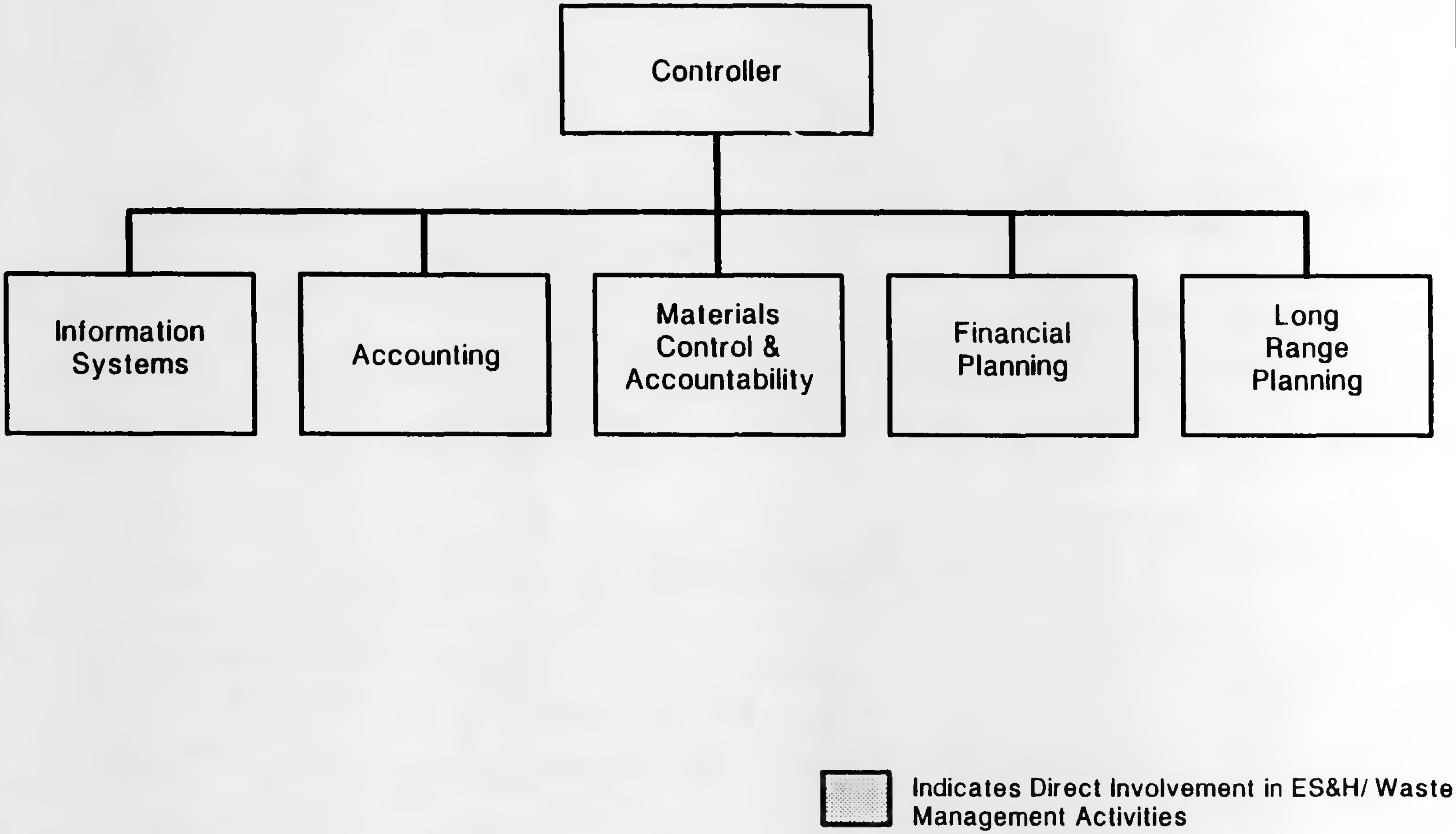

Figure 1-11. WMCO Controller's Department

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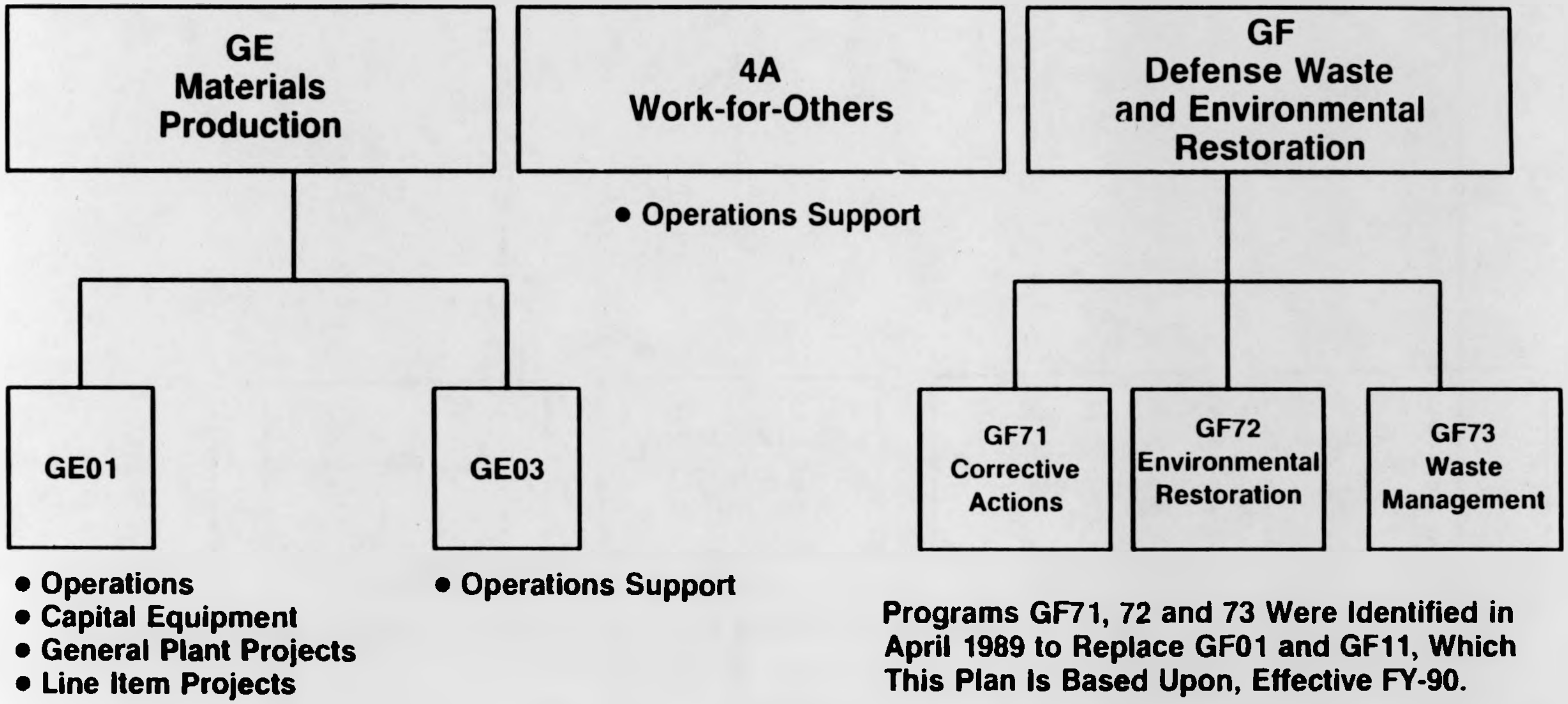


Figure 1-12. FMPC Budget Categories

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 (i.e. - Thorium disposition, Development, Warehouseing, and Preliminary Engineering).

1.9.2 GF - Defense Waste and Environmental Restoration

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 Defense Waste management and disposition of low-level radioactive and mixed hazardous waste materials generated at the FMPC in previous years. Specific activities are segregated into five categories: safety and continuity; environmental compliance; treatment; storage; and disposal.

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.

All restoration planning is based upon these two categories and not the recently enacted Program GF-71-73 B&R Categories.

1.9.3 4A - Work for Others

The third major budget category is 4A, Work for Others. This budget is used for the processing 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.

1.9.4 Divisions Within the Budget and Reporting Categories

Except for GF11, GE03, and 4A, each B&R category is grouped into four types of funds:

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

Operating 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 construction activities 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.

1.10 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 1.11
- **Project:** A planned activity intended to accomplish a specific objective
- **Program:** A planned effort 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.
- **Time:** Costs and Schedules are based upon the status as of March 31, 1989.

1.11 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 approximately 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.

- **Water Pollution Control - Phase II, Biodentrification Upgrade (WPC/BDN) Project:** The BDN facility will be upgraded from a two bioreactor demonstration facility into a full scale four reactor production facility through addition of building enclosures, necessary piping and equipment, process control systems, and analytical capabilities which will support sustained FMPC process wastewater outputs.

The Environmental Remedial Action (ERA) project is funded by Program GF-11, and is currently designated an operating Line-Item that will become a major systems acquisition. This project is aimed at restoring environmental quality to the FMPC and nearby surrounding areas.

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 and the USEPA (NESHAP) 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 section.

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

2.1.1 Criteria Pollutant Regulations

Criteria Pollutants

- Total suspended particulates (TSP)
- Suflur dioxide (SO_2)
- Nitrogen oxides (NO_x)
- Carbon monoxide (CO)
- Ozone
- Hydrocarbons(nonmethane)

Noncriteria Pollutants

- Asbestos
- Beryllium
- Mercury
- Vinyl chloride
- Radionuclides
- Lead

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	X								
DOE 5500.3	X											
RCRA	X		X									
NPDES		X	X									
CWA		X	X									
RCRA		X	X	X								
DOE 5480.1	X		X		X	X			X	X		
DOE 5820.2			X									
DOE 5480.14	X		X	X								
TSCA			X									
DOE 5480.15					X							
SWDA			X									
NAAQS	X											
NESHAP	X			X								
10 CFR 20	X											
OAC	X	X	X									
40 CFR 265			X									
40 CFR 761			X									
FFCA	X	X	X	X								
Ohio Consent Decree		X	X	X								
Director's Findings & Orders				X								
40 CFR 300		X		X								
40 CFR 61	X			X								
DOE 5480.5					X			X	X			X
DOE 5484.1					X		X					
DOE 5480.11					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
DOE 5481.1								X				X
NFPC										X		

Figure 2-1. Regulations and Compliance Matrix

0770.7

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. Demolition and removal activities involving friable asbestos must be reported to regulatory agencies as required under NESHAP regulations. These regulations also specify requirements for disposal facilities containing friable asbestos. Radionuclides are currently the only NESHAP substance emitted from the FMPC.

For airborne radionuclides, the USEPA has issued final NESHAP regulations. These regulations currently limit offsite radiological dosages to a committed 70-year dose equivalent, no greater than 25 mrem/year whole body and 75 mrem/yr to critical organs of any member of the general public. All projects must be assessed for potential impact to site compliance with NESHAP.

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 in a 24-hour period 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

More than 400 air emission sources are located at the FMPC. Each source must be permitted under Ohio law to be installed or modified and then to operate. These permits, which are usually on a three-year renewal cycle, establish allowable source emission levels, monitoring, sampling and reporting requirements. New air emission sources are required, under the provisions of the CAA, to use the Best Available Control Technology. 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 federal and state regulations.

2.2.1 Clean Water Act

Until 1977, the USEPA regulated FMPC waste water discharges under 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. Ohio was granted primacy for Federal Facility NPDES permits on January 14, 1983. 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. The latest NPDES permit specifies five additional sampling locations.

The NPDES permit for the FMPC expired at midnight February 1, 1985. Under the Consent Decree and the NPDES Administrative Extension, the FMPC currently operates under the conditions of the expired permit. A complete new renewal application was submitted to the OEPA on August 1, 1988. This application is under review by OEPA.

2.2.2 Ohio Administrative Code - Permitting Requirements

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 or modify an existing wastewater treatment works. New industrial wastewater treatment systems are required, under the provisions of the CWA, to use the best available technology (BAT) economically achievable. All proposed wastewater treatment or runoff control systems at the FMPC are evaluated for CWA compliance.

A "Permit to Operate" (PTO) perse does not exist for wastewater treatment works. The facility NPDES permit satisfies this need.

2.2.3 RCRA Groundwater Monitoring Requirements

The USEPA considers FMPC Pit 4 as a RCRA waste unit; therefore, all applicable monitoring and reporting requirements must be addressed. RCRA Solid Waste Regulations specify that a minimun of 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, selected onsite groundwater monitoring wells are sampled quarterly and analyzed per RCRA requirements. Data from sampling performed in 1988 can be found in the Environmental Monitoring Annual Report for 1989. Reports are filed annually with OEPA and USEPA on the status of the RCRA Groundwater Program.

2.3 Solid Waste Regulations

The FMPC conducts Solid Waste Management programs in accordance with the following statutes, regulations and guides:

- RCRA and implementing regulations
- 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 low-level radioactive waste (LLW) generated onsite and at the RMI facility in accordance with DOE Order 5820.2, Chapter III, Management of Low-level Radioactive Waste. A revised Order 5820.2A will cover the policies, requirements, and guidelines for LLW generation reduction, characterization, treatment, storage, and disposal effective FY-1990. The FMPC ships LLW offsite for disposal. Current compliance status with requirements of DOE 5820.2 is shown in Table 2-1.

TABLE 2-1
FMPC REGULATORY COMPLIANCE WITH DOE REGULATION 5820.2, CHAPTER III, MANAGEMENT OF LOW-LEVEL WASTE

Regulation	Regulatory Requirement	FMPC Compliance
1. Waste Disposal	A. Dispose solid LLW at DOE shallow land burial or greater confinement sites.	A. Solid LLW generated at the FMPC is shipped offsite to a DOE disposal facility.
	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. No liquid LLW is directly discharged to the environment at the FMPC.
2. Waste Acceptance (for both shallow land burial and greater confinement disposal)	A. Not Applicable.	A. Not Applicable.
3. Disposal Site Selection	A. Siting criteria shall be developed to establish any new disposal sites.	A. Not Applicable.
4. Disposal Site Design	A. Design criteria shall be established prior to selecting new disposal sites.	A. Not Applicable.

TABLE 2-1
FMPC REGULATORY COMPLIANCE WITH DOE REGULATION 5820.2, CHAPTER III,
MANAGEMENT OF LOW-LEVEL WASTE

Regulation	Regulatory Requirement	FMPC Compliance
(Continued)		
5. Disposal Site Operations (develop and implement operations procedures for new and existing LLW disposal sites, addressing regulatory requirements)	A. Not Applicable.	A. Not Applicable.
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. Not Applicable.	A. Not Applicable.

2.3.2 Hazardous and Mixed Waste

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

- Standards for generators 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 Amendments of October 1984 to RCRA have two principal purposes: to regulate previously exempt generators and sources; and to regulate land disposal more stringently than it was previously and eliminate it where possible. These new RCRA requirements are very specific. 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. The USEPA or its designee inspects the FMPC to ensure compliance. The FMPC filed RCRA Part B application in November 1985, and it is currently under revision for resubmittal in September 1989.

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). These waste minimization programs are outlined in Section 6 of this plan.

An Underground Storage Tank (UST) is defined by both State and Federal regulations as any tank that has at least 10 percent of its total volume located below the ground surface. The volume of storage contained in the underground piping connected to the tank is also considered in the total volume. The regulations in Subtitle I of RCRA apply to underground storage tanks containing "regulated substances." "Regulated substances" are defined as substances defined as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and petroleum. Hazardous wastes regulated under Subtitle C of RCRA are excluded. The Ohio Hazardous Waste Management Rules found in OAC 3745-50 through -69 are virtually identical to RCRA. Ohio is expected to be granted authority to administer Hazardous Waste Program. Authority for the Solid and Hazardous Waste Amendment of 1984 will be retained by USEPA. Ohio, however continues to regulate RCRA wastes under its own state authorizations and the removal of abandoned USTs is required by the Ohio Fire Marshall Code.

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.

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.

Future expansion of the FMPC sanitary landfill is currently being evaluated as an alternative to offsite commercial disposal. Any such expansion will be governed by the Ohio Solid Waste Disposal Act regulations. A permit application will be submitted in 1989 to the state if the evaluation indicates a need for the 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 (FS) under CERCLA provide for a detailed evaluation of potential remedial alternatives for individual facilities based upon the findings of the RI.

RCRA also requires site remediation and corrective actions to be taken that are applicable to solid waste management units, as well as groundwater and hazardous waste management unit closures.

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 continuation of certain programs aimed at assuring FMPC compliance with the CWA, CAA, RCRA, and CERCLA.

To comply with CWA regulations, the FMPC must maintain continuous liquid discharge sample collectors at all discharge points; monitor and report results to USEPA, OEPA and ODH; maintain administrative controls for liquid discharges sufficient to identify and deal with any unplanned release within 24 hour period; maintain sample collection analysis procedures along with a quality assurance plan for liquid samples.

To comply with the CAA, the FMPC must continue 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 completed the majority of activities required by the DFO's. All remaining open DFO activities are reported to the OEPA in the Consent Decree bi-monthly progress reports.

2.5.3 Consent Decree

On December 2, 1988 the DOE and OEPA signed the Consent Decree after almost 2 years of negotiations. The Consent Decree focuses on hazardous waste requirements and the control of waste water and runoff. During negotiations this action was referred to as the Proposed Consent Decree.

On January 5, 1987, DOE directed that certain actions be taken to support the directives contained in the Proposed Consent Decree. Therefore, when the Consent Decree was signed in December 1988, substantial progress had already been made to comply with the Consent Decree directives. Consent Decree actions include:

- Prepare and submit Permits to Install (PTI's) for the full-scale BDN Facility and the BDN effluent treatment system
- Implement and maintain a Best Management Practices Plan
- Modify the Zone of Influence Study, as required
- Comply with OEPA decision regarding a liner for the coal pile storage area and the coal pile runoff collection and treatment system
- Establishing requirements for hazardous waste storage, inspection, chemical analysis, groundwater monitoring and documentation
- Comply with current NPDES permit requirements until the new NPDES permit is issued
- Complete construction of the expanded Stormwater Retention Basin
- Submit a Spill Prevention Control and Countermeasures Plan
- Revise draft contingency plan to address environmental impact of leakage, overflow, or bypass of the Stormwater Retention System
- Submit bi-monthly technical progress reports to OEPA

2.5.4 Proposed National Emission Standards for Hazardous Air Pollutants (NESHAP) 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.

DOE-ORO submitted certain items, including UF_6/UF_4 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 submitted sixteen project applications to request USEPA determinations on the need for approvals. Revisions to NESHAPS are under consideration by the USEPA.

2.5.5 Best Management Practices Plan (BMP)

Best Management Practices (BMP's) are defined by the U.S. EPA to be "actions or procedures to prevent or minimize the potential for the release of toxic pollutants or hazardous substances in significant amounts to surface waters." BMP plans are authorized under the Clean Water Act of 1977 and are implemented under National Pollution Discharge Elimination System (NPDES) regulations to help control discharges of such materials associated with or ancillary to industrial manufacturing processes or treatment systems. The general types of discharges to be addressed by BMP plans are spills and leaks, drainage from material storage areas, plant site runoff, and sludge and waste disposal discharges. Because effluent guidelines are not always available, particularly for toxic or hazardous materials, BMP plans are designed to be one form of supplemental controls to effluent limitations for minimizing harmful discharges and protecting water quality, human health, and the environment.

The Department of Energy (DOE) was requested to prepare a BMP plan for the FMPC under the OEPA's 1987 Directors Findings and Orders (DFO's). An FMPC BMP Plan was prepared and issued in February of 1988. The plan includes descriptions of existing site practices as related to our overall BMP program and addresses improvements planned or deemed necessary to minimize discharges from the FMPC. The plan specifically covers the following:

- Descriptions of all FMPC production, material storage, and water treatment facilities, including how they are operated to prevent releases.

- A hazardous materials inventory and assessment of release risks.

- A definition of the role and function of the FMPC's BMP Committee in preventing environmental discharges.

- Emergency preparedness and spill control/notification procedures.

- Material compatibility, housekeeping, preventive maintenance, and security practices used at the FMPC to prevent discharges.

- A summary of planned or suggested improvements for the FMPC program to further prevent spills or discharges from reaching surrounding waterways.

The BMP Plan was reviewed and approved by OEPA in 1988 with the stipulation that improvement actions be implemented to correct deficiencies identified in the plan. Thirty-two specific BMP Action Items designed to enhance our ability to prevent and mitigate the consequences of spills and discharges were identified and initiated. Several other Action Items were later added to address additional OEPA concerns.

A number of important accomplishments were made during 1988 toward completing BMP commitments. A storm sewer and site drainage sampling program was conducted and completed to study and limit avenues for release of hazardous materials including radionuclides. The FMPC completed construction of the Stormwater Retention Basin (SWRB) which will ultimately be used to collect site runoff prior to release to the Great Miami River, thereby insuring that no untreated spills or planned discharges occur. Additional inspections of areas where hazardous materials are stored or transported throughout the site were initiated to ensure the prompt detection and containment of spills. Surplus supplies of anhydrous HF and ammonia were removed from the FMPC to minimize the risks for spills and environmental releases. A site spill response and reporting procedure was adopted and interim emergency preparedness procedures were drafted. BMP awareness training was conducted for all FMPC employees at the start of 1989. The BMP Committee met regularly through 1988 to help prevent spill situations from occurring at the FMPC and provide overall BMP program coordination.

Additional actions will be completed during 1989 and 1990 to fully implement the BMP Plan. These include the final testing and use of the SWRB system to collect site runoff for necessary treatment prior to discharge to the river. An evaluation of all FMPC sumps and stormwater overflow devices will be made to determine the necessity of their discharges to the storm sewer system. Secondary containment systems will be added for all small tanks to prevent releases. Plans will be fully implemented to eliminate runoff from the scrap metal piles, fly ash piles, and from uranium metals stored onsite. Inspection programs will be fully implemented to prevent and detect sources of leakage of hazardous materials. A Level II spill prevention and response training program will be provided for individuals working in process or storage areas where spills or discharges are possible. The FMPC Spill Prevention Control and Countermeasures Plan (SPCCP) will be updated as required every three years by federal regulations. The FMPC's spill notification and response procedures will be strengthened. Additional measures will be taken as recognized to improve the overall management of spill prevention and control activities for hazardous materials at the FMPC.

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 the FMPC and other 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. DOE issued the Environmental Survey Preliminary Report (ESPR) in March 1987; WMCO provided technical accuracy review comments to DOE in April 1987. WMCO developed an action plan in October 1987 to address each of the 68 findings listed in the ESPR. As of January 1989, WMCO had completed the action items for 34 of the findings.

Several other findings will be completed in the near future, while the actions for the majority of the remaining findings will be completed as part of the RI/FS. An interim report will be issued by DOE to address all comments on the preliminary report and to incorporate appropriate changes and modify findings where appropriate. 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 ranking of environmental problems in the final survey report.

Furthermore, the DOE Environmental Survey Team visited the FMPC in March 1989 to review the progress the site has made in completing the actions for several of the findings. The Survey Team's conclusions on which findings can be closed will be published in the summer of 1989.

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 and Policies:

- DOE Order 5480.11, "Radiation Protection for Occupational Workers," and accompanying FMPC Implementation Plan
- 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."
- DOE Order 5480.15, "Department of Energy Laboratory Accreditation Program for Personnel Dosimetry"
- DOE/ORO Contamination Control Policy

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"
- 10 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"
- ANSI N323-1983, "Radiation Protection Instrumentation Test and Calibrations"
- DOE publication PNL-6577, "Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are As Low As Reasonably Achievable (ALARA)

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
- Providing hazard information for operation of the medical programs

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 5500.2a requires that a contractor management representative respond to all events and classify it according to the criteria presented in the order. In addition, if the event involves environmental protection, personnel safety, or health issues, the contractor must report the event in accordance with the requirements in DOE Orders 5480.4 and 5484.1. 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. To comply with this requirement, WMCO prepares Safety Analysis Reports and participates with other DOE-ORO contractors in developing guidelines for implementing the requirements of the DOE Orders.

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 has developed a procedure for configuration control to comply with this requirement.

WMCO has prepared Operational Safety Requirements (OSR) for each facility/system that has an approved Final Safety Analysis Report (FSAR). In addition, WMCO must review design criteria, environmental assessments and environmental impact statements, and other design documents. WMCO is providing for review by an Independent Safety Review and Preoperational Readiness Review Committees to comply with this requirement.

The facilities protection program includes an independent contractor safety review and appraisal system. In FY-87, WMCO initiated such a program.

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 (FSAR). 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 5480.11. DOE Order 5480.3 establishes the requirements for packaging fissile and other radioactive materials for shipment. 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 evaluation 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 are being obtained 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. The FMPC currently complies with this section of the order.

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 Packaging, 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.

2.8.5 Facility Decontamination and Decommissioning (D&D)

The FMPC manages contaminated facilities, both operational and excess, in accordance with DOE Order 5820.2, Chapter V, Decontamination and Decommissioning of Surplus Facilities. This Order establishes policies and guidelines for surplus facility identification and project planning. Current status of compliance with D&D requirements of DOE 5820.2 is shown in Table 2-2.

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 their final report, the team identified eleven new safety concerns and closed 35 of the original 90 recommendations.

As recommendations are completed by WMCO, the Quality Assurance Department conducts reviews to verify documentation exists to support the completion status. If verification cannot be made, Quality Assurance identifies the deficiency in a report to the manager responsible for complying with the recommendation.

2.11 Status of Compliance with DOE Order 5820.2

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 2-2
FMPC COMPLIANCE WITH DOE REGULATION 5820.2A, CHAPTER V,
DECONTAMINATION AND DECOMMISSIONING OF SURPLUS FACILITIES

Regulation	Regulatory Requirement	FMPC Compliance
1. General	A. Design features to limit dispersion of radioactive material and to facilitate ultimate D&D.	A. Design features to limit dispersion of radioactive material and to facilitate ultimate D&D are being incorporated into ongoing renovation projects.
2. Preproject Activities	B. Identify surplus facilities; document potential for reuse; provide surveillance and maintenance; develop radiological criteria.	B. Three non-orphan facilities have been identified for D&D: Plant 7, Plant 1 metal oxide storage bins, Plant 6 rolling mill. All of these facilities are being characterized and maintained. One hundred thirty four (134) pieces of abandoned-in-place equipment (AIP) have been identified. Radiological surveys have been performed on 133. Eight pieces have been removed.
3. Project Activities	C. Develop decommissioning project plans.	C. Plans are under development for all three identified orphan facilities. A preliminary design for decommissioning Plant 7 has been completed.
4. Transfer of Facilities	D. Facility transfer to other DOE program organizations.	D. Not Applicable.

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 weighted 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. A grade ranking that is based upon FMPC Site objectives is then assigned. 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. All planning is based upon Programs GF01 and GF11, and not the recently enacted Program GF71, 72 and 73 B&R categories.

Approximately $581 million in Program GE and another $639 million in Program GF funds will be required through FY-1995 for the improvements identified in this Plan for both the FMPC and RMI Facility. Annual funding levels are consistent with the target levels of the FY-1991 FMPC ES&H Crosscut Budget and the Duffy Five-Year Plan for environmental improvements. This Plan includes approximately $127 million in environmental projects funded prior to FY-1990 that have been excluded in the Duffy Plan. The sharp decrease in Program GE funds needed after FY-1992 is offset by similar increases in Program GF. Overall, the project for environmental pollution control, solid waste management, and site restoration account for 87% of the funds needed.

3.3 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 presented by fiscal year in Figures 3-1 through 3-11.

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

FUNDING Type	**Total**	**FISCAL YEAR 1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-CE	14.2	1.0	1.8	2.9	2.2	2.1	2.1	2.1
GE-GPP	31.4	4.5	1.8	2.9	4.8	5.0	5.7	6.7
GE-LI	399.2	78.5	86.3	85.0	97.5	42.5	9.4	
GE-OP	136.2	25.7	17.2	18.7	19.3	19.4	18.5	17.4
GE-Total	581.0	109.7	107.1	109.5	123.8	69.0	35.7	26.2
GF-GPP	8.5		1.5	1.5	1.5	1.5	1.5	1.0
GF-OP	87.4	9.3	14.7	15.1	15.3	12.0	11.0	10.0
GF-11	543.3	9.7	25.3	40.6	57.7	128.2	135.9	145.9
GF-Total	639.2	19.0	41.5	57.2	74.5	141.7	148.4	156.9
Total GE & GF	1220.2	128.7	148.6	166.7	198.3	210.7	184.1	183.1
Environmental	1068.1	92.7	116.0	154.3	158.4	196.6	175.6	174.5
Health/Safety	152.1	36.0	32.6	12.4	39.9	14.1	8.5	8.6
Total ES&H	1220.2	128.7	148.6	166.7	198.3	210.7	184.1	183.1

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	PROJECT NAME	FUNDING TYPE	TEC ($1,000)	START FY
1	6	E-WASTE	RCRA	1.5.04	Solid Waste Compliance (RCRA)	GF 01	2,101	88
2	7	E-REMEDIAL	DOE 5480.4/CAA	1.1.3.1.01	Thorium Handling - Plant 8	GE-LI	2,288	87
3	7	E-REMEDIAL	CERCLA	1.2.1	Remedial Investigation / Feasibility Study	GF-11	14,652	88
4	4	E-AIR	DOE 5480.4/OHIO EPA	1.1.1.3.aa	Dust Collectors Refer to Table 3-2A	GE-LI	23,326	87
5	7	E-REMEDIAL	DOE 5480.4/CAA	1.5.04	Thorium Metal Overpacking	GE-03	2,200	88
6	6	E-WASTE	DOE 5820.2	1.7.02	Current Proc Waste Ship.	GE 01	44,100	88
7	6	E-WASTE	DOE 5820.2	1.7.02	Backlog Proc. Waste Ship.	GF 01	14,198	88
8	7	E-REMEDIAL	CERCLA	1.5.04	K-65 Silo Interim Stabilization	GF 01	2,067	88
9	7	E-REMEDIAL	DOE 5480.4/CAA	1.5.04	Warehouse Thorium Overpacking	GE-03	3,200	88
10	7	E-REMEDIAL	DOE 5820.2	1.4.02.xx	Thorium Repackaging Equipment	GE-CE	645	88
11	5	E-WATER	OHIO EPA	1.4.01.x	Stormwater Retention Basin Expansion	GF-GPP	1,199	88
12	7	E-REMEDIAL	RCRA	1.4.01.xx	Pit 4 Interim Closure	GF-GPP	579	88
13	5	E-WATER	CWA/NPDES	1.3.03	Biodenitrification Project	GE-LI	8,700	89
14	5	E-WATER	CWA/OHIO EPA	1.4.01.x	Surge Lagoon Liner Replacement	GF-GPP	565	88
15	7	E-REMEDIAL	CERCLA	1.2.2.3	Plant 6 Perched Goundwater Pumping (IRA)	GF-11	100	89
16	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.4.01.xx	Mod. Orig. Strmwtr. Retn. Ben. to Meet EPA Req.'s	GF-GPP	30	89
17	5	E-WATER	40CFR151 PROPOSED	1.3.01.12	Tank Farm Restoration	GE-LI	13,049	85
18	9	H&S	DOE 5480.1	1.1.4.2.07	Fire Alarm System Upgrade	GE-LI	372	87
19	4	E-AIR	DOE 5480.1/NESHAP/DOE 5500.3	1.4.02.xx	Wet Stack Sampler	GE-CE	300	89
20	10	H&S	CWA/NPDES	1.4.01.xx	Industrial Hygiene Trailer	GF-GPP	40	89
21	6	E-WASTE	DOE 5820.2	1.1.3.1.03	Decontamination & Decommissioning (D&D) Facility	GE-LI	7,509	87
22	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.01.xx	Respirator Facility	GF-GPP	616	89
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.x	In-Vivo Monitoring Facility	GF-GPP	1,492	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	5	E-WATER	CWA/NPDES	1.4.01.xx	Water Plant Brine System	GF-GPP	350	89
28	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.01.xx	Rally Points	GF-GPP	180	89
29	7	E-REMEDIAL	CERCLA	1.1.2.4.04	South Plume Groundwater Treatment	GE-LI	13,104	90
30	10	H&S	DOE 5500.2/5500.3/5484.1	1.7.xx	Asbestos Monitoring Equipment	GE-OP		90
31	8	H&S	DOE 5480.1/OSHA	1.1.3.3.bb	Material Handling Systems Refer to Table 3-2B	GE-LI	25,667	88
32	8	H&S	ALARA	1.1.4.1.05	Receiving & Incoming Materials Inspection Area	GE-LI	4,482	88
33	8	H&S	DOE 5480.1/5483.1	1.1.4.1.04	ES&H Building Expansion & Upgrade	GE-LI	13,818	87

Note: TEC i.e. Total Estimated Cost

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	PROJECT NAME	FUNDING TYPE	TEC ($1,000)	START FY
34	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.5.04	Controlling Surface Water on Plant 1 Storage Pad	GE 01	133	87
35	6	E-WASTE	DOE 5820.2	1.5.04	Pretreatment of Backlog Waste/Rubble	GF 01	3,500	89
36	4	E-AIR	OHIO EPA	1.3.02.02.04	Improve Nitric Acid Recovery System	GE-LI		87
37	5	E-WATER	OHIO EPA	1.1.2.3.01	Leakproof Dikes	GE-LI	533	88
38	6	E-WASTE	DOE 5820.2	1.7.02	Waste Shipments to SEG ('88 only)	GF 01	3,162	88
39	10	H&S	DOE 5480.1	1.1.3.2.09	Maintenance Warehouse - Bldg. 12	GE-LI	1,580	90
40	7	E-REMEDIAL	CERCLA	1.2.2.4	Other Facilities Perched G/Water Pumping(IRA)	GF-11		90
41	9	H&S	DOE 5480.1 CHAPTER V	1.1.4.5.01	Radiation Detection Alarm Upgrade	GE-LI	208	88
42	10	H&S	DOE 5500.2/5500.3/5484.1	1.7.xx	Emergency Training, Drills & Exercises	GE-01	1,700	90
43	10	H&S	DOE 5500.2/5500.3/5484.1	1.1.3.2.08	Utilities Heavy Equipment Storage	GE-LI	420	90
44	4	E-AIR	DOE 5483.1	1.1.1.4.06	Cafeteria HVAC	GE-LI	345	87
45	6	E-WASTE	DOE 5820.2	1.5.04	Waste Operations Support	GF 01	15,142	88
46	8	H&S	DOE 5480.1/NPDES/RCRA	1.1.3.2.01	Warehouse - Plant 6	GE-LI	1,497	88
47	9	H&S	DOE 5480.1	1.1.4.2.06	Fire Truck	GE-LI	188	88
48	7	E-REMEDIAL	CERCLA	1.2.4.6	Operable Unit 6 (South Plume) ERA	GF-11	1,100	90
49	4	E-AIR	DOE 5480.4/OHIO EPA	1.4.02.xx	Derby Cleaning System	GE-CE	1000	91
50	9	H&S	DOE 5480.1	1.1.4.2.04	Fire Protection Improvements - Building 64	GE-LI	248	88
51	7	E-REMEDIAL	CERCLA	1.2.4.4	Operable Unit 4 (special Facilities) FRA	GF-11	2,300	90
52	10	H&S	DOE 5500.2/5500.3/5484.1	1.7.xx	Sitewide Emergency Procedures	GE-01	900	90
53	5	E-WATER	CWA/NPDES	1.3.02.01.02	General Sump	GE-LI	5,258	86
54	9	H&S	DOE 5480.1	1.1.4.2.01	Fire Protection Improvements - Pilot Plant	GE-LI	50	92
55	7	E-REMEDIAL	CERCLA	1.2.4.1	Operable Unit 1 (Waste Storage Area) FRA	GF-11	1,800	90
56	7	E-REMEDIAL	CERCLA	1.2.5	Remediation Support & Facilities	GF-11	2,800	90
57	4	E-AIR	DOE 5480.1/NESHAP	1.1.1.2.01	Air Monitoring Stations	GE-LI	128	88
58	8	H&S	OSHA	1.1.4.1.01	Boiler Plant Storage, Maint. and Off. Facilities	GE-LI	521	87
59	6	E-WASTE	RCRA	1.6.01	RCRA Compliance Activities	GF 01	7,412	89
60	7	E-REMEDIAL	CERCLA	1.2.4.3	Operable Unit 3 (Facilities and Suspect Areas) FRA	GF-11	1,200	91
61	6	E-WASTE	RCRA	1.7.02	Mixed Waste Shipments to ORGDP	GF 01	2,270	88
62	8	H&S	DOE 5483.1	1.1.4.4.01	Plantwide Lighting Upgrade	GE-LI	5,209	88
63	8	H&S	DOE 5480.10	1.4.02.xx	Portable Toxic Gas Detection System	GF-CE	14	90
64	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.05	Pilot Plant Storage Building 64D	GE-LI	270	88
65	4	E-AIR	DOE 5480.1/NESHAP/DOE 5500.3	1.1.4.1.04	Toxic Atmospheric Dispersion Modeling System	GE-LI		87
66	7	E-REMEDIAL	CERCLA	1.2.4.2	Operable Unit 2 (Solid Waste Units) FRA	GF-11	1,000	90
67	8	H&S	OSHA	1.1.4.1.02	Locker Room Upgrade/Laundry Upgrade (LU/LU)	GE-LI	8,205	87
68	4	E-AIR	OHIO EPA	1.7.xx	Stack Testing	GE-01	300	89
69	5	E-WATER	CWA/NPDES	1.4.01.x	Upgrade Effluent Flow Sampling Equipment	GF-GPP	667	89

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	PROJECT NAME	FUNDING TYPE	TEC ($1,000)	START FY
70	7	E-REMEDIAL	CERCLA	1.2.7.2	Fields Brook	GF-11	1,100	91
71	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.01.x	Emergency Warning System	GF-GPP	106	88
72	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.03	Warehouse - Plant 9	GE-LI	817	88
73	7	E-REMEDIAL	CERCLA	1.2.4.5	Operable Unit 5 (Environmental Media) FRA	GF-11	500	90
74	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.01	Covered Controlled Storage Pad Plant 1	GE-LI	35,733	89
75	6	E-WASTE	DOE 5820.2	1.4.02.xx	Surface Decontamination Equipment	GE-CE	55	88
76	5	E-WATER	CWA/NPDES	1.4.01.x	pH Control - Manhole 175	GF-GPP	131	88
77	7	E-REMEDIAL	CERCLA	1.2.4.xx	Development Engineering	GF-11	1,600	91
78	6	E-WASTE	DOE 5820.2	1.5.04	Backlog Construction Rubble Disposition	GF 01	21,504	91
79	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.07	Storage Warehouse Upgrade (Buildings 64 & 65)	GE-LI	1,559	90
80	6	E-WASTE	DOE 5480.1	1.4.02.xx	Floor Scrubber	GE-CE	32	88
81	8	H&S	DOE 5480.10	1.4.02.xx	Tracking MSDS System for Hazardous Chemicals	GF-CE	20	90
82	8	H&S	DOE 5480.4/5480.10	1.4.02.xx	Air Sampling Equipment	GF-CE	9	90
83	7	E-REMEDIAL	CERCLA	1.2.1.xx	Interim Monitoring	GF-11	1,600	91
84	7	E-REMEDIAL	CERCLA	1.2.1.xx	Other Environmental Studies	GF-11		90
85	8	H&S	DOE 5480.10/5483.1	1.7.xx	Follow-up Ventilation Survey	GF-OP	250	91
86	4	E-AIR	CAA	1.1.1.5.cc	Exhaust Systems Refer to Table 3-2C	GE-LI	19,123	87
87	6	E-WASTE	DOE 5820.2	1.4.02.xx	Waste Minimization Equipment	GE-CE		88
88	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.03	Environmental Upgrade - West of Plant 8	GE-LI	559	88
89	6	E-WASTE	DOE 5820.2	1.1.3.1.04	Waste Handling Facilities	GE-LI	11,863	92
90	5	E-WATER	CWA/NPDES	1.3.01.07	Plant 6 Sump (Replacement)	GE-LI	5,219	85
91	7	E-REMEDIAL	DOE 5820.2	1.2.3	Decommission Site Structures	GF-11		91
92	6	E-WASTE	DOE 5820.2	1.4.01	Truck Dock Shelter	GF-GPP	2,000	91
93	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.05	Environmental Upgrade - East of Plant 8	GE-LI	1,047	88
94	9	H&S	DOE 5480.1	1.1.4.2.05	Fire Protection Improvements - Building 65	GE-LI	270	90
95	8	H&S	DOE 5480.10	1.4.02.xx	Particulate Air Monitoring Instrument	GF-CE	10	90
96	5	E-WATER/AIR	CWA/NPDES	1.3.02.01.11	Automation/Modification of Plant 8 Sump	GE-LI	5,458	86
97	8	H&S	OSHA	1.4.02.xx	Noise Monitoring Instrumentation	GF-CE	10	90
98	6	E-WASTE	DOE 5820.2	1.4.02.xx	Drum Handling	GE-CE	44	88
99	6	E-WASTE	DOE 5820.2	1.4.02.xx	Drum Cleaning	GE-CE	30	88
100	6	E-WASTE	DOE 5820.2 RCRA/CERCLA	1.5.04	Engineering Support of RMI	GF 01	1,200	89
101	5	E-WATER	CWA/NPDES	1.3.02.01.01	Automation/Modification of Refinery Sump	GE-LI	3,097	86
102	8	H&S	OSHA	1.4.01.x	Locker Room Upgrade (Phase I)	GF-GPP	1,130	87
103	6	E-WASTE	RCRA	1.4.02.xx	RCRA Items	GE-CE	200	88
104	5	E-WATER	DOE 5480.1/CWA	1.1.2.4.01	Wastewater Treatment Improvements	GE-LI	24,616	90
105	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.02	Covered Controlled Storage Pad Plant 5	GE-LI	2,236	89

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	PROJECT NAME	FUNDING TYPE	TEC ($1,000)	START FY
106	8	H&S	DOE 5480.10	1.4.02.xx	Respirator Fit Test Instrumentation	GF-CE	40	90
107	8	H&S	DOE 5483.1/5480.10/OSHA	1.7.xx	Breathing Air System Survey	GE-01	40	90
108	8	H&S	DOE 5480.1/5483.1	1.4.02.xx	Respirator Face Piece Test Fixture	GF-CE	7	90
109	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.2.1.04	Controlled Storage Pads - Plantwide	GE-LI	10,481	90
110	4	E-AIR	DOE 5480.14/CAA	1.7.xx	Upgrade Operational Procedures	GE-01		88
111	8	H&S	DOE 5480.1	1.4.02.xx	Replace Hand and Foot Monitors	GF-CE	50	90
112	8	H&S	DOE 5480.1	1.1.4.3.01.01	Enclose Saws	GE-LI	779	88
113	8	H&S	DOE 5500.2/5500.3/5484.1	1.1.4.3.01.02	Enclose Lathes	GE-LI	2230	92
114	8	H&S	DOE 5480.1	1.4.02.xx	NaI In-Vivo Monitoring Detectors	GF-CE	80	90
115	6	H&S	DOE 5480.1	1.1.4.2.03	Fire Protection Improvements - Building 14	GE-LI	93	88
116	8	H&S	DOE NUCLEAR STD. NEF3-43	1.4.02.xx	HEPA Test Equipment	GF-CE	15	90
117	6	E-WASTE	RCRA	1.4.02.xx	Analytical Certification	GE-CE	215	88
118	8	H&S	DOE 5480.1	1.4.02.xx	Ultrasound Unit - In-Vivo Facility	GF-CE	25	89
119	7	E-REMEDIAL	DOE 5820.2	1.7.xx	Remove Abandoned-In-Place (AIP) Equip.	GE 01	350	88
120	5	E-WATER	DOE 5480.1/CWA/NPDES	1.1.2.4.03	Storm Sewer Improvements - Plantwide	GE-LI	3,463	90
121	8	H&S	DOE 5480.10	1.4.02.xx	Respirator Washing Facility	GE-CE	300	88
122	8	H&S	DOE 5480.10	1.4.02.xx	Portable Fit Test Unit	GF-CE	7	90
123	6	E-WASTE	CWA/NPDES	1.4.01.x	Ultraviolet System	GF-GPP	224	88
124	6	E-WASTE	SWDA	1.7.xx	Conventional Waste Disposal	GE 01	300	88
125	8	H&S	DOE 5480.15	1.4.02.xx	Replace Automatic TLD Reader	GF-CE	80	89
126	6	E-WASTE	RCRA	1.4.01.x	RCRA Satellite System	GF-GPP	223	88
127	8	H&S	DOE 5480.1	1.4.02.xx	Instrumentation for In-Vivo Facility	GF-CE	300	92
128	8	H&S	DOE 5480.1	1.4.02.xx	Replace Automatic Alpha/Beta Planchet Counter	GF-CE	40	90
129	9	H&S	DOE 5480.3/5480.5	1.7.06	Storage Racks - Enriched Nuclear Material	GF-OP	75	89
130	8	H&S	DOE 5480.1	1.4.02.xx	In-Vivo Facility Phantoms & Calibration Source	GF-CE	50	90
131	5	E-WATER	DOE 5480.1/CWA	1.1.2.2.01	Nitrate/Nitrite Removal	GE-LI	7,466	92
132	6	E-WASTE	DOE 5820.2	1.4.02.xx	Oil Reclaimation System	GE-CE	60	91
133	5	E-WATER	CWA/NPDES	1.1.2.2.02	Sump Improvements - Building 13	GE-LI	3,786	92
134	6	E-WASTE	DOE 5820.2	1.4.02.xx	Skid Cleaning Equipment	GE-CE	400	90
135	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.04	Storage Warehouse Upgrade Building 30	GE-LI	1,772	90
136	6	E-WASTE	DOE 5820.2/RCRA	1.4.02.xx	Bar Coder	GE-CE	20	89
137	8	H&S	DOE 5480.15	1.4.02.xx	TLD System Computer & Software	GF-CE	60	89
138	5	E-WATER	DOE 5480.4/CWA	1.4.01.xx	Surge Lagoon Piping Modifications	GF-GPP	500	89
139	8	H&S	DOE 5480.10	1.4.02.xx	Gas/Vapor Standard Generation System	GF-CE	28	90
140	6	E-WASTE	RCRA	1.4.02.xx	Oil Reclaimation Upgrade	GE-CE	400	90
141	6	E-WASTE	DOE 5820.2	1.5.04	Backlog LLW Storage & Disposition	GF 01	6,716	89

TABLE 3-2
FMPC PROJECT PRIORITIES

PRIORITY	SECTION	ES&H CATEGORY	APPLICABLE REGULATION	WBS NO.	PROJECT NAME	FUNDING TYPE	TEC ($1,000)	START FY
142	5	E-WATER	DOE 5480.1/NPDES/RCRA	1.1.3.2.02	Warehouse – Plant 8	GE-LI	2,483	88
143	7	E-REMEDIAL	CERCLA	1.4.01.x	Personnel Support Systems	GF-GPP	1,600	90
144	9	H&S	DOE 5480.1 CHAPTER V	1.7.xx	Nuclear Criticality Safety Training	GE-01		89
145	6	E-WASTE	DOE 5820.2	1.4.01.x	Shipping Building Expansion	GF-GPP	500	91
146	8	H&S	DOE 5480.1	1.4.02.xx	Ion Chromatograph Ultraviolet Detector	GF-CE	10	90
147	8	H&S	DOE 5483.1	1.1.1.4.dd	HVAC Out Years Refer to Table 3-2D	GE-LI	10,885	90
148	8	H&S	DOE 5480.1	1.4.02.xx	Gamma Spectroscopy System	GF-CE	13	90
149	6	E-WASTE	DOE 5820.2	1.4.02.xx	Motor Vehicle	GE-CE	35	88
150	8	H&S	OSHA	1.4.02.xx	New Vacuum System	GE-CE	15	89
151	8	H&S	DOE 5480.10	1.4.02.xx	Document Storage System	GF-CE	8	90
152	9	H&S	DOE 5480.1 CHAPTER V	1.7.xx	Nuclear Criticality Safety Studies	GE-01		89
153	10	H&S	DOE 5500.2/5500.3/5484.1	1.4.02.xx	Access Bar Code System	GF-CE	500	90
154	8	H&S	DOE 5480.10	1.7.xx	Establishing Employee Incentive Program	GE-01		89
155	5	E-WATER	CWA	1.7.xx	Alternate Denitration Studies	GE-01		90
156	8	H&S	ANSI N3.23	1.4.02.xx	Electric Cart for Servicing & Retrieving Instruments	GF-CE	6	90
157	6	E-WASTE	RCRA	1.1.4.1.03	Upgrade Analytical Facility	GE-LI	22,468	89
158	9	H&S	DOE 5480.5	1.7.xx	Nuclear Criticality Safety Audit Program	GE-01		89
159	4	E-AIR	DOE 5480.4/OHIO EPA	1.7.xx	Development Support Program	GF-OP		88
160	7	E-REMEDIAL	CERCLA	1.4.01.x	NW Substation Expansion	GF-GPP		
161	6	E-WASTE	SWDA	1.2.1.xx	Sanitary Landfill Engineering	GF-01		90
162	7	E-REMEDIAL	CERCLA	1.1.3.01.02	Pit 5 Interim Remediation	GE-LI	83826	90
163	5	E-WATER	CWA/NPDES	1.1.03.02.06	U03 Warehouse	GE-LI	3000	91
164	7	E-REMEDIAL	CERCLA	1.2.5.xx	CERCLA Monitoring	GF-11		90
165	7	E-REMEDIAL	CERCLA	1.2.7.1	RMI Refer to Table 3-3	GF-11		
166	7	E-REMEDIAL	DOE 5480.4/CAA	1.2.1.xx	EIS	GE-01		90

TABLE 3-2A
DUST COLLECTOR SYSTEMS
CAPITAL PROJECTS

INDEX	WBS NO	PROJECT	PLANT OR LOCATION	FUNDING TYPE	K$	START FY
		FUNDING YR THRU 89				
1	1.3.0.1.09	Dust Collector G2-6015 Repl.(DRUM RECOND.)	1	PRI	$ 1,121	85
2	1.4.02.x	Replace G55-E-100 Dust Collector	5	CE	$ 1,200	85
3	1.4.02.x	Replace Dust Collector G5-253	5	CE	$ 1,380	85
4	1.4.02.x	Replace Dust Collector G5-251	5	CE	$ 1,200	85
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	1.1.1.3.10	Dust Collector G5-247 and 248	5	EHSI	$ 2,376	88
8	1.1.1.3.11	Dust Collector G43-27/G43-29	8	EHSI	$ 8,888	88
9	1.1.1.3.18	Dust Collector REMELT FURNACE	5	EHSI	$ 5,373	89
10	1.1.1.3.02	Dust Collector G2-6042	1	EHSI	$ 1,867	89
11	1.1.1.3.04	Dust Collector G1-856	2	EHSI	$ 379	89
		FUNDING YR THRU 92				
12	1.4.02.x	Dust Collector Replacement(G2-172)-Plt.1	1	CE		92
13	1.4.02.X	Dust Collector G5-262	5	CE		92
14	1.1.1.3.15	Dust Collector G6-93A	37	EHSI	$ 1,039	92
15	1.1.1.3.17	Dust Collectors G1 and G2	54	EHSI	$ 1,532	92
16	1.1.1.3.12	Dust Collector 8-021, 8-024, G8-057	8	EHSI	$ 2,649	92
17	1.1.1.3.16	Dust Collector G2-95	39	EHSI	$ 442	92
		Projects impacted by N Reactor or onHOLD				
N	1.1.1.3.03	Dust Collector G1-104	2	EHSI	$ 527	
N	1.1.1.3.06	Dust Collector G4-1	4	EHSI	$ 1,090	
N	1.1.1.3.07	House Vacuum System G4-6	4	EHSI	$ 298	
N	1.1.1.3.05	Dust Collector G4-13	4	EHSI	$ 922	
N	1.1.1.3.08	Dust Collector G4-15	4	EHSI	$ 384	
H	1.1.1.3.13	Dust Collector G42-615	9	EHSI	$ 2,235	88

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	$ 35	88
2	1.1.3.3.01	Material Handling PLT.1	1	EHSI	$ 2,732	88
3	1.1.3.3.10	Chain Hoist Replacement BLD 12	12	EHSI	$ 39	88
4	1.1.3.3.04	Material Handling PLT.5	5	EHSI	$ 301	88
5	1.1.3.3.12	Intraplant Movement/Materials	PLTWIDE	EHSI	$ 621	88
6	1.1.3.3.13	T-Hopper Maintenance Facility Plt.4	4	EHSI	$ 367	88
		FUNDING YR. 92				
7	1.1.3.3.05	Material Handling PLT.6	6	EHSI	$ 21,430	92
8	1.1.3.3.07	Material Handling PLT.9	9	EHSI	$ 284	92

TABLE 3-2C
EXHAUST SYSTEMS
CAPITAL PROJECTS

INDEX	WBS NO	PROJECT	PLANT OR LOCATION	FUNDING TYPE	K$	START FY
		FUNDING YR 89				
1	1.1.1.5.01	Wet Process Exhaust Modification	2	EHSI	$ 1,039	89
2	1.1.1.5.03	Reduction Furnace/Pot Cooler Ventilation	5	EHSI	$ 701	89
3	1.1.1.5.05	Maintenance Areas Ventilation	5	EHSI	$ 405	89
		FUNDING YR 91				
4	1.1.1.5.06	New Filter System – Plant 6	6	EHSI	$ 12,901	91
5	1.1.1.5.18	Crush Area Machine	6	EHSI	$ 123	91
6	1.1.1.5.20	Chip Briquetting Press and Conveyor	6	EHSI	$ 107	91
		FUNDING YR 92				
7	1.1.1.5.24	UF6 to UF4 Fire Retardant Exhaust System	54	EHSI	$ 552	92
8	1.1.1.5.21	Salt Oil Treatment Room	6	EHSI	$ 468	92
9	1.1.1.5.19	Inspection Area	6	EHSI	$ 11	92
10	1.1.1.5.09	Flat Machining Area	6	EHSI	$ 281	92
11	1.1.1.5.10	Lathe Exhausts Systems	6	EHSI	$ 1,583	92
12	1.1.1.5.11	Sunstrand Lathe Exhaust	6	EHSI	$ 223	92
13	1.1.1.5.12	Harding Lathe/Exhaust Removal	6	EHSI	$ 71	92
14	1.1.1.5.13	Cincinnati Grinder/Exhaust Removal	6	EHSI	$ 73	92
15	1.1.1.5.14	Heald Machines & J&L Lathes Exhaust Systems –	6	EHSI	$ 265	92
16	1.1.1.5.15	Coolant Clarifiers	6	EHSI	$ 406	92
17	1.1.1.5.16	Tocco Induction Furnaces	6	EHSI	$ 90	92
18	1.1.1.5.17	Cross Transfermatics	6	EHSI	$ 284	92

TABLE 3-2D
HEATING & VENILATING SYSTEMS
CAPITAL PROJECT

INDEX	WBS NO	PROJECT	PLANT OR LOCATION	FUNDING TYPE	K$	START FY
		FUNDING YR.90				
1	1.1.1.4.11	Ventilation System Bldg. 25A & 25C	25a	EHSI	$ 80	90
		FUNDING YR.91				
2	1.1.1.4.09	Heating / Air Cond. – Building 20	20	EHSI	$ 106	91
3	1.1.1.4.13	Air Conditioning System Bld 28	28	EHSI	$ 207	91
4	1.1.1.4.03	Heating & Ventilating System Plt 5	5	EHSI	$ 1600	91
5	1.1.1.4.07	Heating & Ventilating System – Bldg. 12	12	EHSI	$ 1147	91
6	1.1.1.4.14	Heating & Ventilating System – Bldg. 30	30	EHSI	$ 70	91
7	1.1.1.4.01	Heating & Ventilating System – Plant 1	1	EHSI	$ 426	91
		FUNDING YR.92				
8	1.1.1.4.15	Heating & Ventilating System – Bldg. 31	31	EHSI	$ 76	92
9	1.1.1.4.16	Heating & Ventilating System – Bldg. 32	32	EHSI	$ 1150	92
10	1.1.1.4.17	Heating & Ventilating System – Bldg. 37	37	EHSI	$ 148	92
11	1.1.1.4.18	Heating & Ventilating System – Bldg. 30	38	EHSI	$ 62	92
12	1.1.1.4.21	Heating & Ventilating System – Bldg. 46	46	EHSI	$ 262	92
13	1.1.1.4.05	Heating & Ventilating System – Plant 9	9	EHSI	$ 826	92
14	1.1.1.4.19	Heating & Ventilating System – Bldg. 39	39	EHSI	$ 18	92
15	1.1.1.4.20	Heating & Ventilating System – Bldg. 45	45	EHSI	$ 12	92
16	1.1.1.4.24	Heating & Ventilating System – Bldg. 56	56	EHSI	$ 69	92
17	1.1.1.4.23	Heating & Ventilating System – Build 55	55	EHSI	$ 82	92
18	1.1.1.4.22	Heating & Ventilating System Bldg. 54	54	EHSI	$ 42	92
19	1.1.1.4.04	Heating & Ventilating System – Plant 6	6	EHSI	$ 4336	92
20	1.1.1.4.08	Ventilating System – Building 13	13	EHSI	$ 271	92

TABLE 3-3
RMI PROJECT PRIORITIES

PRIORITY	PLAN SECTION	ES&H CATEGORY	APPLICABLE REGULATION	PROJECT NAME	TYPE OF FUNDING	TEC ($1,000s)	START
1	15	ES&H	DOE/EPA/OSHA	Base Environmental and Support Costs	GE-01	9,040	89
2	15	ES&H	DOE/EPA/OSHA	Sitewide Restoration Investigation	GF-11	50	89
3	15	E-Waste	CERCLA	Task 1 – Ongoing Fields Brook Clean-up	GE-01	5,000	89
4	15	E-Water	DOE 5820.2/RCRA	Task 2 – Groundwater Contamination Investigation	GF-11	1,203	87
5	15	E-Waste	DOE 5820.2	Task 3 – Surface Soil Contamination	GF-11	10,028	87
6	15	E-Waste	DOE 5820.2/RCRA	Task 4 – Trench, Pit, Drain Line and Misc. Restoration	GF-11	303	89
7	15	E&H	DOE 5820.2/5480.11	Task 5 – Building and Equipment Clean-up	GE-01	12,014	89
8	15	E&H	DOE 5820.2/5480.11	Task 6 – Low-Level Waste Shipping	GF-11	450	87
9	15	E&H	CAA/5480.11	Cooling Table Ventilation System	GE-CE	508	88
10	15	H	DOE 5480.11	Office Air Filtration	GE-CE	130	89
11	15	E-Water	NPDES	Acid Neutralization Wastewater Evaporator	GF-11	60	89
12	15	E-Waste	DOE 5820.2/DOT	Sludge Dryers	GF-11	60	89
13	15	S	OSHA	Air Condition Electric Substation	GE-CE	25	89
14	15	E&H	DOE 5820.2/5480.11	Decontamination Facility	GE-GPP	700	89
15	15	E&H	CAA/DOE 5480.11/OSHA	Salt Bath Ventilation System	GE-CE	900	90
16	15	E-Air	CAA/DOE 5480.11	Meteorological Tower	GE-CE	100	90
17	15	E-Waste	RCRA	RCRA Hazardous Waste Storage	GE-GPP	300	90
18	15	ES&H	EPA/DOE/OSHA	Miscellaneous Monitoring and Sampling Equipment	GF-11	375	91
19	15	H	DOE 5480.11	Health Physics Equipment	GE-01	300	88
20	15	E-Air	CAA	Stack Monitor Replacement Equipment	GE-CE	200	91
21	15	E&H	CAA/DOE 5480.11	Continuous Air Sampling Equipment	GE-CE	75	91
22	15	E-Water	CWA	Continuous Water Sampling Equipment	GE-CE	125	91
23	15	E&H	CAA/DOE 5480.11	Miscellaneous Replacement Equipment for Air Filtration	GE-CE	75	91
24	15	E&H	CAA/DOE 5480.11	Uranium Tube Transfer Table Ventilation	GE-CE	515	92
25	15	E&H	CAA/DOE 5480.11	Uranium Tube Roof Straightener Ventilation	GE-CE	450	92

