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

FOR COMPLIANCE

ORDER

DOE 5400.1

11-9-88

SUBJECT: GENERAL ENVIRONMENTAL PROTECTION PROGRAM

1. PURPOSE. To establish environmental protection program requirements, authorities, and responsibilities for Department of Energy (DOE) operations for assuring compliance with applicable Federal, State and local environmental protection laws and regulations, Executive orders, and internal Department policies. The Order more specifically defines environmental protection requirements that are generally established in DOE 5480.1B.
2. SUPERSESSON. DOE 5480.1A, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DOE OPERATIONS, of 8-13-81, Chapter XII, Prevention, Control, and Abatement of Environmental Pollution.
3. SCOPE. The provisions of this Order apply to all Departmental elements and contractors performing work for the Department as provided by law and/or contract as implemented by the appropriate contracting officer.
4. REFERENCES.
 - a. DOE Orders.
 - (1) DOE 4300.1B, REAL PROPERTY AND SITE DEVELOPMENT PLANNING, of 7-1-87, which establishes requirements for preparing site development plans for DOE facilities.
 - (2) DOE 4700.1, PROJECT MANAGEMENT SYSTEM, of 3-6-87, which establishes requirements and objectives, and assigns responsibilities and authorities necessary for acquisition of major systems.
 - (3) DOE 5000.3, UNUSUAL OCCURRENCE REPORTING SYSTEM, of 11-7-84, which establishes DOE policy and provides instructions for reporting, analyzing, and disseminating information on programmatically significant events.
 - (4) DOE 5400.2, ENVIRONMENTAL COMPLIANCE ISSUE COORDINATION, of 8-13-87, which sets forth policy, direction, and procedures for coordinating environmental issues that are of significance to DOE.
 - (5) DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

DISTRIBUTION:
All Departmental Elements

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Office of Environment,
Safety and Health

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- (6) DOE 5440.1C, NATIONAL ENVIRONMENTAL POLICY ACT, of 4-9-85, which establishes DOE policy for implementation of the National Environmental Policy Act of 1969.
- (7) DOE 5480.1B, ENVIRONMENT, SAFETY, AND HEALTH PROGRAM FOR DEPARTMENT OF ENERGY OPERATIONS, of 9-23-86, which outlines environmental protection, safety, and health protection policies and responsibilities.
- (8) DOE 5482.1B, ENVIRONMENT, SAFETY AND HEALTH APPRAISAL PROGRAM, of 9-23-86, which establishes the DOE environmental protection, safety, and health protection appraisal program.
- (9) DOE 5484.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS, of 2-24-81, which establishes the requirements and procedures for reporting and investigating matters of environmental protection, safety, and health protection significance to DOE operations.
- (10) DOE 5500.1A, EMERGENCY MANAGEMENT SYSTEM, of 2-26-87, which establishes overall policies and requirements for DOE emergency preparedness and response programs.
- (11) DOE 5700.6B, QUALITY ASSURANCE, of 9-23-86, which establishes DOE's quality assurance program.
- (12) DOE 5820.2, RADIOACTIVE WASTE MANAGEMENT, of 2-6-84, which establishes policies and guidelines for the management of radioactive waste and contaminated facilities.
- (13) DOE 6430.1, GENERAL DESIGN CRITERIA, of 12-12-83, which provides general design criteria for use in acquisition of DOE facilities.

b. Legislation.

- (1) Title 42 U.S.C. 2011, et seq., The Atomic Energy Act of 1954, as amended, which authorizes the conduct of atomic energy activities.
- (2) Title 42 U.S.C. 7101, et seq., The Department of Energy Organization Act, which establishes the statutory responsibility to ensure incorporation of national environmental protection goals in the formulation of energy programs, and advance the goal of restoring, protection, and enhancing environmental quality, and assuring public health and safety.

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- (3) Title 42, U.S.C. 4321, et seq., The National Environmental Policy Act of 1969, as amended, which establishes broad national environmental policy.
- (4) Title 42 U.S.C. 7401, et seq., The Clean Air Act, as amended, which provides requirements to protect and enhance the quality of the Nation's air resources to promote the public health and welfare.
- (5) Title 33 U.S.C. 1251, et seq., The Federal Water Pollution Control Act, as amended, which provides requirements to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.
- (6) Title 42 U.S.C. 6901, et seq., Solid Waste Disposal Act of 1965, as amended, which authorizes the U.S. Environmental Protection Agency (EPA) to regulate hazardous and solid wastes.
- (7) Title 40 U.S.C. 9601, et seq., The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, which requires the identification, characterization, and cleanup of inactive hazardous waste sites by responsible parties; and, imposes certain response and reporting requirements for operations from which hazardous substances have been released.
- (8) Title 42 U.S.C. 300, et seq., The Safe Drinking Water Act, as amended, which authorizes EPA to promulgate regulations under two specific programs: the first protects the Nation's public drinking water supplies; the second protects subsurface waters.
- (9) Title 16 U.S.C. 1451, et seq., The Coastal Zone Management Act of 1972, as amended, which establishes and supports national coastal zone management policies.
- (10) Title 16 U.S.C. 1531, et seq., The Endangered Species Act of 1973, as amended, which establishes a program for the conservation of endangered species and their ecosystems.
- (11) Title 16 U.S.C. 661, et seq., The Fish and Wildlife Coordination Act, as amended, which authorizes the Secretary of the Interior to provide assistance to and cooperate with public and private organizations in the development and protection of the Nation's fish and wildlife.

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- (12) Title 16 U.S.C. 470, et seq., The National Historic Preservation Act of 1966, as amended, which establishes the policy of the U.S. Government to protect and preserve historical structures, sites and artifacts.
 - (13) Title 15 U.S.C. 2601, et seq., Toxic Substances Control Act, as amended, which provides requirements to safely regulate the manufacture, processing, distribution in commerce, use or disposal of chemical substances and mixtures which may present an unreasonable risk to either the public health or the environment.
 - (14) Title 42 U.S.C. 1996, et seq., The American Indian Religious Freedom Act, as amended, which establishes a policy of the U.S. Government to protect and preserve for American Indians their inherent right of freedom of religion, including access to sites.
 - (15) Title 7 U.S.C. 136, et seq., The Federal Insecticide, Fungicide, and Rodenticide Act, as amended, which authorizes EPA to promulgate regulations governing the use and disposal of pesticides.
 - (16) Title 42 U.S.C. 4901, et seq., The Noise Control Act of 1972, as amended, which establishes a means for coordination of Federal noise control research, setting noise emission standards, and providing information to the general public.
 - (17) Title 33 U.S.C. 1412, et seq., The Marine Protection, Research, and Sanctuaries Act, as amended, which regulates the dumping of materials into ocean waters.
 - (18) Title 16 U.S.C. 1273, et seq., The Wild and Scenic Rivers Act, as amended, which establishes a national wild and scenic rivers system to preserve and protect selected rivers of the Nation.
 - (19) Title 42 U.S.C. 10101, et. seq., The Nuclear Waste Policy Act of 1982, as amended, which provides for the development of repositories for the disposal of high-level radioactive waste and spent fuel, and to establish a program of research, development, and demonstration regarding the disposal of high-level radioactive waste and spent nuclear fuel.

- (20) Title 42 U.S.C. 2021, et. seq., The Low-Level Radioactive Waste Policy Act, as amended, which establishes procedures for the implementation of compacts providing for the establishment and operation of regional disposal facilities for low-level radioactive waste.
- (21) Title 42 U.S.C. 7901, et. seq., The Uranium Mill Tailings Radiation Control Act of 1978, as amended, which provides for a remedial action program at selected inactive uranium mill tailings sites.
- (22) Title 42 U.S.C. 7158 Note, The Department of Defense Authorization Act of 1985, which statutorily prescribes Executive order 12344.

c. Executive Orders.

- (1) Executive order 12088, "Federal Compliance with Pollution Control Standards," of 10-13-78, which requires that all Federal facilities and activities comply with applicable pollution control standards.
- (2) Executive order 12344, "Naval Nuclear Propulsion Program," of 2-1-82, which establishes an integrated Naval Nuclear Propulsion Program to be carried out by two organizational units, one in the U.S. Department of the Navy and one in the U.S. Department of Energy.
- (3) Executive order 12580, "Superfund Implementation," of 1-23-87, which delegates to various federal officials the responsibilities vested in the President for implementing the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). [The Order delegates most of these responsibilities to the Administrator of the Environmental Protection Agency (EPA), but several are delegated to the heads of Federal agencies, including DOE.]
- (4) Office of Management and Budget (OMB) Circular No. A-106, "Reporting Requirements in Connection with the Prevention, Control, and Abatement of Environmental Pollution of Existing Federal Facilities," of 12-31-74.

d. Applicable State and Local Legislation and Regulations in Which DOE Operations are Located.

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e. Other.

- (1) DOE's "Final Guidelines for Compliance with the National Environmental Policy Act," 52 FR 47662, of 12-15-87, and subsequent amendments, which establish final guidelines for implementing the procedural provisions of the National Environmental Policy Act as required by the Council on Environmental Quality regulations.

