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G-000-105.6

SITE CHARACTERIZATION OF THE WASTE STORAGE AREAS
PART 2, VOLUME 2: SUPPORT DOCUMENTATION
AUGUST 1986

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WESTON/WMCO
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REPORT

Department of Energy Feed Materials Production Center

Fernald, Ohio

Site Characterization Of The Waste Storage Areas

Part 2, Volume 2:
Support Documentation

For: Westinghouse Materials Company Of Ohio

Prepared By:
Roy F. Weston, Inc.

August 1986

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DEPARTMENT OF ENERGY
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

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SECTION 6

ENVIRONMENTAL SAFETY AND HEALTH PROGRAM PLAN

6.1 INTRODUCTION

6.1.1 Policy

All reasonable precautions shall be taken by Roy F. Weston, Inc. (WESTON) and its subcontractors to ensure the health and safety of workers and the general public in a cost effective manner. WESTON and its subcontractors shall comply with all Federal, State, local, and Department of Energy health and safety regulations and requirements. WESTON and its subcontractors shall also comply with all safety and health requirements delineated in the "Remedial Investigation and Feasibility Study of Waste Storage Facilities at the Feed Materials Production Center", subcontract No. S-1174. Evidence of compliance will be provided by the monitoring records generated from this program (Attachment A).

6.1.2 Scope

This Environmental, Safety and Health Plan establishes: 1) the organization and responsibilities, 2) health and safety standards, 3) environmental standards, 4) program requirements, occupational monitoring, and personnel protection methods, 5) hazard control and monitoring methods, and 6) a contingency plan for emergencies for the Feed Materials Production Center (FMPC) during characterization of the waste disposal areas. 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. It is important that the standards and procedures be understood and observed by all personnel and subcontractors.

6.1.3 Hazard Description

Section 3.0 in Part 1 of this document provides a full description of the nature and extent of the contamination at the Fernald FMPC site. At this time there are insufficient data available to provide a full inventory of the radiological and chemical constituents that exist at the Fernald site and their locations. Table 6-1 lists the contaminants that have thus far been identified by Westinghouse for the Dames and Moore RCRA sampling of Pit 4. This list represents only the presently known contaminants, and is not intended to be complete. At this time it is not possible to map out these constituents or estimate quantities.

TABLE 6.1

CHEMICAL AND RADIOLOGICAL CONSTITUENTS
AT THE FERNALD FMPC SITE

(III) Parameters Analyzed : RCRA Sampling Pit #4 , August 1985 (Dames and Moore)

A. For General Water Quality

1. Chloride
2. Iron
3. Manganese
4. Phenols (total)
5. Sodium
6. Sulfate

B. For Indicators of Contamination (Quadruplicate Analysis)

1. pH
2. Specific Conductance
3. Total Organic Carbon (TOC)
4. Total Organic Halogen (TOX)

C. For Drinking Water Suitability

1. Arsenic
2. Barium
3. Cadmium
4. Chromium-Hexavalent
   -Total
5. Fluoride
6. Lead
7. Mercury
8. Nitrate
9. Selenium
10. Silver
11. Gross alpha
12. Gross beta
13. Radium
14. Endrin
15. Lindane
16. Methoxychlor
17. Toxaphene
18. 2,4-D
19. 2,4,5-TP Silvex
20. Coliform Bacteria

D. Other Metals, Organics, and Site Specific Parameters

1. Nickel
2. Cyanide
3. Copper
4. Zinc
5. Magnesium
6. Calcium
7. Phosphorus
8. Chlorobenzene
9. Chlorodibromomethane
10. Chloroethane
11. 2-chloroethlvinyl Ether
12. Chloroform
13. Dichlorobromomethane
14. Dichlorodifluromethane
15. Total Dissolved
    Solids (TDS)
16. Total Potassium
17. Biochemical Oxygen
    Demand (COD)
18. per Chloroethylene
19. cis 1,2,Dichloroethyl
20. Tributylphosphate
21. Acrolein
22. Acrylonotrille
23. Benzene
24. bis (chloromethyl) Et
25. Bromoform
26. Bromodichloromethane
27. Bromoethane
28. Carbontetrachloride
29. Chloromethane
30. 1.2 Dichlorobenzene
31. 1,3 Dichlorobenzene
32. 1,4 Dichlorobenzene
33. 1,1 Dichloroethane
34. 1,2 Dichloroethane
35. 1,1 Dichloroethylene
36. 1,2 Dichloropropane

D. Other Metals, Organics, and Site Specific Parameters (continued

37. 1,2 Dichloropropylene
38. Ethylbenzene
39. Methylbromide
40. Methylchloride
41. trans-1,2 Dichloroethylene
42. 1,3 Dichloropropane
43. 1,1,2,2 Tetrachloroethane
44. Tetrachloroethylene
45. Toulene
46. 1,1,1 Trichloroethane
47. 1,1,2 Trichloroethane
48. Trichloroethylene
49. Trichlorofluoromethane
50. Vinyl Chloride

E. Radionuclides

1. Potassium 137
2. Total Uranium
3. Radium 226
4. Radium 228
5. Technetium 99
6. Thorium 228
7. Thorium 230
8. Thorium 232
9. Cessium 137
10. Strontium 90
11. Ruthenium 106
12. Neptunium 237
13. Plutonium 238
14. Plutonium 239
15. Plutonium 240

6.2 ORGANIZATION AND RESPONSIBILITIES

6.2.1 Staffing and Lines of Authority

WESTON 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 this plan. Lines of authority for health and safety management will be independent of those for operational management to assure that FMPC health and safety functions are not overridden by operational concerns.

For this project, Alan Solow of WESTON will be the Site Manager. The Site Health and Safety Officer will be Richard Haaker. He will report directly to George Crawford, Corporate Health and Safety Manager. Individuals with appropriate training and experience designated by the SHSO will be responsible for day-to-day site health and safety concerns when the SHSO is not on-site.

6.2.2 Personnel Responsibilities

The Site Health and Safety Officer shall be responsible for the health and safety of the workers and ensuring environmental releases do not affect the health and safety of the general public. This individual shall be provided properly trained staff and adequate equipment to assure that all work is done safely. The equipment, number of staff, and staff qualifications will be commensurate with the potential hazard and of the task to be completed at the FMPC site.

The Site Health and Safety Officer shall:

- Act on employee concerns in accordance with procedures outlined in this plan.
- Consider variations of all prescribed health and safety standards, and the timing and manner of correction. Willful violation or refusal or failure to correct violations of health and safety standards or regulations will result in appropriate action.

- When necessary, submit requests for variance from the requirements of this plan to the Westinghouse Environmental Monitoring Manager, and the Westinghouse Safety Manager.

- Assure that all information regarding health and safety matters is recorded and reported for WESTON employees and the employees of all subcontractors.

Line management on this project shall:

- Know and understand the applicable environmental, safety and health program (ES & HP) requirements.

- Assure that all workers know and understand the applicable ES & HP requirements.

- Stop work when a safety/environmental condition is uncertain and request assistance from the appropriate safety person.

Workers on this project shall:

- Know and understand applicable ES & HP requirements.

- Obtain guidance from the supervisor or safety representative in the event that any uncertainties about safety arise.

- Comply in full with all safety requirements.

6.3 ENVIRONMENTAL SAFETY AND HEALTH PROGRAM STANDARDS

WESTON and its subcontractors shall comply with applicable Federal, state, local, and Department of Energy health and safety regulations and requirements including but not limited to those established pursuant to the Occupational Safety and Health Act (OSHA). Special attention shall be given to the following OSHA and other Federal regulations.

- 29 CFR Part 1910 "Occupational Safety and Health Standards"
- 29 CFR 1926 "Safety and Health Regulations for Construction"
- 40 CFR 264, 265, and 300 "Regulations for Owners and Operators of Permitted Hazardous Waste Facilities", "Interim Statutes Standards for Owners and Operators of Hazardous Waste Facilities"
- 49 CFR 172-174 "DOT Transportation of Hazardous Materials"
- DOE Order 5000.3 "Unusual Occurrence Reporting System"
- 10 CFR Part 20 "Standards for Protection Against Radiation"
- DOE Order 5480.1A "Environmental Protection, Safety, and Health Protection Program for DOE Operations"
- DOE Order 5480.4 "Environmental Protection, Safety, and Health Protection Standards"
- DOE Order 5482.4 "Environmental Protection, Safety, and Health Protection Appraisal Program"
- DOE Order 5484.1A "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"

Copies of these regulation will be available in the Site Health and Safety Officer's on-site files.

WESTON and subcontractors shall comply with the radiation exposure standards listed in Tables 6.2 and 6.3. In all cases, exposures to workers and members of the public shall be maintained as low as reasonably achievable (ALARA).

TABLE 6.2

Exposure of Individuals and Population Groups in Uncontrolled Areas[a]

Type of Exposure	Annual dose equivalent or dose commitment (rem)[b] 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 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 uptakes of radionuclides by a person exposed.

TABLE 6.3
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 5480.1.

[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 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 uptakes by a person occupationally exposed.

[c]A beta exposure below a maximum energy of 700keV 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).

6.4 PROGRAM REQUIREMENTS

6.4.1 Initial Site Survey

Prior to initiating full scale characterization activities, an initial survey will be conducted in and around the Waste Storage Area, Paddy's Run, the two fly ash disposal area, and the storm sewer outfall. On the basis of exploratory radiation measurements which were made on May 2, 1986, it is anticipated that initial survey activities will be concentrated in the Waste Storage Area, which includes grounds adjacent to Silos 1-3, and the six in-ground waste pits (Figure 6.1.)

The following activities will be included in the initial survey:

- Physical hazards inspections.
- Radiation measurements at specific points in the vicinity of stored wastes and along drainage paths.
- Determination of radon and radon progeny concentrations in anticipated work areas.
- Monitor for the presence of potentially hazardous organic vapors.
- Monitor for the presence of potentially hazardous asbestos fibers.
- Verify that an area west of Waste Pit No. 5 (outside waste area fence) is suitable for use as a staging area (access control) and for placement of project trailers.
- Identify an area which can be utilized for decontaminating equipment and personnel.
- Liquids in the waste pits will be sampled and analyzed for pH and organic chemical constituents. Results of the analysis will be used to determine the level of protection needed in subsequent activities.
- Control Zone Boundaries will be determined and posted.

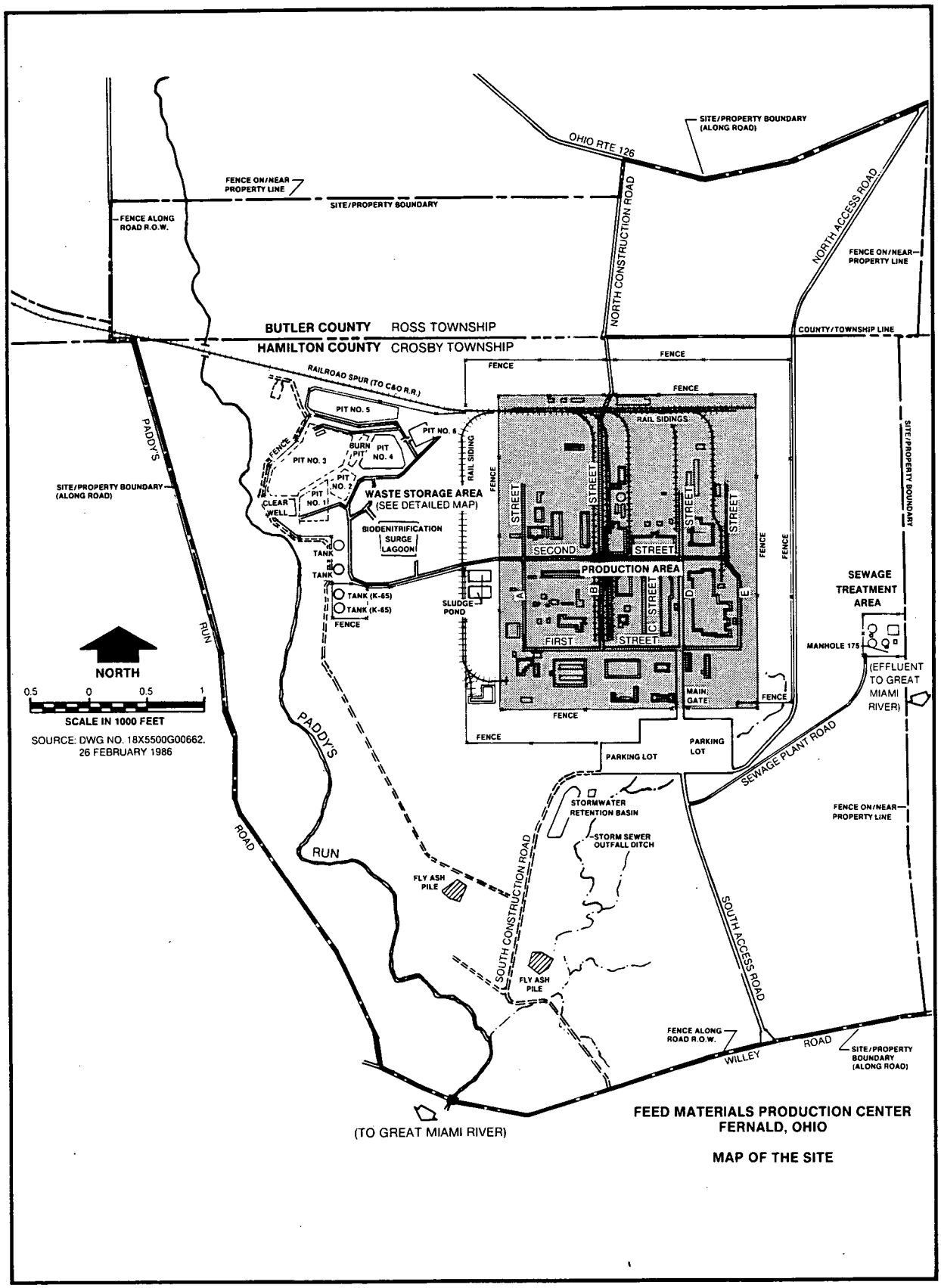

FIGURE 6.1 MAP OF THE SITE

It is anticipated that hazardous situations peculiar to the site will be identified by FMPC officials following their review of this Health and Safety Plan, and during a pre-characterization conference. Findings from the initial survey and information received from FMPC will be used to verify the boundaries of controlled areas. The initial site survey will be conducted using Level B protective clothing.

6.4.2 Operating Procedures

All characterization activities will be carried out in accordance with existing WESTON/Eberline Standard Operating Procedures. These procedures were developed in accordance with requirements under existing Federal Regulations and Standards, and have been used for several years to ensure that the exposure of workers and members of the public to radiological and chemical pollutants is maintained "As Low As Reasonably Achievable".

6.4.3 Worker Training

A formal training program shall be provided by the Corporate or Site Health and Safety Officers to workers before they begin on-site work. The training will be commensurate with the work hazard, and will include discussions of the FMPC waste characterization project, industrial and radiological safety procedures, emergency and contingency procedures, and the potential for encountering hazardous materials on the site. The training will also include the highlights of this health and safety plan and a detailed description of decontamination procedures. Practical demonstrations shall be given, when appropriate. 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 as determined by the initial site survey.

Personnel working in jobs involving possible radiation exposure shall be advised of NCRP Report 39 recommendations indicating that the intent of the recommendations is to minimize exposure to embryos and fetuses. All such workers shall be advised of the biological risks to embryos and fetuses exposed to the various expected levels of ionizing radiation. Workers also shall 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.

Each worker shall pass a written or oral examination with the results documented. The instructor shall discuss and provide workers with literature on the biological effects of radiation, when requested. The instructor shall also provide each worker with a copy of USNRC Regulatory Guide 8.13, "Instructions Concerning Potential Radiation Exposure."

Prior to beginning work each day, the Site Health and Safety Officer 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.

6.4.4 Records and Reporting Requirements

WESTON shall notify the Westinghouse Safety Manager, the WESTON FMPC Project Manager, and the responsible installation safety officer, of a fatality or serious accident as required in DOE Order 5484.1A. Fatal accidents shall be investigated by the state, Federal, or local office having environmental, health, and safety jurisdiction.

WESTON shall be responsible for the recording and reporting of recordable illnesses and injuries in accordance with DOE requirements. Copies of these reports shall be forwarded to the appropriate WESTON and Westinghouse personnel, including the WESTON FMPC Project Manager, and the responsible installation safety officer. Recordable occupational accidents and illnesses are those defined in DOE Order 5484.1A (Attachment A).

WESTON shall submit a DOE Form 5484.X (Attachment B), "Individual Accident/Incident Report" for each occurrence for which reporting is required under DOE 5484.1A, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements". Forms will be submitted to the responsible Westinghouse installation safety officer, and cognizant DOE Operations Office.

WESTON will maintain records of employees' exposures to radioactive or toxic materials or other harmful physical

agents. DOE Form 5484.8, "Termination Occupational Exposure Report" (Attachment C), shall be forwarded to the WESTON FMPC Project Office, and responsible Westinghouse 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__," shall be forwarded to the WESTON FMPC Project Office, 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 shall be transferred to the Westinghouse installation safety officer upon employee termination or completion of the contract.

WESTON and its subcontractors are required by DOE Order 5000.3 to notify the responsible Westinghouse 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 it 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 man-made 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 exposure in excess of applicable limits.

- Any incidence of breach of access control by unauthorized personnel.
- Any acts of vandalism or major theft occurring at a site.
- Any release of contamination outside the controlled area; including personnel, equipment, and roadways.

WESTON shall maintain a central file of all enforcement inspections and reports along with violations and abatement actions for inspection by Westinghouse and the DOE.

WESTON shall maintain a central file of formal employee health and safety complaints and reports of their disposition. Upon request, these shall be made available for inspection by affected employees or their authorized representative.

6.4.5 Complaints

Employees are encouraged to report to the WESTON Site Health and Safety Officer, 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 shall also have available in the workplace DOE Form F-5480.4, "Occupational Safety and Health Complaint Form" (Attachment D), a 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 Site Health and Safety Officer for resolution. In the event of inadequate corrective action, the employee and/or authorized representative may also contact the local agency having jurisdiction, the WESTON 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.

6.4.6 Restrictions

A worker under age 18 shall neither be employed in, or 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 6.2.

Administrative limits shall be used to assure that workers do not exceed the quarterly or annual limits specified in Table 6.2. If administrative limits or standards are exceeded, workers who are potentially exposed to the elevated levels of radiation shall 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.

Visitors to the site shall be required to comply with all health and safety restrictions provided in this document. Visitors will be accompanied by another site worker at all times.

6.4.7 Internal Audits

WESTON shall 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 waste characterization sampling and will provide follow-up actions if any violation of health and safety standards. Additional audits will be conducted twice annually, or more frequently, if necessary. These audits of the radiation control program shall be in accordance with guidelines set forth in DOE Order 5482.1A.

6.4.8 Controlled Areas

Controlled areas shall 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.
- Airborne concentrations of radionuclides exceed quantities provided in DOE Order 5480.1A, Attachment XI-1, Table 1, Column 1.

Access to these areas shall be controlled for people, vehicles, and equipment by fencing the area or using other methods to prevent inadvertent exposure to contaminated material. In addition, a map will be provided to workers clearly delineating controlled areas. This map will be produced using the data collected in the initial site survey.

Smoking, drinking, and eating shall be prohibited in controlled areas.

6.4.9 Posting

Controlled areas must be conspicuously marked at points of potential access with 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 roadway or not, shall be in accordance with ANSI Standards D-6.1-1971.

6.5 OCCUPATIONAL MONITORING AND PERSONNEL PROTECTION

6.5.1 Medical Monitoring Program

All personnel who perform chemical or radiological waste sampling in controlled areas will participate in a medical monitoring program. All personnel except non-working supervisory personnel and visitors will not be allowed in the Waste Storage Area, Paddy's Run, the fly ash disposal area, or the storm sewer outfall unless they have a current annual medical exam and current respirator fit test.

Prior to initiating work, a work related radiation exposure history shall be acquired and maintained for each employee working in a controlled area as defined in Section 6.6.1. Results of termination bioassays shall be obtained from the last employer where exposure to radiation occurred. If not available, a baseline bioassay measurement shall be acquired prior to permitting the employee to perform radiation related work.

6.5.2 Bioassay Program

The bioassay program provides for monitoring of internal deposition of radioactive material. All site personnel who enter and

work in contaminated areas shall be evaluated at regular intervals using established bioassay techniques to verify that radiological controls are adequate and ALARA principles are being adhered to. Based on the evaluation of these data, corrective action may be required.

Radiobioassay of urine samples (urinalysis) shall be utilized for determining whether the contaminated materials have been taken internally by workers on-site. All personnel who perform work at the Fernald site on a daily basis shall submit a urine sample prior to beginning work on the project, after approximately each 30 days at the site, 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 are not permanently assigned to that site shall be sampled at the direction of the Site Health and Safety Officer. The following collection instructions are provided for guidance to workers.

Urine Sample Collection Instructions

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 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.

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

(a) Re-sample Action Level - If the results of a routinely scheduled urine sample equals or exceeds this level, a 24 hour re-sample (Section 5.2b) will be collected during the following weekend.

(b) Work Evaluation Action Level - If the results of a routinely scheduled urine sample will be collected during the immediately following 16 off duty hours.

(c) Work Restriction Action Level - If the results 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 (Section 5.2d) will be collected 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 Manager, Safety and Licensing.

Radionuclide concentrations corresponding to these three action levels are listed in Table 6-4.

6.5.3 Personal Precautions

- Eating, drinking, chewing gum or tobacco smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in areas designated contaminated as determined in the initial site survey. 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 shall not be permitted in fuel or paint storage areas.

TABLE 6-4
RADIONUCLIDE CONCENTRATIONS CORRESPONDING TO BIOASSAY ACTION LEVELS ASSUMING MONTHLY SAMPLING[1]

RADIONUCLIDE	ACTION LEVELS		
	(a) Re-sample	(b) Work Evaluation	(c) Work Restriction
U (nat)	40 ug/l	90 ug/l	180 ug/l
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]Action levels may vary for different sampling frequencies.
[2]Action levels to be identified.

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

- Whenever decontamination procedures for outer garments are in effect, the individuals clothing and body will be scanned to determine if contamination is present, if contamination is found, the entire body will be thoroughly washed as soon as possible to remove any amounts of contaminants.

- No facial hair which interferes with a satisfactory fit of the mask-to-face-seal shall be allowed on personnel who may be required to wear an air purifying respirator. When air-supplied respirators are used, workers will have not facial hair restrictions.

- Contact with contaminated or suspected contaminated surfaces shall 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 shall consult with the SHSO prior to working where the potential for absorption, inhalation, or ingestion of toxic substances exists.

- All safety equipment shall be routinely cleaned, checked, and maintained according to WESTON/Eberline standard operating procedures to ensure the highest level of performance, and to reduce any potential for malfunction in the field. Safety equipment and non-disposable safety apparel will be monitored for contaminants and maintained at levels less than those specified in ANSI N13.12.

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

6.5.4 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 (1986). These guidelines are reproduced below and have been adopted for the Fernald FMPC site characterization activities.

Heat Stress and Other Physiological Factors

Wearing 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:

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

Reduced work tolerance and the increased risk of excessive heat stress is directly influenced by the amount of 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 PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once 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.
- Individual worker characteristics and fitness.

Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

- 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 [11]. 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. [12].

- For workers wearing semipermeable or imperable' 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°F (21°C) [6].

To monitor the worker, measure:

- 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 heat rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third [12].

- Oral temperature. Use a clinical thermometer (3 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°F (37.6°C) shorten the next work cycle by one-third without changing the rest period.

  If the oral temperature still exceeds 99.6° (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third [12].

  Do <u>not</u> permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C) [12].

- 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 [12].

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 6-5). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Prevention

Proper training and preventive 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, management 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.

TABLE 6-5

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATIZED WORKERS*

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: Reference [13].

[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. Estimated 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.

- Provide shelter (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 sweat, 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 sweat [14]. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

  Maintain water temperature at 50° to 60°F (10° to 15.6°C).

  Provide small disposal cups that hold about 4 ounces (0.1 liter).

  Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.

  Urge workers to drink a cup or two 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 are recommended, but more may be necessary to maintain body weight.

  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, acclimatize workers to site work conditions: temperature, protective clothing, and workload (see Level of Acclimatization at the end of this chapter).

  Urge workers to maintain normal weight levels.

- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:

Field showers 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 training, identify the signs and symptoms of heat stress (see Table 6-6).

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 need to be taken to avoid PPE-induced injury.

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

- Physical condition.
- Level of acclimatization.
- Age.
- Gender.
- Weight.

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 [5,8,15,16]:

- 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 sweating mechanism.
- Slightly lower oxygen consumption.
- Slightly lower carbon dioxide production.

Level of Acclimatization

The degree to which a worker's body has physiologically adjusted or acclimatized to working under hot conditions affects his or her ability to do work. Acclimatized individuals generally have lower heat rates and body temperatures than unacclimatized individuals

TABLE 6-6

SIGN AND SYMPTOMS OF HEAT STRESS*

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

- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

  - muscle spasms
  - pain 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 sweating
  - dizziness
  - nausea
  - 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 and 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
  - coma

*Source: Reference [6].

[17], and sweat sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and work loads than unacclimatized workers [18]. Sweat composition also becomes more dilute with acclimatization, which reduces salt loss [8].

Acclimatization can occur after just a few days of exposure to a hot environmental [15,16]. NIOSH recommends a progressive 6-day acclimatization period for the unacclimatized worker before allowing him/her to do full work on a hot job [16]. 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 day 6 [16]. With fit or trained individuals, the acclimatization period may be shortened 2 or 3 days. However, workers can lose acclimatization in a matter of days, and work regimens should be adjusted to account for this.

When enclosed in an impermeable suit, fit acclimatized individuals sweat more profusely than unfit or unacclimatized 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 previous section on Prevention for additional information.

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. However, there is some evidence, indicated by lower sweat rates and higher body core temperatures, that older individuals are less effective in compensating for a given level of environmental heat and work loads [19]. At moderate thermal loads, however, the physiological responses of "young" and "old" are similar and performance is not affected [19].

Gender

The literature indicates that females tolerate heat stress at least as well as their male counterparts [20]. Generally, a female's work capacity averages 10 to 30 percent less than that of a male [8]. The primary reasons for this are the greater oxygen-carrying capacity and the strong heart in the male [15]. However, a similar situation exists as with aging: not all males have greater work capacities than all females.

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. However, when wearing impermeable clothing, the weight of an individual is not a critical factor in determining the ability to dissipate excess heat.

References for Heat Stress Monitoring

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6.5.5 External Radiation Exposure

All persons working in the Waste Storage Area, Paddy's Run, the fly ash disposal area, or the storm sewer outfall will be issued a thermoluminescent dosimeter, which will be read quarterly and the SHSO will maintain copies of these results. Storage of the working and control dosimeters will be in a low background area when not in use. Dosimeters will be exchanged quarterly and results recorded.

A gamma exposure rate survey will be required in any site areas with an exposure rate greater than 0.60 mR/hr. The survey will consist of one waist-high measurement taken with an ionization chamber survey instrument at each sampling location. If exposure rates exceed 6 mR/hr at any sampling locations, the Site Health and Safety Office will limit exposure time at that location. In addition to time limitations, the SHSO will issue workers in >6 mR/hr gamma fields a self-reading ionization dosimeter and/or a dose integrating alarm device. In certain cases, the SHSO may issue workers extremity dosimeters and instruct workers on their use and placement.

ALARA CONSIDERATIONS

All reasonable efforts will be made to keep radiation exposures as well as releases of radioactive material to unrestricted areas, as far below the limits specified in 10CFR20 and DOE Order 5480.1A as is reasonably achievable. Toward this end, several ALARA principles shall be considered for planning purposes:

- The SHSO shall 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 shall be required as indicated in this plan.
- Radiation and Chemical Work Permits will be required as described in the following section.

Use of Radiation and Chemical Work Permits (RCWP)

The radiation/chemical work permit is used to identify the administrative steps required to insure that personnel exposures in areas with a potential radiological or chemical hazard are maintained as low as reasonable achievable (Figure 6-2).

The RCWP is used to control personnel exposures to radiation by establishing the radiation protection requirements for entry into a controlled access area where work must be performed under the following conditions:

a. Average external radiation levels exceed 2.5 mrem/hr.

b. Airborne radioactivity levels exceed 25 percent of the levels in DOE Order 5480.1, Attachment XI-1, Table I, Column 1.

c. Surface contamination levels exceed those provided in Table 6-7.

The RCWP is also used to control personnel exposure to chemical contaminants.

6.5.6 Air Monitoring

An air sampling program will be initiated during the site characterization and will continue until all site work is completed. Continuous high volume air samplers will be placed at each boundary fence in the Waste Storage Area. These will be used to assess releases due to site characterization activities. Portable personnel air samplers will be placed in the vicinity of drilling activities, in order to assess exposures to personnel during field activities. Locations and number of samplers will be determined by the Site Health and Safety Officer.

High volume and portable air sample filters will be analyzed for gross alpha and total suspended particulates. The frequency of filter analyses will be dependent on site conditions. Dry soil caused by drought conditions or high winds which increase airborne dust will require frequent air sampler filter changes. The Site Health and Safety Officer shall be aware of such conditions and shall require filter changes and analysis at his discretion.

TABLE 6-7

RADIOLOGICAL CONTAMINATION LEVELS

CONTAMINATION	CONTAMINATION LEVELS dpm/100 cm^2			
	ALPHA		BETA GAMMA	
	Total	Removable	Total	Removable
Unknown	100	20	22,000	2200
Uranium	5000	1000	22,000	2200
^{226}Ra	100	20	22,000	2200
^{232}Th	1000	200	22,000	2200
^{90}Sr	-	-	22,000	2200
^{137}Cs	-	-	22,000	2200
^{239}Pu	100	20	-	-

The site health and safety officer shall review all existing data in order to determine the current chemical and radiological status of the area prior to issuance of a 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 representative shall 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 a RCWP be issued. The RCWP shall contain details of all required protection procedures. The personnel listed on the RCWP shall 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 during the initial site survey indicates that concentrations exceed the limits specified in Tables Z-1 or Z-2 of 29 CFR 1910.1000, additional monitoring by flame ionization (OVA) or photoionization shall be performed. For personnel working in areas suspected of having high airborne concentrations or when drilling in the waste pits is performed, organic chemical vapors potentially escaping from the holes shall be monitored in the breathing zone. The decision to continue monitoring during drilling operations will be based on the results of breathing zone monitoring at all drill holes in the waste storage pits.

6.5.7 Respiratory Protection

Dust suppression techniques, such as vehicle speed control and/or water spray, shall be used to minimize airborne particulates. Respiratory protection devices will be employed only when all reasonable efforts to minimize airborne particulates fail to maintain airborne concentrations at acceptable levels.

If respirators are used, radiological protection factors other than 1.0 are acceptable only for respiratory protection programs in full compliance with USNRC Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," and "Programs for Respiratory Protection," ANSI Z88.2-1980. Only those personnel appropriately trained, fit-tested and determined to be physically capable working with respiratory protection will be used when working conditions require a respirator.

Figure 6-2

WESTON RADIATION WORK PERMIT NO. _____

1. Initiated By: _____

2. Work Location: _____

2. RWP Date: _____
Mo Day Yr

4. Job Category:
a. Operations/Surveillance _____
b. Routine Maintenance _____
c. Special Maintenance _____
d. Waste Processing _____
e. Other (Specify) _____

5. Radiation Surveys:

No.	Date	By

6. Radiation Levels:

Highest ____ mR/hr General Area _____

Contamination Levels:
Maximum ___ dpm/100 cm^2 General Area ___ dpm/100 cm^2

Airborne Activity _____ pCi/

7. Work Descrition _____

8. Remarks and Special Instructions:

9. Protective Equipment Required:

Head		Body	
Cap	___	Lab Coat	___
Hood	___	Coveralls	___
Hardhat	___	Wet Suit	___
Other	___	Other	___
Hands		**Feet**	
Cotton Gloves	___	Rubber Boots	___
Rubber Gloves	___	Plastic Boots	___
Neoprene Gloves	___	Cloth Cover	___
Plastic Gloves	___	Other	___
Other	___		
Respirator		**Dosimetry**	
Full Face	___	TLD	___
Airline	___	SRD	___
SCBA	___	Extremity	___
Other	___	Other	___
H.P. Escort	___	Survey Instr.	___

10. Expiration Date: _____

11. Authorizations:

_____
Health Physics Supervisor

_____
Site Superintendent

12. Terminated By: _____
Date: _____

Terminated Because: _____

13. Copies To: _____

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 or radionuclides exceed 25 percent of maximum permissible concentrations averaged over a 40 hour week, or when organic chemical vapors exceed the limits specified in 29 CFR 1910.1000, Tables Z-1 and Z-2. Maximum permissible concentrations of radionuclides are listed in DOE Order 5480.1A, Attachment 11. Maximum permissible concentrations for radium, thorium, and uranium are reproduced in Table 6.8. 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 and when sampling is performed near the fly ash waste disposal area. Respirators will also be provided to personnel working in the waste site controlled area, upon request.

6.5.8 Change Facilities

WESTON shall provide a trailer with a shower which will serve as a clothing change facility. The trailer will be located near the Waste Storage Area access control point. If personnel contamination is detected and cannot be removed by simple washing or brushing, personnel must take a complete shower. All protective clothing will be removed before entering the trailer.

6.5.9 Levels of Protection/Protective Clothing and Equipment

Personal protective equipment shall be provided based on projected need. Such equipment may include respirators, safety glasses, ear plugs, coveralls, hard hats, rubber boots, and safety shoes. The Site Health and Safety Officer will select equipment based on constant awareness of site conditions and any changes that may occur.

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.

- Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.

TABLE 6.8

MAXIMUM PERMISSIBLE RADIONUCLIDE CONCENTRATIONS IN AIR

Nuclide	Solubility	Concentration (uCi/ml)
U-238	S	7×10^{-11}
U-234	I	1×10^{-10}
Th-230	S	2×10^{-12}
Ra-226	S	3×10^{-11}

- Level B: Should be selected when the highest level of respiratory protection is needed, by a lesser level of skin protection. Level B protection is the minimum level recommended on initial site entries until the hazards have been further defined by on-site studies and appropriate personnel protection utilized.

- Level C: Should be selected when the type(s) of airborne substance(s) is known, the concentration(s) is measured, and the criteria for using air purifying respirators are met.

- Level D: Should not be worn on any site with respiratory or skin hazards. Is primarily a work uniform providing minimal protection.

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 and its toxicity.

- Potential or measured exposure to substances in air, splashes of liquids, or other direct contact with material due to work being performed.

For the initial site survey and in situations where the type(s) of chemical(s), concentration(s) are not known, the Level B Protection has been selected based on professional experience and judgement until the hazards can be better characterized.

6.5.9.1 Levels of Protection

Level D

Level D protection is primarily a work uniform. It can be worn in areas where:

- Only boots can become contaminated

- There is no inhalable or dermal toxic substance

- No hazardous air pollutants have been measured.

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

Personal protection equipment may include:

- 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)

- Hard hat

  faceshield (as needed)
  escape mask (as needed)

Level C

Level C protection will be selected when the type(s) and concentration(s) of respirable material is 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.

Personal protection equipment includes:

- Air purifying respirator (MESA/NIOSH approved)
- 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)
- Hard hat

Level B

Level B protection will be selected when the highest level of respiratory protection is needed, but cutaneous or percutaneous exposure to the small unprotected areas of the body (i.e., neck and the back of head) is unlikely, or where concentrations are known to be within acceptable exposure standards.

Personal protection equipment 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 throw aways)
  Inner (chemical protective, steel toe and shank)

- 2-way radio communications

- Hard hat

- Face shield (as needed)

Criteria for Use - When the type(s) and concentration(s) of hazardous substances are known and require the highest degree of respiratory protection, but with a lower level of skin and eye protection is required.

Atmospheres with concentration of known substances greater than protection factors associated with full-face, air purifying respirators with appropriate cartridges.

Atmosphere with less than 19.5 percent oxygen.

Type(s) and concentrations(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 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.

Level A

Level A protection will be selected when the highest available level of respiratory, skin, and eye contact protection is needed. Personal protection equipment includes:

- Positive Pressure 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
- 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)
- 2-way radio communications

Criteria for Use - 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 are those where vapors may be generated or splashing occurs through site activities.

  Oxygen deficient atmospheres with the above conditions.

6.5.10 Contamination Monitoring

All personnel leaving controlled areas as defined in Section 6.4.7, that potentially have been in contact with contaminated materials shall be monitored with an appropriate detection instrument. Personnel contamination, as measured by appropriate detection instruments will, to the extent possible, be removed before the worker leaves the site, according to procedures described following. A personnel contamination log shall be maintained where levels exceed background. Decontamination measures and levels measured will be noted on the log. The monitoring instrument must be able to reliably detect the limits as specified in ANSI Draft Standard N13.12. Appropriately trained personnel may monitor themselves.

All potentially contaminated tools and equipment to be released from a controlled area for unconditional use shall be monitored and decontaminated, if necessary, to levels as specified in ANSI Draft Standard N13.12 Table 1 (Attachment E). In all cases, an extensive effort shall be made to reduce contamination levels to as low as reasonably achievable. Decontamination procedures are outlined in detail below in Section 6.5.11.

Contamination removed from tools, equipment, or personnel shall be contained on plastic tarps or other suitable materials. Wash water shall be contained in drums. Permission shall be requested of Westinghouse Safety Personnel to pour contaminated washwater into drilled holes on the waste pits, or Pits 5 or 6.

All vehicles shall be cleaned at the Westinghouse decontamination pad to remove all visible soil prior to leaving a contaminated site.

For vehicles potentially in contact with material having any quantities of radioactive or toxic materials, the tires (and cab interior, if potentially contaminated) shall be monitored and decontaminated to meet the limits specified in ANSI Draft Standard N13.12, Table 1. Appropriate spot checks shall be made of other potentially contaminated truck surfaces.

6.5.11 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 or liquids or on contaminated soil.
- Using contaminated instruments or equipment.

Protective clothing and respirators help prevent the wearer from becoming contaminated or inhaling contaminants; while 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. Or in removing contaminated clothing, personnel may contact contaminants on the clothing and/or inhale them. To prevent such occurrences, methods to reduce contamination, and decontamination procedures must be developed and implemented before anyone enters a site and must continue (modified when necessary) throughout site operations.

Decontamination consists of physically removing contaminants and/or changing their chemical nature to innocuous substances. How extensive decontamination must be depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough decontamination must be. Less harmful contaminants may require less decontamination. Combining decontamination, the correct method of doffing personnel protective equipment, and the use of site work zones minimizes cross contamination from protective clothing to wearer, equipment to personnel, and one area to another. Only general guidance can be given on methods and techniques for decontamination. The exact procedure to use must be determined after evaluating a number of factors specific to the incident.

- Preliminary Concerns:

  Initial Planning - The initial decontamination plan assumes all personnel and equipment leaving the Exclusion Zone (area of potential contamination) are grossly contaminated. A system is then set up to wash and rinse, at least once, all the personnel protective equipment worn. This is done in combination with a sequential doffing of equipment, starting at the first station with the most heavily contaminated item and progressing to the last station with the least contaminated article. Each piece of clothing or operation requires a separate station.

  The spread of contaminants during the washing/doffing process is further reduced by separating each decontamination station by a minimum of 3 feet. Ideally, contamination should decrease as a person moves from one station to another farther along in the line.

  While planning site operations, methods should be developed to prevent the contamination of people and equipment. For example, using remote sampling techniques, not opening containers by hand, bagging monitoring instruments, using drum grapplers, watering down dusty areas, and not walking through areas of obvious contamination would reduce the probability of becoming contaminated and require a less elaborate decontamination procedure.

  The initial decontamination plan is based on a worst case situation (if no information is available about the incident). Specific conditions at the sites are then evaluated, including:

- Type of contaminant
- The amount of contamination
- Levels of protection required
- Type of protective clothing worn

The initial system is modified, eliminating unnecessary stations or otherwise adapting it to site conditions. For instance, the initial plan might require a complete wash and rinse of chemical protective garments. If disposable garments are worn, the wash/rinse step could be omitted. Wearing disposable boot covers and gloves could eliminate washing and rinsing both gloves and disposable boots and reduce the number of stations needed.

Contamination Reduction Corridor (CRC) Figure 6.3 - The CRC controls access into and out of the Exclusion Zone and confines personnel decontamination activities to a limited area. The size of the corridor depends on the number of stations in the decontamination procedure, overall dimensions or work control zones, and amount of space available at the site. A corridor of 75 feet by 15 feet should be adequate for full decontamination. Whenever possible, it should be a straight path.

The CRC boundaries should be conspicuously marked, with entry and exit restricted. The far end is the hotline - the boundary between the Exclusion Zone and the Contamination Reduction Zone. Personnel exiting the Exclusion Zone must go through the CRC. Anyone in the CRC should be wearing the Level of Protection designated for the decontamination crew. Another corridor may be required for the entrance and exit of heavy equipment needing decontamination. Within the CRC, distinct areas are set aside for decontamination of personnel, portable field equipment, removed clothing, etc. These areas should be marked and personnel restricted to those wearing the appropriate Level of Protection. All activities within the corridor are confined to decontamination.

Personnel protective clothing, respirators, monitoring equipment, sampling supplies, etc. are all maintained outside of the CRC. Personnel don their protective equipment away from the CRC and enter the Exclusion Zone through a separate access control point at the hotline.

- Extent of Decontamination Required

Modifications of the Initial Plan - The original decontamination plan must be adapted to specific conditions found at incidents. These conditions may require more or less personnel decontamination than planned, depending on a number of factors.

Type of contaminant - The extent of personnel decontamination depends on the effects the contaminants have on the body. Contaminants do not exhibit the same degree of toxicity (or other hazard). The more toxic a substance is the more extensive or thorough decontamination must be. Whenever it is known of suspected that personnel can become contaminated with highly toxic or skin destructive substances, a full decontamination procedure should be followed. If less hazardous materials are involved, the procedure can be downgraded.

Amount of Contamination - The amount of contamination on protective clothing is usually determined visually. If it is badly contaminated, a thorough decontamination is generally required. Gross material remaining on the protective clothing for any extended period of time may degrade or permeate it. This likelihood increases with higher air concentrations and greater amounts of liquid contamination. Gross contamination also increases the probability of personnel contact. Swipe tests may help determine the type and quantity of surface contaminants.

Level of Protection - The Level of Protection and specific pieces of clothing worn determine on a preliminary basis the layout of the decontamination line. Each Level of Protection incorporates different problems in decontamination and doffing of the equipment. For example; decontamination of the harness straps and backpack assembly of the self contained breathing apparatus is difficult. A butyl rubber apron worn over the harness makes decontamination easier. Clothing variations and different Levels of Protection may require adding or deleting stations in the original decontamination procedure.

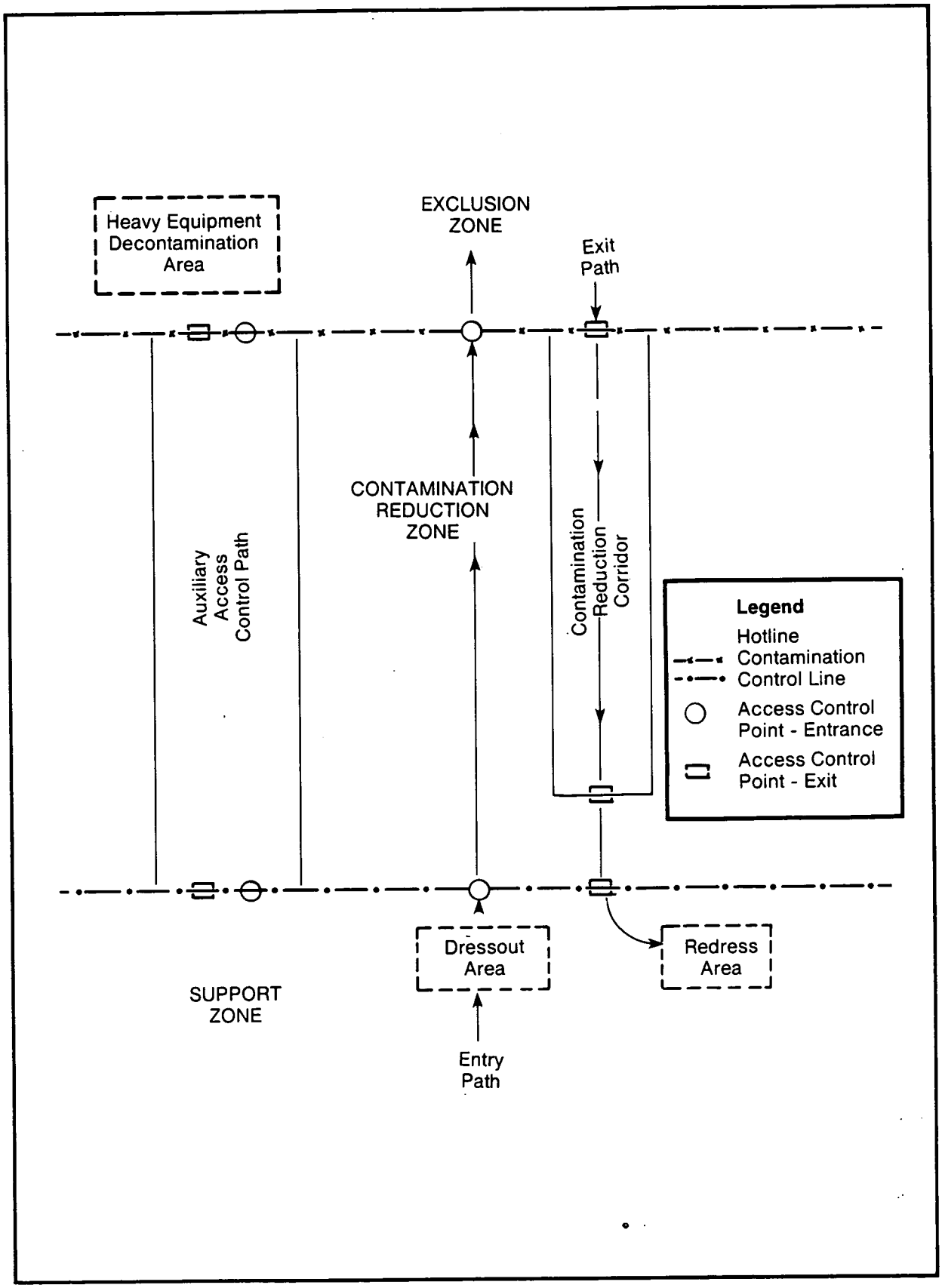

FIGURE 6-3 CONTAMINATION REDUCTION ZONE LAYOUT

Work Function - the work each person does determines the potential for contact with hazardous materials. In turn, this dictates the layout of the decontamination line. Observers, photographers, operators of air samplers, or others in the Exclusion Zone performing tasks that will not bring them in contact with contaminants may not need, for example, to have their garments washed and rinsed. Others in the Exclusion Zone with a potential for direct contact with the hazardous material will require more thorough decontamination. Different decontamination lines could be set up for different job functions, or certain stations in a line could be omitted for personnel performing certain tasks.

Location of Contamination - Contamination on the upper areas of protective clothing poses a greater risk to the worker because volatile compounds may generate a hazardous breathing concentration both for the worker and for the decontamination personnel. There is also an increased probability of contact with skin when doffing the upper part of clothing.

Reason for Leaving Site - The reason for leaving the Exclusion Zone also determines the need and extent of decontamination. A worker leaving the Exclusion Zone to pick up or drop off tools or instruments and immediately returning may not require decontamination. A worker leaving to get a new air cylinder or change a respirator or canisters, however, may require some degree of decontamination. Individual departing the CRC for a break, lunch, end of day, etc., must be thoroughly decontaminated.

Effectiveness of Decontamination - There is no method 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. However, observable effects 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 is swipe testing. Cloth or paper patches - swipes - are wiped over predetermined surfaces of the suspect object and analyzed in a laboratory. Both the inner

and outer surfaces of protective clothing should be swipe tested. Positive indications of both sets of swipes would indicate surface contamination has not been removed and substances have penetrated or permeated through the garment. Swipe tests can also be done on skin or inside clothing. Permeation of protective garments requires laboratory analysis of a piece of the material. Both swipe and permeation testing provide after the fact information. Along with visual observations, results of these can help evaluate the effectiveness of decontamination.

Equipment - Decontamination equipment, materials, and supplies are generally selected on availability. Other considerations are ease of equipment decontamination or disposability. Most equipment and supplies can be easily procured. For example, soft bristle scrub brushes or long handle brushes are used to remove contaminants. Watering buckets or garden sprayers are used for rinsing. Large galvanized wash tubs or stock tanks can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags store contaminated clothing and equipment. Contaminated liquids can be stored temporarily in metal or plastic cans of drums. Other gear includes paper or cloth towels for drying protective clothing and equipment.

Decontamination Solution - Personnel protective equipment, sampling tools, and other equipment are usually decontaminated by scrubbing with detergent water using a soft bristle brush followed by rinsing with copious 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), it is a relatively safe option compared with using a chemical decontamination solution. This requires that the contaminant be identified. A decon 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.

Establishment of Procedures - Once decontamination procedures have been established, all personnel requiring decontamination must be given precise instructions (and practice, if necessary). Compliance must be frequently checked. The

time it takes for decontamination must be ascertained. Personnel wearing SCBA's m,must leave their work area with sufficient air to walk to CRC and go through decontamination.

- Decontamination During Medical Emergencies

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

- Some response team members fully trained in first aid and 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 toxicologist.
- Emergency eye washes, showers, and/or wash solutions.
- First aid kits, blankets, stretcher, and resuscitator.

In addition, the plan should have established methods for decontaminating personnel with medical problems and injuries. There is the possibility that the 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. The outside garment 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 illness range from fatigue to heat stroke, the most serious. 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 and 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.

- 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 is flooding the affected area with water; however, for a few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, contaminants 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.

- Protection for Decontamination Workers

The Level of Protection worn by decontamination workers is determined by:

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

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.

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 protections.

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.

- 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 taped and secured around the instrument. Openings are made in the bag for sample intake.

6.5.12 Asbestos Monitoring and Protection

When it is suspected or known that asbestos is present, an asbestos monitoring, protection, and record keeping program shall be initiated as per regulations cited in 29 CFR 1910.1001. The eight hour time weighted average airborne concentrations of asbestos fibers, to which employees may be exposed without respiratory protection shall not exceed 2.0 fibers, longer than 5 micrometers, per cubic centimeter (or ml) of air as determined by the membrane filter method at 400-450X magnification (4mm objective) with phase contrast illumination.

Drilling in Pits 2, 4, and 6 will require respiratory protection and monitoring for asbestos fibers.

6.5.13 Noise

TLV's for workers shall be limited to those specified by the DOE Prescribed Standard AF 161-35. Noise suppression devices shall be used where appropriate and the use of hearing protective devices shall be mandatory for levels above the TLV or 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 1985-86," ACGIH, related to noise exposure shall be followed.

6.6 Environmental Protection Plan

Using the procedures specified in Section 2.12, "Continuous Air Sampling for Radioactive Particulates," and Section 2.13, "Work Area Air Quality Investigation" air samples will be collected and analyzed for radioactive and chemical constituents.

Additional air monitoring, as well as ground and surface water, soil, sediment and biota sampling will be provided by Westinghouse's routine Environmental Monitoring Program. These data should provide the documentation of all discharges of radioactive and chemical contaminants to the surrounding area, DOE Order 5480.1A "Environmental Protection Safety and Health Protection Program for DOE Operations (Attachment G).

To verify that site control procedures are preventing the spread of contamination, a monitoring and sampling program shall be implemented by the Site Health and Safety Officer. Environmental monitoring will be required during periods of all major activities at the Fernald site, particularly intensive activities. A monitoring plan shall be developed for each activity designating sampling stations, types and quantities of samples required and types of analyses required. The information acquired from these samples will be used to:

1. Estimate the maximum potential chemical and radiation exposure to the public resulting from remedial action at the Fernald site.

2. Ascertain whether the regulatory requirements of the DOE and appropriate agencies have been met.

3. Evaluate dispersion controls.

4. Determine the environmental impact of remedial action activities.

6.7 HAZARD CONTROL AND MONITORING

6.7.1 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 due to the physical, chemical, and toxicological properties of the material(s) present, other types of hazards - electricity, water, heavy equipment, falling objects, loss of balance, or tripping for example, can have an adverse effect on the health and safety of personnel. The following sections describe the requirements will be implemented to minimize these potential adverse effects.

6.7.2 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 characterization activities with another individual. At no time will workers be permitted to wander the site alone.

6.7.3 Equipment Safety

Life lines and safety belts shall 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, they shall 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 4 ft 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 Health and Safety personnel prior to being brought on-site to assure compliance with DOE and OSHA requirements. Any equipment failing to meet these requirements will not be permitted on-site.

6.7.4 Storage of Tools and Equipment

WESTON and its subcontractors shall 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 shall be kept in segregated storage areas. The location of materials, tools, or equipment within the buildings in the Production Area at FMPC shall be subject to the approval of the Westinghouse Materials Project Engineer. No materials, tools, or equipment may be stored in such a manner as to interfere with flow of traffic and production activities, or that could possibly expose buildings, pipe lines, or process equipment to damage in the event of fire.

6.7.5 Fire and Explosion Prevention

WESTON and its subcontractors shall maintain a fire and explosion prevention and control effort appropriate for the needs at the site as determined in the initial site survey. Training shall be provided to employees on reactive materials. Fire extinguishers shall be provided and maintained and employees instructed in their use. Good housekeeping practices and proper storage of flammable and combustible materials, liquids shall be required. All class I and II flammable liquids, e.g., motor fuels, paint thinners, and solvents, shall be dispensed from approved and properly labeled safety containers. The Site Health and Safety Officer or his designated representative shall tour the work area at the end of each work day to ensure that no evidence of combustible debris remains.

6.7.6 Safety Precautions Near Utility Lines

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

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

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

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

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

6.7.7 Safety Precautions When Drilling

All drillers shall wear safety glasses, hard hats, and steel-toed shoes and respiratory protection with a maximum protection factor of 100 as determined by the SHSO. Subsurface exploration will be conducted in the Waste Storage pits prior to drilling in that area.

6.7.8 Sanitation

Toilet facilities shall be provided in accordance with 29 CFR 1926.51. The location of these will be determined following the initial site survey.

Potable water for drinking and for washing prior to eating shall be provided for all employees.

6.7.9 Transport of Contaminated Material

WESTON and its subcontractors shall 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 shall be made. If the sum of all radionuclide concentrations do not exceed 2000 pCi/g, the material does not meet the Department of Transportation's definition of "Radioactive Material," and can be transported accordingly.

6.8 CONTINGENCY PLAN

The waste characterization work could be impacted by events not related tot he work (external) and by the work itself (internal). Procedures and training shall be provided for both externally and internally initiated events.

The nature of the waste characterization work is such that personnel injuries, fire, and/or an explosion could occur due to internal conditions. A fire or an explosion could result in either personnel injuries or an onsite/offsite release of radioactive materials or both.

Thus, the emergency procedures must include provisions for medical transport and treatment and contamination surveys. Coordination with offsite agencies will be necessary and the contingency plan should include appropriate training and drills.

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.

a. Call Mr. Steve Wentzel, Westinghouse Emergency Preparedness (513) 738-6802.

b. Call Mr. George Crawford, WESTON Corporate Health and Safety Manager, (215) 692-3030.

c. Call Dr. Donald R. Phoenix, WESTON Project Director and Manager, (215) 692-3030 or (215) 524-1925.

All accident/incident responds shall 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.
- Estimated property damage, if applicable.
- Nature of damage; effect on contract schedule.
- Action taken by contractor to ensure safety and security.
- Other damage or injuries sustained (public or private).

Information release will not be made to parties other than those listed above without approval of the 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 WESTON and Westinghouse Corporate Health and Safety Managers. A copy of this form is provided in Attachment H.

ATTACHMENT A

DOE ORDER 5484.1A - ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5484.1A

5-9-84

SUBJECT: ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS

1. PURPOSE. This order establishes requirements and procedures for the reporting of information having environmental protection, safety, or health protection significance for DOE operations.

2. CANCELLATION. DOE 5484.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS, of 2-24-81.

3. SCOPE. The provisions of this order apply to all DOE operations, including DOE contractor operations where, under the contractual arrangements for the work to be performed, the Department of Energy has established control over environmental protection, safety, and health protection program content.

4. REFERENCES.

   a. 29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses, which provides the Occupational Safety and Health Administration (OSHA) standards for recording and reporting of occupational injuries and illnesses.

   b. 29 CFR 1960, 10-21-80, Basic Program Elements for Federal Employee Occupational Safety and Health Programs, Subpart I, Recordkeeping and Reporting Requirements, which provides uniform occupational safety and health standards for recording and reporting Federal employee occupational injuries and illnesses.

   c. 49 CFR 173.401, General Requirements for Shipments and Packagings, which establishes the requirements for transportation and packaging of radioactive materials.

   d. Executive Order 12196, Occupational Safety and Health Programs for Federal Employees, which establishes the requirement for Federal agencies to provide occupational safety and health programs for their employees.

   e. Freedom of Information Act, PL 90-23, which establishes guidelines and procedures for the processing of requests made to the Department of Energy under the Act.

   f. Privacy Act, PL 93-579, which establishes guidelines and procedures for implementing the Privacy Act of 1974 in the Department of Energy.