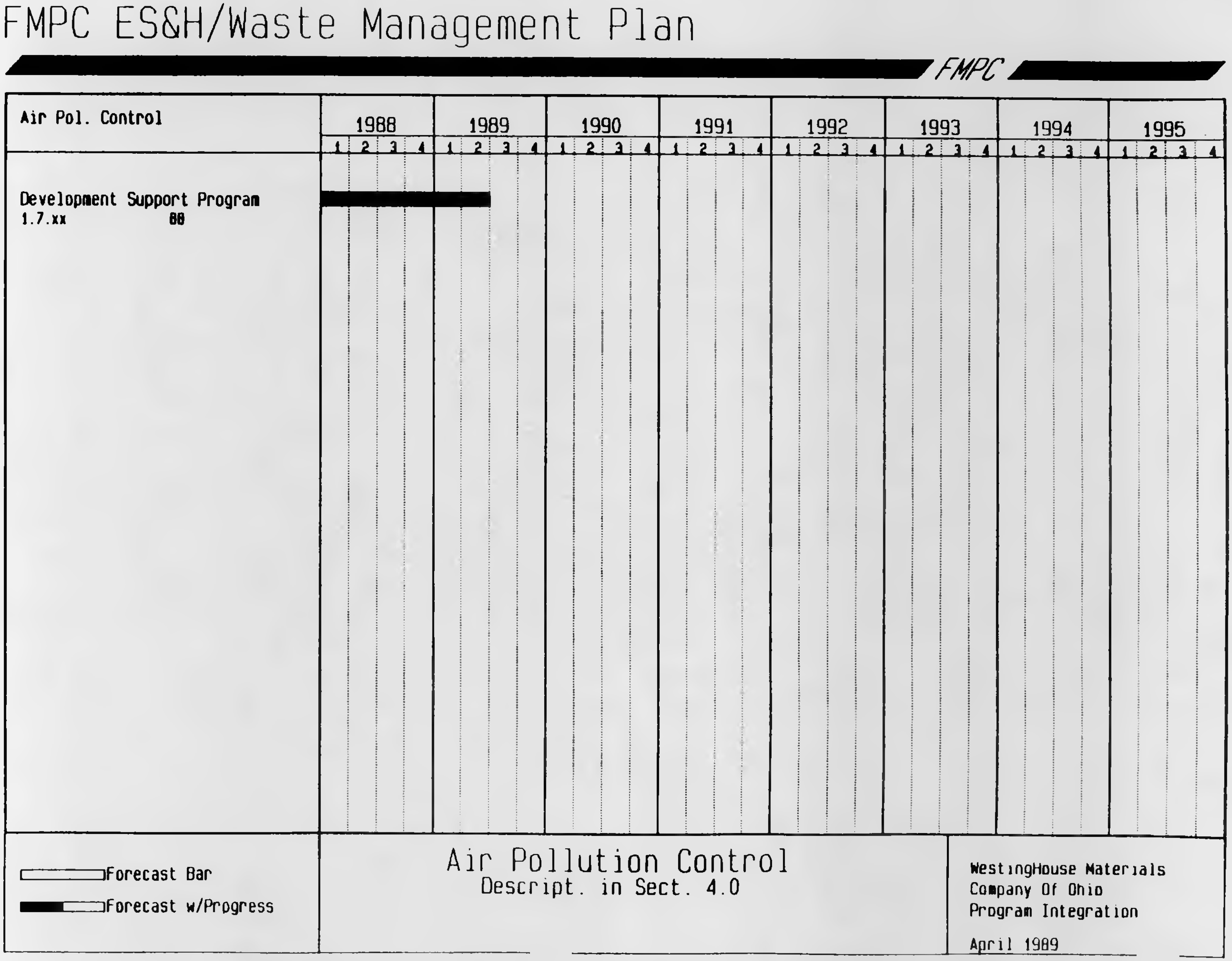
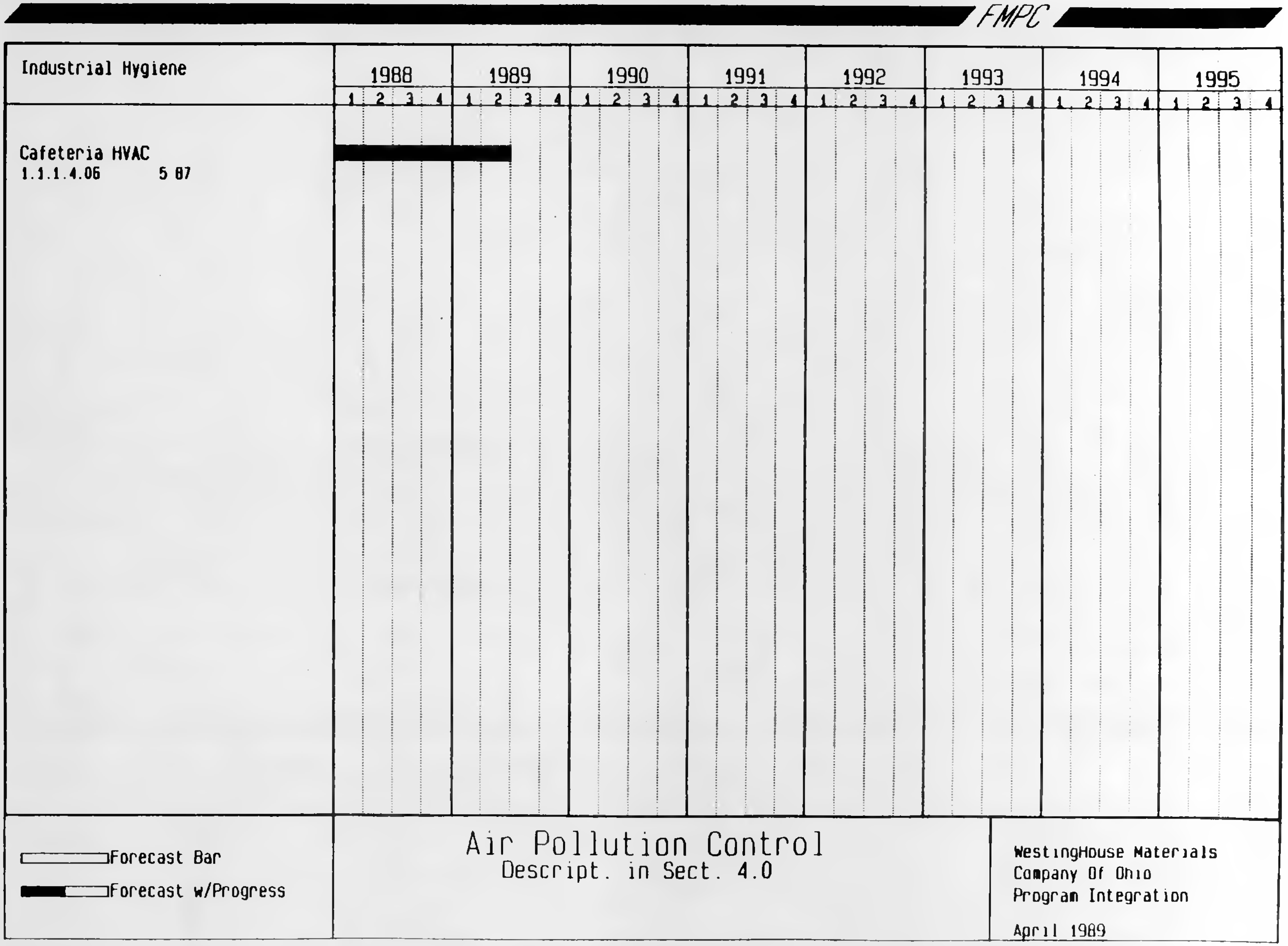


Figure 3-1 Air Po :ion Control Project Schedules

FMPC ES&H/Waste Management Plan



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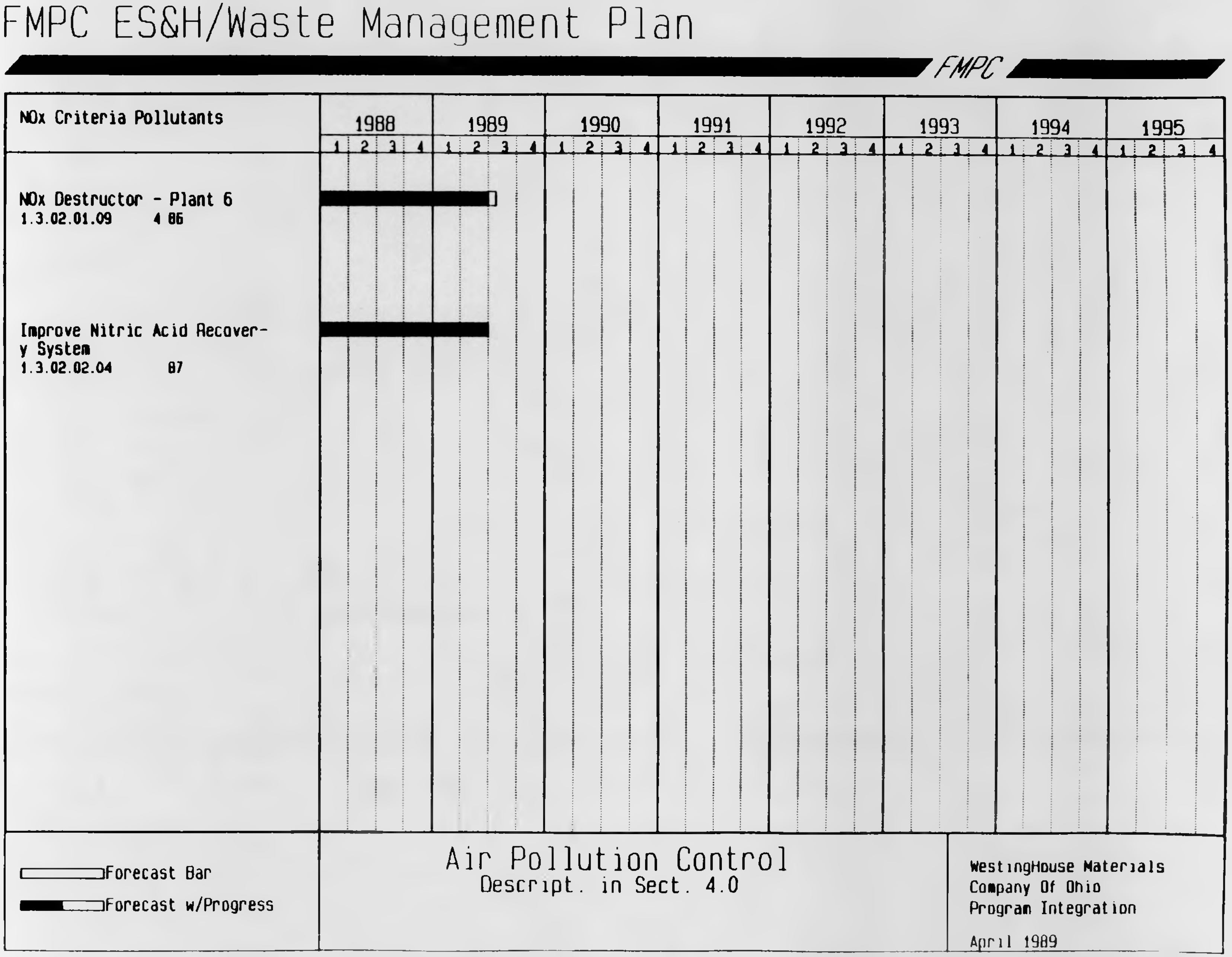

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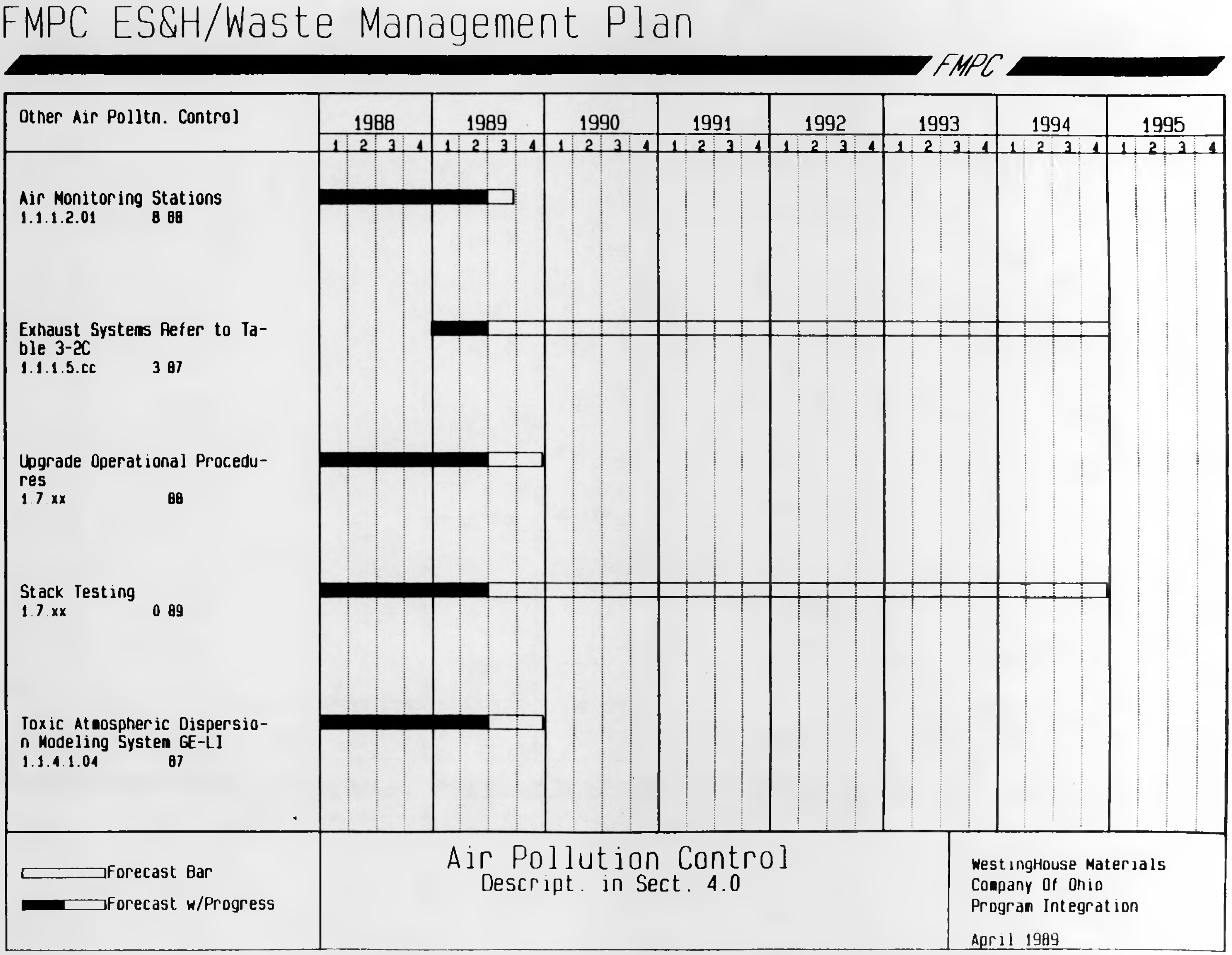

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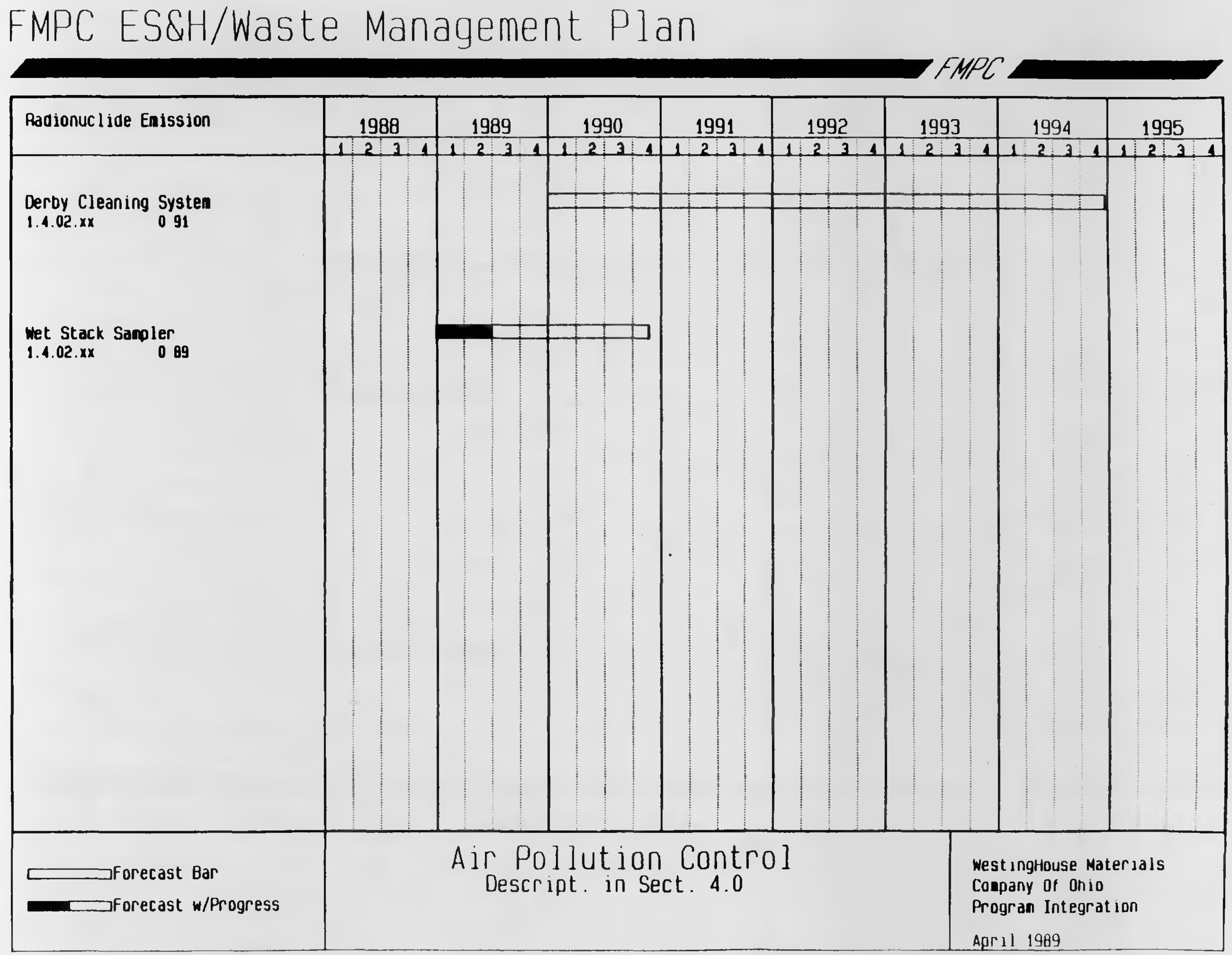

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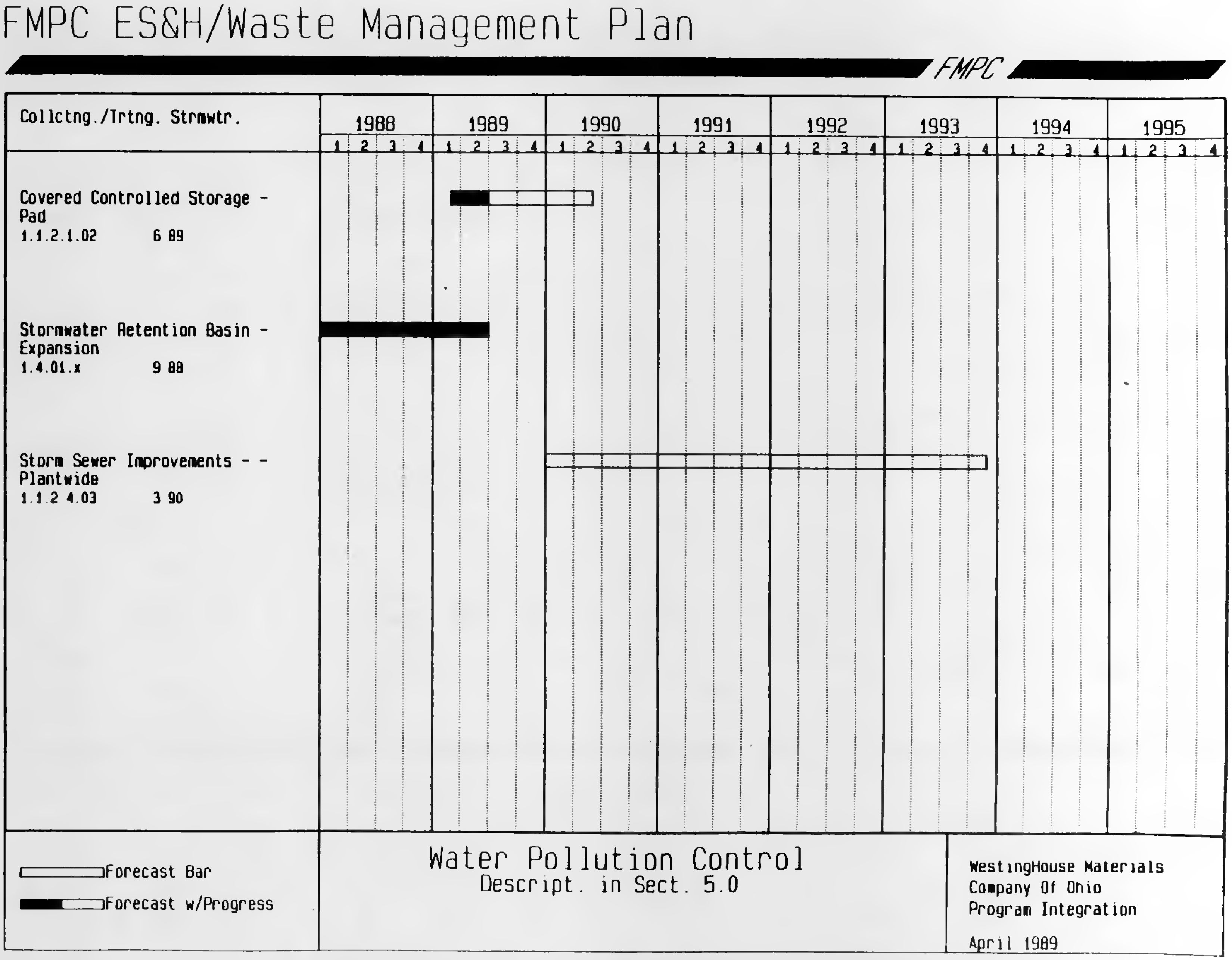
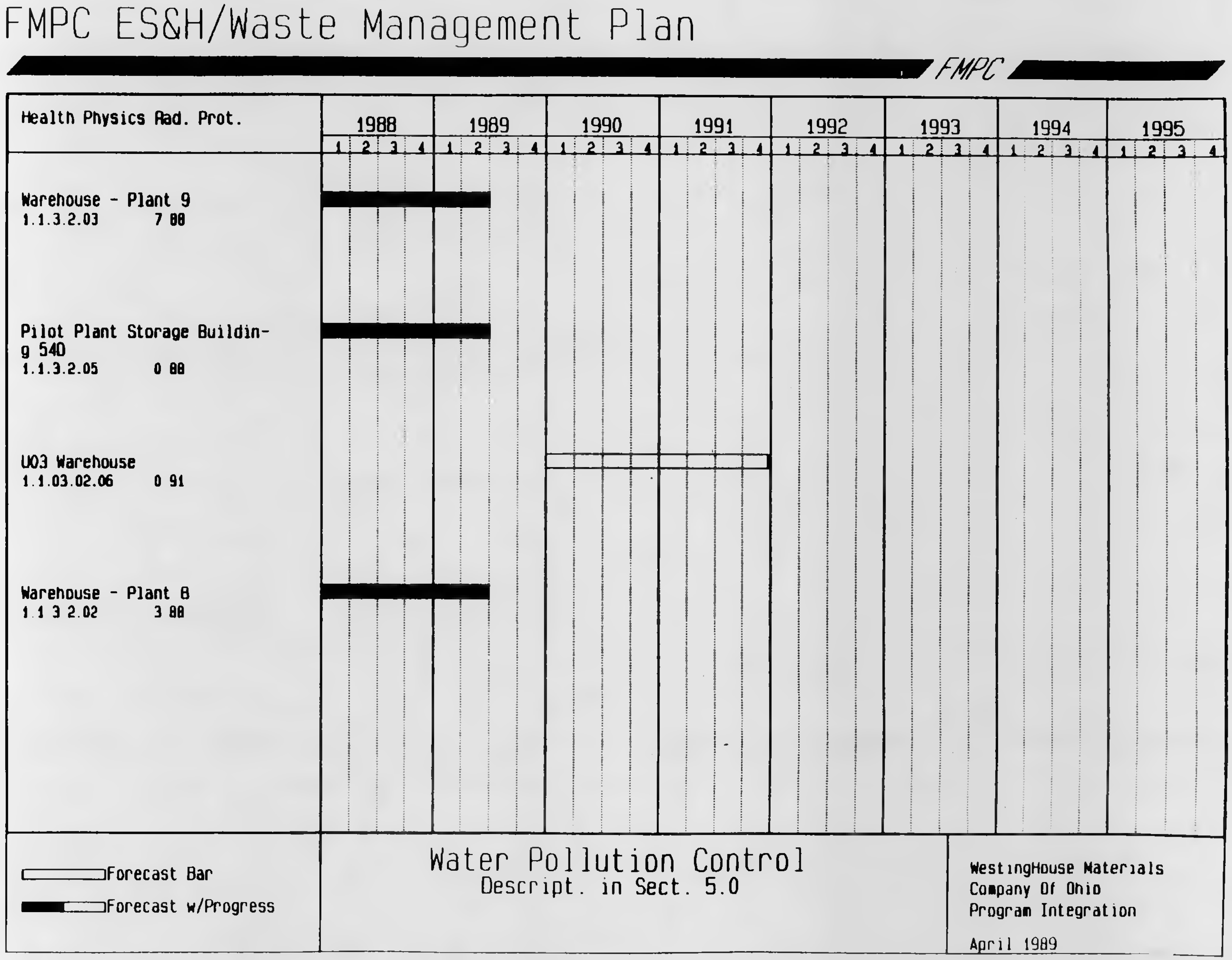


Figure 3-2 Water Pollution Control Project Schedules



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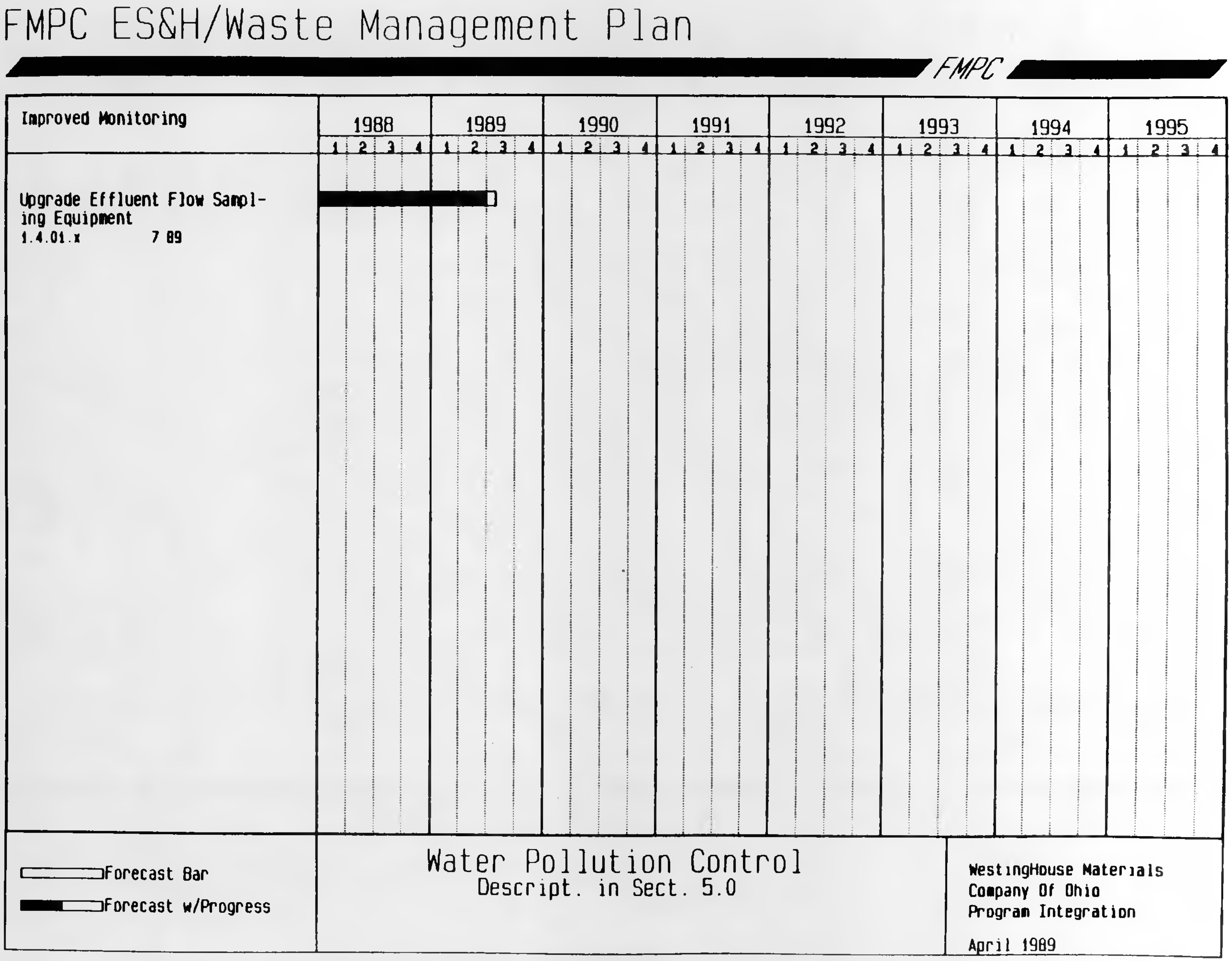

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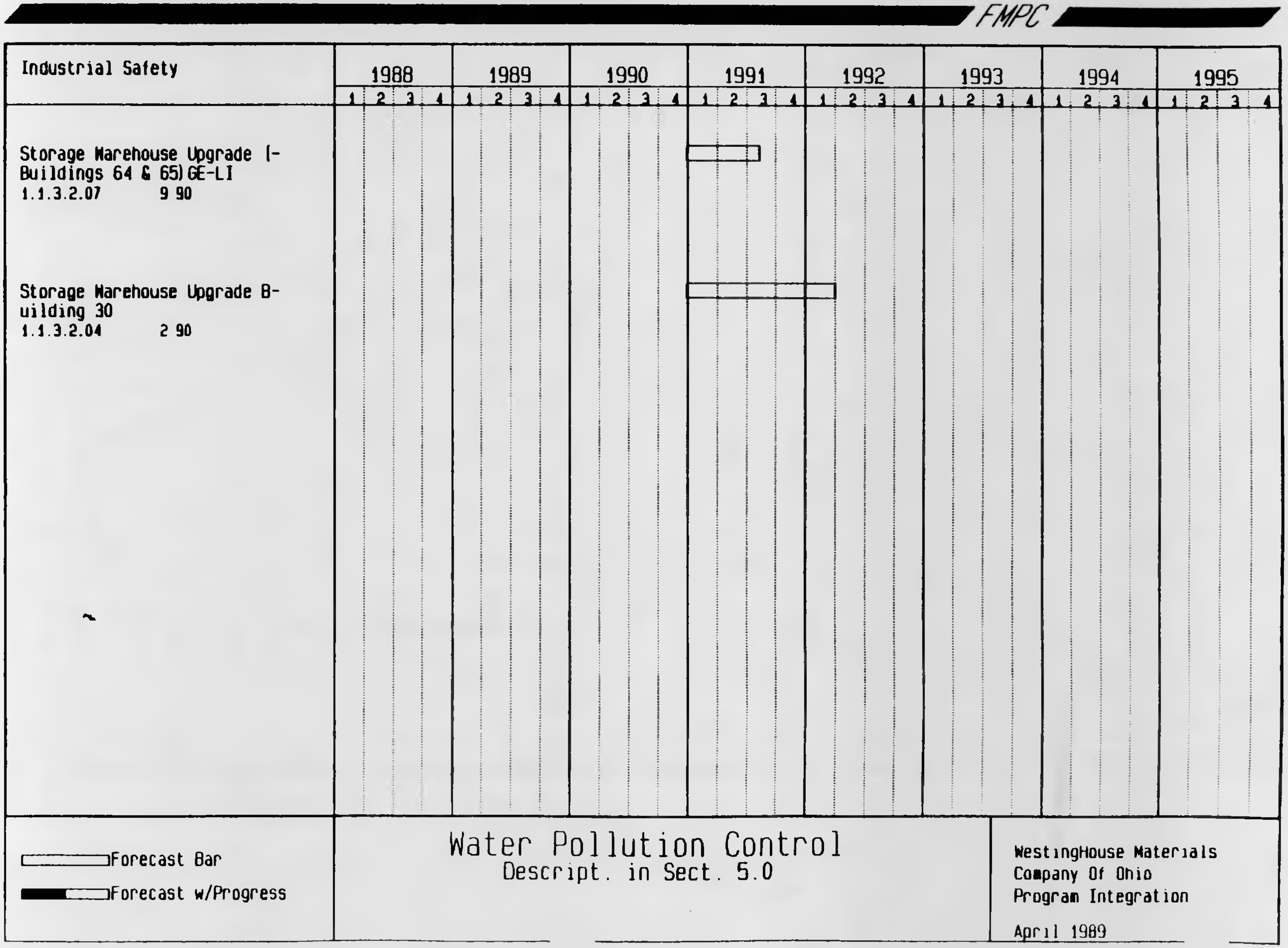
FMPC ES&H/Waste Management Plan



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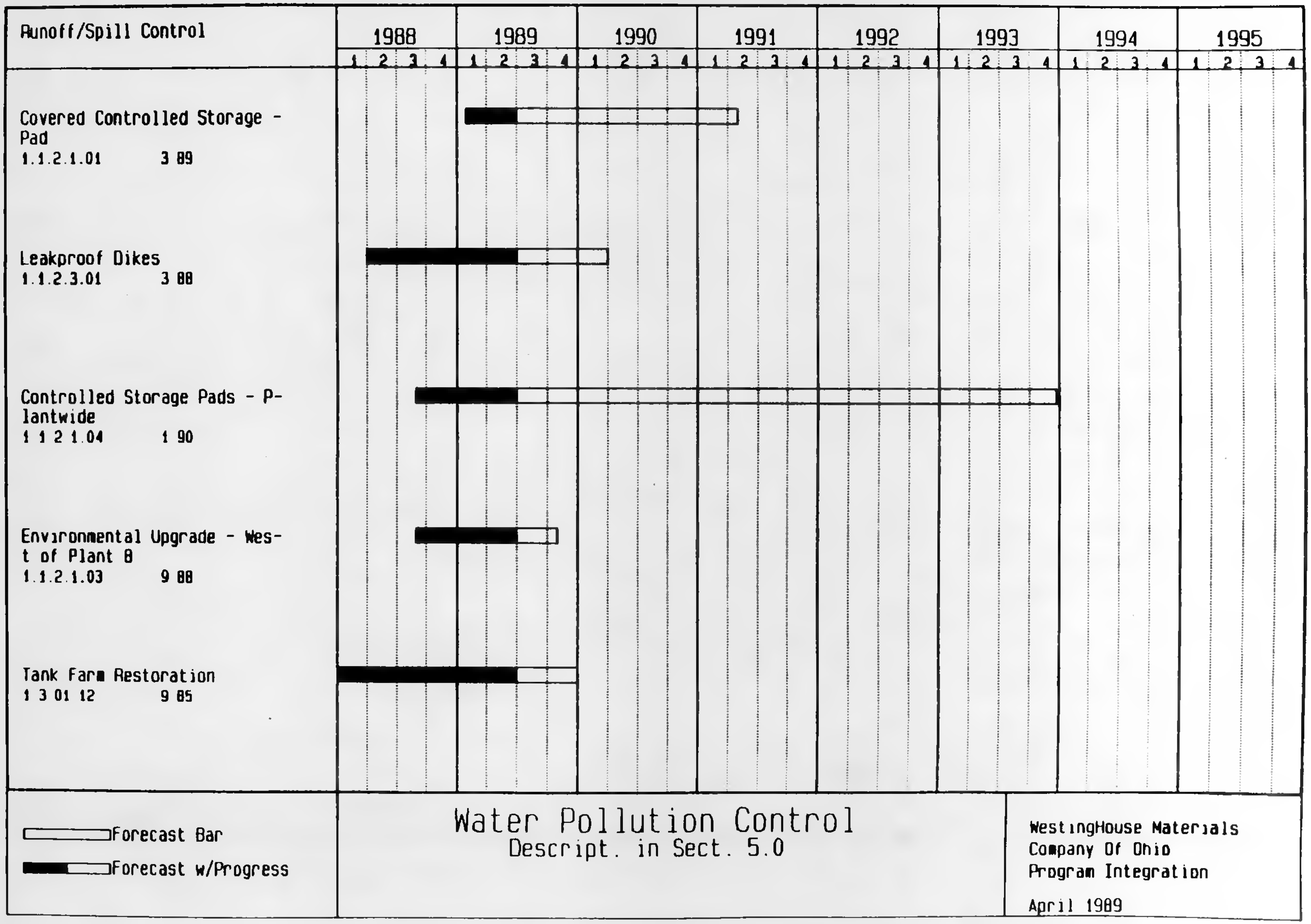
FMPC ES&H/Waste Management Plan

FMPC



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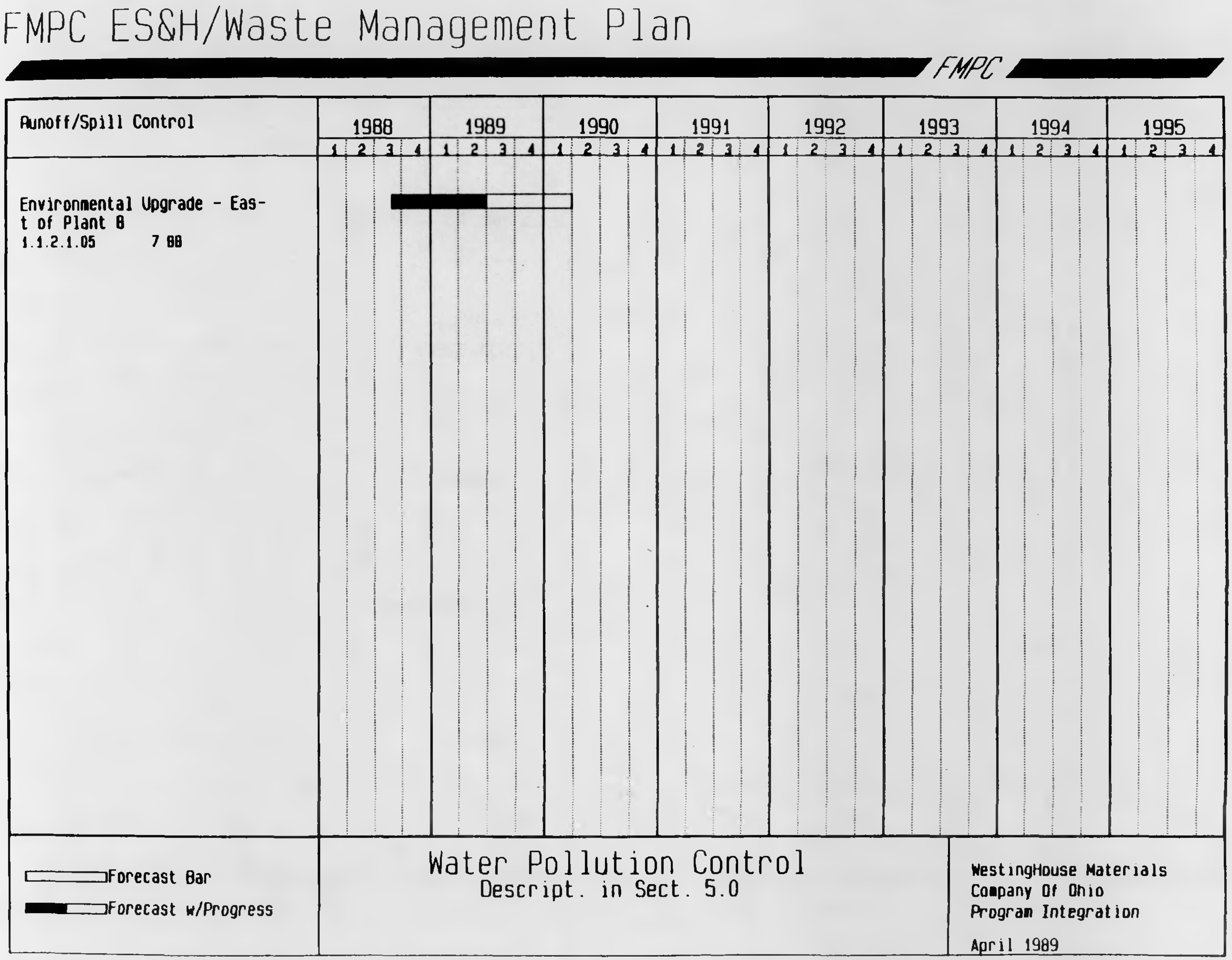

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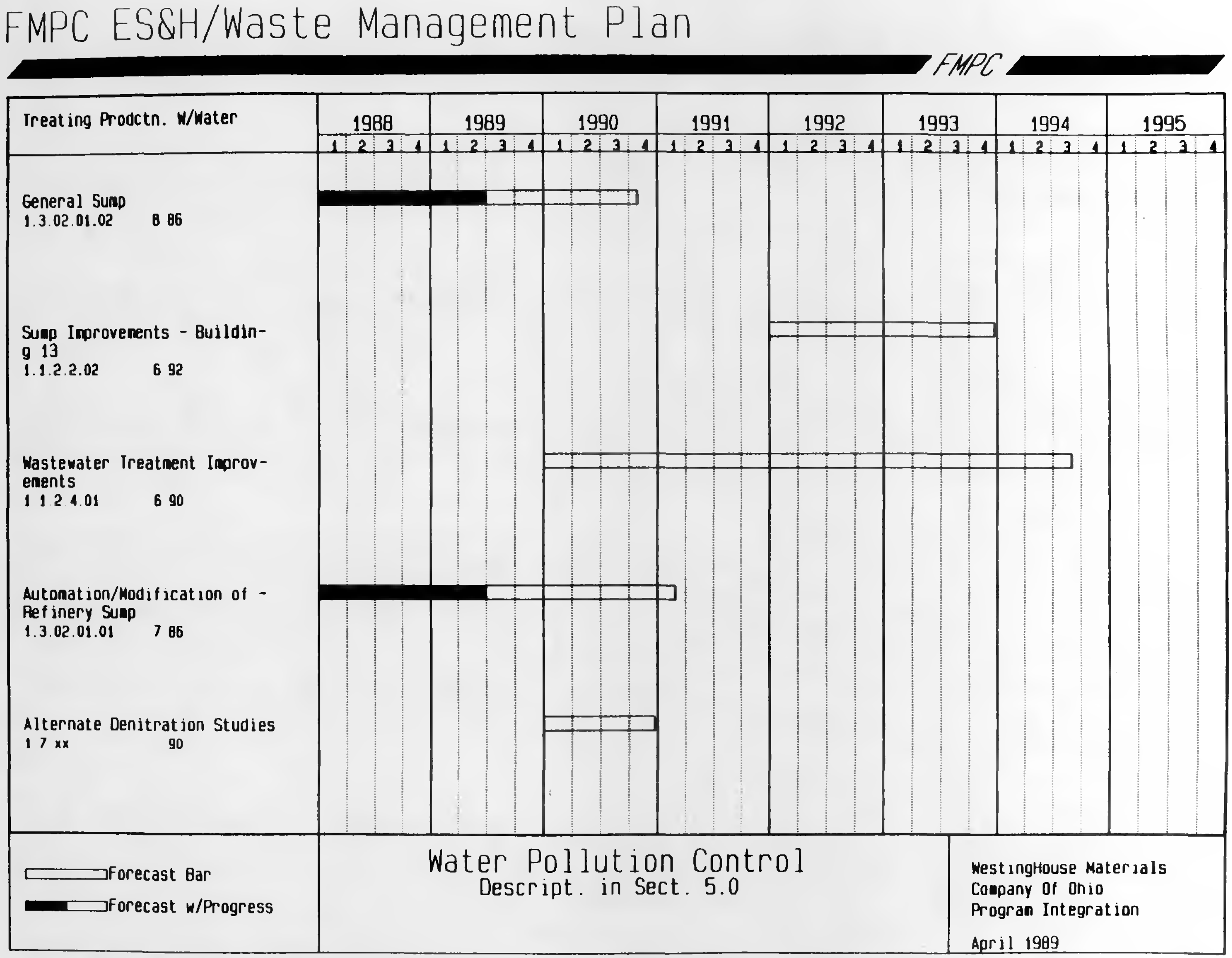

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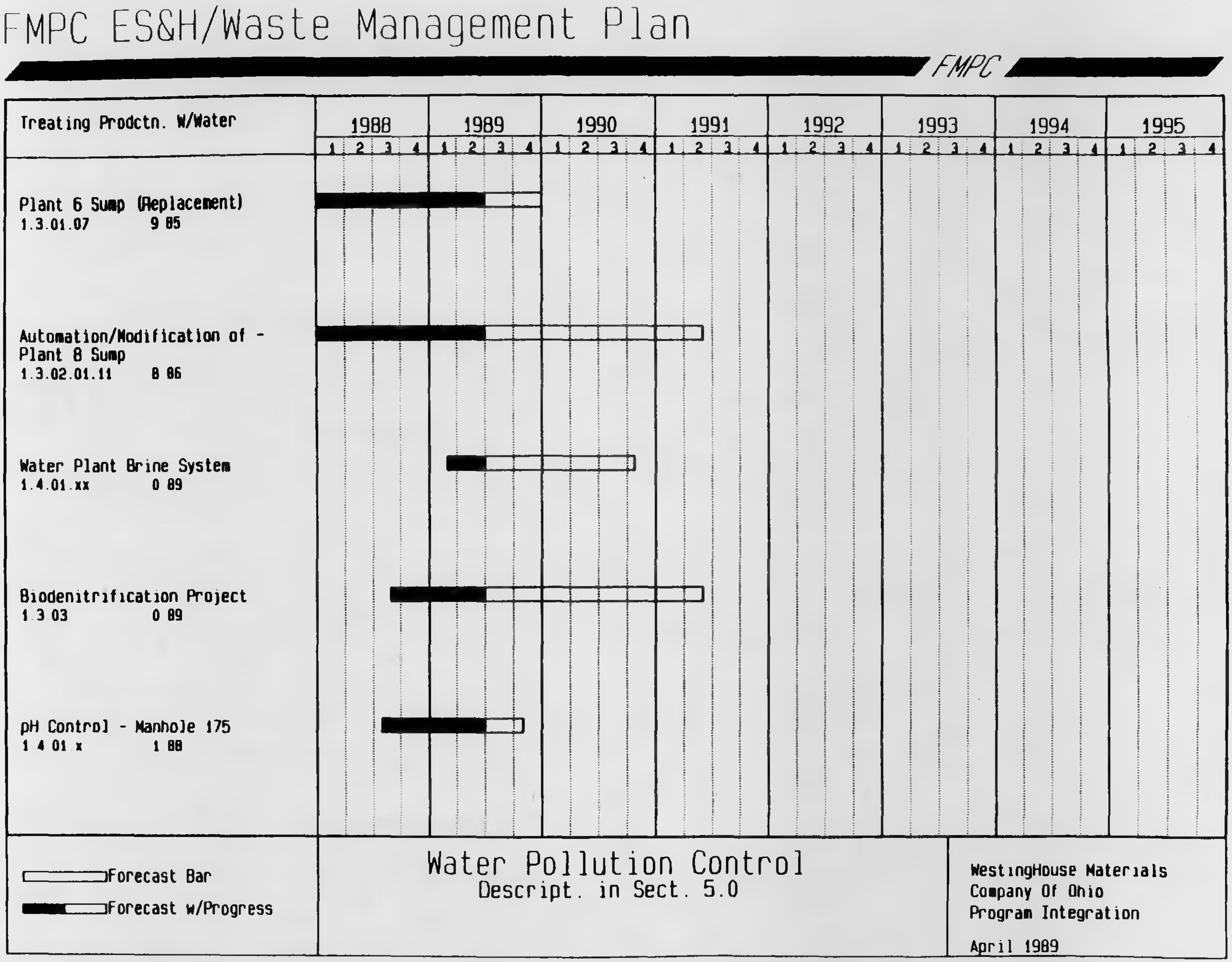

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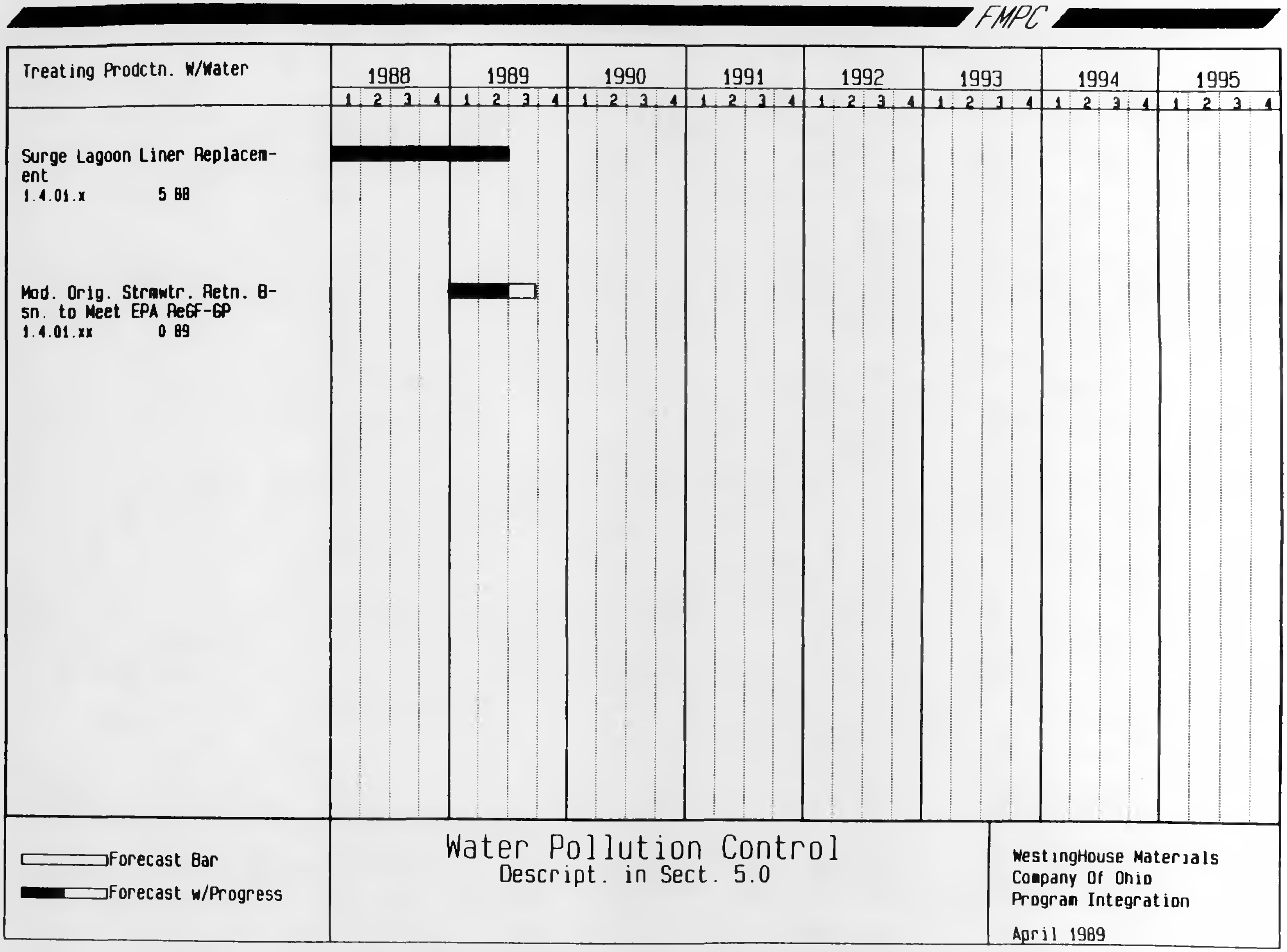
FMPC ES&H/Waste Management Plan



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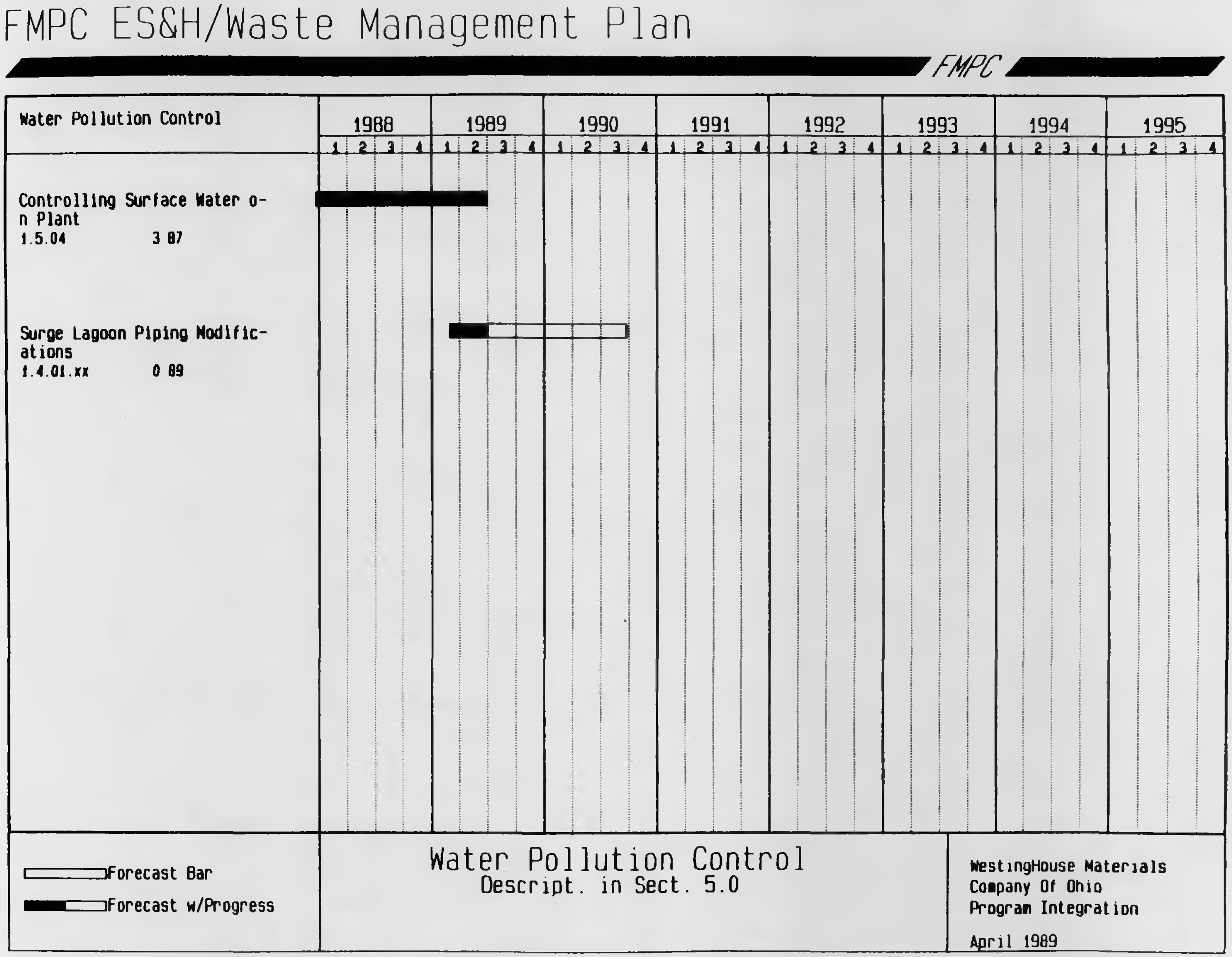

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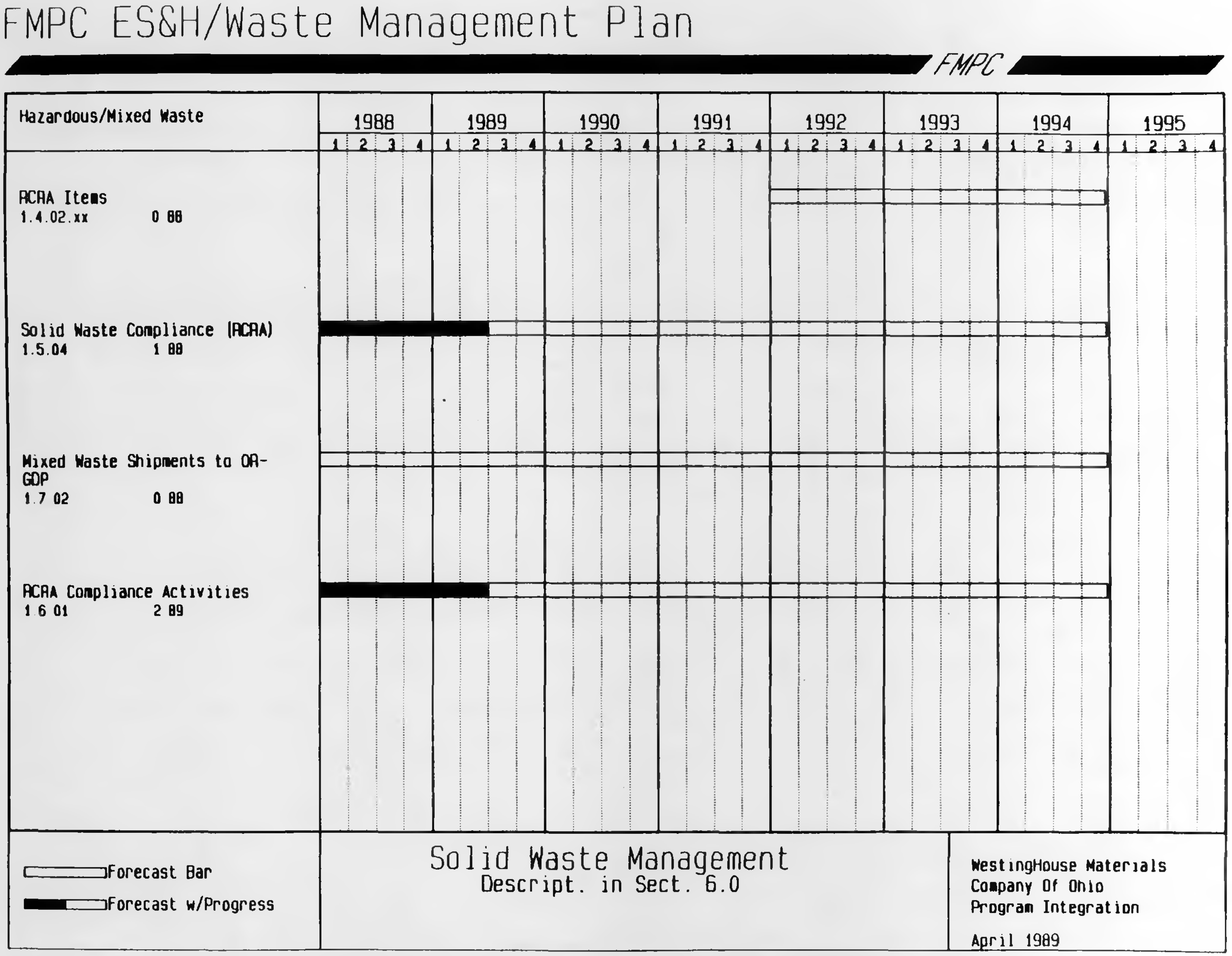