5. POLICY.

- a. It is DOE policy to conduct its operations in an environmentally safe and sound manner. Protection of the environment and the public are responsibilities of paramount importance and concern to DOE. All DOE activities should recognize and reflect this concern and public trust. To that end, DOE is firmly committed to ensuring incorporation of national environmental protection goals in the formulation and implementation of DOE programs. It has an equal commitment to advance the goals of restoring and enhancing environmental quality, and ensuring public health. Accordingly, it is DOE policy to conduct the Department's operations in compliance with the letter and spirit of applicable environmental statutes, regulations, and standards. In addition, DOE is committed to good environmental management of all its programs and at all its facilities to correct existing environmental problems, to minimize risks to the environment or public health, and to anticipate and address potential environmental problems before they pose a threat to the quality of the environment or the public welfare. Finally, it is DOE's policy that efforts to meet environmental obligations be carried out consistently across all operations and among all field organizations and programs.
- b. While responsibility for good environmental management is a Departmental one, environmental protection practices will, of necessity, be carried out at the levels and locations where many DOE activities are performed by its management and operating contractors. Thus, although the Department will continue to indemnify its management and operating contractors for fines, penalties, and other liabilities that are incurred pursuant to their contracts and not the result of willful misconduct or lack of good faith, it is DOE policy that contractors will share the Department's commitment to good environmental management. DOE expects its management and operating contractors to conduct their operations in an environmentally sound manner that limits the risks to the environment and protects the public health. DOE will actively oversee contractors' activities to assure compliance with this policy.

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6. APPLICABILITY.

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- a. In recognition of the environmental significance of Departmental activities authorized by the Atomic Energy Act (AEA), this Order addresses and, of necessity, emphasizes requirements for radiation protection. It also is written to reflect the DOE organizational structure for operations that implement AEA activities. It is understood and expected that other DOE elements, e.g., power marketing administrations, will design and manage their environmental protection programs in such a manner so as to be equivalent to requirements contained in this Order and in compliance with applicable statutes and regulations.
 - b. Environmental management activities of DOE are extensively, but not entirely, regulated by EPA, State, and local environmental agencies. Where these agencies clearly exercise environmental protection authority through permitting and compliance administrative procedures applicable to DOE, they establish and regulate required performance for environmental protection. This Order and other DOE environmental protection directives provide requirements for satisfying these externally imposed regulations. Additionally, these directives establish requirements for those environmental protection programs that are not externally regulated, but require internal management consistent with DOE Orders that provide specific, detailed requirements in selected areas of environmental protection.
 - c. Inasmuch as this directive for the most part serves to implement legislatively mandated requirements, it is expected that activities, documentation, and special planning conducted to meet these legal requirements will be used to the maximum extent to satisfy requirements of this Order.

7. LEGISLATIVE AUTHORITY. The Department of Energy Organization Act of 1977 and the Atomic Energy Act of 1954, as amended, provide for, among other things, the protection of the health and safety of the public and the environment in the conduct of the Department's programs.

8. DEFINITIONS.

- a. DOE Operations, for the purposes of this Order, are those DOE managed, directed, or funded activities for which the Department has responsibility for Environment, Safety and Health (ES&H).
- b. Effluent is any treated or untreated air emission or liquid discharge at a DOE site or from a DOE facility.

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- c. Environmental Monitoring is the collection and analysis of samples or direct measurements of environmental media. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance.
 - d. Environmental Protection Standard is a specified set of rules or conditions concerned with: delineation of procedures; definition of terms; specification of performance, design, or operations; or measurements that define the quantity of emissions, discharges, or releases to the environment and the quality of the environment.
 - e. Effluent Monitoring is the collection and analysis of samples, or measurements of liquid and gaseous effluents for the purpose of characterizing and quantifying contaminants, assessing radiation exposures of members of the public, providing a means to control effluents at or near the point of discharge, and demonstrating compliance with applicable standards and permit requirements.
 - f. Environmental Surveillance is the collection and analysis of samples, or direct measurements, of air, water, soil, foodstuff, biota, and other media from DOE sites and their environs for the purpose of determining compliance with applicable standards and permit requirements, assessing radiation exposures of members of the public and assessing the effects, if any, on the local environment.
 - g. Environmental Occurrence is any sudden or sustained deviation from a regulated or planned performance at a DOE operation that has environmental protection and compliance significance.
 - h. DOE Contractor includes any prime contractor or subcontractor subject to the contractual provisions of 48 CFR Part 923.70, 48 CFR Part 970.23, or other contractual provisions where DOE has elected to enforce ES&H requirements by specific negotiated contract provisions.
 - i. Field Organization is the first line DOE field element that carries the organizational responsibility for (1) managing and executing assigned programs, (2) directing contractors who conduct the programs, and (3) assuring that environment, safety, and health are integral parts of each program.
 - j. Program Senior Official (PSO) is a senior outlay program manager and includes the Assistant Secretaries for Conservation and Renewable Energy, Defense Programs, Fossil Energy, and Nuclear Energy, the Director of Energy Research, and the Director of Civilian Radioactive Waste Management. For purposes of this Order, this definition also includes the Administrators of the Bonneville and Western Area Power Administrations.

9. RESPONSIBILITIES AND AUTHORITIES. The following responsibilities and authorities, as well as those contained in DOE 5480.1B, are assigned.
- a. The Deputy Secretary (S-2) has overall responsibility and authority for DOE programs and may take necessary management actions to ensure safety, including directing the curtailment and suspension of operations, when in his or her opinion, such operation would result in undue risk.
 - b. The Assistant Secretary for Environment, Safety and Health (EH-1) shall:
 - (1) Establish environmental protection policies, guidance, requirements, and procedures for DOE operations.
 - (2) Provide the central point for coordination among PSOs and field organizations, and interact with other agencies and groups in:
 - (a) The development of internal DOE environmental protection policy, guidance, and directives;
 - (b) The development of environmental protection regulations, standards, and requirements by Federal and State regulatory agencies; and
 - (c) The review and comment on proposed environmental legislation and regulation that may affect DOE operations.
 - (3) Conduct the environmental survey program and follow-on audits of line organizations in accordance with DOE 5482.1B and other environmental requirements.
 - (4) Direct the DOE National Environmental Policy Act program, approve and concur in Departmental Environmental Impact Statements and other NEPA documents, and assure Departmental compliance with NEPA in accordance with DOE 5440.1C.
 - (5) Develop environmental compliance policies, requirements, and procedures for DOE operations including notification and reporting of significant environmental occurrences.
 - (6) Coordinate the timely review, resolution, and dissemination of significant environmental compliance issues (which are to be included in permit applications, settlement agreements, consent decrees and Orders, and lawsuits) and related activities for the Department with the Office of the General Counsel, affected PSOs and field organizations, in accordance with DOE 5400.2.

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- (7) Develop and maintain systems for collection, retention, evaluation and dissemination of information that characterizes DOE environmental management and demonstrates compliance with environmental protection laws and regulations.
 - (8) Coordinate, prepare, and submit pollution abatement plans and progress reports to the Environmental Protection Agency in accordance with Executive order 12088 and OMB Circular A-106.
 - (9) Review and concur in program and project direction guidance issued by a PSO related to environmental protection matters that affect more than one field organization or that have environmental policy implications.
 - (10) Curtail or suspend operations at DOE facilities, under the conditions described below, when a clear and present danger exists to workers or members of the public, as provided in DOE Order 5480.1B. (Clear and present danger is a condition or hazard which could reasonably be expected to cause death or serious harm to plant workers or the public immediately or before such condition or hazard can be eliminated through normal procedures.)
 - (a) Whenever EH-1, in carrying out his or her responsibilities, determines that the environmental, safety, or health conditions at any DOE facility present a clear and present danger, EH-1 shall notify the Deputy Secretary that such a determination has been made. In addition, notification shall be provided to the PSO and the Head of the appropriate field organization. Upon receiving such notification, the Head of the Field Organization shall take immediate action to curtail or suspend the operation and mitigate the danger.
 - (b) If appropriate action is not taken to curtail or suspend the operation and mitigate the identified danger, EH-1 shall advise the Secretary. In the event that the Secretary is unavailable, EH-1 is authorized to direct the PSO or field organization to suspend or curtail an operation which EH-1 has determined is posing a clear and present danger until the danger has been mitigated.
 - (c) The authority reflected in subparagraph (11) may not be re delegated or assumed by acting officials and will terminate on 1-31-89, unless specifically renewed.

11-9-88

- (11) Issue guidance in cooperation with PSOs to field organizations for the preparation of long range environmental protection plans; review those plans upon submission by field organizations; coordinate the development of a DOE-wide long range environmental protection plan.

c. Program Senior Officials (PSOs) shall:

- (1) Provide clear and explicit delegations of authority and responsibilities for implementing DOE environmental protection programs.
- (2) Ensure that appropriate environmental requirements are included in program plans.
- (3) Advise EH-1, in a timely manner, of significant programmatic environmental issues requiring resolution.
- (4) Concur in significant environmental compliance issues, such as compliance agreements and consent orders which may affect programs or projects under his or her jurisdiction.
- (5) In consultation with EH-1, provide environmental protection direction to field organizations consistent with Departmental Orders and policies.
- (6) Provide oversight and, as appropriate, verify field organization compliance with any environmental guidance provided by the PSO.
- (7) Assure that program budget proposals include provisions to comply with environmental protection requirements that are consistent with programs and projects identified in the OMB Circular A-106 pollution plans and, as required by DOE 5480.1B, take appropriate management actions to include adequate ES&H resources for assigned functions in budget proposals that incorporate results of the ES&H upgrade project ranking process.
- (8) Participate with, and support EH-1 in preparing and coordinating Departmental comments on emerging environmental regulations and policies of other agencies that may affect DOE operations.
- (9) Participate in selected environmental appraisals, surveys, and audits as described in DOE 5482.1B.

