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REMEDIAL INVESTIGATION AND FEASIBILITY STUDY, FEED MATERIALS PRODUCTION CENTER

Fernald, Ohio

VOLUME II: HEALTH AND SAFETY PLAN
VOLUME III: COMMUNITY RELATIONS PLAN
VOLUME IV: DATA MANAGEMENT PLAN

MARCH 31, 1988

REVISION 3

U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

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VOLUME 2: HEALTH AND SAFETY
VOLUME 3: COMMUNITY RELATIONS PLAN
VOLUME 4: DATA MANAGEMENT PLAN
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ASI/WMCO
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REPORT

VOLUME II

HEALTH AND SAFETY PLAN FOR THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY FEED MATERIALS PRODUCTION CENTER FERNALD, OHIO

Prepared for:

U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1 of 5
1.1	POLICY	1 of 5
1.2	SCOPE	2 of 5
1.3	HAZARD DESCRIPTION	2 of 5
2.0	ORGANIZATION AND RESPONSIBILITIES	1 of 3
2.1	STAFFING AND LINES OF AUTHORITY	1 of 3
2.2	PERSONNEL RESPONSIBILITIES	1 of 3
3.0	ENVIRONMENTAL, SAFETY, AND HEALTH PROGRAM STANDARDS	1 of 3
4.0	PROGRAM REQUIREMENTS	1 of 8
4.1	INITIAL SITE SURVEY	1 of 8
4.2	OPERATING PROCEDURES	2 of 8
4.3	WORKER TRAINING	2 of 8
4.4	RECORDS AND REPORTING REQUIREMENTS	4 of 8
4.5	COMPLAINTS	6 of 8
4.6	RESTRICTIONS	7 of 8
4.7	INTERNAL AUDITS	7 of 8
4.8	CONTROLLED AREAS	8 of 8
4.9	POSTING	8 of 8
5.0	OCCUPATIONAL MONITORING AND PERSONNEL PROTECTION	1 of 33
5.1	MEDICAL MONITORING PROGRAM	1 of 33
5.2	BIOASSAY PROGRAM	1 of 33
5.3	PERSONNEL PRECAUTIONS	2 of 33
5.4	HEAT STRESS MONITORING	3 of 33
5.4.1	Heat Stress and Other Physiological Factors	3 of 33
5.4.2	Monitoring	4 of 33
5.4.3	Prevention	7 of 33
5.4.4	Other Factors	8 of 33

TABLE OF CONTENTS

(Continued)

SECTION		PAGE
	5.4.5 Physical Condition	10 of 33
	5.4.6 Level of Acclimation	10 of 33
	5.4.7 Age	11 of 33
	5.4.8 Gender	11 of 33
	5.4.9 Weight	12 of 33
5.5	EXTERNAL RADIATION EXPOSURE	12 of 33
	5.5.1 ALARA Considerations	13 of 33
	5.5.2 Use of Radiation and Chemical Work Permits	14 of 33
5.6	AIR MONITORING	14 of 33
5.7	RESPIRATORY PROTECTION	17 of 33
5.8	CHANGE FACILITIES	18 of 33
5.9	LEVELS OF PROTECTION/PROTECTIVE CLOTHING AND EQUIPMENT	18 of 33
	5.9.1 Levels of Protection	20 of 33
	5.9.1.1 Level A	20 of 33
	5.9.1.2 Level B	21 of 33
	5.9.1.3 Level C	23 of 33
	5.9.1.4 Level D	23 of 33
5.10	CONTAMINATION MONITORING	24 of 33
5.11	DECONTAMINATION	25 of 33
	5.11.1 Effectiveness of Decontamination	26 of 33
	5.11.2 Decontamination Solution	26 of 33
	5.11.3 Establishment of Procedures	27 of 33
	5.11.3.1 Decontamination During Medical Emergencies	27 of 33
	5.11.3.2 Protection for Decontamination Workers	29 of 33
	5.11.3.3 Decontamination of Equipment	30 of 33
5.12	ASBESTOS MONITORING AND PROTECTION	30 of 33
5.13	NOISE	31 of 33

7

TABLE OF CONTENTS

(Continued)

SECTION		PAGE
5.14	SAMPLING METHODOLOGY	31 of 33
5.14.1	Solids	31 of 33
5.14.2	Liquids - Surface Water, Liquid Process Streams, Sump Water	33 of 33
5.14.3	Gas and Vapors	33 of 33
6.0	ENVIRONMENTAL PROTECTION PROGRAM	1 of 1
7.0	HAZARD CONTROL AND MONITORING	1 of 3
7.1	GENERAL PRECAUTIONS	1 of 3
7.2	BUDDY SYSTEM	1 of 3
7.3	EQUIPMENT SAFETY	1 of 3
7.4	STORAGE OF TOOLS AND EQUIPMENT	2 of 3
7.5	FIRE AND EXPLOSION PREVENTION	2 of 3
7.6	SAFETY PRECAUTIONS NEAR UTILITY LINES	2 of 3
7.7	SAFETY PRECAUTIONS WHEN DRILLING	3 of 3
7.8	SANITATION	3 of 3
7.9	TRANSPORT OF CONTAMINATED MATERIAL	3 of 3
8.0	CONTINGENCY PLAN	1 of 2
REFERENCES		1 of 2

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

TABLE NO.		PAGE
1-1	Potential Chemical and Radiological Constituents of the FMPC Site	4 of 5
3-1	Exposure of Individuals and Population Groups in Uncontrolled Areas	2 of 3
3-2	Occupational Radiation Exposure Standards	3 of 3
5-1	Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers	6 of 33
5-2	Signs and Symptoms of Heat Stress	9 of 33
5-3	Maximum Permissible Radionuclide Concentrations in Air	19 of 33

LIST OF FIGURES

FIGURE NO.		PAGE
1-1	Health and Safety Plan Consent Form	3 of 5
5-1	Radiation and Chemical Work Permits	15 of 33

LIST OF ATTACHMENTS

ATTACHMENT NO.		PAGE
A	Environmental, Safety, and Health Regulations	1 of 4
~~B~~	~~Uranium in Urine Bioassay Procedure~~	~~2 of 4~~
C	Time - Weighted Radiation Exposure Determinations	3 of 4
D	Surface Contamination Limits (ANSI N13.12)	4 of 4

1.0

1.0 INTRODUCTION

Advanced Sciences, Inc. (ASI) and its subcontractors, principally IT Corporation (IT), have the responsibility to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Feed Materials Production Center (FMPC) Production Area, Waste Storage Area, and adjacent environs. The FMPC is a U.S. Department of Energy (DOE) facility operated by Westinghouse Materials Company of Ohio (WMCO). The site background and history are presented in the Description of the Current Situation, a report prepared as the Task 1 deliverable of the RI/FS.

This Health and Safety Plan (HSP) applies specifically to the ASI investigation and is published as a separate document from the Work Plan for the site wide RI/FS at the FMPC. Copies of this plan, with the applicable DOE Orders attached, will be distributed to each member of the ASI team working at the FMPC and will be reviewed in the ASI training sessions.

1.1 POLICY

All reasonable precautions will be taken by ASI and its subcontractors to ensure the health and safety of workers and the general public in a cost-effective manner. ASI and its subcontractors will comply with all federal, state, local, and DOE health and safety regulations and requirements. Evidence of compliance will be provided by the monitoring records generated from this program as specified in DOE Order 5484.1A - Environmental Protection, Safety, and Health Protection Information Reporting Requirements.

All personnel that participate in the remedial investigation at the FMPC are required to read, understand, and comply with the provisions of this HSP and are required to sign the consent form presented in Figure 1-1 or its equivalent.

7

FIGURE 1.1
HEALTH AND SAFETY PLAN CONSENT FORM

I have read, understood and agree to comply with the provisions set forth in this Health and Safety Plan.

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Project Manager	Signature	Date
Corporate Health and Safety Manager	Signature	Date
Site Health and Safety Officer	Signature	Date

1.2 SCOPE

This HSP establishes: (1) the organization and responsibilities, (2) environmental, safety, and health program standards, (3) program requirements, (4) occupational monitoring and personnel protection methods, (5) environmental protection program, (6) hazard control and monitoring methods, and (7) a contingency plan for emergencies at the FMPC. Applicable health and safety standards are specified. Responsibilities in carrying out this plan are delineated. Guidance on program requirements and hazard control and monitoring is included. The standards and procedures must be understood and observed by all participatory personnel and subcontractors.

1.3 HAZARD DESCRIPTION

The hazards associated with wastes at the FMPC are addressed in this HSP. Those hazards are, in part, identified by specifying the chemicals and radionuclides that could possibly be present at the FMPC. Data generated from the Characterization Investigation Study (CIS) have been incorporated. Table 1-1 lists the chemical and radiological parameters for which samples will be analyzed to determine which constituents are present. Until this determination is made, the potential for encountering these constituents during sampling efforts will be considered as potential hazards. In addition to the parameters listed, chemicals used in the process operations may also pose hazards. These include: anhydrous ammonia, anhydrous hydrofluoric acid, nitric acid, methanol, sulfuric acid, anhydrous hydrogen fluoride, potassium fluoride, ammonium, and ammonium hydroxide.

TABLE 1-1

POTENTIAL CHEMICAL AND RADIOLOGICAL
CONSTITUENTS OF THE FMPC SITE

Inorganics and Metals

1. Arsenic
2. Cadmium
3. Chromium - Hexavalent, Total
4. Fluoride
5. Lead
6. Nitrate
7. Selenium
8. Silver

Organics

1. Chlorobenzene
2. Chlorodibromoethane
3. Chloroethane
4. 2-Chloroethylvinyl ether
5. Chloroform
6. Dichlorobromoethane
7. Dichlorodifluoromethane
8. Endrin
9. Lindane
10. Methoxychlor
11. 2,4-D
12. 2,4,5-TP Silvex
13. Perchloroethylene
14. Cis-1,2-Dichloroethylene
15. Tributylphosphate
16. Acrolein
17. Acrylonitrile
18. Benzene
19. Bis(chloromethyl)Ether
20. Bromoform
21. Bromodichloromethane
22. Bromoethane
23. Carbontetrachloride
24. Chloromethane
25. Dichlorobenzene (1,2; 1,3; 1,4)
26. 1,2-Dichloroethane
27. 1,1-Dichloroethylene
28. 1,2-Dichloropropane
29. 1,2-Dichloropropylene
30. Ethylbenzene
31. Methylbromide
32. Methylchloride
33. Trans-1,2-Dichloroethylene
34. 1,3-Dichloropropane
35. 1,1,2,2-Tetrachlorethane

TABLE 1-1
(Continued)

POTENTIAL CHEMICAL AND RADIOLOGICAL
CONSTITUENTS OF THE FMPC SITE

36. Tetrachloroethylene
37. Toluene
38. 1,1,1-Trichloroethane
39. 1,1,2-Trichloroethane
40. Trichloroethylene
41. Trichlorofluoromethane
42. Vinyl Chloride
43. Polychlorinated Biphenyl (PCB)
44. Dioxins, 2,3,7,8-TCDD/TCDF and PCDD/PCDF
45. Organophosphorus Pesticides

Radiological Parameter

1. Isotopic Uranium
2. Radon-222
3. Radium-226
4. Radium-228
5. Technetium-99
6. Thorium-228
7. Thorium-230
8. Thorium-232
9. Cesium-137
10. Strontium-90
11. Ruthenium-106
12. Neptunium-237
13. Plutonium-238
14. Plutonium-239
15. Plutonium-240
16. Gross alpha
17. Gross beta

2.0

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 STAFFING AND LINES OF AUTHORITY

ASI or IT personnel at the FMPC will include a Site Health and Safety Officer (SHSO) to ensure that all work activities are conducted in accordance with the requirements of the HSP. Lines of authority for health and safety management will be independent of those for operational management to ensure that FMPC health and safety functions are not overridden by operational concerns.

For this project, Richard Wilde is the ASI Project Director. The SHSO will be Richard Greene of IT. He will report on a project basis to Richard Haaker, the ASI Corporate Health and Safety Manager, who reports to George Wolf, the ASI Senior Vice President of Operations. Individuals with appropriate training and experience designated by the SHSO will be responsible for day-to-day health and safety concerns when the SHSO is not on site. The project organizational structure is presented in Section 3.0 of the QAPP.

2.2 PERSONNEL RESPONSIBILITIES

The Corporate Health and Safety Officer will:

- Establish environmental, health, and safety policies;
- Develop or modify the HSP;
- Provide technical assistance to the SHSO;
- Conduct and/or direct any special studies related to the environmental, health, or safety issues;
- Keep appraised of new environmental, health, and safety regulations and keep the SHSO informed of those regulations; and
- Develop new training material and assist the SHSO with employee training.

The SHSO will be responsible for the health and safety of the workers and for ensuring that environmental releases do not affect

the health and safety of the general public. This individual will be provided with properly trained staff and adequate equipment as needed to ensure that all work is done safely. The equipment, number of staff, and staff qualifications will be commensurate with the potential hazard of the task to be completed at the FMPC site.

The SHSO will:

- Be responsible for the complete implementation of the HSP;
- Act on employee concerns in accordance with procedures outlined in this plan;
- Consider variations of prescribed health and safety standards, and the timing and manner of correction. Willful violation, refusal, or failure to correct violations of health and safety standards or regulations will result in disciplinary action;
- Ensure that all information regarding health and safety matters is recorded and reported for ASI employees and the employees of all subcontractors;
- With the concurrence of ASI's Corporate Health and Safety Officer or ASI's Senior Vice President of Operations, stop work when a safety/environmental condition is uncertain, and request assistance from the appropriate safety person; and
- Present environmental, safety, and health training to employees.

Line management on this project will:

- Know and understand the applicable HSP requirements;
- Ensure that all workers know and understand the applicable HSP requirements; and
- Enforce the HSP requirements.

Workers on this project will:

- Know and understand applicable HSP requirements;
- Obtain guidance from the supervisor or safety representative in the event that any uncertainties about safety arise; and
- Comply in full with all safety requirements.

3.0

3.0 ENVIRONMENTAL, SAFETY, AND HEALTH PROGRAM STANDARDS

ASI and its subcontractors will comply with applicable federal, state, local, and DOE health and safety regulations and requirements including, but not limited to, those established pursuant to the Occupational Safety and Health Act (OSHA). A summary of these regulations is presented in Attachment A. The HSP, to be distributed to individuals, will contain the specified regulations. ASI and its subcontractor employees will be informed of the potential chemical and radiological hazards associated with the work to be conducted and the methods to be used to prevent adverse health effects.

ASI team members will comply with the radiation exposure standards listed in Tables 3-1 and 3-2. In all cases, exposures to workers and members of the public will be maintained As Low As Reasonably Achievable (ALARA).

TABLE 3-1

EXPOSURE OF INDIVIDUALS AND POPULATION GROUPS IN UNCONTROLLED AREAS[a]

	Annual dose equivalent or dose commitment[b]	
Type of Exposure	Based on dose to individuals at points of maximum probable exposure (rem)	Based on average dose to a suitable sample of the exposed population (rem)
Whole body, gonads, or bone marrow	0.5	0.17
Other organs	1.5	0.5

[a]From DOE Order 5480.1A

[b]In keeping with DOE policy on lowest practicable exposures, exposure to the public will be limited to as small a fraction of the respective annual dose limits as is reasonably achievable. Dose commitment is defined as the dose equivalent (rem) received by specific organs during a period of one calendar year (the result of radionuclide uptake by a person).

TABLE 3-2

OCCUPATIONAL RADIATION EXPOSURE STANDARDS[a]

Type of Exposure	Exposure Period	Dose equivalent (dose or dose commitment)[b] (rem)
Whole body, head and trunk, gonads, lens of the eye[c], red bone marrow, active blood-forming organs	Year	5
	Calendar Quarter	3
Unlimited areas of the skin (except hands and forearms). Other organs, tissues, and organ systems (except bone).	Year	15
	Calendar Quarter	5
Bone	Year	30
	Calendar Quarter	10
Forearms	Year	30
	Calendar Quarter	10
Hands	Year	75
	Calendar Quarter	25

[a]From DOE Order 5480.1A

[b]To meet the above dose commitment standards, operations must be conducted in such a manner that it would be unlikely that an individual would assimilate in a critical organ, by inhalation, ingestion, or absorption, a quantity of radionuclide or mixture of radionuclides that would cause the individual organ dose to exceed the limits. Dose commitment is defined as the dose equivalent (rem) received by specific organs (the result of radionuclide uptake by an occupationally exposed person).

[c]A beta exposure below a maximum energy of 700 KeV will not penetrate to the lens of the eye; therefore, the applicable limit for these energies would be that for the skin (15 rem/yr).

4.0

4.0 PROGRAM REQUIREMENTS

4.1 INITIAL SITE SURVEY

Prior to initiating full-scale characterization activities, a physical walk-through inspection was conducted in and around the Production Area. That inspection familiarized ASI team members with the building locations and the chemical processes conducted in each building.

Prior to conducting any work in the Production Area, ASI's SHSO will consult with WMCO's radiation safety and industrial safety personnel to assess the following conditions, if known:

- Physical hazards of the proposed work;
- Radiological conditions present at the proposed work location (alpha, beta, gamma, and radon processing levels);
- Chemical conditions present at the proposed work locations (organic chemicals, inorganic chemicals, acids, bases, oxidants, asbestos, etc.);
- Contamination levels present at the proposed work locations; and
- The access routes to and exit routes from the work location.

The SHSO will supplement the WMCO information with surveys to complete the assessment of conditions to be encountered during the proposed work. The SHSO will determine, based on available information and the process equipment in the area, the level of protective clothing necessary to collect the supplemental information. The SHSO will also determine the number of personnel necessary to perform the particular work function. At a minimum, all WMCO health and safety policies and protocols will be followed by ASI and its subcontractors.

4.2 OPERATING PROCEDURES

All characterization activities will be carried out in accordance with existing WMCO Standard Operating Procedures (SOP's) applicable to instrumentation and equipment present at FMPC to the extent that they are adequate. Any surveys or equipment to be used in ASI's work and for which SOP's are not available will have SOP's written and approved by WMCO prior to use of the survey equipment. SOP's are used to help ensure the accuracy of and precision of measurements being made and to help ensure that radiological and chemical exposures to workers and members of the public on the FMPC site are maintained to levels that are ALARA.

4.3 WORKER TRAINING

A formal site-specific training program will be provided by the ASI Corporate Health and Safety Manager or the SHSO to workers before they begin on-site work. The training will be commensurate with the work hazard, and will include discussions of the FMPC remedial investigation project, industrial and radiological safety procedures, emergency and contingency procedures, the signs and symptoms of heat stress as outlined in Section 5.4, the potential for encountering hazardous materials on the site and emergency telephone numbers, first aid, and location of first aid stations and hospitals. The training will also include the highlights of this health and safety plan, WMCO's emergency plan, a detailed description of decontamination procedures, and respirator use and fit testing.

Practical demonstrations shall be given, when appropriate, i.e., in self-monitoring for contamination on workers. Fit test for respirator users will, at a minimum, include qualitative testing. Quantitative testing will be provided. Adequate information regarding known hazardous materials that may be encountered on site, including radioactive materials, chemical constituents, and asbestos, will be provided to ensure compliance with the Hazard Communication Standard (29 CFR 1910.1200). Workers will be

informed of the physical hazards at the site. Refresher training will be provided by the ASI Corporate Health and Safety Manager or the SHSO, as deemed appropriate for the time span of the project. Visitors will receive training on the specific hazards they may encounter.

Personnel working in jobs involving possible radiation exposure will be advised of National Council on Radiation Protection (NCRP) Report 39 which recommends that exposures to embryos and fetuses be minimized. Workers will be advised of the biological risks to embryos and fetuses exposed to ionizing radiation. Workers will also be made aware that specific efforts and attention should be taken to keep the exposure of an embryo or fetus to radiation or hazardous materials at the very lowest practicable level during the gestation period.

Training will be provided to workers on the potential health impacts resulting from chemical exposure. Following the initial site survey, an assessment will be made of these impacts and the health and safety requirements needed for individual areas on site. For example, if PCBs or PCB-containing materials are to be sampled, training specific to the safe handling and disposal of PCBs will be provided. 40 CFR 761 lists PCB prohibitions that must be followed (U.S. Environmental Protection Agency (U.S. EPA), 1986). When and if asbestos is to be encountered at the FMPC, worker training specific to the occupational exposure to asbestos will be provided [29 CFR 1926.58(k)(3)].

Each worker will pass a written or oral examination with the results documented. The instructor will discuss and provide workers with literature on the biological effects of radiation, such as the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 8.13, "Instructions Concerning Potential Radiation Exposure."

Prior to beginning work at a new work location or under different working conditions, the SHSO will provide a briefing to workers stating the nature and extent of contamination to be encountered that day and an explanation of safety equipment to be used.

4.4 RECORDS AND REPORTING REQUIREMENTS

ASI will notify the WMCO ES&H Department, the ASI FMPC Project Director, and the responsible installation safety officer, of a fatality or serious accident, as required in DOE Order 5484.1A. Fatal accidents will be investigated by the state, federal, or local office having environmental, safety, and health jurisdiction.

ASI will be responsible for the recording and reporting of reportable illnesses and injuries in accordance with DOE requirements. Copies of these reports will be forwarded to the appropriate ASI and WMCO personnel, including the ASI FMPC Project Director, and the responsible installation safety officer. Recordable occupational accidents and illnesses are those defined in DOE Order 5484.1A, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements".

ASI will submit a DOE Form 5484.X, "Individual Accident/Incident Report", for each occurrence for which reporting is required under DOE 5484.1A. Forms will be submitted to the responsible WMCO installation safety officer and the cognizant DOE Operations Office.

ASI will maintain records of employees' exposures to radioactive or toxic materials or other harmful physical agents for a period of 30 years. DOE Form 5484.8, "Termination Occupational Exposure Report", will be forwarded to the ASI FMPC Project Office and responsible WMCO installation safety officer within 30 days of termination of employment or within 30 days of the determination of exposure in accordance with Annex A of DOE Order 5484.1. Forms 5484.6, "Annual Summary of Whole Body Exposures to Ionizing

Radiation," and 5484.7, "Summary of Exposure Resulting in the Internal Body Depositions of Radioactive Materials for CY___," will be forwarded to the ASI FMPC Project Office, and the responsible installation safety officer by March 15 for the preceding year, in accordance with Annex A of DOE Order 5484.1. In addition, all radiation exposure records, or a copy of all radiation exposure records, will be transferred to the WMCO installation safety officer upon employee termination or completion of the contract.

ASI team members, through the SHSO, are required by DOE Order 5000.3 to notify the responsible WMCO installation safety officer and cognizant DOE Operations Office of any unusual occurrence. An "unusual occurrence" is any unusual or unplanned event having programmatic significance such that the event adversely affects or potentially affects the integrity of the site or the performance, reliability, or safety for the FMPC Project. Notification of occurrences similar to the following will be required:

- Any substantial degradation of a barrier designed to contain radioactive or toxic material or any substantial release of radioactive or toxic material past this barrier (e.g., overflow of a water treatment pond, contaminant release into a stream or river, or contamination released beyond the site boundary);
- Accidents involving the transport of radioactive or toxic materials;
- Any fire or explosion which affects the integrity of the site or project;
- Any condition, resulting from natural events or manmade activities, which substantially affects or threatens performance, reliability, or safe operation (e.g., site flooding, wind damage, soil stability problems, personnel operation errors which create hazardous conditions);
- Any radiation or chemical exposure in excess of applicable limits;
- Any incidence or breach of access control by unauthorized personnel;
- Any acts of vandalism or major theft occurring at a site; and

- Any release of contamination outside the controlled area; including personnel, equipment, and roadways.

ASI will maintain a central file of all enforcement inspections and reports along with violations and abatement actions for inspection by WMCO and the DOE. ASI will also maintain a central file of formal employee health and safety complaints and reports of their disposition. Upon request, these will be made available for inspection by affected employees or their authorized representative.

ASI will maintain documentation of all employee training, including new employee orientation, refresher courses, respirator fit test results, and respirator training. Documentation on the medical evaluation of employees will be maintained by ASI's health and safety personnel or the ASI personnel office.

4.5 COMPLAINTS

Employees are encouraged to report to the SHSO, either directly or through their authorized employee representative, any conditions or practices which they consider detrimental to their health or safety or which they believe are in violation of applicable health and safety standards. Such complaints may be made orally or in writing. Each contractor will also have available in the workplace DOE Form F-5480.4, "Occupational Safety and Health Complaint Form", to be used in reporting violations.

An employee, or representative of employees, who believes that an imminent danger exists that threatens death or serious physical harm, is encouraged to bring this matter to the immediate attention of the SHSO for resolution. In the event of inadequate corrective action, the employee and/or authorized representative may also contact the local agency having jurisdiction, the ASI FMPC Project Office, or the FMPC Health and Safety Official by telephone and set forth with reasonable particularity the basis for their request for

an immediate inspection. Competent medical personnel, which may include a physician, will evaluate the symptoms of illnesses that could seriously affect a worker's health and safety.

4.6 RESTRICTIONS

A worker under age 18 will neither be employed in, nor allowed to enter, controlled areas in such a manner that they will receive doses of radiation in amounts exceeding one-tenth the standards in Table 3-2.

ASI administrative limits used to ensure that workers do not exceed the quarterly or annual limits are at 50 percent of the limits specified in Table 3-2. If administrative limits or standards are exceeded, workers who are potentially exposed to the elevated levels of radiation will be placed on work restrictions until the end of the period of concern. Also, the work environment and work procedures will be investigated to ensure that the ALARA program is being properly implemented.

ASI and subcontractor nonessential personnel and visitors to the site will be required to comply with all health and safety restrictions provided in this document. ASI or subcontractor visitors will be accompanied by another ASI or subcontractor site worker at all times, and must sign into the ASI access log to gain access to the FMPC site.

4.7 INTERNAL AUDITS

The ASI Corporate Health and Safety Manager will conduct internal health and safety audits to ensure compliance with the requirements of this plan. An initial audit will be conducted within three weeks of commencing remedial investigation sampling and will provide follow-up actions if any violation of health and safety standards are observed. Additional audits will be conducted twice annually, or more frequently, if necessary. These audits of the

radiation control program will be in accordance with guidelines set forth in DOE Order 5482.1A.

4.8 CONTROLLED AREAS

Controlled areas will be established to protect the workers from unnecessary exposure to radiation or toxic materials and to prevent the spread of contamination. Controlled areas include, but are not limited to, any work areas which meet any of the following conditions:

- The potential exists for significant dispersal of contaminated material from a work area through personnel or equipment transfer;
- The estimated external gamma ray exposure rate to any individual in that work area exceeds 500 millirem/year; and
- Airborne concentrations of radionuclides exceed quantities provided in DOE Order 5480.1A, Attachment XI-1, Table 1, Column 1.

Access to these areas will be controlled for people, vehicles, and equipment by fencing and posting the area or by using other methods to prevent inadvertent exposure to contaminated material.

Smoking, drinking, eating, or other activities that would enhance the transfer of radionuclides into the human body will be prohibited in controlled areas.

4.9 POSTING

Controlled areas must be conspicuously marked at points of potential access with an appropriate sign or signs according to applicable posting and labeling requirements set forth in 10 CFR 20 and 29 CFR 1910.1200. At times when it is necessary to barricade or "rope off" an area, all barricades, ropes, and warning signs, whether used in a roadway or not, will be in accordance with American National Standards Institute (ANSI) Standards D-6.1-1971.

5.0

5.0 OCCUPATIONAL MONITORING AND PERSONNEL PROTECTION

5.1 MEDICAL MONITORING PROGRAM

All ASI and subcontractor personnel who perform chemical or radiological waste sampling or other work in the Production Area and Waste Storage Area (except nonworking supervisory personnel and visitors who are typically observing work from a distance) will participate in an annual medical monitoring program and a respirator fit test. The objective of the medical monitoring program is to determine the medical competency of employees who work while wearing respiratory protection and those who work under the heat and physical stress that may be encountered in the work place. Only those employees determined to be physically capable will be eligible for respirator fit testing and training and/or assigned work involving physical stress.

Prior to initiating work, a work-related radiation exposure history will be acquired and maintained for each employee working in a controlled area. Results of termination bioassays will be obtained from the last employer where internal exposure to radiation may have occurred. If not available, a baseline bioassay measurement will be acquired prior to permitting the employee to perform radiation-related work.

5.2 BIOASSAY PROGRAM

The bioassay program provides for monitoring of internally deposited radioactive material. The bioassay data are used to document the extent of radionuclide intake into the human body and to determine the degree of adherence to ALARA principles. Based on the evaluation of these data, corrective action may be required.

Radiobioassay of urine samples (urinalysis) will be utilized to determine whether radionuclides have been taken into the bodies of workers on site. All ASI team members who perform work in the FMPC Production Area or Waste Storage Area, where the time-weighted

exposure to airborne radionuclides approaches or exceeds 25 percent of the maximum permissible time-weighted exposure, will submit urine samples. Those samples will be submitted prior to beginning work on the project, and every two weeks while working in the Production Area or Waste Storage Area and after termination of the work assignment at the site. Instructions for this activity will be given during a radiological orientation at the site prior to the commencement of work. Employees who make occasional visits, but do not work regularly in the FMPC Production Area, will be sampled at the direction of the SHSO. Attachment B presents the "Uranium Urine Bioassay Procedure."

5.3 PERSONNEL PRECAUTIONS

The following practices will be adhered to by all ASI team members working at the FMPC:

- Eating, drinking, chewing gum, tobacco chewing, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in contaminated areas. Attention is specifically called to "No Smoking" areas posted at various locations throughout the FMPC. All employees must strictly adhere to the regulations governing these areas. Smoking will not be permitted in fuel or paint storage areas.

- Hands and face will be thoroughly washed upon leaving the work area.