Figure 3-3 Solid Waste Management Project Schedules

FMPC ES&H/Waste Management Plan

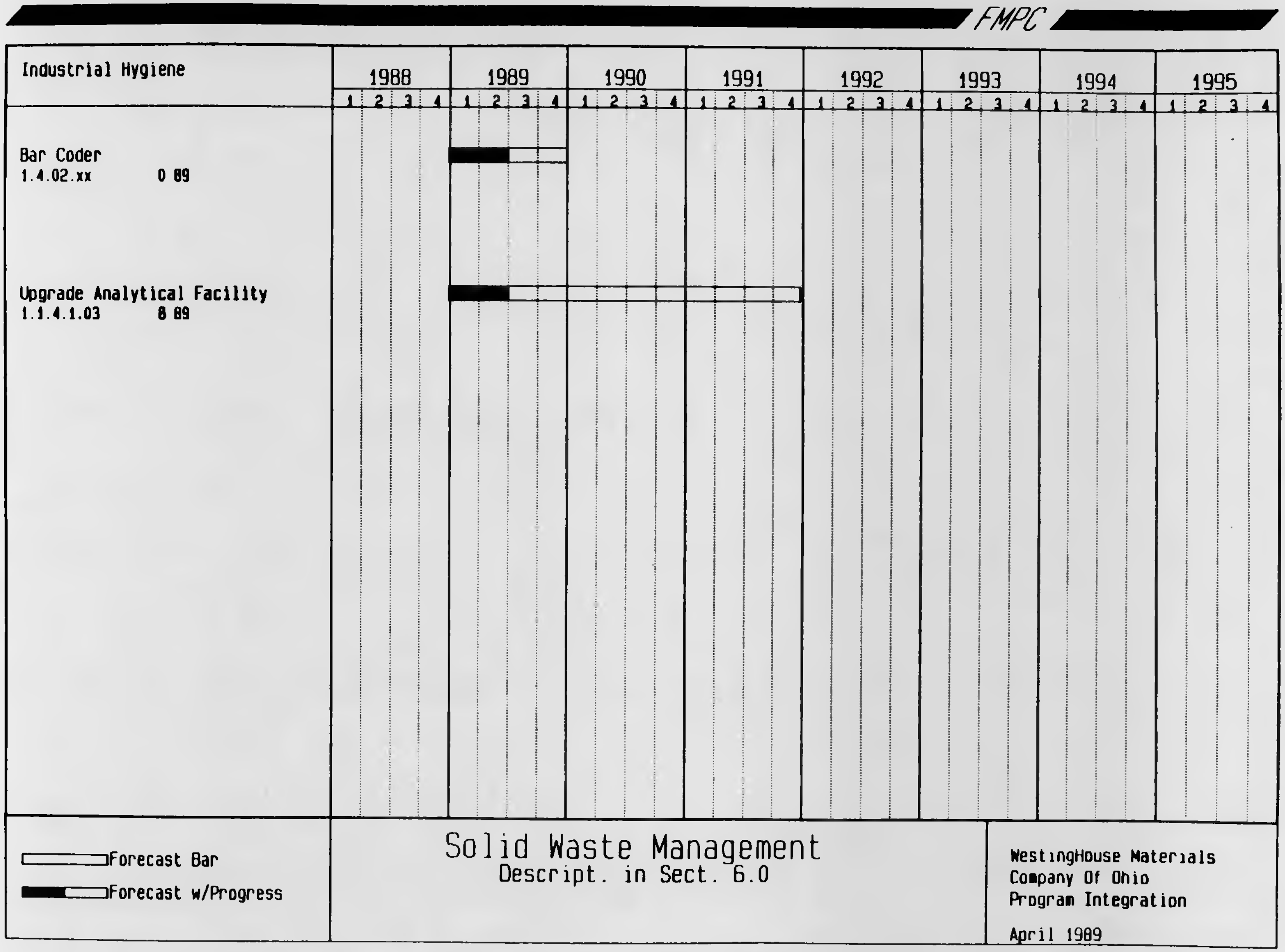
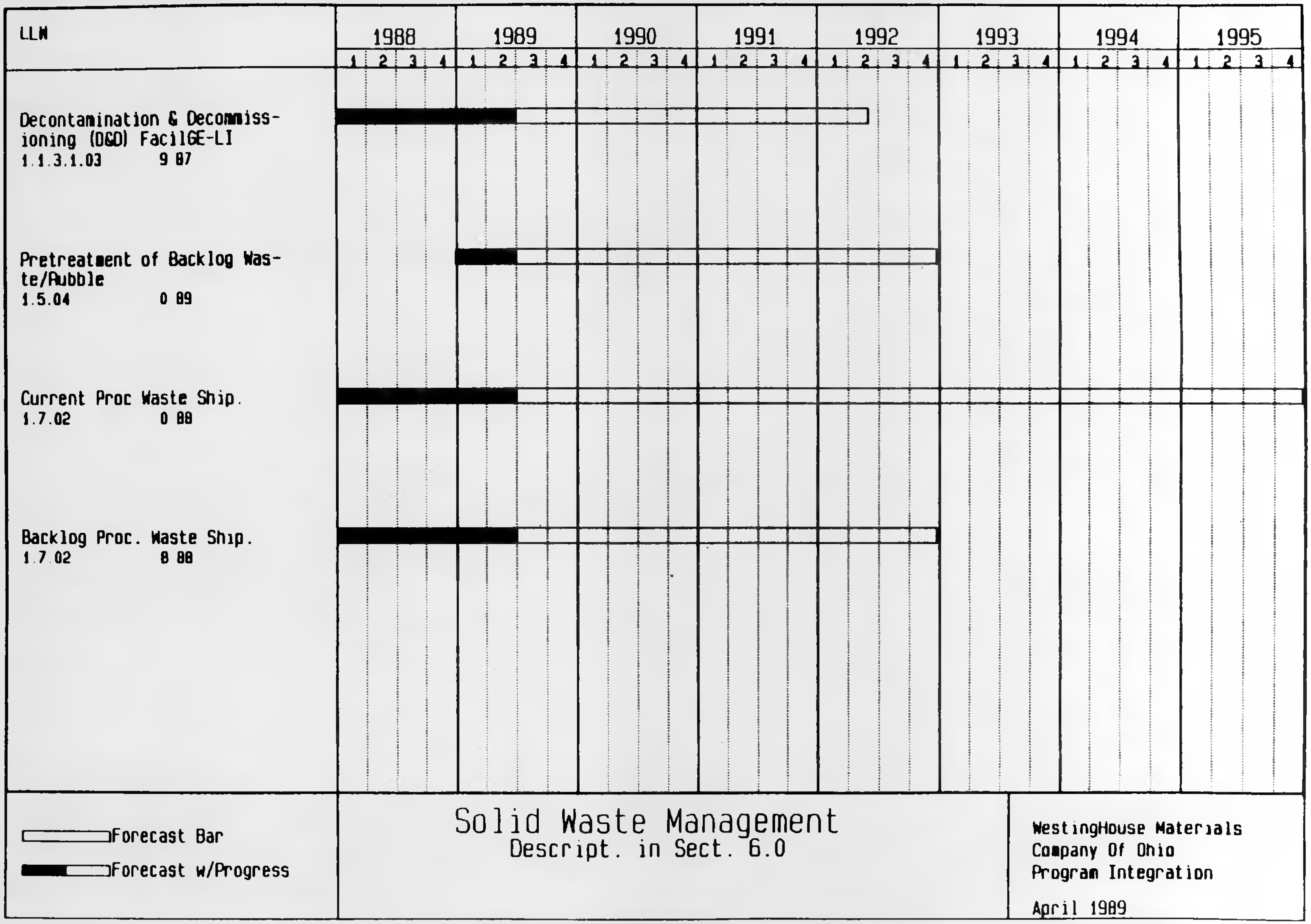


Figure 3-3 (Continue

FMPC ES&H/Waste Management Plan

FMPC



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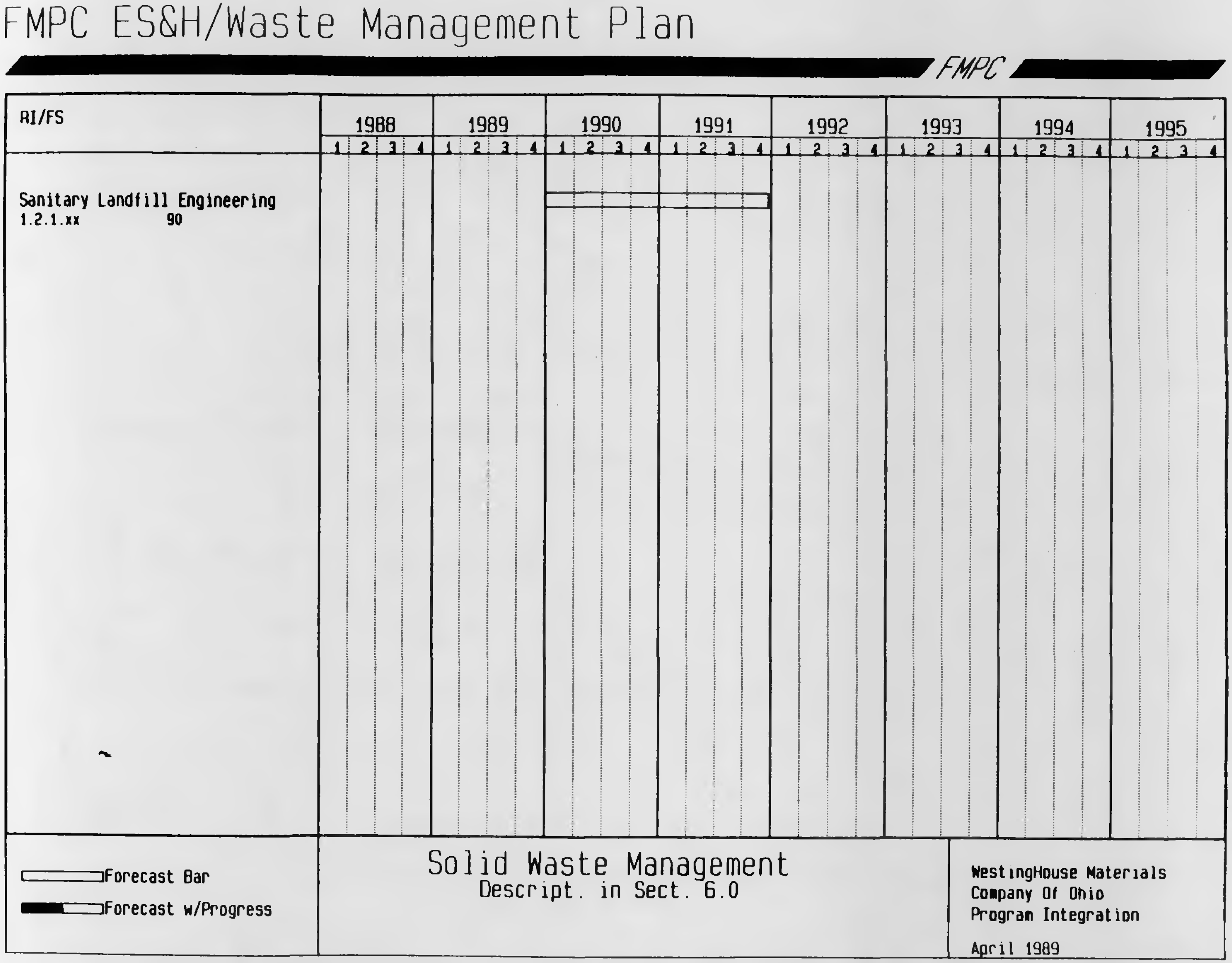

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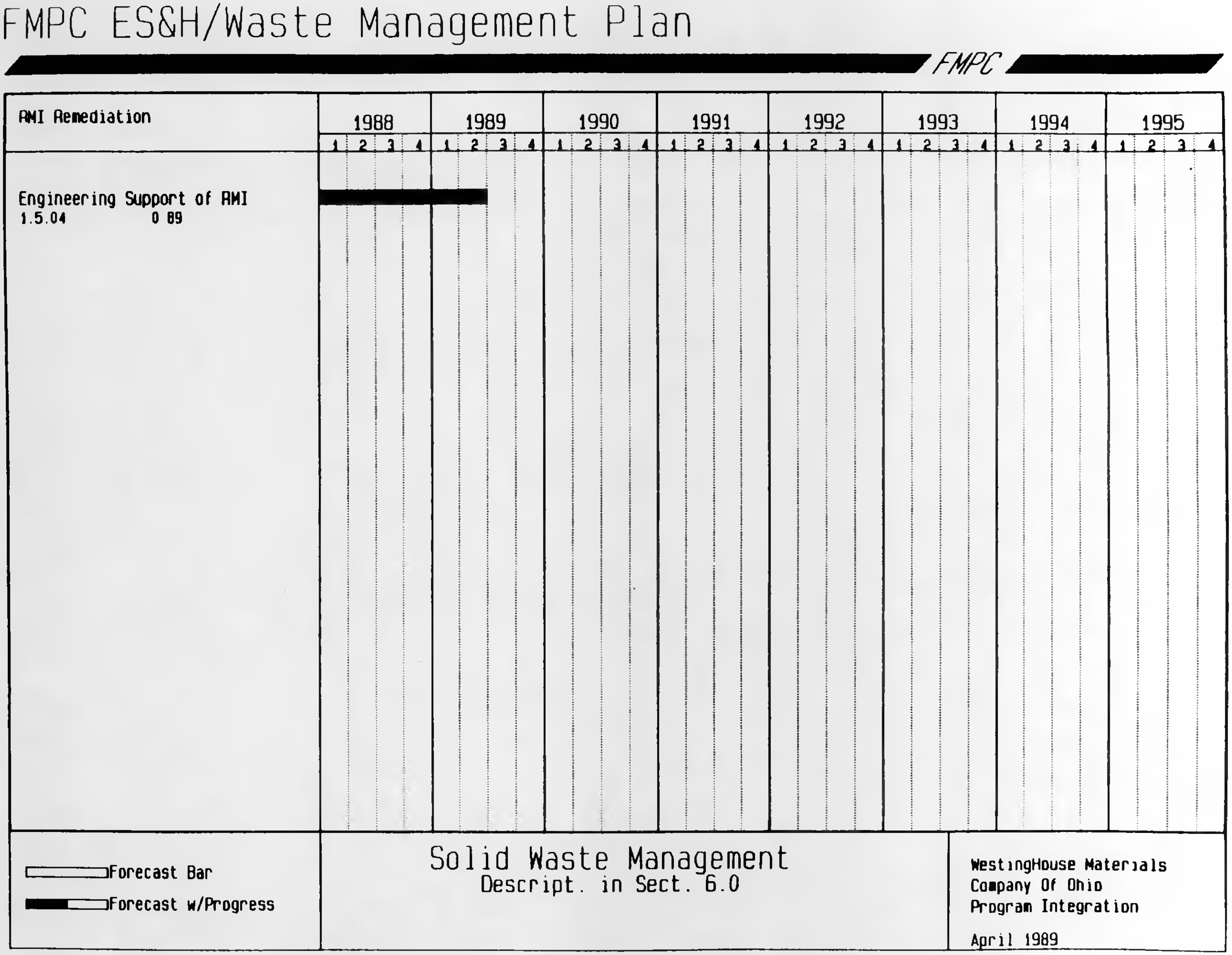

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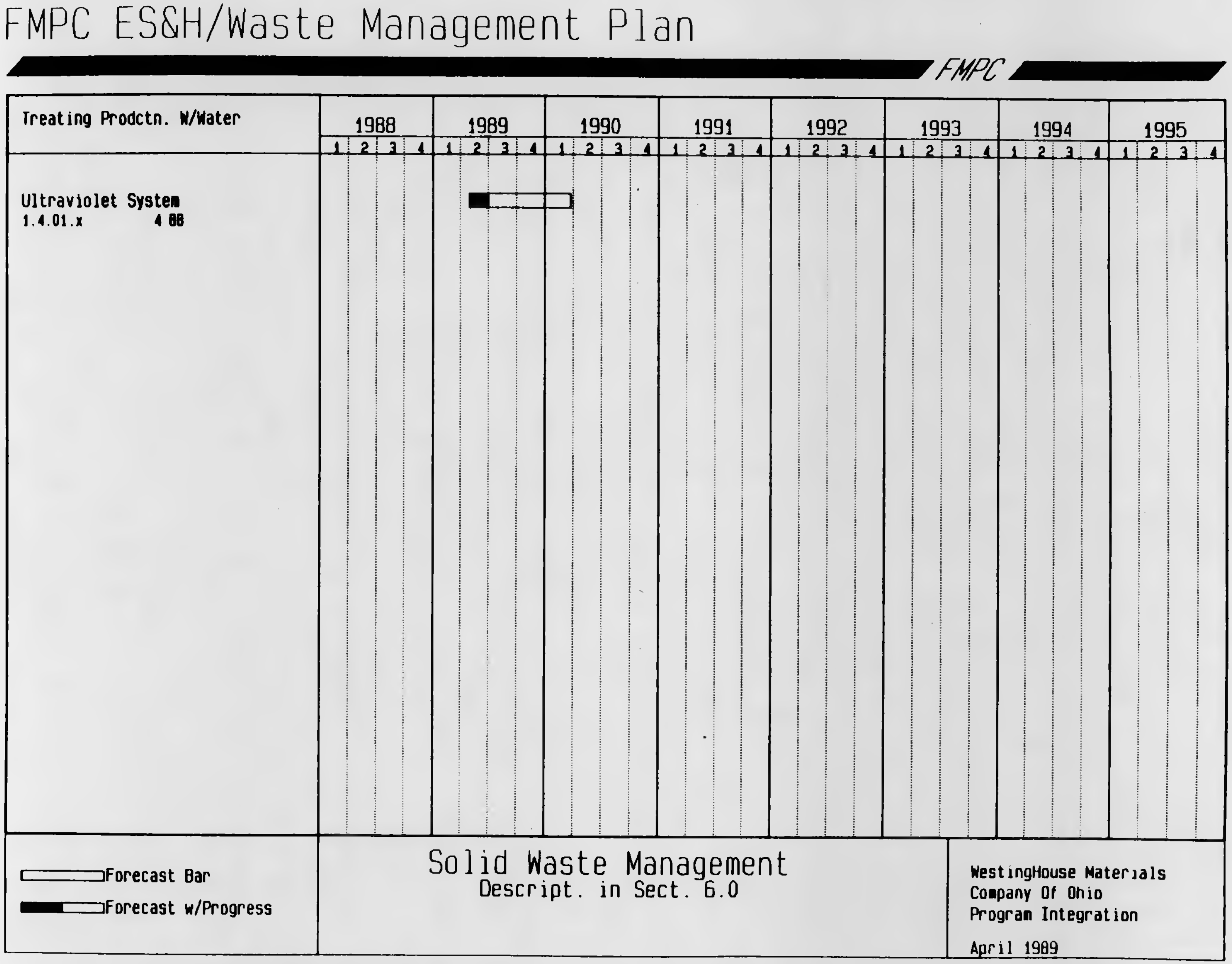

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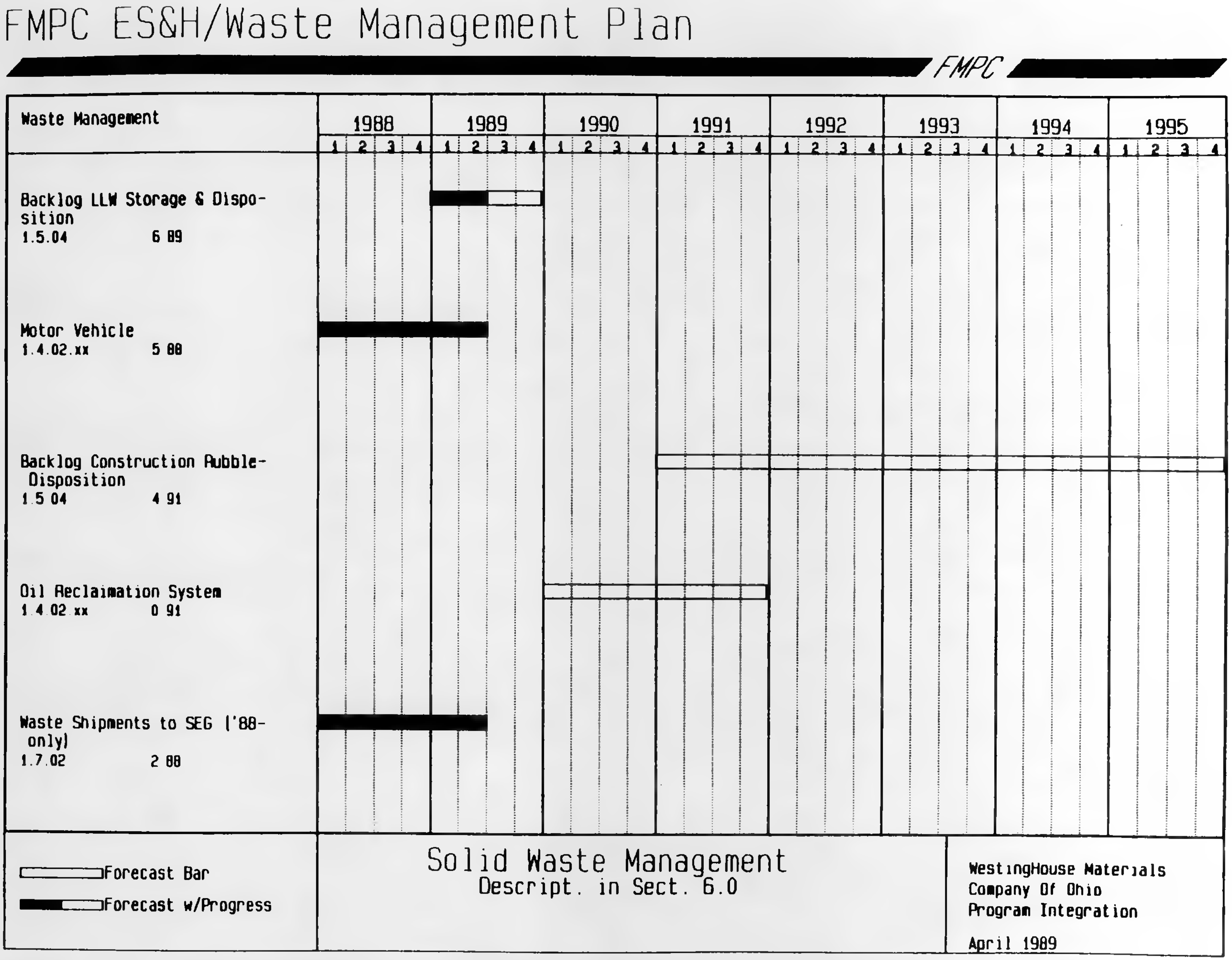

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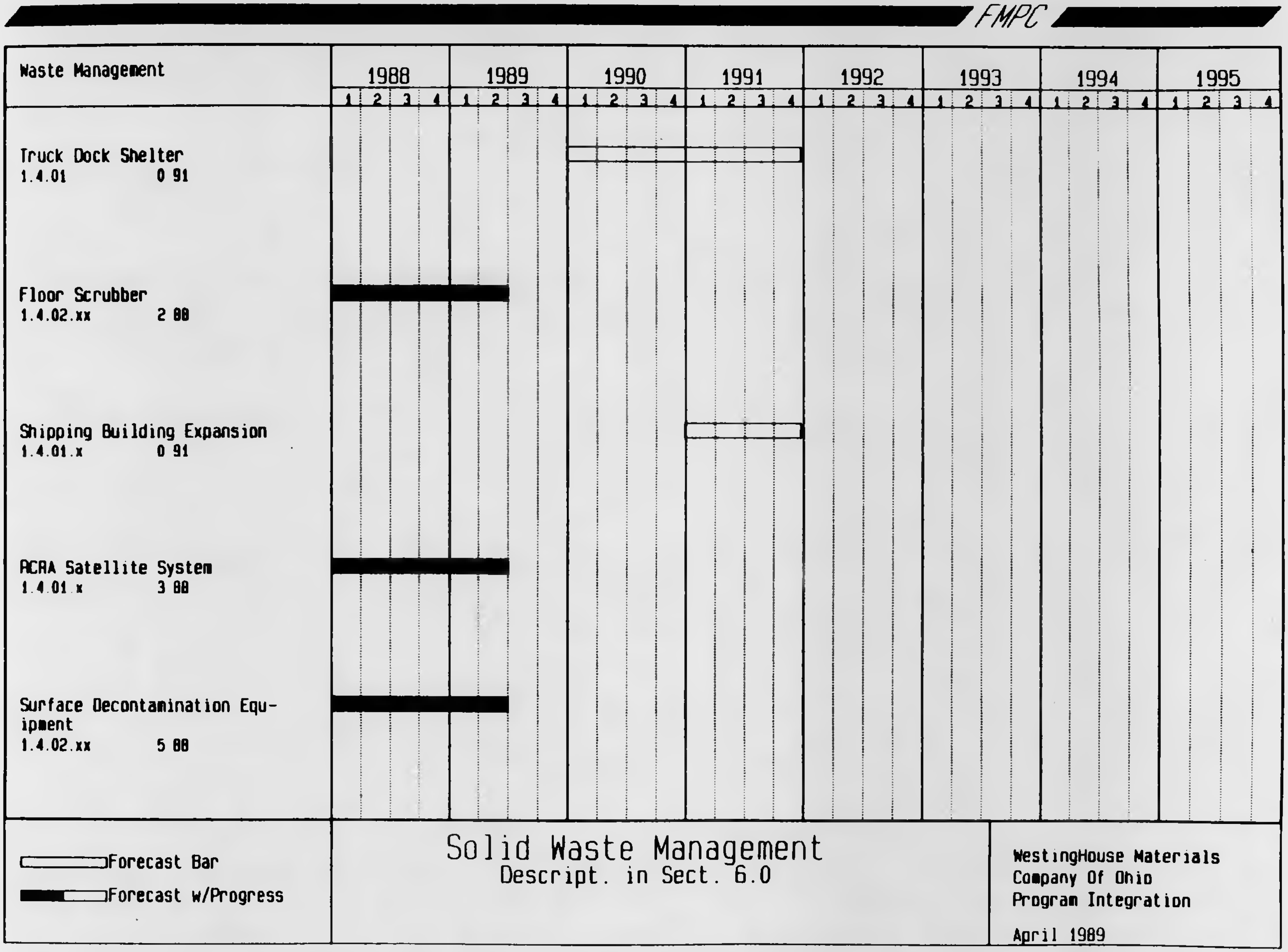
FMPC ES&H/Waste Management Plan



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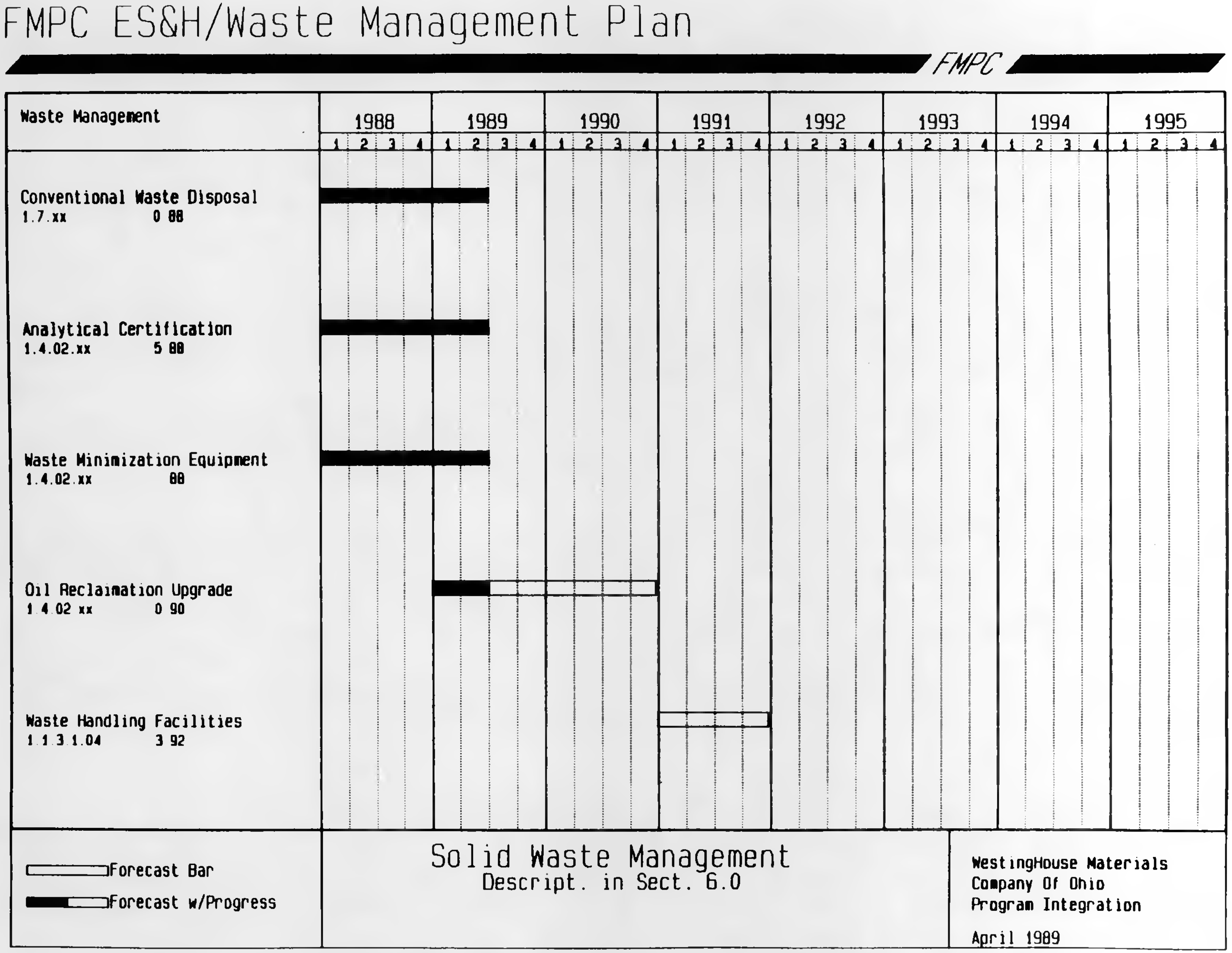

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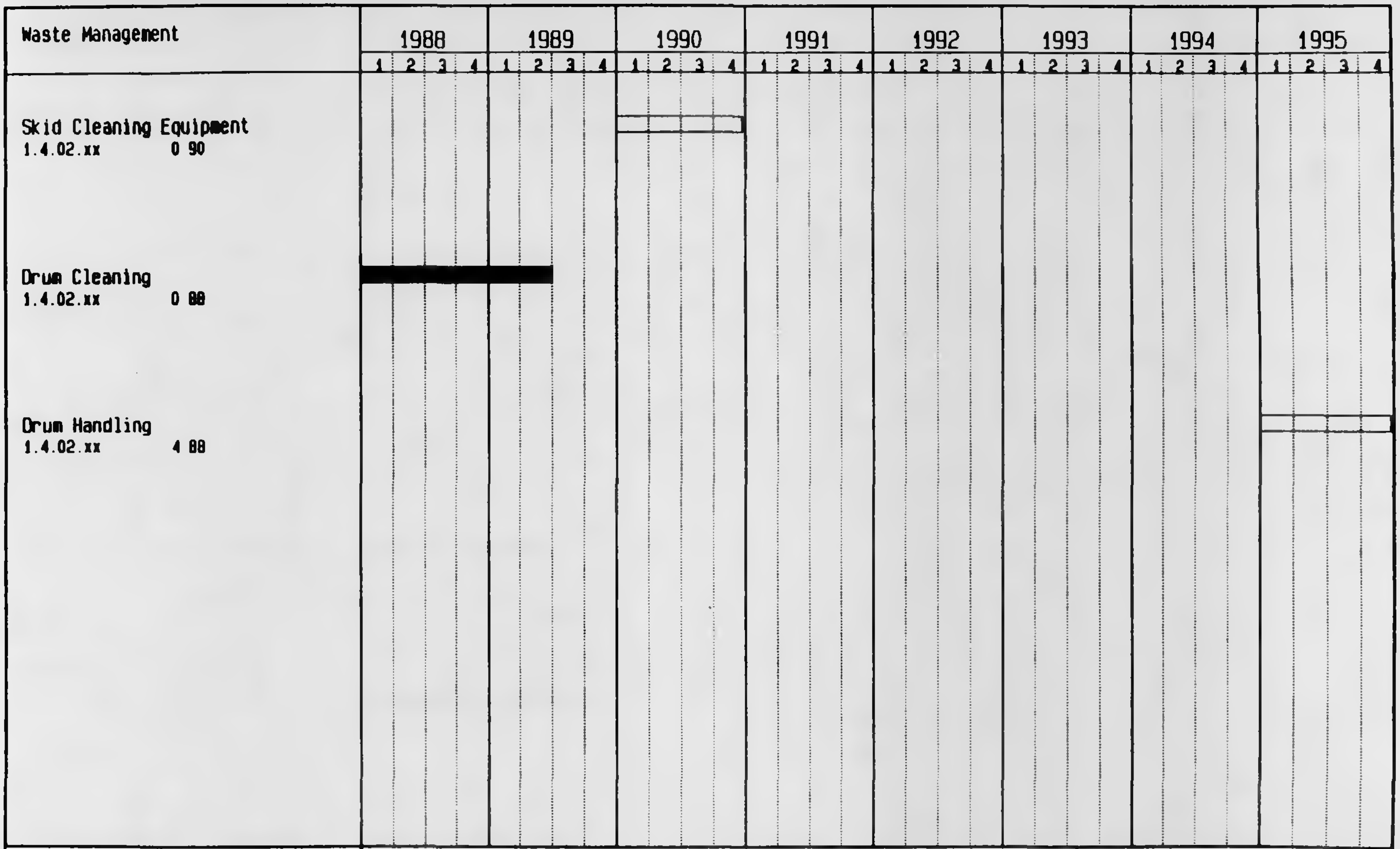
FMPC ES&H/Waste Management Plan

FMPC



Forecast Bar

Forecast w/Progress

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Figure 3-3 (Continued)

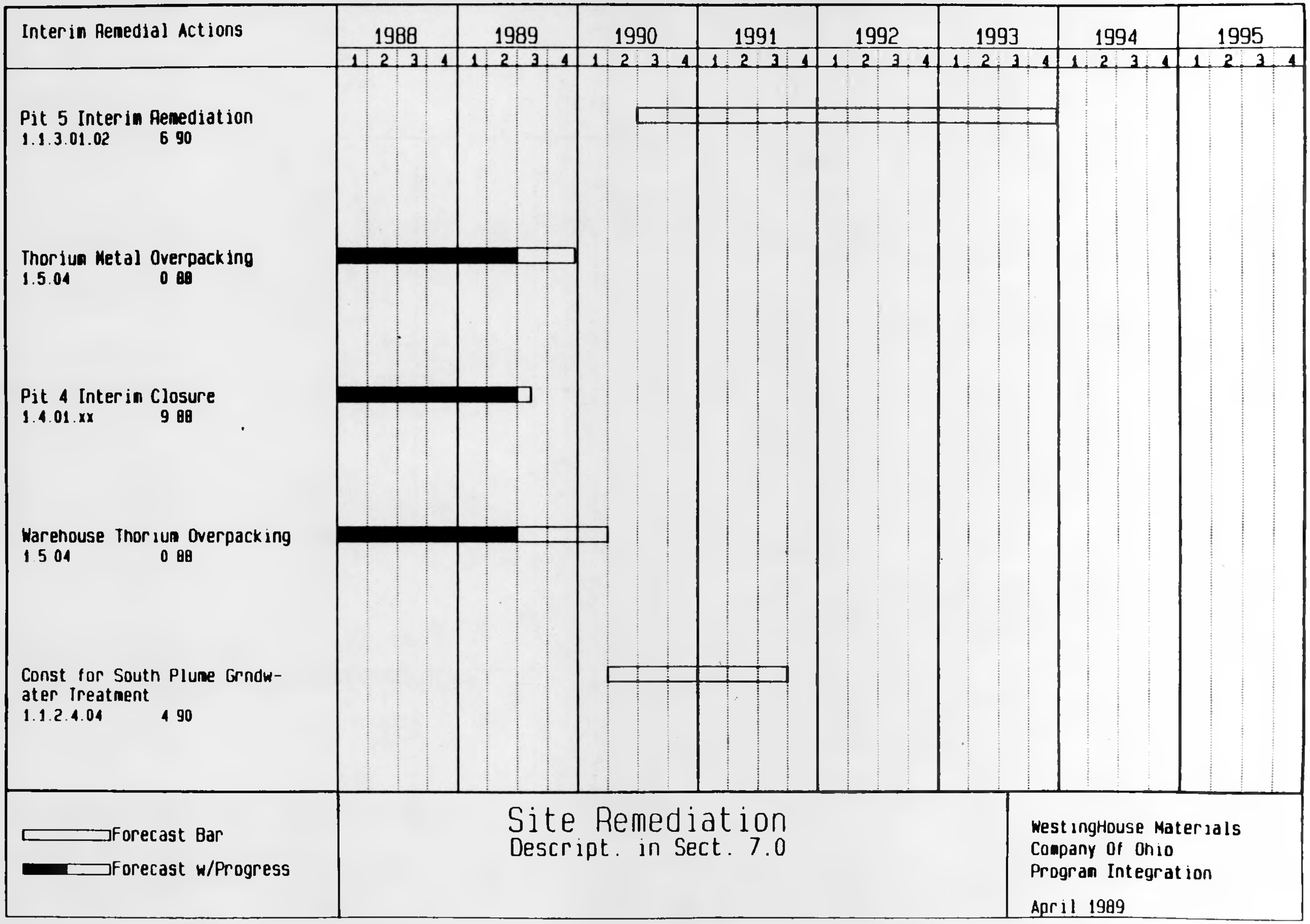
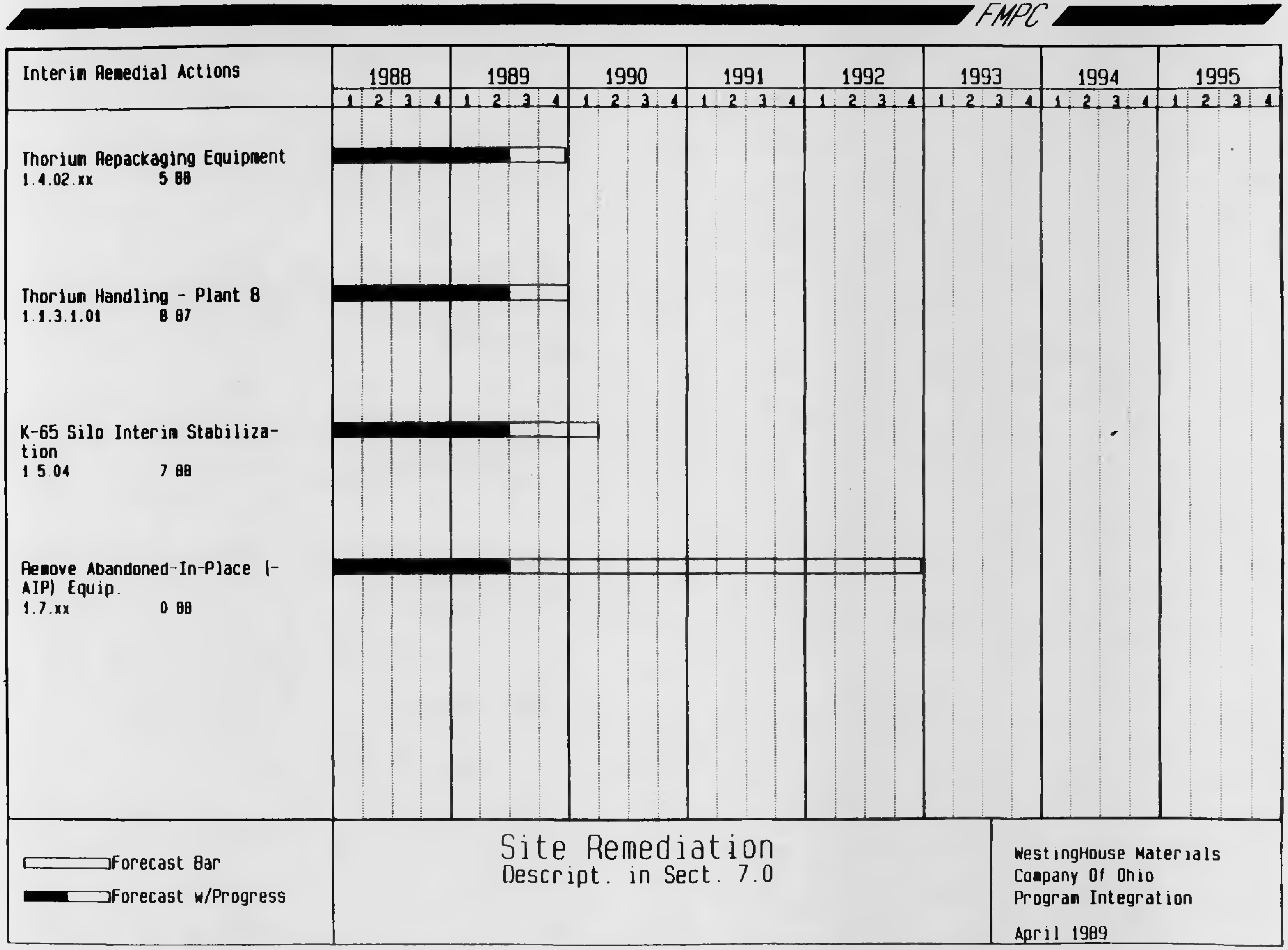


Figure 3-4 Site Remediation Project Schedules

FMPC ES&H/Waste Management Plan



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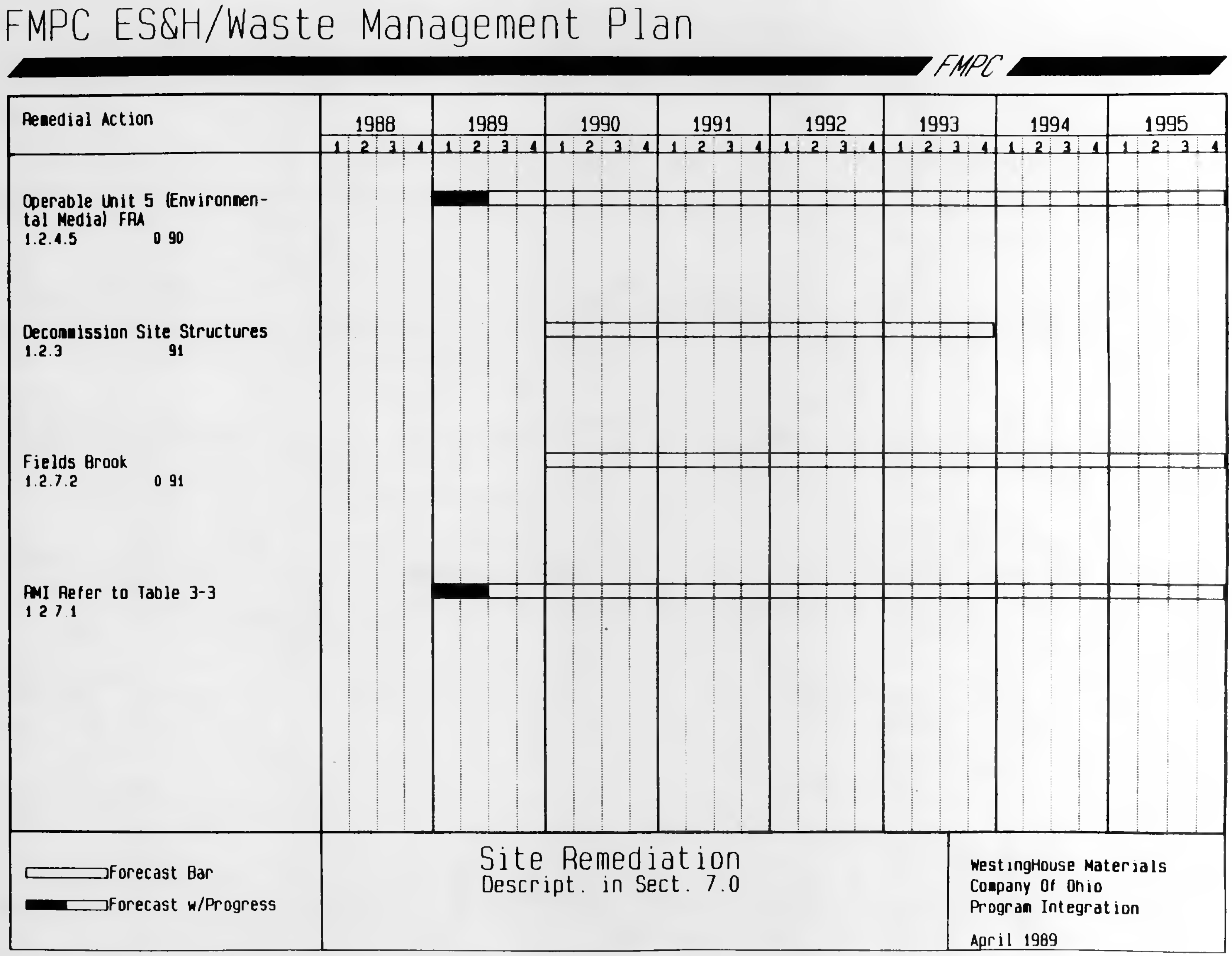

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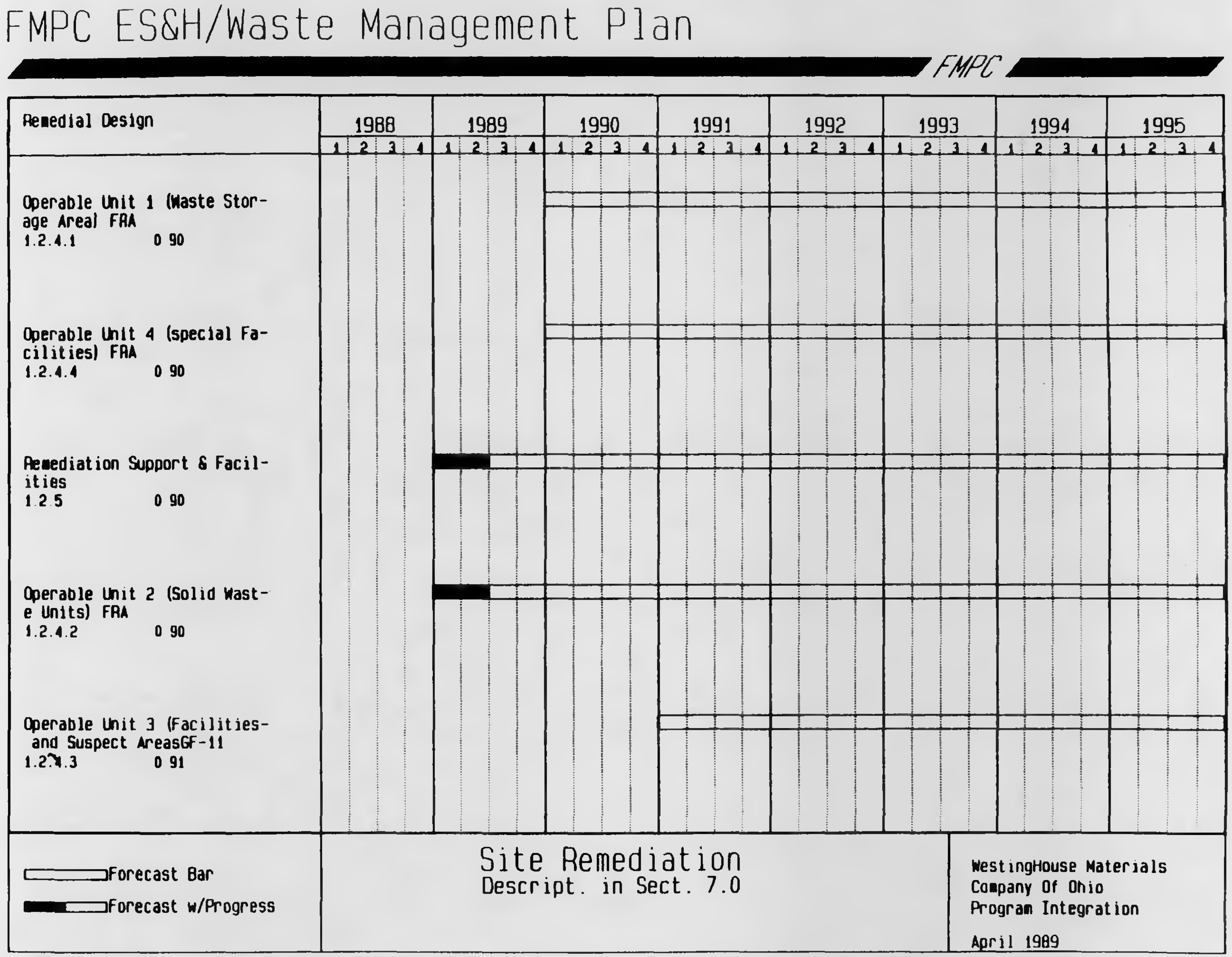

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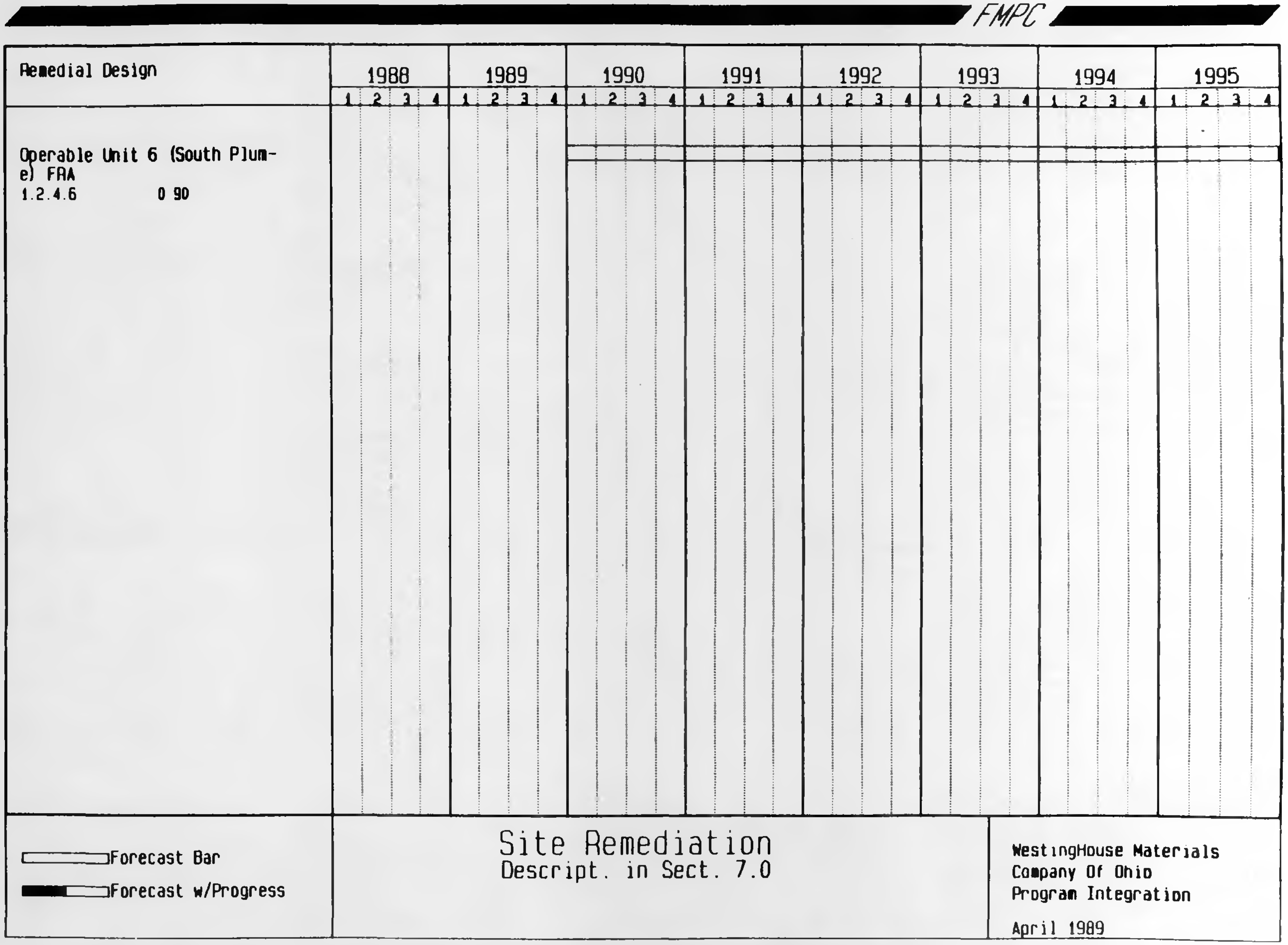
FMPC ES&H/Waste Management Plan



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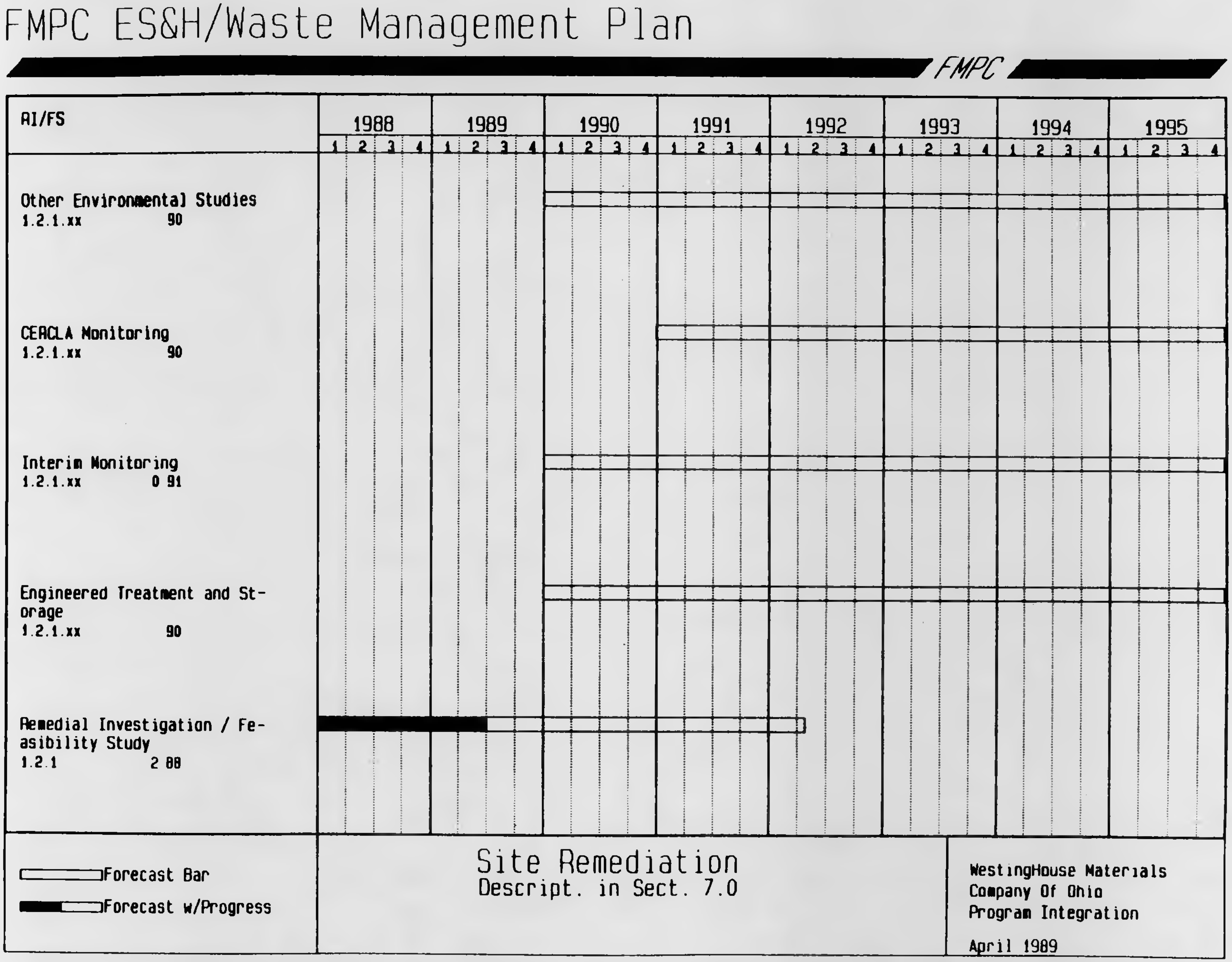

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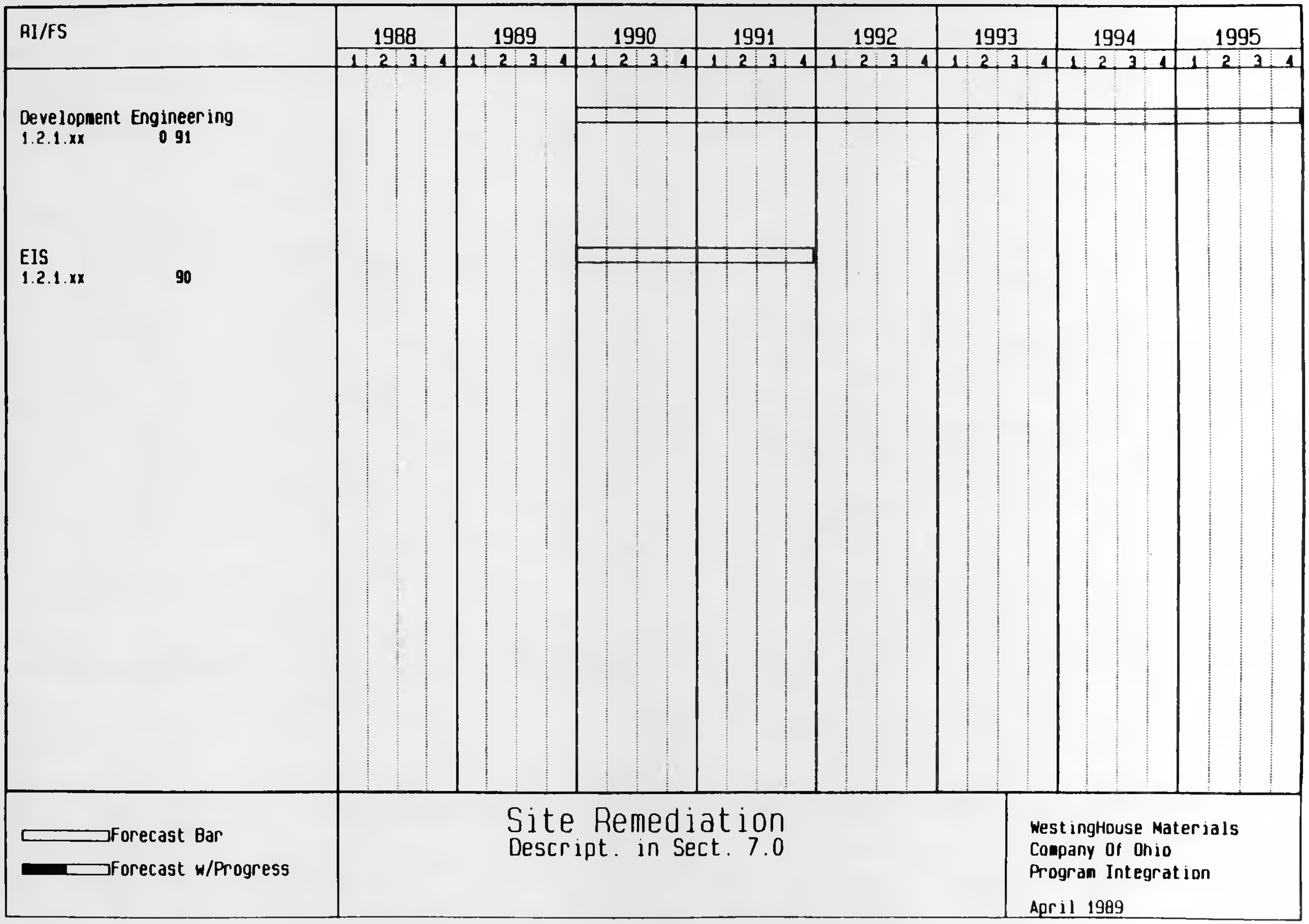
FMPC ES&H/Waste Management Plan



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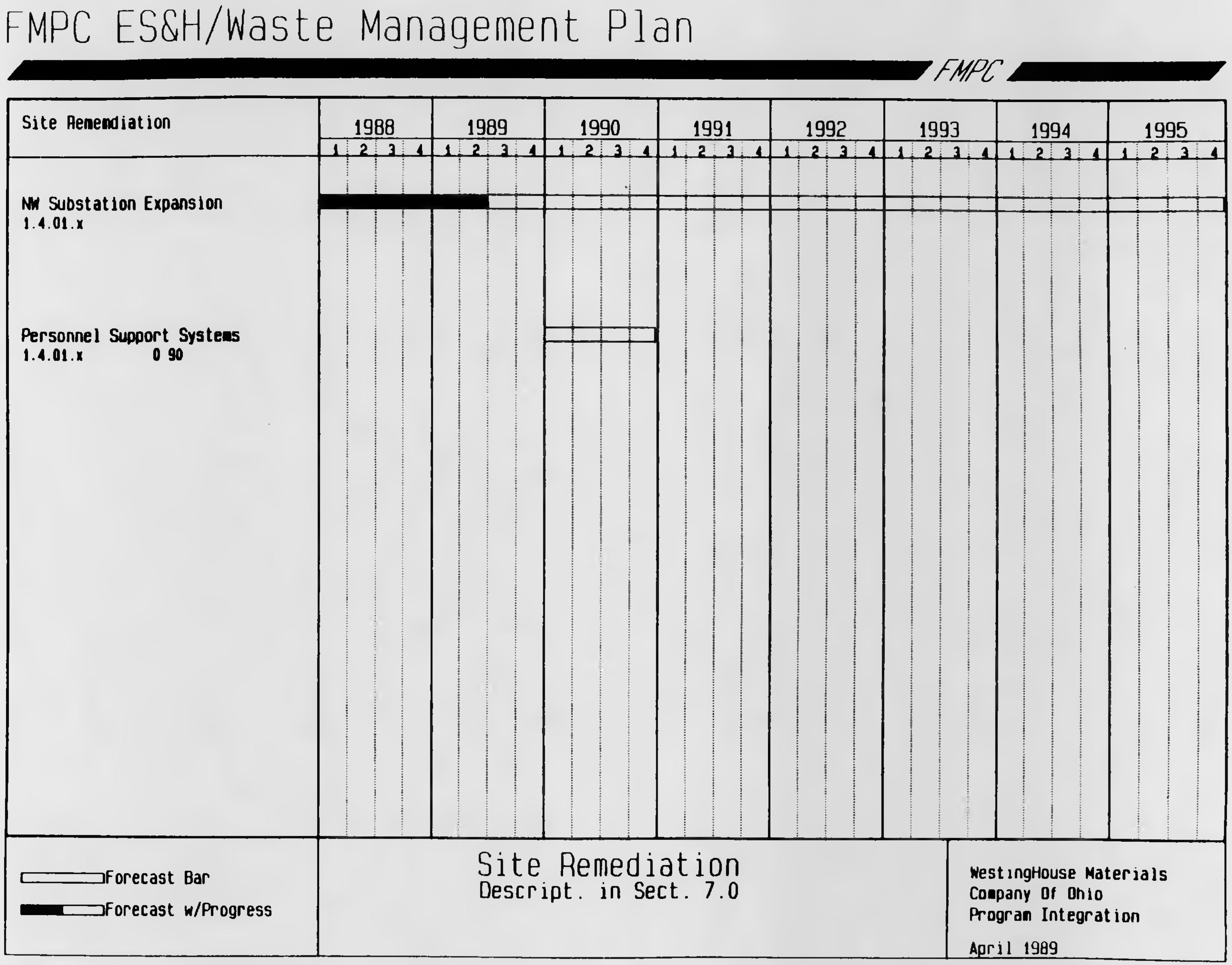