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Office of Operational Safety

g. DOE Procurement Regulation 9-50.704.2, which provides environmental protection, safety, and health protection contract clauses.

h. DOE 3790.1, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR FEDERAL EMPLOYEES, of 12-11-80, which establishes the policy for the implementation and administration of the occupational, safety, and health program for Federal employees.

i. DOE 5480.1A, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM, of 8-13-81, which establishes the environmental protection, safety, and health protection program for the Department.

j. DOE 5480.2, HAZARDOUS AND RADIOACTIVE MIXED WASTE MANAGEMENT, of 12-23-82, which establishes hazardous waste management procedures for facilities operated under authority of the Atomic Energy Act of 1954, as amended.

k. DOE 5484.2, UNUSUAL OCCURRENCE REPORTING SYSTEM, of 5-13-81, which establishes a system for reporting unusual occurrences having programmatic significance.

l. DOE 5632.2, PHYSICAL PROTECTION OF SPECIAL NUCLEAR MATERIALS, of 2-16-79 which establishes minimum protection standards for special nuclear materials.

m. Accident/Incident Investigation Manual, ERDA 76-20, which provides guidance for conducting Department of Energy accident investigations.

n. American National Standards Institute Method of Recording and Measuring Motor Vehicle Fleet Accident Experience, D15.1, which provides a standard format for recording and measuring accident experience for motor vehicle fleets.

o. ERDA Guide to the Classification of Occupational Injuries and Illnesses, ERDA-7645-7, which provides guidance for recording and reporting occupational injuries and illnesses.

p. Effluent Information System (EIS) and Onsite Discharge Information System (ODIS) User's Manual, October 1977, which provides instructions for reporting radioactivity released by Department of Energy facilities.

5. DEFINITIONS.

a. Annual Commited Dose Equivalent. The dose equivalent (rem) received by specified organs during a period of one calendar year which was the result of an uptake of a radionuclide by a person occupationally exposed.

b. Monitored Visitor. Any non-employee, other than a resident non-employee, visiting a facility which is operated by the DOE or a DOE contractor under circumstances requiring that he be monitored for radiation exposure.

c. Confirmed Organ Burden. Deposition of radioactive material in lung, whole body, or specific organs that has been confirmed in using bioassay (in vivo) or excreta analysis techniques. For excreta samples, it may require positive results for a second sample before a "deposition" is considered confirmed.

d. Contracting Officer. An official designated to enter into or administer contracts and make related determinations and findings.

e. DOE Contractor. Any DOE prime contractor or subcontractor subject to the provisions of the Department of Energy Procurement Regulation 9-50.704-2 or other contractual provisions (e.g., cost-shared) where the DOE has elected to enforce environmental protection, safety, and health protection regulations by specific negotiated contract requirements.

f. DOE Site.

(1) A DOE-owned or -controlled tract used for DOE operations:

(a) Containing one or more facilities (excluding tracts used primarily for substations and transmission towers, and similar utility facilities), or

(b) At which one or more major DOE operations or program activities are being carried out.

(2) A Department of Energy-controlled site is one which is leased or otherwise made available to the Government under terms which afford to the Department of Energy rights of access and control substantially equal to those which the Department of Energy would possess if it were the holder of the fee (or pertinent interest therein) as agent of and on behalf of the Government.

g. Effluent. Airborne and liquid wastes discharged from a DOE site or facility following such engineered waste treatment and all effluent controls, including onsite retention and decay, as may be provided. This term does not include solid wastes, wastes for shipment offsite, wastes which are contained (e.g., underground nuclear test debris) or stored (e.g., in tanks) or wastes which are to remain onsite through treatment or disposal.

h. Effluent Monitoring. Collection and analysis of samples and other measurements for the purpose of establishing the type and concentration of radioactive and nonradioactive pollutants in liquids and airborne discharges from DOE facilities.

i. Environmental Surveillance. Sample collection and analysis of environmental media, i.e., air, water, soil, foodstuff, biota, etc., from the environs of DOE sites for the purpose of assessing effects of DOE operations at that site on the local environment.

j. Field Organization. A general term for any officially established Departmental component (excludes individual duty stations) located outside the Washington, DC, metropolitan area.

k. Headquarters Safety Program Official. For the DOE Federal Employees Occupational Safety and Health Program, this official is the Director of Administration. For the DOE Contractor Employees Occupational Safety and Health Program, this official is the Director, Office of Operational Safety.

l. Investigation. A detailed, systematic search to uncover the "who, what, when, where, why, and how" of occurrences and to determine what corrective actions are needed in order to prevent a recurrence.

(1) Board Investigations:

(a) Type A -- All members of the board are DOE employees. Used for investigation of fatalities and other major occurrences where the appointing official determines that conflict of interest or sensitive issues may be involved.

(b) Type B -- The board may consist of all contractor employees or both DOE and contractor employees, as circumstances surrounding the investigation permit.

(2) Non-Board Investigations (Type C). Type C investigations are performed for occurrences as specified in Chapter II of this Order.

m. Investigation Report. A clear and concise written account of the results of the investigation.

n. Notification. The actions taken to notify cognizant DOE officials of an occurrence, and the subsequent actions taken at successive levels within the DOE to notify the Secretary of an occurrence.

o. Occurrence. Any deviation from the planned or expected behavior or course of events in connection with any DOE or DOE-controlled operation if the deviation has environmental protection, safety, or health protection significance.

p. Onsite Discharge. Airborne and liquid wastes discharged to onsite treatment or disposal systems, e.g., sewage lagoons, retention ponds, and cribs, for retention, settling, decay, or storage onsite.

q. Positive Exposure. Any recorded exposure, corrected for background, greater than the established minimum sensitivity of the monitoring device or the measuring technique employed.

r. Radiation Records Library. The DOE centralized data base which maintains statistical summaries of occupational radiation exposure information for individuals monitored while engaged in activities associated with the DOE or DOE contractor operations. Individual legal occupational exposure records are maintained by DOE sites. The records library includes summary data submitted for the Atomic Energy Commission and the Energy Research and Development Administration activities.

s. Recorded Exposure. That number (corrected for background), zero (or minimal, negligible) and above, which is recorded as representing an individual's dose from ionizing radiation or internally deposited radioactive materials determined in accordance with established health physics principles and Order DOE 5480.1A, Chapter XI, requirements.

t. Monitored Worker. Any employee who works with ionizing radiation or radioactive material and who is monitored for compliance with radiation protection standards.

u. Resident Non-Employee. An individual not employed by the DOE or DOE contractor, but who routinely visits the site to provide support activities, i.e., telephone company personnel, reactor outage personnel, long-term experimenters (or users), vending machine personnel, etc. These individuals are considered visitors for radiation monitoring purposes.

v. Substantial. Clearly outside normally accepted or experienced bounds.

w. Terminated Employee. An individual employed by the DOE or a DOE contractor who terminates his employment; an individual who transfers to another DOE or contractor facility or office; an individual who begins a leave of absence of greater than 12 months' duration; all employees of contractors whose contracts with the DOE are terminated.

x. Trained Investigator. An individual who has completed the DOE Accident Investigation Workshop and who maintains active certification in accordance with prescribed criteria.

y. Variance. A short-term release from a requirement of this Order.

6. POLICY AND OBJECTIVES.

a. It is the policy of the DOE that timely notification of occurrences involving DOE and DOE contractor operations be made to responsible authority; that all occurrences be investigated; that reports be submitted to responsible DOE officials; that management take responsive action; and that there be consistency in the treatment of such occurrences.

b. The objectives of the information reporting system are:

(1) To investigate and evaluate occurrences to determine their causes and the appropriate measures to prevent recurrences and improve the safety of the DOE and DOE contractor operations.

(2) To obtain early, complete, and factual information on occurrences as a basis for: (a) reports to the Secretary, Congress, and other Federal agencies; and (b) where appropriate, informing the public.

(3) To assess the impact and cost of unplanned occurrences.

(4) To assure the gathering of adequate information on which to base management action.

(5) To establish a procedure for the development and reporting of occupational radiation exposure information to the Radiation Records Library that will be of assistance to the DOE in determining that radiation doses to individuals are maintained at the lowest levels technically and economically practicable.

(6) To monitor, evaluate, and report onsite discharges, liquid and airborne effluents, and environmental conditions in the vicinity of DOE sites to assess the levels of radioactive and nonradioactive pollutants and their impact on the public and the environment.

(7) To provide Federal employee occupational safety and health information under 29 CFR 1960 as required by the Director of Administration.

(8) To provide a basis for the improvement of codes, guides, and standards used in the DOE and DOE contractor operations.

7. RESPONSIBILITIES AND AUTHORITIES.

a. Assistant Secretary for Policy, Safety, and Environment: For occurrences involving DOE contractor employees and/or DOE contractor operations:

(1) Determines the need for and establishes the scope of Headquarters investigations of operational occurrences and, if needed, appoints Headquarters investigation boards.

(2) Accepts Headquarters investigation boards' reports.

b. The Director, Office of Operational Safety:

(1) Develops policies, procedures, standards, and guidelines for notification, investigation, and reporting of occurrences in the Department of Energy and Department of Energy contractor operations.

(2) Establishes DOE's information system requirements and procedures for the collection and compilation of data and reports related to occurrences and other information of environmental protection, safety, and health protection significance.

(3) Maintains, consolidates, and summarizes information regarding occurrences in the DOE and DOE contractor operations in order to:

(a) Provide basic safety statistics used in evaluating safety program performance.

(b) Provide safety information to the Secretary, the Congress, DOE offices, DOE contractors, other Federal agencies, and the public.

(c) Provide a basis for identifying needed improvements in safety codes, standards, and regulations.

(4) Conducts and coordinates all activities associated with operation and maintenance of the DOE Radiation Records Library, assuring that:

(a) Radiation exposure data are submitted to the Records Library.

(b) Annual employee locator file information is submitted to the Records Library.

(c) Annual monitored visitors locator file information is submitted to the Records Library.

(d) Requests for exposure information from the Records Library is processed.

(5) Prescribes requirements for certification of trained accident investigators.

(6) Develops and maintains a cadre of DOE trained accident investigators who are available to participate as members of Headquarters and field investigation boards.

For occurrences involving DOE contractor employees or DOE contractor operations:

(7) Recommends to PE-1, Headquarters or field investigations (when not otherwise required by this Order) for operational occurrences which have a significant impact on DOE programs.

(8) Recommends members for Headquarters investigation boards to PE-1.

(9) Reviews Headquarters and field investigation board reports to:

(a) Determine whether the investigations and the reports meet DOE standards for thoroughness, objectivity, and independence.

(b) Assure prompt identification and correction of injury and property damage causes.

(c) Assure appropriate distribution of the reports in those instances where the lessons learned are potentially applicable to other DOE and DOE contractor sites.

(d) Identify areas where research or development work is needed for safety evaluation or control purposes.

(10) Recommends to PE-1 the acceptance of the reports of Headquarters investigation boards and the necessary corrective actions based on the boards' reports and other appropriate considerations.

(11) Accepts field investigation reports and, if appropriate, recommends to heads of field organizations additional corrective actions.

(12) Circulates investigation reports for review by appropriate Headquarters divisions and offices when the recommendations for corrective actions involve or may affect activities under their jurisdiction.

(13) Approves variances from this Order.

(14) Establishes and interprets DOE environmental surveillance and effluent monitoring and reporting requirements.

(15) Reviews and approves field organization recommendations as to which sites need not perform routine effluent or environmental monitoring and reporting. This approval authority does not extend to monitoring and reporting required by Federal, state, and local laws, regulations, and permits.

c. Director of Administration: For occurrences within the DOE Federal Employees Occupational Safety and Health Program:

(1) Determines the need for and establishes the scope of Headquarters investigations of occurrences and, if needed, appoints Headquarters investigation boards.

(2) Accepts Headquarters and field investigation reports and, if appropriate, recommends additional corrective actions.

(3) Directs corrective actions based on Headquarters investigation boards' recommendations.

(4) Approves variances from this Order.

d. The Director, Office of Nuclear Safety:

(1) Notifies the Deputy Assistant Secretary for Environment, Safety, and Health and other Federal agencies, as appropriate, of significant occurrences in DOE or DOE contractor operations pertaining to nuclear reactors and nuclear facilities.

(2) Reviews Headquarters and field investigation board reports of occurrences in contractor operations pertaining to reactors and nuclear facilities to:

(a) Determine whether the investigations and the reports provide an objective and thorough review with appropriate recommended actions.

(b) Assure prompt and correct identification and correction of injury and property damage causes.

(3) Provides management and coordination of Departmental responses to nuclear accidents and incidents.

(4) Coordinates ASPE interests in the Headquarters Emergency Operations Center.

(5) Provides ASPE representation on the Emergency Action Coordination team.

e. Director, Emergency Action and Coordination Team (EACT):

(1) Informs Headquarters and field organizations, as appropriate, of significant occurrences in DOE and DOE contractor operations.

f. Inspector General:

(1) Reviews and recommends policies and standards for notification, investigation, and reporting of occurrences, in the DOE and DOE contractor operations.

(2) Conducts investigations as required by the Secretary.

g. Heads of Offices and Divisions, Headquarters:

(1) Review reports of occurrences for operations for which they are cognizant in order to determine if any policies or procedures for which they are responsible need revision. Those responsible Headquarters officials having contractor organizations directly under their jurisdiction will assume the same responsibilities as heads of

field organizations in paragraph 7h. The Deputy Assistant Secretary for Naval Reactors shall assume, for Naval Reactors' activities, the same responsibilities as heads of field organizations.

(2) Direct and assure satisfactory completion of corrective actions applicable to their programs based on Headquarters investigation boards' recommendations.

(3) Notify, within 24 hours after receipt of exposure information, any DOE employee in their organization of any radiation exposure received which exceeds the dose equivalent standards specified in Order DOE 5480.1, Chapter XI.

(4) Request, for employees in their organization visiting facilities not operated by the DOE or DOE contractors where exposure to radiation is possible, that any resultant exposure information along with the individual's name, social security number, and date of birth be sent to the DOE Headquarters, Attention: Director, Office of Operational Safety.

h. Heads of Field Organizations and Other Contracting Officers:

(1) Establish procedures to assure proper notification (internally and to Federal, state, regional, and local agencies), investigation, and reporting of occurrences as required in this Order.

(a) Appoint field investigation boards and establish the scope of their investigations, including limitations, if any; may designate the head of the contractor organization as the appointing official for an all-contractor board investigation. Heads of field organizations may desire to use trained investigators from other offices. The Director, Office of Operational Safety, maintains a roster of currently certified accident investigators for this purpose.

(b) Request a variance from the Headquarters safety program official after determining that the report of another organization (e.g., National Transportation Safety Board, Federal Aviation Administration, Federal Bureau of Investigation, state highway patrol, etc.) should be accepted in lieu of a field investigation. Formally request copies of other organizations' investigation reports of field occurrences when such variances are approved.

(3) Review reports of field investigation boards and other organizations, where applicable, and order additional investigation by field staff, if necessary.

(4) Transmit reports and recommendations of field investigation boards and other agencies, where applicable, to the Headquarters safety program official with copies to the Inspector General and other appropriate Headquarters officials. Transmit with each report a field organization evaluation of the report, including a statement of the corrective actions which have been taken or are planned by the field organization.

(5) Assure that corrective actions are satisfactorily completed and so advise the Headquarters safety program official with copies to the appropriate Headquarters program organization.

(6) Assure that, except for necessary emergency actions, the scene of any occurrence requiring or possibly requiring a Headquarters or field organization board investigation is not disturbed until the investigation board concurs that recovery or normal operations may be resumed.

(7) Assure that Headquarters and field investigation boards receive the necessary logistic and administrative support.

(8) Direct the preparation and release of public statements on occurrences, where deemed appropriate.

(9) Assure that individuals under their jurisdiction are:

(a) Notified within 24 hours after receipt of exposure information of any radiation exposures that exceed the dose equivalent standards specified in Order DOE 5480.1A, Chapter XI.

(b) Provided, upon written and signed request, with a summary of their reported occupational radiation exposures. Such report shall be furnished within 30 days from the time the request is made, or within 30 days after the exposure has been determined, whichever is later.

(10) Prepare an Annual Summary of Property Protection Program Report and submit it to the Director, Office of Operational Safety, on or before March 15 of each year.

(11) Determine when preoperational and environmental surveys are required to obtain background and baseline data in advance of startup of any new site or a new facility or process at an existing site; review and approve the preoperational survey program prior to its implementation; and review and approve the report of the survey results prior to startup of the new facility, site, or operation.

(12) Assure that the DOE facilities and sites under their purview conduct the effluent monitoring, environmental surveillance, and reporting programs in accordance with the requirements of this Order and as

necessary to determine compliance with all applicable Federal, state, and local effluent standards and permit conditions and report to the local, state, and regional environmental protection agencies, the public, the program Headquarters office and the Office of Operational Safety on the status of such compliance.

(13) Recommend to the Director, Office of Operational Safety, with the concurrence of the director(s) of the responsible program office(s), when routine environmental monitoring and reporting is not required (programs to be waived) or is to be terminated at DOE sites. Requests for approval to terminate any environmental surveillance and effluent monitoring and reporting activities should include an explanation, with supporting data, as to why the site is not expected to have significant releases or a significant effect on the environment.

(14) May grant an exemption from monitoring and reporting for those effluents which meet all of the following criteria:

(a) Do not routinely contain and are not a potential source of accidental releases of significant quantities or concentrations of radioactivity or nonradioactive pollutants in relation to applicable standards.

(b) Are of no health, safety, or environmental significance.

(c) Are not required to be monitored by other Federal, state, or local pollution control agencies or regulations.

(The Office of Operational Safety will assist in the interpretation of "significant" as used in (14) (a), and elsewhere in this Order, on a case-by-case basis as requested.)

(15) Assure that the DOE facilities and sites under their purview submit occupational exposure data, employee locator information and monitored visitor locator information to the Radiation Records Library in accordance with the requirements of this Order.

i. <u>Members of Headquarters and Field Organization Boards of Investigation</u>:

(1) Report directly to the appointing official during the investigation.

(2) Understand the scope of the investigation including the limitations, if any, prior to initiating the investigation. If necessary, the board should discuss the scope of the investigation with the appointing official or designee.

(3) Conduct an investigation and prepare an investigation report in accordance with the requirements in this Order.

(4) Transmit the report with a cover memorandum which includes the board's recommendations to the appointing official within the specified period of time.

j. Appointing Officials Designated by Heads of Field Organizations or DOE Headquarters:

(1) Appoint field investigation boards and establish the scope of their investigations, including limitations, if any.

(2) Assure that investigation boards receive the necessary logistic and administrative support.

(3) Transmit reports and recommendations of field investigation boards to the DOE designating official.

k. Requestors of Radiation Exposure Information:

All requests for exposure information for individuals from the DOE Radiation Records Library should be directed to the Director, Office of Operational Safety. Exposure information which identifies the individual will be disclosed only upon written authorization of the individual or his or her duly authorized representative pursuant to the Privacy Act of 1974 and the Freedom of Information Act. The release of summary statistical information reported in accordance with this Order is governed by Chapter 3101, "Public Information Program."

Martha O. Hesse
Assistant Secretary
Office of Management and Administration

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CHAPTER I

NOTIFICATION OF OCCURRENCES

1. IMMEDIATE NOTIFICATION. Notification to the Headquarters Emergency Operations Center of the following occurrences shall be made as soon as sufficient information is obtained to indicate the general nature and extent of the occurrence:

   a. People.

      (1) Any fatal or imminently fatal injury or illness involving a DOE or DOE contractor employee or a member of the public due to an occurrence associated with a Department of Energy or Department of Energy contractor operation. (Requires Type A Board Investigation.)

      (2) Any one occurrence (involving either occupational injuries or illness) in a DOE or DOE contractor operation which results in five or more lost workday cases.

      (3) Any occupational illness which results in inpatient hospitalization.

      (4) Any series of occupational illnesses with the same or similar causes involving five or more persons of which at least one is a lost workday case.

      (5) Any occupational illness which is a lost workday case involving more than 5 days away from work.

      (6) Any radiation exposure to an individual which in one calendar quarter exceeds the following:

         (a) 5 rem to the whole body.

         (b) 15 rem to skin of whole body or thyroid.

         (c) 30 rem to the forearms.

         (d) 75 rem to the hands or feet.

      (7) Any internal uptake of radioactive material which on the basis of a small number of early assay data could result in a dose or dose commitment in excess of the pertinent annual standard set forth in the Order DOE 5480.1A, Chapter XI, "Standards for Radiation Protection." For whole body dose, 5 rem is the pertinent annual standard.

b. Environment.

(1) Any accidental releases of pollutants which result or could result in significant effect on the public or on the offsite environment, e.g., need to relocate people, substantial fish kill, requirements for corrective action in the environment, requests that downstream water supply intakes be shut down, etc.

(2) Any accidental releases of reportable quantities of oil and hazardous substances to the environment should be reported in to the National Response Center or the nearest United States Coast Guard or U.S. Environmental Protection Agency office, in accordance with the statutory requirements of the Comprehensive Environmental Response, Compensation and Liability Act and the Clean Water Act.

(3) Any release of radioactive material to controlled or uncontrolled areas in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the respective concentration guides specified for such materials in the Order DOE 5480.1A, Chapter XI "Standards for Radiation Protection."

(4) Any release of radioactive material offsite that could reasonably be expected to result in an annual dose or dose commitment to any member of the general population greater than the annual standards set forth in Order DOE 5480.1A, Chapter XI, "Standards for Radiation Protection."

(5) Any discovery of significant radioactive or nonradioactive contamination in the onsite or offsite environment attributable to current or past DOE operations.

c. Property.

(1) Estimated loss or damage to DOE or other property amounting to $50,000 or more, or estimated costs of $50,000 or more required for cleaning (including decontamination), renovating, replacing, or rehabilitating structures, equipment, or property.

(2) Any occurrence involving a nuclear explosive device under DOE jurisdiction which results in an explosion, fire, the spread of radioactive material, personal injury or death, or damage to private property.

(3) Any apparent loss or theft of radioactive or nonradioactive material in such quantities and under such circumstances that it could constitute a hazard to the health and safety of individuals. Where this involves the possible theft of Government property, the Federal Bureau of Investigation shall be notified by the Office of Safeguards and Security for a decision as to acceptance of investigation jurisdiction. For apparent losses of source material, special

nuclear material, and such other material included in the category "Special Nuclear Materials," see Order DOE 5632.2.

(4) Any nuclear criticality achieved in a system not intended to reach criticality.

(5) Any unplanned nuclear excursion in a reactor, whether or not terminated by protective actions, which is clearly outside the routinely accepted and experienced bounds for that reactor.

d. Transportation.

(1) Any aviation related occurrence involving lost workday injuries to crew members, ground crew, or other personnel assigned to aviation operations; injuries to passengers or members of the general public; an explosion or fire involving an aircraft; substantial damage to property, or to classified, radioactive, high explosive, or other hazardous cargo.

(2) Any vehicle transporting radioactive material that is known by the shipper or the receiver to have been found on arrival at a DOE or DOE contractor facility to be contaminated in either the interior or exterior above the limits specified in Section 173.397, "Contamination Control," Department of Transportation Regulations, 49 CFR 173.

(3) Any shipment of radioactive material that arrives at a Department of Energy contractor facility damaged to the extent that there is substantial reduction in the effectiveness of the package; from which radioactive contents are leaking or may have leaked; or contaminated above the limits specified in Section 173.397, "Contamination Control," Department of Transportation Regulations, 49 CFR 173.

e. Other.

(1) Any occurrence which is likely to give rise to an inquiry by members of the public or press, if the field organization head involved considers the inquiry to be of sufficient importance to notify Headquarters.

(2) Any occurrence where a press release is made or where information is provided to the news media, other Federal agencies, or state or local authority, either by the field organization or a DOE contractor.

(3) Any radiological assistance occurrence.

(4) Any request to an offsite authority for emergency assistance involving a nuclear operation.

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INFORMATION REQUIRED IN NOTIFICATIONS.

a. For immediate notifications, or as soon as sufficient information is obtained to indicate the general nature and extent of the occurrence, the reporting official shall notify the Emergency Operations Center by telephone (301-353-5555 or FTS 233-5555). All calls on this emergency number are tape recorded. A confirming teletype shall be sent as soon as possible.

b. For the immediate notification confirmation, a teletype shall be directed to the Director, Office of Nuclear Safety, with copies to the Headquarters safety program official, the appropriate programmatic division director, the Inspector General, and the Director, Office of Public Affairs. The teletype shall state all of the following information which is known at the time:

(1) Time, date, location, name of involved organization(s), general nature of the occurrence, and its major consequences.

(2) Whether a press release has been issued or is contemplated.

(3) Whether known facts eliminate need for investigation by a Department of Energy board.

(4) Known significant details of the occurrence, the consequences, programmatic and public effects, injuries, property damage, action taken for emergency control and amelioration, status of actions to initiate investigation, and comments on possible causes of occurrence.

(5) Whether a Type A or Type B board investigation is planned, and the names and titles of appointing official, proposed investigation board members (indicate the trained investigator), advisors, and consultants.

c. The following information on occurrences which take place during the transportation of radioactive materials shall be obtained and filed:

(1) Identification of the shipper and receiver.

(2) Identification of service used for shipment, i.e., public vehicle or common carrier and mode of shipment (truck, rail, air, or waterway). Include the name of the carrier and the specific vehicle or car number.

(3) Location of occurrence.

(4) Driver's account or report of the occurrence.

(5) Identification of the packaging by model, special permit, specification, or certificate number.

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(6) Type and quantity of material in each package, and total quantity in the shipment(s).

(7) Nature of package and vehicle contamination, if any.

(8) Radiation levels detected (direct) and amount of removable contaminants (microcuries per 100 square centimeters).

(9) Personnel exposure and contamination, how determined, and action taken.

(10) Extent of contamination and estimated cost of cleanup.

(11) Nature of packaging failure, if any.

(12) Source of contamination if the package is undamaged.

(13) Nature of any defects or deterioration of the packaging.

(14) Evidence of improper package handling.

3. NOTIFICATION OF ENVIRONMENTAL COMPLIANCE. Notification shall be made within one week to the Director, Office of Operational Safety, of the following events:

a. Any notice of violation which has been issued to the DOE or its contractors by an environmental regulatory agency. (By copy)

b. Any circumstance which is likely to result in the issuance of a notice of violation by an environmental regulatory agency. (By report)

c. Any violation of, or deviation from, prescribed regulatory or permit limits for which a formal notification to an environmental regulatory agency is required. (By copy)

CHAPTER II

INVESTIGATION REQUIREMENTS

1. TYPES OF INVESTIGATIONS.

a. Board Investigations - Board investigations shall be conducted for any fatal accident (Type A board) and for other occurrences where in the judgment of the head of the field organization or the Headquarters appointing official, the consequences were, or could have been, so severe as to justify an indepth investigation.

(1) Board Types

(a) Where the head of the field organization or the Headquarters appointing official determines that conflict of interest or sensitive issues may be involved in the investigation, the board shall consist entirely of DOE personnel (Type A board).

(b) If the Type A board is not required, the board may consist of all contractor employees or both DOE and contractor employees (Type B board).

(2) Investigation of Occurrences by Headquarters.

(a) Headquarters investigations of occurrences within the DOE Federal Employees Occupational Safety and Health Program will be conducted by a board appointed by the Director of Administration.

(b) Headquarters investigations of occurrences within the DOE Contractor Employees Occupational Safety and Health Program will be conducted by a board appointed by the Assistant Secretary for Policy, Safety, and Environment.

(3) Designated Appointing Official. At the discretion of the head of the field organization or the Headquarters appointing official, the head of an involved DOE prime contractor organization may be designated as the appointing official of a Type B board if all of the following conditions are met:

(a) The investigation board consists entirely of contractor employees.

(b) There was no major involvement of other DOE prime contractors in the occurrence.

(c) The Type B board investigation will preclude the involved contractor organization from conducting a parallel investigation of its own.

b. Non-Board Investigations (Type C). Type C investigations are normally conducted by DOE contractor personnel when their operations are involved. Heads of field organizations should encourage the use of trained investigators, when available, to investigate Type C occurrences. Standards for these investigations beyond those in this part may be established by the individual management. Type C investigations shall be conducted for:

(1) All "recordable occupational injuries and illnesses" (as defined on Form OSHA No. 200, Log of Occupational Injuries and Illnesses (Attachment 5), property losses of $1,000 or more, and all vehicle accidents resulting in losses or claims of $250 or more (involving Government-owned, -rented, or -leased vehicles or privately-owned vehicles while operated on official business).

(2) All radiation exposures of individuals which in any one calendar quarter exceed the following shall be reported by memorandum to the Office of Nuclear Safety with a copy to the Office of Operational Safety:

(a) 3 rem to whole body.

(b) 5 rem to skin of whole body or thyroid.

(c) 10 rem to forearms.

(d) 25 rem to hands or feet.

(3) Any other occurrence where, in the judgment of the head of a field organization, the consequences were serious enough to require a non-board investigation.

(4) Type C investigations, providing preliminary information for reporting purposes, also shall be conducted for all occurrences for which a Type A or B board investigation is planned.

c. Submission of Type A and Type B Board Investigation Reports.

(1) The investigation board shall submit the investigation report and the board's recommendations to or through the appointing official within the amount of time prescribed by the appointing official.

(2) The head of the field organization shall submit six copies of the investigation report and board's recommendations to the appropriate Headquarters safety program official (for all occurrences, the Director, Office of Operational Safety, is to receive one copy

and one glossy print set of the report's photographs for archive purposes). In addition, one copy shall be submitted to the appropriate program director.

(3) If the investigation report cannot be submitted within 45 days, the Headquarters safety program official shall be notified as to the reason for the delay and the anticipated date of submission.

(4) The head of the field organization shall transmit the investigation reports by a memorandum which contains, but is not limited to, the actions taken, or to be taken, as a result of the findings.

(5) Preliminary information shall be submitted to the System Safety Development Center (SSDC) on Form DOE F 5484.X, as specified in d. below.

d. Submission of Type C Investigation Reports (including those which also result in formal board investigations) shall be made on Form DOE F 5484.X, Individual Accident/Incident Report For All Type A, B, and C Investigations (Attachment 2). Copies of form DOE F 5484.X shall be submitted to the SSDC, EG&G Idaho, Inc., either individually as the forms are completed, or in batches; however all DOE F 5484.X forms shall be received by the SSDC no later than the 15th of the month following the end of the month in which the accident occurred. Normally, this will require that the form for a Type A or B investigation be submitted before the board investigation is completed. However, this information may be revised later, based on findings of the formal board investigation.

2. STANDARDS FOR INVESTIGATION.

a. Appointing the Board.

(1) A board of investigation shall consist of three to five members including a chairman.

(2) All members of Type A investigation boards shall be DOE employees. Type B investigation boards may consist of DOE contractor employees, or both DOE contractor and DOE employees, at the discretion of the head of the field organization. All employees appointed to an investigation board shall be assigned and report to the appointing official during the investigation.

(3) At least one of the board members shall be a trained accident investigator.

(4) All competencies should be considered in appointing each board, including managerial, scientific, professional, and investigative qualifications.

(5) The use of necessary consultants or advisors who are experts in certain areas or who are familiar with the operations or management of the program involved in the occurrence is encouraged. These persons may be contractor personnel.

(6) A superior and his subordinate shall not serve on the same board.

(7) Employees directly related to the operation or activity involved in the occurrence shall not serve on a board.

b. The Investigation Report. The investigation report is to convey in clear and concise language the results of the investigation (the facts surrounding the occurrence, the analysis of these facts, and the conclusions). The investigation report shall constitute a record of the occurrence reflecting accuracy and objectivity, and shall provide a sound basis for the development of recommendations and corrective actions.

(1) General. The investigation report shall consist of, but is not limited to, four sections: summary, facts, analysis, and conclusions.

(a) The summary is a brief account of the essential facts of the occurrence and the investigators' conclusions. The facts section consists of a recitation of the factual information determined in the course of the investigation. The analysis section of the report is based upon the factual information developed, and addresses the investigators' reasoning which supports the conclusions. The conclusions section consists of the findings, the probable causes and contributing factors to the occurrence, and the judgment of needs.

(b) The investigation report shall fully cover and explain the technical elements of the causal sequences of the occurrence and shall also describe the management systems which should have, or could have, prevented the occurrence, e.g., the hazard review system or the quality assurance program.

(c) The investigators' recommendations for corrective actions to prevent a similar occurrence shall be included in the cover memorandum that transmits the investigation report to the appointing official, rather than contained in the report. This affords the appointing official some latitude in responding to the judgment of needs without changing the content of the report.

(2) Outline of the Report.

(a) Cover. The cover and title page shall be limited to subject and date of occurrence, the date of the report, and the security classification. These pages shall not include distribution

lists, internal organization nomenclature, name of organization participating or preparing the report, or other such information.

(b) Table of Contents. The table of contents shall identify the sections and subsections of the report, illustrations, charts, and appendixes with their report page number designated.

(c) Scope of Investigation. This statement shall set forth the issues or objectives to be investigated and any special limitations or instructions to the board.

(d) Summary. This section shall be written in such a manner that the reader, who may be relatively unfamiliar with the subject matter, can obtain the essential facts, major consequences (injuries, losses, etc.), the findings, and the probable causes and contributing factors with a minimum of effort and time. The summary shall not contain information that is not discussed elsewhere in the report.

(e) Facts. This section of the report shall cover the major areas of investigation in a uniform manner and in a reasonable, logical sequence.

1 Include all the facts and do not include any conclusions in this section.

2 Give the reader a good understanding of the accident.

3 Stress the areas of the accident investigation bearing on causal considerations.

4 Establish an accurate, complete, and substantive basis for the analysis and conclusions sections. This assures both accuracy and completeness to mitigate introducing new facts in the analysis and conclusions sections.

5 Stress the areas which form the basis for corrective measures.

6 Where additional information on a subject is contained elsewhere in the report, use a footnote or note of reference naming the section or appendix where such material can be found.

7 Do not omit any relevant factual information for any reason whatever, i.e., that it might conflict with some preconceived notion of the investigator or interfere with the dissemination of information (bulletins, news releases, etc.). Investigators must, at all times, be critical of their own reasoning to assure a completely objective and independent

account of the occurrence. Examples of information to include are:

a Pertinent background information, where available, i.e., brief description of facilities, location, history, etc.

b Description of injury, exposure, or loss due to property damage or decontamination costs.

c Physical evidence, including environmental conditions at the time of the occurrence.

d Chronological account of events.

e Physical hazards and review of safety controls.

f Technical data accumulated.

g Related events not in the causal sequence, but revealing deficiencies (to be placed at the end of the section).

h Description of quality assurance and safety assurance programs.

(f) The Analysis.

1 This section of the report is intended to present an analysis of the factual material relevant to the occurrence based on the interpretation of the facts, conditions, circumstances, and inferences which support the findings, probable causes, and judgments of needs. This section should include a discussion of the causal sequences, with due consideration being given to charting the relationship of events and causal factors. Speculated events, facts in controversy, denial of allegations, and what could not be determined should be discussed in the analysis section.

2 The analysis should lead up to the findings, probable causes, and judgment of needs so as to support the causal factors.

3 Make the analysis "accident prevention-worthy" not blameworthy.

(g) Conclusion.

1 Findings. This subsection consists of the relevant significant facts and the analytical conclusions drawn by the investigators.

a Organize findings sequentially, preferably in chronological order, or in logical sets of sequences, e.g., hardware, procedures, people, organization.

b Make analytical conclusions which can be understood on the basis of the facts and the subsequent analysis.

c Keep findings to a minimum number. They are a recap of the significant facts and the analytical highlights, not the entire sequence of events.

d Keep findings as short as possible and, to the extent possible, put only one highlight in each finding.

2 Probable causes. The statement of probable causes shall consist of a series of relatively simple statements which summarize the causes and contributing factors, including any systemic factors.

3 Judgment of needs. This section consists of the investigators' conclusions as to the kinds of managerial controls and safety measures believed necessary and sufficient to prevent, or to minimize the probability or severity of, a recurrence. These statements should be clear, concise, direct, and based on the weight of the substantive evidence, while providing the basis for the subsequent recommendations for corrective action.

(h) Signatures. The chairman and members of the board shall sign the report. Any board member has the right to set forth a dissenting position to the report. A dissenting position shall be stated in a letter to the board chairman and shall be transmitted to the appointing official with the investigation report.

(i) Minority report. If there is a minority report, it should be limited to the variance between analytical highlights and conclusions. The minority report should be signed.

(j) Board authority. This is the investigation board appointment. It shall include the names, employer, job titles, positions of board members, and the authority for the investigation. It should also detail the scope of the investigation including the limitations, if any.

(k) Appendix. (Exhibits). Material that is pertinent but need not be made a part of the written report in order to understand or use the report, shall be included as exhibits to the report and shall follow the body of the report. These may include written statements, witnesses' statements, letters, laboratory analyses,

memoranda, pictures, death certificates, etc. Medical records and legal opinions shall not be included in the report. Only material that a reader may want to evaluate or material that is in controversy should be included in the appendix. All such material should be identified the same; e.g., "Exhibit ___," or "Appendix ___." Where more than one such item is used, they shall be numbered in sequence as introduced in the report, i.e., "Exhibit A," "Exhibit B," etc. Every exhibit shall be introduced in the report in appropriate sequence and, at the time introduced, there shall be a brief recitation of its contents. Long, detailed, complex exhibits shall be avoided.

(3) Recommendations. The natural followup to the judgment of needs is the recommendations. Each board shall arrive at recommendations intended to prevent or mitigate similar occurrences. The utmost care should be exerted in forming the recommendations so that all are clear-cut, feasible, logical, and applicable in the field for which they are intended. These recommendations shall be transmitted to the appointing official in the cover memorandum for the investigation report. The purpose in separating the recommendations from the body of the report is to reflect the actual implementation process. The head of the field organization, the Headquarters safety program official, the Secretary, and finally Congress may add to or modify recommendations.

. CORRECTIVE ACTIONS.

a. Immediate Corrective Actions. These are the immediate measures taken by the Department of Energy or Department of Energy contractors that are necessary to prevent a second occurrence, pending completion of the investigation and acceptance of the report with long range corrective actions.

b. Recommendations of the Board. Headquarters and field investigation boards shall formulate appropriate recommendations for long range corrective actions to prevent the recurrence of a similar type of event and to correct any systemic problems that contributed to the occurrence.

c. Corrective Actions from the Appointing Official. The recommendations of the board are reviewed by the appointing official. Any additional corrective actions that the official considers appropriate for the operation involved and for other Department of Energy operations with a similar accident potential shall be separately noted in the memorandum transmitting the investigation report to the Headquarters safety program official.

d. Corrective Actions from Headquarters. The recommendations of the board and the corrective actions of the appointing official are reviewed by the Headquarters safety program official. If necessary, major policy issues will be discussed with the Secretary. Any additional corrective

actions suggested by the Headquarters safety program official shall be included in the memorandum to the head of the field organization. The Headquarters safety program official may transmit copies of the investigation report by a memorandum with appropriate corrective actions for consideration to all Department of Energy field organizations which oversee or conduct operations with a similar potential.

e. Closing the Case. When all proposed actions are complete, the head of field organization shall inform the Headquarters safety program official, with copies to the Inspector General and the appropriate programmatic division director(s), that the case is closed. Only those occurrences investigated by Type A and Type B boards must be closed officially by the Headquarters safety program official.

CHAPTER III

ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION REPORTS

1. GENERAL.

   a. Requirements for reports resulting from Types A and B board investigations are provided in Chapter II to this Order.

   b. Approval of the Director, Office of Operational Safety, is necessary prior to substitution of contractor forms for those required in this chapter.

   c. Department of Labor, Occupational Safety and Health Administration (OSHA), rules and definitions shall govern the recording and measuring of work injury experience. Chapter IV of this Order shall govern the determination of DOE property valuation for property damage experience. "American National Standards Institute Method of Recording and Measuring Motor Vehicle Fleet Accident Experience," D15.1 (latest edition) shall govern the recording and measuring of motor vehicle accident experience. Revision of statistics for prior calendar years shall be transmitted to the System Safety Development Center (SSDC), EG&G Idaho, Inc., whenever new information is available. Doubtful cases of occupational injury or illness classification shall be forwarded to the Director, Office of Operational Safety, for final determination.

2. TYPE C INVESTIGATION REPORTS.

   a. A quarterly report of radiation exposures defined in paragraph 1.b.(2) of Chapter II of this Order, which occurred during the calendar quarter shall be prepared by field organizations and submitted to the System Safety Development Center, EG&G Idaho, Inc., on or before the 15th of the month following the end of the month in which the exposure occurred. The report shall include the following information:

      (1) A brief description of how the exposure occurred.

      (2) Personal information:

         (a) Name.

         (b) Date of birth.

         (c) Place of birth.

         (d) Sex.

         (e) Social security number.

(3) Radiation exposure information:

(a) Approximate dates for period during which the exposure was accumulated.

(b) Types of radiation involved.

(c) Total estimated radiation dose in rem.

b. Form DOE F 5484.X, Individual Accident/Incident Report For All Type A, B, and C Investigations (Attachment III-1), shall be prepared (based on instructions in Attachment III-2) by each DOE office and DOE contractor organizational unit for:

(1) "recordable occupational injuries and illnesses" as defined on Form OSHA No. 200, Log of Occupational Injuries and Illnesses (Attachment III-3),

(2) property damage losses of $1,000 or more. Accidents which cause damage to DOE property, regardless of fault, or accidents wherein DOE may be liable for damage to a second party, are reportable where the damage is $1,000 or more. Include damage to facilities, inventories, equipment, and properly parked motor vehicles. Exclude damage resulting from a DOE reportable vehicle accident.

(3) any Government motor vehicle accident resulting in damages of $250 or more or which involved an injury. Exclude those cases where the Government vehicle is not at fault and where damage of $250 or more was not sustained to the Government vehicle, or no injury was inflicted to the government vehicle occupants. Accidents defined in ANSI D15.1 Motor Vehicle Accidents are reportable to DOE if:

- o Damage to a Government vehicle, not properly parked, is greater than or equal to $250.
- o Damage to DOE property is greater than or equal to $250, and where the driver of a Government vehicle is at fault.
- o Damage to any private property or vehicle is greater than or equal to $250 and where the driver of a Government vehicle is at fault.
- o Any person is injured and the driver of a Government vehicle is at fault.

The description of the motor vehicle accident on Form DOE F 5484.X shall include the following information:

(1) Whether or not the vehicle was equipped with seat belts.

(2) Whether or not the seat belts were in use at the time of the accident.

c. Attachment III-4, Form DOE F 5484.Z, Transmittal of DOE F 5484.W, DOE F 5484.X, or DOE F 5484.Y, or equivalent, shall accompany all transmittals of the subject forms.

d. Injury, illness, property damage, and/or motor vehicle damage revisions are to indicate the new (corrected) totals, rather than additions or deletions which should be applied to the previous report. Revisions are due whenever new information is available.

3. QUARTERLY SUMMARIES AND OTHER REPORTS.

a. Form DOE F 5484. For DOE F 5484.Y, Tabulation of Work-hours, Vehicle Usage, and Tort Claims (Attachment III-5), shall be prepared by each DOE office and DOE contractor organization unit. One copy from each field office, area office, and contractor organizational unit shall be received by the System Safety Development Center, EG&G Idaho, Inc., for each quarter on or before the 25th of the month following the quarter. Revisions to reports should be submitted as new information becomes available.

b. Visitor Radiation Exposure Report. Report all positive results of external and internal monitoring for visitors. Submit copies to the visitor's employer (or to the visitor if he has no employer) within a period of 30 days after the date of the visit or within 30 days after the visitor's exposure has been determined, whichever is later. For visitors who are employees of the DOE or DOE contractors, a report should be submitted only to the visitor's employer. Include the visitor's name, social security number, contractor and facility visited, period of monitored visit (beginning date and ending date), portion of body or organ monitored, nuclides detected, and the assigned or calculated dose.

c. Preoperational Environmental Survey Reports. The results of environmental surveys conducted prior to the actual startup of a new site, facility, or process which has the potential for adverse environmental impact shall be documented in this report. Five copies shall be submitted to the Office of Operational Safety and one copy to appropriate program offices before the new site becomes operational.

d. Aircraft Accident/Incident Reports. Form DOE F 5484.X shall be prepared for preliminary reports of aircraft accidents and incidents. Form DOE F 5484.2, Aircraft Accident/Incident Record (Attachment III-6), shall be prepared as the final report for all aircraft accidents and incidents. One copy of each form, as soon as completed, shall be forwarded to the Office of Operational Safety Analysis Branch, EP-322, and one copy each to the System Safety Development Center, EG&G Idaho, Inc., and to the appropriate Headquarters program office. Copies of both completed (preliminary and final) forms also will be included in the regular report of an aircraft accident/incident investigation board.

. ANNUAL REPORTS. Heads of field organizations shall submit the following reports:

a. Annual Dose Summary Data Input. Field organization managers shall submit reports to the System Safety Development Center (SSDC), at Idaho Falls, Idaho, by March 31 for the preceding calendar year on DOE forms as follows:

Form 5484.6, Annual Dose Summary - (Attachment III-7) for all monitored Department of Energy employees, contractor employees and resident non-employees.

Form 5484.6 (Items 1. through 6., 9., and 10. only, as well as the Internal Dose File, as appropriate) - for monitored visitors to Department of Energy or DOE contractor operated facilities with positive results.

Form 5484.7, Employee Locator File - (Attachment III-8) for all monitored personnel reported on 5484.6 above, excluding visitors.

Form 5484.7.a, Monitored Badged Visitor File - (Attachment III-9) for all monitored visitors.

Background, not related to occupational exposure, will be subtracted from the total annual external body dose prior to submitting the data. Form DOE F 5484.6 (Attachment IV-7) will include internal exposure data, as prescribed, for workers whose internal exposure exceeds 10 percent of DOE limits (DOE 5480.1A).[1/] Radiation exposures requiring Type A, B, or C investigations shall be reported on Form 5484.6, as well as on Form 5484.X.

b. DOE and DOE Contractor Monitored Personnel Locator File. Information specified on Form DOE F 5484.7 will be submitted to the System Safety Development Center, EG&G Idaho, Inc., by March 31 for each individual having been employed by DOE or a DOE contractor during the preceding calendar year.

c. Monitored Visitor File to DOE and DOE Contractor Sites. Form DOE F 5484.7.a. reports all visitors of a DOE or DOE contractor operated facility, who upon their visit, were badged or otherwise monitored for possible exposure to a radiation environment. Exclude as visitors any person employed by the host contractor visiting another onsite facility other than that to which he is normally assigned.

[1/] The current state-of-the-art for internal dose assessment may not provide the required capability for all radionuclides. In such cases, the capability provided by the contractor program shall be fully documented and retained in its permanent file.

d. Estimated DOE Property Valuation. Form DOE F 5484.W, Estimated DOE Property Valuation (Attachment III-10), shall be submitted to the System Safety Development Center, EG&G Idaho, Inc., by March 31 of each calendar year. List the current estimated replacement value of all property under the field office's jurisdiction, together with the individual values for each contractor having replacement values of $1 million or more. Refer to Chapter IV of this Order for calculation of replacement property valuation.

e. Annual Summary of Property Damage Control Programs. Heads of organizations shall submit a report summarizing the property damage control programs of facilities under their jurisdiction to the Office of Operational Safety by March 31 of each year following the calendar year covered by the report.

(1) The report shall contain the following information:

(a) Losses of Significance. Include a brief summary of all losses, regardless of cause, that exceeded $50,000 in government property damage. Losses under $50,000 also should be included when lessons learned may be applicable to other DOE facilities.

(b) Recurring Fire Protection Cost. List the cost of fire departments, fire inspection and maintenance contract costs, and fire protection engineering expenses incurred by each major facility and for the field office as a whole. The expense allotted to the field office fire protection engineering effort (Federal salaries, travel, consulting contracts, etc.) should be identified as a separate item.

(c) Major Improvements Completed. Identify the major property protection improvements, physical and programmatic, accomplished during the past calendar year.

(d) Planned Improvements. Identify the major property protection improvements, physical and programmatic, planned for the coming calendar year.

(e) Appraisal Program. Identify the property protection appraisals accomplished during the calendar year.

(f) Extinguishing System Performance. For each fire, regardless of loss, in which an automatic fire extinguishing system functioned, describe the incident including:

1 Occupancy of building and area of origin.

2 Dollar loss.

3 Type of system, including number of heads operated or amount of agent discharged.

4 Whether the fire was completely extinguished by the system, or other agents were used.

5 Any failures in the system(s).

(g) Items of Interest. Include any topics of general interest to other DOE facilities, areas needing further study or research, areas requiring code development or interpretation, or recommendations for Headquarters action or discussion at DOE fire protection conferences.

f. Effluent and Environmental Reports. All DOE facilities shall prepare annual reports of the previous years' activities. The reports are:

- o Annual Site Environmental Report.
- o Effluent Information System (EIS) and Onsite Discharge Information System (ODIS) Report.

(1) Annual Site Environmental Report

(a) Reporting Criteria. All DOE facilities shall submit an Annual Site Environmental Monitoring Report to the Office of Operational Safety. Environmental reports covering the previous calendar year shall be prepared annually and distributed by April 1 to the Office of Operational Safety (10 copies), appropriate program offices, the Department of Energy Technical Information Center, and to other agencies and organizations, as appropriate.

(b) Nonradioactive Emissions. Effluent monitoring data for nonradioactive pollutants, both routine and accident releases and their impacts, shall be reported in the Annual Site Environmental Report.

(c) Radioactive Emissions. A summary of the total number of curies in airborne and liquid effluents released to the offsite environment, and the nuclides, shall be included in the Annual Site Environmental Report. Detailed effluent data shall not be included in the Environmental Report.

(d) Format, Guidelines, and Examples. The format for the Environmental Report is provided below with guidelines and examples included to illustrate the kind and quality of information required. The overall quality of the report shall be of the high quality typical of DOE and contractor technical and

public reports. The cover should be appropriate; the text printed and professionally edited; the size of figures, maps, etc., shall be 8-1/2" x 11".

1 Cover Page. The cover page shall include the site name, facility, reporting period, operating contractor, address, and document number.

2 Title Page. Same as for 1 above.

3 Table of Contents. The contents page shall list sections, locations of figures, texts, appendixes, references, etc., in the document.

4 Introduction. The introduction shall include a brief description of the site, the nature of its primary operations, and activities. A general discussion of environmental features and land and water use, including pertinent demographic information, shall be included for facilities.

5 Summary. The summary shall provide a concise evaluation and interpretation of the information included in each of the sections (Items 6-9 which follow) contained in the report in relation to applicable standards and requirements. This shall be written in a manner understandable by the general public. Explanations, as appropriate, shall be included for unusual events or releases. A discussion of abnormal occurrences which resulted from or could have impact upon either the program activity or the site, shall be included. Population dose estimates and the dose to the maximum exposed individual (where appropriate) shall be included. The total quantity of radioactivity released as airborne and liquid effluents shall be included, along with descriptive information on nonradioactive effluents.

6 Environmental Program Information. This section shall provide a summary of environmental activities at the site performed to comply with environmental regulations and to enhance the environmental quality. Items to be included are:

a A summary of environmental monitoring performed. This shall be a brief description of the type of monitoring performed; which regulations require it; number of stations, frequency, parameters measured; to whom data reported and summary of results compared to applicable standards.

b A listing of environmental permits issued to the site by Federal, state, or local regulatory agencies. Include

the type of permit, by whom issued, and the expiration date.

c A listing of draft and final EIS's and EA's completed during the year that pertain to site activities.

d A summary of significant environmental activities at the site. This could include activities to meet permit or EIs requirements, new procedures implemented to comply with regulations, pollution abatement projects, and special studies of the fate and effect of pollutants from the site.

e A summary of nonradioactive effluent monitoring conducted, reason for the monitoring, parameters measured, to whom data reported, a summary of results, and an indication of noncompliance results.

7 Environmental Radiological Program Information. This section shall include sufficient information to provide an accurate description of the environmental radiological monitoring program conducted at each facility. For facilities which do not monitor for radioactivity in the environment, a "Not Applicable" response is sufficient.

Include a brief description of each of the media sampled as part of the monitoring program or as part of a special study. The type and frequency of sampling and the methods of analysis shall be presented. Individual data points are not required, but tables, graphs, or text which clearly and accurately present the overall monitoring results, shall be provided. A map showing the location of monitoring stations and sampling points shall also be included.

As a general rule, data shall only be presented for radioactivity in media for which there are applicable standards or other meaningful bases for interpreting the results. Interpretation shall be made, where appropriate, of how the environmental levels (resulting from site operations) compare to relevant parameters such as background, natural radioactivity, and applicable effluent or environmental standards.

a Reporting Potential Dose to the Public. The Environmental Report shall contain an assessment of the potential radiation exposure to the public which could have resulted from site operations during the calendar year. The assessment shall be as accurate and realistic.

The modeling and calculation methodology, used in the dose assessment, shall be included or referenced. A comparison of results with applicable standards and relevant parameters (e.g., natural and artificial sources of exposure) shall also be included.

b Radioactive Effluent Data. Effluent data for radionuclides shall be summarized in the report. The total number of curies in airborne and liquid effluents released to the offsite environment with the nuclides of interest shall be included in the portion of the report dealing with air and water monitoring, respectively. In instances where liquid effluents released to different receiving streams results in separate routes of potential exposure, the radioactivity discharged to each receiving stream shall be identified. For purposes of reporting radiological effluent data, gross radioactivity measurements are considered unacceptable unless: the gross releases are a small fraction of the concentration guides in Order DOE 5480.1A, Chapter IX for "unidentified mixtures" and are of no health or environmental significance; the relative concentrations of specific radionuclides are so well known by other means that gross radioactivity measurements are truly indicative of the activity released; or when the activity of waste streams is so low as to preclude specific nuclide measurements.

c Reporting Units. Should be as follows:

- Metric Units. Metric units shall be used throughout the report, with English equivalents included parenthetically, when necessary to clarify the meaning.

- Air. Ci/m (for uranium and thorium also include g/m^3).

- Sediment. Ci/g or pCi/g dry weight. Specify depth and method of obtaining dry weight. For uranium and thorium, also include g/g dry or wet weight, where possible. For tritium, the concentration may be expressed in mCi/m of moisture content in unit volume of wet samples.

- Food and Vegetation. Ci/g or pCi/g dry weight. Specify percent moisture and method of obtaining dry weight. For tritium, the concentration may be expressed in mCi/m of moisture content in unit volume of wet samples.

- Milk. Ci/m .
- Penetrating Radiation. mrem/yr.
- Soil. Two possible reporting units: (1) Ci/m^2 (or pCi/m^2). Specify depth or profile depth. For tritium, the concentration may be expressed in Ci/m of soil mosture; (2) Ci/g (or pCi/g) dry weight. Specify depth and method of obtaining dry weight.

8 Ground Water. The ground-water monitoring program shall be described including the number of wells, sampling, frequency, analyses performed and a summary of results. There shall also be a summary of the hydrogeology of the site, major aquifers, movement of ground water, potential sources of ground-water pollution, and uses of ground water in the vicinity of the site.

9 Quality Assurance. This section shall be a summary of the quality assurance measures taken to ensure the quality of the monitoring data. A description of the overall program, including sampling, analysis and data management, shall be included for both radioactive and nonradioactive effluent and environmental monitoring. A summary of results from participation in interlaboratory cross-check programs shall be included, listing site results and expected results.

10 References. List and explain, as appropriate, the applicable standards or other documents cited in the body of the report.

11 Distribution. A standard distribution list of those persons or organizations receiving copies of the report should be included.

(2) Effluent Information System (EIS)/Onsite Discharge Information System (ODIS) Radioactive Effluent and Onsite Discharge Data Reports covering the previous calendar year shall be submitted to the Information Systems Branch, EG&G Idaho, Inc., by April 1, with a copy of the cover letter to the Office of Operational Safety. The reports, including the data forms, cover sheet, maps, and, if necessary, explanatory information, shall be submitted in accordance with instructions provided in Section II of the Effluent Information System and Onsite Discharge Information system User's Manuals. The Monitoring Data Report shall consist of:

(a) Cover Sheet. A cover sheet shall list the site, facility, report period, contractor(s), and address.

(b) Summary Sheet. A summary shall provide pertinent descriptive and interpretive information which would serve to explain any facets of the data which are not adequately described on the forms. Classified effluent data shall be submitted on separate forms.

(c) Maps. Maps, 8 1/2" x 11", shall show the locations of effluent streams and onsite discharge points. Maps should be included only when they reflect modifications (terminations or startups, etc.) from previous years.

(d) Completed Radioactive Effluents/Onsite Discharges/Unplanned Releases, Form DOE F 5821.1. This form (Attachment III-11) shall be included unless the information required is submitted via the Secure Automatic Communications Network (SACNET) or directly to computer operations.

(e) Exceptions. Unplanned releases of radioactivity in effluents, or that go offsite by spills, leaks, etc., (which are reported according to Chapter I of this Order) and unplanned releases of radioactivity in onsite spills, leaks, etc. shall be reported to the Information System Branch, EG&G Idaho, Inc., on the separate Form DOE F 5821.1.

(f) Data Errors. Field organizations shall assure that any data errors on the Radioactive Effluent/Onsite discharge Data Form are reported promptly to the Information Systems Branch, EG&G Idaho, Inc., using amended forms.