- Upon leaving the FMPC Production Area or Waste Storage Area, all ASI team members will self-monitor for radionuclide contamination. Contaminated clothing will be removed and, upon reentry, exchanged for clean clothing or cleaned prior to reuse. If contamination is found on an individual's body, the affected area will be cleaned and remonitored before leaving the FMPC controlled area.

- No facial hair which interferes with a satisfactory fit of the mask-to-face seal will be allowed on personnel who may be required to wear respiratory protection equipment. When air-supplied respirators are used, workers will have the same facial hair restrictions.

- Contact with contaminated or suspected contaminated surfaces will be avoided by personnel working in contaminated areas.

- In certain cases, medicine and alcohol can potentiate the effects from exposure to toxic chemicals. Personnel taking prescribed drugs will consult with the SHSO prior to working where the potential for absorption, inhalation, or ingestion of toxic substances exists.

- All safety equipment will be routinely cleaned, checked, and maintained according to WMCO standard operating procedures, if adequate, to ensure the highest level of performance and to reduce any potential for malfunction in the field. Safety equipment and nondisposable safety apparel will be monitored for contaminants and maintained at levels less than those specified in ANSI N13.12 (Attachment D).

- The consumption of alcohol will be prohibited during all working hours.

5.4 HEAT STRESS MONITORING

Guidelines have been developed by the National Institute for Occupational Safety and Health (NIOSH) for monitoring heat stress and other physiological factors and are published in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH, 1986). These guidelines are presented below and have been adopted for the FMPC site remedial investigation.

5.4.1 HEAT STRESS AND OTHER PHYSIOLOGICAL FACTORS

Wearing personnel protection equipment (PPE) puts a hazardous waste worker at considerable risk of developing heat stress. This can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions are vital.

Individuals vary in their susceptibility to heat stress. Factors that may predispose someone to heat stress include:

7

- Lack of physical fitness;
- Lack of acclimation;
- Age;
- Dehydration;
- Obesity;
- Alcohol and drug use;
- Infection;
- Sunburn;
- Diarrhea; and
- Chronic disease.

Reduced work tolerance and the increased risk of excessive heat stress is directly influenced by the amount or type of PPE worn. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditures. Therefore, when selecting the PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once the PPE is selected, the safe duration of work/rest periods should be determined based on the:

- Anticipated work rate;
- Ambient temperature and other environmental factors;
- Type of protective ensemble; and
- Individual worker characteristics and fitness.

5.4.2 MONITORING

Because heat stress depends on a number of different factors, all workers, even those not wearing PPE, will be evaluated by the SHSO for heat stress monitoring as follows:

- For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress (ACGIH, 1986). If the actual clothing worn differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules accordingly (NIOSH, 1981); and

- For workers wearing semipermeable or impermeable encapsulating ensembles, the ACGIH standard cannot be used. For these situations, workers should be monitored

when the temperature in the work area is above 70 degrees Fahrenheit (21 degrees Celsius).

The monitoring program will be determined by the SHSO on a task-by-task basis. Work/rest schedules will be established for each task and documented in the Radiation and Chemical Work Permit (RCWP) (Section 5.5). Specific measurements may be necessary to determine the adequacy of the work/rest schedules, including:

- Heart rate: Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by another one-third.

- Oral temperature: Use a clinical thermometer (three minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking). If the oral temperature exceeds 99.6 degrees Fahrenheit (37.6 degrees Celsius) shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6 degrees Fahrenheit (37.6 degrees Celsius) at the beginning of the next rest period, shorten the following work cycle by another one-third (NIOSH, 1981). Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6 degrees Fahrenheit (38.1 degrees Celsius) (NIOSH, 1981).

- Body water loss, if possible: Measure weight on a scale accurate to ± 0.25 lb. at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day (NIOSH, 1981).

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (Table 5-1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

TABLE 5-1

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATIZED WORKERS[a]

Adjusted Temperatures[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87°-90°F (30.8°- 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°- 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°- 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°- 25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Source: Henschel, 1985.

[a]For work levels of 250 kilocalories/hour.

[b]Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulk shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

[c]A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

7

5.4.3 PREVENTION

Proper training and preventative measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because, once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. To avoid heat stress, project management personnel should take the following steps:

- Adjust work schedules:
  - Modify work/rest schedules according to monitoring requirements.
  - Mandate work slowdowns as needed.
  - Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
  - Add additional personnel to work teams.
  - Perform work during cooler hours of the day, if possible, or at night, if adequate lighting can be provided.
- Provide sheltered (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in perspiration, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 8 ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost perspiration (Goldman, 1983). When heavy perspiration occurs, encourage the worker to drink more. The following strategies may be useful:
  - Maintain water temperature at 50 degrees to 60 degrees Fahrenheit (10 degrees to 15.6 degrees Celsius).
  - Provide small disposal cups that hold about 4 ounces (0.1 liter).
  - Instruct workers to drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.

- Urge workers to drink a cup or two of liquid every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day maintains body weight. When drinking fluids in an area where removable radionuclides or hazardous materials are present, take precautions not to ingest radionuclides or hazardous materials along with the liquids.

- Weigh workers before and after work to determine if fluid replacement is adequate.

• Encourage workers to maintain an optimal level of physical fitness:

  - Where indicated, acclimate workers to site work conditions: temperature, protective clothing, and workload. (See Level of Acclimation at the end of this section.)

  - Urge workers to maintain normal weight levels.

• Provide cooling devices to aid natural body heat exchange during prolonged work and severe heat exposure. Cooling devices include the use of field showers, fans, or hose-down areas to reduce body temperature and/or to cool off protective clothing.

• Train workers to recognize and treat heat stress. As part of the training, identify the signs and symptoms of heat stress (Table 5-2).

5.4.4 OTHER FACTORS

PPE decreases worker performance as compared to an unequipped individual. The magnitude of this effect varies considerably, depending on both the individual and the PPE ensemble used. This section discusses the demonstrated physiological responses to PPE, the individual human characteristics that play a factor in these responses, and some of the precautionary and training measures that must be taken to avoid PPE-induced injury.

7

TABLE 5-2

SIGNS AND SYMPTOMS OF HEAT STRESS

- Heat rash may result from continuous exposure to heat or humid air.

- Heat cramps are caused by heavy perspiration with inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain to the hands, feet, and abdomen.

- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

  - Pale, cool, moist skin;
  - Heavy perspiration;
  - Dizziness;
  - Nausea; and
  - Fainting.

- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occur. Competent medical help must be obtained. Signs and symptoms are:

  - Red, hot, usually dry skin;
  - Lack of or reduced perspiration;
  - Nausea;
  - Dizziness and confusion;
  - Strong, rapid pulse; and, in severe cases,
  - Coma.

Source: U.S. EPA, 1984

The physiological factors which may affect worker ability to function using PPE include:

- Physical condition;
- Level of acclimation;
- Age;
- Gender; and
- Weight.

5.4.5 PHYSICAL CONDITION

Physical fitness is a major factor influencing a person's ability to perform work under heat stress. The more fit someone is, the more work they can safely perform. At a given level of work, a fit person, relative to an unfit person, will have:

- Less physiological strain;
- A lower heart rate;
- A lower body temperature, which indicates less retained body heat (a rise in internal temperature precipitates heat injury);
- A more efficient perspiration mechanism;
- Slightly lower oxygen consumption; and
- Slightly lower carbon dioxide production (Goldman, 1970; McArdle, 1981).

5.4.6 LEVEL OF ACCLIMATION

The degree to which a worker's body has physiologically adjusted or acclimated to working under hot conditions affects his or her ability to do work. Acclimated individuals generally have lower heart rates and body temperatures than unacclimated individuals and perspire sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and workload than unacclimated workers. Perspiration composition also becomes more dilute with acclimation, which reduces salt loss (McArdle, 1981).

Acclimation can occur after just a few days of exposure to a hot environment. NIOSH recommends a progressive six-day acclimation period for the unacclimated worker before allowing him/her to do full work on a hot job. Under this regimen, the first day of work on site is begun using only 50 percent of the anticipated workload and exposure time, and 10 percent is added each day through the sixth day. With fit or trained individuals, the acclimation period may be shortened two or three days. Workers can lose acclimation, however, in a matter of days, and work regimens should be adjusted to account for this. When enclosed in an impermeable suit, fit acclimated individuals perspire more profusely than unfit or unacclimated individuals and may therefore actually face a greater danger of heat exhaustion due to rapid dehydration. This can be prevented by consuming adequate quantities of water. See the previous section on prevention for additional information.

5.4.7 AGE

Generally, maximum work capacity declines with increasing age, but this is not always the case. Active, well-conditioned seniors often have performance capabilities equal to or greater than young sedentary individuals. There is some evidence, however, indicated by lower perspiration rates and higher body core temperatures, that older individuals are less effective in compensating for a given level of environmental heat and workloads. At moderate thermal loads, the physiological responses of "young" and "old" are similar and performance is not affected.

5.4.8 GENDER

The literature indicates that females tolerate heat stress at least as well as their male counterparts. Generally, a female's work capacity averages 10 to 30 percent less than that of a male (McArdle, 1981). The primary reasons for this are the greater oxygen-carrying capacity and the stronger heart in the male.

However, not all males have greater work capacities than all females.

5.4.9 WEIGHT

The ability of the body to dissipate heat depends on the ratio of its surface to its mass (surface area/weight). Heat loss (dissipation) is a function of surface area and heat production is dependent on mass. Therefore, heat balance is described by the ratio of the two.

Since overweight individuals (those with a low ratio) produce more heat per unit of surface area than thin individuals (those with a high ratio), overweight individuals should be given special consideration in heat stress situations. When wearing impermeable clothing, however, the weight of an individual is not a critical factor in determining the ability to dissipate excess heat.

5.5 EXTERNAL RADIATION EXPOSURE

Chemical and radiological exposures can usually be minimized or prevented by investigating the work conditions and implementing protective measures prior to the beginning of work. Initially, the potential routes of exposure are identified. Engineered controls such as the use of fume loads for airborne contaminants, or shields for radiation exposures, are then implemented. Safety showers, eye washes, and employee change rooms with washing/showering facilities should be available for use to block or minimize a potential route of exposure for chemicals or radioactive materials.

Work procedures and administrative controls are used to minimize potential exposures. For example, contaminated areas must be isolated. The number of employees in those areas will be minimized, as will their time spent in those areas. Other procedural and administrative controls will include good housekeeping to

minimize the presence of chemical and radioactive materials in the workplace, and the routine maintenance of protective equipment such as filters and respirators.

All ASI team members working in the Production Area and Waste Storage Area will be issued a thermoluminescent dosimeter. These will be read monthly. The SHSO will maintain copies of these results. Working dosimeters, when not in use, and control dosimeters will be stored in a low-background area.

A gamma exposure rate survey will be required in any area where the exposure rate is greater than 0.60 mR/hr as defined in Attachment C. The survey will consist of one waist-high measurement taken with an ionization chamber survey instrument or scintillation counter. If exposure rates exceed 6 mR/hr at any location, the SHSO will limit exposure time, use shielding, or increase the source-to-exposure distance to limit exposures. In certain cases, the SHSO will issue extremity dosimeters to workers and will instruct them on their use and placement. Self-reading ionization dosimeters ("pencils") or dose integrating alarming dosimeters will be available through ASI and/or WMCO, when required.

The feasibility of a criticality accident resulting from the sampling activities to be conducted by ASI and its subcontractors is minimal due to the small sample volumes to be obtained. However minimal that possibility, the potential for a criticality must be considered. When handling any enriched uranium or uranium compounds, ASI and its subcontractors will conduct their operations under the approval and direction of WMCO health physics personnel.

5.5.1 ALARA CONSIDERATIONS

All reasonable efforts will be made to keep radiation exposures, as well as releases of radioactive material to unrestricted

areas, to levels that satisfy ALARA goals. Toward this end, several ALARA principles will be used by the ASI project team:

- The SHSO will have sufficient delegated authority to enforce regulations and administrative practices concerning any aspect of the radiological safety program.
- Personnel will be trained in radiation safety procedures and ALARA philosophies to a level commensurate with their work scope.
- Safety audits will be required, as indicated in this plan.
- Radiation and chemical work permits will be required, as described in the following section.
- Radiation exposures will be minimized where practical by the use of time, distance, shielding, and administrative controls.

5.5.2 USE OF RADIATION AND CHEMICAL WORK PERMITS

The radiation and chemical work permits (RCWP) are used to identify the administrative steps and personnel protective equipment and clothing required to ensure that personnel exposures in areas with a potential radiological or chemical hazard are maintained as low as reasonably achievable (Figure 5-1). The RCWP is used to control personnel exposures to radiation by establishing the radiation protection requirements for entry into a controlled access area under the following conditions:

- Average external radiation levels exceed 2.5 mrem/hr;
- Airborne radioactivity levels exceed 25 percent of the levels in DOE Order 5480.4, Table I, Column 1; and
- Surface contmination levels exceed those provided in ANSI Draft Standard N13.12 (Attachment D of this report).

The RCWPs are also used to control personnel exposures to chemical contaminants.

7

11/89

RADIATION WORK PERMIT

No.: _____

SECTION I: *TO BE COMPLETED BY THE JOB SUPERVISOR*

(1) JOB LOCATION:	(2) ISSUE DATE:	(3) SHIFT:	(4) EXPIRATION DATE:*
BUILDING: DATE:			

JOB DESCRIPTION:

REQUESTING SUPERVISOR'S SIGNATURE:

* *Maximum 7 days from issuance.*

SECTION II: *TO BE COMPLETED BY ERMT*

(5) RADIATION LOCATION	INSTRUMENT READING (6) OW OPEN WINDOW mRad/hr	(7) CW CLOSED WINDOW mRad/hr	EXTREMETIES (8) OPEN WINDOW mRad/hr
1.			
2.			
3.			
4.			

INSTRUMENT TYPE	SERIAL NUMBER	CALIBRATION DATE

(9) STAY-TIME CALCULATIONS

BETA DOSE	SKIN DOSE	EXTREMITY
CORRECTION FACTOR (OW-CW)*F = mRem/hr		
	WHOLE BODY	TIME LIMIT
Side Window GM F = 8 mRem/hr		
CP Ion Chamber F = 3 mRem/hr		

(10) AMBIENT BACKGROUND β/γ mrem/hr

(11) RADIOLOGICAL SURVEY FORM ATTACHED ☐ YES ☐ NO

(12) SURVEY MAP ATTACHED ☐ YES ☐ NO

(13) MONITORING REQUIREMENTS

- ☐ At start of job
- ☐ Intermittent
- ☐ Continuous
- ☐ On completion of job
- ☐ Not required
- ☐ Personnel survey at completion
- ☐ Air monitoring

(14) DOSIMETRY REQUIREMENTS**

- ☐ Direct reading dosimeter
- ☐ Wrist dosimeter
- ☐ Ring dosimeter
- ☐ Other _____

** *TLD required for all radiation work*

(15) PROTECTIVE EQUIPMENT

WHOLE BODY	BREATHING REQUIREMENTS	HEAD
☐ None	☐ Half face respirator	☐ Safety glasses
☐ Cloth coveralls	☐ Full face respirator	☐ Goggles
☐ Disposable coveralls	☐ Airline respirator	☐ Face shield
☐ Lab coat	☐ Airline hood	☐ Cap
☐ Tape openings	☐ Combination canister	☐ Hood
☐ Other _____	☐ SCBA	☐ Hard hat
	☐ Other _____	

HANDS (GLOVES)	SHIELDING	FEET AND LEGS
☐ Cotton	☐ Rubber Mat	☐ Latex shoe covers
☐ Rubberized	☐ Aluminum	☐ Disposable shoe covers
☐ Surgical	☐ Plywood	☐ Safety shoes
☐ Gauntlet	☐ Other _____	☐ Safety boots
☐ Other _____		☐ Other _____

(16) SPECIAL HEALTH PHYSICS INSTRUCTIONS AND REQUIREMENTS

ERMT SIGNATURE: DATE: TIME ISSUED:

SECTION III: *APPROVAL SIGNATURES (as required)*

NO.	DISTRIBUTION OF COPIES
1	Posting
2	ERM Supervisor
3	Health Physics

SECTION IV: *TO BE COMPLETED BY EMPLOYES* ***

(17) NAME(S) OF EMPLOYE(S) (SIGNATURE)	(18) BADGE NUMBER	(19) RESPIRATOR FIT TEST	(20) RADIATION WORKER TRAINING
1.		☐ YES ☐ NO	☐ YES ☐ NO
2.		☐ YES ☐ NO	☐ YES ☐ NO
3.		☐ YES ☐ NO	☐ YES ☐ NO
4.		☐ YES ☐ NO	☐ YES ☐ NO
5.		☐ YES ☐ NO	☐ YES ☐ NO
6.		☐ YES ☐ NO	☐ YES ☐ NO

*** *Signature indicates employe has read this RWP.*

FMPC-ES&H-1372 (REV. 5/18/87)

FIGURE 5-1

7

5.6 AIR MONITORING

An air sampling program will commence with any operations which have the potential for radionuclides to become airborne and will continue until all related site work is completed. Continuous high volume samplers are in operation at each FMPC boundary fence. Filters are changed weekly to prevent dust loading and a reduction of air flow through the filters. These monitors will be used to assess releases due to remedial investigation activities and normal operations at the FMPC. Portable breathing-zone air samplers will be worn by at least one member of each field team during all operations involving airborne radionuclides. Those air samples will collect particulates from the air that are representative of the air breathed by the team member. Normally, less than six breathing-zone air samplers will be in use at any given time. The length of time that each air sampler is in use will be closely monitored and documented to determine the time-weighted exposures for employees. At the termination of each operation, the air filter will be analyzed for the radionuclides encountered. For uranium, the samples will be analyzed fluorimetrically as soon as possible, to avoid prolonged exposure to unsafe concentrations.

All air samplers and radiation detection instrumentation will be calibrated at least every six months. Prior to each use of a sampler or instrument, a secondary calibration will be performed, using rotometers for air samplers, check sources for instruments, or the like. The secondary calibration ensures that the sampler or instrument is working. Records are maintained for all primary calibrations (six month calibrations). Exposures to airborne radioactive materials will be determined by the procedure presented in Attachment C to demonstrate compliance with DOE Order 5480.1.A, as well as and to satisfy ASI's commitment to an effective ALARA program for controlling radiation exposures.

The SHSO will review all existing data in order to determine the current chemical and radiological status of the area prior to issuance of an RCWP. All areas previously unsurveyed or with inadequate contaminant data will have RCWP requirements assigned at the discretion of the SHSO. Based upon the available information, the SHSO will estimate the potential radiation and chemical exposure. Appropriate protective gear and monitoring instrumentation will be recommended and required by the SHSO. In addition, the SHSO or a designated representative will provide the orientation and explanation to workers concerning the use of protective equipment and special work restrictions.

Only after the above requirements have been met will an RCWP be issued. The RCWP will contain details of all required protection procedures. The personnel listed on the RCWP will indicate by their counter-signature that they are aware of the conditions and restrictions and that they have received the necessary orientation.

If organic chemical vapor monitoring, performed prior to specific work assignments, indicates that concentrations exceed the limits specified by the ACGIH (1986), monitoring by organic vapor analyzer (OVA) or photoionization detector (PID) will be performed. For personnel working in areas suspected of having high airborne concentrations, organic chemical vapors will be monitored in the breathing zone, using battery operated personal sampling pumps. The decision to continue monitoring will be based on the results of the breathing zone monitoring. For multiple hazardous chemicals in the breathing zone, the SHSO will consult the ACGIH (1986) guidelines, "Threshold Limit Value (TLV) for Mixtures", to determine airborne chemical exposures.

5.7 RESPIRATORY PROTECTION

Respiratory protection devices will be employed only when all reasonable efforts to minimize airborne particulates fail to

maintain airborne concentrations at an acceptable level. If respirators are used, radiological protection factors other than a value of 1.0 are acceptable only for respiratory protection programs in full compliance with U.S. NRC Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection", and ANSI Z88.2-1980, "Programs for Respiratory Protection". Only those personnel appropriately trained, fit tested and determined to be physically capable of working with respiratory protection will be permitted to use a respirator and to work in areas requiring respirators. ASI team members will follow, at a minimum, the respirator protection program used by WMCO at the FMPC. All ASI team members who work in areas that require Level C or a higher (more restrictive) level of protection will receive respiratory protection training and fit testing prior to working in those areas.

Air-purifying or air-supplied respirators will be required when airborne concentrations of radionuclides, averaged over eight hours, exceed maximum permissible concentrations for occupational exposure; when airborne concentrations of radionuclides exceed 25 percent of maximum permissible concentrations, averaged over a 40 hour week; or when organic chemical vapors exceed the TLV limits specified in ACGIH, 1986. Maximum permissible concentrations of radionuclides are listed in DOE Order 5480.1A, Attachment 11 and in 10 CFR 20. Maximum permissible concentrations for radium, thorium, and uranium are listed in Table 5-3. The need for use of air purifying respirators will be evaluated when gross alpha measurements of air sampling filters exceed 2 x 10^{-12} uCi/ml, averaged over eight hours. Respirators will also be provided to personnel upon request.

5.8 CHANGE FACILITIES

ASI team members will use the same change facilities and protective clothing used by WMCO personnel.

TABLE 5-3

MAXIMUM PERMISSIBLE RADIONUCLIDE CONCENTRATIONS IN AIR

Nuclide	Solubility[a]	Concentration (uCi/ml)
U-238	S	7E-11[b]
	I	1E-10
U-235	S	5E-10
	I	1E-10
U-234	S	6E-10
	I	1E-10
U-NATURAL	S	1E-10
	I	1E-10
Th-232	S	3E-11
	I	3E-11
Th-230	S	2E-12
	I	1E-11
Ra-226	S	7E-11
	I	4E-11
Rn-222	Gas	1E-8

[a]S = Soluble: I = insoluble
[b]7E-11 is equal to 7×10^{-11}

7

5.9 LEVELS OF PROTECTION/PROTECTIVE CLOTHING AND EQUIPMENT

PPE will be provided, based on projected needs. Such equipment may include respirators, respirator eyeglass inserts, safety glasses, ear plugs, coveralls, hard hats, rubber boots, and safety shoes. The ACGIH 1983 guidelines should be referenced for the selection of chemical protective clothing. The SHSO will select and require the use of safety equipment, based on site conditions and any changes in work conditions that may occur. The specific protective equipment and level of protection will be specified on work permits, when applicable.

Equipment to protect the body against contact with known or anticipated chemical and radiological hazards has been divided into four categories according to the degree of protection afforded (Section 5.9.1). The level of protection selected will be based primarily on:

- Type(s) and measured concentration(s) of the chemical substance(s) in the ambient atmosphere, its toxicity, and hazard; and
- Potential for measured exposure to substances in air, splashes of liquids, or other direct contact with material due to work being performed.

The level of protection necessary for each working condition will be determined by the SHSO, based on a knowledge of the process equipment in and near the work location and information on the concentration of each chemical or radiological substance to be anticipated. Existing surveys or supplemental surveys in the work area will be used to determine the level of protective clothing needed.

5.9.1 LEVELS OF PROTECTION

5.9.1.1 Level A

Level A protection will be selected when the type(s) and concentration(s) of toxic substances are known and require the

highest level of combined protection to the respiratory tract, skin and eyes. These conditions would be:

- Atmospheres which are "Immediately Dangerous to Life and Health" (IDLH). IDLH's can be found in the NIOSH/OSHA's "Pocket Guide to Chemical Hazards" and/or other references;

- Known atmospheres or potential situations that would affect the skin or eyes, or could be absorbed into the body through these surfaces;

- Potential situations where vapors may be generated or splashing may occur through site activities; and

- Oxygen deficient atmospheres with the above conditions.

PPE for Level A includes:

- Positive Pressure Self Contained Breathing Apparatus (SCBA) (MESA/NIOSH approved);

- Totally encapsulating suits (boots and gloves attached);

- Gloves:

  - Outer, chemical protective - Depending on suit construction, worn over suit gloves. May be replaced with tight fitting, chemical resistant gloves worn inside suit gloves.

  - Inner, tight fitting, chemical resistant gloves;

- Chemical protective boots - chemical protective, steel toe and shank. Depending on suit/boot construction, worn over suit/boot;

- Underwear - cotton, long john type;

- Hard hat;

- Disposal protective suit, gloves and boots (worn under or over encapsulating suit);

- Coveralls (under suit); and

- 2-way radio communications.

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5.9.1.2 Level B

Level B protection will be selected when the type(s) and concentration(s) of hazardous substances are known and require the highest degree of respiratory protection, but when a lower level of skin and eye protection is required. These conditions would be:

- Atmospheres with concentration of known substances greater than protection factors associated with full-face, air-purifying respirators with appropriate cartridges;
- Atmospheres with less than 19.5 percent oxygen;
- Type(s) and concentration(s) of vapors in air do not present a cutaneous or percutaneous hazard to the small, unprotected areas of the body;
- A determination is made that potential exposure to the body parts not protected by a fully encapsulating suit (primarily neck, ears, etc.) is highly unlikely;
- Activities performed preclude splashing of individuals;
- Total sustained vapor levels range from 5 ppm to 500 ppm above background on instruments such as OVA or HNu and do not contain high levels of toxic substances affecting skin or eyes; and
- Hazards are completely unknown.

PPE for Level B includes:

- Positive Pressure SCBA (MESA/NIOSH approved);
- Two-piece chemical resistant suit;
- Chemical resistant hood;
- Coveralls (fire resistant) under splashsuit;
- Gloves
  - Outer, chemical protective
  - Inner, tight fitting, chemical resistant;
- Boots
  - Outer (chemical protective heavy rubber throwaways)
  - Inner (chemical protective, steel toe and shank);

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- 2-way radio communications;
- Hard hat; and
- Face shield (as needed).

5.9.1.3 Level C

Level C protection will be selected when the type(s) and concentration(s) of respirable material are known, or reasonably assumed to be not greater than the protection factors associated with air purifying respirators; and exposure to the few unprotected areas of the body (i.e., neck and back of head) is unlikely to cause harm.

PPE for Level C includes:

- Air purifying respirator (MESA/NIOSH approved) with an appropriate approved cartridge; a half or full facepiece is required depending on the facial protection needed against flashing, grinding, etc.;
- Coveralls
  - Chemical resistant
  - 2-piece splash suit (as needed);
- Boots/shoes, leather or chemical-resistant, steel toe, disposable (as needed);
- Gloves (as needed)
  - Outer (chemical protective - as needed)
  - Inner (surgical type);
- 2-way radio communications (if not in restricted area); and
- Hard hat.

5.9.1.4 Level D

Level D protection is primarily a work uniform and is worn in areas where:

- Only boots are likely to become contaminated;
- There is no inhalable or dermal toxic substance; and
- No hazardous air pollutants have been measured.

Work functions must preclude splashes, immersion or potential for unexpected inhalation of any chemicals.

PPE for Level D includes:

- Coveralls;
- Gloves (as needed);
- Boots/shoes, leather or chemical resistant, steel toe boots (outer), chemical resistant (disposal as needed);
- Safety glasses-splash goggles (as needed); and
- Hard hat
  - Faceshield (as needed)
  - Escape mask (as needed).

5.10 CONTAMINATION MONITORING

All personnel leaving the FMPC controlled areas who potentially have been in contact with contaminated materials will be monitored with an appropriate detection instrument. Personnel contamination will, to the extent possible, be removed before the worker leaves the controlled area. Hand and foot counters or hand-held beta-gamma contamination monitors available through WMCO will be used to detect contamination on personnel and their clothing. The monitoring instrument must be able to reliably detect the limits as specified in ANSI Draft Standard N13.12, which for uranium are 1,000 dpm/100 cm^2 removable and 5,000 dpm/100 cm^2 total. For Th-232 the limits are 200 dpm/100 cm^2 removable and 2,000 dpm/100 cm^2 total. (For other radionuclides, see Attachment D). ASI team members will be trained in the proper use of the contamination monitors.

All potentially contaminated tools and equipment to be released from a controlled area for unconditional use will be monitored and decontaminated, if necessary, to levels as specified in ANSI Draft Standard N13.12. In all cases, a reasonable effort will be made to reduce contamination levels to as low as reasonably

achievable. Decontamination procedures are outlined in Section 5.11.

Only under the direction of WMCO will contamination removed from tools, equipment, or personnel be flushed into the Production Area drains designed to accept contaminated liquids. For vehicles potentially in contact with material having any quantities of radioactive or toxic materials, the tires (and cab interior, if potentially contaminated) will be monitored and decontaminated to meet the limits specified in Attachment D. Appropriate spot checks will be made of other potentially contaminated truck surfaces.

5.11 DECONTAMINATION

Personnel responding to hazardous substance incidents may become contaminated in a number of ways, including:

- Contacting vapors, gases, mists, or particulates in the air;
- Being splashed by materials while sampling or opening containers;
- Walking through puddles of liquids or on contaminated soil; and
- Using contaminated instruments or equipment.

Protective clothing and respirators help prevent the wearer from becoming contaminated or inhaling contaminants. Good work practices help reduce contamination on protective clothing, instruments and equipment.

Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. When removing contaminated clothing, personnel may contact contaminants on the clothing and/or inhale them. For personnel or equipment, decontamination will involve physically removing contaminants or neutralizing chemicals such that they

become innocuous. For the work area, decontamination would involve stabilization of a spill, and collection of the contaminants and stabilization materials for disposal. ASI team members will use the decontamination procedures and decontamination facilities available through WMCO at the FMPC. All decontamination activities will be directed by WMCO as well as the control and containment of all contaminated solids and liquids.

5.11.1 EFFECTIVENESS OF DECONTAMINATION

No known method exists to immediately determine how effective decontamination is in removing contaminants. Discolorations, stains, corrosive effects, and substances adhering to objects may indicate contaminants have not been removed. Observable effects, however, only indicate surface contamination and not permeation (absorption) into clothing. Also many contaminants are not easily observed.