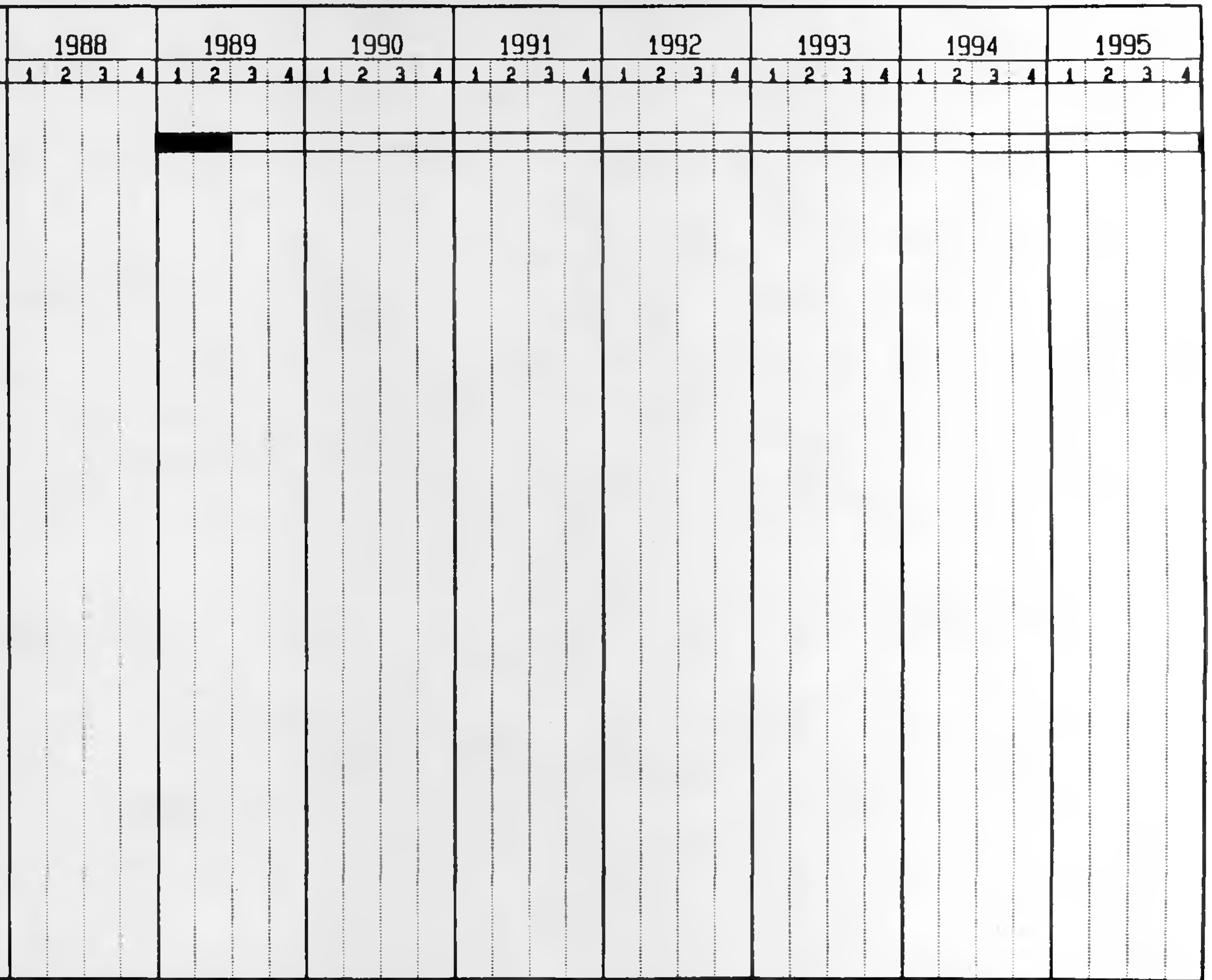
Figure 3-4 (Continued)

FMPC ES&H/Waste Management Plan

FMPC

Water Pollution Control

Plant 6 Perched Goundwater - Pumping (IRA)
1.2.2.3 0 89



Forecast Bar

Forecast w/Progress

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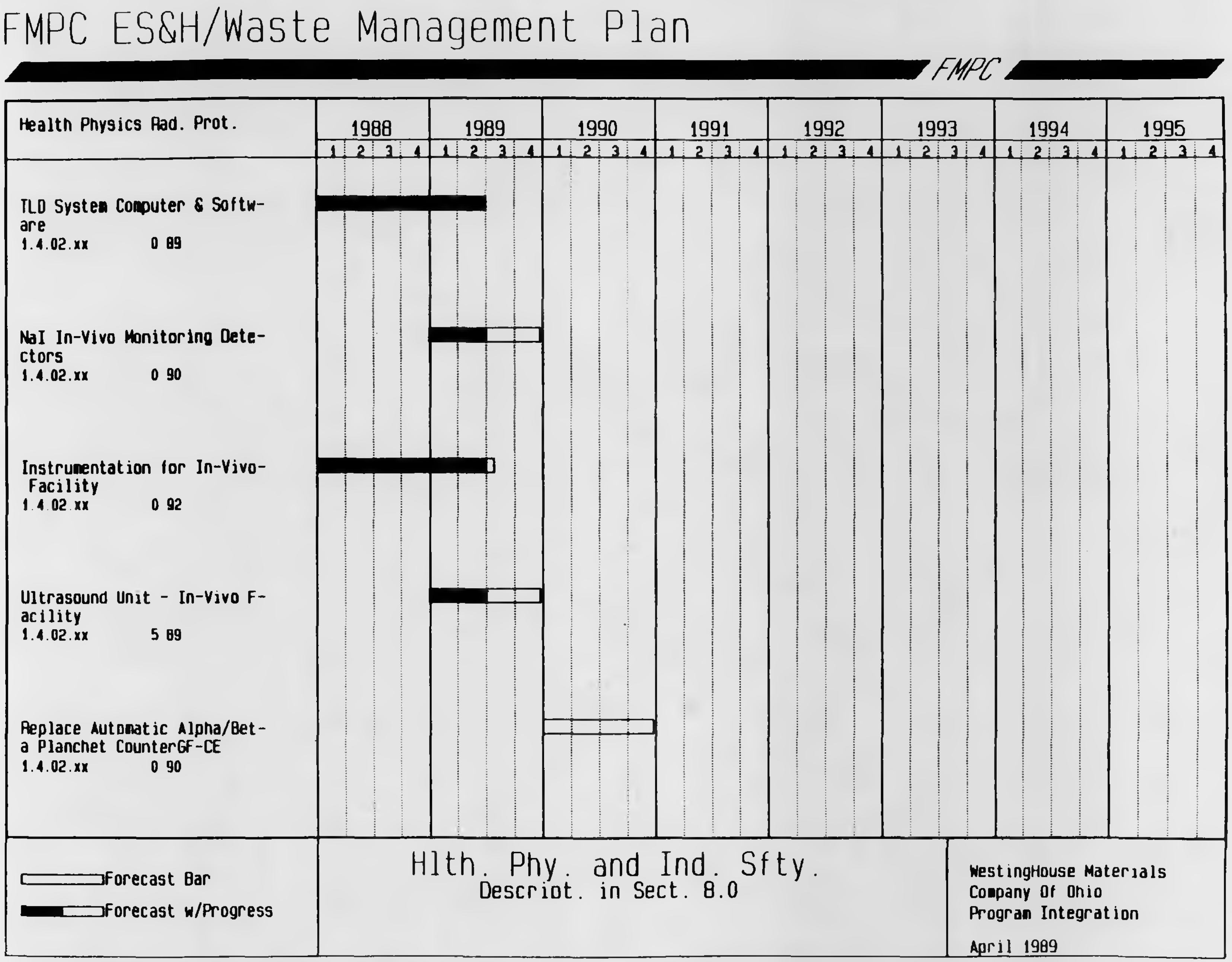


Figure 3-5 Health Physics and Industrial Safety Project Schedules

FMPC ES&H/Waste Management Plan

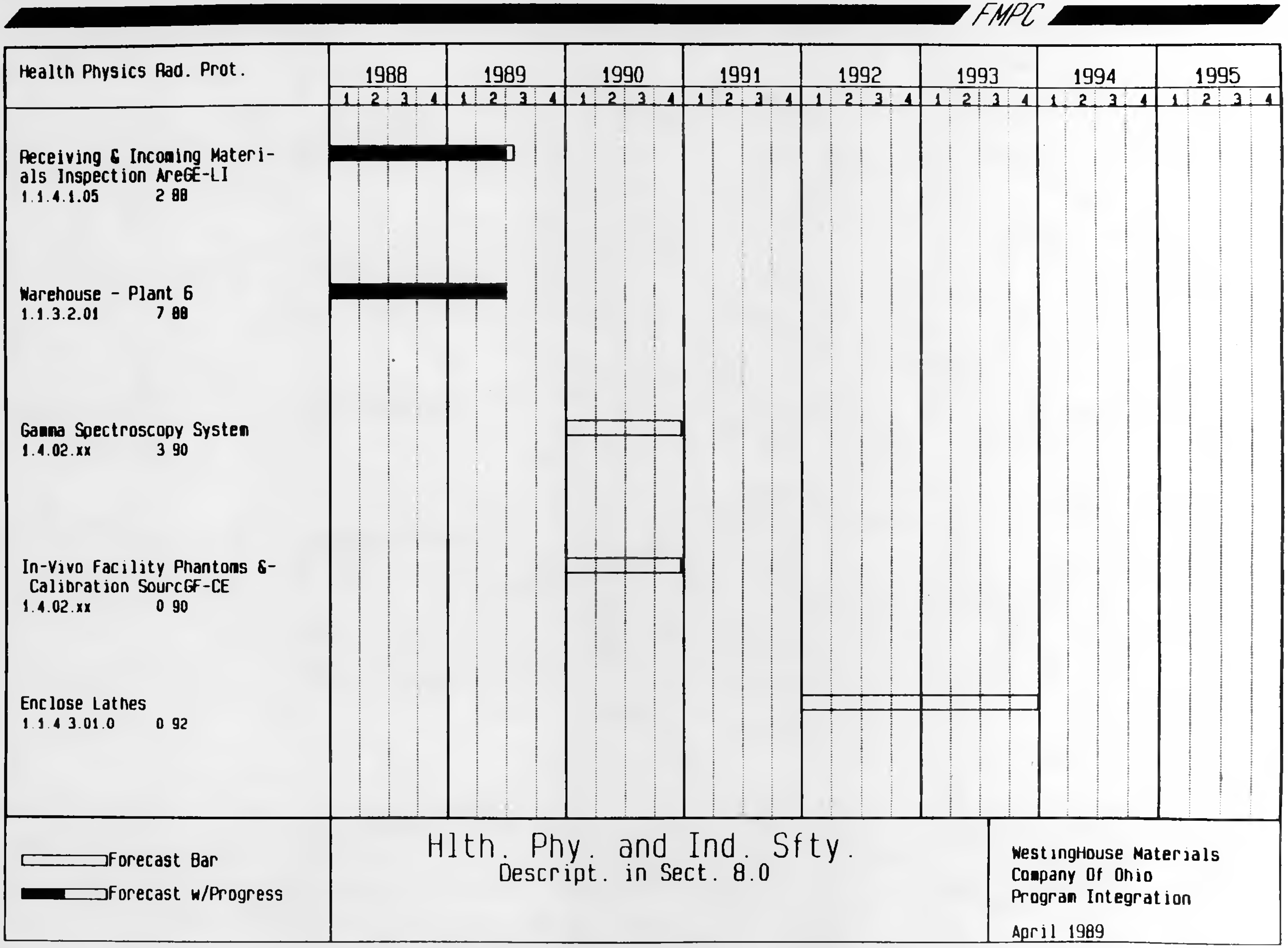
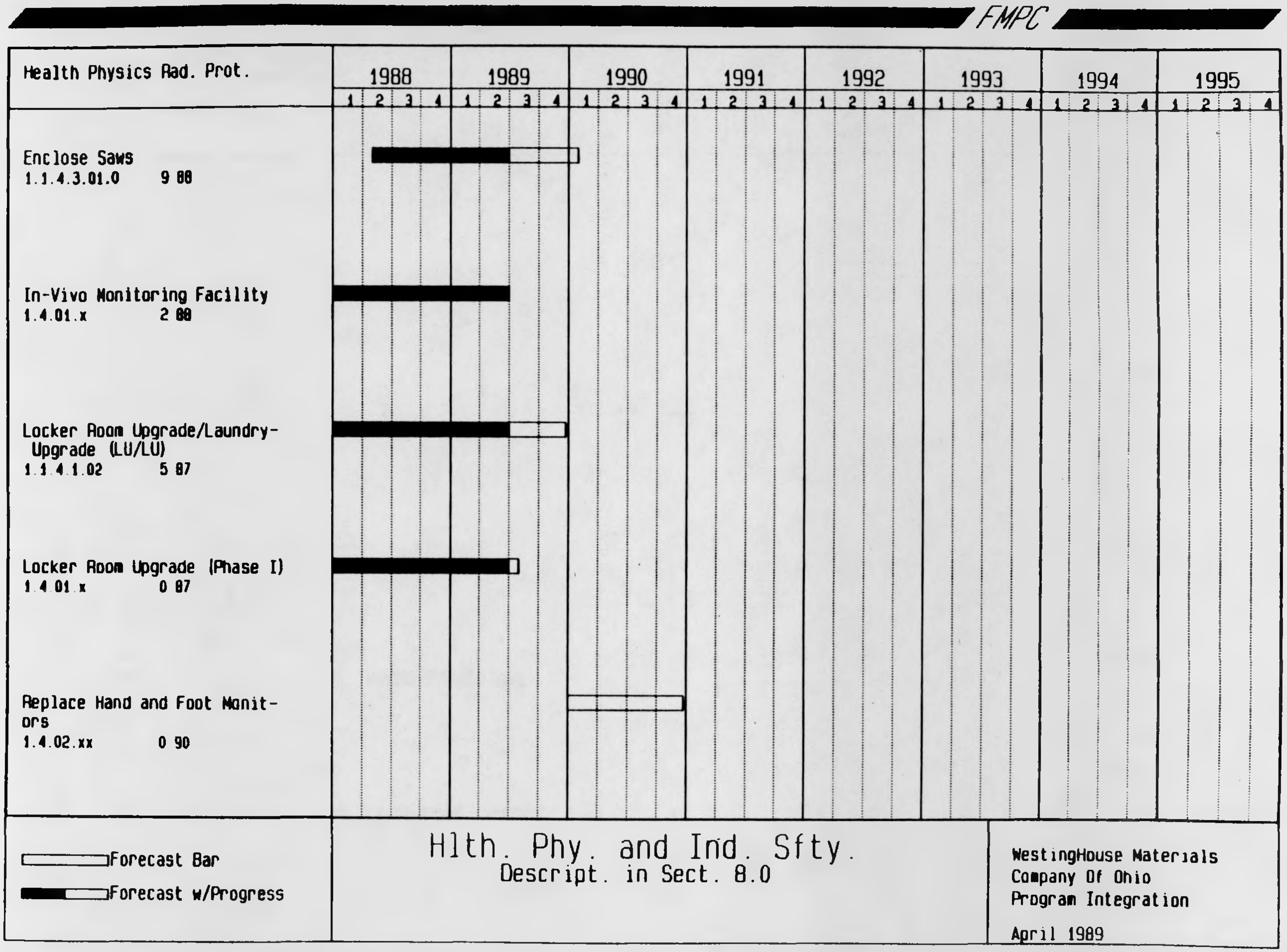


Figure 3-5 (Continued)

FMPC ES&H/Waste Management Plan



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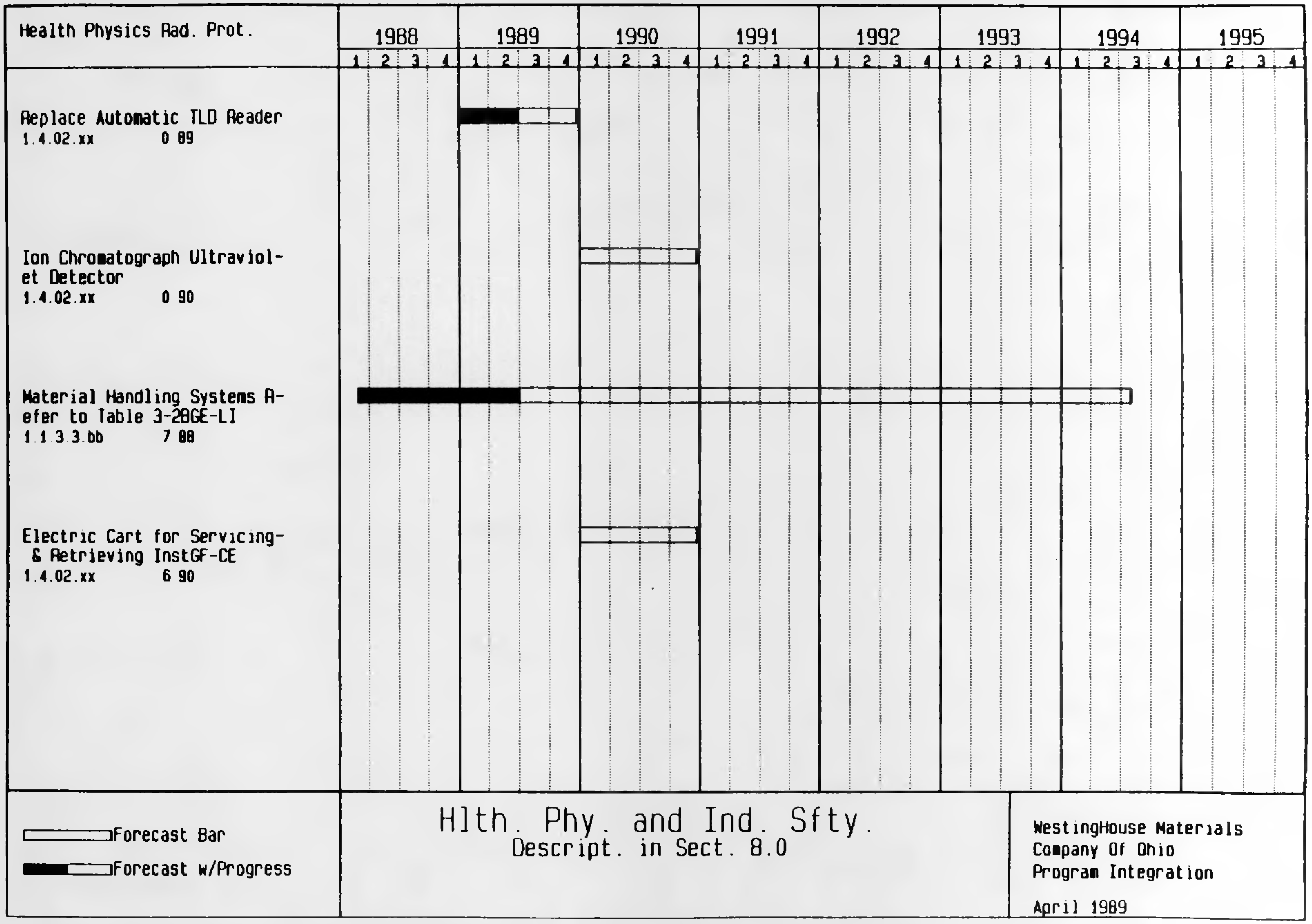
FMPC ES&H/Waste Management Plan

FMPC



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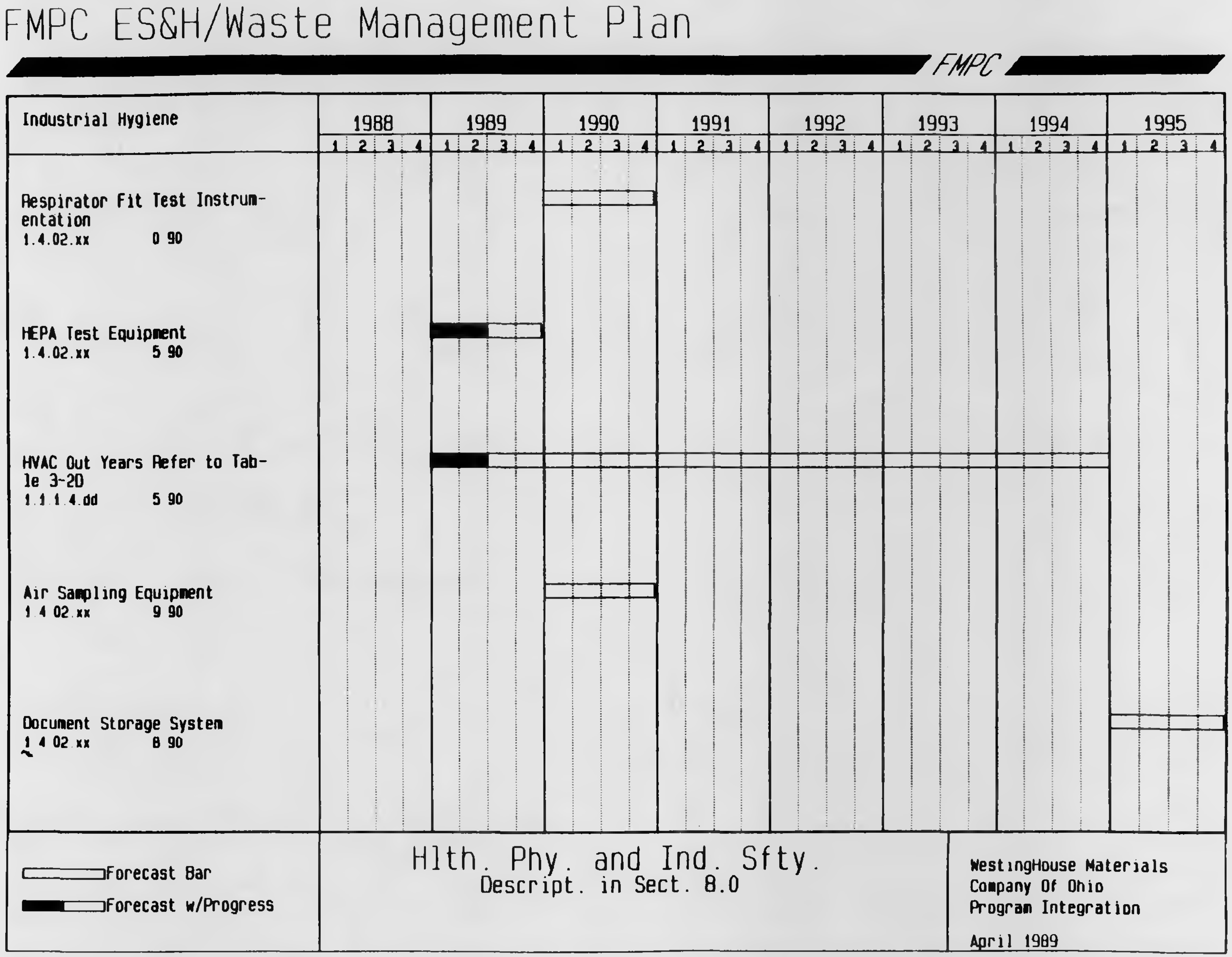

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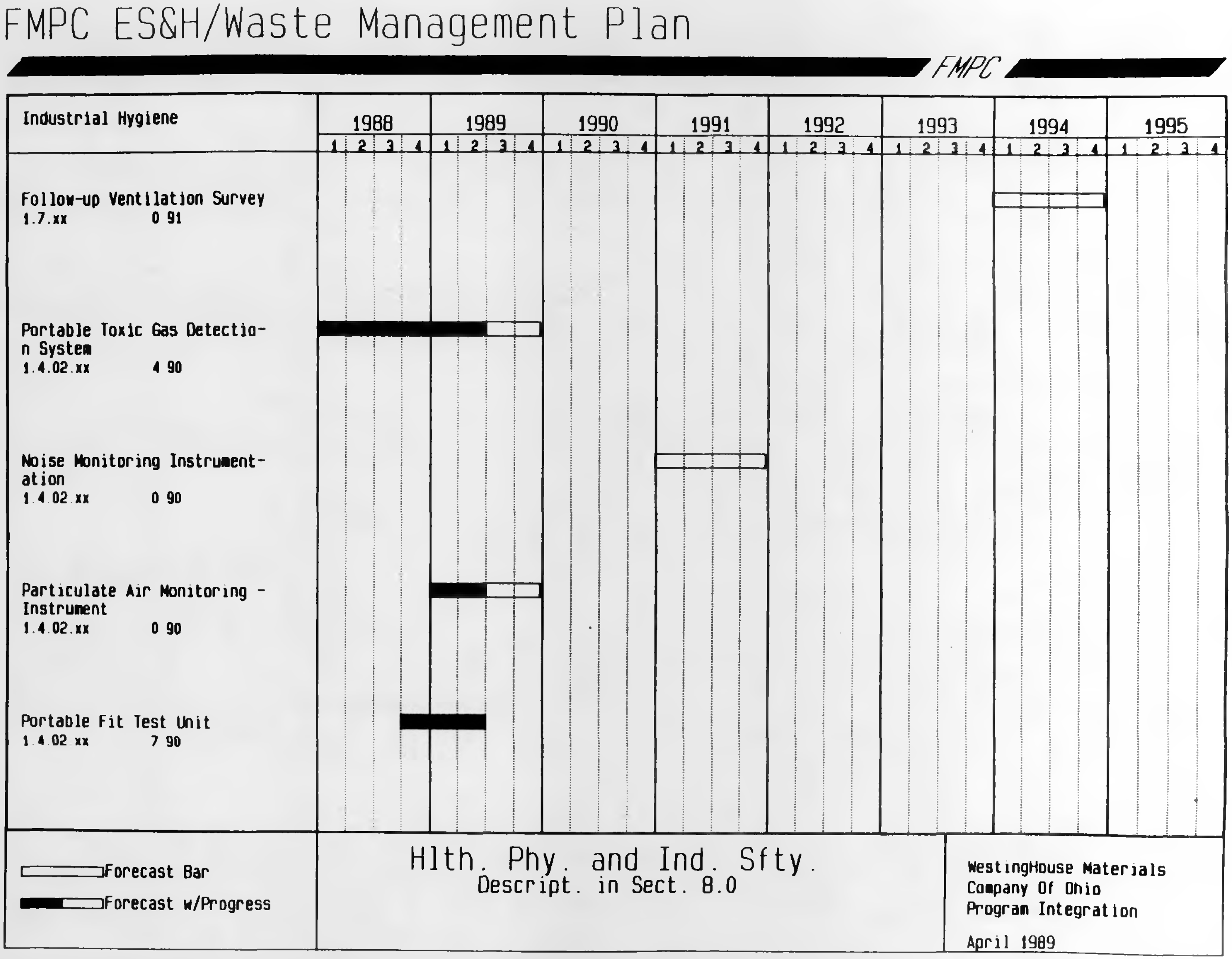

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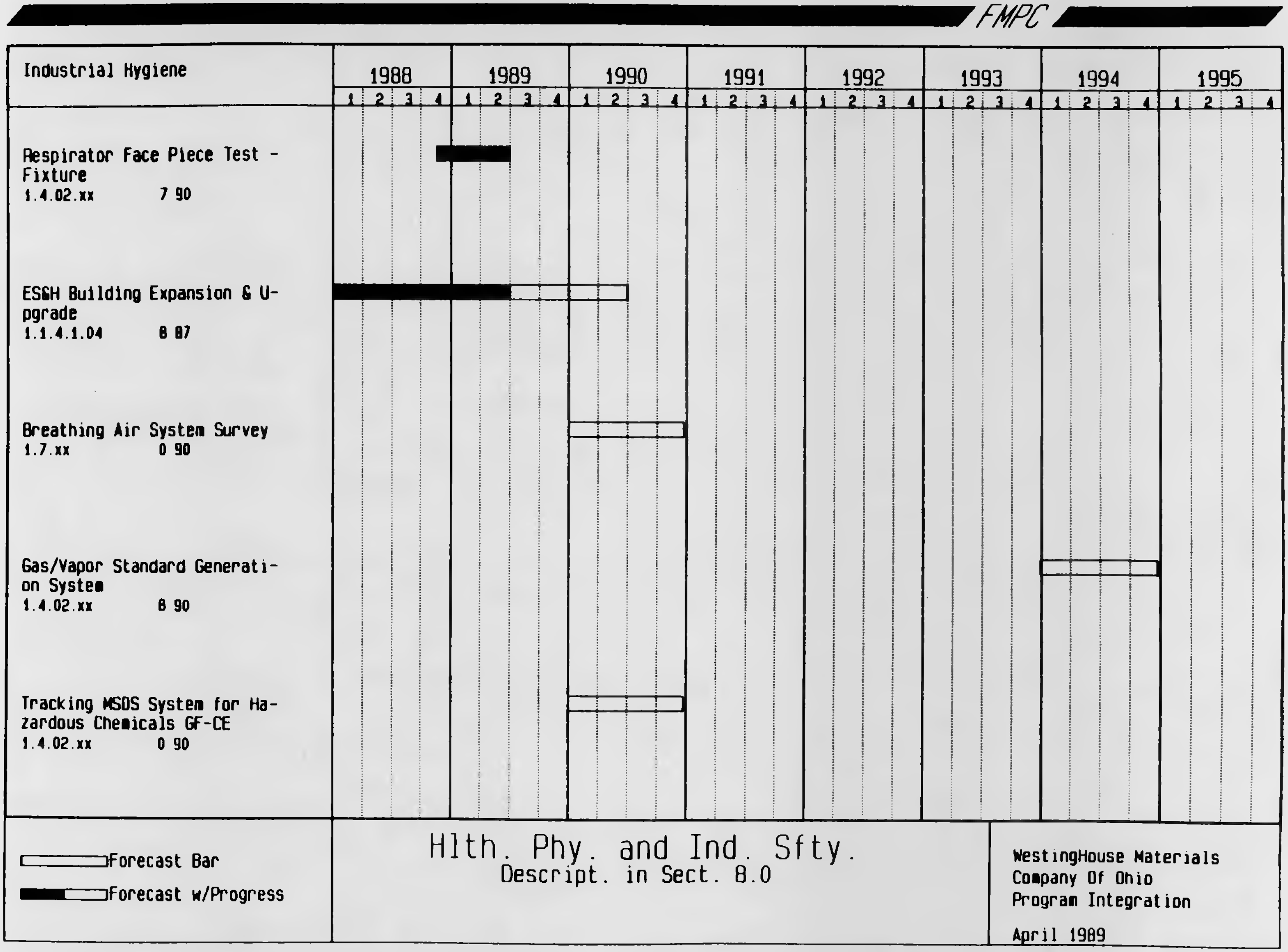
FMPC ES&H/Waste Management Plan



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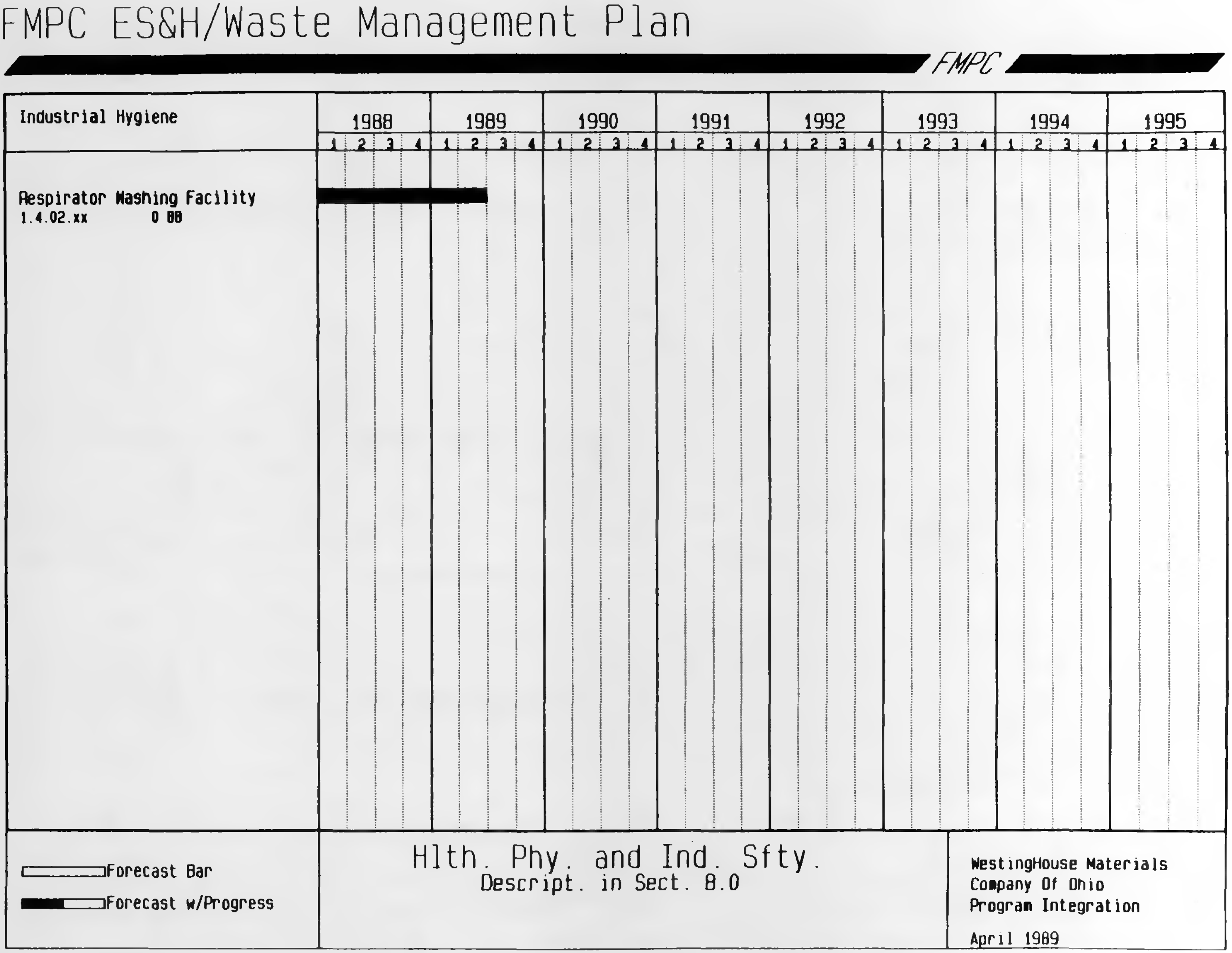

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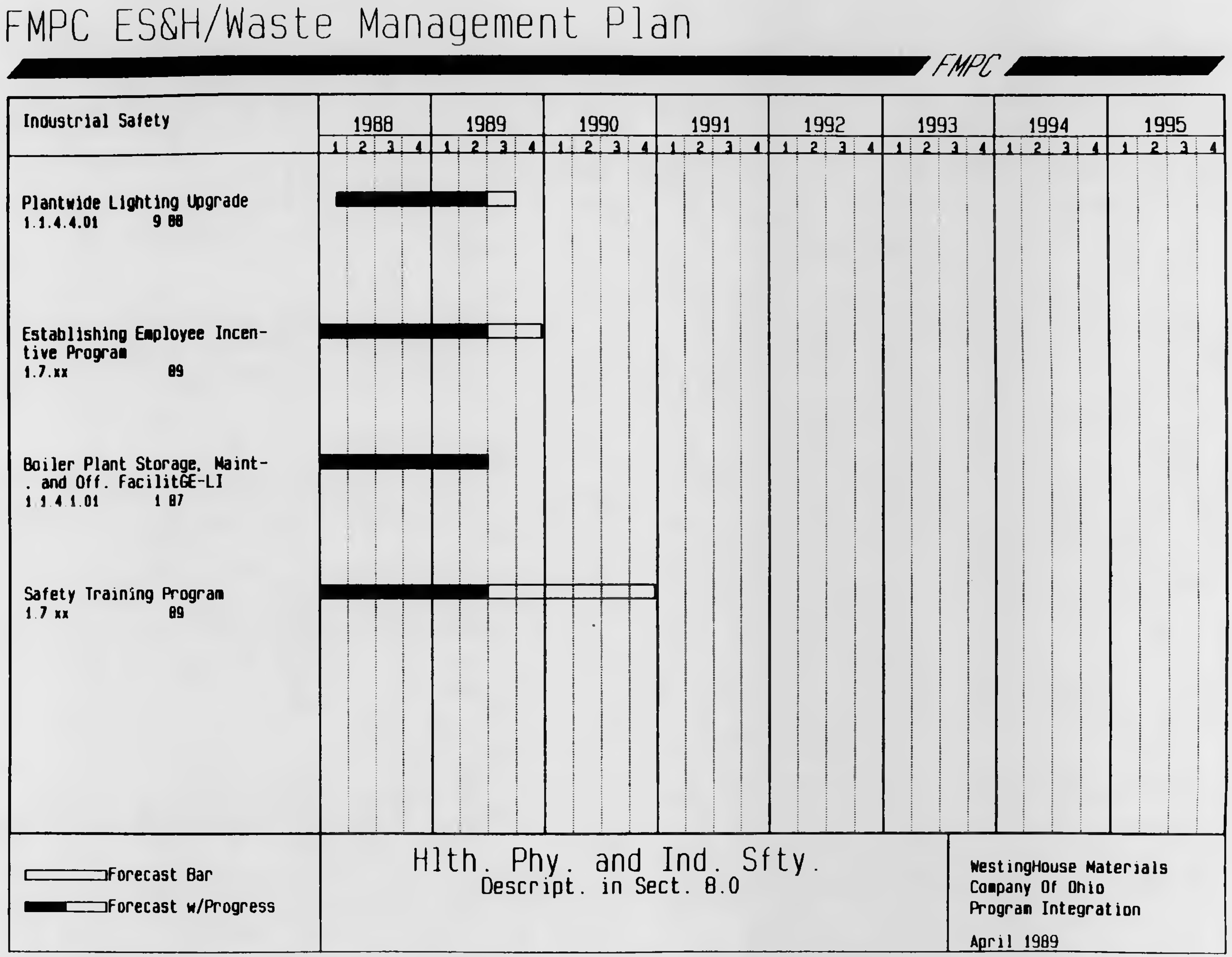

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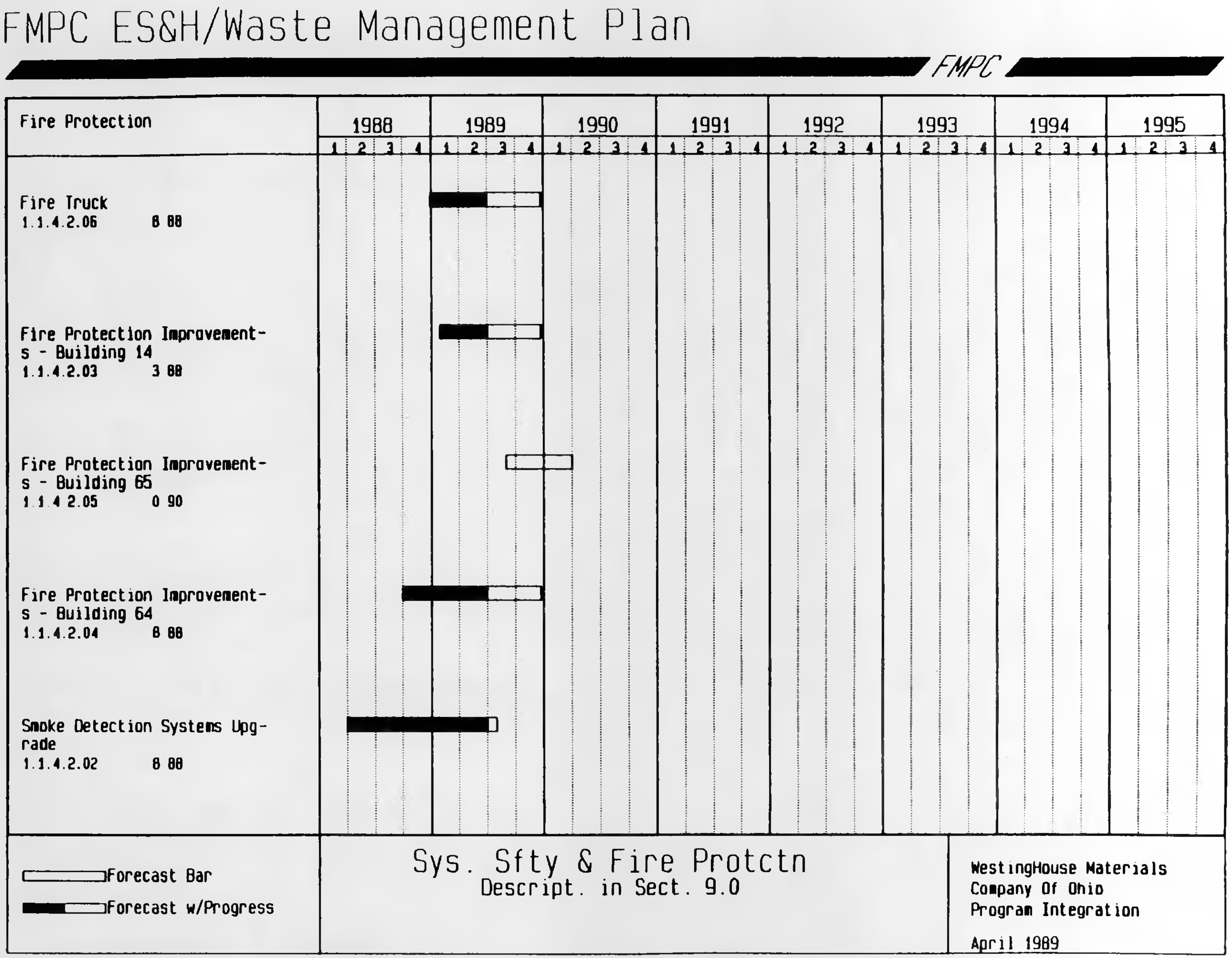
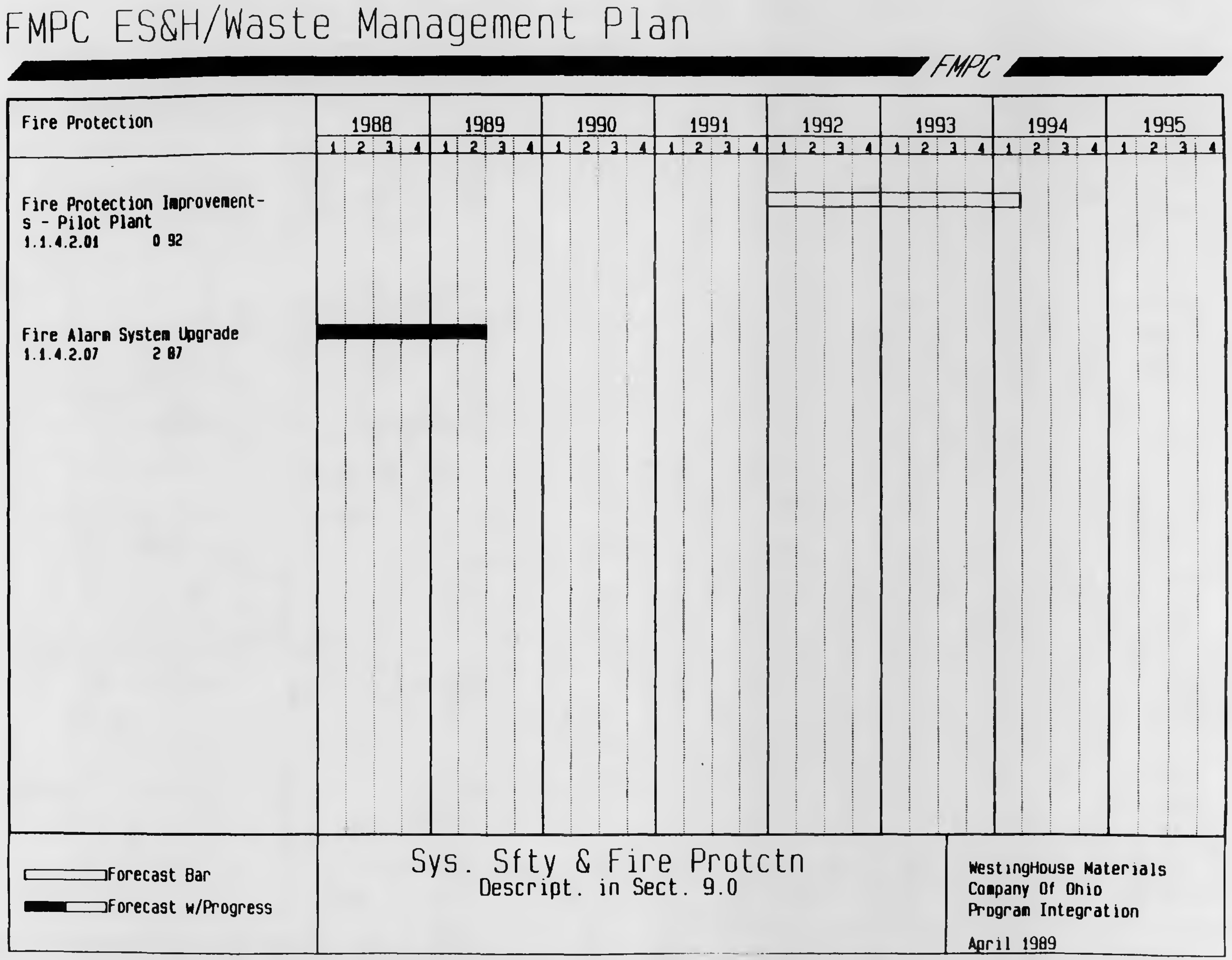


Figure 3-6 Safety and Fire Protection Project Schedules



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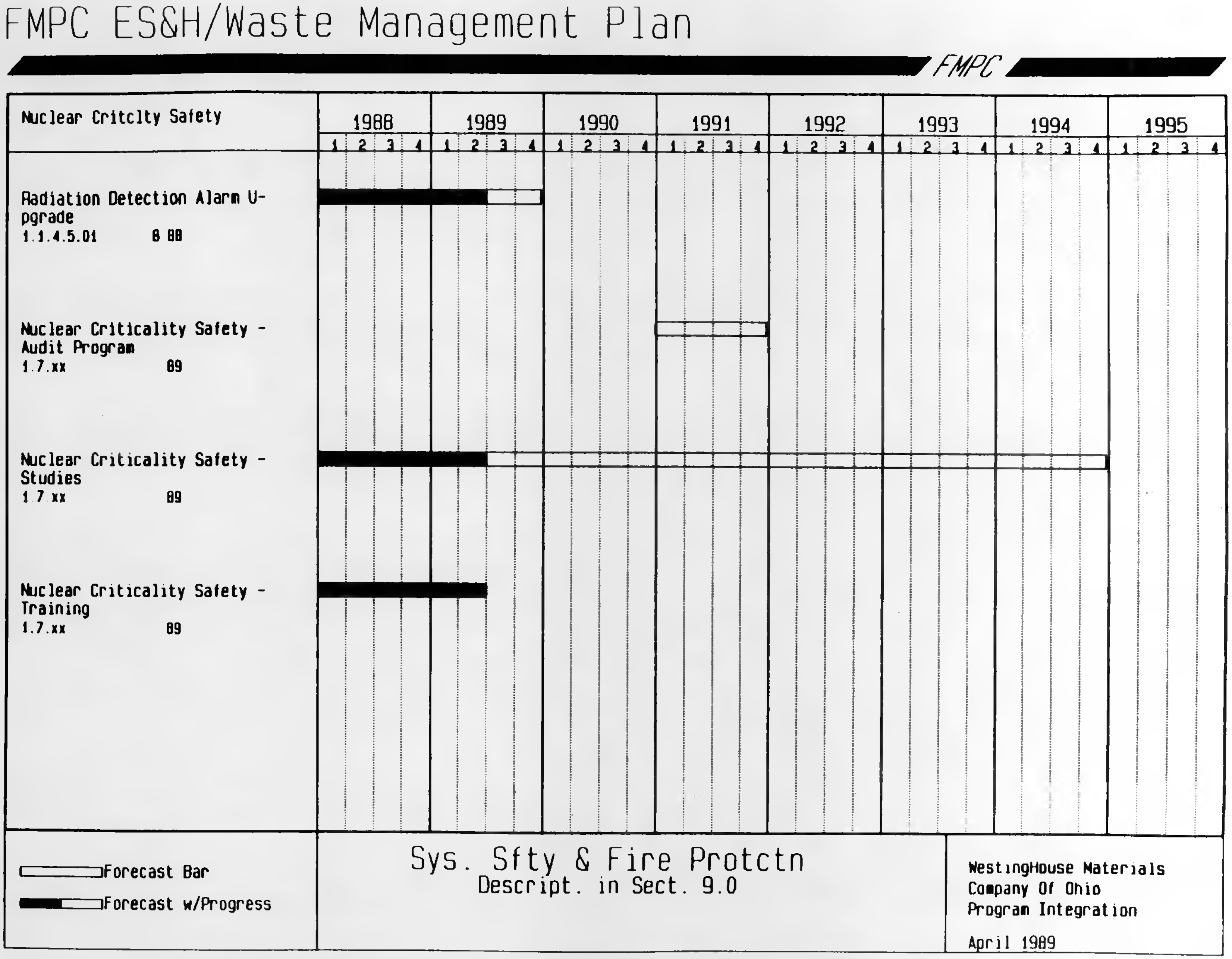

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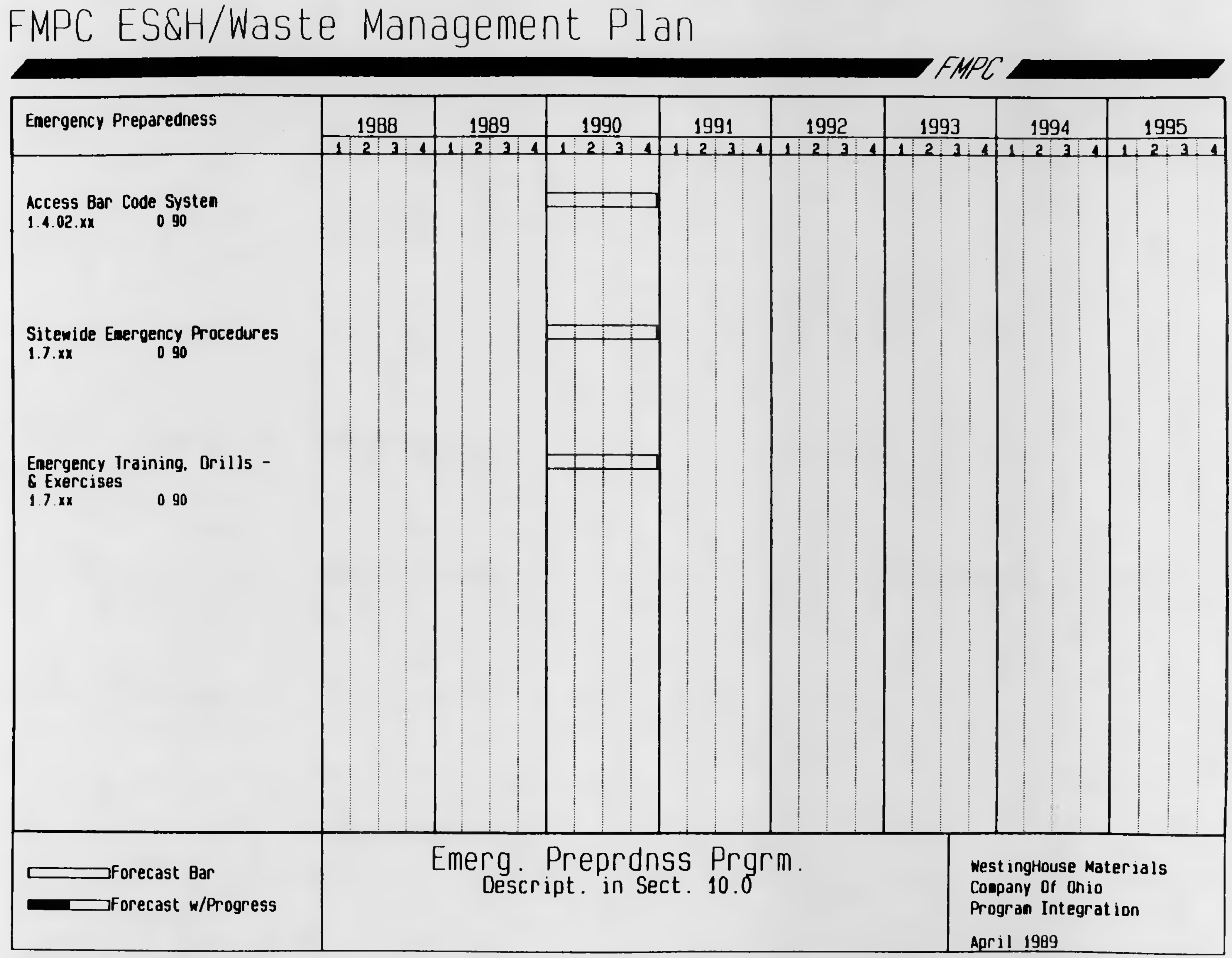
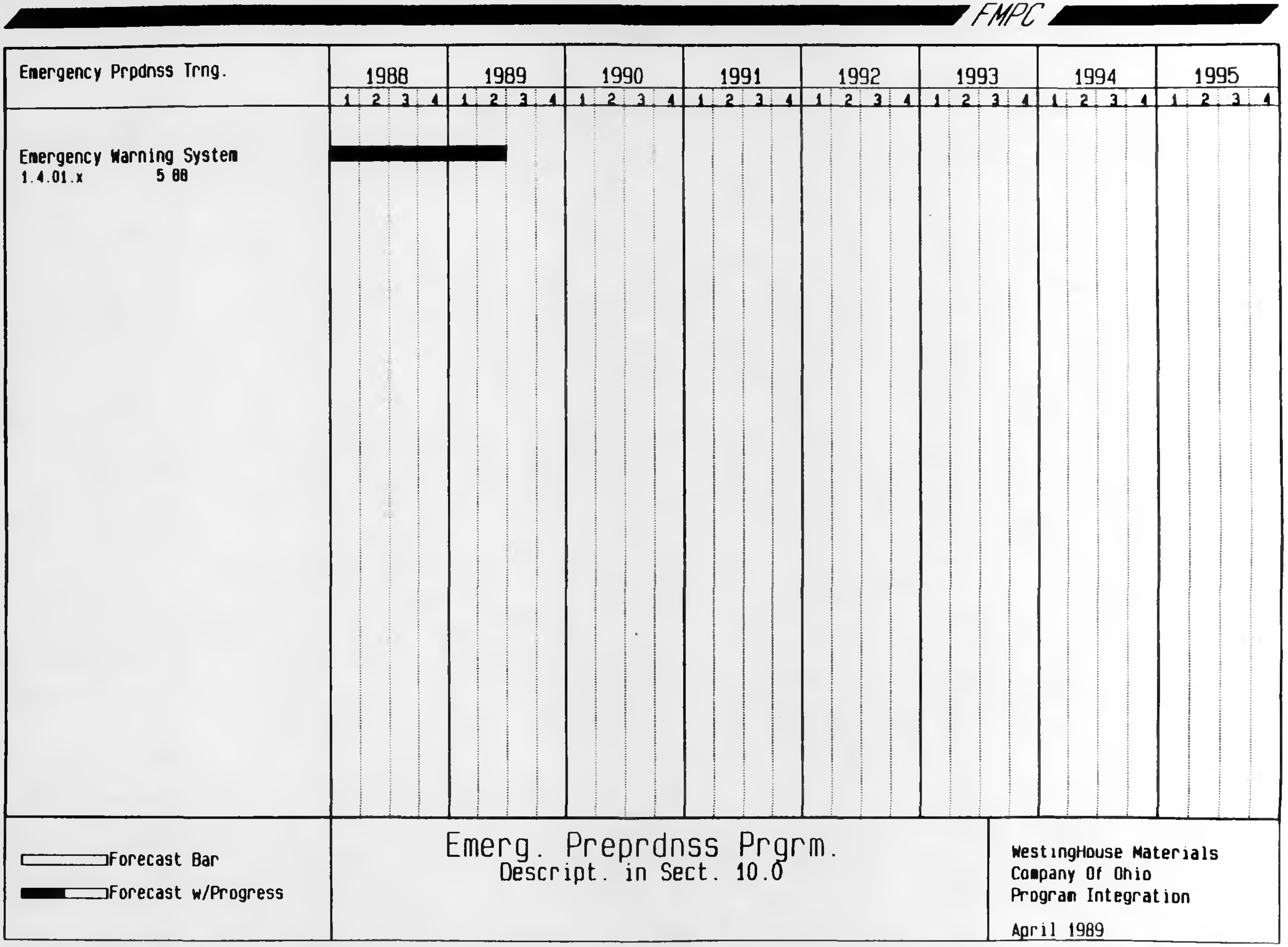


Figure 3-7 Emergency Preparedness Project Schedules

FMPC ES&H/Waste Management Plan



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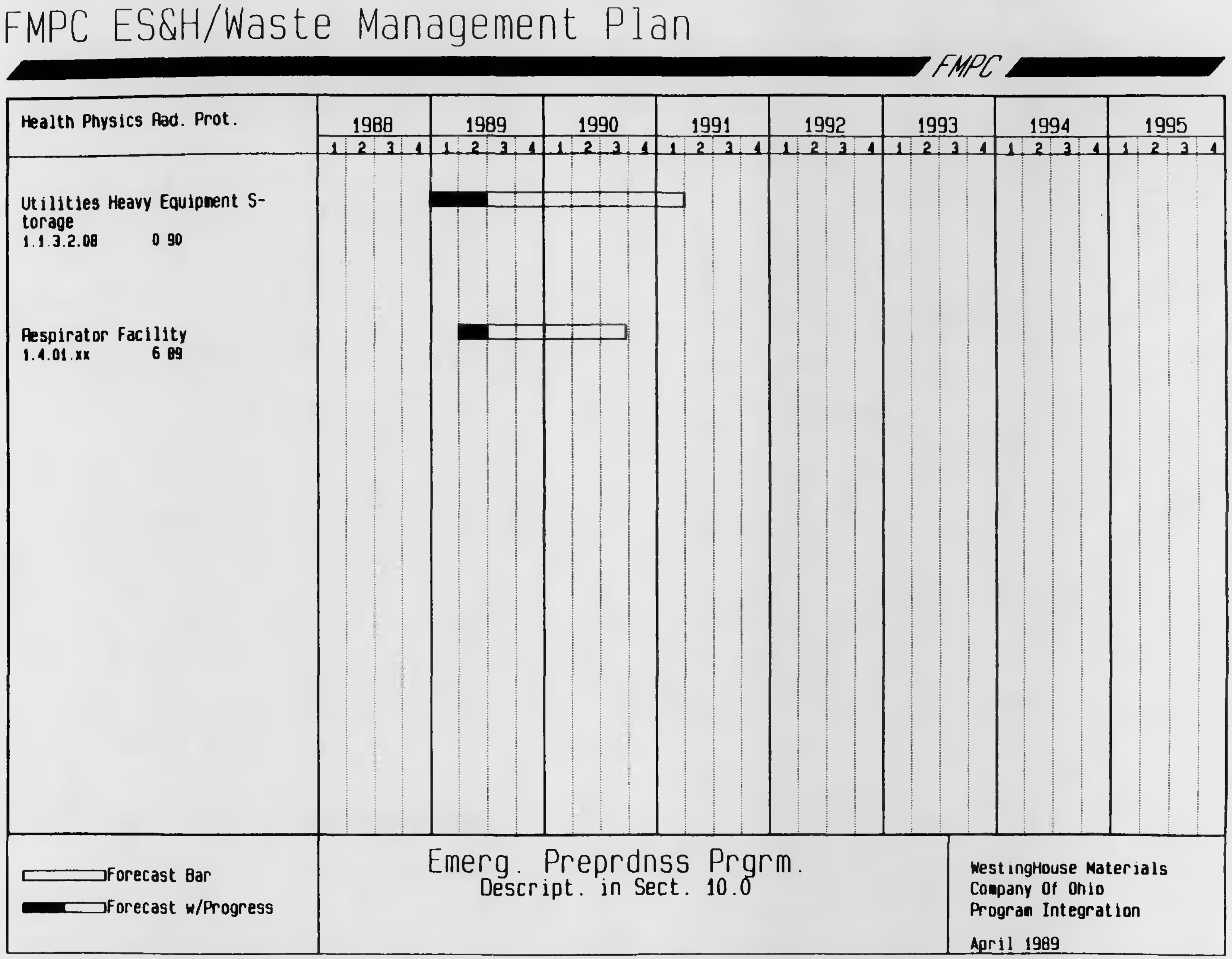

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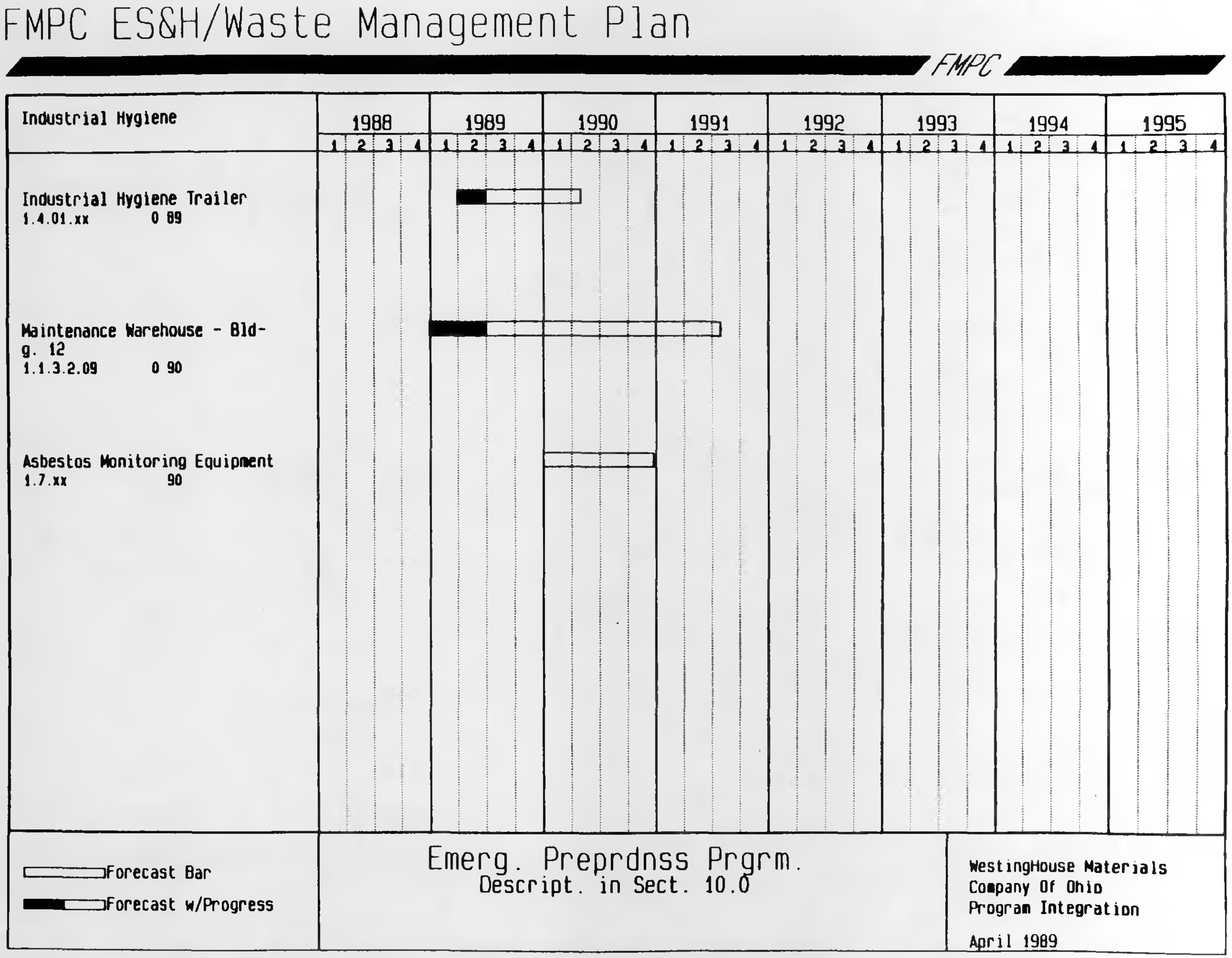