U. S. Department of Energy

INDIVIDUAL ACCIDENT/INCIDENT REPORT

For All Type A, B, and C Investigations

[Official Use Only - Privacy Act]

DOE F 5484.X

For SSDC Use Only

P.D. Accident Type ____ Energy Flow ____ ____ ____ ____

Enter GICS ____ Narrative ____ FRASE Coding ____ Revision: [ ]1st [ ]2nd [ ]3rd [ ]4th

General Information

1. Reporting Organization Identification Code Modern Engineering 1,0,0,0,7,0,3
2. Case Number 8,3,0,0,9 (Year) Revision: [ ]Yes
3. Multiple-Case Number ____
4. Accident Type [X]Injury/Illness [ ]Vehicle [ ]Property Damage [ ]Other
5. Investigation Type [ ]A [ ]B [X]C [ ]Declassified
6. Department, Division, or ID Code (Optional) Tool Shop
7. Date of Occurrence 0,2 (Month) 1,9 (Day) 8,3 (Year)
8. Time 0,2 (Hour) 3,5 (Minute) [ ]A.M. [X]P.M. [ ]Military
9. Accident Occurred [X]Indoors [ ]Outdoors
10. On Employer's Premise? [ ]Yes [ ]No
11. Specific Location Bldg. 34

Employee Information

12. Check One: [X]Injured/Ill Employee [ ]Operator of Equipment/Vehicle
13. Name [redacted]
14. S.S./ID [redacted]
15. Age 3,1
16. Sex: [ ]Female [X]Male
17. Occupation Helper
18. Length of present employment [ ]Under 3 months [X]3 to 12 months [ ]Over 12 months
19. Experience on this job/equipment [ ]Under 3 months [X]3 to 12 months [ ]Over 12 months

(If Property Damage or Vehicle Accident, go to Line 26)

Injury/Illness (OSHA Information)

20. [ ]Injury Code (10)

Illness

[ ]Code 7a (21) - Skin diseases or disorders
[ ]Code 7b (22) - Dust diseases of lungs
[ ]Code 7c (23) - Resp. due to toxic agents
[ ]Code 7d (24) - Poisoning
[ ]Code 7e (25) - Disorders - Physical agents
[ ]Code 7f (26) - Disorders - Repeated trauma
[ ]Code 7g (29) - All other

21. Workdays Lost 0,0,4
22. Workdays Restricted 0,0,1
23. Death [ ]Yes [X]No
    If "Yes", enter date ____ (Month) ____ (Day) ____ (Year)
24. Permanent transfer to different job because of accident?
    [ ]Yes [X]No
    Terminated because of accident?
    [ ]Yes [X]No
25. Has Employee returned to work with no further anticipated workdays lost or restricted?
    [ ]Yes [X]No

Property/Vehicle Damage

26. Property [ ]Fire [ ]Non-Fire

(If Property Damage Accident go to Line 29)

27. Vehicle [ ]Government [ ]Private - Driven by Government Employee
    [ ]Car/Pickup/Van/Motorcycle
    [ ]Truck (1 ton or over)
    [ ]Bus
    [ ]Other (Air, Marine, Railroad, etc.)
28. Was Vehicle equipped with seat belts?
    [ ]Yes [ ]No
    If "Yes", was seat belt worn? [ ]Yes [ ]No
29. $ ____ Total Accident Damage
    $ ____ DOE Property/Vehicle
    $ ____ Non-DOE Property/Vehicle
30. $ ____ Claim against DOE $ ____ Paid by DOE
    $ ____ Reimbursable to DOE $ ____ Paid to DOE
31. Are dollar amounts final? [ ]Yes [ ]No

Equipment/Hardware/Vehicle Involved (as applicable)

32. #1 Equipment ____ (Generic (or brand) name and model) ____ (Identification Number) 110

    #2 Equipment ____ (Generic (or brand) name and model) ____ (Identification Number)
33. Did Equipment design or defect contribute to accident cause or severity? [ ]No [ ]Yes

(Continue on reverse side)

NARRATIVE GUIDE

35. Activity in progress at time of accident

36. Events - Begin with initial energy flow and end with nature and extent of injury/damage

37. Accident Causes

a. Conditions

b. Actions

c. Factors influencing a or b

38. Corrective Actions (If risk is acceptable, corrective action may not be necessary)

a. Actions taken

b. Actions recommended

To be completed by _____
Implementation Date

39. _____ Accident Investigator _____ Date _____ FTS Telephone

Job Title: [ ] Supervisor [ ] Safety Professional [ ] Other _____

40. _____ Supervisor _____ Date _____ FTS Telephone

INSTRUCTIONS FOR COMPLETING DOE F 5484.X

To be used for all occurrences for which reporting is required under DOE 5484.1A Environmental Protection, Safety, and Health Protection Information Reporting Requirements: As preliminary input for all Type A and B investigation reports and as sufficient data for Type C accidents. Mail completed DOE F 5484.X forms, along with the transmittal form (DOE F 5484.2) to SSDC, P.O. Box 1625, Idaho Falls, Idaho 83415 - Attention: CAIRS. Revisions to information on this form may be transmitted by telephone (FTS 583-9566 or Commercial 1-208-526-9566) or by mailing a copy of the revised original to the above address.

General Information

1. Indicate the reporting organization (DOE Office or DOE Contractor) which experienced the accident/incident. Also, enter the seven-character identification number which has been assigned to that specific reporting organization.
2. Enter case number. All cases for a given reporting organization will be numbered in sequence regardless of accident type, with the first two digits representing the year; (e.g., The tenth accident in 1983 is 83010). Check the YES box to indicate a revision.
3. Multiple-case accidents are those which result in more than one recordable injury, property damage or vehicle case or combination thereof; (two or more injured persons, two or more damaged vehicles, any combination of injury and/or property damage, etc.). Report each injury/property damage/vehicle case resulting from a single accident on a separate DOE F 5484.X form, with an identical multiple-case accident number to show relationship to the common accident/incident; (e.g., If the first multiple-case accident of the year resulted in two separate contractor employees being injured in a one-car rollover, each case would be reported on a separate 5484.X form and assigned sequential case numbers 83005 and 83006. The vehicle damage, if reportable, would be shown on a third form, number 83007. The same multiple-case number "01" should be entered on line 4 on each of the three forms. Number each additional multiple accident sequentially).
4. Check appropriate accident type. Include in Vehicle type, all transportation accidents; i.e., vehicle, aircraft, marine and railroad. Any reportable incident other than Injury/Illness, Property Damage or Vehicle, should be reported as "Other".
5. Indicate the Investigation Type: A, B, or C. The Declassified box is used when a previously reported case has been declassified to non-recordable status; (e.g., Found to be not work-related, first-aid case only, under $250 loss for Vehicle, under $1,000 loss for Property Damage, etc.).
6. Enter the Department, Division or ID code as desired. This input field is available for restructuring sub groups within a reporting organization.
7. Enter date of accident.
8. Enter time of accident; A.M./P.M. or military time, according to preference.
9. Check appropriate box.
10. Check appropriate box.
11. Enter brief statement for specific location of accident.

Employee Information

12. Check appropriate box.
13. Enter the name of the employee or operator.
14. Enter the Social Security number or other employee ID number.
15. Enter age of employee/operator.
16. Check appropriate box.
17. Enter generic job title.
18. Check appropriate box.
19. Check appropriate box.

Injury/Illness

(If "Injury/Illness" was checked in No. 4, fill in this section; otherwise, proceed to No. 26.)

20. Check appropriate box. (Reference: OSHA log).
21. Enter number of workdays lost.
22. Enter number of restricted workdays.
23. Check appropriate box. If accident/incident resulted in death, enter death date.
24. Check appropriate box.
25. Check appropriate box.

Property/Vehicle Damage

26. If "Property Damage" was checked in No. 4, check appropriate box and proceed to dollar loss section (No. 29).
27. If "Vehicle" was checked in No. 4, indicate whether the vehicle is Government-owned, or is a privately-owned vehicle driven by a Government employee. Government vehicles include those owned, leased, or rented by the Federal Government and any contractor operated privately-owned vehicles used in DOE contract work for which cost reporting to DOE is required. Also check the type of vehicle or conveyance involved.
28. Check appropriate box for each question.
29. Enter the total accident damage loss, also separate the loss between the DOE and non-DOE property or vehicle damage.
30. Claims against DOE for damages to non-DOE vehicles/property should be recorded here. Also the amount actually paid by DOE, if and when available. Enter the dollar loss, if any, to DOE vehicles/property which should be reimbursable; Also enter the amount actually paid to DOE, if and when available. Do not delay the report; if necessary, report actual amounts paid via revision after the case is settled.
31. Check appropriate box.

Equipment/Hardware/Vehicle Involved

32. Give generic or brand name, model, and as applicable, the identification number of the equipment/hardware/vehicle involved. Identification should be adequate to alert others of potential hazards associated with a specific equipment model.
33. Check appropriate box.

Narrative Guide

34. Activity
What activity or assignment was in progress at the time of the accident?
Example: 1) Routine housekeeping duties were being performed.
2) No activity in facility due to extended holiday weekend.
3) Employee was involved in routine security inspection.

35. Events
Describe accident, in order of sequence, beginning with initiating event and followed by secondary and tertiary events. End with nature and extent of injury/damage.
Example: 1) Employee was pulling utility cart which was loaded with wastepaper from office area to hallway. Wheel of utility cart caught against door casing. Bags of heavy wastepaper which were in cart fell to end of cart. Cart tipped over onto foot of employee. Right foot was crushed between utility cart and door casing, resulting in severe contusion to right foot of employee.
2) No employee activity. HVAC system malfunctioned during long weekend. Upper floor of office building became excessively hot and triggered the automatic sprinkler system. Upper office area and contents were damaged by water. Extensive clean-up required.
3) Employee was driving patrol car from guard station to research facility. Patrol car struck icy section of road. Employee lost control of vehicle, which skidded across road into concrete abutment on side of road. Accident resulted in damage to right front fender, tire, headlight and grill.

36. Accident Causes.
a. State the conditions which existed at the time of the accident (the specific control factors which were or may have been the direct or immediate cause or causes of the accident).
Example: 1) Wheel of utility cart was worn and would not roll properly. Utility cart was overloaded with wastepaper.
2) Thermostatic control on HVAC system had been improperly installed during recent replacement.
3) Road was covered with icy spots. Weather was foggy.
b. Enter the actions on the part of the employee which contributed to the occurrence of the accident/incident.
Example: 1) Employee overloaded the utility cart with wastepaper.
2) Facility maintenance had not inspected the newly installed thermostatic control.
3) Employee forcefully applied brakes in attempt to stop skidding vehicle.
c. List the influencing factors or underlying causes, either conditions or actions or both, which contributed to the accident/incident.
Example: 1) Employee had not been instructed in overloading hazards.
2) No existing supervisory review over craft-assigned repairs.
3) Employee had not been trained in driving under winter conditions. Company has no driver training program.

37. Corrective Actions
a. Actions taken to prevent recurrence of accident/incident.
Example: 1) Wheels of utility cart were replaced with larger size wheels. All carts will be inspected for safe operation. Maintenance employees were instructed in overloading hazards.
2) Thermostatic control was inspected and found free of defects and was properly revised.
3) All security personnel were instructed at safety training meeting on driving under hazardous conditions.
b. Recommended corrective actions are those which are planned by line management which require time for implementation.
Example: 1) Provide human factors review of utility carts and other equipment purchases.
2) Management to review maintenance procedures and inspection process.
3) Provide implementation date.

38. Enter signature of accident investigator who can be contacted for follow-up, the date and FTS or commercial telephone number, and indicate the investigator's job title.
39. Enter name and FTS or commerical telephone number of cognizant supervisor. This should be an individual who, by his signature, concurs in and assures corrective action implementation.
40. Enter name and FTS or commerical telephone number of person to contact if different from No. 38.

U.S. Department of Labor

For Calendar Year 19 80

Simpson Engineering Company
Medical Research Institute
1732 Research Drive, Livermore, California 94550

Case No.	Date	Employee's Name	Occupation	Department	Description of Injury or Illness	Date of Death	Injuries Resulting Only Lost Workdays: Enter a CHECK if injury involves days away from work	Injuries Resulting Only Lost Workdays: Enter a CHECK if injury involves days of restricted work activity	Injuries Resulting Only Lost Workdays: Enter number of DAYS away from work	Injuries Resulting Only Lost Workdays: Enter number of DAYS of restricted work activity	Injuries Without Lost Workdays: Enter a CHECK if injury involves neither	Type of Illness: CHECK Only One Column for Each Illness	Fatalities	Nonfatal Illnesses: Enter a CHECK if injury involves days away from work	Nonfatal Illnesses: Enter a CHECK if injury involves restricted work activity	Nonfatal Illnesses: Enter number of DAYS away from work	Nonfatal Illnesses: Enter number of DAYS of restricted work activity	Illnesses Without Lost Workdays: Enter a CHECK if injury involves neither
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
CF-1	1/10/80	E. L. Bagley	Bus Driver	Transportation	Right lumbo sacral strain		✓	✓	9	9								
CF-2	1/17/80	A. S. LaGrange	Nurse	Medical	Abrasion left knee, swollen right ankle, tender with movement		✓	✓	1									
CF-3	1/14/80	C. M. Fowler	Laborer	Maintenance	Pain lumbo sacral neck		✓	✓										
CF-4	1/17/80	O. D. Collier	Bus Driver	Transportation	Bruised right shin and knee, knee swollen, pain in back						✓							
CF-5	1/21/80	J. M. Thomas	Cook	Service	1st - 2nd degree burns, right forearm						✓							
CF-6	2/1/80	C. D. Silden	Attendant Service Station	Transportation	Pain in right shoulder				0	1								
CF-7	2/3/80	F. W. Palmateer	Cook	Service	Deep laceration, left arm						✓							
CF-8	2/22/80	T. L. Carson	Painter	Maintenance	Lower lumbar pain			✓	1	1								
CF-9	3/10/80	O. A. Turner	Equipment Operator	Production	Muscle spasm, right shoulder		✓		0	1								
CF-10	3/17/80	O. S. Story	Bus Driver	Transportation	Sprained right ankle		✓	✓	1	0								
CF-11	4/26/80	C. C. Knowles	Mechanic	Maintenance	1 1/2" laceration, third finger left hand						✓							
CF-12	6/23/80	S. I. Conway	Bus Driver	Transportation	Pain in lumbo sacral area, extending down left leg		✓	✓	13	36								
					PREVIOUS PAGE TOTALS →		0	0	4	33	44	4						

EXAMPLE

Ben Curtin — Safety Engineer — 6/30/80

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1

Instructions for OSHA No. 200

I Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is identical, easily readable, and under standards as the OSHA No. 200.

Enter each recordable case on the log within six (6) work days after learning of its occurrence. Although other records must be maintained at the establishment to which they relate, it is possible to prepare and maintain the log at another location using data performing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times at the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health, Education and Welfare, or States administrating jurisdiction under the Act.

II Changes in Extent of or Outcome of Injury or Illness

If during the 5 year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 11, the first entry should be lined out and a new entry made. For example, if an injured employee is first reported only medical treatment but later lost work days away from work, the check in column 6 should be lined out and checks prepared in columns 2 and 3 and the number of lost work days entered in column 4.

In another example, if an employee with an occupational illness lost work days, returned to work, and then died of the illness, the entries in columns 8 and 10 should be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be never recordable. For example, an injury or illness which is later determined not to be work related, or which was initially thought to involve medical treatment but later was determined to have involved only first aid.

III Posting Requirements

A copy of the totals and information following the total line of the last page for the year must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than February 1 and must remain in place until March 1.

Even though there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the annual summary totals shall certify that the totals are true and complete by signing at the bottom of the form.

IV Instructions for Completing Log and Summary of Occupational Injuries and Illnesses

Column A - CASE OR FILE NUMBER Self-explanatory

Column B - DATE OF INJURY OR ONSET OF ILLNESS
For occupational injury, enter the date of the work accident which resulted in injury. For occupational illness, enter the date of initial diagnosis of illness or, if illness or illness was not recognized before diagnosis, enter the first day of the disease or illness thought to be the illness which was later diagnosed or recognized.

Columns C through F - Self-explanatory

Column 1 and 8 - INJURY OR ILLNESS RELATED DEATHS
Self-explanatory

Column 2 and 9 - INJURIES OR ILLNESSES WITH LOST WORK DAYS
Self-explanatory

Any injury which involves days away from work, or days of restricted work activity, or both must be recorded since it also involves one or more of the criteria for recordability.

Columns 3 and 10 - INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK Self-explanatory

Columns 4 and 11 - LOST WORK DAYS - DAYS AWAY FROM WORK
Enter the number of work days (consecutive or not) on which the employee would have worked but could not because of an occupational injury or illness. The number of lost work days should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

NOTE: For employees not having a regularly scheduled shift such as certain truck drivers, construction workers, farm labor, casual labor, part time employees, etc., it may be necessary to estimate the number of lost work days. For purposes of lost work days shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 - LOST WORK DAYS - DAYS OF RESTRICTED WORK ACTIVITY
Enter the number of work days (consecutive or not) on which the date of injury or illness

(1) the employee was assigned to another job on a temporary basis, or

(2) the employee worked at a permanent job less than full time, or

(3) the employee worked at a permanently assigned job but could not perform all duties normally carried out with it.

The number of lost work days should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Columns 6 and 13 - INJURIES OR ILLNESSES WITHOUT LOST WORK DAYS Self-explanatory

Columns 7a through 7g - TYPE OF ILLNESS
Enter a check in only one column for each illness.

TERMINATION OR PERMANENT TRANSFER Place an asterisk to the right of the entry in columns 7a through 7g type of illness which represented a termination of employment or permanent transfer.

V Totals

Add number of entries in columns 1 and 8.
Add number of checks in columns 2, 3, 6, 7, 9, 10 and 13.
Enter the totals for each column at the end of each page and at the end of each year. Only the yearly totals are required for posting.

If an employee's loss of work days is continuing at the time the totals are summarized, estimate the number of future work days the employee will lose and add that estimate to the work days already lost and include this figure in the annual totals. Notations are to be made with respect to such cases at the next year's log.

VI Definitions

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc. which results from a work accident or from an exposure involving a single incident in the work environment.

NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one time exposure to chemicals are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following being given the categories of occupational diseases and disorders that will be utilized for the purpose of classifying recordable illnesses. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a Occupational Skin Diseases or Disorders
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or photosensitizers, oil acne, chrome ulcers, chemical burns or inflammations, etc.

7b Dust Diseases of the Lungs (Pneumoconiosis)
Examples: Silicosis, asbestosis, coal worker's pneumoconiosis, byssinosis, siderosis and other pneumoconiosis.

7c Respiratory Conditions Due to Toxic Agents
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to toxic materials, irritant gases or fumes, flour dust, etc.

7d Poisoning (Systemic Effect of Toxic Materials)
Examples: Poisoning by lead, mercury, cadmium, arsenic or other metals; poisoning by toxic organic compounds or other organic solvents; poisoning by toxic inorganic acids or caustics; poisoning by other chemicals such as formaldehyde, plastics and resins, etc.

7e Disorders Due to Physical Agents (Other than Toxic Materials)
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; hearing loss or other effects of noise; effects of exposure to low temperature, cold stress, effects of ionizing radiation (ionizing radiation, x-ray, radium), other effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn), etc.

7f Disorders Associated With Repeated Trauma
Examples: Noise-induced hearing loss, synovitis, tenosynovitis and bursitis, Raynaud's phenomena and other conditions due to repeated motion, vibration or pressure.

7g All Other Occupational Illnesses
Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid or routine, one time, occupational exposure to blood or other potentially infectious materials (with follow up testing and subsequent observation of exposure source) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where activity is performed at a single physical location, such as a construction site, it is recommended that the same physical location be used on a separate record for each activity shall be treated as a separate establishment.

For those engaged in activities which may be physically dispersed such as agriculture, construction, transportation, construction crews, pipelines, gas and sanitary services, records may be maintained at a place to which employees report each day.

Records for employees who do not primarily report or work at a single establishment, such as traveling salesmen, truckers, or delivery messengers, are shall be maintained at the location from which they are based or the base from which personnel operate to pick up and direct their activities.

WORK ENVIRONMENT is concerned with the physical location in which the employee does most of his work and the kind of equipment and materials he uses. The physical or an employee's work site may change or it may be stationary.

U. S. Department of Energy

TRANSMITTAL OF DOE F 5484.X, DOE F 5484.Y, OR DOE F 5484.W

Reporting Organization Modern Engineering

Organization Code 1.0.0.7.0.3. Date 4/10/83

[X] Transmittal of DOE F 5484.X - INDIVIDUAL ACCIDENT/INCIDENT REPORT

[X] New Cases Number of Cases: 5

Case Numbers: 83-008 83-009 83-010 83-011 83-012

[X] Revised Cases Number of Cases: 1

Case Numbers: 82-019

Comments:

[X] Transmittal of DOE F 5484.Y - TABULATION OF WORK-HOURS, VEHICLE USAGE, AND TORT CLAIMS

Quarterly Only

Quarterly Reporting Period: [X]1 [ ]2 [ ]3 [ ]4

[ ] Transmittal of DOE F 5484.W - ESTIMATED DOE PROPERTY VALUATION

Annually Only by Operations Office

Submitted by Clay Wheeling (Person to Contact) 8-236-1701 (FTS Number)

Address: Modern Engineering
100-B Industrial Blvd.
New City, Iowa 60932

For SSDC Use Only

Date received

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INSTRUCTIONS FOR COMPLETING DOE F 5484.Z

To be used for transmittal of all Forms DOE F 5484.X, DOE F 5484.Y, or DOE F 5484.W.

Transmittal of Forms DOE F 5484.X (Individual Accident/Incident Report) - Check the appropriate boxes and include the number of cases being enclosed and their individual case numbers. This will provide a record, both for the reporting organization and for the SSDC, of those cases which have been reported. Recordable cases should be numbered in numerical sequence, beginning with the first case of the year as number 84001 (the first two digits representing the current year). The number of revised cases (if any) should also be indicated and their individual case numbers listed. Any comments pertinent to the transmittal of the Forms DOE F 5484.X should be included in the space allowed. It is recommended that cases be submitted weekly, monthly, or quarterly (whenever five or more cases have been accumulated) in order to maintain an up-to-date database.

Transmittal of Form DOE F 5484.Y (Tabulation of Work-Hours, Vehicle Usage, and Tort Claims) - To be submitted by all reporting organizations on a quarterly basis. Check the appropriate box when including this report and also indicate the quarterly period represented in the report.

Transmittal of Form DOE F 5484.W (Estimated DOE Property Valuation - To be submitted annually by the operations offices only, on or before March 15 of the current year. Check the appropriate box when this report is being submitted.

Include the name of the person submitting the above indicated reports, who can be contacted for any further information, and corresponding FTS number. Address of the reporting organization should also be included.

A copy of each DOE F 5484.W which is sent to the SSDC should also be mailed to the operations office of the reporting organization.

DOE F 5484.Y

U. S. Department of Energy

TABULATION OF WORK-HOURS, VEHICLE USAGE, AND TORT CLAIMS

Reporting Organization Modern Engineering Organization Code 1,0,0,0,7,0,3

Calendar Year 19 82

Revision: [ ]Yes Quarterly Reporting Period: [ ]1 [ ]2 [ ]3 [x]4

DOE OR DOE-CONTRACTOR WORK-HOURS	NUMBER OF HOURS
A. Total Work-Hours this Quarter*	80,635

* Optional - To obtain accident/incident rates by subgroups, see instructions on reverse side

DOE OR DOE-CONTRACTOR-OPERATED CONVEYANCES		NUMBER OF CONVEYANCES	QUARTERLY USAGE MILES OF TRAVEL	QUARTERLY USAGE HOURS OPERATED
B. Cars, Light Trucks, Vans, & Motorcycles		7	4,932	
C. Trucks (1 ton and over)		2	587	
D. Buses		1	1,615	
E. Aircraft	Fixed Wing	2		41
	Rotary	1		18
F. Marine		0		0
G. Railroad		4	409	
DOE FEDERAL EMPLOYEE-OPERATED VEHICLES/EQUIPMENT				
H. Private Motor Vehicles		5	2,613	
I. Material Handling Equipment		1		79

YEAR-END DATA

J. Total Amount of Safety-Related Tort Claims $ 2,930

Submitted by Clay Wheeling Date 1/15/83

For SSDC Use Only

Date received _____ CRT Input _____

INSTRUCTIONS FOR COMPLETING DOE F 5484.Y

The data submitted on this form are required for normalizing DOE accident statistics. Report all data (other than tort claims data) at the end of each quarter, for that quarter only. Report tort claims at year-end only. Mail completed DOE F 5484.Y forms, along with the transmittal form (DOE F 5484.Z) to SSDC, P.O. Box 1625, Idaho Falls, Idaho 83415 - Attention: CAIRS. Revisions to information on this form may be transmitted by telephone (FTS 583-9566 or Commercial 1-208-526-9566) or by mailing a copy of the revised original to the above address.

Item A - Include the hours worked for the quarter being reported. Do NOT report cumulative year-to-date totals. *Optional - To obtain accident/incident rates for subgroups (departments, divisions, program groups, etc.) within a reporting organization, complete Item 6 on Form DOE F 5484.X (the incident form) and also report the corresponding work-hours for each of these subgroups. The SSDC will assign a permanent reporting code for each subgroup name (provided to them) and also explain the reporting procedures for subgroup work-hours.

Item B - Cars, vans, light trucks (less than one ton rating), and motorcycles which are owned, leased, or rented by the Federal Government. Include data for contractor operated privately-owned vehicles of the same class if they are used in DOE contract work and for which cost reporting to DOE would be required in the event of accidental damage.

Item C - Trucks, (rated at one ton or greater) which are owned, leased, or rented by the Federal government. Include data for contractor operated privately-owned trucks if used in DOE contract work and for which cost reporting to DOE would be required in the event of accidental damage.

Item D - Buses owned, leased or rented by the Federal Government which are used in transporting passengers and are operated by a professional driver. Include data for contractor operated privately-owned buses used in DOE contract work and for which cost reporting to DOE would be required in the event of accidental damage.

Item E - Aircraft, whether powered, towed, or free-flying, which are being operated by a DOE or DOE contractor employee. This includes privately-owned as well as Federal Government-owned, -leased or -rented aircraft. Count only airborne operation hours.

Item F - Waterborne craft, motorized, non-motorized, steam, sail, towed, etc., which are operated by a DOE or DOE contractor employee. This includes privately-owned as well as Federal Government-owned, -leased or -rented marine craft.

Item G - Railroad - any unit of equipment (or combination) listed below, which is operated by a DOE or DOE contractor employee: Count each separate unit or car as a single conveyance. Count only the miles traveled by the power unit.

<u>Locomotive</u>: self-propelled unit of equipment designed solely for moving other equipment.
<u>Light Locomotive</u>: self-propelled unit of equipment not coupled to any other equipment.
<u>Motor Car</u>: self-propelled unit of equipment, designed to carry freight or passengers (not a locomotive).
<u>Cars</u>: examples include freight, passenger, dining equipment, caboose, chemical, gondola, mining, ATMX, courier.

Item H - DOE Federal Government reporting units only, limit reporting to data for private vehicles used in Federal Government work and operated by a DOE employee. (Necessary to satisfy OSHA) Federal reporting requirements).

Item I - DOE Federal Government reporting units only, limit reporting to data for material handling equipment operated by a DOE employee. (Necessary to satisfy OSHA Federal reporting requirements).

Item J - Report at the end of each calendar year the total dollar amount paid by DOE for tort claims. Include only tort claims which are ES&H-related and result from an occupational occurrence.

DOE F 5484.1
DOE F 5484.1

U.S. DEPARTMENT OF ENERGY

AIRCRAFT ACCIDENT/INCIDENT RECORD

A – GENERAL IDENTIFICATION (WHAT, WHERE, WHEN)

1. CATEGORY	2. AGENCY AIRCRAFT	3. TYPE OCCURRENCE
☒ 135 Aircraft ☐ Large Aircraft	☒ Owned ☐ Rented	☒ Accident ☐ Incident
4. AIRCRAFT MAKE AND MODEL: Conair C 1000	5. REGISTRATION MARK: N-3624	6. LOCATION OF ACCIDENT (City, County, State): Copinsburg, Colorado
7. NAME OF OPERATOR: Atlas Aviation	8. ADDRESS OF OPERATOR: Three Mile Road, Brunswick, New Mexico	9. DATE: April 20, 1980 / 10. TIME (local): Unknown

B – NARRATIVE (Explanations - Remarks)

Aircraft departed Markel Airport at 0916 20 April, 1980. Did not arrive at destination, declared overdue and missing 1141 20 April. Subsequent search discovered wreckage and bodies approximately 100 feet below peak of Mt. Moran.

EXAMPLE

(Continue on additional sheet when necessary)

C – PERSONS INVOLVED

	1. Passenger	2. Flt. Crew	3. Cabin Crew	4. Grnd. Crew	5. Public	6. Total
ABOARD	1	1				2
INJURED (Under 24 Hrs / 24 Hrs Over)						
DECEASED	1	1				2

D – DAMAGE

	YES	NO
1. Minor		
2. Substantial		
3. Demolished	✓	
4. Fire after wreck		
5. Property damage		
6.		

F – AIRCRAFT OPERATION

1. TYPE OF OPERATION	2. FLT. NO.	3. OPERATION CONDUCTED UNDER FAR PART.	4. PHASE OF FLIGHT	GROUND	TAKEOFF	LEVEL	APPROACH
				TAXI	CLIMB	DESCENT	LANDING

E – AIRPORT

1. NAME OF AIRPORT	2. RUNWAY NUMBER	3. RUNWAY LENGTH	4. ELEVATION	5. RUNWAY TEMP

6. REMARKS (Condition of runway - ice, snow, lighting, etc.)

Not Used

G – WEATHER

1. STATION	2. TIME	3. SKY CONDITION	4. VIS.	5. RESTRICTIONS TO VIS.	6. TEMP.	7. D. P.	8. WIND
Markel Airport	1000	10,000 Scattered	6 mi.	None	46	210	4 kts

9. REMARKS (Sequence advisories, precip. thunderstorms, storms, etc.)

H – AIR TRAFFIC CONTROL

1. CONTROL/COMMUNICATION FACILITY				2. CLEAR/FLT. PLAN	3. TYPE OF APPROACH				
TOWER	CENTER	FSS	IFR	NONE	ILS FRONT	VOR	VOR/DME	PAR	
OTHER (explain)	UNICOM	NONE X	VFR		ILS BACK	ADF	ASR	VISUAL	

4. RADAR			5. DEPARTED	DESTINATION	
IN AREA OF COVERAGE	YES	NO	Markel Airport 0916	FOR Buford Airport	AT Z
UNDER CONTROL			6. LAST COMMUNICATION (Position, time, altitude): Markel Airport Time 0916 Altitude 000 feet		

I – CREW HISTORY (Who)

1. Pilot in Control: ☒ PIC ☐ SIC
2. Seat Occupied: ☒ Left ☐ Right
3. Name of VIP or Noteworthy Aboard: None

4A. Name of Pilot in Command: Colin Ferguson
B. Date of Birth: 6/17/36
C. Domicile (city and state): Hyattstown, Colorado
D. Certificate - Grade, Number and Rating: Airline, Multi-engine land 6033498
E. Total Time: 3277 hrs.
F. Time in Equip.: 241 hrs.
G. Medical - Class, Date: 1st 12/31/79
H. Profic. Check - Date: 6/24/79
I. Line Check - Date: 9/3/79
J. Duty Time - 24 Hrs.: None

8A. Name of Second in Command: None
B. Date of Birth
C. Domicile (city and state)
D. Certificate - Grade, Number and Rating
E. Total Time
F. Time in Equip.
G. Medical - Class, Date
H. Profic. Check - Date
I. Line Check - Date
J. Duty Time - 24 Hrs.

J – FACTORS INVOLVED

(Check applicable box)	YES	NO
TAKEOFF/LANDING		
1. Unscheduled landing		
2. Forced emergency landing		
3. Landed short of runway - 500 feet or LESS		
4. Landed short of runway - 500 feet or MORE		
5. Landed on wrong airport		
6. Landed on wrong runway		
7. Overran departure end of runway		
8. Off side of runway		
9. Rejected takeoff		
10. Mercy landing (lack passing, crew)		
EMERGENCIES		
11. Declared		
12. Descent		
13. Collision avoidance maneuver		
14. Evacuation		
15. Fire and rescue alert		
16. Fire and rescue action		
17. Other emergency/alternate/abnormal action (specify)		

(Check applicable box)	YES	NO
COLLISION		
18. Near midair		
19. Midair between aircraft		
20. Midair with obstruction		
21. Ground - Aircraft, other object, person	X	
22. Bird(s)		
PRESSURE VESSEL		
23. Explosive decompression		
24. Rapid decompression		
25. Passenger oxygen masks extended		
26. Ruptured/pierced (prop, turbine, etc.)		
FIRE		
27. Inflight		
28. Ground (refueling, APU, etc.)		
29. Smoke/fumes in cockpit or cabin		
30. Fire warning		

(Check applicable box)	YES	NO
CONTROL AFFECTED		
32. Inflight (incl. takeoff & landing)		
33. Ground		
34. Off taxiway/ramp while taxiing		
35. Unable/unsafe to taxi (install gust, tow, etc.)		
MISCELLANEOUS		
36. Structural failure		
37. Loss/separation of parts		
38. Cargo containment/restraint		
39. Lightning strike		
40. Turbulence		
41. Powerplant shutdown		
42. Nonroutine gear, off loading		
43. Crew member incapacitation		
44. Runway blocked		
45. Air security (hijack, bomb threat, sabotage, etc.)		
46. Public protestor		
47. Passenger disturbance (unruly passenger, etc.)		
48. Public complaint (noise, low flying, etc.)		
49. Personnel incident		

EXAMPLE

K – MALFUNCTIONS/FAILURES

(Check applicable box)	YES	NO
1. Flight controls		
2. Lift/drag devices		
3. Flight instruments (alt., air speed, gyro, etc.)		
4. Other instruments/gages (press., temp., qty., etc.)		
5. Other indicators (gear, doors, horns, lights, etc.)		
6. Emergency equip. (exits, slides, oxygen, extng., etc.)		
7. Navigation systems		

(Check applicable box)	YES	NO
8. Communication		
9. Propulsion (engine, prop, fuel, reverser, etc.)		
10. Hydraulic system		
11. Landing gear (wheels, brakes, gear, doors, etc.)		
12. Electrical system		
13. Pressurization system		
14. Other (specify)		

15. Components involved (engine make and model, part name and numbers)
UNKNOWN

L – INVESTIGATION

1. NTSB/FAA NOTIFIED: ☒ YES ☐ NO
2. RECORDER REVIEW: A. FLIGHT ☐ YES ☒ NO; B. VOICE ☐ YES ☒ NO
3. EXTENT OF INVESTIGATION: ☐ OFFICE ☒ SCENE
4. SOURCE OF INFORMATION: ☒ ATC ☐ OPERATOR ☐ SURVEILLANCE ☐ OTHER (specify)
5. RELATED REPORTS: ☐ MRR ☐ M or O ☐ OTHER (specify) ☒ NONE
6. NTSB/FAA INVESTIGATOR: R. Wesssching
7. DOE COORD./INVESTIGATOR: L. T. Farley

M – DISPOSITION

1. REPORT SUBMITTED BY (Signature): L. T. Farley
2. OFFICE: ASD
3. DATE: 4/20
4. RECEIVED: Field Safety Div. Date: 4/20 Init. 4/20; OESD-HQ Date: 4/20 Init. 4/20
DIST OF REPORT: List

DOE F 5484.6

U. S. DEPARTMENT OF ENERGY
ANNUAL DOSE SUMMARY

MONITORED WORKERS AND VISITORS[1/]

Item	Date Example and Definitions
1. Social security number or sequence number	001 00 0001[2/]
2. Sex	M (or F)
3. Birth year	1942
4. Calendar year	1982
5. Contractor code[3/]	LASL
6. DOE field office[3/]	ALO
7. Facility	Test Reactor Production Reactor Fuel Fabrication Fuel Reprocessing Fuel Enrichment Weapons Fabrication Weapons Testing Waste Processing/Management Nuclear Research Non-Nuclear Research Accelerator Office or Administrative General Plant/Maintenance Support Construction Other[4/]
8. Occupation	o Administrative and Managerial (Including administrative/clerical support) SOC[5/] 11-4, 19-21, 24-25, 32-33, 45-47 o Engineers/Scientists SOC 16, 17, 18 o Medical Support SOC 26-30, 36

1/ Only Items 1. through 6., 9., and 10., as well as the Internal Dose File, as appropriate, should be reported for monitored visitors to DOE or DOE contractor operated facilities with positive results.
2/ Pursuant to DOE 5484.1A, this information will be deleted from the reporting system by May 30 or within 60 days following receipt.
3/ If applicable.
4/ When the "Other" category is used, the site will identify a facility which adequately describes the individual's location.
5/ Standard Occupational Codes, U.S. Department of Labor, 1982.

DOE F 5484.6

U. S. DEPARTMENT OF ENERGY
ANNUAL DOSE SUMMARY

MONITORED WORKERS AND VISITORS[1/]

Item	Date Example and Definitions
	o Technician Support Radiological SOC 37, 38, 39 Non-Radiological SOC 37, 38, 39 o Non-Technical Support Construction SOC 63-65, 67-69, 864, 865 Mechanics SOC 60, 61, 863 Machining and Fabrication SOC 71, 73-78, 861, 862 Transportation SOC 81-83, 87 o Other[1/] e.g., SOC 52, 56, 99
9. Employment code	DOE or CON or RNE or VIS
10. Exposure monitoring period(s)	
a) Begin	010182 081082 or 010182
b) End	050682 100382 or 123182
11. Whole body dose rem for CY	
a) Deep dose equivalent[2/]	actual dose with floating decimal
b) Shallow dose equivalent[2/]	actual dose with floating decimal
c) Tritium dose	actual dose with floating decimal
d) Neutron dose	actual dose with floating decimal
12. Extremity dose (rem)	actual dose for each of four extremities with floating decimal: Right arm _____ rem Left arm _____ rem Right leg _____ rem Left leg _____ rem
13. Lifetime whole body deep dose equivalent[3/] (rem)	
a) Lifetime at contractor	actual dose with floating decimal
b) Total estimated lifetime for contractor plus other facilities	actual dose with floating decimal

1/ When the "Other" category is used, the site will identify an occupation which adequately describes the individual's situation.
2/ Deep dose equivalent -- dose at 1 cm (excluding neutron dose)
Shallow dose equivalent -- total dose at 7 mg/cm^2, or within range of 5-10 mg/cm^2 (excluding neutron dose).
3/ Includes deep dose equivalent plus tritium dose and neutron dose, but excludes the shallow dose equivalent.

[Report the following information for confirmed internal deposition which results in an annual dose which exceeds 10 percent of DOE limits.[1/] The dose equivalent from radionuclides that are considered to deposit uniformly throughout the whole body shall be added to the whole body dose received from external sources of radiation and the sum reported as whole body dose.]

14. Intake(s) of Radioactive Material

14.a. Date(s) of intake(s)	
If chronic:	
14.a.1. Exposure period - Begin	031482
14.a.2. Exposure period - End	031582
If acute:	
14.a.3. Date(s) of intake(s)	040582
14.a.4. Intake date:	1 = Assumed 2 = Known
14.b. Mode(s) of intake	Ingestion Innalation Wound Absorption Other
14.c. Radionuclide(s)	241AM 239PU 238U
14.d.1. For inhalation cases, the ICRP Lung Model classification of material	Y
14.d.2. Is classification known or assumed?	1 = Assumed 2 = Known

15. Uptakes of Radioactive Material*
[To the extent practicable based on the existing state-of-the-art at each site the following data shall be recorded and reported:]

1/The current state-of-the-art may not provide the required capability for all radionuclides. In such cases, the capability provided by the contractor program shall be fully documented and retained in its permanent file.

15.a. Estimates of Lung Burden/Dose.

The initial pulmonary burden in Ci (for each radionuclide specified in 14.c.) and the dose equivalent for the year in rem from:

15.a.1.	New intake(s) occurring during the year	321 Ci 0.9 rem
15.a.2.	Both the new intake(s) and any residual deposition from intake(s) occurring in previous years	1600 Ci 4.5 rem
15.a.3.	Date of estimate(s)	051583

15.b. Estimates of Systemic Burden/Ordan Doses

The systemic burden for radionuclides with physical half-lives greater than 1 year in Ci (for each critical organ) and the dose equivalent for the year in rem to individual organs of concern from:

15.b.1.	New intake(s) occurring during the year	450 Ci Lung 1.5 rem Lung
15.b.2.	Both the new intake(s) and any residual deposition from intake(s) occurring in previous years	1200 Ci Lung 40 Ci Bone 3.5 rem Lung 0.4 rem Bone
15.b.3.	Date of estimate(s)	051583

DOE F 5484.7

U. S. DEPARTMENT OF ENERGY
MONITORED WORKER LOCATOR FILE

Item	Date Field Example and Definitions
1. Calendar year	1982
2. Social security number	123456789
3. First name	JOHN
4. Middle name	QUINCY
5. Last name	DOE
6. Date of birth	012247
7. Sex	M (or F)
8. Date of hire	011567
9. Termination date/Date of last visit	042782
10. DOE office	AL
11. Contractor	RO
12. Site	RFP

DOE F 5484.7.a

U. S. DEPARTMENT OF ENERGY
MONITORED VISITOR LOCATOR FILE

Item	Date Field Example and Definitions
1. Calendar year	1982
2. Social security number	123456789
3. First name	JOHN
4. Middle name	QUINCY
5. Last name	DOE
6. Date of birth	012247
7. Exposure period a. Begin	07 14 82
b. End	12 31 82
8. Contractor, DOE field office, or DOE HQ	PNL
9. Field Office	RL

U. S. Department of Energy

ESTIMATED DOE PROPERTY VALUATION

Annual Replacement Valuation

Field Organization Western Operations

Submitted by John H. Doe, Safety Director Date 3/10/84

Reporting Organization Code	Name	Replacement Valuation beginning CY 1983 ($1000s)	CY 1984 ($1000s)
1201201	Western Operations Office	$ 0	$ 0
1200504	X.Y.Z. Engineering Corp.	25,040	30,200
1201006	Tip Top Construction, Inc.	0	0
1202003	Forward Research Corp.	2,400,293	2,876,543
1202502	New Operations, Inc.	900,165	945,678
1202506	New Operations subs	0	0
1204405	Mountain Engineering	0	0
1205003	Professional Research	2,492,308	2,999,000
1207007	Modern Engineering	0	0
1208004	Good Care Services, Inc.	1,501	2,111
TOTAL FIELD ORGANIZATION VALUATION		$ 5,819,307	$ 6,853,532

Valuations should reflect current estimate per DOE order 5484.1
Submit report to SSDC by March 15

INSTRUCTIONS FOR COMPLETING DOE F 5484.W

Estimated DOE Federal Government property valuation should be submitted to the SSDC on or before March 15 of each calendar year by the operations offices only. List the current estimated replacement value of all property under the field office's jurisdiction, together with the individual valuation for each contractor having a replacement valuation of $1 million or more. Refer to Chapter VI of Order DOE 5484.1A for calculation of replacement valuation.

The previous year's valuation as reported to the SSDC, will appear in the left-hand column, to provide comparative figures for the current year's input. Mail completed DOE F 5484.W, along with the transmittal form (DOE F 5484.Z) to SSDC, P.O. Box 1625, Idaho Falls, ID 83415 - Attention: CAIRS. Revisions to information on this form may be transmitted by telephone (FTS 583-9566 or Commercial 1-208-9566) or by mailing a copy of the revised original to the above address.

U.S. DEPARTMENT OF ENERGY
RADIOACTIVE EFFLUENT/ONSITE DISCHARGES/UNPLANNED RELEASES

Section O

Prepared By: I. G. Marfarity
Date: 5/6/80 Area Code: FTS Phone: 739-1165
Approved By: N. K. Meyers
Date: 5/7/80 Area Code: FTS Phone: 739-1397

C U V K B L36 392 790101 791231

SECTION I NARRATIVE SUMMARY (For New Release Points and Amended Data Only)

Plant Type: Pacific Refractory
Facility Type: CMC-1 High Temperature Unit
Effluent Release Point or Onsite Waste Discharge Point: Liquid Waste Evaporator Exhaust Stack
Operations Generating Pollutants: Evaporation of Liquid Waste Materials
Waste Treatment System: Condensation
Monitoring System: Continuous Air Sampler 15 Foot Sample Line
Monitoring System Continued:
No. of Samples: 32 Sampling Information: Continuous
Name of Receiving Media or Storage/Disposal Facility Receiving Discharge: Atmosphere

DO NOT WRITE IN THIS SPACE

EXAMPLE

SECTION II NUCLIDE DATA

Storage/Disposal Facility Operations Status
Starting Date
Termination Date
Discharge/Eff. Point Gross Volume: 1 46 410
UNITS
Section "O" Report Control Codes
Section "O" Report Control Codes
DO NOT WRITE IN THIS SPACE

Nuclide Description	Amount of Contamination			Short Comments
[illegible]-90 BETA	7.645	E-12	MI	Total Stack Concentration
[illegible]-90 ALPHA	5.694	E-13	MI	Total Stack Concentration
[illegible]-208	2.917	E-17	MI	Total Stack Concentration
[illegible]-214	3.009	E-15	MI	Total Stack Concentration
[illegible]-60	3.943	E-15	MI	Total Stack Concentration
Other Factor				

DO NOT WRITE IN THIS SPACE

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INSTRUCTIONS

SECTION B

SECTION C

SECTION F

CHAPTER IV

CRITERIA FOR DETERMINING DEPARTMENT OF ENERGY PROPERTY VALUATION AND DEPARTMENT OF ENERGY LOSSES

1. DEPARTMENT OF ENERGY PROPERTY VALUATION.

   a. Include

      (1) Approximate replacement value of all DOE-owned buildings and equipment. The replacement value shall be calculated by applying to the original cost (or most recent appraised value) an appropriate cost index ratio (cost index data published by "Engineering News Record" shall be used).

      (2) Cost of all DOE-owned supplies.

      (3) Average inventory of all source and special nuclear materials.

   b. Exclude

      (1) Land and land improvements, such as sidewalks, roads, etc.

      (2) Below-ground facilities not susceptible to damage by fire or explosion, such as major water mains, water ponds, etc., which are carried as separate capital accounts.

2. GUIDELINES GOVERNING LOSS ESTIMATION.

   a. Include.

      (1) All estimated or actual costs to restore DOE property to preoccurrence conditions irrespective of whether this is done in fact. Where the occurrence involves property that has been lost, completely destroyed, or contaminated to a degree precluding economically justifiable recovery, estimates should be based on cost for actual replacement and installation of identical building equipment, devices, or materials (including nuclear materials). In the case of unused, obsolete, or excess buildings, equipment, or materials, the estimated market value at the time of occurrence should be used.

      (2) Estimated cost for restoring to preoccurrence condition, without improvement, all partially lost or damaged DOE property. Include cost for decontamination where required.

      (3) Estimated costs for reprocessing and reclaiming partially destroyed and damaged materials. Include damage resulting from firefighting, such as that caused by water and smoke.

(4) All post-occurrence cleanup expenses, e.g., cleanup of radioactive contamination resulting from accidents, explosions, fires, or other occurrences.

b. Exclude.

(1) Expenses directly resulting solely from loss of the use or occupancy of facilities affected by the occurrence.

(2) All post-occurrence expenses paid for by non-DOE sources, e.g., expenses covered by private insurance.

c. Miscellaneous Guidelines.

(1) Credit should be allowed for the estimated salvaged value of items recovered.

(2) The damage and loss of privately owned property is not reportable, under the requirements of this appendix, except to the extent that the DOE is liable for damage and loss consequences resulting from the occurrence.

(3) Burnout of electric motors and other electrical equipment through overheating from electrical causes will be considered a "fire loss" only if self-sustained combustion exists after power is shut off.

(4) Expenses due to normal wear are not considered as a reportable loss provided that all of the loss is reasonable, foreseeable, and pre-accepted. However, unanticipated loss accompanying such occurrences is reportable. For example, the cost for repairing or replacing a tank, which developed a leak due to corrosion, may be a reasonably foreseeable loss; but the cost for recovery and/or replacement of released material, including accompanying costs for product recovery, or replacement and costs for cleanup and decontamination, should be considered as an accidental loss.

ATTACHMENT B

DOE FORM 5484.X - INDIVIDUAL
ACCIDENT EXPOSURE REPORT

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U. S. Department of Energy
INDIVIDUAL ACCIDENT/INCIDENT REPORT
For All Type A, B, and C Investigations

Official Use Only - Privacy Act

For SSDC Use Only

P.D. Accident Type ____ Energy Flow ____ ____ ____ ____

Enter GICS _____ Narrative _____ FRASE Coding _____ Revision: [ ]1st [ ]2nd [ ]3rd [ ]4th

General Information

1. Reporting Organization _____
   Identification Code ____
2. Case Number ____ (Year) Revision: [ ]Yes
3. Multiple-Case Number ____
4. Accident Type [ ]Injury/Illness [ ]Vehicle [ ]Property Damage [ ]Other
5. Investigation Type [ ]A [ ]B [ ]C [ ]Declassified
6. Department, Division, or ID Code (Optional) ____
7. Date of Occurrence ____ (Month) ____ (Day) ____ (Year)
8. Time ____ (Hour) ____ (Minute) [ ]A.M. [ ]P.M. [ ]Military
9. Accident Occurred [ ]Indoors [ ]Outdoors
10. On Employer's Premise? [ ]Yes [ ]No
11. Specific Location _____

Employee Information

12. Check One: [ ]Injured/Ill Employee [ ]Operator of Equipment/Vehicle
13. Name _____
14. S.S./ID Number ____
15. Age ____
16. Sex: [ ]Female [ ]Male
17. Occupation _____
18. Length of present employment [ ]Under 3 months [ ]3 to 12 months [ ]Over 12 months
19. Experience on this job/equipment [ ]Under 3 months [ ]3 to 12 months [ ]Over 12 months

(If Property Damage or Vehicle Accident, go to Line 26)

Injury/Illness (OSHA Information)

20. [ ]Injury Code (10)
    Illness
    [ ]Code 7a (21) - Skin diseases or disorders
    [ ]Code 7b (22) - Dust diseases of lungs
    [ ]Code 7c (23) - Resp. due to toxic agents
    [ ]Code 7d (24) - Poisoning
    [ ]Code 7e (25) - Disorders - Physical agents
    [ ]Code 7f (26) - Disorders - Repeated trauma
    [ ]Code 7g (29) - All other
21. Workdays Lost ____
22. Workdays Restricted ____
23. Death [ ]Yes [ ]No
    If "Yes", enter date ____ (Month) ____ (Day) ____ (Year)
24. Permanent transfer to different job because of accident? [ ]Yes [ ]No
    Terminated because of accident? [ ]Yes [ ]No
25. Has Employee returned to work with no further anticipated workdays lost or restricted? [ ]Yes [ ]No

Property/Vehicle Damage

26. Property [ ]Fire [ ]Non-Fire
    (If Property Damage Accident go to Line 29)
27. Vehicle [ ]Government [ ]Private - Driven by Government Employee
    [ ]Car/Pickup/Van/Motorcycle
    [ ]Truck (1 ton or over)
    [ ]Bus
    [ ]Other (Air, Marine, Railroad, etc.)
28. Was Vehicle equipped with seat belts?
    [ ]Yes [ ]No
    If "Yes", was seat belt worn? [ ]Yes [ ]No
29. $ ____ Total Accident Damage
    $ ____ DOE Property/Vehicle
    $ ____ Non-DOE Property/Vehicle
30. $ ____ Claim against DOE $ ____ Paid by DOE
    $ ____ Reimbursable to DOE $ ____ Paid to DOE
31. Are dollar amounts final? [ ]Yes [ ]No

Equipment/Hardware/Vehicle Involved (as applicable)

32. #1 Equipment _____ (Generic (or Brand) name and model) ____ (Identification Number)
    #2 Equipment _____ (Generic (or Brand) name and model) ____ (Identification Number)
33. Did Equipment design or defect contribute to accident cause or severity? [ ]No [ ]Yes

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(Continue on reverse side)

INSTRUCTIONS FOR COMPLETING DOE F 5484.X

To be used for all DOE recordable accident/incident cases: As preliminary input for all Type A and B investigation reports and as sufficient data for Type C accidents (reference: DOE 5484.1). Mail completed DOE F 5484.X forms, along with the transmittal form (CAIRS 300) to SSDC, P.O. Box 1625, Idaho Falls, Idaho 83415 - Attention: CAIRS. Revisions to information on this form may be transmitted by telephone (FTS 583-9566 or Commercial 1-208-526-9566) or by mailing a copy of the revised original to the above address.

General

1. Each reporting organization is assigned a unique seven-character identification number. If code is unknown, enter reporting organization name (company, field office, etc.) above the code block on the form.
2. Enter case number. The first two digits are the year, followed by a three digit serial number. Each reportable accident/incident will be numbered in sequence, regardless of injury/illness, property damage or vehicle type; (e.g., the tenth accident in 1982 is 82010).
3. Multiple-case accidents are those which result in more than one recordable injury, property damage or vehicle case or combination thereof; (two or more injured persons, two or more damaged vehicles, any combination of injury and/or property damage, etc.). Report each injury/property damage/vehicle case resulting from a single accident on a separate form, with an identical multiple-case accident number to show relationship to the common accident/incident; (e.g., if the first multiple-case accident of the year resulted in two contractor employees being injured in a one-car rollover, each case would be reported on a separate form 5484.X and assigned sequential case numbers 82005 and 82006. The vehicle damage, if reportable, would be shown on a third form, number 82007. The same multiple-case number "01" should be entered in line 3 on each of the three forms. Number each additional multiple accident sequentially).
4. Check appropriate accident type. Include in vehicle type, all transportation accidents; i.e., vehicle, aircraft, marine and railroad.
5. Indicate the investigation Type; A, B, or C. The declassified box is used when a previously reported case has been declassified to non-recordable status.
6. Check the program type classification under which the accident occurred.

Date and Location

7. Enter date of accident.
8. Enter time of accident.
9. Check appropriate box.
10. Check appropriate box.
11. Enter brief statement for specific location of accident.

Employee Information

12. Check appropriate box.
13. Enter the name of the employee or operator.
14. Enter Social Security Number or other employee number.
15. Enter department or division where employee/operator is employed.
16. Enter age of employee/operator.
17. Check appropriate box.
18. Enter specific job classification title.
19. Check appropriate box.
20. Check appropriate box.
21. Check appropriate box. Complete number 35 if this is checked.
22. Check appropriate box.

Injury/Illness

23. Check appropriate box. (Reference: OSHA log).
24. Enter number of workdays lost.
25. Enter number of restricted workdays.
26. Check appropriate box.
27. Check appropriate box.
28. Check appropriate box.
29. Check appropriate box.

Vehicle/Property Damage

30. Indicate whether the vehicle is government-owned, or is a privately-owned vehicle driven by a Government employee. Also check the type of vehicle involved in the accident. To be used only if "vehicle" was checked in number 4.
31. Check appropriate box. To be used only if "Property Damage" was checked in number 4.
32. Enter the total loss for this case to be borne by DOE. Claims against DOE for damages to non-DOE vehicles or property should be included in the total DOE loss as well as recorded separately here. For multiple-case accidents, the dollar loss should not be redundant; e.g., prorate the cost of a multiple-case accident, involving two DOE vehicles.
33. Enter the dollar loss, if any, to DOE vehicles/property which should be reimbursable; also enter the amount actually paid to DOE. Do not delay the report; if necessary report actual amounts paid via revision after the case is settled. (Note: The sum of the loss borne by DOE, line 32, and the reimbursable amount, line 33, is the total dollar loss to all parties).
34. Check appropriate box.

Equipment/Hardware Involved

35. Give generic name, brand name and identification of equipment involved in the accident.
36. Check appropriate box.

INSTRUCTIONS FOR COMPLETING DOE F 5484.X

Narrative Guide

37. Activity

a. What activity or assignment was in progress at the time of the accident?

Example: 1) Routine housekeeping duties were being performed.
2) No activity in facility due to extended holiday weekend.
3) Employee was involved in routine security inspection.

b. What specific task was the employee actually performing at the time of the accident?

Example: 1) Employee was pulling utility cart which was loaded with bags of heavy wastepaper from office area to hallway.
2) No employee activity.
3) Employee was driving patrol car from guard station to research facility.

38. Events

a. Describe accident, in order of sequence, beginning with initiating event, and followed by secondary and tertiary events.

Example: 1) Wheel of utility cart caught against door casing. Bags of heavy wastepaper which were in cart fell to end of cart. Cart tipped over onto foot of employee. Right foot was crushed between utility cart and door casing.
2) HVAC system malfunctioned during long weekend. Upper floor of office building became excessively hot and triggered the automatic sprinkler system.
3) Patrol car struck icy section of road. Employee lost control of vehicle, which skidded across road into concrete abutment on side of road.

b. Nature and Extent of Injury/Damage.

Example: 1) Right foot of employee was severely bruised.
2) Upper office area and contents were damaged by water. Extensive clean-up required.
3) Damage to right front fender, tire, headlight and grill.