A method for determining effectiveness of surface decontamination of removable contamination is swipe testing. Cloth or paper patches -- swipes -- are used to wipe for an estimated 100 cm^2 of contaminated surfaces to test for removable contaminants. The results are compared to the limits for removable radionuclides specified in Attachment D. In addition, alpha or beta-gamma survey meters are used to detect the combination of removable and fixed contamination of equipment, clothing or personnel.

5.11.2 DECONTAMINATION SOLUTION

PPE, sampling tools, and other equipment are usually decontaminated by scrubbing with detergent water, using a soft bristle brush, followed by rinsing with large amounts of water. While this process may not be fully effective in removing some contaminants (or in a few cases, contaminants may react with water), this method is relatively safe compared with using a chemical decontamination solution which requires that the contaminant be identified. In the latter case, a decontamination

chemical is then needed that will change the contaminant into a less harmful substance. Especially troublesome are unknown substances or mixtures from a variety of known or unknown substances. The appropriate decontamination solution must be selected in consultation with an experienced chemist.

5.11.3 ESTABLISHMENT OF PROCEDURES

Once decontamination procedures have been established, all personnel requiring decontamination must be given precise instructions (and practice, if necessary). Contamination must be frequently monitored. Personnel wearing SCBA's must leave their work area with sufficient air to walk to the decontamination area.

5.11.3.1 Decontamination During Medical Emergencies

Basic Considerations

Part of the overall planning for incident response is managing medical emergencies. The plan should provide for:

- Some response team members fully trained in first aid and Cardiopulminary Resuscitation (CPR)
- Arrangements with the nearest medical facility for transportation and treatment of injured, and for treatment of personnel suffering from exposure to chemicals;
- Consultation services with a health physicist;
- Emergency eye washes, showers, and/or wash solutions; and
- First aid kits, blankets, stretcher, and resuscitator.

In addition, the plan should have established methods for decontaminating personnel with medical problems and injuries. Decontamination may aggravate or cause more serious health effects. If prompt life-saving first aid and/or medical treatment is required, decontamination procedures should be omitted. Whenever possible, response personnel should accompany

contaminated victims to the medical facility to advise on matters involving decontamination.

Physical Injury

Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. For more serious injuries, additional assistance may be required at the site or the victim may have to be treated at a medical facility.

Life-saving care should be instituted immediately without considering decontamination. Outside garments can be removed (depending on the weather) if they do not cause delays, interfere with the treatment, or aggravate the problem. Respiratory masks and backpack assemblies must always be removed. Fully encapsulating suits or chemical resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating the inside of the ambulances and/or medical personnel. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

Heat Stress

Heat-related illnesses range from fatigue to heat stroke. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention, or they may lead to a heat stroke. Unless the victim is obviously

contaminated, decontamination should be omitted or minimized and treatment begun immediately.

Chemical Exposure

Exposure to chemicals can be divided into two categories: injuries from direct contact, such as acid burns or inhalation of toxic chemicals; and potential injury due to gross contamination on clothing or equipment.

For the contaminant inhaled, treatment can only be by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect. First aid treatment usually involves flooding the affected area with water; however, for a few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, contamination may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed.

5.11.3.2 Protection for Decontamination Workers

The level of protection worn by decontamination workers is determined by:

- Expected or visible contamination of workers;
- Type of contaminant and associated respiratory and skin hazards;
- Total vapor/gas concentrations in the work area;
- Particulates and specific inorganic or organic vapors in the work area;
- Results of swipe tests; and
- The presence (or suspected presence) of highly toxic or skin destructive materials.

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- Level A Use: Level A is not usually required in decontamination activities.

- Level B Use: In situations where site workers may be contaminated with unknowns, highly volatile liquids, or highly toxic materials, decontamination workers should wear Level B protection. Level B protection includes SCBA, hard hat with face shield, chemical resistant gloves, and protective covering. The clothing suggested is chemical resistant overalls, jacket, and a rubber apron. The rubber apron protects the SCBA harness assembly and regulator from becoming contaminated.

- Level C Use: Level C includes a full face, canister-type, air-purifying respirator, hard hat with face shield (if splash is a problem), chemical resistant boots and gloves, and protective clothing. The body covering recommended is chemical resistant overalls with an apron, or chemical resistant coveralls and jacket. A face shield is recommended to protect against splashes because respirators alone may not provide this protection. The respirator should have a canister approved for filtering any specific known contaminants such as ammonia, organic vapors, acid gases, and particulates.

5.11.3.3 Decontamination of Equipment

Insofar as possible, measures should be taken to prevent contamination of sampling and monitoring equipment. Sampling devices become contaminated, but monitoring instruments, unless they are splashed, usually do not. Once contaminated, instruments are difficult to clean without damaging them. Any delicate instrument which cannot be decontaminated easily should be protected while it is being used. It should be bagged, and the bag should be taped and secured around the instrument. Openings are made in the bag for sample intake.

5.12 ASBESTOS MONITORING AND PROTECTION

When it is suspected or known that asbestos is present, an asbestos monitoring, protection, and record keeping program will be initiated as per regulations cited in 29 CFR 1929.58. The eight-hour time-weighted average airborne concentrations of asbestos fibers, to which employees may be exposed without respiratory

protection, will not exceed 0.2 fibers, longer than 5 micrometers, per cubic centimeter or milliliter of air, as determined by the membrane filter method at 400-450X magnification (4mm objective) with phase contrast illumination. Should this regulation become more restrictive during the duration of remedial investigation activities at the FMPC, the more restrictive regulation will be adopted.

5.13 NOISE

Noise suppression devices will be used where appropriate and the use of hearing protective devices will be mandatory for levels above the TLV of 85 db A-scale for an 8-hour day, and encouraged for levels below the TLV. All other guidance in "Threshold Limit Values and Biological Exposure Indexes for 1986-87," ACGIH, related to noise exposure will be followed.

5.14 SAMPLING METHODOLOGY

Numerous samples will be collected by the ASI team to characterize the waste streams from the FMPC Production Area. Protecting the health and safety of ASI team members for each of the different sampling operations will require special protective measures to be established on site by the SHSO. General guidance and precautions are presented below by the media to be sampled:

5.14.1 SOLIDS

Surface Soils

As most of the surface soils in the Production Area are covered with gravel, removal of the gravel can generate dust which can be contaminated. Respiratory protection for particulates is advised.

Subsurface Soils

Sampling may generate dust if soil is dry. Respiratory protection for particulates may be advised.

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Surface Sediments

Sampling may generate dust if sediment is dry. Respiratory protection for particulates may be advised.

Airborne Particulates From Production Operations

Transfer operations such as the dumping of green salt from the transport cases generates airborne particulates. In all such areas, which are usually labeled "airborne radioactive material" or "respirator required", respiratory protection for particulates is required.

Dry Powders

Dry powders can be asbestos, dust from dust collectors, process chemicals such as magnesium fluoride, floor sweepings, or the like. The powders may or may not be contained. Respiratory protection for particulates is required. Level C protective clothing, including coveralls and gloves, is advised for sampling radionuclides or hazardous chemicals where the hazards are known. Level B protection is advised where contaminants are not known, become easily airborne, have a high specific activity, or are highly toxic.

Metal Shavings and Turnings

If shavings or turnings are very fine and closely packed, a fire hazard may exist. Fire fighting equipment should be made available before sampling. Respiratory protection is advised.

Removable Contamination

In areas where removable contamination exceeds the ANSI standards presented in Attachment D, the use of gloves, shoe covers, and coveralls is advised. If the area is dusty, respiratory protection for particulates and Level C protective clothing may be advised.

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Wet or Damp Powders

Protective clothing, including gloves, is advised. If materials are volatile, have a high specific activity, or are highly toxic, Level C protection is advised.

5.14.2 LIQUIDS - SURFACE WATER, LIQUID PROCESS STREAMS, SUMP WATER

Gloves and laboratory coats or coveralls usually provide adequate protection unless the liquids are under pressure, as in piping; contain hazardous materials; or have a high specific activity. The latter conditions may require Level C protective clothing or greater protection, especially if the liquids could be sprayed or easily spilled. Oils and organic solvents are of concern because they can facilitate the transport of radionuclides or toxic materials into and through the skin and can make decontamination difficult.

5.14.3 GAS AND VAPORS

Volatile Chemicals

Vapor and gas sampling should be conducted prior to work in the area. Level C respiratory protection, using organic cartridges, may be advised.

Radon and Thoron

In areas where uranium residues, e.g., uranium ores, uranium tailings, or uranium process byproducts are present, radon decay products can be present in high concentrations. Those high concentrations usually occur where the radon is confined, e.g., inside buildings, storage tanks, or silos. The same conditions apply for thorium, which produces thoron gas. Radon and/or thoron sampling must be conducted prior to entry into those structures. Respiratory protection for particulates may be advised.

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6.0 ENVIRONMENTAL PROTECTION PROGRAM

The environmental protection program is designed to monitor effluents released to the environment from WMCO's operations and the ASI study team's activities at the FMPC. Gamma monitoring and the sampling of airborne particulates, radon, ground and surface water, soil, sediment and biota will be provided by WMCO's routine Environmental Monitoring Program. Data from this sampling and monitoring should provide the documentation of all discharges of radioactive and chemical contaminants to the surrounding area for compliance with DOE Order 5480.1A "Environmental Protection Safety and Health Protection Program for DOE Operations."

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7.0 HAZARD CONTROL AND MONITORING

7.1 GENERAL PRECAUTIONS

Personnel working at sites involving chemical and radiological substances may encounter conditions that are unsafe or potentially unsafe. In addition to the danger caused by the physical, chemical, and toxicological properties of the material(s) present, other types of hazards (e.g, electricity, water, heavy equipment, falling objects, loss of balance, tripping) can have an adverse effect on the health and safety of personnel. This section describes the requirements that will be implemented to minimize these potential, adverse effects.

7.2 BUDDY SYSTEM

For all on-site activities, the buddy system will be implemented to ensure safety of personnel. Workers will be required to perform all remedial investigation activities with another individual. At no time will workers be permitted to enter the work area alone.

7.3 EQUIPMENT SAFETY

Life lines and safety belts will be constructed and tested in accordance with ANSI AN10.14 for use at all times by personnel engaged in securing or shifting thrustouts, inspecting or working on overhead machines, supporting scaffolds or other high rigging. For scaffolding, life lines and safety belts will be provided for and used by all workmen exposed to the hazard of falling more than 10 feet to the surface below. All open side floors or platforms greater than four feet shall also require fall protection.

The use of ladders shall be in accordance with OSHA 1910.25 and 1910.26. Use of scaffolding shall be in accordance with OSHA 1910.28.

Equipment shall be subject to inspection by the SHSO prior to being brought on site to ensure compliance with DOE and OSHA requirements. Any equipment failing to meet these requirements will not be permitted on site.

7.4 STORAGE OF TOOLS AND EQUIPMENT

ASI or WMCO will provide any facilities which may be required to store tools and equipment in order to maintain the site in a clean and orderly manner as would be indicated by good housekeeping standards. Contaminated and clean equipment tools will be kept in segregated storage areas. The location of materials, tools, or equipment within the buildings in the Production Area at the FMPC will be subject to the approval of the WMCO Materials Project Engineer. No materials, tools, or equipment will be stored in such a manner as to interfere with the flow of traffic and production activities, or that could possibly expose buildings, pipe lines, or process equipment to damage in the event of fire.

7.5 FIRE AND EXPLOSION PREVENTION

WMCO maintains a fire and explosion prevention and control effort appropriate for the needs at the FMPC. Training will be provided to ASI study team members handling reactive materials. Fire extinguishers are provided and maintained and study team members will be instructed in their use. Good housekeeping practices and proper storage of flammable and combustible materials is required. All Class I and II flammable liquids, e.g., motor fuels, paint thinners, and solvents, must be dispensed from approved and properly labeled safety containers.

7.6 SAFETY PRECAUTIONS NEAR UTILITY LINES

While in use, the minimum distance of a crane or drilling rig to a power line will be:

- 10 feet from a 50 KV line;
- 20 feet from a 50 KV to 345 KV line; and
- 34 feet from a 345 KV to 750 KV line.

In transit, with the boom on a derrick lowered, the closest approach to a power line will be:

- 4 feet to a 50 KV line;
- 10 feet to a 50 KV to 345 KV line; and
- 16 feet to a 345 KV to 750 KV line.

Safety personnel from WMCO will be consulted if drilling near buried lines is necessary. Utility clearance and written approval from WMCO Safety Personnel is required prior to subsurface drilling.

7.7 SAFETY PRECAUTIONS WHEN DRILLING

All drillers will wear safety glasses, hard hats, and steel-toed shoes and respiratory protection in accordance with the HSP.

7.8 SANITATION

Toilet facilities are provided in the Production Area in accordance with 29 CFR 1926.51. Potable water for drinking and for washing prior to eating is provided for all personnel in the Production Area.

7.9 TRANSPORT OF CONTAMINATED MATERIAL

ASI and its team members will comply with the applicable state or Federal regulations regarding the transportation of contaminated material. A site-specific determination of the levels of toxicity and radioactivity associated with the contaminated material will be made. If the sum of all radionuclide concentrations do not exceed 2,000 pCi/g, the material does not meet the Department of Transportation's definition of "Radioactive Material", and can be transported accordingly.

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8.0 CONTINGENCY PLAN

The emergency procedures must include provisions for medical transport, treatment and contamination surveys (see the WMCO Emergency Plan). Coordination with off-site agencies will be necessary and the contingency plan should include appropriate training and drills. All emergencies will be reported immediately to the Communication Center (513) 738-6511.

In the event that an accident or some other incident occurs during the course of this project, the SHSO (or other team member, if the SHSO is not available) will execute the following notification and reporting sequence:

1. Call Mr. Steve Wentzel, WMCO Emergency Preparedness (513) 738-6802.
2. Call Mr. Richard Haaker, ASI Corporate Health and Safety Manager, (513) 738-3100 or (505) 883-0959.
3. Call Mr. Richard Wilde, ASI Project Director (513) 738-3100.

Documentation of an accident/incident will include the following information:

- Name, organization, telephone number, and location of contractor;
- Name and title of the person(s) reporting;
- Date and time of accident/incident;
- Location of accident/incident, building number, facility name;
- Summary of accident/incident giving pertinent details including type of operation ongoing at time of accident;
- Suspected/known cause of accident/incident;
- Casualties (fatalities, disabling injuries);
- Details of any existing chemical hazard or contamination;

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- Estimated property damage, if applicable;
- Nature of damage;
- Action taken by contractor to ensure safety and security;
- Other damage or injuries sustained (public or private); and
- Effect on contract schedule.

Information will not be released to parties other than those listed above without approval from the ASI Project Director.

OSHA Form No. 101/OMB 44R1453, "Supplementary Record of Occupational Injuries and Illnesses", will be completed by the SHSO or other team member as appropriate, and submitted to the ASI and WMCO Corporate Health and Safety Managers.

VOLUME II REFERENCES

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ATTACHMENT A ENVIRONMENTAL, SAFETY, AND HEALTH REGULATIONS

TABLE A
ENVIRONMENTAL, SAFETY, AND HEALTH REGULATIONS

Topic	Requirement Source/Identification
1. Appraisal Program	
. Environmental, Safety and Health Protection	DOE 5482.4
2. Emergency Preparedness	
. Operations	DOE 5500.2
. Public Information	DOE 5500.4
3. Environmental	
. Implementing National Policy Act	DOE[a] 5440.1B
. Standards	DOE 5480.1A (Attachment 1) 40 CFR 264, 265, and 300
. Supporting QA	DOE 5480.1A (5400.6A)
. Environmental Control	DOE 5480.1A
. Environmental Monitoring and Reporting	DOE 5480.1A
. Asbestos Emissions	40 CFR 61[b]
4. Fire Protection	
. Standards	DOE 5480.1A
. Protection	DOE 5480.1A Chg. 1
. Related Standards	Factor Mutual Approval Guide National Fire Codes (NFPA)[c] WASH-1245-1, DOE/EV-0043 Handbook of Fire Protection (NFPA)

(a) Department of Energy
(b) U.S. Code of Federal Regulations
(c) National Fire Protection Association

TABLE A (Continued)
ENVIRONMENTAL, SAFETY, AND HEALTH REGULATIONS

Topic	Requirement Source/Identification
5. Hazardous Waste Facility	
. Standards	40 CFR 264, 265, 300
6. Industrial Hygiene	
. Standards	DOE 5480.1A
. Threshold Limit Values (e.g., asbestos)	ACGIH[d]
. Respiratory Protection	ANSI[e] Z88.2-1980
. Asbestos	29 CFR 1910

(a) Department of Energy
(b) U.S. Code of Federal Regulations
(c) National Fire Protection Association
(d) American Conference of Government Industrial Hygienists
(e) American National Standards Institute

7. Industrial Safety	
. Standards	DOE 5480.1A
. Occupational Safety	DOE 5483.1
. Related Standards	ANSI
	Crane Manufacturers Assoc. of America, Inc. Spec. 70
8. Occupational Medicine	
. Standards	DOE 5480.1A
. Program	DOE 5480.1A Chg. 4
9. Occupational Medicine	
. "Inspections, Citations, and Proposed Penalties"	29 CFR 1903

(d) American Conference of Governmental Industrial Hygienists
(e) American National Standards Institute

TABLE A (Continued)
ENVIRONMENTAL, SAFETY, AND HEALTH REGULATIONS

Topic	Requirement Source/Identification
. "Recording and Reporting of Occupational Injuries and Illnesses"	29 CFR 1904
. "Occupational Safety and Health Standards"	29 CFR 1910
. "Safety and Health Regulations for Construction"	29 CFR 1926
. "Federal Employee Safety and Health Programs"	29 CFR 1960
. "Coverage of Employees under the Occupational Safety and Health Act"	29 CFR 1975
. "Regulations on Discrimination Against Employees Exercising Rights under the Occupational Safety and Health Act"	29 CFR 1977
10. Public Health & Sanitation	
. Standards	DOE 5480.1
11. Radiation Protection	
. Standards	DOE 5480.4 DOE 5480.1A 10 CFR 20
. Radiation Control (ALARA)	DOE 5480.1A
. Supporting QA	DOE 5480.1A
. Respiratory Protection Equipment Use	ANSI Z88.2-1980
. Posting of Radiation Areas	10 CFR 20

TABLE A (Continued)
ENVIRONMENTAL, SAFETY, AND HEALTH REGULATIONS

Topic	Requirement Source/Identification
2. Radioactive Shipments	
. Standards	DOE 5480.1A
. Program	DOE 5480.1A Chg. 3
. Requirements, labeling, etc.	49 CFR 100-189 10 CFR 71
3. Records and Reports	
. Program Elements	DOE 5480.1A
. Shipping Records	DOE 5480.1A Chg. 3
. Container QA Records	DOE 5480.1A Chg. 3
. Records and Document Requirements	DOE 5480.1A
. Medical Records	DOE 5480.1A
. Industrial Hygiene Records	DOE 5480.1A Chg. 4
. Appraisal and Review Records	DOE 5481.1A
. Safety and Health Programs Records	DOE 5483.1
. Occurrence and Accident Investigations and Reporting Unusual Occurrences	DOE 5484.1 DOE 5484.2 DOE 5000.3
. Records Disposition	DOE 1324.1
. Records Retention Schedule	DOE 1324.2
. DOE Forms	DOE 1322.1
. Information Reporting	DOE 5484.1A

TABLE A (Continued)
ENVIRONMENTAL, SAFETY, AND HEALTH REGULATIONS

Topic	Requirement Source/Identification
14. Safety Reviews and Appraisals	
. Analysis and Review System	DOE 5481.1A
. Appraisal Program	DOE 5482.1A
. Basic Requirements	DOE 5480.1A
. Unannounced Compliance Inspections	DOE 5483.1
15. Training	
. Program Elements	DOE 5480.1A
. Radiation Protection	DOE 5480.1A Chg. 2
. Employee Protection	DOE 5483.1
. Emergency Preparedness	DOE 5500.2 DOE 5500.4

A team members shall comply with the radiation exposure standards listed in Tables 7-1 and 7-2. In all cases, exposures to workers and members of the public shall be maintained as low as reasonably achievable (ALARA).

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ATTACHMENT B URANIUM IN URINE BIOASSAY PROCEDURE

Uranium in Urine Bioassay Procedure

Uranium in urine bioassays will be performed if there is any reason to suspect an inhalation exposure to soluble uranium compounds of 1.0E-9 uCi-hr/ml in a period of one workweek, accidental ingestion of any amount of soluble uranium, or inhalation exposure to uranium ore dust or uranium ore residues exceeding 1.02E-8 uCi-hr/ml in a period of one (1) calendar quarter.

The urinalysis procedure follows:

a) Urine samples will be collected from all employees prior to initial work assignments within the restricted area to determine baseline concentrations.

b) Urinalysis will be performed with sufficient frequency to detect exposure to soluble uranium before elimination of uranium from the body renders the exposure undetectable. Therefore, urine specimens shall be collected every 30 days from those employees whose work assignments daily expose them to airborne uranium compounds. The samples will be submitted 48 to 96 hours after the most recent occupancy in the work area. In addition, any employee assigned to perform work in the areas containing airborne uranium compounds will be required to submit a urine sample 48 to 96 hours after the most recent occupancy in those areas. In the event that this time period falls on the employee's off days, the employee will be given a sealed sample container so that he can give the sample during his time-off.

1. The employee will be given the following items:

   i. Sealed container labeled with the employee's first initial of his last name and the last four digits of his social security number with an equivalent labeling system.

   ii. A card showing the time frame in which the sample must be given and a space for the employee to write the date and time the sample was given.

   iii. A plastic bag for the container and card. The employee will be instructed to place the container and card into the plastic bag after giving the urine sample and then to place the sample in a refrigerator for sample preservation.

2. The employee will deliver the sample to the ASI site Health and Safety Officer at the beginning of his first shift.

3. If the employee was unable to obtain the sample during the 48 to 96 hour time frame, he will be required to give the sample prior to entering the restricted area.

c) Urine specimens shall be collected prior to the employee entering the FMPC restricted area; the hands of the employee shall be washed prior to voiding and disposal collection containers shall be used. The collection containers should either be sterilized or sealed as received from the distributor to preclude contamination of the FMPC site.

d) All lab analyses will be performed in a laboratory free of uranium contamination, using containers and equipment free of such contamination. At least two specimens obtained from persons with no known lung or systemic uranium burden will be analyzed with each batch of specimens collected from FMPC employees. If one such batch of specimen indicates a concentration higher than 12 ug/l uranium, then an investigation shall be undertaken by the laboratory to determine the cause of the contamination. The other specimen will be spiked to a known concentration of approximately 15 ug/l or 30 ug/l. If the results for the quality control specimens are in error by + or - 30% or more, repeat collection and analyses for the entire batch will be performed.

Three splits from one sample are satisfactory if two specimens cannot be obtained.

e) Samples shall be preserved by refrigeration only.

f) Bioassay results will be reviewed by the ASI Site Health and Safety Officer, and appropriate action will be undertaken if the results exceed those levels specified in Table B-1.

1. Measurement sensitivity will be 5 ug/l of uranium or less.

2. Any positive urinalysis results are an indication that the kidney may have been exposed to soluble uranium.

3. Corrective action undertaken in accordance with Table B-1 will be documented on the employees' Urine Sampling Data Sheet (Figure B-1 or the equivalent).

TABLE B-1
CORRECTIVE ACTIONS BASED ON URINARY URANIUM RESULTS

Urinary Uranium Concentrations	Interpretation	Actions
Less than 15 ug/l	Uranium confinement and air sampling capabilities are adequate.	1. None
15 to 25 ug/l	Uranium confinement and perhaps air sampling capabilities do not provide an adequate margin of safety.	1. Confirm results (repeat urinalysis. 2. Determine why air samples were not representative and did not warn of excessive concentrations of airborne uranium. Make corrections. 3. Identify the cause of airborne uranium and initiate additional control measures. 4. Determine whether other workers could have been exposed and perform bioassay measurements for them. 5. Consider work assignment limitations to ensure the worker does not exceed a urinary uranium concentration of 30 ug/l.

TABLE B-1 (Continued)
CORRECTIVE ACTIONS BASED ON URINARY URANIUM RESULTS

Urinary Uranium Concentrations	Interpretation	Actions
Greater than 25 ug/l.	Uranium confinement and perhaps air sampling capabilities are not acceptable.[a]	1. Take the actions given above for 15 to 25 ug/l. 2. Continue operations only if it is virtually certain that no other worker will exceed a urinary uranium concentration of 25 ug/l. 3. Establish work restrictions for affected employees.
Greater than 25 ug/l for four consecutive specimens or greater than 130 ug/l for any specimen.	Possibility of kidney damage to worker.	1. Take the actions given above. 2. Have additional urine specimen tested for albuminuria.

[a]Unless the result was anticipated and caused by conditions already corrected

FIGURE B-1
URANIUM IN URINE SAMPLING DATA SHEET

Subject's Name_____ SSN_____

Collection Date and Time_____

Sample Volume_____

Date of Analysis_____

Net Urinary Uranium Concentration_____

Interpretation of Results_____

_____

_____

_____

_____

Action (If Necessary)_____

_____

_____

Urine Bioassay Procedures Other Than Uranium

When members of the ASI team are required to work with any of the soluble radionuclides listed in TABLE B-2 where their time-weighted exposure approaches or exceeds 25% of the maximum time-weighted exposure for the radionuclides in TABLE B-2, the following urine bioassay procedures should be used:

Note: Minimum acceptable volume for a 24-hour sample shall be 700 ml. Samples not meeting this requirement shall not be accepted and an immediate 24-hour resample shall be initiated. The original sample submitted shall not constitute a part of the resample volume.

(a) Samples shall not be collected on site.

(b) Urinalysis sampling kits will be provided to the worker with instructions to provide a complete 24-hour voiding, preferably over a weekend and at least 24 hours after departing the site. Sample kits will be issued and returned to the Site Health and Safety Officer or designated individual.

(c) The ASI Site Health and Safety Officer will review instructions contained in the kit with each employee when it is issued.

(d) Non-routine or "spot" samples will be requested when there is reason to suspect that an employee may have sustained an internal deposition of radioactive material. "Spot" samples should be obtained overnight and cover the longest feasible period of time.

(e) The termination or final sample should be collected at least 48 hours but not more than 96 hours after leaving the site.

(f) As directed by the Site Health and Safety Officer, urine samples may be collected for bioassay on a more frequent schedule.

Results of the bioassay program will be used to evaluate the internal dose due to the inhalation or ingestion of radionuclides. The following action levels have been identified for the purpose of carrying out supplemental evaluation. The radionuclide concentrations for each action level are specified by radionuclide in TABLE B-2.

(a) Re-sample Action Level - If the result of a routinely scheduled urine sample equals or exceeds this level, a 24 hour re-sample will be collected during the following weekend.

(b) Work Evaluation Action Level - If the result of a routinely scheduled urine sample equals or exceeds this level, a urine sample will be collected during the immediately following 16 off duty hours.

(c) Work Restriction Action Level - If the result of a routinely scheduled urine sample equals or exceeds this level, the worker's activities will be restricted immediately so as to avoid further uptake of radioactivity. A spot sample will be collected during the immediately following 16 off-duty hours, and 24 hour re-samples will be collected over each successive three weekends. Based on the results of these 4 samples, further samples may be requested, and the need for whole body counting will be evaluated by the ASI SHSO.

TABLE B-2
ACTION LEVELS FOR RADIONUCLIDES
IN URINE ASSUMING MONTHLY SAMPLING[1]

RADIONUCLIDE	ACTION LEVELS		
	(a) Re-sample	(b) Work Evaluation	(c) Work Restriction
Isotopic Thorium	0.05 pCi/l	0.1 pCi/l	0.2 pCi/l
Ra-226	0.1 pCi/l	0.5 pCi/l	1.0 pCi/l
Ra-228	0.1 pCi/l	0.5 pCi/l	1.0 pCi/l
Sr-90	18 pCi/l	36 pCi/l	72 pCi/l
Pu-239	0.05 pCi/l	0.1 pCi/l	0.2 pCi/l
Pu-240	0.05 pCi/l	0.1 pCi/l	0.2 pCi/l
Tc-99[2]			

[1] ion levels may vary for different sampling frequencies.

[2] Action levels to be identified.

ATTACHMENT C TIME - WEIGHTED RADIATION EXPOSURE DETERMINATIONS

Time-weighted radiation exposures are determined by:

a. Measure the concentration of airborne radionuclides using the breathing-zone air sampler in each work area. Express the concentration in uCi/ml. If radon or thoron daughters are greater than 10% of their respective maximum permissible concentrations, their concentrations may be measured using low-volume air samplers and an alpha scintillator. Express the concentration in working levels.

b. Determine the length of time the sampler was actually worn and turned on.

c. If the employee is authorized to wear a respirator and the work area has been designated as an Airborne Radioactivity Area (respirator required area), then the appropriate respirator protection factor can be applied. Protection factors for respirators are listed in Table 7C-1. To apply the protection factor use the following formula:

$$\text{Concentration inhaled} = \frac{\text{Ambient Airborne Concentration}}{\text{Protection Factor}}$$

d. For each radionuclide multiply the concentration inhaled, as modified by the respirator protection factor if applicable, by the number of hours the sampler was actually worn. That value is the time weighted exposure. Sum the time-weighted exposures for each work day and then for the entire work week.

e. Divide the weekly time-weighted exposure by the weekly time-weighted exposure limit for that radionuclide (Table 7C-2) and multiply by 100 to obtain the percentage of the time-weighted exposure limit.

f. If the percentage of the weekly time-weighted exposure limit is less than 25% then no action needs to be taken. If the percentage is greater than 25% but less than 100% of the weekly time-weighted exposure limit, then the conditions of the employee's exposure should be evaluated to determine if the exposure is as low as reasonably achievable. If the percentage is greater than 100% of the weekly time-weighted exposure limit, then the conditions of the employee's exposure should be evaluated and specific action taken to assure against recurrence. Records of such occurrences, the evaluations, and the corrective actions undertaken shall be documented. If the radionuclide in question is soluble uranium and the percentage of the <u>weekly</u> time-weighted

exposure limit is greater than 100%, then a calculated overexposure has occurred. For other radionuclides if the percentage of the quarterly time-weighted exposure limit is greater than 100%, then a report need to be submitted under DOE Order 5000.3 "Unusual Occurrence Reporting System" and DOE Order 5484.1A "Environmental Protection, Safety and Health Protection Information Reporting Requirements."

g. For each radionuclide, a time-weighted exposure for the month shall be calculated. Sum the weekly time-weighted exposures. Divide the monthly time-weighted exposure by the monthly time-weighted exposure limit (Table 7C-2) and multiply by 100 to obtain the percentage of time-weighted exposure limit. If the percentage exceeds 100% then the conditions of exposure should be evaluated and specific action undertaken so as to prevent a quarterly overexposure.