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- (10) Direct Heads of Field Organizations to curtail or suspend operations when any activity presents a clear and present danger to workers, members of the public, or the environment, as provided in DOE 5480.1B, page 10, paragraph 8(c)(20).
- (11) Provide EH-1 with environmental information and documentation upon request.
- (12) Support EH-1 in issuing guidance for the preparation of long range environmental protection plans; review those plans upon submission by field organizations; coordinate with EH-1 in the development by EH-1 of a DOE-wide long range environmental protection plan.

d. The General Counsel shall:

- (1) Provide advice and assistance to EH-1 and other DOE elements in support of DOE environmental protection programs and compliance activities.
- (2) Provide prompt advice and assistance to EH-1 in resolving environmental compliance issues and related activities within his or her area of responsibility (e.g., consent decrees and consent administrative orders).
- (3) Provide advice and assistance to EH-1 and other DOE program elements in preparing departmental comments on emerging environmental regulations and policies that may affect DOE operations.
- (4) Advise EH-1 and other DOE program elements on Departmental environmental impact statements and other NEPA documents.
- (5) Coordinate DOE environmental litigation activities and represent DOE at the Department of Justice on these activities.

e. Assistant Secretary, Management and Administration (MA-1) shall review long range environmental protection plans prepared by Heads of Field Organizations; and support the development of a DOE-wide long range environmental protection plan.

f. Heads of Field Organizations shall:

- (1) Issue and update, as required, a general environmental statement that reflects the statement of policy in this Order and contains broad environmental protection goals for all facilities and activities for which he or she is responsible.

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- (2) Ensure that all operations under their authority comply with applicable environmental protection laws and regulations, and directives.
- (3) Identify significant environmental compliance issues that require resolution and coordination, and advise EH-1 and Headquarters program elements in a timely manner.
- (4) Ensure that all required environmental permits are secured from the appropriate regulatory agency in a timely fashion. Consistent with the requirements of DOE 5400.2, in negotiating the terms and conditions of permits, settlements, consent orders, consent decrees, or other legal or administrative documents, every effort shall be made to assure that permit requirements and conditions reflect the requirements of environmental regulations, consistent with national security interests, and are cost-effective.
- (5) Conduct environmental appraisals of programs, projects, and facilities in accordance with DOE 5482.1B, and other ES&H requirements, and provide copies of appraisal reports to EH-1 and the appropriate program office.
- (6) Establish and maintain liaison and cooperative programs with appropriate Federal, Regional, State, and local environmental officials so as to facilitate effective environmental management.
- (7) Develop and implement programs that direct contractors to execute environmental protection compliance programs and policies, and provide for oversight, confirmation, and independent verification of those contractor programs.
- (8) Prepare long range environmental protection plans in accordance with guidance issued by EH-1.
- (9) Ensure that budget requests provide for required environmental protection upgrades and corrective action, that they are timely, and are consistent with pollution abatement plans prepared as required by OMB Circular A-106.
- (10) Prepare biannual pollution abatement plans required by OMB Circular A-106 and submit to EH-1 on a schedule provided by that office.
- (11) Provide EH-1 all environmental information and documentation that is requested.

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- (12) Curtail or suspend any operation that poses a clear and present danger to members of the public or the environment.
- (13) Provide for community public information and education programs concerning DOE environmental protection programs, consistent with the requirements of environmental regulations and national security interests.

g. Director, Naval Nuclear Propulsion Program: Executive Order 12344, statutorily prescribed by P.L. 98-525 (42 USC 7158 note), establishes the responsibilities and authority of the Director, Naval Nuclear Propulsion Program (who is also the Deputy Assistant Secretary for Naval Reactors within the Department) over all facilities and activities which comprise the Program, a joint Navy-DOE organization. The policy principle promoted by these executive and legislative actions is cited in the Executive Order as ". . . preserving the basic structure, policies, and practices developed for this Program in the past . . .". Accordingly, based on the Executive Order and this policy principle, the Naval Nuclear Propulsion Program is exempt from the provisions of this Order. The Director shall maintain an environmental protection program to assure compliance with applicable environmental statutes and regulations. The Director and EH-1 shall cooperatively develop information exchange and other mutually beneficial programs as appropriate, consistent with P.L. 98-525.

BY ORDER OF THE SECRETARY OF ENERGY:



JOSEPH F. SALGADO
Deputy Secretary

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TABLE OF CONTENTS
(continued)

	<u>Page</u>
6. Meteorological Monitoring Program	IV-4
a. Meteorological Information/Monitoring Programs	IV-4
b. General Requirements	IV-5
7. Radiological Monitoring	IV-5
8. Non-Radiological Monitoring	IV-5
a. Air Monitoring - Emissions	IV-5
b. Air Monitoring - Environmental Surveillance	IV-6
c. Water Monitoring - Effluents	IV-7
d. Water Monitoring - Environmental Surveillance	IV-8
9. Groundwater Monitoring Program	IV-9
a. Groundwater Monitoring Plans	IV-9
b. General Requirements	IV-9
10. Quality Assurance and Data Verification	IV-10
a. Quality Assurance	IV-10
b. Laboratory Certification	IV-10
c. DOE Laboratory Quality Assurance Program for Radioactive Material	IV-11
d. Independent Data Verification	IV-11
Attachment IV-1 - Selected References for Environmental Monitoring	IV-13

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CHAPTER I

ENVIRONMENTAL PROTECTION STANDARDS

1. PURPOSE. To provide the mandatory environmental standards that are in effect at DOE operations and procedural guidance for securing an exemption from a standard.
2. ENVIRONMENTAL PROTECTION STANDARD. See definition at page 8, subparagraph 8d.
3. STANDARDS. Environmental protection standards fall into three categories.
 - a. Those imposed by Federal statutes, regulations, and requirements. (The major federal environmental protection standards that apply to DOE operations are contained in the listing in Attachment I-1.)
 - b. Those imposed by State and local statutes, regulations, and requirements which are applicable to DOE.
 - c. Those imposed by DOE directives.
4. EXEMPTION PROCEDURES. Requests for exemptions from applicable environmental protection standards are not encouraged. However, in limited cases, programmatic circumstances or operational conditions may warrant such requests in accord with the following procedures.
 - a. From Federal, State and Local Regulations.
 - (1) Specific procedures for processing exemptions to standards are contained in Federal, State, and local laws and regulations. To the extent that Federal, State, and local laws and regulations allow for an exemption from any standard, field organizations and PSOs, as appropriate, are to use applicable administrative and legal procedures to secure approval for any exemption. EH-1 will provide technical and administrative support to any organization upon request. In the case of generic issues that affect department-wide compliance with environmental standards, EH-1 will coordinate efforts to obtain agreements from the regulatory authority for a DOE-wide exemption. Heads of Field Organizations and PSOs, as appropriate, shall submit to EH-1, the General Counsel, and the appropriate Program Senior Official(s) information copies of all requests to Federal or State agencies for exemptions.

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- (2) The field organization and PSOs, as appropriate, shall take the lead role in coordinating the exemption request with the appropriate Federal, State, or local agency responsible for the enforcement of the standard for which the exemption is being requested.
- (3) After a determination has been made by the appropriate Federal, State, or local agency, the field organization and PSOs, as appropriate, shall notify EH-1, the General Counsel, and the appropriate PSOs of the disposition of the request.
- b. From Internal DOE Environmental Standards. Procedures for exemptions from standards which are internally imposed as a matter of DOE policy are as follows:
- (1) Temporary Exemptions.
- (a) Heads of Field Organizations and PSOs, as appropriate, shall submit to EH-1, with copies to the appropriate Program Senior Official(s), a request for a temporary exemption from DOE mandatory standards. A request for a temporary exemption shall contain the following:
- 1 A specification of the standard from which the field organization or PSO seeks an exemption;
 - 2 Detailed statements of why the field organization or PSO is unable to comply with the standard;
 - 3 A statement of the steps taken or to be taken to minimize the risk to the public and environment, including the conditions the field organization or PSO shall maintain and the means, methods, operations, and processes which shall be adopted and used;
 - 4 An analysis of the benefits to be gained from the exemption and the negative impact on the program or activity if not granted, compared with the risk posed by conducting the activity under the exemption; and
 - 5 A statement of when the field organization or PSO will be able to comply with the standard and what steps have been and will be taken by the field organization to come into compliance with the standard.