39. Accident Causes

a. State the pre-accident condition, omission, or error; (the specific control factor which was the direct or immediate cause of the accident).

Example: 1) Wheel of utility cart was worn and would not roll properly. Utility cart was overloaded with wastepaper.
2) Thermostatic control on HVAC had been improperly installed during recent replacement.
3) Road was covered with icy spots. Weather was foggy.

b. List in order of importance the contributing factors or underlying causes; (management system factors).

Example: 1) Employee had not been instructed in overloading hazards.
2) Facility maintenance had not inspected the newly-installed thermostatic control. No existing supervisory review over craft-assigned repairs.
3) Employee had not been trained in driving under winter conditions. Company has no driver training program.

40. Corrective Actions

a. Actions taken to prevent recurrence of accident/incident.

Example: 1) Wheels of utility cart were replaced with larger size wheels. All carts will be inspected for safe operation. Maintenance employees were instructed in overloading hazards.
2) Thermostatic control was inspected and found free of defects and was properly rewired.
3) All security personnel were instructed at safety training meeting on driving under hazardous conditions.

b. Recommended corrective actions are those which are planned by line management which require time for implementation. Provide implementation date.

Example: 1) Provide human factors review of utility carts and other equipment purchases.
2) Management to review maintenance procedures and inspection process.
3) Provide defensive driver training course.

41. Enter signature of accident investigator who can be contacted for follow-up, the date and FTS or commercial telephone number and indicate the investigators job title.

42. Enter signature and FTS or Commercial telephone number of cognizant supervisor.

ATTACHMENT C

DOE FORM 5484.8 - "TERMINATION OCCUPATIONAL EXPOSURE REPORT"

DOE F 5484.8
(8 80)
DOE 5484.1

U.S. DEPARTMENT OF ENERGY

TERMINATION OCCUPATIONAL EXPOSURE REPORT

REPORTING ORGANIZATION | PREPARED BY

ADDRESS | DATE | AREA CODE PHONE

KEYPUNCH COLS. 1-9 & 68-79 IN ALL CARDS

1. SOCIAL SECURITY NO. (1 – 9)

6. CONTRACTOR CODE (68 – 78) | 7. (79)

2. HIRE (M M D D Y Y, 10 – 15) | 3. NAME: FIRST (22 – 36) | M.I. (37) | LAST (38 – 53) | 4. BIRTH (M M D D Y Y, 54 – 59) | 5. TERM (M M D D Y Y, 60 – 65) | CARD 1 (80)

8. BEGIN (M M D D Y Y, 10 – 15) | 9. END (M M D D Y Y, 16 – 21) | 10. AREA EXP. (22 – 23) | 11. EXTERNAL EXPOSURE (39 – 45) | 12. TYPREC (64) | 13. TYPEXP (65) | CARD 2 (80)

14. BEGIN (M M D D Y Y, 10 – 15) | 15. END (M M D D Y Y, 16 – 21) | 16. ORGAN. CODE (22 – 23) | 17. INTERNAL EXPOSURE (31 – 39) | 18. METH. DOSE (40 – 41) | 19. ORGAN. CODE (42 – 43) | 20. UNIT (44) | 21. NUCLIDE(S) (L.J.) (45 – 60) | 22. TYPREC (64) | 23. TYPEXP (65) | CARD 3 (80)

ATTACHMENT D

DOE FORM 5480.4 - "OCCUPATIONAL SAFETY AND HEALTH COMPLAINT FORM"

Form 5480.4
(7-82)

U.S. DEPARTMENT OF ENERGY

CONTRACTOR EMPLOYEE OCCUPATIONAL SAFETY OR HEALTH COMPLAINT

This form is provided for the assistance of any DOE contractor employee or representative thereof who (1)believes that a violation of a DOE safety or health standard exists and (2)desires to file a complaint. It is not intended to constitute the exclusive means by which a complaint may be registered with the contractor or with the DOE.

1.A. THE UNDERSIGNED BELIEVES THAT A VIOLATION OF A DOE OCCUPATIONAL SAFETY OR HEALTH STANDARD EXISTS AT THE PLACES OF EMPLOYMENT INDICATED BELOW, RESULTING IN A JOB SAFETY OR HEALTH HAZARD TO EMPLOYEES.

(Check One)

☐ Employee ☐ Representative of employees ☐ Other (Specify) _____

B. DOES THE HAZARD(S) IMMEDIATELY THREATEN DEATH OR SERIOUS PHYSICAL HARM? ☐ YES ☐ NO

2. CONTRACTOR'S NAME	3. ADDRESS (Street, City, State, Zip Code)	4. TELEPHONE NO.

5. SPECIFY THE PARTICULAR BUILDING OR WORKSITE WHERE THE ALLEGED VIOLATION IS LOCATED, INCLUDING ADDRESS.

6. KIND OF ACTIVITY	7. NAME AND PHONE NUMBER OF CONTRACTOR'S AGENT(S) IN CHARGE

8. DESCRIBE BRIEFLY THE HAZARD WHICH EXISTS INCLUDING THE APPROXIMATE NUMBER OF EMPLOYEES EXPOSED TO OR THREATENED BY SUCH HAZARD. (Continue on another sheet if necessary)

9. LIST BY NUMBER AND OR NAME THE PARTICULAR OSHA STANDARD(S) PRESCRIBED BY THE DOE WHICH YOU BELIEVE HAS BEEN VIOLATED, IF KNOWN.

10.A. TO YOUR KNOWLEDGE, HAS THIS VIOLATION BEEN THE SUBJECT OF ANY UNION/MANAGEMENT GRIEVANCE OR HAVE YOU (OR ANYONE YOU KNOW) OTHERWISE CALLED IT TO THE ATTENTION OF, OR DISCUSSED IT WITH, THE EMPLOYER OR ANY REPRESENTATIVE? (Check one) ☐ YES ☐ NO

B. IF "YES" IS CHECKED ABOVE, PLEASE GIVE THE RESULTS, INCLUDING ANY EFFORTS BY MANAGEMENT TO CORRECT THE VIOLATION.

11. PLEASE CHECK ONE:

☐ I do not want my name revealed to the employer.

☐ My name may be revealed to the employer.

(Signature)	(Date)	(Typed or printed name)

IF YOU ARE A REPRESENTATIVE OF EMPLOYEES, GIVE THE NAME OF YOUR ORGANIZATION.

141

ADDRESS OF ORGANIZATION (Street, City, State, Zip Code)	TELEPHONE NO.

ATTACHMENT E

ANSI DRAFT STANDARD N13.12, TABLE 1

Draft American National Standard Control of Radioactive Surface Contamination on Materials, Equipment, and Facilities to Be Released for Uncontrolled Use

1. Scope

This standard provides criteria for the control of materials, equipment, and facilities, contaminated with radioactivity, proposed to be released for uncontrolled use. Permissible contamination limits are specified, as well as methods for assessing the levels of contamination. The following areas are a matter of separate consideration and are beyond the scope of this standard:

(1) Control of radioactive contamination that is dispersed through material

(2) Materials made radioactive by neutron irradiation

(3) Contaminated soils

(4) Contaminated clothing and evaluation of contamination on persons

The control measures of this standard are designed to provide protection of the general public and the environment against unwarranted exposure to radioactive materials.

2. Definitions

NOTE: The definitions given in this section are of a restrictive nature for the purpose of this standard only.

2.1 **Shall, Should, and May.** The word "shall" is used to denote a requirement; the word "should" to denote a recommendation; the word "may" to denote permission, being neither a requirement nor a recommendation. To conform to this standard, surface contamination control shall be performed in accordance with the standard's requirements but not necessarily with its recommendations.

2.2 **Uncontrolled Use.** Uncontrolled use means use without restriction for radiation protection purposes.

2.3 **Removable Surface Contamination.** Removable surface contamination denotes radioactive material measured by the portions that can be transferred to another surface by simple mechanical contact.

2.4 **Property.** The term "property" is used to denote materials, facilities, and equipment; it is not used to denote land.

3. Criteria for Release

3.1 Property shall be treated as potentially contaminated if it has been used or stored in conjunction with operations that could produce contamination levels in excess of the values given in Table 1.

3.2 Surfaces of potentially contaminated property shall be surveyed by means of appropriate instruments and techniques before release.

3.3 Where potentially contaminated surfaces are not accessible for measurement (as in some pipes, drains, and ductwork), such property shall not be released pursuant to this standard, but shall be made the subject of case-by-case evaluation.

3.4 Contaminated property shall be cleaned as thoroughly as practicable before release for uncontrolled use.

3.5 Property shall not be released for uncontrolled use unless measurements show the total and removable contamination levels to be no greater than the values in Table 1 or Table 2. (The values in Table 2 are easier to apply when the contaminants cannot be individually identified.)

3.6 Coatings used to cover the contamination shall not be considered a solution to the contamination problem. That is, the monitoring techniques shall be sufficient to determine, and such determination shall be made, that the total amount of contamination present on and under any coating does not exceed the Table 1 or Table 2 values before release.

3.7 The person or organization releasing property previously contaminated above allowable limits shall main-

Table 1
Surface Contamination Limits*

Contaminants			Limit (Activity) (dpm/100 cm²)†	
Group	Description	Nuclides (Note 1)	Removable	Total (Fixed plus Removable)
1	Nuclides for which the nonoccupational MCP_a (Note 2) is 2×10^{-13} Ci/m³ or less or for which the nonoccupational MCP_w (Note 4) is 2×10^{-7} Ci/m³ or less	^{227}Ac $^{241,242m,243}Am$ $^{249,250,251,252}Cf$ $^{243,244,245,246,247,248}Cm$ $^{125,129}I$ ^{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_a (Note 2) is 1×10^{-12} Ci/m³ or less or for which the nonoccupational MCP_w (Note 4) is 1×10^{-6} Ci/m³ or less	^{254}Es ^{256}Fm $^{126,131,133}I$ ^{210}Po ^{223}Ra ^{90}Sr ^{232}Th ^{232}U	200	2000 α Nondetectable β, γ (Note 5)
3	Those nuclides not in Group 1 or Group 2		1000	5000

*The levels may be averaged over one square meter provided the maximum activity in any area of 100 cm² 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 cm², 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 cm² determined from measurement of section i; or (2) it is determined that the activity of all isolated spots or particles in any area less than 100 cm² exceeds $3L$.

†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 cm².

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

(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 2
Alternate Surface Contamination Limits
(All Alpha Emitters, except U_{nat} and Th_{nat}, Considered as a Group)*

Contamination Contingencies	Limit (Activity) (dpm/100 cm²)† 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 α Nondetectable β, γ (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 cm² 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 cm², if (1) from measurements of a representative number n of sections it is determined that $1/n\ \Sigma_n S_i \geq L$, where S_i is the dpm/100 cm² determined from measurement of section i; or (2) it is determined that the activity of all isolated spots or particles in any area less than 100 cm² exceeds $3L$.

†Disintegrations per minute per square decimeter.

NOTES:

(1) U_{nat} and decay products.

(2) The instrument utilized for this measurement shall be calibrated to measure at least 100 pCi of any Group-1 contaminants uniformly spread over 100 cm².

(3) 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.

tain records of released property. The record shall include identification of the property, the date of last monitoring operation, the identity of the individual who performed the monitoring operation, the type of monitoring instruments used, and the results of the monitoring operation.

3.8 A quality assurance program shall be implemented to ensure the adequacy of surface contamination measurements.

4. Quantification of Contamination

4.1 General. The limits in Tables 1 and 2 are based on "as low as practicable" considerations; that is, they are levels that can be achieved in most cases with reasonable decontamination methods. (Some guidance on hazard evaluation at these levels is given in Appendix B.) Because the limits are so low, they tax the capabilities of available instrumentation to detect them, particularly if the contamination occurs as an individual, small-

diameter, widely dispersed source. Some classes of contaminants (beta emitters ≤ 0.15 MeV maximum energy and beta emitters at the 1000 dpm/100 cm² total contamination limits) may, in order to determine compliance with the limits, require special detection methods and analysis beyond those presented here.

4.2 Measurement and Sampling. Although alpha and beta surface contamination usually can be detected by direct monitoring methods, certain situations (high background, insufficient sensitivity, lack of accessibility, etc) may require the use of indirect (smear) methods as the primary monitoring procedure. Both methods should be used as necessary to obtain a complete assessment of the surface being examined – that is, coverage of a surface by direct measurement should be followed by smears of representative portions. Acceptable practices for the purpose of this standard are described in 4.2.1, 4.2.2, and 4.2.3.

4.2.1 Procedures. The surface shall first be monitored by a direct method as described in 4.2.2. The direct measurement should be followed by the taking of smears from representative portions of the surface as described in 4.2.3.

4.2.2 Direct Methods of Surface Monitoring. Direct monitoring of a surface for total surface contamination may be accomplished by making sequential measurements over the surface with a stationary detector or by slowly sweeping the detector over the surface. If the detector passes over an isolated small-diameter source, the number of pulses produced by the source in the detector will be inversely proportional to the scanning speed. The scanning speed should be slow enough to ensure detection of at least half the sources with emission rates at the appropriate limits as specified in Tables 1 and 2. Aural indicators of counts (speakers or earphones) should be used, particularly in surveys for alpha emitters.

4.2.2.1 Alpha Contamination Monitoring. Since alpha particles have a short range in air, the distance from the probe window to the surface to be monitored shall not exceed 0.5 cm. When monitoring for Group-1 alpha emitters, the scanning speed across a surface (in centimeters per second) shall not exceed one-third the numerical value of the detector window dimension (in centimeters) in the direction of the scan.[1] In general, the scanning speed shall be slow enough to ensure a source detection frequency of 50% or more. The probe shall be stationary for actual measurement of levels when contamination is located.

4.2.2.2 Beta Contamination Monitoring. Beta monitoring shall be performed with a low-background, thin-window detector. The detector window and the intervening medium shall transmit at least 60% of the incident beta particles. The scanning speed shall be slow enough to ensure a source detection probability of 50% or more[2] and the detector window shall be no more than 5 cm from the surface. The probe shall be stationary for measurement when contamination is detected. If the external gamma-radiation background is significantly above natural background levels, shielding or other measures may be required to enable detection of the contamination.

The beta contamination monitoring methods described above are not suitable for detection of low-energy (E_{max} ≤ 150 keV) beta sources. Beta emitters with limits of 2000 dpm/100 cm² (total) will also be very difficult to detect at the limits. In both cases, special monitoring procedures will have to be used.

4.2.3 Indirect Methods of Surface Monitoring (Smear Method). The indirect method of surface monitoring (smear method) shall be used whenever contamination is found above surface contamination limits using direct methods. It should also be used to sample representative portions as part of a total survey for surface contamination as a sensitive method of finding contaminated areas near the limits.

The level of removable surface contamination is given by the amount of radioactivity transferred to a standard material with which the contaminated surface has been wiped. The large variability in the contamination removal factor makes quantitative estimation by smear methods of contamination present on the surface uncertain. Since the removal factor is affected by varying the pressure applied during smearing according to the type of surface being smeared and the form of the contamination, efforts should be made to obtain a uni-

[1] This is equivalent to specifying that the time required by the detector to traverse a point source will be at least 3 seconds. This is a very slow scanning speed; a detector with a window that is 20 cm long in the direction of the scan will traverse only 0.4 m in 1 minute.

[2] The performance requirements should be readily met with a 20-cm² thin-end window (5-cm diameter) and a 5-cm/s scanning speed. Skilled technicians may be able to survey at higher speeds. The following are examples of average detection efficiencies obtained by experienced monitors on beta sources (E_{max} = 0.57 MeV), using 5-cm diameter, 1.7-mg/cm² end-window GM detectors coupled with a count-rate meter having a speaker output giving 1 sound pulse for each GM pulse (J. F. Sommers, personal communications). Sources were less than 1 cm in diameter, background count rate was 120 counts/min, and window-surface distance was 1 cm.

	Test 1	Test 2
Scanning speed (cm/s)	3.5–15	5
Source emission rate (betas/min)	5000	2000
Average detection frequency	80%	50%

form removal factor by using appropriate devices or practices in order to ensure uniformity in pressure applied to smears.

The amount of removable radioactive material shall be determined by wiping with soft absorbent material (for example, filter paper), applying uniform moderate pressure. The amount of radioactive material on the wipe shall be determined with an appropriate instrument of known efficiency (including geometry).

4.3 Instrument Selection. For alpha monitoring, scintillation and gas proportional detectors are acceptable. Scintillation detectors can become light sensitive if pinholes are produced in the thin window. Gas-flow and air-filled proportional counters, although adversely affected by extreme climatic conditions, are usually more stable under normal use and less light sensitive. The GM pancake-type tube with a 5-cm diameter thin window is the detector of choice for the beta particles. Proportional counters or plastic organic scintillators with thin light-tight covers are also suitable for beta monitoring.

4.4 Basic Performance Considerations for Monitoring Instruments

4.4.1 The instrument shall have sufficient counting efficiency to determine the disintegration rates for the specific radionuclides involved (see Table 1 or 2) with an accuracy of better than ± 50% at the 90% confidence level in a counting time of less than 5 min.

4.4.2 The response of the instrument to radiation of different energies shall be known.

4.4.3 The instrument shall have a rapid response time to ensure proper performance when monitoring nonuniformly contaminated surfaces.

4.4.4 The pertinent requirements of American National Standard Specification of Portable X- or Gamma Radiation Survey Instruments, ANSI N13.4-1971, shall be met.

4.5 Instrumentation Test and Calibration. Instruments shall be tested and calibrated in accordance with the specifications contained in American National Standard for Radiation Protection Instrumentation Test and Calibration, ANSI N323-1977.

Appendixes

(These Appendixes are not a part of Draft American National Standard Control of Radioactive Surface Contamination on Materials, Equipment, and Facilities to Be Released for Uncontrolled Use, N13.12, but are included for information purposes only.)

Appendix A
Methods for Decontamination

A1. Introduction

This section summarizes general methods for decontamination and is presented as a guide in planning and selecting decontamination procedures for radioactively contaminated materials and equipment being cleaned for unrestricted release. Decontamination procedures, in general, follow acceptable industrial practices for maintaining cleanliness and removing contaminants such as surface dirt, oils, scale deposits, and oxide film. Decontamination methods range from simple procedures such as hand wiping to complex operations involving large facilities, heavy mechanical equipment, and extensive logistical support and are often dependent on the resources, experience, and innovativeness of those responsible for accomplishing the task. Techniques vary widely on the basis of the type of material contaminated, the nature of the contaminant, and the factors underlying the need to perform the decontamination. Detailed treatment of decontamination methods is beyond the scope of this standard; however, techniques and experiences are well documented in the literature. A partial list of useful references, primarily literature searches and bibliographica, are provided at the end of this appendix. Preliminary measures to facilitate decontamination, such as removable coatings, are strongly recommended.

A2. Basic Considerations

A2.1 Resources. The availability of adequate resources is a key factor in selecting a decontamination method. Resources which should be evaluated include decontamination facilities, auxiliary equipment, decontamination supplies, protective clothing, monitoring equipment, and manpower. Particular emphasis should be placed on adequacy of containment and waste-handling facilities. Migration of contamination caused by decontamination procedures or ineffective containment of waste material may contaminate surrounding equipment or facilities and add significantly to the overall cost of cleaning.

A2.2 Cost. Essentially all decontamination efforts are influenced by the cost of the procedure compared with the value of the material, equipment, or facilities being cleaned. In some instances it may be more economical to dispose of the objects as controlled or contaminated waste than to clean them to unrestricted release levels. When contaminants involve short-lived isotopes, it may be more economical to wait for radioactive decay below unrestricted release levels than to decontaminate the material.

A2.3 Personnel Safety. Protection for personnel performing the decontamination and for those in surrounding areas should be considered in initial planning. Respiratory protection is a key consideration since many decontamination procedures generate airborne contamination. The toxicity of the cleaning agent should be considered along with the potential for evolution of toxic fumes when the cleaning agent comes in contact with the surface being cleaned. In addition, the potential for the presence or generation of explosive or flammable gas mixtures should be evaluated. Procedures with significant radiological, industrial hygiene, or safety hazards should be performed under an approved written job plan in which all hazards and precautions are clearly defined. Personnel using the job plans should understand the requirements of the job plan before starting work.

A2.4 Effects of Decontamination. The effect of the decontamination procedure on the material being cleaned should be considered in the initial planning. In addition to the obvious destructive effect of procedures such as sandblasting, grinding, etc, corrosion or insidious changes associated with various chemical reactions should also be evaluated.

A3. Decontamination Methods

A3.1 General. It is often of advantage to try several different decontamination procedures or techniques on a test basis before making a commitment to a single method. In most procedures the decontamination fac-

tor (DF) is high on the initial cleaning but significantly reduced in successive steps.

A3.2 **Manual Cleaning.** Manual cleaning includes such procedures as wiping, scrubbing, mopping, etc, and, in general, is an effective method of removing low or moderate levels of contamination on nonporous or nearly nonporous surfaces. Water or a variety of detergents, solvents, chelating agents, and other chemicals may be used. Manual cleaning usually presents minimal airborne and surface contamination control problems.

A3.3 **Mechanical Cleaning.** Mechanical cleaning includes such decontamination methods as vacuuming, high-pressure steam and water cleaning, soaking, and ultrasonics. These methods are generally associated with the decontamination of highly contaminated equipment but have application with lower levels of contamination.

A3.3.1 **Vacuuming, Wet or Dry.** Vacuuming is generally effective in removing loose particulate contamination and is frequently used as an initial decontamination step preparatory to manual cleaning. Vacuum systems should be properly filtered to prevent the spread of contamination to surrounding areas and to reduce the hazard of airborne contamination. Care should be taken to ensure that the concentration of radioactive material in the vacuum system does not create unusually high radiation exposure rates to personnel and that it does not present a criticality hazard.

A3.3.2 **Jet Cleaning.** High-pressure steam and water used alone or mixed with chemicals and detergents are effective in attaining high decontamination factors. Commercial systems using the jet cleaning principle are available. Equipment of this type is ideally suited for remote operation and for cleaning large surface areas. High-pressure jet cleaning has the disadvantage of spreading contamination over a large area and is more effective when used in a cave or cell designed especially for this purpose.

A3.3.3 **Soaking and Spraying.** Soaking and spraying are used extensively for decontamination of small and moderate size material and equipment. Both methods make use of chemical solutions and may require support features such as catch tanks, liquid recycle ability, and filtered ventilation systems. Spraying has the advantage of combining mechanical as well as chemical action; however, in some cases the shape of the object being cleaned prevents effective cleaning action on all surfaces. Soaking provides good access to surfaces but does not provide mechanical action.

A3.3.4 **Ultrasonic Cleaning.** Ultrasonic cleaning combines the advantage of chemical action and mechanical energy for cleaning. It is best suited for small components and offers the advantage of remote operation and rapid decontamination of objects with irregular shapes and crevices.

A3.4 **Grinding and Abrasive Action.** Cleaning procedures employing grinding or abrasive action are effective means of decontaminating metal and concrete surfaces, provided alteration of the surface area of the object being cleaned can be tolerated.

A3.4.1 **Grinding.** Grinding of surfaces to remove contamination is usually limited to small objects or isolated spots of contamination where the surface is reasonably smooth. Grinding normally produces a high decontamination factor and is economical. A variety of commercial grinders may be used. Grinding inherently leaves residual contamination on the surface of the object being cleaned and therefore usually requires final cleaning by some other method (vacuuming, wiping, etc).

Grinding frequently produces particulate air activity and is generally not economical for large surface areas.

A3.4.2 **Abrasive Blasting.** Abrasive blasting has a number of advantages over grinding. It is rapid, provides a high DF, is effective on irregular shaped surfaces and can be used for large areas. Abrasive blasting makes use of a large variety of abrasives (sand, shells, glass beads, metals, etc) with velocity, shape, and size of the abrasive influencing surface-removal characteristics. A prime disadvantage of abrasive blasting is that it usually generates high airborne contamination and spreads surface contamination; however, this can be minimized by wet blasting techniques, vacuum systems, or filtered enclosures.

A3.5 **Destructive Decontamination.** Destructive decontamination procedures include physical removal of contaminated parts or sections. Generally, little or no effort is made to clean the contaminated parts before disposal as waste. Containment and other radiological controls associated with destructive cleaning are dependent on contamination levels, the nature of the contaminant, and the physical characteristics of the parts being removed.

A4. References for Appendix A

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--. Bibliographic Review of Selected Subjects. Decontamination. 1963; German Report No. AED-C-13-02.

Appendix B
Hazard Analysis of Surface Contamination Levels

B1. Introduction

The surface contamination limits of this standard are a consensus, based on what is considered to be safe and practicable with current technology. This appendix presents a formalism by which the hazards at these limits may be evaluated. It is recognized that reasonable changes in the assumptions could make major changes in the results.

A number of papers have been published on the setting of surface contamination limits (for example, Ref. [1–6]).[3] There are two basic considerations: Since uncontrolled surface contamination can constitute a radiological hazard, limits are needed; because there is no unique relationship between the contamination level and the resulting radiation doses to humans, the limits must be somewhat arbitrary. A comprehensive approach to the analysis of potential hazards from surface contamination can be found in Ref. [2].

B2. Ingestion

Experience with worldwide fallout from nuclear weapons tests and with the reactor accident at Windscale, England, in 1957 suggests that ingestion of contaminated food is a major factor in radiation dose resulting from surface contamination. As a first approximation, the ingestion hazard is taken as proportional to the maximum permissible concentration in water (MPC_w, Ref. [7]). The limit for ^{90}Sr is arbitrarily taken as 1000 dpm/100 cm^2 and is approximately the value of background ^{90}Sr contamination produced as a result of fallout from past nuclear weapons tests. (In this appendix the dimensions are expressed as disintegrations per minute per square decimeter [dpm/dm^2] for convenience in manipulations; this is identical to dpm/100 cm^2.) Limits thus derived would be objectionably high for nuclides for which the MPC_w values are high. High surface contamination limits have been shown to be unnecessary in practice and could lead to unnecessary radiation exposure via direct radiation, percutaneous absorption, etc. Accordingly, the upper bound is taken as 5000 dpm/dm^2. The permissible contamination limits based on possible ingestion are presented in Fig. B1.

B3. Inhalation

Surface contamination can be resuspended in air and thereby become a potential inhalation hazard. This problem has been studied extensively and it has been demonstrated that no unique relationship exists between surface and airborne levels of contamination. By making reasonable assumptions, however, it is possible to calculate a potential hazard. This is done in the following paragraphs.

The rate at which the surface contamination becomes airborne is $q_1 = wAR$, where w is the contamination level (Ci/m^2), A is the surface area (m^2), and R is the resuspension rate (hr^{-1}). In a reasonably well-ventilated room the contamination is removed almost entirely by the ventilation process. The removal rate is $q_2 = CVD$ where C is the airborne concentration (Ci/m^3), V is the room volume (m^3), and D is the ventilation rate (hr^{-1}). At equilibrium, the contamination is removed at the same rate that it becomes airborne, $q_1 = q_2$. Thus the surface contamination level giving a particular level of airborne contamination is $w = CVD/AR$. The values assumed here are (Ref. [2, 4])

$$V/A = 2.25 \text{ (m)}$$
$$D = 5 \text{ (hr}^{-1}\text{)}$$
$$R = 10^{-4} \text{ (hr}^{-1}\text{)}.$$

The surface contamination level that produces maximum permissible air concentrations (MPC_a) under these conditions is

$$w(\text{Ci/m}^2) = 1.125 \times \cancel{10^5}\ 10^5 \times MPC_a\ (\mu\text{Ci/cc})$$

Expressed in disintegrations per minute per square decimeter, this is

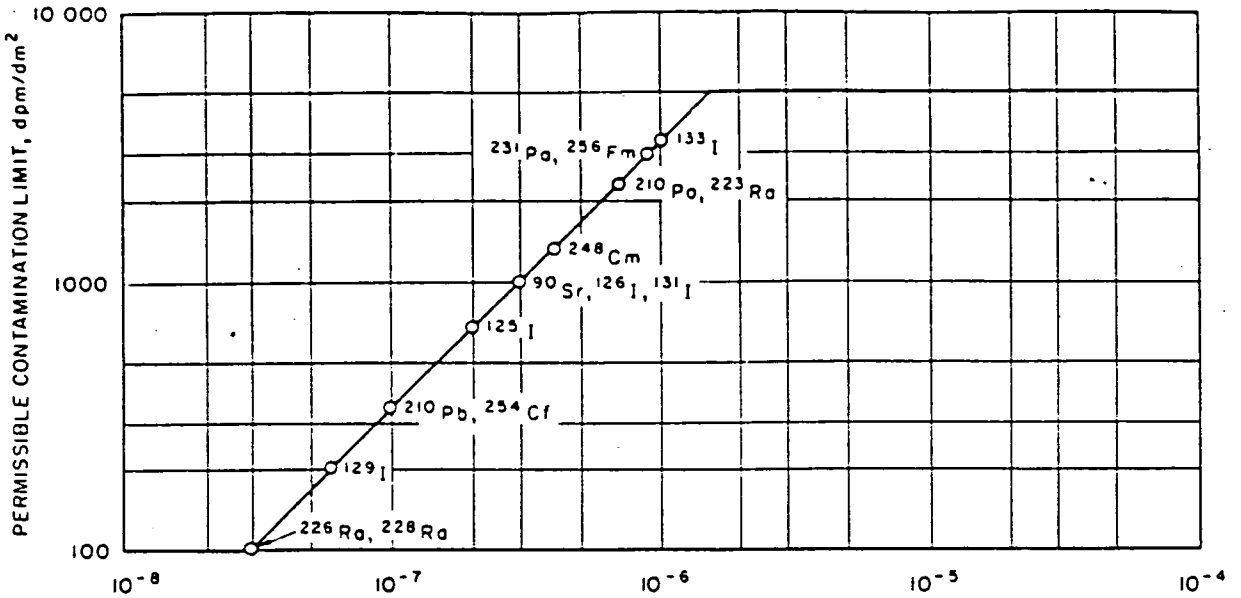
$$w(\text{dpm/dm}^2) = 2.5 \times 10^{15} \times MPC_a\ (\mu\text{Ci/cc})$$

For ^{239}Pu, the MPC_a value is 6×10^{-14} μCi/cc (Ref [7]), and the corresponding surface contamination level is

$$w = 2.5 \times 10^{15} \times 6 \times 10^{-14} = 150 \text{ (dpm/dm}^2\text{)}$$

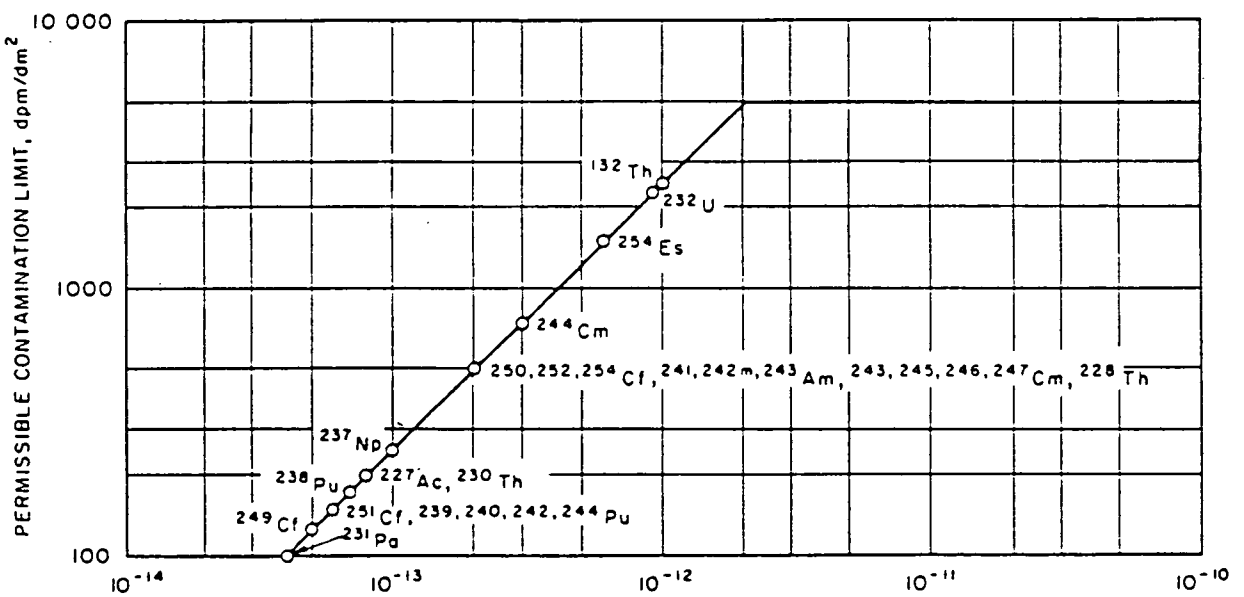
The permissible contamination limits thus based on possible inhalation are presented in Fig. B2.

[3] Numbers in square brackets refer to corresponding numbers in Section B7, References for Appendix B.



NOTE: Maximum permissible concentration in water for continuous nonoccupational exposure, Ci/m³. From the *Code of Federal Regulations*, Title 10, Part 20, Appendix B, Table 2, Column 2, April 30, 1975.

Fig. B1
Permissible Contamination Limits for
Uncontrolled Areas Based on
Possible Ingestion



NOTE: Maximum permissible concentration in air for continuous nonoccupational exposure, Ci/m³. From the *Code of Federal Regulations*, Title 10, Part 20, Appendix B, Table 2, Column 1, April 30, 1975.

Fig. B2
Permissible Contamination Limits for
Uncontrolled Areas Based on
Possible Inhalation

Table B1
Derived Contamination Limits*

Nuclide	Limit (dpm/100 cm²) Ingestion	Inhalation
^{248}Cm		50
$^{226, 228}Ra$	100	
^{231}Pa		100
^{249}Cf		125
^{251}Cf; $^{239, 240, 242, 244}Pu$		150
^{238}Pu		175
^{129}I	200	
^{227}Ac; ^{230}Th		200
^{237}Np		250
^{210}Po; ^{254}Cf	330	
$^{250, 252}Cf$; $^{243, 245, 246, 247}Cm$; $^{241, 242m, 243}Am$; ^{228}Th		500
^{125}I	660	
^{244}Cm		750
$^{126, 131}I$; ^{90}Sr	1000	
^{254}Es		1500
^{232}U		2250
^{223}Ra; ^{210}Po	2300	
^{256}Fm	3000	
^{232}Th; ^{133}I	3300	

*The limits in Table 1 of the standard are based on these limits as well as on practical considerations in their measurements.

Table B2
Permissible Contamination Limits*

Contaminant	Limit (dpm/100 cm²)
Group 1 Table B1 limits < 1000 dpm/100 cm²	100
Group 2 Table B1 limits ≥ 1000 dpm/100 cm²	1000
Group 3 Others	5000

*The limits in Table 1 of the standard are based on these limits as well as on practical considerations in their measurements.

B4. Limits Based on Potential Inhalation or Ingestion

Limits must be set low enough to control potential hazards from both inhalation and ingestion. Thus for each nuclide the lower of the limits derived in Sections B2 and B3 is taken as the permissible contamination limit.

Table B3
Alternate Permissible Contamination Limits

Contaminant	Limit (dpm/100 cm²)
Group 1	
All alpha emitters except U_{nat} and Th_{nat}; the beta emitters ^{227}Ac, ^{226}Ra, ^{228}Ra, ^{125}I, ^{129}I; unidentified radionuclides	100
Group 2 ^{126}I; ^{131}I; ^{133}I; ^{90}Sr	1000
Group 3 Others	5000

For example, consider ^{231}Pa. The MPC_w is 9×10^{-7} Ci/m³; so the surface contamination limit based on possible ingestion (Fig. B1) would be 2900 dpm/dm². The MPC_a is 4×10^{-14} Ci/m³; thus the surface contamination limit based on possible inhalation (Fig. B2) would be 100 dpm/dm². Clearly, for this nuclide, inhalation is the limiting consideration; so the permissible contamination limit is 100 dpm/dm².

As a second example, consider ^{228}Ra. From Fig. B1, the ingestion-based limit is 100 dpm/dm²; from Fig. B2, the inhalation-based limit is 5000 dpm/dm². For this nuclide, possible ingestion is the limiting consideration; so the permissible contamination limit is 100 dpm/dm².

The results are presented in Table B1.

B5. Surface Contamination Limits for Groups of Nuclides

The limits in Table B1 are based on rather gross assumptions. The state of the technology does not justify the implication that the hazards associated with surface contamination are known with precision. It may be more realistic to set the limits for groups of nuclides. These limits are given in Table B2. (The limits given in Table B2 were used in arriving at the limits presented in Table 1.)

B6. Alpha-Emitting Nuclides versus Others

In practice, alpha emitters are usually treated as a separate group of nuclides because (1) alpha emitters are generally more hazardous than others if taken into the human body and (2) alpha emitters require dif-

ferent monitoring instruments than those used for other nuclides.

Since almost all alpha emitters are members of Group 1, if alpha emitters are to be treated as a single group they must be assigned to Group 1. Although this is acceptable in general, these low limits are neither necessary nor acceptable for natural uranium or natural thorium. Thus, these widely used materials are not considered parts of the "alpha emitter" group. The limits obtained by including the alpha emitters in Group 1 are presented in Table B3. (The limits given in Table B3 were used in arriving at the alternate limits presented in Table 2.)

B7. References for Appendix B

[1] Gallagher, F. E. [and others]. Progress on surface contamination standards. In: *Health Physics Operational Monitoring.* New York: Gordon and Breach Science Publishers; 1972: pp 1767–1781.

[2] Healy, J. W. Surface Contamination: Decision Levels. Springfield, Va.: National Technical Information Service; 1971; Los Alamos Scientific Laboratory Report No. LA-4558-MS.

[3] Safe Handling of Radioisotopes. Vienna: International Atomic Energy Agency; 1958; Safety Series 1.

[4] Fish, B. R., ed. *Surface Contamination.* London: Pergamon Press; 1967.

[5] Control and Removal of Radioactive Contamination in Laboratories. Washington, D.C.: National Committee on Radiation Protection and Measurement; 1951.

[6] General Principles of Monitoring for Radiation Protection of Workers. London: Pergamon Press; 1969; International Commission on Radiological Protection Publication 12.

[7] Standards for Protection against Radiation. *Code of Federal Regulations.* Title 10, Part 20; 1975 April 30.

ATTACHMENT F

WORK LOCATION PERSONNEL PROTECTION AND
SAFETY EVALUATION FORM

WESTON

WORK LOCATION PERSONNEL PROTECTION AND SAFETY
EVALUATION FORM
APPROVAL/SIGN OFF

I have read, understood, and agreed with the information set forth in this Health and Safety Plan (and attachments) and discussed in the Personnel Health and Safety briefing.

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Site Safety Co-ordinator	Signature	Date
Project Manager	Signature	Date
Project Director/ Department Manager	Signature	Date
Director, Corporate Health and Safety	Signature	Date

Personnel Health and Safety Briefing Conducted By:

Name	Signature	Date

WESTON

WORK LOCATION PERSONNEL PROTECTION
AND SAFETY EVALUATION FORM

Attach Pertinent Documents/Data

Fill in Blanks As Appropriate

WO# _____ Prepared By _____

Division _____ Date _____

Office _____ Reviewed By _____

A. Work Location Description

1. Name _____ 2. Location _____

3. Type: HW Site ( ) Industrial ( )

Spill ( ) Construction ( )

( ) Existing WESTON Work Location

( ) Existing Client Work Location

Other ( ) Describe _____

_____

4. Status _____

5. Anticipated activities: _____

_____

6. Size _____

7. Surrounding Population _____

8. Buildings/Homes/Industry _____

_____

9. Topography _____

_____

10. Anticipated Weather _____

11. Unusual Features _____

12. Site History _____

_____

_____

B. Hazard Description

1. Background Review: Complete ( ) Partial ( )

If partial, why? _____

2. Hazard Level: A ( ) B ( )

Unknown ( ) C ( ) D ( )

Justification _____

3. Types of Hazards: (Attach additional sheets as necessary)

A. Chemical ( ) Inhalation ( ) Explosive ( )

Biological ( ) Ingestion ( ) O_2 Def. ( )

Skin Contact ( ) Toxic ( )

Describe _____

_____

_____

B. Physical ( ) Cold Stress ( ) Noise ( )

Heat Stress ( ) Other ( )

Describe _____

_____

_____

C. Radiation ( )

Describe _____

_____

_____

4. Nature of Hazards:

Air ( ) Describe _____

_____

Soil ( ) Describe _____

_____

Surface Water ( ) Describe _____

_____

Groundwater ( ) Describe _____

_____

Other ( ) Describe _____

_____

Chemical Contaminants of Concern ( ) N/A

Contaminant	TLV (PPM)	I.D.L.H. (PPM)	Source/Quantity Characteristics	Instrument Used To Monitor Contaminant	Ionization Potential	MSDS Reference (Attached)

Physical Hazard	Description	Location	Procedure Used To Monitor

7. Work Location Instrument Readings ( ) N/A

Location _____

% O_2 _____ % LEL _____

Radioactivity _____ PID _____

FID _____ Other _____

Other _____ Other _____

Location _____

% O_2 _____ % LEL _____

Radioactivity _____ PID _____

FID _____ Other _____

Other _____ Other _____

Location _____

% O_2 _____ % LEL _____

Radioactivity _____ PID _____

FID _____ Other _____

Other _____ Other _____

Location _____

% O_2 _____ % LEL _____

Radioactivity _____ PID _____

FID _____ Other _____

Other _____ Other _____

8. Hazards expected in preparation for work assignment. ( ) N/A

Describe: _____

_____

C. Personnel Protective Equipment

1. Level of Protection

A ( ) B ( ) C ( ) D ( ) Location/Activity:

_____

A ( ) B ( ) C ( ) D ( ) Location/Activity:

_____

2. Protective Equipment (specify probable quantity required)

Respiratory ( ) N/A

( ) SCBA, Airline

( ) Full Face Respirator (Cart._____)

( ) Escape Mask

( ) None

( ) Other _____

( ) Other _____

_____

Clothing ( ) N/A

( ) Fully Encapsulating Suit

( ) Chemically Resistant Splash Suit

( ) Apron, Specify_____

( ) Tyvek Coverall

( ) Saranex Coverall

( ) Coverall, Specify _____

( ) Other _____

( ) Other _____

_____

Head & Eye ( ) N/A

( ) Hard Hat

( ) Goggles

( ) Face Shield

( ) Chemical Eyeglasses

( ) None

( ) Other _____

_____

( ) Hand Protection ( ) N/A

( ) Undergloves _____ Type

( ) Gloves _____ Type

( ) Overgloves _____ Type

( ) None

( ) Other _____

_____

Foot Protection ( ) N/A

( ) Safety Boots

( ) Disposable Overboots

( ) Other _____

_____

3. Monitoring Equipment ( ) N/A

( ) CGI ( ) PID

( ) O_2 ( ) FID

( ) Rad Survey ( ) Other_____

( ) Detector Tubes _____

Type:_____ ( ) Other_____

_____ _____

_____ _____

D. Personnel Decontamination (Attach Diagram)

Required ( ) Not Required ( )

Equipment Decontamination (Attach Diagram)

Required ( ) Not Required ( )

If required, describe and list equipment_____

_____

_____

_____

_____

_____

_____

_____

E. Personnel

NAME	WORK LOCATION TITLE/TASK	MEDICAL CURRENT	FIT TEST CURRENT	CERTIFICATION LEVEL
1.	( )	( )	( )	( )
2.	( )	( )	( )	( )
3.	( )	( )	( )	( )
4.	( )	( )	( )	( )
5.	( )	( )	( )	( )
6.	( )	( )	( )	( )
7.	( )	( )	( )	( )
8.	( )	( )	( )	( )
9.	( )	( )	( )	( )
10.	( )	( )	( )	( )

Site Safety Coordinator _____

F. Activities Covered Under This Plan

Task No.	Description	Preliminary Schedule

G. Subcontractor's Health and Safety Program Evaluation ( ) N/A

Name and Address of Subcontractor: _____

_____

_____

EVALUATION CRITERIA

ITEM	ADEQUATE	INADEQUATE	COMMENTS
Medical Surveillance Program	( )	( )	
Personal Protective Equipment Availability	( )	( )	
On-Site Monitoring Equipment Availability	( )	( )	
Safe Working Procedures Specification	( )	( )	
Training Protocols	( )	( )	
Ancillary Support Procedures (if needed)	( )	( )	
Emergency Procedures	( )	( )	
Evacuation Procedures Contingency Plan	( )	( )	
Decontamination Procedures Equipment	( )	( )	
Decontamination Procedures Personnel	( )	( )	

GENERAL HEALTH AND SAFETY PROGRAM EVALUATION:

ADEQUATE ( ) INADEQUATE ( )

ADDITIONAL COMMENTS: _____

_____

_____

EVALUATION CONDUCTED BY: _____

DATE: _____

H. Contingency Contacts

Agency	Contact	Phone Number
Fire Department	_____	_____
Police Department	_____	_____
Health Department	_____	_____
Poison Control Center	_____	_____
State Environmental Agency	_____	_____
EPA-Regional Office	_____	_____
EPA-ERT. ICOM	_____	_____
Spill Contractor	_____	_____
State Police	_____	_____
F.A.A.	_____	_____
Civil Defense	_____	_____
On Site Coordinator	_____	_____
Site Telephone	_____	_____
Nearest Telephone	_____ (Location)	
Other	_____	

I. Contingency Plans

Spill, Accidental Release; Describe _____

_____

Fire Explosion; Describe _____

_____

Other; Describe _____

_____

Exit Routes, Communication Systems; Describe _____

_____

WESTON

MEDICAL EMERGENCY

Name of Hospital _____

Address: _____ Phone No. _____

Name of Contact _____

Address: _____ Phone No. _____

Route to Hospital: (Attach Map) _____

_____

_____

_____

_____

Travel Time From Site (Minutes) _____

Distance to Hospital (Miles) _____

Name/Number of 24 Hr. Ambulance Service _____

_____

FOR HEALTH AND SAFETY DEPT. USE ONLY

CHANGE IN PERSONNEL:

___ Delete:	___ Add:	Certification Level	Active
_____ (Name)	_____ (Name)	_____	___
_____ (Name)	_____ (Name)	_____	___
_____ (Name)	_____ (Name)	_____	___
_____ (Name)	_____ (Name)	_____	___

ADDITIONAL SAMPLING RESULTS:

___ New ___ WESTON ___ Additional ___ Attached

Summary: _____

_____

_____

CHANGE OF SCOPE:

___ Completed/Delete: _____

_____

___ New/Additional: _____

_____

ADDITIONAL HAZARDS:

___ Physical ___ Chemical ___ Other: _____

LEVELS OF PROTECTION ADEQUATE? ___ Yes ___ No

___ Upgrade to:_____ ___ Downgrade to: _____

ADDITIONAL EQUIPMENT? ___ Monitoring Instrumentation: _____

___ Protective Clothing: _____

___ Other: _____

CURRENT SAFETY PLAN ADEQUATE? ___ Yes ___ No

_____

Corporate Health and Safety Dept. Date

ATTACHMENT G

DOE ORDER 5480.1A
ENVIRONMENTAL PROTECTION SAFETY AND HEALTH
PROTECTION PROGRAM FOR DOE OPERATIONS

U.S. Department of Energy
Washington, D.C.

359 **ORDER**

DOE 5480.1A

8-13-81

SUBJECT: ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DOE OPERATIONS

1. PURPOSE. This Order establishes the Environmental Protection, Safety, and Health Protection Program for Department of Energy (DOE) operations.

2. CANCELLATION. DOE 5480.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DOE OPERATIONS, of 5-5-80. Its chapters are not cancelled; see Table of Contents.

3. SCOPE. The policy and requirements outlined in this Order apply to all DOE operations including all DOE contractor operations where, under the contractual arrangements for the work to be performed, DOE has authority to establish and enforce environmental protection, safety, and health protection program requirements. The extent to which requirements apply is specified in the various supplementary chapters of this Order.

4. REFERENCES.

   a. DOE Procurement Regulations (DOE PRs), Part 9-50, which provide the clauses to be used in contracts where DOE elects to enforce environmental protection, safety, and health protection requirements.

   b. E.O. 12196, "Occupational Safety and Health Programs for Federal Employees," which establishes the requirement for Federal agencies to provide occupational safety and health programs for their employees.

   c. 29 CFR 1960, SAFETY AND HEALTH PROVISIONS FOR FEDERAL EMPLOYEES, which provides the regulations and guidelines for the implementation of E.O. 12196.

   d. DOE 5482.1A, ENVIRONMENTAL, SAFETY, AND HEALTH APPRAISAL PROGRAM, which presents the Department's policy and requirements for appraisal of environmental protection, safety, and health protection programs.

   e. DOE 5481.1A, SAFETY ANALYSIS AND REVIEW SYSTEM, which establishes uniform requirements for the preparation and review of safety analyses.

   f. DOE 5700.6A, QUALITY ASSURANCE, which sets forth principles and assigns responsibilities for establishing, implementing, and maintaining programs of plans and actions to assure quality achievement in DOE programs.

DISTRIBUTION:
All Departmental Elements
Federal Energy Regulatory Commission (info)

INITIATED BY:
Assistant Secretary, Environmental Protection, Safety, and Emergency Preparedness

g. DOE 1324.2, RECORDS DISPOSITION, which prescribes requirements for the retention and disposition of records.

h. DOE 5483.1, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR GOVERNMENT-OWNED CONTRACTOR-OPERATED (GOCO) FACILITIES, which provides guidance and establishes procedures for the GOCO safety and health program.

i. DOE 5484.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION REPORTING REQUIREMENTS, which establishes the requirements and procedures for reporting and investigating matters of environmental protection, safety, and health protection significance to DOE operations.

j. DOE 5484.2, UNUSUAL OCCURRENCE REPORTING SYSTEM, which establishes a system for reporting unusual occurrences having programmatic significance.

k. DOE 6430. , FACILITIES GENERAL DESIGN CRITERIA, implemented while in coordination by Assistant Secretary, Management and Administration memorandum of 6-10-81.

l. DOE 3790.1, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR FEDERAL EMPLOYEES, which establishes the policy for the implementation and administration of the occupational, safety, and health program for Federal Employees.

m. DOE 5610.3, PROGRAM TO PREVENT ACCIDENTAL OR UNAUTHORIZED NUCLEAR EXPLOSIVE DETONATIONS, which establishes safety policies and procedures applicable to activities involving nuclear explosives.

n. Pending the development and promulgation of supplemental chapters to this Order, the references listed in Attachment 2 may be used as guideline procedures and standards in the discharge of the Department's environmental protection, safety, and health protection responsibilities under the Occupational Safety and Health Act of 1970; Executive Order 12088; the Atomic Energy Act of 1954, as amended; and the Energy Reorganization Act of 1974, as amended.

5. DEFINITIONS.

a. Environmental Protection, Safety, and Health Protection Program refers to those DOE requirements, activities, and functions in the conduct of all DOE and DOE-controlled operations that are concerned with: controlling air, water, and soil pollution; limiting to acceptably low levels risks to the well-being of both operating personnel and the general public; and protecting property adequately against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, the following: environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, process and facilities safety, nuclear safety, and quality assurance.

b. Federal Employee Occupational Safety and Health Program refers to the program mandated by E.O. 12196, and implemented by 29 CFR 1960, and DOE 3790.1.

c. DOE Operations are those activities funded by DOE for which DOE has responsibility for environmental protection, safety, and health protection.

d. Line Organization includes the program secretarial officer, the program office, and the field organization responsible for the management of a given DOE operation.

e. DOE Contractor includes any DOE prime contractor or subcontractor subject to the contractual provisions of DOE PR-50.704.2 or other contractual provisions where DOE has elected to enforce environmental protection, safety, quality assurance, and health protection requirements by specific negotiated contract provisions.

f. Program Secretarial Officer is an outlay program manager and includes the Assistant Secretaries for Conservation and Renewable Energy, Fossil Energy, Nuclear Energy, Defense Program, Environmental Protection, Safety and Emergency Preparedness, and the Director of Energy Research.

g. Standard means a specified set of rules or conditions concerned with the classification of components; delineation of procedures; definition of terms; specifications of materials, performance, design, or operations; or measurements of quality in describing materials, products, systems, services or practices. Standards may be specified by DOE as prescribed (i.e., required) or recommended.

h. Prescribed Standards are those standards adopted by DOE that define the minimum requirements that DOE and its contractors must comply with to the extent they apply to the activities being conducted.

i. Recommended Standards are those guides or standards adopted by DOE that DOE and its contractors should consider for guidance, as applicable, in addition to the prescribed standards.

j. An Exemption is a release from the requirements of this Order, or any other DOE Orders.

k. An Exception is an interim release from a standard of the type specified under the Occupational Safety and Health Act.

l. A Temporary Variance is a short-term release from a standard of the type specified under the Occupational Safety and Health Act.

m. A Permanent Variance is a release from a standard of the type specified under the Occupational Safety and Health Act.

n. Quality Assurance are all those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily in service.

o. An Implementation Plan is a concise description of the approach, resources, and time period planned for implementing Orders that require such plans on a site wide basis including a description of the execution of environmental protection, safety, and health responsibilities and authorities by the field organization, and any proposed exemptions to parts of such DOE Orders.

p. An Assessment is an examination and evaluation by a Program Secretarial Officer of those portions of its internal environmental protection, safety, and health program, program plan implementation, and operations retained under its control.

6. POLICY. It is the policy of the DOE to:

a. Assure protection of the environment, the safety and health of the public, and Government property against accidental loss and damage.

b. Provide safe and healthful workplaces and conditions of employment for all employees of DOE and DOE contractors.

c. Assure compliance with applicable statutory requirements affecting Federal facilities and operations.

d. Assure that research, development, demonstration, and production activities are performed in a controlled manner; that components, systems, and processes are designed, developed, constructed, tested, operated, and maintained according to sound engineering standards, quality practices, and technical specifications; and that resulting technology data are valid and retrievable.

7. RESPONSIBILITIES AND AUTHORITIES

a. Line Management. DOE Headquarters primary responsibility and authority is in program development, planning, and policy. Program execution is the responsibility of the DOE field structure which also provides input to program formulation and policy. The program secretarial officers and operations office managers all report to the Under Secretary for overall direction, administration, and institutional matters. The program Secretarial Officers have the primary responsibility for development of assigned programs. The field organization managers are responsible to the respective program Secretarial Officers for execution of these programs. Environmental protection, safety, and health protection is an integral part of the programs. Accordingly, line management responsibility for these functions of the assigned programs and

facilities flows from the Under Secretary to the program Secretarial Officers to the field organization managers.

b. Program Secretarial Officers are assigned primary responsibility for assuring implementation of the DOE environmental protection, safety, and health protection program. This responsibility includes assuring that DOE and Federal environmental protection, safety, quality assurance, and health protection policies, directives, and orders are adhered to continuously and vigorously in all DOE operations. They are also responsible for implementation of the Federal Employee Occupational Safety and Health Program. They shall:

(1) Provide clear and explicit delegations of authority and responsibilities.

(2) Assure that appropriate program elements, as identified in Attachment 1, are included in program plans and proposals for design, construction, operation, modification, and decommissioning of DOE operations.

(3) Take necessary management actions, including the assurance that budget proposals for their assigned functions provide adequately for protection requirements.

(4) Assure that applicable requirements are identified and provided to the contracting officers for inclusion in contracts.

(5) Perform program reviews and assessments to assure compliance of their program organizations and field organizations with DOE Orders. In the execution of this responsibility maximum use should be made of the appraisals and other reviews performed by the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness (EP-1) and the Assistant Secretary, Management and Administration (MA-1).

(6) Provide program direction to the field consistent with DOE prescribed requirements relating to environmental protection, safety, and health protection.

(7) Review and approve summary type implementation plans for DOE Orders submitted by field organizations.

(8) Provide the Deputy Assistant Secretary for Environmental Safety and Health, EP-30, an opportunity to review and comment on field office prepared implementation plans for DOE Orders. Must consider comments received from EP-1 before giving final approval.

(9) For DOE program activities not assigned to a field organization for implementation, assume the responsibilities assigned to Heads of Field Organizations in 7(c) below.

(10) Take such action as may be appropriate to assure safety, including directing the field office manager to curtail and suspend their operations when, in their opinion, such operation would result in an undue environmental protection, safety, or health protection risk.

(11) Ensure that documents generated under this Order are reviewed for classification where appropriate.

c. Heads of Field Organizations, consistent with other actions stated in this Order, DOE 5481.1A, DOE 3790.1, and as deemed necessary to assure safety of operation of facilities and operations under their jurisdiction, shall:

(1) Execute programs and assure that contractors and their subcontractors execute programs and policies which utilize appropriate program elements, as identified in Attachment 1, for siting, design, construction, operation, maintenance, modification, deactivation, decontamination, and decommissioning of DOE facilities and activities.

(2) Require preparation of, and approve, safety analyses and facility operations safety requirements and changes thereto, consistent with DOE 5481.1A and with appropriate chapters of this Order.

(3) Take such action as may be appropriate to assure safety, including curtailment and suspension of operations when, in their opinion, such operation would result in an undue environmental protection, safety, or health protection risk.

(4) Give due consideration in the selection of contractors to the ability of offerors to meet environmental protection, safety, and health protection requirements. Assure that applicable safety requirements are included in contracts.