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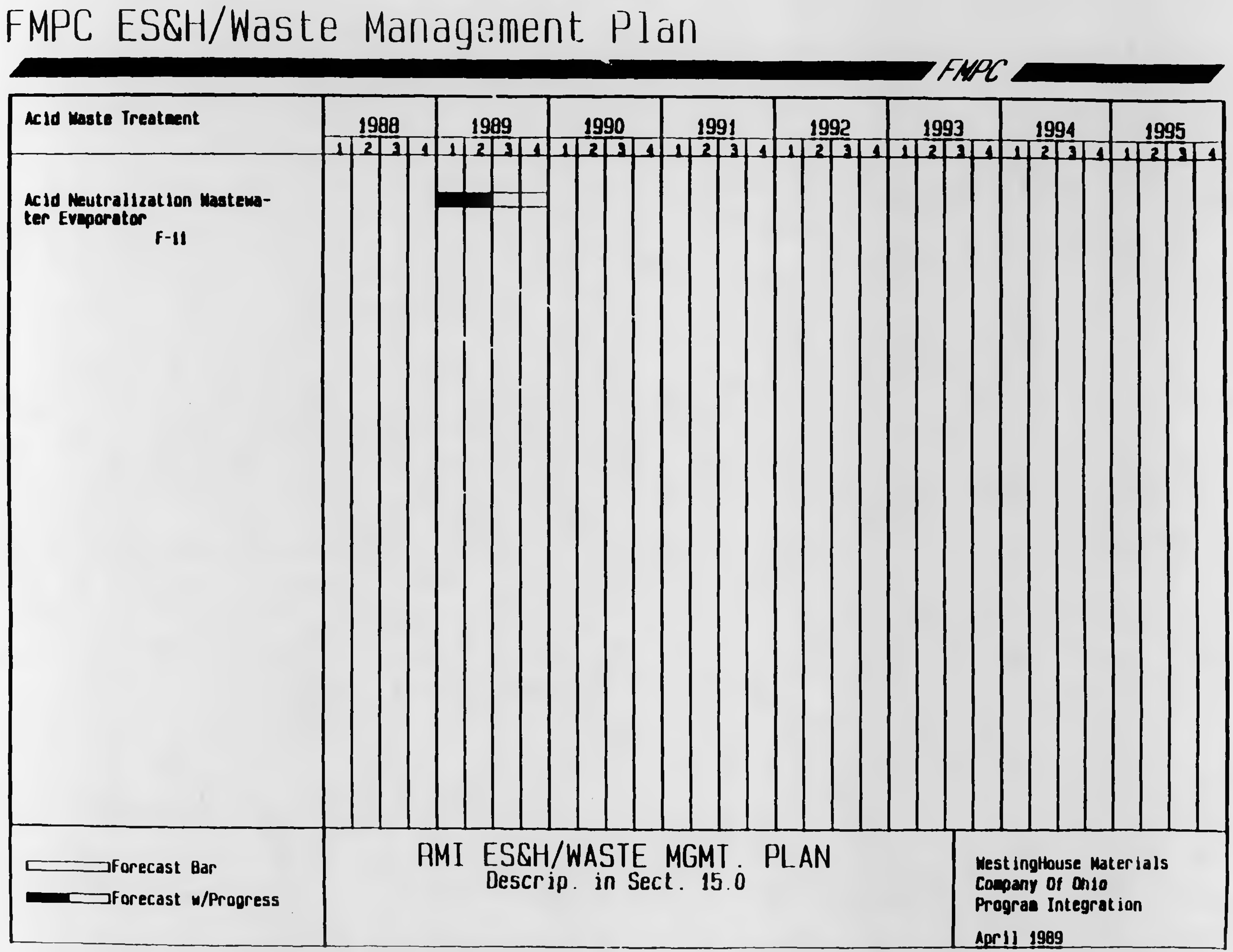
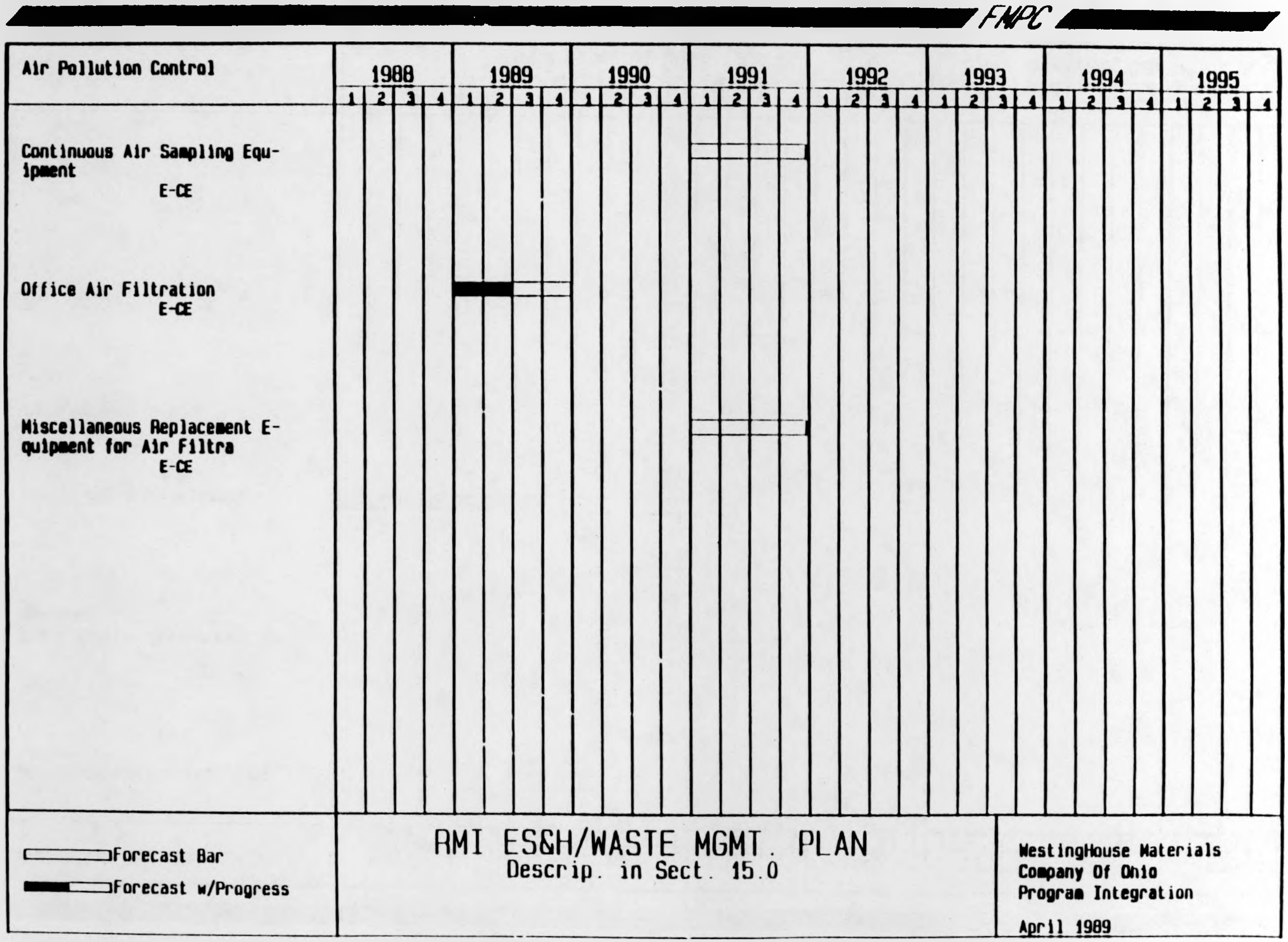


Figure 3-8 RMI ES&H Was anagement Project Schedule

FMPC ES&H/Waste Management Plan



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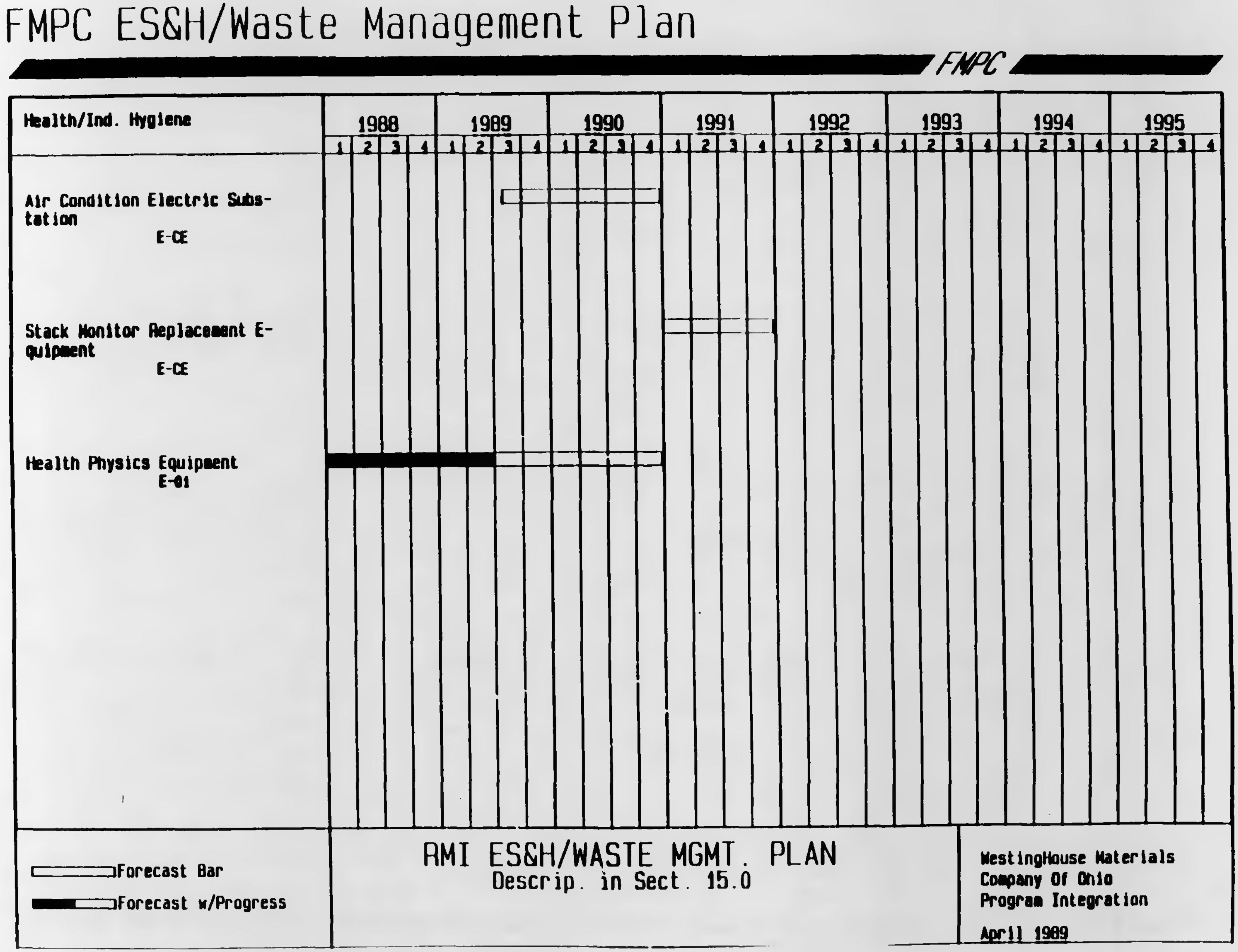

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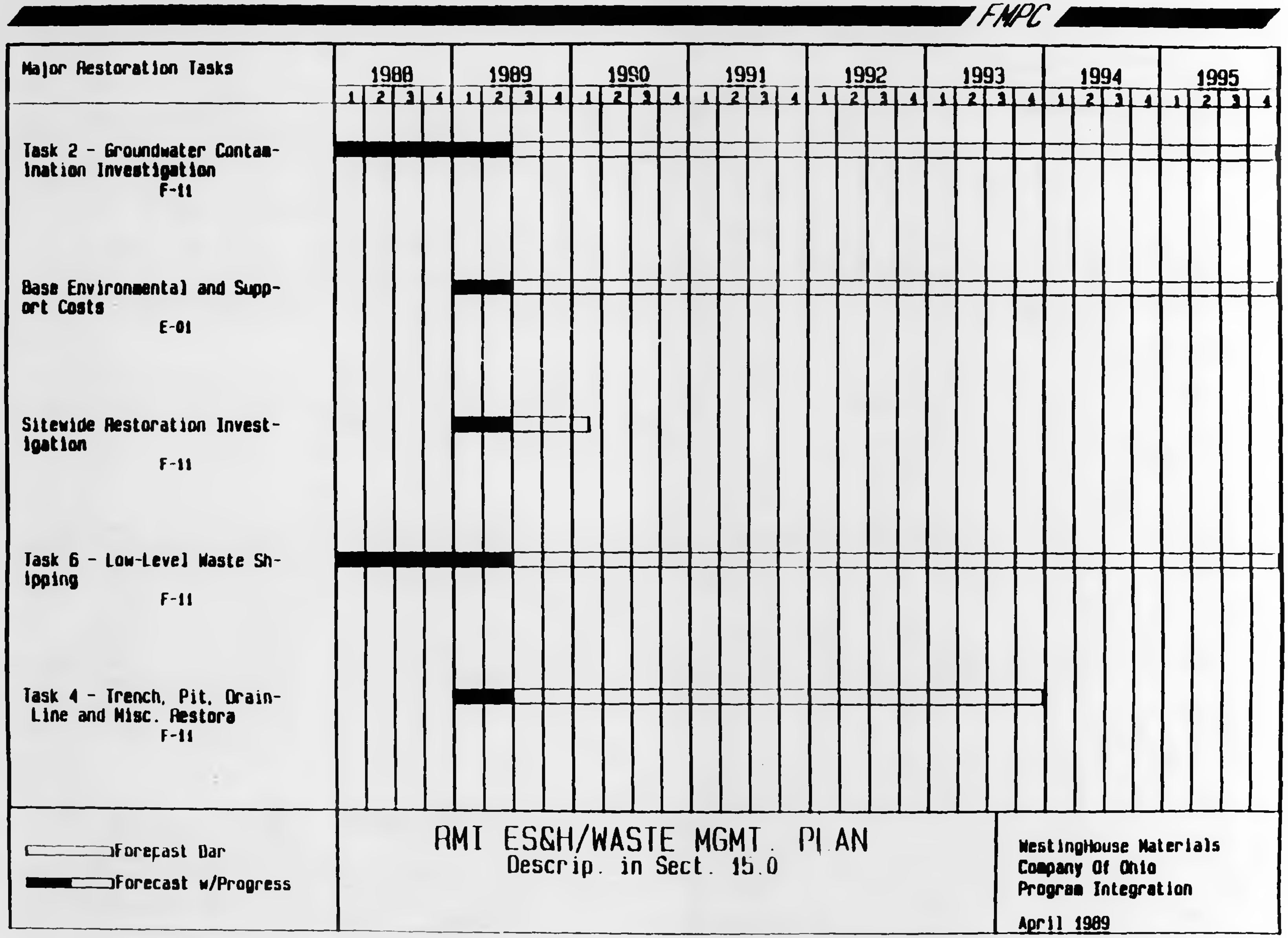
FMPC ES&H/Waste Management Plan



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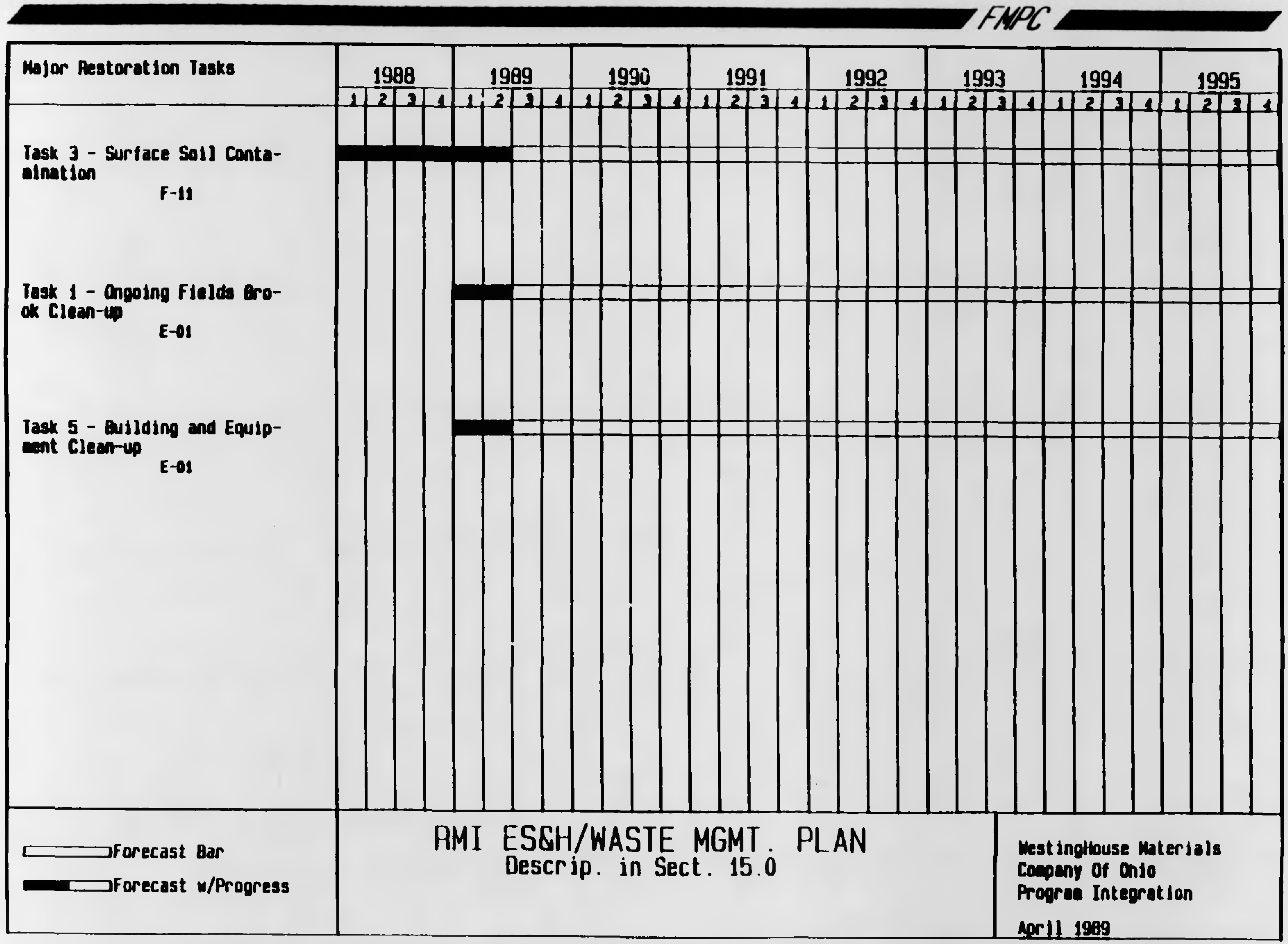
FMPC ES&H/Waste Management Plan



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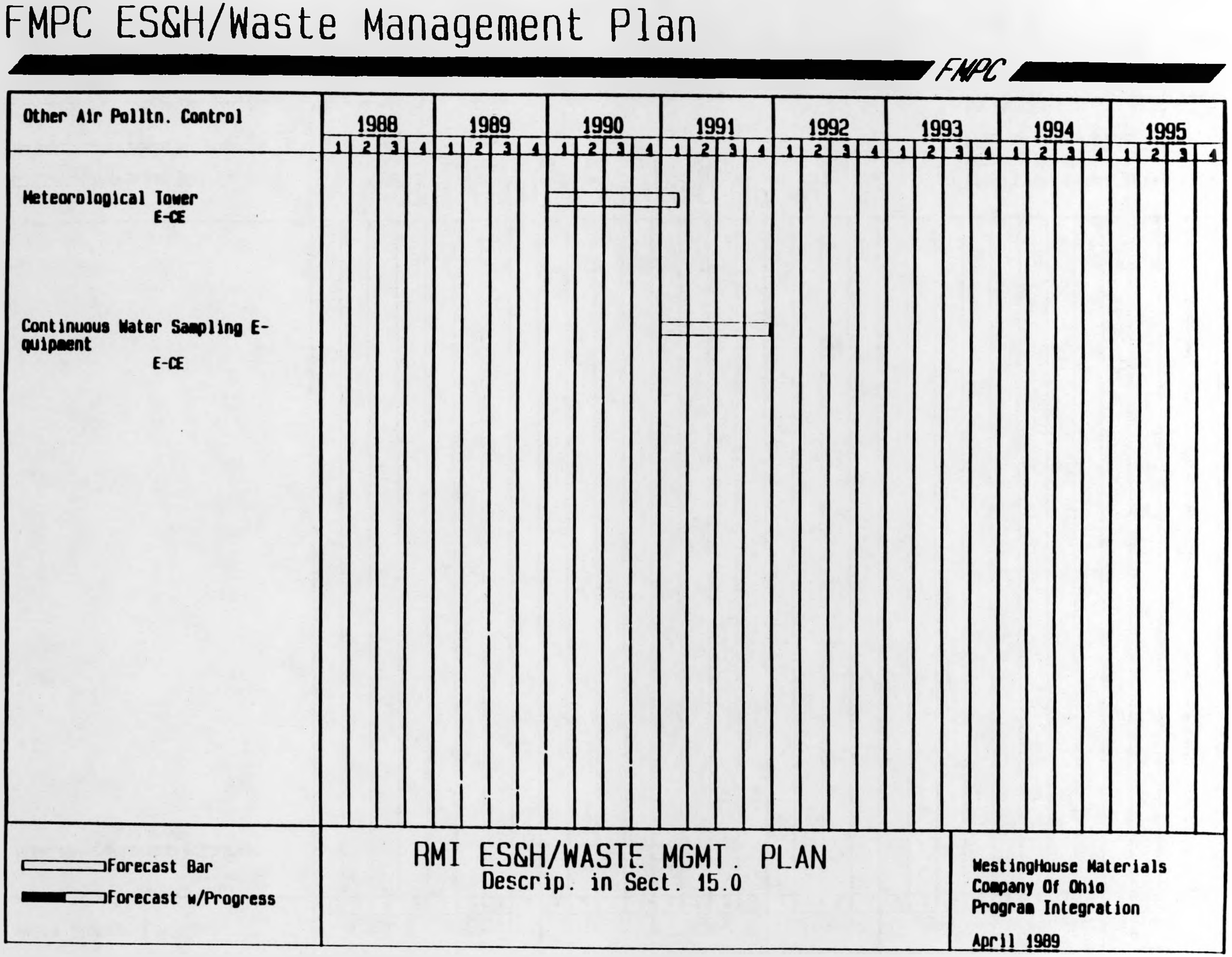

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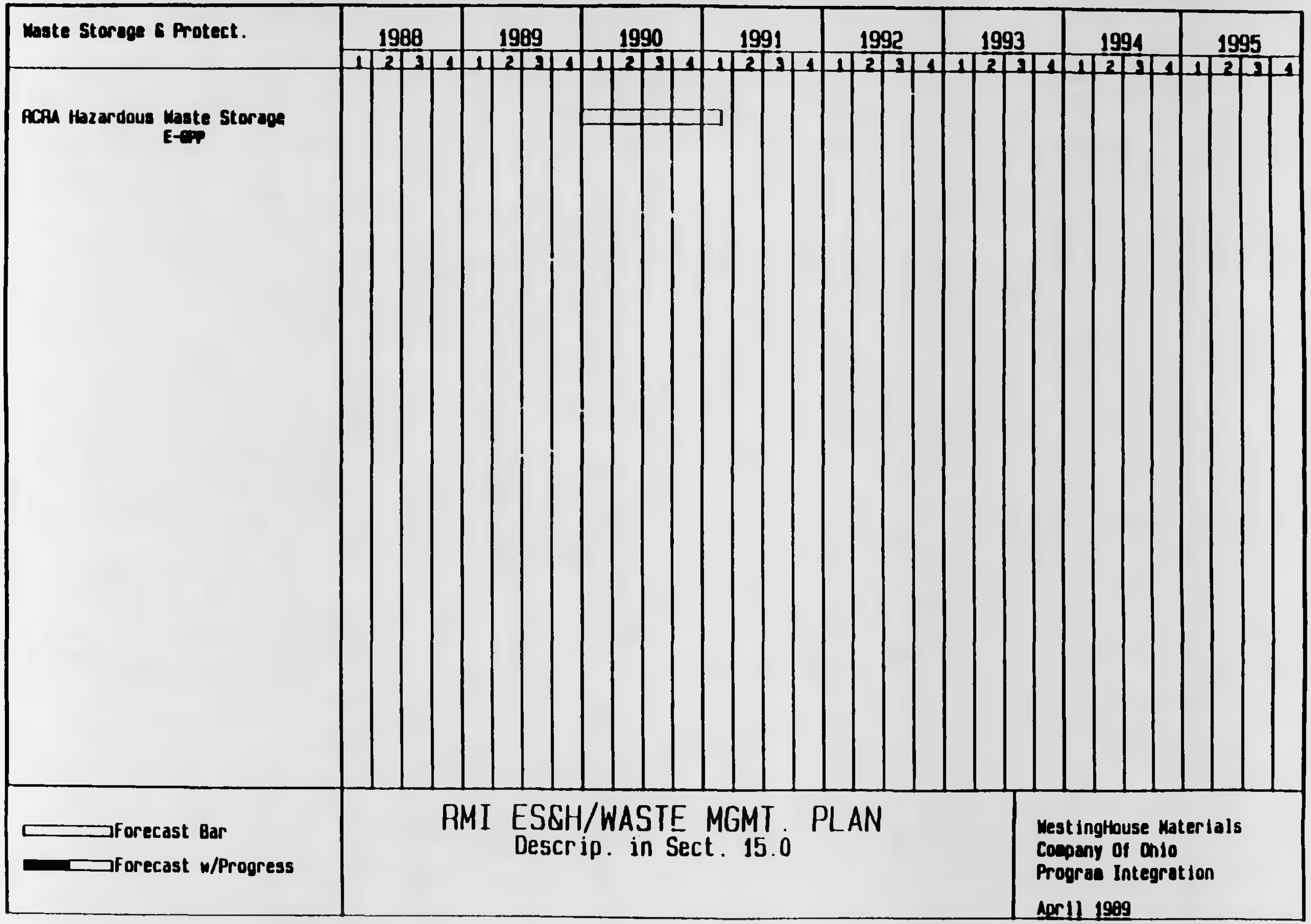
FMPC ES&H/Waste Management Plan

FMPC



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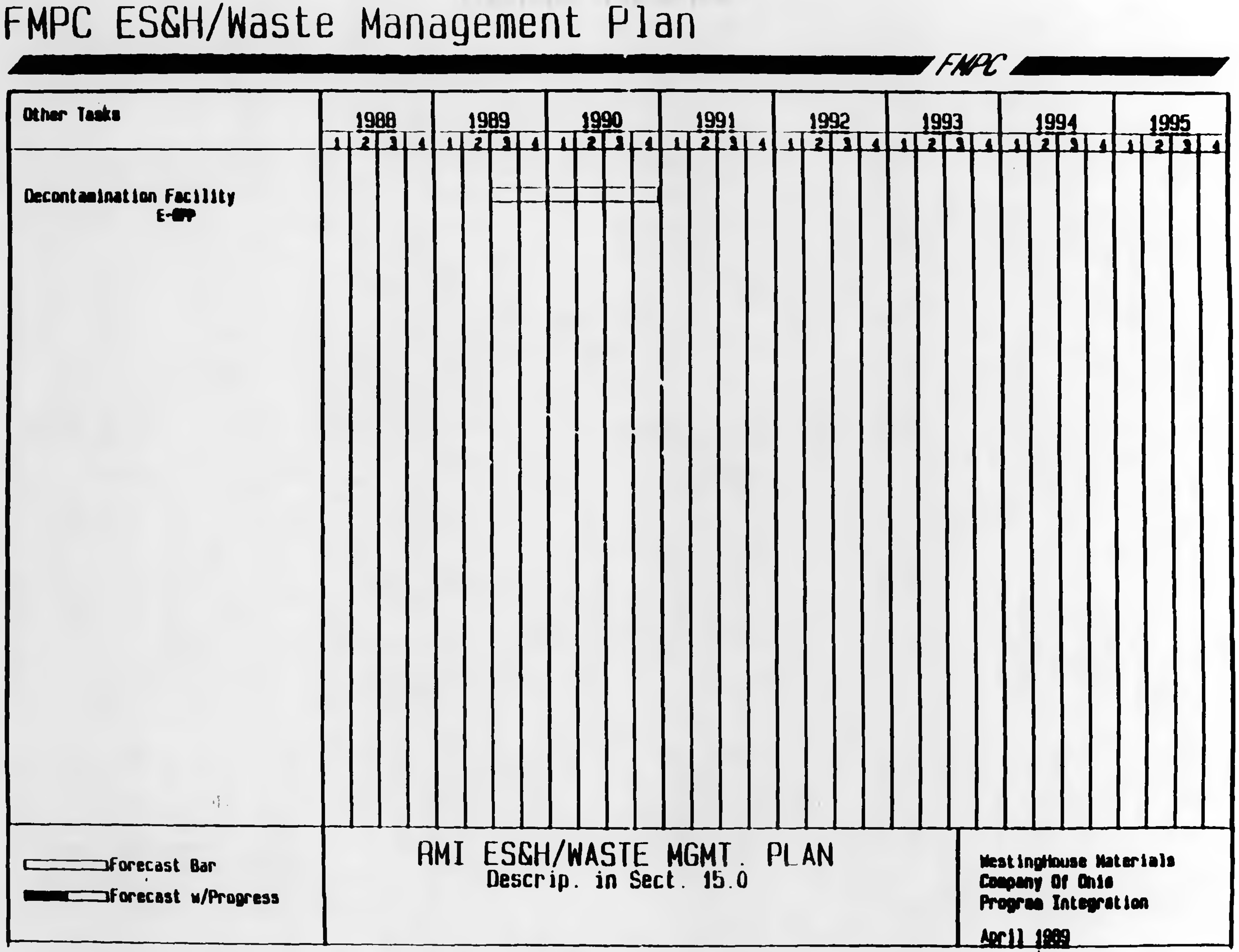

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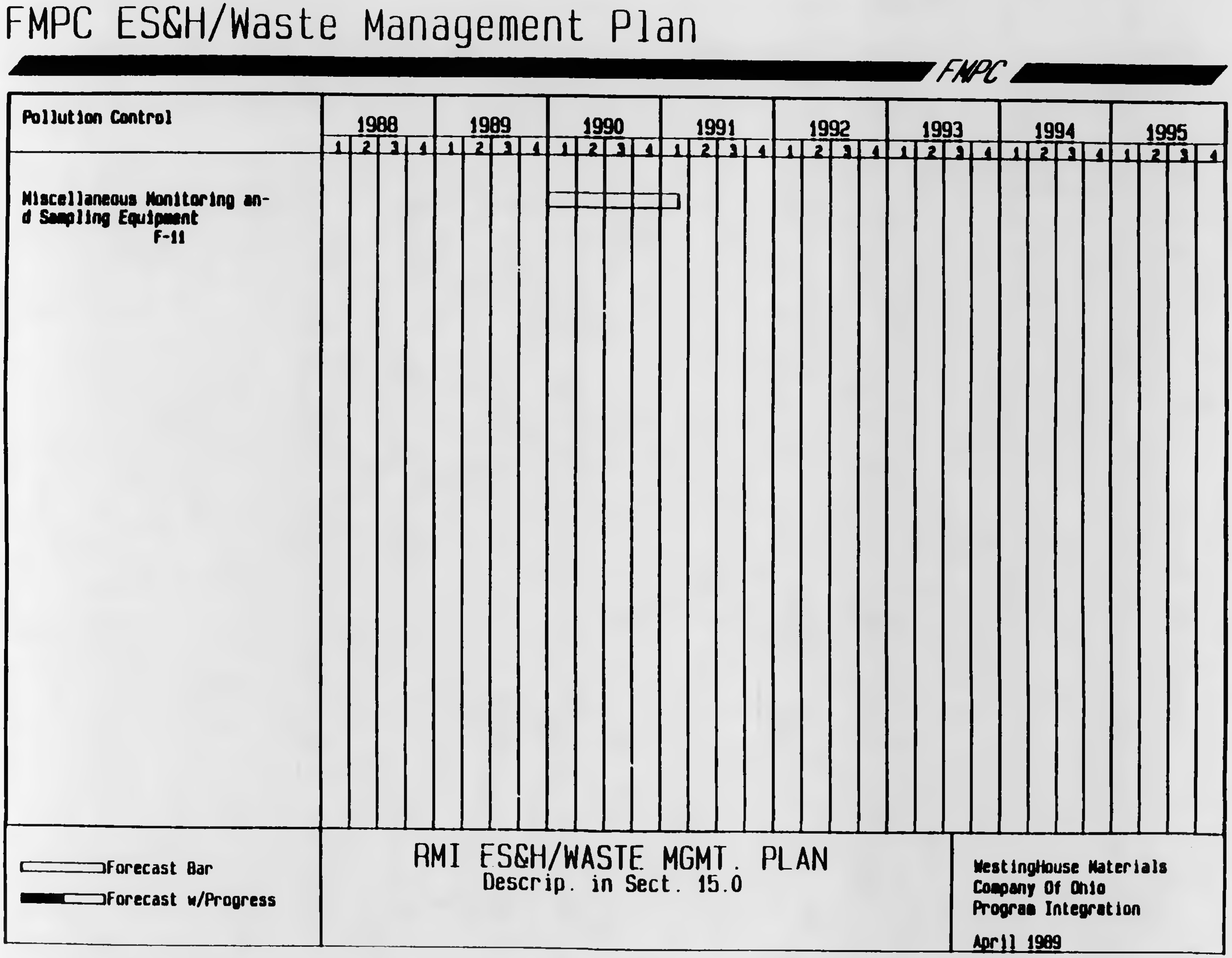

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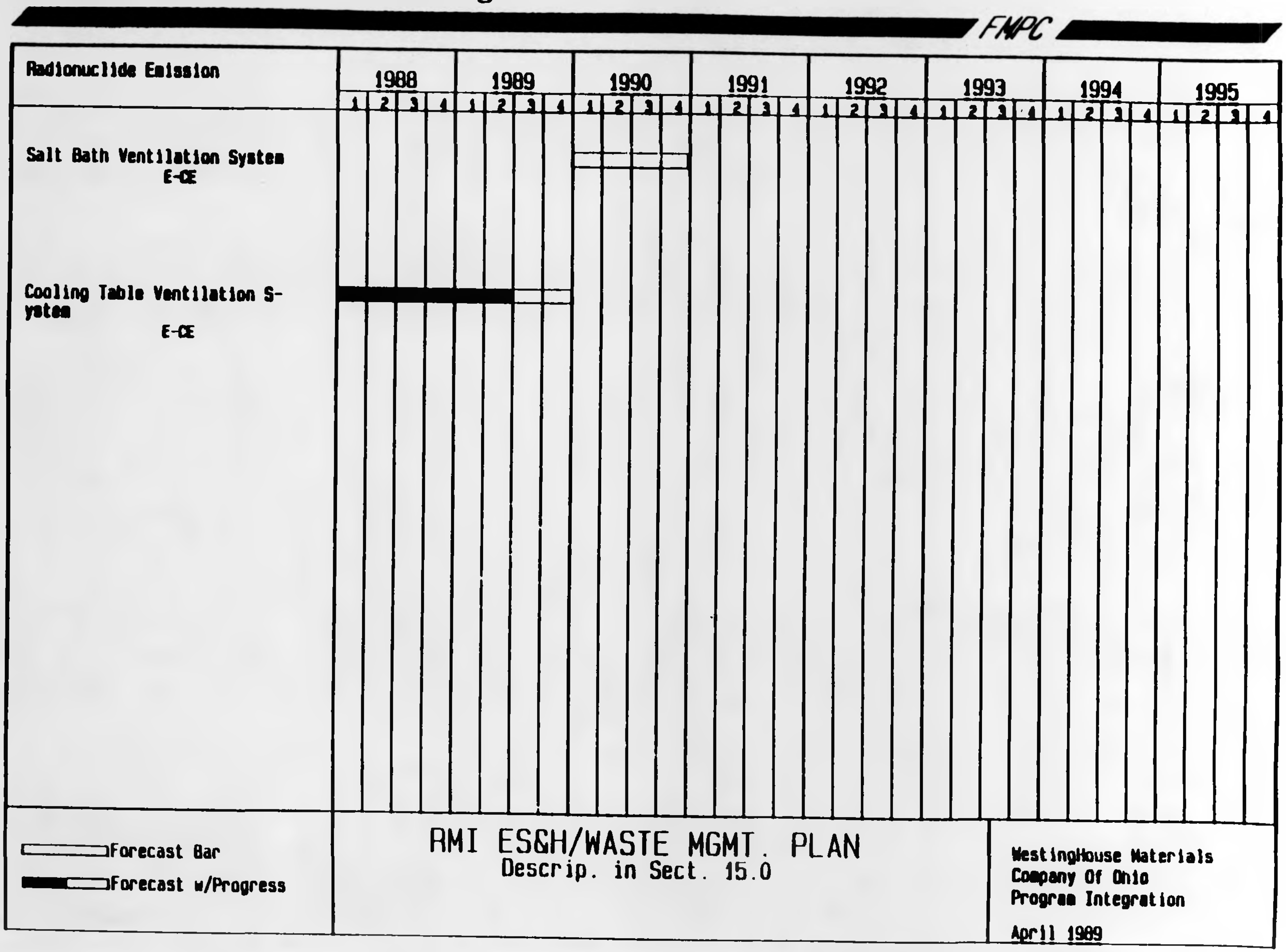
FMPC ES&H/Waste Management Plan



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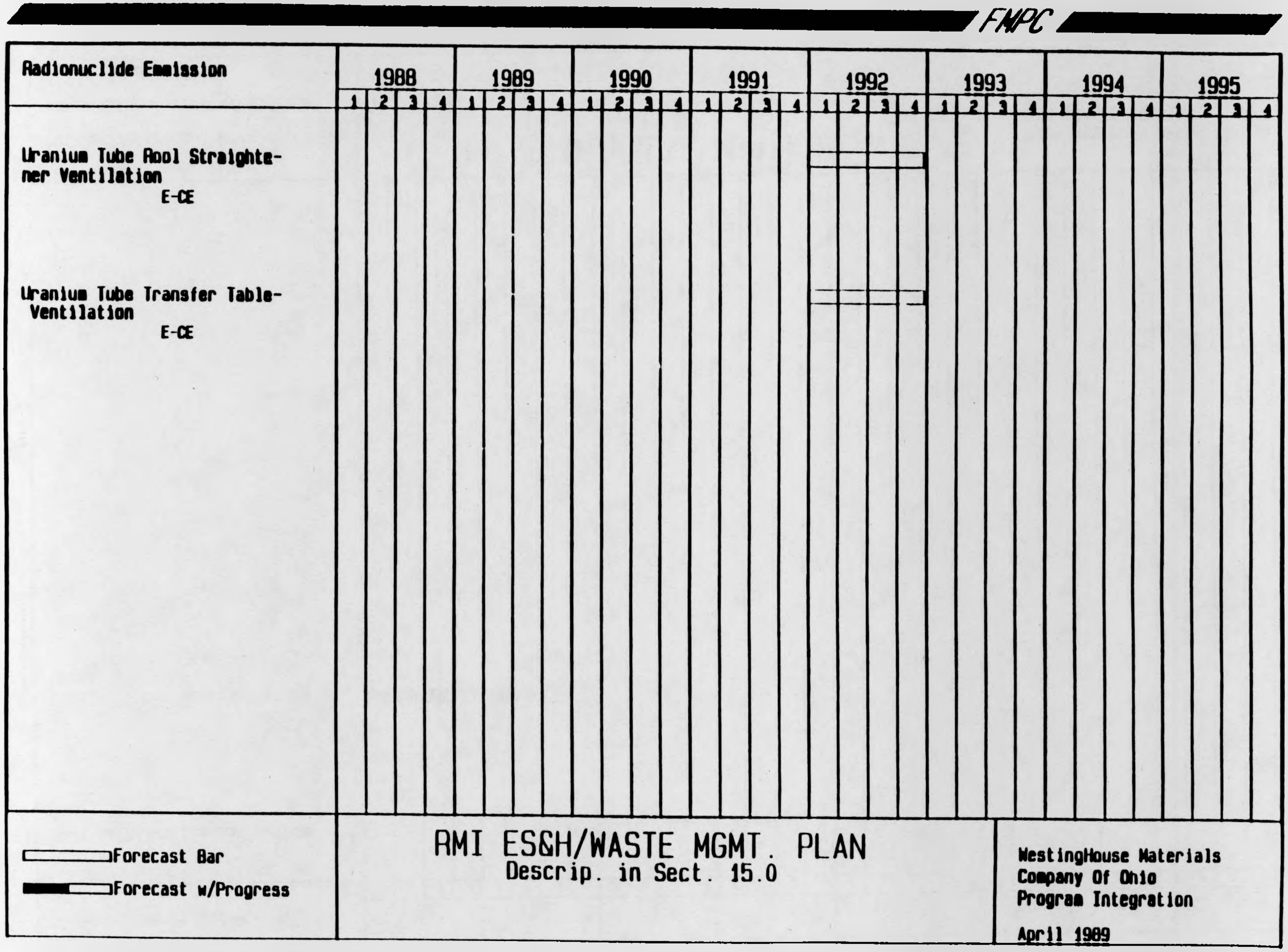
FMPC ES&H/Waste Management Plan



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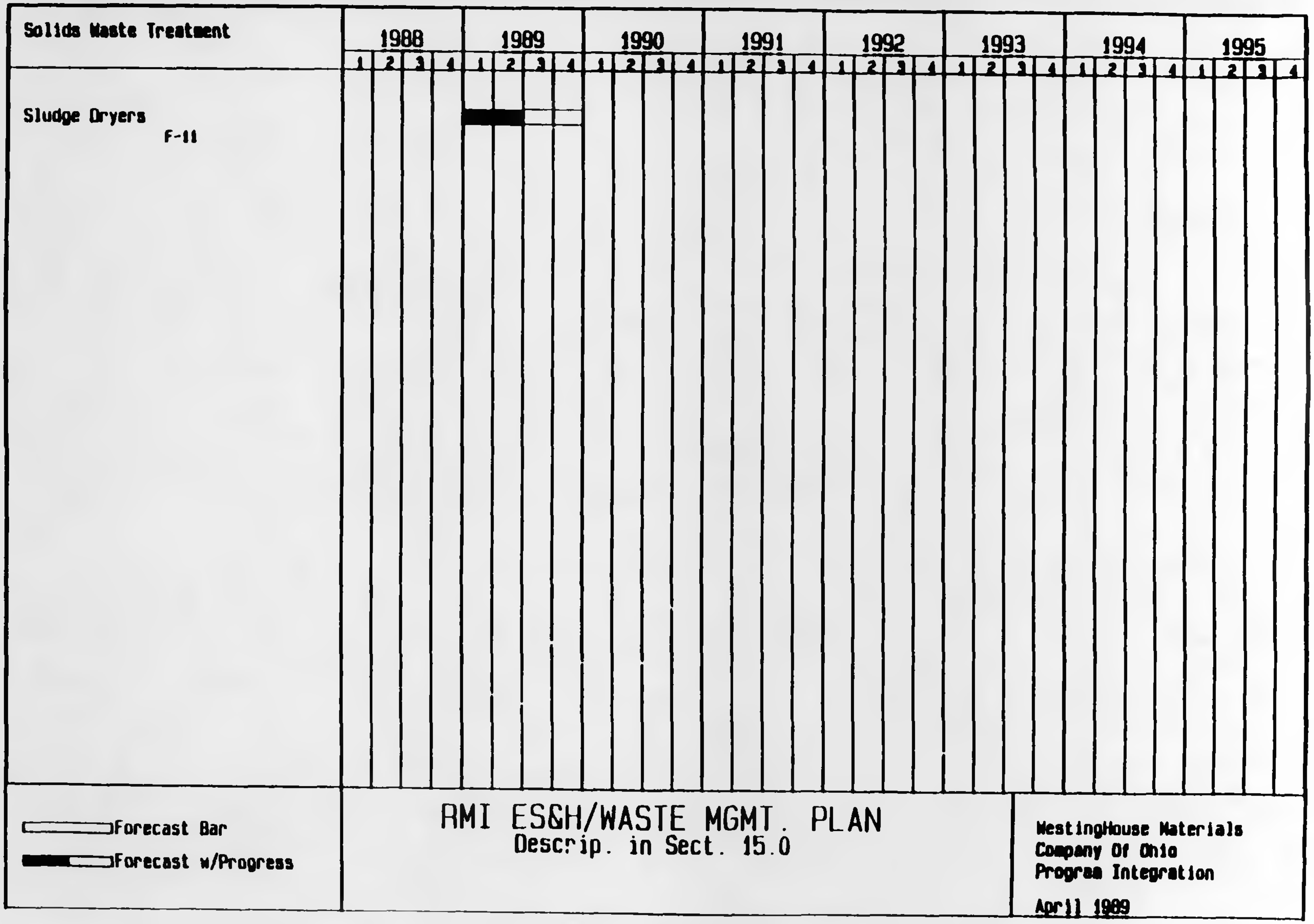
FMPC ES&H/Waste Management Plan

FMPC



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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, the FMPC will upgrade control equipment, improve equipment that generates emissions, and increase operational and administrative controls.

The 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 prior to implementation.

Facility upgrades involving emission control systems and monitoring and sampling equipment are the responsibility of the Services section. 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), sulfur dioxide (SO_2), 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 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.

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 annually was 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.

A plantwide program has been initiated 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. A radionuclide scan is 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 USEPA and 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 one cubic meter 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 weekly when 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 discharged 107.8 kg of uranium during calendar year 1988. The sources of these discharges include dust collectors, scrubber exhausts, chip pickling and briquetting, nitric acid recovery (NAR) system, cooling towers, building exhausts, laboratories, waste pits and non-routine releases. Dust collector emissions are monitored continuously by stack samplers. Emission factors for scrubber, pickling, briquetting and the NAR system have been developed by stack sampling conducted during 1988. These factors are multiplied by operating hours for a particular process to determine emissions. Factors are being developed for each feed material type for the Plant 8 recovery and waste furnaces to provide an emission factor for each specific feed material. Data presented in Table 4-1 shows most of the emissions occurred from plant scrubbers. A breakdown of emission sources from particulate stacks and scrubbers is presented in Table 4-2.

Emissions were estimated for the building exhausts based on uranium concentration in the building, blower capacity and a factor for dilution due to make-up air. The emissions from the waste pits were estimated using an EPA method for fugitive emissions. Non-routine events are defined as occurrences that produce emissions that are not part of normal operations, such as spills, leaks, etc. The quantity of emissions from non-routine events were estimated based on number of events and factors developed to estimate emissions from each type of event.

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
- Reducing the level of NOx and other criteria pollutants
- Improving air pollution control and monitoring

The planned improvements are discussed in the following paragraphs and the fiscal year funding requirements are presented in Table 4-3.

TABLE 4-1
SUMMARY OF URANIUM EMISSIONS FOR CY-1988

Emission Source	Total Emissions (kg U)	% of FMPC Total Emissions
Monitored Stacks	5.045	4.7
Scrubbers	81.643	75.8
Uranium Processes	3.5	3.2
Building Exhausts	1.54	1.4
Laboratories	1.9	1.8
Waste Pits	13.25	12.3
Accidental Releases	0.9	0.8
Total Site	107.8	

TABLE 4-2
SUMMARY OF 1988 URANIUM EMISSIONS FROM PARTICULATE STACKS AND SCRUBBERS

Emission Source	Total Emissions (kg U)	% of FMPC Total Emissions
Plant 1	0.027	0.03
Plant 2/3	0.011	0.01
Plant 2/3 Scrubbers	66.0	76.14
Plant 4	1.122	1.29
Plant 5	1.475	1.70
Plant 6	0.239	0.28
Plant 8	0.497	0.57
Plant 8 Scrubbers	15.643	18.05
Plant 9	0.033	0.04
Pilot Plant	1.639	1.89
Laboratory	0.002	<0.01
Total Emissions	**86.68 kg**	

TABLE 4-3
BUDGET AUTHORITY FOR AIR POLLUTION CONTROL
($ Thousands)

Funding				Fiscal Year				
Type	**Total**	1989	1990	1991	1992	1993	1994	1995
GE-CE	2,500	100	300	1,100	250	250	250	250
GE-LI	81,658	24,730	26,769	1,659	16,700	5,900	5,900	
GE-OP	22,006	5,645	2,057	2,276	2,880	3,200	3,050	2,898
GE-GPP	475	475						
TOTALS	106,639	30,950	29,126	5,035	19,830	9,350	9,200	3,148

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

Replacing/Upgrading of Dust Collection System: The majority of existing FMPC dust collection equipment is nearly 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, multi-point 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

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 chip pickling operations in Plant 6 discharge visible NOx emissions to the atmosphere. A new NOx destructor is currently being 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

Installing Additional Air Monitoring Stations: Additional high volume air monitoring stations and associated controls are required for selected 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, developed by the National Oceanic and Atmospheric Administration (NOAA), is activated in parallel with the FMPC Emergency 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 of the study will be expanded to decide if additional input to the model's development 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-95.

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.

4.5 Radon Monitoring

One of the public's concerns with the FMPC is the potential release of radon to the air. The largest contribution to the average annual effective dose to individuals is from natural background concentrations of radon and its decay products. Although the FMPC is not currently required under NESHAP to calculate the dose due to radon, DOE standards specify that emissions of radon to uncontrolled areas must be at average concentrations less than 3.0 pCi/l. The net radon concentration of 0.60 $\pm$ 0.60 pCi/l (0.022 $\pm$ 0.022 Bq/l) indicates that the concentrations measured at the FMPC fenceline are not statistically distinguishable from background radon concentrations, and are within DOE guidelines.

The FMPC does store materials that produce radon and thoron Radium-226, the immediate precursor of radon, is a constituent of the material stored in the K-65 Silos. Thorium-228, a precursor of thoron, is found in the material that had been stored in the Plant 8 silo and bins and in the thorium warehouses. Because of the increased awareness about radon concentrations, FMPC collected radon data by monitoring 21 locations along the FMPC fenceline in 1988. In addition, there were 16 radon monitoring locations immediately adjacent to the K-65 Silos; four monitoring locations onsite at various distances from the silos and nine offsite locations.

Offsite and fenceline radon monitoring locations are identified in Figure 4-2; those for the Waste Storage Area are shown in Figure 4-3. At the FMPC fenceline, radon concentrations are well within DOE guidelines of 3 pCi/l above background. Although the data indicate that the west fenceline concentrations are slightly above background, those concentrations do not represent a health concern and are less than the average indoor radon concentration for houses in the United States as reported by the USEPA. Radon monitoring will continue through the long-range period of this Plan.

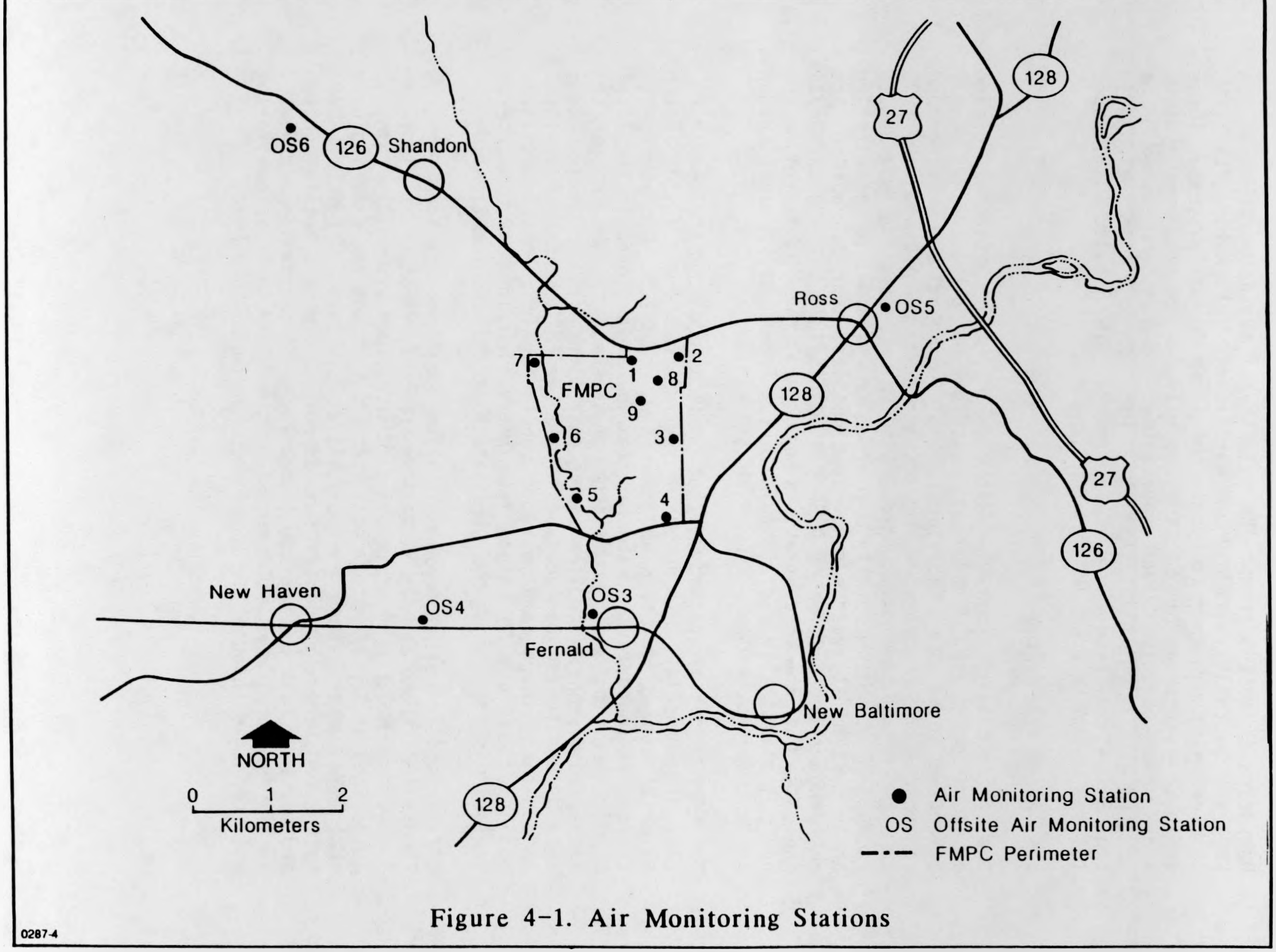

Figure 4-1. Air Monitoring Stations

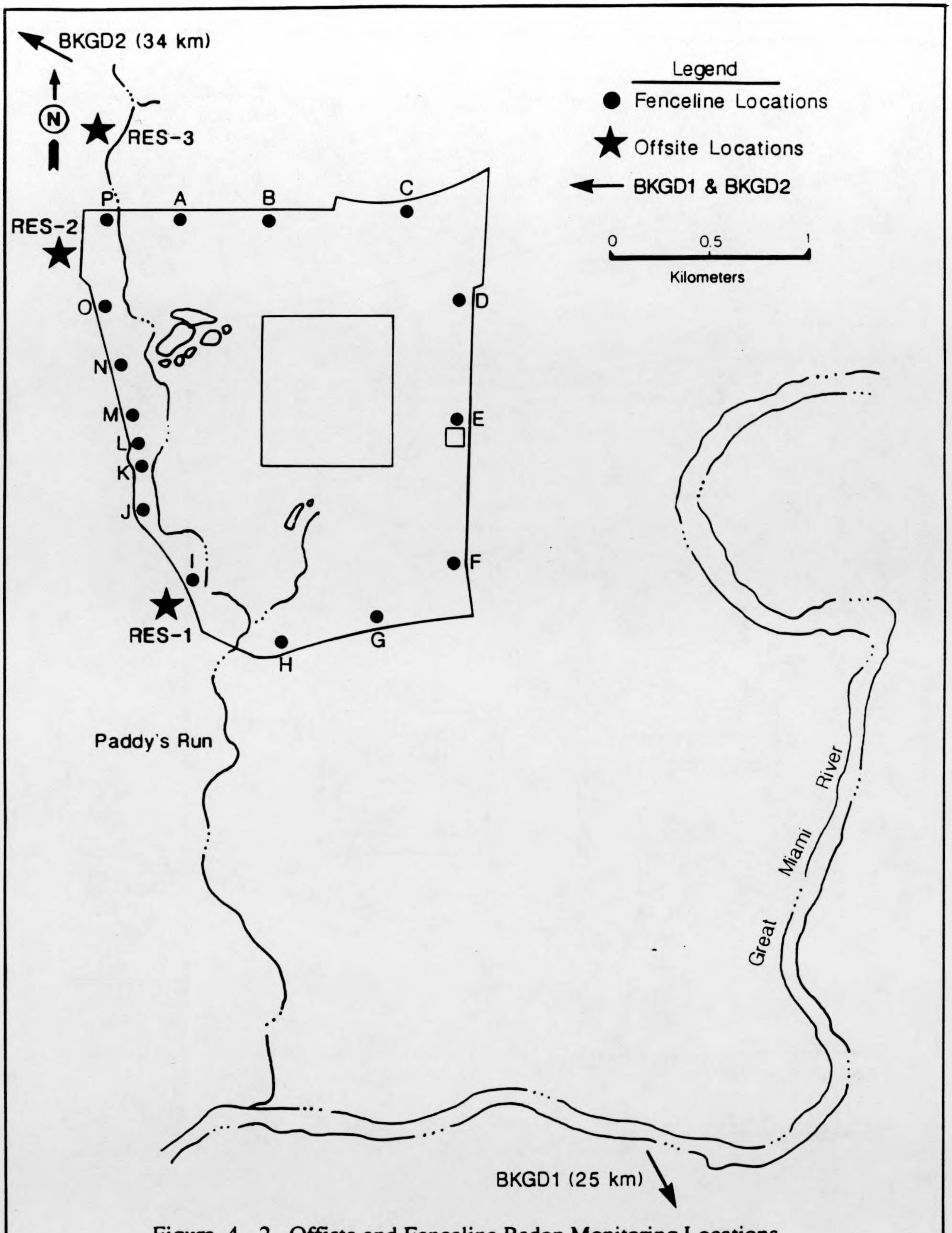

Figure 4 - 2. Offiste and Fenceline Radon Monitoring Locations

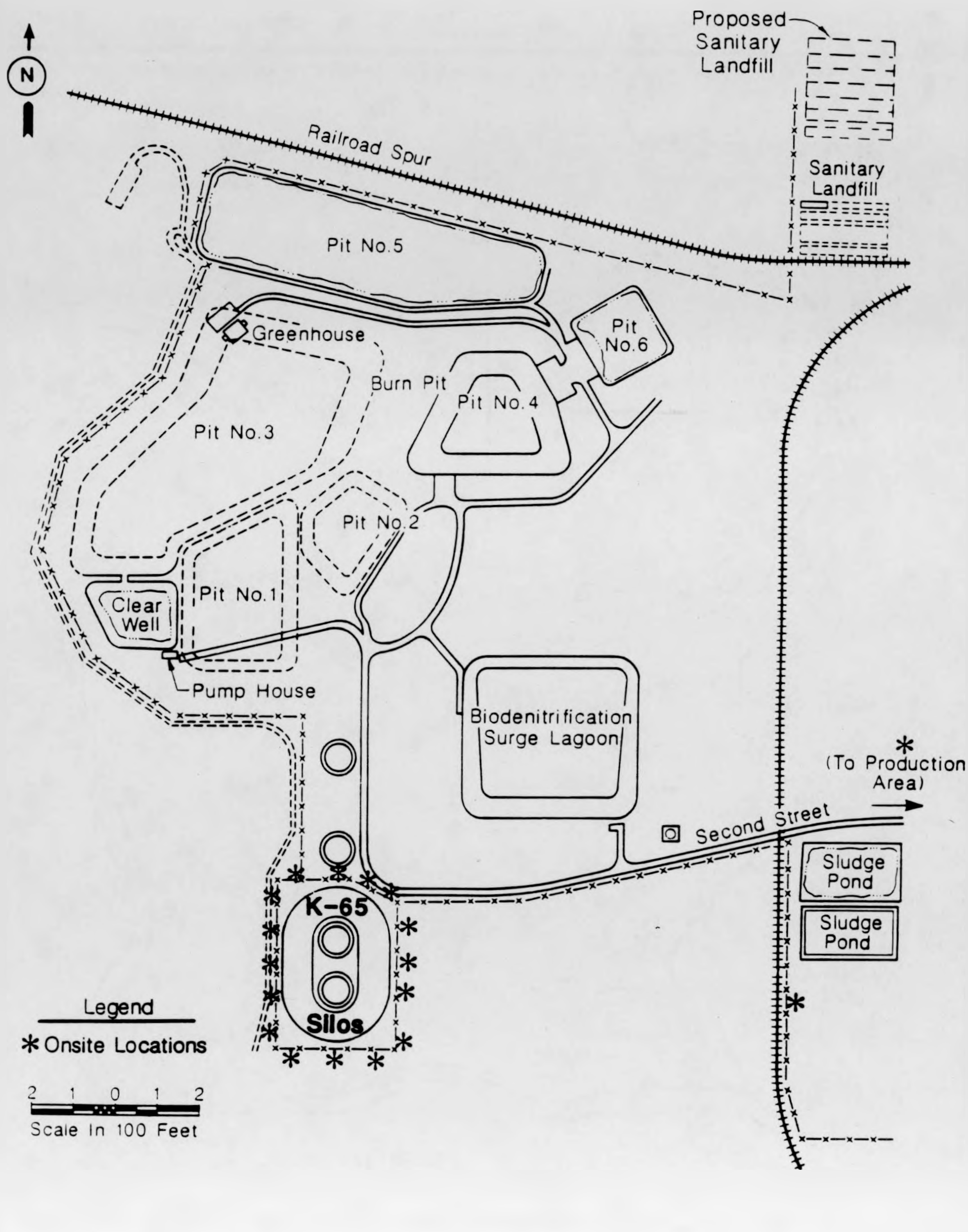

Figure 4 - 3. Onsite Radon Monitoring Locations - Waste Storage Area

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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, and/or 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 of primary concern include:

- Nitrates
- Fluorides
- Hexavalent & total chromium
- Nickel
- pH
- Gross alpha and beta activities
- Ammonia
- Suspended solids
- Uranium
- Iron
- Copper

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 coliform bacteria
- Total suspended solids (TSS)
- Biochemical oxygen demand (BOD)
- Uranium
- Residual chlorine
- Pathogens (Fecal Coliform)

Pathogens are the primary pollutant. The amount of fecal coliform is generally in direct relation to the amount of pathogens in the wastewater stream. Therefore, fecal coliform is used as an indicator of the amount of pathogens present.