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- (b) EH-1 shall review the field organization's or PSO's request within 60 days of receipt of the request. After review and evaluation of the request and recommendations from the appropriate PSO, EH-1 shall approve a temporary exemption if the request establishes that the field organization or PSO:
- 1 Is unable to comply with the standard because of unavailability of funding, professional or technical personnel, materials or equipment, or because necessary construction or alteration of facilities must be completed to comply;
 - 2 Is taking all available steps to provide environment and health protection; and,
 - 3 Has an effective program for coming into compliance with the standard as quickly as possible.
- (c) A temporary exemption may be in effect for the period needed by the field organization or PSO to achieve compliance with the standard, but no longer than 2 years, except that in unusual circumstances (e.g., lack of programmatic funding), a temporary exemption may be renewed for a 1-year period. An application for renewal must be filed and processed in the same manner specified in subparagraphs 4b(1)(a) and 4b(1)(b); this shall be done at least 90 days prior to expiration of the temporary exemption.
- (2) Permanent Exemptions. In limited cases, EH-1 may approve a permanent exemption if the field organization or PSO has demonstrated that the conditions, practices, means, methods, operations, or processes to be used will provide environment, safety, and health protection which is comparable to that which would prevail if the field organization or PSO had complied with the standard. Heads of Field Organizations or PSOs shall submit to EH-1 any request for a permanent exemption from DOE standards. The request for exemption shall contain all applicable information specified in subparagraph 4b(1)(a). Within 60 days of the receipt of the request, EH-1 shall review and evaluate the request and recommendations from the appropriate PSO.
- (3) Field-Level Exemptions. The Head of the Field Organization or PSO may grant field-level exemptions from mandatory standards during the period of time in which the request for a temporary or permanent exemption is being processed by Headquarters. A field-level exemption shall be granted where the Head of the Field Organization or PSO has sufficient assurance that the

environmental and health risks are acceptably low. The field-level exemption is to be effective until a decision on the issuance of an exemption is made by EH-1.

- c. Presidential Exemption. Any request for a Presidential exemption from applicable pollution control standards shall comply with the procedures prescribed in Section 1-7 of Executive order 12088. The request should be forwarded to EH-1 with copies to the appropriate PSO. Recommendations for Presidential exemptions will be developed by EH-1, concurred in by GC and the PSO, and transmitted to the Office of Management and Budget under the Secretary's signature. Presidential exemptions may be requested under the following Acts, inter alia.

- (1) Clean Air Act, as amended, Section 118(b).
- (2) Clean Water Act, as amended, Section 313(a).
- (3) Safe Drinking Water Act, as amended, Section 1447(b).
- (4) Resource Conservation and Recovery Act, as amended, Section 6001.
- (5) Comprehensive Environmental Response, Compensation, and Liability Act, as amended, Section 120(j)(1).
- (6) Noise Control Act, as amended, Section 4(b)(2).

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MANDATORY ENVIRONMENTAL PROTECTION STANDARDS

To the extent legally applicable to a particular activity, standards contained in the following legislation, regulations, and Executive orders are mandatory for DOE Operations. This Appendix includes certain major federal requirements, but is not necessarily all-inclusive. Specific standards - including state and local requirements - applicable to individual activities should be determined on a site-specific basis.

1. EXECUTIVE ORDERS (E.O.)

- a. E.O. 11987, "Exotic Organisms."
- b. E.O. 11988, "Floodplain Management."
- c. E.O. 11989, "Off-Road Vehicles on Public Lands."
- d. E.O. 11990, "Protection of Wetlands."
- e. E.O. 11514 and E.O. 11991, "Protection and Enhancement of Environmental Quality."
- f. E.O. 11593, "Protection and Enhancement of Cultural Environment."
- g. E.O. 12088, "Federal Compliance with Pollution Control Standards."
- h. E.O. 12146, "Management of Federal Legal Resources."
- i. E.O. 12316, "Response to Environmental Damage."
- j. E.O. 12342, "Environmental Safeguards on Activities for Animal Damage Control on Federal Lands."
- k. E.O. 12344, "Naval Nuclear Propulsion Program."
- l. E.O. 12580, "Superfund Implementation."

2. THE NATIONAL HISTORIC PRESERVATION ACT OF 1966, AS AMENDED.

- a. Title 36 CFR Part 800, "Protection of Historic and Cultural Properties."
- b. Title 43 CFR Part 7, "Protection of Archaeological Resources."

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3. TITLE 42 U.S.C. 7401, ET SEQ., THE CLEAN AIR ACT, AS AMENDED.

- a. Title 40 CFR Part 50, "National Primary and Secondary Ambient Air Quality Standards."
- b. Title 40 CFR Part 52, "Approval and Promulgation of Implementation Plans."
- c. Title 40 CFR Part 53, "Ambient Air Monitoring Reference and Equivalent Methods."
- d. Title 40 CFR Part 58, "Ambient Air Quality Surveillance."
- e. Title 40 CFR Part 60, "Standards of Performance for New Stationary Sources."
- f. Title 40 CFR Part 61, "National Emission Standards for Hazardous Air Pollutants."
- g. Title 40 CFR Part 65, "Delayed Compliance Orders."
- h. Title 40 CFR Part 66, "Assessment and Collection of Noncompliance Penalties by EPA."
- i. Title 40 CFR Part 69, "Special Exemptions from Requirements of the Clean Air Act."
- j. Title 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purpose."

4. TITLE 33 U.S.C. 1251 ET SEQ., THE CLEAN WATER ACT, AS AMENDED.

- a. Title 33 CFR Parts 153-157, "Control of Pollution by Oil and Hazardous Substances."
- b. Title 33 CFR Part 159, "Marine Sanitation Devices."
- c. Title 33 Parts 320, 322-329, "Permit Programs Regulations."
- d. Title 40 CFR Part 109, "Criteria for State, Local and Regional Oil Removal Contingency Plans."
- e. Title 40 CFR Part 110, "Discharge of Oil."
- f. Title 40 CFR Part 112, "Oil Pollution Prevention."
- g. Title 40 CFR Part 113, "Liability Limits for Small Onshore Storage Facilities."

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- h. Title 40 CFR Part 114, "Civil Penalties for Violation of Oil Pollution Prevention Regulations."
- i. Title 40 CFR Part 116, "Designation of Hazardous Substances."
- j. Title 40 CFR Part 117, "Determination of Reportable Quantities for Hazardous Substances."
- k. Title 40 CFR Part 121, "State Certification of Activities Requiring a Federal License or Permit."
- l. Title 40 CFR Part 122, "EPA Administered Permit Programs: The National Pollutant Discharge Elimination System."
- m. Title 40 CFR Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System."
- n. Title 40 CFR Part 129, "Toxic Pollutant Effluent Standards."
- o. Title 40 CFR Part 131, "Water Quality Standards."
- p. Title 40 CFR Part 133, "Secondary Treatment Regulation."
- q. Title 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants."
- r. Title 40 CFR Part 140, "Marine Sanitation Device Standard."
- s. Title 40 CFR Parts 220-225, 227-229, "Ocean Dumping Regulations and Criteria."
- t. Title 40 CFR Part 230, "Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material."
- u. Title 40 CFR Part 231, "Section 404(c) Procedures."
- v. Title 40 CFR Part 401, "General Provisions for Effluent Guidelines and Standards" (Note: Title 40 CFR Part Section 401.14, "Cooling Water Intake Structures").
- w. Title 40 CFR Part 403, "General Pretreatment Regulations for Existing and New Sources of Pollution."
- x. Title 40 CFR Part 413, "Electroplating Point Source Category."
- y. Title 40 CFR Part 423, "Steam Electric Power Generating Point Source Category."

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- z. Title 40 CFR Part 457, "Explosives Manufacturing Point Source Category."
- aa. Title 40 CFR Part 459, "Photographic Point Source Category."

5. TITLE 42 U.S.C. 300 F, ET SEQ., THE SAFE DRINKING WATER ACT, AS AMENDED.

- a. Title 40 CFR Part 141, "National [Interim] Primary Drinking Water Regulations."
- b. Title 40 CFR Part 142, "National Primary Drinking Water Regulations Implementation."
- c. Title 40 CFR Part 143, "National Secondary Drinking Water Regulations."
- d. Title 40 CFR Part 144, "Underground Injection Control Program."
- e. Title 40 CFR Part 146, "Underground Injection Control Program: Criteria and Standards."
- f. Title 40 CFR Part 147, "State Underground Injection Control Programs."
- g. Title 40 CFR Part 149, "Sole Source Aquifers."

6. TITLE 16 U.S.C. 1451, ET SEQ., THE COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED.

- a. Title 15 CFR Part 921, "NOAA Guidelines on Estuarine Sanctuaries."
- b. Title 15 CFR Part 923, "NOAA Coastal Zone Management Program Approval Regulations."
- c. Title 15 CFR Part 930, "NOAA Regulations on Federal Consistency with Approved Coastal Management Program."
- d. Title 15 CFR Part 931, "NOAA Regulations on Coastal Energy Impact Program."

7. RADIATION PROTECTION.

- a. Title 10 CFR Part 712, "Grand Junction Remedial Action Criteria."
- b. Title 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."
- c. Title 40 CFR Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes."