TABLE C-1
PROTECTION FACTORS FOR RESPIRATORS[a]

Description[b]	Modes[c]	Protection factors[d]		Tested and certified equipment - National Institute for Occupational Safety and Health/Mine Safety and Health Administration tests for permissibility.
		Particulates only	Particulates, gases and vapors[e]	
I. Air-purifying respirators[f]				
Facepiece, half-mask[g]	NP	10	.....	30 CFR Part 11, Subpart K.
Facepiece, full	NP	50	.....	
Facepiece, half-mask, full, or hood	PP	1,000	.....	
II. Atmosphere-supplying respirators				
1. Air-line respirator:				
Facepiece, half-mask	CF	.....	1,000	
Facepiece, half-mask	D	.....	5	
Facepiece, full	CF	.....	2,000	
Facepiece, full	D	.....	5	30 CFR Part 11, Subpart J.
Facepiece, full	PD	.....	2,000	
Hood	CF	.....	([h])	
Suit	CF	.....	([j])	([j])
2. Self-contained breathing apparatus (SCBA):				
Facepiece, full	D	.....	50	
Facepiece, full	PD	.....	[k]10,000	30 CFR Part 11, Subpart H.
Facepiece, full	RD	.....	50	
Facepiece, full	RP	.....	[l]5,000	
III. Combination respirator: Any combination of air-purifying and atmosphere-supplying respirators.	.....	.....	([m])	30 CFR Part 11, § 11/63(b).

[a] For use in the selection of respiratory protective devices to be used only where the contaminants have been identified and the concentrations (or possible concentrations) are known.

[b] Only for shaven faces and where nothing interferes with the seal of tightfitting facepieces against the skin. (Hoods and suits are excepted.)

TABLE C-1 (Continued)

c The mode symbols are defined as follows: CF - continuous flow; D - demand; NP - negative pressure (i.e., negative phase during inhalation); PD - pressure demand (i.e., always positive pressure); PP - positive pressure; RD - demand, recirculating (closed circuit); RP- positive pressure, recirculating (closed circuit).

d-1 The protection factor is a measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of airborne radioactive material outside the respiratory protective equipment to that inside the equipment (usually inside the facepiece) under conditions of use. It is applied to the ambient airborne concentration to establish the concentrations inhaled by the wearer according to the following formula:

Concentration inhaled = (Ambient airborne concentration)/(Protection factor)

d-2 The protection factors apply:

(a) Only for trained individuals wearing properly fitted respirators used and maintained under supervision in a well-planned respiratory protective program.

(b) For air-purifying respirators only when high efficiency particulate filters (above 99.97% removal efficiency by thermally generated 0.3 uM dioctyl phthalate (DOP) test) are used in atmospheres not deficient in oxygen and not containing radioactive gas or vapor respiratory hazards.

(c) No allowance is to be made for the use of sorbents against radioactive gasses or vapors.

(d) For atmosphere-supplying respirators only when supplied with adequate respirable air. Respirable air shall be provided of the quality and quantity required in accordance with NIOSH/MSHA certification (described in 30 CFR Part 11). Oxygen and air shall not be used in the same apparatus.

e Excluding radioactive contaminants that present an absorption or submersion hazard. For tritium oxide, approximately one half of the intake occurs by absorption through the skin so that an overall protection factor of less than 2 is appropriate when atmosphere-supplying respirators are used to protect against tritium oxide. If the protection factor for a device is 5, the effective protection factor for tritium is about 1.4; for devices with protection factors of 10 the effective factor for tritium oxide is about 1.7; and for devices with protection factors of 100 or more the effective factor for tritium oxide is about 1.9. Air-purifying respirators are not suitable for protection against tritium oxide. See also footnote i concerning supplied-air suits.

f Canisters and cartridges shall not be used beyond service-life limitations.

g Under-chin type only. This type of respirator is not satisfactory for use where it might be possible (e.g., if an accident or emergency were to occur) for the ambient airborne concentration to reach instantaneous values greater than 10 times the pertinent values in Table 1, Column 1 of Appendix B of this part. This type of respirator is not suitable for protection against plutonium or other high-toxicity materials. The mask shall be tested for fit with irritant smoke, prior to use, each time it is donned.

h Equipment shall be operated in a manner that ensures that proper air flow-rates are maintained. A protection factor of no more than 1000 may be used for tested-and-certified supplied-air hoods when a minimum air flow of 6 cubic feet per minute is maintained and calibrated airline pressure gauges or flow measuring devices are used. A protection factor of up to 2000 may be used for tested and certified hoods only when the air flow is maintained at the manufacturer's recommended maximum rate for the equipment, this rate is greater than 6 cubic feet per minute, and calibrated airline pressure gauges or flow measuring devices are used.

TABLE C-1 (Continued)

The design of the supplied-air hood or helmet (with a minimum flow of 6 cfm of air) may determine its overall efficiency and the protection it provides. For example, some hoods aspirate contaminated air into the breathing zone when the wearer works with hands-over-head. This aspiration may be overcome if a short cape-like extension to the hood is worn under a coat or overalls. Other limitations specified by the approval agency shall be considered before using a hood in certain types of atmospheres, such as the design and its permeability to the contaminant under conditions of use.

j No approval schedules are currently available for this equipment. Equipment shall be evaluated by testing or on the basis of reliable test information.

k This type of respirator may provide greater protection and be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure such as skin absorption shall be taken into account in these circumstances.

l Quantitative fit testing shall be performed on each individual and no more than 0.02% leakage is allowed with this type of apparatus. Perceptible outward leakage of gas from this or any positive pressure self-contained breathing apparatus is unacceptable because service life will be reduced substantially. Special training in the use of this type of apparatus shall be provided to the wearer (see footnote k).

m Protection factor for type and mode of operation as listed above.

Note 1: Protection factors for respirators, as may be approved by the U.S. Bureau of Mines/National Institute for Occupational Safety and Health (NIOSH) according to applicable approvals for respirators for type and mode of use to protect against airborne radionuclides, may be used to the extent that they do not exceed the protection factors listed in this table The protection factors listed in this table may not be appropriate to circumstances where chemical or other respiratory hazards exist in addition to radiological hazards. The selection and use of respirators for these circumstances should take into account applicable approvals of the U.S. Bureau of Mines/NIOSH.

Note 2: Radioactive contaminants for which the concentration values in Table 1, column 1, Appendix B of this part are based on internal dose due to inhalation may, in addition, present external exposure hazards at higher concentrations. Under these circumstances, limitations on occupancy may have to be governed by external dose limits.

TABLE C-2

TIME-WEIGHTED EXPOSURE LIMITS

	Weekly	Monthly	Quarterly
Uranium or dust	2.0E-9 uCi-hr/ml	8.4E-9 uCi-hr/ml	2.6E-8 uCi-hr/ml
Soluble Uranium	4.0E-9	1.68E-8	5.20E-8
Thorium-232	1.2E-9	5.0E-9	1.6E-8
Thorium-Natural	2.4E-9	1.0E-8	3.2E-8
Radon daughters	0.07 WLM	0.33 WLM	1.0 WLM

Exposure limits are a product of the MPC in air from Table 1, Column 1, Appendix B of 10 CFR Part 20 multiplied by the number of hours normally worked in each specified time period (40 hours/week, 168 hours/month, 520 hours/quarter).

η

ATTACHMENT D SURFACE CONTAMINATION LIMITS (ANSI N13.12)

TABLE D ANSI N13.12
SURFACE CONTAMINATION LIMITS*

Contaminants			Limit (Activity) (dpm/100 cm^2)**	
Group	Description	Nuclides (Note 1)	Removable	Total (Fixed plus Removable)
1	Nuclides for which the nonoccupational MCP_a (Note 2) is 2 x 10^{-13} Ci/m^3 or less or for which the nonoccupational MCP_w (Note 4) is 2 x 10 10^{-7} Ci/m^3 or less.	^{227}Ac $^{241,242m243}Am$ $^{249,250,251,252}Cf$ $^{243,244,245,246,247,248}Cm$ $^{125,129}I$ ^{237}Np ^{231}Pa ^{210}Pb $^{238,239,240,242,244}Pu$ $^{226,228}Ra$ $^{228,230}Th$	20	Nondetectable (Note 3)
2	Those nuclides not in Group 1 for which the nonoccupational MCP_o (Note 2) is 1 x 10^{-12} Ci/m^3 or less	^{254}Es ^{256}Fm $^{126,131,133}I$ ^{210}Po ^{223}Ra ^{90}Sr ^{232}Th ^{232}U	200	2000 a Nondetectable (Note 5)
3	Those nuclides not in Group 1 or Group 2		1000	5000

TABLE D ANSI N13.12 (Continued)
SURFACE CONTAMINATION LIMITS*

* The levels may be averaged over one square meter provided the maximum activity in any area of 100 cm^2 is less than three times the limit value. For purposes of averaging with regard to isolated spots of activity, any square meter of surface shall be considered to be contaminated above the limit L, applicable to 100 cm^2 if (1) from measurements of a representative number n of sections it is determined that $1/n \sum_n S_i \geq L$, where S, is the dpm/100 cm^2 determined from measurements of section i; or (2) it is determined that the activity of all isolated spots or particles in any area less than 100 cm^2 exceed 3L.

** Disintegrations per minute per square decimeter.

NOTES:

(1) Values presented here are obtained from the Code of Federal Regulations, Title 10, Part 20, April 30, 1975. The most limiting of all given MCP values (for example, soluble versus insoluble) are to be used. In the event of the occurrence of mixtures of radionuclides, the fraction contributed by each constituent of its own limit shall be determined and the sum of the fractions shall be less than 1.

(2) Maximum permissible concentration in air applicable to continuous exposure of members of the public as published by or derived from an authoritative source such as the National Committee on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), or the Nuclear Regulatory Commission (NRC). From the Code of Federal Regulations, Title 10, Part 20, Appendix B, Table 2, Column 1.

(3) The instrument utilized for this measurement shall be calibrated to measure at least 100 pCi of any Group-1 contaminants uniformly spread over 100 cm^2.

(4) Maximum permissible concentration in water applicable to members of the public.

TABLE D ANSI N13.12 (Continued)
SURFACE CONTAMINATION LIMITS*

(5) The instrument utilized for this measurement shall be calibrated to measure at least 1 nCi of any Group-2 beta or gamma contaminants uniformly spread over an area equivalent to the sensitive area of the detector. Direct survey for unconditional release should be performed in areas where the background is ≤ 100 counts per minute. When the survey must be performed in a background exceeding 100 counts per minute, it may be necessary to use the indirect survey method to provide the additional sensitivity required.

TABLE D (Continued)
ALTERNATE SURFACE CONTAMINATION LIMITS
(All Alpha Emitters, except U_{nat} and Th_{nat} Considered as a Group)*

Contamination Contingencies	Limit (Activity) (dpm/100 cm^2)** Removable	Total (Fixed plus Removable)
If the contaminant cannot be identified: or if alpha emitters other than U_{nat} (Note 1) and Th_{nat} are present; or if the beta emitters comprise ^{227}Ac or ^{228}Ra	20	Nondetectable (Note 2)
If it is known that all alpha emitters are generated from U_{nat} (Note 1) and Th_{nat}; and if beta emitters are present that, while not identified, do not include ^{227}Ac, ^{125}I, ^{226}Ra, and ^{228}Ra	200	2000 alpha Nondetectable beta-gamma (Note 3)
If it is known that alpha emitters are generated only from U_{nat} (Note 1) and Th_{nat} in equilibrium with its decay products; and if the beta emitters, while not identified, do not include ^{227}Ac, ^{125}I, ^{129}I, ^{90}Sr, ^{223}Ra, ^{228}Ra, ^{126}I, ^{131}I, and ^{133}I	1000	5000

* The levels may be averaged over one square meter provided the maximum activity in any area of 100 cm^2 is less than three times the limit value. For purposes of averaging with regard to isolated spots of activity, any square meter of surface shall be considered to be contaminated above the limit L, applicable to 100 cm^2, if (1) from measurements of a representative number n of sections it is determined that $1/n \sum_n S_i \geq L$, where S_i is the dpm/100 cm^2 determined from measurements of section i; or (2) it is determined that the activity of all isolated spots or particles in any area less than 100 cm^2 exceeds 3L.

7

VOLUME II

FERNALD RI/FS
HEALTH AND SAFETY PLAN
ADDENDUM

Prepared for:

U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

7

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1 of 1
2.0	KEY PERSONNEL AND EMERGENCY NUMBERS	1 of 1
3.0	SITE CONTROL	1 of 1
4.0	PERMISSIBLE EXPOSURE LIMIT GUIDELINES	1 of 3
5.0	SAFETY AND HEALTH RISK ANALYSIS	1 of 8
6.0	TRAINING	1 of 1
7.0	PERSONNEL PROTECTIVE EQUIPMENT	1 of 5
8.0	MEDICAL SURVEILLANCE	1 of 1
9.0	MONITORING METHODS AND EQUIPMENT	1 of 5
10.0	DECONTAMINATION	1 of 1
11.0	GENERAL SAFETY REQUIREMENTS	1 of 2
12.0	HAZARD COMMUNICATION AND MATERIAL SAFETY DATA SHEETS	1 of 1
13.0	EMERGENCY RESPONSE	1 of 2
	APPENDIX 1	A1 of A6
	APPENDIX 2	A1 of A3
	APPENDIX 3	A1 of A3

1.0

7

1.0 INTRODUCTION

The Feed Materials Production Center (FMPC) is a government-owned, contractor-operated facility for the production of high purity uranium metal for the United States Department of Energy (DOE). The FMPC is operated by Westinghouse Materials Company of Ohio (WMCO) under prime contract with the DOE.

In accordance with a Federal Facility Compliance Agreement (FFCA) between DOE and the U.S. Environmental Protection Agency (U.S. EPA), a site-wide Remedial Investigation and Feasibility Study (RI/FS) is being conducted to determine the nature and extent of any release, or threat of release, of hazardous or radioactive substances, pollutants, or contaminants at or from the FMPC and to propose remedial actions. In order to meet these objectives, the following seven tasks have been developed; radiation measurement, surface soil sampling, ground water sampling, subsurface soil sampling, surface water and sediment sampling, biological resources sampling, and facilities testing.

The RI/FS is being performed for DOE by Advanced Sciences, Inc. (ASI) under contract to the Small Business Administration. IT Corporation (IT) is the main subcontractor to ASI for the FMPC site-wide RI/FS.

The Health and Safety Plan (HSP) and this addendum apply specifically to the RI/FS activities conducted by ASI and its subcontractors at the FMPC. The intent of the Environmental, Safety, and Health Program is to ensure the health and safety of the workers and to comply with all applicable federal, state, local, and DOE health and safety requirements.

2.0

2.0 KEY PERSONNEL AND EMERGENCY NUMBERS

WMCO EMERGENCY	513/738-6511
HAMILTON COUNTY EMERGENCY	513/825-2260
BUTLER COUNTY EMERGENCY	513/867-5700
Project Health and Safety Officer Rick Greene, IT	615/482-9707
Site Health and Safety Officers Dale Anderson, IT Art Farmer, ASI Donna Nugent, IT	513/738-3100
Project Director Dick Wilde, ASI	513/738-3100
On-Site Technical Project Manager Bob Galbraith, IT	513/738-3100
Site Manager Bob Lenyk, ASI	513/738-3100
Project Engineer Dennis Carr, WMCO	513/738-6930
WMCO Manager of Health Physics Bob Rogers	513/738-6837
Contractor Health and Safety Coordinator Larry Hubschmann, WMCO	513/738-6897
Corporate Health and Safety Officer Richard Hoaker, ASI	

3.0

7

3.0 SITE CONTROL

A site control program has been developed to control worker exposure to radioactive and hazardous materials to prevent the spread of contamination. The FMPC site has been divided into three general work zones. These work zones have been established based on worker exposure potential, established site control zones, and contamination control considerations.

Zone 1 is the FMPC Process Area. This area includes both the Production Area and the Waste Storage Area. Personnel access to the Process Area will be through the change rooms in the Service Building. Personnel entering the Process Area are required to change into WMCO-issued undergarments, coveralls, and boots. Showers, clothing change, and contamination monitoring are required when leaving the Process Area. Vehicle access to the Process Area will be through the South Gate. Vehicles leaving this zone will be monitored for contamination. Eating, drinking, and smoking are only permitted in designated areas within this zone.

Zone 2 includes the fly ash piles, Paddy's Run, storm sewer outfall ditch, and the Sewage Treatment Plant. These areas are outside of the security fence but within the site boundary. Access by RI/FS team members to these areas will be maintained administratively. Personnel working in these areas will be provided personnel protective equipment as required and will be monitored for contamination as they leave these areas.

Zone 3 includes the balance of the property within the FMPC site boundary and areas outside of the site (off site). Personnel protective equipment and personnel monitoring may be required for some tasks in this zone. Personnel safety equipment, such as life vests for working on or near water, will be provided as needed. Area and job monitoring requirements will be determined by the Site Health and Safety Officer (SHSO).

4.0

7

4.0 PERMISSIBLE EXPOSURE LIMIT GUIDELINES

The prescribed standards for chemical exposures at DOE Facilities are the current Threshold Limit Values (TLVs) adopted by the Americal Conference of Governmental Industrial Hygienists (ACGIH).[1] The current TLVs are found in the 1986-1987 ACGIH TLV Handbook. If no TLV has been established by the ACGIH for a material in question, other sources of permissible levels will be used. Other sources would include the National Institute of Occupational Safety and Health's (NIOSH) criteria documents, material safety data sheets as available, and toxicology textbooks. The Project Health and Safety Officer (PHSO), or his representative will evaluate appropriate data and establish personnel protection requirements.

Radiation exposures will be maintained As Low As Reasonably Achievable (ALARA) within the standards prescribed in DOE Order 5480.1, Chapter XI, Requirements for Radiation Protection. The concentration guides given in the order will be used in evaluating the adequacy of health protection measures against airborne radioactivity in regulated areas.

Radiation protection standards for occupationally exposed persons and for members of the public are given in Tables 4-1 and 4-2, respectively.

[1] DOE Order 5480.1A, Chapter 1, Environmental Protection Safety, and Health Protection Standards, 8.C.(1) (a)

TABLE 4-1

OCCUPATIONAL RADIATION EXPOSURE STANDARDS[a]

TYPE OF EXPOSURE	EXPOSURE PERIOD	DOSE EQUIVALENT (Dose or Dose Commitment[b] in rem)
Whole body, head and trunk, gonads, lens of the eye[c], red bone marrow, active blood-forming organs	Year Calendar Quarter	5 3
Unlimited areas of the skin (except hands and forearms). Other organs, tissues, and organ systems (except bone).	Year Calendar Quarter	15 5
Bone	Year Calendar Quarter	30 10
Forearms	Year Calendar Quarter	30 10
Hands	Year Calendar Quarter	75 25

[a] From DOE Order 5480.1A.

[b] To meet the above dose commitment standards, operations must be conducted in such a manner that it would be unlikely that an individual would assimilate in a critical organ by inhalation, ingestion, or absorption, a quantity of radionuclide or mixture of radionuclides that would commit the individual to an organ dose that exceeds the limits specified in the above table. Dose commitment is defined as the dose equivalent (rem) received by specific organs during a period of one calendar year that was the result of radionuclide uptakes by a person occupationally exposed.

[c] A beta exposure below a maximum of energy of 700 KeV will not penetrate to the lens of the eye; therefore, the applicable limit for these energies would be that for the skin (15 rem/yr).

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TABLE 4-2

EXPOSURE OF INDIVIDUALS AND POPULATION GROUPS IN UNCONTROLLED AREAS[a]

	ANNUAL DOSE EQUIVALENT OR DOSE COMMITMENT[b]	
TYPE OF EXPOSURE	Based on Dose to Individuals at Points of Maximum Probable Exposures (rem)	Based on Average Dose to a Suitable Sample of the Exposed Population (rem)
Whole body, gonads or bone marrow	0.5	0.17
Other organs	1.5	0.5

(a) From DOE Order 5480-1A.

(b) In keeping with DOE policy on lowest practicable exposures, exposure to the public shall be limited to as small a fraction of the respective annual dose limits as is reasonably achievable. Dose commitment is defined as the dose equivalent (rem) received by specific organs during a period of one calendar year that was the result of radionuclide uptakes by a person.

5.0

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5.0 SAFETY AND HEALTH RISK ANALYSIS

The RI/FS study area has been divided into three zones based on existing boundaries and exposure potential to radiological and chemical hazards. Zone 1, which includes the FMPC Production Area and Waste Storage Area, represents the highest exposure potential to radioactive and hazardous materials. The principal radiation hazards within Zone 1 are from uranium, thorium, and their daughter products (including radon), although low levels of other radioactive materials have been identified. These materials primarily represent an internal exposure hazard; that is, the primary hazard occurs when these materials enter into the body by inhalation, ingestion, or injection.

Inhalation of these materials can occur when the material becomes airborne, either through release of the material into the air from process stacks and vents, from storage areas, or by resuspension of contaminated soil or waste material. Sampling activities which generate airborne dusts have the potential for creating inhalation exposure hazards. When inhalation hazards exist or are suspected, respiratory protection and monitoring will be required.

Another route of entry of radioactive materials into the body is through the ingestion of contaminated food or drink or by transfer of radioactive materials to the mouth by way of contaminated hands. For these reasons, eating, drinking, and smoking are only allowed within designated areas within Zone 1. As a minimum, the face and hands should be washed prior to eating after working in a potentially contaminated area.

Injection refers to the intake of radioactive material directly into the bloodstream and is usually associated with accident conditions. Intake by injection is not likely during this project.

Although the radioactive materials that may be found at the FMPC are primarily an internal exposure hazard, these materials also emit radiation that can present an external exposure hazard.

However, results of previous site characterizations indicate that any external radiation exposure that results from RI/FS activities will be very small. External radiation dosimeters will be issued by WMCO to all personnel that have the potential to receive measurable radiation exposure. In addition, work inside the Process Area (Zone 1) will be covered by a WMCO-issued Radiation Work Permit (RWP) which includes an evaluation of worker exposure potential and required protective measures. The SHSO will review the RWPs to determine the need for additional protective measures or work restrictions.

Exposure to hazardous materials and chemicals is also possible in Zone 1. Process chemicals used on site include: anhydrous ammonia, anhydrous hydrofluoric acid, nitric acid, methanol, sulfuric acid, anhydrous hydrogen fluoride, potassium fluoride, ammonium, ammonium hydroxide, and sodium hydroxide. These materials are typically contained in diked pads or other controlled containment systems. Some other materials on site include trichloroethane, tributylphosphate (TBP), and kerosene-TPB mix. The greatest potential for exposure to hazardous materials will come during the subsurface soil and ground water monitoring program in the Waste Storage Area. Preliminary results from waste pit sample analysis have identified significant amounts of PCBs in Pit 1 samples. The principal hazardous constituents that have been identified in waste storage pit samples are chlorinated organic solvents. The drilling of the boreholes and monitoring wells will be continuously monitored for organic/inorganic chemical vapors and combustible gases using an HNu Photoionization Detector and combustible gas meter.

Zone 2 includes Paddy's Run, the storm sewer outfall ditch, fly ash piles, and the Sewage Treatment Plant. This zone represents a lower exposure potential to radioactive and hazardous materials than Zone 1, although these materials have been identified in some of these areas. Personnel protective equipment and

monitoring requirements will be based on an evaluation of the sampling/measurement task and a health protection survey of the area by the SHSO.

Zone 3 includes the balance of the RI/FS study area. Exposure to significant concentrations of radioactive and hazardous materials in this zone is highly unlikely.

In addition to the radiological and chemical hazards that may be encountered at the site, workers may be exposed to other types of hazards that are common at industrial facilities such as electrical hazards, working on or near water, flammable materials, working in or around heavy equipment, falling objects, and slip, trip, and fall hazards. The procedures and requirements that will be implemented to minimize the potential adverse effects from these hazards are described in the HSP. Other hazards that employees will be made aware of include wild animals, insects, and poison ivy.

Adverse climatic conditions are important considerations in planning and conducting site investigations. High ambient temperatures can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal injury, increased accident probability, etc. to serious illness or death. Heat stress is of particular concern when protective garments are worn, since these garments prevent evaporative body cooling. Wearing personnel protective equipment puts a worker at considerable risk of developing heat stress. Because heat stress is probably one of the most common illnesses at sites, regular monitoring and other preventive measures as described in the procedures will be conducted.

Since the RI/FS will extend into the winter months, employee exposure to cold must be considered. Exposure to cold can result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences. Procedures to evaluate and control cold stress will be followed.

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5.1 RADIATION MEASUREMENT

Radiation measurements will be conducted to quantify surface radiation fields, develop exposure rate contours for selected areas, and to indicate sampling locations for biased surface soil sampling. Radiation measurements will occur primarily in Zones 1 and 2. In Zones 1 and 2, radiation measurement team members may be exposed to above-background radiation levels and low-level surface contamination. In addition, workers may come in contact with process and waste chemicals. All work in Zone 1 will be conducted under a WMCO-issued RWP. The RWP, which will be reviewed by the SHSO, will include personnel and area monitoring requirements and protective clothing requirements. A complete clothing change, shower, and contamination monitoring is required when leaving the Process Area (Zone 1). Protective clothing, such as shoe covers, and monitoring requirements for work in Zone 2 will be specified by the SHSO.

5.2 SURFACE SOIL SAMPLING

Surface soil samples will be collected to determine the type and extent of contamination by hazardous chemicals and radioactive materials on or near the FMPC. Surface soil sampling will take place in all three zones. In Zones 1 and 2, sampling team members may be exposed to above-background radiation levels and low-level surface contamination. In addition, workers may come in contact with process and waste chemicals. Respiratory protection may be used in some areas in Zones 1 and 2 if significant generation of contaminated dust is expected. All work in Zone 1 will be conducted under a WMCO-issued RWP. The RWP, which will be reviewed by the SHSO, will include personnel and area monitoring requirements and protective clothing requirements. A complete clothing change, shower, and contamination monitoring is required when leaving the Process Area. Protective equipment and monitoring requirements for sampling in Zone 2 will be specified by the SHSO.

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5.3 GROUND WATER SAMPLING

The ground water sampling plan is designed to determine the effect that the facility operations and waste disposal practices have had on ground water. Drilling and well installation will occur in all three zones. In Zones 1 and 2, drillers and sampling team members may be exposed to above-background radiation levels and low-level surface contamination. In addition, workers may come in contact with process and waste chemicals. Drilling of the monitoring wells comprises the greatest potential exposure hazard during the ground water sampling program. Exposure to airborne contaminants as well as skin contact with hazardous materials is possible during drilling operations. Protective clothing and respiratory protective equipment requirements will be determined by the PHSO and/or SHSO based on monitoring results and analytical results as they become available. The highest level of protection expected for drilling operations is Level B, although most drilling is expected to occur at Level C or D. All work in Zone 1 will be conducted under a WMCO-issued RWP. The RWP, which will be reviewed by the SHSO, will include personnel and area monitoring requirements and protective clothing requirements. A complete clothing change, shower, and contamination monitoring is required when leaving the Process Area.

Requirements for work in Zones 2 and 3 will be specified by the SHSO.

5.4 SUBSURFACE SOILS SAMPLING

The subsurface soils sampling plan is designed to determine the nature and extent of contamination of subsurface soils and the geochemical and geotechnical properties of the soils. The subsurface soil sampling program will be a part of the ground water monitoring program in that samples will be collected during the well drilling operations. Drilling will occur in all three zones. In Zones 1 and 2, drillers and sampling team members may be exposed to above-background radiation levels and low-level surface contamination. In addition, workers may come in contact

with process and waste chemicals. Drilling of the borings comprises the greatest potential exposure hazard during the subsurface soil sampling program. Exposure to airborne contaminants as well as skin contact with hazardous materials is possible during drilling operations. Protective clothing and respiratory protective equipment requirements will be determined by the PHSO and/or SHSO based on monitoring results and analytical results as they become available. The highest level of protection expected for drilling operations is Level B, although most drilling is expected to occur at Level C or D. All work in Zone 1 will be conducted under a WMCO-issued RWP. The RWP, which will be reviewed by the SHSO, will include personnel and area monitoring requirements and protective clothing requirements. A complete clothing change, shower, and contamination monitoring is required when leaving the Process Area.

The potential exists for exposure to chemical and radiological hazards in Zone 2. Monitoring and protective clothing requirements for sampling in this zone will be specified by the SHSO. Exposure to radiation and hazardous materials is not a concern when sampling in Zone 3.