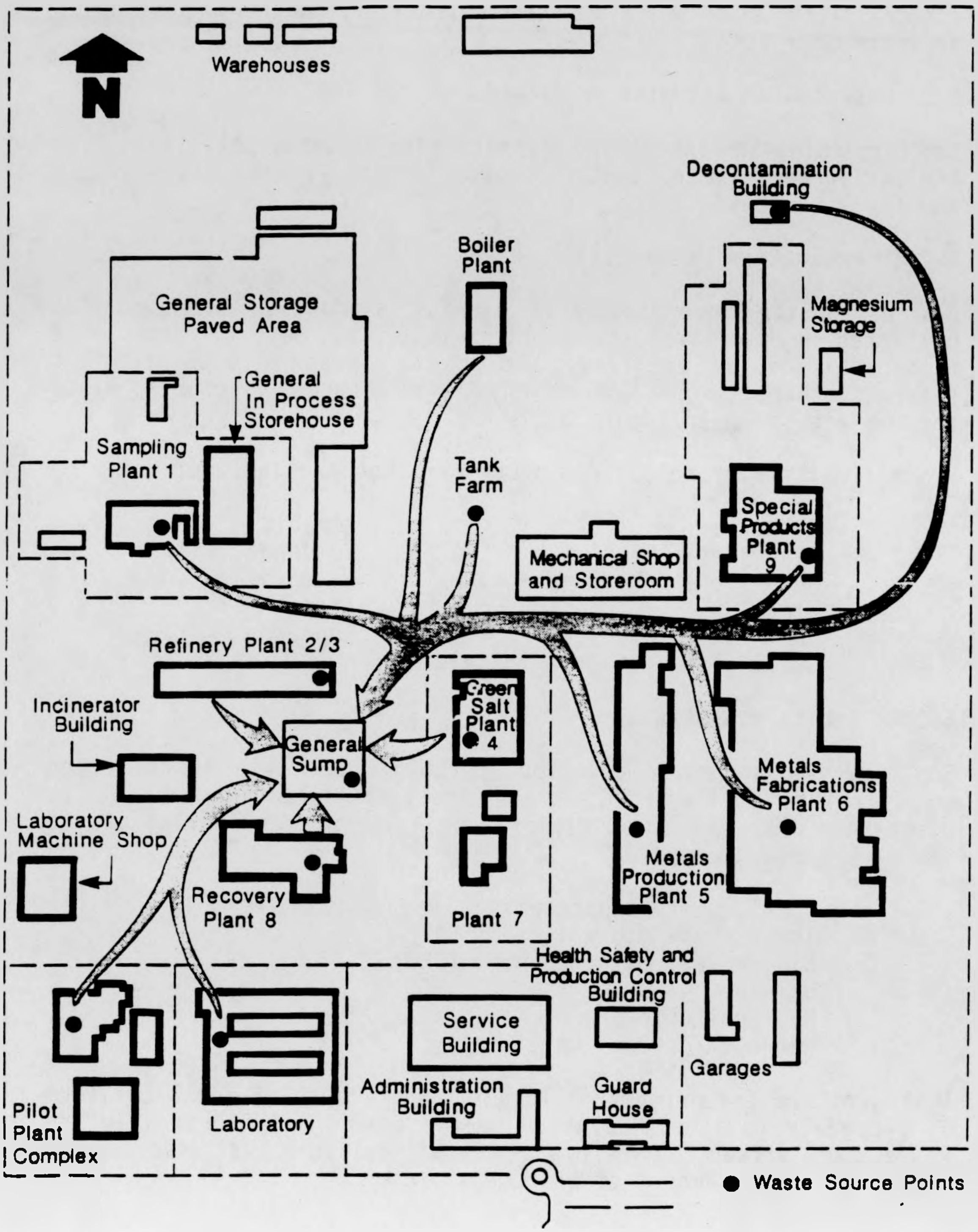

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Figure 5-1. Sources of Production Wastes Collected & Treated in the General Sump

5.1.3 Stormwater Runoff

Stormwater runoff, steam condensate, groundwater from railroad track underdrains and other uncontrolled runoff in the Production Area are collected in the Storm Sewer system. The runoff collected in the branches of the system flows by gravity and converges at Manhole 34 into 60-inch storm drain line. Just below this junction a small dam in the storm drain line diverts the flow into the Storm Sewer Lift Station.

During dry weather, the Lift Station pumps lifts the intercepted runoff to the Great Miami River via Manhole 175. During the initial flush of a rainfall event (one to four hours), when the suspended solids loading is expected to be heaviest, the pumps are temporarily shut down and all stormwater continues down the 60-inch storm drain into the Stormwater Retention Basin. After this time, the pumps are restarted and up to 450 gpm of the runoff is transferred to Manhole 175. Runoff flow in excess of this quantity overflows the dam and drains into the Stormwater Retention Basin. Flow is directed to either the East or West Chamber of the basin by stop gates at the entrances to each chamber. While the flow continues to one chamber, the water collected in the other chamber is allowed to settle. After the suspended solids in the quiesent chamber have had time to settle, the water is pumped from that chamber to the Great Miami River via Manhole 175. After the quiesent chamber is emptied, the chambers are switched and the process is repeated. Should the runoff volume exceed the capacity of both chambers of the Stormwater Retention Basin, the excess water will overflow an emergency spillway into the Outfall Ditch, which is a tributary of Paddy's Run. Primary pollutants of concern in stormwater runoff include:

- Suspended Solids
- Oil and Grease
- pH
- Uranium
- Nitrate (Waste Pit Area Runoff Only)

A portion of the stormwater runoff from the Waste Pit area flows to the Clearwell for settling. The Clearwell is normally pumped to the Biodenitrification Facility. During a major rainfall event, if the volume of the Clearwell is in danger of being exceeded, the stormwater is pumped to the Great Miami River via Manhole 175.

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 treatment facilities or sumps to collect and initially treat

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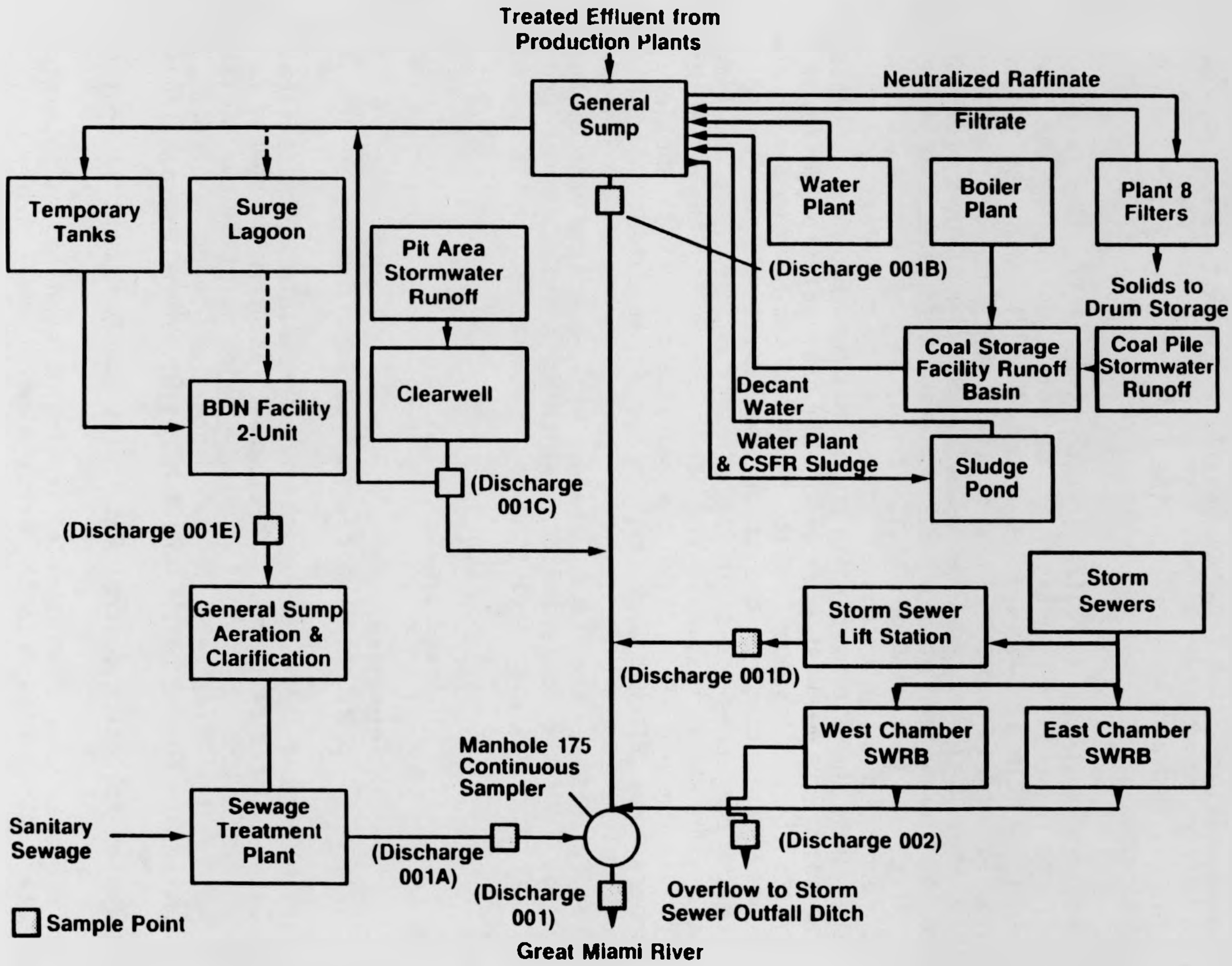

Figure 5-2. Current FMPC Wastewater Treatment Diagram

process wastewater by precipitation and sedimentation. This process removes more than 99% of the contained uranium and other heavy metals. At the various plant sumps acidic wastewaters are neutralized; free and emulsified oils are removed by coagulation, coalesing and skimming; uranium and heavy metals are removed by lime precipation and filtration; and suspended solids are removed by sedimentation. Sludges from the various plant treatment sumps are taken to Plant 8, where they may be processed for recovery of contained uranium or to prepare nonrecoverable residues for offsite disposal. The filtrates generated in Plant 8 processing are returned to the General Sump. Non-process wastewater from the Water Treatment Plant, boiler, and Coal Storage Facility runoff are treated at the General Sump. Sediment from the non-process wastewater is sent to the Lime Sludge Pond to settle before the water is decanted and returned to the General Sump for discharge. Process wastewater from the General Sump is pumped to the Biodenitrification Surge Lagoon (BSL) for additional settling. From the BSL, it is neutralized by the addition of dilute sulfuric acid before processing 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 the General Sump for aeration and clarification before being discharged to the Sewage Treatment Plant. After treatment at the Sewage Treatment Plant, the wastewater is discharged to Manhole-175 and then into the Great Miami River.

Sanitary wastes may contain small amounts of uranium from the laundry and showering facilities. Process effluents also contain some trace uranium. A good portion of this uranium settles out in the BSL. The Sewage Treatment Plant also removes a very small part of the uranium, but the effluent may still contain an average of 2 mg/l uranium and has peaked at 8 mg/l.

Uranium enters the stormwater collection system from settled airborne emissions from post operation and through accidental spills and runoff from uncontrolled pad areas and roadways. Accidental spills are intercepted by the Storm-sewer Lift Station and pumped to the General Sump for treatment, if possible, or routed to the Stormwater Retention Basin for containment.

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 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, along Paddy's Run near the K-65 Silos and fly ash pile, are analyzed for radium-226 and radium-228; biannual composites are analyzed for other radionuclides. Chemical 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 quarterly to 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 onsite and offsite wells are analyzed for uranium. Offsite wells are analyzed annually for other metals. Semiannual groundwater samples collected from onsite and 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 of the Paddy's Run sampling locations. 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.

5.3 Quantity of Pollutants Treated or Discharged

Table 5-1 summarizes pollutants discharged from MH-175 into the Great Miami River in 1988. Table 5-2 summarizes the pollutants discharged into Paddy's Run via the Stormwater Retention Basin overflow in 1988. One of the major pollutant discharged into the Great Miami River from the FMPC is nitrate. The Biodenitrification facility significantly reduced the mass of this pollutant, but increased the total suspended solids (TSS) and the biochemical oxygen demand (BOD). The increased BOD and TSS are currently being treated by the General Sump and Sewage Treatment Plant. The Stormwater Retention Basin dramatically reduced the pollutant load discharged to Paddy's Run during 1988, by retaining and settling the stormwater before discharging to Manhole 175.

5.4 Description of Water Pollution Control Projects

The water pollution control system includes four general strategies for proposed improvements. The first strategy involves constructing facilities to prevent stormwater and accidental spills containing

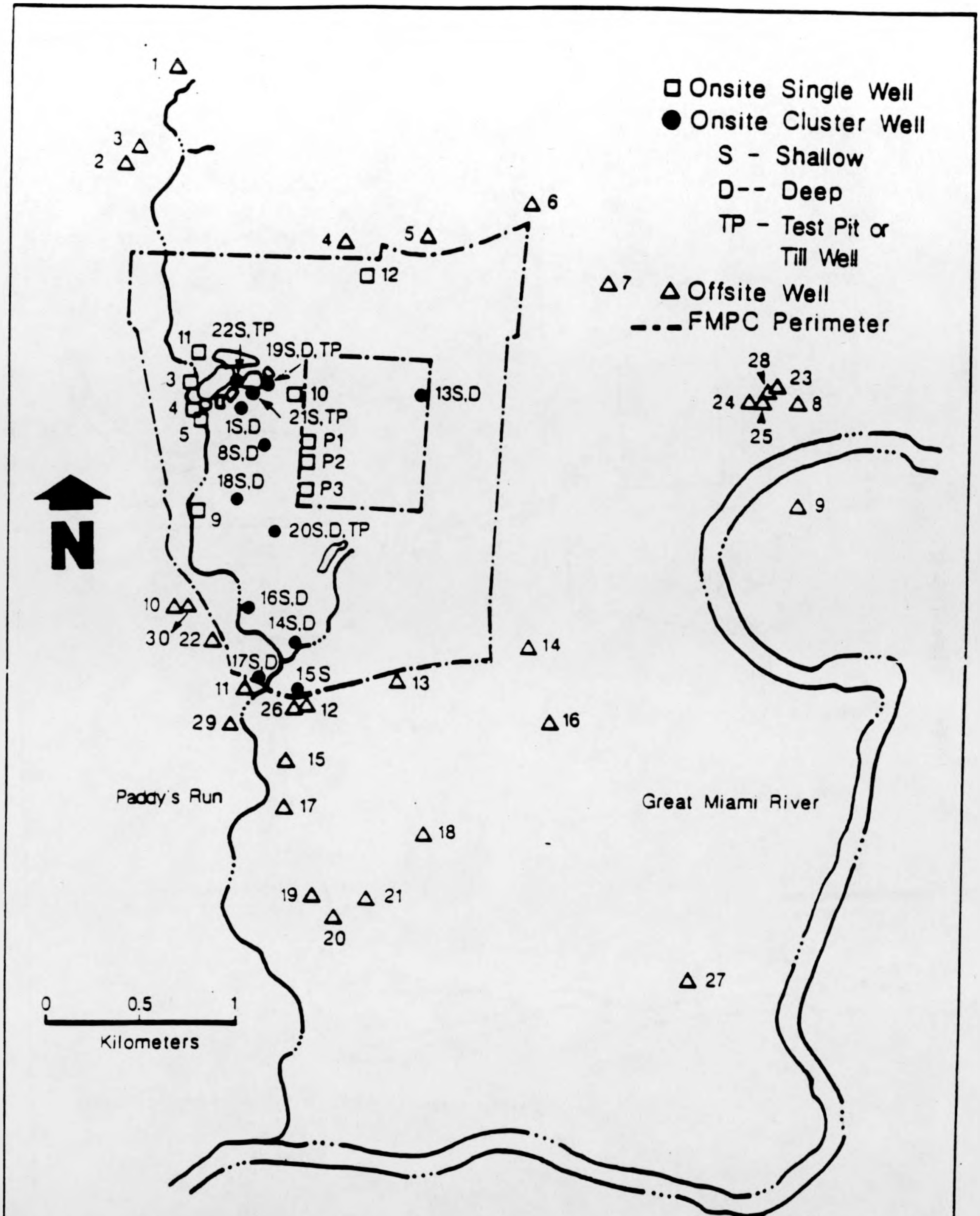

Figure 5-3. Monitoring Well Locations

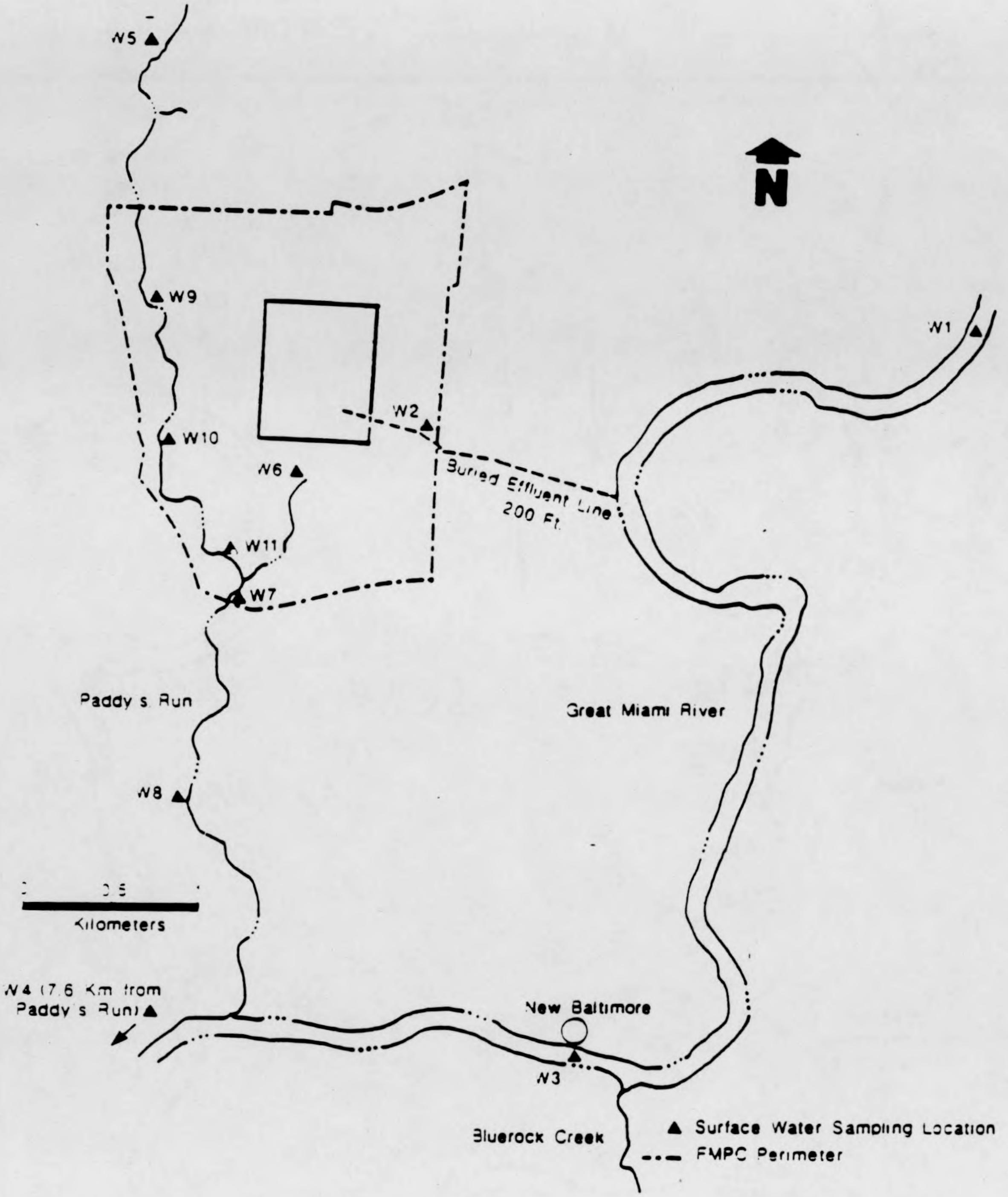

Figure 5-4. Surface Water Sampling Locations

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TABLE 5-1
Estimated Quantity of Pollutants Discharged to the Great Miami River via Manhole-175 During 1988

Pollutant	Estimated Annual Discharge
Flow	202 million gallons
BOD - 5 day	14[a] kg
TSS	10,728 kg
NH_3-N	<368 kg
Oil & Grease	<3,831 kg
Residual Cl	<31 kg
NO_3-N	36,015 kg
Uranium (Total)	840 kg
pH	7.2 - 9.6
Flow[b]	19 million gallons
Cr +6	0.11 kg
Total Cr	0.22 kg
Fe	14. kg
Ni	0.3 kg
Cu	0.3 kg
	Estimated Annual Discharge (Ci)[c]
Cs-137	0.0049
Np-237	0.00003
Pu-238	0.00002
Pu-239/240	0.00002
Ra-226	0.0024
Ra-228	0.0021
Ru-106	0.032
Sr-90	0.0012
Tc-99	5.9
Th-232	0.00084
U-234	0.21
U-235	0.012
U-236	0.011
U-238	0.28
U-Total	0.63

[a] Measured at Sampling Location 001A (Sewage Treatment Plant)
[b] Measured at Sampling Locations 001B & C (combined General Sump & Clearwell)
[c] 1988 FMPC Annual Environmental Monitoring Report, FMPC-2173, May, 1989.

TABLE 5-2
QUANTITY OF POLLUTANTS DISCHARGED TO PADDY'S RUN VIA THE STORMWATER RETENTION BASIN OVERFLOW DURING 1988

Pollutant	Discharge*
Flow**	1.6 million gallons
TSS	288 kg
Oil and Grease	<30 kg
Uranium	5.3 kg
pH	7.7-7.9

* One-time overflow occurred February 1-4, 1988, (from February 1988 FMPC NPDES Discharge Monitoring Report).

** Not a pollutant

Note: Annual discharges from other sources have been estimated to be 181 kgU.

uranium and other pollutants from entering the environment. The second strategy involves renovating and improving wastewater systems to provide efficient treatment, collection capabilities and improve NPDES compliance with NPDES and DOE regulations. These improved projects will also meet BAT economically achievable requirements, and in some instances introduce innovative technologies. The third strategy involves increasing monitoring of effluent discharges and groundwater to better detect possible contaminant sources and potential migration pathways. The final strategy deals with pumping and treating contaminated groundwater.

The individual projects to improve the water pollution control system fall under these five 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)
- Pumping contaminated groundwater (Section 5.4.5)

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.

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
- Expansion of Lime Storage Lagoon
- Replacing the Surge Lagoon Piping
- Lagoon Sludge Removal System
- Wastewater Treatment Improvements - Plantwide
- Flow Monitoring and Measurement Improvements
- Pilot Plant Sump System Improvement
- Refinery Sump Upgrade
- Plant 6 Sump Upgrade
- Plant 8 Sump Upgrade
- General Sump Upgrade

The Biodenitrification Project: The Biodenitrification facility operated continuously with no unscheduled downtime throughout 1988.

TABLE 5-3
BUDGET AUTHORITY FOR WATER POLLUTION CONTROL
($ Thousands)

Type	Total	1989	1990	1991	1992	1993	1994	1995
GE-CE	1,700	100	300	300	250	250	250	250
GE-GPP	12,259	3,030	619	810	1,500	2,000	2,100	2,200
GE-LI	102,558	19,570	26,846	48,142	8,000			
GE-OP	24,346	4,495	2,514	2,757	3,480	3,900	3,700	3,500
TOTALS:	140,863	27,195	30,279	52,009	13,230	6,150	6,050	5,950

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

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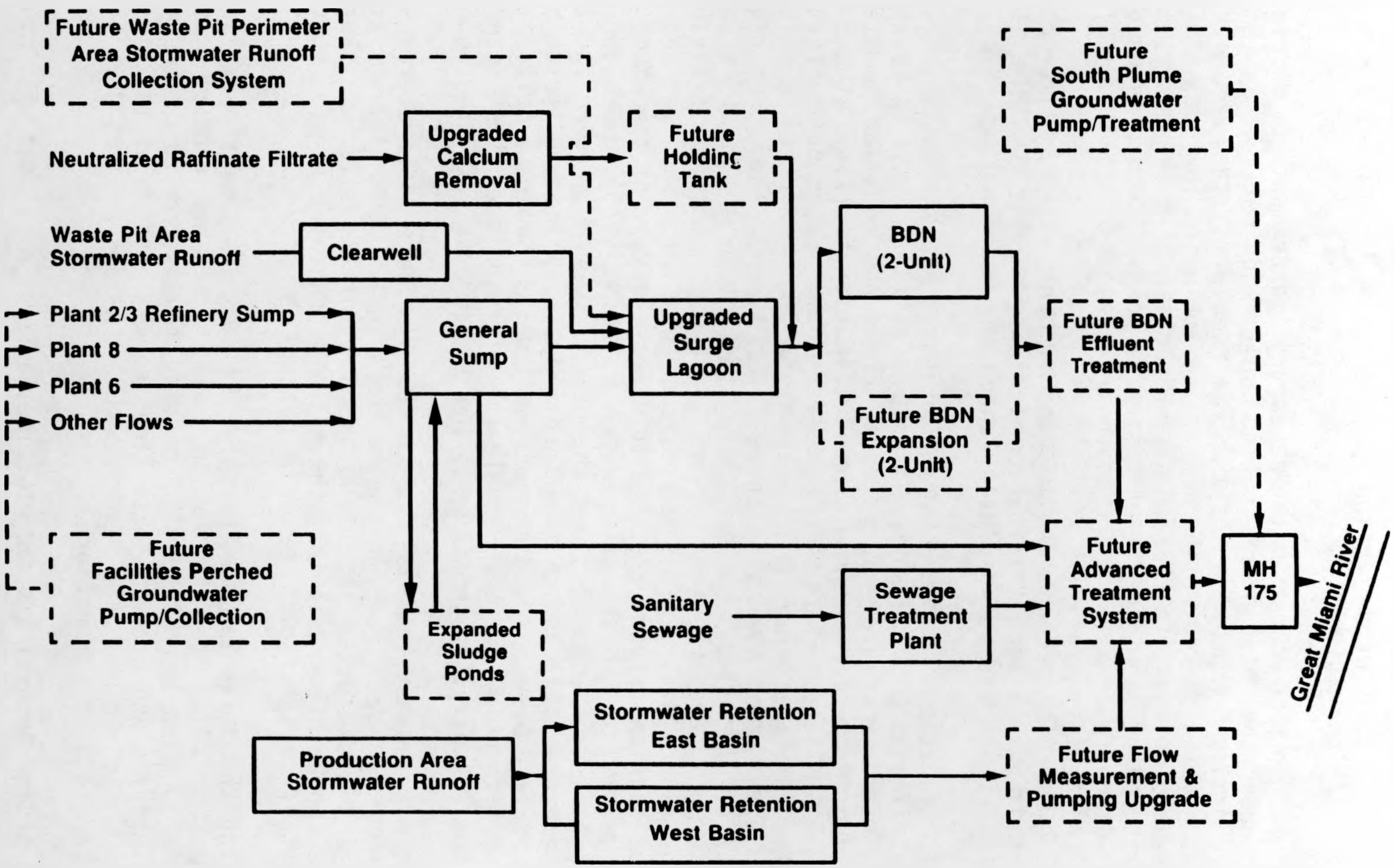

Figure 5-5. Proposed FMPC Wastewater Treatment Flow Diagram

By controlling the operation of the Refinery, the existing facility operated within the limits for nitrate (as nitrogen). The continued operation of the facility helped to further develop a data base which will be used in the design for upgrading the facility and to help optimize operations.

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 bioreactors, and installing an effluent treatment system to remove BOD and suspended solids discharged from the Biodenitrification 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 and is currently funded and underway.

Biodenitrification Surge Lagoon Liner Replacement: The Biodenitrification Surge Lagoon is used to settle process wastewater and waste pit area stormwater runoff flows and equalize them for processing in the downstream Biodenitrification facility. Leaks in the original lagoon liner were repaired and a second synthetic flexible membrane liner (FML) was installed above the original liner. The lagoon now has a three-layer liner. The outer liner consists of 18 inches of a bentonite-soil mixture. The first and second liners are oil and solvent resistant synthetic flexible membrane liners having a minimum thickness of 30 mils. Two under-drain collection systems are used to detect leakage of the FML's to ensure protection of the groundwater. The existing lower under-drain system is located between the bentonite-soil mixture and the first membrane liner and an upper under-drain collection system has been installed between the two membrane liners. Separate collection sumps were provided so that any leakage through the liners can be individually collected, monitored, and pumped back into the lagoon.

A temporary tank system was used to store process wastewater while the Surge Lagoon liner was 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 can be controlled.

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

Lagoon Sludge Removal System: In time, a layer of sludge will build up on the floor of the lagoon liner. A sludge removal system is needed to remove the sediment from the floor of the surge lagoon. This equipment will also be used to remove the sediment from the Stormwater Retention Basin.

Wastewater Treatment Improvements - Plantwide: The planned improvements to the wastewater treatment system consist of the improved control of process area storm water runoff and spills and control of contaminated storm water runoff in the waste pit storage area.

Also, the installation of an Advanced Wastewater Treatment Facility to treat FMPC wastewater and storm water runoff. This includes flow from the Sewage Treatment, the Biodenitrification Facility, the General Sump, and the Storm Water Retention Basin. The effluent from the Advanced Wastewater Treatment Facility shall meet all discharge requirements for the Great Miami River and shall be discharged to the river through Manhole 175 or stored in tanks for in-plant process reuse.

A Treated wastewater recycle tank complete with pumps, piping, and valving to permit the recovery and reuse of wastewater will also be included.

Pilot Plant Sump System Improvement: 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, but is on hold.

Refinery Sump Upgrade: 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, 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, reference WBS 1.3.02.01.01.

Plant 6 Sump Upgrade: 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, reference WBS 1.3.02.01.07.

Plant 8 Sump Upgrade: 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, reference WBS 1.3.02.01.11.

General Sump Upgrade: 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, reference WBS 1.3.02.01.02.

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
- Storm Sewer Improvements - Plantwide
- Expanding the Stormwater Retention Basin
- Controlling Surface Water on the Plant 1 Pad

Improving Stormwater Treatment: The current Storm-Sewer Lift Station (SSLS) will be modified so that all water collected will flow to the SWRB. New piping from the SSLS to the General Sump 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. The two chambered SWRB will be able to contain a spill until the General Sump can treat the contaminated runoff. Because of the increased flow to the SWRB, larger pumps and new control valves will be required to operate and reduce the incidence of overflows.

Runoff Control - Waste Pit Area Phase II: Contaminated stormwater runoff in the waste pit area will be segregated into runoff streams uranium contaminated and noncontaminated area by means of berms, drainage ditches, and existing topographical features. The noncontaminated (<0.89 mg/lU) water will be allowed to continue to flow by gravity to Paddy's Run. The contaminated water from the perimeter area around the waste pits and K-65 Silos will be collected in a concrete sump or holding basin and then pumped to the

Surge Lagoon. This activity will reduce the direct release of uranium to Paddy's Run. 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.

Wastewater Treatment Improvements - Plantwide: Water sample studies conducted by Dames and Moore indicate that dissolved and suspended uranium is entering the stormsewer system from external sources. 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 purging 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 has been expanded to a capacity of 10.5 million gallons, this makes the basin large enough to hold the runoff from a 10 year-24 hour rainfall event. The new basin has a synthetic liner and operates in parallel with the existing basin. Funding was by GPP, reference 18-87102.

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 did not drain into the site storm sewer system and flowed to Paddy's Run. A curb has been added around the periphery of the pad to help direct all stormwater to the pad drainage system. The drainage line from the pad drainage system has been redirected to a catch basin that is tied into the plant storm sewer system.

5.4.3 Controlling Process Area Runoff and Containing Spills

Planned improvements to control runoff and contain spills of potential contaminants will be accomplished by:

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

Projects are described in the following paragraphs.

Controlled Storage Pads: To increase the 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:

- 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 West of Plant 2 (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)
- UO_3 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)
- 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. TBP/Kerosene unloading and storage facilities will be provided at the Refinery. 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. 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 improvement for conventional wastewater systems is upgrading the ultraviolet treatment system of the Sewage Treatment Plant. Two other projects are planned.

Water Plant Residuals (Lime Sludge) Pond: A new pond having a capacity of one million gallons is planned to supplement the two existing ponds (each with half a million gallon storage capacity). The southern existing pond has been full for some time and the northern pond is nearing capacity. The pond provides storage for the total suspended solids (TSS) generated from a conventional water treatment operation. After the solids have settled, the decanted water from the pond will meet NPDES compliance limits.

Coal Storage Facility Environmental Upgrade: In July 1988, a Subsurface Investigation of the Coal Storage Facility and its Runoff Collection Basin was conducted in response to the proposed Consent Decree. The purpose of this investigation was to determine the permeability of the soils underlying the areas and whether any leaching of acidic runoff from the areas had occurred. The Subsurface Investigation consisted of six soil borings; four under the coal storage area and two adjacent to the Runoff Collection Basin. These borings were logged, sampled, classified and analyzed for soil pH and permeability. The results of the testing showed that there was no evidence of acidic leaching and that the existing permeabilities were superior to the OEPA requirements specified in the proposed Consent Decree.

The report summarizing the investigation was transmitted to OEPA for a decision whether a liner would be required beneath either the Coal

Storage Area or the Runoff Collection Basin. The OEPA has agreed in writing that no liner will be required beneath the Coal Storage Area and verbally that no liner will be required beneath the Runoff Collection Basin. Groundwater and basin level monitoring must be provided.

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. The new equipment is scheduled for installation by the 4th quarter of FY-1989. The equipment control panel at each location has an electrical tie-ins to the alarm panel located at the Water Plant. Operators can respond to alarm conditions when they are occurring at the above remote locations.

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. The annual Groundwater Monitoring Program is continually reviewed to assure that it is responsive to emerging demands.

Environmental Monitoring Vehicle: A new environmental monitoring vehicle equipped with a mobile sample preparation lab has been purchased and is onsite for use. The vehicle provides clean storage of sampling equipment, and an area to collect and prepare offsite or nonprocess area environmental samples.

5.4.6 Pumping Contaminated Groundwater

Three interim remedial action projects have been identified for removal of uranium contaminated groundwater:

- South Plume Groundwater Pumping
- Plant 6 Perched Groundwater Pumping
- Other Facilities Perched Groundwater Pumping

Contaminated water is defined as any water which is above derived concentration guidelines (32.5 micrograms/liter) based on EPA's proposed drinking water standard. Costs and schedules are being developed. A brief description of the two broad areas of activity follows.

South Plume Groundwater Pumping: A hydraulic barrier will be established North of the Albright and Wilson Company which is south of the FMPC and north of the village of Fernald. This hydraulic barrier will be designed to intercept the contaminated plume migrating southward from the FMPC while not reversing the aquifer flow South of the well field. The flow from the hydraulic barrier will be pumped through a force main piping system to Manhole 175, the existing NPDES discharge monitoring point for the FMPC. The flow will be monitored and discharged to the Great Miami River. Tentatively, the force main piping system will run in a northerly direction along Paddy's Run Road, then easterly, along Willey Road toward the FMPC south access road. The main will then parallel the south access roadway to Manhole 175. The routing will utilize the public right of way and/or DOE property wherever feasible. The EPA must approve this proposal and may require treatment of water pumped prior to discharge.

The overall system will be monitored for flow at the discharge to Manhole 175. Surge arresters, check valves, backflow valves, manholes and air/vacuum release valves will be included where required. Flow and pump status information will be provided for monitoring at the FMPC Emergency Operations Center.

Plant 6 and Other Facilities Perched Groundwater Pumping: As part of the RI/FS Facilities Testing Plan, 14 suspect areas have been selected in Plant 6 for soil and perched water sampling. These 8 or 10-inch borings will be confined to a maximum of 20 feet depth so as to avoid entering the upper aquifer that exists below the FMPC site. For sites where uranium contamination water is encountered, a four inch stand pipe will be substituted for the usual two-inch sampling pipe. For these water contaminated sites, WMCO will install a demand-controlled four inch submersible electric pump, and pipe the groundwater to the nearest floor trench/drain feeding to the plant sump treatment system, where oil and uranium removal is routinely accomplished.

After all 14 pumping sites have been installed and operated three months, a reassessment will be made to determine whether a more automatic and comprehensive piping/control system is warranted. The initial collection/treatment period will be handled on an intensive demand basis by the Plant 6 Water Treatment Operation. Approximately 4000 gallons/shift can be processed on a batch basis. The upgraded Water Treatment System is scheduled for completion early in FY-1990. Groundwater with uranium below 2-3 mg/liter may bypass the treatment system for direct transfer to the General Sump.

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 of. 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

Contaminated Process Area Wastes:

- Trash (plastic, cardboard, paper, etc.)
- Scrap salts (high fluoride)
- Asphalt
- Floor sweepings
- Scrap drums
- Asbestos
- Refuse metal
- Used filters
- Pallets, scrap wood
- Ceramics, glass
- Dust collector bags
- Furnace cleanings (Rockwell)

Contaminated Construction Wastes:

- Soil
- Rocks, gravel
- Concrete
- Metal
- Wood
- Asbestos
- Trash (plastic, cardboard, paper, etc.)
- Asphalt
- Glass

High Grade Nonrecoverable Uranium Residues:

- Depleted UF_4 (off-spec)
- Depleted Scrap U_3O_8
- Enriched Uranium Residues Below Economic Discard Limit

Low Grade Nonrecoverable Uranium Residues:

- Discard process residues
- Trailer cakes
- Waste slurries (dried)
- Raffinate
- Sump cake
- Dust collector residues
- Filter cakes
- MgF_2

Toxic Substances

- PCB-containing materials
- Batteries with mercury contamination
- Flourescent bulbs contaminated with mercury
- Mercury
- Caustic soda

Hazardous and Mixed Radioactive/Hazardous Waste

- Contaminated cutting and cooling oils
- Spent $BaCl_2$ salts
- Xylene
- HF residue
- Absorbent, w/Mercury
- Spill clean-up material (gloves, clothing, absorbent)
- Material containing lead
- Solvent still bottoms and sludges
- PCB-containing materials
- Photo lab material

Methanol
- Tributyl phosphate

Kerosene
- Solvents

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, treat, or safely store these solid wastes in compliance with the regulations discussed in Section 2.3. This objective covers LLW 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 treated
- 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 capability can generate large quantities of the low-level waste. Production activities have the potential for generating approximately 260,000 cubic feet of low-level waste annually. Although metal production operations are undergoing a downward transition to the commercial sector, examples of typical production waste streams are discussed below. The Refinery is projected to operate on processing residues to UO_3 through this planning period.

Magnesium Fluoride (MgF_2) slag is a byproduct generated from the reduction of UF_4 with magnesium metal. Slag contains depleted uranium metal and oxide, together with some magnesium metal oxide. Depleted slag is a major waste stream whenever Plant 5 is operated to produce uranium derby metal. Process waste was generated when MgF_2 containing enriched uranium was recycled to the Refinery for recovery. The backlog of enriched slag is almost gone and this material is no longer economical to process for uranium recovery.

In addition, Neutralized, filtered raffinate 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 containing depleted uranium include dust collector residues, sump sludges, uranium metal chips, and spilled uranium salts.

Over time, a layer of sludge will build up on the bottom of the Biodenitrification surge lagoon and the storm water retention basin. The sludge from the surge lagoon and retention basin will periodically be removed.

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. Construction projects are expected to generate 950,000 cubic feet of low-level waste for the time period of 1987 to 1992.

As a result of maintenance and renovation activities since 1985, approximately 6000 tons of contaminated scrap ferrous metal and refuse have accumulated at the FMPC. In addition, approximately 1350 tons of contaminated scrap copper are stored at the FMPC. The copper scrap, consisting mostly of motor windings, was generated during the Cascade Improvement and Cascade Uprating (CIP/CUP) Programs during the 1970's. This copper scrap was transferred to the FMPC for interim storage. The metal is a potential source of airborne contamination and radiation exposure to FMPC employees working nearby.

Current generated wastes presently are minor compared to the backlog and reclassified backlog wastes. Over 27,000 drum equivalents of residues, previously categorized as recoverable, have been reclassified as nonrecoverable based upon the revised economic discard limit (EDL). A preliminary determination of the effect of the revised EDL on the FMPC inventory showed a 79 percent reduction in the net weight (pounds) of material previously classified as recoverable. A corresponding 27 percent reduction in kilograms of uranium was also indicated.

The original backlog waste inventory as estimated by WMCO at the beginning of FY 1987 included approximately 91,482 drum equivalents of waste. The goal was to reduce the original backlog waste inventory to zero by the end of FY 1991. As of January 31, 1989, approximately 52,206 drum equivalents of waste remained in the original backlog inventory. Given the previously identified funding levels, the FMPC will complete the original backlog waste reduction near the end of FY 1991. The impact of the reclassified nonrecoverable residues on the original backlog waste reduction goal is that it will take an additional 13 months to process and ship the residues. Current planning is based upon processing and shipping this material by the end of FY 1992.

6.1.2 Hazardous and Mixed Radioactive/Hazardous Waste

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

Examples of FMPC mixed wastes include the solvent 1,1,1-trichloroethane, xylene and mineral spirits (paint thinners), and perchloroethylene which was used to dry clean leather-palmed gloves. Perchloroethylene is no longer used, because dry cleaning of these gloves was discontinued in FY 1988. Some of these solvents are contained in bulk storage tanks located at the FMPC. Spent 1,1,1-trichloroethane solvent received from National Electric Coil Co. was generated during decontamination activities in the 1970's and are no longer being shipped to the FMPC.

Approximately 80 drums of spent barium chloride salt have been generated annually by RMI. Future $BaCl_2$ generation rates are uncertain. 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 which makes this a mixed radioactive/hazardous waste.

In addition, on-going and planned construction projects may generate RCRA waste such as, lead contaminated soil and grit contaminated with lead from grit blasting operations.

PCB-containing capacitors, a TSCA waste, removed from service at the FMPC and articles used in their handling (rags, clothes, gloves) are stored onsite because treatment/disposal options are not available. PCB is a toxic substance as discussed in Section 2.3.3.

Quantities of 1,1,1-trichloroethane still bottoms and sludges are presently stored onsite and are contaminated with uranium. They were generated as a result of attempts to distill the NEC waste to reclaim the solvent using the Plant 1 Detrex still during the early 1980's.

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

Approximately 2200 drums of solid and liquid hazardous and mixed radioactive/hazardous waste are stored onsite. This figure does not include approximately 13,000 gallons of the waste stored in the spent solvent Tanks T5 and T6.

6.1.3 Conventional Industrial Waste

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

Included in this category are, solid waste associated with the boiler plant, fly ash and sludges from water treatment. Nonprocess trash includes cafeteria waste and paper and plastics from offices located inside and outside of 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 uranium is the largest component of backlog residue waste; to fulfill offsite disposal criteria, the filter cake must be dried before it is shipped offsite. Sump sludges must also 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 program is in place and is currently being used to reduce the quantity of contaminated trash. Trash produced in offices and other clean zones within the production area is monitored and segregated. Noncontaminated trash collected in the process area is now sent to a sanitary landfill instead of a low-level waste disposal facility.

Contaminated scrap wood has also been shipped to an offsite contractor for processing and disposal. All of the backlogged waste wood was removed at that time and disposed of, but FMPC is currently generating another pile of scrap wood. A large backlog of scrap wood remains in the process area. Contaminated construction rubble, soil, and asbestos are being packaged and temporarily stored onsite, awaiting disposition.

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 elsewhere in the plant. Contaminated, nonusable metal is packaged and shipped offsite for disposal. A large inventory of rusted, baled drums has also been accumulated at FMPC. Packaging and disposal of this backlogged waste is currently in progress.

Contaminated scrap metal that is thick-gauge and potentially usable is transported to the scrap yard 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 demonstrate their ability to decontaminate it. Phase II vendors will bid 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 6000 tons of scrap metal was separated into three categories: 3,100 tons of usable ferrous metal, 200 tons of usable nonferrous metal, and 2,700 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. The refuse and asbestos will be disposed of as low-level waste. The separation and eventual disposal of refuse metal and asbestos has improved environmental conditions around the scrap yard and created space for additional metal.

The residues reclassified as nonrecoverable as a result of the revised EDL continue to be evaluated for possible sale to the private sector. Since the reclassified residues are chemically similar to those of the original FMPC backlog nonrecoverable residues, they should be processed for offsite disposal. Current methods for processing nonrecoverable residues for subsequent disposal include:

- Drying wet waste residues in the Rotary Kiln/Primary Calciner in Plant 8
- Repackaging dry granular waste residues through the Rotex station in Plant 8
- Overpacking dry, coarse or nongranular waste materials at Plant 1

6.2.2 Hazardous and Mixed Radioactive/ Hazardous Waste

Some 900 drums of the mixed radioactive/hazardous waste discussed in Section 6.1.2 were shipped to the Oak Ridge Gaseous Diffusion Plant (ORGDP) for treatment. These wastes will be incinerated in that plant's mixed hazardous waste incinerator, which is expected to begin operation in FY 1989. In CY 1988, 24 drums of toxic substances were shipped to the ORGDP. In FY 1989, shipments to ORGDP are planned pending certification of the incinerator for operation. Due to the delay in the certification of the incinerator at Oak Ridge, the FMPC is investigating alternative disposal methods. WMCO is investigating the use of the incinerators at Idaho National Engineering Lab (INEL) to burn solid and liquid mixed radioactive/hazardous waste. Hazardous waste and mixed radioactive/hazardous waste are being considered separately. Barium chloride salt, and solids containing the salt, continue to be shipped from RMI to the FMPC for storage. Possible disposal options are being investigated for this waste stream.

Current RCRA storage facilities include an area in the KC-2 warehouse which is allowed to store 1,168 drums of hazardous and mixed radioactive/hazardous wastes and the Pilot Plant Warehouse which has a capacity of 160 drums. The new Plant 6 warehouse is capable of storing 2,432. The additional space in the new Plant 6 warehouse will not be sufficient to accommodate the projected generation because treatment/disposal options are not available. The design of a new RCRA warehouse is in progress.

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. A post-closure plan Waste Pit No. 4 must be developed. Waste Pit No. 4 contains approximately 23,500 pounds $BaCl_2$ placed between 1981 and 1983. The remediation of this material is covered in Section 7.0.

6.2.3 Conventional Industrial Waste

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

The Boiler Plant produces fly ash and sludges from boiler water treatment. Fly ash is taken to the fly ash pile in the southwest corner of the site. A cover will eventually be placed over the fly ash pile to prevent water runoff and air dispersal. The boiler water sludges along with Coal Storage Facility stormwater runoff are drained to a Runoff Collection Basin. An application for a Permit to Install is being written for the Coal Storage Facility Runoff Collection System and will include groundwater and basin water level monitoring.

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 this problem.

6.3 Shipping and Storing Solid Waste

Table 6-1 summarizes the solid wastes shipped offsite for disposal in FY 1988, 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.

TABLE 6-1
WASTE SHIPMENTS AND STORAGE INVENTORY
FOR FY-88

Waste Shipped

Destination	Quantity (drum equivalents)
LLW Offsite Disposal	67,142
RCRA Offsite	606

Waste Stored (Backlog)

Type	Quantity (drum equivalents)
RCRA Waste	1,300
LLW	53,935

Waste Stored (Remedial)

Type	Quantity (drum equivalents)
Total Thorium	11,000
Contaminated Residue in pits	1,660,000
Contaminated Residue in silos	56,700

6.4 Description 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.

6.4.1 Processing and Disposing Low-level Waste

This section addresses the following eight projects related to low-level waste.

- Backlog Low-Level Waste Processing
- Backlog Low-Level Waste Storage and Disposition
- Backlog Low-Level Waste Disposal
- Pretreatment of Backlog Wastes
- Construction Rubble Disposition
- Low-Level Waste Disposition Support
- Decontamination and Decommissioning Facility
- Scrap Metal Management

Backlog Low-Level Waste Processing: This project supports Plant 8 drying/repackaging and Waste Operations packaging/overpacking. Plant 8 activities include drying wet waste residues in the kiln/calciner and repackaging dry granular residues into 48/55 gallon drums. Waste Operations activities include the packaging of loose bulk backlog waste such as refuse metal/wood and the overpacking of 55 gallon drums and dry residues in 83 gallon drums.

A total of 17,552 drum equivalents were processed in FY 1988, funded by GF-01. Funding for FY 1990 will support 25,864 drum equivalents of backlog low-level waste.

TABLE 6-2
BUDGET AUTHORITY FOR SOLID WASTE MANAGEMENT
($ Thousands)

Funding Type	Total	Fiscal Year 1989	1990	1991	1992	1993	1994	1995
GE-CE	3,210	10	400	400	600	600	600	600
GE-GPP	8,664		714	750	1,500	1,375	1,800	2,525
GE-LI	41,046	6,395	4,992	4,985	6,240	18,434		
GE-OP	20,933	2,161	2,300	3,854	4,168	3,353	2,897	2,200
GF-OP	83,121	7,404	13,543	13,924	15,250	12,000	11,000	10,000
GF-GPP	8,500		1,500	1,500	1,500	1,500	1,500	1,000
TOTALS	165,474	15,970	23,449	25,413	29,258	37,262	17,797	16,325

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
GF-GPP	-	General Plant Projects from GF Budget

Backlog Low-Level Waste Storage and Disposition: Remediation and disposal plans would be greatly impacted, if in the future, offsite disposal of low-level waste becomes unavailable to the FMPC. The magnitude of low-level radioactive and other wastes generated by FMPC remediation could be unacceptable to current disposal sites. Therefore, onsite technologies for interim durable storage are being explored. The conceptual design is scheduled to be completed in FY-89.

The preliminary Conceptual Design Report (CDR) for the interim durable storage facility will be initiated in FY 1989 and completed in FY 1990. Careful attention will be given to overall intrasite transport, storage, and removal to ultimate disposal of waste materials. Approvals and preliminary design will begin in FY 1990.

Backlog Low-Level Waste Disposal: Table 6-3 lists the projected shipments of solid low-level waste from the FMPC to disposal over the 1989-1995 time frame. These shipments are divided between currently-generated low-level waste, funded by GE-OP, and backlog low-level waste, funded by GF-OP.

Funds for this project support the following activities associated with the disposal of backlog low-level wastes:

- Package preparation
- Staging
- Radiological monitoring
- Certification
- Transportation
- Burial

Funding for FY 1989 supported 150 shipments of backlog waste offsite. FY 1990 funding will support 219 backlog waste shipments.

Construction Rubble Disposition: The FMPC will generate construction rubble as a result of ongoing maintenance, renovation, and remediation activities. Emphasis has been placed on minimizing construction waste and segregating contaminated and noncontaminated waste in an effort to reduce the quantity of contaminated construction rubble.

Some contaminated construction rubble is being shipped for offsite disposal. The order of shipment is based on the age of the rubble, the oldest being shipped first. The construction rubble that is slightly contaminated <(100 Pci/g) is being stored onsite for use as backfill in the process area. Construction rubble considered clean <(35 Pci/g) is currently being stored in the K-65 area for use as backfill in the clean area.

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

Fiscal Year	Current Waste	Backlog Waste	Construction Rubble
1989	100	150	362
1990	100	219	200
1991	180	212	400
1992	223	112	400
1993	223	0	400
1994	223	0	400
1995	223	0	400

NOTE: Shipments average about 100 drum equivalents.

Waste Technology: Provides engineering support to Waste Operations to develop optimum low-level waste handling , packaging, and minimization methods and procedures. The investigation of bulk shipping methods, alternate packaging designs and volume reduction actions are typical waste engineering projects. Investigation of onsite storage capabilities is also required.

Low-Level Waste Disposition Support and Capital Projects: This activity encompasses several programs and capital projects that support low-level waste disposition:

- **Bar Coders:** FMPC is developing a bar code waste identification system to be compatible with equipment 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. This equipment has not yet been installed at the FMPC. This installation is pending the determination of requirements at the NTS. Installation is expected to occur during FY 1989. The labeling of drums has been initiated at the FMPC for internal purposes. These labels indicate the lot mark and container number in both clear text and bar code format. They are for internal FMPC use only and are not intended to fulfill NTS requirements.

- **Waste Monitoring Station:** The basic concept of the waste monitoring station is to use state-of-the-art non-destructive assay technology for monitoring low-density waste packages. Since the wastes are not amenable to conventional sampling and analysis techniques, a factor assay value is assigned to low-level contaminated wastes by Materials Control and Accountability. The current factor assay used for these materials may reflect the item-to-item variability in uranium content. Low density waste packages contain approximately one kilogram of uranium (plus or minus one kilogram). Non-destructive assay technology can be used to determine uranium content by using a Canberra system 100 multichannel analyzer which is integrated into a computer. The Canberra system 100 will interpret the uranium content of the waste package using the gamma spectrum recorded by a NaI detector. The measurement precision of this system is approximately ten percent.

- **Low-Level Waste Shredder/Compactor:** The use of a low level waste shredder/compactor facility is currently being investigated at the FMPC. Waste will be transported in drums or dumpsters to the facility and dumped into a bin which will convey the waste to a shredder. The shredded waste will then be compacted into 40" x 40" boxes, marked, labeled, and sent to the Plant 1 pad for shipment for offsite disposal. This facility will streamline waste shipment preparation and reduce employee exposures. Savings of $1,000,000 a year have been estimated for disposal costs by reducing waste volumes by shredding and compacting.

- **Shipping Dock Upgrade:** 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. The preliminary engineering will be done in FY 1989 and the design and construction is planned for FY 1990.

- **Drum Cleaning/Handling Equipment:** Portable washers are needed for 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 is 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 wastes generated by the site restoration project. Some of the necessary equipment may become available as a result of reduced production demands. Approximately 40% of old drums are expected to be recovered for future use after the backlog waste currently contained has been processed and repacked for shipment. The remainder of the drums will be crushed, processed, and shipped as low-level waste.

- **Miscellaneous Equipment:** Equipment such as floor scrubbers are used to support FMPC's contamination control program. Laundry equipment such as scrubbers and washers are used to provide a safer working environment, as well as minimizing low-level waste.

Scrap Metal Management: The 2209 tons of recoverable metal separated from the scrap yard, and 1,350 tons of scrap copper will remain onsite until they are recycled to the private sector as part of the DOE's scrap reclamation program. Activity is expected to begin in the fourth quarter of FY 1989 and continue through FY-1996.

In the meantime, packaging and disposal plans are being implemented for the 2,700 tons of refuse 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. The design is complete for a new facility to decontaminate a wide variety of items, many of which can be reused. This effort will contribute to the reduction of low-level waste. 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 be a significant factor in FMPC's Contamination Control Program.

Funding for construction has been approved by DOE and bids for the construction package were due in February 1989. Utility lines have been extended to the construction site and the water permit to install has been received from OEPA. Construction is currently on hold pending receipt of the air permit to install from OEPA and NESHAP from the Federal EPA Region 5.

6.4.2 Hazardous and Mixed Radioactive/Hazardous Waste Management

Hazardous and mixed radioactive/hazardous 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
- RCRA Compliance Program Management
- RCRA Compliance Performance
- RCRA Facilities/Closures
- Underground Storage Tank Removal
- Mixed Radioactive/Hazardous Waste Minimization

Shipping RCRA Waste: This program funds the characterizing of hazardous or mixed radioactive/hazardous waste in preparation for shipping it to ORGDP. Coordination of the FY 1988 mixed radioactive/hazardous waste oil shipments to the TSCA incinerator in Oak Ridge continued. Funds were used to remedy leaking containers and to cleanup the FMPC waste in storage at Oak Ridge.

Funds are required to provide engineering support to Waste Operations to remedy emergent problems associated with the storage of mixed radioactive/hazardous waste at the FMPC in conformance with RCRA/TSCA regulations. A sampling contract will be let to characterize waste for shipping, to determine RCRA and mixed hazardous waste constituents, and to determine the selection of drum material for long term storage. In addition, a test plan will be implemented to determine the capability of other DOE sites to dispose of FMPC/RMI oils, solvents and oil/solvent mixtures though the INEL incinerator.

Four shipments of mixed hazardous waste offsite for disposal are planned for FY 1990. This will reduce the onsite backlog inventory by 25 percent. In addition, the funds will allow onsite activities to upgrade RCRA storage facilities following EPA compliance inspections to meet minimum requirements. The program also covers the engineering support associated with transferring contaminated oils from RMI to the FMPC (packaging, characterizing, shipping, and unloading).

RCRA Compliance Program Management: Compliance with the Resource Conservation and Recovery Act necessitates the revision of the FMPC Part A and B permit applications via major updates and revisions. The technical data in the permit was improved to provide the depth of detail necessary. The following were included in RCRA Compliance Program Management:

- RCRA Implementation Plan
- Development of Regulatory Compliance Guides
- Maintenance of a computerized RCRA Waste Inventory Control System
- Interfaces with waste shipment organization to insure proper documentation and availability of analytical data

In addition, a subcontractor was used to formulate a long-term, comprehensive training program and record keeping system to facilitate compliance with RCRA training requirements. Significant effort was focused on coordinating FMPC activities associated with the RCRA Implementation Plan. Issued on November 10, 1988, this plan is comprised of ten separate sets of Action Plans and Milestones designed to integrate RCRA compliance into daily activities.

Effort in FY 1990 will focus on compliance aspects of alterative treatment and disposal options. This will facilitate shipment of RCRA waste from the FMPC. Definition and prediction of generated and received RCRA wastes will be used to insure compliant, adequate, onsite storage for wastes which have no treatment or disposal outlet. The requirements for ground water monitoring for those RCRA storage and treatment facilities in closure (i.e. corrective action) will be met, with appropriate reporting. Support for the compliance adequacy of the closure plans and the demonstration of the corrective action taken will be provided. Close interface with CERCLA activities will be necessary to properly classify contamination under RCRA and/or CERCLA. The onsite requirements for training, inventory control, and record keeping will continue as will efforts defined in the RCRA Implementation Plan.

RCRA Compliance Performance: The FMPC began a program to identify RCRA wastes which may be incompatible with their present containers. Those packages where the container's integrity is suspect are redrummed as part of this program. FY-1988 funding supported redrumming of leaking containers stored at the ORGDP. Funds are needed to deal with any recurrence at ORGDP or the FMPC and provide suitable drums to avoid future leakages. This effort will be coordinated with RCRA shipping plans and waste minimization plans. Potentially large quantities of RCRA waste may materialize as a result of interim remediation activities at the FMPC and RMI.

RCRA Facilities/Closures: FY 1989 funding supports the closure of the Barium Chloride Facility, the Trane Liquid Waste Incinerator and any other RCRA facilities. This program also supported the modification to existing storage areas, such as the KC-2 and new Plant 6 warehouses, to meet RCRA storage requirements. CDR was approved for a new RCRA warehouse.

Funding is required for continued support of the engineering design of a new RCRA warehouse, to develop closure plans for RCRA facilities, as required, and to address emerging issues and unanticipated regulatory requests associated with RCRA facilities and closures. Funding is also needed to support post-closure activities of retired RCRA facilities.

Underground Storage Tank Removal: The FMPC has sixteen underground storage tanks, three of which are in service, and three of which do not fall under the UST Program. Fourteen have been in service in excess of twenty years. Testing of the three tanks in service will be completed in FY-1989 under the field program of the RI/FS. The ten abandoned tanks will be removed as required under the Fire Marshall Code of Ohio during FY-1990. It is assumed that these tanks have leaked and will require some soil excavation. Restoration activities at these sites will include:

- Tank removal and disposal
- Contaminated soils removal and disposal

This project will address activities associated with the tank and soils removal/treatment.

Hazardous and Mixed Radioactive/Hazardous Waste Minimization: These programs will minimize the generation of mixed low-level radioactive/hazardous waste. Funds are required to modify and implement existing technology and engineered solutions to:

- Minimize hazardous waste generation
- Detoxify hazardous waste
- Delist mixed radioactive/hazardous waste
- Immobilize hazardous waste

These activities will identify existing technologies from outside sources for application at the FMPC. Any operations that include detoxification or immobilization will require a permit. Funds will also be used to address emergent problems and extraordinary situations in the storage of mixed radioactive/hazardous waste on site.