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- d. Title 40 CFR Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."
8. TITLE 42 U.S.C. 9601 [9615] ET SEQ., THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980, AS AMENDED.
- a. Title 40 CFR Part 300, "National Oil and Hazardous Substances Pollution Contingency Plan."
- b. Title 40 CFR Part 302, "Designation, Reportable Quantities, and Notification."
- c. Title 40 CFR Part 305, "Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Arbitration Procedures."
- d. Title 40 CFR Part 306, "Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Natural Resources Claims Procedures."
- e. Title 43 CFR Part 11, "Natural Resource Damage Assessments."
9. TITLE 7 U.S.C. 136, ET SEQ., THE FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT, AS AMENDED.
- a. Title 40 CFR Part 162, "Regulations for the Enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act."
- b. Title 40 CFR Part 165, "Regulations for the Acceptance of Certain Pesticides and Recommended Procedures for the Disposal and Storage of Pesticides and Pesticides Containers."
- c. Title 40 CFR Part 166, "Exemption of Federal and State Agencies for Use of Pesticides Under Emergency Conditions."
- d. Title 40 CFR Part 170, "Worker Protection Standards for Agricultural Pesticides."
- e. Title 40 CFR Part 171, "Certification of Pesticide Applicators."
10. TITLE 42 U.S.C. 6901, ET SEQ., THE RESOURCE CONSERVATION AND RECOVERY ACT OF 1976, AS AMENDED.
- a. Title 40 CFR Part 240, "Guidelines for the Thermal Processing of Solid Wastes."
- b. Title 40 CFR Part 241, "Guidelines for the Land Disposal of Solid Wastes."

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- c. Title 40 CFR Part 243, "Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste."
- d. Title 40 CFR Part 244, "Solid Waste Management Guidelines for Beverage Containers."
- e. Title 40 CFR Part 245, "Promulgation Resource Recovery Facilities Guidelines."
- f. Title 40 CFR Part 246, "Source Separation for Materials Recovery Guidelines."
- g. Title 40 CFR Part 247, "Guidelines for Procurement of Products that Contain Recycled Material."
- h. Title 40 CFR Part 256, "Guidelines for Development and Implementation of State Solid Waste Management Plans."
- i. Title 40 CFR Part 257, "Criteria for Classification of Solid Waste Disposal Facilities and Practices."
- j. Title 40 CFR Part 260, "Hazardous Waste Management System: General."
- k. Title 40 CFR Part 261, "Identification and Listing of Hazardous Waste."
- l. Title 40 CFR Part 262, "Standards Applicable to Generators of Hazardous Waste."
- m. Title 40 CFR Part 263, "Standards Applicable to Transporters of Hazardous Waste."
- n. Title 40 CFR Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."
- o. Title 40 CFR Part 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."
- p. Title 40 CFR Part 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities."
- q. Title 40 CFR Part 267, "Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities."
- r. Title 40 CFR Part 268, "Land Disposal Restrictions."

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- s. Title 40 CFR Part 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program."
 - t. Title 40 CFR Part 272, "Approved State Hazardous Waste Management Programs."
 - u. Title 40 CFR Part 280, "Underground Storage Tanks."
11. TITLE 16 U.S.C. 1531, ET SEQ., THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED, TITLE 50 CFR PART 17, "FISH AND WILDLIFE SERVICE LIST OF ENDANGERED AND THREATENED WILDLIFE AND PLANTS".
 12. TITLE 15 U.S.C., ET SEQ., THE TOXIC SUBSTANCES CONTROL ACT, AS AMENDED, TITLE 40 CFR PART 761, "POLYCHLORINATED BIPHENYLS (PCBs) MANUFACTURING, PROCESSING, DISTRIBUTION IN COMMERCE, AND USE PROHIBITIONS".
 13. TITLE 42 U.S.C. 4901, ET SEQ., THE NOISE CONTROL ACT OF 1972, AS AMENDED.
 14. TITLE 16 U.S.C. 1131, ET SEQ., THE WILDERNESS ACT, AS AMENDED, TITLE 43 CFR PART 19, "WILDERNESS PRESERVATION".

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CHAPTER II

NOTIFICATION AND REPORTS

1. PURPOSE. To establish requirements for: (a) notification and follow-up of environmental occurrences; and, (b) periodic routine reporting of significant environmental protection information. Each DOE facility is unique; thus, notification and reporting requirements shall be determined by the Head of Field Organization on a case-by-case basis, consistent with regulatory requirements and DOE directives.
2. NOTIFICATION OF ENVIRONMENTAL OCCURRENCES TO EH-1.
 - a. Consistent with the notification requirements contained in DOE 5484.1 and DOE 5000.3, and the DOE orders in the 5500 series dealing with emergency management, field organizations shall notify the Headquarters Emergency Operations Center (EOC) of the significant nonroutine release of any pollutant or hazardous substance, e.g., releases of hazardous substances that are reported to the Environmental Protection Agency National Response Center as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Notification to the EOC shall be concurrent with notification to any regulatory agencies. Where applicable, existing reporting formats should be used. A written report of follow-up and resolution of any reported environmental occurrence which has environmental significance shall be prepared in accordance with the requirements of DOE 5484.1 and DOE 5000.3.
 - b. Field organizations shall maintain documentation of responses to environmental occurrences and have them available for regulatory agency inspectors, DOE auditors, and the general public. Field organizations shall prepare annual summary reports on environmental occurrence activities. This information shall be included in Annual Site Environmental Reports.
3. OFFICE OF MANAGEMENT AND BUDGET CIRCULAR A-106. Departmental pollution abatement projects shall be reported in a 5-year plan as required by Office of Management and Budget (OMB) Circular A-106, and EPA and DOE guidance issued thereto. Field Organizations shall submit their reports semiannually to EH-1 on dates determined by EH-1, but in any event no later than May 1 and December 15 of each year. Confirmatory reports are to be submitted by line organizations in those instances where there are no pollution abatement projects planned or underway.

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4. ANNUAL SITE ENVIRONMENTAL REPORT.

- a. Purpose. The purpose of this report is to present summary environmental data so as to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts.
- b. Extent. Reports shall be prepared for all sites that conduct significant environmental protection programs. The breadth and detail should reflect the size and extent of any program at a particular site.
- c. Reporting Criteria. All DOE facilities that conduct significant environmental protection programs shall prepare an Annual Site Environmental Report. Environmental reports covering the previous calendar year shall be prepared annually and distributed by June 1 to EH-1 (10 copies), appropriate PSOs, the Office of Scientific and Technical Information, the Environmental Protection Agency, and to other agencies and organizations, as appropriate.
- d. Content and Format. Suggested content and format for the Annual Site Environmental Report is contained in Attachment II-1.

5. REPORTS ON RADIOACTIVE EFFLUENT/ON-SITE DISCHARGE/UNPLANNED RELEASES.

- a. Radioactive Effluent and On-site Discharge Data Reports covering the previous calendar year shall be submitted to the Waste Information Systems Branch, EG&G Idaho, Inc., Idaho Falls, Idaho 83415, by April 1; a copy of the cover letter shall be sent to EH-1. 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 On-site Discharge Information System User's Manuals. Maps should be included only when they reflect modifications (terminations or startups, etc.) from previous years. The report shall consist of:
- (1) A cover sheet listing the site, facility, report period, contractor(s), and address;
 - (2) A summary providing pertinent descriptive and interpretative information which would serve to explain any facets of the data which are not adequately described on the sheets. (Classified effluent data should be submitted on separate forms.);
 - (3) Maps, 8-1/2 x 11 inches, showing the locations of effluent streams and on-site discharge points;

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- (4) Completed DOE F 5821.1, "Radioactive Effluents/On-site Discharges/Unplanned Releases," unless submitted via the Secure Automatic Communications Network (SACNET) or directly to the computer operations.
- b. Unplanned releases of radioactive materials in effluents, such as spills, leaks, etc., whether on-site or offsite, also shall be reported to the Information System Branch, EG&G Idaho, Inc., on Form DOE F-5821.1. Releases of no environmental concern, including those that are subsequently cleaned up, need not be reported.
 - c. Field Organizations should assure that any data errors on DOE F 5821.1 are reported promptly to the Information Systems Branch, EG&G Idaho, Inc., using amended forms.

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SUGGESTED CONTENT AND FORMAT FOR ANNUAL SITE ENVIRONMENTAL REPORTS

Content and format for the Annual Site Environmental Report is provided below; guidelines and examples are included to illustrate the quality and kind of information required. The report should be of the high quality typical of DOE and contractor technical and public reports. The cover should be of appropriate quality and appearance, and the text printed and professionally edited. Where possible, pages illustrating figures, maps, etc. should be 8 1/2" x 11".

1. COVER PAGE. The cover page should include the site name, facility, reporting period, reporting organization, address, and document number. The report should be titled "(Name) Site Environmental Report for Calendar Year 19--."
2. TITLE PAGE. Same as for 1 above.
3. TABLE OF CONTENTS. The Table of Contents should list sections, locations of figures, texts, appendices, references, etc., in the document.
4. INTRODUCTION. The introduction should include a brief description of the site, its mission, the nature of its primary operations, and activities. A general discussion of environmental features and land and water use, including pertinent demographic information, should be included in this section.
5. SUMMARY. The summary should provide evaluation and interpretation of the information included in each of the sections (items 6-9 which follow) contained in the report; the meaning of these data should be explained in the context of applicable environmental standards and requirements. The summary should be written in a manner understandable to the general public. Explanations, as appropriate, should 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, should be included. Population dose estimates and the dose to the maximum exposed individual (where appropriate) should be included. The total quantity of radioactivity by radionuclide released as airborne and liquid effluents should be included, along with descriptive information on nonradioactive effluents.
6. COMPLIANCE SUMMARY. This section should review the facility's compliance record. Specific instances of noncompliance should be discussed and a description of corrective actions should be included.