(5) Appraise the programs of subordinate field activities in accordance with DOE 5482.1A and initiate remedial actions as appropriate.

(6) Execute programs and assure that contractors and their subcontractors execute programs and policies in a manner that shall include compliance with prescribed requirements relating to environmental protection, safety, and health protection.

(7) Prepare implementation plans for this Order and other DOE Orders where required.

(7) Prepare implementation plans for this Order and other DOE Orders where required.

(a) These plans will include:

1 The execution of safety responsibilities and authorities by the field office and their contractors; and

2 The proposed generic exemptions to parts of DOE Orders because of site specific conditions.

(b) The field office implementation plans will be reviewed and approved by the cognizant program Secretarial Officers before implementation. This requirement in no way prohibits field office managers from initiating actions of necessity in exercising responsibility for environmental, safety, and health activities. Specific exemptions to the standards identified in Chapter I of this Order or the requirements of this Order or other environmental protection, safety, and health Orders which are dependent on specific facility designs would not be a part of the field office prepared implementation plans, but shall be identified in the facility design documentation and safety analysis which will be reviewed and approved in the normal process of facility design and operation and assessed as part of the environmental, safety, quality assurance, and health appraisal programs.

Note: These procedures for exemptions do not apply to Federal Regulations listed in Chapter I of this Order or any National Environmental Protection Act Environmental Impact Statement or Environmental Assessment documents.

(8) Establish and maintain liaison with regional, State, or local officials as appropriate, and advise the responsible program Secretarial Officer of any environmental protection, safety, and health protection requirements issued by these officials that will affect their operations. Concurrently advise EP-1 of all requirements issued that will affect any DOE operation.

(9) Grant exceptions to, and process requests for, variances from occupational safety and health standards in accordance with DOE 5483.1.

(10) Establish procedures to assure that required information is recorded and reported as prescribed by this Order.

(11) Authorize operation of a new or significantly modified facility after determining that its operation will not create undue environmental, safety or health risks.

(12) The Manager, Pittsburgh Naval Reactors Office, and the Manager Schenectady Naval Reactors Office, together with their branch field offices located at DOE Naval reactor prototype sites, report to the Deputy Assistant Secretary for Naval Reactors because of their unique responsibility solely involved with the Naval Reactors Programs. In this regard, the Deputy Assistant Secretary for Naval Reactors will continue to carry out responsibilities for approving implementation of DOE requirements in the areas of reactor safety, criticality control, and radiation protection defined herein and in other DOE Orders for field organization managers.

(13) Assure that documents generated under this Order are reviewed for classification where appropriate.

d. Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness (EP-1) is responsible for providing an independent overview of the environmental protection, safety, and health protection program as it applies to the Department's operations and is directly responsible to the Secretary for this function. In carrying out this function, the EP-1:

(1) Develops policies, standards, guides, requirements, and procedures covering environmental protection, safety, and health protection programs for DOE operations, including those on notification, investigation, and reporting of occurrences having environmental protection, safety, or health protection significance.

(2) Provides technical advice and assistance concerning environmental protection, safety, and health protection programs to line organizations.

(3) Provides a central point for coordination within DOE and with other agencies and other groups in the development of environmental protection, safety, and health protection standards and requirements and resolution of environmental, safety or health operational issues applicable to DOE operations, including review of proposed standards and requirements for their application to and potential impact on DOE activities, and participation in the development and review of general design criteria.

(4) Reviews field office implementation plans for DOE Orders for consistency and the advisability of site specific exemptions, and advises the cognizant Program Secretarial Officer on the adequacy of the proposed implementation plans. Advises the Under Secretary if, in the opinion of EP-1, the approved implementation plan is significantly deficient and the issue cannot be resolved with the cognizant program Secretarial Officer.

(5) Conducts appraisals in accordance with DOE 5482.1A.

(6) Identifies needs for research and development to support environmental protection, safety, and health protection programs and recommends appropriate actions.

(7) Provides a central point for the collection, retention, evaluation and dissemination of information having environmental protection, safety, and health protection significance.

(8) Renders interpretations of this Order and its chapters.

(9) Provides overview assurance that safety analyses are prepared and reviewed in accordance with DOE 5481.1A.

(10) Reviews and recommends appropriate actions on reports and documents having significant environmental protection, safety, or health protection implications.

(11) Delegates to the Deputy Assistant Secretary for Environmental Safety and Health (EP-30), the authority to carry out responsibilities (1) through (10) above, except as set forth in paragraphs 7e and 7f.

(12) Approves requests for variances from occupational safety and health standards in accordance with DOE 5483.1.

e. Assistant Secretary, Management and Administration (MA-1) is responsible for providing an overview of the Federal Employee Occupational Safety and Health Program as it applies to the Department's operations and is directly responsible to the Secretary of this function. In carrying out this function, MA-1 shall:

(1) Be responsible for developing policies guides, requirements and procedures for the DOE Federal Employees Occupational Safety and Health Program (including the provision of medical services). These efforts are to be consistent with E.O. 12196, Department of Labor policies, and applicable DOE requirements, standards, guides, and Orders.

(2) Act as the Department's designated safety and health official for dealings with the Department of Labor on Federal employee safety and health matters.

(3) Carry out all of the environmental protection, safety, and health protection responsibilities appropriate to line management responsibility for the operation of Headquarters facilities.

(4) Provide advice to program Secretarial Officers and Heads of Field Organizations on employment standards and safety and health training of Federal employees and concurs in all Departmentwide safety and

health training programs for Federal employees. Acts for the Department in gaining concurrence from the Office of Personnel Management on all proposed revisions to employment standards of Federal employees.

f. Deputy Assistant Secretary for Naval Reactors shall be responsible for conducting management appraisals, implementing DOE environmental protection, safety and health protection requirements, and establishing independent overviews of reactor safety, criticality control and radiation protection in the Naval Reactors program. These appraisals, implementation actions, and overviews are excluded from EP-1 responsibility and authority.

William S. Heffelfinger
Assistant Secretary
Management and Administration

ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM ELEMENTS

The following elements establish the general framework for the environmental protection, safety, and health protection program.

1. Statutory Basis.

   a. Assurance that applicable Federal, State, and local environmental protection, safety, and health protection statutes, Executive orders, and regulations are met.

   b. Fulfillment of Federal requirements such as those of the Clean Water Act, the Endangered Species Act, the Toxic Substances Control Act, and the Energy Supply and Environmental Coordination Act.

2. Policy and Implementation.

   a. Establishment and interpretation of environmental protection, safety, and health protection program policy and requirements.

   b. Development, adoption, and application of codes, standards, and guides.

   c. Assignment of responsibilities to DOE elements.

   d. Execution of appropriate environmental protection, safety, and health protection contractual requirements.

   e. Funding support by line organizations to support environmental protection, safety, and health protection needs.

   f. Provision of safety and health services for Federal employees.

   g. Establishment and maintenance of an emergency response capability.

   h. Support of training programs.

   i. Support of operational environmental protection, safety, and health protection research.

3. Hazard and Risk Assessment and Systems Safety.

   a. Application of systems safety principles to DOE activities.

   b. Implementation of quality and reliability assurance programs.

c. Analysis of activities to identify hazards and assess risks.

d. Analysis of the adequacy of risk-limiting mechanisms.

e. Documented acceptance of residual risks by the appropriate level of management.

f. Conduct of hazardous operations under written procedures appropriate for the level of hazard involved.

g. Investigation of accidents and incidents to determine causal factors and provide feedback to improve performance.

4. Internal Audit and Appraisal.

a. Implementation of an internal audit program at the first level of operations.

b. Implementation of an independent appraisal mechanism at the various levels of the DOE or contractor system.

5. Information and Reporting.

a. Collection, evaluation, and dissemination of environmental protection, safety, and health protection information.

b. Public reporting of DOE performance data.

GUIDELINES

Pending the issuances of additional supplementary chapters to this Order, the following may be used as guideline procedures and standards in the discharge of the Department's environmental protection, safety, and health protection program:

ERDAM 0511, RADIOACTIVE WASTE MANAGEMENT, of 9-19-73, which provides for minimizing radioactive exposure and associated risk to man and environment. (To be replaced by a proposed Order 5820. , MANAGEMENT OF RADIOACTIVE WASTE.)

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CHAPTER I

ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION STANDARDS

1. PURPOSE. This chapter sets forth the environmental protection, safety, and health protection standards applicable to all operations of the Department of Energy, hereafter referred to as the Department.

2. GENERAL REQUIREMENTS.

   a. Provisions of this chapter shall be followed during facility design, construction, operation, modification, and decommissioning. Existing facilities need not be changed arbitrarily to comply with the specified standards except as required by law. As part of the normal facility design effort for each new facility the applicable codes, standards, and guides to be used in the design and operation are to be identified and documented.

   b. This chapter covers the prescribed standards to be used by the Department and its contractors. In addition, DOE and its contractors shall comply with all legally applicable Federal and State standards. Where a Department contractor is also a Nuclear Regulatory Commission licensee, the contract relationship will not exempt the contractor from compliance with Nuclear Regulatory Commission regulations and the terms of the license. Where Department of Energy contractors are tenants on a military installation and a Host-Tenant Agreement has been executed, the standards established by the host shall be observed unless the Department prescribed standards provide for greater protection, in which case Department standards shall be observed. Facilities covered by this chapter include those owned, leased or otherwise controlled by the Department or leased by contractors for use in work, and include those of either a permanent or temporary nature (e.g., trailers, rented spaces, field sites).

   c. In addition to the prescribed and recommended standards set forth by this chapter, the user should also consult the other chapters of this Order. The sources for the standards and a glossary of abbreviations are contained in Attachment 1.

   d. If there are conflicts between prescribed standards in this chapter, or between this chapter and other chapters of this Order, the standards providing the greater protection shall govern.

   e. Those DOE-owned reactor plants which are prototype reactor plants for design and development of Naval reactor plants, and which are concommitantly used for training of operators for Naval nuclear propulsion plants, have certain unique requirements because of their military application. All of these plants and supporting laboratory facilities are under the cognizance of the Deputy Assistant Secretary for Naval

Reactors who jointly serves as the Director of the Naval Nuclear Program. Accordingly, the Deputy Assistant Secretary for Naval Reactors is responsible for assuring that adequate standards are applied for emergency preparedness, environmental protection, nuclear safety, and health protection for Naval reactor prototype plants and supporting laboratory facilities owned by DOE."

3. RESPONSIBILITIES AND AUTHORITIES.

a. Program Secretarial Officers shall:

(1) Assure compliance with the standards of this chapter on a site-wide basis by organizations under their jurisdiction by review and approval of the summary type implementation plans for DOE Orders submitted by field organizations.

(2) Prescribe, as appropriate, additional or more stringent standards for individual facilities after appropriate consultation with field organization management and other affected Program Secretarial Offices.

b. Heads of Field Organizations and the Assistant Secretary, Management and Administration shall:

(1) Apply the prescribed standards contained herein.

(2) Assure that the level of performance of health and safety are maintained consistent with the intent of these standards, for those activities under their direction.

(3) Prescribe, as appropriate, additional or more stringent standards, based on the determination that such standards are essential to safety and proper performance of their function.

(4) Grant exemptions as set forth in paragraph 4, where such action will best serve the interest of DOE, providing that the safety of employees, the public, and Government and private property can be maintained.

(5) Identify needs to Deputy Assistant Secretary for Environmental Safety and Health (EP-30) for new standards to address environment, safety, and health concerns.

c. Assistant Secretary, Environmental Protection, Safety, and Emergency Preparedness (EP-1) shall:

(1) Review nationally recognized health and safety requirements, guides, codes, and standards and prescribe those applicable to DOE activities,

following appropriate review and comment by affected Departmental elements.

(2) Determine the need for and develop or promote the development of new or revised standards applicable to environmental safety and health.

(3) Act as liaison with voluntary standards bodies and other Federal agencies on ES&H standards to reflect DOE needs and requirements.

(4) Develop and maintain appropriate mechanisms for maintaining the standards listing comprehensive, up-to-date, and revising the standards listing, as necessary.

4. PROCEDURE FOR GRANTING EXEMPTIONS.

a. Heads of Field Organizations are authorized to grant exemptions from the prescribed standards of this chapter for specific facilities or activities, except as noted in subparagraph 4b. Specific exemptions to the prescribed standards identified in this chapter, which are dependent on specific facility designs, shall be identified in the facility design documentation and safety analysis, which will be reviewed and approved in the normal process of facility design and operation and assessed as part of the Environmental, Safety, Quality Assurance, and Health Appraisal Programs.

b. Exemptions from standards established pursuant to the Federal regulations listed herein, unless allowed by the procedure identified in subparagraph 4c, are to be submitted with suitable justification to EP-1.

c. Those Department contractor operations subject to DOE 5483.1, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR GOVERNMENT-OWNED CONTRACTOR-OPERATED FACILITIES, must follow the procedures of that Order to obtain variances from the Occupational Safety and Health Administration standards listed herein. Those Department operations directly subject to the Occupational Safety and Health Administration's regulations must follow the procedures of 29 CFR 1960, Subpart C, or 29 CFR 1905, as appropriate, to obtain relief from standards listed herein (which are also listed in 29 CFR 1910, 1915-1918, and 1926). Requests are to be forwarded to the appropriate Department of Energy official as defined in DOE 5483.1 or DOE 3790.1.

5. EMERGENCY PREPAREDNESS. The following standards, in addition to those listed in the other chapters, shall be used as applicable.

a. Prescribed Standards. To be identified.

b. Recommended Standards. "Immediate Evacuation Signal for Use in Industrial Installations Where Radiation Exposure May Occur," ANSI N2.3-1979 (ANSI).

6. ENVIRONMENTAL PROTECTION. The following standards, in addition to those listed in the other chapters, shall be used as applicable.

a. Prescribed Standards.

(1) Executive Order 12088 "Federal Compliance with Pollution Control Standards."

(2) The following standards, regulations, and guidelines promulgated pursuant to Federal environmental legislation:

(a) Air.

1 New Source Performance Standards (40 CFR 60).

2 National Hazardous Air Pollutant Standards (40 CFR 61).

3 Regulations Designating Air Quality Control Regions (40 CFR 81).

(b) Water.

1 Discharge of Oil (40 CFR 110).

2 Oil Pollution Prevention (40 CFR 112).

3 National Oil and Hazardous Substances Contingency Plan (40 CFR 1510).

4 Water Quality Standards Approved by the Federal Government (40 CFR 120).

5 National Pollutant Discharge Elimination System (40 CFR 122).

6 Policies and Procedures for the National Pollutant Discharge Elimination System (40 CFR 125).

7 General Pretreatment Regulations for Existing and New Sources of Pollution (40 CFR 403).

8 Secondary Treatment Information (40 CFR 133).

9 Transportation for Dumping, and Dumping of Material into Ocean Waters (40 CFR 220-230).

10 Cooling Water Intake Structures (40 CFR 401.14) (General Provisions for Effluent Guidelines and Standards - 40 CFR 401).

(c) Drinking Water.

1 National Interim Primary Drinking Water Regulations (40 CFR 141).

2 National Interim Primary Drinking Water Regulations Implementation (40 CFR 142).

(d) Solid Waste.

1 Guidelines for the Thermal Processing of Solid Wastes and for the Land Disposal of Solid Wastes (40 CFR 240 and 241).

2 Solid Waste Storage and Collection (40 CFR 243).

(e) Radiation. "Performance Testing and Procedural Specifications for Thermoluminescense Dosimetry (Environmental Applications)," ANSI N 545-1975 (ANSI).

(f) Pesticides.

1 Executive Order 11870, "Environmental Safeguards on Activities for Animal Damage Control on Federal Lands."

2 Regulations for Enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR 162).

3 Regulations for the Acceptance of Certain Pesticides and Recommended Procedures for the Disposal and Storage of Pesticides and Pesticide Containers (40 CFR 165).

4 Exemption of Federal and State Agencies for Use of Pesticides Under Emergency Conditions (40 CFR 166).

5 Worker Protection Standards for Agricultural Pesticides (40 CFR 170)

6 Certification of Pesticide Applicators (40 CFR 171).

b. Recommended Standards.

(1) Standard Methods for the Examination of Water and Wastewater (AWWA).

(2) Guide for Use of Insecticides, Handbook 290 (USDA).

(3) Manual of Septic Tank Practice, Publication No. 526 (USPHS).

(4) Sanitary Landfill Design and Operation Publication No. SW-65ts. (EPA).

(5) Interim Guide of Good Practice for Incineration at Federal Facilities, Publication No. AP-46 (USPHS).

(6) Incinerator Guidelines, Publication No. 2012 (USPHS).

(7) Air Pollution Engineering Manual, Publication No. AP-40 (USPHS).

(8) Compilation of Air Pollutant Emission Factors (EPA).

7. FIRE PROTECTION. The following standards, in addition to those listed in the other chapters, shall be used as applicable.

a. Prescribed Standards.

(1) National Fire Codes (NFPA).

(2) Standard for Fire Protection of AEC Electronic Computer Data Processing Systems, WASH 1245-1. (Compliance with this standard satisfies the requirements for NFPA-75).

(3) Product Directories of Underwriters Laboratories together with the periodic supplements (UL).

(4) Factory Mutual Approval Guide (FM).

(5) TP20-11 General Fire Fighting Guidance for Nuclear Weapons (this document is confidential restricted data).

(6) Standard on Fire Protection for portable structures, DOE/EV-0043, August 1979.

b. Recommended Standards.

(1) Handbook of Fire Protection (NFPA).

(2) Loss Prevention Data Sheets (FM).

8. HEALTH PROTECTION. The following standards, in addition to those listed in the other chapters, shall be used as applicable.

a. Radiation Protection.

(1) Prescribed Standards.

(a) Performance Specifications for Direct Reading and Indirect Reading Pocket Dosimeters for X and Gamma Radiation, ANSI N13.5-1972 (ANSI).

(b) Radiation Symbol, ANSI N2.1-1969 (ANSI).

(c) Radiological Safety in the Design and Operation of Particle Accelerators, ANSI N43.1-1978 (ANSI).

(d) Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactivity in Effluents, ANSI N13.10-1974 (ANSI).

(e) Personnel Neutron Dosimeters (Neutron Energies Less Than 20 MeV), ANSI N319-1976 (ANSI).

(f) Performance Criteria for Instrumentation Used for Inplant Plutonium Monitoring, ANSI N317-1978 (ANSI).

(g) "Inspection and Test Specifications for Direct and Indirect Reading Quartz Fiber Pocket Dosimeters," ANSI N322-1975. (ANSI).

(h) A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA), DOE/EV/1830-TS, April 1980 (to be used until issued as formal standard).

(2) Recommended Standards.

(a) Applicable (FRC) Reports (#1-1960, #2-1962, #5-1964, #7-1965, #8 (Revised) (EPA).

(b) Handbooks, NCRP Recommendations (NBS).

(c) Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities, ANSI N13.1-1969 (ANSI).

(d) Criteria for Film Badge Performance, ANSI 13.7-1972 (ANSI).

(e) Radiation Protection Instrumentation Test and Calibration, ANSI N323-1978 (ANSI).

(f) Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications, ANSI N545-1975 (ANSI).

(g) Standards for Protection Against Radiation (10 CFR 20).

(h) Radiation Protection Standards Reports (ICRP).

(i) Reports (ICRU)

1 Report 20, 1971, Radiation Protection Instrumentation and Its Application.

2 Report 19, 1968, Radiation Quantities and Units.

3 Report 14, 1969, Radiation Dosimetry.

(j) Safety Series (IAEA).

(k) Electronic Product Radiation Control, Subpart 3 of P.L. 90-602, as amended on 10-18-68.

(l) Technical Considerations in Emergency Instrumentation Preparedness, BNWL-1742, 1974 (DOE).

1 Phase II-C - Emergency Radiological and Meteorological Instrumentation for Fuel Reprocessing Facilities, BNWL-1857, 1976.

2 Phase II-D - Evaluation Testing and Calibration Methodology for Emergency Radiological Instrumentation, BNWL -1991, 1976.

3 Phase II-B - Emergency Radiological and Meteorological Instrumentation for Mixed Fuel Fabrication Facilities, BNWL-1742, 1974.

4 Phase II-A - Emergency Radiological and Meteorological Instrumentation Criteria for Reactors, BNWL-1635, 1972.

b. Occupational Medicine.

(1) Prescribed Standards. To be identified.

(2) Recommended Standards.

(a) Scope, Objectives, and Functions of Occupational Health Programs, OOCH-213 (AMA).

(b) Occupational Health Services for Employees, U.S. Department of Health, Education, and Welfare. Public Health Service Publication No. 1041 (May 1963)(USPHS).

(c) An Administrative Guide for Federal Occupational Health Units, HEW, Public Health Service Publication No. 1325-A (March 1966), (USPHS).

(d) Epidemiology in Occupational Disease and Injury, OOCH-290 (AMA).

(e) Medical Aspects of Radiation Accidents Handbook, Eugene Saenger, M.D., Editor (GPO).

c. Industrial Hygiene.

(1) Prescribed Standards.

(a) Current Threshold Limit Values (ACGIH).

(b) Practices for Respiratory Protection, ANSI Z88.2-1980 (ANSI).

(2) Recommended Standards.

(a) Hygienic Guide Series (AIHA).

(b) Heating and Cooling for Man in Industry (AIHA).

(c) Respirator Manual, LA-6370-M (DOE).

(d) Industrial Ventilation Manual (ACGIH).

(e) Industrial Noise Manual (AIHA).

(f) Guide for Conservation of Hearing and Noise (AAOO).

(g) NIOSH Criteria Documents (NIOSH).

d. Public Health and Sanitation.

(1) Prescribed Standards.

(a) Food.

1 Food Service Sanitation Manual, DHEW Publication No. 78-2081 (FDA).

2 The Vending of Food and Beverages, USPHS Publication No. 546 (1965).

(b) Water.

1 National Interim Primary Drinking Water Regulations, Publication No. EPA-570/9-76-003 (EPA).

2 Manual for Evaluating Public Drinking Water Supplies, Publication No. 1820 (EPA).

3 Manual of Individual Water Supply Systems, Publication No. 430 9/73-003 (EPA).

4 Quality Standards for Bottled Water (21 CFR 11).

5 Sanitary Standard for Manufactured Ice, USPHS 1183 (1964).

6 GSA Handbooks on Performance Standards for Cleaning Public Buildings (GSA).

9. OCCUPATIONAL SAFETY. The following standards, in addition to those listed in the other chapters, shall be used as applicable.

a. General Safety.

(1) Prescribed Standards.

(a) Forest Service Safety Standards (USDA).

(b) Boiler and Pressure Vessel Code; Sections I-XI (ASME).

(c) Occupational Safety and Health Standards, 29 CFR 1910.

(d) Safety and Health Regulations for Construction, 29 CFR 1926.

(e) Safety and Health Regulations for Ship Repairing, 29 CFR 1915.

(f) Safety and Health Regulations for Shipbuilding, 29 CFR 1916.

(g) Safety and Health Regulations for Shipbreaking, 29 CFR 1917.

(h) Safety and Health Regulations for Longshoring, 29 CFR 1918.

(i) Department of Defense Explosive Safety Board Standards (Ordnance Operations).

(j) Department of Navy Standards (for Naval Reactors program applications) (NAV).

(2) Recommended Standards.

(a) Chemical Rocket Propellant Hazards, JANNAF Propulsion Committee, Volume I - General Safety Engineering Design Criteria, NTIS-AD 889763, May 1970. Volume II - Solid Rocket Propellant Processing, Handling, Storage, and Transportation, NTIS-AD

870258, May 1970. Volume III - Liquid Propellant Handling, Storage, and Transportation, N.T.I.S.-AD 870259, May 1970. (Quantity distance tables are expected-OSHA/NFPA QD tables apply where appropriate).

(b) Manual Sheets (MCA).

(c) Chemical Safety Data Sheets (MCA).

(d) Accident Prevention Manual for Industrial Operations (NSC).

(e) Supervisor's Safety Manual (NSC).

(f) Handbook of Laboratory Safety (CRC).

(g) Handbook of Rigging, W.E. Rossnagel, McGraw-Hill Book Co., Inc., publishers. (McGraw).

(h) Data Sheet Series (NSC).

(i) Matheson Gas Data Book (MPD).

(j) Handling Hazardous Materials, NASA SP-5032 (NASA).

(k) Testing Materials Standards (those applicable to safety) (ASTM).

(l) Handbook of Compressed Gases (CGA).

(m) Service Station Safety, Accident Prevention Manual 5 (API).

(n) Operating Personnel Training Program on Oxygen Deficient Atmospheres, UC-240-002, September 1978.

b. Construction Safety.

(1) Prescribed Standards.

(a) Pipeline Safety Standards (49 CFR 192).

(b) Safety and Health Regulations for Construction (29 CFR 1926).

(2) Recommended Standards.

(a) Manual of Accident Prevention in Construction (AGCA).

(b) Guidelines for Minimizing Soil Erosion and Water and Air Pollution During Construction, Soil Conservation Service Engineering Memorandum 66, 6-19-68 (USDA).

c. Crane Safety.

(1) Prescribed Standards.

(a) ANSI Series B 30.

(b) Crane Manufactures Association of America, Specification No. 70 (CMAA).

(2) Recommended Standard.

(a) Requirements for Hoisting and Rigging of Special Components and Equipment, RDT F8-6 (DOE).

(b) DOE Hoisting and Rigging Manual, May 1980.

d. Drilling Safety.

(1) Prescribed Standards.

(a) Petroleum Safety Orders, Administrative Code, Title 8, Chapter 4, Subchapter 14, State of California (except the requirement of paragraph (b) Section 6640, of article 41 of the 1959 orders is permanently waived-API PR 9B applies). (CALIF)

(b) Applicable Division of Production Specifications and Recommended Practices on Oil Field Equipment (API).

(c) Safe Practices in Drilling Operations, Third Edition, 1967, RP 2010 (API).

(2) Recommended Standards.

(a) Rotary Drilling Handbook on Accident Prevention and Safe Operating Practices (IAODC).

(b) Applicable Division of Production Bulletins (API).

e. Electrical Safety.

(1) Prescribed Standards.

(a) National Electrical Code, ANSI/NFPA No. 70-1978.

(b) National Electrical Safety Code (ANSI-C2-1977).

(2) Recommended Standards.

(a) Electrical Engineering Regulations, CG-259, U.S. Coast Guard (DOT).

(b) Miscellaneous Electrical Equipment List, CG-293, U.S. Coast Guard (DOT).

(c) Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines, NBS No. 81.

(d) Electrical Safety Guides for Research, Safety, and Fire Protection, Bulletin No. 13 (DOE).

(e) Safety Guidelines for High Energy Accelerator Facilities, TID 23992 (DOE).

(f) IEEE Standards.

(g) Electrical Safety Criteria for Research and Development Activities, DOE/EV-0051/1.

f. Explosives Safety.

(1) Prescribed Standards.

(a) Development and Readiness Command Safety Manual, DARCOM 385-100, U.S. Army Materiel Development and Readiness Command. (AMC)

(b) DOD Ammunition and Explosives Safety Standards, DOD 5154.4S (DOD).

(c) Blaster's Handbook (DuPont).

(2) Recommended Standards.

(a) Rules for Storing, Transporting, and Shipping Explosives, Pamphlet 5 (IME).

(b) Safety in the Transportation, Storage, Handling, and Use of Explosives, Pamphlet 17 (IME).

(c) Structures to Resist the Effects of Accidental Explosions, Department of the Army Technical Manual TM5-1300 (AMC).

(d) Safety Guide for the Prevention of Radio Frequency Radiation Hazards, Pamphlet 20 (IME).

(e) Evaluation of Explosive Storage Safety Criteria, May 1970, AD 871 194 (NTIS).

g. Firearm Safety.

(1) Prescribed Standards.

(a) GSA Handbook HB, Federal Protective Service Uniformed Force Operations, PBS P5930.17.

(b) Pistols and Revolvers, FM 23-35, 7-60 (AMC).

(c) Safety with Firearms Handbook (NRA).

(2) Recommended Standards.

(a) Education and Training Security Police, Training Course AMCP 621-1 (AMC).

(b) Military Police Preservation of Order Activities, AMCR 190-3, 12-71 (AMC).

h. Mine and Tunnel Safety.

(1) Prescribed Standards.

(a) P.L. 91-173 88 Stat. 742-804 as amended by P.L. 95-164, Federal Mine Safety and Health Act of 1977.

(b) Tunnel Safety Orders, Administrative Code, Title 8, Chapter 4, Subchapter 20, State of California (CALIF).

(c) Mine Safety Orders, Administrative Code, Title 8, Chapter 4, Subchapter 12, State of California (CALIF).

(2) Recommended Standard. Tunneling: Recommended Safety Rules, Bulletin 644, Bureau of Mines. (BUMINES)

10. NUCLEAR SAFETY. The following standards, in addition to those listed in the other chapters, shall be used as applicable.

a. Reactor Safety.

(1) Prescribed Standards.

(a) Criteria for Protection Systems for Nuclear Power Generating Stations, ANSI/IEEE 279-1971.

(b) Boiler and Pressure Vessel Code, ASME.

(c) Selection, Qualification, and Training of Personnel for Nuclear Power Plants, ANS 3.1, October 1980 (for Category A reactors).

(2) Recommended Standards.

(a) Applicable Nuclear Energy (RDT) Standards (See index of NE (RDT) Standards) (DOE).

(b) Licensing of Production and Utilization Facilities, 10 CFR 50 and appendices, including regulatory guides issued to describe methods of implementing these regulations.

(c) Operators' Licenses, 10 CFR 55.

(d) Reactor Site Criteria, 10 CFR 100.

(e) Safe Operation of Critical Assemblies and Research Reactors, 1971 Edition, Safety Series No. 35 (IAEA).

(f) Safe Operation of Nuclear Power Plants, Safety Series 31 (IAEA).

(g) IEEE Standards.

(h) ANS Series 15 Standards.

(i) Design Guide; Critical Facilities, BNL-50831-I.

(j) Design Guide; Light and Heavy Water Cooled Reactors, BNL-50831-II.

(k) Design Guide; Pool Type Reactors, BNL-50831-III.

(l) Design Guide; Liquid Metal Reactors, BNL-50831-IV.

(m) Design Guide; Transient Reactors, BNL-50831-V.

(n) Design Guide; Air Cooled Graphite Reactors, BNL-50831-VI.

b. Nuclear Facility Safety.

(1) Prescribed Standards.

(a) Criticality Accident Alarm System, ANSI/ANS-8.3-1979 (ANSI).

(b) Safety Standards for Operations with Fissionable Materials Outside Reactors, ANSI N16.1-1975 (ANSI).

(c) Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Materials, (ANSI/ANS 8.5-1979) (ANSI).

(2) Recommended Standards.

(a) Nuclear Safety Guide, TID-7016 (DOE).

(b) Critical Dimensions of Systems Containing uranium-235, plutonium-239, and uranium-233, TID-7028 (DOE).

(c) Critical and Safe Masses and Dimensions of Lattices of U and UO2 in Water, DuPont-1014 (DUPONT).

(d) United Kingdom Atomic Energy Authority Handbook of Criticality Data, AHSB(S), Handbook 1 (1st Revision).

(e) Criticality Handbook, ARH-600, (3 volumes).

(f) ANSI N16 Series Standards.

(g) Licensing of Production and Utilization Facilities, (10 CFR 50).

(h) Special Nuclear Material (10 CFR 70).

(i) Rules of General Applicability to Licensing of Byproduct Material (10 CFR 30).

(j) Licensing of Source Material (10 CFR 40).

(k) Operators' Licenses (10 CFR 55).

(l) Appropriate Portions of Reactor Site Criteria (10 CFR 100).

(m) Nuclear Air Cleaning Handbook ERDA 76-21, (DOE).

11. TRANSPORTATION SAFETY. The following standards, in addition to those listed in the other chapters, shall be used as applicable.

a. Aircraft Safety.

(1) Prescribed Standards. Federal Aviation Regulations (DOT).

(2) Recommended Standard. Aviation Ground Operation Safety Handbook (NSC).

b. Motor Vehicle and Traffic Safety.

(1) Prescribed Standards.

(a) Motor Carrier Safety Regulations, Federal Highway Administration (DOT).

(b) Hazardous Materials Regulations (49 CFR 397) (DOT).

(c) Manual on Uniform Traffic Control Devices for Streets and Highways, Bureau of Public Roads (DOT).

(d) Inspection Requirements for Motor Vehicles, Trailers and Semi-trailers Operated on Public Highways, ANSI D7.1-1973 (ANSI).

(e) Uniform Vehicle Code (NCUTLO).

(f) A Policy on Geometric Design on Rural Highways (AASHTO).

(2) Recommended Standards.

(a) Traffic Engineer's Handbook (ITE and NSC).

(b) Traffic Engineering, Matson, Smith and Hurd. McGraw-Hill Book Company, Inc., publishers (McGraw).

(c) Motor Fleet Safety Manual (NSC).

(d) Traffic Accident Investigator's Manual for Police, The Traffic Institute, Northwestern University (NWU).

(e) Handbook of Highway Safety Design and Operating Practices (DOT).

c. Vessels (Marine) Safety Prescribed Standards.

(1) Rules and Regulations for Uninspected Vessels, Booklet 258, U.S. Coast Guard (DOT).

(2) Rules and Regulations for Numbering of Undocumented Vessels and the Reporting of Boating Accidents, Booklet 257, U.S. Coast Guard (DOT).

(3) Equipment Lists, Booklet 190, U.S. Coast Guard (DOT).

(4) Marine Engineering Regulations and Material Specifications, Booklet 115, U.S. Coast Guard (DOT).

(5) Ventilation System for Small Craft, Booklet 395, U.S. Coast Guard (DOT).

d. Transportation of Radioactive Material.

(1) Prescribed Standards.

(a) Department of Transportation Hazardous Materials Regulations (49 CFR 100-179).

(b) Packaging of Radioactive Materials for Transport (10 CFR 71).

(2) Recommended Standards.

(a) Cask Designers Guide ORNL-NSIC-68, 1970 (DOE).

(b) Structural Analysis of Shipping Casks, ORNL-TM-1312, Volumes I through X (DOE).

(c) Packaging of Uranium Hexafluoride for Transport, ANSI N14.1-1971 (ANSI).

e. Railroad Safety. Prescribed Standard. Federal Railroad Administration, (49 CFR 211-240).

SOURCES OF STANDARDS

1.	AAOO	American Academy of Ophthalmology and Otolaryngology 15 Second Street, SW. Rochester, Minnesota 55901
2.	AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, NW. Washington. D.C. 20001
3.	ACGIH	American Conference of Governmental Industrial Hygienists 2205 South Road Cincinnati, Ohio 45238
4.	AGCA	Associated General Contractors of America, Inc. 1957 E Street, N.W. Washington, D.C. 20006
5.	AIHA	American Industrial Hygiene Association 475 Wolf Ledges Parkway Akron, Ohio 44311
6.	AMC	United States Department of the Army Headquarters, U.S. Army Material Development and Readiness Command Pentagon Washington, D.C. 20310
7.	ANSI	American National Standards Institute 1430 Broadway New York, New York 10018
8.	API	American Petroleum Institute 2101 L Street N.W. Washington, D.C. 20037
9.	ASME	American Society of Mechanical Engineers, Inc. 345 East 47th Street New York, New York 10017
10.	ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, Pennsylvania 19103

11. AWWA — American Water Works Association, Inc.
666 Quincy Street
Denver, Colorado 80235

12. BUMINES — Publications Section
U.S. Bureau of Mines
4800 Forbes Avenue
Pittsburgh, Pennsylvania 15213

13. CALIF — State of California
General Services Publications
P.O. Box 1015
North Highland, California 95660

14. CGA — Compressed Gas Association, Inc.
500 Fifth Avenue
New York, New York 10036

15. CMAA — Crane Manufacturers Association of America, Inc.
1326 Freeport Road
Pittsburgh, Pennsylvania 15238

16. CRC — C. R. C. Press, Inc.
2000 N.W. 24th Street
Boco Raton, Florida 33431

17. DOD — Department of Defense
The Pentagon
Washington, D.C. 20301

18. DNA — Field Command
Defense Nuclear Agency
Albuquerque, New Mexico

19. DOT — Department of Transportation
400 7th Street, S.W.
Washington, D.C. 20590

20. DOT — Coast Guard
Department of Transportation
400 7th Street, SW.
Washington, D.C. 20590

21. DUPONT — E.I. duPont de Nemours and Company
Petrochemicals Department
Wilmington, Delaware 19898

22. EPA — Environmental Protection Agency
401 M Street, SW.
Washington, D.C. 20460

23. FDA — Food and Drug Administration
5600 Fishers Lane
Rockville, Maryland 20857

24. FEMA — Federal Emergency Management Agency
Administrative Services Division
Printing and Publications Branch
Room 404
Washington, D.C. 20472

25. FM — Factory Mutual Engineering Division
1151 Boston-Providence Turnpike
Norwood, Massachusetts 02062

26. GPO — Superintendent of Documents
United States Government Printing Office
Washington, D.C. 20402

27. GSA — General Services Administration
General Services Building
18 and F Street, NW.
Washington, D.C. 20405

28. IAEA — UNIPUB
P.O. Box 433, Murray Hill Station
New York, New York 10016

29. ICRP — International Committee on Radiation Protection
4201 Lexington Avenue
New York, New York 10017

30. ICRU — International Commission on Radiation Units and Measurements
7910 Woodmont Avenue
Washington, D.C. 20014

31. IEEE — Institute of Electrical and Electronic Engineers, Inc.
345 East 47th Street
New York, New York 10017

32. IME — Institute of Makers of Explosives
420 Lexington Avenue
New York, New York 10017

33. IRI — Industrial Risk Insurers
85 Woodland Street
Hartford, Connecticut 06102

34. ISO — International Standards Organization
c/o American National Standards Institute
1430 Broadway
New York, New York 10018

35. ITE — Institute of Transportation Engineers, Inc.
Suite 905, 1815 North Fort Myer Drive
Arlington, Virginia 22209

36. MCA — Chemical Manufacturers Association
1825 Connecticut Avenue, NW.
Washington, D.C. 20009

37. MCGRAW — McGraw-Hill Book Company, Inc.
1221 Avenue of Americas
New York, New York 10020

38. MPD — G. D. Searle and Company
Will Ross, Inc./Matties or Products Division
P.O. Box 85
East Rutherford, New Jersey 07073

39. NASA — National Aeronautics and Space Administration
400 Maryland Avenue, SW.
Washington, D.C. 20546

40. NAV — Commanding Officer
(Code 512) Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, Pennsylvania 19120

41. NBS — National Bureau of Standards
Department of Commerce
Washington, D.C. 20234

42. NCRP — National Council on Radiation Protection and Measurement
7910 Woodmont Avenue, Suite 1016
Bethesda, Maryland 20014

43. NCUTLO — National Committee on Uniform Traffic Laws and Ordinances
1776 Massachusetts Avenue, NW.
Washington, D.C. 20036

44.	NFPA	National Fire Protection Association 470 Atlantic Avenue Boston, Massachusetts 02210
45.	NIOSH	Publications NIOSH (MSR6) 4676 Columbia Parkway Cincinnati, Ohio 45226
46.	NRA	National Rifle Association 1600 Rhode Island Avenue, NW. Washington, D.C. 20036
47.	NSC	National Safety Council 444 North Michigan Avenue Chicago, Illinois 60611
48.	NTIS	National Technical Information Service Department of Commerce Springfield, Virginia 22151
49.	NWU	Traffic Institute Northwestern University 405 Church Street Evanston, Illinois 60201
50.	OMB	Office of Management and Budget Old Executive Office Building 17th and Pennsylvania Avenue, NW. Washington, D.C. 20503
51	OSHA	OSHA Publications Office U.S. Department of Labor Room S1212 3rd Street and Constitution Avenue, NW. Washington, D.C. 20210
52.	UL	Underwriters' Laboratories, Inc. 207 East Ohio Street Chicago, Illinois 60611
53.	USDA	Department of Agriculture Washington, D.C. 20250
54.	USPHS	Public Health Service Office of Public Affairs 100 Independence Avenue, SW. Room 7406 Washington, D.C. 20201

ATTACHMENT H

OSHA FORM NO. 101/OMB 44R1453
"SUPPLEMENTARY RECORD OF OCCUPATIONAL
INJURIES AND ILLNESSES"

OSHA No. 101
Case or File No. _____

Form approved
OMB No. 44R 1453

Supplementary Record of Occupational Injuries and Illnesses

EMPLOYER

1. Name _____
2. Mail address _____
   (No. and street) (City or town) (State)
3. Location, if different from mail address _____

INJURED OR ILL EMPLOYEE

4. Name _____ Social Security No. _____
   (First name) (Middle name) (Last name)
5. Home address _____
   (No. and street) (City or town) (State)
6. Age _____ 7. Sex: Male_____ Female_____ (Check one)
8. Occupation _____
   (Enter regular job title, *not* the specific activity he was performing at time of injury.)
9. Department _____
   (Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure _____
    (No. and street) (City or town) (State)
    If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.
11. Was place of accident or exposure on employer's premises? _____ (Yes or No)
12. What was the employee doing when injured? _____
    (Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)
13. How did the accident occur? _____
    (Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

14. Describe the injury or illness in detail and indicate the part of body affected. _____
    (e.g.: amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)
15. Name the object or substance which directly injured the employee. (For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)
16. Date of injury or initial diagnosis of occupational illness _____
    Time of Injury _____ (Date)
17. Did employee die? _____ (Yes or No)

OTHER

18. Name and address of physician _____
19. If hospitalized, name and address of hospital _____

Date of report _____ Prepared by _____
Official position _____

Supervisor's Signature _____

FIGURE 4-2 OSHA INCIDENT REPORT FORM

Section 7

SECTION 7

QUALITY ASSURANCE AND QUALITY CONTROL PLAN FOR THE CHARACTERIZATION OF THE WASTE STORAGE AREA AT THE FEED MATERIALS PRODUCTION CENTER

SECTION 7

QUALITY ASSURANCE/QUALITY CONTROL PLAN
FOR THE CHARACTERIZATION OF THE WASTE STORAGE
AREAS AT THE FEED MATERIALS PRODUCTION CENTER

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SECTION 7.0

QUALITY ASSURANCE/QUALITY CONTROL PLAN

7.1 PROJECT DESCRIPTION

Roy F. Weston, Inc. (WESTON) has been contracted to perform the site characterization and evaluation of disposal alternatives for the Feed Materials Production Centers (FMPC) Waste Storage Area and the overall Work Plan describes the project in detail. a brief project background and statement of objectives follow.

7.1.1 Site Description and History

The FMPC is located in a rural area of southwestern Ohio approximately ten miles northwest of Cincinnati and eight miles southwest of Hamilton. The site occupies 1,050 acres and is bounded by highway 126 to the north, a transmission line to the east, Willey Road to the south, and Paddy's Run Road and the Ohio and Chesapeake Railroad to the west (Figure 7.1).

The primary work at the FMPC was the production of metallic uranium fuel elements, target cores and other uranium compounds for use at DOE facilities. The initial processing began with ore concentrates, recycles uranium or miscellaneous other uranium compounds. The mill concentrates were digested with nitric acid and this solution was then extracted with tributyl phosphate (TBP) in a kerosine carrier. This organic extract of uranyl nitrate was stripped with water. The purified aqueous solution was further concentrated by evaporation and was finally denitrated by heating to produce uranium trioxide, UO_3. Conversion of this product to the green salt, UF_4, was accomplished by hydrogen reduction to produce UO_2, followed by hydrofluorination with anhydrous HF. Uranium metals were produced from UF_4 by direct reduction with magnesium.

This process generated a variety of waste types. These included depleted MgF_2 slag, slag leach filter cake, various raffinate solutions, depleted sump cake, general sump sludges, and dust collector residues. Since 1952, when the production operations were initiated, these low-level radioactive wastes have been stored at a designated storage area west of the FMPC Production Area.

The FMPC Waste Storage Area utilized two types of facilities for the long-term storage of these low-level radioactive in-ground

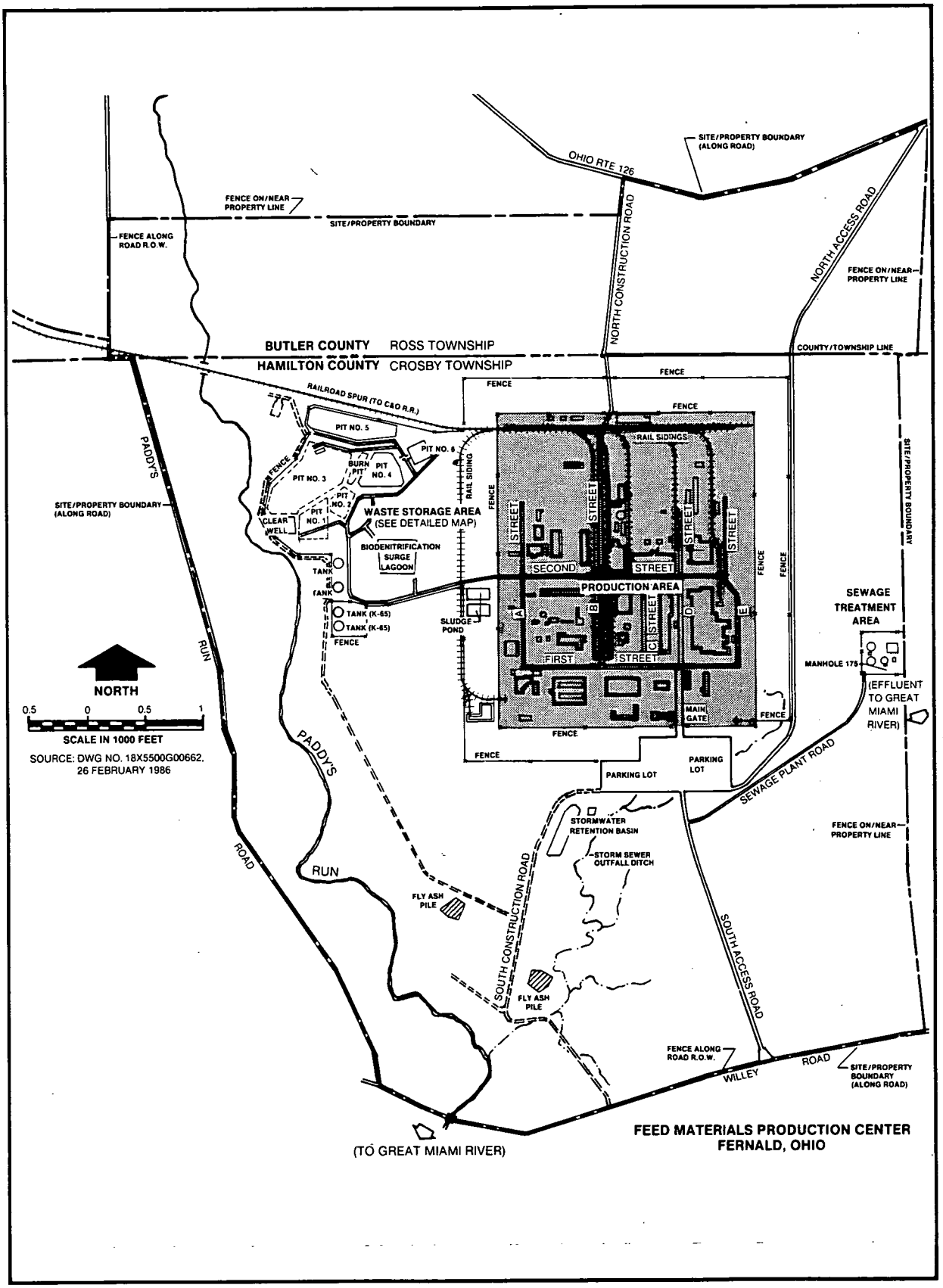

FIGURE 7-1 MAP OF THE SITE

waste storage pits. Other waste storage areas on site include a burn pit, the clear well and two fly-ash disposal areas. All of these facilities are presented in Figure 7.1.

The six in-ground waste pits were constructed principally for disposal of depleted magnesium fluoride slag, slag leach filter cake, neutralized raffinate, depleted sump cake, sump sludges, and dust collection residues. In addition, miscellaneous construction wastes (brick, graphite, concrete, asbestos, etc.) were disposed of into Pits 2 and 4.

The four concrete waste storage silos were constructed in 1952. Silos 1 and 2 were utilized to dispose of K-65, an acronym describing the radium bearing raffinate wastes used to dispose of dry residues from the dewatering of waste raffinate slurries.

The burn pit was constructed in 1957 and was used to incinerate laboratory chemicals and various other wastes. Although actual contents are unknown, items burned include pyrophoric and reactive chemicals, oils, and contaminated combustibles. The burn pit apparently was backfilled and is now overgrown with native grasses.

The clear well was built in 1959 primarily to collect clear process supernate from the waste pits. Surface runoff from the waste pits also collects in the clearwell. Its purpose is to provide final settling prior to transport to the on-site sewage treatment plant.

The fly ash disposal areas are located south of the production facility. Fly ash from the FMPC coal fired power plant continues to be deposited into the lower fly ash area. Dumping into the upper fly ash pile has been discontinued.

7.1.2 Project Objectives

The purpose of the project is to assess the nature of the material, and degree, and extent of contamination resulting from past storage activities at the site, to evaluate the hazard to human health and the environment, and to identify and evaluate the alternative disposal solutions. These objectives can be efficiently met by completing the following tasks:

- Characterizing the site in terms of wastes present; lateral and vertical extent of contamination in surface waters, grounds waters, sediments and soils; rate and direction of waste migration; target receptors

(population at risk, threatened resources, and sensitive ecosystems); and site geology and surface water/ground water hydrology.

- Developing and evaluating alternative disposal measures considering economic feasibility, technological feasibility, environmental impacts, regulatory constraints, and timeliness of completion; and offering recommendations regarding the most cost effective disposal alternatives.

This Quality Assurance/Quality Control Plan has been prepared to document the measures that will be undertaken by WESTON and its subcontractors to assure that the work performed will be of proper quality to accomplish project objectives and will be responsive to the requirements of the DOE. This plan describes the Quality Assurance (QA) organization, procedures, documentation requirements, acceptance criteria, and audit and corrective action procedures for the investigation of the FMPC Waste Storage Area and associated drainages.

7.1.3 Project Schedule

WESTON anticipates beginning work on the FMPC Waste Storage Area 30 days after satisfactory review of the Health and Safety Plan, approval of this Quality Assurance/Quality Control Plan and the Sampling Plans. Anticipated completion of the investigation will be six months after site work begins.

7.2 PROJECT ORGANIZATION AND RESPONSIBILITIES

Figure 7.2 shows the project organization chart indicating individual assignments. For purposes of this project, the personnel of WESTON and subcontractors will work within a single organization. All participants in the organization are directly subject to the requirements of this Quality Assurance/Quality Control Plan.

7.2.1 Authority and Responsibilities

7.2.1.1 Project Director

This corporate level manager will be the prime point of contact with Westinghouse and will act as the corporate interface for the project team. Other duties include disseminating all project-related information to and from Westinghouse.

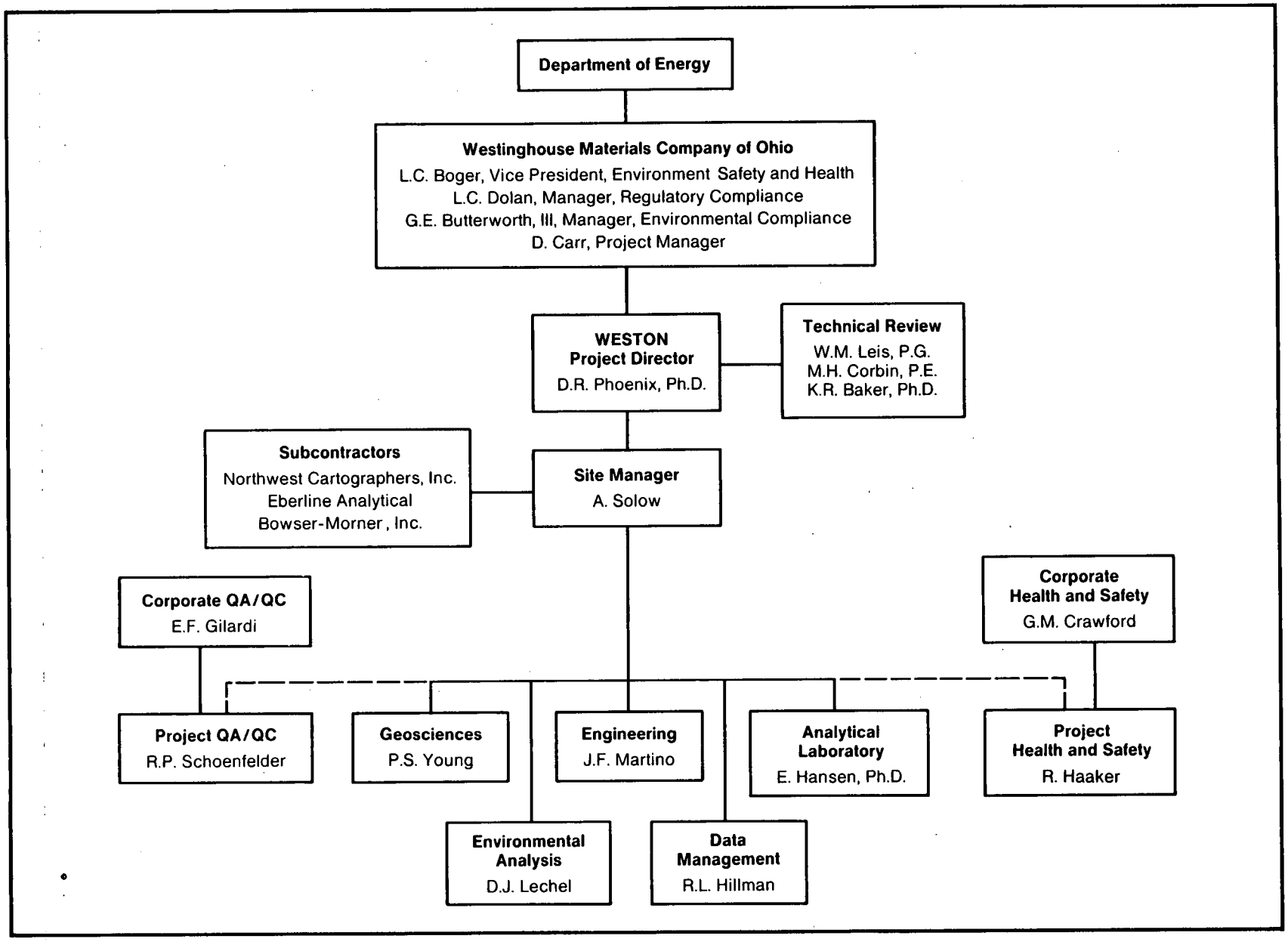

FIGURE 7-2 PROJECT ORGANIZATION

As Project Manager, he will have responsibility for technical, financial, and scheduling matters. Other duties, as necessary, will include:

- Subcontractor procurement
- assignment of duties of the Project Staff and orientation of the Staff to the needs and requirements of the project
- Approval of project-specific procedures and internally prepared plans, drawings, and reports
- Serve as liaison between the Project Staff and other internal groups, such as the laboratories
- Serve as the "collection point" for Project Staff reporting of nonconformances and changes in project documents and activities
- Determination of the effect of nonconformance and changes on the project and the appropriateness for reporting such items to Westinghouse.

7.2.1.2 Technical Review Committee

The Technical Review Committee will, as requested, provide the Project Director and Westinghouse Personnel with technical input and guidance during all phases of the project.

7.2.1.3 Project Quality Assurance Officer (QAO)

Responsibilities of the Project Quality Assurance Officer, as appropriate, include:

- Be the official organizational contact for all QA matters for the project.
- Actively identify and respond to QA needs, resolve problems, and answer requests for guidance or assistance.
- Review, evaluate and approve QA project plans prior to review, evaluation and approval/non-approval.
- Provide guidance in the development of QA project plans.

- Ensure that management, data quality, field and laboratory audits are performed on QA Project Plans.
- Actively track the progress of all QA tasks in QA Project plans and consult periodically with program/project managers or officers.
- Prepare and submit all QA reports to the appropriate line managers in their organization.
- Assure that appropriate corrective actions are taken on all QA tasks when, where and however needed.
- Ensure that data of known quality and integrity are available for each planning and report phase.

Note: Although some of these responsibilities may be delegated out, the ultimate responsibility still lies with the Project QA Official.

7.2.1.4 Corporate Health and Safety Manager

The Corporate Health and Safety Manager will assume responsibility for approving and implementing a Health and Safety Plan which satisfies state and federal regulations and is consistent with the site's nature. Additional details on the Health and Safety Program are presented in the FMPC Health and Safety Plan.

7.2.1.5 Site Manager

The Site Manager will be responsible for field activities including those of subcontractors such as drillers. As Site Manager, he will also be responsible for subcontractor compliance with applicable requirements of this Quality Assurance/Quality Control Plan and for communication of field activity information to Westinghouse. The Site Manager will assist the Project Director/Manager in day-to-day management of the project. The Site Manager will also be responsible for issuance and tracking of measurement and test equipment, and will be responsible for the proper labeling, handling, storage, shipping, and chain of custody procedures used at the time of sampling.