RCRA Capital Projects and Equipment: Two RCRA projects under consideration for funding are miscellaneous capital equipment and a facility needed to support waste minimization. Equipment is needed to conduct hazardous and mixed waste operations in a manner consistent with recommendations and requirements contained in regulations (e.g., stacking, spacing, and communications requirements). Examples of equipment needed include scales, handstackers, portable ramps, overpacking hoists, temporary spill containment, and portable radios. This equipment must be available for dedicated use in FMPC RCRA waste centers. The process facility would house an area for processing RCRA wastes to stabilize them non-hazardous or to convert mixed waste into simply a Low-Level Waste or hazardous waste. Staging and temporary storage areas would also be included. All actions will be in accordance with RCRA permit provisions.

A new $BaCl_2$ treatment facility, which separates the hazardous component, barium, from the radioactive component, uranium, is an option for treating contaminated $BaCl_2$. This project is currently included in EHSI Line-Item (Project 87-D-154, WBS 1.1.3.4.04), but will likely be deleted because operations at RMI are being phased downward.

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 Sanitary 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 1989.

Expanding the Sanitary Landfill: A feasibility study is currently being performed which will examine several alternatives for disposing of the FMPC's noncontaminated sanitary waste. The present method of disposal at a local commercial landfill has been effective, however, continuation of this method is somewhat uncertain. With this in mind, the FMPC must be prepared for any possible changes relating to interrupted disposal service. Among the alternatives being considered is the proposed expansion of the onsite landfill. This expansion was formerly proposed in 1985 when it was clear that the landfill operating at that time would soon be full. A permit application was filed, but was not adequately updated to address the continually changing regulations. If it is decided to undertake this project, the permit will have to be modified significantly prior to submittal for approval.

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 1989.

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 DOE Order 5820.2A require a waste minimization program.

The following two site policy and procedures directly address waste minimization:

- **FMPC-312, Revision 1, 10/19/88, Disposal of Noncontaminated Waste from the Non-process Areas** - This procedure implements segregation and isolation techniques used as the waste is generated to minimize the volume of non-process waste that is treated as contaminated.

- **FMPC-720, 11/10/88, Control of Construction Waste** - This procedure establishes the requirements and responsibilities for minimizing construction waste generated at the FMPC, for determining contamination present and disposition, and for proper handling and packaging of these waste materials.

During FY 1988 and early FY 1989 several waste minimization programs were implemented:

- **Waste Minimization Program** - a plan was issued which delineates FMPC's waste minimization goals and strategies. The waste minimization program will significantly reduce the generation of contaminated waste at the FMPC by confining contamination to specific areas. A procedure was implemented which keeps hazardous waste oils from being mixed with nonhazardous waste oils.

- **Establishment of Contamination Zones** - Three distinct zones were established at the FMPC for contamination control.

Zone 1 - Clean Areas - Smearable contamination less than 20 dpm/100 cm^2 alpha and 100 dpm/100 cm^2 beta.

Zone 2 - Transition Areas - Smearable contamination less than 200 dpm/100 cm^2 alpha and 1000 dpm/100 cm^2 beta.

Zone 3 - Areas requiring additional controls due to the nature of the work being accomplished and smearable contamination greater than 200 dpm/100 cm^2 alpha and 1000 dpm/100 cm^2 beta.

- **Anhydrous Hydrogen Fluoride (AHF) By-product Sale and Load-out Facility Project** - With the decision to put N-reactor in stand-by, there was no use for the AHF by-product of the UF_6 reduction process. There were two options - scrap or sell. Although there was a path for disposal, the decision was to sell. A buyer was found and the product was qualified. In addition, a sampling and loading facility for the AHF was designed, engineered, installed. The FMPC is now selling excess AHF rather than neutralizing and shipping the resulting salts. For the three months of June, July and August of 1988, this resulted in a net sales of $65,000 and a cost avoidance of $580,000 for shipping 1.15 million pounds of neutralized salt cake to offsite low-level waste burial.

- **Transuranic Processing at the FMPC Refinery** -A process was engineered and utilized for removal of out-of-specification levels of plutonium (Pu) and neptunium (Np) from refinery feed materials. The old process started with acceptable levels of Pu and Np in recoverable scrap. However, in the purification process, most of the Pu and Np was concentrated with the uranium which caused an out-of-specification product. As a result of the new process, an in-specification product is produced, but the residues are not contaminated. Approximately 7,000 metric tons of feed are now being processed in this manner, rather than boxed for waste shipment.

  Approximately 360 metric tons of uranium equivalent can now be processed. This material will average approximately 0.99% U235 and has a value of about $25 million including feed and Separative Work Units (SWU).

- **4A Metals** - The dwindling supply of 4A raw materials and the growing inventory of 4A scrap metal represented a business threatening problem for the FMPC. The Customer specified that only virgin derby material was to be cast into product billets. The specification eliminated the use of recycled scrap metal in product castings.

The testing and development for utilizing scrap metal in product castings was completed in eight months (sixteen months earlier than expected). As a result of the test program, the Site Customer received approval, effective January 1, 1988, to recycle metal scrap. By substituting the scrap metal for virgin derby metal in 4A billet production, the Customer realized a $7.2 million cost benefit in manpower and raw materials, a $2.2 million benefit in decreasing low-level waste shipments, and a $1.3 million potential cost benefit in remedial waste shipments.

- **Operation of Plant 8 Kiln and Calciner** - Processing of non-recoverable residues resulted in a 63 percent weight reduction as well as a 34 percent volume reduction.

  During the eight month period of operation, April to December 1988, offsite low-level waste burial shipments were reduced from 202 potential shipments to 106 actual shipments, a cost avoidance of $21,000 per shipment or a total of approximately $2,000,000. Processing of non-recoverable residues will continue through 1989.

- **Reduction Pot Salvage** - The salvage operation (repair welding) will place a minimum of 1,500 scrap reduction pots back into production. The need to purchase new pots will be eliminated for some time and a reduction in the quantity of scrap reduction pot waste is reduced. The cost savings realized from salvaging 400 scrap reduction pots is $210,000.

- **Magnesium Fluoride Jolters** - The magnesium fluoride jolters in Plant 5 were fine-tuned during 1988 to produce consistently good pot liners. In conjunction with captive mandrels for liner formations, a significant reduction in rejects and liner collapses during filling was achieved. Because rejects and collapses resulted in waste generation, direct waste generation was reduced.

Several waste minimization projects are planned for FY 1989 and beyond:

- **Waste minimization Award Program** - A program to encourage employees to submit waste minimization suggestions is being established. Under the program, employees will be given awards for their waste minimization suggestions. Also being considered is the establishment of a program to award the plant/facility with the best waste minimization track record.

- **Volume Reduction of Raffinate Cake** - Developmental work was done which indicates that substitution of magnesium hydroxide for calcium hydroxide in the neutralization of the raffinate produced by plant 2/3 will reduce the volume of waste generated by one-third. Plans are underway to perform plant tests which may lead to the implementation of this process change.

- **Utilization of Reconditioned Drums** - The current practice at the FMPC is to purchase new white drums for shipping waste for offsite disposal. During the process of reducing the volume of refinery raffinate and slag leach filter cake stored onsite, hundreds of empty drums are being generated. These drums are reconditioned at the FMPC and reused onsite. The feasibility of utilizing any excess inventory of these drums to package process residues for offsite disposal is being investigated.

- **Reduction of the Volume of Contaminated Concrete** - Efforts are being made to procure equipment, such as a scabbler, that will allow the removal of the top 0.5 inches of concrete floors during decontamination efforts. This allows the removal of only contaminated concrete. Fresh concrete can be poured over the noncontaminated concrete or the noncontaminated concrete can be sent to a noncontaminated waste disposal facility.

- **Segregation of Soils** - WMCO will investigate the potential of developing and using a soils segregation unit that will quickly and accurately segregate soils by contamination. This unit will be necessary to minimize the quantity of soils considered LLW during the remediation of the site.

7.0 FMPC Restoration

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

A sitewide RI/FS is being conducted to characterize the extent of any contamination found at the FMPC and the surrounding area, and to assess the relative impacts associated with current and past operating and waste storage practices. The investigation is being performed pursuant to the FFCA (Section 2.5.1). The RI/FS is the initial step in the systematic process to implement corrective actions programs to ensure the safe and permanent disposition of stored waste inventories at the FMPC. The FMPC has completed a parallel study entitled the Characterization Investigation Study (CIS) aimed at completing an in-depth investigation of the FMPC waste storage area. On the basis of the CIS results and the progressive findings of the ongoing RI/FS, the following is a partial list of facilities and environmental media which may require corrective actions:

- Groundwater
- Storage silos containing radium-bearing residues
- Waste storage pits containing low-level waste and mixed waste
- Abandoned-in-place equipment and facilities
- Soils and sediments
- Sanitary landfill and flyash piles

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

- Pursue interim corrective actions to maintain the stored materials and facilities in a safe, stable condition until the methodology for final disposition of the materials is identified and implemented
- Initiate resource planning to support eventual restoration actions
- Provide appropriate focus on the RI/FS and milestone schedules
- Implement the restoration actions recommended by the RI/FS Record of Decision

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

7.1 Description of FMPC Areas Requiring Restoration

7.1.1 Thorium Storage at the FMPC

The FMPC has served as the thorium materials repository for DOE since 1972. Approximately two-thirds of the material in the repository was processed at the FMPC. The remainder originated from other DOE facilities. Approximately 1,087 metric tons of thorium are stored on the plant site. The thorium is primarily a mixture of thorium metal, thorium oxides, and process residues. Twenty-three of these drums contain potentially pyrophoric thorium metal millings. A summary of the FMPC thorium inventory is presented in Table 7-1.

7.1.2 K-65 and Metal Oxide Silos

There are four concrete waste storage silos at the FMPC. The silos are 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 concentration of radium. Silo 3 contains cold metal oxides having concentrations of uranium and minor quantities of other select radionuclides. Silo 4 is empty. An estimated 150 curies of radon, a gaseous radium decay product, are released each year from each K-65 Silos (No. 1 & 2), since the application of a weatherproof foam coating was completed in December 1987. Although the radiation dose to employees and area residents from this source is negligible, these emissions will be reduced as part of the interim restoration discussed in Section 7.2. The type and quantities of material in each silo are listed in Table 7-2.

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 remain a potential source of environmental contamination. Pits 1-4 have a dirt cover and are graded to ensure positive drainage. Pit 4 is a RCRA waste facility since it contains approximately 23,500 pounds of $BaCl_2$. Pits 5 and 6 are retired, but remain uncovered. The contents of the six

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	Quonset #1
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 of Building 65
Low-grade residues (<30% Th)	0.2	Building 67
TOTAL	**1,087.5**	

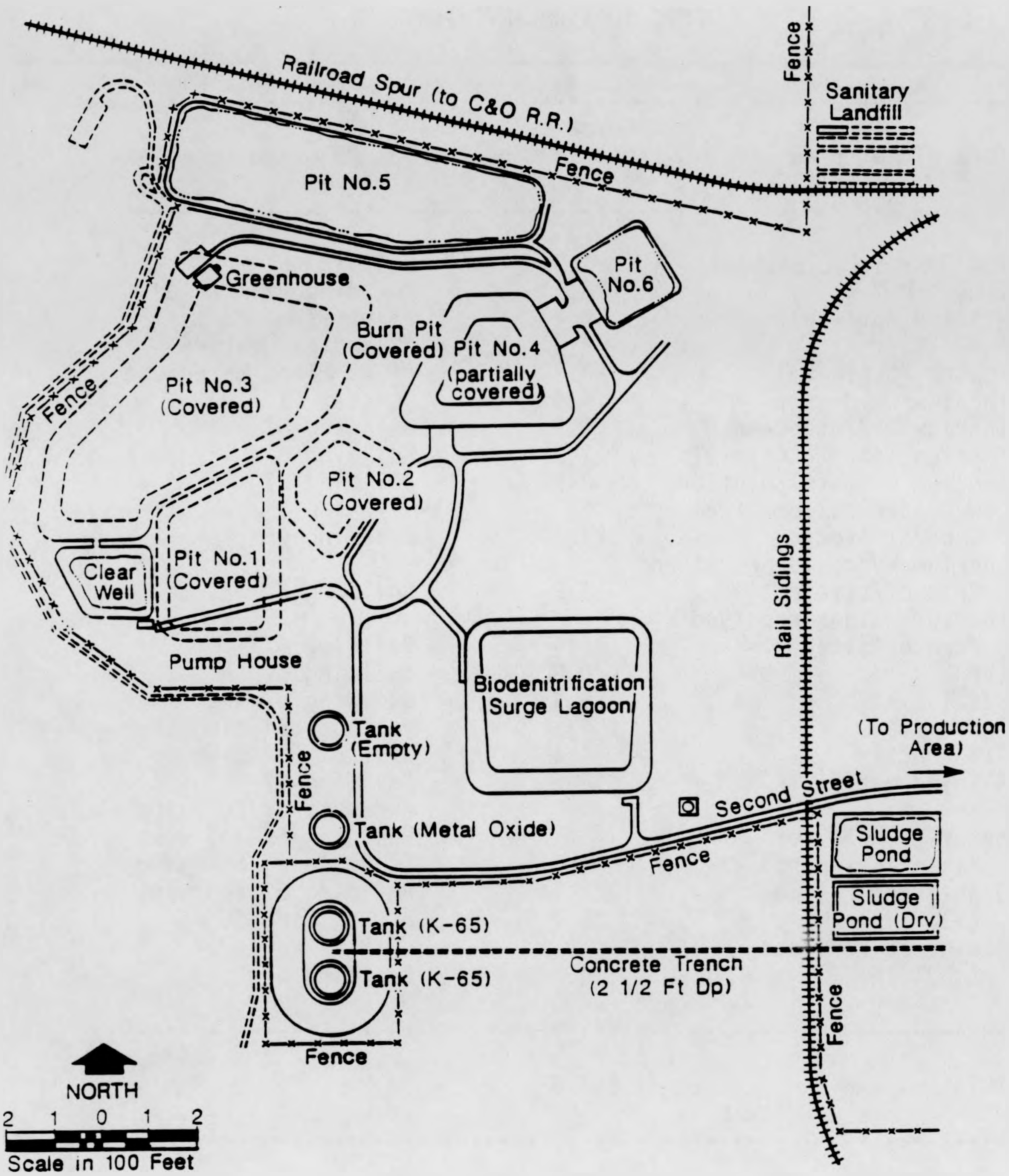

Figure 7-1. Location of FMPC Waste Pits and Silos

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waste storage pits are also summarized in Table 7-2. Interim restoration measures, as discussed in Section 7.2, are planned for these pits. The final disposition of the pit contents will be identified in a Record of Decision on the RI/FS.

7.1.4 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 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. Table 7-3 is a listing of prioritized equipment to be removed in fiscal year 1989. 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 conducted during renovation and maintenance projects, a large volume of soil containing above background concentrations of uranium exist at the FMPC. Most of the surface soils at the FMPC having elevated uranium concentrations resulted from the deposition of airborne emissions. Exceptions include areas where accidental spills occurred, and zones contiguous to waste storage units, and production units.

7.1.6 Contaminated Groundwater

Environmental monitoring has identified two localized areas of above background concentrations of uranium in the regional sand and gravel groundwater aquifer:

- Waste pit area and area east of the pits
- Area south of the FMPC extending ~ 2500 ft. offsite

Groundwater contamination likely resulted from surface water ladden with slightly elevated levels of uranium, infiltrating into the groundwater flow.

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)**

TABLE 7-3
ABANDONED-IN-PLACE EQUIPMENT

Equipment Tag No.	Equipment Description	Building No.	Scheduled Removal Fiscal Year
AIP-001-015	Lab Size Dryer	1	1989*
AIP-001-018	Sampler	1	1989*
AIP-001-019	Sampler	1	1989*
AIP-001-020	Sampler	1	1989*
AIP-001-021	Sampler	1	1989*
AIP-001-022	Oven	1	1989*
AIP-001-023	Scale	1	1989*
AIP-001-043	Pump	1	1989*
AIP-001-044	Tank-Rinse	1	1989*
AIP-001-045	Overflow Tank	1	1989*
AIP-001-046	Pump	1	1989*
AIP-004-001	H2 Control Panel 1&2	4	1989
AIP-004-002	H2 Control Panel 3&4	4	1989
AIP-004-003	H2 Control Panel 5&6	4	1989
AIP-004-004	H2 Control Panel 9&10	4	1989
AIP-004-005	H2 Control Panel 11&12	4	1989
AIP-004-027	Scale	4	1989
AIP-004-028	Scale	4	1989
AIP-004-029	Scale	4	1989
AIP-004-030	Scale	4	1989
AIP-004-031	Scale	4	1989
AIP-004-032	Scale	4	1989
AIP-005-001	Rotary Blender	5	1989*
AIP-008-002	Oil Reclaimer	8	1989*
AIP-013-001	Control Panel	13	1989*
AIP-037-003	Furnace (Tank)	37	1989*
AIP-037-004	Jolter	37	1989*

* - Prioritized equipment with higher contamination levels.

7.2 Description of Site Restoration Activities

Site restoration activities are described in this section. The fiscal year funding requirements are presented in Table 7-4.

7.2.1 Remedial Investigation/Feasibility Study

7.2.1.1 RI/FS

In accordance with the provisions of the CERCLA section of the Federal Facilities Compliance Agreement, a Remedial Investigation and Feasibility Study (RI/FS) is being conducted at the FMPC site to evaluate the nature and extent of any environmental impacts from past and present plant operations. The study is divided into two phases. The Remedial Investigation (RI) phase includes sampling of the air, soil, groundwater, sediment, and select production facilities for the presence of above background concentrations of chemical and/or radiological constituents. The Feasibility Study (FS) phase will study restoration alternatives for environmental concerns identified during the RI. The preferred cleanup alternative based upon a systematic engineering and cost evaluation will be proposed as part of this phase. The USEPA will make the final selection of alternatives and issue Records of Decision (ROD) identifying alternatives to be implemented at the FMPC. The RI/FS was initiated in July of 1986 and is tentatively scheduled for completion in January 1992.

Areas under RI/FS investigation include the active production area, the inactive waste storage area, other historical FMPC facilities, and public/private properties adjacent to the site. Progressive findings of the RI/FS have identified the following FMPC facilities as potential areas for restoration action:

- The six waste pits
- The clearwell and burnpit
- Groundwater beneath production facilities, South plume and beneath the waste pits
- The fly ash piles and sanitary landfill
- K-65 and other silos
- Deactivated facilities
- The underground storage tanks

In order to expedite the restoration process at the FMPC to address critical environmental and/or community concerns, the RI/FS has been segmented into six operable units. These operable units are as follows:

1. **Waste Storage Areas** - Pits 1-6, Burnpit, and Clearwell (excluding contents of Pit 5)
2. **Solid Waste Units** - Lime Sludge Pond, Sanitary Landfill, and Flyash Piles

3. **Facilities & Suspect Areas** - Facilities inside the Process Area, Tanks, Lines, Fire Training Area, Incinerator Area, Diked Areas, Graphite Burner Area, Storage Pads, Storm Water System, Stored Waste Inventory, Sumps, and Other Suspect Areas
4. **Special Facilities** - K-65 Silos and Silo 3
5. **Environmental Media** - Soils, Sediments, Surface Water, and Groundwater
6. **South Plume** - Pump and Treat Contaminated Groundwater

They represent discrete facilities or concerns, which comprise the total scope of the ongoing RI/FS. Separate RI and FS reports and RODs will be prepared and issued for each operable unit.

Progressive actions on the RI/FS will continue during FY 1989 and FY 1990. Major milestones Scheduled for FY 1989 include:

- Completion of the K-65 Silo Sampling Project
- Completion of installation and sampling of 24 additional wells
- Completion of the Alternatives Report for the South Plume (Operable Unit No. 6)

Scheduled major milestones for FY 1990 include:

- Issuance of the RI/FS Reports on the South Plume (Operable Unit No. 6)
- Issuance of a ROD on the South Plume (Operable Unit No.6)
- Issuance of the RI and FS final reports for the K-65 Silos and Silo No. 3 (Operable Unit No. 4)
- Issuance of the RI report for Solid Waste Units (Operable Unit No. 2)
- Completion of site investigation activities

7.2.1.2 EIS

DOE directives require the integration of the RI/FS and the Environmental Impact Study (EIS) to fulfill NEPA requirements for restoration actions. FY 1990 funding supports the scoping of the necessary meetings and the implementation plans for the six operable units. Funding will also support the completion of the required documentation on Operable Units No. 4 and No. 6.

7.2.1.3 Other Environmental Studies

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 during FY 1989. Analytical data

TABLE 7-4
BUDGET AUTHORITY FOR SITE RESTORATION
($ Thousands)

Funding					Fiscal Year			
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-LI	79,482		2,612	25,814	35,212	12,410	3,434	
GE-OP	1,330	445	440	445				
GF-OP	4,272	1,912	1,150	1,210				
GF-11	520,045	9,745	23,000	39,000	50,850	125,250	131,250	140,950
TOTALS:	**605,129**	**12,102**	**27,202**	**66,469**	**86,062**	**137,660**	**134,684**	**140,950**

KEY

GE-LI - Line Item Projects from GE Budget
GE-OP - Operating Funds from GE Budget
GF-11 - Funding for Site Restoration Projects

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 will be collected in strict accordance with DOE ALARA and USEPA sampling protocol.

Biological Study: Biological studies will be continued to determine the cause of identified ecological stresses which may be occurring as a result of past or present waste disposal practices at the FMPC. The ecological stresses were identified in a previous study conducted by Miami University under subcontract with WMCO.

7.2.2 Restoration Design

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

Conceptual Design Reports (CDR), Design Criteria Documentation, and Title I-II engineering designs must be completed to effectively implement restoration actions at the FMPC. In general, detailed engineering will be prepared to support all significant restoration activities. These activities include, but are not limited to implementation of the alternatives identified in each of the RODs issued for the six operable units of the RI/FS.

Restoration design and engineering will also support the implementation of interim remedial, or removal, actions in addition to those discussed in Section 7.2.3 which are initiated prior to the issuance of the ROD for the RI/FS.

Final restoration actions will begin within a reasonable time period following the ROD, but in no event, longer than what is required under SARA. To support this effort, high priority Feasibility Studies and Conceptual Designs for the restoration of the waste pits and silos were initiated during FY 1989. In addition, Design Criteria documents for the high priority restoration actions will be initiated in FY-1990, prior to the issuance of the ROD. Title I-II design will not commence until after the issuance of the ROD. While facility upgrades necessary to support restoration actions will begin in FY-1990, final restoration actions generally will not begin prior to issuance of the respective ROD.

7.2.2.1 Operable Unit No. 1, Waste Storage Areas

The FY 1990 budget supports the completion of a CDR and the initiation of Design Criteria Documentation for restoration actions associated with the FMPC Waste Storage Area, including the six waste pits (excluding the contents of Pit 5), the burnpit and the clearwell. Final restoration actions may include waste stabilization and entombment.

Interim remedial efforts are directed toward maintaining the uncovered pits (5 & 6) in a safe, stable condition. Design activities for the remediation of Pit 5 are being conducted under the EHSI Line Item Project 87-D-159 (WBS 1.1.3.1.02).

As part of the FFCA, DOE agreed to provide an interim closure for Pit 4 to prevent the infiltration of water and reduce the possibility of spreading contamination to the environment. The closure was completed in the third quarter of FY-1989.

7.2.2.2 Operable Unit No. 2, Solid Waste Units

Conceptual Design Reports for restoration activities associated with the sanitary landfill, fly ash piles and lime sludge ponds in Operable Unit No. 2 will be initiated in FY-1990. This action is required to provide for the timely initiation of restoration actions on this unit following the issuance of the ROD.

7.2.2.3 Operable Unit No. 3, Facilities and Suspect Areas

Funding is required to support the initiation of Conceptual Design for Facilities and Suspect areas and initiation of design criteria for restoration actions, in FY 1990.

The interim restoration plan for abandoned equipment is to identify the equipment, determine its radiological condition, and gradually remove it from the plant.

All abandoned equipment at the FMPC was identified and bar-coded in FY-1987. Plant drawings were updated to show the location of this equipment. Disconnection and radiological surveying of abandoned equipment has begun. The disposition of abandoned-in-place equipment will continue depending on budget constraints and manpower availability.

7.2.2.4 Operable Unit No. 4, K-65 Silos and Silo No. 3

A CDR and a Design Criteria Document will be completed for Operable Unit No. 4 in FY 1990. Title I engineering for restoration actions associated with this unit will be initiated after issuance of the Record of Decision in FY-1991.

Interim efforts for the K-65 silos includes internal visual inspection of the silos using remote video cameras and the installation of a uniform four foot layer of sand inside the silos for stabilization. Internal video monitoring of Silos 1 and 2 was conducted in June 1988, and the interim stabilization is undergoing EPA review and is scheduled for completion in December 1989.

7.2.2.5 Operable Unit No. 5, Environmental Media

Design studies and process development studies for restoration actions associated with Operable Unit No. 5 will be initiated in FY 1990. Restoration action technologies being considered include groundwater recovery and treatment, and sediment removal and encapsulation.

Interim restoration actions may include localized sediment removal from runoff channels and/or a liner system to prevent fugitive dust emissions.

7.2.2.6 Operable Unit No. 6, South Plume

The FY 1990 budget supports the completion of design and process development studies for the implementation of final restoration actions on the groundwater plume located to the south of the FMPC. Potential final restoration actions include pump and treatment of groundwater in existing or planned FMPC wastewater treatment facilities.

7.2.2.7 Engineered Treatment and Storage Facility

The CDRs and Design Criteria Documents for an above ground Engineered Storage Facility (ESF) and for the Packaging and Staging Facility will be completed in FY 1990. The above ground ESF is proposed for the long term retrievable storage of waste material generated from the FMPC restoration activities. The ESF CDR will include waste packaging considerations. The Packaging and Staging Facility will provide needed waste preparation, packaging and staging facilities for waste materials prior to placement in the ESF or for offsite shipment.

7.2.2.8 Development Engineering

The process development studies to support design consideration for Operable Units No.s 1, 2 and 4, and the Restoration Support Facilities will be completed in FY 1990 and 1991.

Development engineering is needed to support the design and implementation of the Environmental Remedial Action (ERA) Project. Studies anticipated include geotechnical evaluations of wastes or ESF cover material, and treatment processes for wastes. Methods to reduce the toxicity of the wastes or reduce gaseous emissions will also be investigated. New or existing technologies will be studied for possible application to the restoration activities. Areas of application include waste minimization, process optimization, and cost reduction. The scope of these studies will be more clearly defined at the conclusion of Task 3 of the RI/FS. Development Engineering was initiated during the first quarter of FY-1989.

7.2.2.9 Laboratory and Quality Assurance Upgrade

Funding is required in FY-1991 for the initiation of Quality Assurance upgrades. Revisions to the FMPC laboratory and Q/A programs are necessary to adequately support the restoration actions proposed for the FMPC. FMPC laboratory procedures will be revised to fulfill the quality requirements of the EPA CERCLA program. Radiochemical, spectrochemical, and geotechnical analyses will be performed in the laboratory to support restoration activities. Geotechnical instrumentation (i.e., triaxle shear, consolidation) will be acquired to support this effort. Site QA/QC procedures will be augmented to support field oriented cleanup programs. Funding is needed for the development of required laboratory and operating procedures, and for the acquisition of geotechnical testing equipment.

7.2.2.10 Interim Monitoring

FY 1990 funding supports the installation of ambient air monitors in the fly ash and waste storage area. These monitors are required to develop baselines for these areas prior to the commencement of restoration activities.

7.2.3 Restoration Actions

7.2.3.1 Operable Unit No. 1, Waste Storage Units

Pits 1-6, Burn Pit and Clearwell: The pits contain approximately 550,000 tons of waste. The primary wastes are process residues with uranium and thorium concentrations too low to be economically recovered. Intermixed with the residues is contaminated construction waste, metal, graphite, asbestos and other materials. Treatment of the pit residues may include a passivation step to reduce the toxicity of the waste.

Pit 4 contains both hazardous and radioactive waste. This effort will cover the removal, treatment, packaging and disposal of the pit contents, and the restoration of the excavated pits. The pit contents will be disposed of in the ESF.

Funding is required to provide engineering design services, construction activities, and Title III services for the restoration of Waste Pits 1, 2, 3, 4, 5 and 6, the clearwell, and the burn pit. The design services include developing the conceptual design, design criteria, and Title I/II definitive design.

Conceptual design will begin during the first quarter of FY-1990, and will be followed by the development of design criteria. Title

I design will begin in the third quarter of FY-1990 for remedial actions. The ROD on Operable Unit No. 1 is anticipated to be issued in April 1991.

7.2.3.2 Operable Unit No. 2, Solid Waste Units

In-Situ Stabilization: The restoration concept for the FMPC involves the in-situ stabilization of the north lime sludge pond, sanitary landfill and fly ash piles. In-situ stabilization involves the placement of a layered cap over the facility to preclude the infiltration of surface waters. This preliminary concept may be revised based upon the final issuance of the Record of Decision. Funding is required in FY-1990 to initiate conceptual design and design criteria development. Definitive design will not be initiated until after the Record of Decision, which is anticipated to be issued in April 1991.

7.2.3.3 Operable Unit No. 3, Facilities and Suspect Areas

Deactivated Facilities: Deactivated facilities and adjacent soils will be investigated during the field investigations of the RI/FS. The need for further restoration action at these facilities will be evaluated under the Feasibility Study. Several facilities will require restoration. These include the graphite incinerators, the fire brigade training area, and the site of the historic drum baling facility. Contaminated soils, building materials, and unusable equipment will be removed and processed at the staging/packaging facility for disposal in the ESF. Funding is required to support Conceptual Design, Design Criteria, Title I, II, and III Design, and restoration of deactivated facilities. The ROD for this operable unit is anticipated to be issued in December 1991.

7.2.3.4 Operable Unit No. 4, K-65 Silos and Silo No. 3

K-65 Silos and Silo 3: The K-65 Silos contain approximately 9,700 tons of residues from the processing of high-grade uranium ore. The residues contain higher-than-normal concentrations of radium, which produces radon, a radioactive gas. They also contain several metals, including lead. Treatment of the K-65 residues may include a passivation step to reduce the toxicity of the residues.

Silo 3 contains residues from the processing of lower-grade uranium ores. This effort will cover the removal, treatment, packaging, and disposal of the silo residues. The silo residues will be disposed of in the ESF.

Funding is required to provide engineering design services, construction activities, and Title III services for the restoration of the K-65 Silos and Silo 3. The design services include developing the conceptual design, design criteria, and Title I/II definitive design.

The conceptual design was begun during the fourth quarter of FY-1988 and will be followed by the development of design criteria in FY-1990. After issuance of the ROD on Operable Unit No. 4, Title I design will be completed and followed immediately by Title II design. The ROD for this operable unit is anticipated in November 1990.

7.2.3.5 Operable Unit No. 5, Environmental Media

Sitewide Soils: The preliminary restoration concept for the FMPC involves the removal, treatment, and disposal of surface soils exhibiting levels of uranium above the cleanup standards defined by the RI/FS risk assessment. Conceptual design for removal and treatment systems will be initiated in FY-1990, following the completion of the risk assessment. Title I engineering will not be initiated until issuance of the Record of Decision (ROD). Several areas have been identified as possibly requiring restoration. Among these are areas adjacent to the metal scrap pile, PCB transformer storage area, the laboratory building, Plants 1 and 6, and the K-65 trench.

Groundwater Restoration: Areas with groundwater having above background concentrations of hazardous constituents will be identified during the Remedial Investigation. Funds are required for design and construction activities associated with the final restoration of affected groundwater. The ROD for this operable unit is anticipated to be issued in January 1992.

7.2.3.6 Operable Unit No. 6, South Plume

Restoration activities associated with affected groundwater to the south of the FMPC has been initiated. Activities anticipated during FY 1991 include the approval of the final design of a pump and treatment system, installation of recovery wells and the fabrication of a package treatment unit. The ROD for this operable unit is anticipated to be issued in September 1990. (EHSI Line Item Project 87-D-159, WBS 1.1.2.4.04)

7.2.3.7 Pit 5 Remediation

The purpose of this subproject is to provide interim remediation of the Pit 5 area. This will be accomplished by draining liquid from the pit, removing sludge, removing the elastomeric membrane liner, inspecting soil for contamination, removing any contaminated soil, backfilling and seeding of the pit.

7.2.3.8 Thorium Overpacking

The interim restoration 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 sequence is as follows:

- Remove and package the thorium oxide stored in plant 8 bins and silos. (completed)

- Repackage the drums containing thorium metal and millings.

- Repackage the remaining drummed thorium inventory stored in warehouses.

Efforts will continue to identify options 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.

7.2.3.9 Engineered Treatment and Storage Facility

ESF and Package: An assessment of restoration activities at the Niagara Falls Storage Site, the West Valley Demonstration Project and the Oak Ridge Sites shows that onsite disposal is a viable option for the disposition of FMPC's stored waste. A review of confinement disposal concepts currently being studied indicates that an ESF would be an appropriate choice for the FMPC.

In an ESF, waste material is first packaged in durable containers. The design of these containers is an important aspect of this concept. The containers are then stacked on a solid, ground-level base. Voids between the stacked containers are filled to prevent subsidence. The stacked containers are subsequently covered by an engineered mound to minimize water infiltration and radiation exposures.

An ESF allows ground-level access to the disposal site and simplifies monitoring of the system, especially the leachate collection system. In addition, the experience gained from ESF demonstrations at the Oak Ridge National Laboratory and the West Valley Demonstration Project can be used to accelerate the design process for the FMPC. For these reasons, the ESF is chosen as the baseline disposal concept for ERA planning purposes.

The wastes entering the ESF would include the contents of the waste pits and storage silos, contaminated soils and rubble, and contaminated equipment from deactivated facilities. Higher-activity wastes would be placed in the central portions of the ESF. The lower-activity wastes surrounding the higher-activity wastes would serve as an intruder barrier.

The ESF must be designed to meet RCRA as well as CERCLA requirements, some of the waste materials contain both hazardous and radioactive material. The Title I effort will be initiated after the RODs for Operable Units No. 1 and 2 are issued.

Packaging/Storage Facility: A Packaging and Staging facility is required which will serve as a central packaging station for waste material before it is transferred to the ESF. It will also serve as a temporary storage area for contaminated soil before the ESF becomes operational. In addition to equipment required for packaging waste, this facility will contain waste minimization equipment to support the Environmental Remedial Action project. The following equipment is anticipated to be required to minimize the volume of material transferred to the ESF:

- Metal shear

- High force compactor

- Concrete scabblers

- Concrete crushers.

Conceptual Designs and Design Criteria for the facility and associated equipment will be initiated in FY-1990. Title I and II engineering and construction have been phased to support the treatment and packaging requirements of the waste pits, K-65 Silos and Silo 3. Title III engineering and construction will follow. Funding is required for this facility.

7.2.3.10 Transportation Engineering and Upgrades

In the course of restoration activities at the FMPC, large quantities of low-level waste will be generated. For high activity materials, such as K-65 residues, the RI/FS will likely show that high risks are associated with storage in the onsite ESF, as well as with shipping for disposal using conventional over-the-road containers and vehicles. The details of low-level waste transportation must be studied and actions taken to ensure that all offsite transportation options, including rail, remain viable. Possible actions include upgrading FMPC's rail system, establishing rail links with prospective disposal or storage facilities, or upgrading existing transportation casks and containers.

Upgrading FMPC's rail system could provide additional benefits for the restoration program. Many of the restoration activities will require large pieces of equipment. Large equipment is most economically shipped by rail.

North Access Road and Facility: The South Access Road and Main Entrance to the FMPC will not be able to handle the sizeable increase of vehicles, trucks, and heavy construction equipment necessary to support restoration efforts at the FMPC. The Environmental Restoration Concept provides for refurbishment of the

FMPC North Access Road to be performed to support activities in the waste storage area. This project provides for:

- Upgrades to the North Access Road for the increased traffic and heavy construction equipment

- Necessary facilities for controlled access and egress from the FMPC.

Facilities will include:

- Security guard post

- Vehicle monitoring facility for surveying exiting vehicles and equipment for radiation contamination

- Truck wash for removing surface radiation contamination.

The funds requested for FY-1991 provide for the engineering and design of the road and facilities, and initiation of construction activities. Additional funds are requested for FY-1992 for completion of the access road upgrades.

7.2.3.11 Building Decommissioning/Demolition

The decontamination and decommissioning of abandoned facilities must be carefully planned and coordinated with other restoration projects. The long-term planning will begin in FY-1989 with a feasibility study. Beyond FY-1989, planning will continue with a conceptual design, and Title I/II engineering. Plant 7 or the Plant 1 silos will likely be the first projects addressed.

7.2.3.12 Supporting Projects

Several projects have been identified as necessary to accomplish the design and implementation of the restoration action projects. Though not directly involved in restoration, these projects will provide technological and historical data, as well as facilities, to support the restoration action efforts. Projects include Developmental Engineering, a Topographic Flyover, and Laboratory and Quality Assurance support.

Topographical Mapping: Topographical mapping of the FMPC is required to serve as a source of historical data and engineering design information on elevation, grading, and surface water run-off. This information is critical to the design and control of large scale restoration projects. Comparisons to previous flyovers will also show changes in grade, water run-off patterns, and elevations. Similar mapping was performed, under the Characterization Investigation Study (CIS) in FY-1987. The mapping information was transferred to a digitized data base compatible with Intergraph CAD systems. To support CAD-based design, a lower elevation flyover will be performed in FY- 1990, and again in FY-1991. All information will be digitized, and the base map in the CAD system updated. Funding is required for this topographical mapping.

Restoration Support Facilities: This facility will include change rooms, showers, radiation survey equipment, and other amenities. It will be located in the northwest section of the FMPC in the location where most of the future planned restoration will take place.

New Electrical Substation: Existing facilities located in the northwest corner of the FMPC (e.g. the Biodenitrification Facility) are fed from a single electrical power source near Plant 1. This substation is currently operating at near maximum capacity. A new power source is needed to supply power to facilities which will be constructed to support restoration efforts in this area.

Supporting Equipment: Several pieces of equipment will be needed to support the restoration effort. These include a hydraulic lift crank, containers, vacuum systems, and vehicles.

Supporting Programs: Several programs are also needed to support the restoration effort. These include establishing organizations for public interaction, agency/DOE interaction, and restoration 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 Radiological Safety Section and the Dosimetry & Instrumentation (D&I) Section administer 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
- Inhalation/ingestion of transuranic impurities or Th-230 in waste and residue handling operations

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 Radiological Section 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 Section which monitors employee exposures to external and internal radiation. This group operates the In-Vivo Examination Center, and conducts the Uranium Urinalysis Program. The OS&H Chemistry Laboratory within the D&I Section analyzes the urine samples while D&I health physicist define sampling frequency, action levels and interpret results.

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 Radiological Safety 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 Radiological Safety 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, Radiological Safety 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 Radiological Safety 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 Radiological Safety 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 Radiological Safety 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 Sections. 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 health physicists in the Dosimetry & Instrumentation and Radiological Safety Section.

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 Radiological Safety Section is primarily responsible for the second program, the Workplace Monitoring Program. The Radiological Safety 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

Radiological Safety 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.

Radiological Safety 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, performs routine operational and QC checks are performed to ensure that the equipment operates properly.

Design and Document Review and Control is the third element of the Health Physics/Radiation Protection program, and is coordinated by the Document Control & Review function. Most of the actual reviews are performed by Radiological Safety personnel. 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 Radiological Safety personnel review 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). The Radiological Safety Section 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

Radiological Safety 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 Radiological Safety Section has responsibilities in Contamination Control, the fifth program. This program includes the following activities:

- Providing radiological monitoring service for receipt and shipment of radioactive materials; Radiological Safety personnel perform 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 an uncontrolled zone (administrative offices), a controlled zone (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 OS&H Dosimetry & Instrumentation Section 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 ring dosimeters for assessing extremity doses. 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 Section. 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 in the recently completed In-Vivo Examination Center. It was placed in service at the end of FY-88 and replaces the Mobile In-Vivo Radiation Monitoring Laboratory (MIVRML) from the Y-12 Plant at Oak Ridge.

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 Radiological Safety which retrieves the instruments and returns them to the Instrument Lab.

The last program in this section is the Radiation Protection Training Program. The Radiological Safety Section 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 Radiological Safety technicians
- Expanding the FMPC radiation worker training program

Depending on previous training and experience, Radiological Safety 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 Radiological Section, and is designed to ensure proper, uniform application of the FMPC radiation protection program.

Radiation Worker Training is provided to new employees who will work with radioactive materials and periodically to current employees.

8.1.4 Health Physics/Radiation Protection Initiatives

Besides the capital projects described in Section 8.4.1 that will improve radiation protection at the FMPC, several improvements in radiation protection operations are planned. Most of these are in response to recommendations or findings in Technical Safety Appraisals, Safety Performance Reviews, Safety Appraisal of the Program to Control and Monitor Worker Internal Radiation Exposure, or reviews of operations in the OS&H Chemistry Laboratory; or they are required to comply with the requirements of DOE Order 5480.11, which was issued in December, 1988 with a one-year implementation period.

FY-1989 Initiatives

Obtain dosimetry re-accreditation from DOELAP. FMPC's DOELAP accreditation expires in December 1989, so re-accreditation must be obtained before that time. This involves preparing an application, establishing a program for quarterly tests using TLDs irradiated at a vendor facility, and undergoing a round of DOELAP performance tests. In addition, a set of algorithm verification irradiations will be performed by a vendor facility in preparation for the performance tests.

Document the internal radiation monitoring program. DOE Order 5480.11 requires that all personnel with the potential to receive 100 mrem annual effective dose equivalent be monitored for internal radiation exposure. The criteria by which individuals are selected to participate in the internal monitoring must be formally documented, as must the technical basis for the monitoring program (i.e., types of monitoring, frequency, interpretation of results, etc.). In order to be in compliance with DOE 5480.11 by December 31, 1989, the end of the implementation period, the technical basis and selection criteria for the internal monitoring program must be pretty well established by the end of FY-1989. Final refinements may continue into FY-1990, with publication of the formal Technical Basis Document occurring by December 31, 1989.

Revise personnel decontamination procedure. DOE 5480.11 provides specific guidance for recording skin doses arising from non-uniform irradiation, such as occurs in a skin contamination event. In order to comply with these requirements, the procedure for responding to personnel contamination must be revised so that appropriate skin dose assessments are performed.

Provide radiation exposure reports to all terminating employees. At present, radiation exposure reports are provided to terminating employees if they request. DOE 5480.11 requires that the reports be sent to all terminating employees. Consequently, practices must be revised to ensure that all terminating employees automatically receive reports of their radiation exposure.

Provide check sources for each contamination monitoring instrument. In order to enable the use of a check source each time a contamination monitoring instrument is utilized, check sources will be procured and attached to each instrument.

Document hand & foot monitor alarm set points. A written evaluation of the lowest practical alarm set point for hand & foot monitors will be prepared. This evaluation will serve to document the reasoning behind selection of alarm set points. This project may be extended to include other contamination monitoring instruments, such as the laundry monitor or friskers used at exits from controlled areas.

Publish procedures for in vivo monitoring. Procedures will be prepared describing operation and calibration of the in vivo monitoring facility, as well as defining action levels and corresponding actions.

Perform additional calibrations on the fluorophotometer. A procedure will be prepared for performing fluorophotometry calibrations using more than 2 standard concentrations. This procedure will be performed periodically to demonstrate continued linearity of the instrument over the range of interest.

Initiate in vivo intercomparisons with other DOE facilities. Appraisers have raised concerns about the quality of the NIST-traceability of in vivo calibration sources provided by the vendor who makes in vivo calibration phantoms. In order to verify the reported activity of FMPC's in vivo calibration sources, a program of intercomparisons with other DOE facilities will be established. This program will probably involve trading and counting calibration sources to determine if results are consistent at each facility for the different calibration sources. The program of performing intercomparison measurements will probably continue into FY-1990.

Perform independent checks of vendor's in vivo monitoring software. Using data from an actual in vivo spectrum, manual calculations will be performed, duplicating the algorithm of the in vivo monitoring software. If there are no errors in the software, the manual calculations should match those produced by the software.

Initiate use of microVAX-based TLD processing software. This software package will enable acquisition of TLD glow curves for use in dosimetry investigations, and will provide additional QC data and QC reports.

Assess current status of compliance with ANSI N13.6, "Practice for Occupational Radiation Exposure Records System." This will be a followup to a similar assessment that was performed in June 1988. Several changes in recordkeeping practices have been instituted since that time. After this new assessment is performed, an action plan for attaining full compliance will be developed. Actions in that plan will probably continue into FY-1990.

FY-1990 Initiatives

Develop a database for tracking visitor exposure. DOE 5480.11 sets an exposure limit for visitors of 100 mrem committed effective dose equivalent per year. Committed effective dose equivalent includes both external exposure as measured by TLD, and internal exposure. In order to ensure compliance, a system must be developed for tracking visitor exposures. The system must not only track external exposures, but must also track internal exposures, or some analogue. It is virtually impossible to develop a bioassay program that would identify a 100 mrem internal exposure, especially if it occurred over several visits. Therefore, it will be necessary to meet the requirements of the order by restricting visitors from "Airborne Radioactivity Areas," and by limiting the time they spend in controlled areas in a year. Visitors who approach the limit on exposure (as measured by the combination of external exposure and time spent in controlled areas) can be re-designated as "non-employee radiation workers" by having them attend Radiation Worker Training.

Develop a database for internal exposure data. Whenever there is a confirmed intake of radioactive materials, a dose assessment is performed that calculates annual and committed organ doses, and annual and committed effective doses. A database must be developed to contain this data for each affected individual. The database or associated software must be capable of combining external exposure with effective dose due to internal exposure in order to calculate total effective dose equivalent.

Develop database for maintaining records of eye doses and non-uniform skin exposure. DOE 5480.11 requires recording of eye doses and skin doses arising from non-uniform exposure. The required data fields will be included in the Flow-Gemini database in order to comply.

Adjust postings to comply with DOE 5480.11. At present, posting of "High Radiation Areas" is based on penetrating radiation exposure rates. Under 5480.11, the posting requirement is based on either penetrating or non-penetrating exposure rates. Consequently, additional locations will have to be posted as "High Radiation Areas." The Derived Air Concentration (airborne contamination guide) in 5480.11 for the least soluble class of uranium is significantly lower than the corresponding Concentration Guide in 5480.1. Therefore additional locations will have to be posted as "Airborne Radioactivity Areas."

Develop database for workplace monitoring data. Airborne activity, surface contamination and Radiation Work Permit data will be recorded in the Flow-Gemini database to assist in control and reduction of the potential for internal exposure.

Initiate use of laser-based phosphorimetry for urinalysis in special studies. Laser-based phosphorimetry is about an order of magnitude more sensitive than the routine sodium-fusion fluorophotometry method. The improved sensitivity of the phosphorimetry technique will enable the identification of significantly smaller uranium intakes than the existing method.

Perform solubility and particle size studies of typical workplace airborne radioactive materials. Knowledge of the solubility and particle size of airborne radioactive materials is very useful to an internal radiation monitoring program. Without this knowledge, conservative assumptions must be made when designing the internal monitoring program, and, when intakes occur, solubilities and particle sizes must be deduced from bioassay measurements.

Finalize implementation of the 3-zone contamination control program. This program divides the site into three categories based on the extent of contamination that is potentially present. Zone I areas are areas where dispersible radioactive materials are prohibited. Zone II areas are areas where radioactive materials may be present, but significant contamination is unlikely. Zone III areas are areas where there is a potential for significant contamination. Personnel and equipment must be monitored for contamination when moving to a lower-numbered zone. In order to fully implement the 3-zone approach, additional contamination monitoring instruments must be installed at ingress/egress points between zones.

Add subcontractor employee exposure records to the Flow-Gemini database. In order to effectively monitor and control subcontractor employee exposures, and in order to provide exposure histories in a timely fashion, exposure data for subcontractors will be added to the Flow-Gemini database.

FY-1991 Initiatives

Computerize historical urinalysis data. Computerized records of urinalysis data for several years in the 1950's are not complete. Consequently, several paper records must be consulted when compiling exposure history information for individuals employed during that time. Computerization of this data will consolidate all urinalysis data in a single location and will facilitate preparation of exposure histories.

Include all bioassay data on Flow-Gemini. All bioassay data and other monitoring information utilized in internal dose assessments will be added to Flow-Gemini. This will serve to consolidate all exposure information in the same location, and will facilitate preparation of summaries and trends of bioassay data.

Computerize historical in vivo monitoring records. From 1968 to 1988 in vivo monitoring was performed using DOE's Mobile In Vivo Radiation Monitoring Laboratory. The data from that monitoring is contained on paper records. Computerization of the data, on Flow-

Gemini for instance, will enable preparation of summaries, and will facilitate data retrieval.

FY-1992 Initiatives

Develop onsite capability for performing alpha spectroscopy on bioassay samples. When an intake of radioactive materials occurs, alpha spectroscopy is used to determine the mix of radionuclides involved. The enrichment of the uranium and the presence of plutonium or thorium isotopes has a significant impact on the resulting doses. Development of onsite alpha spectroscopy capability will eliminate the time delay associated with obtaining this analysis from offsite vendor labs.

The capital projects that affect Health Physics/Radiation Protection are described in Section 8.4. In addition, several initiatives are planned within the programs described above to enhance the effectiveness of the Health Physics/Radiation Protection. The fiscal year funding requirements are presented in Table 8-1.

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, 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.

TABLE 8-1
BUDGET AUTHORITY FOR HEALTH PHYSICS/RADIATION PROTECTION
($ Thousands)

FUNDING		FISCAL YEAR						
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-CE	3,520	250	150	620	700	600	600	600
GE-GPP	3,592	350	152	400	890	550	600	650
GE-LI	41,214	16,022	2,668	1,131	16,164	5,200	29	
GE-OP	15,592	2,650	2,375	2,075	2,123	2,123	2,123	2,123
TOTALS:	63,918	19,272	5,345	4,226	19,877	8,473	3,352	3,373

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

TABLE 8-2
BUDGET AUTHORITY FOR INDUSTRIAL HYGIENE
($ Thousands)

FUNDING		FISCAL YEAR						
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-CE	1,500	300	200	200	200	200	200	200
GE-GPP	2,870	350	150	140	430	550	600	650
GE-OP	5,480	620	885	775	800	800	800	800
GE-LI	48,182	7,900	21,400	3,292	15,000	590		
TOTALS:	58,032	9,170	22,635	4,407	16,430	2,140	1,600	1,650

KEY

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

The IH staff consists of administrative, professional, technical, and clerical personnel. Additional professional personnel will be necessary in 1990 for industrial hygiene training, monitoring, and for coordinating and handling industrial hygiene data. The fiscal year funding requirements are presented in Table 8-2.

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 and recommending corrective measures. The potential hazards of exposure to toxic/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

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 paces 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.

A number of projects are planned that will improve industrial hygiene at the FMPC. These are identified in Section 8.4.2. Section 8.2.4 describes initiatives that will be undertaken by the Industrial Hygiene organization in order to make the Industrial Hygiene Program more effective.

8.2.4 Industrial Hygiene Initiatives

Within the programs described above, several specific initiatives have been completed and others are planned to enhance the effectiveness of the Industrial Hygiene Program. For example, in FY-1989 the following activities have been accomplished.

- Asbestos Worker Training was expanded to provide additional hands-on training for those workers needing this type of training.

- Increased effort was directed at labeling chemical drums. Labels were developed, procured, and placed on over 18,000 drums of chemicals, as required by Hazard Communication regulation.

- Training on supervising asbestos removal projects was provided for Industrial Hygiene personnel. This training helped make them aware of asbestos removal requirements and proficient in prevention and protection from asbestos exposure.

- A FMPC Respiratory Protection Manual was developed, approved, published, and distributed to all department managers to document and clarify respirator program requirements.

Additional initiatives are planned for the remainder of FY-1989 and for future years.

FY-1989 Initiatives

Improve respirator washing facilities. A trailer shall be procured to be used as a respirator washing facility. Respirators are currently being washed near construction work, which can contribute to dusty conditions. Using a trailer will permit cleaner washing facilities and will increase the efficiency of the respirator cleaning operation.

Improve emergency response capabilities. IH&S personnel respond to chemical emergencies and drills. Additional training and equipment is required to upgrade emergency response capability.

FY-1990 Initiatives

Conduct a sitewide inspection for asbestos identification. A survey of the site will be conducted to perform a comprehensive identification of all asbestos materials onsite. Asbestos contaminated areas will be cordoned off and deteriorated asbestos will be removed or repaired. These actions will be a jump ahead of asbestos regulation which may soon make sitewide asbestos identification a mandatory requirement.

Improve decontamination capabilities. Asbestos regulations require shower and decontamination facilities for large scale asbestos removal projects. Current practice has asbestos workers having to take showers in the Service Building. Procurement of two portable showers and decontamination facilities would enable workers to shower adjacent to the asbestos removal area and thus provide increased control of asbestos contamination. If feasible, decontamination facilities may also be used for chemical spill incidents.

Improve asbestos contamination control. Asbestos regulations require negative air pressure work areas for large scale asbestos removal projects. Purchase of a negative air unit would increase control of asbestos contamination and help prevent asbestos from escaping the asbestos removal area.

Improve asbestos inventory tracking program. The current inventory of asbestos identified materials onsite involves a large quantity of analysis reports spread over several binders. Utilization of a computer program tracking system for asbestos building inspections would improve the retrieval speed of asbestos analysis results and provide an up-to-date inventory of asbestos identified materials onsite.

Multigas detection equipment. Multigas detection equipment is used to evaluate confined work areas for the presence of deadly gases. New state-of-the-art multigas detection equipment is needed to replace existing equipment worn out from normal usage, and may take advantage of technological advances. This will ensure that high quality data is being obtained.

Improve construction communications. In order to halt unsafe construction activities or to obtain answers to health-related questions, quick communications with construction personnel is imperative. Construction activities currently use radio frequencies which are unavailable on the radios used by Industrial Hygiene. Procurement of a multiband radio would enable IH personnel to communicate with construction personnel as well as with FMPC and Emergency personnel.

Improve chemical spill response. Various emergency spill response equipment is required to ensure containment of a chemical spill. This equipment would improve spill response readiness and capability.

Improve the chemical hazard training program. OSHA's Hazard Communication Program requires personnel to be trained in chemical hazards and the prevention of overexposure to the chemicals. Industrial Hygiene can take advantage of the training materials and videos available on the market to improve the quality of hazards training.

Ventilation measurement equipment. Ventilation measurement equipment is used to evaluate worker protection exhaust systems. New state-of-the-art instrumentation is required to replace current equipment worn out from normal usage and to take advantage of technological advances. This will ensure that high quality data is being obtained.

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 Safety and Fire Protection Engineering and Safety & Fire Services Groups 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 safety. 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.

8.4 Description of Personnel Protection Projects

8.4.1 Health Physics/Radiation Protection Project Descriptions

The four projects that affect the Health Physics/Radiation Protection area are described in the paragraphs that follow this list:

- Enclosing saws and lathes in Plants 5 and 6
- 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 6: 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.

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.

TABLE 8-3
BUDGET AUTHORITY FOR INDUSTRIAL SAFETY
($ Thousands)

FUNDING				**FISCAL YEAR**				
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-CE	350	50	50	50	50	50	50	50
GE-LI	4,170	3,600	570					
GE-OP	7,701	1,110	1,211	1,060	1,080	1,080	1,080	1,080
GE-GPP	2,847	267	150	200	430	550	600	650
TOTALS:	15,068	5,027	1,981	1,310	1,560	1,680	1,730	1,780

KEY

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

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 four 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)
- Automatic TLD reader (replacement)
- In-vivo phantoms and calibration sources
- Ultrasound unit for In-vivo Facility
- Electric cart for servicing/retrieving instruments

8.4.2 Industrial Hygiene Project Descriptions

There are 14 planned improvements in the Industrial Hygiene area. They are described in the paragraphs that follow this list:

- Respirator Fit-test Facility
- Calibration Wind Tunnel
- Noise Monitoring Instrumentation
- Tracking/MSDS System for Hazardous Chemicals
- Portable Toxic Gas Detection System
- Gas/Vapor Standards Generator System
- HEPA Test Equipment
- Particulate Air Monitoring Instrument

- Respirator Fit-test Instrumentation
- Breathing Air System Survey
- Air Sampling Equipment
- Asbestos Monitoring Equipment
- Document Storage System
- Follow-up Ventilation Survey

Respirator Fit-test Facility: A respirator fit-test enclosure was erected in FY-87 and a computerized fit-test instrument was installed in early FY-88. A new fit-test facility is being planned for a new respirator fit-testing, issuance and respirator receiving area. The new area will provide a more efficient way of dispensing respirators and will ensure greater control over the use of respirators.

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.

Tracking/MSDS System for Hazardous Chemicals: This system will keep a running chemical inventory of products onsite and will provide Material Safety Data Sheet (MSDS) information for emergency and every day use. The tracking system is needed to ensure that the FMPC complies with annual EPA SARA reporting requirements and the MSDS information is needed to comply with the Hazard Communication Standard.

Portable Toxic Gas Detection System: This system was purchased with FY-88 funds and obtained in early FY-89 to extend the capabilities of the industrial hygiene monitoring programs. This portable instrument can monitor airborne contaminants such as hydrogen fluoride, hydrogen chloride, nitrogen dioxide and ammonia.

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 that 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.

Air Sampling Equipment: This instrumentation will replace air sampling equipment damaged due to normal usage and to take advantage of technological advances and changes in regulations.

Asbestos Monitoring Equipment: This equipment will monitor work areas for asbestos fiber concentrations and provide real-time results. The equipment will assist in monitoring areas adjacent to asbestos removal work areas as well as provide data for background asbestos concentrations sitewide.

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.

Follow-up 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.

8.4.3 Industrial Safety Project Descriptions

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

- Plantwide Lighting Upgrade
- Increasing Safety Training Programs
- Establishing Employee Incentive Programs
- Increased support for waste operations

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. One professional and one Safety and Fire Services Inspector are now assigned training as their primary area of responsibility.

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-89.

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-89.

Increased support for Waste Operations: Because of the increased emphasis being placed upon preparing materials for offsite shipment this effort will be maintained. A Safety Engineer will be assigned support of Production Waste Operations as primary area of responsibility. This will allow for daily interface between Safety and Waste Operations first line supervision.

8.5 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 Safety & Fire Services Group 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 50 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.

8.5.1 Fire Protection Project Descriptions

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

- 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
- Plant Evacuation Alarm System

Installing a Fire Protection System in the Pilot Plant: A fire protection system will be installed under the raised metal floor in the UF_6-UF_4 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 2500 gallon/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.

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 8-4.

TABLE 8-4
BUDGET AUTHORITY FOR FIRE PROTECTION
($ Thousands)

FUNDING		FISCAL YEAR						
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-CE	350	50	50	50	50	50	50	50
GE-LI	895	280	415		200			
GE-OP	5,370	610	875	765	780	780	780	780
GE-GPP	600			600				
TOTALS:	7,215	940	1,340	1,415	1030	830	830	830

KEY

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

9.0 Safety of Nuclear Facilities

Facility Safety oversight at the FMPC is the primary responsibility of these groups:

- System Safety Analysis
- Nuclear Criticality Safety
- Materials Handling, Packaging and Transporting

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 primarily by Operations, Construction, Quality and Safety, FMPC Restoration to ensure that all those affected understand the risks involved in site operations.

During FY-87, the 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 was revised and supplemented by FMPC-512, "Configuration Control of Safety Systems, Design Features for Safety, and OSR-Affected Procedures." A revision to FMPC-118, "Independent Safety Review Committee Charter," was also issued. The site program will be fully established with the issuance of FMPC-2116, "Topical Manual for Implementing FMPC Policies and Procedures for System Safety Analysis." This manual will expand the safety analysis procedure, as well as formally establish a program for and delineate the requirements of configuration control of safety systems, design features for safety, and OSR-affected procedures.

A continuing program exists for preparing the existing site FSAR. This program includes developing a series of safety studies for existing facilities which include process descriptions and accident analyses. Also included in this program is the preparation of natural phenomena analyses for all existing facilities. The natural phenomena analyses, being prepared by a subcontractor, evaluate the structures against current design criteria for protection against natural phenomena events such as tornados, earthquakes, and straight wind hazards.

Furthermore, safety analysis documentation is prepared for new projects. The schedule for project safety analyses is dependent on the schedule of projects established by Capital Projects and/or Site Remediation.

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 are directly associated with the Safety Analysis and Review Program.

9.1.1 System Safety Analysis Concerns

System safety at the FMPC is essential since large quantities of fissile and toxic, as well as some flammable/explosive 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.

Toxic and radioactive materials used in the FMPC production processes are stored in large quantities onsite. Some of the materials are:

- Thorium
- Uranium metal
- Uranium compounds (UO_2, UO_3, U_3O_8, UF_4, UF_6, UNH
- Nitric Acid (HNO_3)
- Sodium Hydroxide (NaOH)
- Magnesium Metal
- Magnesium Fluoride (MgF_2)
- Process Waste Products

Should any of these materials become surplus to needs, disposition will be made in accordance with DOE policy and with full regulatory compliance. WMCO personnel use a systematic process to document and 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.

TABLE 9-1
BUDGET AUTHORITY FOR SYSTEM SAFETY ANALYSIS
($ Thousands)

FUNDING		FISCAL YEAR						
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-CE	310	50		50	60	50	50	50
GE-OP	3,609	1025	490	414	420	420	420	420
Totals:	3,919	1075	490	464	480	470	470	470

KEY

GE-OP - Operating Funds from GE Budget

The first category covers all existing facilities and 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 two Safety Analysis Reports for Packaging (SARP) in effect. As transportation container requirements change, additional SARPs will be prepared to reflect new container designs.

9.1.2 Strategy for System Safety Analysis

The System Safety Analysis Program includes preparing Safety Analysis Reports (SARs) of criticality safety items conducting independent safety reviews, and establishing 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 Operations Safety & Health and the Technical and/or Site Remediation 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 the project SARs. The Nuclear & System Safety subsection prepares Safety Assessments and the major portions of project SARs 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 SARs and existing-plant safety studies will be combined to form the Final Safety Analysis Report (FSAR) for the FMPC site, which will supersede 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 evaluations will be included in the site FSAR.