5.5 SURFACE WATER AND SEDIMENT SAMPLING

The surface water and sediment sampling program is designed to determine the extent and distribution of radiological and chemical contamination in sediments, to determine the presence and concentration of radionuclides in the Great Miami River, and to determine if the FMPC is a significant source of organics and selected inorganics to the Great Miami River. As in all other RI/FS sampling programs, samples will be collected in all three zones. In Zones 1 and 2, sampling team members may be exposed to above-background radiation levels and low-level surface contamination. In addition, workers may come in contact with process and waste chemicals. All work in this zone will be conducted under a WMCO-issued RWP. The RWP, which will be reviewed by the SHSO, will include personnel and area monitoring

requirements and protective clothing requirements. A complete clothing change, shower, and contamination monitoring is required when leaving the Process Area.

The potential exists for exposure to chemical and radiological hazards in Zone 2. Monitoring and protective clothing requirements for sampling in this zone will be specified by the SHSO. Exposure to radiation and hazardous materials is not a concern when sampling in Zone 3.

5.6 BIOLOGICAL RESOURCES SAMPLING

Samples of agricultural products, garden produce, terrestrial, and aquatic organisms on or near the FMPC will be collected and analyzed to identify the pathways by which humans may be exposed to hazardous, toxic, or radioactive substances and to determine the effects to the area ecosystem. Sample sites will be located in all three zones.

Vegetation and terrestrial and aquatic organism sampling will occur in all three zones. Garden produce and agricultural crop samples will only be collected in Zone 3. In Zone 1, sampling team members may be exposed to above-background radiation levels and low-level surface contamination. In addition, workers may come in contact with process and waste chemicals. All work in this zone, including vegetation sampling, will be conducted under a WMCO-issued RWP. The RWP, which will be reviewed by the SHSO, will include personnel and area monitoring requirements and protective clothing requirements. A complete change, shower, and contamination monitoring is required when leaving the Process Area.

The potential exists for exposure to chemical and radiological hazards in Zone 2. Monitoring and protective clothing requirements for sampling in this zone will be specified by the SHSO. Exposure to radiation and hazardous materials is not a concern when sampling in Zone 3.

Biological resources sampling team members may be exposed to hazards from wildlife and water. The potential exists for being bitten or stung while collecting samples, therefore gloves will be worn when handling wildlife and first aid kits will be available at the sampling sites. Sampling team members in boats or on banks near deep water are required to wear life vests.

5.7 FACILITIES TESTING

The facilities testing program is designed to determine if leakage has occurred from facilities which might potentially release hazardous materials. The facilities to be tested include underground storage tanks, sumps, pads, and underground pipe lines in the Production Area (Zone 1), and the main effluent lines. As with all work in Zone 1, sampling team members may be exposed to above-background radiation levels, low-level surface contamination, and process and waste chemicals. All work in this zone will be conducted under a WMCO-issued RWP which will be reviewed by the SHSO. A complete clothing change, shower, and contamination monitoring is required when leaving the Process Area.

In the event that tank entry is deemed necessary, sampling team members will strictly adhere to confined space entry procedures. Procedures for confined space entry-industrial and confined space entry-leaded product are included in the Field Procedures Manual. The procedures include protective equipment and monitoring requirements as well as a description of the required tests and inspections prior to tank entry. Prior to entry into a confined space, a qualified person shall inspect the confined space, test the atmosphere, survey the surrounding area, and take positive steps to ensure that employees are protected from other physical hazards. In addition, personnel shall not enter storage tanks until they have been inspected by a competent engineer and certified as structurally sound.

6.0

6.0 TRAINING

All RI/FS team members will receive forty hours of off-site training and a minimum of three days of actual field experience under the direct supervision of a trained and experienced supervisor. The training program is designed to meet the requirements of OSHA 1910.120. The training program will include safe work practices, protective clothing and equipment, site health and safety plan, decontamination, respirator program requirements, hazard assessment, toxic hazards, flammable hazards, and emergency procedures.

WMCO requires Radiation Worker Training for all persons engaged in activities within the Production Area. In addition, a site-specific training course will be conducted which covers names of key personnel, emergency procedures, site control, personnel, protective equipment, safe work practices, site-specific health and safety requirements, radiation work permits, safety and health hazards at the site, medical surveillance requirements, and monitoring.

Tailgate safety meetings will be conducted at the beginning of each shift or when new workers arrive on the site. The purpose of these meetings is to discuss the day's activities, review protective equipment and monitoring requirements, review the hazards that may be encountered, and review emergency procedures.

The above training must be verified and documented by the PHSO or the SHSO before team members will be allowed to start work on site.

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7.0 PERSONNEL PROTECTIVE EQUIPMENT

Personnel protective equipment refers to the protective clothing and equipment used to protect individuals from chemical and physical hazards which may be encountered at the site. As a minimum, WMCO requires a complete clothing change, safety glasses, and safety shoes for work in the Process Area (Zone 1). In addition to the standard clothing issued by WMCO, protective clothing and equipment will be provided to team members based on the hazards expected for specific operations and areas. The types of protective equipment used may range from fully encapsulating chemical resistant suits with supplied air respirators for emergency response, to basic work clothes (including personal clothing) such as coveralls and safety shoes for sample collection in Zone 3. The type of protective equipment selected will be based on the type of operation, area in which the sampling takes place, monitoring results, and chemical and/or radioactive hazards involved. In any case, the equipment selected will be designed to protect the employee from the hazard involved.

As mentioned in Section 5.0, Safety and Health Risk Analysis, the primary exposure hazards are from airborne uranium, thorium, and their decay products (including radon), and from skin contact with chlorinated organic solvents. Respiratory protection for these airborne radionuclides can be achieved through the use of full-face air purifying respirators with high efficiency particulate air (HEPA) cartridges or with supplied air respirators. If concentrations of organic vapors as measured with the HNu are above background but less than 10 ppm, additional industrial hygiene monitoring will be performed to identify the contaminant. Full-face air purifying respirators with organic vapor and HEPA cartridges will be used if approved cartridges at the concentrations found are available. When skin contact with organic solvents is likely, protection will be

achieved using polyethylene-coated Tyvek and chemical resistant boots and gloves.

If higher levels of protection are deemed necessary, for example, if the concentration of organic vapors in the workers breathing zone exceeds 10 ppm as measured with the HNu, if the contaminant has not been identified, or if approved cartridges are not available, then positive pressure supplied air respirators will be required. Operations will be suspended if concentrations exceed 100 ppm. Since some of the suspected contaminants (e.g., chloroform, trichloroethane) cannot be detected with the HNu using the 10.2 eV probe, the personnel protective equipment requirements will also be based on traditional industrial hygiene monitoring techniques. The atmospheric action levels for monitoring wells is summarized in Table 7-1.

Based on current information, the following protective equipment is prescribed for the sampling and measurement tasks as given below.

7.1 RADIATION MEASUREMENTS

The following personnel protective equipment, as a minimum, is required for making radiation measurements in Zone 1.

- Safety glasses;
- Safety shoes (supplied by WMCO); and
- Coveralls (supplied by WMCO).

The personnel protective equipment required for radiation measurements made in Zone 2 may include:

- Work clothes (coveralls or personal clothes);
- Work shoes; and
- Boot covers.

7.2 SURFACE SOIL SAMPLING

Surface soil samples will be collected within the FMPC site and off site where vegetation samples are collected. If significant generation of contaminated dust is expected, respiratory protection may be used in Zones 1 and 2. However, under normal conditions, respiratory protection will not be used.

TABLE 7-1

Atmospheric Action Levels for the RI/FS*

Hazard	Equipment	Measured Level	Action
Explosive Atmosphere	Exotox 50	<10% LEL	Continue operations
		>10% LEL	Suspend operations immediately and notify the SHSO.
Oxygen	Exotox 50	<20%	Suspend operations and notify the SHSO.
Organic gases	HNu	<10 ppm (above ambient background)	Perform additional monitoring to identify the contaminant. Full-face APR with GMA-H or equivalent cartridge.**
		>10 ppm but <100 ppm	Positive pressure supplied air respirator.
		>100 ppm	Suspend operations.
Radionuclides	Personnel and area sampling	<25% MPC	Continue sampling.
		>25% MPC	Full-face APR with GMA-H or equivalent cartridge.

*The basic protective equipment ensemble for boring and monitoring well installation is a modified Level C. This includes: steel toe/steel shank boots, safety glasses, hard hat, cotton coverall undergarment, saranex coverall outer garment, boot covers, PVC or nitrile outer glove, viton inner glove. The respiratory protection requirement will be modified based on the action levels given above.

**This type of respiratory protection will be used if approved cartridges for the identified hazard and level are available. Positive pressure supplied air respirators will be required if the contaminant is not identified or if approved cartridges for the contaminant are not available.

Sampling within Zone 1 will require:

- Safety glasses;
- Safety shoes (supplied by WMCO);
- Coveralls (supplied by WMCO);
- Gloves (cotton, leather, or chemical resistant); and
- Air-purifying respirator with HEPA canister (possible).

7.3 GROUND WATER SAMPLING

Drilling of the monitoring wells comprises the greatest potential hazard during the ground water sampling program. Based on currently available information, Level B protective clothing may be required for certain on-site drilling locations.

- Supplied-air respirator (airline, pressure demand);
- Coated Tyvek coveralls, hooded (polyethylene or saranex);
- Gloves (outer), chemical-resistant (nitrile or viton);
- Gloves (inner), chemical-resistant (latex);
- Boots (outer), chemical-resistant (PVC or neoprene); and
- Boot covers (outer), disposal (latex).

Sampling ground water will usually require chemical resistant gloves and coveralls as described above.

7.4 SUBSURFACE SOILS SAMPLING

Equipment requirements are similar to ground water sampling. Level B is the highest level expected although sampling could occur at Level C or D.

7.5 SURFACE WATER AND SEDIMENT SAMPLING

In addition to the WMCO clothing requirements, the following protective equipment may be required for sampling in Zones 1 and 2:

- Tyvek coveralls;
- Chemical-resistant gloves (nitrile or viton);
- Chemical-resistant overboots (latex); and
- PVC rain gear.

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7.6 BIOLOGICAL RESOURCES SAMPLING

WMCO issued clothing is required in Zone 1. In addition, the following protective equipment is required as appropriated:

- Waders;
- Life jackets; and
- Leather gloves.

7.7 FACILITIES TESTING

Additional protective equipment requirements will be specified if tank entry is deemed necessary.

- Hard hats;
- Safety glasses;
- Safety shoes; and
- Coveralls (supplied by WMCO).

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8.0 MEDICAL SURVEILLANCE

All ASI/IT personnel who perform sampling or site characterization activities for the Fernald RI/FS are required to participate in an annual medical examination. The objective of the medical monitoring program is to determine the physical and emotional fitness of employees who work while wearing respiratory protection, who are exposed routinely to hazardous substances, and whose duties involve heat and physical stress. Only those employees who have been determined to by physically capable for work by an occupational physician will be allowed to perform sampling or site characterization activities. All employees who are required to wear respiratory protection devices must be medically approved and fit tested. Documentation of medical approval must be on file with the PHSO prior to initial on-site activities.

Exit physical examinations will be provided for employees who leave the project by resignation, termination, layoff, or at the project end. The PHSO will determine the need for exit physical examinations based upon, among other factors, the nature of the individual's job assignment, monitoring results, and time since the last physical exam.

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9.0 MONITORING METHODS AND EQUIPMENT

A health physics and industrial hygiene monitoring program will be conducted for the duration of the RI/FS. The components of the monitoring program include: external radiation monitoring, radioactive contamination monitoring, air monitoring for radioactive and chemical contaminants, sound level monitoring, and bioassay. The results of the monitoring program will be used to dictate protective equipment requirements, evaluate employee exposure control measures, and to determine potential employee exposure to radiation and hazardous materials.

The monitoring methods, frequency, and equipment used will depend on the type of sampling/measurement activity and the zone in which the activity takes place (Health and Safety Procedure HS 001). For example, in Zone 1, WMCO procedures and equipment, as a minimum, will be used for personnel radiation contamination monitoring when exiting this area. Persons working in Zone 1 will wear WMCO-issued coveralls and boots while in the area and will shower before leaving. All personnel are required to monitor themselves for radioactive contamination with WMCO's monitoring equipment before leaving the change room. Additional personnel radiation contamination monitoring may be required by the SHSO for certain areas and tasks within Zone 1.

The components of the Health Physics and Industrial Hygiene monitoring program are given below.

- External Radiation Monitoring

  All members of the RI/FS sampling/measurement teams that work in Zone 1 will be issued radiation dosimeters that are read monthly. The PHSO will review and maintain copies of dosimeter results and will issue a monthly dosimeter report. In addition to personnel dosimeters, the SHSO will routinely survey work areas to measure external radiation fields. Work restrictions and personnel monitoring requirements will be based on survey results.

- Radioactive Contamination Monitoring

  All personnel leaving Zone 1 will be required to monitor themselves for radioactive contamination using the hand and foot monitors and friskers available at the exit points. All equipment and vehicles leaving Zone 1 must be monitored for contamination. Additional personnel and equipment contamination monitoring may be required by the SHSO for exclusion zones established within Zone 1. Personnel and equipment monitoring requirements for work in Zone 2 will be established by the SHSO. Surface Radioactivity Guides from ANSI Draft Standard N13.12 or FMPC Surface Contamination Limits, whichever is not restrictive, will serve as release levels.

- Air Monitoring

  Air monitoring will be performed during certain tasks in the work area and in the workers breathing zone for radioactive particulates, combustible gases, and chemical vapors. Radioactive particulate monitoring will be performed using personal sampling pumps and glass fiber filters. The filters will be screened in the field laboratory. Drilling operations will be monitored using an HNu Photoionization Detector and a combustible gas meter. When a change in airborne chemical vapors is detected with the HNu or when measured concentrations of combustible gases exceed ten percent of the lower explosive limit (LEL), operations should be suspended and the SHSO should be notified. Since the HNu is not sensitive to several of the suspected contaminants, traditional industrial hygiene monitoring techniques will be used to assess employee exposure and will serve as an additional basis for modifying levels of protection.

- Sound Level Monitoring

  Employee exposure to sound will be monitored using a sound level meter which meets the requirements of the American National Standard Specification for Sound Level Meters, S1.4, Type S2A. Hearing protection devices will be worn whenever employee noise exposures equal or exceed an eight-hour, time-weighted average sound level of 85 dBA or when employees are exposed to impulsive or impact noise (ACGIH Threshold Limit Values and Biological Exposure Indices for 1986-1987).

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- Bioassay

  The bioassay program provides for monitoring of internal deposition of radioactive material. All site personnel who enter and work in contaminated areas will submit a baseline bioassay sample and will be evaluated at intervals deemed appropriate by the PHSO. Instructions for bioassay will be given during the Site Health and Safety Training. Action levels and a more complete discussion of this activity are given in the HSP.

The monitoring equipment needed for this project will include, but is not limited to, Pancake G-M Detectors, HNu Organic Vapor Detector, Alpha Scintillation Detector, Sound Level Meter, Exposure Rate Meter, Combustible Gas Meter, and traditional industrial hygiene monitoring equipment (portable sampling pumps, and collection media, etc.).

The general procedure to be followed for monitoring and controlling the health and safety of each task on this project will be as follows. The supervisor or team leader should inform the SHSO of work plans well in advance so that RWPs and prework surveys of the work area can be completed and documented before work begins. After the prework survey, the SHSO and the task supervisor will discuss the findings of the survey and any other possible hazards. A monitoring and safety outline will be put in place for each specific job and area. This outline is subject to change as conditions change and as monitoring results become available.

The monitoring methods and equipment for each task is given below.

9.1 RADIATION MEASUREMENT MONITORING

Monitoring for the radiation measurement task will include external radiation monitoring and contamination monitoring when leaving Zone 1. In Zones 2 and 3, the task supervisor will be responsible to see that his workers monitor themselves for contamination with the equipment provided.

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9.2 SURFACE SOIL SAMPLING

The general requirement for personnel radiation monitoring and exit contamination monitoring in Zone 1 will apply. If respiratory protection is indicated, personal breathing zone samplers will be used. Workers will be required to submit bioassay samples if exposure to airborne radionuclides approaches or exceeds 25 percent of the maximum permissible time-weighted exposure. In Zones 2 and 3, the task supervisor will be responsible to see that his workers monitor themselves for contamination with the equipment provided.

9.3 GROUND WATER SAMPLING

Zone 1 general monitoring requirements will apply. Before actual samples are taken from monitoring wells, an HNu will be used to determine if there is any need for respiratory equipment. Once the sample has been taken, the container will be checked for radioactive contamination by using a pancake G-M detector. If the container is contaminated, it will be wiped with disposable towels and wrapped in a plastic bag. All tools and equipment used to collect the sample will be wrapped in plastic until they can be decontaminated. All gloves and disposable towels will be placed in a plastic bag to be disposed of according to WMCO's procedure.

9.4 SUBSURFACE SOIL SAMPLING

As mentioned in the introduction, WMCO personnel monitoring equipment and shower facilities will be used for entering and exiting Zone 1. In all other areas, the person assigned to do the task monitoring, as described below, will also be responsible for personnel contamination monitoring.

In Zones 1 and 2, continuous monitoring will be done for organic vapors, combustible gases, and radioactive contamination. In areas where the potential for exposure to radioactive materials and hazardous chemicals is considered to be probable, the monitoring will be done by the SHSO or a designated technician. Other areas will be monitored by the geologist. Sound levels

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will be measured around drilling equipment or any other equipment that may cause hearing impairment to determine if hearing protection is needed.

In Zone 3, the monitoring will be done by the geologist at routine intervals and after completion of the drilling.

9.5 SURFACE WATER AND SEDIMENT SAMPLING

As mentioned in the introduction, WMCO's monitoring equipment and shower facility, as a minimum, will be used in Zone 1. In the event that sampling from a boat is necessary in Zone 1, a real time H_2S monitor will be used. In addition, organic vapor headspace measurements will be collected on initial water samples before sampling from a boat. Additional monitoring requirements will be determined by the SHSO. In Zone 2, the task supervisor will be responsible to see that his workers monitor themselves with the equipment provided. Zone 3 should only require spot checking unless monitoring is deemed necessary by the SHSO.

9.6 BIOLOGICAL SAMPLING

Personnel radiation and contamination monitoring, as a minimum, is required in Zone 1. Requirements for additional monitoring will be established by the SHSO. In Zone 2, the task supervisor will be responsible to see that the workers monitor themselves with the equipment provided. Routine contamination monitoring for work in Zone 3 is not required.

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10.0 DECONTAMINATION

Personnel working in Zone 1 are required to wear WMCO-issued clothing and work boots. In addition, safety glasses, gloves, and hard hats may be required. Personnel leaving Zone 1 are required to shower and monitor themselves for radioactive contamination. Exclusion zones may be established within Zone 1 at drilling sites or at other sample locations if necessary. When exclusion zones are established and additional protective clothing is required, decontamination stations will be established at the exit points to these areas. It is important to remember that Zone 1 is considered a contaminated area and that final personnel decontamination will occur at the exit point from this zone. Decontamination areas established at exclusion zone exits are designed to prevent the spread of gross chemical and radiological contamination from the exclusion zone and to reduce employee exposure to these materials. Materials and equipment used in Zone 1 will be decontaminated at an established FMPC decontamination area.

Decontamination stations for Zone 2 will be set up in areas where exclusion zones are established and protective clothing is used. These decontamination areas will be designed to suit the specific need of each task. In addition, a centralized decontamination pad has been established for the decontamination of tools and sampling equipment. Persons involved in doing the actual decontamination will generally be dressed in protective clothing one level below what the exclusion zone workers are in. All decontamination materials (liquids and solids) must be contained and stored in drums with proper labels and all other pertinent information. Since this will require considerable space and money, all efforts will be made to keep the volume of these materials to a minimum. Further information on decontamination can be found in the HSP.

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11.0 GENERAL SAFETY REQUIREMENTS

The following general safety requirements will be followed in order to minimize the occurrence and potential adverse effects of unsafe or hazardous conditions at the site:

- Contaminated protective equipment, such as respirators, hoses, boots, etc., will not be removed from the regulated area unless it is properly packaged and labeled.

- Legible and understandable precautionary labels will be affixed prominently to containers of contaminated scrap, waste, debris, and clothing.

- Contaminated materials will be stored in tightly closed containers in well-ventilated areas.

- Removal of contaminated particulates from protective clothing or equipment by blowing, shaking, or any other means which disperses contaminants into the air is prohibited.

- No food or beverages will be present or consumed in Zones 1 and 2 except in designated break areas.

- Designated break areas will have a hand wash facility.

- No tobacco products will be present or used, and cosmetics will not be applied in Zones 1 and 2 except in designated break areas.

- Personnel on site will use the "buddy" system. Buddies should prearrange hand signals for communication. Communication or visual contact will be maintained between crew members at all times.

- Team members must observe each other for signs of toxic exposure. Indications of adverse effects include, but are not limited to:

  - Changes in complexion and skin discoloration;
  - Changes in coordination;
  - Changes in demeanor (behavior);
  - Excessive salivation and pupillary response; and
  - Changes in speech pattern.

- Team members should inform each other of nonvisual effects of toxic exposure such as:

  - Headaches;
  - Dizziness;

- Nausea;
- Blurred vision;
- Cramps; and
- Irritation of eyes, skin, or respiratory tract.

- All air cylinders placed on heavy equipment for use by the operator will be well secured in a bracket which is bolted or welded to the unit.

- Prompt remedial action will be taken whenever an inadvertent release of a hazardous material occurs.

- Appropriate action to provide secure footing will be taken at all locations where personnel will be working.

- Change rooms and shower facilities will be provided for the use of employees working in Zone 1.

- As appropriate, equipment on site will be bonded and grounded, spark proof, and explosion resistant.

- A sufficient number of fire extinguishers, with a minimum rating of 10B:C, will be strategically located throughout the areas where active work is progressing. Fire extinguishers will be available on all vehicles used on site or for sample collection (e.g., boats, drill rigs).

- All personnel will avoid contact with potentially contaminated substances. Walking through puddles or mud, kneeling on the ground, or leaning against drums should be avoided whenever possible.

- Monitoring equipment will not be placed on potentially contaminated surfaces.

In addition to the above, health and safety requirements of the FMPC must be followed. These requirements are found in Appendix 1.

12.0

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12.0 HAZARD COMMUNICATION AND MATERIAL SAFETY DATA SHEETS

A hazard communication program will be in place for the duration of the project that will be in compliance with federal and state regulations. The purpose of this program is to provide information and training to the workers who either work with or around hazardous materials. This includes such information as types of materials and their hazards. If any employee has a question about a hazardous substance that is associated with their task, they can request a Material Safety Data Sheet (MSDS) for that substance which will describe all of the hazards and physical characteristics of the substance and precautions for safe handling and use.

To make a request for an MSDS, an employee must fill out an Employee Request for MSDS and either bring it to the SHSO or the PHSO, or they can mail it to the PHSO.

For this project, a properly completed MSDS will be required for all substances before they can be brought on site. These sheets will be kept on file at the Site Health and Safety Office.

13.0

13.0 EMERGENCY RESPONSE

In the event of an emergency or an accident, such as an injury/illness or fire, the following procedures will be followed:

- Emergency procedures must be initiated by the first person recognizing the emergency situation.
- Telephones or radios must be located in the area of each team.
- Emergencies within the site boundary should be reported immediately to the WMCO Communication Center at (513) 738-6511. If a telephone is not available in the area, the SHSO, his designee, or the team leader must be notified, and he will in turn notify the WMCO Communication Center.
- Off-site emergencies should be reported immediately to the numbers listed below:

  - North of Ohio Route 126 - Butler County Emergency (513) 867-5700
  - South of Ohio Route 126 - Hamilton County Emergency (513) 825-2260.

- The person reporting the emergency should provide the following information to the communication center:

  - Location;
  - Nature of emergency; and
  - Action already taken.

After the emergency team has been dispatched the SHSO or other team member will then contact:

- Steve Wentzel - WMCO Emergency Preparedness (513) 738-6802
- Rick Greene - Project Health and Safety Officer (615) 482-9707
- Dick Wilde - Project Manager, ASI (513) 738-3100
- Bob Lenyk - Site Manager, ASI (513) 738-3100.

In case of accident or injury, the supervisor must fill out a "Supervisor's Employee Injury Report" and give it to the SHSO.

Appendix 2 contains a listing of all FMPC plant emergency alarm system coded alarms and their respective designations.

Appendix 3 contains maps to two local medical facilities.

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APPENDIX 1

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APPENDIX 1

PRECONSTRUCTION CONFERENCE
SUBCONTRACTOR HEALTH AND SAFETY REQUIREMENTS

Conference Date: 6-17-87

SUBCONTRACTOR: ASI
CONTRACT(S):
LOCATION(S): FMPC
OPERATION(S): Sampling and Characterization of Environment

TENTATIVE START DATE: 7-1-87 ENDING: 9-30-88
NUMBER OF EMPLOYEES: 4-16
WMCO PROJECT ENGINEER: D. J. Carr
SUBCONTRACTOR SITE MANAGER: B. Lenyk

This information is provided as a convenience to the subcontractor in highlighting the health and safety requirements at the FMPC. All work at the FMPC will be performed in accordance with the safety and health requirements and programs of the U.S. Department of Energy (DOE), the U.S. Department of Labor (OSHA), the National Fire Protection Association (NFPA), and Westinghouse Materials Company of Ohio (WMCO).

SAFETY AND FIRE PROTECTION REQUIREMENTS

Prior to the commencement of any construction activity, the subcontractor will submit an accident prevention program for the specific contracted work, implementing in detail the pertinent requirements of the safety standards referenced herein.

All subcontractors' equipment and tools will be inspected by WMCO fire and safety personnel prior to entry into the FMPC and throughout the course of the work activities. Equipment which fails to meet the safety requirements herein referenced will not be permitted on the site.

All injuries will be reported to the WMCO medical facility as soon as is practical following the injury.

Safety glasses, hard hats, and leather safety shoes are required to be worn by all persons engaged in the construction activity.

Safety glasses, hard hats, and a complete clothing change out, including company-issued safety shoes, are required for all work within the process area. A shower is required prior to leaving the process area.

Safety glasses, hard hats, shoe covers, and smocks are to be worn by all nonmanual personnel within the process area, provided they do not actively engage in any manual work activity. Otherwise, a complete clothing change out with shower is required.

All pockets are to be emptied prior to discarding soiled process area clothing. Used razor blades or other sharp objects will be deposited in the containers provided in the change rooms.

Subcontractors will not move any plant materials or equipment without the prior permission of the local production supervisor and/or the WMCO project engineer.

All employees are to immediately leave the building upon activation of localized evacuation alarms.

INDUSTRIAL HYGIENE REQUIREMENTS

1. Hearing Conservation Program:

Purpose - To prevent hearing loss from prolonged loud noise exposure.

Hearing protection (muff or plug type) must be worn by employees exposed to noise levels exceeding 90 dba; e.g., grinding wheels, jackhammers, air compressors, sandblasting.

2. Respiratory Protection Program:

Purpose - To prevent acute and chronic adverse health effects from excessive inhalation of chemical and radioactive airborne contaminants.

Respirators will be used in accordance with a minimally acceptable respiratory protection program according to OSHA standards, 29 CFR 1910.134, including medical evaluations, training, and fit testing of employees who will use respirators. Only NIOSH-approved respirators will be used.

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Airline respirators will be supplied with air from a breathing air quality compressor or by FMPC instrument air. Unknown subcontractor compressors will be checked for air quality.

Approved respirators are required for welding, spray painting, or dusty operations which exceed the OSHA limits for airborne contaminants. Approved respirators are required for certain spraying and cleaning operations.

3. Confined Spaces:

Purpose - To prevent accidents and injuries resulting from working in confined spaces, where dangerous atmospheres or insufficient oxygen may be present.

A completed Access Permit listing the appropriate work requirements is required prior to all work in a confined space.

A safety attendant is to be stationed at the opening of any manhole while a worker is in the manhole.

Safety glasses with side shields or cover goggles are required during any operation, manual or with powered equipment, which produces dust or possible flying particles, e.g., chipping, grinding, sawing.

Cover goggles or full face shield and acid resistant gloves are required when handling or working around acids or caustic solutions.

All safety belts and harnesses must conform to DOE/OSHA 29 CFR 1926.104, requiring an inspection and the attachment of a current certification tag.

A completed Access Permit, listing the appropriate work requirements, is required prior to beginning any work in a confined space.

The transporting of personnel in the beds of pick-up trucks or other motor vehicles is prohibited unless such vehicles are provided with fixed seating as required by DOE/OSHA.

All ladders, scaffolds, man lifts, and other elevated work platforms will be used in accordance with DOE/OSHA 29 CFR 1926, Subparts L and N.

Ground fault circuit interrupters (GFCI's) are required on all 15 and 20 amp electrical equipment used outside of buildings or in damp places.

The work area will be completely roped off from other plant areas. The use of yellow "CAUTION" tape is permitted. All markings and/or barricades will be maintained at an appropriate height to provide adequate warning of hazards.

Open fires are prohibited at the FMPC.

Flammable or combustible liquids with a flash point of 140 degrees Fahrenheit or less (e.g., gasoline, diesel fuel, solvents) will be handled in approved safety cans with operable flame arrestor. All safety cans will be properly marked with the name of the liquid contents.

All areas where flammable liquids are stored or paints are mixed will have "NO SMOKING" signs posted, and no one is to smoke in the posted areas.

Liquified petroleum gas (e.g., propane, butane, MAPP) will not be stored inside any FMPC building.

All compressed gas cylinders are to be stored and transported in an approved rack or otherwise securely supported in an upright position.

Subcontractors will provide suitable, approved portable fire extinguishers for all work and storage areas which are not considered a part of the permanent facility.

A completed FMPC flame permit is required for all cutting, welding, and burning operations.

The storage of combustible materials will be kept at least 50 feet from any building or structure.