7.2.1.6 Laboratory Managers

The Laboratory Managers will be responsible for the project laboratories (i.e., radiological, chemical and geotechnical)

implementing the requirements of this QA/QC Plan. The manager's responsibilities will, as appropriate, include:

- General supervision of laboratories.
- Collaboration with the Project Group in establishing sampling and testing programs.
- Schedule and execution of testing programs.
- Serve as liaison between the Laboratory Staffs and other groups.
- Serve as the "collection point for Laboratory Staff reporting of nonconformances and changes in laboratory activities.
- Notification of the Laboratory and Quality Assurance Groups of specific laboratory nonconformances and changes.
- Maintenance of laboratory data and checkprints while the project, or testing phase, is in progress.
- Release of testing data and results.
- Calibration of equipment.
- Storage of samples.

7.2.1.7 Field Health and Safety Officer

The Field Health and Safety Officer will be responsible for the day-to-day adherence to the Health and Safety Plan during site activities. Specifically her responsibilities include, in part:

- Issuance of personal protective equipment and proper dosimetry.
- Maintaining and using field air monitoring equipment.
- Designating protection levels and deciding protection level upgrades.

7.2.2 Project Communications

Project-related materials which are incoming to WESTON in the form of correspondence, sketches, logs, authorizations, or other information will be routed to the Project Director/Manager after the original is marked with the date received. The Project Director/Manager will then determine which personnel will review the materials and route the materials accordingly.

As soon as practical, incoming correspondence originals will be placed in the project central file. If the correspondence is required by the project personnel for reference, a copy should be made rather than holding the original. Correspondence which is of importance to the QA/QC Plan will be routed to the Project QAO.

Project-related materials transmitted external to WESTON including correspondence, reports, drawings, and sketches will be appropriately reviewed, approved, and if necessary signed prior to transmittal. Project outgoing correspondence will, as a minimum, be signed by the Project Director/Manager, or a key level individual assigned this responsibility by the Project Director. If joint signatures are desirable, the originator of the correspondence, when different from management, may also sign. Quality assurance correspondence will be signed by the Project QAO.

Outgoing project correspondence and reports should be read by the Project Director prior to mailing. The office copy of project correspondence should bear routing information and be routed to the Project QAO, if judged appropriate by the Project Director.

To facilitate communications, progress meetings will be held on site as needed; with the Project Director, Site Manager, and key staff members in attendance. Meeting notes will be subsequently issued to appropriate staff members.

On or before the 10th of each month, the Project Director will summarize project progress. Copies of such reports will be distributed to a Westinghouse representative and the Project QAO.

Communications relative to the project which are initiated by third parties (e.g.; media, interested individuals and groups) will be referred directly to designated Westinghouse representative(s) without comment, unless directed otherwise.

7.3 QUALITY ASSURANCE OBJECTIVES

The purpose of the Project Quality Assurance/Quality Control Program is to facilitate the implementation of regulatory requirements and to provide internal means for control and review so that the work performed by WESTON and its subcontractors is of the highest professional standards.

Project objectives are as follows:

- Scientific data generated will be of sufficient or greater quality to stand up to scientific and legal scrutiny.
- Data will be gathered or developed in accordance with procedures appropriate for the intended use of the data.
- Data will be of known or acceptable precision, accuracy, representativeness, completeness, and comparability within the limits of the project.

The quality of the measurement data can be defined in terms of the following elements:

- Completeness - the adequacy in quantity of valid measurements to prevent misinterpretation and to answer all important questions.
- Representativeness - the extent to which discrete measurements accurately describe the greater picture which they are intended to represent. Good representativeness is achieved through careful, informed selection of sampling sites, drilling sites, drilling depths and analytical parameters; and through the proper collection and handling of samples to avoid interferences and to minimize contamination and loss.
- Accuracy and Precision - the agreement between a measurement and the true value and the degree of variability in the agreement, respectively. Accuracy and precision of data collected in the investigation will depend upon the measurement standards used and the meticulous, competent use of them by qualified personnel.
- Comparability - the extent to which comparisons among different measurements of the same quantity or quality will yield valid conclusions. Comparability among

measurements through the use of standard procedures and standard field data sheets.

- Traceability - the extent to which data can be substantiated by hard-copy documentation. Traceability documentation exists in two essential forms: that which links quantitation to authoritative standards, and that which explicitly describes the history of each sample from collection to analysis.

The fundamental mechanisms that will be employed to achieve these quality goals can be categorized as prevention, assessment and correction, as follows:

1. Prevention of defects in the quality through planning and design, documented instructions and procedures, and careful selection and training of skilled, qualified personnel.

2. Quality assessment through a program of regular audits and inspections to supplement continual informal review.

3. Permanent correction of conditions adverse to quality through a closed-loop corrective action system.

The FMPC Quality Assurance/Quality Control Plan has been prepared in direct response to these goals. This plan describes the Quality Assurance Program to be implemented and the quality control procedures to be followed by WESTON and WESTON subcontractors during the course of the investigation for the FMPC Waste Storage Area and associated drainages.

7.4 QUALITY ASSURANCE/QUALITY CONTROL SITE EXPLORATION AND SAMPLING

This section describes specific activities aimed at the prevention and early detection of circumstances adversely affecting quality in each of the measurement tasks of the field investigation.

7.4.1 Training

All WESTON and subcontractor personnel working on the FMPC Waste Storage Area investigation will be properly-trained, qualified individuals. Prior to commencement of field work, all field

personnel will be given instruction specific to the FMPC Waste Storage Area investigation, covering the following areas:

- Organization and lines of communication and authority.
- Description of the Waste Storage Area and associated drainages.
- Overview of the Work Plan and QA Plan.
- Documentation Requirements.
- Personal Protection.
- Decontamination Procedures.
- Emergency Procedures.

Training of field personnel will be provided by the Site Manager or a qualified designee, and documentation of training recorded.

7.4.2 Quality Control of Subcontractors

Subcontractors quality control is that system of activities which ensures that products or services obtained from subcontractors fulfill the needs of the project, as defined by contractual, regulatory, or other requirements.

All subcontractors will be required to follow the procedures of this Quality Assurance/Quality Control Plan. On-going observation and monitoring of subcontractor performance during the field investigation will be the responsibility of the Site Manager. Periodic quality control inspections of each subcontractor will be performed by the Work Plan, QA Plan and Health and Safety Plan. Inspection will include (as appropriate):

- Type and condition of equipment.
- Calibration procedures.
- Personnel qualifications.
- Documentation.

Results of the inspections will be recorded in the Field Log and reported on a regular basis to the Project Director.

7.4.3 Field Documentation

An integral part of Quality Assurance/Quality Control of field activities will be the maintaining of a field log. Information obtained from site exploration activities will be recorded and documented.

Members of the Project Staff working in field operations will keep a field log of their project activities. Items to be included in the field log are job specific and are listed in the appendices of each Work Plan. Additional information to be recorded in each field log are:

- Field activity subject.
- General work activity.
- Unusual events.
- Visitors on site.
- Subcontractor progress or problems.
- Communication with Westinghouse or others.
- Westinghouse personnel on site.
- Sampling locations.

Appropriate test data forms will also be prepared. They will include, as appropriate, the test location (e.g., boring, well, depth, sampling station, elevation, and field coordinates) and applicable analysis to be conducted. All requested information will be addressed. If not applicable, requested information should be designated as such.

All field documentation must be recorded in ink, in reproduction quality.

Field records will be collected and maintained by the Site Manager until completion of the field program or program phase, or until they are submitted to the project central file. During the performance of a field program, it is anticipated that a copy of the field records be periodically made and sent to the Project Director. These copies can provide adequate documentation of work activities should the originals be destroyed, lost, or stolen.

7.4.4 Document Control

When the QA plan is revised, the affected pages are reissued to all personnel with updated revision numbers (as appropriate) and dates. Issuance of revisions is accompanied by explicit instructions as to which documents or portions of documents have become obsolete.

7.4.5 Project Sampling Plan

Detailed Project Sampling Plans have been prepared to document the scope and methodology of exploration, radiation measurement, and sampling activities on the FMPC Waste Storage Area and associated drainages. This section of the Quality Assurance/Quality Control Plan will refer extensively to procedures and requirements included in the Sampling Plan.

The representativeness of the data collected in the investigation is primarily addressed in the Sampling Plan, through the selection of sample types and quantities, collection methods, sampling sites and analytical parameters. Representativeness is addressed in this QA Plan in terms of the proper collection and handling of samples to prevent or minimize alteration through contamination and loss. Procedures for detection of representativeness error contributed by the sample collection and handling process are also provided in this QA Plan, in the form of field blanks, and field duplicates/replicates. Similarly, the completeness criterion cited in Section 7.3 of this Plan is addressed in the design of the Sampling Plan. Completeness goals are provided in this QA Plan only as they apply to the yield of valid data from samples collected.

The sampling program is based on the project objectives coupled with a review of existing data for the site vicinity. The program includes the following elements:

- Site Reconnaissance.
  - Inventory of Existing Water Wells.
  - Geophysical Survey
- Radiation Measurement Protocol.
- Surface Sediment Sampling.
- Surficial Soil Sampling.
- Soil Borings/Subsurface Soil Sampling.
- Shallow Monitor Wells.
- Deep Monitor Wells.
- Storm Water Runoff/Surface Water Sampling.
- Ground Water Sampling.
- Radon Flux Measurements.
- Air Sampling and Monitoring.

7.4.5.1 Sample Control Procedures and Chain of Custody

Successful analysis depends on the capability to produce valid data and to demonstrate such validity. In addition to proper sample collection, preservation, storage and handling, it is

necessary to follow proper procedures for sample identification and chain-of-custody. The procedures specified herein are those used by the Office of Enforcement, U.S. Environmental Protection Agency as of October, 1980.

7.4.5.2 Sample Identification

All samples will be containerized in sample containers that have been cleaned, treated with preservative (as appropriate) and pre-labeled by the laboratory. The labels on containers provided by the laboratory will state the type and amount of preservative (if any) and the sample type for which the container is intended. As samples are collected and containerized, the following information will be added to each label:

- Project Name.
- Sample Number.
- Station Location - Description of place where sample was taken (e.g., the well or boring site identification).
- Date - A six-digit number indicating the year, month and day of collection.
- Time - A four-digit number indicating the military time of collection.
- Sampler - Initials of person collecting the sample.
- Remarks - Any pertinent observations or further sample description.

After collection, identification, and preservation, the sample is maintained under chain-of-custody procedures discussed below.

7.4.5.3 Chain-of-Custody Procedures

Chain-of-custody procedures are intended to document sample possession from the time of collection to disposal, in accordance with Federal guidelines. To maintain and permanently document sample possession, chain-of-custody procedures are followed. A sample is under custody if:

- It is in your possession, or
- It is in your review, after being in your possession, or
- It was in your possession and then you locked it up to prevent tampering, or
- It is in a designated secure area.

FIELD CUSTODY PROCEDURES

1. Collect only that number of samples which provides a good representation of the media being sampled. To the extent possible, the quantity and types of samples and sample locations have been determined and are outlined in the Sampling Plan. As few people as possible should handle samples.

2. The Site Manager is responsible for the care and custody of the samples collected until they are transferred or dispatched properly.

3. The Site Manager determines whether proper custody procedures were followed during the field work and decides if additional samples are required.

4. Prior to commencement of sampling, the Site Manager will instruct all sampling personnel in the chain-of-custody procedures, if it is necessary.

TRANSFER OF CUSTODY AND SHIPMENT

1. Samples are accompanied by a Chain-of-Custody Record (see Appendix A of Radiological/Chemical Sampling Plan) from the time they are collected until analysis is performed. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst at the laboratory.

2. Samples will be packaged properly for shipment (see Appendix D of the Radiological/Chemical Sampling Plan) and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment. Shipping containers will be sealed with fiber tape for shipment to the laboratory, so that the container cannot be opened without tearing the tape. The method of shipment, courier name(s)

and other pertinent information are entered on the Chain of Custody form.

4. Whenever samples are split with another laboratory, it is noted on the Chain of Custody form. The note indicates with whom the samples are being split and is signed by both the sampler and recipient. If either party refuses a split sample, this will be noted and signed by both parties. The person relinquishing the samples to the facility or agency should request the signature of a representative of the appropriate party, acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted on the Chain of Custody form. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time.

5. Each shipment will be accompanied by the Chain-of-Custody Record identifying its contents. The original record will accompany the shipment, and a copy will be retained by the Site Manager.

6. The receiving laboratory's sample log should indicate the condition of samples as received, and should explicitly state whether the chain-of-custody seal (fiber tape) is intact.

7. The receiving laboratory should retain a copy of each chain-of-custody record, with the shipper's waybill or airbill attached.

7.5 ANALYTICAL LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Attached are the quality assurance plans for the two laboratories designated to perform the analyses on the FMPC samples. The WESTON Lionville Analytical Laboratory will perform chemical analyses for Priority Pollutants and RCRA characteristics along with uranium in water. The Eberline Analytical Laboratories will sample and perform radionuclide analyses.

7.6 EQUIPMENT PREVENTIVE MAINTENANCE

Periodic preventive maintenance is required for sensitive equipment. Instrument manuals are kept on file for reference purposes should equipment need repair. Trouble shooting section of manuals are often useful in assisting personnel in performing maintenance tasks.

Laboratory equipment requiring routine maintenance will be tagged with maintenance labels indicating the date of required maintenance, person maintaining the equipment, and the next maintenance date. Information pertaining to life histories of equipment maintenance will be kept in individual logs for each instrument.

Major instruments in the laboratories are normally covered by annual service contracts with manufacturers. Under these agreements, regular preventive maintenance visits are made semiannually and annually by trained service personnel.

7.7 NUMERICAL ANALYSIS AND PEER REVIEW

All numerical analyses, including manual calculations, mapping, and computer modeling will be documented and subjected to quality control review, numerical analysis and Peer Review. All records of numerical analyses will be legible, reproduction-quality and complete enough to permit logical reconstruction by a qualified individual other than the originator.

A statistical evaluation of analytical results will be performed that will apply precision and accuracy criteria for each parameter that is analyzed. When the analysis of a sample set is completed, the quality control data generated will be reviewed and evaluated to validate the data set. The quality control data will be reviewed for the following criteria:

- The reagent and/or method blank results will be evaluated for high readings characteristic of background contamination. If high blank values are observed, laboratory glassware and reagents should be checked for contamination. A high background is defined as a background value sufficient to result in a difference in the uncorrected sample value greater than or equal to smallest significant digit know to be true.

- The appropriate VOA field blank results will be evaluated for high readings similar to the reagent and/or method blanks described above. If high field blank

readings are encountered, the procedure for sample collection, shipment, and laboratory analysis shall be reviewed. If both the reagent and/or method blanks and the field blanks exhibit significant background contamination, the source of contamination is probably within the laboratory.

- The duplicate sample analyses will be used to determine the precision of the analytical method for the sample matrix. The duplicate results are used to calculate the precision as defined by the mean relative percent difference (RPD). The precision value, RPD, is then evaluated for the parameter being determined.

- The spiked sample results will be used to determine the accuracy of the analytical method for the sample matrix. The observed recovery of the spike versus the theoretical spike recovery is used to calculate the accuracy as defined by the percent recovery. The accuracy value, the percent recovery, is then evaluated for the parameter being determined.

7.8 AUDITS AND CORRECTIVE ACTION

7.8.1 Field Audits

An individual audit plan will be developed to provide a basis for each audit. This plan will identify the audit scope, activities to be audited, audit personnel, any applicable documents, and the schedule. Checklists will be prepared by the auditors and used to conduct all audits. They will be developed to accomplish the review of necessary items and to document the results of the audit.

A field operations audit will involve an on-site visit by the Quality Assurance Officer. Items to be examined may, as appropriate, include the availability and implementation of approved work procedures, calibration and operation of equipment; packaging, storage and shipping of samples obtained, documentation procedures, and nonconformance documentation.

The records of field operations will be reviewed to verify that field-related activities were performed in accordance with appropriate project procedures, Items reviewed will include, but not be limited to, the calibration records of field equipment; daily field activity logs, chain of custody documentation, and

data resulting from field operations. Audits of field activities will occur at least once during the site characterization.

During an audit and upon its completion, the auditors will discuss the findings with the individuals audited and cite corrective actions to be initiated.

Minor administrative findings which can be resolved to the satisfaction of the auditors during an audit are not required to be cited as items requiring corrective action. Findings that are not resolved during the course of the audit and findings affecting the overall quality of the project, regardless of when they are resolved, will be noted on the audit checklists.

7.8.2 Laboratory Audits

Sample analysis of chemical constituents, as well as elemental uranium, will be performed by WESTON Analytics, a laboratory that participates in the EPA Contract Laboratory Program (CLP). Isotopic analysis of radionuclides will be conducted by Eberline Analytical. Records of laboratory audits and performance evaluations of both laboratories will be provided.

7.8.3 Corrective Action

Whenever quality deficiencies are observed that warrant attention, formal corrective action request forms will be issued to the Project Director by the Quality Assurance Officer. The Corrective Action Form is shown in Figure 7.3. This is a multicopy form. The QA Officer retains one copy of the form when it is issued. The Project Director completes the form and signs it when corrective action has been implemented, and returns the original to the QA Officer to close that loop.

The Quality Assurance Officer maintains a record of all corrective action requests and reports their status to Westinghouse management in a quarterly report.

7.9 FINAL QUALITY ASSURANCE REPORT

At the completion of the site characterization phase of the FMPC Waste Storage Area and associated drainages, a final Quality Assurance report will be submitted to Westinghouse. This report will be prepared by the FMPC Project Quality Assurance Officer. The final report will include:

- Quality Assurance management
- Measures of data quality from the project

Car No. _____

Date _____

Corrective Action Request

To From	
Reported Conditions Answer Due Date	Signature
Review and Comments	Signature
Review and Comments	Follow Up Action

FIGURE 7-3 CORRECTIVE ACTION REQUEST

- Significant quality problems, quality accomplishments, and status of corrective actions taken.
- Results of quality assurance performance audits.
- Results of quality assurance system audits.
- Assessment of data quality in terms of precision, accuracy, completeness, representativeness, and comparability.
- Quality Assurance related training conducted during course of project.
- Status of completed and updated Quality Assurance project plan.

ATTACHMENT 1

PRELIMINARY

WESTON Lionville Analytical Laboratory
Quality Assurance Plan

(effective date 9-1-85)

Approved by:

Earl M. Hansen, Ph.D.
Manager
WESTON Lionville Analytical Laboratory

Dianne S. Therry
Quality Assurance Coordinator
WESTON Lionville Analytical Laboratory

This preliminary QA Plan reflects actual practice in the WESTON laboratory. The final draft will incorporate additional sections to make the plan more definitive.

econENVIROnmics QUALITY ASSURANCE
ANALYTICAL LABORATORY QUALITY ASSURANCE PLAN

PRELIMINARY

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1.0 PURPOSE

Establish routine operating practices to ensure that all data generation in the laboratory conform to specific requirements for accuracy, precision, and completeness. The purpose and goal of quality assurance/quality control (QA/QC) is to ensure that all data generated in the laboratory conform to specific requirements for accuracy, precision, and completeness. This quality assurance/quality control plan describes the organization and procedures routinely incorporated into all analyses performed by the WESTON laboratory for the purpose of producing reliable data.

2.0 DISCUSSION

Customized, client-specific quality control measures (to include project-specific quality assurance/quality control plans) can be added to these basic guidelines to satisfy the special needs of individual programs. Laboratory personnel are available to discuss the design, advantages, and disadvantages of other quality control options.

This plan has been prepared in accordance with "Guidelines and Specifications for Preparing Quality Assurance Program Plans," QAMS-004/80, 20 September 1985.

3.0 ORGANIZATION

3.1 Laboratory Manager

The ultimate responsibility for the generation of reliable laboratory data rests with the Laboratory Manager. The Laboratory Manager is vested with the authority to effect those policies and procedures to ensure that only data of the highest attainable caliber are produced.

3.2 Section Managers

To assist the Laboratory Manager in achieving his goals, the Organic Section Manager, Inorganic Section Manager, and Support Section Manager as well as the laboratory Quality Assurance/ Quality Control Coordinator and analytical project managers are responsible for the implementation of the established policies and procedures. They possess the authorities commensurate with their responsibilities for the day-to-day enforcement and monitoring of laboratory activities.

Section Managers have the responsibility for ensuring that their personnel are adequately trained to perform analyses, that equipment and instrumentation under their control are calibrated

and functioning properly, and that system audits are performed on a periodic basis. These system audits will consist of analyses of external check samples to determine the analyst/instrument capability to identify and quantify routine analytes.

3.3 Quality Assurance/Quality Control Coordinator

The Quality Assurance/Quality Control Coordinator has the responsibility for the conduct of and evaluation of results from system audits. In addition, the preparation of standard operating procedures and quality assurance documentation for the laboratory is a function of the Quality Assurance/Quality Control Coordinator. The Quality Assurance/Quality Control Coordinator will review program plans for consistency with organizational and contractual requirements and will advise appropriate personnel of inconsistencies.

3.4 Laboratory Personnel

Any effective quality assurance and quality control program depends not only on organization and management but also on the efforts of each and every individual on the laboratory staff. The initial review for acceptability of analytical results rests with the analysts conducting the various tests. Observations made during the performance of an analytical method may indicate that the analytical system is not in control. Analysts must be constantly aware for indications of perturbations from the norm and be ready to verify that the system is in control before continuing analyses or reporting results of analyses.

4.0 SAMPLE MANAGEMENT

An organized and efficient sample management system is a necessary and critical foundation on which actual analyses of samples are based. Sample management includes client file creation, bottle preparation, sample preservation, sample receipt, sample storage, chain-of-custody documentation, reporting and invoicing, and sample retention and disposal.

4.1 Client File

On notification of a sampling and analysis effort, the laboratory will create a client file to maintain records associated with the project. In addition to administrative information (work order and plan numbers, client contacts, etc.), requests for sample containers, preservatives, and required analyses will be included in the file. As the project progresses, chain-of-custody and analytical results as well as any other pertinent information will be added to the file.

4.2 Bottle Preparation and Sample Preservation

On request by the Project Manager, sample bottles will be prepared by the laboratory and made available to the sampling team. The bottles will be prepared according to WESTON standard operating procedures and will include sample preservatives appropriate to the analytes and matrices of concern. Addition of preservatives to samples shall be recorded in field notebooks and on chain-of-custody forms. WESTON adheres to the most recent recommendations from the U.S. Environmental Protection Agency (EPA) for proper sample containers and preservatives.

If sample bottles are not prepared by the laboratory, the client assumes responsibility for bottle selection and preparation.

4.3 Chain-of-Custody

Chain-of-custody procedures document the history of samples and constitute a crucial part of sampling and analysis programs. Chain-of-custody documentation assists and enables the identification and tracing of a sample from the time of collection through the time of analysis.

When sample bottles are supplied by the laboratory, chain-of-custody forms will accompany the containers to the field. As samples are collected, entries are made on the chain-of-custody forms. Data to be noted include:

- Date
- Samples
- Sample description
- Client/program
- Container and preservative
- Analyses required
- Special instructions/notes

Sample containers are also labelled with:

- Date
- Sample description
- Preservatives
- Analyses required
- Client/program

When samples are received at the laboratory, the sample custodian will verify each and every sample against the chain-of-custody forms, note any discrepancies or losses of samples, and then sign for receipt of the samples. Samples will remain under the control of the sample custodian until samples are transferred to

the analysts for processing. Analysts will acknowledge receipt of samples by signing the chain-of-custody forms.

A sample is considered to be in custody if it:

- Is in the physical possession of the responsible party.
- Is in view of the responsible party.
- Is secured by the responsible party to prevent tampering.
- Is secured by the responsible party in a restricted area.

4.4 Sample Receipt

Samples received at the laboratory are inspected for integrity, and any field documentation is reviewed for accuracy and completeness. If chain-of-custody forms do not accompany the samples, the sample custodian will initiate these forms. When samples are received with missing or deficient chain-of-custody forms, the legal traceability of these samples cannot extend to the time of collection but must begin at the time of laboratory receipt.

Chain-of-custody and sample integrity problems are noted and recorded during sample log-in. The Project Manager is informed of the deficiencies and will advise the laboratory on the desired disposition of the samples. Chain-of-custody forms and deficiency notices are maintained in the client file.

Each sample that is received by the laboratory is assigned a unique sequential WESTON sample number which will identify the sample in the laboratory's internal tracking system.

References to a sample in any communication will include the assigned sample number to specify which sample is of concern.

4.5 Sample Storage

Samples will be stored in a locked refrigerator at 4°C. The temperature of the storage refrigerators will be monitored and recorded daily by the sample custodian. Sample fractions and extracts will also be stored under these same conditions.

4.6 Sample Retention and Disposal

Samples will be retained in the refrigerator for thirty (30) calendar days after the date of the invoice accompanying the analytical results. Unless a written request is received for retaining the sample beyond the thirty (30) days, the samples will be disposed of in an appropriate manner.

5.0 ANALYTICAL SYSTEMS

5.1 Instrument Maintenance

Instruments will be maintained in accordance with manufacturers' specifications. More frequent maintenance may be dictated dependent on operational performance. Instrument logs will be maintained to document the date and type of maintenance performed.

Contracts on major instruments with manufacturers and service agencies are used to provide routine preventive maintenance and to ensure rapid response for emergency repair service. Minimal instrument down-time is experienced through the use of these contracts.

5.2 Instrument Calibration

Before any instrument can be used as a measurement device, the instrumental response to known reference materials must be determined. The manner in which the various instruments are calibrated will be dependent on the particular instrument and the intended use of the instrument. All sample measurements will be made within the calibrated range of the instrument.

Laboratory balances will be calibrated annually and will be checked before and after use on a daily basis. A record of calibrations and daily checks will be kept in the balance log.

Oven thermometers will be calibrated annually against a National Bureau of Standards certified thermometer in the range of interest. Annual calibrations and daily readings will be maintained in the oven logs.

5.3 Personnel Training

Prior to conducting analyses on an independent basis, analysts are trained by experienced personnel in the complete performance of an analytical method. If instrumentation is particularly complicated, analysts may be trained at instrument manufacturers' training courses. The analyst is then required to independently

generate data on several method and/or matrix spikes to demonstrate proficiency in that analytical method. The type of data to be generated will be dependent on the analytical method to be performed. Results of this "certification" are then reviewed by the appropriate supervisor for adequacy.

Since method blanks and method spikes are required routine samples in every lot, performance on a day-to-day basis can be monitored by comparison with the original and cumulative data on similar samples. Supervisors and the laboratory Quality Assurance/Quality Control Coordinator are responsible for ensuring that samples are analyzed by only competent analysts.

5.4 Standard Analytical Methods

General: Analytical methods are routinely conducted as outlined in published sources (EPA, Standard Methods, ASTM, AOAC, etc.). Modifications to these methods may be necessary in order to provide accurate analyses of particularly complex matrices. When modifications to standard analytical methods are performed, the specific alterations as well as the reason for the change will be reported with the results of analyses.

5.4.1 Gas Chromatography/Mass Spectroscopy

5.4.1.1 Calibration

Mass spectrometers are tuned on a daily basis to manufacturer's specifications with FC-43. In addition, once per shift, these instruments are tuned with decafluorotriphenylphosphine (DFTPP) or 4-bromo-fluorobenzene (BFB) for semi-volatiles or volatiles, respectively. Ion abundances will be within the windows dictated by the specific program requirements. Once an instrument has been tuned, initial calibration curves for analytes (appropriate to the analyses to be performed) are generated for at least three solutions containing known concentrations of authentic standards of compounds of concern. The calibration curve will bracket the anticipated working range of analyses.

Calibration data, to include the correlation coefficient, will be entered into laboratory notebooks to maintain a permanent records of instrument calibrations.

5.4.1.2 Quality Control

During each operating shift, a midpoint calibration standard is analyzed to verify that the instrument responses are still within the initial calibration determinations. The calibration check compounds will be those analytes used in the EPA Contract

Laboratory Program's multicomponent analyses (e.g., priority pollutants and hazardous substances list) with the exception that benzene is used in place of vinyl chloride (volatiles) and di-n-octyl phthalate is deleted from the semi-volatile list.

The response factor drift (% RSD) will be calculated and recorded. If significant (>30%) response factor drift is observed, appropriate corrective actions will be taken to restore confidence in the instrumental measurements.

All GC/MS analyses will include analyses of a method blank, a method spike, and a method spike duplicate in each lot of samples. In addition, appropriate surrogate compounds specified in EPA methods will be spiked into each sample. Recoveries from method spikes and surrogate compounds are calculated and recorded on control charts to maintain a history of system performance.

Duplicate samples will be analyzed for analytical lots of twenty (20) or more.

Audit samples will be analyzed periodically to compare and verify laboratory performance against standards prepared by outside sources.

5.4.2 Gas Chromatography and High Performance Liquid Chromatography

5.4.2.1 Calibration

Gas chromatographs and high performance liquid chromatographs will be calibrated prior to each day of use. Calibration standard mixtures will be prepared from appropriate reference materials and will contain analytes appropriate for the method of analysis.

Working calibration standards will be prepared fresh daily. The working standards will include a blank and a minimum of three concentrations to cover the anticipated range of measurement. At least one of the calibration standards will be at or below the desired instrument detection limit. The correlation coefficient of the plot of known versus found concentrations must be at least 0.996 in order to consider the responses linear over a range. If a correlation coefficient of 0.996 cannot be obtained, additional standards must be analyzed to define the calibration curve. A midpoint calibration check standard will be analyzed each shift to confirm the validity of the initial calibration curve. The check standard must be within twenty (20) percent of the initial response curve to demonstrate that the initial calibration curve is still valid.

Calibration data, to include the correlation coefficient, wil be entered into laboratory notebooks to maintain a permanent record of instrument calibrations.

5.4.2.2 Quality Control

At least one method blank and two method spikes will be included in each laboratory lot of samples. Regardless of the matrix being processed, the method spikes and blanks wil be in aqueous media. Method spikes will be at a concentration of approximately five (5) times the detection limits.

The method blanks will be examined to determine if contamination is being introduced in the laboratory.

The method spikes will be examined to determine both precision and accuracy.

Accuracy will be measured by the percent recovery of the spikes; precision will be measured by the reproducibility of both method spikes.

5.4.3 Atomic Absorption Spectrophotometry

5.4.3.1 Calibration

Atomic absorption spectrophotometers will be calibrated prior to each day of use.

Calibration standards will be prepared from appropriate reference materials, and working calibration standards will be prepared fresh daily. The working standards will include a blank and a minimum of five concentrations to cover the anticipated range of measurement.

Duplicate injections will be made for each concentration. At least one of the calibration standards will be at or below the desired instrument detection limit. The correlation coefficient of the plot of known versus found concentrations will be at least 0.996 in order to consider the responses linear over a range. If a correlation coefficient of 0.996 cannot be achieved, the instrument will be recalibrated prior to analysis of samples.

Calibration data, to include the correlation coefficient, will be entered into laboratory notebooks to maintain a permanent record of instrument calibrations.

5.4.3.2 Quality Control

At least one method blank and two method spikes will be included in each laboratory lot of samples. Regardless of the matrix being processed, the method spikes and blanks will be in aqueous media. Method spikes will be at a concentration of approximately five (5) times the detection limit.

The method blanks will be examined to determine if contamination is being introduced in the laboratory and will be introduced at a frequency of one per analytical lot or five (5) percent of the samples, whichever is more. The method spikes will be examined to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes,es. The recovery must be within the range 75-125 percent to be considered acceptable.

Precision will be measured by the reproducibility of both method spikes. Results must agree within twenty (20) percent in order to be considered acceptable.

5.4.4 Inductively Coupled Plasma Spectroscopy

5.4.4.1 Calibration

The inductively coupled plasma spectrometer will be calibrated prior to each day of use. Calibration standards will be prepared from reliable reference materials and will contain all metals for which analyses are being conducted. Working calibration standards will be prepared fresh daily. The working standards will include a blank and a minimum of five (5) concentrations to cover the anticipated range of measurement. Triplicate readings will be made for each concentration. At least one of the calibration standards will be at or below the desired instrumental detection limit. The correlation coefficient of the plot of responses versus concentrations will be at least 0.996 in order to consider the responses linear. If a correlation coefficient of 0.996 cannot be obtained, the spectrometer will be recalibrated prior to analysis of samples.

Calibration data, to include the correlation coefficient, will be entered into laboratory notebooks to maintain a permanent record of instrument calibrations.

5.4.4.2 Quality Control

At least one method blank and two method spikes will be included in each laboratory lot of samples. Regardless of the matrix being processed, the method spikes and blanks will be in aqueous

media. Method spikes will be at a concentration of approximately five (5) times the detection limit.

The method blanks will be examined to determine if contamination is being introduced in the laboratory.

The method spikes will be examined to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes. The recovery must be within the range 75-125 percent to be considered acceptable.

Precision will be measured by the reproducibility of both method spikes.

Results must agree within twenty (20) percent in order to be considered acceptable.

5.4.5 Total Organic Carbon

5.4.5.1 Calibration

The total organic carbon analyzer will be calibrated prior to each day of use.

Calibration standards will be prepared from potassium hydrogen phthalate, and working calibration standards will be prepared fresh daily. The working standards will include a blank and a minimum of five (5) concentrations to cover the anticipated range of measurement.

At least one of the calibration standards will be at or below the desired instrument detection limit. The correlation coefficient of the plot of known versus found concentrations will be at least 0.996 in order to consider the responses linear over a range. If a correlation coefficient of 0.996 cannot be achieved, the instrument will be recalibrated prior to analysis of samples. Calibration data, to include the correlation coefficient, will be entered into laboratory notebooks to maintain a permanent record of instrument calibrations.

5.4.5.2 Quality Control

At least one method blank and two method spikes will be included in each laboratory lot of samples. Method spikes will be at a concentration of approximately five (5) times the detection limit.

The method blanks will be examined to determine if contamination is being introduced in the laboratory. The method spikes will be

examined to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes. The recovery must be within the range 90-110 percent to be considered acceptable.

Precision will be measured by the reproducibility of both method spikes.

Results must agree within twenty (20) percent in order to be considered acceptable.

5.4.6 Ion Chromatography

5.4.6.1 Calibration

The ion chromatograph will be calibrated prior to each day of use. Calibration standards will be prepared from appropriate reference materials, and working calibration standards for the ions of interest will be prepared fresh daily. The working standards will include a blank and a minimum of five (5) concentrations to cover the anticipated range of measurements. At least one of the calibration standards will be at or below the desired instrument detection limit. The correlation coefficient of the plot of known versus found concentrations will be at least 0.996 in order to consider the responses linear over a range. If a correlation coefficient of 0.996 cannot be achieved, the instrument will be recalibrated prior to analysis of samples.

Calibration data, to include the correlation coefficient, will be entered into laboratory notebooks to maintain a permanent record of instrument calibrations.

5.4.6.2 Quality Control

At least one method blank and two method spikes will be included in each laboratory lot of samples. Regardless of the matrix being processed, the method spikes and blanks will be in aqueous media. Method spikes will be at a concentration of approximately five (5) times the detection limit.

The method blanks will be examined to determine if contamination is being introduced in the laboratory.

The method spikes will be examined to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes. The recovery must be within the range of 85-115 percent to be considered acceptable.

Precision will be measured by the reproducibility of both method spikes.

Results must agree within fifteen (15) percent in order to be considered acceptable.

5.4.7 Spectrophotometric Methods

5.4.7.1 Calibration

Spectrophotometers will be calibrated prior to each day of use. Calibration standards will be prepared from reference materials appropriate to the analyses being performed, and working calibration standards will be prepared fresh daily. The working standards will include a blank and minimum of five (5) concentrations to cover the anticipated range of measurement. At least one of the calibration standards will be at or below the desired instrument detection limit. The correlation coefficient of the plot of known versus found concentrations will be at least 0.996 in order to consider the responses linear over a range. If a correlation coefficient of 0.996 cannot be achieved, the instrument will be recalibrated prior to the analysis of samples.

Calibration data, to include the correlation coefficient, will be entered into laboratory notebooks to maintain a permanent record of instrument calibrations.

5.4.7.2 Quality Control

At least one method blank and two method spikes will be included in each laboratory lot of samples. Regardless of the matrix being processed, the method spikes and blanks will be in aqueous media. Method spikes will be at a concentration of approximately five (5) times the detection limit.

The method blanks will be examined to determine if contamination is being introduced in the laboratory.

The method spikes will be examined to determine both precision and accuracy.

Accuracy will be measured by the percent recovery of the spikes. The recovery must be in an acceptable range (based on EPA data for the method of interest) in order to be considered acceptable.

Precision will be measured by the reproducibility of both method spikes.

Results must agree within acceptable limits (based on EPA data) in order to be considered acceptable.

5.5 Methods Development

When standard (published) methods of analyses are not applicable to analyses to be performed, methods can be developed to provide the desired information. However, the lack of a historical data base does not obviate the necessity for documented quality control data to demonstrate the validity of the generated results. Reference material sources must be identified, and proof of compound identity and purity must be available. Instrumental operating parameters as well as calibration data must be documented, and specific procedures (to include sampling, if applicable) must be noted. Quality control samples (method blanks, method spikes, method spike duplicates, matrix spikes, and matrix duplicates) should be analyzed with greater frequency than with standard analytical methods to demonstrate the certainty and uncertainty of generated data. Exact requirements for demonstrating the reliability of developed methods are normally dictated by the specific program.

5.6 Reference Materials

Whenever possible, primary reference materials will be obtained from the National Bureau of Standards (NBS) or the U.S. Environmental Protection Agency (EPA). In the absence of available reference materials from these organizations, other reliable sources will be sought. These reference materials will be used for instrument calibration, quality control spikes, and/or performance evaluations. Secondary reference materials may be used for these functions provided that they are traceable to an NBS standard or have been compared to an NBS standard within the laboratory.

5.7 Reagents

Laboratory reagents will be of a quality to minimize or eliminate background concentrations of the analyte to be measured. Reagents must also not contain other contaminants that will interfere with the analyte of concern.

5.8 Corrective Actions

When an analytical system is deemed to be questionable or out-of-control at any level of review, corrective actions performed. If possible, the cause of the out-of-control situation is determined, and efforts are made to bring the system back into control. Demonstration of the restoration a reliable analytical

system will normally be accomplished by generating satisfactory calibration and/or quality control sample data. The major consideration in performing corrective actions ensure that only reliable data are reported from the laboratory.

6.0 DATA MANAGEMENT

6.1 Data Collection

In addition to the data collected in the field and recorded on the chain-of-custody forms, data describing the processing of samples will be accumulated in the laboratory and recorded in laboratory notebooks. Laboratory notebooks will contain:

- Date of processing
- Sample numbers
- Client (optional)
- Analyses or operation performed
- Calibration data
- Quality control samples included
- Concentrations/dilutions required
- Instrument readings
- Special observations (optional)
- Analysts signature

6.2 Data Reduction

Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments. The complexity of the data reduction will be dependent on the specific analytical method and the number of discrete operations (extractions, dilutions, and concentrations) involved in obtaining a sample that can be measured.

For those methods utilizing a calibration curve, sample responses will be applied to the linear regression line to obtain an initial raw result which is then factored into equations to obtain the estimate of the concentration in the original sample. Rounding will not be performed until after the final result is obtained to minimize rounding errors, and results will not normally be expressed in more than two (2) significant figures.

Copies of all raw data and the calculations used to generate the final results will be retained on file to allow reconstruction of the data reduction process at a later date.

6.3 Data Review

System reviews are performed at all levels. The individual analyst constantly reviews the quality of data through calibration checks, quality control sample results, and performance evaluation samples. These reviews are performed prior to submission to the Section Managers or the Analytical Project Manager.

The Section Manager and/or the Analytical Project Manager review data for consistency and reasonableness with other generated data and determine if program requirements have been satisfied. Selected hard copy output of data (chromatograms, spectra, etc.) will be reviewed to ensure that results are interpreted correctly. Unusual or unexpected results will be reviewed, and a resolution will be made as to whether the analysis should be repeated. In addition, the Analytical Project Manager or Section Manager will recalculate selected results to verify the calculation procedure.

The Quality Assurance Officer independently conducts a complete review of selected projects to determine if laboratory and client quality assurance/quality control requirements have been met. Discrepancies will be reported to the appropriate Section Manager and/or Analytical Project Manager for resolution.

The final routine review is performed by the Laboratory Manager prior to reporting the results to the client. Non-routine audits are performed by regulatory agencies and client representatives. The level of detail and the areas of concern during these reviews are dependent on the specific program requirements.

6.4 Data Reporting

Reports will contain final results (uncorrected for blanks and recoveries), methods of analysis, levels of detection, surrogate recovery data, and method blanks data. In addition, special analytical problems, and/or any modifications of referenced methods will be noted. The number of significant figures reported will be consistent with the limits of uncertainty inherent in the analytical method. Consequently, most analytical results will be reported to no more than two (2) significant figures. Data are normally reported in units commonly used for the analyses performed. Concentrations in liquids are expressed in terms of weight per unit volume (e.g., milligrams per liter). Concentrations in solid or semi-solid matrices are expressed in terms of weight per unit weight of sample (e.g., micrograms per gram).

Reported detection limits will be the concentration in the original matrix corresponding to the low level instrument calibration standard after concentration, dilution, and/or extraction factors are accounted for.

6.5 Data Archiving

The laboratory will maintain on file all of the raw data, laboratory notebooks, and other documentation pertinent to the work on a given project. This file will be maintained for five (5) years from the date of invoice unless a written request is received for an extended retention time.

Data retrieval from archives will be handled in a similar fashion to a request for analysis. Specifically, a written work request to include a quotation must be submitted for retrieval of data.

Client confidentiality will be maintained with retrieved data. Consequently, the laboratory can honor only those requests for data authorized by the original client.

7.0 SUBCONTRACTED ANALYSES

The subcontracting of analytical services does not relieve the laboratory of requirements set forth in this plan. Adherence to the provisions of this plan will be part of the subcontracting agreement, and data generated by the subcontractor laboratory will be reviewed with the same rigor as those analyses performed at WESTON facilities.

ATTACHMENT 2

Thermo Electron
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QUALITY ASSURANCE MANUAL

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COPY NO. 63 ISSUE DATE 6/17/86

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REVISION RECORD

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ACKNOWLEDGEMENT FORM

Quality Assurance Manaul No. _____ Revision No. _____ Rev. Date _____. To assure receiving future revision, please sign this form and return in the enclosed pre-addressed and stamped envelope.

Please do not return the superseded Manual. Destroy it or process it per your document control program.

Acknowledged by: _____

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QUALITY ASSURANCE PROGRAM
AUDIT REPORT

AUDIT NO. _____ AUDIT DATE _____

TYPE OF AUDIT: AUDITOR(S):

FACILITY AUDITED

INDIVIDUALS CONTACTED

DESCRIPTION OF AUDIT (AGENDA)

SUMMARY OF DEFICIENCIES, NOTED AND CORRECTIVE ACTION COMMITMENTS

QUALITY AUDIT FINDINGS ARE ATTACHED

DISTRIBUTION w/e

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QUALITY ASSURANCE PROGRAM
AUDIT CHECKLIST

AUDIT NO. _____ AUDIT DATE _____

AUDIT ITEM	REQUIREMENT REFERENCE	NOT APPLI CABLE	SATIS FACTORY	UNSATIS FACTORY

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QUALITY ASSURANCE PROGRAM
QUALITY AUDIT FINDING

No. _____

FACILITY AUDITED: AUDIT NO. _____

LOCATION: DATE: _____

AUDITOR: AGENDA/CHECKLIST ITEM

CONTROLLING DOCUMENT/SECTION PARAGRAPH:

DESCRIPTION/FINDINGS:

RECOMMENDED CORRECTIVE ACTION:

RESPONSIBLE PERSON: SCHEDULE COMPLETION DATE:

CORRECTIVE ACTION TAKEN:

RESPONSIBLE AUTHORITY: DATE COMPLETED:

FOLLOW-UP AUDIT TO VERIFY CORRECTION ACTION IMPLEMENTATION

AUDITOR: DATE:

RESULTS OF FOLLOW-UP AUDIT

REV 5/85

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SECTION 1 INTRODUCTION

1.1 PREFACE

The management of Eberline Analytical Corporation (EAC) is committed to a rigorous Quality Assurance Program. While this commitment is necessary for the normal conduct of business, our basic policies dictate professional ethics based upon concern for a safe and clean environment. This philosophy, and the specific procedures to attain the objectives, form the framework of our Quality Assurance Program. Eberline will provide only those services within our qualifications and with confidence that our Q.A. Program, and all related procedures, permits reliable performance of these services.

1.2 PURPOSE

The purpose of this Quality Assurance Manual is to set forth management policy and the operating procedures to be used to accomplish each of the quality assurance elements necessary to fulfill EAC's responsibility to meet and/or exceed customer or regulatory specifications. It also provides a means for creating mutual understanding regarding our quality assurance system and

reliability techniques with our vendors and with our customers. Each of our facilities is affected and therefore operate within the policy and procedures established herein.

1.3 SCOPE

This Manual complies with applicable requirements of the following specifications:

1.3.1 NRC 10 CFR Part 50, Appendix B "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants".

1.3.2 ANSI N45.2, "Quality Assurance Program Requirements for Nuclear Power Plants".

1.3.3 MIL-Q-9858, "Quality Program Requirements for Government Agencies."

1.3.4 NRC 10 CFR Part 21, "Reporting of Defects and Non-compliance".

1.3.5 ANSI/ASME NQA-1-1983, "Quality Assurance Program Requirements for Nuclear Facilities".

1.3.6 NRC Regulatory Guide 4.15 Rev. 1, "Quality Assurance for Radiological Monitoring Programs - Effluent Streams and the Environment".

1.3.7 ANSI 13.11, "Criteria for Testing Personnel Dosimetry Performance".

1.3.8 Other more specific standards covering specific services functions.

1.4 RESPONSIBILITY

The Quality Assurance Manager of EAC shall be responsible for the establishment and execution of the Quality Assurance Program and for the overall program effectiveness.

1.4.1 The Quality Assurance Manager reports directly to the President of EAC.

1.4.2 The Quality Assurance Manager shall be responsible for reviewing and revising the Quality Assurance Program on a continuing basis to assure compliance with the latest revisions of applicable USNRC regulations, and with the ANSI standards, codes and specifications. A formal review and revision of the Program will be performed at least annually.

1.4.3 Changes (revisions) will be made to this Manual on a page replacement basis and will be documented on the Revision Record Form. Each page will be dated for identification.

1.4.4 The Quality Assurance Manager shall be responsible for maintaining, controlling and updating all controlled copies of the Quality Assurance Manual.

1.4.5 An acknowledgement form will be sent with each Manual, and change to the Manual, for verification of receipt. Returned acknowledgement forms will be maintained on file for review.

1.4.6 Responsibility for quality control resides with each Profit Center Manager who is designated as the Quality Control (Q.C.) Representative.

1.4.7 All Q.C. Representatives report directly to the Quality Assurance Manager on matters pertaining to quality assurance.

1.4.8 All Q.C. Representatives shall review the adequacy of the Quality Assurance Program portions for which they are responsible, and recommend improvements, additions or deletions to the program. Should a condition adverse to quality be observed, the Q.A. Manager will be advised. He will determine the cause and what corrective action will be taken to correct the condition and to prevent recurrence.

SECTION 2 ORGANIZATION

2.1 ORGANIZATIONAL STRUCTURE

The organizational structure, functional responsibilities, levels of authority, and lines of communication for management, direction and execution of the quality assurance program are documented in this section.

2.2 RESPONSIBILITY

The delineation of authority and the responsibility of persons and organizations performing activities affecting quality are clearly established in this Manual.

2.2.1 The Quality Assurance Manager shall be responsible for defining and measuring the overall effectiveness of the Quality Assurance Program. He shall not be responsible for production schedules.

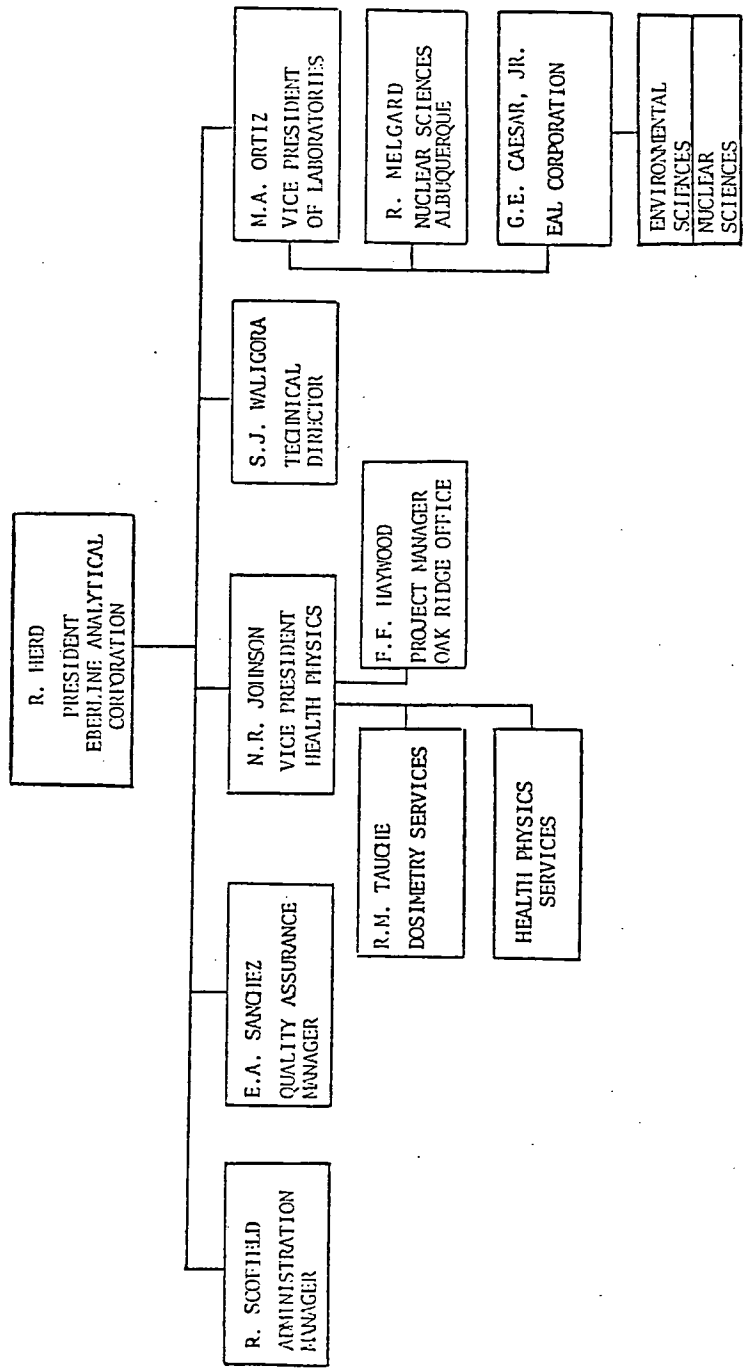
2.2.2 The Quality Assurance Manager reports directly to the President so that appropriate action can be taken in implementing an effective program.

2.3 ORGANIZATIONAL CHARTS

2.3.1 The Corporate organizational chart is illustrated on Figure 1.

2.3.2 The Quality Assurance organizational chart is illustrated on Figure 2.

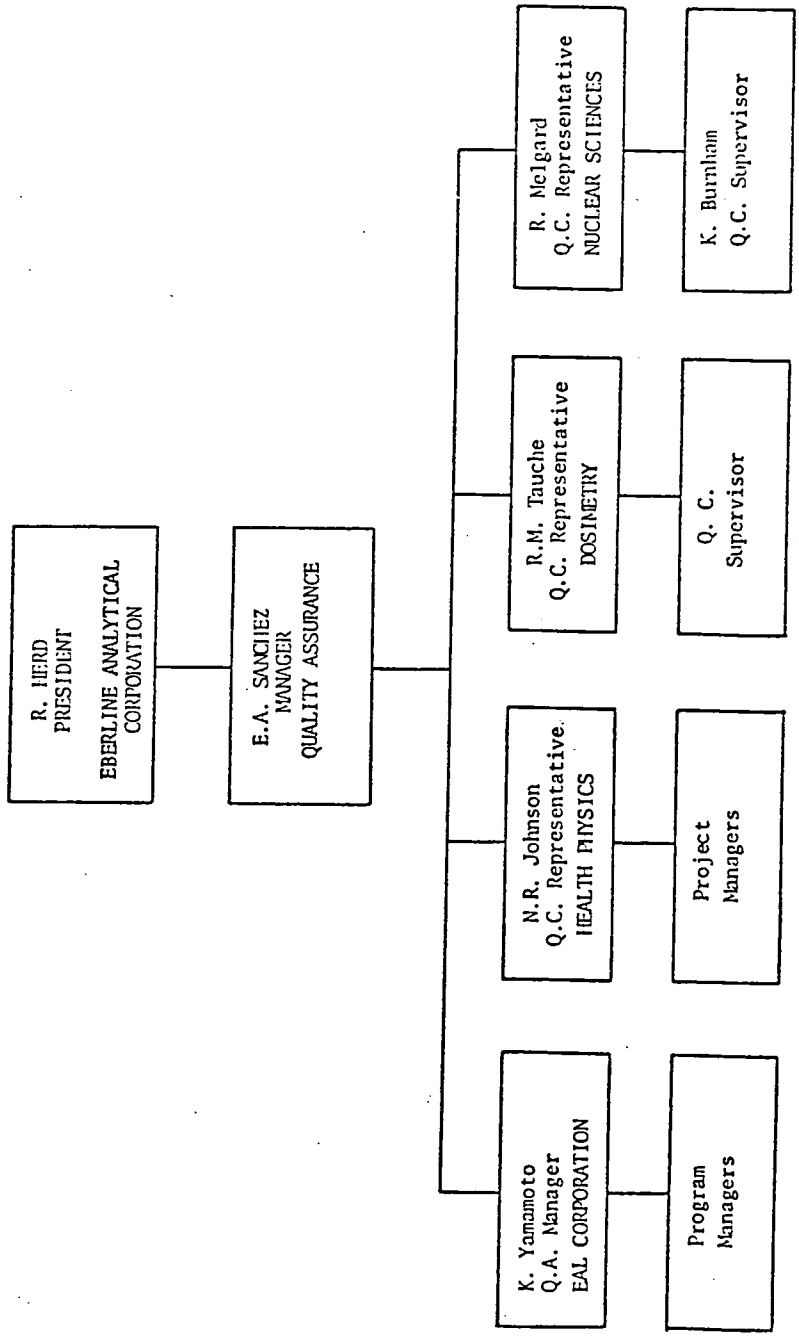
8



CORPORATE ORGANIZATION

FIGURE 1

REV 5/85



QUALITY ASSURANCE ORGANIZATION

FIGURE 2

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SECTION 3 QUALITY ASSURANCE OBJECTIVES

3.1 OBJECTIVES

The objectives of the EAC Quality Assurance Program are outlined below.

3.1.1 To provide an effective and adequate control for the verification of quality characteristics of analytical laboratories, dosimetry and health physics services.

3.1.2 To assure that services meet the rigid quality and reliability standards of EAC including those Standards given in Section 1.3. Also, assure that individual customer criteria pursuant to these standards are met.

3.1.3 To provide a continuing monitoring service for review of procedures, overall effectiveness, and evaluation of the quality assurance program, and to provide observations and recommendations for improvement in all areas of company operations where quality may be affected.

SECTION 3

3.1.4 To provide a value analysis system for all services of EAC and establish a "feedback system" for improved quality.

3.1.5 It shall be the combined responsibility of the Quality Assurance/Quality Control Representatives to prevent and/or control non-conforming work, materials and supplies such that none are utilized in services operations.

3.2 WORK ORDER POLICY

All work to be performed by EAC shall be authorized by work order and/or assigned job number.

3.2.1 The work order shall specify all special contract requirements including specific analyses and reporting that is necessary to assure compliance with Quality Assurance and related contractural obligations. This may be done by reference to other documents (e.g., Purchase Order) that contain the contract requirements.

SECTION 3

3.3 CUSTOMER ACCESS TO EBERLINE FACILITIES AND PERSONNEL

Eberline will make available for client inspection its equipment, records, and facilities, along with the necessary personnel to permit verification of quality characteristics. This evaluation is normally permitted without cost except where the scope of the client program does not justify the attendant expense for EAC participation in such an audit.

3.3.1 The Quality Assurance Manager will coordinate all audits conducted by the client or his representative.

SECTION 4 PROCUREMENT DOCUMENT CONTROL

4.1 PURCHASING

Procurement of material, components, supplies, reagents, equipment, and services necessary to carry on the business interests of EAC shall be initiated by purchase requisition and controlled by an authorized EAC purchase order.

Note: For detailed information on procurement see the Eberline Analytical Corporation General Purchasing Policies and Procedures Manual.

4.2 PURCHASE REQUISITION REVIEW

Purchase requisitions or change orders shall be reviewed by the Purchasing Office to assure conformance to the procurement requirements.

4.3 CERTIFICATION/CERTIFICATE OF CONFORMANCE

All material and/or processes requiring certification and/or certificates shall be indicated on the face of the purchase order or by attachment thereto. There shall be adequate information provided to assure vendor compliance to the required specifications. The facility

SECTION 4

Q.C. Representative shall be responsible for the retention, filing, and recall of material certification and/or certificates of conformance.

4.4 SUBCONTRACTS

It shall be the policy of EAC to subcontract work only when internal capabilities preclude accomplishment of the work on a timely basis to meet performance schedules or when internal capabilities prevent accomplishment of the work to meet customer specifications.