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 has been 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. Procedures have been 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 is being implemented in FY-89.

9.2 Nuclear Criticality Safety Plan

In FY-89, FMPC-2117, "Topical Manual for Nuclear Criticality Safety," was issued. This document gives a detailed description of the NCS Program. A site procedure to invoke this manual will be issued in FY-89.

The predominant means of criticality control has been through administrative controls based on the double contingency principle; that is, at least 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 enrichment 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 & System Safety subsection is responsible for providing Nuclear Criticality Safety technical support and establishing nuclear safety limits 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 uranium material enriched to <20% U-235. This material is blended down to various enrichments for the metal end product. The FMPC's typical 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.

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 and analysis 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 incorporated into designs and procedures as appropriate, and enforced by regular process area inspections by Nuclear Criticality Safety personnel.

To ensure criticality safety as higher enrichments are encountered, it has been necessary to construct equipment which prohibits the violation of one or more components of the double contingency principle. One example was 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.

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 two weeks 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 was initiated. In addition, criticality analyses are being performed for new projects 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 into the FMPC VAX 750. When needed, KENO Va is available from Oak Ridge National Laboratories (ORNL) via a modem.

Section 9.4.2 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 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 responsibiity for emergency response. If deemed necessary, bills of lading are noted with emergency telephone numbers in case of an accident.

9.4 Facilities Safety Project Descriptions

9.4.1 System Safety Analysis Projects

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

9.4.2 Nuclear Criticality Safety Projects

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

- Nuclear Criticality Safety Studies (Ongoing)
- Nuclear Criticality Safety Audit Program
- Upgrading the Radiation Detection Alarm System

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 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-Vectra 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.

Nuclear Criticality Safety Audit Program: The Nuclear Criticality Safety Audit Program is a triennial 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 stations (three detectors per station), an additional detector for the current 10 stations, 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.

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

9.4.3 Handling, Packaging, and Transportation Projects

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

TABLE 9-2
BUDGET AUTHORITY FOR NUCLEAR CRITICALITY SAFETY
($ Thousands)

FUNDING		**FISCAL YEAR**						
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-OP	920	130	145	125	130	130	130	130
Totals:	920	130	145	125	130	130	130	130

KEY

GE-OP - Operating Funds from GE Budget

10.0 Emergency Preparedness Program

The Emergency Preparedness Section 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 Emergency Preparedness 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 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 (JPIC) staff
- Emergency Operations Center (EOC) staff
- Local hospitals (radiological and hazardous materials related to injuries)
- County EOC staff and communications coordination and mutual aid responders

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

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.

10.6 Superfund Amendment and Reauthorization Act (SARA)

The Emergency Preparedness Section is responsible for coordinating the SARA Title III Community Right to Know activities for the FMPC. Emergency Preparedness representatives serve on the following Emergency Preparedness 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 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. 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, and the Emergency Message System. A number of departments share responsibility for these systems even though the Emergency Preparedness Section 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 WMCO Information Systems. This equipment will be included in the new master communications contract that will be negotiated.

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. Eleven sirens have been installed; seven of these are offsite. Three additional sirens were installed in FY-

88, bringing the total to eleven as shown in Figure 10-1. 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. Major tests of this warning system are conducted annually. 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.

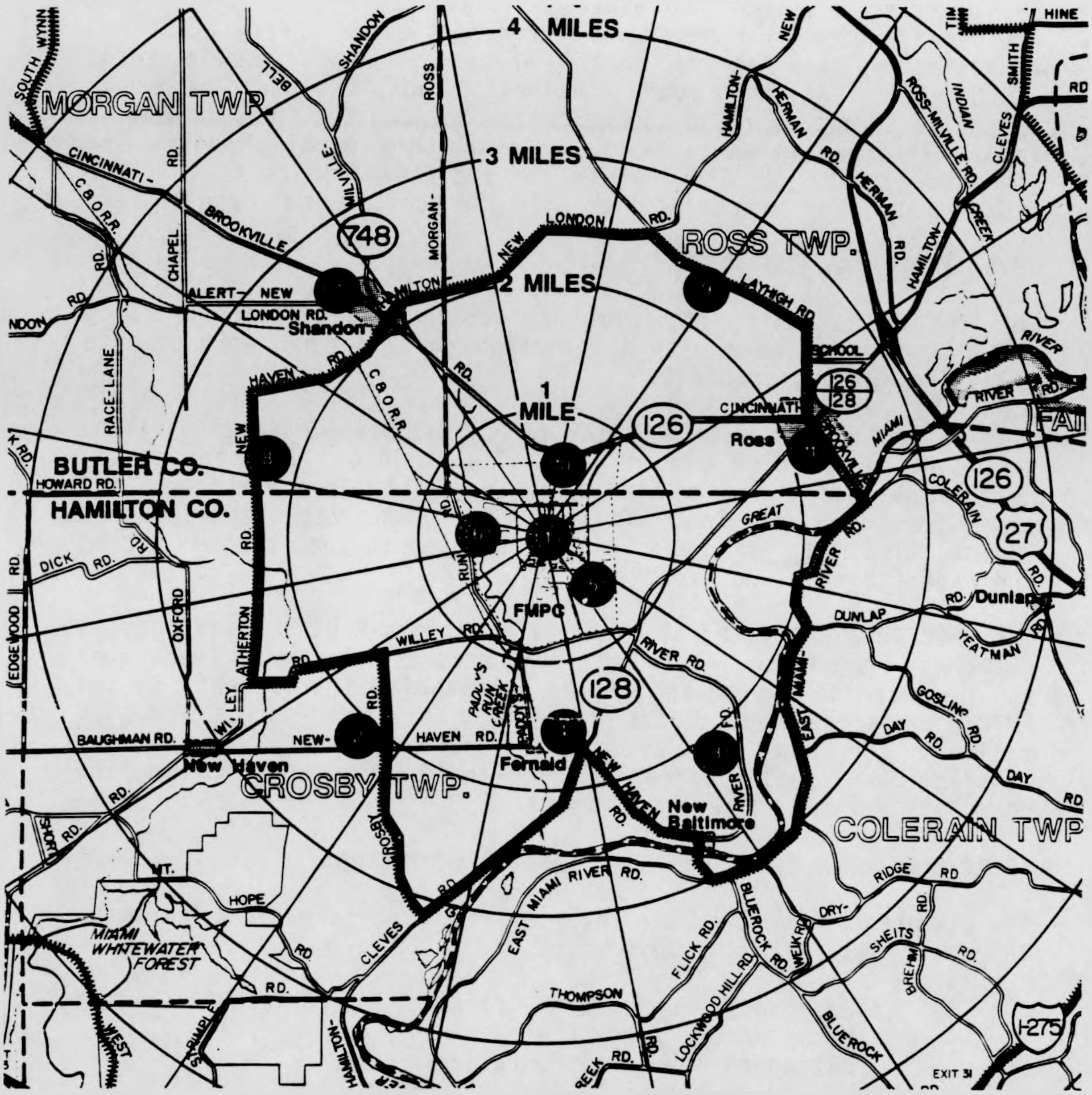
10.10 Emergency Preparedness Project Descriptions

The six 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
- 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.

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



2 MILE IMMEDIATE NOTIFICATION ZONE

SIREN LOCATIONS

HAMILTON COUNTY

1. FMPC Central
2. Crosby Elementary School
3. New Baltimore
4. Webb's Flea Market
5. FMPC Southeast
6. FMPC West

BUTLER COUNTY

7. Morgan Township Fire Department
8. New Haven Road
9. Layhigh Road and Windy Knoll Drive
10. FMPC North
11. Ross Township Fire Department

Figure 10-1. FMPC Area Siren Locations

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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 exercises 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 order 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 has been modified to serve as a mobile EOC. This center will be operational in FY-89.

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-89 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.)

TABLE 10-1
BUDGET AUTHORITY FOR EMERGENCY PREPAREDNESS
($ Thousands)

Funding				Fiscal Year				
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-CE	710	50	300	150	60	50	50	50
GE-OP	2,125	300	335	290	300	300	300	300
Totals:	2,835	350	635	440	360	350	350	350

KEY

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

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.

- Categorical Exclusion; DOE/FMPC
- Routine Maintenance Upgrade/Routine Operations; DOE/FMPC
- NEPA Checklist; DOE/HQ
- Action Description Memorandum; DOE/HQ
- Environmental Assessment; DOE/HQ

11.2 Sitewide 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 for the time period October 1985 through the mid-1990s. Prior to implementing remedial actions and renovations, cumulative impacts of projects included in the EIS are 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 technical data and information.

11.2.1 Background

In 1986, the Department of Energy (DOE) began preparation of a sitewide Environmental Impact Statement (EIS) to address and evaluate the cumulative environmental impacts of directed actions and renovation projects that have been and will be conducted at the FMPC for the time period October 1, 1985 through the mid 1990s. Included in this time period are projects underway by October 1, 1985 and projects with a construction start (but not completion) prior to September 30, 1993.

The evolution of the EIS has been very involved. At the time of publication of a Notice of Intent to prepare an EIS, the scope of the EIS included assessing the environmental impacts of the projects associated with renovating production operations, as well as assessing the impacts of all remediation activities at the FMPC. However, since the development and subsequent revisions of the EIS, a sitewide Remedial Investigation/Feasibility Study (RI/FS) of potential FMPC remediation sites was initiated to evaluate the environmental impact of the final FMPC remedial actions. This reduced the scope of the EIS to only include an evaluation of cumulative impacts of plant renovation projects and directed actions.

Renovation is defined in the sitewide EIS, as "changes to existing facilities and the construction and operation of new and replacement facilities/systems designed to achieve the following: (1) improve environmental safety and health conditions and plant reliability, (2) maintain production capacity for future national defense needs (also termed "maximum capacity"), and (3) enhance management of hazardous and radioactive waste materials." Directed actions are those actions agreed to or entered into by DOE and various federal and state agencies. These actions include the Director's Findings and Orders, the Federal Facilities Compliance Agreement and the Consent Decree. The directed actions are designed to stabilize potentially serious environmental situations until the FMPC completes the RI/FS. There are currently more than 300 renovation projects and directed actions contained in the EIS project listing.

The EIS is a cumulative impact assessment of more than 300 renovation projects and directed actions. Final FMPC remedial action projects will be identified and analyzed under the RI/FS; however, certain actions as required by the Federal Facilities Compliance Agreement, the Director's Findings and Orders, and the Consent Decree, have been initiated and/or completed. The environmental impacts of these projects are considered in the cumulative impact assessment of the EIS.

The DOE-Oak Ridge Operations (ORO) has overall responsibility for preparing the EIS. Oak Ridge National Laboratory (ORNL) is the preparer and publisher of the EIS, using technical data and information provided by a Westinghouse Materials Company of Ohio (WMCO) EIS Task Force. The WMCO EIS Task Force was formed in March 1988 and is responsible for providing up-to-date technical data and information to ORNL, as well as performing many extensive reviews of the EIS and its associated Implementation Plan.

11.2.2 Remedial Actions Considered

The EIS will evaluate only directed actions regarding remediation activities at the FMPC. Directed actions are those actions agreed to or entered into by DOE and various federal and state agencies. Detailed examination of remedial actions will be done as part of combined RI/FS documents.

11.2.3 Issues Discussed

Issues evaluated in the EIS include, but are not limited to, the following:

- Air quality impacts
- Water quality impacts
- Radiological impacts
- Impacts from chemicals used in production processes
- Ecological impacts
- Socioeconomic impacts
- Monitoring and mitigation
- Institutional issues
- Cumulative environmental impacts (including past, present, and future practices).

11.2.4 Alternatives Evaluated

The FMPC EIS evaluates the following three alternatives:

Alternative 1: Full Renovation - This is the proposed action and consists of conducting approximately 300 projects listed in the EIS. This includes projects not completed as of October 1, 1985, projects scheduled through the mid-1990s, and directed actions required by various federal and state agencies.

Alternative 2: Present Situation - No Action - This alternative reflects completion of approximately 180 of the 300 projects started before October 1, 1989. Although the President's Council on

Environmental Quality requires that an EIS analyze the No Action alternative, it is not a feasible alternative for the FMPC. A true No Action alternative would return the FMPC to production and environmental conditions present at the time of the EIS baseline (October 1, 1985). This scenario is not feasible due to, among other things, various legal and binding agreements entered into by DOE and federal and state agencies regarding environmental improvement projects.

Therefore, for the pruposes of the FMPC EIS, the No Action alternative has been modified and now consists of completing projects initiated (construction started) prior to October 1, 1989. At that time, about 180 of the approximate 300 projects will have been started or completed.

Alternative 3: Relocation of FMPC Production Activities: This alternative would involve relocating all or a portion of FMPC production activities to another part of the FMPC site or to another DOE Site. Remedial activities would still be conducted at the FMPC.

Final remediation activities, as evaluated by the RI/FS currently underway, will be done regardless of the alternative chosen.

11.2.5 Impacts Assessed

The EIS will assess cumulative impacts from FMPC renovation projects and directed actions. The extent of impacts from remedial actions and their contributions to impacts from renovation are also of interest and are further analyzed and evaluated under the RI/FS currently underway at the FMPC. Cumulative impact analyses will also ensure that proposed renovations do not prejudice future remedial actions.

11.2.6 Tentative Schedules

A review of the December 1987 version of the EIS was performed by the DOE-ORO FMPC site office in January 1988. The draft document was judged unacceptable and DOE tasked WMCO to review the document. In response, WMCO formed an EIS Task Force in March 1988. The primary purpose of the Task Force has been to supply ORNL with up-to-date technical data and information.

The draft EIS is expected to be released to cooperating agencies, Congress, and the general public during the second quarter (April-June) 1989. After a 60-day public review period, the EIS will be revised to answer any and all comments made by the public. The sitewide final EIS will be published after resolution of review comments, with a DOE Record of Decision expected to take place within two to three months after the publication of the final EIS.

12.0 Quality Assurance Program

The programs identified in this 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 Quality Assurance 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 section (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 Quality & Safety Department uses an internal review and approval cycle for their procedures.

12.3 Surveying and Auditing Products and Processes

The QA section 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 Operations Section.

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. Waste Operations may also request an internal audit as needed to check its own performance.

The Quality & Safety 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 section 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 Environmental Compliance Section 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 federal 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 annual FMPC Environmental Monitoring 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
- Soils and Sediments
- Groundwater
- Grass/vegetables
- Milk
- Surface water
- FMPC liquid effluent
- Fish

14.0 Handling of In-process Materials

The FMPC's production operations generate intermediate products needed to produce the uranium metal products. These uranium compounds and metal inventories are stored onsite and identified as work in process (WIP) materials. Final products for customers are also stored onsite prior to shipment.

This section of this Plan is developed to address the movement and storage of process materials at the FMPC. The material types and the inventory of each by metric ton uranium (MTU) are listed in Table 14-1.

14.1 Uranium Compounds

The process materials are described as compounds of uranium. These materials are listed below:

- Uranium Hexafluoride (UF_6). Stored in cylinders. This compound of uranium is a feed for the green salt (UF_4) production operation.

- Uranium Trioxide (UO_3). Stored in drums and mobile hoppers. This compound of Uranium is also feed for the green salt (UF_4) production operation.

- Uranium Tetrafluoride (UF_4). Stored in drums. This compound of Uranium is a feed supply for the uranium reduction to metal production operation.

- Black Oxide (U_3O_8). Stored in drums. High purity black oxide is a feed supply for the green salt (UF_4) production operation. High impurity black oxide is a feed for the UO_3 production operation.

- Magnesium Fluoride (MgF_2). Uranium contaminated magnesium fluoride is a residue feed supply for the UO_3 production operation.

- Recoverable residues based on economic discard limit (EDL) are feeds for the UO_3 production operation.

- UNH a refinery process solution can be both pure and impure and is an intermediate product of the UO_3 production process.

Uranium compounds represent a large volume of process materials for Production Opeations. These compounds are packaged in various sized containers. UO_3 is packaged in 5-ton mobile hoppers and either 30-gallon or 55-gallon drums. UF_4 is packaged in 10-gallon cans. UF_6 is packaged in mobile cylinders. Impure UNH as Refinery Work in Process. U_3O_8 is packaged in 5-ton hoppers and either 30-gallon or 55-gallon drums. Other process residues are packaged in either 30-gallon or 55-gallon drums. These other process residues are identified as MgF_2 for digestion, sump cakes for drying, milled and/or screened materials.

Table 14-1 identifies the current inventory of Uranium compounds both process materials and recoverable residues.

14.2 Uranium Metals

The uranium intermediate metal products are listed below:

- Ingots. Uranium metal product for shipment to customers. Reject ingots are feed supplies for the metal casting production operation.

- Cores. Uranium metal product for shipment to other DOE sites.

- Derbies. Uranium metal product for shipment to customers. Derbies are also feed supplies for the metal casting production operation.

- Metal Chips. Uranium metal chips are feed supplies for the briquetting production operation. Nonbriquettable chips are feed supply for the oxidation furnace to produce impure U_3O_8.

- Briquettes. Uranium briquettes are feed supplies for the metal casting production operation.

- Metal Scrap. Uranium metal scraps are feed supplies for the metal casting production operation. Nonremeltable scrap is a feed supply for the oxidation furnace or for the metal dissolver.

Uranium metals represent the scrap recycle metal, briquettable chips, derbies, product ingots, product cores and primary ingots for the casting operations. These metals are packaged in various containers.

TABLE 14-1
URANIUM COMPOUND INVENTORY
(As of February 1989)

Material Type	Inventory in MTU
UF_6	596
UO_3	845
UF_4	2349
U_3O_8	195
MgF_2	113
Other Residues	394
Refinery WIP	111

TOTAL..............4603 MTU

URANIUM METAL INVENTORY
(As of February 1989)

Material Type	Inventory in MTU
Product Ingots	1297
Product Cores	603
Briquettes	25
Briquettable Chips	13
Derbies	2556
Recycle Scrap	4975
Metal Dissolver	123

TOTAL.............9592 MTU

Briquettes are packaged in 10-gallon cans. Small size uranium metal scrap is packaged in 30-gallon drums. Ingots are placed onto ingot skids. Derbies are placed onto derby skids.

Table 14-1 identifies the current inventory of Uranium metal.

A flowchart of uranium compounds and metal is shown in Figure 14-1.

The objectives of the Uranium Process Materials Management are to safely store materials available for processing, but not scheduled to be processed, and comply with provisions of the FMPC Best Management Practices (BMP) plan. The BMP plan includes, but not limited to, a commitment for storage of all uranium metal under roof.

The FMPC strategies for meeting the objectives are as follows:

- Develop action plans for compliance

- Assure the safety of the workforce by proper isolation of radioactive materials in process buildings by using adequate shielding techniques

14.3 Related Or Supporting Practices

Each process plant has storage capacity for in-process uranium inventories. Materials are stored at each source awaiting independent analytical data for further processing. The materials are then shipped to the next processing plant.

The BMP has initiated a commitment to store all uranium metal under roof. The Plant 9 warehouse is being been used to store uranium metal previously stored outside on controlled pads.

Uranium Compounds stored in drums are identified using the FMPC lot marking and color coding system. This marking system identifies the FMPC plant that the material came from, the enrichment of Uranium and the material type.

The design and operational criteria for storage pads has been addressed in the Regulatory Compliance guide. The storage pads at FMPC are scheduled to be revised to comply with the regulatory guidelines. (Figure 14-2)

The control of intraplant transfers of nuclear materials has been in place for some time. Drummed materials must pass a rigorous smear test survey. Skids of metal ingots and derbies are covered with plastic to prevent losses to the environment.

Nuclear materials control and accountability functions have been in place at the FMPC for some time. Nuclear materials are accounted for in each material balance account, with hard copy printouts. Bimonthly inventories are taken for all nuclear materials at FMPC.

The inventories stated in Table I (Uranium Compounds) are compiled based on the revised Economic Discard Limit. The level of U-235 for economic recovery was increased to .64% U-235 November 1988. A decrease in recoverable residues of 1651 metric ton uranium was realized based on the new requirements. This change affected an additional 27,000 drum equivalents (DE) to the site inventory of non-recoverable residues. The 27,000 drum equivalents increases the backlog and waste processing and disposal costs by 9.44M through FY-92.

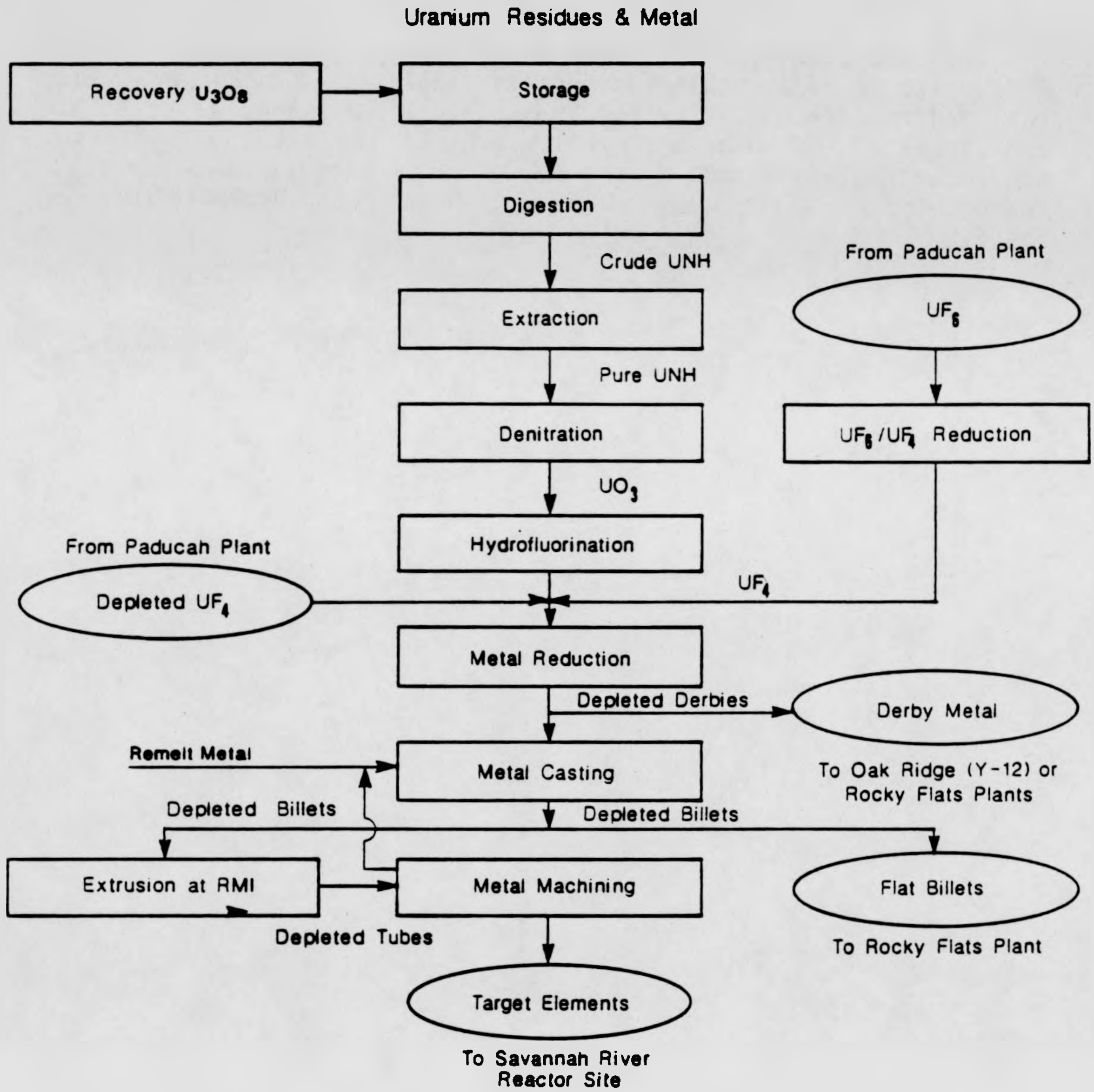

Figure 14-1. Flow of Uranium Compounds and Metal at FMPC

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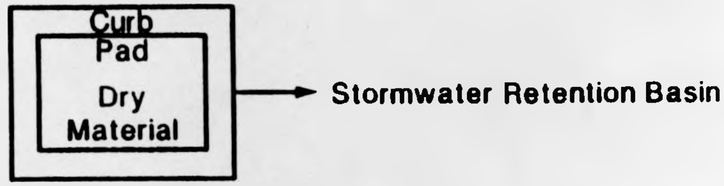
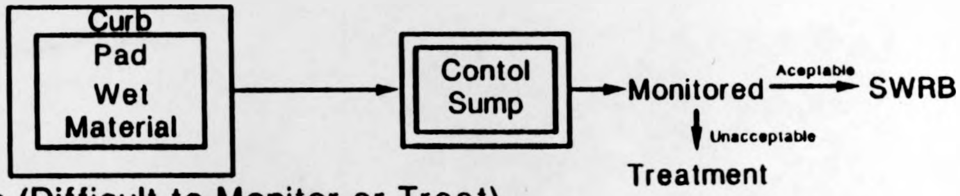
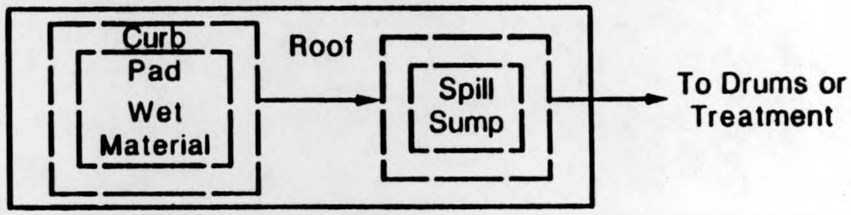
1. Drummed Dry Materials
   Example: MGF_2, Roasted Filter Cake



2. Drummed Materials With Free Liquids (Easy to Monitor or Treat)
   Example: Acids, Non-Roasted Filter Cake



3. Drummed Materials With Free Liquids (Difficult to Monitor or Treat)
   Example: Organic Solvents, PCB's Contaminated Oils



4. Exposed Dry Materials Which Can Produce Contaminated Runoff
   Example: Scrap Metal Pile — Same as 3
5. Active Processing Areas
   Example: Drum Washing — Either 2 or 3
6. Long Term Storage
   Storage Greater Than a Drum Life (Approximately 4 Years) — Cover (Minimum) or Warehouse
7. Product or Intermediate Processing Materials
   Example: UF_4 U_3O_8 — Cover (Minimum) or Warehouse

Figure 14-2. Material Classification

15.0 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. The layout of the facility is shown in Figure 15-1. The management organization for the facility is presented in Figure 15-2; the specific areas of responsibility of the ES&H section are shown in Figure 15-3. 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 has been the extrusion of depleted and slightly enriched uranium billets into tube-shaped products. The principal activity for FY 89 and continuing for several years is a major restoration process, which includes clean-up of contamination in selected areas.

A five-year plan, which delineates the stepwise progression for environmentally restoring the RMI facility, is currently under development. Major areas of this plan are included in Section 15.7. The restoration effort involves tasks for exterior soil and groundwater remedial actions and decontamination buildings and equipment. A special task has been identified for the Fields Brook CERCLA cleanup since RMI has been identified as a potentially responsible party. Budgetary estimates are provided in preliminary form in Tables 3-3 and 15-1.

15.1 Site Restoration

Past industrial and waste disposal practices, many of which were common and acceptable at the time, are now known to have potential environmental impacts. Upon termination of uranium extrusion work in early FY-1989, RMI undertook to characterize the impact of past practices and to perform the initial stages of restoration at the RMI facility. The restoration process has been divided into six tasks which are funded by the DOE. Task descriptions are presented in Section 15.7.1.

15.2 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.

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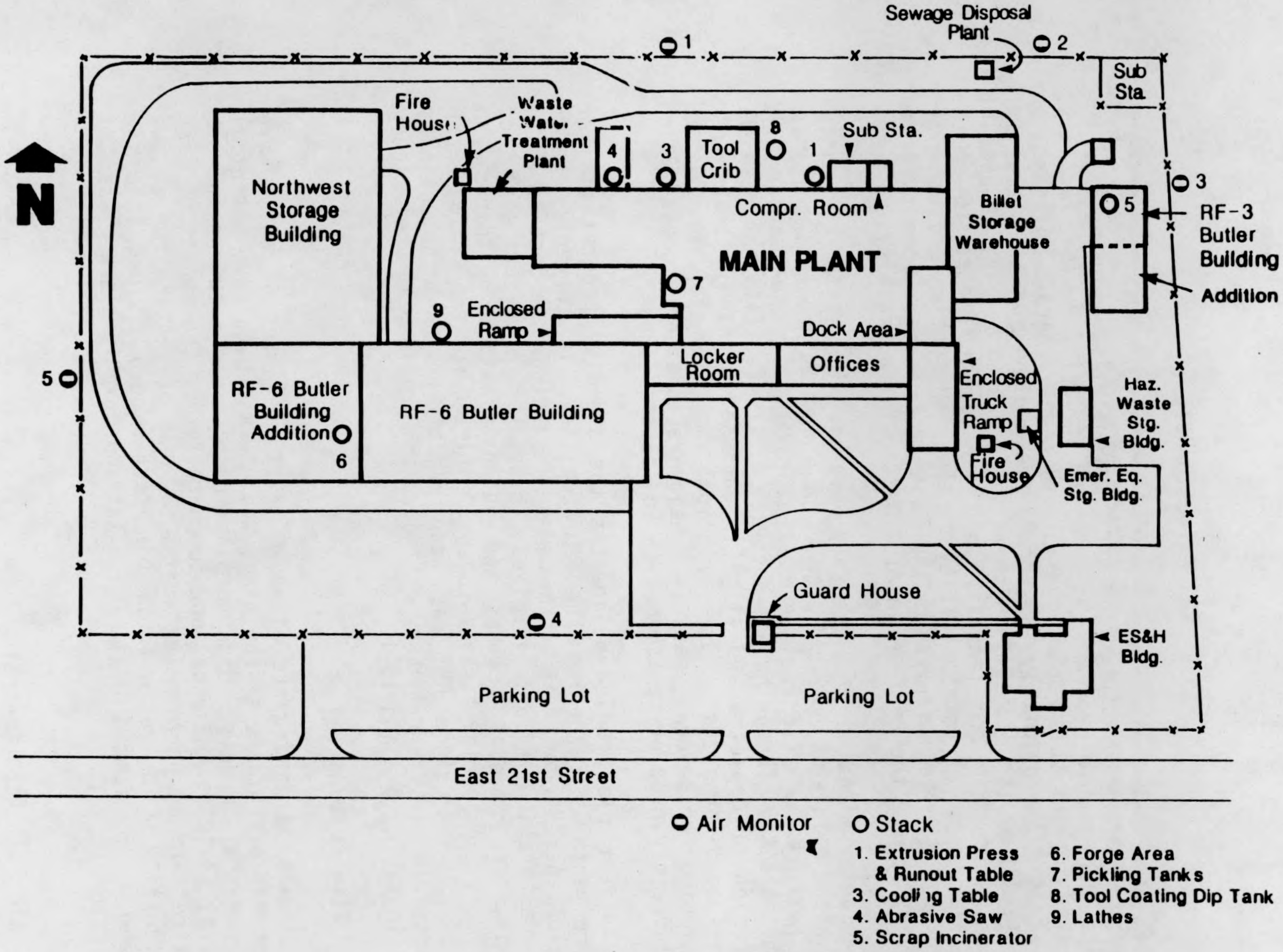

Figure 15-1. RMI Facility Layout

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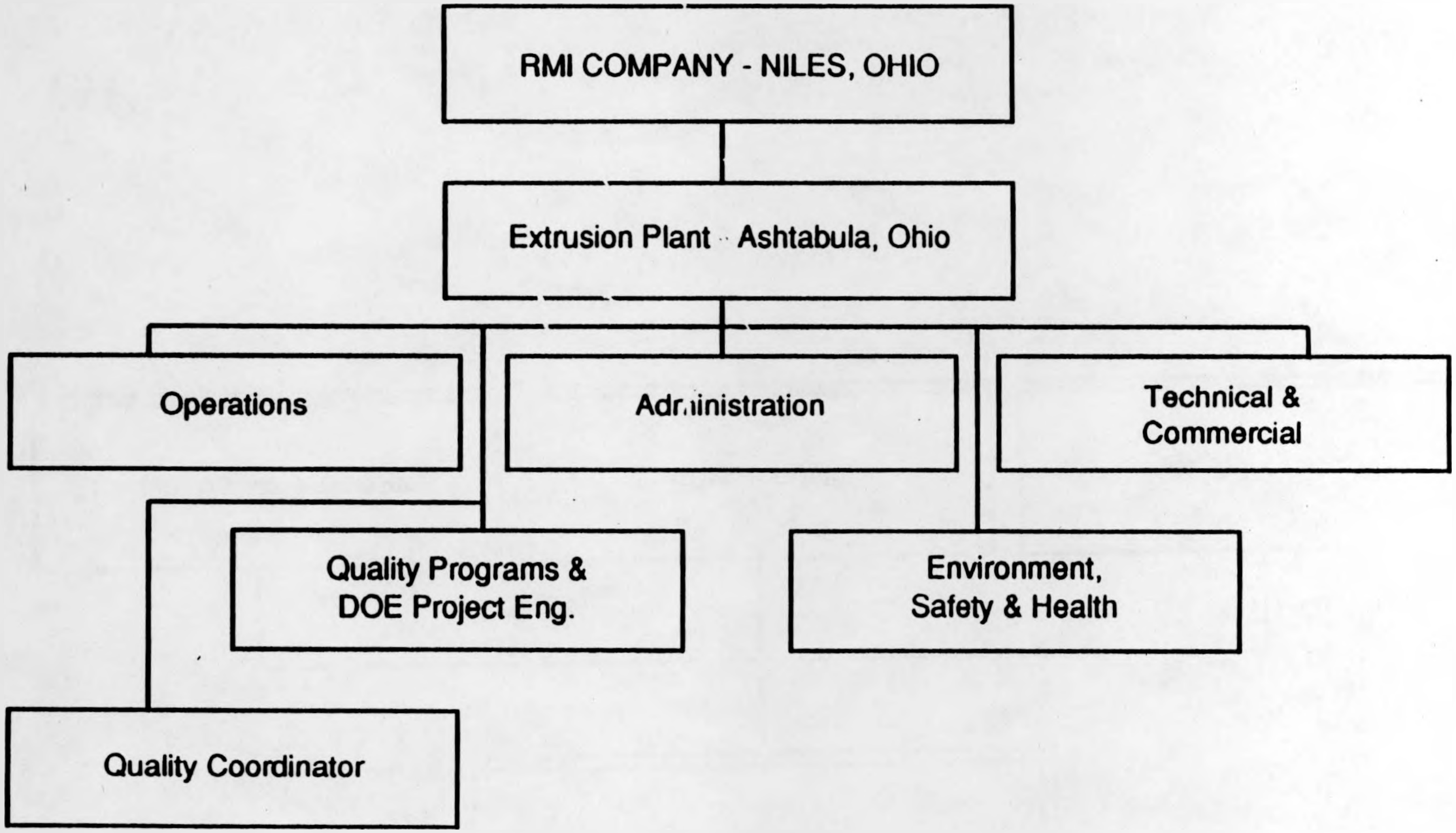

Figure 15-2. RMI Organization

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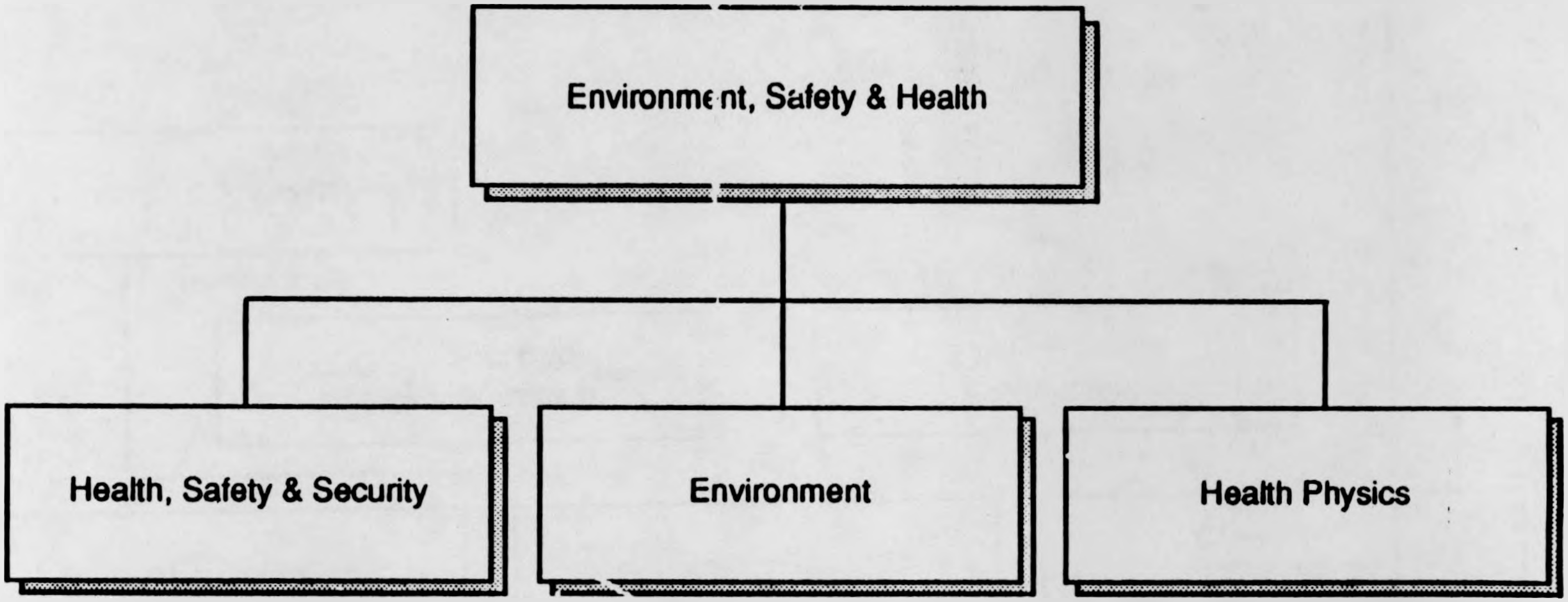

Figure 15-3. RMI Environmental, Safety and Health Organization

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 off-site 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 on-site meteorological tower or to use meteorological data from the nearby (30 miles) Erie International Airport National Weather Service Station. The National Oceanic and Atmospheric Administration (NOAA) has installed a portable meteorological tower at RMI. After several months of data have accumulated, they will be compared to Erie Airport data and a recommendation will be prepared as to the need for a permanent meteorological tower at RMI. After completing improvements to the sources of major air pollution emitters, appropriate 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 15.7.2.

15.3 Water Pollution Control

During 1988 RMI installed a wastewater treatment facility for process wastewater. The system utilizes the Best Available Technology (BAT) that is economically achievable as described in the DOE Orders and the U.S. EPA non-ferrous metal forming effluent standard. OEPA is currently finalizing an NPDES permit for RMI based on the water quality guideline set forth in the effluent standard. Also installed in 1989 was an upgrade to the final outfall sampling and flow measurement station. Water Pollution Control project descriptions are contained in Section 15.7.3.

15.4 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 current clean-up and restoration activities are generating new wastes and increasing the generation rate of others. 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 off-site disposal is particularly important to limit the potential for the spread of contamination and the direct radiation exposure to on-site personnel. Solid Waste Management project descriptions are contained in Section 15.7.4.

15.5 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 15.7.5.

15.6 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.

Facilities Protection Improvement project descriptions are contained in Section 15.7.6.

15.7 RMI Extrusion Plant Project Descriptions

A listing and description of all planned RMI projects are contained in the sections that follow. Due to the termination of the uranium extrusion work the RMI plant no longer performs a major function for the DOE. However, there is a slight possibility that RMI may be required to resume extrusion operations for the Savannah River

Site at some future date. A major restoration process is planned beginning in FY 1989 and continuing at least through FY-1994. An overall funding summary for restoration projects is presented in Table 15-1.

15.7.1 Site Restoration Projects

The tasks described below represent the work being performed in FY 1989. After completion of the five-year work plan for performing a sitewide restoration investigation, more precise estimates of the time duration and cost of the restoration process will be prepared. The six tasks under the sitewide restoration investigation are:

1. Fields Brook CERCLA Cleanup
2. Groundwater Remedial Action
3. Surface Soil Remedial Investigation
4. Trench, Pit, and Buried Drain Line Restoration
5. Building and Equipment Decontamination Project
6. Remove DOE Uranium Materials from the Site

RMI continues to participate as a *deminimis* party in the Laskin/Poplar Oil Site remediation.

Sitewide Restoration Investigation: RMI and WMCO shall prepare a five-year work plan detailing the requirements for performing a sitewide environmental audit for WMCO approval. RMI shall have an independent consultant perform a review and submit an environmental audit report to WMCO detailing any findings and recommendations.

Task No.1 - Fields Brook CERCLA 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. Funding for engineering and clean-up efforts associated with Fields Brook is required.

Task No.2 - Groundwater Remedial Action: 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. Funding for ongoing studies as related to the investigation and selection of future remedial actions at RMI.

TABLE 15-1

BUDGET AUTHORITY FOR RMI
($ Thousands)

Funding		**Fiscal Year**						
Type	**Total**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
GE-OP	26,712	6,470	3,661	3,781	3,200	3,200	3,200	3,200
GF-11	23,300	0	2,300	1,600	6,850	2,950	4,650	4,950
Totals:	50,012	6,470	5,961	5,381	10,050	6,150	7,850	8,150

KEY

GE-OP - Operating Funds from GE Budget
GE-GPP - General Plant Projects from GE Budget

The scope of the groundwater remediation project includes:

- Identification of groundwater contamination sources
- Determination of the size and location of the plume(s) and of the concentration of the plume constituents
- An understanding of the site hydrogeology
- A technically based plan for corrective action to specific clean-up criteria
- Corrective action
- Remediation to the clean-up criteria

Task No.3 - Surface Soil Remedial Investigation: The scope of this task shall include excavation of plant area and some adjacent off-site area surface soils down to soil with acceptable uranium levels, shipment of the excavated soil to proper off-site storage, and replacing the soil with clean backfill.
Surface Soil Contamination Restoration activities shall include:

- Package and Ship to proper storage the existing soil piles and contaminated equipment stored in the area
- Estimate remaining volume of soil and uranium concentrations
- WMCO/RMI develop a short list of environmental consulting firms potentially suitable for the investigation
- WMCO/RMI define acceptable clean levels
- RMI develop a work plan for WMCO approval
- Determination of area(s) to be restored shall be completed
- An estimate of depth of excavation and identification of soil concentrations shall be completed
- Sample to determine RCRA status of any uncertain areas shall be completed
- Determine disposal site, packaging and shipping methods
- Develop a plan to screen excavations to determine whether additional excavation is necessary
- Develop an overall excavation plan
- Implement Excavation, Packaging and Shipping Procedures

Task No.4 - Trench, Pit, and Buried Drain Line Restoration: RMI shall investigate several areas of concern on the RMI site to determine if contaminants have been discharged to the environment through these sources. The Sitewide Restoration Investigation Task will consider areas of concern and might identify additional areas. The areas of concern include but are not limited to the following:

- Trenches
- Pits
- Sump Tanks
- Acid and Rinse Tanks
- Drain Pipes
- Sewer Access Holes
- Quench Tanks
- Evaporation Tank

These areas shall be investigated by appropriate methods to determine their integrity. Cracks and leaks shall be further investigated. The scope of this project shall include the following tasks:

- Define all potential areas of concern through the sitewide Remedial Investigation
- Define methods to determine integrity of the area of concern
- Determine integrity of each area of concern
- Decide from integrity test which areas of concern may have leaked contaminants to the environment

The following steps shall be performed only if it has been determined that an area of concern may have leaked material to the environment. A schedule shall be developed for cleanup at that time. Some areas of concern to be cleaned up may be such in nature that clean-up is improbable until site decontamination and/or decommissioning takes place and the RMI mission for the DOE is complete.

- Develop plan of action and evaluate areas for cleanup
- Develop cleanup action alternatives
- Select appropriate cleanup action methods
- Perform cleanup action
- Package and ship contaminated material for disposal
- Restore area of concern to original condition with noncontaminated material

Task No.5 - Building and Equipment Decontamination Project: Due to the termination of uranium extrusion work for the DOE, it is a worthwhile objective to reduce uranium contamination as low as reasonably achievable. The scope of the Building and Equipment Decontamination task shall include but not be limited to:

- Cleanup of the plant areas to the level of a Regulated Area as defined in the DOE Contamination Control Policy
- Develop Health Physics and Operational Procedures to document and maintain Regulated Area Status
- Reduce major contamination of buildings and equipment
- Prevent unnecessary generation of contaminated wastes and contamination of equipment
- Decontaminate to the extent possible and protect from recontamination peripheral areas such as warehouses, offices, and out buildings
- Develop a list of contamination levels and contaminating incidents designed to facilitate total decontamination at the end of the DOE mission at RMI

Specific Building and Equipment Decontamination activities shall include:

- Develop and Install Procedures to Minimize Recontamination
- Characterize the Site for Radionuclide Levels
- Develop Site Criteria
- Provide trained personnel to maintain site to specified criteria
- Prioritize major decontamination projects
- Provide trained personnel for decontamination areas
- Develop procedures to protect decontaminated areas
- Develop procedures to develop a total decontamination check list for future reference

Task No.6 - Remove DOE Uranium Materials from the site: In order to prevent major accidental recontamination of decontaminated equipment completed under Task No.5 above, all DOE uranium metal and potentially recoverable residues shall be shipped either for storage or processing to other DOE sites. In compliance with recent DOE directives, RMI shall remove all DOE-owned uranium and other low-level radioactive wastes from the RMI site.

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 waste oil to this site and is participating as a deminimis party in the remediation. This improvement requires funding for underwriting the engineering and remediation of Laskin/Poplar Oil Site.

15.7.2 Air Pollution Control Projects

The four planned improvements for air pollution control are described in the paragraphs that follow this list:

- Dust Collection Systems
- Meteorological Tower
- Emission Dispersion Modeling Studies
- Perimeter Air Samplers

Dust Collection Systems: Upgrades of the existing ventilation of the process area is nearly complete resulting in significant reductions in releases to the environment. Improvements include redesigned hooding, best available technology that is economically achievable (BAT), air scrubbers with HEPA filters, and new discharge stacks equipped with air samplers. The only major process ventilation system which remains to be completed before future DOE uranium work is scheduled at RMI, is the salt bath ventilation system.

Meteorological Tower: The National Oceanic and Atmospheric Administration (NOAA) is evaluating the need for an on-site meteorological tower at RMI in order to provide more accurate atmospheric conditions to be used to calculate air emissions dispersions. A portable meteorological tower has been temporarily installed at RMI and the data generated will be compared to the nearby (30 miles) Erie, Pennsylvania, National Weather Service Station data, which is used now.

Emission Dispersion Modeling Studies: Subsequent to completing the improvements to major emissions sources, a computer program will be sued 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: ES&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.

15.7.3 Water Pollution Control Projects

Two improvements for water pollution control were completed in FY 88.

- Process Wastewater Treatment Facility
- Wastewater Outfall Sampling Improvements

Process Wastewater Treatment Facility: An upgraded system was constructed which utilizes the BAT philosophy in order to ensure that the equipment is capable of satisfying the effluent discharge limits. The new system is designed to more efficiently remove uranium, oil and grease, and total dissolved solids.

Wastewater Outfall Sampling Improvements: Concurrent with the upgrade of the Wastewater Treatment Facility, the existing wastewater sampling system was replaced. The upgraded system ensures a more accurate determination of effluent contamination levels.

15.7.4 Solid Waste Management Projects

The following solid waste management improvement was completed in FY 88.

Asbestos Removal: Insulation applied to some of the process piping contained asbestos and was removed. The resulting uranium contaminated asbestos waste is stored on-site awaiting eventual shipment to the Nevada Test Site for disposal.

The planned improvements for solid waste management are described in the paragraphs that follow this list:

- Pickling Waste Evaporator
- RCRA Shipments to the TSCA Incinerator
- Low-Level Waste Shipments to NTS
- Sludge Dryers
- 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 waste stream generated as a result of decontamination via acid pickling. The resulting nitrate solution becomes part of the radioactive low-level waste which is shipped off-site for disposal.

RCRA Shipments to the TSCA Incinerator: This improvement provides for shipment of uranium 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. Trace amounts of uranium which result from decontamination operations are also included in these wastes. A portion of the material is packaged and shipped to FMPC. Material which satisfies the requirements of the NTS facility are now being shipped directly to NTS.

Sludge Dryers: Scrap material which as accumulated in process equipment collection basins must be collected, dried and disposed. Until recently, the materials were dried on inefficient gas-fired heaters. This improvement provides for the procurement and installation of state-of-the-art dryers to increase the efficiency of the operation.

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.

15.7.5 Personnel Protection Projects

The four planned improvements for personnel protection are described in the paragraphs that follow this list:

- Health Physics Equipment
- 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.

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.

15.7.6 Facilities Protection Projects

The two planned improvements for facilities protection described in the paragraphs that follow this list:

- Constructing a Dedicated Equipment Decontamination Facility
- Electrical Substation Air Conditioner

The construction of a dedicated on-site decontamination facility is crucial to the implementation of an effective program to arrest further spread of radioactive contamination to this plant and the environment, and to serve as the focal point of future equipment decontamination and scrap segregation/radwaste reduction programs. A closed-ambient facility with decon media/contaminant recovery systems is necessary to curtail the persistent spread of contamination in the plant and the environment as a result of continuing operations.

Housing electrical substations in a conditioned positive pressure enclosure is recommended in the industry as good practice to dissipate heat build up and reduce equipment contamination. During past hot weather conditions the temperature in the substation has risen to near high temperature tripout. The only current safe remedial action is to reduce electrical load by shutting down operations.

15.8 Recent Environmental Actions

The work performed in the recent past in regard to environmental concerns is described in the following sections.

15.8.1 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 15-1) that extend 25 to 40 feet above ground. During 1987 a seventh stack (Stack 2) was in operation. Periodic isokinetic sampling is performed in each stack. Table 15-2 summarizes this sampling.

Variations in the number of samples from each stack listed in Table 15-2 exist due to scheduling of specific operations and the ventilation equipment dedicated to these operations.

Perimeter air samplers are located on the plant boundary fence line (see Figure 15-1). The samplers continuously draw air at 35 liters per minute through a 47 mm filter which is changed weekly during regular plant operations. Table 15-3 summarizes this sampling.

Stack emissions totalled 0.00055 curie (0.642 kilograms) uranium (98.99% U-238, 0.946% U-235, 0.054% U-236, 0.0078% U-234) for DOE operations and 0.0015 curie (0.405 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 for 1987 predict a committed dose to a maximally exposed organ (lung) of 0.62 mrem, 0.82% of the allowable limit under the current NESHAP regulations. The whole body dose is estimated at 1.4×10^{-5} mrem/year, well below the 25 mrem/year limit. The effective 50-year dose equivalent to the population is 0.27 person-rem due primarily to inhalation.

The highest average perimeter air concentration in 1988 was 3.18×10^{-14} microcurie natural uranium per ml; this figure represents 32% of the DOE guideline for concentrations in air in uncontrolled areas. The average perimeter air concentration was 20% of the established DOE guidelines.

TABLE 15-2

STACK SAMPLING RESULTS FOR URANIUM, 1988

Stack No.	Location	No. of Samples	Uranium Concentration (uCi/Ml) Maximum	Minimum	Average
1	Extrusion Press/ Runout Table	20	7.50×10^{-14}	5.00×10^{-15}	1.73×10^{14}
3	Cooling Table	5	9.11×10^{-11}	2.60×10^{-11}	6.14×10^{11}
4	No Discharge in 1988				
5	Scrap Oxidizer	94	2.10×10^{-9}	4.00×10^{-15}	1.84×10^{11}
6	Forge Booths	27	3.93×10^{-11}	8.10×10^{-14}	1.69×10^{11}
8	Lathes	21	4.43×10^{-13}	5.00×10^{-15}	1.87×10^{13}

15.8.2 Water Pollution Control

Prior to discharge, all process water from plant operations is treated in a batch type lime and settle treatment system which employs ferric chloride and polymer to aid in the precipitation of contaminants. The treated water is polished in a multi stage sand filter before discharge. Installation of this system was completed in June 1988. A ten fold reduction in uranium discharge at the final outfall has resulted. Sanitary waste is treated in a sequencing batch reactor treatment plant. Process water, sanitary sewage, storm sewer runoff and salt bath noncontact cooling water all combine to form the final effluent. In 1988, total uranium in waste water discharged from all operations was 0.0334 curie (49.4 kg) based on total effluent volume and average uranium concentration at the monitoring point.

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 15-3 and 15-4 summarize the sampling.

During calendar year 1988, there were nineteen instances of noncompliance with the NPDES permit for the Extrusion Plant. Several minor noncompliances for dissolved solids, suspended solids, and oil and grease and copper were noted.

The wastewater treatment facility placed on-line in June 1988 is designed for more efficient removal of oil and grease, total dissolved solids and uranium than the former diatomaceous earth filter. Table 15-5 presents a tabulation of total water usage during CY-1988.

Wastewater sampling data comprised of uranium and technetium for the period predicted an effective dose equivalent of <0.35 mrem at the downstream sampling point, and <0.17 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 0.36% of the DOE guideline for uranium concentrations in water in uncontrolled areas. For technetium, the average downstream concentration was <0.17% of the DOE guideline.

TABLE 15-3

PERIMETER AIR SAMPLING SUMMARY FOR URANIUM, 1988

Stack No.	Location	No. of Samples	Uranium Concentration (uCi/Ml) Maximum	Minimum	Average
1	North Fence-West	42	4.04×10^{-13}	1.60×10^{-16}	2.87×10^{-14}
2	North Fence-East	42	3.13×10^{-13}	2.80×10^{-16}	3.18×10^{-14}
3	East Fence	42	3.25×10^{-13}	4.80×10^{-16}	3.18×10^{-14}
4	South Fence	42	1.87×10^{-13}	7.00×10^{-17}	1.10×10^{-14}
5	West Fence	42	2.26×10^{-13}	1.00×10^{-17}	1.19×10^{-14}
6	North Fence-Outfall	42	5.08×10^{-14}	1.00×10^{-16}	5.30×10^{-15}
	Overall Average of Perimeter Samples				2.01×10^{-14}

Note: DOE Guideline for all sampling locations is 1.00×10^{-13} uCi/ml.

TABLE 15-4

WASTEWATER MONITORING SUMMARY FOR URANIUM AND TECHNETIUM-99, 1988

Sample Location	No. of Samples	Uranium Concentration (uCi/ml) Maximum	Minimum	Average
Plant Outfall	51	3.53×10^{-6}	1.79×10^{-8}	4.40×10^{-7}
Fields Brook 800 ft. Upstream	51	1.71×10^{-9}	1.16×10^{-10}	8.23×10^{-10}
Fields Brook 1800 ft. Downstream	51	6.53×10^{-9}	4.81×10^{-11}	1.70×10^{-9}
		Technetium-99 (uCi/ml)		
Plant Outfall	44	6.32×10^{-6}	5.15×10^{-8}	7.52×10^{-7}
Fields Brook 800 ft. Upstream	44	8.04×10^{-8}	$<1.5 \times 10^{-8}$	$<2.14 \times 10^{-8}$
Fields Brook 1800 ft. Downstream	44	8.97×10^{-8}	$<1.5 \times 10^{-8}$	$<2.24 \times 10^{-8}$

TABLE 15-5

SUMMARY OF 1988 WATER USAGE
AT THE RMI EXTRUSION PLANT

Water Usage During 1988 (Million Gallons)	
January	1.414
February	1.719
March	1.174
April	1.324
May	1.480
June	1.426
July	1.440
August	2.206
September	2.256
October	2.081
November	2.136
December	1.423
Total	20.079

15.8.3 Groundwater Monitoring

Background data which describe the extent of groundwater contamination at RMI have been collected since 1985. 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 15-4 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 in 1988 better defined the extent of the contaminant plume. A Corrective Measures Study is underway with implementation to begin at the end of Calendar Year 1989.

Key monitoring wells are sampled and analyzed quarterly. Table 15-6 summarizes the RMI monitoring well findings.

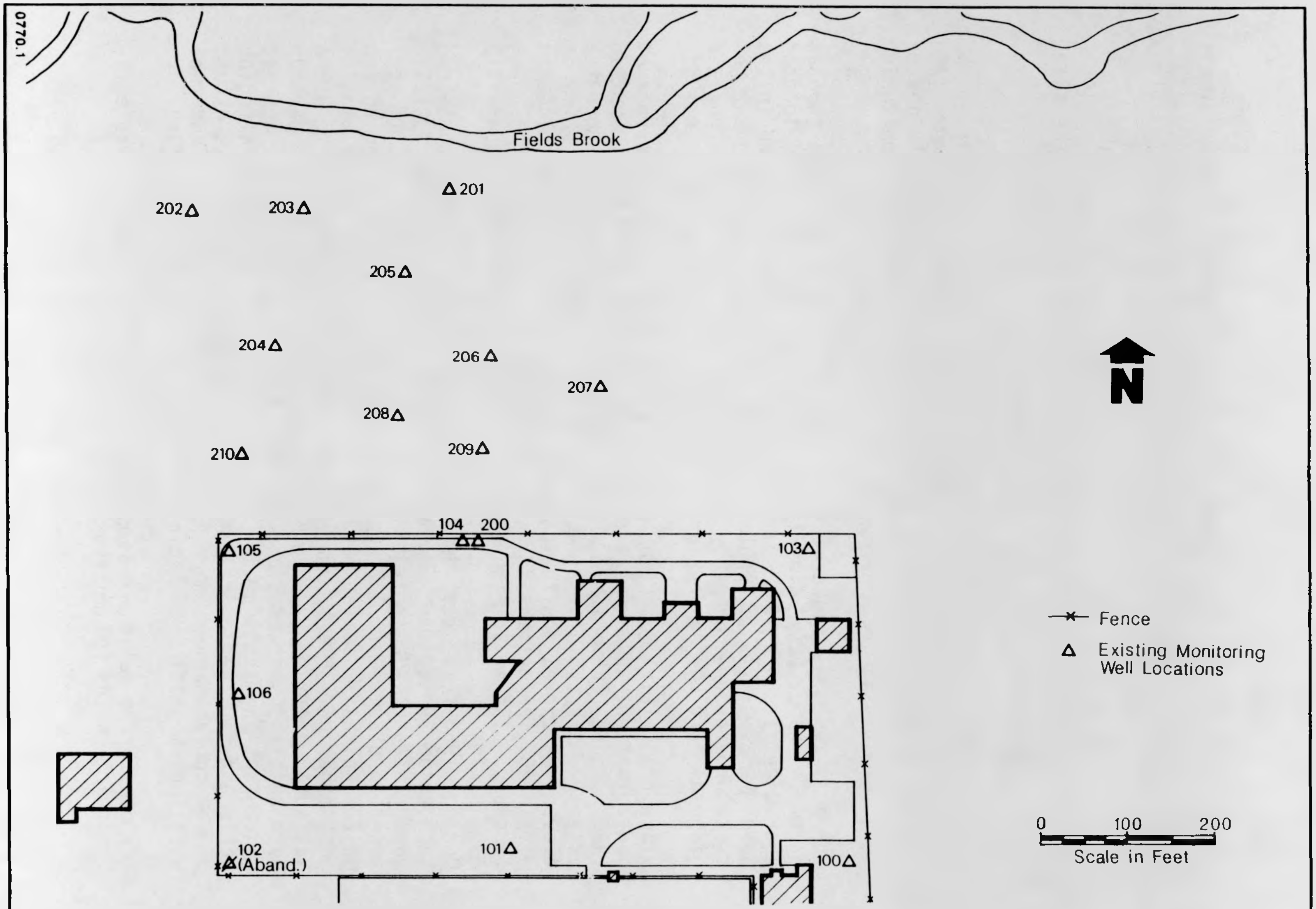

Figure 15-4. Location of Groundwater Monitoring Wells

TABLE 15-6

AVERAGE 1988 MONITORING WELL CONCENTRATIONS FOR RMI

Parameter	Units	Upgradient Wells #100, 401, 402	Monitoring Well #104 (Center of Plume)	Monitoring Well #206 (Center of Second. Plume)
pH(1)(2)	S.U.	6.2 - 8.0	6.6 - 8.1	7.0 - 7.4
Specific Conductance(1)	umho	2,340	15,000	1,340
Total Organic Carbon(1)	mg/l	<3.4	14	<2.7
Total Organic Halogen(1)	ug/l	<0.06	93	<0.014
Trichloroethylene(3)	mg/l	<0.002	84	<0.003
Uranium(4)	mg/l	0.004	0.216	0.063
Gross Alpha	pCi/l	<4	375	86
Gross Beta	pCi/l	<4	23,000	3,230
Technetium 99(4)	pCi/l	<4	99,000	7,000
Calcium	mg/l	129	137	65
Magnesium	mg/l	61	32	17
Potassium	mg/l	8.7	5.7	4.5
Sodium(5)	mg/l	266	3,600	149
Chloride(2)	mg/l	381	153	93
Carbonate	mg/l	<1	<1	<1
Bicarbonate	mg/l	254	272	140

1. RCRA indicator parameter - Look for statistically significant increase in downgradient compared to upgradient well, 40 CFR 265.93.

The following drinking water citations are included for reference only; there are no drinking water wells in the area.

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. DOE Draft Derived Concentration Guides - Concentrations of radionuclides in water that could be continuously consumed and not exceed an effective dose equivalent of 100 mrem/year, 600 pCi/l for U238, U235 (0.81 mg/l for natural U), 500 pCi/l for U234, 100,000 pCi/l for Tc 99.
5. USEPA recommended drinking water maximum contaminant level for sodium of 20 mg/l for persons on sodium restricted diets, 49 FR 6/18/84.