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7. ENVIRONMENTAL PROGRAM INFORMATION. This section should provide a summary of all of a site's environmental activities performed to comply with laws and regulations, to enhance environmental quality, and to improve understanding of the effects of environmental pollutants from site operations. Items to be included are:

- a. A summary of environmental monitoring performed. This should be a brief description of the types of monitoring performed; which regulations require it; number of stations, frequency, and parameters measured; to whom data are reported; and a summary of results compared to applicable standards. This summary should address programs for both radioactive and nonradioactive monitoring.
- b. A listing of environmental permits issued to the site by Federal, state and local regulatory agencies. Include the type of permit, by whom issued, and the expiration date.
- c. A listing of draft and final EISs and EAs 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.

8. ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION. This section should provide an accurate description of the environmental radiological monitoring program conducted at each facility. For facilities that do not need to monitor for radioactivity in the environment, a "Not Applicable" response is sufficient.

- a. Radioactive Effluent Data. Effluent data for radionuclides should be summarized. The nuclides of concern and the total number of curies in airborne and liquid effluents released to the offsite environment should 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 result in separate routes of potential exposure, the radioactivity discharged to each receiving stream should be identified. For purposes of reporting radiological effluent data, gross radioactivity measurements are unacceptable, unless specified by applicable federal, state, or local regulations.
- b. Environmental Sampling for Radioactivity. 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 should be presented. Individual data points are not required, but tables, graphs, or text which clearly and accurately present the overall monitoring results should be provided. A map

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

- c. Reporting Potential Dose to the Public. The Environmental Report should contain an assessment of the potential radiation exposure to the public which could have resulted from site operations during the calendar year. The assessment should be as accurate and realistic as possible. The modeling and calculation methodology used in the dose assessment should be included or referenced. A comparison of results with applicable standards and relevant parameters (e.g., natural and manmade sources of exposure) also should be included.
- d. Reporting Units. The following units should be used in reporting radiological data:
- (1) Air. uCi/ml (for tritium, report in pCi/ml; for uranium and thorium, also include pg/ml).
 - (2) Sediment. uCi/g or pCi/g dry weight. Specify sample depth and method of obtaining dry weight. For uranium and thorium, also include ug/g dry or wet weight, where possible. For tritium, the concentration may be expressed in uCi/ml of moisture content in unit volume of wet samples.
 - (3) Food and Vegetation. uCi/g or pCi/g dry weight. Specify percent moisture and method of obtaining dry weight. For tritium, the concentration may be expressed in uCi/ml of moisture content in unit volume of wet samples.
 - (4) Milk. uCi/ml.
 - (5) Penetrating Radiation. mrem/yr.
 - (6) Soil. Three possible reporting units:
 - (a) uCi/m² (or pCi/m²). Specify sample depth or profile depth. For tritium, the concentration may be expressed in uCi/ml of soil moisture;

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- (b) uCi/g (or pCi/g) dry weight. Specify sample depth and method of obtaining dry weight;
- (c) For uranium and thorium, also include ug/g dry or wet weight.

(7) Water. uCi/ml.

9. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION. This section should provide an accurate description of the environmental non-radiological monitoring program conducted at each facility. For facilities that do not need to monitor non-radiological pollution, a "Not Applicable" response is sufficient.

- a. Effluent Data. Effluent monitoring data should be summarized. Pollutants of concern and discharge volumes in airborne and liquid effluents released to the environment should be included in the portion of the report dealing with air and water monitoring, respectively.
- b. Environmental Sampling for Non-Radiological Pollution. 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 should be presented. Individual data points are not required, but tables, graphs, or text which clearly and accurately present the overall monitoring results should be provided. A map showing the location of monitoring stations and sampling points also should be included.

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

- c. Reporting Units. In reporting non-radiological data, units should agree with those specified by the analytical methods. Where applicable, reporting units should agree with the units specified on permits issued under regulatory programs.

10. GROUNDWATER PROTECTION. The groundwater protection program should be summarized, including a review of the monitoring program that describes the number of wells, sampling method, sampling frequency, analyses performed and a summary of results. There also should be a summary of the hydrogeology of the site, major aquifers, movement of groundwater, potential sources of groundwater pollution, and uses of groundwater in the vicinity of the site.

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11. QUALITY ASSURANCE. A quality assurance section should summarize the measures taken to ensure the quality of monitoring data. The overall program, including sampling, analysis, and data management, should be described for both radioactive and nonradioactive effluent and environmental monitoring. A summary of results from participation in interlaboratory cross-check programs should be included, listing site results and expected results.
12. REFERENCES. A section should list applicable references and other documents cited in the body of the report.
13. DISTRIBUTION LIST. A standard distribution list of those persons or organizations receiving copies of the report should be included.

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CHAPTER III

ENVIRONMENTAL PROTECTION PROGRAM PLANS

1. PURPOSE. This Chapter establishes requirements for DOE operations to develop and implement specific program plans for each facility or group of facilities for which they are responsible. The Office of Fossil Energy shall be responsible for developing these plans for operations under its direct cognizance.
2. IMPLEMENTATION PLAN. Each field organization shall prepare a plan for implementing the requirements of this Order. An implementation plan shall be prepared for each facility or group of facilities, the purpose of which is to provide management direction, including assignment of responsibilities and authorities, to ensure that all DOE facilities are operated and managed in a manner that will protect, maintain, and, where necessary, restore environmental quality, minimize potential threats to the environment and the public health, and comply with environmental regulations and DOE policies. Specifically, the implementation plan shall:
 - a. Provide environmental protection goals and objectives for the organization, and identify strategies and timetables for attaining them. Organization and staffing, including assignment of responsibilities for environmental activities, policies, facility operating procedures, and budgeting, will be described.
 - b. Provide an overall framework for the design and implementation of an environmental protection program for each DOE facility; and
 - c. Assign responsibilities for complying with requirements under all Federal, state and local environmental laws and/or regulations for all DOE facilities.
 - d. The implementation plan shall be prepared no later than 12 months after the effective date of this Order and shall be updated annually. The plan shall be approved by the appropriate PSO, with concurrence by EH-1.
3. LONG RANGE ENVIRONMENTAL PROTECTION PLAN. As an element of its long range ES&H planning, each field organization shall develop a long range environmental protection plan that comprehensively defines specific environmental objectives and the means and schedules for attaining objectives and completing programs and projects at each facility or group of facilities. Information contained in this plan will be integrated into the appropriate PSO planning, support environmental program budget requests, and provide the basis for comprehensive PSO environmental long range planning. The plan will serve as a mechanism for Headquarters and field organizations to coordinate strategies for addressing environmental needs.

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- a. The plan shall:
- (1) Identify requirements;
 - (2) Compare operations against requirements to identify needs;
 - (3) Establish strategies for meeting identified needs;
 - (4) Identify activities required to implement the strategies; and
 - (5) Identify needed resources and develop a schedule to accomplish those activities.

b. Specific guidance for preparing the plan will be issued by EH-1. Each plan will be submitted to the appropriate PSO, EH-1, and MA-1.

4. SPECIAL PROGRAM PLANNING REQUIREMENTS. In addition to other program requirements and documentation required in this Order, each Head of Field Organization shall prepare a separate plan of sufficient scope and detail to reflect program significance, as appropriate, for each of the following activities.

- a. A Groundwater Protection Management Program that includes, for each site, the following: (1) documentation of the groundwater regime with respect to quantity and quality; (2) design and implementation of a groundwater monitoring program to support resource management and comply with applicable environmental laws and regulations; (3) a management program for groundwater protection and remediation, including specific Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act (RCRA) and CERCLA actions; (4) a summary and identification of areas that may be contaminated with hazardous substances; (5) strategies for controlling sources of these contaminants; (6) a remedial action program that is part of the site CERCLA program required by DOE 5400.4; (7) decontamination and decommissioning, and other remedial programs contained in DOE directives. Plans, permits, and other technical documents such as those associated with compliance with the SDWA, RCRA, and CERCLA may be used in whole or in part to satisfy this requirement. This plan shall be completed no later than 18 months after the effective date of this Order. The plan shall be reviewed annually and updated every 3 years.
- b. A Waste Minimization Program that will contain goals for minimizing the volume and toxicity of all wastes that are generated, with annual reductions if programmatic requirements allow. Changes in waste quantity, volume and toxicity that are achieved shall be compared with quantities generated in the previous year. The proposed methods of treatment, storage, and disposal that accomplish waste minimization that are technically and economically practicable shall be reported as appropriate. Waste minimization plans required by specific legislation,

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such as RCRA, shall be included as a part of this program plan. This plan shall be completed no later than 18 months after the effective date of this Order. The plan shall be reviewed annually and updated every 3 years.

- c. A Pollution Prevention Awareness Program that shall be specifically identified in his or her environmental protection statement. All mission statements and project plans shall recognize a requirement for pollution prevention, where appropriate. The documented program, including elements for employee awareness through specific training, special awareness campaigns, and incentives and award programs shall be implemented. This plan shall be completed no later than 12 months after the effective date of this Order. The plan shall be reviewed annually and updated every 3 years.