4.4.1 When subcontracting is required, it shall be the policy of EAC to award subcontracts only to those companies which have been evaluated and selected by the Purchasing Office.

4.5 NON-CONFORMING MATERIALS

When materials do not conform to EAC purchase order requirements, the receiving clerk shall initiate a Discrepant Shipment Report (DSR), forward the DSR to

Purchasing, and move the discrepant material to the Receiving Hold Area pending disposition.

4.6 INSPECTION

The receiving clerk shall verify the material received conforms to the procurement document. Any special inspection required shall be performed under the direction of the Q.C. Representative.

4.7 COST CENTER CODES

All purchase orders and/or subcontracts issued by EAC Purchasing Office shall be identified with a cost center code or job number for cost accounting purposes.

SECTION 5 MATERIAL RECEIPT AND CONTROL

5.1 POLICY

Only materials with acceptable quality characteristics shall be allowed into stock.

Note: See Section T, "Inspections and Receiving," in the General Purchasing Policies and Procedures Manual.

5.2 RESPONSIBILITY

Receipt of an initial verification for all materials and equipment received by EAC, both purchased and/or contract (customer) supplied, shall be the responsibility of the receiving and stock control clerk, or the Q.C. Representative, whichever is applicable.

5.3 VENDORS

The Purchasing Office shall be responsible for maintaining a record of materials received from vendors, including any DSRs for non-conforming material.

5.4 MATERIAL CONTROL

Purchased material shall be controlled by the receiving and stock control clerk.

SECTION 5

5.4.1 The receiving and stock control clerk shall be responsible for the expedient and correct routing of all accepted received materials to stock, designated department or individual, as indicated by cost center code, job number or individuals name on the purchase order.

5.5 NON-CONFORMING MATERIAL

When received material has been determined as non-conforming, the receiving and stock control clerk shall be responsible for initiating the following action.

5.5.1 Enter the non-conforming inspection data on the DSR and return the DSR to the Purchasing Office.

5.5.2 The material shall be clearly marked as a discrepant shipment and moved to the Receiving Hold Area for disposition. Eberline's General Purchasing Policies and Procedures Manual specifies disposition of the DSR copies.

5.5.3 Under no circumstances will non-conforming material be used unless, specifically approved in writing by the customer.

SECTION 6 MATERIAL STORAGE AND CONTROL

6.1 POLICY

All materials and supplies in storage shall have the necessary protection to preclude deterioration, corrosion and damage during storage life, and shall carry identification sufficiently clear to assure that only those materials specified by process instructions will be withdrawn from material storage and issued for processing.

6.2 RESPONSIBILITY

Only authorized personnel assigned to material control shall have access to and the responsibility for control and issue of materials or supplies. Materials and supplies shall be stored to allow for ready identification and shall not be mixed in the same storage container.

SECTION 7 CONTROL OF PROCESS

7.1 STANDARD PRACTICES

Standard practices applicable to services provided by EAC shall be contained in documented procedures and this Quality Assurance Manual. Every effort shall be made to fulfill requirements of the following generic sources of specific practices or factors affecting those practices.

7.1.1 Federal and State rules and regulations.

7.1.2 Consensus standards related to the nature of services performed (e.g., American National Standards Institute).

7.1.3 Regulatory Guides published by the Nuclear Regulatory Commission.

7.1.4 Specific contractual agreements with clients.

7.1.5 Where conflict or disagreement occur among the above four items, or other appropriate authority, EAC will inform the client and act upon the decision reached by the client and EAC.

SECTION 7

7.2 DOCUMENTED PROCEDURES

All routine operating procedures are documented. Most services are in the nature of standard health physics, analytical or dosimetry procedures and are contained in a procedure manual. Each procedure includes applicable prerequisites and quality control features which are unique to that process.

7.2.1 Health Physics Services - Radiation Protection Manual and Instrument Calibration Procedures Manual.

7.2.2 Dosimetry Services - Operating Procedures Manual.

7.2.3 Nuclear Sciences Services - Analytical Procedures Manual.

7.2.4 Purchasing - General Purchasing Policies and Procedures Manual.

7.3 RESPONSIBILITY

The Profit Center Manager will determine which instructions, procedures or drawings require quantitative

or qualitative acceptance criteria and will specify the appropriate criteria.

7.3.1 The Profit Center Manager shall be responsible for changes to the procedures manual. Incorporation of a significant or generic change may be adopted immediately by the using manager with ample evidence of the effectiveness of the procedure. The change shall be promptly forwarded to the Quality Assurance Manager by interoffice memorandum for review and approval. This submittal will include a detailed description of the change, the reason for same, and supportive data and information.

7.3.2 Following the review, the Quality Assurance Manager will approve or disapprove the change. Notification will be accomplished by interoffice memorandum.

7.3.3 Minor changes in the operating procedures manual may be made by the supervisor or manager through a handwritten, initialed, and dated change on the procedure. A copy of that page is forwarded to the Quality Assurance Manager. The Quality Assurance Manager will review these minor changes and will approve a new procedure, with all the changes incorporated. The Quality Assurance Manager or Profit Center Manager will document those changes for historical reference.

7.3.4 The Profit Center Manager will review the operating procedures on an annual basis and will document changes on the Revisions Record Form.

7.3.5 A current copy of each department's operating procedures manual will be maintained by the Quality Assurance Manager.

7.4 EQUIPMENT CALIBRATION AND MAINTENANCE

All equipment whose operation and function directly affect the quality of service will be carefully calibrated and maintained, with records of each

calibration or maintenance action kept in appropriate log books.

7.4.1 Certified standards will be used for all primary calibrations. Available NBS standards will be used for most of the primary calibrations.

7.4.2 All dilutions of solution standards will be recorded in a readily accessible log book. Identity of dilutions will be such that a secondary standard or dilution can be traced, through subsequent actions, back to the initial certification.

7.4.3 Dosage measurements are determined using ionization chambers that have been calibrated by the National Bureau of Standards.

SECTION 8 QUALITY CONTROL

8.1 HEALTH PHYSICS SERVICES

Health Physics Services quality control is provided by independent peer review of all computations, reports and related consulting services. Peer review will be for technical accuracy, approach, choice of assumption and conclusions drawn.

8.1.1 After peer review, reports will be reviewed and approved by the Vice President of Health Physics or his designated representative.

8.2 PERSONNEL DOSIMETRY SERVICES

Personnel Dosimetry Operating Procedures are documented by and incorporated with many quality control features including the periodic reading of reference dosimeters which have been closely selected and irradiated to a calibrated exposure.

8.2.1 In-House Quality Control

Eberline's program shall consist of a group of dosimeters, closely selected for uniform response, used to indicate the consistency in the annealing

and reading process. These dosimeters shall be processed using the same routine procedure used for client dosimeters. Since they are representative of the current supply provided to customers, the results obtained from these dosimeters indicate the consistency and accuracy of the total dosimetry program. Results shall be reviewed and reported by the Q.C. Representative to the Quality Assurance Manager.

8.2.2 Independent Performance Testing

TLD badges representative of the current supply, and routinely processed in the same manner as those shipped to customers, shall be sent monthly to Battelle Pacific Northwest Laboratories (BPNL) for additional performance testing. The type and quantity of each exposure shall be determined by testing protocol described by ANSI N13.11-1983 "Criteria for Testing Personnel Dosimetry Performance". Upon returning from BPNL, the TLD badges shall be read out using the standard operating procedures. The exposures shall be

reported by BPNL following receipt of the EAC exposure report. Results shall be reviewed and reported by the Quality Assurance Manager on a monthly basis. This program helps insure that accuracy, as well as precision, shall be maintained.

8.2.3 National Voluntary Laboratory Accreditation Program (NVLAP)

A certification is performed by NVLAP every two years. Accreditation is received in all eight categories described in ANSI N13.11-1983 Standard.

8.3 NUCLEAR SCIENCES SERVICES

Precautions will be taken in the laboratory to avoid cross-contamination of samples and to assure the reporting of accurate results. Quality control samples will be analyzed along with routine samples to indicate when results may be in error due to improper operation or calibration of equipment, inadequate training of personnel, some deficiency in the procedure, or cross-contamination from other samples.

SECTION 8

8.3.1 Laboratory Precision

The analytical laboratories shall be responsible to ensure that analytical results are reproduced internally within acceptable limits.

8.3.1.1 Reference Radioactive Sources

Reference radioactive sources shall be counted weekly to check instrument stability. The reference sources shall be prepared so that they contain sufficient activity to give good counting statistics in a reasonably short counting time. The isotopic content of the standards should have a long half-life or should have a high enough purity to allow accurate correction of the activity for decay. The reference radioactive source shall not be an efficiency standard, however, a standard may be used for both stability and efficiency determinations. If two successive determinations of the established mean for a reference radioactive source or counts fall outside

the two standard deviation limits, and in the same direction (both above or both below), an assignable cause will be sought and the situation corrected.

8.3.1.2 Duplicate Analyses

In this method, duplicate aliquots of randomly selected samples will be processed with each batch of samples (a batch is a set of 20 samples). The analyst will always process samples in accordance with routine standard operating procedures. The evaluation of the duplicate analyses will be based on examination of the difference between the duplicates. This shall be done by the Q.C. Representative without the subsequent statistical treatment; however, a statistical analysis of the data may be performed when a cursory evaluation indicates problems with the

results. If the two results agree with the two standard deviation limits, more detailed evaluation will be generally unnecessary. Duplicate analyses will be included in the monthly Q.C. report.

8.3.2 Detection and Elimination of Bias

Where possible, EAC analytical laboratories calibrate with solution standards that are traceable to the National Bureau of Standards. However, traceability to the National Bureau of Standards is not always possible and the laboratory may have to rely on other suppliers (e.g., Amersham-Searle, New England Nuclear, U.S. Department of Energy and U.S. Environmental Protection Agency). Standards in the appropriate geometry or form will be used to determine efficiency of instruments on a weekly basis. In the calibration process, the ideal standard will be a known quantity of the nuclide to be measured, prepared in exactly the same form as the samples

and counted under the same conditions. In this way, factors such as self-absorption, back-scattering, sample geometry, and detector efficiency will be accounted for empirically.

8.3.2.1 Spiked Samples

A known quantity of calibrated radioactive standard solution will be added to an aliquot of the sample or to a "blank" sample for replicate analyses. When the entire analytical system is operating properly, the laboratory record will demonstrate the accuracy and precision of the data. Divergent data from the spiked samples will point out problem areas. For example, if the data is consistently higher or lower than the known value, they indicate bias in the analytical procedure. This may require a search for personnel errors, restandardization of carriers or tracers, and/or recalibration of counting equipment.

8.3.2.2 Internal Tracer

The radioactive tracer will be added in a chemical and physical form appropriate to the analytical procedure to help assure uniform reproduction of the path followed by radionuclides present in the sample.

8.3.2.3 Replicate Analyses

Replicate spiked samples will be used, whenever practicable, when an internal tracer is not used as a routine part of the analytical procedure. Calibration standards will be periodically counted and calibration standard solutions used to spike blank samples, to allow for quality control, where replicates are impractical. Results of spiked samples will be included in the monthly Q.C. report.

8.3.3 Background Determination

A number of equipment and environmental factors contribute to variation in counting or instrument

background. The background of each system shall be determined and recorded with sufficient frequency to provide a firm statistical basis for that measurement and also to assure response to potential instrument problems or other artifacts such as uncontrolled contamination.

8.3.3.1 These background determinations will include use of items which most closely duplicate the analytical configuration in type, geometry, and with any associated fixtures. In some cases, true blanks are not available, but the closest practicable analog is used.

8.3.3.2 Some systems and samples are sufficiently stable to require no change in backgrounds used for data reduction (e.g., uranium daughter gamma-rays found in gamma spectra due to adjacent building materials and earth). In this case, backgrounds will be compared to

historical data to insure sufficient stability. Other systems experience enough variability to require calculational backgrounds based upon running averages.

8.3.3.3 Background data will be recorded in the log book for that specific instrument along with calibration data and instrument maintenance records. Results of blanks processed with batches of samples will be included in the monthly Q.C. report.

8.3.4 Collaborative Testing

In addition to the internal quality control samples described above, each laboratory shall participate in collaborative testing or interlaboratory comparison programs. Natural or synthetic samples carefully prepared to contain known concentrations of the nuclides are sent to participating laboratories by an independent

referee group such as the Quality Assurance Branch of the National Environmental Research Center of the U.S. Environmental Protection Agency at Las Vegas, Nevada or the Environmental Measurements Laboratory, U.S. Department of Energy, at New York. After statistically comparing the resulting data from triplicate analyses of the special standard sample, the degree of analytical validity of the results are reported and updated performance information is returned to each participant. The program thus enables each laboratory to document the precision and accuracy of radioactivity measurements, identify instrumental and procedural problems and compare performance with other laboratories.

8.4 QUALITY CONTROL AND DATA REPORTS

8.4.1 Quality Control Reports

Quality control results shall be summarized monthly with distribution to the Quality Assurance Manager and to others upon request.

SECTION 8

8.4.2 Data Reports

8.4.2.1 Dosimetry Services

Dosimetry work sheets shall be the document of record and shall be signed or initialed by the person performing the work and initialed by the supervisor after review. Dosimetry radiation exposure reports shall be computer generated and not signed. Work sheets will be filed by individual customer number along with all related pertinent information.

8.4.2.2 Nuclear Sciences Services

Routine performance requires documentation of all pertinent information with basic documents dated and initialed or signed. A major document shall be the initial Work Order which records all pertinent information such as the identity of samples and analyses to be performed. Work sheets,

utilized during the analytical procedure, shall be another major document and include all raw data and other information used in performing the analysis. The Report of Analysis shall be the final report of the data to the client and at least two successive steps of review, usually the supervisor and Cost Center Manager, are performed with review of the work sheet and the final data. Laboratory reports of analysis shall be signed by either the supervisor or Profit Center Manager who along with the persons who signed the data sheets can attest to the fact that the data was generated in accordance with established procedures.

8.5 INDEPENDENT AUDITS

Results shall be reviewed by the Q.C. Representative at each department. If a problem is indicated by the data, the nature of the problem shall be investigated and corrective steps taken immediately. A copy of each

quality control report shall be provided to the Quality Assurance Manager who reviews the results to evaluate the adequacy of the quality assurance program. The Quality Assurance Manager also provides independent audits of the quality assurance program at each department to verify compliance with quality assurance requirements set forth in this Quality Assurance Manual and in the standard procedures manual.

8.5.1 Responsibilites

8.5.1.1 The Profit Center Manager shall be responsible for documented procedures, equipment calibration, and maintenance.

8.5.1.2 Responsibility for compliance to the general workmanship and standard practices shall be vested in first line level of supervision. The supervisor shall, as necessary, indoctrinate and enforce employee compliance.

8.5.1.3 The Q.C. Representative at each department is responsible for in-house and independent performance testing, quality control samples, interlaboratory comparisons and quality control reports.

8.5.1.4 The Quality Assurance Manager shall be responsible for an independent quality assurance audit of each department.

SECTION 9 PERSONNEL TRAINING AND INDOCTRINATION

9.1 QUALIFIED PERSONNEL

All personnel within EAC perform activities that will affect quality. Training and indoctrination will be performed on an individual basis to assure that suitable proficiency is achieved and maintained.

9.1.1 Personnel processing TLD badges, performing analyses, and calibration functions shall have known and documented minimum qualifications of education and related work experience.

9.2 RESPONSIBILITY

Appropriate training shall be the responsibility of the supervisor with support by Profit Center Managers.

9.2.1 The supervisor shall determine capability and qualification of personnel and shall assign personnel to perform processes, analyses or calibrations based on their known abilities.

9.2.2 The supervisor shall be responsible for determining initial capabilities and qualifications, shall document and re-examine, and shall recertify personnel periodically. Documentation results shall be retained in personnel files for audit purposes.

9.2.3 Technicians will be informed of the requirements of 10 CFR Part 21, "Reporting of Defects and Non-compliance", and will be expected to familiarize themselves with this regulation.

9.2.4 Milestone achievements or unique training will be noted by the supervisor through entry to a training file and/or to the individual's personnel file.

9.2.5 Through both the management organization and also through the quality assurance chain of responsibility, individual cases of potential need for supportive training will be recognized with requirements developed by the individual supervisors.

SECTION 10 CONTROL OF MEASUREMENT AND TEST EQUIPMENT

10.1 MEASUREMENT AND TEST EQUIPMENT CALIBRATION POLICY

This section establishes the controls and calibration procedures for all equipment used to measure radiation, radioactive materials, or toxic materials. Equipment shall be routinely calibrated at intervals appropriate to the measurement being performed.

10.1.1 All equipment, both mechanical and electronic, shall be inspected/calibrated at established intervals against certified standards which have known, valid relationships to national standards.

10.1.2 The equipment that is used to determine the quality characteristics and accuracy of instruments shall be checked and verified either internally (dependent upon capability) or only by qualified calibration facilities.

10.1.3 Frequency of inspection/calibration shall be based upon how often the equipment or instrument is used, its inherent stability, and the type of

wear or condition of usage the equipment or instrument is subjected.

10.2 RESPONSIBILITY

Testing and calibration of equipment and instruments shall be performed by qualified technicians under the direction of the supervisor or Profit Center Manager, and performed under suitable environmental conditions.

10.3 PROCEDURES

All tests and calibrations shall be performed in accordance with written procedures which contain provisions for assuming that all prerequisites for the given test have been met including the appropriate equipment to be used.

10.4 CERTIFICATION AND CERTIFICATE OF CALIBRATION

10.4.1 National Bureau of Standards (NBS)

To the extent possible, calibration shall be traceable to the National Bureau of Standards. Records of traceability to NBS shall be maintained along with records of routine calibrations of each instrument or measurement

system. Where no NBS traceability exists, the basis used for calibration shall be documented.

10.4.2 Radioactive Source Calibration

Radioactive sources requiring periodic calibration shall be controlled and calibrated on a preset schedule. The gamma calibration sources shall be checked at one-year intervals. New calibration charts will be prepared when there is measurable change in calibration effect on instruments or dosimeters to be calibrated.

10.4.2.1 Gamma source calibration shall be measured by an instrument which has been calibrated at preset intervals by the National Bureau of Standards.

10.4.2.2 Alpha/beta sources shall be checked periodically to insure stability. If a source is damaged, then a recalibration will be requested to certify activity.

SECTION 10

10.5 CALIBRATION RECORDS

The calibration data for counting instruments will be recorded on the instrument log book, or on data work sheets if the calibrations are performed at more frequent intervals. Field/portable survey instruments will be identified with individual calibration labels. If an instrument is determined to be out of tolerance, it will be segregated or otherwise clearly tagged.

SECTION 11 DOCUMENT CHANGE CONTROL

11.1 POLICY

As the primary method of communication between all EAC facilities, documents that inform or direct activities affecting purchasing, sample analyses, TLD badge processing, instrument calibration and testing shall be controlled by the Quality Assurance Manual, standard operating procedures manuals, other documented procedures and by interoffice memorandums.

11.2 RESPONSIBILITY

The Quality Assurance Manager shall be primarily responsibile for the control of the Quality Assurance Manual.

11.2.1 The Q.A. Manager will notify all holders of Q.A. Manuals of changes to the Manual by distributing a document change notice.

11.2.2 Revisions or changes to the standard operating procedures shall be the responsibility of each Cost Center Manager.

11.2.3 The Q.A. Manager shall be advised of any changes

in procedures required to satisfy specifications of the client.

SECTION 12 QUALITY ASSURANCE AND INSPECTION RECORDS

12.1 POLICY

Work sheets, test and calibration data, and other documents that provide objective evidence of the quality of work shall be gathered, reviewed, and stored under the direction of the Q.C. Representative or designated representative at each department. These records shall be periodically reviewed appropriate to the work being performed. Records shall be maintained to provide historical review of any anomalies that are encountered. Records shall be identified so as to be retrievable at a later date.

12.2 RESPONSIBILITY

Primary responsibility for the control, completeness and reliability of quality assurance data, work sheets and documents shall be vested in the Q.C. Representatives. Secondary responsibility shall be vested with all EAC personnel handling, processing, analyzing, calibrating, etc., materials or services, for which controlling documentation is an associated part of the work being performed.

SECTION 12

12.3 RECORDS

Quality assurance records and work sheets as well as other documents verifying quality will be properly stored and made available to the customer upon request from the customer and/or responsible governmental agency representative.

12.3.1 All required records shall be legible and of a quality that can be copied.

12.3.2 Correspondence from clients may be available for inspection at the discretion of EAC and authorization from the originating organization.

12.3.3 Quality control records shall be identified and controlled by job number, customer identification and/or work order number which shall be assigned at the time the work is initiated.

12.3.4 Work sheets will identify the technician, his/her initials, results, calibration data, acceptability and date.

SECTION 12

12.4 STORAGE OF RECORDS

All quality assurance records shall be firmly attached in binders, placed in folders or envelopes and, if applicable, cross referenced by customer and stored in file cabinets.

12.4.1 Analytical records will be retained for a minimum of two years after results are reported to the customer.

12.4.2 Specific arrangements shall be made by the customer for longer retention of records.

12.4.3 Certain personnel dosimetry records will be retained indefinitely.

12.4.4 The Q.C. Representative or Profit Center Manager shall be responsible for governing access to and control of these files.

12.4.5 Some records will be moved and maintained in a storage area.

SECTION 13 CORRECTIVE ACTION

13.1 POLICY

In order to maintain and assure acceptable quality levels for services provided by EAC, a feed-back system shall be established to assure that conditions adverse to quality shall be promptly identified and corrected. Corrective actions shall be determined and initiated as indicated below.

13.2 RESPONSIBILITY

The supervisor, other professionals, and technicians shall be responsible for communicating any evidence of unacceptable quality performance to his supervisor and/or Profit Center Manager.

13.2.1 The Q.C. Representative and/or Profit Center Manager shall be responsible for investigating conditions adverse to quality, determining the assignable causes and recommending the actions necessary for their correction.

13.2.2 The Q.A. Manager and Profit Center Manager shall investigate and provide pertinent information regarding cause of the adverse conditions.

13.2.3 The Q.A. Manager shall review the information and actual conditions, assign cause then determine the specific corrective action necessary to preclude recurrence of the adverse quality condition.

13.2.4 The Q.A. Manager shall review routine quality control reports for evidence of unacceptable quality.

SECTION 14 AUDITS

14.1 POLICY

Eberline Analytical Corporation has established a comprehensive system of planned and documented audits to verify compliance with all aspects of the quality assurance program.

14.1.1 External Audits

The client is frequently responsible for auditing EAC's performance in satisfaction of regulatory requirements. The exact nature of this responsibility is in relation to the nature of the regulatory or licensing requirements, the significance of the services, and the technical expertise available or inherent within the client's organization. The need for and frequency of client audits is dependent upon the above factors. A client may authorize the regulatory authority to perform an audit on his behalf.

SECTION 14

14.1.2 Internal Audits

Eberline Analytical Corporation shall audit its own department to verify compliance with established procedures and requirements set forth in the Quality Assurance Manual. Audit frequency will be based upon performance indicators but will be at least once every two years. Use of a check list will insure items in compliance are noted as well as any requirements for improvement (see Audit Report Forms).

14.2 RESPONSIBILITY

These audits shall be performed by the Q.A. Manager with assistance from the Q.C. Representative and Profit Center Manager.

14.2.1 The Q.A. Manager shall be responsible for assuring that proper audits are performed by knowledgeable professional members of the EAC staff.

14.2.2 The Q.A. Manager shall have technical expertise in the functions audited as well as experience and training in the conduct of these audits.

SECTION 14

14.2.3 The Q.C. Representative shall not be directly responsible for the functions in the areas being audited.

14.3 DOCUMENTATION

Audit results along with recommendations for corrective action shall be documentated by the Q.A. Manager on the Audit Report Forms.

14.3.1 The President of EAC shall be provided with a copy of the audit report prepared by the Q.A. Manager.

14.3.2 The audit results shall be reviewed by the Profit Center Manager and Q.C. Representative having responsibility in the area audited.

14.3.3 Responsible supervisors in these areas shall take necessary action to correct the deficiencies revealed by the audit.

SECTION 14

14.4 DEFICIENT AREAS

Deficiencies shall be corrected by the person designated in the audit report as responsible for the corrective action.

14.4.1 The Q.A. Manager shall use various techniques to verify that corrective action has been accomplished including review of procedures, review of Q.C. results, and/or receipt of an interoffice memorandum from the Q.C. Representative or Profit Center Manager indicating what has been done to correct the deficiency.

14.4.2 The Q.A. Manager shall verify during the next audit that corrections have been accomplished.

14.5 FREQUENCY OF AUDITS

Audits shall be conducted every two years. It is desirable to conduct audits when one or more of the following conditions exists:

SECTION 14

14.5.1 When significant changes shall be made in functional areas of the quality assurance program, including significant reorganization and procedure revisions.

14.5.2 When systematic, independent assessment of program effectiveness shall be considered necessary.

14.5.3 When it shall be considered necessary to verify implementation of required corrective actions.

Section 8

SECTION 8

COMMUNITY INFORMATION PLAN FOR THE CHARACTERIZATION OF THE WASTE STORAGE AREA AT THE FEED MATERIALS PRODUCTION CENTER

SECTION 8

COMMUNITY INFORMATION PLAN FOR THE CHARACTERIZATION OF THE WASTE STORAGE AREA AT THE FEED MATERIALS PRODUCTION CENTER

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COMMUNITY INFORMATION PLAN

8.1 OVERVIEW

8.1.1 Background

This community information plan describes a two-way communication program that will be an integral part of the Waste Storage Area characterization study and analysis of remedial alternatives. To identify community concerns and desired opportunities for public involvement in this study, 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: first, accurate, understandable, and timely information concerning the study; and second, frequent opportunities to interact with study investigators. To meet these needs, an information and involvement program will be implemented, as detailed in this plan. The program's objectives to fulfill these objectives are described below.

8.1.2 Program Objectives

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

- To provide the community with accurate, understandable, timely information.
- To give community members opportunities to review data and analyses and to consider their viewpoints in our planning.
- 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 study 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.

8.1.3 Plan Organization

The community information plan contains four additional sections and two appendices:

- Section 8.2 describes briefly the two-phased study that will be performed. This section, along with the scope of work in Appendix A, should enhance the community's understanding of the waste characterization effort and the evaluation of remedial alternatives.

- Section 8.3 presents a summary of community concerns that will be addressed in the community information program.

- Section 8.4 describes information activities that will be a key part of the community information program. These activities are not necessarily related to study milestones.

- Section 8.5 lists community information activities targeted to specific study milestones.

- Appendix A contains a copy of the study scope of work.

- Appendix B contains a list of managers with major responsibilities for the study. The name, telephone number, and address of the community liaison for this study are also listed here.

8.2 INVESTIGATION AND STUDY

The community information program defined by this plan supports an investigation of the FMPC waste storage area and potentially affected areas within site boundaries and an evaluation of remedial alternatives.

A two-phased study will be performed beginning in the spring of 1986: first, a characterization of the waste storage facilities and their actual or potential impacts on health and the environment; and second, an identification and analysis of remedial action alternatives, including recommendations on the final disposition of the waste in the Waste Storage Area. The investigation and study are scheduled for completion in the winter of 1987. Phase I 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 comprehensive workplans for the site characterization, including a sampling plan, a health physics and

occupational safety and health plan, a quality assurance and quality control plan, and a data management plan. The community information plan will also be a component of the comprehensive workplan.

- 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 Phase II of the study, remedial alternatives for the FMPC waste storage area will be developed and evaluated. Remedial response objectives, identification of feasible remedial technologies and alternatives, and screening those alternatives against environmental protection, environmental effects, and technical feasibility factors will be carried out. Finally, for those alternatives that pass initial screening, alternatives will be subjected to a thorough technical, environmental, public health, institutional, and cost analysis, ranking of alternatives on the basis of this analysis, and selection of a preferred remedial alternative for the Department of Energy's consideration.

As described in the next section of this plan, citizens living near the FMPC and local officials are concerned about the data that will emerge from the investigation, and are interested in the analysis and selection of a remedial alternative. Because the community has expressed a strong desire for information and frequent interaction with study investigators, community members may have detailed questions about the scope of work (see copy in Appendix A). As described in Sections 8.4 and 8.5 of this plan, a number of activities will be undertaken a number of activities to ensure that community members understand the scope of work, are informed about study progress, and have an opportunity to review data and analyses.

8.3 CITIZEN INFORMATION AND INVOLVEMENT NEEDS

In April 1986, discussions were held with community members to identify major concerns about the site characterization study and the analysis of remedial alternatives. In general, community members suggested that an information program for the study should contain the following elements.

- Accurate, timely communications.
- Ease of access to information.
- Technical information and data.
- Improved relationship with plant management.
- Direct interactions with Westinghouse technical experts and WESTON investigators.

8.4 THE GENERAL PROGRAM

This section describes information and involvement activities that will be conducted during the site characterization study and the analysis of remedial alternatives. In general, these communication activities are applicable to both phases of the study 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.

8.4.1 Study Liaison

Community members have stated that they do not know whom to contact with specific questions related to the FMPC. To address this problem, Harry Horner has been designated by Westinghouse as the study liaison to the community. Mr Horner will be available to answer public officials' and citizens' questions on a day-to-day basis. In addition, Mr. Horner may set up meetings between community members and other study investigators, and assist community members in identifying information or reports that will be useful in their examination of study data or conclusions. Mr. Horner may be reached at (513) 738-6750, P.O. Box 398704, Cincinnati, OH 45239.

8.4.2 Reading Areas

Community members have asked to have an off-site reading area maintained and to be provided with circulating copies of reports in both the off-site reading area and in the FMPC's reading room.

Duplicate copies of study reports, fact sheets, news releases and briefings related to the study, as well as other relevant information related to the FMPC will be placed in the FMPC reading room. An index of items in the reading room will be updated monthly. Community members may sign out circulating copies for a seven day period. In addition, duplicate copies of these same items will be placed in the Lane Library in Hamilton.

The reading areas were ready for public use on June 1, 1986. The readiness of these areas was announced in the Hamilton Journal, the Cincinnati Post, and the Cincinnati Enquirer.

8.4.3 Regular Meetings

Community members have stressed that they want ease of access to information, regular opportunities to discuss study progress with the study investigators and clear explanations of technical data and study results. Community members have also requested productive meetings that encourage the provision of information and two-way discussion without generating negative publicity. To help address these needs, study investigators will meet with a small group of interested citizens and public officials concerns within the Fernald community three times a year to discuss study progress in detail, to answer questions, and to elicit community viewpoints. Meeting participants will primarily be technical experts and those responsible for carrying out the study investigation and analysis.

It is believed that meetings with community members who want to participate may be more productive than infrequent large meetings. (Please note in Table 8.1 that a large public meeting will be held, however, to review the recommended remedial alternative.) This activity will be to meet with the local interested public to discuss their questions, and information requests from the media. Advance notification of meetings and the meeting subject will be given so that interested community members may attend and participate.

Local elected officials and school board officials will be invited to evening seminars to review and discuss the WESTON activities and results. These meetings will be held at least three times a calendar year.

The community will have access to a Speaker's Bureau to talk to any small group meeting. The speakers will be kept current on the WESTON activities so they can address the questions.

At this time, it is believed that three meetings per year may be the most effective because it gives community representatives sufficient time to study reports and to prepare for the next meeting. Meetings can be held more or less frequently if community members believe a different schedule is more appropriate, or that it is important to schedule a meeting to support a study milestone (as described in Section 8.5 of this plan. Furthermore, community members need not wait two months to

get questions answered or to provide comments on study progress or results. The community liaison will be available on a daily basis to answer community members' questions and to transmit their comments to study managers.

8.4.4 Quarterly Newsletter

To provide another mechanism for improving access to timely information about the study, a quarterly newspaper will be distributed. The newsletter will be a substantive report of study progress, data gathered and analyzed, problems encountered, and next steps.

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 who sign up for its distribution.

8.4.5 Meetings With Local Officials

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

8.4.6 Media Briefings

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

8.4.7 Other Communication Activities

Ways will be continually looked for to explain study progress, findings, data, and next steps. A site tour program will be implemented to point out where and how Weston is working at the facility. A speakers bureau program will also be established that can support the information needs of schools, community groups, environmental organizations, and local businesses.

8.5.0 Study Milestones and Communication Activities

The previous section described general approach to providing information and to eliciting community viewpoints about the site characterization study and analysis of remedial alternatives. Table 8.1 defines the two-way communication program that has been planned for each stage of the study.

TABLE 8.1

COMMUNICATION ACTIVITIES

PHASE I: COMPREHENSIVE CHARACTERIZATION OF FMPC WASTE STORAGE AREA

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Task 1.1 Evaluate current waste situation on site; develop a comprehensive workplan for phase I work. Estimated completion: June 1986 • Prepare site background data • Prepare a summary of actual/potential on-site and off-site health and environmental effects • Prepare a summary of response actions to date • Establish site boundary conditions and grid system, and prepare map • Identify broad categories of applicable remedial technologies • Develop a sampling plan, a health physics/occupational safety and health plan, a quality assurance/quality control plan, and a data management plan	Conduct activities that will inform the community about the study • Prepare a press release which will: -- Announce beginning of site characterization study -- 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 8.4.3 of this plan) to review workplans, answer questions, and elicit community views

PHASE I: COMPREHENSIVE CHARACTERIZATION OF FMPC WASTE STORAGE AREA

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Task 1.2 Conduct site investigation. Estimated completion: October 1986 Investigations will include: • Waste characterization • Hydrogeologic investigations • Soil investigations • Surface water/sediments investigations • Air investigations • Radiological surveys	Conduct all relevant information activities listed in Section 4 of this plan Activities will include: • Preparing fact sheets on the investigations • Maintaining the reading areas • Providing information to the media and local officials, as requested • Holding discussions with the study liaison as needed

TABLE 8.1 (Cont.)

PHASE I: COMPREHENSIVE CHARACTERIZATION OF FMPC WASTE STORAGE AREA

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Task 1.3 Analyze results of site investigation. Estimated completion: early 1987. • 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 waste storage area 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 analysis phase of investigation; provide estimated publication date of final report • Throughout task, conduct all relevant information activities listed in Section 8.4 of this plan • When the final report is issued: -- Hold a Saturday or evening seminar for any citizen or official interested in attending that facilitates intensive review and discussion of study results -- Hold detailed media briefing -- Place report in reading areas

PHASE II: DEVELOPMENT AND EVALUATION OF REMEDIAL ALTERNATIVES FOR THE FMPC WASTE STORAGE AREA

TECHNICAL TASKS

Task 2.1 Evaluate any changes in the understanding of the waste situation on site; prepare workplan for analysis. Estimated completion: 30 days after approval of Phase II startup.

- Based on data gathered during the site investigation, clarify understanding of problems and issues related to cleanup
- Prepare a workplan for Phase II. Include technical approach, personnel requirements, and schedules

COMMUNITY INFORMATION ACTIVITIES

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. (See section 8.4.3 of this plan for comments on small meetings
- Revise this community information plan to reflect community comments on Phase II
- Continue to conduct all relevant information activities listed in Section 8.4 of this plan

PHASE II: DEVELOPMENT AND EVALUATION OF REMEDIAL ALTERNATIVES FOR THE FMPC WASTE STORAGE AREA

TECHNICAL TASKS

Task 2.2 Develop and screen alternatives for source control or off-site remedial actions, or both.

Estimated completion: spring/summer 1987.

- Establish objectives
- Identify technologies
- Identify alternatives
- Screen alternatives on the basis of environmental effects, environmental protection, and technical feasibility
- Eliminate alternatives for further study that do not meet screening tests

COMMUNITY INFORMATION ACTIVITIES

Conduct activities that will inform the community about the process of developing and screening alternatives; provide opportunities for community members to comment on objectives, identified alternatives, and the screening process.

- Prepare a fact sheet to explain process of developing and screening alternatives
- Hold a meeting with community representatives during this task (even if a digression from schedule) to ensure that community members have an opportunity to discuss the screening process
- When alternatives are selected for further analysis, again issue a fact sheet to document decision
- Continue to conduct all relevant information activities listed in section 8.4 of this plan

PHASE II: DEVELOPMENT AND EVALUATION OF REMEDIAL ALTERNATIVES FOR THE FMPC WASTE STORAGE AREA

TECHNICAL TASKS

Task 2.3 Conduct detailed analysis of alternatives and prepare draft and final reports.

Estimated completion: summer/fall 1987.

- Analyze each alternative's technical viability, environmental acceptability, ability to protect public health, institutional viability, and costs
- Rank alternatives against selected criteria

COMMUNITY INFORMATION ACTIVITIES

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 fact sheet to explain the process of analyzing alternatives, the alternatives under consideration, and the ranking process
- Announce preliminary findings on ranked alternatives
- Hold a Saturday or evening seminar open to citizens or officials interested in attending to explain the preliminary findings on ranked alteratives. Follow seminar with a three week period during which time community members can study and prepare additional questions

PHASE II: DEVELOPMENT AND EVALUATION OF REMEDIAL ALTERNATIVES FOR THE FMPC WASTE STORAGE AREA

TECHNICAL TASKS	COMMUNITY INFORMATION ACTIVITIES
Task 2.3 (Continued)	
• Prepare preliminary findings and draft 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,study investigators local officials, and represent-tives from community. Time limits for questions of the panel would be imposed by an impartial third party chair
• Prepare a final report	• Throughout the task, conduct all relevant information and involvement activities listed in Section 8.4 of this plan

APPENDIX A

SCOPE OF WORK

Appendix "A"

STATEMENT OF WORK

INTRODUCTION

NLO, Inc., hereafter referred to as the contractor, operating under its prime Contract No. DE-AC05-76OR01156 with the United States Department of Energy (DOE), coordinates activities, including waste management activities, at the Feed Materials Production Center (FMPC), Fernald, Ohio. NLO is administratively responsible to the Oak Ridge Operations Office of the DOE. Waste Management activities are funded and directed by the DOE Office of Defense Waste and By-Product Management.

As part of the comprehensive waste management/environmental program for the FMPC, specific remedial alternatives are being developed and evaluated for the final disposition of low-level radioactive waste inventory currently stored at the site. The alternatives currently identified include in-site stabilization, retrieval/reprocessing and off-site disposal. This subcontract is being issued to conduct a Remedial Investigation of the FMPC waste storage facilities and a Feasibility Study examining the various remedial alternatives. For purposes of this Request for Proposals the term FMPC waste storage facilities shall refer to six storage pits, three concrete silos and adjoining area. Activities associated with the Remedial Investigation will include, but are not limited to, assessment of existing data and reports, development of a detailed work plan, performance of field investigations, data interpretation and analysis and final reporting. Work items associated with the Feasibility Study include: development of remedial alternatives, initial screening of alternatives, and detailed analysis of options, ranking of alternatives and final reporting.

The services of a qualified engineering-consulting firm to conduct the Remedial Investigation and Feasibility Study, including all necessary and required sampling, measurement and analytical services, equipment and facilities, field and office personnel and necessary support facilities is being sought through this Request for Proposals.

OBJECTIVES

The purpose of the proposed subcontract will be to perform a Remedial Investigation/Feasibility Study for the FMPC waste storage area which consists of the following tasks:

1) Review existing data, records, reports, drawings, etc. to assess the current site situation to establish a basis for the proposed investigations.

2) Develop necessary support documentation, eg. Safety Plan, necessary to scope and to conduct the site investigations.

3) Conduct investigations necessary to characterize the waste storage facilities and their actual or potential impact on health and the environment, and to provide data for evaluation of remedial alternatives.

4) Perform an analysis of the site investigation results to identify pathways, assess exposures, and identify any additional data needs to support the Feasibility Study.

5) Develop and perform a detailed analysis of a limited number of remedial action alternative for the final disposition of the stored waste inventories.

6) Evaluate and select a preferred remedial action alternative.

Scope of Work

1.0 Purpose

The purpose of this subcontract is to obtain professional engineering services to conduct a comprehensive characterization of the radioactive waste storage area at the Contractor's plant and to prepare a detailed Feasibility Study examining the various remedial action alternatives available for the eventual disposition of the stored waste inventories. For purposes of this subcontract, the FMPC waste storage area includes six low-level radioactive waste storage pits, two earthern-bermed concrete silos containing K-65 residues (high specific activity, low-level radium-bearing residues), one concrete silo containing cold metal oxides and all affected adjoining areas.

1.1 The subcontractor shall furnish all labor, materials, equipment, services and supervision required to complete this project other than specifically listed herein this Request for Proposals as being furnished by NLO, Inc.

1.2 Prospective subcontractors shall inspect the site and review available documents in order to fully understand the scope of work and to arrive at a clear understanding of the conditions under which the work is to be performed. Failure to inspect the site prior to submitting a proposal will not relieve the Subcontractor of the responsibility of performing all work included in this subcontract.

1.3 The following general outline of the principal features of work included in this project does not in any way relieve the Subcontractor of the responsibility to perform all of the work required:

A. The work shall consist of furnishing all labor, equipment and materials and performing all operations in connection with an investigation and Feasibility Study as described herein, including the preparation of Phase I and II Final Reports.

B. Where the term Subcontractor is used in this specification, it shall refer to an organization experienced in radiological/hazardous waste site analysis and having, either within its structure or through subcontract, the capability of making these tests and performing the analysis of the testing as described herein. The firm shall have within its organization a technical staff knowledgeable in this type of testing and analysis which enable them to properly interpret test results and to provide the information specified herein. Information or data demonstrating the subcontractor's qualifications as stated herein, shall be furnished with the subcontractor's proposal.

2.0 Execution

2.1 General

A. The Subcontractor shall furnish from its organization, or by subcontract, a competent crew experienced in radiological/hazardous waste site investigations, and all equipment and facilities necessary to conduct the study.

B. The equipment used for making tests under this specification shall provide a means to reference documents for calibration. The equipment shall be maintained in first class condition.

c. The Subcontractor shall have on the job at all times when operations are in progress, a trained technician or engineer who can prepare field notes and logs. This individual shall be authorized to accept and act upon instructions of the Engineer in Charge of Project, and to make on-site decisions concerning the field characterization program.

3.0 Work Required

The work required under this subcontract consists of two separate phases. Phase I of the subcontract entails the completion of the Remedial Investigation. Phase II is the completion of an engineering Feasibility Study examining potential remedial action alternatives.

3.1 Phase I - Remedial Investigation

A. Purpose

The purpose of this Remedial Investigation is to perform a comprehensive characterization of the FMPC waste storage area.

B. Scope

The remedial investigation consists six tasks:

Task 1 -- Evaluation of Current Situation

Task 2 -- Investigation Support Documentation

Task 3 -- Site Investigations

Task 4 -- Site Investigation Analysis

Task 5 -- Laboratory and Bench-Scale Studies

Task 6 -- Reporting

TASK 1 -- EVALUATION OF CURRENT SITUATION
The Subcontractor shall identify and develop a data base and evaluate the background of the site and its problems to further define the scope of the remedial investigation of the site. Data gathered during previous investigations, site inspections, and other relevent activities shall be used as appropriate. Previous investigations shall be summarized and referenced.

a. Site Background. Prepare a summary from existing reports of the regional location, pertinent area boundary features, and general site physiography, hydrology, geology, and current and historic land and water use. The total area of the site and the general history relative to the use of the site for radioactive/hazardous waste activity should be defined.

b. Nature and Extent of Problem. Prepare a summary of actual and potential on-site and off-site health and environmental effects. This summaryu shall include: the types, physical states, and amounts of radioactive/hazardous wastes; the existence and condition of the FMPC waste storage facilities; affected media and pathways of exposure; contaminated releases such as leachate and runoff; and any human or environmental exposure. Emphasis shall be placed on describing the threat or potential threat to public health and environment.

c. History of Response Actions. Prepare a summary of any response actions conducted by the Contractor or its representatives. This summary shall include field inspections, sampling surveys, cleanup activities, and other technical investigations.

d. Definition of Boundary Conditions. Establish site boundary conditions to limit the area of remedial investigations. The boundary conditions shall be set so that subsequent investigations will cover the contaminated media in sufficient detail to support following activities, e.g., feasibility study.

e. Establishment of Grid System. Establish a permanent, recoverable grid system for locating sampling points and all current or future work performed at the site. The grid system shall be tied to the existing FMPC coordinate system.

f. Site Map. Prepare a site map showing all wetlands, surface water features, waste storage facilities, buildings, utilities, paved areas, and other features. The map shall be of sufficient detail and accuracy to locate all current or future work performed at the site.

g. Pre-Investigation Evaluation. Prior to starting any remedial investigations, the Subcontractor shall assess the site conditions to identify potential remedial technologies applicable to the site and associated data needed to evaluate alternatives based on these technologies for the feasibility studies. A report shall be prepared identifying broad categories of remedial technologies that may be applicable to the site and data needs.

TASK 2 - INVESTIGATION SUPPORT DOCUMENTATION

The Subcontractor shall prepare and submit for approval a comprehensive work plan to direct the remedial investigation. The work plan shall outline data needs for characterizing the site and for support of the feasibility study. The work plan shall include a detailed outline of proposed investigation activities, a time schedule, personnel and equipment requirements, and budget as well as the following:

- Sampling Plan
- Health Physics/Occupational Safety and Health Plan
- Quality Assurance/Quality Control Plan
- Community Relations Plan
- Data Management Plan

a. Sampling Plan. The subcontractor shall prepare a Sampling Plan to address all field activities to obtain additional site data and to physically and chemically characterize all potentially radioactive/hazardous wastes at the site. This activity should include identification of the location and probably quantities of subsurface wastes using appropriate methods. The plan will contain a statement of sampling objectives; specification of equipment, analytes of interest, sample types, and sample locations and frequency; and schedule. The plan shall provide for use of field screening techniques to screen out samples that do

not require off-site laboratory analysis. The plan will also include or reference a quality assurance and quality control plan and documentation and estimates of costs and labor. The plan must address all levels of the investigation as well as all types of investigations conducted (e.g., waste characterization, hydrogeologic, soils and sediments, air and surface water). The plan shall include a description of the chain-of-custory procedures to be used.

The sampling plan developed for this subtask shall address incompatibility testing of wastes (tank and drum opening procedures if necessary). Wastes shall be analyzed and grouped in compatibility classes to support any subsequent conclusions about segregating wastes on-site and developing remedial alternatives.

b. Health Physics/Occupational Safety and Health Plan

The Subcontractor shall prepare a Health and Safety Plan to address hazards to the investigation team and the surrounding community from investigation activities. The plan should address all applicable regulatory requirements and detail personnel responsibilities, protective equipment, procedures and protocols, decontamination, training, and medical surveillance. The plan should identify problems or hazards that may be encountered and their solutions. Procedures for protecting third parties such as visitors or the surrounding community will also be provided.

The plan will be consistent with applicable guidelines, regulations and consensus standards provided by agencies including: Department of Energy, Environmental Protection Agency, Occupational Safety and Health Administration, Nuclear Regulatory Commission, National Institute for Occupational Safety and Health, and American Conference of Governmental Industrial Hygienists.

c. Quality Assurance/Quality Control Plan (QA/QC)

The subcontractor shall prepare a Quality Assurance/Quality Control Plan to assure that information of the highest attainable precision and accuracy is obtained in the investigation, through pre-planned control of all project elements whichmay directly or indirectly have an impact on the integrity of the information.

The QA/QC Plan will be consistent with applicable regulations and the following QA documents and successors:

DOE 5700.6A (latest revision),
OR 5700.6 (latest revision), and
DOE 5484.1 (latest revision).

The QA/QC Plan shall apply to all work undertaken by the subcontractor, suppliers and all others involved in the program. The Plan will assure that activities are performed in a controlled manner according to sound standards and practices, with valid and retrievable data, with provisions to control and verify the work as undertaken, and to identify and correct any significant quality problems.

To reflect the nature of the work to be undertaken, the Plan will be implemented and maintained with primary emphasis on health and safety, and environmental concerns. The Plan shall include or reference from the Sampling Plan the following points:

a) QA Objectives for Measurement Data, in terms of precision, accuracy, completeness, representativeness, and comparability.

b) Sampling Procedures

c) Sample Custody

d) Calibration Procedures, References,and Frequency

e) Internal QC Checks and Frequency

f) QA Performance Audits,System Audits, and Frequency

g) QA Reports to Management

h) Preventive Maintenance Procedures and Schedule

i) Specific procedures to be used to routinely assess data precision, representativeness, comparability, accuracy, and completeness of specific measurement parameters involved.

j) Corrective Action

d. Community Relations Plan. The Subcontractor shall prepare a plan, based on discussions with responsible local and State officials and interested community leaders, for the dissemination of information to the public regarding investigation and feasibility study activities and results. Opportunities for comment and input by citizen, community and other groups must also be identified and incorporated into the plan.

e. Data Management Plan. The Subcontractor shall develop and initiate a data management plan to document and track investigation data and results. This plan should identify and set up laboratory and data documentation materials and procedures, project file requirements, and project related progress and financial reporting procedures and documents.

TASK 3 -- SITE INVESTIGATIONS

The Subcontractor shall conduct investigations necessary to characterize the site and its actual or potential hazard to public health and the environment. The investigations shall produce sufficient data to assess remedial alternatives and support the detailed evaluation of alternatives during the feasibility study.

The site investigation activities will follow the plans set forth in Task 2. All sample analyses will be conducted at laboratories following EPA protocols, or equivalents. Strict chain-of-custody procedures will be followed and all samples will be located on the site map (and grid system) established under Task 1.

a. Waste Characterization. The Subcontractor shall develop and conduct a complete sampling and analysis program to supplement existing data and to physically and chemically characterize all potentially radioactive/hazardous wastes at the site. This activity should include identification of the location and probable quantities of subsurface wastes using appropriate methods (e.g., core sampling, borehole logging, electromagnetic survey, ground penetrating radar). All sampling and analytical work shall be conducted following EPA protocols and strict chain-of-custody procedures as outlined in the Sampling Plan.

b. Hydrogeologic Investigation. The Subcontractor shall develop and conduct a program to determine the present and potential extent of groundwater contamination within the waste storage area. The sampling program shall be developed to augment, as necessary, the existing groundwater monitoring program to determine the location of water-bearing strata and other subsurface geologic features, groundwater flow direction, vertical and horizontal distribution of contaminants, background levels of contamination, and the ability of the facility and local geology to control or contain the contaminants. Long-term disposition of contaminants will be evaluated based on mobility of the contaminants, attenuation capacity of local soils and other geologic features, regional flow direction and quantity, effects of local pumping, and the presence of discharge/recharge areas.

The Sampling Plan developed for this subtask shall define the type of well construction and any geophysical or modeling techniques proposed.

c. Soil Investigation. The Subcontractor shall develop and conduct a program to determine the nature and vertical and horizontal extent of contamination of surface and subsurface soils in the waste storage area. Cores from groundwater monitoring wells may serve as soil samples.

d. Surface Water and Sediments Investigation. The Subcontractor shall develop and conduct a program to determine the nature and extent of contamination of surface water and sediments in drainage ditches within and surrounding the waste storage area, and in Paddy's Run Creek. This program shall also evaluate the impacts of the contaminants on the floral and faunal communities in the surface water, sediments, and any adjacent wetlands.

e. Air Investigation. The Subcontractor shall develop and conduct a program to determine the nature and extent of on-site and off-site contamination resulting from waste facility operations. The program shall be developed to augment, as necessary, the existing air monitoring programs to assess the tendency of the substance identified through Waste Characterization to enter and disperse in the atmosphere, considering seasonal weather conditions and wind patterns.

f. Radiological Survey. The Subcontractor shall conduct a program to determine the nature and extent of surface and subsurface radioactive contamination present in the soil within and surrounding the waste storage area.

The above tasks should be summarized in a single sampling plan which is to be included in the detailed work plan.

TASK 4 -- SITE INVESTIGATION ANALYSIS

The Subcontractor shall prepare a thorough analysis and summary of all site investigations and their results. The objective of this task will be to ensure that the investigation data are sufficient in quality and quantity to adequately describe the nature and extent of contamination and to support the feasibility study.

The results and data from all site investigations shall be organized and presented logically so that the relationships between remedial investigations for each medium are apparent.

a. Data Analysis. Analyze all site investigation data and develop a summary of the type and extent of contamination at the site. This analysis shall include all significant pathways of contamination and an exposure assessment. The exposure assessment shall describe any actual or potential threats to public health, welfare, and the environment.

b. Application of Potential Remedial Technologies. Analyze the results of the site investigations in relation to the potential remedial technologies applicable to the site. This analysis will determine the adequacy of data quality and quantity to support the feasibility study and will identify any additional data needs.

TASK 5 -- LABORATORY STUDIES AND BENCH-SCALE STUDIES [redacted]

The Subcontractor shall conduct any necessary laboratory and bench scale treatability studies required to evaluate the applicability of remedial technologies, e.g., leachate treatment, groundwater treatment, compatibility of waste/leachate with liners, cover, or other materials proposed for use in the remedy. The scope of this Task will depend on the results of Task 4. The Subcontractor will submit a separate work plan for any proposed laboratory studies for Contractor's approval

TASK 6 -- REPORTING

a. Monthly Technical Progress Reports. The subcontractor shall prepare Monthly Technical Progress Reports covering the following elements:

1. Identification of site and activity.
2. Status of work at the site and progress to date.
3. Percentage of completion.
4. Difficulties encountered during the reporting period.
5. Actions being taken to rectify problems
6. Activities planned for the next month.
7. Changes in personnel.

The Progress Monthly Report will list target and actual completion dates for each element of activity including project completion, and provide an explanation of any deviation from the milestones in the work plan schedule.

b. Final Report. Upon completion of the site investigation, the Subcontractor shall prepare a Final Remedial Investigation Report. The Report shall include the results of Tasks 1 through 5. The Subcontractor shall submit a draft report within thirty (30) calendar days following completion of Tasks 1 through 5. The Final Remedial Investigation Report shall be issued within thirty (30) calendar days after receiving Contractor comments on the draft report.

3.2 Phase II - Feasibility Study

PURPOSE

The purpose of this Feasibility Study is to develop and evaluate remedial alternatives for the FMPC waste storage area.

The Subcontractor shall furnish the necessary personnel, materials, and services required to prepare the remedial action Feasibility Study.

SCOPE

The feasibility study consists of seven (7) tasks:

Task 1 -- Description of Current Situation
Task 2 -- Work Plan
Task 3 -- Development of Alternatives
Task 4 -- Initial Screening of Alternatives
Task 5 -- Detailed Analysis of Alternatives
Task 6 -- Evaluation and Selection of Preferred Alternative
Task 7 -- Reporting

TASK 1 -- DESCRIPTION OF CURRENT SITUATION

Any changes to the description of the current situation from Phase I Task 1 shall be presented. Justification for changes must be based on results of the remedial investigation.

A site-specific statement of purpose for the response, based on the results of the remedial investigation, should be presented. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by remedial alternatives. This statement of purpose shall be submitted for concurrence before continuing the remaining tasks of the Feasibility Study.

TASK 2 -- WORK PLAN

The Subcontractor shall prepare a work plan that includes a detailed technical approach, personnel requirements, and schedules for the proposed Feasibility Study.

TASK 3 -- DEVELOPMENT OF ALTERNATIVES

Based on the results of the remedial investigation, the Subcontrctor shall develop a limited number of alternatives for source control or off-site remedial actions, or both, on the basis of objectives established for the response.

a. Establishment of Remedial Response Objectives. Establish site-specific objectives for the response based on public health and environmental concerns, information gathered during the remedial investigation, and the requirements of any applicable Federal or State statutes. Preliminary cleanup objectives shall be developed in consultation with and for concurrence by the Contractor.

b. Identification of Remedial Technologies. Based on the site-specific problems and statement of purpose identified in Task 1, develop a master list of potentially feasible technologies. These technologies will iclude both on-site and off-site remedies, depending on site problems. This master list will be screened based on site conditions, waste characteristics, and technical development to eliminate or modify those technologies that may prove extremely difficult to implement, will require unreasonable time periods, or will rely on insufficiently developed technology.

c. Identification of Remedial Alternatives. Develop alternatives to incorporate remedial technologies, response objectives, and other appropriate considerations into a comprehensive, site-specific approach.

There may be overlap among the alternatives developed. All alternatives must meet the requirements of all applicable State and Federal environmental laws including permitting requirements as well as objectives of the DOE Low-level Waste Management Program.

TASK 4 -- INITIAL SCREENING OF ALTERNATIVES

The alternatives developed in Task 3 shall be screened by the Subcontractor to eliminate alternatives, prior to detailed analysis, that are clearly not feasible or appropriate. All decisions made as a part of this screening of alternatives should be documented.

a. Considerations to be Used in Initial Screening. Three (3) broad considerations must be used as a basis for the initial screening: cost, public health, and environmental. More specifically, the following factors must be considered:

1. Environmental Protection. Only those alternatives that satisfy the response objectives and contribute substantially to the protection of public health, welfare, or the environmental will be considered further. Source control alternatives will achieve adequate control of source materials. Off-site alternatives will minimize or mitigate the threat of harm to public health, welfare, or the environment.

2. Environmental Effects. Alternatives posing significant adverse environmental effects will be excluded.

3. Technical Feasibility. Technologies that may prove extremely difficult to implement, will not achieve the remedial objectives in a reasonable time period, or will rely upon unproven technology should be modified or eliminated.