4. Hazard Communication:

Purpose - To ensure that employees are aware of any physical or chemical hazards associated with chemicals or chemical mixtures, which they may use or potentially be exposed to in a foreseeable emergency, and that the proper protection from exposure is utilized. This includes materials such as paints, solvents, cleaners, adhesives, etc.

All materials considered hazardous under 29 CFR 1910.1200 ("Hazard Communication Standard") must be properly labeled. This includes all containers into which a hazardous material has been transferred.

Material safety data sheets (MSDS) for all materials used by the subcontractor and considered to be hazardous will be submitted to the IH department for at least one week prior to the materials' arrival at the FMPC.

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APPENDIX 2

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APPENDIX 2

CODED ALARM DESIGNATIONS

CODE	DESIGNATION	DESCRIPTION
9-9-9	Disaster Signal	This signal is used under the following circumstances and will be followed by an announcement over the emergency message system: (1) A report is received that any emergency condition of disaster proportions exists in the plant (e.g., fire out of control, major fume release). (2) A radiation detector in the radiation detection alarm (RDA) system is activated.
8-8-8	Take Cover Signal	This signal will be sounded only when an enemy air attack is imminent and there is not sufficient time to evacuate personnel. It will be accompanied by a series of intermittent, five-second blasts from the boiler plant steam whistle.
7-7-7	Tornado	This signal will be sounded on the sighting of a funnel cloud in the immediate vicinity of the FMPC. Personnel should take immediate cover.
6-6-6	General Plant Evacuation Signal	This signal will be sounded only upon authorization of the Emergency Duty Officer (EDO) when personnel are to evacuate the plant. When the EDO is not present, this function will be performed by the emergency response team leader. It will be accompanied by a steady continuous blast from the boiler plant steam whistle.
5-5-5	Fire Alarm Signal	This signal is used to indicate that a fire alarm has been received in the communications office. The emergency response team or other necessary personnel will be notified of the location via radio.

APPENDIX 2
(Continued)

CODE	DESIGNATION	DESCRIPTION
4-4-4	Supervisory Alert Signal	This signal is used when important information not of a disaster nature (e.g., notice to evacuate plants in the event of an emergency other than air attack, important weather information, and notice of practice drills) is to be transmitted over the emergency message system.
4-1-1	CO Alert	This signal will be sounded when an alarm is received in the communications office that there is an elevated amount of carbon monoxide (CO) in the instrument air supply system. Air line respirator usage should be discontinued at once. This signal will be sounded at four hour intervals and at the beginning of each shift until the all clear is sounded.
3-3-3	All Clear Signal	This signal is used to indicate that a state of emergency has been terminated. It will also be used after a CO alert and after practice drills to indicate it is safe to return to the work area.
2-2-2	Test Signal	This signal is used to indicate that a test is being performed on the fire alarm system. It is routinely sounded at 0200, 1400, and 2100 hours each Monday.
1-1-1	Ambulance Alarm Signal	This signal is used in conjunction with the local ambulance alarm to indicate that there has been a request for emergency medical services. The emergency response team leader and/or fire and safety inspector will be notified by radio of the location.

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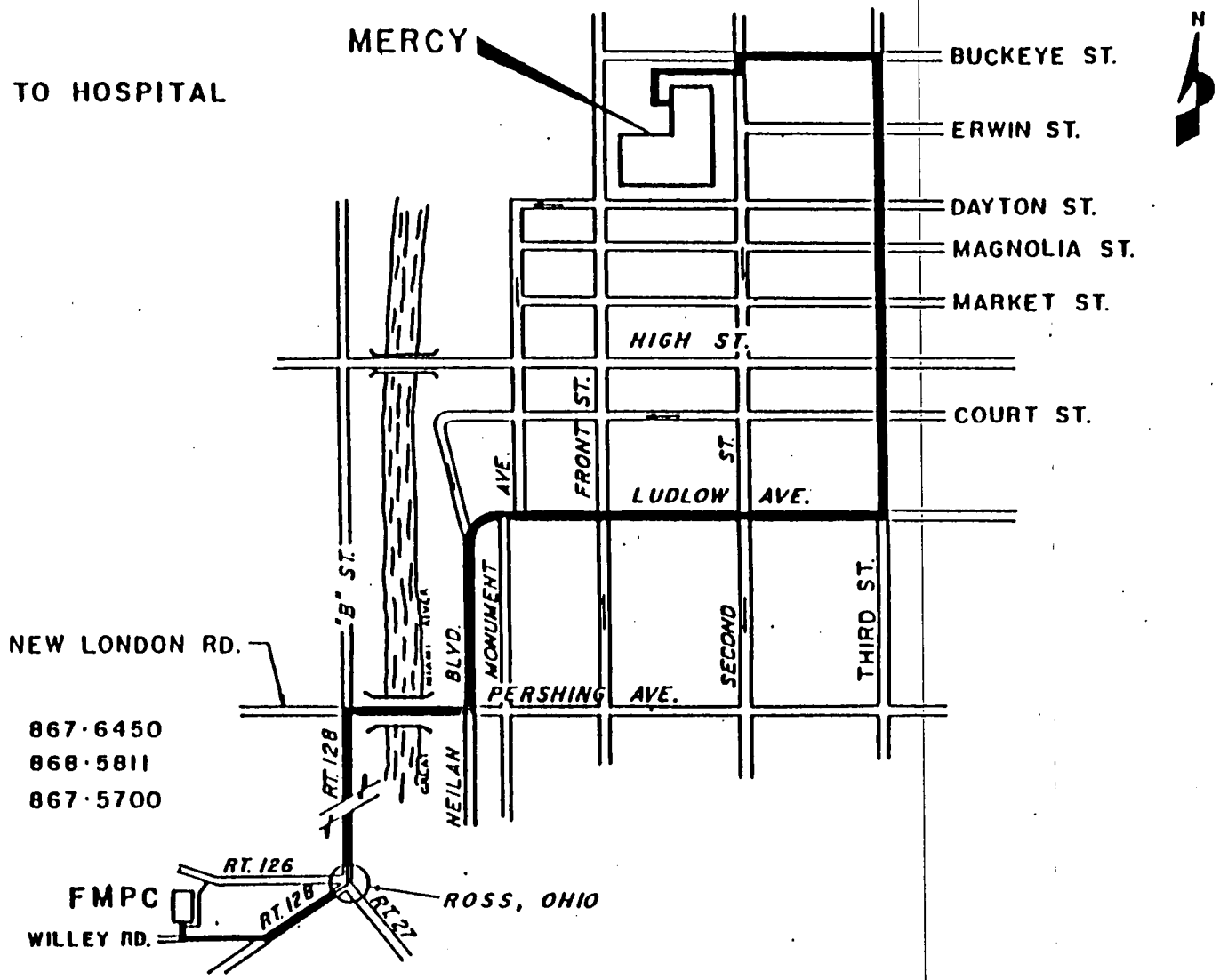
APPENDIX 3

EMERGENCY ROUTES

TO AREA HOSPITALS

HAMILTON

EMERGENCY ROUTE TO HOSPITAL



IN HAMILTON

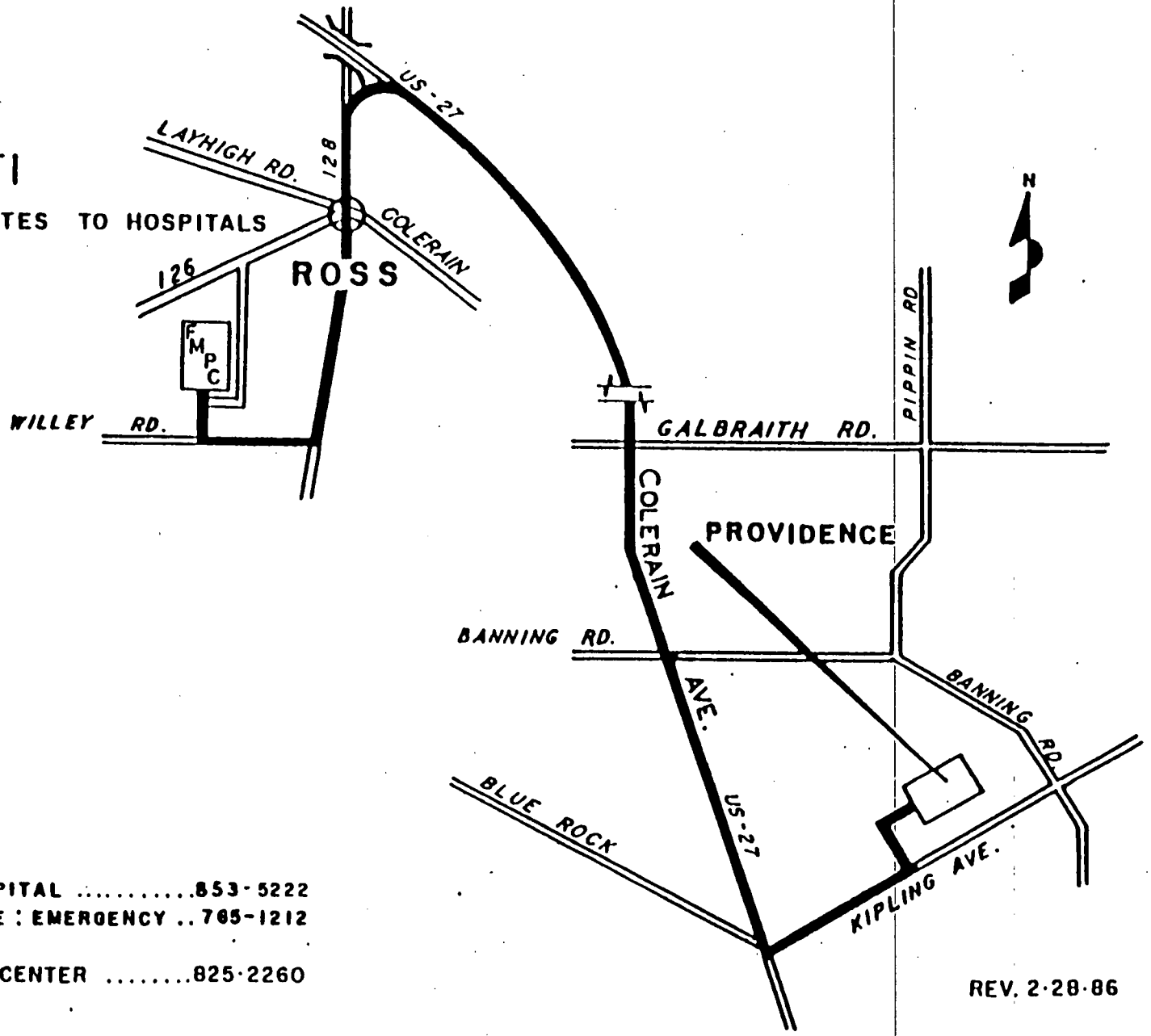
MERCY OF HAMILTON	867·6450
HAMILTON POLICE DEPT.	868·5811
BUTLER COUNTY POLICE	867·5700

REV. 3·3·86

MERCY OF HAMILTON

CINCINNATI

EMERGENCY ROUTES TO HOSPITALS



IN CINCINNATI

PROVIDENCE HOSPITAL 853-5222
CINCINNATI POLICE : EMERGENCY ..765-1212
HAMILTON COUNTY
COMMUNICATIONS CENTER 825-2260

REV. 2-28-86

PROVIDENCE

140

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VOLUME III

COMMUNITY RELATIONS PLAN FOR THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY FEED MATERIALS PRODUCTION CENTER FERNALD, OHIO

Prepared for:

U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

NOTE:

This volume, Volume III: Community Relations Plan, is part of the Work Plan and supporting documents for the Remedial Investigation and Feasibility Study (RI/FS). This volume was not reproduced in its entirety during Revisions 1 and 2 of the Work Plan. Individual change pages were used to identify those revisions. For consistency, all components of this submittal of the Work Plan and supporting documents will be referred to as Revision 3.

7

TABLE OF CONTENTS

SECTION		PAGE
1.0	OVERVIEW	1 of 7
	1.1 Background	1 of 7
	1.2 Program Objectives	1 of 7
	1.3 Plan Organization	2 of 7
	1.4 Existing Environment	2 of 7
	1.4.1 Regional Location and Boundary Features	2 of 7
	1.4.2 Land Use and Population	5 of 7
	1.4.3 Reports of Human or Animal Illness Related to FMPC	7 of 7
2.0	INVESTIGATION AND STUDY	1 of 9
3.0	CITIZEN INFORMATION AND INVOLVEMENT NEEDS	1 of 2
4.0	THE GENERAL PROGRAM	1 of 4
	4.1 Community Relations Manager	1 of 4
	4.2 Reading Areas	1 of 4
	4.3 Regular Meetings	2 of 4
	4.4 Quarterly Newsletter	3 of 4
	4.5 Meetings with Local Officials	4 of 4
	4.6 Media Briefings	4 of 4
	4.7 Other Communication Activities	4 of 4
5.0	STUDY MILESTONE AND COMMUNICATION ACTIVITIES	1 of 2

LIST OF TABLES

TABLE		PAGE
1-1	Project Management	3 of 7
1-2	Population Centers Within a Five-Mile Radius of the FMPC	4 of 7
2-1	Communication Activities: FMPC Remedial Investigation	3 of 9
2-2	Communication Activities: FMPC Feasibility Study	6 of 9

7

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

FIGURE		PAGE
1-1	Regional Location and Boundary Features of the Feed Materials Production Center	6 of 7
5-1	FMPC Remedial Investigation and Feasibility Study Summary Project Schedule	2 of 2

APPENDIX A

List of State and Local Officials and Media Offices A1 of A7

APPENDIX B

Procedures for the Classification, Notification, and Reporting of Emergency and Nonroutine Events at the Feed Materials Production Center B1 of B3

1.0

1.0 OVERVIEW

1.1 BACKGROUND

This Community Relations Plan describes a program that will be an integral part of the Fernald Materials Production Center (FMPC) Remedial Investigation and Feasibility Study (RI/FS). To identify community concerns and desired opportunities for public involvement in this RI/FS, discussions were held with citizens and local officials living near the FMPC in April, 1986. During these discussions, community members identified two major information and involvement needs: (1) accurate, understandable, and timely information concerning the RI/FS; and (2) frequent opportunities to interact with RI/FS investigators. To meet these needs, an information and involvement program will be implemented, as detailed in this plan.

1.2 PROGRAM OBJECTIVES

The objectives of the information program during the site characterization study and analysis of remedial alternatives are:

- To provide the community with accurate, understandable, and timely information;
- To give community members opportunities to review data and analyses and to consider their viewpoints in RI/FS planning; and
- To develop good working relationships with community members.

It is anticipated that the plan may change to reflect changing communication needs. For example, as the RI/FS proceeds, community members may ask to hold more or fewer meetings than are specified in the plan. Community members will be consulted on a regular basis to determine whether the approaches specified in the plan are effective or require modification.

1.3 PLAN ORGANIZATION

The Community Relations Plan contains the following sections:

- Section 2.0 describes the RI/FS that will be performed. This section should enhance the community's understanding of the remedial investigation effort and the evaluation of remedial alternatives.
- Section 3.0 presents a summary of community concerns that will be addressed in the community information program.
- Section 4.0 describes information activities that will be a key part of the community information program. These activities are not necessarily related to RI/FS milestones.
- Section 5.0 lists community information activities targeted to specific RI/FS milestones.

Table 1-1 contains a list of managers with major responsibilities for the RI/FS. The name, telephone number, and address of the Community Relations Manager for this RI/FS is also listed. All communications should be addressed to the Community Relations Manager.

1.4 EXISTING ENVIRONMENT

1.4.1 REGIONAL LOCATION AND BOUNDARY FEATURES

The FMPC is located near the unincorporated village of Fernald in the Great Miami River Valley approximately 20 miles northwest of Cincinnati in southwestern Ohio. The unincorporated villages of New Baltimore, Ross, and Shandon are within a few miles. Hamilton, Ohio is approximately 10 miles northeast. Table 1-2 presents information on the population of each community within a five-mile radius of the FMPC, as well as the distance from the FMPC.

The FMPC comprises 1,050 acres. Approximately 850 acres lie in northern Hamilton County and about 200 acres in adjacent Butler County. The Production Area encompasses approximately 136 acres

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TABLE 1-1
PROJECT MANAGEMENT

WMCO Project Manager	
Mr. Robert Conner	(513) 738-6017
ASI Project Director	
Mr. Richard T. Wilde	(513) 738-3100
WMCO Community Relations Manager	
Ms. S. R. Cook	(513) 738-6750

TABLE 1-2

POPULATION CENTERS WITHIN A
FIVE-MILE RADIUS OF THE FMPC

POPULATION CENTER	APPROXIMATE DISTANCE	ESTIMATED POPULATION
Fernald	1.75	39
Shandon	2.0	200
Venice (Ross)	2.5	3,000
New Baltimore	2.75	200
New Haven	3.0	200
Dunlap	4.0	100
Harrison	5.0	4,408
Total		8,147

Ref. NLO, 1977

in the center of the FMPC. A detailed description of the FMPC site can be found in Section 2 of the Work Plan. The FMPC is bounded by Ohio Route 126 to the north, a transmission line to the east, Willey Road to the south, and Paddy's Run Road and the Chesapeake and Ohio Railroad to the west (Figure 1-1).

1.4.2 LAND USE AND POPULATION

The FMPC is located in Hamilton and Butler Counties, which are highly urbanized. The local area is characterized by residential, commercial, and light industrial development along the Great Miami River and highway corridors. The community of Ross lies at the junction of state routes 126 and 128 about two miles northeast of the FMPC. Areas immediately surrounding the FMPC are primarily rural in nature, characterized by the predominance of agriculture, with some light industry and scattered residences.

Other local land uses include sand and gravel operations along the Great Miami River, industrial facilities (e.g., Delta Steel), parks, and primary and secondary transportation corridors. The two commercial sand and gravel extraction operations are located one mile east and two miles southeast of the FMPC, respectively.

Three parks that are used primarily during the summer lie in the vicinity of the FMPC. Camp Ross Trails (1.5 miles northeast) and Camp Fort Scott (2.0 miles southeast) are youth camps operated by the Girl Scouts of America and the Roman Catholic Archdiocese of Cincinnati, respectively. The Miami Whitewater Forest, located 5.0 miles southwest of the FMPC, is one of the largest parks in Hamilton County. Approximately 20 percent of the 2,260-acre park is available or may be developed for public use (e.g., golfing, paddle boats). The remainder is dedicated as a wildlife sanctuary (Welsh, 1986).

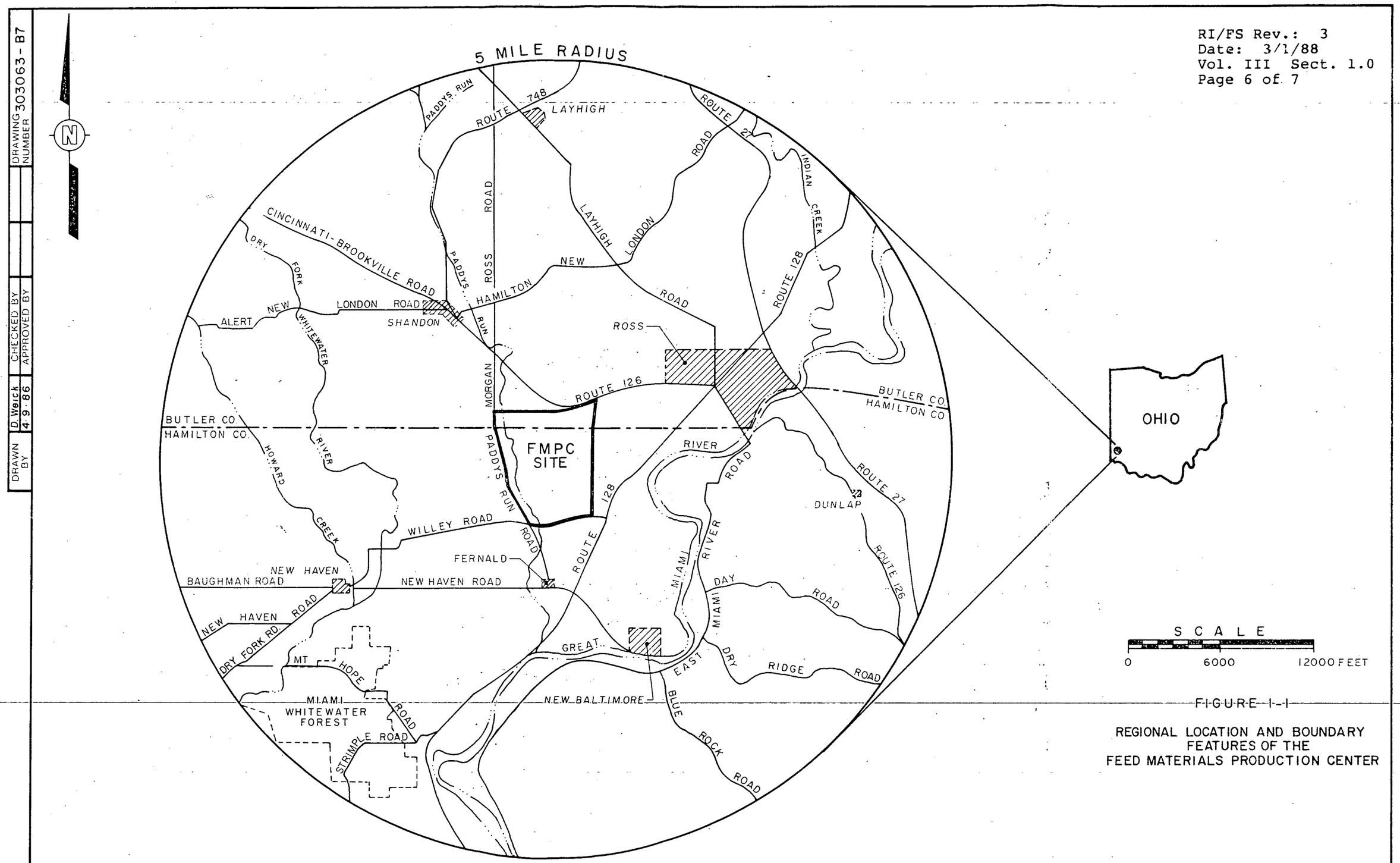

FIGURE I-1

REGIONAL LOCATION AND BOUNDARY FEATURES OF THE FEED MATERIALS PRODUCTION CENTER

DRAWN BY	D. Warck 4-9-86	CHECKED BY / APPROVED BY		DRAWING NUMBER	303063-B7

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"Do Not Scale This Drawing"

65360

Land use in Butler County is guided by the County Land Use Plan which was adopted in 1983-1984. Morgan Township, adjacent to the FMPC within Butler County, has zoning ordinances and relies on the County plan to control land uses. Ross Township (containing approximately 200 acres of the 1,050 acre FMPC) zones by class, i.e., residential or agricultural (Kosobut, 1986). The area north of the FMPC and south of state route 126 is zoned for agricultural use (Thiem, 1986).

Hamilton County does not have a county plan; some individual townships or municipalities have their own zoning ordinances (Brienza, 1986). The majority of the FMPC is within Crosby Township, which controls land use through zoning. Land immediately south of the FMPC is zoned industrial, and to the east is zoned agricultural. The FMPC existed prior to township zoning and is thus pre-empted from zoning ordinances (Strunk, 1986).

There are no hospitals or retirement homes within five miles of the FMPC; the closest facilities are located in the cities of Hamilton and Cincinnati. The nearest schools are located in Ross or the Crosby Township School on New Haven Road, both approximately 2.0 miles from the FMPC.

Within 50 miles of the FMPC there is a population of approximately 2,577,000. Hamilton County supports a population of about 864,000 and Butler County a population of about 275,000 (NLO, 1985). Most populated areas in the vicinity of the FMPC are unincorporated small towns varying from an estimated population of 39 at Fernald to 3,000 at Ross (Table 1-2).

1.4.3 REPORTS OF HUMAN OR ANIMAL ILLNESS RELATED TO FMPC

There are no known reports of human or animal illness related to the production processes at the FMPC.

2.0

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2.0 INVESTIGATION AND STUDY

The Community Relations Program defined by this plan supports both an investigation of the FMPC and potentially affected areas within site boundaries, and an evaluation of remedial alternatives. The RI consists of:

- Evaluating the current situation within site boundaries, including preparing a summary of actual and potential on-site and off-site health and environmental effects, preparing a history of previous response actions, establishing a grid system, and preparing a site map;
- Preparing a comprehensive Sampling Plan, which includes work plans for the site characterization;
- A Health and Safety Plan, a Quality Assurance Project Plan, and a Data Management Plan. The Community Relations Plan is also a component of the comprehensive Work Plan; and
- Conducting all investigations necessary to characterize the site and its actual or potential hazard to public health and the environment, and preparing a thorough analysis and summary of these investigations and their results.

In the FS, remedial alternatives for the FMPC Waste Storage and Production Areas, as well as other FMPC areas requiring remediation, will be developed and evaluated. Remedial response objectives include identifying feasible remedial technologies and alternatives, screening those alternatives against environmental protection, public health and environmental effect criteria, and determining the technical feasibility of the remedial alternatives. Finally, those alternatives that pass initial screening will be subjected to a thorough technical, environmental, public health, and institutional analysis. They will be ranked on the basis of this analysis, and submitted to the U.S. EPA for the selection of the preferred alternative.

As described in Section 3.0 of this plan, residents living near the FMPC and local officials are concerned about the data that

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will emerge from the investigation, and are interested in the analysis and selection of a remedial alternative. The community has expressed a strong desire for information and frequent interaction with RI/FS investigators. As described in Sections 4.0 and 5.0 of this plan, a number of activities will be undertaken to ensure that community members understand the statements of work, are informed about RI/FS progress, and have an opportunity to review data and analyses. A summary of the overall statement of work and corresponding community information activities for the RI and FS are provided in Tables 2-1 and 2-2, respectively.

TABLE 2-1

COMMUNICATION ACTIVITIES

FMPC REMEDIAL INVESTIGATION

TECHNICAL TASKS

Evaluate current waste situation on-site; develop a comprehensive work plan for Phase I work, Estimated completion:
Waste Storage Area - June 1988
Production Area - October 1988

- Prepare site background data.
- Prepare a summary of actual/potential on-site and off-site health and environmental effects.
- Establish site boundary conditions and grid system, and prepare map.
- Identify broad categories of applicable remedial technologies.
- Develop a Sampling Plan, a Health and Safety Plan, a Quality Assurance Project Management Plan.

COMMUNITY INFORMATION ACTIVITIES

Conduct activities that will inform the community about the RI/FS

- Prepare a press release which will:
  - -- Announce beginning of RI/FS.
  - -- Explain purposes of study and how to obtain additional information.
  - -- Publicize name and number of liaison to community.
- Hold first meeting with interested local citizens (see section 4.3 of this plan to review work plans, answer questions, and elicit community views.

TABLE 2-1 (Continued)

COMMUNICATION ACTIVITIES

FMPC REMEDIAL INVESTIGATION

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Conduct site investigations. Estimated completion: Waste Storage Area - April 1989 Production Area - April 1989 Investigations will include: • Radiation measurements • Surface soils investigation • Ground water investigation • Subsurface soils investigation • Surface water and sediment investigation • Biological resources investigation • Facilities testing	Conduct all relevant information activities. Activities will include: • Prepare press releases on the investigations. • Maintaining information in the reading areas. • Providing information to the media and local officials, as requested. • Holding discussions with the communities.

TABLE 2-1 (Continued)

COMMUNICATION ACTIVITIES

FMPC REMEDIAL INVESTIGATION

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Analyze results of site investigations. Estimated completion: Waste Storage Area: mid 1989 Production Area: mid 1989 • Prepare a thorough analysis and summary of all site investigations. • Analyze results of the site investigation in relation to potential remedial technologies applicable to the site. • Prepare final report on the characterization of the FMPC and potentially affected areas within site boundaries.	Conduct activities that will inform community members about the results of the site investigation. • As Task 1.3 begins, announce the provide analysis phase of investigation; provide estimated publication date of final report. • Throughout Task, conduct all relevant information activities listed in Section 4.0 of this plan. • When the final report is issued: -- Hold discussions with interested citizens or officials that facilitates review and discussion of study results. -- Hold detailed media briefing. -- Place report in reading areas.

TABLE 2-2

COMMUNICATION ACTIVITIES

FMPC FEASIBILITY STUDY

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Evaluate any changes in the understanding of the waste situation on site; prepare work plan for FS. Estimated completion: 30 days after approval of FS startup. • Based on data gathered during the site investigation, clarify understanding of problems and issues related to cleanup. • Prepare a work plan for FS. Include technical approach, personnel requirements, and schedules.	Conduct activities that will inform the community about the initiation of the analysis of remedial alternatives. • Announce beginning of alternative evaluation study; explain purpose of study and current understanding of problems and issues. • Hold meeting with interested local citizens to review work plan, and answer questions. • Revise Community Relations Plan to reflect community comments on FS Work Plan. • Continue to conduct all relevant information activities listed in Section 4.0 of this plan.

TABLE 2-2 (Continued)

COMMUNICATION ACTIVITIES

FMPC FEASIBILITY STUDY

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Develop and screen alternatives for source control of off-site remedial actions, or both. Estimated completion: Summer 1989 • Establish objectives. • Identify technologies. • Identify alternatives. • Screen alternatives on the basis of public health and environmental protection, and technical feasibility. • Eliminate alternatives for further study that do not meet screening criteria.	Conduct activities that will inform the community about the process of developing screening alternatives; provide opportunities for community members to comment on objectives, identified alternatives, and the screening process. • Prepare a press release to explain process of developing and screening alternatives. • Hold a meeting with community representatives during this task to ensure that community members have an opportunity to discuss the screening process. • When alternatives are selected for further analysis, again issue a press release to document interim decision. • Continue to conduct all relevant information activities listed in Section 4.0 of this plan.