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CHAPTER IV

ENVIRONMENTAL MONITORING REQUIREMENTS

1. PURPOSE.

- a. This Chapter contains requirements and guidance for environmental monitoring programs concerned with: (1) measuring and monitoring effluents from DOE operations; and (2) surveillance through measurement, monitoring, and calculation of the effects of those operations on the environment and public health. The objectives of the monitoring programs are to: demonstrate compliance with legal and regulatory requirements imposed by applicable Federal, State and local agencies; confirm adherence to DOE environmental protection policies; and support environmental management decisions. A critical element of monitoring is quality assurance and verification. Each DOE Facility is unique; therefore, the need and levels of effort for monitoring programs shall be determined by the appropriate field organization on a case-by-case basis, consistent with regulatory requirements, DOE directives, and the degree of environmental assurance that activities at the particular site require.
- b. All requirements contained in Chapter IV shall be implemented no later than 36 months after the effective date of this Order, unless otherwise required by other DOE Orders, or by applicable Federal, State, or local legislation or regulation.
- c. Monitoring requirements for radioactivity are contained in DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

2. APPLICABILITY.

- a. The following environmental monitoring requirements apply: (1) those contained in DOE Orders in the 5400 series dealing with radiation protection of the public and the environment, and DOE 5820.2; and (2) those specified by applicable Federal, State, or local regulations.
- b. To the extent that a regulation or permit allows for exemptions from required monitoring practices and procedures, Heads of Field Organizations shall obtain approval for any exemption from the appropriate regulatory agency. In those instances where an exemption from a DOE-imposed monitoring requirement is justifiable, approval shall be granted by the appropriate Head of Field Organization. The procedures contained in page I-1, paragraph 4 of this Order are not applicable to any exemptions that are made for environmental monitoring requirements.

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- (c) Evaluate the effectiveness of effluent treatment and control.
 - (d) Identify potential environmental problems and evaluate the need for remedial actions or mitigation measures.
 - (e) Support permit revision and/or reissuance.
 - (f) Detect, characterize, and report unplanned releases.
- (2) Effluent monitoring shall comply with applicable regulations and shall be conducted to provide representative measurements of the quantities and concentrations of pollutants in liquid and airborne discharges, and solid wastes.
- (a) Monitoring Stations. Effluents from on-site waste treatment or disposal systems shall be monitored in accordance with applicable regulations. Influent to on-site waste treatment or disposal systems should be monitored as needed.
 - (b) Sampling. Sample collection programs shall reflect specific facility needs. Type and frequency of sampling shall be adequate to characterize effluent streams.
 - (c) Sample Analysis. Standard analyses shall be used to analyze samples whenever such methods are required by regulatory programs. Exemptions due to analytical problems or for non-routine analyses may be employed after receiving approval from the appropriate regulatory agency. Analyses not required by regulations may be conducted as determined by site-specific conditions.
 - (d) Monitoring Data Recordkeeping. Auditable records shall be established in accordance with the requirements of DOE 5700.6B.

b. Environmental Surveillance.

- (1) Environmental surveillance shall be conducted to monitor the effects, if any, of DOE activities on on-site and offsite environmental and natural resources. An environmental surveillance screening program shall be undertaken at DOE sites to determine the need for a permanent surveillance program. Environmental surveillance shall be designed to satisfy one or more of the following program objectives:
- (a) Verify compliance with applicable environmental laws and regulations;

- (b) Verify compliance with environmental commitments made in Environmental Impact Statements, Environmental Assessments, Safety Analysis Reports, or other official DOE documents;
 - (c) Characterize and define trends in the physical, chemical and biological condition of environmental media;
 - (d) Establish baselines of environmental quality;
 - (e) Provide a continuing assessment of pollution abatement programs;
 - (f) Identify and quantify new or existing environmental quality problems.
- (2) Environmental surveillance programs and components should be determined on a site-specific basis by the field organization. Programs should reflect facility characteristics, applicable regulations, hazard potential, quantities and concentrations of materials released, the extent and use of affected air, land, and water, and specific local public interest or concern. Surveillance programs are likely to include one or more of the following:
- (a) Monitoring stations;
 - (b) Sampling and analysis; and
 - (c) Monitoring data recordkeeping.

6. METEOROLOGICAL MONITORING PROGRAM. Representative meteorological data are required at DOE facilities to support environmental monitoring activities. This information is essential to characterize atmospheric transport and diffusion conditions in the vicinity of the DOE facility and to represent other meteorological conditions (e.g., precipitation, temperature, and atmospheric moisture) which are important to environmental surveillance activities such as air quality and radiation monitoring.

- a. Meteorological Information/Monitoring Programs. A meteorological information/monitoring program shall be developed as a specific element of all environmental monitoring plans. The program shall identify types of meteorological information required to support all environmental protection activities (both routine and non-routine) and the regulations applicable to assessing impacts of airborne releases. The elements of the program (e.g., acquisition, analysis, and data management) shall be specified and the rationale or purpose for selecting those elements documented.

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- b. General Requirements. Representative meteorological information shall be available at or in the vicinity of DOE facilities to:
- (1) Provide data to characterize atmospheric transport, diffusion conditions, and other climatic conditions of importance in the vicinity of the DOE facility for assessments of the impacts of airborne releases (both routine and non-routine) on public health and safety;
 - (2) Provide data to characterize conditions important to environmental surveillance activities such as air quality and radiation monitoring;
 - (3) Provide data to confirm compliance with and implementation of applicable regulations and DOE Orders; and
 - (4) Provide a consistent data base upon which decisions can be made concerning airborne releases and appropriate control activities.

7. RADIOLOGICAL MONITORING.

- a. Requirements for the environmental monitoring of radioactive materials are to be found in DOE Orders in the 5400 series dealing with radiation protection of the public and the environment. Airborne radiation and radioactive materials discharged from DOE facilities shall comply with the requirements of 40 CFR Part 61, "National Emission Standards for Hazardous Air Pollutants." Further, for those radioactive materials not regulated under the Clean Air Act, DOE has established standards to meet its responsibilities under the Atomic Energy Act.
- b. An assessment of the potential radiation dose to members of the public which could have resulted from site operations shall be made for facilities required to conduct effluent and environmental radiological monitoring. Assessments shall be made in accordance with the requirements of DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

8. NON-RADIOLOGICAL MONITORING.

a. Air Monitoring - Emissions.

- (1) Air emission monitoring shall be in accordance with the requirements of applicable Federal, State, and local regulations authorized by the Clean Air Act (42 U.S.C. 7401, et. seq.). Section 118 of the Act specifically addresses the control of airborne pollution from federal facilities. Design of air quality monitoring programs should be undertaken with a thorough understanding of the complex framework of air quality management.

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- (2) Where applicable, DOE facilities shall comply with monitoring requirements discussed in 40 CFR Part 60, which includes monitoring of fossil fuel combustion sources and associated test methods. Appendix A of 40 CFR Part 60 provides methods referred to in 40 CFR Part 60.8 (Performance Tests) and 40 CFR Part 60.11 (Compliance with Standards and Maintenance Requirements).
 - (3) Large permanent facilities or modification to such facilities may require a Prevention of Significant Deterioration (PSD) permit prior to construction. In addition to pre- and post-operational emission testing, the permit process may require up to a year of meteorological and ambient air quality monitoring. Monitoring shall conform to the EPA PSD monitoring regulations (40 CFR Part 58) which contain siting, quality assurance, and accuracy requirements. Siting of monitoring stations requires the use of atmospheric dispersion modeling to locate areas of expected maximum offsite impact. The rules also identify specific reference methods and equivalent method analyses which shall be used for the program.

b. Air Monitoring - Environmental Surveillance.

- (1) Ambient air quality monitoring programs should be designed to accomplish the following:
 - (a) Establish background concentration levels of pertinent chemical species;
 - (b) Determine the highest concentrations of the pertinent pollutant species expected to occur in the vicinity of DOE operations;
 - (c) Determine representative pollutant concentrations at areas where public health and other concerns should be considered; and
 - (d) Evaluate the effects of emissions on ambient levels of pertinent contaminants.
- (2) Where possible, background data should be gathered from existing State and Local Air Monitoring Stations (SLAMS) which are required by 40 CFR Part 58.20 to be provided for in a State's implementation plan. Design considerations for siting any supplementary air quality monitoring stations should include emissions, meteorology and climatology, topography, and geography. Specific requirements associated with ambient air quality monitoring are found in regulations promulgated by EPA. Particular attention shall be given to the following:

- (a) 40 CFR Part 50, "National Primary and Secondary Ambient Air Quality Standards"
- (b) 40 CFR Part 52, "State Implementation Plans"
- (c) 40 CFR Part 53, "Ambient Air Monitoring Reference and Equivalent Methods"
- (d) 40 CFR Part 58, "Ambient Air Quality Surveillance"

c. Water Monitoring - Effluents.

- (1) Under the authority of the Clean Water Act (33 U.S.C. 1251, et. seq.), EPA has promulgated regulations for monitoring liquid effluent discharges. In the National Pollutant Discharge Elimination System (NPDES) established by section 402, the EPA Administrator, or States with approved programs, after opportunity for public hearing, issues permits that control and limit the discharge of any pollutant to the waters of the United States.
- (2) Where required, DOE facilities shall monitor liquid effluent discharges. Federal regulations defining NPDES requirements for monitoring nonradioactive effluents appear in the following:
 - (a) 40 CFR Part 123, "State Program Requirements"
 - (b) 40 CFR Part 124, "Procedures for Decisionmaking"
 - (c) 40 CFR Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System"
 - (d) 40 CFR Part 129, "Toxic Pollutant Effluent Standards"
- (3) NPDES permits contain specific and legally enforceable effluent limitations and self-monitoring requirements for flow measurement and sampling.
- (4) In addition to rules promulgated under the Clean Water Act, DOE facilities shall satisfy monitoring requirements called for under the Resource Conservation and Recovery Act (RCRA), as amended, since under RCRA, a solid waste can be a liquid. Under RCRA, it shall first be determined if a waste is hazardous. If a waste is determined to be hazardous, the applicable regulations in 40 CFR Parts 260 through 280 shall be implemented.