TASK 5 - DETAILED ANALYSIS OF ALTERNATIVES

Evaluate the cost-effectiveness of alternative remedies that pass through the initial screening in Task 4.

Alternative evaluation will be preceded by a detailed development of the alternatives remaining after the screening.

a. Technical Analysis. The Technical Analysis will include as a minimum:

1. Description of appropriate treatment, storage, and disposal technologies.

2. A discussion of how the alternative does (or does not) comply with specific requirements of other environmental programs. When an alternative does not comply, discuss how the alternative prevents or minimizess the migration of wastes and public health or environmental impacts and describe special design needs that could be implemented to achieve compliance.

3. Operation, maintenance, and monitoring requirements of the remedy.

4. Identify and review potential off-site facilities to ensure compliance with applicable DOE and EPA environmental program requirements. Potential disposal facilities should be evaluated to determine if off-site management of site wastes could result in the potential for a future release from the disposal facility.

5. Temporary storage requirements, off-site disposal needs, and transportation plans.

6. Describe whether the alternative results in permanent treatment or destruction of the wastes, and if not, the potential for future release to the environment.

7. Safety requirements for remedial implementation (including both on-site and off-site health and safety considerations).

8. A description of how the alternative could be phased into individual operable units. The description should include a discussion of how various operable units of the total remedy could be implemented individually or in groups, resulting in a significant improvement to the environment or savings in costs.

9. A description of how the alternative could be segmented into areas to allow implementation of differing phases of the alternative.

10. A description of special engineering requirements of the remedy or site preparation considerations.

b. Environmental Analysis. Perform an environmental analysis considering each alternative. The environmental analysis should focus on the site problems and pathways of contamination actually addressed by each alternative. The environmental analysis for each alternative will include, at a minimum, an evaluation of beneficial effects of the response, adverse effects of the response, and an analysis of measures to mitigate adverse effects. The no-action alternative will be fully evaluated to describe the current site situation and anticipated environmental conditions if no actions are taken. The no-action alternative will serve as the baseline for the analysis.

c. Public Health Analysis. Each alternative will be assessed in terms of the extent to which it mitigates long-term exposure to any residual contamination and protects public health both during and after completion of the remedial action. The assessment will describe the levels and characterizations of contaminants, potential exposure routes, and potentially affected population. The effect of "no-action" should be described in terms of the short-term effects (e.g., lagoon failure), long-term exposure to hazardous substances and resulting public health impacts. Each remedial alternative will be evaluated to determine the level of exposure to contaminants and the reduction over time. The relative reduction in public health impacts for each alternative will be compared to the no-action level. For off-site measures, the relative reduction in impact will be determined by comparing residual levels of each alternative with existing criteria, standards, or guidelines acceptable to EPA. For source control measures, or when criteria, standards, or guidelines are not available, the comparison should be made based on the relative effectiveness of technologies. The no-action alternative will serve as the baseline for the analysis.

d. Institutional Analysis. Each alternative will be evaluated based on relevant institutional needs that may apply. Specifically, regulatory requirements, permits, community realtions, and participating agency coordination will be assessed.

e. Cost Analysis. Evaluate the cost of each feasible remedial action alternative (and for each phase or segment of the alternative). The cost will be presented as a present worth cost and will include the total cost of implementing the alternative and the annual operating and maintenance costs. Both monetary costs and associated non-monetary costs will be included. A distribution of costs over time will be provided.

TASK 6 - EVALUATION AND RANKING OF ALTERNATIVES

The Subcontractor shall review the results of the detailed analyses of alternatives prepared under Task 5, and rank the alternatives considering, at a minimum, the following areas:

a. Present Worth of Total Costs. The net present value of capital and operating and maintenance costs also must be presented.

b. Health Information. For the no-action alternative, a quantitative statement including a range estimate of maximum individual risks should be presented. Where quantification is not possible, a qualitative analysis may suffice. For source control options, a quantitative risk assessment is not required. For off-site measures, present a quantitative risk assessment including a range estimate of maximum individual risks.

c. Environmental Effects. Only the most important effects or impacts should be summarized. Reference can be made to supplemental information arrayed in a separate table, if necessary.

d. Technical Aspects of the Remedial Alternative. The technical aspects of each remedial alternative relative to the others should be clearly delineated. Such information generally will be based on the professional opinion of the Subcontractor regarding the site and the technologies comprising the remedial alternative.

e. Extent to Which Remedial Alternatives Meet the Technical Requirements and Environmental Regulations. This information should be arrayed so that differences between the remedial alternatives, in terms of how they satisfy such standards, are readily apparent. The general types of standards that may be applicable at the site include:

1. RCRA design and operating standards;
2. DOE Orders for Waste Management;
3. DOE Order for Environment, Safety and Health.

f. Information on Community Effects. The type of information that should be provided is the extent to which implementation of a remedial alternative disrupts the community (e.g., traffic, temporary health risks, and relocation).

g. Other Factors. This category of information would include such things as institutional factors that may inhibit implementing a remedial alternative and any other site-specific factors identified in the course of the detailed analyses that may be important enough to influence which alternative is eventually selected.

TASK 7 - REPORTING

a. Monthly Technical Progress Reports. The Subcontractor shall prepare Monthly Technical Progress Reports covering the following elements:

1. Status of work and progress to date
2. Percentage of completion.
3. Difficulties encountered during the reporting period.
4. Actions being taken to rectify probloems.
5. Activities planned for the next month.
6. Changes in personnel.

The progress monthly report will list target and actual completion dates for each element of activity including project completion and provide an explanation of any deviation from the milestone in the work plan schedule.

b. Final Report. Upon completion of the Feasibility Study, the Subcontractor shall prepare a Final Feasibility Study Report. The Report shall include the results of Tasks 1 through 6. The Subcontractor shall submit a Draft Report within thirty (30) calendar days following completion of Tasks 1 through 6. The Final Feasibility Study Report shall be issued within thirty (30) calendar days after receiving Contractor comments on the draft report.

4.0 Deliverables:

Phase I - Remedial Investigation

1. Task 1a - Site Background
   b - Nature and Extent of Problem
   c - History of Response Actions
   d - Definition of Boundary Conditions
   e - Establishment of Grid System
   f - Site Map
   g - Pre-Investigation Evaluation

2. Task 2a - Sampling Plan
   b - Health Physics/Occupational Safety & Health Plan
   c - QA/QC Plan
   d - Data Management Plan

3. Task 4 -- Site Investigation Analysis

4. Task 5 -- Work Plan for Laboratory and Bench Scale Studies (optional)

5. Task 6a - Monthly Technical Progress Reports
   b - Final Remedial Investigation Report

Phase II - Feasibility Study

6. Task 1 -- Description of Current Situation

7. Task 2 -- Work Plan

8. Task 3a - Remedial Response Objectives
   b - Identified Remedial Technologies
   c - Identified Remedial Alternatives

9. Task 5 -- Detailed Analysis of Alternatives Including Decisions Documents

10. Task 7a - Monthly Technical Progress Reports
    b - Final Feasibility Study Report

TENTATIVE SCHEDULE AND CONTRACT:

Phase I work should begin within thirty (30) days of the subcontract award date. It is anticipated that records review, site orientation, and final scoping will be completed within thirty (30) days of work start date, completion of support documentation within sixty (60) days, and completion of charactyerization field work and analysis within one hundred eighty (180) days. The Subcontractor shall submit a draft Remedial Investigation Report within thirty (30) calendar days after all testing is completed for review by Contractor. Contractor shall require thirty (30) days for review of the draft report.

After receiving comments by Contractor concerning the draft report the subcontractor shall sbumit the final Remedial Investigation Report within thirty (30) calendar days.

The Subcontractor shall not proceed with Phase II, nor incur any costs therefore, until written authorization has been granted by Contractor. In the event the Contractor does not grant authority to proceed with Phase II, the Subcontractor agrees that the total Subcontract price shall be actual costs incurred for Phase I, plus the fixed fee for that Phase. After receiving authorization, the Subcontractor shall commence work on Phase II within fifteen (15) calendar days. The Subcontractor shall submit a draft Feasibility Study within one hundred twenty (120) calendar days from the authorization date. Contractor shall require thirty (30) days for review of the draft report. After receiving comments by Contractor concerning the draft report, the Subcontractor shall submit the final Feasibility Study within thirty (30) calendar days.

SPECIAL PROJECT CONDITIONS

GENERAL CONDITIONS

The following General Conditions shall become a part of the proposed subcontract.

1.0 General

Services furnished under this subcontract will be performed at the Feed Materials Production Center (FMPC), Fernald, Ohio. The Production Center is operated by NLO, Inc., herein referred to as "Contractor," for the Department of Energy.

2.0 Submittals

2.1 Scheduling

The Subcontractor, prior to commencing site work under this subcontract, shall submit to the Contractor a schedule for review and approval. The Subcontractor shall not start any work prior to the approval of the schedule.

A. The schedule shall relate to the entire project to the extent required for a realistic schedule.

B. The schedule shall indicate the date for starting and completing the subcontract.

C. The schedule shall be maintained and updated as required by the circumstances of the work.

2.2 Schedule of Values

Before the first application for payment, the Subcontractor shall submit to the Contractor a schedule of values allocated to the various portions of the work, prepared in such a form and supported by such data to substantiate its accuracy. This schedule shall be used only as a basis for the Subcontractor's progress payments.

2.3 Safety Program

The Subcontractor shall submit to the Contractor an outline of his safety program as defined in the "Safety and Health Regulations" section of these specifications.

3.0 Time Losses

The Subcontractor is entitled to compensation for all Contractor-caused time losses such as fume releases and other unforeseen events if the time loss per event is excess of fifteen (15) minutes. A list of Subcontractor personnel affected, time of occurrence and the time lost shall be submitted in writing to the Project Engineer no later than the close of the day in which the time loss occurred. Substantiation or denial of a claim by the Subcontractor for lost time shall be by the NLO, Inc. Engineer in Charge of Project.

4.0 Applicable Codes and Standards

4.1 Applicable Codes and Standards (in effect as of the date of the Subcontract) referred to in these specifications shall establish minimum requirements for equipment, materials, and construction and shall be superseded by more stringent requirements of drawings and specifications when and where they occur.

4.2 All specifications of national organizations and trade associations related to the building industry, such as the American Society for Testing and Materials; Portland Cement Association; American Institute of Steel Construction; National Fire Protection Association; American Association of State Highway Transportation Officials; National Electrical Code and others, as referred to in this specification, shall mean the lab test revision of such specifications, except as otherwise noted.

4.3 Any conflicts between specifications and applicable codes and standards shall be resolved by mutual agreement between the Contractor and the Subcontractor.

5.0 Prework Conference

5.1 Prior to the start of any construction work, a responsible representative of the Subcontractor and the Subcontractor's Supervisor who will be in active charge of the actual work, shall meet with the Contractor's representatives to discuss all aspects of the work involved.

5.2 The Subcontractor Administrator will contact the Subcontractor within three (3) days after issuance of the Notice to Proceed to arrange a meeting date which is mutually agreeable.

6.0 Utilities Furnished

6.1 Electric power, water and plant air for the Subcontractor's use in performing the work and for his use in warehousing and offices will be furnished without charge by the Contractor. Steam will be available for heating Subcontractor's buildings. The quantities and characteristics of these utilities will be limited to that which is available from existing outlets to be designated by the Contract.

6.2 The Subcontractor shall make arrangements with the Contractor for telephone service if required. Telephone service shall be at the Subcontractor's expense. The Subcontractor must notify the Contractor in writing to stop telephone service when it is no longer required. Service charges will continue until this is done.

7.0 Operations and Storage Areas

7.1 All operations of the Subcontractor, including storage of materials upon the site owned by the Government, shall be confined to the areas and roadways specifically shown on the drawings as being for such purposes and/or such other areas as may be directed by the Contractor.

7.2 No unauthorized or unwarranted entry upon or passage through or storage or disposal of materials on the site of work shall be done.

7.3 In the event the drawings do not specifically designate space or spaces for the exclusive use of the Subcontractor, areas of the site adjacent to the worksite will be made available for use as ground storage only.

7.4 All temporary shelters, such as trailers and/or shacks, shall be located as shown on the site plan drawing and/or as directed by the Contractor.

7.5 The work and storage areas shall be returned to their original condition after completion of the work.

8.0 Plant Operations Vital

8.1 It is vital that plant operations continue without undue interruption.

8.2 Where an interruption to plant operations is required in progressing the work covered by this subcontract, the following procedure shall be strictly adhered to:

A. The Subcontractor shall notify the Contractor, in writing, a minimum of one week in advance of the contemplated date of tie-in, giving a schedule showing actual operations and time required. The Contractor will notify all interested parties and secure approval for the tie-in at the time requested, or, if conditions so dictate, advise the Subcontractor when the tie-in can be made.

B. All operations required for the shutdown, i.e., operations of valves, switches, or other operating devices will be performed by Contractor forces. The actual tie-in work will be performed by the Subcontractor. NO SUBCONTRACTOR PERSONNEL WILL BE PERMITTED TO CLOSE OR OPEN ANY VALVE OR SWITCH.

C. The work performed by the Subcontractor will be inspected by the Contractor's authorized inspectors to determine if the completed work is satisfactory. Upon approval of the work, only the Contractor's forces will operate the valves, switches, or other operating devices, as required.

D. NO WORK ON TIE-INS WILL BE SCHEDULED BEFORE ALL MATERIALS AND/OR EQUIPMENT REQUIRED TO COMPLETE THE WORK ARE ON HAND. ALL work scheduled during shutdown shall be ABSOLUTELY completed within the previously agreed upon time schedule.

E. If anything caused by unforeseeable events should occur during the scheduled shutdown that will delay in any way the scheduled completion time, the Contractor shall be notified immediately so that the necessary steps can be taken.

9.0 Damage, Patching and Cleaning Up

9.1 The Subcontractor shall be held responsible for damage to existing facilities, or to completed new facilities, that may be caused by his work or workmen, or the work or workmen of his sub-subcontractors, and shall properly patch or remove and replace same as required by the Contractor.

9.2 The Subcontractor shall keep the premises free from accumulation of its waste material or rubbish and prior to completion of the work, remove all rubbish, tools, equipment and materials from and about the premises. Upon completion of the work, the Subcontractor shall

leave the work and premises in a condition satisfactory to the Contractor.

10.0 Removal of Subcontractor's Equipment and Surplus Materials

10.1 Before equipment and materials belonging to the Subcontractor can be removed from the FMPC, their removal must be authorized in writing by the Construction Supervisor.

10.2 The Subcontractor shall notify the Contractor of his intention to remove any equipment and/or materials from the FMPC site at least 24 hours prior to the proposed time of removal so that arrangements can be made for decontamination by the Contractor if required. If contamination exists, the items will be decontaminated by Contractor, at no expense to the Subcontractor.

10.3 All equipment and materials removed from the existing work by the Subcontractor and not specifically directed in the drawings and specifications to be reused in the subcontract work shall be delivered to the Contractor at a designated spoil area or storage warehouse or area on the FMPC site that will be designated by the Contractor's representative specified in Subsection 2.1 of the special conditions.

SPECIAL CONDITIONS

The following Special Conditions shall become a part of the proposed subcontract.

1.0 General

1.1 In the event of any discrepancies or differences between these Special Conditions and any other sections or porovisions of this subcontract, these Special Conditions shall govern.

1.2 Schedule

A. The Subcontractor shall commence work on Phase I of the project within thirty (30) calendar days after receipt of a written Notice to Proceed, and shall complete characterization within one hundred eighty (180) calendar days.

B. The Subcontractor shall submit a draft Remedial Investigation Report within thirty (30) days after characterization activities are complete.

C. The Subcontractor shall issue a final Remedial Investigation Report within thirty (30) days of receiving Contractor's comments on the draft version.

D. The Subcontractor shall proceed with Phase II within fifteen (15) calendar days of receiving written authorization from Contractor.

E. The Subcontractor shall submit a draft Feasibility Study within one hundred twenty (120) calendar days from the receipt of the authorization.

F. The Subcontractor shall submit a final Feasibility Study within thirty (30) calendar days after receiving the Contractor's comments on the draft version.

1.3 The time for compmletion set forth in foregoing subsection 1.2 shall be subject only to such changes as are specifically provided for in this subcontract.

2.0 Engineers Assigned to the Project

2.1 The Contractor hereby designates specific representatives as being in charge of this project for the purpose of assuring that the work is being properly executed. These representatives are:

	Phone Number
N. R. Leist, Director of Technical Services	738-6348
D. E. Diehl, Waste Management Dept. Head	738-6459
T. A. Poff, Subcontract Administrator	738-6453
T. A. Poff, Engineer in Charge of Project	738-6453

The above-named will be available to assist and cooperate with the Subcontractor to facilitate the progress and completion of the work involved with particular regard to interpretation of the drawings and specifications. However, these representatives are not authorized to direct any additional work not required by this subcontract, or to otherwise amend or modify any terms or conditions of this subcontract.

SAFETY AND HEALTH

All Subcontractor personnel must comply with the Safety and Health Regulation and Programs developed as part of the proposed subcontract. The following Special Conditions - Safety and Health Regulations shall become a part of the proposed subcontract.

SPECIAL CONDITIONS - SAFETY AND HEALTH REGULATIONS

1.0 Safety Program

As part of the safety requirements with which the Subcontractor must comply under Article XXXII, "Safety and Health", of the subcontract, the Subcontractor shall, prior to commencing site work under this subcontract, submit to

the Contractor a descriptive outline of his safety program (including the operations of sub-subcontractors) encompassing aspects of safety, health and fire protection, which program shall contain the following items:

1.1 A statement of the Subcontractor's safety policy.

1.2 The name and qualifications of the Subcontractor's official administering the safety program at the worksite.

1.3 The schedule of regular safety inspections to be conducted by the designated Subcontractor official.

1.4 The schedule of regular safety meetings to be held with employees to emphasize project safety, health and fire prevention.

1.5 The locations at which the "Notice to Employees" (Form ERDA-627) will be posted, and at which the "Occupational Safety and Health Complaint" forms will be available to employees.

1.6 An analysis of the personnel safety, health and fire hazards expected on the project, and the types of safety equipment and/or procedures to be used in facing those hazards.

1.7 A description of the Subcontractor's program for certifying the safe operating condition, and for assuring proper maintenance of earthmoving equipment, cranes, vehicles, pressure vessels, drillings protective devices for portable electric tools and other portable equipment.

1.8 The Subcontractor's program for ensuring adequate illumination and housekeeping in work areas.

1.9 The mechanism by which the Subcontractor will have available at all times information concerning the names and characteristics of all toxic materials, gases or liquids that he may introduce to the site or that may be produced in the course of the job. An affirmative plan to identify these materials and their effects to the employees and a program to protect employees from these potential hazards shall be included.

1.10 The mechanism for insuring that all personnel have and wear eye protection at all times while at the worksite.

1.11 <u>First Aid Program</u>

A. A list of employees available at the site who are trained in administering first aid.

B. Provisions for adequate first aid supplies.

C. The method for prompt investigation and reporting

of injuries to the Department of Energy.

1.12 Fire Prevention Program

The fire fighting facilities and capabilities of the operating contractor will be utilized by the Subcontractor as necessary. The Subcontractor's program should include specific measures for fire prevention and fire protection, such as cleanup of combustible debris and a final tour of the facility by a responsible employee of the Subcontractor to insure that no evidence of combustion remains undetected at the end of the work shift.

2.0 Safety and Health Requirements

2.1 The Subcontractor shall provide any facilities which he may require for the storage of tools and equipment of his personnel in order to maintain the work site in a clean orderly manner as would be indicatedby good housekeeping standards. The location of materials, tools, or equipment within the buildings in the Production Area at FMPC shall be subject to the approval of the Project Engineer. No materials, tools, or equipment may be stored in such a manner as to interfere with flow of traffic and production activities, or that could possibly expose buildings, pipe lines, or process equipment to damage in the event of fire.

2.2 Any hazard that is peculiar to the work site of this subcontract will be pointed out by the Contractor's Health & Safety Division in the Preconstruction Conference called for in Subsection 5.1 of the General Conditions.

2.3 Attention is specifically called to "No Smoking" areas posted at various locations throughout FMPC. All employees under the jurisdiction of the Subcontractor must strictly adhere to the regulations governing these areas. No smoking shall be permitted in paint storage or mixing area.

2.4 All Subcontractor personnel shall wear safety glasses or other appropriate eye protection equipment whenever they are in the working area. Goggles or safety glasses with side shields shall be worn by Subcontractor personnel involved in the removal of existing concrete work or other dust generating construction activities. Chemical goggles, when required, will be furnished by the Contractor. All other goggles and welding helmets shall be furnished by the Subcontractor.

2.5 Respiratory protection shall be used by Subcontractor personnel as required to conform to the limits for airborne contaminants specified in OSHA Subpart Z.

2.6 Hearing protection shall be used by Subcontractor

personnel operating air hammers and by any other workers whose exposure to noise level may exceed limits specified in OSHA 1910.95, "Occupational Noise-Exposure."

2.7 When special permission is necessary to perform certain phases of the work, for example, flame cutting and welding, the Subcontractor will obtain a "Flame Permit" from the Contractor's representative designated by Subsection 2.1 of the Special Conditions.

2.8 Equipment used by the Subcontractor shall be subject to inspection by Health and Safety personnel prior to being brought on site to assure compliance with DOE and OSHA requirements. Any equipment failing to meet these requirements will not be permitted on site. Where equipment requires periodic testing, i.e., cranes, hoists, electrical gloves, hot sticks, etc., proof of current testing must be provided.

2.9 The Subcontractor shall provide life lines and safety belts constructed and tested in accordance with ANSI A10.14. for use at all times by Subcontractor personnel engaged in securing or shifting thrustouts, inspecting or working on overhead machines, supporting scaffolds or other high rigging, and on steeply pitched roofs. Similarly, they shall be provided for and used by all workmen exposed to the hazard of falling more than 10 feet to the surface below.

2.10 All Class I & II flammable liquids, i.e., motor fuels, paint thinners, and solvents, shall be dispensed from approved and properly labeled safety containers only.

2.11 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.

2.12 All insulation on pipes, ducts, and other surfaces shall be presumed to contain asbestos unless markings or other evidence clearly prove the insulation to be asbestos-free. Asbestos containing materials shall be cut, removed, bagged, and otherwise handled in accordance with the requirements contained in 40 CFR 61, Subpart B, "National Emission Standards for Asbestos." During work involving asbestos, the work area shall be isolated and posted and workers in the isolated area shall wear suitable respiratory protection and follow provisions of OSHA 1910.1001, "Asbestos." The Subcontractor shall obtain a "Permit for Asbestos Work" from the Contractor's representative.

2.13 At times when it is necessary to barricade or "rope off" an area, all barricades, ropes, and warning signs, whether used in roadway or not, shall be in accordance with ANSI Standards D-6.1-1971 and will be furnished by the Subcontractor.

2.14 Smoking, other use of tobacco or the ingestion of any substance at work locations where radioactive materials or radioactively contaminated materials are handled is prohibited.

Any person who wishes to smoke or ingest of any item, including prescription medicines, is required to do so in an approved smoking area. Furthermore, Subcontractor personnel will be required to first wash their hands before proceeding to the approved area. These areas will be identified throughout the various plants.

2.15 The Subcontractor shall provide evidence of an assured equipment grounding conductor program as outlined in OSHA Section 1926.400 (h) (3) or provide ground fault circuit interrupter on all 15 to 20 ampere receptacles used to supply electricity to portable equipment. In addition for work taking place outside of a permanent building or for work in a wet area of a building ONLY, ground fault circuit interrupters as outlined in OSHA 1926.400 (h) (2) will be permitted.

CLOTHING CHANGE AND SHOWER:

All Subcontractor personnel must comply with the Clothing Change and Shower Regulations developed as part of the proposed subcontract. The following Special Conditions - Clothing Change and Shower requirements shall become a part of the proposed subcontract.

SPECIAL CONDITIONS - CLOTHING CHANGE AND SHOWER

1.0 Clothing Change Requirements

In addition to the provisions of said Article XXXII, the Subcontractor shall comply with the following regulations:

1.1 All Subcontractor personnel, except non-working supervisory personnel, must make a complete clothing change in the Contractor's Service Building before entering the Production and Waste Management areas, and must wear safety helmets that meet the requirements of ANSI Z89.1.

1.2 Non-working supervisory and delivery personnel need not make a complete clothing change but shall wear smocks, shoe covers and safety helmets that meet the requirements of ANSI Z89.1.

1.3 The required protective clothing will be furnished by the Contractor, at no expense to the Subcontractor. The Subcontractor shall be responsible for issuing clothing to his employees and shall return clothing to the Contractor upon completion. Any loss of or damage,

ordinary wear and tear excepted, to such Contractor furnished items will be charged to the Subcontractor. Laundering of such clothing will be by the Contractor as required.

1.4 A complete shower must be taken by all personnel subject to Paragraph 1.1 whenever they leave the Production and Waste Management areas. A shower must be taken before entering the cafeteria and before leaving FMPC.

1.5 The Contractor will provide locker room facilities for this subcontract. All Subcontractor personnel will be required to sign for clothing, equipment and lockers as a part of the regular check-in procedure. It will be the Subcontractor's responsibility, through his supervision in the field, to see that all of his personnel return all issued items and check out at the Contractor's Service Building when their work at FMPC is complete. This is necessary to insure the return of all Contractor property and to permit unused lockers to be made promptly available to others.

1.6 Food shall not be taken into the Production and Waste Management areas by Subcontractor personnel. The subcontractor's employees shall eat their lunches only in areas designated by the Contractor. Cafeteria facilities of the Contractor will be available at the discretion of the Contractor's representative.

1.7 It is estimated that the Subcontractor's employees will lose one-half to one hour per day per employee while complying with the above listed clothing change requirements.

SECURITY REQUIREMENTS:

The Subcontractor and all Subcontractor personnel must comply with the Contractor's security regulations for the FMPC site. The following Special Conditions - Security Regulations shall become a part of the proposed subcontract.

SPECIAL CONDITIONS - SECURITY REGULATIONS

1.0 Security Requirements

The Subcontractor shall comply with the following security regulations:

1.1 A complete list of the Subcontractor's personnel, sub-subcontractor-firm names and sub-subcontractor personnel shall be furnished to the Contractor, c/o the Subcontract Administrator, in writing, three days in advance of the start of any work. This list shall include all personnel actively engaged in the work at the FMPC site, but will not include truck drivers or delivery men who will enter FMPC for the purpose of

making deliveries only. The list shall show names, job titles, starting and quitting times for all personnel.

Only those employees of the Subcontractor and sub-subcontractor who are citizens of the United States of America will be allowed entrance to FMPC. It shall be the responsibility of the Subcontractor to ascertain such citizenship status of all employees who will work at FMPC.

Failure to comply with the above requirements could cause undue delay to personnel on gaining entrance to FMPC.

1.2 On the first day of work all Subcontractor personnel must report to the Pass and Public Room of the Main Guard House and present identification, such as a driver's license, Social Security card, etc. An appropriate type Subcontractor badge will be issued. Any of these employees who will be required to be on the site ten or more working days will be required to report to the Pass and Public Room to have pictures taken for preparation of a laminated picture badge. Approximately ten minutes per man will be required for taking the necessary picture. Pictures will be taken from 8:00 a.m. to 11:00 a.m. Monday through Friday.

After the first day of work, the picture badge will be used for identification and will be picked up at the turnstiles when reporting for work and deposited there when leaving work.

Employees who will require entrance to FMPC for less than ten working days will be issued a temporary Subcontractor's badge at the Pass and Public Room. These badges will be returned to the Pass and Public Room at the end of each working day.

1.3 When vehicles are required to perform work under this subcontract, other than material or equipment deliveries, the Contractor's representative designated by Subsection 2.1 of the Special Conditions will be advised of the necessity and period of time the vehicle will be in use on the FMPC site. This advice should be given at least 24 hours prior to the time the vehicle is scheduled to be brought on the site.

1.4 The Contractor's Security Police, or cleared Subcontractor personnel, will escort all Subcontractor personnel during their work under this subcontract. Subcontractor personnel will be subject to the orders of the Security Police escorting them where those orders apply directly to the Security Regulations.

1.5 In the event an individual must leave the work site, either for personal reasons or in the line of work, he must be escorted by a Security Policeman.

1.6 All personnel working under this subcontract will take the same lunch period.

1.7 Each working day the Subcontractor's Job Superintendent will notify the Security Police Desk Sergeant how many men will work the next working day, the work location or locations, the hours to be worked, and the number of escorts required. Without this notification escorts may not be available.

1.8 The normal workweek shall be five (5) days, Monday through Friday, exclusive of holidays. All work under this subcontract normally shall be performed between the hours of 7:15 a.m. and 4:00 p.m. during the workweek. If the Subcontractor wishes to perform any work under this subcontract prior to 7:15 a.m. or after 4:00 p.m., Monday through Friday, or at any time Saturday, Sunday or holidays, the Subcontractor shall notify the Construction Supervisor of his request as far in advance as possible. Approval of the Subcontractor's request shall be discretionary with the Construction Supervisor.

1.9 On Friday of each week the Subcontractor's Job Superintendent will notify the Contractor's representative designated by Subsection 2.1 of the Special Conditions the names of all personnel that will no longer require admittance to FMPC on this subcontract.

1.10 When work under this subcontract is complete, authorization for admittance of the involved personnel will be canceled and their picture badges will be returned to the Contractor.

PROJECT INTERFACES:

The Subcontractor shall report to and take instructions from designated Contractor representatives exclusively. Interfaces with other project participants, if any, shall be directed by the Contractor.

PUBLIC INTERFACES:

No release of information concerning the proposed project by the Subcontractor to the public shall be made without prior consent by the Contractor. The Subcontractor shall cooperate with the Contractor in maintaining an orderly flow of information to the public if required. All requests for information shall be referred to the Contractor.

AVAILABLE FACILITIES:

Contractor shall make available to the Subcontractor an outside area and/or inside building facilities, as required and/or as available, for storage of the Subcontractor's equipment. Other facilities shall be furnished as outlined in the General Conditions.

RADIOLOGICAL CONDITIONS

General

The FMPC waste storage area contains low-level radioactive waste material. The Subcontractor shall maintain strict compliance with applicable FMPC and Federal guidelines for personnel hygiene and radiation exposure. Contractor personnel will be available to discuss with perspective Subcontractors the level of radiation in the waste storage area and the applicable exposure limitations.

At least one of the Subcontractor's personnel at the worksite must be knowledgeable about radiation and must be responsible for seeing that all Subcontractor employees wear proper dosimeters (supplied by Contractor) and follow all applicable radiation protection requirements.

K-65 AREA

The K-65 tanks contain approximately 8800 MT of radium-bearing residues. The waste contains approximately 11,200 kg uranium and 1,652 Ci of radium. Strict attention must be given to limiting exposure time in the vicinity of the tanks. Contractor personnel will be available to discuss specific exposure limitatiions in the vicinity of the K-65 tanks.

In the event either K-65 tank is opened, air supplied respiratory protection must be worn by all employees in the area.

APPENDIX B
PROJECT MANAGEMENT

Westinghouse Project Manager

Mr. Dennis Carr (513) 738-6801

Weston Project Manager

Dr. Donald R. Phoenix (215) 692-3030

Study Community Liaison

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Section 9

SECTION 9

DATA MANAGEMENT PLAN FOR THE CHARACTERIZATION OF THE WASTE STORAGE AREAS AT THE FEED MATERIALS PRODUCTION CENTER

DATA MANAGEMENT PLAN FOR THE CHARACTERIZATION OF THE WASTE STORAGE AREAS AT THE FEED MATERIALS PRODUCTION CENTER

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DATA MANAGEMENT PLAN
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SECTION 9
DATA MANAGEMENT PLAN

9.1 INTRODUCTION AND PURPOSE

This report describes the overall plan for all activities concerning data handling during characterization of the FMPC Waste Storage Area. Procedures and guidelines in this report are in accordance with the Environmental Protection Agency's (EPA) Guidance on Remedial Investigations under CERCLA.

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 to be used for all aspects of data handling, such as collection, encoding, entry, verification, extraction, and analysis. Several types of data will be utilized on this project. First, there is scientific data, which is collected and handled throughout the entire analysis process. The management of this type of data consumes the majority of this report and is the content for Section Three.

Second, there is data previously collected on the site which is already documented and organized. This is the content of Section Two.

Third, there is non-scientific data which covers items such as medical records, quality assurance and quality control procedures, financial data, etc. Sections Four, Five and Six will cover this.

9.2 EVALUATION OF EXISTING DATA

All data resulting from previous studies will be evaluated on the basis of validity and sufficiency prior to the development of the site sampling plan to provide an effective means of supporting the objective of sampling.

9.2.1 Data Validity Requirements

- Sampling date
- Sampling location and description
- Sampling depth and increment
- Collection technique
- Field preparation technique
- Laboratory preparation technique

- Laboratory analytical methods
- Laboratory detection limits

9.2.2 Data Sufficiency Requirements:

- Does the data adequately characterize the site
- Does the data satisfy regulatory and engineering criteria.

9.2.3 Data Sensitivity

This will determine the impact on site confirmation if no additional sampling is performed.

9.2.4 Data Loading

All relevant existing technical data will be loaded into the Tecnical Data Management System. This data will be augmented by data collected as part of the sampling plan to provide a full view of the environment when performing data analysis.

9.3 TECHNICAL DATA MANAGEMENT

9.3.1 Data Processing

The flow of data, from the original source to the final destination, is illustrated in Figure 3-1. The subsections contained in the flow process include the collection of data, the data base manager and the output spawned from the data.

9.3.2 Data Collection

The Fernald site will be characterized through existing and newly collected data and the subsequent analysis of that data. Factors such as aerial extent of the site, concentrations and volume of disposed contaminants, geomorphic setting of the site, health hazard potential, and the propensity for contaminant migration all contribute to the range and amount of data to be collected.

Particularly as related to site characterization, spatial and temporal aspects of data collection must be of appropriate distribution to correctly identify the existence, nature, extent, and sources of contamination. The iterative process of data collection is based upon the investigative nature of site characterization where subsurface conditions must be evaluated. Patterns and techniques used in data collection must be representative of waste site conditions and are typically employed in some combination to provide a thorough view of natural phenomena.

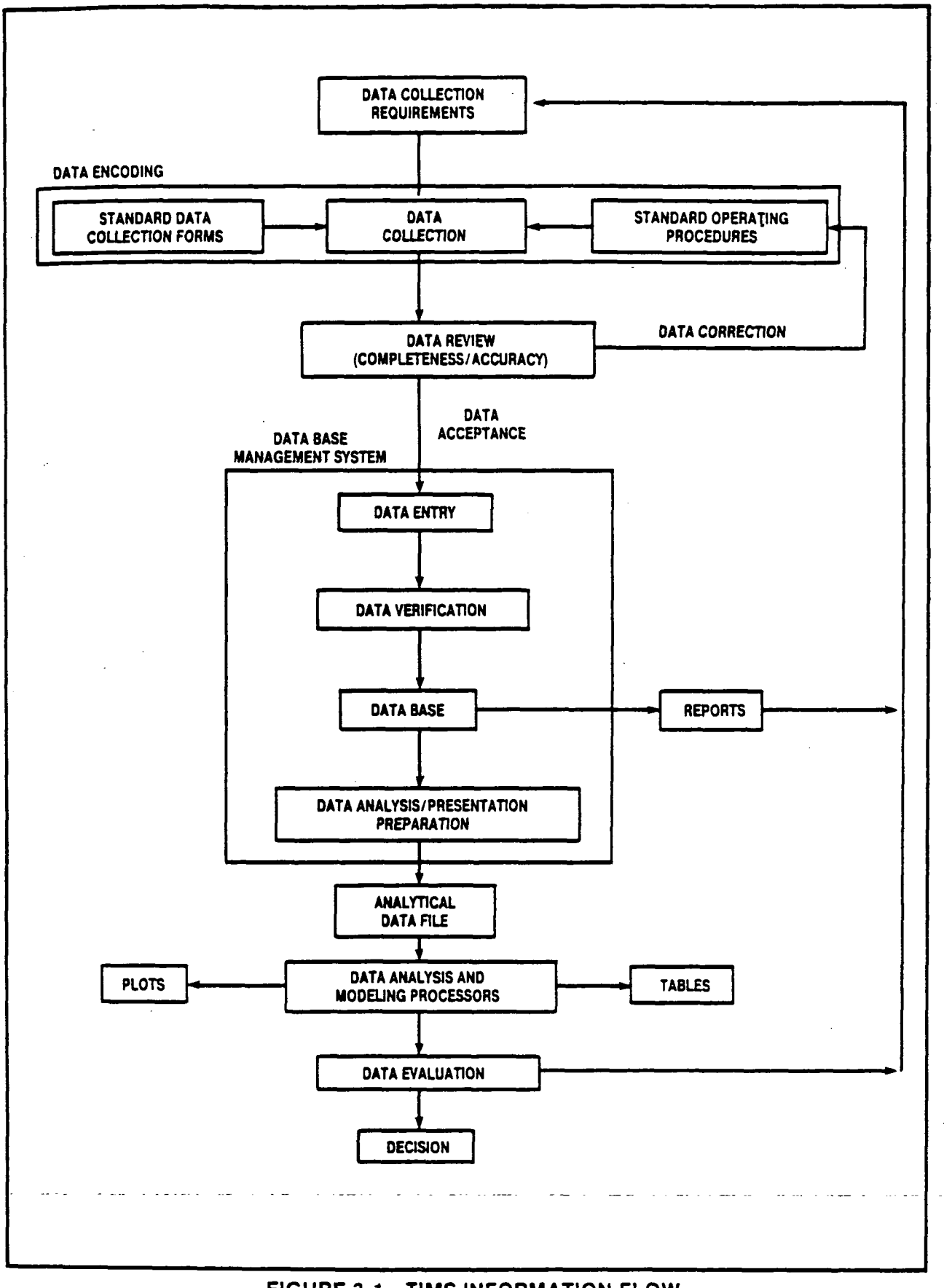

FIGURE 3-1 TIMS INFORMATION FLOW

For example, it may be desirable to assess the impact of contamination of ground water supplies on properties adjacent to a site. To accomplish this, the capacity of groundwater flow to transport contaminants would require investigation. Data from borehole logs, slug or pump tests, piezometric surface measurements, groundwater quality analysis, soil physical properties analysis, etc., would then be utilized to determine contaminant transport.

The types. frequency, and locations of data to be collected are described in the sampling plans of the preceding sections of this document.

Although these data will be collected from many different sources by numerous program participants and contractors, all data will be controlled by conforming to standardized formats, have identifiable sampling and analysis documentation (standard procedures), and be appropriately referenced with respect to detection limits. This control will be provided by establishing a data collection methodology that identifies responsibility for classification of data, defining standard formats, ensuring against collection of invalid or redundant data, and preventing critical gaps in data.

Data Encoding

Data encoding is composed of three steps which collectively impose control and organization of data. This intentional grouping consolidates the recording and handling of data, beginning with field collection, through laboratory analysis, and finally automation of the data. Considered at this stage are the importance and difficulty of obtaining data from the field in a complete and accurate manner, followed by the minimization of human transcriptions. Subsequent uses of data completely depend upon the integrity of the observation, recording, and referencing of data. Preservation of this integrity constitutes the primary objective in the coordination of data at this stage.

The quality of data ultimately used in data analysis is subject to, and influenced by, several primary factors that are considered in the data collection step.

- Units of measure accompany each parameter and are consistent for that parameter throughout the term of measurement

- Low concentration values, typically values less than a specified detection limit and qualitatively denoted by

a less than "<" sign, are analyzed at half the reported value.

- Significant figures of parameter values are reported with a consistent number of digits, subject to the same round-off rules, and measured with equal precision.

The technical data collection step is flanked on both sides by the mechanisms that achieve the objectives stated previously. Standard data collection forms promote the control of data by unifying the content of information regardless of its origin. This data collection methodology consolidates the vast possibilities of data collection into a group of information pertinent to problem solving needs. Attributes of this focused pattern on the broad array of data required for site characterization ensure against collection of invalid or redundant data and eliminates the critical gaps in data. Data collection forms directly correspond to the data base files, which are described in greater detail in a subsequent section.

Equally important to data collection are the standard operating procedures that outline the steps to be taken in the acquisition and review of data. In effect, procedures address the integrity, validity, and security of information based upon the objectives outlined above. 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 consistency to function optimally.

Data Review

The focal point between the data collection process and any data management system is the manual review of data for completeness and accuracy. At this stage, data collected by field testing or generated by laboratory analysis requires organization for appropriate subsequent use. The above discussion concerning data encoding concentrates on data organization and consistency through standard data collection forms, and is coordinated by guidelines established through standard operating procedures. While these mechanisms strive to ensure regularity in the data that is collected, they do not necessarily guarantee that the correct data has been obtained in accordance with the original data collection requirement.

In summary, this stage involves the intervention of professional evaluation. The enforcement process is accomplished by the feedback loop extending from the data review stage to the date encoding stage (in specific, the data collection step). This provides a means of returning data to the field or laboratory for revision or completion when necessary. Incorrect analyses could result if an incomplete set of data was used. For example, omitting the water quality results of a key down gradient well from a contour plot of down gradient contamination concentrations would skew the extent and potential migration of contaminants.

9.3.3 Data Base Manager

The Data Base Management System (DBMS) that will be used to handle all data involved with the Fernald site will be ORACLE. ORACLE is a relational data base with a high level standard query language. ORACLE will be used for several reasons including successful past experience with the product and its unique compatibility with several types of micro-computers.

The hardware used to run the DBMS will be WESTON'S Digital Equipment Corporation VAX 11/785. This system is a high powered mini-computer with the capacity to handle large amounts of data and several on-line users simultaneously. The system configuration of the VAX 11/785 is illustrated in Figure 3-2.

There will be other DBMS add-on packages used depending on the needs of the client and the environment expansion requirements.

9.3.4 System Security

The security of data is necessary for legal and financial reasons. The entire sphere of the data security process will be governed by four major points of interest. They are:

Personnel Handling Data

All personnel connected in any way with the DBMS will be authorized beforehand and will be given certain and limited access to the data itself. When an employee is removed from the project, their access rights will be withdrawn. A data base administrator will be appointed to police all activities concerning the DBMS.

Procurement of Documents

All documents associated with the data gathered for the project will be limited to public use, unless authorized by the client.

When documents are produced concerning data, access restrictions will be applied unless waived by the client.

Data Base Locking Mechanisms

When dealing with simultaneous users, locking procedures will be employed to ensure the integrity and interpretation of data. Write locks will be in effect when more than one user at the same time attempts to update the same file. All users will be in a waiting mode until the first user is finished updating.

Read locks will be in effect when a user attempts to access data they are not authorized for. These read locks can be on a user defined level or a file level.

Passwords (System Oriented)

Passwords will be assigned to each user, data screen, and data base. These passwords will be assigned and controlled by the data base administrator. There can be multi-levels of passwording, depending upon the degree of security desired.

9.3.5 Data File Structure

Many data types associated with characterization of hazardous waste disposal sites are necessary to coordinate all information entering the data base. The range of data types collectively describe or enable the description of the magnitude, extent, direction, and rate of movement of contaminants.

The variety of data collected is configured into logical sets of information contained in computerized data files. These files are then be connected by the data base management system software. Data used to construct these files will be selected from data collection activities. This data will be a subset of all information collected. Within each file will be one or more data types that logically define specific segments of the data elements which characterize the content of the particular data.

The structure of some of these files is as follows:

a) General Site Information
   1) Site code
   2) Site type
   3) Site name
   4) Location identifier
   5) Site coordinator

b) Site Coordinate Information
   1) Site code
   2) Site coordinator values (relating to information shown on
      site maps)
   3) Survey reference benchmark
   4) Standard map scale
   5) Site surface area

c) Topographic Surface Data
   1) Site code
   2) North coordinate
   3) East coordinate
   4) Topographic surface elevation

d) Legal Survey Data
   1) Site code
   2) Boundary designation
   3) North coordinate
   4) East coordinate

e) Parameter Definition Information
   1) Parameter code
   2) Parameter name
   3) Parameter description
   4) Units of measure
   5) Standard detection limits

f) Borehole/Surface Location Definition
   1) Site code
   2) Location ID
   3) North coordinate
   4) East coordinate
   5) Ground elevation
   6) Drilling company code
   7) Date of establishing location
   8) Borehole depth
   9) Borehole diameter
  10) Casing flag

g) Well Casing Definition
   1) Site code
   2) Location ID
   3) Well owner code
   4) Installing company code
   5) Installation date
   6) Casing elevation

7) End depth of casing
8) Casing diameter
9) End depth of seal
10) Filter pack length
11) Formation of completion
12) Stratagraphic order of formation
13) Screen beginning depth
14) Screen length
15) Screen unit area
16) Hydrologic flow relationship

h) Lithological Data
1) Site code
2) Location ID
3) Log date
4) Logging company code
5) Log depth
6) Soil/Rock stratum
7) Stratagraphic order of stratum
8) Visual classification

i) Soil Properties Data
1) Site code
2) Location ID
3) Log date
4) Analytical laboratory code
5) Sample ID
6) Beginning depth of sample
7) Ending depth of sample
8) Parameter code
9) Parameter value indicator
10) Parameter value

j) Water Quality Data
1) Site code
2) Location ID
3) Sample ID
4) Log date
5) Log depth
6) Analytical laboratory code
7) Parameter code
8) Parameter value indicator
9) Parameter value
10) Value uncertainty
11) Detection limit

k) Slug Test Data
   1) Site code
   2) Location ID
   3) Log date
   4) Logging company code
   5) Slug volume
   6) Elapsed time from start of test
   7) Water level

l) Pump/Recovery Test Data
   1) Site code
   2) Test type
   3) Location ID
   4) Log date
   5) Logging company code
   6) Distance from pumped well
   7) Elapsed time from start of test
   8) Water level

m) Ground Water Level Data
   1) Site code
   2) Logging company
   3) Location ID
   4) Log date
   5) Log time
   6) Water level

n) Geophysical Test Data
   1) Site code
   2) Location ID
   3) Log date
   4) Logging company code
   5) Ending depth of test
   6) Parameter code
   7) Parameter value indicator
   8) Parameter value.

9.3.6 Data Entry/Modification

The data base will incorporate automated screens for the entry and modification of data. The screens will coincide with the data collection forms and will be laid out accordingly. These data collection forms will serve jointly as the data entry forms so as to eliminate the need for recopying the data. This eradicates one potential source of error.

All screens will contain functions, both automatic and programmed, which relate to data entry and maintenance. These functions include:

- Data editing and verification at the field level - Each field will be verified at the time of entry and before continuing to the next field.

- Use of pre-defined codes - Acronyms will be established beforehand and these codes will be entered in the data base in that way. Separate files will contain full descriptions of these codes.

- Field completeness at the record level - Certain fields will be added based on information found for the entire record. This will occur after the record has been entered. An example would be a parameter description added after a parameter code has been entered.

- Integrity of data - All steps will be taken to ensure full integrity of data. The term "house-keeping" is usually associated with this process. It involves updating data records relative to information added by the user.

- Error messages - When a recognizable error occurs, a message will appear on the screen. This message will be clear and concise with the intent of informing 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.

- Automatic entry of repetitious field values -On occasion, there is a need to enter a value more than once. Sometimes the screen program will be able to duplicate this value and automatically enter it into the record. This not only saves time, but also ensures data integrity and minimizes error.

- User friendly environment - The screen will be developed with the data entry operator in mind. All steps will be taken to limit the amount of paper oriented assistance and include this type of help on the screens.

- External data entry utilities - Utilities will be made available to add data that is already entered in a file outside of the data base. These utilities will automatically add this data to the data base, thus saving the time of reentering the entire file.

9.3.7 Data Reporting

The data base will have data reporting modules that will be flexible and easy to use. These modules will be able to run in a batch mode as well as an interactive mode. They will incorporate all standard high-level query capabilities such as searches, sorts, control breaks, and reformatting. Standard and customized modules will allow for regular production reports and ad-hoc (on demand) reports.

Standard Report Module

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 fields,
control of field sequences,
selection of specific records,
multiple search conditions,
alternative search conditions,
negative search conditions,
search for a range,
search for values in a list,
ordering records,
arithmetic expressions,
character string functions,
date formatting.
date arithmetic

Customized Report Module

Customized reporting is often a necessary function needed by the user. This includes the customization of data analysis, manipulation of data and the reporting of data. These report modules will incorporate all facets of the standard report modules, but will be produced in a more personalized way and sometimes in more detail.

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

There are numerous custom report functions available, some of which include:

alter file,
sound alike function,
custom formatting of data,
selecting null values of data
grouping items of data,
indexing of data,
upper and lower case transition,
setting report lengths for custom forms,
setting report widths for custom forms,
rounding data,
selection of data through a where clause,

9.3.8 Data Preparation Modules

There is often a need to have data manipulated and analyzed outside the realm of the data base itself. Having these modules directly incorporated into the data base degrades total system performance and adds complexity to the data base which impairs efficiency. An interface of utilities providing the capability to analyze certain subsets of data will be selected. Sections 3.8.1 to 3.8.3 pertains to these utilities.

Graphics/Numerics Management System

Graphics and numerics capabilities are incorporated into the system. This will enable the generation of a numerical surface representation over a uniform grid, the plotting of the surface by various techniques, the operation upon a surface or between surfaces logically, and the numerical analysis of a surface. The primary uses of this system are as follows:

- Plotting the spatial distribution of well locations.
- Plotting contours of contaminant distribution and migration.
- Vector generation and plotting of contaminant and groundwater movement.

- Cross-section of a site showing the topographic surface, groundwater surface, original disposal site interface with natural ground, etc.
- Volumetric calculations of contaminated material under consideration for excavation or stabilization.
- Surface area calculation of the contaminated region at a specified concentration.
- Volume calculation of the contaminated region at a specified concentration.

The Radian Corporation CPS-1 System will be used to provide this function.

X-Y Graphic System

General X-Y plotting capabilities are incorporated into the system. These will be flexible, and extensive user control will provide for the manipulation of data. A graphics preprocessor has been designed to produce standardized plots for various analysis techniques (e.g., slug tests, pump tests, static ground water levels, etc.) Various methods are used to plot relationships of data. The SAS/Graph system and application programs will be used to provide this function.

Statistical Analysis System

A statistical analysis system will be provided to perform various statistical operations, to evaluate the distributions of data as a set, over time, for a site, for various types of data, etc. A curve-fitting utility will be incorporated for graphical presentations. The statistical package SAS will be used to provide the capability discussed above. Data will be retrieved from the data base, loaded to SAS, manipulated, and then uploaded back to the data base.

9.3.9 Data Models

Programs and models are used to give a verifiable representation of actual data. All models will be tested to run accurately against standard test data. The test data and an example run pattern will be provided. Each model will be evaluated for further integration into the overall system by using data base and supplemented by designing parameters and/or calibration data.

The library of models includes:

- Hydrology and hydraulics
- Ground water flow
- Aquifer simulation
- Contaminant transport
- Chemical equilibrium

9.3.10 Laboratory Data

The analysis of chemical data will be performed by both the data base system itself and by WESTON Analytical Services. The data base has customized programming to include the calculation of data to be presented in a report form. These programs provide searches, sorts, and computations which are combined and used repetitively. The basic concept is to provide an applications-oriented approach to problem solving and decision making to serve program needs. Through this process, data is be delivered to the data base analyzer as a scientific and a management tool.

WESTON Analytical Services will provide the laboratory data analytical functions necessary for data calculation and manipulation.

Various types of instruments are used to analyze different types of data. These instruments include GC/MS (gas chromotography/mass spectroscopy) for organic data, AA furnaces and ICP's for metals, as well as a variety of instruments for Inorganic data.

Once the data is analyzed in the laboratory, it is entered into the data base. The method for entering this data follows the standard procedures found in the Data Entry/Modification section of this report.

9.3.11 Data Storage

Once data is collected and entered in the system, it must be stored in an environment that is well suited for long-term retention and integrity. This data must be maintained in this manner for several reasons, including legal and financial.

Several factors will be taken into consideration when storing the data. The purpose of these determining elements is to ensure the reliability of the data being stored. Some of these factors include, but are certainly not limited to:

temperature,
off-site storage,

method of magnetic tape access,
BPI factor,
read-only access,
ease of transferability,
transportation of data,
client access,
data error hit rate,

9.4 HEALTH AND SAFETY RECORDS

WESTON will have specific health and safety responsibilities for the health and safety of workers and the public as described in the Health and Safety Plan.

The entire set of records concerning specific health and safety requirements will be organized and saved in a fashion for quick access and completeness. These records will be held in a micro-computer and backed up on a regular basis. All files will be the responsibility of WESTON'S Health and Safety Director.

9.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

9.5.1 Purpose

Quality assurance is a measure of how accurately the data falls within prescribed predefined limits set for environmental sampling to ensure repeatability of results and that the measured parameters reflect reality. This is an external check of accuracy.

Quality control is a measure of how precise predefined procedures for collecting and analyzing data are followed to ensure correctness of results. This is an internal check of precision.

Guidelines and procedures have been established at WESTON to ensure that QA/QC methods are adhered to. In regards to the data itself, data base and laboratory QA/QC procedures are followed. All management and record keeping pertaining to the data follow the administrative QA/QC procedures.

9.5.2 Data Base Procedures

The data base manager encompasses all data related items relative to the complete study of a hazardous waste site. To ensure that this data is kept accurate and preserved for long term use, QA/QC procedures are established for the data base.

Some data base QA/QC procedures will include:

- Data verification - (system) - Verification checks inherent to the systematic approach of data handling include proper spelling, correct format of an entry, completeness of data, etc. This will be accomplished through programmable checks and built-in data base checks.

- Data verification - (manual) - Verification will also be done through visual checks of data for accuracy and completeness. This procedure will be accomplished by competent and thoroughly trained individuals.

- Run scheduling - The scheduling of runs is very important because of the possibility of conflicting runs causing error conditions. The proper scheduling will be overseen by the Operations Department with input from the Data Base Administrator.

- Data redundancy restrictions - All precautions will be taken to limit the need for data items to be repeated throughout the data base. These limitations must be enforced because of exceeding storage boundaries and overall data clarity. The less complicated a system remains, the easier it becomes to maintain.

- Personnel training - All personnel connected in any way with the data base will be qualified in every phase of his or her task. These individuals will possess these qualities beforehand or will be trained at the time their task is given to them.

9.5.3 Laboratory Procedures

WESTON Analytical Services incorporate their own in-house QA/QC procedures. The lab is concerned with keeping measurements of data throughout the entire analytical process and also ensuring that this data is not tampered with by unauthorized personnel.

Some ways in which the laboratory controls this QA/QC procedure are:

- Contract Lab Program (CLP) - The CLP reporting process is an EPA accepted format in which all laboratories under contract with the EPA must conform to. These reports, among other things, determine what types of

analyses are performed on the sample data. The reports are computer generated and fall under the specific guidelines of the EPA.

- QA/QC reports - In addition to CLP reports, specific QA/QC reports are generated through the laboratory's computer. These reports ensure the consistency and accuracy of data handled.

- Chain of custody reports - All samples entering the laboratory are tracked from the time they are delivered to the time they leave the premises. The way this is accomplished is through Chain of Custody reports. Each department or individual handling the samples sign off when finished with the data. Hard copies are kept by appropriate department heads as well as the client.

- Sample identification - All samples will be labeled in accordance with EPA guidelines and laboratory guidelines. These labels will be easily identified and attached to the sample throughout the analyses process.

9.5.4 Administrative Procedures

QA/QC procedures have been established at Weston pertaining to all administrative aspects of corporate dealings. A standard operating procedure memo was circulated through the company with these terms defined. The reason for these guidelines is the need for an organized, consistent approach to filing, controlling, and retrieval of project related information. This system was developed under the following guidelines:

1) Files are the documented corporate memory - The system must be useable both by project team and by other corporate personnel often long after the project team has been disbanded and may no longer be available.

2) The filing system must be consistent and flexible - File headings that are generally applicable to all projects have been identified. Provision has also been made for additional headings for future or project specific needs.

3) Files must be controlled so that information required is available when needed by corporate, project management and project execution personnel.

9.6 FINANCIAL AND PROJECT TRACKING

9.6.1 Purpose

The collection, documentation, and reporting of data will take a systematic approach. The purpose of this tracking is for legal and financial reasons and helps to ensure that each phase of the project meets specified deadlines and deliverables.

The automated system in which this tracking is accomplished is VISION by Systonetics, Inc.

VISION is an advanced Management Information System designed for program and project management applications.

Some of VISION's capabilities include:

- Network scheduling of Critical Path models.
- Multiple resource allocations, tracking and projection.
- Cost tracking, projection and reporting.
- "What-if" analysis.
- Sophisticated graphical representation in the form of Networks, Bar charts, and Management graphs.
- Standard, flexible reporting formats for cost, resource, and scheduling information.
- User-oriented, free-format report writer for custom reporting.

The Project Control Coordinator will be responsible for maintaining and executing the system. This individual will interface with department managers to control all resources as well as on-demand changes to scheduling.

9.6.2 Reporting

Financial and project tracking is extremely important to the overall control of a project. The reports processed by VISION will be distributed on a monthly basis. These reports include the schedule performance index and cost schedule status report.

9.6.3 Data Base Interface

INFO, developed by Systonetics, Inc., will be used as an interface to VISION for the purpose of holding all data and providing flexibility to the system. This data base will establish easy access to the information and also give high level query capabilities to the user.

THE END