TABLE 2-2 (Continued)

COMMUNICATION ACTIVITIES

FMPC FEASIBILITY STUDY

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Conduct detailed analysis of alternatives and prepare draft and final reports. Estimated completion: Waste Storage Area: Fall 1989 Production Area: Fall/Winter 1989 • Analyze each alternative's technical viability, environmental acceptability, ability to protect public health, institutional viability, and costs. • Rank alternatives against selected criteria.	Conduct activities that will inform the community about the analysis of alternatives and that will provide community members with an opportunity to comment prior to the selection of a remedial alternative. • Prepare a press release to explain the process of analyzing alternatives, the alternatives under consideration, and the ranking process. • Announce preliminary findings on ranked alternatives. • Hold a discussion with interested citizens or officials to explain the preliminary findings on ranked alternatives. Follow seminar with a three-week period during which time community members can study and prepare additional questions.

TABLE 2-2 (Continued)

COMMUNICATION ACTIVITIES

FMPC FEASIBILITY STUDY

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
• Prepare preliminary findings and draft report. • Prepare final report.	• At the conclusion of the three week review period, hold a public meeting on the preliminary findings on remedial alternatives. During the meeting, community members will have an opportunity to question members of a panel including Department of Energy officials, WMCO personnel, study investigators, local officials, and representatives from the community. Time limits for questions of the panel would be imposed by an impartial third party chair. • Throughout the task, conduct all relevant information and involvement activities listed in Section 4.0 of this plan.

3.0

7

3.0 CITIZEN INFORMATION AND INVOLVEMENT NEEDS

Community involvement prior to 1984 was very minimal. In 1986, nearby residents were interviewed to identify their concerns for the health and welfare of those who live near the FMPC. The following general concerns were identified by the participants:

- Accurate, timely communications;
- Ease of access to information;
- Technical information and data;
- Sensitivity to declining property values; and
- Interactions with contractor staff.

Health and environmental concerns expressed by the nearby residents during discussions centered around these major areas:

- The safety of the K-65 silos and the potential for radioactive releases;
- The reduction of noise and ground vibration levels at the site from FMPC machinery and processes;
- The identification of radiological toxic materials on-site and dissemination of information about the shipping, storage, and disposal of these materials; and
- The reduction of fumes and particulates released into the atmosphere from plant processes and dust collectors.

The Community Relations Plan will highlight technical changes and improvements as they occur. In order to keep the community informed as issues are resolved, the Community Relations Plan will include frequent discussions with nearby residents and interested citizens on a regular basis, in addition to frequent publicized information via press releases. For example, on the K-65 stabilization project, a press briefing was held in advance of project start-up. Local residents were continually updated on the progress of remedial work on the K-65 silos.

A list of names, addresses, and telephone numbers of key state and local officials, local congressional staff offices, state elected officials, state environmental and pollution control agencies, public interest groups, and the media is included as Appendix A. A mailing list of local residents has been compiled; it will be used with discretion during the course of the RI/FS.

4.0

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4.0 THE GENERAL PROGRAM

This section describes information and involvement activities that will be conducted during the remedial investigation and the analysis of remedial alternatives. In general, these communication activities are applicable to all phases of the RI/FS and are not necessarily related to study milestones. This section will explain how these activities address the community information needs discussed in the preceding section.

4.1 COMMUNITY RELATIONS MANAGER

Community members have stated that they do not know which WMCO representative to contact with specific questions related to the FMPC. To address this problem, Ms. S. R. Cook has been designated by WMCO as the Community Relations Manager to the community. Ms. Cook will be available to answer public officials' and residents' questions on a day-to-day basis. In addition, Ms. Cook will set up meetings between community members and other study investigators, and assist community members in identifying information or reports that will be useful for examining RI/FS data or developing conclusions. Ms. Cook may be reached at (513) 738-6750, P.O. Box 398704, Cincinnati, Ohio 45239.

4.2 READING AREAS

Community members have requested that an off-site reading area be maintained, with circulating copies of reports in both the off-site reading area and in the FMPC reading room.

Duplicate copies of technical reports, fact sheets, news releases, and briefings related to the RI/FS, as well as other relevant information related to the FMPC, will be placed in the following FMPC reading rooms:

- Lane Public Library
  North 3rd and Buckeye Streets
  Hamilton, OH 45011
  (513) 894-7156

  Hours: Mon - Thurs 9AM - 9PM
  Fri - Sat 9AM - 9PM
  Sun 1PM - 5PM

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- FMPC Administration Building Entry Foyer
  7400 Willey Road
  Fernald, OH
  (513) 738-6376.
  Hours: Mon - Fri 7AM - 6PM

An index of items in the reading rooms will be updated monthly. Residents may check out circulating copies for a seven-day period. Duplicate copies will be placed in the Lane Library in Hamilton.

The reading areas have been available for public use since June 1, 1986. The Hamilton Journal, The Cincinnati Post, and The Cincinnati Enquirer carried announcements of reading room availability.

4.3 REGULAR MEETINGS

Community members have stressed a desire for ease of access to information, and regular opportunities to discuss RI/FS progress with the RI/FS investigators in order to clarify explanations of technical data and RI/FS results. Community members have also requested productive meetings that encourage dissemination of information and two-way discussion without generating negative publicity. To help address these needs, RI/FS investigators will meet with a small group of interested residents and public officials within the Fernald community three times a year to discuss RI/FS progress in detail, to answer questions, and to elicit community viewpoints. Participants will include technical experts and individuals responsible for the RI/FS investigation and analysis.

At this time, it is believed that three meetings per year may be most effective because it gives community representatives sufficient time to study reports and prepare for the next meeting. Meetings will be held more or less frequently if community members believe a different schedule is more appropriate, or

if it is important to schedule a meeting to support an RI/FS milestone (as described in Section 5.0 of this plan). Questions will be answered or comments provided on RI/FS progress or results as needed. The Community Relations Manager will be available daily to answer questions and transmit resident comments to study managers.

Smaller, more frequent meetings with community members desiring participation may be more productive than infrequent large meetings. Note in Table 2-2 that a public meeting will be held to review the recommended remedial alternative. This activity will be to meet with the local, interested public to discuss citizen questions, and to respond to information requests from the media. Advance notification of meetings and topics will be given so that interested community members may attend and participate.

Local, elected officials and school board members will be invited to evening seminars to review and discuss investigation activities and results. These meetings will be held at least three times during the year.

The public will have access to a Speaker's Bureau to provide discussion at any small group meeting. Speakers will be well versed on investigation activities to accurately respond to questions.

4.4 QUARTERLY NEWSLETTER

To provide another mechanism for improving access to timely information about the RI/FS, a quarterly newsletter will be distributed. The newsletter will be a substantive report of RI/FS progress, data gathered and analyzed, problems encountered, and future direction.

The newsletter will be placed in the FMPC reading room and in the Lane Library in Hamilton. It will be sent to community and environmental organizations, local, state, and federal officials,

the media, real estate firms, and individuals or groups requesting a copy.

4.5 MEETINGS WITH LOCAL OFFICIALS

Information on RI/FS progress will be provided to local officials prior to township or county meetings. For example, prior to the monthly meeting of township trustees, RI/FS actions taken since the last meeting will be identified, any RI/FS findings summarized, and activities scheduled for the following month outlined.

4.6 MEDIA BRIEFINGS

As RI/FS milestones occur, RI/FS investigators will hold detailed briefings for media representatives. The media will also be encouraged to provide features and updates on RI/FS progress and will be supplied with information that will be useful for preparing those reports.

4.7 OTHER COMMUNICATION ACTIVITIES

RI/FS progress, findings, data, and future direction will be presented in a number of ways. A site tour program will be implemented to show where and how site contractors are working at the facility. The Speaker's Bureau program discussed in Section 4.3 will be established to meet the information needs of schools, community groups, environmental organizations, and local businesses. In the event of an emergency or nonroutine event at the FMPC, a plan is in existence for the notification of the public. This plan is provided in Appendix B of this document.

5.0

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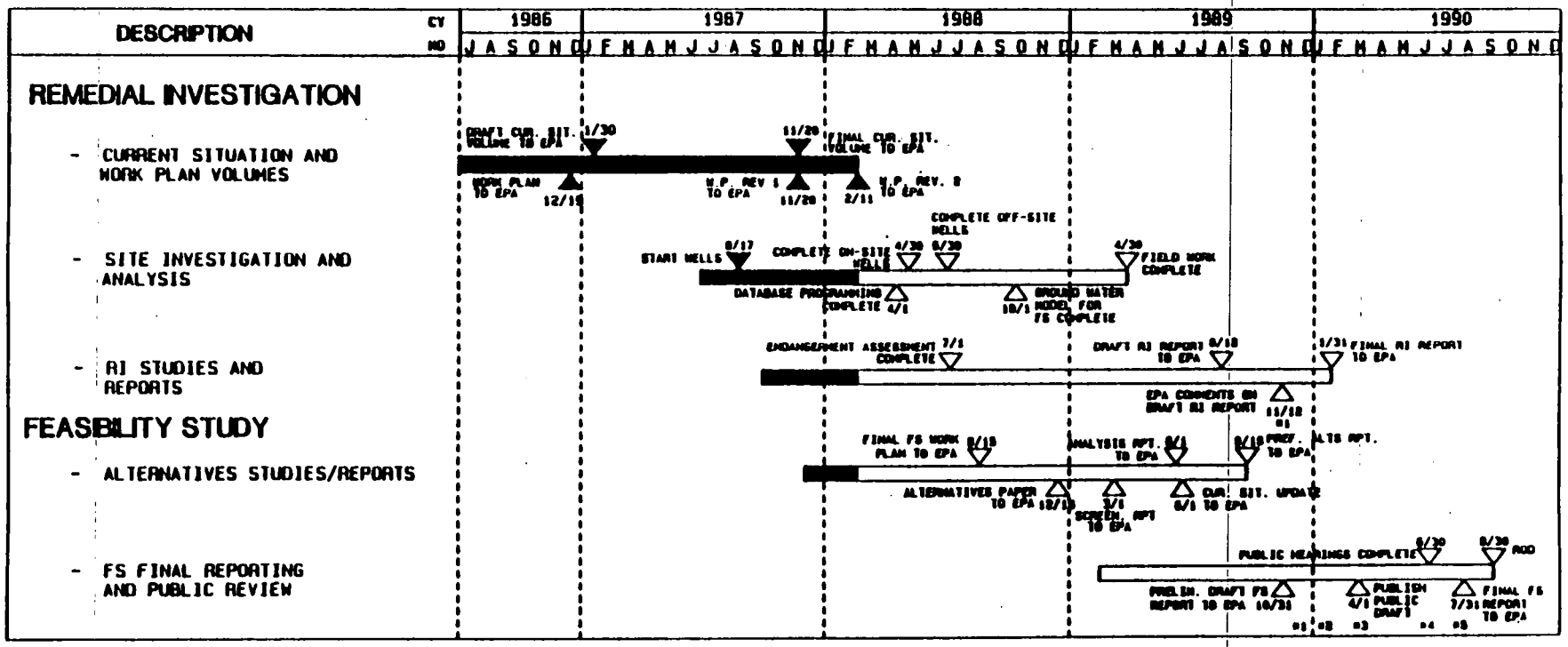
5.0 STUDY MILESTONES AND COMMUNICATION ACTIVITIES

The previous section described general approaches to providing information and eliciting community viewpoints about the RI/FS. Tables 2-1 and 2-2 define the two-way communication program that has been planned for each stage of the RI/FS. The schedule of milestones for the RI/FS is presented in Figure 5-1.

FMPC REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SUMMARY PROJECT SCHEDULE



LEGEND

MILESTONE-PLANNED ▽-----◇ FORECAST-LATE

MILESTONE-ACTUAL ▼-----◆ ACTUALLY LATE

* NOTES

1. EPA REVIEW AND COMMENT PERIOD FOR DRAFT RI REPORT AND FS PRELIM. DRAFT NOT TO EXCEED 60 CALENDAR DAYS.
2. SIXTY CALENDAR DAYS ASSUMED TO INCORPORATE EPA COMMENTS TO PRELIM. DRAFT FS.
3. EPA REVIEW AND COMMENT PERIOD FOR PUBLIC DRAFT FS NOT TO EXCEED 60 CALENDAR DAYS.
4. THIRTY DAY PUBLIC REVIEW PERIOD, THIRTY DAYS FOR CONDUCT OF PUBLIC HEARINGS.
5. SCHEDULE IMPACTS MAY OCCUR DUE TO SCOPING CHANGES OR LONGER THAN PLANNED REVIEW TIMES.

REVISION STATUS		
REV	DATE	REFERENCE
0	6/26/87	BASELINE SCHEDULE
1	2/11/88	WORK PLAN, REV.2

PAGE 1 OF 1

FIGURE 5.1

APPENDIX A

7

APPENDIX A

LIST OF STATE AND LOCAL OFFICIALS AND MEDIA OFFICES

APPENDIX A

LIST OF STATE AND LOCAL OFFICIALS AND MEDIA OFFICES

U.S. Senator Mitch McConnell
Suite 120
Russell Senate Office Bldg.
Washington, D.C. 20510
(202) 224-6395

(606) 261-6304
Room 307
Federal Office Bldg.
Covington, KY 41011

U.S. Senator John Glenn
Room 503
Hart Senate Office Bldg.
Washington, D.C. 20510
(202) 224-3353

(513) 684-3265
Room 600
Federal Office Bldg.
Cincinnati, OH 45202

U.S. Senator Howard Metzenbaum
Room 140
Russell Senate Office Bldg.
Washington, D.C. 20510
(202) 224-2315

Room 10411
Federal Office Bldg.
Cincinnati, OH 45202
(513) 684-3894

Congressman Thomas A. Luken
Room 2368
Rayburn House Office Bldg.
Washington, D.C. 20515
(202) 225-2216

Room 712
Gwynne Bldg.
602 Main Street
Cincinnati, OH 45202
(513) 684-2723

Congressman Donald E. Lukens
117 Cannon Hse. Office Bldg.
Washington, D.C. 20515
(202) 225-6205

646 High Street
Hamilton, OH 45011
(513) 895-5656

Congressman Bill (Willis D.) Gradison Jr.
Room 2311
Rayburn House Office Bldg.
Washington, D.C. 20515
(202) 225-3164

Room 8010
Federal Office Bldg.
Cincinnati, OH 45202
(513) 684-2456
(513) 684-3967

Federal Environmental Protection Agency
26 West S. Clair Street
Cincinnati, Ohio 45268

(513) 569-7931

Ohio Environmental Protection Agency
7 East 4th Street
Dayton, Ohio 45402

(513) 449-6357

Ohio Environmental Protection Agency
5092 Aber Road
Jackson, Township
Williamsburg, Ohio 45176

(513) 724-1522

APPENDIX A (CONTINUED)

HAMILTON COUNTY COMMISSIONERS

Norman A. Murdock (513) 632-8222
Room 603
County Administration Bldg.
138 East Court Street
Cincinnati, Ohio 45202

Robert A. Taft II (513) 632-8222
Room 603
County Administration Bldg.
138 East Court Street
Cincinnati, Ohio 45202

Joseph M. DeCourcy (513) 632-8222
Room 603
County Administration Bldg.
138 East Court Street
Cincinnati, Ohio 45202

BUTLER COUNTY COMMISSIONERS

Courtney Combs (513) 867-5800
Butler County Administration Center
130 High Street
Hamilton, Ohio 45011

Cale Logsdon (513) 867-5800
Butler County Administration Center
130 High Street
Hamilton, Ohio 45011

Edward Shelton (513) 867-5800
Butler County Administration Center
130 High Street
Hamilton, Ohio 45011

APPENDIX A (CONTINUED)

MEDIA OFFICES

WCKY/WWEZ 219 McFarland St. Cincinnati, OH 45202	(513) 241-6565
WGUC 1223 Central Pkwy Cincinnati, OH 45214	(513) 475-4444
WKRC/WKRQ Radio 1906 Highland Avenue Cincinnati, Ohio 45219	(513) 381-5500 (513) 721-6397 (News Room)
WLW-AM Radio 3 East 4th Street Cincinnati, Ohio 45202	(513) 241-9597 (513) 421-6397 (Newsline)
WMOH 2081 Fairgrove Avenue Hamilton, OH 45011	(513) 863-6501 (News Room)
WCPO Television (Channel 9) (CBS Affiliate) 500 Central Avenue Cincinnati, Ohio 45202	(513) 852-4072 (News Room)
WKRC-TV (Channel 12) (ABC Affiliate) 1906 Highland Avenue Cincinnati, OH 45219	(513) 651-1207 (513) 421-6872 (News Room)
WLWT-TV (Channel 5) (NBC Affiliate) 140 W. 9th. Street Cincinnati, OH 45202	(513) 352-5011
WXIX-TV (Independent) 10490 Taconic Terrace Cincinnati, OH 45215	(513) 772-1919
Associated Press 617 Vine Street Cincinnati, OH 45202	(513) 241-2386
Cincinnati Business Courier 1005 Carew Tower Cincinnati, OH 45202	(513) 621-6665
Cincinnati Business Journal 1212 Scamore Street Cincinnati, OH 45210	(513) 241-7701

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APPENDIX A (CONTINUED)

HAMILTON COUNTY TRUSTEES

COLERAIN TOWNSHIP

Patricia Clancy
John Schivierling
Joseph Walterman
William Lenhart, Clerk (thru March 31, 1988)
Kathy Mohr, Clerk (after April 1, 1988)

Municipal Bldg
Colerain Township
4200 Springdale Road
Cincinnati, OH 45239
(513) 385-7500

CROSBY TOWNSHIP

James Miller
Gary Storer
Warren Strunk
Doris Turner, Clerk

Municipal Building
Crosby Township
9139 Baughman Road
Harrison, OH 45030
(513) 738-2356

BUTLER COUNTY TRUSTEES

MORGAN TOWNSHIP

Charlotte Lahmann, Clerk [redacted]

Karl Dillhoff [redacted]

Robert Copeland [redacted]

Gary Colegate [redacted]

ROSS TOWNSHIP

James M. Brown, Clerk [redacted]

Larry Rohling [redacted]

Thomas Willsey, Jr. [redacted]

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APPENDIX A (CONTINUED)

BUTLER COUNTY TRUSTEES (CONTINUED)

Donald H. Thiem [redacted] [redacted]

David M. Young [redacted] [redacted]

*FRESH

(*FERNALD RESIDENTS FOR ENVIRONMENTAL SAFETY AND HEALTH)

c/o Lisa Crawford (513) 948-3779 (Office)
[redacted] [redacted] (Home)

LEAGUE OF WOMEN VOTERS OF CINCINNATI

102 William Howard Taft Road (513) 281-8683
Cincinnati, Oh 45219

SIERRA CLUB

6425 Orchard Lane (513) 841-0111
Cincinnati, OH 45213

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APPENDIX A (CONTINUED)

MEDIA OFFICES (CONTINUED)

Cincinnati Enquirer 617 Vine Street Cincinnati, Ohio 45202	(513) 369-1951
Cincinnati Post 125 E. Court Street Cincinnati, Ohio 45202	(513) 352-2706
Cincinnati Suburban Press Western Division 5505 Cheviot Road Cincinnati, OH 45247	(513) 661-8352
Fairfield Echo 5120 Dixie Hwy. Fairfield, OH 45014	(513) 829-7900
(Hamilton) Journal-News Court & Journal Square Hamilton, Ohio 45011	(513) 863-8200 (Ext. 453)
Harrison Record 613 Harrison Avenue Harrison, OH 45030	(513) 367-0261
Harrison Press 307 Harrison Avenue Harrison, OH 45030	(513) 367-4582
Register Publications 126 W. High Street, P.O. Box 328 Lawrenceburg, IN 47025	(812) 537-0063
United Press International 125 E. Court Street Cincinnati, OH 45202	(513) 721-0345
Whitewater Publications P.O. Box 38 Brookville, IN 47021	(317) 647-4221

APPENDIX
B

7

APPENDIX B

PROCEDURES FOR THE CLASSIFICATION, NOTIFICATION, AND REPORTING OF EMERGENCY AND NON-ROUTINE EVENTS AT THE FEED MATERIALS PRODUCTION CENTER

APPENDIX B

PROCEDURES FOR THE CLASSIFICATION, NOTIFICATION, AND REPORTING OF EMERGENCY AND NON-ROUTINE EVENTS AT THE FEED MATERIALS PRODUCTION CENTER

Procedures for the classification, notification, and reporting of emergency and non-routine events at the FMPC are outlined in the following DOE Orders:

1. DOE Order 5500.4 -- Public Affairs Policy and Planning Requirements for Emergencies.

2. Draft DOE Order 5500.2a -- Procedures for the Classification, Notification, and Reporting of Emergency and Non-Routine Events.

At the FMPC, it is the responsibility of the Emergency Duty Officer or the Assistant Emergency Duty Officer (AEDO) to notify WMCO's Public Affairs office by phone and/or facsimile of any "reportable events" at the FMPC that might require notification of the news media or the general public. A copy of the AEDO Event Log is provided daily to the Public Affairs office.

The WMCO Director of Public Affairs shall have a staff member designated as Public Information Duty Officer 24-hours a day to respond to plant emergencies and to notify the public and media if the level of the emergency and/or the public sensitivity to an incident are sufficient to require public notification.

The Public Information Duty Officer will be available to assist WMCO and DOE management in determining the emergency classification level and the public sensitivity. Emergency press releases must be authorized and approved in advance by WMCO and DOE management. The Public Information Duty Officer will gather the information concerning the emergency, prepare a news release and verify the information for accuracy.

If time permits, the news release is reviewed by the DOE's Oak Ridge Operations Public Information Manager prior to issuance. Upon approval, appropriate local news media and selected plant neighbors and local governmental officials are notified by representatives of WMCO's Public Affairs staff of the plant emergency situation via the news release or press statement.

An Emergency Operations Center (EOC) has been established at the FMPC to provide an enhanced capability for the management of a plant emergency. Resources available in the EOC include maps, engineering drawings, emergency reference materials, and communications and computer equipment.

The Director of Public Affairs or his designee is an active member of the EOC staff. Should it be activated by WMCO management, the EOC provides word processing, facsimile, telephone, electronic mail, and reproduction capabilities to the Public Affairs Director.

The Director of Public Affairs or his designated Public Information Duty Officer is also authorized to activate the FMPC's Joint Public Information Center (JPIC) depending upon the severity or potential severity of the plant emergency. The Emergency Duty Officer, or his designee, and the Emergency Director, or his designee, may also call for activation of the JPIC, as provided for in the Joint Public Information Center Procedure. In the event of JPIC activation, news media would be notified to report to the JPIC for press releases and briefings rather than to the FMPC.

VOLUME IV

DATA MANAGEMENT PLAN FOR THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY OF THE FEED MATERIALS PRODUCTION CENTER FERNALD, OHIO

Prepared for:

U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

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NOTE:

This volume, Volume IV: Data Management Plan is part of the Work Plan and supporting documents for the Remedial Investigation and Feasibility Study (RI/FS). This volume was not reproduced in its entirety during Revisions 1 and 2 of the Work Plan. Individual change pages were used to identify those revisions. For consistency, all components of this submittal of the Work Plan and supporting documents will be referred to as Revision 3.

VOLUME IV

DATA MANAGEMENT PLAN
TABLE OF CONTENTS

SECTION	PAGE
1.0 INTRODUCTION	1 of 2
2.0 TECHNICAL AND SCIENTIFIC DATA MANAGEMENT	1 of 17
2.1 Background	1 of 17
2.2 System Overview	2 of 17
2.3 Environmental Information System Description	3 of 17
2.3.1 Data Collection	3 of 17
2.3.2 Data Validation	6 of 17
2.3.3 Laboratory Analysis	7 of 17
2.3.4 Data Review	7 of 17
2.3.5 Data Base Management System	7 of 17
2.3.5.1 Data File/Partition Structure	8 of 17
2.3.5.2 Data Entry	8 of 17
2.3.5.3 Data Reporting	9 of 17
2.3.6 System Security	10 of 17
2.3.6.1 Functional Access	10 of 17
2.3.6.2 Data Access	11 of 17
2.3.6.3 Record Restrictions	11 of 17
2.3.6.4 Security Profiles	11 of 17
2.3.6.5 User Identification and Password	11 of 17
2.3.6.6 Additional Measures	12 of 17
2.4 Data Analysis Support	12 of 17
2.4.1 Statistical Analysis	12 of 17
2.4.2 X-Y Graphics	13 of 17
2.4.3 Spatial Plotting	13 of 17
2.4.4 Computer Modeling/Simulation	13 of 17
2.5 Operation and Support	14 of 17
2.6 System Summary	15 of 17

7

TABLE OF CONTENTS
(Continued)

SECTION	PAGE
3.0 HISTORICAL DATA INTERFACE	1 of 1
4.0 DATA MANAGEMENT QUALITY ASSURANCE AND QUALITY CONTROL	1 of 5
4.1 Data Base Procedures	1 of 5
4.2 Human Factor Considerations	2 of 5
4.2.1 Source Information Conversions	2 of 5
4.2.2 Machine Processing and Interactions	2 of 5
4.2.3 Machine-Processed Output Utilization	3 of 5
4.3 Data Validation Controls	3 of 5
4.4 Software Development Procedure	4 of 5
5.0 IMPLEMENTATION SCHEDULE	1 of 1

LIST OF FIGURES

FIGURE		PAGE
2-1	REMEDIAL INVESTIGATION/FEASIBILITY STUDY FUNCTIONAL INFORMATION FLOW	4 of 17
2-2	REMEDIAL INVESTIGATION/FEASIBILITY STUDY INFORMATION SYSTEM SUPPORT	16 of 17

1.0

7

1.0 INTRODUCTION

This volume describes the overall plan for data management during the Remedial Investigation and Feasibility Study (RI/FS) at the Department of Energy's (DOE) Feed Materials Production Center (FMPC), operated by Westinghouse Materials Company of Ohio (WMCO).

The purpose of this Data Management Plan is to document the procedures and requirements necessary for the achievement of high data-quality standards. The primary objective of this plan is to highlight the methodology and to characterize the system to be used for all aspects of data handling, such as collection, encoding, entry, verification, extraction, and analysis.

Proper management and use of site characterization data are essential to the effective conduct of an RI/FS. It requires an extensive effort, including:

- Acquisition of a wide variety of physical and chemical data types;
- An orderly procedure for storing and retrieving large amounts of information and site-specific parameters;
- Data validation techniques ensuring maintenance of data quality;
- Application of analytical computer techniques to support technical investigations of the site;
- The use of computer models to synthesize dynamic behavior and potential extent of contaminant transport; and
- Statistical methods to enhance interpretation and communication of information to decisionmakers.

Site data such as geophysical and chemical measurements from soil, water, air, biological, and waste media, along with geographical and institutional data are acquired by specialists in each of the relevant disciplines. The results of various individual studies are contained in distinct data files,

permitting evaluations that become meaningful when integrated within a consistent framework. This framework provides, for example, appropriate data elements related to a common coordinate system, as well as a format that permits efficient access to data and a means to interface with required analytical procedures.

Data base management for this project is a complex task underlying all of the other assigned activities. As with many environmental engineering assignments, data base management is intended to ensure that the collection, handling, verification, analysis, and display of information acquired throughout the investigation is accomplished efficiently, accurately, and in a manner that can be reproduced. To effectively model and evaluate results and to provide information necessary to complete an acceptable feasibility study, an integrated computerized data base management system containing capabilities for graphics, statistical analysis, and technical assessment is required.

2.0

2.0 TECHNICAL AND SCIENTIFIC DATA MANAGEMENT

2.1 BACKGROUND

To conduct the required technical and scientific analyses and studies, it is necessary to acquire, validate, manage, and display large quantities of information describing the FMPC and the geological, hydrological, meteorological, and environmental characteristics of the FMPC site. Data must be accessible to scientists and engineers who will be responsible for converting it into information to be used in completing permit applications, in conducting studies that contribute to determinations of potential health and environmental effects, and in evaluating remediation alternatives that may be necessary. It is expected that the various types of data will be received from hundreds of different locations and that a data base of hundreds of thousands of data elements will be developed over the next several years. Furthermore, continued monitoring over the life of the FMPC will lead to ongoing growth and applications of the data base.

Several criteria were used in evaluating software/hardware requirements for this automated information system. In particular, the data management system is to have the following basic attributes:

- Hierarchical data base management architecture;
- Menu-driven accessibility for user simplicity and short learning curve, as well as menu bypass as users gain experience with the system;
- Multiple-user accessibility (because of the diversity of analytical applications, number of people, and different locations where the system will be used);
- Upload and download capability with completed or partial data;
- Integrated security;

- Flexibility in accepting chemical analysis data directly from a laboratory (either through telecommunications or by magnetic medium); and
- Integrated graphic display, plotting and drawing, and statistical analysis capabilities.

It is evident that effective procedures and processes applying state-of-the-art computer technology are required to provide the project with the level of analytic responsiveness and data consistency that is needed to meet its goals. Without a centralized data management system that makes the same data and information available to all who need it, each investigator would be forced to develop an independent data base, often duplicating effort and exposing the study to inefficiencies, errors, and potential inconsistencies. Furthermore, it is necessary that information flow smoothly from field data collection activities, through data entry and analysis, and ultimately into an active data base that can be accessed as needed and that includes access to external, preexisting sources of information.

All information must enter the data base systematically and be subject to rigorous quality control procedures to produce reliable information that is readily accessible to meet staff needs. The access, transfer, and interpretation of data through the use of statistical analysis techniques, numerical models of ground water or air transport, analytical models, and graphical display routines, must be achieved efficiently.

The benefits of such procedures are multifold, and experience has shown that they enhance productivity, quality, and the capacity to respond to unforeseen information requests that always occur in such programs.