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d. Water Monitoring - Environmental Surveillance.

- (1) Ambient water quality monitoring should be conducted through a network of fixed stations from which data will establish well-defined histories of the physical, biological, and chemical conditions of local bodies of water and sediments. The data obtained from this network should be coordinated with other monitoring activities. Water quality data may be obtained from existing State and local monitoring stations.
- (2) Analysis of data collected from a fixed station monitoring network should support:
 - (a) Characterizing and defining trends in the physical, chemical, and biological condition of surface waters;
 - (b) Establishing baselines of water quality;
 - (c) A continuing assessment of water pollution control programs;
 - (d) Identifying new water quality problems; and
 - (e) Detecting, characterizing, and reporting unplanned releases and their effects on water quality.
- (3) Monitoring networks should be operated and maintained in a uniform manner, i.e., through established procedures that allow comparative evaluations of data from monitoring sites. Receiving water characteristics will determine the location of stations. A reconnaissance survey might be sufficient in siting stations. Under complex circumstances, mathematical models could be needed to select stations sites.
- (4) Monitoring programs are best served by fixed station networks. However, a network of effluent monitoring and selected mobile monitoring stations could satisfy the needs at some facilities.
- (5) Surface water sampling performed at fixed monitoring stations will characterize physical and chemical properties of the water column and sediments, and biological species in the water column and benthos. Types of sampling performed should depend upon local conditions and the variability of stream characteristics and water quality.
- (6) The monitoring frequency at a fixed network station is a function of the variability of the chemical, physical, and biological conditions of the water body. Data collected shall be representative of the variations in water quality and changes in pollutant loads. Varying sampling frequencies could be required

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to accurately reflect seasonal changes, variable pollution sources, time of water travel between stations, and tidal and diurnal variations.

- (7) Ambient water quality monitoring serves to confirm compliance with the Clean Water Act. An understanding of the Water Quality Management (WQM) process implemented by EPA, the States, interstate agencies, and area-wide, local and Regional planning organizations is essential to the design of a water quality monitoring program. The elements of the WQM processes are described in 40 CFR Part 130. Test procedures for pollutant analyses are listed in the 40 CFR Part 136.

9. GROUNDWATER MONITORING PROGRAM. Groundwater that is or could be affected by DOE activities shall be monitored to determine and document the effects of operations on groundwater quality and quantity and to demonstrate compliance with DOE requirements and applicable Federal, State, and local laws and regulations.

- a. Groundwater Monitoring Plans. A groundwater monitoring plan shall be developed as a specific element of all environmental monitoring plans and the Groundwater Protection Management Program required in page III-2, subparagraph 4a. The plan shall identify all DOE requirements and regulations applicable to groundwater protection and include monitoring strategy. The elements of the groundwater monitoring program shall be specified (sampling plan, sampling, analysis, and data management), as shall the rationale or purpose for selecting these elements.
- b. General Requirements. Groundwater monitoring programs shall be conducted on-site and in the vicinity of DOE facilities to:
 - (1) Obtain data for the purpose of determining baseline conditions of groundwater quality and quantity;
 - (2) Demonstrate compliance with and implementation of all applicable regulations and DOE Orders;
 - (3) Provide data to permit the early detection of groundwater pollution or contamination;
 - (4) Provide a reporting mechanism for detected groundwater pollution or contamination.
 - (5) Identify existing and potential groundwater contamination sources and to maintain surveillance of these sources;
 - (6) Provide data upon which decisions can be made concerning land disposal practices and the management and protection of groundwater resources.

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- c. Site-specific characteristics shall determine monitoring needs. Where appropriate, groundwater monitoring programs shall be designed and implemented in accordance with 40 CFR Part 264, Subpart F, or 40 CFR Part 265, Subpart F. For sites with multiple groundwater pollutant sources, extensive groundwater pollution or other unique site problems, groundwater monitoring programs could require more extensive information than those specified in 40 CFR Parts 264 and 265. Monitoring for radionuclides shall be in accordance with DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

10. QUALITY ASSURANCE AND DATA VERIFICATION.

- a. Quality Assurance. A quality assurance program consistent with DOE 5700.6B shall be established covering each element of environmental monitoring and surveillance programs commensurate with its nature and complexity. The quality assurance program shall include, but not be limited to, the following:
- (1) Organizational responsibility;
 - (2) Program design;
 - (3) Procedures;
 - (4) Field quality control;
 - (5) Laboratory quality control;
 - (6) Human factors;
 - (7) Recordkeeping;
 - (8) Chain-of-custody procedures;
 - (9) Audits;
 - (10) Performance reporting; and
 - (11) Independent data verification.
- b. Laboratory Certification. DOE and DOE contractor laboratories shall confirm the need and apply for any certification requirements with appropriate Federal, State or local agencies. Where DOE operations secure the support of outside contractor laboratories, this work shall be conducted by appropriately certified laboratories.

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- c. DOE Laboratory Quality Assessment Program for Radioactive Material. All DOE and contractor laboratories that conduct analytical work in support of DOE environmental radiological monitoring programs for radioactive materials shall participate in the DOE interlaboratory quality assurance program coordinated by the DOE Environmental Measurements Laboratory, New York, New York. Guidelines and procedures for this program shall be issued annually by EH-1.

- d. Independent Data Verification. EH-1, in consultation with the appropriate PSO and field organization shall develop an independent data verification program as a part of environmental monitoring programs at DOE facilities. The program shall be in place no later than twelve months after the effective date of this Order.

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SELECTED REFERENCES FOR ENVIRONMENTAL MONITORING

1. 40 CFR Part 60, "Standards of Performance for New Stationary Sources."
2. 40 CFR Part 61, "National Emission Standards for Hazardous Air Pollutants."
3. 40 CFR Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System."
4. 40 CFR Part 129, "Toxic Pollutant Effluent Standards."
5. 40 CFR Part 130, "Water Quality Planning and Management."
6. 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants."
7. 40 CFR Part 146, "Underground Injection Control Program: Criteria and Standards."
8. 40 CFR Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."
9. 40 CFR Part 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."
10. MCD-51, NPDES Compliance Sampling Inspection Manual, U.S. Environmental Protection Agency, 1979.
11. EPA 600/4-82-029, Handbook for Sampling and Sample Preservation of Water, U.S. Environmental Protection Agency, 1982.
12. EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, 1979.
13. EPA-600/7-77-088, Handbook for Analytical Quality Control in Radioanalytical Laboratories, U.S. Environmental Protection Agency, 1977.
14. EPA-550/7-77-14, Quality Control for Environmental Measurements Using Gamma-Ray Spectrometry, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 1977.
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16. EPA 600/4-84-077, Characterization of Hazardous Waste Sites - A Methods Manual, U.S. Environmental Protection Agency, 1984.

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17. SW-846, Test Methods for Evaluating Solid Waste, U.S. Environmental Protection Agency, 1986.
18. Guidance for Air Quality Monitoring Network Design and Instrument Siting (40 CFR Part 58, Appendices D and E), U.S. Environmental Protection Agency, January 1974.
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21. EMSL-LV-0539-17, Radiochemical Analytical Procedures for Analysis of Environmental Samples, U.S. Environmental Protection Agency, 1979.
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23. Methods of Air Sampling and Analysis, APHA Intersociety Committee, Morris Katz, editor, 1983.
24. ANSI N.13.1-1969, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities, American National Standards Institute.
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26. HASL-300, HASL Procedures Manual, Environmental Measurements Laboratory.
27. Manual of Groundwater Sampling Procedures, National Water Well Association, Worthington, Ohio, 1981.
28. Groundwater Monitoring, L.G. Everett, General Electric Company, Schenectady, NY, 1980.
29. Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operations)--Effluent Streams and the Environment, Revision 1, U.S. Nuclear Regulatory Commission, Office of Standards Development, Washington, DC, 1979.
30. IDO-12096, Radiological and Environmental Sciences Laboratory Analytical Chemistry Branch Procedures Manual, U.S. Department of Energy, Idaho Falls, ID, 1982.

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31. ANSI N.42.18-1980, Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactivity in Effluents, American National Standards Institute.
32. Air Pollutant Sampling and Analysis Deskbook, Cheremisinoff 1979.
33. AIRDOS-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Doses to Man from Airborne Releases of Radionuclides, Oak Ridge National Laboratory, ORNL-5532.
34. Test Report: Particulate Sampling Strategy in Circular Ducts, J. Brown and K. Yu, Emission Measurement Branch, Emissions Standards and Engineering Division, U.S. Environmental Protection Agency, 1980.
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38. EPA 600/8-78-017, Microbiological Methods for Monitoring the Environment, Water and Waste, U.S. Environmental Protection Agency, 1978.
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