2.2 SYSTEM OVERVIEW

The technical data base management system (DBMS) is a key component of the overall environmental information system that

will support the RI/FS. The DBMS is built around FLOW GEMINI data base management software developed by General Research Corporation. The FLOW GEMINI-based environmental information system is being tailored specifically to meet the assessment and evaluation requirements of a site-oriented, multidisciplinary analysis and waste contamination characterization. As such, the system includes:

- Centralized and distributed data entry with rigid quality assurance procedures for site-sampled data;
- Site grid coordinate system developed as part of the project, with versatile graphic display using CPS-PC developed by Radian and AUTOCAD developed by Autodesk;
- Flexibility in displaying information relative to site geometry, topography, and subsurface conditions;
- Statistical analysis and display software using SAS, SAS-PC, and SAS-GRAPH developed by SAS Institute; and
- Dynamic assessment models to simulate environmental conditions related to ground water and air transport including the models SWIFT III, GEOFLOW, and AIRDOS-EPA/DARTAB.

2.3 ENVIRONMENTAL INFORMATION SYSTEM DESCRIPTION

Prior to describing the characteristics of the FLOW GEMINI-based environmental information system, it is essential to understand the overall functional characteristics of the data flow requirements as depicted in Figure 2-1 and discussed in the following paragraphs.

2.3.1 DATA COLLECTION

The Fernald site will be characterized through the analysis of existing and newly collected data. Factors such as spatial extent of the site, types, volumes, and concentrations of contaminants, geomorphic setting of the site, health and environmental hazard potential, and the possibility for contaminant migration contribute to the range and amount of data to be collected and analyzed.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY FUNCTIONAL INFORMATION FLOW

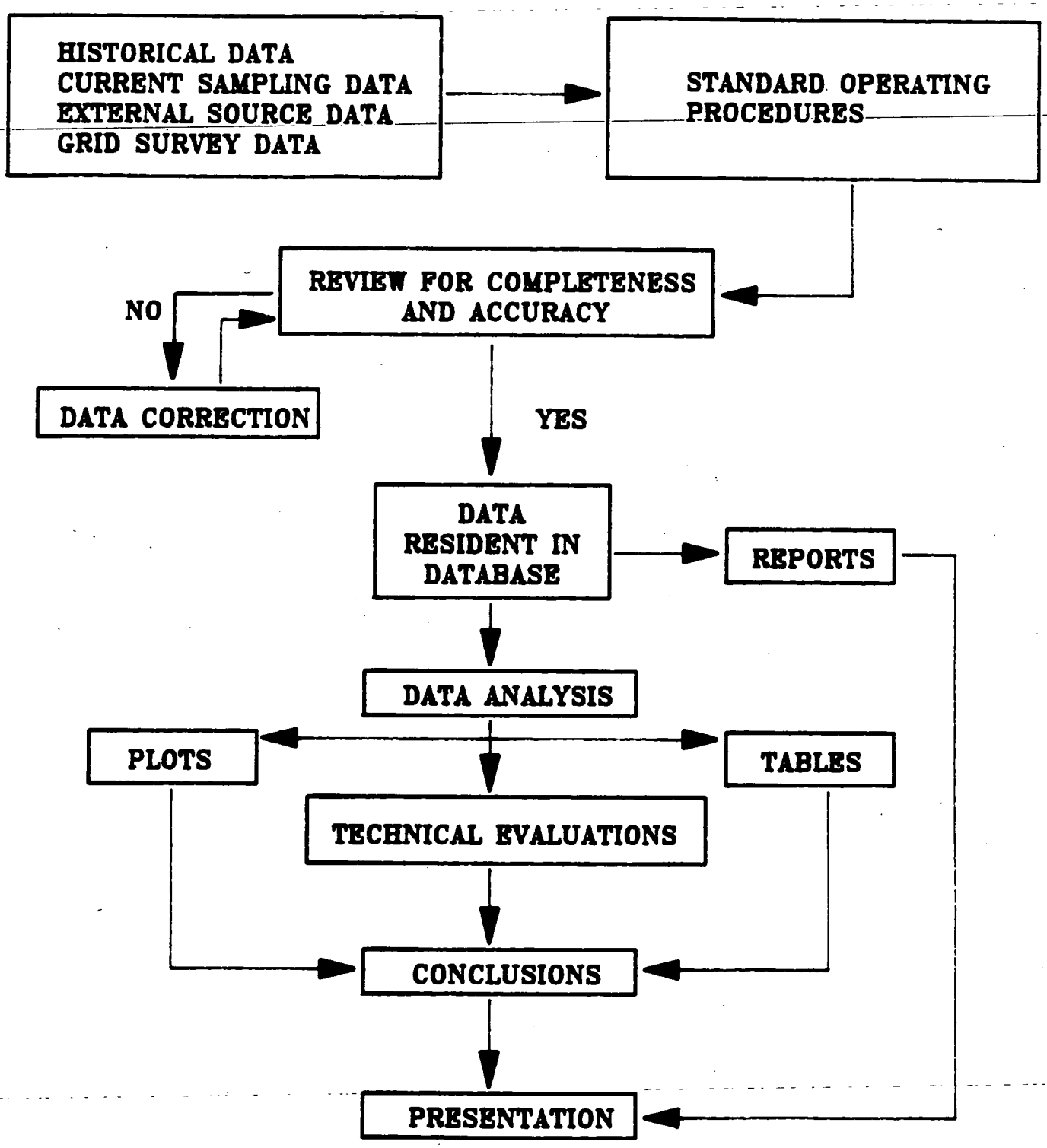

FIGURE 2-1

As related to site characterization, spatial and temporal aspects of data collection must be adequately distributed to correctly identify and bound the existence, sources, nature, extent, and migration of contamination. The iterative requirement of data collection is based upon the extent of knowledge gained in earlier investigations and the inherent complexity of environmental and contaminant interactions. Collection patterns and techniques must be provided for quantification of waste site conditions and are typically employed in various combinations to provide adequate data for a thorough investigation of characteristics and contamination.

For example, the impact of potential contamination of ground water supplies on properties adjacent to the site will be assessed. To accomplish this, the dynamics of ground water flow and subsurface conditions which influence contaminant migration will require investigation. Data from borehole logs, slug and pump test, surface soil measurements, ground water quality analysis, soil physical properties analysis, etc., will be utilized to determine contaminant types, levels, and transport extent and potential. The types, frequency, and locations of data to be collected are described in the Sampling Plan.

Although data will be collected from many different sources by numerous program participants, including subcontractors, all data collection will be controlled by conforming to standardized procedures, maintaining identifiable sampling and analysis documentation, and appropriate labeling practices. This control will be provided by establishing a data collection methodology that identifies responsibility for classification of data, that defines standard formats, that protects against collection of invalid data, and that prevents critical gaps or omissions in the data collected.

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2.3.2 DATA VALIDATION

Validation of data integrity starts with data recording and handling, from field collection through laboratory analysis, and ends when finally entered into the DBMS. The critical factor is the importance of obtaining data from the field in a complete and accurate manner and minimizing human transcription errors. Subsequent data analysis depends upon the integrity of the observation, recording procedures, and the preservation of this information for later interpretation. Preservation of this integrity constitutes the primary objective in the coordination of the various data validation processes.

The quality of data ultimately used in analysis is subject to and influenced by several factors, such as:

- Units of measure that accompany each parameter must be consistent for that parameter throughout the term of measurement.
- Low concentration values, typically values less than a specified detection limit, are qualitatively denoted (e.g., by a "<" sign).
- Significant values of parameters are reported with a consistent number of digits, subject to the same round-off rules, and must be measured with equal precision.

Standard data collection forms promote the control and consistency of data by unifying the content of information, regardless of its origin. Equally important to data collection are the standard operating procedures described in the Quality Assurance Project Plan (QAPP) that outline steps to be taken in the acquisition and review of data. In effect, these procedures address the integrity and validity of information based upon the objectives outlined above. Standard operating procedures also provide the vehicle for establishing authority, responsibility, and accountability for the acquisition and classification of data. Without these guidelines, the data collection process would lack consistency and coordination. Automated systems

designed to manage information inherently require overall consistency to function optimally.

2.3.3 LABORATORY ANALYSIS

Analytical laboratories will provide the results of physical and chemical data analyses in a form suitable for data integration and manipulation and in a state ready for entry into the DBMS. Once laboratory data are reviewed for completeness, they are entered into the data base according to established procedures.

2.3.4 DATA REVIEW

A critical focal point between the data collection process and the DBMS is a manual review of data for completeness, consistency, and accuracy. At this stage, data collected as field measurements or generated by laboratory analysis requires review prior to DBMS entry and storage. Data review is accomplished through data organization and use of standard data collection forms and guidelines established in the standard operating procedures. These procedures strive to provide consistency in data collection.

2.3.5 DATA BASE MANAGEMENT SYSTEM

The automated DBMS that will be used to manage all scientific and technical data from the Fernald site is based on FLOW GEMINI software. There are several reasons for the use of this proven software. It enjoys a history of previous, successful applications in environmental data management. Moreover, WMCO also uses FLOW GEMINI software at the FMPC.

The DBMS will reside in a Digital Equipment Corporation VAX 11/780 minicomputer located at the General Research Corporation facility in Santa Barbara, California. Through time-sharing of

this VAX 11/780, the data will be accessible through a user-dedicated system consisting of microcomputers, graphic printer, and supporting software (e.g., SAS Graph, SAS-PC, CPS). The download and upload capability of this system allows it to interface with other technical data management software used for specific analysis and modeling.

2.3.5.1 Data File/Partition Structure

With the FLOW GEMINI software, the variety of data collected is configured into logical sets of information contained in computerized data files or partitions. These partitions are then structured by the DBMS software to reflect subsets of related data and any pertinent cross-field references. Within each partition are one or more data items that logically define specific segments of the data elements that characterize the content of that particular data set.

2.3.5.2 Data Entry

The data base incorporates screen menus for the entry and modification of data. The screens emulate data collection forms to eliminate the need for manual data copying prior to data entry, thus removing a potential source of error.

The DBMS is both menu-driven and screen-prompt-driven, providing a series of instructions to the user. Both automatic and programmed functions that facilitate data entry and maintenance are incorporated into the data screens. These functions include:

- Error Messages
  When a recognizable error occurs, a message appears on the screen. This message is clear, concise, and is intended to inform the user of the error. There are many reasons for error conditions, including incorrect spelling, unmatched fields, mandatory fields not filled in, and fields exceeding established bounds on the range of values.

7

- Automatic Entry of Repetitious Field Values
  On occasion, there may be a need to enter a value more than once. The screen program is able to duplicate this value and automatically enter it into the record. This not only saves time, but also provides data integrity and reduces error.

- User-Friendly Environment
  The screen is developed with the data entry operator in mind. All steps are taken to limit the amount of paper-oriented assistance and to include this type of help on screen.

- Capability for Developing External Data-Entry Utilities
  Utilities are available to add data that is already entered in a file outside of the data base. These utilities automatically add this data to the data base, thus saving the time to reenter entire partitions.

All data entry will, at a minimum, be verified under the procedure presented in Section 10.3 of the QAPP, which is Volume V of the Work Plan.

2.3.5.3 Data Reporting

The data base reporting modules are flexible and easy to use. These modules run in a batch mode as well as an interactive mode. They incorporate standard query capabilities such as searches and sorts. Standard and customized modules allow for regular production and on-demand reports.

The query language has the capability of providing all data search, analysis, and report-writing features. Some of the standard data query features are:

- Selection of specific partitions;
- Control of partition sequences;
- Selection of specific records;
- Multiple search conditions;
- Alternative search conditions;
- Negative search conditions;
- Search for range;
- Search for values in a list;
- Ordering records;
- Arithmetic expressions;
- Character string functions;

- Data formatting; and
- Data arithmetic.

Customized reporting is required by the user. This includes the customization of data analysis, manipulation of data, and reporting of data. These report modules incorporate all facets of the standard report modules but are produced in specifically requested outputs, occasionally providing more detail than the standard reporting modules.

The need often arises to modify a standard production report. The change may be minor and may only be needed one time. User-friendliness must be stressed here because of the frequent need to produce these reports on short notice.

2.3.6 SYSTEM SECURITY

Security of the data entered, stored, retrieved, and analyzed is an essential requirement for technical, legal, and financial reasons. Moreover, assurance that data are not tampered with is necessary to provide the most fundamental basis for appropriate evaluations and conclusions resulting from the study. Security for data in the FLOW GEMINI system is discussed in the following paragraphs.

2.3.6.1 Functional Areas

Five levels of access that define the types of functions and command users are permitted:

- Administrative Clerk;
- Confidential Clerk;
- Supervisor;
- Data Base Administrator; and
- DBMS Manager.

Examples of the types of commands allowed at each level include commands to add, display, verify, modify, store, or sort data.

2.3.6.2 Data Access

Segments of data that users may access and the types of user access are prespecified. There are three types: (1) NO access; (2) READ ONLY access -- a user may display data but not modify it in any way; and (3) READ/WRITE access, permitting modification and display of the data.

2.3.6.3 Record Restrictions

Types of resident data are grouped so that accessibility to those record groupings can be restricted. For example, sample identification numbers grouped in series can be restricted according to sample type so that only those users authorized to access a particular type of sample data may retrieve it.

2.3.6.4 Security Profiles

Security profiles for every authorized user are established and maintained by the DBMS Manager. For each user, the security profile determines the functional access level, the type of access allowed to specific types of data, and restrictions that may be placed on the entry or retrieval of types of data records.

2.3.6.5 User Identification and Password

Once security profiles for a given user are established, a user identification (User ID) will be issued; usually a person's initials compose the User ID. A six-character password is also assigned. This is not displayed on screen when it is keyed in; it is to be kept confidential by each user and may be changed only by the DBMS Manager if warranted.

The User ID and password are attached to the security profile for each user. This User ID and password, in turn, either permit or restrict access to the data base as described above.

2.3.6.6 Additional Measures

The system can restrict other types of access to data such as certain specified indexed lists necessary to the structure of the data base itself. In addition, the system provides a data base locking function that permits only one user to modify a given record at a time. If such modification is made, the user making the modification is recorded in the system; this provides part of the system audit trail. Finally, types of report requests to be honored by the system are restricted. This prevents unauthorized staff from generating and receiving data.

In cases where an individual may have sufficient authorization to generate a particular type of report, each segment of data retrieved is checked against that person's security profile to ensure that authorization exists. Any unauthorized data does not appear on the report.

2.4 DATA ANALYSIS SUPPORT

In the course of the RI/FS, it is necessary to analyze and evaluate data utilizing analytical techniques not contained in the data base itself. Thus, interfaces are required with a number of basic utility programs to facilitate the site characterization process. The major analytical support utilities are summarized below.

2.4.1 STATISTICAL ANALYSIS

Statistical analysis software is required to perform various statistical operations, to evaluate distributions of data sets over time for various types of data, etc. A curve-fitting utility is also incorporated for graphic presentations. Statistical software packages, SAS and SAS/PC, provide this capability. Data are retrieved from the data base, downloaded to SAS/PC, manipulated, then uploaded back to the data base.

2.4.2 X-Y GRAPHICS

General X-Y plotting capabilities are also incorporated into the DBMS. Extensive user control is provided for the graphical manipulation of data. Various methods are used to plot relationships of data. The SAS/Graph software system and application programs are used to provide this capability.

2.4.3 SPATIAL PLOTTING

Graphic and numeric plotting capabilities are incorporated into the system. In particular, the Radian Corporation CPS/PC software and AUTOCAD software are included. This will enable the generation of a numerical surface distribution over a uniform grid, the plotting of surfaces by various techniques, the representation of data upon a surface or between surfaces, and the numerical analysis of surface distributions. The anticipated primary uses of this system are as follows:

- Plotting the FMPC site to be used as a base map for many other overlain applications;
- Plotting the spatial distribution of well locations;
- Plotting contours of estimated distribution and concentration of chemical parameters;
- Vector generation and plotting of chemical parameters and ground water movement;
- Cross-section of a site showing the topographic surface, ground water surface, original disposal site boundaries, etc.;
- Surface area distribution of specific regions at or above a specified chemical parameter concentration level; and
- Calculation of the estimated volume of material at or above a specified concentration level.

2.4.4 COMPUTER MODELING/SIMULATION

Computer models and simulation are used to understand dynamic site contamination and ground water interactions and health risk potential. The DBMS will provide a mechanism for organizing,

storing, and documenting data sets to be used for model calibration and verification. The results of progressive, critical runs of the models can also be stored and statistically manipulated for use in the model calibration, verification, and application efforts. The models included as part of this discussion are:

- Ground Water Models (e.g., GEOFLOW, SWIFT III);
- Air Dispersion Models (e,g., AIRDOS-EPA/DARTAB); and
- Risk Assessment Models.

2.5 OPERATION AND SUPPORT

The RI/FS data management team will provide the overall management, training, and technical support required to maintain and use all of the information that is collected to support environmental studies and evaluations at the FMPC Services including:

- Consulting support, structuring, and preparing reports using information from the environmental data base;
- Preparation of statistical interpretation, graphic displays of information, and reports through the application of the FLOW GEMINI and other integrated software;
- Development of procedures to facilitate information management in support of special studies;
- Design of data structures to support special sampling needs;
- Interface between FLOW GEMINI software and sample tracking systems;
- Data entry, validation, and maintenance of backup files and archives;
- Special training and instruction in the use of the information system; and
- FLOW GEMINI-based DBMS software maintenance.

Based upon the use of the FLOW GEMINI software, WMCO will receive applications training as needed. All software enhancements, modifications, and documentation will be provided. Special

training in usage of the system and software packages will be provided on an as-needed basis.

2.6 SYSTEM SUMMARY

The technical and scientific data and information management system supporting the RI/FS is illustrated in Figure 2-2. In summary, the application of this system includes the following attributes and characteristics:

- Site Characterization
  All sampling and analytical data will be entered into the FLOW GEMINI-based DBMS;

- Information Management
  All data will be quality controlled and stored in files that are available interactively via remote user access;

- Graphics
  Site data will be relatable to site locations via maps and graphic display interfaces to support interpretations and assessments;

- Laboratory Interface
  Interfaces with analytical laboratories will be provided to support timely and efficient flow of processed data;

- Sample Tracking
  The sample tracking software developed to support chemical analysis will be integrated with the FLOW GEMINI software;

- Statistics
  Access to statistical analysis and graphic display software will be included within the system;

- Modeling
  Interface to geohydrological models for ground water flow analysis, air models, and other simulation software required to conduct environmental assessments will be provided;

- Plotting
  A plotter will be available to provide graphic displays of statistical and analytical results; and

- Multiuser Availability
  The system will be accessible to multiple users via telecommunications.

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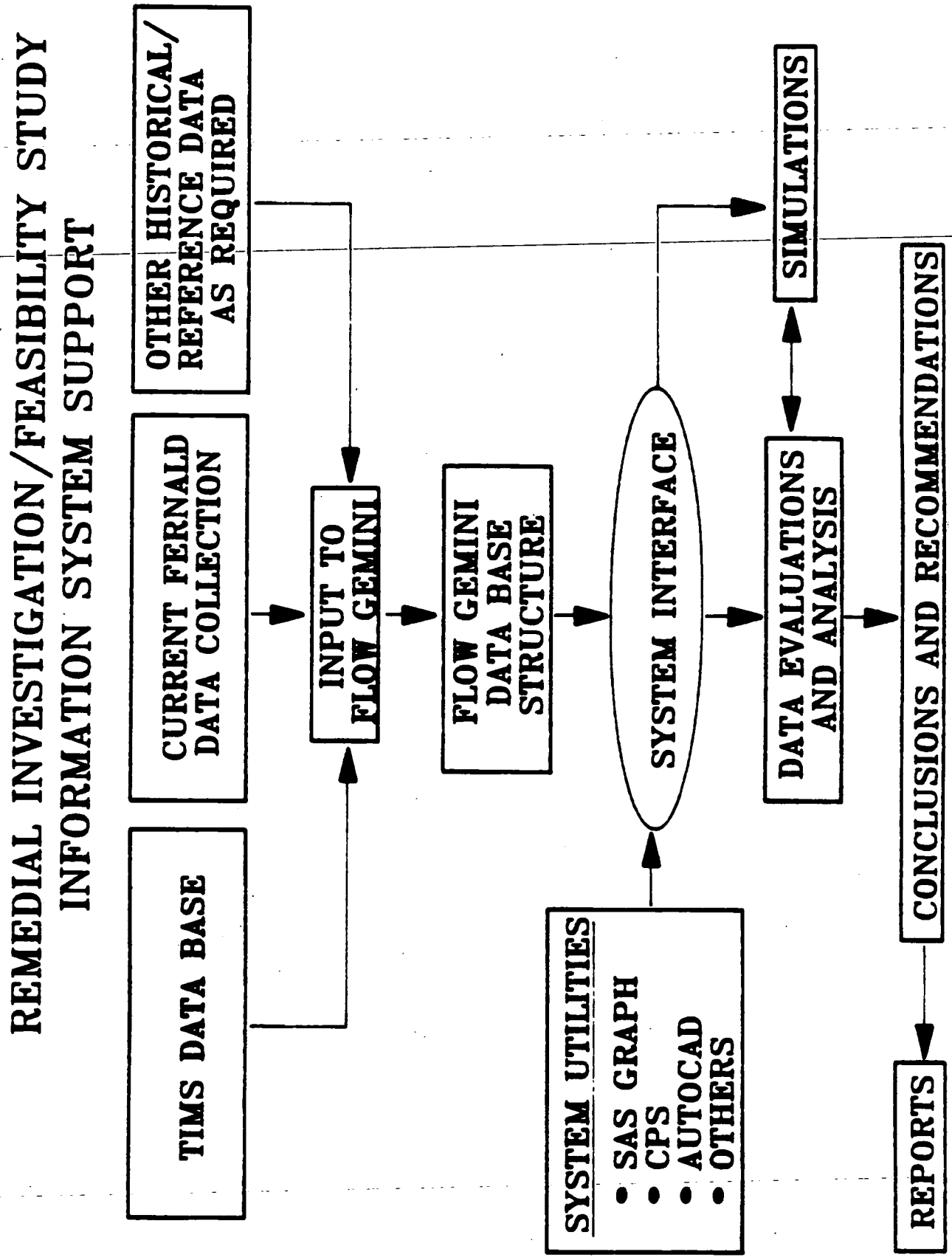

FIGURE 2-2

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This DBMS will be used to support:

- Project-wide information management;
- Site characterization;
- Site restoration studies;
- Engineering and scientific modeling;
- Short-term response to information needs; and
- Long-term monitoring efforts.

3.0

3.0 HISTORICAL DATA INTERFACE

Available data from previous data collection and analysis efforts at the FMPC have been evaluated for validity and sufficiency prior to the development of the current site sampling plan. Data sufficiency requirements address two questions:

- Do the data adequately characterize the site?
- Do the data satisfy regulatory and engineering criteria?

Data validity requirements examine such factors as the following:

- Sample date;
- Sample location;
- Sample depth and increments;
- Collection technique;
- Field sample preparation technique;
- Laboratory sample preparation technique;
- Laboratory analytical technique;
- Laboratory detection limits; and
- Results of quality assurance/quality control checks.

Relevant existing technical data will be loaded into the FLOW GEMINI data base. These historical data, augmented by data collected under the current sampling efforts, will provide a data base on the site environment sufficient to satisfy the objectives of the RI/FS.

The data from the Characterization Investigation Study (CIS) conducted in the waste pit area was stored in a separate data base (TIMS) by the CIS contractor. TIMS data will be loaded by magnetic tape into the DBMS. Other pertinent data will be loaded by direct data entry or by magnetic tape/diskette transfer depending on the situation. In all cases, the conversion software used to transfer data into the FLOW GEMINI system and the validation of the transferred data will be fully documented.

4.0

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4.0 DATA MANAGEMENT QUALITY ASSURANCE AND QUALITY CONTROL

4.1 DATA BASE PROCEDURES

Strict guidelines and detailed procedures will be established to incorporate quality assurance/quality control (QA/QC) methods into the data management practices of the RI/FS program. In regard to the data itself, data base and laboratory QA/QC procedures will be followed. All management and record keeping pertaining to the data follow the administrative QA/QC procedures outlined below.

The DBMS Manager oversees all data-related items relative to the complete RI/FS at the FMPC. To ensure accurately managed and preserved data for long-term use, QA/QC procedures are required for the data base. These data base QA/QC procedures include the following:

- Data Redundancy Restrictions
  Precautions will be taken to limit the need for data items to be repeated throughout the data base.

- Identifying Potential Problems
  Determining the potential problems associated with data entry and circumventing these problems is of importance in the initial design stages of the system. Considerable attention will be given to the design of the data entry mechanisms from the originator's point-of-view so that data can be recorded as accurately and completely as possible.

- Unusual Input Specifications
  Requirements for an unusual data format (such as the requirement for recording leading zeros) will be avoided.

For data entry through display screens, the screen layouts will be designed with:

- Compatibility between the sequence of screen input and the format of the input data.

- Provisions for displaying and highlighting fields and error messages requiring operator response.

7

- Provisions for operator correction or cancellation of invalid fields and transactions.

4.2 HUMAN FACTOR CONSIDERATIONS

While the machine processing requirements of a system are usually well understood, little consideration is often given to the human factors necessary for effective system utilization. Human interaction with a system generally occurs at the following stages:

- Source of information;
- Machine processing and interface; and
- Utilization of machine-processed output.

The factors that must be considered for each of these stages are discussed in the following paragraphs.

4.2.1 SOURCE INFORMATION CONVERSION

When data transcription procedures are established, the process exists solely for converting data from one medium to another, with no intermediate interpretation required or allowed. The data transcription process will be as unencumbered as possible, consistent with the highest possible level of accuracy. Procedures for the entry of data and verification are presented in Section 10.7 of the QAPP.

4.2.2 MACHINE PROCESSING AND INTERACTION

In the machine processing phase, manual intervention should be kept to the absolute minimum, consistent with practical utilization of machine resources. The system and program will be designed to minimize ambiguities so that question-and-answer interactions are clear. Questions and output messages used as instructional aids will be provided in both terse and complete forms so the user can operate with either at his/her discretion.

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4.2.3 MACHINE-PROCESSED OUTPUT UTILIZATION

Output from the machine processing phase will be designed to be clearly understood. The user should not require references to additional sources for translation. Coded data values will be avoided to the extent possible.

4.3 DATA VALIDATION CONTROLS

To maintain the functional integrity of the DBMS, it is necessary to include the provisions for data validation at the earliest possible point in the process. Data validation provides that the data type is correct (e.g., numeric or alphabetic), that the data values are valid (e.g., month of the year is between 1 and 12), and that the data value falls within the ranges considered reasonable for the parameter. Validation of data input records will be performed so that all data elements of the transaction are validated regardless of the results of previously encountered elements.

All update programs will be written to protect the data base from incorrect data. The following techniques will be utilized:

- Establish batch controls to detect the loss or distortion of data during preliminary processing.
- Apply checks to each data field, for example:
  - Character checks to detect illegal characters;
  - Limit checks to detect low or high values; and
  - Validity checks to provide that the input fields maintain appropriate cross-relationships.
  - Capability to review and correct data.
- Maintain record counts.

The system will notify the responsible user when it detects a major failure that requires automated procedures to prevent further erroneous processing. When a system is designed, standard system procedures for restart and recovery must be

established so that they are available when required. If special reconstruction programs are needed, they should be written within the system itself.

4.4 SOFTWARE DEVELOPMENT AND DOCUMENTATION

The complete, detailed description of processing rules, algorithms, encoding/decoding functions, table handling procedures, etc., will be provided in either structured narrative or decision table form. These detailed processing descriptions will serve as a statement of the logic and data manipulations necessary to transform input to the required output; therefore, they will be written as if each program module is completely independent of all other program modules.

The processing descriptions included within the transformation instruction will be related to the overall structure of the program logic chart. These instructions will be an exploded view of the contents of each subroutine/program module. Thus, the logic chart will be the blueprint for the program structure/design.

As each data element is addressed with the transformation specifications for a program/module, an entry will be made in the usage/cross-reference section of the file definition sheet to indicate which program module has addressed each data element.

Top-down design procedures will be used in software development, and will consist of analyzing decisions and separating them into successively more specific functions. There are several levels at which decisions can be made and modules identified, as outlined below:

- Main Level
  The top-level decisions identify and control the sequencing in which lower-level modules are to be executed, as well as prescribe the data availability to each of the lower-level modules;

- Partition Level
  Major types of categories such as laboratory analysis or surface radiological data;

- Data Segment
  Sections of data within a partition such as sample location data; and

- Data Element
  Elements of data within a segment such as grid coordinates.

Each hierarchical level in the program structure deals with one of these key levels. The modules concerned with housekeeping functions are assigned to the lowest level. The approach to structured program design is summarized as follows:

- Sketch a functional picture of the sequence of program functions required to solve the problem.

- Identify the principal external data streams (one for each input and one for each output) and determine their points of decision based upon the known decision criteria.

- Define the transactions to be applied, actions to be taken, or types of records to be processed.

- Define the intermodule communications regions, including the data one module might need to pass to another module to describe a needed action, accumulators, and record counts. As the function, limits, and linkage procedures of each module are described, the communication region will be checked to ensure that all necessary information will be available. Linkage procedures and codes used to request actions will be carefully cross-checked for consistency.

5.0

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5.0 IMPLEMENTATION SCHEDULE

The planned implementation schedule for the DBMS is as follows:

Activity	Planned Date
• Requirements (Hardware/Software) Analysis Completion	6/15/87
• Hardware/Software Acquisition	9/8/87
• Facility Installation	10/1/87
• Initiate Data Entry	10/19/87
• FLOW GEMINI/TIMS Interface Completed	12/31/87
• System Development Completed	3/31/88
• Documentation and Users Guide Completed	3/31/88
• User Support Available	As Needed